Road-, Air- and Water-based Future Internet Experimentation

Project Acronym:	RAWFIE		
Contract Number:	645220		
Starting date:	Jan 1st 2015	Ending date:	Dec 31st, 2018

Deliverable Number and Title	D3.2 - Specification & Analysis of RAWFIE Components Requirements (b)		
Confidentiality	PU	Deliverable type[1]	R
Deliverable File	RAWFIE_D_3_2_final	Date	2016-03-15
Approval Status[2]	WP leader	Version	1.000
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[1] Deliverable type: P(Prototype), R (Report), O (Other)
[2] Approval Status: WP leader, 1st Reviewer, 2nd Reviewer, Advisory Board

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DISTRIBUTION

Name / Role	Company	Level of confidentiality[3]	Type of deliverable
All		PU	R

CHANGE HISTORY

Version	Date	Reason for Change	Pages/Sections

[3] Deliverable Distribution: PU (Public, can be distributed to everyone), CO (Confidential, for use by consortium members only), RE (Restricted, available to a group specified by the Project Advisory Board).

			Affected
0.001	2015-11-17	First Document Issue with Introduction & ToC.	All
0.002	2015-12-03	Finalize ToC and assignment of responsible partners	All
0.003	2016-01-15	New scenario added in chapter 3, Requirements added in various subsections of chapter 4	Chapter 3, Chapter 4
0.004	2016-01-18	Update in requirements sections	4.2, 4.3
0.005	2016-02-08	Update of Booking tools & booking services requirements	4.1.3
0.006	2016-02-14	Update of Testbed Manager requirements	4.2.6
0.007	2016-02-17	Update of scenarios section	3
0.008	2016-02-18	Update of various requirements sections and accept of changes	All
0.009	2016-03-01	Added and updated requirements for System Monitoring Tools and Resource Explorer Tool	4.1
0.010	2016-03-10	Document issued for internal review	4.1, 4.2, 4.3, 4.4, 5, 6
1.000	2016-03-14	Adaptation/modifications based on internal review comments	All

Abstract:
This deliverable comprises the 2nd version of the RAWFIE Components requirements. Based on the grounds of the 1st version and by utilizing information regarding the architecture and detailed design elaborated during the 1st iteration of the project it attempts to refine the list of requirements defined in the previous version of the Requirements document.
The initial version of the Requirements Analysis provided a coarse-grained outline of the overall system, the envisaged components and the expected user and system high-level requirements by defining two broad categories. In the present version, a more elaborated requirement analysis look is attempted. Requirements are classified following the RAWFIE component breakdown structure prescribed by the RAWFIE Architecture related documents compiled during the 1st iteration cycle. The methodology used is still based on the VOLERE like card template agreed in the 1st version.
In keeping with the overall project workflow, the requirements captured and synthesized here will be provided as input to WP4 – Platform Design for the 2nd development cycle.
The use cases defined in the 1st version of the Requirements document remain valid while some additional ones have been added.
A traceability matrix is also provided between the requirements defined during the 1st and the 2nd version of the Requirement analysis

Keywords: requirements, scenario, experiment, constraints standards & regulations, functional & non-functional

Part II: Table of Contents

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Part III: Executive Summary

The deliverable provides a deep look at the requirements and needs of the RAWFIE system. It attempts a more elaborated analysis and allocation of requirements to certain components based on experience gained and feedback provided during the 1st iteration cycle. RAWFIE deliverables D4.1 (High Level Design and Specification of RAWFIE Architecture) and D4.2 (Design & Specification of RAWFIE Components) were used as input as well as the experience obtained during the implementation and validation activities in the 1st year of the project. The use of the Slice Federated Architecture (**SFA**), considered mandatory for FIRE related projects was also taken into account during the requirement analysis.

The present document is the second in a series of three requirements analysis documents each one to be delivered in the beginning of each RAWFIE iteration cycle (see [1] 1.3.2. WT2 list of deliverables, page 93) .

Part IV: Main Section

1 Introduction

1.1 Scope of Deliverable

The purpose of this document, "D3.2 **Specification & Analysis of RAWFIE Components Requirements**", is to decompose the higher level requirements identified in D3.1 and assigning them to lower level functions (requirements allocation) as well as to identify new requirements that can be assigned to the various components of the RAWFIE architecture initially identified during the Platform Design activities of the first iteration cycle. The present document is the second deliverable in a series of three that will all focus on incrementally identifying requirements for the various RAWFIE components.

This document structure has as follows:

- Chapter 2 briefly restates the methodology adopted, the general formalizations followed and the templates used for recording requirements.
- Chapter 3 presents any updates and modifications that apply to the initial use cases (defined in the previous deliverable) while it defines some additional ones.
- Chapter 4 presents the result of requirement analysis performed in the second iteration. It records down the RAWFIE detail level requirements both functional and non-functional, following an appropriate categorization based on the defined components.
- Chapter 5 provides a traceability matrix between the initial user and system requirements (as defined in the 1st iteration) and the requirements defined in the present deliverable (2nd iteration)
- Chapter 6 provides a summary of the work performed in the present deliverable and sets the target for the next iterations

1.2 Abbreviations

Abbreviation	Meaning
AHRS	Attitude and Heading Reference System
AGL	Above Ground Level
AP	Access Point
AT	Aerial Testbed
AUV	Autonomous Underwater Vehicle
B-VLOS	Beyond Visual Line Of Sight
CAA	Civil Aviation Authority
CAO	Cognitive-based Adaptive Optimization
CBNR	Chemical Biological Nuclear Radiological
CEP	Circular Error Probability
CPU	Central Processing Unit
DETEC	Department of the Environment, Transport, Energy and Communication

DGCA	Directorate General of Civil Aviation
DoA	Description of Activities
DoW	Description of Work (synonym to DoA)
EASA	European Aviation Safety Agency
ECC	Error Correction Code
EDL	Experiment Description Language
EU	European Union
E-VLOS	Extended Visual Line Of Sight
FIRE	Future Internet Research & Experimentation
FOCA	Federal Office of Civil Aviation
FPS	Frames Per Second
FPV	First Person View
GAA	German Aviation Act
GIS	Geographical Information System
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input/Output
GPS	Global Positioning System
HD	High Definition
HW	Hardware
IAA	Irish Aviation Authority
IaaS	Infrastructure as a Service
IFR	Instrument Flight Rules
IDE	Integrated Development Environment
IP	Internet Protocol
ISO	International Standards Organization
JSON	JavaScript Object Notation
KPI	Key Performance Indicators
LBL	Long Baseline
MEMS	MicroElectroMechanical System
MM	Monitoring Manager
MSO	Multi Swarm Optimization
MT	Maritime Testbed
NF	Non Functional
OEDL	OMF EDL
OMF	Control and Management Framework
OS	Operating System
OTA	Over The Air
P2P	Point to Point
PSO	Particle Swarm Optimization
PTZ	Pan Tilt Zoom
RC	Radio Controller
RE	Requirement Engineering
RIA	Research and Innovation Action
ROS	Robot Operating System
ROV	Remotely Operated Vehicle
RPA	Remotely Piloted Aircraft
RPAS	Remotely Piloted Aircraft System
RPS	Remotely Piloted Station

SaaS	Software as a Service
SQL	Simple Query Language
TM	Testbed Manager
TMS	Testbed Manager Suite
TP	Testbed Proxy
UAV	Unmanned Aerial Vehicle
UGV	Unmanned Ground Vehicle
UI	User Interface
USB	Universal Serial Bus
USV	Unmanned Surface Vehicle
UxV	Unmanned System (of any type)
VFR	Visual Flight Rules
VLL	Very Low Level flight, below 150m above ground level
VLOS	Visual Line of Sight
VT	Vehicular Testbed
XML	Extensible Markup Language

Table 1: Abbreviations

2 Methodology

2.1 General

The methodology adopted has been described in the first version of the deliverable, thus it will not be analysed in details again. In brief we restate here that the overall requirements analysis activities are performed in the context of the RAWFIE iterative development process. Therefore, requirements in RAWFIE are defined incrementally since having a complete requirement specification from the very beginning is pretty difficult due to the inherent system complexity and the fact that certain constraints or issues are not evident until development activities start or even a first version of the system is put in operation.

The present work forms the basis of the second iteration cycle (see Figure 1). Although, this is not clearly depicted in the figure below, the second iteration partially overlaps with the first one. Feedback from design and development activities is used to modify, enhance and further refine the previous requirement specification.

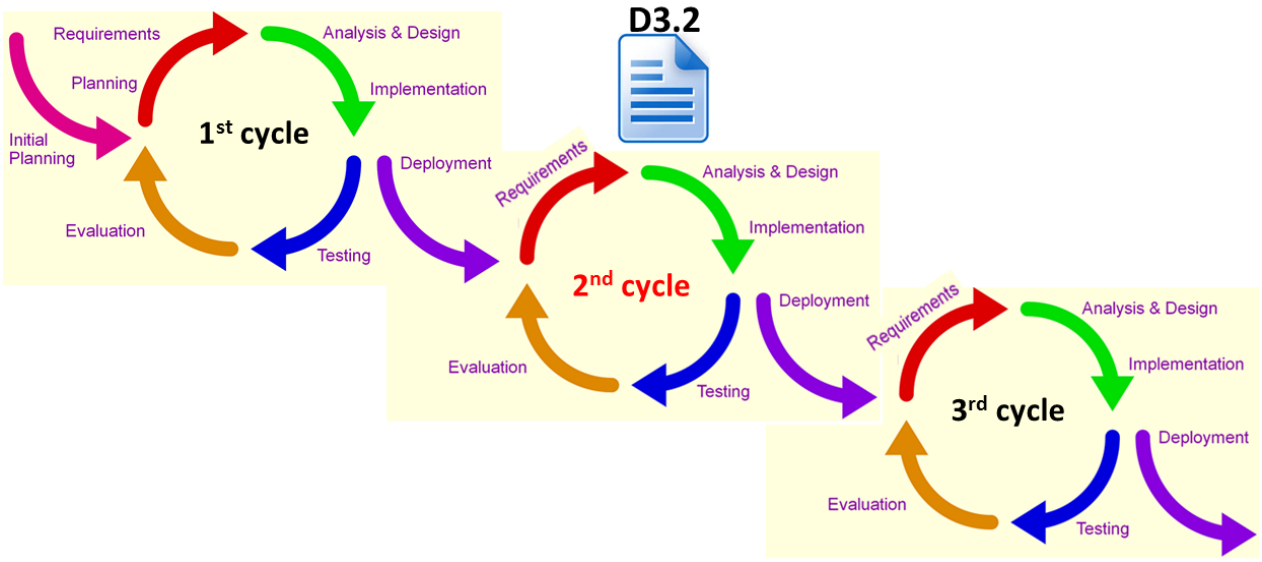

Figure 1: RAWFIE iterative development process (2nd cycle)

The requirements process is comprised of four (4) main activities: requirements discovery, classification, prioritization and negotiation. During classification of requirements, coherency among requirements is achieved by organizing them according to the identified classification categories. Subsequently, prioritization and negotiation of requirements assists in identifying and resolving requirements conflicts.

Finally, we remind the use of the VOLERE methodology through the use of an appropriate template card for presenting requirements. Given the fact that in this second version of the

deliverable we focus more in system and component level requirements based on the 1st version of identified RAWFIE architecture we introduce a modification of the "requirement card" used to include also the name of the component or system where the requirement should be allocated. The {classId} value should adhere to the name of the component or system (a complete list of the available components is given in Table 4).

The type of requirement is based on the classification performed in the previous version of the deliverable (see Table 3)

Id:	{ClassId}-{XXX}	**Type:**	follow categorization proposed in Volere template (see Table 3)	**Importance (priority):**	LOW, MEDIUM, HIGH	**Source:**	Requirement origin e.g.: Consortium Know-how, members, law regulation, standards, Deliverable. Iteration1 Exp, etc.	**Ver:**	2
Title:	Requirement title/name (1 short sentence)								
Description:	More detailed description of particular requirement (textual form only). If Requirement title is sufficient enough to understand the requirement, this field can remain empty.								
Additional Info (comments):	Any additional info to better clarify or illustrate concepts (pictures may be possible).								
Component or Subsystem	The component or subsystem the requirement is assigned to (should be inferred also by Requirement ID								
Refines/Replaces	Should be completed for requirements that modify, replace, or refine version 1 requirements								

Table 2: Exemplary Requirement Card used in this Deliverable

Functional	Functional	FUNC
	Data	DATA
Non-functional:	Look and Feel Requirements	L&F

	Usability Requirements	USE
	Performance Requirements	PERF
	Operational - Environmental Requirements	ENV
	Maintainability and Support Requirements	SUP
	Security & safety Requirements	SEC
	Other	OTH

Table 3 List of Requirements Types

Subsystem	ClassId	Component	Component ClassId
General	**GEN**		
Platform	**PT**	General	**PT-GEN-R**
		Web Portal	**PT-WEB-P**
		Booking Tool	**PT-BOK-T**
		System Monitoring Tool	**PT-SYM-T**
		Resource Explorer Tool	**PT-REE-T**
		Experiment Authoring Tool	**PT-EXA-T**
		Experiment Monitoring Tool	**PT-EXM-T**
		UxV Navigation Tool	**PT-NAV-T**
		Visualisation Tool	**PT-VIS-T**
		Data Analysis Tool	**PT-DAA-T**
		Testbeds Directory Service	**PT-DIR-S**
		EDL Compiler and Validator	**PT-EDL-S**
		Experiment Validation Service	**PT-EXV-S**
		Users & Rights Service	**PT-USR-S**

		Booking Service	**PT-BOK-S**
		Launching Service	**PT-LAU-S**
		Visualisation Engine	**PT-VIS-S**
		Experiment Controller	**PT-EXP-C**
		Data Analysis Engine	**PT-DAA-S**
		System Monitoring Service	**PT-SYM-S**
		Accounting Service	**PT-ACC-S**
Testbed	**TB**	General	**TB-GEN-R**
		Monitoring Manager	**TB-MOM**
		Network Controller	**TB-NEC**
		Resource Controller	**TB-REC**
		Testbed Proxy	**TB-PRO**
		Testbed Manager	**TB-MAN**
UxV	**UXV**	General	**UXV-GEN**
		UxV Node	**UXV-NOD**
		UxV Network and Communication	**UXV-NET**
		UxV Sensor and Localisation	**UXV-SEN**
		UxV On-board storage	**UXV-STO**
		UxV On-board processing	**UXV-PRC**
		UxV Management	**UXV-MGT**

Table 4 List of subsystems and components

2.2 Definitions

To enable better formalization of requirements throughout this document, the following wording is encouraged to be used during definition of requirements:

“Shall” statements are binding requirements. They describe something that is mandatory. If a requirement uses “shall”, then that requirement must be satisfied without fail. Non-compliance is not allowed. Failure to comply with one single 'shall' is sufficient reason to reject the entire product

“Should” is weaker. It can be regarded as a non-mandatory provision. It describes something that might not be satisfied in the final product, but that is desirable enough that any non-compliance shall be *explicitly* justified. Any use of “should” should be examined carefully, as it probably means that something is not stated clearly. If a “should” can be replaced by a “shall” or can be discarded entirely, so much the better.

“May” statements are also non-mandatory provisions. It grants permission to do something, and makes only a weak statement. It does not mean that it is possible to do it, only that you have permission to do it. In a user requirements document it shall only appear rarely, if ever. It is more appropriate to the detailed design where it could be used to define the behaviour of the product.

“Will” statements are non-mandatory, either they imply intent on design constraints or future tense.

3 User Scenarios

In the previous version of the deliverable six main scenarios were defined and used as a starting point to identify the user level and overall system level requirements. These scenarios included:

- Scenario 1 – Environmental Monitoring of Water Canal
- Scenario 2 – Border Surveillance or Perimeter protection of large area
- Scenario 3 – On demand deployable Internet facilities
- Scenario 4 – Exploration & Assessment of Network Technologies Robustness
- Scenario 5 – Efficient Coordination for phenomena or mission coverage
- Scenario 6 – Over the Air (OTA) UxV Re-programming

All these scenarios are still valid for iteration 2 while two extra scenarios have been identified and included in the list. Details on these scenarios are presented below.

3.1 Scenario 7 – Gathering Information for Naval Search and Rescue (SAR) Operations (ops).

Overview/Rationale

In this use case RAWFIE platform will be used to mobilize resources that can collaborate for the purpose of gathering information for naval search and rescue (SAR) operations (ops). The potential environments of this scenario are wide sea area or sea area between islands, with intense coastline variations.

Potential end users for this scenario are:

- Governmental Organizations responsible for SAR operations.
- Non Governmental Organizations aiding SAR operations
- UAV, USV providers.

Picture

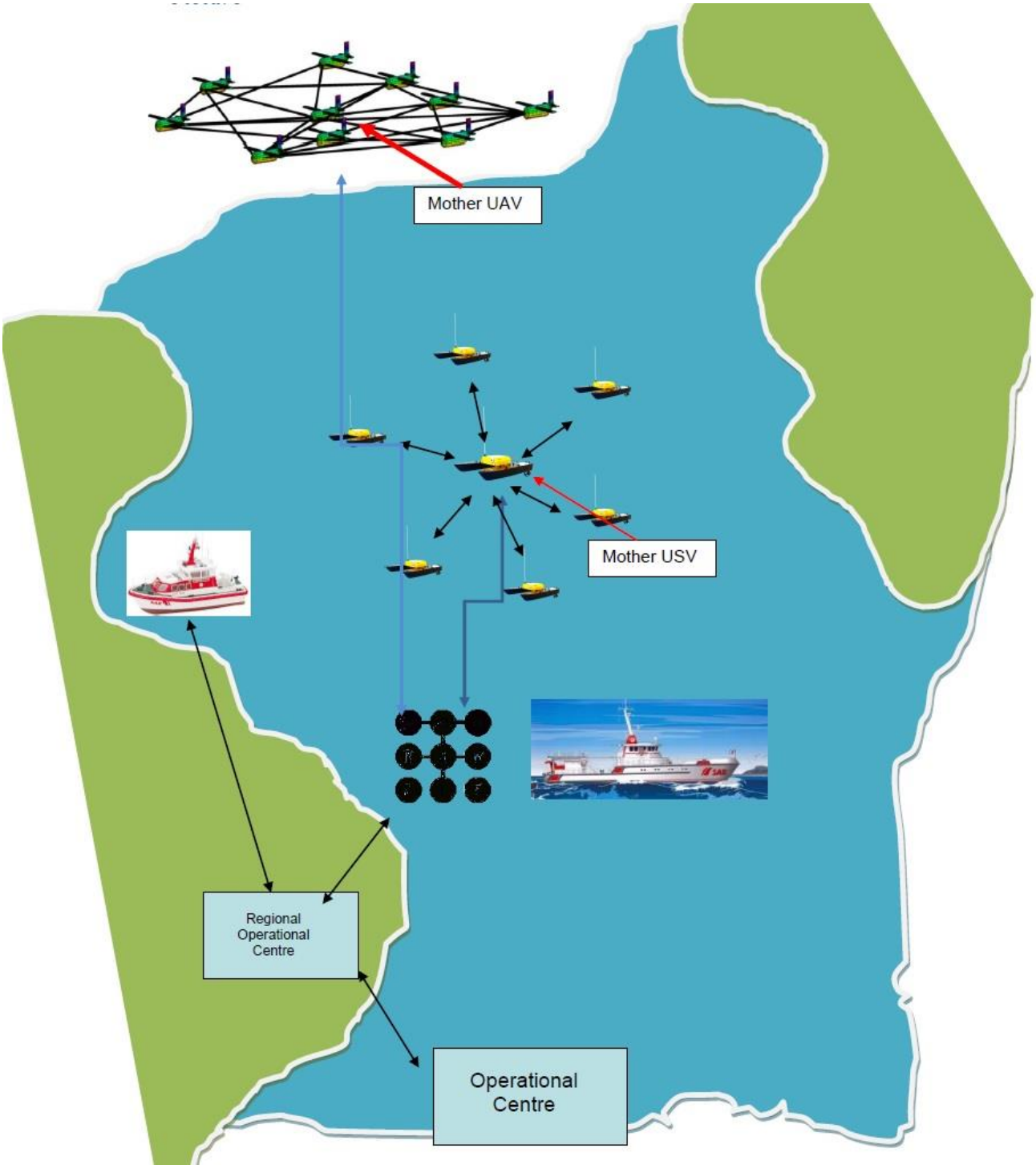

Figure 2: Gathering Information for Naval Search and Rescue (SAR) Operations scenario

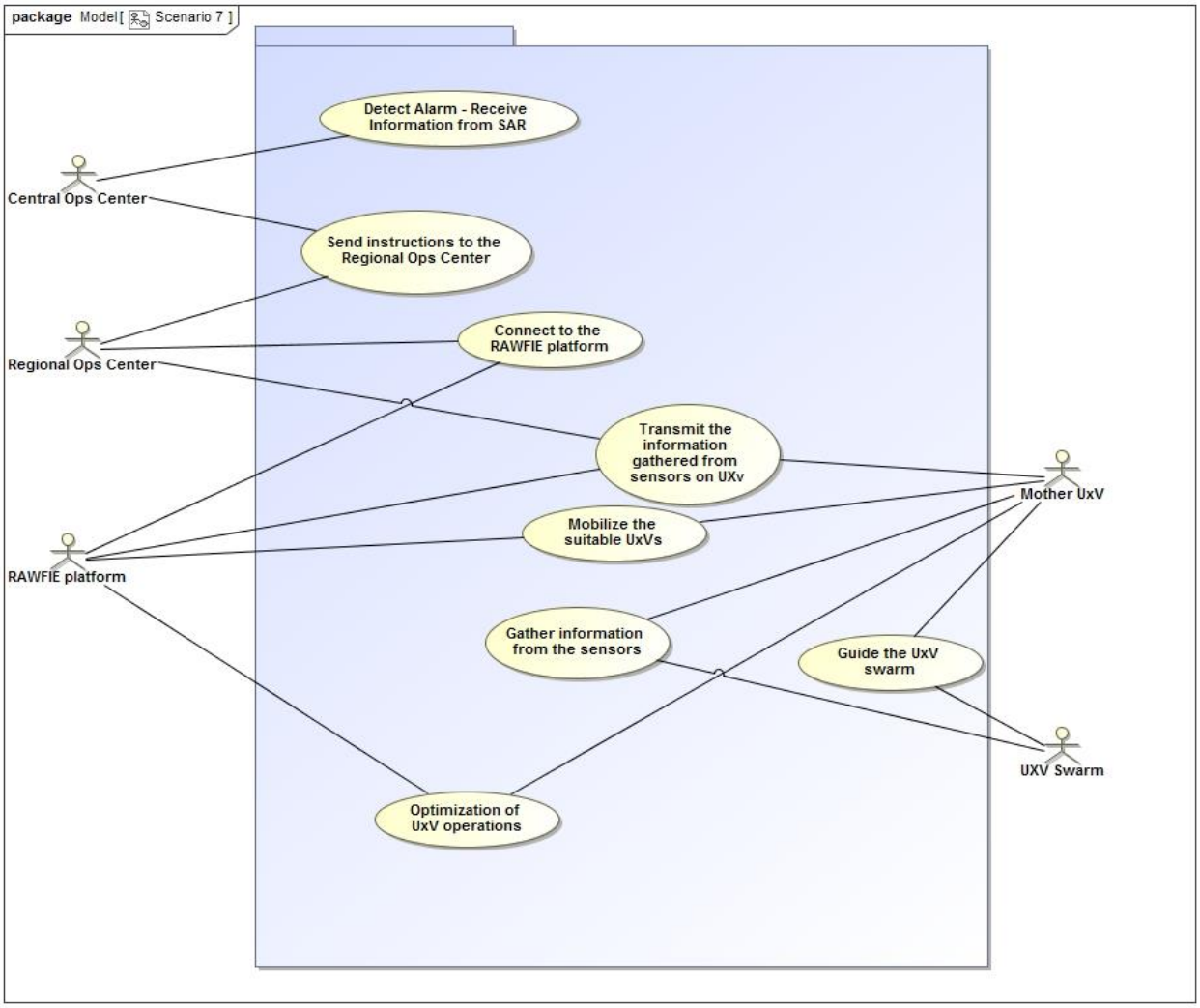

Figure 3: UML Diagram for scenario 7

Analytic Description

According to the scenario (Figure 2) the operational center, responsible for the SAR Ops of the BLUE sea area, receives information for a sinking vessel in the sea between the green Left and Right island areas. Immediately the central ops center gives order to the Regional Ops Centre (ROC) for spotting the vessel in danger. The RAWFIE platform, which controls a swarm of UAVs and USVs, loaded on a patrolling boat, mobilize the appropriate UxVs in accordance with the searching area. If the signal came from wide sea area, a swarm of UAVs is launched. If the area is near the coastline of the islands, USVs are launched. Finally, if the signal information is not accurate, a combination of surface and areal UxVs is used.

In any of the above cases, one UxV from the swarm is playing the role of the "mother" vehicle and is responsible:

- To guide the swarm effectively in order to scan the area of interest fast and thoroughly by utilizing efficiently the consumption of the limited resources.
- To gather the information from the swarm's sensors and transmit them back to the ROC.

When the vessel in danger is spotted, the ROC initiates the SAR operation and the UxVs return back to the patrolling boat.

In the context of the above described use case, RAWFIE platform can be utilized to execute a series of experiments in order to assess and identify the optimum way to utilize available UxV's resources in order to perform the requested task of scanning a specific sea area and spot an "object" in danger. Indicatively, the following experiments can be performed:

- Optimization of the used UxVs in relation to the particularities of the scanned sea area.
- Optimization of the UxVs search pattern.
- Optimization of the UxV's sensors used in relation to the requested information.

Type of sensors on the UxVs could be:

- Day/night thermal cameras
- Radars
- Sonars
- Acoustic sensors

3.2 Scenario 8 – Mobilize resources and gather sensor data (1st year review scenario)

Overview/Rationale

This section describes the scenario that was demonstrated during the 1st year project review. The main purpose of this scenario is to show the functionalities provided by the RAWFIE platform as a result of the 1st implementation cycle.

Location: UPTEC – Polo do MAR, Matosinhos

Date: 29 February 2016

UxV resources: USV and UGV

The experimenter uses the RAWFIE platform to define and run a simple experimentation scenario. In this use case the RAWFIE tools are utilized to mobilize the resources and retrieve measurements from the sensors. The sensor data that could be gathered during the experiment execution are: angular velocity, CPU usage, fuel usage, linear velocity, resources location, storage usage, system information, and voltage.

Picture

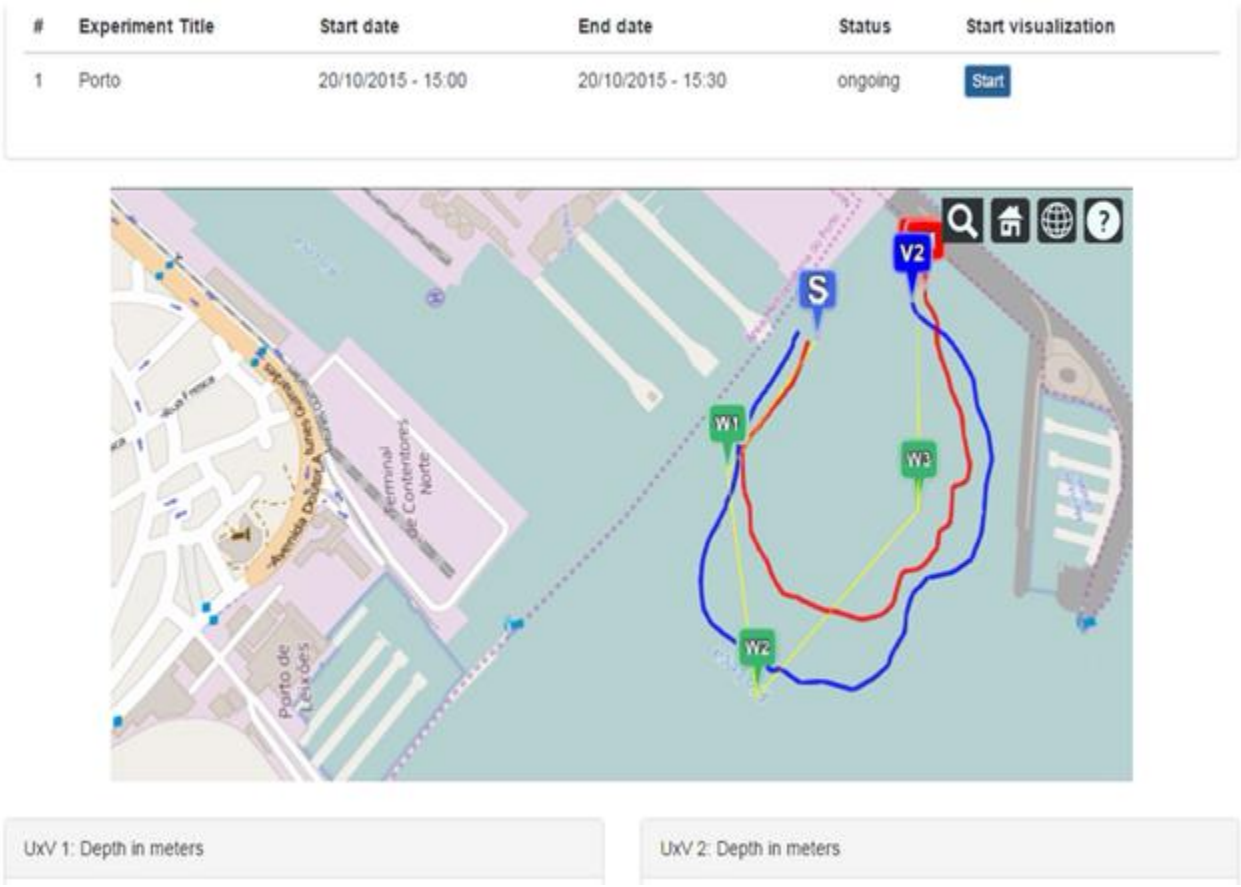

Figure 4: Visualization of resources waypoints

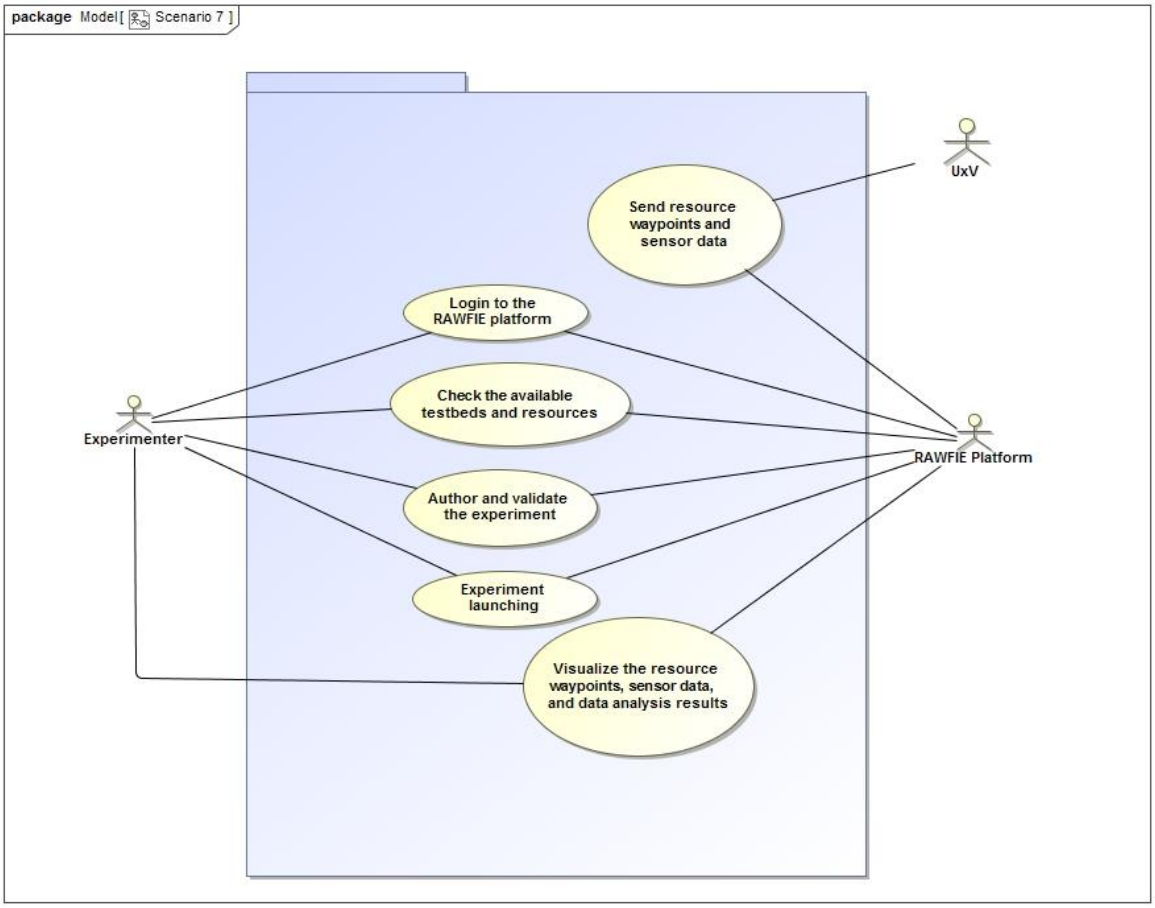

Figure 5:UML diagram for Scenario 8

Analytic Description

The experimenter through the RAWFIE platform is able to move the resources and gather a variety of sensor data. The steps of this scenario are the following (see also Figure 5 UML diagram):

- Login through the RAWFIE web portal
- The experimenter can check the available testbeds and resources
- In the next step the experimenter can define and validate an experimentation scenario
    a. Authors an EDL script
    b. Validate the experiment
    c. Store the experiment for future launching
- Experiment launching
    a. The experimenter can launch the experiment right after the definition
    b. The experimenter can launch a stored experiment through the database
- During the experiment execution the experimenter is able to:
    a. Visualize the resource waypoints (Figure 4)

b. Gather sensor measurement
c. Perform outlier detection through the data analytics tools (Figure 6)

Figure 6: Outlier detection for Scenario 8

4 System & Component Requirements

On the grounds of the first version of the requirements deliverable (D3.1) the pre-requirements analysis activities involved the following:

- Study Architecture Definition and defined components (mainly from D4.1 & D4.2)
- State of the art survey related to certain key elements of the RAWFIE system (EDL, UxVs)
- A more mature look to related FIRE projects
- A more detail look at testbed related to:
    - Deployment requirements and actions
    - Specific HW & SW needed

The classification of requirements is based on information regarding the subsystems and components defined during the first iteration of architecture design. This information is presented in Table 4 and is also used within this section to provide appropriate sub-sectioning. Figure 7 provides an overview of the envisaged architecture components as defined in D4.1.

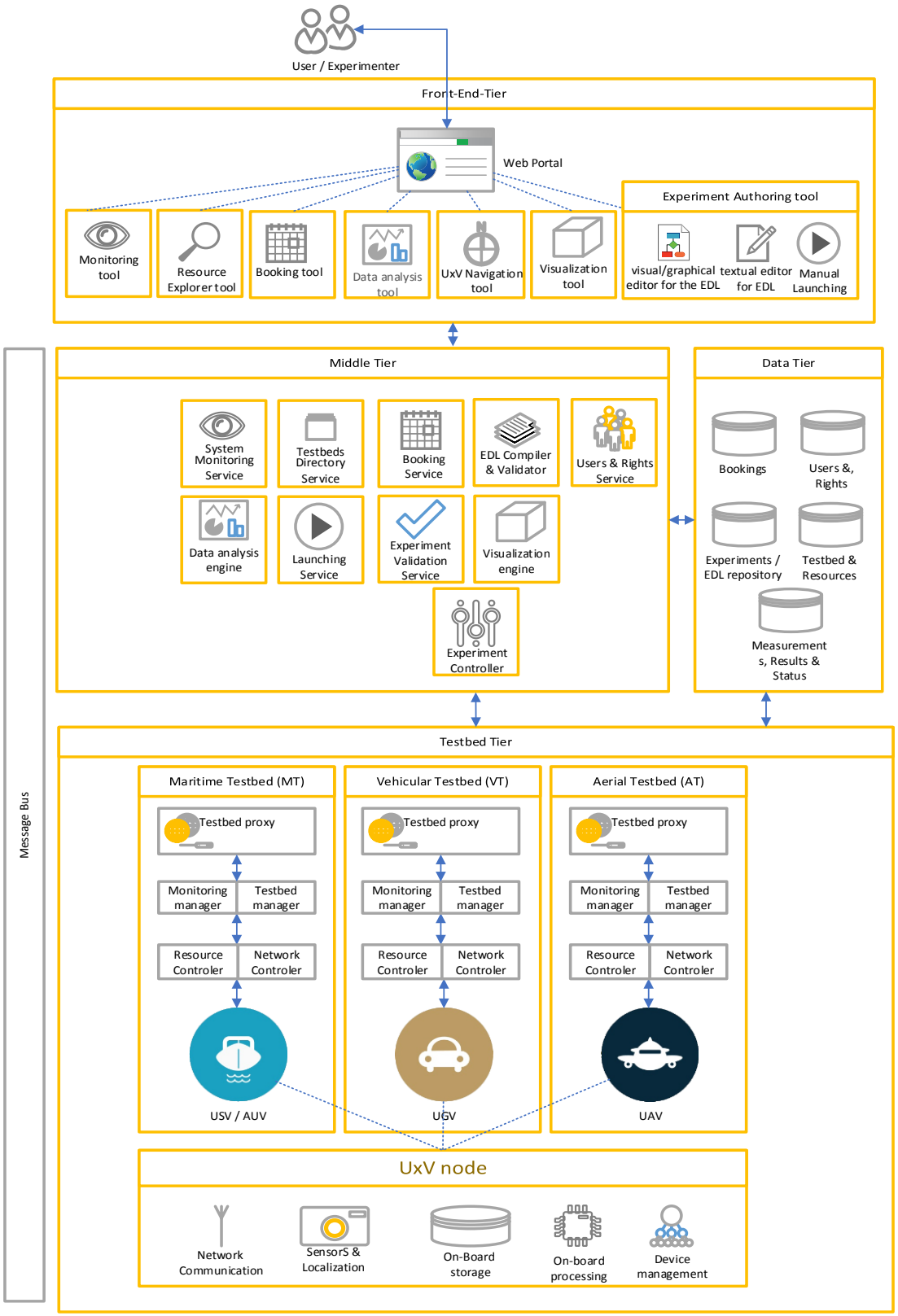

Figure 7: RAWFIE Overall Component Architecture (see also [4], [2])

4.1 Platform Requirements

The term Platform refers to the middleware solution responsible for managing and monitoring the lifecycle of an experiment in the context of the RAWFIE system. In the 1st iteration requirements were defined according to the experiment's lifecycle phases that included: authoring, booking, launching and evaluation of an experiment. Based on them a number of conceptual components were defined by WP4 (Design Phase).

4.1.1 General

Id:	PT-GEN-R-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		RAWFIE Platform should adopt Sliced Federated Architecture (SFA)							
Description:		The RAWFIE Platform should be compatible with the overall SFA concept adopted in other FIRE projects. SFA prescribes a minimal interface to enable federation of testbeds with different technologies and belonging to different administrators.							
Additional Info (comments):									
Component or Subsystem									
Refines/Replaces		PT-P-001, PT-NF-008							

Id:	PT-GEN-R-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		RAWFIE platform shall support various roles with different privileges at every level of access.							
Description:		The platform shall provide a set of different roles with predefined privileges. Every platform user should be assign to a role. At least the following roles shall exist: • Experimenter • Admin • Testbed Operator Each of them providing different access rights to the various platform services. Definition of additional roles should be possible.							

Additional Info (comments):	
Component or Subsystem	Web Portal, SFA interface
Refines/Replaces	PT-GEN-002

Id:	PT-GEN-R-003	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The RAWFIE Data model should include all basic entities that are used or/and exchanged by the various components of the RAWFIE Platform								
Description:	Such entities are: • Users • Resources • Testbeds • Experiments • Sensors An exhaustive list should be defined in the appropriate component definition and implementation documents								
Additional Info (comments):									
Component or Subsystem									
Refines/Replaces	PT-P-005								

Id:	PT-GEN-R-004	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	RAWFIE platform shall provide appropriate data storage for information that needs to be persisted, or used after an experiment completion (e.g. analysed by the various tools and services).								
Description:	The platform shall provide database services in the form of relational (and/or object database), that can be used for persisting information used or exchanged among the various services and tools. The exact information will be based on a defined data model and may include:								

	• Data information • Spatial information • Configuration information • Historical information
Additional Info (comments):	The database structure should adhere to the defined RAWFIE data model
Component or Subsystem	
Refines/Replaces	PT-P-005

4.1.2 Web Portal

Id:	PT-WEB-P-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	A web portal interface shall be provided to the users of the platform to access almost all main functionalities.								
Description:	The RAWFIE web portal shall provide a user-friendly Graphical User Interface (GUI), acting as a central point of access to all the necessary resources and services used by the experimenters.								
Additional Info (comments):									
Component or Subsystem	Web Portal								
Refines/Replaces	PT-GEN-001								

Id:	PT-WEB-P-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	Web portal usage shall be allowed only to authenticated users								
Description:	An experimenter should firstly be registered by creating an account through the portal (initial sign up). Access to the portal functionality shall be allowed only after the information is reviewed and approved by a RAWFIE administrator. Single sign-in authentication (login) process should be provided.								

Additional Info (comments):	
Component or Subsystem	Web Portal, User & Rights Service
Refines/Replaces	PT-GEN-003

Id:	PT-WEB-P-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	A tutorial or similar type of documentation shall be provided to the users of the platform								
Description:	A self-contained didactic material shall be provided to the experimenters about the experiment design,, the use and the variety of resources, the testbed facilities, etc. This can be in the form of a wiki. These functionalities shall be available to all possible future experimenters that may be interested in RAWFIE federation and want to explore its capabilities								
Additional Info (comments):									
Component or Subsystem	Web Portal (Wiki page)								
Refines/Replaces	PT-P-002								

4.1.3 Booking Tool

Id:	PT-BOO-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking Tool should allow booking of resources at the experimenter level for a specified period and for selected resources								
Description:	Through the booking tool a potential experimenter should be able to create a Reservation that includes UxV resources from one or more testbeds. This first level of reservation is related to a particular user only (user level reservation) and is a prerequisite for proceeding with subsequent association of resources with an experiment.								

Additional Info (comments):	Reservation of resources are expected to be performed at 2 different levels (1) experimenter level and (2) experiment level (see also section 4.1.15 on Booking Service)
Component or Subsystem	Booking Tool
Refines/Replaces	PT-B-001

Id:	PT-BOO-T-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking Tool functionality shall be compatible with the SFA myslice architecture and the notion of slices reservations								
Description:	SFA and myslice implementation in particular, provide mechanisms for reserving underline resources by allocating them in slices created by the experimenter. RAWFIE booking functionality shall try to reuse whatever functionality from there can fit its business model.								
Additional Info (comments):									
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-001								

Id:	PT-BOO-T-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2
Title:	Booking Tool should delegate all its actions related to Booking of a resource to the Booking Service								
Description:	Booking Tool provides the front end of the overall reservation functionality. All logic related to actual booking, validations and interactions with the Database should go via the Booking Service								
Additional Info (comments):									
Component or	Booking Tool								

Subsystem	
Refines/Replaces	PT-B-001

Id:	PT-BOO-T-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking Tool shall also interact with the Testbeds Directory Service in order to retrieve information on unallocated testbed resources								
Description:	In order to provide the user/experimenter with a list of available resources for initial reservation, the Booking tool shall retrieve information from the Testbeds Directory Service								
Additional Info (comments):									
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-001								

Id:	PT-BOO-T-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking Tool should communicate with the underline services using JSON formatted messages (through an RPC or REST API)								
Description:									
Additional Info (comments):	The JSON formatted messages used should respect the Avro protocol								
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-001								

Id:	PT-BOO-T-006	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2
Title:	Booking Tool should provide appropriate functionality for viewing the reservations of a user/experimenter								
Description:	An appropriate page should be provided that enables viewing of Reservations with the involved resources. The page may include information on which resources are already involved in running or future scheduled experiments and provide means to navigate to the experiment info page								
Additional Info (comments):	An experimenter should be able to see a list of Reservations made by him. An administrator should be able to view all users' reservations								
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-002								

Id:	PT-BOO-T-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2
Title:	Booking Tool should allow editing of existing Reservations								
Description:	A user should be able to edit/modify existing reservations this may include: • Modification of time reservation period (adding or removing timeslots) • Adding and deletion of resources associated with existing reservation (only for resources not involved in running experiments)								
Additional Info (comments):									
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-002								

Id:	PT-BOO-T-008	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2

Title:	Booking Tool should allow cancellation of existing Reservations
Description:	Existing Reservations may be cancelled based on user request. • If no experiments are running or are associated with the reservation, a direct cancellation is possible. • If running or scheduled experiments are found for a given reservation then the running experiments should allow to complete but the reservation should be marked cancelled and future scheduled experiments should be deleted.(or not allowed to be launched)
Additional Info (comments):	A user should be able to cancel reservations created by him An administrator should be able to cancel any reservation
Component or Subsystem	Booking Tool. Booking Service
Refines/Replaces	PT-B-002

Id:	PT-BOO-T-009	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2
Title:	Booking Tool should allow creation of bookings through an intuitive UI interface								
Description:	Booking tool should provide a step wizard that will permit: 1. Definition of booking date and time via selection of discrete timeslot(s) on a Calendar and timeline view 2. Selection of resources that will be included in the Reservation (only available resources for the timeslots defined in step 1 should be available) 3. Issue a request for reservation								
Additional Info (comments):	In order to achieve step 2 experimenter should be able to retrieve information about the testbeds and their resources. Since resources are whole UxV systems there is a possibility that the actual reservation response is not directly available. In such a case the experimenter should be informed via a proper notification mechanism								
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-002								

Id:	PT-BOO-T-010	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Arcitecture Deliverables	**Ver:**	2
Title:		Appropriate notification mechanism should be provided to the user in case status of reservation request is not directly available.							
Description:		Since resources are whole UxV systems there is a possibility that the actual reservation response is not directly available. In such a case the experimenter should be informed via a proper notification mechanism							
Additional Info (comments):		This may include situations where a reservation is impossible to be satisfied in the future.							
Component or Subsystem		Booking Tool, Booking Service							
Refines/Replaces		PT-B-002							

Id:	PT-BOO-T-011	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Other	**Ver:**	2
Title:		Booking Tool may provide assistance of feedback to the potential experimenter during the booking process							
Description:		In order to facilitate the experimenter during the initial reservation of resources, the booking tool may provide information to the user regarding the booked resources per timeslot or the available timeslots per testbed.							
Additional Info (comments):									
Component or Subsystem		Booking Tool							
Refines/Replaces		PT-B-005							

Id:	PT-BOO-T-012	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Booking functionality should provide means to ensure fairness in resource booking as well as protect for malevolent actions that a user may perform.							

Description:	The booking process should ensure that some checks/validations apply to ensure resource reservation fairness and avoid spurious actions that may lock out other users like: • Reservation of enormous size of resources by a single user • Reservation of resources for very long lasting periods
Additional Info (comments):	The process may use some configurable max limits for number of resource, number of consecutive timeslots, total number of reservations that should be validated upon issuing a Booking request.
Component or Subsystem	Booking Tool, booking Service
Refines/Replaces	PT-B-005

Id:	PT-BOO-T-013	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Consortium	**Ver:**	2
Title:	RAWFIE platform should allow virtualization of available UxVs resources during reservation process								
Description:	Unless an experimenter explicitly requests reservation of specific testbeds/resources for an experiment, the RAWFIE platform should offer to an experimenter the ability to reserve resources in a topology agnostic manner thus offering virtualization of available resources. Internally the service should attempt to reserve resources in the same physical testbed and if this is not possible then consider resources from multiple testbeds. At the same time the service has to guarantee that the reserved resources will really be available for the experiment.								
Additional Info (comments):	Exact level of virtualization that will be available in RAWFIE will be defined in next iteration of the deliverable								
Component or Subsystem	Booking Tool								
Refines/Replaces	PT-B-006								

4.1.4 System Monitoring Tool

Id:	PT-SYM-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Listing and/or visualisation of current system health status shall be available.							
Description:		The users of the RAWFIE platform shall be informed about the system health status. This includes: • Hardware servers are up and running • Services (application server, message bus, databases) up and running • Testbeds are connected and ready • UxVs are connected and ready							
Additional Info (comments):									
Component or Subsystem		System Monitoring Tool							
Refines/Replaces		(PT-NF-007)							

Id:	PT-SYM-T-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		The current system health status should be grouped thematically.							
Description:		For better comprehensibility all services of a component should be grouped under the component. The grouping of component may be by • servers of the cloud infrastructure • Testbeds • UxV							
Additional Info (comments):									
Component or Subsystem		System Monitoring Tool							
Refines/Replaces									

Id:	PT-SYM-T-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Filtering of the accessible component health statuses by user roles/rights should be possible.								
Description:	Based on the access rights of the user, the health statuses of special component should be filtered out.								
Additional Info (comments):									
Component or Subsystem	System Monitoring Tool								
Refines/Replaces									

Id:	PT-SYM-T-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The health statuses webpage should be updated automatically.								
Description:	The current health statuses should be requested at fixed intervals from the System Monitoring Service and the webpage should be updated accordingly. The update interval should be configurable								
Additional Info (comments):									
Component or Subsystem	System Monitoring Tool								
Refines/Replaces									

Id:	PT-SYM-T-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The health status information should include a severity indication and possibly textual information with additional details.								
Description:	The information received for a components health status should include a status or severity field with possible values (CRITICAL, WARNING, NORMAL) . Extra information may be received with additional details regarding the health								

	status.
Additional Info (comments):	
Component or Subsystem	System Monitoring Tool
Refines/Replaces	

4.1.5 Resource Explorer Tool

Id:	PT-REE-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	The UI interface shall illustrate testbed and UxV information of the RAWFIE federation that the experimenters should take advantage of								
Description:	Essential information provided shall include at least: • Testbed facilities information • UxVs information								
Additional Info (comments):									
Component or Subsystem	Resource Explorer Tool								
Refines/Replaces	PT-P-001, (PT-P-003)								

Id:	PT-REE-T-002	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Registration of testbeds and UxVs may be possible via the Web Portal								
Description:	Editing of all relevant information about testbeds and UxVs may be possible.								
Additional Info (comments):	This functionality is needed if the testbed does not support automatic resource discovery.								
Component or Subsystem	Resource Explorer Tool								

Refines/Replaces	PT-P-004

Id:	PT-REE-T-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		Resource Explorer tool shall allow for fine-grained resources' searches							
Description:		Resource Explorer tool shall provide basic query capabilities to facilitate the experimenter identifying testbed or/and UxV resource specific capabilities needed for an experiment. An experimenter shall be able to fill in some specific technical details about the hardware he/she is looking for. It should be possible for the resource discovery tool to construct a suitable response based on the resource information provided for a testbed. When the query in the resource discovery phase returns a certain list of resources, it should be possible for the experimenter to select the resources that would like to include in the experiment. This should be supported in relation to a specific resource ID.							
Additional Info (comments):		Need to define what exactly these capabilities could be for the testbed node and its various resources (i.e. CPU, RAM, Op. system, battery state, communication interfaces, sensor types, capabilities regarding resource controller, etc.) Need also to agree whether query capabilities would be available via an SQL query like language or via appropriate drop down menus or catalogues (the latter might be preferable for novice users but may limit the complexity of queries and consequently the granularity of searches).							
Component or Subsystem		Resource Explorer Tool							
Refines/Replaces		PT-A-016							

Id:	PT-REE-T-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		Link to the Booking Tool should be provided							
Description:		It should be possible to book the found resources. So links that opens the Booking Tool with the selected resources should be provided.							
Additional Info (comments):									

Component or Subsystem	Resource Explorer Tool
Refines/Replaces	PT-P-001, (PT-P-003)

4.1.6 Experiment Authoring Tool

Id:	PT-EXA-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Experiment Description Language (EDL) shall be used as a language for the definition of experiment scenarios								
Description:	A Domain Specific Language combining some common characteristics of well-known scripting languages shall be developed for the effective creation and handling of simple or complex experiment scenarios.								

Additional Info (comments):	The EDL shall provide:
	• Syntax Coloring
	• Content Assist
	  ○ common constructs like loops, conditional statements, synchronization blocks, task definitions etc.
	  ○ location/topology specific elements
	  ○ domain specific elements specific to each UxV testbed
	  ○ elements for describing the UxV behavior
	• Validation and Quick Fixes								

Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-001								

Id:	PT-EXA-T-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The EDL shall allow the definition of all necessary requirements for an experiment								
Description:	The experimenter shall be able to define for the available booked resources: • The number of the resources used in the experiment								

	• The name of the testbed • The initial position of the UxVs • The time duration of the experiment • The maximum distance that the UxVs can cover
Additional Info (comments):	These are important features for the setup of the resources and their usage during the experiment. These features also help to the validation phase.
Component or Subsystem	Experiment Authoring Tool
Refines/Replaces	PT-A-002

Id:	PT-EXA-T-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	For each defined experiment specific metadata, i.e. name, version, date and description shall be defined.								
Description:	In RAWFIE experimenters that create an experiment will need to provide a short high-level description of the experiment via metadata and its purpose. This allows infrastructure providers to keep track of the usage of the infrastructure and enables them to report about this to their funding sources.								
Additional Info (comments):	Additionally searching and reusing experiments is greatly simplified by providing a short description, possibly even a video demonstrating the experiment.								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-002								

Id:	PT-EXA-T-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	An experimenter shall be able to provide initial conditions and/or configuration parameters for an experiment								
Description:	The EDL should support experimenter in defining initial conditions and/or configuration parameters for an experiment. Such conditions may include (not an exhaustive list): • initial position of UxV resources								

	• specific communication interface to be used • the enabled sensors • etc.
Additional Info (comments):	It should also be possible to define what happens if the initial conditions are not met (abort the experiment, run it with additional sensors needed to gather the initial situation etc.).
Component or Subsystem	Experiment Authoring Tool
Refines/Replaces	PT-A-009

Id:	PT-EXA-T-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Scenario	**Ver:**	2
Title:	An experimenter shall be able to manage/guide the available booked resources during experiment authoring								
Description:	The experimenter perform for each node/ a group of nodes • Waypoints management: define specific waypoints at the operating track • Timeline management (sequential or parallel execution, execution at predefined intervals) • Data management – which sensor will send data in a time interval • Communication management- which network protocol will be used by the experimenters • Sensor management- which sensor will be activated / deactivated and when								
Additional Info (comments):	Triggered based activation can be initiated based on the fulfillment of certain constraints (i.e. battery below a certain level). The constraints supported for triggered based activation/deactivation are still to be defined. Type of events may relate to a failure or malfunction (or other criteria). List of supported events is still to be defined.								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-004								

Id:	PT-EXA-T-006	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	An experimenter shall be able to define the type of information to be gathered and/or stored by UxV resource(s)								
Description:	During experiment authoring the experimenter should be able to prescribe for an UxV resource the type and characteristics of the (sensor's) information that should be gathered in a specific time interval The types of the information gathered will be proposed to the experimenter as an auto-complete function.								
Additional Info (comments):									
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-006								

Id:	PT-EXA-T-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Scenario	**Ver:**	2
Title:	An experimenter shall be able to define the type of metrics to be gathered and/or stored during an experiment and/or per UxV resource								
Description:	During experiment authoring the experimenter should be able to define specific metrics or performance indicators that need to be collected and stored for later analysis. These metrics may include: • network related metrics (i.e. distributions of errors, SNR, throughput, etc) (check scenario 4) • energy/consumption related metrics (i.e. coverage vs energy expenditure) (check scenario 5) • information quality metrics (i.e. information freshness) (check scenario 5)								
Additional Info (comments):	The EDL should support some basic type of metrics and be extendable if additional ones identified in the future.								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-007								

Id:	PT-EXA-T-008	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Scenario	**Ver:**	2
Title:	An experimenter shall be able to provide navigation or movement directives during experiment authoring								
Description:	The EDL should provide the capability to define navigation or movement directives. This can be done in the form of geo-referenced waypoints or predefined movement patterns when group of nodes is the case.								
Additional Info (comments):	Experiment authoring tool will provide a map. Experimenter can mark on the map the points of each node in order to define a specific trace.								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-008								

Id:	PT-EXA-T-009	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Scenario	**Ver:**	2
Title:	An experimenter should be able to create groups of UxVs resources, for which specific directives will apply.								
Description:	The EDL should support the definition of formation info and/or coordination directives that a group of UxV resources should follow during an experiment execution.								
Additional Info (comments):	Formation info may be provided in the form of certain algorithms (i.e. PSO, MSO) that should be adopted by the UxVs for their optimal placement								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-010								

Id:	PT-EXA-T-010	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	A textual editor shall be provided for the authoring of RAWFIE experiments								

Description:	A textual editor tool providing access to all EDL elements and all the functionality needed to edit experiment scenarios shall be provided.
Additional Info (comments):	Ideally the editor will be an IDE with a code completion, syntax highlighting, syntax checking, debugging capabilities as well as other features making the authoring process easier and more productive.
Component or Subsystem	Experiment Authoring Tool
Refines/Replaces	PT-A-011

Id:	PT-EXA-T-011	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	A visual/graphical editor shall be provided for the authoring of RAWFIE experiments								
Description:	The visual editor tool shall provide a graphical interface for handling experiments.								
Additional Info (comments):	-								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-012								

Id:	PT-EXA-T-012	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:	Platform shall allow saving, editing and/or deletion of an experiment defined via EDL								
Description:	The experimenters shall have the option to save an experiment and retrieve it later on demand. They shall also be allowed to delete or modify existing scenarios owned by them. Every version of the scenario will be saved and can be retrieved later on, i.e. an integrated version control system will be available. This is done by assigning a unique ID to every saved scenario version and stored in database								

Additional Info (comments):	-
Component or Subsystem	Experiment Authoring Tool
Refines/Replaces	PT-A-015

Id:	PT-EXA-T-013	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:	The visual editor should allow the definition of movement and location waypoints from a map								
Description:									
Additional Info (comments):									
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-A-012								

Id:	PT-EXA-T-014	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	During authoring of an experiment selection of resources should be limited only to the ones previously reserved from the user at the foreseen time of experiment								
Description:	The selection of resources to be included in an experiment should be based on a previous reservation performed by a user/experimenter. Only reserved resources for the expected time of experiment should be available for inclusion in the EDL script.								
Additional Info (comments):	After the inclusion of a resource to an experiment script, the resource should somehow be flagged as reserved for the experiment timeslots in order to be excluded from future experiment definitions.								
Component or Subsystem	Experiment Authoring Tool								

Refines/Replaces	

Id:	PT-EXA-T-015	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Validation of EDL script should be possible prior to or during saving								
Description:	The authoring tool should provide some basic real time validation during authoring mainly related to legality of provided values. Additional contextual validations may apply during the saving process (possibly by contacting the Validation Service)								
Additional Info (comments):	Each experiment should be valid in syntax, semantics and securiry constraints.								
Component or Subsystem	Experiment Authoring Tool								
Refines/Replaces	PT-L-002								

Id:	PT-EXA-T-016	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Scenario	**Ver:**	2
Title:	An experimenter shall have the means to define actions or tasks that should run on a periodic or ad hoc basis during execution of an experiment								
Description:	The EDL should support the definition of actions or sequence of actions (tasks) that may run periodically or triggered based on predefined criteria or events. Such actions may related to: • enablement/disablement of certain functionality (or modules) • data storage (or caching) • data transmission • error reporting Additional type of actions may exist based on scenario specific needs								
Additional Info (comments):									
Component or Subsystem	Experiment Authoring Tool								

Refines/Replaces	PT-L-010

4.1.7 Experiment Monitoring Tool

Id:	PT-EXM-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		A RAWFIE user should be able to view an overview of his/her experiments							
Description:		A user will be provided with a page showing his/her experiments (finished, running or scheduled ones). Also the monitoring tool shall manage the presentation of the information needed for monitoring the status of the nodes during the experiments.							
Additional Info (comments):									
Component or Subsystem		Experiment Monitoring Tool							
Refines/Replaces		PT-L-004							

Id:	PT-EXM-T-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Experiment Monitoring and Visualisation should be integrated							
Description:		The values of the sensing modules and the status of the different networking modules are some essential elements of the monitoring process.							
Additional Info (comments):		The visualisation of collected data is done via the Visualisation Tool. The two tools should work together.							
Component or Subsystem		Experiment Monitoring Tool, Visualisation Tool							
Refines/Replaces									

Id:	PT-EXM-T-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Cancellation of running experiments should be possible via Web Portal							
Description:		A running experiment should be able to be cancelled if the experimenter notices serious problems.							
Additional Info (comments):									
Component or Subsystem		Experiment Monitoring Tool, Booking Tool							
Refines/Replaces									

4.1.8 UxV Navigation Tool

Id:	PT-NAV-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		This component will provide to the user the ability to remotely navigate a squad of UxVs through a user friendly interface.							
Description:		Through a user friendly interface, the experimenter will specify the required details of the experiment, providing information regarding the number of the vehicles, the number of the units etc. Navigating an UxV is not an easy task and requires initial instructions and an extensive training to become proficient. The UxV Navigation Tool will provide the ability to non-expert users to remotely guide a squad of robotic vehicles so as to perform basic navigation missions such as waypoint navigation, map construction, area surveillance and path planning.							
Additional Info (comments):		The virtual controller will allow the experimenter to guide the vehicles using a turn based navigation mechanism and to collect data from their equipped sensors. Through the provided interfaces Rawfie users specify the next desired location for each unit. In the sequel, these instructions are transmitted to the “Experiment Controller” and sequentially are translated, evaluated and delivered to the robots.							
Component or Subsystem		UxV Navigation Tool							
Refines/Replaces		PT-L-008							

Id:	PT-NAV-T-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The tool should provide some validation of user's instructions								
Description:	The UxV Navigation Tool component should provide some basic real time validation mainly related to legality of provided instructions.								
Additional Info (comments):	Each experiment should compatible with the resource controller.								
Component or Subsystem	UxV Navigation Tool								
Refines/Replaces									

Id:	PT-NAV-T-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	UxV Navigation Tool should be available for the navigation of all moving resources								
Description:	Real time navigation may be restricted by the communication technology of the UxV data transmission.								
Additional Info (comments):									
Component or Subsystem	UxV Navigation Tool								
Refines/Replaces	PT-L-008								

Id:	PT-NAV-T-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	UxV Navigation Tool should be available to read from the database a detailed version of the map of the available areas								
Description:	A map of the area will illustrate the current position of each robot. Simply, by clicking on the map, the users define the next desired location								

Additional Info (comments):	
Component or Subsystem	UxV Navigation Tool
Refines/Replaces	

4.1.9 Visualisation Tool

Id:	PT-VIS-T-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualisation Tool shall allow the visualisation of information about the running experiments, in tabular/graphical form								
Description:	From the Visualisation Tool GUI, it should be possible to access to "near to real time" visualisation of the information coming from the experiment, as well as to the summary of the same information after the experiment stops. This includes: • current location (e.g. lat and lon values) of each resource • values of all measurements coming from the different sensors available for the experiment • the value of any other kind of parameters relevant for the specific experiment purposes								
Additional Info (comments):									
Component or Subsystem	Visualisation Tool								
Refines/Replaces									

Id:	PT-VIS-T-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	DoW	**Ver:**	2
Title:	A 3D visualization should be available for the tracking of all moving resources								
Description:	Together with the tracking of UxV resources on a traditional 2D map during the execution of the experimentation scenario, 3D visualisation should be also available. The possibility that 3D visualization will be supported by the Visualisation Tool and the VIsualisation Engine will depend on the availability of 3D GIS or image data sources, of the experiment and the experimentation area								

Additional Info (comments):	Real time tracking may be restricted by the communication technology of the UxV data transmission. 3D visualization is possible only if suitable 3D maps of the area of interest will be available for free.
Component or Subsystem	Visualisation Tool
Refines/Replaces	PT-L-006

Id:	PT-VIS-T-003	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualisation Tool may allow visualisation of video streams coming from the experiment, and experiment's camera control								
Description:	From the Visualisation Tool GUI, it may be possible to get and visualize video streams coming from cameras on board of the devices or placed in the experiment's area. In such cases, a functionality could be provided so that the experimenters can control the position of the cameras directly from the web browser, by sending specific commands to the cameras/devices								
Additional Info (comments):	The functionality will be available provided that cameras will be available at the experiment's location, or on board of the UxVs								
Component or Subsystem	Visualisation Tool								
Refines/Replaces									

Id:	PT-VIS-T-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualisation Tool shall provide access to information / features associated to each UxV device on the geographic map								
Description:	From the Visualisation Tool GUI, it shall be possible to access to the features associated to each UxVs, after e.g. clicking on the specific UxV icon on the map. Available information may include: • current location (e.g. lat and lon values) • list of on-board sensors • current values of all measurements coming from the different sensors • basic information about the status of the device								

Additional Info (comments):	
Component or Subsystem	Visualisation Tool
Refines/Replaces	

Id:	PT-VIS-T-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualisation Tool shall allow organization and manipulation of multiple geographic layers								
Description:	The Visualisation Tool GUI shall allow to add and manipulate multiple geographic elements as overlays on the map. Such geographic elements may include: • UxVs themselves, and associated sensors • Specific, detailed maps of the experiment area (outdoor, indoor) or building (indoor) • Other geo-referenced information such as roads, obstacles, thermal layers It will be possible to show / hide the different layers, as well as to choose the base map (e.g. Google Map, Open Street Map)								
Additional Info (comments):									
Component or Subsystem	Visualisation Tool								
Refines/Replaces									

Id:	PT-VIS-T-006	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	Possibility of Adding/Removing/Updating graphical widgets should be provided								
Description:	The experimenter can directly edits the widgets in the browser window. The new widgets are plotted on the screen. The user can adjust the information on the screen based, on the requirements and the current scenario.								

Additional Info (comments):	
Component or Subsystem	Visualisation Tool
Refines/Replaces	

Id:	PT-VIS-T-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:		Possibility to display both actual and expected UxVs' route and position should be provided							
Description:		As the position and the route of the UxVs may change due to recalculation of the path between waypoints, for the presence of obstacles, other UxVs in the path, and in general for security and safety reasons, the tool should provide the possibility to visualise the actual position and route, as well as the ones originally expected							
Additional Info (comments):									
Component or Subsystem		Visualisation Tool							
Refines/Replaces									

4.1.10 Data Analysis Tool

The Data Analysis Tool is the main UI interface that relays information to the Data Analysis Engine. It implements the standard UI decoupling interface. The Analysis Tool has three components: the data selection section, the result visualization (via graphite) and the job manager which is provided via the Spark jobserver.

Id:	PT-DAA-T-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis tool will provide interface to data engine.							

Description:	The Data Analysis Tool provides a user interface with which the consumer can select data metric(s) and a data analytics procedure, coupled with source and destination points. This information is relayed to the analytics engine which builds the required spark job.
Additional Info (comments):	• The metrics that will be support are currently restricted to integer/floating point values, however a user may decide to write a custom job that utilizes character values for say NLP. • A spark job is basically a model coupled with the parameters for it. For clarity we will refer to the model as the spark 'jar' and the parameters + model as the spark 'job'
Component or Subsystem	Data Analysis
Refines/Replaces	PT-E-003, PT-E-002

Id:	PT-DAA-T-002	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis tool will provide access to past experiments							
Description:		Access will be provided to reference past experiments & results via a time series database that holds previous results							
Additional Info (comments):		Every experiment should be uniquely identified within the RAWFIE platform							
Component or Subsystem		Data Analysis							
Refines/Replaces		PT-E-003, PT-E-001							

Id:	PT-DAA-T-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis tool will provide ability to query message bus streams							
Description:		Using the Jobserver UI interface the analysis tool should be able to query all available streams and metrics							

Additional Info (comments):	• Our use case for our provided jobs currently restrict jobs to one job per metric. The metric restriction definition is provided in PT-DAA-T-001 • Messages between the analysis tool and engine will take place via a simple message exchange on the message bus. • The definition of this schema is provided in WP5 ○ It encompasses a model structure as well as source and destination location
Component or Subsystem	Data Analysis
Refines/Replaces	PT-E-004

Id:	PT-DAA-T-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis tool will provide interface to end running jobs							
Description:		If a job is stuck or the user wants to abort, there should be an interface to be able to do this.							
Additional Info (comments):		This functionality is provided by linking natively to the Spark Jobserver UI from the Analysis Tool. The job server shows all the running jobs, the failed jobs as well as links to all the logs on the workers.							
Component or Subsystem		Data Analysis							
Refines/Replaces		PT-E-004, PT-E-003							

Id:	PT-DAA-T-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis tool will provide a simple metric selection interface, a view of the result stream & the job status tab							
Description:		The Data Analysis Tool will provide a simple list based system of selecting the desired metric. It will also have a tab to graphite to view the result stream. Finally, it will also have a tab to the jobserver UI which is talked about more in PT-DAA-T-004							

Additional Info (comments):	
Component or Subsystem	Data Analysis
Refines/Replaces	PT-E-003, PT-E-002

4.1.11 Testbeds Directory Service

Id:	PT-DIR-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service shall provide access to information on all Testbeds registered in RAWFIE								
Description:	The Testbed Directory Service shall provide the Web Service interface for other RAWFIE components to be able to access information on the testbeds' registered in the RAWFIE database.								
Additional Info (comments):	Provided testbeds' information includes: • name • geographic location • short description (possibly mentioning guidelines applying to the testbed usage) • type of resources supported/available • total number of resources available / in use • list of resources with an indication as "free","booked","in use" • connectivity / health status • capabilities in terms of available technologies and corresponding tests								
Component or Subsystem	Testbeds Directory Service								
Refines/Replaces	PT-P-003								

Id:	PT-DIR-S-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service should provide access to information on all Testbeds registered in RAWFIE according to predefined filters								
Description:	The Testbed Directory Service should provide the Web Service interface for other RAWFIE components to be able to filter and access information of the								

	testbeds' registered in the RAWFIE database, according to specific filtering parameters (e.g. name, supported technologies)
Additional Info (comments):	
Component or Subsystem	Testbeds Directory Service
Refines/Replaces	

Id:	PT-DIR-S-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service shall provide access to information about available resources (UxVs) belonging to the testbeds registered in RAWFIE								
Description:	The Testbed Directory Service shall provide the Web Service interface for other RAWFIE components to be able to access information on the resources belonging to the different testbeds registered in RAWFIE.								
Additional Info (comments):	Provided resources (UxVs) information includes: • name • geographic location • short description • testbed to which the resource is associated • type of resource (e.g. USV, UAV, etc) • status (e.g. "free","booked","in use", "non operational") • health status • capabilities in terms of available technologies and corresponding tests								
Component or Subsystem	Testbeds Directory Service								
Refines/Replaces									

Id:	PT-DIR-S-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service should provide access to information onavailable resources (UxVs) belonging to the testbeds registered in RAWFIE, and according to predefined filters								

Description:	The Testbed Directory Service should provide the Web Service interface for other RAWFIE components to be able to filter and access information of the resources, according to specific filtering parameters (e.g. name, supported technologies)
Additional Info (comments):	
Component or Subsystem	Testbeds Directory Service
Refines/Replaces	

Id:	PT-DIR-S-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service shoud provide the possibility to register new testbeds in the RAWFIE platform, as well as to unregister (delete) testbeds from the platform								
Description:	Each participating testbed shall be registered in order to participate in RAWFIE Platform. During initial registration important details needed to access the testbed shall be provided and stored in an appropriate testbed directory service. The registration service should allow for periodic or testbed initiated updates of the registered data. Basically, the Testbed Directory Service should provide basic CRUD operations (CREATE, READ, UPDATE, DELETE) for testbeds and resources								
Additional Info (comments):									
Component or Subsystem	Testbeds Directory Service								
Refines/Replaces	PT-P-004								

Id:	PT-DIR-S-006	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	Some basic query capabilities should be provided.								
Description:	Some basic query capabilities should be provided. to find resources that provide certain capabilities (testbed or/and UxV resource specific) that may need for an								

	experiment.
Additional Info (comments):	Need to define what exactly these capabilities could be for the testbed node and its various resources (i.e. CPU, RAM, Op. system, battery state, communication interfaces, sensor types, capabilities regarding resource controller, etc.) Need also to agree whether query capabilities would be available via an SQL query like language or via appropriate drop down menus or catalogues (the latter might be preferable for novice users but may limit the complexity of queries and consequently the granularity of searches).
Component or Subsystem	Testbeds Directory Service
Refines/Replaces	PT-A-016

Id:	PT-DIR-S-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Testbed Directory Service shall provide the possibility to register new resources belonging to a specific testbed in the RAWFIE platform, as well as to unregister (delete) resources								
Description:	The service shall also allow for updates of the registered resources and related information. Basically, the Testbed Directory Service should provide basic CRUD operations (CREATE, READ, UPDATE, DELETE) for testbeds and resources								
Additional Info (comments):									
Component or Subsystem	Testbeds Directory Service								
Refines/Replaces									

4.1.12 EDL Compiler and Validator

Id:	PT-CPV-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	A tool for translating EDL into user directives shall be provided								

Description:	The compilation and validation will be performed on top of the proposed EDL model that is based on a specific grammar. The compiler / validator will access the provided script and identify any errors that could jeopardize the execution of the experiment.
Additional Info (comments):	
Component or Subsystem	EDL Compiler & Validator
Refines/Replaces	PT-A-003

Id:	PT-CPV-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		An experimenter should have the opportunity to use a code generation engine							
Description:		When no errors are present, the EDL compiler and validator should generate the final code to be uploaded in the UxVs.							
Additional Info (comments):		The code generation module will transform the EDL elements into a specific format that will be adopted by the underlying nodes.							
Component or Subsystem		EDL Compiler & Validator							
Refines/Replaces		PT-A-003							

Id:	PT-CPV-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		Experiments defined via EDL shall be validated after their authoring							
Description:		Both textually or visually defined experiments shall be validated based on a predefined set of rules (i.e. syntactically, regarding spatial and/or spatiotemporal availability of selected resources) providing feedback to the author of the experiment about syntactic or semantic errors and possible restrictions/contradictions.							
Additional Info									

(comments):	
Component or Subsystem	EDL Compiler & Validator
Refines/Replaces	PT-A-014

Id:	PT-CPV-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The compiler and validator should communicate with the authoring tool in order to transfer error indications and hints for solving them								
Description:	The compiler and validator will communicate with the front end layer to convey messages to the experimenters in order to provide help in editing their experiments. Errors and hints for securing the correct editing of the experiments will be also transferred in the front end.								
Additional Info (comments):									
Component or Subsystem	EDL Compiler & Validator								
Refines/Replaces									

4.1.13 Experiment Validation Service

Id:	PT-EXV-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:	RAWFIE shall provide a validator to constantly check experiment scenarios during runtime								
Description:	EVS will validate if each experiment can efficiently be executed in the selected testbed. Cross experiments validation will be performed accompanied by qualitative characteristics of an experiment. For instance, the EVS, based on each experiment workflow, will retain security and qualitative issues. Communication between nodes will be secured as well as collision avoidance and qualitative control activities..								
Additional Info (comments):	EVS provides semantic validation for each experiment. It checks the fulfilment of a set of constraints defined by experts or Security Board. It can handle the Handle security & safety issues e.g., collision avoidance, and other non-functional (qualitative) aspects of each experiment. Efficient communications								

	and control of the UxVs team will be performed in order to increase the performance of the system. It performs also cross experiment validation in order to help in maximising the performance of RAWFIE framework.
Component or Subsystem	Experiment Validation Service
Refines/Replaces	PT-L-001

Id:	PT-EXV-S-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		The validation service should perform syntactic checking							
Description:		The EDL validation service is responsible for performing syntactic analysis on the provided EDL scripts. The service will access the provided script and identify any syntactic errors that could jeopardize the execution of the experiment.							
Additional Info (comments):		The service will syntactically check every script in terms of the EDL. Hints for correcting possible errors will be provided to the experimenters.							
Component or Subsystem		Experiment Validation Service, EDL Authoring Tool							
Refines/Replaces		PT-L-001							

Id:	PT-EXV-S-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		The validation service should perform semantic checking							
Description:		The EDL validation service is responsible for performing semantic analysis on the provided EDL scripts. The service will access the provided script and identify any semantic errors also with the use of data stored in the underlying infrastructure. It is capable of applying semantic checking for nodes communication, spatio-temporal management, sensing and data management.							
Additional Info (comments):		The service will semantically check every script in terms of the EDL. Hints for correcting possible errors will be provided to the experimenters.							

Component or Subsystem	Experiment Validation Service
Refines/Replaces	PT-L-001

4.1.14 Users & Rights Service

Id:	PT-USR-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		User login credentials checking shall be provided							
Description:		The login credentials of user shall be check, before the user may access any restricted services.							
Additional Info (comments):		Login via X.509 client certificate may also be possible.							
Component or Subsystem		Users & Rights Service							
Refines/Replaces		PT-GEN-002							

Id:	PT-USR-S-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		The Users & Rights Service shall support various roles with different privileges at every level of access.							
Description:		The platform shall provide a set of different roles with predefined privileges. Every platform user should be assign to a role. At least the following roles shall exist: • Experimenter • Admin • Testbed Operator							
Additional Info (comments):		Each of them providing different access rights to the various platform services. Definition of additional roles may be possible. Each service has to check if the use has the appropriate roles to access it. A proxy service may also be used that restricts the access to the service.							

Component or Subsystem	Users & Rights Service
Refines/Replaces	PT-GEN-002

Id:	PT-USR-S-003	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Users & Rights Service may provide a proxy service for web application that do not check access rights.								
Description:	The platform may provide a proxy service that restricts the access to special web page only authorise users.								
Additional Info (comments):	Implementation specific, if this proxy needed.								
Component or Subsystem	Users & Rights Service								
Refines/Replaces									

4.1.15 Booking Service

Id:	PT-BOO-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking Service shall support reservations of resources at both user level and experiment level								
Description:	The Reservation of Resources in RAWFIE system is expected to be performed at two (2) levels: • The user level which is performed by a potential experimenter and usually should precede experiments definition. The resources reserved at this stage are not assigned to a specific experiment but are guarantee to be available for a user for the specified time frame • The experiment level which is performed after (or during) authoring and validation of an experiment. This level of reservation assigns resources to specific experiments of sequence of experiments								
Additional Info (comments):									

Component or Subsystem	Booking Service
Refines/Replaces	PT-B-001

Id:	PT-BOO-S-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	User level booking shall be triggered by the Booking Tool via a REST API.								
Description:	The main way for a user to reserve resources will be locate them via the Booking Tool interface. This kind of reservation does not contain any kind of information related to a particular experiment								
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces	PT-B-001								

Id:	PT-BOO-S-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Experiment level booking shall be triggered by the experimenter before issuing a manual or schedule launching of a validated experiment								
Description:	The reservation of resources to specific experiments is achieved during authoring of an experiment and should precede the actual launching of the experiment								
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces	PT-B-001, PT-L-002								

Id:	PT-BOO-S-004	Type:	FUNC	Importance (priority):	HIGH	Source:	Iteration1 Exp	Ver:	2
Title:	Experiment level booking shall support both immediate booking as well as booking at a future time								
Description:	Experiment level booking shall allow an experimenter to define whether the resources are to be reserved directly or a a future timeslot.								
Additional Info (comments):	immediate booking will probably be initiated during experiment authoring.								
Component or Subsystem	Booking Service								
Refines/Replaces	PT-B-001								

Id:	PT-BOO-S-005	Type:	FUNC	Importance (priority):	HIGH	Source:	Architecture Deliverables	Ver:	2
Title:	Booking Service shall provide all the necessary methods to manage the bookings including addition, modification and cancellation/deletion operations								
Description:									
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces									

Id:	PT-BOO-S-006	Type:	FUNC	Importance (priority):	HIGH	Source:	Architecture Deliverables	Ver:	2
Title:	Booking Service shall be able to compute and return feedback on conflicting bookings for a provided booking request								
Description:									
Additional Info (comments):									

Component or Subsystem	Booking Service
Refines/Replaces	

Id:	PT-BOO-S-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Reservation Data shall be persistent in order to survive service failures and be available by other services								
Description:	The reservation information should be backed in a relational database for persistence purposes as well as since it might be needed by other RAWFIE components (i.e. the launching service for scheduled experiments).								
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces									

Id:	PT-BOO-S-008	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Historical data retrieval for Bookings/Reservations shall be available on demand								
Description:	Persisted Booking information should be available for search and statistic purposes. Therefore booking information should maintain timestamps (for the start and end time of booking)								
Additional Info (comments):	Information should be available for both user level and experiment level reservations								
Component or Subsystem	Booking Service								
Refines/Replaces									

Id:	PT-BOO-S-009	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	Booking functionality shall support reservation of resources involving multiple testbeds								
Description:	The booking module must allow for the purpose of a single experiment the possible reservation of resources from different physical testbeds if this is explicitly requested from an experimenter.								
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces	PT-B-003								

Id:	PT-BOO-S-010	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Booking functionality shall be able to correctly handle simultaneous Reservations requests by end users								
Description:									
Additional Info (comments):									
Component or Subsystem	Booking Service								
Refines/Replaces	PT-B-003								

Id:	PT-BOO-S-011	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	Notification mechanisms may be provided for experiments scheduled for execution in the future.								
Description:	A notification mechanism to remind an experimenter the date and the timeslot allocated for running his/her experiment on the RAWFIE infrastructure may also be envisaged to improve the user experience. The time of notification prior to the								

	experiment launch should be configurable.
Additional Info (comments):	
Component or Subsystem	Booking Service, Launching Service
Refines/Replaces	PT-B-004

4.1.16 Launching Service

Id:	PT-LAU-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:		Launching Service shall support short-term or manual launching of an experiment initiated directly by an experimenter							
Description:		The Launching Service through a specific interface will give the opportunity to experimenters to execute in real time pre-defined and pre-approved experiments stored in the RAWFIE system.							
Additional Info (comments):									
Component or Subsystem		Launching Service							
Refines/Replaces									

Id:	PT-LAU-S-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:		Launching Service shall support long-term or scheduled launching of an experiment initiated directly by an experimenter							
Description:		The Launching Service shall provide the ability to execute experiments at a future time based on the associated bookings/reservations. In order to do that the Launching Service may utilize an appropriate scheduler.							
Additional Info (comments):									
Component or		Launching Service							

Subsystem	
Refines/Replaces	

Id:	PT-LAU-S-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	Each executing experiment shall be uniquely identified within RAWFIE ecosystem								
Description:	The Launching Service shall ensure that during launching a unique Identifier is associated with the experiment which can be used from any other component or service to reference the running experiment								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces	PT-E-001								

Id:	PT-LAU-S-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	During launching it must be ensured that the experiment to be started has been validated based on spatio-temporal constraints								
Description:	The Launching Service shall allow execution of experiments that have been validated based on spatial (usually imposed by an experimenter reservations/bookings) or temporal (usually based on information present in the EDL script) constraint that may exist								
Additional Info (comments):									
Component or Subsystem	Launching Service, Experiment Validation Service								
Refines/Replaces	PT-L-002								

Id:	PT-LAU-S-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	During launching it must be ensured that the experiment to be started belongs to an authorized user of the RAWFIE platform								
Description:	The Launching Service shall allow execution of experiments that have been issued by existing RAWFIE platform users. If e.g. a request is received for a user that is not active any more it should be discarded.								
Additional Info (comments):									
Component or Subsystem	Launching Service, Experiment Validation Service								
Refines/Replaces	PT-L-002								

Id:	PT-LAU-S-006	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Launching Service shall be able to address simultaneous requests for starting an experiment								
Description:	The Launching Service should be able to handle multiple requests for launching an experiment at a reasonable time and in a thread safe manner.								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces									

Id:	PT-LAU-S-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Launching Service shall send an appropriate message upon successful starting of an experiment								
Description:	The Launching Service shall provide an indication of successful experiment start by publishing an appropriate message that contains the execution ID of the experiment and possible additional information that may be needed by other								

	services.
Additional Info (comments):	
Component or Subsystem	Launching Service
Refines/Replaces	PT-E-001

Id:	PT-LAU-S-008	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Launching Service shall interact with other components or database services in order to retrieve information needed for deciding on launching an experiment								
Description:	The Launching Service shall be able to directly interact with the RAWFIE databases and possibly additional services or tools (Validation Service, Experiment Controller etc.) in order to figure out whether an experiment start request should be issued.								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces									

Id:	PT-LAU-S-009	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Interactions of the launching service with database services and/or other components should respect the RAWFIE platform boundary								
Description:	The Launching Service should not be allowed to directly interact with components or services outside the RAWFIE platform. Direct calling of a Testbed service i,e. should not be allowed.								
Additional Info (comments):									
Component or Subsystem	Launching Service								

Refines/Replaces	

Id:	PT-LAU-S-010	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Launching service shall support requests for experiment cancellation								
Description:	Requests for cancelling an already running or scheduled experiment should be handled by the launching service								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces									

Id:	PT-LAU-S-011	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	RAWFIE platform shall provide means to ensure fairness in experiments execution								
Description:	RAWFIE platform shall provide mechanisms, either automated or involving manual intervention (i.e. by an administrator) that will ensure fairness in experiments execution thus avoiding a resource being perpetually used by a certain experiment.								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces	PT-L-007								

Id:	PT-LAU-S-012	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2

Title:	Launching service shall provide appropriate feedback to the requested entity regarding failures on fulfilling a request
Description:	If a request for starting or cancelling an experiment fails to be successfully processed by the Launching Service then an appropriate response should be returned indicating the reason of failure.
Additional Info (comments):	Possible reason of failure may include (not exhaustive): • Experiment already running • Not existent experiment ID • Experiment addressing not reserved resources • Communication failure (inability to sent StartExperimentRequest • Experiment with inconsistency regarding its initial execution time
Component or Subsystem	Launching Service
Refines/Replaces	

Id:	PT-LAU-S-013	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Launching service shall not alter or modify any information related to the actual execution of an experiment								
Description:	The purpose of launching service is to initiate an experiment and generate a unique Id capable of being used for identifying a "running" experiment within the RAWFIE ecosystem. Information related to the internals of the experiment are not be handled by this component.								
Additional Info (comments):									
Component or Subsystem	Launching Service								
Refines/Replaces									

4.1.17 Visualisation Engine

Id:	PT-VIS-E-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2

Title:	The Visualization Engine shall retrieve from the message bus all runtime experiment information needed for visualizing the UxVs and/or any sensor measurments
Description:	During the experiment execution, the Visualisation Engine will be in charge of handling the communication with the Message Bus, in order to retrieve all the information (e.g. sensors measurements and position) that will be available during the experiment's execution
Additional Info (comments):	
Component or Subsystem	Visualisation Engine
Refines/Replaces	PT-L-005

Id:	PT-VIS-E-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualization Engine shall provide a GIS server capable of handling geographical layers (overlays)								
Description:	The Visualisation Engine shall provide all server side functionalities (GIS server) to add and manipulate multiple geographic elements as overlays on the map. It shall be possibile to add, organise and access to georeferenced elements (layers) using one or more of the following technologies: • Georeferenced information stored in the PostGIS database • WMS layers from external providers • WFS layers from external providers • Shapefiles								
Additional Info (comments):									
Component or Subsystem	Visualisation Engine								
Refines/Replaces									

Id:	PT-VIS-E-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Architecture Deliverables	**Ver:**	2

Title:	The Visualization Engine may allow cache of data for faster access to the available geographic layers
Description:	The GIS Server provided by the Visualisation Engine may provide caching functionality of geographic data, for faster loading time.
Additional Info (comments):	
Component or Subsystem	Visualisation Engine
Refines/Replaces	

Id:	PT-VIS-E-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Architecture Deliverables	**Ver:**	2
Title:	The Visualization Engine shall provide the possibility to reply experiments using historical data								
Description:	The experimenter shall be able to choose, from the Visualisation Tool, the experiment to be repeated. The request shall be handled by the Visualisation Engine, which retrieves information about the past experiment (including related maps and layers) directly from the database of through other Middle Tier components.								
Additional Info (comments):	By replaying any of the experiments, the user can gather or check data for an experiment at a convenient time after the experiment finished.								
Component or Subsystem	Visualisation Engine								
Refines/Replaces									

4.1.18 Experiment Controller

Id:	PT-EXP-C-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Cancellation of running experiments should be possible								

Description:	Experiment controller should be able to receive from the experimenter instructions regarding the cancellation of an ongoing experiment. In the sequel, the experiment controller should forward these instructions to the resource controller
Additional Info (comments):	
Component or Subsystem	Experiment Controller
Refines/Replaces	

Id:	PT-EXP-C-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		RAWFIE platform shall allow experimenters to remotely navigate UxVs.							
Description:		RAWFIE experimenters shall have ability to guide the unmanned vehicles through a virtual remote controller provided by the application's interface. Either the experimenter directly controls the UxV or the provided instructions are translated into a "global form" of waypoints (a reference scheme compatible with the build-in navigation system of the UxVs) and transmitted to the controlled units.							
Additional Info (comments):		The virtual remote controller will act as proxy control unit communicating with the real control unit that lies on each testbed The exchanged messages should be designed in respect to open standards possibly using well know formats (i.e. JSON or XML).							
Component or Subsystem		Experiment Controller							
Refines/Replaces		PT-L-008							

Id:	PT-EXP-C-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		The Experiment Controller shall support the execution of experiments that involve multiple testbeds							
Description:		Experiments written by users can involve resources that belong in different geographically dispersed locations. The experiment controller must be able to handle and coordinate all kinds of information exchange for all the different							

	testbeds participating in the experiment.
Additional Info (comments):	
Component or Subsystem	Experiment Controller
Refines/Replaces	

Id:	PT-EXP-C-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller shall be able to support multiple experiments running the same time in parallel								
Description:	As a multi-user environment multiple RAWFIE experiments can run in parallel in temporal dimension. The Experiment Controller must be able to smoothly support all the experiments that temporally coexist without degradation of service performance.								
Additional Info (comments):									
Component or Subsystem	Experiment Controller								
Refines/Replaces									

Id:	PT-EXP-C-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller shall be able to analyse the whole experiment script and dispatch the appropriate parts to each responsible testbed facility								
Description:	After receiving the validated EDL script, Experiment Controller must be able to process its content, identify the involved testbeds and send to each testbed's responsible component (Resource Controller) only the information related to this testbed.								
Additional Info (comments):									
Component or	Experiment Controller								

Subsystem	
Refines/Replaces	

Id:	PT-EXP-C-006	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller shall support receiving feedback at regular intervals from all testbed facilities about the progress of the experiment in this time interval								
Description:	RAWFIE experiments can be expanded in different testbeds and Experiment Controller as a coordination point must be aware in time about the progress of the experiment in all physical testbeds involved. Experiment Controller must be able to compose the whole picture of the experiment upon receiving feedback from the individual testbeds building a clear view of the overall status and the correctness of steps executed so far.								
Additional Info (comments):									
Component or Subsystem	Experiment Controller								
Refines/Replaces									

Id:	PT-EXP-C-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller may be able to override the order of instructions described in the input script while the experiment is running								
Description:	Based on the feedback from testbed facilities, the Experiment Controller may have the ability to override the future steps described in the input script. This may be done for safety or feasibility reasons.								
Additional Info (comments):	This can of override should be allowed only after special authorization and always respecting the constraints of each testbed facility.								
Component or Subsystem	Experiment Controller								
Refines/Replaces									

Id:	PT-EXP-C-008	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller shall be able to continuously feed the front-end tier (Experiment Monitoring Tool) giving the experimenter a clear view of the experiment workflow as a whole								
Description:	Experiment Controller is the responsible component for composing the whole picture of the experiment and its progress compared to the aimed target and must send this information in front-end components and user interfaces through which the user interacts, giving the experimenter the ability to have a clear assessment about the experiment progress.								
Additional Info (comments):									
Component or Subsystem	Experiment Controller								
Refines/Replaces	PT-L-004								

Id:	PT-EXP-C-009	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Experiment Controller shall send distinct error and warning messages in every case the experiment's state diverges from the aimed target								
Description:	End users must have a clear view of the errors and warnings that occur during the experiment execution and Experiment Controller must provide all error notifications that occurred in its domain.								
Additional Info (comments):									
Component or Subsystem	Experiment Controller								
Refines/Replaces									

4.1.19 Data Analysis Engine

The Data Analysis Engine is the intermediary between the analysis tool and spark. Spark is a distributed compute platform that can effectively factor out computations such as BLAS

operations. We utilize the Spark jobserver API to do most of the communication between our tool and the compute cluster.

Id:	PT-DAA-S -001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis engine will support accepting of analysis jobs							
Description:		The Data Analysis Engine will provide a schema based approach where it will accept analytics jobs. Will also provide access to spark transparently.							
Additional Info (comments):		Data analytical software will deliver a set of analytical functionalities such as: • outlier detection, • distribution shift detection, • classification. • Dimensionality reduction The end user will also be able to deploy custom jobs by posting a model [‘jar’] to the jobserver.							
Component or Subsystem		Data Analysis							
Refines/Replaces		PT-E-004, PT-E-005							

Id:	PT-DAA-S -002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Analysis engine will support compiling analysis jobs							
Description:		• The Analysis Engine supports posting models [‘jar’] and parameters [‘job’]. • For obvious reasons a model should be decoupled from it’s parameters because we might want to post models of the same type with different parameters and/or working on different metrics. • A job is either a streaming job or a batch job. A streaming job has no end of life, while a batch job does.							
Additional Info (comments):									
Component or Subsystem		Data Analysis							

Refines/Replaces	PT-E-005

4.1.20 System Monitoring Service

Id:	PT-SYM-S-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		RAWFIE middle tier shall include a module to monitor the performance of the middle tier components.							
Description:		This module will check the performance of the middle tier components by utilizing Key Performance Indicators (KPI) and this way ensure that all critical software modules will perform at optimum levels.							
Additional Info (comments):		Indicators could be: CPU load, free disc space, availability of system services (SSH, web server, etc.), availability and response time of the web services and databases servers etc.							
Component or Subsystem		System Monitoring Service							
Refines/Replaces		PT-GEN-004							

Id:	PT-SYM-S-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		RAWFIE Testbeds and UxVs statuses should be monitored							
Description:		This module will collect the availability information of testbeds and UxVs.							
Additional Info (comments):		Testbeds and UxVs are very heterogeneous. They have to evaluate their availability by their own and have to send them to the monitoring component (e.g. via the message bus). Testbeds and UxVs that did not sent status updates for a long time are considered as offline.							
Component or Subsystem		System Monitoring Service							
Refines/Replaces		N/A							

Id:	PT-SYM-S-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	RAWFIE system administrators should be informed if critical, for the RAWFIE platfrom operation, services are down								
Description:	Emails should be sent to the system administrators if the monitoring considers critical components as down.								
Additional Info (comments):									
Component or Subsystem	System Monitoring Service								
Refines/Replaces	(PT-NF-007)								

Id:	PT-SYM-S-004	**Type:**	FUNC	**Importance (priority):**	LOW	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	User may register for notifications if certain components are down								
Description:	Emails should be sent to the users if the monitoring considers critical components as down.								
Additional Info (comments):									
Component or Subsystem	System Monitoring Service								
Refines/Replaces	(PT-NF-007)								

Id:	PT-SYM-S-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Notifications about planned downtimes								
Description:	Emails should be sent to the interested users if some components are planned to be down.								
Additional Info (comments):									

Component or Subsystem	System Monitoring Service
Refines/Replaces	(PT-NF-007)

4.1.21 Accounting Service

Id:	PT-ACC-S-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	DoW	**Ver:**	2
Title:	The accounting service should be capable to accept different cost models regarding RAWFIE usage on a per service basis								
Description:	The main role of the accounting service will be to provide an effective cost model for charging users of the platform based on the type of experiment and the services used. Different cost models should be supported and be configurable in terms of parameters.								
Additional Info (comments):	In the early days of the federation and while the RAWFIE platform is in the phase of development and evaluation virtual credit units may be used to enable a policy of fair resource sharing among users while after the EU funding period the accounting system can be used for applying a cost model viable for commercial use based on quantification of all costs involved in setting up, maintaining, developing and managing the different facilities that are part of the federation								
Component or Subsystem	Accounting Service								
Refines/Replaces	PT-B-007								

Id:	PT-ACC-S-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	DoW	**Ver:**	2
Title:	The accounting service should be capable to gather statistics regarding usage of the platform by experimenters.								
Description:	The accounting service should be available from the early days of RAWFIE federation and ensure that all information pertaining to the use of the platform and its services by potential experimenters is available.								
Additional Info (comments):									
Component or	Accounting Service								

Subsystem	
Refines/Replaces	PT-B-007

Id:	PT-ACC-S-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	DoW	**Ver:**	2
Title:	The RAWFIE platform should record information related to time and type of access for a service by a user.								
Description:	Information on when and what type of service each user interacts with can be exploited later on for determining the platform accounting issues.								
Additional Info (comments):									
Component or Subsystem	Accounting Service								
Refines/Replaces	PT-B-007								

Id:	PT-ACC-S-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The cost model used may take into consideration the overall time of experiments executed by a user of the platform.								
Description:									
Additional Info (comments):									
Component or Subsystem	Accounting Service								
Refines/Replaces	PT-B-007								

Id:	PT-ACC-S-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The accounting service may support different types of charging based on the type of the experimenter (industrial, research, university etc.)								
Description:									
Additional Info (comments):									
Component or Subsystem	Accounting Service								
Refines/Replaces	PT-B-007								

Id:	PT-ACC-S-006	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The accounting service may support predefined types of memberships regarding usage of the platform that may depend on various types of parameters								
Description:									
Additional Info (comments):									
Component or Subsystem	Accounting Service								
Refines/Replaces	PT-B-007								

Id:	PT-ACC-S-007	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The accounting service should be able to handle the addition of new services that may be incorporated in the RAWFIE platform during time.								

Description:	The accounting service must be able to update the applied cost model for services that possibly may be added after its initial deployment
Additional Info (comments):	
Component or Subsystem	Accounting Service
Refines/Replaces	PT-B-007

4.2 Testbed Requirements

Testbed requirements include all the requirements pertaining the testbed facility components. The testbed components are mainly used for interconnecting with the RAWFIE server platform and for managing the UxV resources.

4.2.1 General

Id:	TB-GEN-R-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Each UxV Testbed should provide a Slice Interface for federating their capabilities/resources to the experimenter.								
Description:	In accordance with the general SFA concept each testbed should provide a minimal interface to enable the federation of testbeds with different technologies and belonging to different administrators, while granting the control of the resources to their owners. The slice interface is used to create and control slices.								
Additional Info (comments):									
Component or Subsystem									
Refines/Replaces									

Id:	TB-GEN-R-002	**Type:**	ENV	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	1

Title:	Each Testbed should provide the exact boundaries within which its UxVs can operate
Description:	The spatial boundary where UxVs can operate within a testbed should be predefined a priori. Any attempt of a UxV to move outside this boundary should be prohibited. Also requests by ground components attempting to breach the operating boundary should be rejected.
Additional Info (comments):	
Component or Subsystem	
Refines/Replaces	

Id:	TB-GEN-R-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	1
Title:	Testbed areas should at least be able to host/operate multiple UxVs of one or more types								
Description:	Testbed areas should provide either indoor and/or outdoor facilities capable of hosting at least one of three types of unmanned vehicles (UAV,USV, UGV). Additionally, the extend/size of the hosting testbed area should be sufficient enough								
Additional Info (comments):									
Component or Subsystem	N/A								
Refines/Replaces									

Id:	TB-GEN-R-004	**Type:**	ENV	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:	Testbed areas environment should be closely monitored								
Description:	Testbed areas that live demonstration will take place, should provide a controlled environment depending on the extend of the outdoor and indoor space. Namely, the indoor testbeds are physically smaller than the outdoor ones and benefit from a much more controlled environment.								

Additional Info (comments):	
Component or Subsystem	N/A
Refines/Replaces	TB-G-002

Id:	TB-GEN-R-005	**Type:**	ENV	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:	Indoor spaces of a testbed should provide a controlled indoor environment								
Description:	Indoor spaces should be used in order to evaluate, at earlier stage (before go-live in outdoor space), all communications and other security checks. This will increase reproducibility of results								
Additional Info (comments):									
Component or Subsystem	N/A								
Refines/Replaces	TB-G-002								

Id:	TB-GEN-R-006	**Type:**	SUPP	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:	Testebed facility areas should comprise storing spaces and be able to receive inspect and assemble and/or fix UxVs								
Description:	All comforts should be provided, in terms of big, storing and spaces for UxV's maintenance, inspections and monitor.								
Additional Info (comments):									
Component or Subsystem	N/A								
Refines/Replaces	TB-G-002								

Id:	TB-GEN-R-007	**Type:**	SEC	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:		Testbed facilities should provide emergency services in an extraordinary event							
Description:		Each testbed facility should have a security/emergency plan and relevant trained staff for common extraordinary events, such as fire, crash.							
Additional Info (comments):									
Component or Subsystem		N/A							
Refines/Replaces		TB-G-002							

Id:	TB-GEN-R-008	**Type:**	ENV	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	2
Title:		Testbed areas should provide proper facilities and equipment							
Description:		Facility area should have appropriate ground – based and mobile equipment that may include (depending on the case): • radar, • cameras, • antennas, • receivers, • optical tracking, • video services.							
Additional Info (comments):									
Component or Subsystem		N/A							
Refines/Replaces		TB-G-002							

Id:	TB-GEN-R-009	**Type:**	ENV	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	1
Title:	Testbed must provide dedicated computational resources								
Description:	Testbed must provide either a committed PCs and/or Virtual Machines, with very-high-bit-rate digital subscriber line, able to host and support RAWFIE system.								
Additional Info (comments):									
Component or Subsystem	N/A								
Refines/Replaces									

Id:	TB-GEN-R-010	**Type:**	OTH	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	1
Title:	Testbeds should be supported by on-site personnel								
Description:	During testbed demonstrations the physical presents of personnel must be provided. Assigned personnel is important for technical support, UxV battery charging, maintenance and upgrades								
Additional Info (comments):									
Component or Subsystem	N/A								
Refines/Replaces									

Id:	TB-GEN-R-011	**Type:**	SEC	**Importance (priority):**	HIGH	**Source:**	Other	**Ver:**	1
Title:	Testbeds should conform to all legal regulations and restrictions								

Description:	Testbeds areas should adhere and follow all legal restrictions that are applicable, according to specific laws and regulations, at local national and EU level that can be applied
Additional Info (comments):	
Component or Subsystem	N/A
Refines/Replaces	TB-NF-G-005

4.2.2 Monitoring Manager

Id:	TB-MOM-001	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Monitoring Manager component should be able to provide information about the capabilities of each resource node.								
Description:	Testbed's monitoring component should check periodically the current status of the available resources (i.e. for each node) in the facility like battery lifetime, CPU load, free RAM, bit error rate, etc.								
Additional Info (comments):									
Component or Subsystem	Monitoring Manager								
Refines/Replaces	TB-G-004, TB-G-006								

Id:	TB-MOM-002	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Monitoring Manager component should collect and report current status of testbed facilities								
Description:	Testbed's monitoring component should check periodically the status of the testbed facilities like weather conditions, network connections available, etc.								

Additional Info (comments):	
Component or Subsystem	Monitoring Manager
Refines/Replaces	TB-G-001

Id:	TB-MOM-003	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Monitoring Manager component should store periodically all testbed information								
Description:	Testbed monitoring manager should collect and store the status of the testbed characteristics and the devices in a data log file, with a specific timestamp.								
Additional Info (comments):	This has to be feasible as in some specific cases communication with other tiers, i.e. System Monitoring Service, will not exist.								
Component or Subsystem	Monitoring Manager								
Refines/Replaces	TB-G-003								

Id:	TB-MOM-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed monitoring manager should be able to transmit the current status to the System Monitoring Service.								
Description:	Monitoring Manager component should have the role of a special plugin which will update the System Monitoring Service of the current status.								
Additional Info (comments):									
Component or Subsystem	Monitoring Manager								
Refines/Replaces	TB-G-003								

4.2.3 Network Controller

Id:	TB-NEC-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	The RAWFIE communication resources shall be managed in order to offer seamless connectivity in the normal operations of the system.								
Description:	The RAWFIE Communication Manager will manage and optimize the use and allocation of the communication resources. This is the case in particular with respect to the communication link and its associated quality of service as well as the possible switching between the two available communication links.								
Additional Info (comments):	This process is done in real-time on the basis of the monitoring of the communication metrics. It is done in conjunction with the Resource Controller.								
Component or Subsystem	Network Controller, Resource Controller								
Refines/Replaces	PT-L-009, TB-G-008								

Id:	TB-NEC-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	Provision of network communication resource								
Description:	Provision network communication with Resource Controller								
Additional Info (comments):									
Component or Subsystem	Network Controller, Resource Controller								
Refines/Replaces									

Id:	TB-NEC-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	Alternative communication system								
Description:	Enable switching between available network technologies								

Additional Info (comments):	This feature should be offered on a per connected entity basis (e.g. a UxV), depending on the communication quality between this entity and the Testbed.
Component or Subsystem	Network Controller, Resource Controller
Refines/Replaces	TB-R-013

Id:	TB-NEC-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	Management of the communication system								
Description:	The UxV shall regularly check the communication status to detect any disconnection, defective link or degradation of the quality of service								
Additional Info (comments):	This feature is bilateral and it shall be present on both sides of the communication: the communicating entity (e.g. a UxV) and the Testbed. This is particularly useful when the UxVs are moving in an environment with obstacles between them and the other components.								
Component or Subsystem	Network Controller, Resource Controller								
Refines/Replaces	TB-NF-G-006								

Id:	TB-NEC-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	Time constraint verification and notification								
Description:	The network controller shall verify during the execution of the experiment that the time constraints specified on the exchanged data for the different types of UxVs are met. Whenever such time constraint is not met, this event shall be notified to the Experiment Controller and the resource controller, so that they can take the appropriate measures								
Additional Info (comments):	Measures include relaxing the constraint, switching to other resources (e.g. alternative communication system), re-balancing the existing resources, stopping the experiment, etc.								
Component or Subsystem	Network Controller, Experiment controller, Resource Controller								

Refines/Replaces	

4.2.4 Resource Controller

Id:	TB-REC-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	RAWFIE platform shall support a semi-autonomously way of navigation of the UxVs								
Description:	Experimenters provide details about the mission that UxVs will execute as well as comprehensive information about the algorithms to be used to process this task. RAWFIE undertakes the evaluation of all the employed elements and in each time step the system assesses the validity of the decisions of the involved algorithms. The internal control mechanism alters the trajectory of the units so as to ensure both, the vehicle's safety and the success of the mission. At each time step next optimum/appropriate waypoint for each UxV is transmitted to it.								
Additional Info (comments):	Real time tracking may be restricted by the communication technology of the UxV data transmission. Cloud Technology may be not fast enough for real time tracking.								
Component or Subsystem	Resource Controller								
Refines/Replaces	PT-L-009, TB-G-008								

Id:	TB-REC-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	RAWFIE platform should be able to activate the “Emergency Scenario”								
Description:	The “Remote Control” component ensures that the system is performing as intended and additionally, guarantees the safety of the equipment. If one of the following conditions occurs, automatically, the component activates an emergency scenario. • The component does not receive any feedback from the units for several time steps • The component receives feedback from the units which report severe localization issues								
Additional Info (comments):									

Component or Subsystem	Resource Controller
Refines/Replaces	PT-L-009, TB-G-008

Id:	TB-REC-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Resource Controller shall receive location messages from the vehicles at regular intervals								
Description:	The Resource Controller shall be able to receive communication messages with the actual position's coordinates at regular intervals and in near real-time constraints. The Resource Controller shall be able to utilize this information for position variation estimation compared to the planned path, trajectory optimization, obstacles avoidance and identification of possible safety violations.								
Additional Info (comments):									
Component or Subsystem	Resource Controller								
Refines/Replaces	TB-G-005, TB-G-003								

Id:	TB-REC-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Resource Controller shall transmit the next location for the current experiment to the vehicles								
Description:	The Resource Controller shall be able to transmit the next navigation point of the UxV taking into account the experimenter's instructions as received from the Experiment Controller and the actual position received from UxVs. Above the previous, for the estimation of the next point the model of UxVs, navigation obstacles and the system dynamics will be used as inputs in the planning algorithm.								
Additional Info (comments):									
Component or Subsystem	Resource Controller								

Refines/Replaces	TB-G-008

Id:	TB-REC-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	The Resource Controller shall be able to plan the next location that will be transmitted in the vehicle taking into account the locations of all UxVs that are active in that testbed								
Description:	Taking into account that the Resource Controller shall be able to receive the actual locations of all UxVs at regular intervals and in near real-time constraints the component shall be able to utilize this information in the next steps for mission optimization and UxVs collision avoidance.								
Additional Info (comments):									
Component or Subsystem	Resource Controller								
Refines/Replaces									

Id:	TB-REC-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	For the experiment accomplishment the Resource Controller shall operate in close coordination with the Experiment Controller								
Description:	Resource Controller is responsible for trajectory monitoring and optimization for each UxV at testbed level and shall report the experiment execution progress to the Experiment Controller which is responsible for the progress estimation of the experiment. Resource controller shall be able to receive experimenter's instructions after processing performed in the Experiment Controller as well as corrective instructions in case needed for the successful accomplishment of the experiment as a whole.								
Additional Info (comments):									
Component or Subsystem	Resource Controller								
Refines/Replaces	TB-I-001, TB-G-005								

4.2.5 Testbed Proxy

Id:	TB-PRO-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	Testbed proxy should act as a reverse proxy								
Description:	Testbed Proxy represents a gateway between the middle and the testbed tier. It forwards the messages from the components that belong to middle tier to the relevant components of testbed tier. Therefore Testbed Proxy • accepts requests from middle tier and forwards only valid requests to testbed components.passes • replies from testebed components back to middle and frontend tier								
Additional Info (comments):									
Component or Subsystem	Testbed Proxy								
Refines/Replaces									

Id:	TB-PRO-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed proxy contains Inner and Outer Firewall								
Description:	Testbed Proxy filters all requests, so that only (mostly) harmless requests will reach the Resource Controller and the Testbed Manager. Two packet filter firewalls ensure that no external network traffic reaches the real web server. The resulting network topology provides a demilitarized zone (DMZ) containing only the testbed components of Resource Controller, Testbed Manager, and Monitoring Manager. Testbed proxy • separates server zone from DMZ • denies inbound connections except from Reverse Proxy • denies outbound connection from backend services • filters incoming network traffic and allows only HTTP port access to the Reverse Proxy • can deny outbound connection from Reverse Proxy								
Additional Info (comments):									

Component or Subsystem	Testbed Proxy
Refines/Replaces	

4.2.6 Testbed Manager

Id:	TB-MAN-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:	Testbed Manager shall support permanent storage of all testbed attributes and resources attributes that belong to testbed								
Description:	Testbed Manager will be connected to a local database responsible for the storage of all the items that exist within the boundaries of each testbed. This must include testbed and resources description, utilization of resources, experiments running at testbed and logging of past activities.								
Additional Info (comments):									
Component or Subsystem	Testbed Manager								
Refines/Replaces	TB-D-001								

Id:	TB-MAN-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:	Testbed Manager shall provide information about the capabilities of each resource node								
Description:	Testbed Manager has to provide a complete set of each resource node capabilities. Such information for UxV nodes may include: • HW characteristics (CPU architecture and speed, RAM). • Communication capabilities (i.e. supported network standards, networking interfaces, software defined radio) • Sensing capabilities • measurement resource type								
Additional Info (comments):									

Component or Subsystem	Testbed Manager
Refines/Replaces	TB-G-004

Id:	TB-MAN-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed Manager shall check periodically the status of all other services running at testbed level								
Description:	Testbed Manager must be aware of the current status of all other components that belong to testbed software and inform the platform in case of detection of abnormal operation or non-responsive components. This information must be transmitted to System Monitoring Service making available the exact representation of the status of all Testbed components.								
Additional Info (comments):									
Component or Subsystem	Testbed Manager								
Refines/Replaces									

Id:	TB-MAN-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed Manager shall contain a registration log for all the experiments executed in the testbed								
Description:	Testbed Manager maintains a history log in the local database with all the experiments that conducted in the testbed giving to the testbed operators the ability to have a clear picture of its previous utilization.								
Additional Info (comments):									
Component or Subsystem	Testbed Manager								
Refines/Replaces	TB-D-002								

Id:	TB-MAN-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed Manager shall be periodically informed about the status of all running experiments in the testbed								
Description:	After an experiment start, Testbed Manager must be able to receive periodic notifications about the status of the experiment (ongoing, completed, cancelled etc).								
Additional Info (comments):	This notification will be available from Resource Controller after communication with UxVs participating in the experiment.								
Component or Subsystem	Testbed Manager								
Refines/Replaces									

Id:	TB-MAN-006	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed Manager shall store configuration parameters for the UxVs in the relevant testbed								
Description:	Configuration parameters of UxVs may include communication interfaces, programs and algorithms running in CPU, calibration and configuration of sensors. These parameters may need a proper adjustment prior making UxVs available to participate in RAWFIE experiments. A history log of every UxV configuration may be stored in local database as well.								
Additional Info (comments):									
Component or Subsystem	Testbed Manager								
Refines/Replaces	TB-G-004								

Id:	TB-MAN-007	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:	Testbed Manager shall implement a user interface to support the interactions between testbed operators and machines								

Description:	A graphical user interface must be able to represent all the information about testbed attributes and its resources, ongoing experiments and logging activities of past experiments, testbed services running, resources configurations and any other information related to testbed administration. The information stored in the local database shall be displayed to the testbed operator through this interface.
Additional Info (comments):	
Component or Subsystem	Testbed Manager
Refines/Replaces	

Id:	TB-MAN-008	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:	Testbed Manager shall be capable to handle temporary interruption of communication and store data locally in case of transmission failure								
Description:	Capability of enabling local data storage in case of transmission failure (Link loss between Testbed and the rest of RAWFIE infrastructure) and retransmission of data as soon as the link is established again.								
Additional Info (comments):									
Component or Subsystem	Testbed Manager								
Refines/Replaces	TB-D-001								

Id:	TB-MAN-009	**Type:**	DATA	**Importance (priority):**	LOW	**Source:**	Consortium	**Ver:**	2
Title:	Testbed Manager may provide statistical data/information about testbed operation								
Description:	Statistical data such as: number of experiments; experiments duration; number of UxV nodes used; Testbed time alive; etc.								
Additional Info (comments):									

Component or Subsystem	Testbed Manager
Refines/Replaces	TB-D-002

4.3 UxV Requirements

This subsection includes requirements related to UxVs and the expected functionality. In order to participate in RAWFIE experiments the UxV should implement a minimum level of common functionality irrespective of their type (UGV, UAV, USV) in terms of communication capabilities, on-board processing capabilities end localization.

4.3.1 General

Id:	TB-UVG-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	1
Title:		Compliance of UxV to RAWFIE specification and interfaces							
Description:		To be able to operate in a RAWFIE Tesbed, a RAWFIE UxV interacts with the other Testbed entities (proxy, controllers, other UxV's). As such the UxV shall conform to the RAWFIE global architecture and conceptual components defined in D4.2.							
Additional Info (comments):		The UxV Node component provides an abstraction layer to the unmanned vehicle systems (such as ROS and other proprietary operating systems) to make it appearing as a RAWFIE compliant component. It provides interfaces to the robot operation resources such as setting the robot waypoints and speed or real-time remote control. The UxV shall for example provide a minimum set of capabilities to the RAWFIE system. The minimum set of features is a subset of the following items: Processing capabilities (type of processors, number of cores, speed); Size and dimensions; Weight; Payload; Battery; Number and type or sensors; Number and type of integrated network components and supported communication interfaces; Minimum and maximum autonomy of the device; Auto-return capability (return to the base station automatically); Ability of the vehicle to operate as an access point; (Remote) Control interface; Over-the-air programming capabilities; Provision of collision avoidance mechanism; Compatibility with Apache Kafka architecture; Data storage of the vehicle; Support of "safe mode" operation; Localization capabilities (e.g., GNSS); Ability to operate in indoor/outdoor/mixed environments; Compliance with standards, Operational conditions (e.g., day/night) and temperature limitations.							
Component or Subsystem		UxV proxy and adapter							

Refines/Replaces	

4.3.2 UxV Node

The UxV Node provides an interface to the robot control mechanisms (waypoints, speed, remote control) and publish the robot localisation information and odometry. It shall:

- Process and execute robot steering commands (either waypoints or real-time remote control commands).
- Control the speed of the robot and enforce any safety rule given: no-go areas, minimal or maximal altitude or depth, collision avoidance.
- Estimate and publish the robot odometry and any other localisation and speed information
- Monitor the vehicle critical resources such as the battery. Take safety measures (e.g. return to base) if energy is too low to complete the mission.
- Publish identification information.

Id:	UXV-NOD-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		Each UxV shall have a unique Identification code.							
Description:		Each UxV shall have a unique Identification code across the testbed							
Additional Info (comments):		This allows each system to be unequivocally identified in the RAWFIE network. Messages transmitted across the network can be addressed to identify recipient by using this unique identification code.							
Component or Subsystem									
Refines/Replaces		TB-R-003							

Id:	UXV-NOD-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		Each UxV node should ensure a minimum autonomy of 15-30 minutes.							

Description:	Multiple UxVs will provide to the experimenters a minimum duration of 45 to 90 minutes per session.
Additional Info (comments):	Several current UxV platforms are capable of providing more autonomy, including the ones already available to the RAWFIE consortium. This figure is conservative to expand the range of UxV systems that can be added to the RAWFIE network (e.g: aerial vehicles) while still providing a minimum amount of autonomy to ensure functionality to the testbed.
Component or Subsystem	
Refines/Replaces	TB-R-007

Id:	UXV-NOD-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	DoW	**Ver:**	2
Title:		Each UxV node should ensure payload.							
Description:		Multiple UxVs will provide to the experimenters a minimum payload of 0.5-1kg per unit.							
Additional Info (comments):		Several current UxV platforms are capable of providing more payload, including the ones already available to the RAWFIE consortium. This figure is conservative to expand the range of UxV systems that can be added to the RAWFIE network (e.g: aerial vehicles) while still providing a minimum amount of payload to ensure functionality to the testbed.							
Component or Subsystem									
Refines/Replaces		TB-R-008							

4.3.3 UxV Network and Communication

Id:	UXV-NET-001	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		Capability of taking the control of the UxVs from distance.							

Description:	The UxV shall support the possibility to be remotely controlled. It shall include a communication system and a control system that allow for its control remotely.
Additional Info (comments):	The UxVs will typically fly under a local control loop, heading to a waypoint, while being monitored by the RAWFIE system. In some circumstances, the UxV may need assistance (for precise action, landing, crossing a river…) which can be provided by remote control. This implies the provision the appropriate communication quality of service, such as real-time guarantees. The corresponding technical requirements must be specified on a case by case basis, since they depend on the type of UxV, its mission and environment.
Component or Subsystem	UxV Network and Communication
Refines/Replaces	TB-R-006, TB-R-013

Id:	UXV-NET-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		UxVs should be able to Synchronize their Time-References between them.							
Description:		The UxV shall include a mechanism for adjusting its local time reference on a regular basis or on demand, with respect to an external time referemce. The objective is to share the same time reference (within a specific error range) across all UxVs in a given set (e.g. test-bed, experiment, swarm…)							
Additional Info (comments):		The UxVs will typically use its local clock, which will drift over time. The UxV shall include a clock synchronization mechanism relying on the communication system. The error range will depend on the chosen mechanism, the refresh rate and the quality of the local clocks, in addition to external factors, such as temperature.							
Component or Subsystem		UxV Network and Communication							
Refines/Replaces		TB-R-011							

Id:	UXV-NET-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:	The UxV should provide Access Point functionality.								
Description:	The UxV shall embed a local access point feature.								
Additional Info (comments):	To be defined (What is the functional need and the use case behind the feature request). This requirement was identified based on defined scenarios								
Component or Subsystem	UxV Network and Communication								
Refines/Replaces	TB-R-012								

Id:	UXV-NET-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:	Each UxV node shall be equipped with primary and secondary communication means.								
Description:	The UxV shall include at least two communication systems.								
Additional Info (comments):	To be defined (What is the functional need and the use case behind the feature request): This can be used also for redundancy, which would allow for the failure of one communication system.								
Component or Subsystem	UxV Network and Communication								
Refines/Replaces	TB-R-013								

Id:	UXV-NET-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	UxV network interface management								

Description:	The UxV shall be able to detect, configure, control and use the network interfaces installed on the UxV specifically for communicate with the RAWFIE components.
Additional Info (comments):	
Component or Subsystem	UxV Network and Communication
Refines/Replaces	

Id:	UXV-NET-006	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	UxV communication interoperability with RAWFIE (incoming)								
Description:	The UXV shall be able to receive and de-capsulate incoming messages from the Testbed, deliver them to the relevant on-board component.								
Additional Info (comments):									
Component or Subsystem	UxV Network and Communication								
Refines/Replaces									

Id:	UXV-NET-007	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:	UxV communication interoperability with RAWFIE (outgoing)								
Description:	The UXV shall be able to encapsulate and send messages originating from on-board components to the RAWFIE platform via the Testbed.								
Additional Info									

(comments):	
Component or Subsystem	UxV Network and Communication
Refines/Replaces	

Id:	UXV-NET-008	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	1
Title:		Neighbouring UxV monitoring							
Description:		The UxV shall be able to detect the presence and estimate the distance with the neighbouring UxVs.							
Additional Info (comments):		A local mechanism shall be embedded into the UxV for the detection of the presence and the estimation of the distance with its neighbouring UxVs, in the case the RAWFIE communication exhibits excessive latencies.							
Component or Subsystem		UxV Network and Communication							
Refines/Replaces									

Id:	UXV-NET-009	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	1
Title:		Each UxV node should be able to send navigation state feedback with at least 2 Hz frequency and maximum 1 sec latency when within radio communication reach.							
Description:		Current radio communication technologies allow exchange of information and data in a network with high bandwidth and low latencies. When reachable through a radio communication protocol, each UxV node must publish at least two messages per second with state navigation information to the network. Network latency shall be less than 1 sec.							
Additional Info (comments):		These should be considered as minimum requirements for a UxV to be used in RAWFIE experiments. Depending on the type of UxV and on a per application case scenario these constraints may become even stricter.							
Component or Subsystem		UxV Network							

Refines/Replaces	

4.3.4 UxV Sensor and Localisation

Id:	UXV-SEN-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Each UxV node should tag location and timing capability to each sensor readings							
Description:		Sensors should provide to RAWFIE system measurement points, namely sensor information together with a timestamp (location information)							
Additional Info (comments):									
Component or Subsystem		UxV Sensor and Localisation							
Refines/Replaces		TB-G-005, TB-R-009							

Id:	UXV-SEN-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Each UxV node shall be able to list the available sensors							
Description:		Apart from listing the available sensors UxVs will describe the available Sensor Control Interface commands. Additionally, this is list shall be accessible from the UxV Network communication component directory service.							
Additional Info (comments):									
Component or Subsystem		UxV Sensor and Localisation							
Refines/Replaces		TB-R-009							

Id:	UXV-SEN-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	1
Title:		UxV location and sensor data should be made available to the experimenter							
Description:		The experimenter by using the visualization tool will be able to view the current resource location and sensor data							
Additional Info (comments):									
Component or Subsystem		UxV Sensor and Localisation, Visualization tool							
Refines/Replaces									

Id:	UXV-SEN-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Location sensors should be supported in each UxV unit and can be used remotely during testbed demonstrations.							
Description:		UxV location sensors should enable users remotely through interfaces to specify the next desired location for each unit. For example, through the experimenter controller the updated locations and/or waypoints of UxV will be sent to the Engine Controller. Then location information should be converted and sent to the Visualization and users will be able to specify or to change the location of each unit.							
Additional Info (comments):									
Component or Subsystem		UxV Sensor and Localisation – Experimenter Controller – Visualization tool							
Refines/Replaces		TB-G-008							

Id:	UXV-SEN-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2

Title:	UxVs should sent a notification to the Resource Controller when they reach the desired location
Description:	The Resource Controller should be informed by the UxVs when all units reach the desired location. Additionally, apart from the current location they can share also information with regard their orientation and battery level
Additional Info (comments):	
Component or Subsystem	UxV Sensor and Localisation & Resource Controller
Refines/Replaces	

4.3.5 UxV On-board storage

Id:	UXV-STO-001	**Type:**	DATA	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:	UxVs shall be able to store data on board.								
Description:	Capability of data storage, not only in case of transmission failure (Link loss between UxV's and the platform), but also upon user request. The data storage will also be needed for large data files because of the limited bandwith.								
Additional Info (comments):	The UxVs usually communicate their sensor measurements together with their exact positions back to the RAWFIE framework. In certain cases there will be a need to store data on board. Example cases include: • Transmission failure (Link loss between UxV's and the platform) and retransmission of data as soon as the link is established again • Sensors data content too large to be transmitted in real time, it will be collected and stored and downloaded on the RAWFIE platform for post analysis after the mission or experiment. Internal data that may not be interesting for the user (i.e if it can't be recognized by the platform but still can be informative for manufacturers etc)								
Component or Subsystem	UxV On-board storage								
Refines/Replaces	TB-R-004								

Id:	UXV-STO-002	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV's shall provide a management tool of the available storage.							
Description:		Each UxV will need some tools not only for exchanging information such as the used or available storage, but also to offer a way of retrieving such shared data or deleting it in order to free the storage. The general functionality should include following features: • Permit to define a default configuration. • Advertise available capacity. Independently manage each data type							
Additional Info (comments):		Information of the available storage can be exchanged within the status of the UxV as a common message. Shared folders and saving/deleting data services shall be used.							
Component or Subsystem		UxV On-board storage							
Refines/Replaces		TB-R-004							

Id:	UXV-STO-003	**Type:**	SEC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV's shall provide an authorized access to the data management tool.							
Description:		Access to data management tool need to be restricted only to authorized personnel in order to avoid accidental overrides or deletions of data storage. A restricted retrieval of some data should be addressed too, given the special nature of some kind of data (images etc.)							
Additional Info (comments):		Any kind of permanent loss of the data will need to be authorized and confirmed. Different layers of permissions given to different users would help to specify who and when can access the information.							
Component or Subsystem									
Refines/Replaces									

Id:	UXV-STO-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV's shall provide a data log.							
Description:		Any change in the data storage component shall be recorded in a log which will be available for querying at any time.							
Additional Info (comments):		The component will allow operator to gain awareness of any change, including data addition/deletion or the retrieval of any kind of data.							
Component or Subsystem									
Refines/Replaces									

Id:	UXV-STO-005	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		UxV's may provide an automated syncing of servers.							
Description:		Semi-automated management of the data may be provided by the component. A periodic upload of the data to a remote server is desirable.							
Additional Info (comments):		Participation of the operator as a requirement for the data storage management should be avoided.							
Component or Subsystem		UxV On-board storage							
Refines/Replaces									

4.3.6 UxV On-board processing

The on-board processing aims at connecting data streams to on-board processing algorithms and publish the resulting output after checking for sufficient computing and energy resources. Allow the installation of new data processing algorithm and keep a registry.

Id:	UXV-PRC-001	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		Each UxV shall be able to operate autonomously.							
Description:		The UxV shall be able to operate autonomously (without any external control). The objective is to give it the capability to make the flight as planned even if there are some disturbances, deviations, unexpected events, etc.							
Additional Info (comments):		See also TB-REC-001							
Component or Subsystem									
Refines/Replaces		TB-R-001							

Id:	UXV-PRC-002	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		The UxV should provide collision avoidance mechanism.							
Description:		The UxV shall be able to autonomously avoid collision, for example by defining an "intimacy zone" in which no other object or UxV is allowed to enter without any specific reaction. However, reactive collision avoidance techniques shall reflect UxV type and environmental contraints. For example, while an AUV may stop its propeller to reduce momentum, and UAV may change height to avoid collision. Finally, since sensors tipically available for collision avoidance are still in development (e.g: reducing form-factor and price on laser systems, reducing noise on acoustic echo sounders, etc.) their performance does not ensure collisions do not occur, and thus, safety procedures shall be applied at the planning stages.							
Additional Info (comments):		See also TB-REC-001							
Component or Subsystem									
Refines/Replaces		TB-R-002							

Id:	UXV-PRC-003	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		Capability of task planning of the UxVs nodes during run-time.							
Description:		The user must have the capability to plan the course of a UxV and the tasks that it would have to execute during this course.							
Additional Info (comments):		This requirement implies an appropriate and easy-to-use User Interface							
Component or Subsystem									
Refines/Replaces		TB-R-005							

Id:	UXV-PRC-004	**Type:**	FUNC	**Importance (priority):**	MEDIUM	**Source:**	Consortium	**Ver:**	2
Title:		UxVs should be able to cooperate during the execution of an experiment.							
Description:		The UxV should be able to exchange some data in real-time, at least with the nearest neighbour. This information may be used for the local and fine coordination inside or between UxV swarms or for cooperative monitoring of an area.							
Additional Info (comments):		This requirement implies an appropriate and easy-to-use User Interface							
Component or Subsystem									
Refines/Replaces		TB-R-010							

Id:	UXV-PRC-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		Each UxV node shall keep position while waiting for new instructions.							

Description:	Each UxV node must keep its position (either stopped in a location, or moving within a contained radius) while waiting for new instructions from the RAWFIE software toolchain.
Additional Info (comments):	While system like UGVs usually stay at a fixed position when not actuated, other systems like USVs or UAVs are unable to keep position (not the case for rotary wing UAVs). This happens for UxV nodes that are underactuated. To ensure safety and guarantee nodes are kept within network reach, each UxV shall have a built-in software routine that prevents drifting from a defined region.
Component or Subsystem	
Refines/Replaces	

4.3.7 UxV Management

The UxV management provides a centralised dashboard view and control of the UxV operations and resources. It keeps a searchable registry of the UxV functions and resources.

Id:	UXV-MGT-001	**Type:**	OTH	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxVs shall offer on demand resources (Network, Sensor, Processing, and Controller).							
Description:		Resources as Network connectivity, sensor readings and low level controllers shall be offered within the Rawfie platform, taking into account safety and functional conditions.							
Additional Info (comments):		The integrity of the UxV's operability shall not be put in danger by any kind of sharing these resources.							
Component or Subsystem		UxV Management							
Refines/Replaces		TB-NF-R-001							

Id:	UXV-MGT-002	**Type:**	SEC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV shall be capable to revert to a safe mode							

Description:	If needed, the UxV shall be capable of aborting any harmful process for the rawfie platform or itself, and revert to a safe mode. In this mode, functionality is limited and external supervision is required before returning to normal operation.
Additional Info (comments):	Operation errors forcing the safe mode should be specified, as well as the actuation protocol in these cases.
Component or Subsystem	UxV Management
Refines/Replaces	TB-NF-R-003

Id:	UXV-MGT-003	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV shall be capable to restart its internal components independently							
Description:		A malfunction in any UxV internal component may need an external restart of it. UxV's shall provide a method of performing such restart without affecting the rest of the system							
Additional Info (comments):									
Component or Subsystem		UxV Management							
Refines/Replaces									

Id:	UXV-MGT-004	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		UxV shall be capable to monitor the health of its components and provide appropriate health status messages to the testbed							
Description:		UxV shall monitor not only if needed components are running smoothly but also situations where errors can be advertised to the testbed.							

Additional Info (comments):	Schemas and message formatting have already been discussed for this purpose. UxV should make use of them.
Component or Subsystem	UxV Management
Refines/Replaces	

Id:	UXV-MGT-005	**Type:**	FUNC	**Importance (priority):**	HIGH	**Source:**	Iteration1 Exp	**Ver:**	2
Title:		UxV shall be capable to enable/disable certain internal components							
Description:		If needed, the UxV shall be able to disable some of its internal component independently provided that these are not essential for the UxV function. The disablement of components may be forced due to new operation errors or queried by the user in order to comply with regulations or save energy.							
Additional Info (comments):		Should be remarked that enable/disable operation would require supervision of authorized personnel.							
Component or Subsystem		UxV Management							
Refines/Replaces									

Id:	UXV-MGT-006	**Type:**	OTH	**Importance (priority):**	HIGH	**Source:**	Consortium	**Ver:**	2
Title:		UxV shall be capable to offer safe maintenance access for manufacturers							
Description:		In order to reprogram or update the system, manufacturers shall have access anytime, according to the operating schedule of the robot or given an emergency condition.							
Additional Info (comments):									
Component or		UxV Management							

Subsystem	
Refines/Replaces	

4.4 Ethics and Security Requirements

In the first version of the Requirements' deliverable, a number of mainly non-functional requirements were defined both at Platform and at Testbed level with the purpose to act as a starting point for defining an architecture as well as methods and procedures that will provide a great degree of shielding against external spurious or malevolent actions. These requirements are presented in Table 5. They address to some extend the various ethics issues listed below that were raised in the RAWFIE DoW:

1. Dual use "Details on potential dual use implications of the project and risk-mitigation strategies must be provided and copy of ethics approval must be forwarded to Commission (if applicable)."
2. Misuse: Details on measures to prevent malevolent/criminal/terrorist abuse of research findings must be provided.
3. Misuse: "Ensure an enhanced, highly encrypted security protocol, that protect mobile units against hacking, being reprogrammed, and potentially used them for malevolent/criminal/terrorist abuses."
4. Misuse: "Ensure and integrate a non re-programmable and non modifiable read-only) code session within all mobile units that automatically send information to mobile-unit owner if a mobile-unit is remotely reprogrammed and allow mobile-unit owner to be able remotely immediately switch the unit off (with non re-programmable and non modifiable, read-only code session) if the change was not initiated by the mobile-unit owner."

ID	Category	Title	Type	Priority	Source
PT-NF-001		RAWFIE platform shall support secure data exchange	SEC	**HIGH**	DoW
PT-NF-002		RAWFIE platform shall provide a reservation/booking system with adequate security and privacy	SEC	**HIGH**	Consortium
PT-NF-003		RAWFIE platform should be able to support backups of all critical data	SUPP	**MEDIUM**	DoW
TB-NF-G-002	General	The Testbed infrastructure should provide reliability and robustness of all components/modules.	SUPP	**MEDIUM**	Consortium
TB-NF-G-004	General	The communication interfaces shall offer security mechanisms	SEC	**HIGH**	Consortium

TB-NF-R-003	Resource	UxV shall be capable to revert to a safe mode	SEC	**HIGH**	Consortium

Table 5: Iteration 1 Requirements that remain valid and relate to Ethical issues

These are also certain functional requirements from iteration 2 that adhere to security and privacy issues

ID	Component	Title	Type	Priority	Source
PT-EXV-S-001	Experiment Validation Service	RAWFIE shall provide a validator to constantly check experiment scenarios during runtime	FUNC	**HIGH**	DoW
TB-GEN-R-002	General	Each Testbed should provide the exact boundaries within which its UxVs can operate	ENV	**HIGH**	Other
TB-REC-002	Resource Controller	RAWFIE platform should be able to activate the “Emergency Scenario”	FUNC	**MEDIUM**	Iteration1 Exp
UXV-MGT-002	UxV Management	UxV shall be capable to revert to a safe mode	SEC	**HIGH**	Consortium

Table 6: Iteration 2 Requirements that relate to Ethical issues

5 Overview table and Traceability Mapping

In this section we provide a traceability matrix which can be used to track D3.2 requirements to D3.1 requirements.

No	ID	Component	Category	Title	Type	Priority	Source	Version	Iteration 1 Reqs	Iteration 1 Reqs (2)
1	PT-GEN-R-001	General	PLATFORM	RAWFIE Platform should adopt Sliced Federated Architecture (SFA)	FUNC	HIGH	Iteration1 Exp	2	PT-P-001	PT-NF-008
2	PT-GEN-R-002	General	PLATFORM	RAWFIE platform shall support various roles with different privileges at every level of access.	FUNC	HIGH	DoW	2	PT-GEN-002	
3	PT-GEN-R-003	General	PLATFORM	The RAWFIE Data model should include all basic entities that are used or/and exchanged by the various components of the RAWFIE Platform	DATA	HIGH	Architecture Deliverables	2	PT-P-005	
4	PT-GEN-R-004	General	PLATFORM	RAWFIE platform shall provide appropriate data storage for information that needs to be persisted, or used after an experiment completion (e.g. analysed by the various tools and services).	DATA	HIGH	Iteration1 Exp	2	PT-P-005	
5	PT-WEB-P-001	Web Portal Tool	PLATFORM	A web portal interface shall be provided to the users of the platform to access almost all main functionalities.	FUNC	HIGH	DoW	2	PT-GEN-001	
6	PT-WEB-P-002	Web Portal Tool	PLATFORM	Web portal usage shall be allowed only to authenticated users	FUNC	HIGH	DoW	2	PT-GEN-003	
7	PT-WEB-P-003	Web Portal Tool	PLATFORM	A tutorial or similar type of documentation shall be provided to the users of the platform	FUNC	HIGH	DoW	2	PT-P-002	
8	PT-BOO-T-001	Booking Tool	PLATFORM	Booking Tool should allow booking of resources at the experimenter level for a specified period and for selected resources	FUNC	HIGH	Iteration1 Exp	2	PT-B-001	
9	PT-BOO-T-002	Booking Tool	PLATFORM	Booking Tool functionality shall be compatible with the SFA myslice architecture and the notion of slices reservations	FUNC	HIGH	Iteration1 Exp	2	PT-B-001	
10	PT-BOO-T-003	Booking Tool	PLATFORM	Booking Tool should delegate all its actions related to Booking of a resource to the Booking Service	FUNC	HIGH	Architecture Deliverables	2	PT-B-001	
11	PT-BOO-T-004	Booking Tool	PLATFORM	Booking Tool shall also interact with the Testbeds Directory Service in order to retrieve information on unallocated testbed resources	FUNC	HIGH	Iteration1 Exp	2	PT-B-001	
12	PT-BOO-T-005	Booking Tool	PLATFORM	Booking Tool should communicate with the underline services using JSON formatted messages (through an RPC or REST API)	FUNC	HIGH	Iteration1 Exp	2	PT-B-001	
13	PT-BOO-T-006	Booking Tool	PLATFORM	Booking Tool should provide appropriate functionality for viewing the reservations of a user/experimenter	FUNC	HIGH	Architecture Deliverables	2	PT-B-002	
14	PT-BOO-T-007	Booking Tool	PLATFORM	Booking Tool should allow editing of existing Reservations	FUNC	HIGH	Architecture Deliverables	2	PT-B-002	
15	PT-BOO-T-008	Booking Tool	PLATFORM	Booking Tool should allow cancellation of existing Reservations	FUNC	HIGH	Architecture Deliverables	2	PT-B-002	
16	PT-BOO-T-009	Booking Tool	PLATFORM	Booking Tool should allow creation of bookings through an intuitive UI interface	FUNC	HIGH	Architecture Deliverables	2	PT-B-002	
17	PT-BOO-T-010	Booking Tool	PLATFORM	Appropriate notification mechanism should be provided to the user in case status of reservation request is not directly available.	FUNC	HIGH	Architecture Deliverables	2	PT-B-002	
18	PT-BOO-T-011	Booking Tool	PLATFORM	Booking Tool may provide assistance of feedback to the potential experimenter during the booking process	FUNC	MEDIUM	Other	2	PT-B-005	
19	PT-BOO-T-012	Booking Tool	PLATFORM	Booking functionality should provide means to ensure fairness in resource booking as well as protect for malevolent actions that a user may perform.	FUNC	HIGH	Iteration1 Exp	2	PT-B-005	
20	PT-BOO-T-013	Booking Tool	PLATFORM	RAWFIE platform should allow virtualization of available UxVs resources during reservation process	FUNC	LOW	Consortium	2	PT-B-006	
21	PT-SYM-T-001	System	PLATFORM	Listing and/or visualisation of current system health status shall be	FUNC	HIGH	Iteration1 Exp	2	PT-NF-007	

		Monitoring Tool		available						
22	PT-SYM-T-002	System Monitoring Tool	PLATFORM	The current system health status should be grouped thematically.	FUNC	MEDIUM	Iteration1 Exp	2	NEW	
23	PT-SYM-T-003	System Monitoring Tool	PLATFORM	Filtering of the accessible component health statuses by user roles/rights should be possible.	FUNC	MEDIUM	Iteration1 Exp	2	NEW	
24	PT-SYM-T-004	System Monitoring Tool	PLATFORM	The health statuses webpage should be updated automatically.	DATA	MEDIUM	Iteration1 Exp	2	NEW	
25	PT-SYM-T-005	System Monitoring Tool	PLATFORM	The health status information should include a severity indication and possibly textual information with additional details.	FUNC	HIGH	Iteration1 Exp	2	NEW	
26	PT-REE-T-001	Resource Explorer Tool	PLATFORM	The UI interface shall illustrate testbed and UxV information of the RAWFIE federation that the experimenters should take advantage of	FUNC	HIGH	DoW	2	PT-P-001	PT-P-003
27	PT-REE-T-002	Resource Explorer Tool	PLATFORM	Registration of testbeds and UxVs may be possible via the Web Portal	FUNC	LOW	Iteration1 Exp	2	PT-P-004	
28	PT-REE-T-003	Resource Explorer Tool	PLATFORM	Resource Explorer tool shall allow for fine-grained resources' searches	FUNC	MEDIUM	Consortium	2	PT-A-016	
29	PT-REE-T-004	Resource Explorer Tool	PLATFORM	Link to the Booking Tool should be provided	FUNC	MEDIUM	Consortium	2	PT-P-001	PT-P-003
30	PT-EXA-T-001	Experiment Authoring Tool	PLATFORM	Experiment Description Language (EDL) shall be used as a language for the definition of experiment scenarios	FUNC	HIGH	Iteration1 Exp	2	PT-A-001	
31	PT-EXA-T-002	Experiment Authoring Tool	PLATFORM	The EDL shall allow the definition of all necessary requirements for an experiment	FUNC	HIGH	Iteration1 Exp	2	PT-A-002	
32	PT-EXA-T-003	Experiment Authoring Tool	PLATFORM	For each defined experiment specific metadata, i.e. name, version, date and description shall be defined.	FUNC	MEDIUM	Consortium	2	PT-A-002	
33	PT-EXA-T-004	Experiment Authoring Tool	PLATFORM	An experimenter shall be able to provide initial conditions and/or configuration parameters for an experiment		MEDIUM	Consortium	2	PT-A-009	
34	PT-EXA-T-005	Experiment Authoring Tool	PLATFORM	An experimenter shall be able to manage/guide the available booked resources during experiment authoring	FUNC	HIGH	Scenario	2	PT-A-004	PT-A-005
35	PT-EXA-T-006	Experiment Authoring Tool	PLATFORM	An experimenter shall be able to define the type of information to be gathered and/or stored by UxV resource(s)	FUNC	HIGH	Iteration1 Exp	2	PT-A-006	
36	PT-EXA-T-007	Experiment Authoring Tool	PLATFORM	An experimenter shall be able to define the type of metrics to be gathered and/or stored during an experiment and/or per UxV resource	FUNC	HIGH	Scenario	2	PT-A-007	
37	PT-EXA-T-008	Experiment Authoring Tool	PLATFORM	An experimenter shall be able to provide navigation or movement directives during experiment authoring	FUNC	HIGH	Scenario	2	PT-A-008	
38	PT-EXA-T-009	Experiment Authoring Tool	PLATFORM	An experimenter should be able to create groups of UxVs resources, for which specific directives will apply.	FUNC	MEDIUM	Scenario	2	PT-A-010	
39	PT-EXA-T-010	Experiment Authoring Tool	PLATFORM	A textual editor shall be provided for the authoring of RAWFIE experiments	FUNC	HIGH	DoW	2	PT-A-011	
40	PT-EXA-T-011	Experiment Authoring Tool	PLATFORM	A visual/graphical editor shall be provided for the authoring of RAWFIE experiments	FUNC	HIGH	DoW	2	PT-A-012	
41	PT-EXA-T-012	Experiment Authoring Tool	PLATFORM	Platform shall allow saving, editing and/or deletion of an experiment defined via EDL	FUNC	HIGH	Other	2	PT-A-015	
42	PT-EXA-T-013	Experiment Authoring Tool	PLATFORM	The visual editor should allow the definition of movement and location waypoints from a map	FUNC	HIGH	Other	2	PT-A-012	
43	PT-EXA-T-014	Experiment Authoring Tool	PLATFORM	During authoring of an experiment selection of resources should be limited only to the ones previously reserved from the user at the foreseen time of experiment	FUNC	HIGH	Iteration1 Exp	2	NEW	

44	PT-EXA-T-015	Experiment Authoring Tool	PLATFORM	Validation of EDL script should be possible prior to or during saving	FUNC	HIGH	Iteration1 Exp	2	PT-L-002	
45	PT-EXA-T-016	Experiment Authoring Tool	PLATFORM	An experimenter shall have the means to define actions or tasks that should run on a periodic or ad hoc basis during execution of an experiment	FUNC	MEDIUM	Scenario	2	PT-L-010	
46	PT-EXM-T-001	Experiment Monitoring Tool	PLATFORM	Experiment Monitoring Tool shall provide overview of experiments of a user	FUNC	HIGH	DoW	2	PT-L-004	
47	PT-EXM-T-002	Experiment Monitoring Tool	PLATFORM	Experiment Monitoring and Visualisation should be integrated	FUNC	MEDIUM	Iteration1 Exp	2	NEW	
48	PT-EXM-T-003	Experiment Monitoring Tool	PLATFORM	Cancellation of running experiments should be possible via Web Portal	FUNC	MEDIUM	Iteration1 Exp	2	NEW	
49	PT-NAV-T-001	UxV Navigation Tool	PLATFORM	This component will provide to the user the ability to remotely navigate a squad of UxVs through a user friendly interface.	FUNC	HIGH	DoW	2	PT-L-008	
50	PT-NAV-T-002	UxV Navigation Tool	PLATFORM	The tool should provided some validation of user's instructions	FUNC	HIGH	Iteration1 Exp	2	NEW	
51	PT-NAV-T-003	UxV Navigation Tool	PLATFORM	UxV Navigation Tool should be available for the navigation of all moving resources	FUNC	HIGH	DoW	2	PT-L-008	
52	PT-NAV-T-004	UxV Navigation Tool	PLATFORM	UxV Navigation Tool should be available to read from the database a detailed version of the map of the available areas	FUNC	HIGH	Iteration1 Exp	2	NEW	
53	PT-VIS-T-001	Visualisation Tool	PLATFORM	The Visualisation Tool shall allow the visualisation of information about the running experiments, in tabular/graphical form	FUNC	HIGH	Architecture Deliverables	2	NEW	
54	PT-VIS-T-002	Visualisation Tool	PLATFORM	A 3D visualization should be available for the tracking of all moving resources	FUNC	MEDIUM	DoW	2	PT-L-006	
55	PT-VIS-T-003	Visualisation Tool	PLATFORM	The Visualisation Tool may allow visualisation of video streams coming from the experiment, and experiment's camera control	FUNC	LOW	Architecture Deliverables	2	NEW	
56	PT-VIS-T-004	Visualisation Tool	PLATFORM	The Visualisation Tool shall provide access to information / features associated to each UxV device on the geographic map	FUNC	HIGH	Architecture Deliverables	2	NEW	
57	PT-VIS-T-005	Visualisation Tool	PLATFORM	The Visualisation Tool shall allow organization and manipulation of multiple geographic layers	FUNC	HIGH	Architecture Deliverables	2	NEW	
58	PT-VIS-T-006	Visualisation Tool	PLATFORM	Possibility of Adding/Removing/Updating graphical widgets should be provided	FUNC	MEDIUM	Architecture Deliverables	2	NEW	
59	PT-VIS-T-007		PLATFORM	Possibility to display both actual and expected UxVs' route and position should be provided	FUNC	HIGH	Architecture Deliverables	2	NEW	
60	PT-DAA-T-001	Data Analysis Tool	PLATFORM	Analysis tool will provide interface to data engine.	FUNC	MEDIUM	Iteration1 Exp	2	PT-E-003	PT-E-002
61	PT-DAA-T-002	Data Analysis Tool	PLATFORM	Analysis tool will provide access to past experiments	FUNC	LOW	Iteration1 Exp	2	PT-E-003	PT-E-001
62	PT-DAA-T-003	Data Analysis Tool	PLATFORM	Analysis tool will provide ability to query message bus streams	FUNC	MEDIUM	Iteration1 Exp	2	PT-E-004	
63	PT-DAA-T-004	Data Analysis Tool	PLATFORM	Analysis tool will provide interface to end running jobs	FUNC	MEDIUM	Iteration1 Exp	2	PT-E-003	PT-E-004
64	PT-DAA-T-005	Data Analysis Tool	PLATFORM	Analysis tool will provide a simple metric selection interface, a view of the result stream & the job status tab					PT-E-003	PT-E-002
65	PT-DIR-S-001	Testbeds Directory Service	PLATFORM	The Testbed Directory Service shall provide access to information on all Testbeds registered in RAWFIE	FUNC	HIGH	Architecture Deliverables	2	PT-P-003	
66	PT-DIR-S-002	Testbeds Directory	PLATFORM	The Testbed Directory Service should provide access to information on all Testbeds registered in RAWFIE according to predefined filters	FUNC	MEDIUM	Architecture Deliverables	2	NEW	

		Service								
67	PT-DIR-S-003	Testbeds Directory Service	PLATFORM	The Testbed Directory Service shall provide access to information about available resources (UxVs) belonging to the testbeds registered in RAWFIE	FUNC	**HIGH**	Architecture Deliverables	2	NEW	
68	PT-DIR-S-004	Testbeds Directory Service	PLATFORM	The Testbed Directory Service should provide access to information onavailable resources (UxVs) belonging to the testbeds registered in RAWFIE, and according to predefined filters	FUNC	**MEDIUM**	Architecture Deliverables	2	NEW	
69	PT-DIR-S-005	Testbeds Directory Service	PLATFORM	The Testbed Directory Service shoud provide the possibility to register new testbeds in the RAWFIE platform,as well as to unregister (delete) testbeds from the platform	FUNC	**HIGH**	Architecture Deliverables	2	NEW	
70	PT-DIR-S-006	Testbeds Directory Service	PLATFORM	Some basic query capabilities should be provided	FUNC	**MEDIUM**	Architecture Deliverables	2	PT-A-016	
71	PT-DIR-S-007	Testbeds Directory Service	PLATFORM	The Testbed Directory Service shall provide the possibility to register new resources belonging to a specific testbed in the RAWFIE platform, as well as to unregister (delete) resources	FUNC	**HIGH**	Architecture Deliverables	2	NEW	
72	PT-CPV-001	EDL Compiler and Validator	PLATFORM	A tool for translating EDL into user directives shall be provided	FUNC	**HIGH**	DoW	2	PT-A-003	
73	PT-CPV-002	EDL Compiler and Validator	PLATFORM	An experimenter should have the opportunity to use a code generation engine	FUNC	**HIGH**	DoW	2	PT-A-003	
74	PT-CPV-003	EDL Compiler and Validator	PLATFORM	Experiments defined via EDL shall be validated after their authoring	FUNC	**HIGH**	DoW	2	PT-A-014	
75	PT-CPV-004	EDL Compiler and Validator	PLATFORM	The compiler and validator should communicate with the authoring tool in order to transfer error indications and hints for solving them	FUNC	**HIGH**	DoW	2	NEW	
76	**PT-EXV-S-001**	Experiment Validation Service	PLATFORM	RAWFIE shall provide a validator to constantly check experiment scenarios during runtime	FUNC	**HIGH**	DoW	2	PT-L-001	
77	PT-EXV-S-002	Experiment Validation Service	PLATFORM	The validation service should perform syntactic checking	FUNC	**HIGH**	DoW	2	PT-L-001	
78	PT-EXV-S-003	Experiment Validation Service	PLATFORM	The validation service should perform semantic checking	FUNC	**HIGH**	DoW	2	PT-L-001	
79	PT-USR-S-001	Users & Rights Service	PLATFORM	User login credentials checking shall be provided	FUNC	**HIGH**	DoW	2	PT-GEN-002	
80	PT-USR-S-002	Users & Rights Service	PLATFORM	RAWFIE platform shall support various roles with different privileges at every level of access.	FUNC	**HIGH**	DoW	2	PT-GEN-002	
81	PT-USR-S-003	Users & Rights Service	PLATFORM	The Users & Rights Service may provide a proxy service for web application that do not check access rights.	FUNC	**HIGH**	Iteration1 Exp	2	NEW	
82	PT-BOO-S-001	Booking Service	PLATFORM	Booking Service shall support reservations of resources at both user level and experiment level	FUNC	**HIGH**	Iteration1 Exp	2	PT-B-001	
83	PT-BOO-S-002	Booking Service	PLATFORM	User level booking shall be triggered by the Booking Tool via a REST API.	FUNC	**HIGH**	Iteration1 Exp	2	PT-B-001	
84	PT-BOO-S-003	Booking Service	PLATFORM	Experiment level booking shall be triggered by the experimenter before issuing a manual or schedule launching of a validated experiment	FUNC	**HIGH**	Iteration1 Exp	2	PT-B-001	PT-L-002

85	PT-BOO-S-004	Booking Service	PLATFORM	Experiment level booking shall support both immediate booking as well as booking at a future time	FUNC	HIGH	Iteration1 Exp	2	PT-B-001	
86	PT-BOO-S-005	Booking Service	PLATFORM	Booking Service shall provide all the necessary methods to manage the bookings including addition, modification and cancellation/deletion operations	FUNC	HIGH	Architecture Deliverables	2	NEW	
87	PT-BOO-S-006	Booking Service	PLATFORM	Booking Service shall be able to compute and return feedback on conflicting bookings for a provided booking request	FUNC	HIGH	Architecture Deliverables	2	NEW	
88	PT-BOO-S-007	Booking Service	PLATFORM	Reservation Data should be persistent in order to survive service failures and be available by other services	FUNC	HIGH	Iteration1 Exp	2	NEW	
89	PT-BOO-S-008	Booking Service	PLATFORM	Historical data retrieval for Bookings/Reservations should be available on demand	FUNC	MEDIUM	Iteration1 Exp	2		
90	PT-BOO-S-009	Booking Service	PLATFORM	Booking functionality shall support reservation of resources involving multiple testbeds	FUNC	HIGH	Architecture Deliverables	2	PT-B-003	
91	PT-BOO-S-010	Booking Service	PLATFORM	Booking functionality shall be able to correctly handle simultaneous Reservations requests by end users	FUNC	HIGH	Iteration1 Exp	2	PT-B-003	
92	PT-BOO-S-011	Booking Service	PLATFORM	Notification mechanisms may be provided for experiments scheduled for execution in the future.	FUNC	MEDIUM	Consortium	2	PT-B-004	
93	PT-LAU-S-001	Launching Service	PLATFORM	Launching Service shall support short-term or manual launching of an experiment initiated directly by an experimenter	FUNC	HIGH	Architecture Deliverables	2	NEW	
94	PT-LAU-S-002	Launching Service	PLATFORM	Launching Service shall support long-term or scheduled launching of an experiment initiated directly by an experimenter	FUNC	HIGH	Architecture Deliverables	2	NEW	
95	PT-LAU-S-003	Launching Service	PLATFORM	Each executing experiment shall be uniquely identified within RAWFIE ecosystem	FUNC	HIGH	Architecture Deliverables	2	PT-E-001	
96	PT-LAU-S-004	Launching Service	PLATFORM	During launching it must be ensured that the experiment to be started has been validated based on spatio-temporal constraints	FUNC	HIGH	Architecture Deliverables	2	PT-L-002	
97	PT-LAU-S-005	Launching Service	PLATFORM	During launching it must be ensured that the experiment to be started belongs to an authorized user of the RAWFIE platform	FUNC	HIGH	Architecture Deliverables	2	PT-L-002	
98	PT-LAU-S-006	Launching Service	PLATFORM	The Launching Service shall be able to address simultaneous requests for starting an experiment	FUNC	HIGH	Architecture Deliverables	2	NEW	
99	PT-LAU-S-007	Launching Service	PLATFORM	The Launching Service shall send an appropriate message upon successful starting of an experiment	FUNC	HIGH	Architecture Deliverables	2	PT-E-001	
100	PT-LAU-S-008	Launching Service	PLATFORM	The Launching Service shall interact with other components or database services in order to retrieve information needed for deciding on launching an experiment	FUNC	HIGH	Architecture Deliverables	2	NEW	
101	PT-LAU-S-009	Launching Service	PLATFORM	Interactions of the launching service with database services and/or other components should respect the RAWFIE platform boundary	FUNC	HIGH	Iteration1 Exp	2	NEW	
102	PT-LAU-S-010	Launching Service	PLATFORM	Launching service shall support requests for experiment cancellation	FUNC	HIGH	Iteration1 Exp	2	NEW	
103	PT-LAU-S-011	Launching Service	PLATFORM	RAWFIE platform shall provide means to ensure fairness in experiments execution	FUNC	MEDIUM	Consortium	2	PT-L-007	
104	PT-LAU-S-012	Launching Service	PLATFORM	Launching service shall provide appropriate feedback to the requested entity regarding failures on fulfilling a request	FUNC	HIGH	Iteration1 Exp	2	NEW	
105	PT-LAU-S-013	Launching Service	PLATFORM	Launching service shall not alter or modify any information related to the actual execution of an experiment	FUNC	HIGH	Iteration1 Exp	2	NEW	
106	PT-VIS-E-001	Visualisation Engine	PLATFORM	The Visualization Engine shall retrieve from the message bus all runtime experiment information needed for visualizing the UxVs	FUNC	HIGH	Architecture Deliverables	2	PT-L-005	

				and/or any sensor measurments						
107	PT-VIS-E-002	Visualisation Engine	PLATFORM	The Visualization Engine shall provide a GIS server capable of handling geographical layers (overlays)	FUNC	HIGH	Architecture Deliverables	2	NEW	
108	PT-VIS-E-003	Visualisation Engine	PLATFORM	The Visualization Engine may allow cache of data for faster access to the available geographic layers	FUNC	MEDIUM	Architecture Deliverables	2	NEW	
109	PT-VIS-E-004	Visualisation Engine	PLATFORM	The Visualization Engine shall provide the possibility to reply experiments using historical data	FUNC	HIGH	Architecture Deliverables	2	NEW	
110	PT-EXP-C-001	Experiment Controller	PLATFORM	Cancellation of running experiments should be possible	FUNC	HIGH	Iteration1 Exp	2	NEW	
111	PT-EXP-C-002	Experiment Controller	PLATFORM	RAWFIE platform shall allow experimenters to remotely navigate UxVs.	FUNC	MEDIUM	Consortium	2	PT-L-008	
112	PT-EXP-C-003	Experiment Controller	PLATFORM	The Experiment Controller shall support the execution of experiments that involve multiple testbeds	FUNC	HIGH	Iteration1 Exp	2	NEW	
113	PT-EXP-C-004	Experiment Controller	PLATFORM	The Experiment Controller shall be able to support multiple experiments running the same time in parallel	FUNC	HIGH	Iteration1 Exp	2	NEW	
114	PT-EXP-C-005	Experiment Controller	PLATFORM	The Experiment Controller shall be able to analyse the whole experiment script and dispatch the appropriate parts to each responsible testbed facility	FUNC	HIGH	Iteration1 Exp	2	NEW	
115	PT-EXP-C-006	Experiment Controller	PLATFORM	The Experiment Controller shall support receiving feedback at regular intervals from all testbed facilities about the progress of the experiment in this time interval	FUNC	HIGH	Iteration1 Exp	2	NEW	
116	PT-EXP-C-007	Experiment Controller	PLATFORM	The Experiment Controller may be able to override the order of instructions described in the input script while the experiment is running	FUNC	HIGH	Iteration1 Exp	2	NEW	
117	PT-EXP-C-008	Experiment Controller	PLATFORM	The Experiment Controller shall be able to continuously feed the front-end tier (Experiment Monitoring Tool) giving the experimenter a clear view of the experiment workflow as a whole	FUNC	HIGH	Iteration1 Exp	2	PT-L-004	
118	PT-EXP-C-009	Experiment Controller	PLATFORM	The Experiment Controller shall send distinct error and warning messages in every case the experiment's state diverges from the aimed target	FUNC	HIGH	Iteration1 Exp	2	NEW	
119	PT-DAA-S -001	Data Analysis Engine	PLATFORM	Analysis engine will support accepting of analysis jobs	FUNC	MEDIUM	Iteration1 Exp	2	PT-E-004	PT-E-005
120	PT-DAA-S -002	Data Analysis Engine	PLATFORM	Analysis engine will support compiling analysis jobs	FUNC	MEDIUM	Iteration1 Exp	2	PT-E-005	
121	PT-SYM-S-001	System Monitoring Service	PLATFORM	RAWFIE middle tier shall include a module to monitor the performance of the middle tier components.	FUNC	HIGH	Consortium	2	PT-GEN-004	
122	PT-SYM-S-002	System Monitoring Service	PLATFORM	RAWFIE Testbeds and UxVs statuses should be monitored	FUNC	HIGH	Iteration1 Exp	2	NEW	
123	PT-SYM-S-003	System Monitoring Service	PLATFORM	RAWFIE system administrators should be informed if critical, for the RAWFIE platfrom operation, services are down	FUNC	HIGH	Iteration1 Exp	2	PT-NF-007	
124	PT-SYM-S-004	System Monitoring Service	PLATFORM	User may register for notifications if certain components are down	FUNC	LOW	Iteration1 Exp	2	PT-NF-007	
125	PT-SYM-S-005	System	PLATFORM	Notifications about planned downtimes	FUNC	MEDIUM	Iteration1 Exp	2	PT-NF-007	

		Monitoring Service								
126	PT-ACC-S-001	Accounting Service	PLATFORM	The accounting service should be capable to accept different cost models regarding RAWFIE usage on a per service basis	FUNC	**MEDIUM**	DoW	2	PT-B-007	
127	PT-ACC-S-002	Accounting Service	PLATFORM	The accounting service should be capable to gather statistics regarding usage of the platform by experimenters.	FUNC	**MEDIUM**	DoW	2	PT-B-007	
128	PT-ACC-S-003	Accounting Service	PLATFORM	The RAWFIE platform should record information related to time and type of access for a service by a user.	FUNC	**MEDIUM**	DoW	2	PT-B-007	
129	PT-ACC-S-004	Accounting Service	PLATFORM	The cost model used may take into consideration the overall time of experiments executed by a user of the platform.	FUNC	**MEDIUM**	Iteration1 Exp	2	PT-B-007	
130	PT-ACC-S-005	Accounting Service	PLATFORM	The accounting service may support different types of charging based on the type of the experimenter (industrial, research, university etc.)	FUNC	**MEDIUM**	Iteration1 Exp	2	PT-B-007	
131	PT-ACC-S-006	Accounting Service	PLATFORM	The accounting service may support predefined types of memberships regarding usage of the platform that may depend on various types of parameters	FUNC	**MEDIUM**	Iteration1 Exp	2	PT-B-007	
132	PT-ACC-S-007	Accounting Service	PLATFORM	The accounting service should be able to handle the addition of new services that may be incorporated in the RAWFIE platform during time.	FUNC	**MEDIUM**	Iteration1 Exp	2	PT-B-007	
133	TB-GEN-R-001	General	TESTBED	Each UxV Testbed should provide a Slice Interface for federating their capabilities/resources to the experimenter.	FUNC	**HIGH**	Iteration1 Exp	2	NEW	
134	**TB-GEN-R-002**	General	TESTBED	Each Testbed should provide the exact boundaries within which its UxVs can operate	ENV	**HIGH**	Other	2	NEW	
135	TB-GEN-R-003	General	TESTBED	Testbed areas should at least be able to host/operate multiple UxVs of one or more types	FUNC	**HIGH**	Other	2	NEW	
136	TB-GEN-R-004	General	TESTBED	Testbed areas environment should be closely monitored	ENV	**HIGH**	Other	2	TB-G-002	
137	TB-GEN-R-005	General	TESTBED	Indoor spaces of a testbed should provide a controlled indoor environment	ENV	**HIGH**	Other	2	TB-G-002	
138	TB-GEN-R-006	General	TESTBED	Testebed facility areas should comprise storing spaces and be able to receive inspect and assemble and/or fix UxVs	SUPP	**HIGH**	Other	2	TB-G-002	
139	TB-GEN-R-007	General	TESTBED	Testbed facilities should provide emergency services in an extraordinary event	SEC	**HIGH**	Other	2	TB-G-002	
140	TB-GEN-R-008	General	TESTBED	Testbed areas should provide proper facilities and equipment	ENV	**HIGH**	Other	2	TB-G-002	
141	TB-GEN-R-009	General	TESTBED	Testbed must provide dedicated computational resources	ENV	**HIGH**	Other	2	NEW	
142	TB-GEN-R-010	General	TESTBED	Testbeds should be supported by on-site personnel	OTH	**HIGH**	Other	2	NEW	
143	TB-GEN-R-011	General	TESTBED	Testbeds should conform to all legal regulations and restrictions	SEC	**HIGH**	Other	2	TB-NF-G-005	
144	TB-MOM-001	Monitoring Manager	TESTBED	The Monitoring Manager component should be able to provide information about the capabilities of each resource node.	DATA	**HIGH**	Iteration1 Exp	2	TB-G-004	TB-G-006
145	TB-MOM-002	Monitoring Manager	TESTBED	The Monitoring Manager component should collect and report current status of testbed facilities	DATA	**HIGH**	Iteration1 Exp	2	TB-G-001	
146	TB-MOM-003	Monitoring Manager	TESTBED	The Monitoring Manager component should store periodically all testbed information	DATA	**HIGH**	Iteration1 Exp	2	TB-G-003	
147	TB-MOM-004	Monitoring Manager	TESTBED	Testbed monitoring manager should be able to transmit the current status to the System Monitoring Service.	FUNC	**HIGH**	Iteration1 Exp	2	TB-G-003	
148	TB-NEC-001	Network Controller	TESTBED	The RAWFIE communication resources shall be managed to offer seamless connectivity in the normal operations of the system.	FUNC	**MEDIUM**	Consortium	2	TB-G-008	PT-L-009
149	TB-NEC-002	Network	TESTBED	Provision of network communication resource	FUNC	**MEDIUM**	Consortium	2		

		Controller								
150	TB-NEC-003	Network Controller	TESTBED	Alternative communication system	FUNC	MEDIUM	Consortium	2	TB-R-013	
151	TB-NEC-004	Network Controller	TESTBED	Management of the communication system	FUNC	MEDIUM	Consortium	2	TB-NF-G-006	
152	TB-NEC-005	Network Controller	TESTBED	Time constraint verification and notification	FUNC	MEDIUM	Consortium	2	NEW	
153	TB-REC-001	Resource Controller	TESTBED	RAWFIE platform shall support a semi-autonomously way of navigation of the UxVs	FUNC	HIGH	Consortium	2	PT-L-008	TB-G-007
154	**TB-REC-002**	Resource Controller	TESTBED	RAWFIE platform should be able to activate the “Emergency Scenario”	FUNC	MEDIUM	Iteration1 Exp	2	PT-L-009	TB-G-008
155	TB-REC-003	Resource Controller	TESTBED	The Resource Controller shall receive location messages from the vehicles at regular intervals	FUNC	HIGH	Iteration1 Exp	2	TB-G-005	TB-G-003
156	TB-REC-004	Resource Controller	TESTBED	The Resource Controller shall transmit the next location for the current experiment to the vehicles	FUNC	HIGH	Iteration1 Exp	2	TB-G-008	
157	TB-REC-005	Resource Controller	TESTBED	The Resource Controller shall be able to plan the next location that will be transmitted in the vehicle taking into account the locations of all UxVs that are active in that testbed	FUNC	HIGH	Iteration1 Exp	2	NEW	
158	TB-REC-006	Resource Controller	TESTBED	For the experiment accomplishment the Resource Controller shall operate in close coordination with the Experiment Controller	FUNC	HIGH	Iteration1 Exp	2	TB-I-001	TB-G-005
159	TB-PRO-001	Testbed Proxy	TESTBED	Testbed proxy should act as a reverse proxy	FUNC	MEDIUM	Consortium	2	NEW	
160	TB-PRO-002	Testbed Proxy	TESTBED	Testbed proxy contains Inner and Outer Firewall	FUNC	MEDIUM	Iteration1 Exp	2	NEW	
161	TB-MAN-001	Testbed Manager	TESTBED	Testbed Manager shall support permanent storage of all testbed attributes and resources attributes that belong to testbed	FUNC	HIGH	Consortium	2	TB-D-001	
162	TB-MAN-002	Testbed Manager	TESTBED	Testbed Manager shall provide information about the capabilities of each resource node	FUNC	HIGH	Consortium	2	TB-G-004	
163	TB-MAN-003	Testbed Manager	TESTBED	Testbed Manager shall check periodically the status of all other services running at testbed level	FUNC	HIGH	Iteration1 Exp	2	NEW	
164	TB-MAN-004	Testbed Manager	TESTBED	Testbed Manager shall contain a registration log for all the experiments executed in the testbed	FUNC	HIGH	Iteration1 Exp	2	TB-D-002	
165	TB-MAN-005	Testbed Manager	TESTBED	Testbed Manager shall be periodically informed about the status of all running experiments in the testbed	FUNC	HIGH	Iteration1 Exp	2	NEW	
166	TB-MAN-006	Testbed Manager	TESTBED	Testbed Manager shall store configuration parameters for the UxVs in the relevant testbed	FUNC	MEDIUM	Iteration1 Exp	2	TB-G-004	
167	TB-MAN-007	Testbed Manager	TESTBED	Testbed Manager shall implement a user interface to support the interactions between testbed operators and machines	FUNC	HIGH	Iteration1 Exp	2	NEW	
168	TB-MAN-008	Testbed Manager	TESTBED	Testbed Manager shall be capable to handle temporary interruption of communication and store data locally in case of transmission failure	FUNC	HIGH		2	TB-D-001	
169	TB-MAN-009	Testbed Manager	TESTBED	Testbed Manager may provide statistical data/information about testbed operation	DATA	LOW	Consortium	2	TB-D-002	
170	TB-UVG-001	General	UxV	Complianceof UxV to RAWFIE specification and interfaces	FUNC	HIGH	Iteration1 Exp	2	NEW	
171	UXV-NOD-001	UxV Node	UxV	Each UxV shall have a unique Identification code.	FUNC	HIGH	Consortium	2	TB-R-003	
172	UXV-NOD-002	UxV Node	UxV	Each UxV node should ensure a minimum autonomy of 15-30 minutes.	FUNC	HIGH	DoW	2	TB-R-007	
173	UXV-NOD-003	UxV Node	UxV	Each UxV node should ensure payload.	FUNC	HIGH	DoW	2	TB-R-008	
174	UXV-NET-001	UxV Network	UxV	Capability of taking the control of the UxVs from distance.	FUNC	MEDIUM	Consortium	2	TB-R-006	

		and Communication								
175	UXV-NET-002	UxV Network and Communication	UxV	UxVs should be able to Synchronize their Time-References between them.	FUNC	MEDIUM	Consortium	2	TB-R-011	
176	UXV-NET-003	UxV Network and Communication	UxV	The UxV should provide Access Point functionality.	FUNC	MEDIUM	Consortium	2	TB-R-012	
177	UXV-NET-004	UxV Network and Communication	UxV	Each UxV node shall be equipped with primary and secondary communication means.	FUNC	HIGH	Consortium	2	TB-R-013	
178	UXV-NET-005	UxV Network and Communication	UxV	UxV network interface management	FUNC	MEDIUM	Consortium	2	NEW	
179	UXV-NET-006	UxV Network and Communication	UxV	UxV communication interoperability with RAWFIE (incoming)	FUNC	MEDIUM	Consortium	2	NEW	
180	UXV-NET-007	UxV Network and Communication	UxV	UxV communication interoperability with RAWFIE (outgoing)	FUNC	MEDIUM	Consortium	2	NEW	
181	UXV-NET-008	UxV Network and Communication	UxV	Neighbouring UxV monitoring	FUNC	MEDIUM	Consortium	2	NEW	
182	UXV-NET-009	UxV Network and Communication	UxV	Each UxV node should be able to send navigation state feedback with at least 2 Hz frequency and maximum 1 sec latency when within radio communication reach.	FUNC	HIGH	Consortium	2	NEW	
183	UXV-SEN-001	UxV Sensor and Localisation	UxV	Each UxV node should tag location and timing capability to each sensor readings	FUNC	HIGH	Iteration1 Exp	2	NEW	
184	UXV-SEN-002	UxV Sensor and Localisation	UxV	Each UxV node shall be able to list the available sensors	FUNC	HIGH	Iteration1 Exp	2	NEW	
185	UXV-SEN-003	UxV Sensor and Localisation	UxV	UxV location and sensor data should be made available to the experimenter	FUNC	HIGH	Iteration1 Exp	2	NEW	
186	UXV-SEN-004	UxV Sensor and Localisation	UxV	Location sensors should be supported in each UxV unit and can be used remotely during testbed demonstrations.	FUNC	HIGH	Iteration1 Exp	2	NEW	
187	UXV-SEN-005	UxV Sensor and Localisation	UxV	UxVs should sent a notification to the Resource Controller when they reach the desired location	FUNC	HIGH	Iteration1 Exp	2	NEW	
188	UXV-STO-001	UxV On-board storage	UxV	UxVs shall be able to store data on board.	DATA	HIGH	Consortium	2	TB-R-004	
189	UXV-STO-002	UxV On-board storage	UxV	UxV's shall provide a management tool of the available storage.	FUNC	HIGH	Consortium	2	TB-R-004	
190	UXV-STO-003	UxV On-board storage	UxV	UxV's shall provide an authorized access to the data management tool.	SEC	HIGH	Consortium	2	NEW	
191	UXV-STO-004	UxV On-board storage	UxV	UxV's shall provide a data log.	FUNC	HIGH	Consortium	2	NEW	
192	UXV-STO-005	UxV On-board storage	UxV	UxV's may provide an automated syncing of servers.	FUNC	MEDIUM	Consortium	2	NEW	
193	UXV-PRC-001	UxV On-board processing	UxV	Each UxV shall be able to operate autonomously.	FUNC	HIGH	Consortium	2	TB-R-001	
194	UXV-PRC-002	UxV On-board	UxV	The UxV should provide collision avoidance mechanism.	FUNC	MEDIUM	Consortium	2	TB-R-002	

		processing								
195	UXV-PRC-003	UxV On-board processing	UxV	Capability of task planning of the UxVs nodes during run-time.	FUNC	**MEDIUM**	Consortium	2	TB-R-005	
196	UXV-PRC-004	UxV On-board processing	UxV	UxVs should be able to cooperate during the execution of an experiment.	FUNC	**MEDIUM**	Consortium	2	TB-R-010	
197	UXV-PRC-005	UxV On-board processing	UxV	Each UxV node shall keep position while waiting for new instructions.	FUNC	**HIGH**	Iteration1 Exp	2	NEW	
198	UXV-MGT-001	UxV Management	UxV	UxVs shall offer on demand resources (Network, Sensor, Processing, and Controller).	OTH	**HIGH**	Consortium	2	TB-NF-R-001	
199	**UXV-MGT-002**	UxV Management	UxV	UxV shall be capable to revert to a safe mode	SEC	**HIGH**	Consortium	2	TB-NF-R-003	
200	UXV-MGT-003	UxV Management	UxV	UxV shall be capable to restart its internal components independently	FUNC	**HIGH**	Consortium	2	NEW	
201	UXV-MGT-004	UxV Management	UxV	UxV shall be capable to monitor the health of its components and provide appropriate health status messages to the testbed	FUNC	**HIGH**	Iteration1 Exp	2	NEW	
202	UXV-MGT-005	UxV Management	UxV	UxV shall be capable to enable/disable certain internal components	FUNC	**HIGH**	Iteration1 Exp	2	NEW	
203	UXV-MGT-006	UxV Management	UxV	UxV shall be capable to offer safe maintenance access for manufacturers	OTH	**HIGH**	Consortium	2	NEW	

Table 7: Overview of Iteration 2 defined requirements including traceability to D3.1 Requirements

Based on the above traceability matrix the following table was created which includes requirements of D3.1 that do not have links to requirements defined in the present document. An extra column is provided for each such requirement specifying whether it is now OBSOLETE, already CONSIDERED or still VALID.

#	Iteration 1 Reqs	Iteration 1 Category	Iteration 1 Description	VALID
1	PT-A-013	Authoring Phase	Spatial information shall be provided for the currently available resources for the authoring of new experiments	
2	PT-E-002	Evaluation Phase	RAWFIE platform shall include a service enabling the data collection, analysis and processing.	YES
3	PT-L-003	Launching Phase	Launching tool shall be kept informed upon an experiment's state	OBSOLETE
4	**PT-NF-001**		RAWFIE platform shall support secure data exchange	YES
5	**PT-NF-002**		RAWFIE platform shall provide a reservation/booking system with adequate security and privacy	YES
6	**PT-NF-003**		RAWFIE platform should be able to support backups of all critical data	YES
7	PT-NF-004		RAWFIE platform shall exhibit high degree of network availability	YES
8	PT-NF-005		RAWFIE platform shall be able to support (near) real-time information gathering from the UxV sensors	YES
9	PT-NF-006		RAWFIE platform shall exhibit high degree of scalability	YES
10	PT-NF-009		RAWFIE architecture should adopt a modular design approach.	CONSIDERED
11	PT-NF-010		RAWFIE platform shall be deployed as a cloud based service (or list of services).	CONSIDERED
12	PT-NF-011		RAWFIE software modules should be implemented as Web Service or as REST	OBSOLETE
13	PT-NF-012		RAWFIE modules should use Open Standards and Open Software as far as possible	CONSIDERED
14	TB-G-009	General	The Testbed shall be able to support simulated UxVs resources	YES
15	TB-I-002	Interconnectivity	The communication system shall be able to use UxVs to relay information to and from other UxVs	OBSOLETE
16	TB-I-003	Interconnectivity	A Testbed's communication system may provide at least 3 levels of Service and the communication means will adapt to these Levels of Service	OBSOLETE
17	TB-I-004	Interconnectivity	The Testbed shall be able to dispatch UxV information on demand	OBSOLETE
18	TB-NF-G-001	General	The Testbed shall provide concurrent requests capacity	CONSIDERED

19	**TB-NF-G-002**	General	The Testbed infrastructure should provide reliability and robustness of all components/modules.	YES
20	TB-NF-G-003	General	The communication system shall offer a high availability	YES
21	**TB-NF-G-004**	General	The communication interfaces shall offer security mechanisms	YES
22	TB-NF-R-001	Resource	UxVs shall offer on demand resources (Network, Sensor, Processing, and Controller).	YES
23	TB-NF-R-002	Resource	UxVs sensor system shall be compliant to connection standards and communication interfaces.	CONSIDERED
24	TB-R-009	Resource	Each UxV node should be equipped with a location identification system.	CONSIDERED

Table 8: Not mapped Requirements of iteration 1 and their status regarding RAWFIE system

6 Conclusion

The present deliverable performs a more detailed requirements analysis for the RAWFIE platform, the testbed facilities and the UxVs to be used for experiments. Compared to the first version of the Requirements deliverable (D3.1) which focuses more in providing high level system requirements this one provides more fine grained requirements per component having as reference the components defined in the first version of the architecture (D4.1). The overall methodology and templates used are similar to the previous iteration with minor additions in order to support traceability between the requirements defined in each version of the requirement document.

While for iteration 1 requirements, we were based mainly in the DoA and the defined scenarios in the present document many requirements were defined based on feedback and experience gained from the first iteration design and development activities.

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