



A holistic
passenger
ship
evacuation
and rescue
ecosystem

PALAEMON Integrated System and Technology Validation Trials WP7 - Final Review 23.03.2023

Final Review and Report for WP7 Deliverable and tasks

The logo for Atos, featuring the word "Atos" in a bold, blue, sans-serif font.

Outline

- ▶ WP7 overview
- ▶ Significant results (task-by-task)
- ▶ Deliverables
- ▶ Use of resources?
- ▶ Deviations from DoA

WP7 – Partners

AIRBUS

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SIMAVI
Software Imagination & Vision

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WISER



danaos

E3 ENGINEERS
FOR
BUSINESS

ASTANDER

 **AdMeS**
Advanced
Mechanical Services

THALES

 **Universidad**
de Alcalá

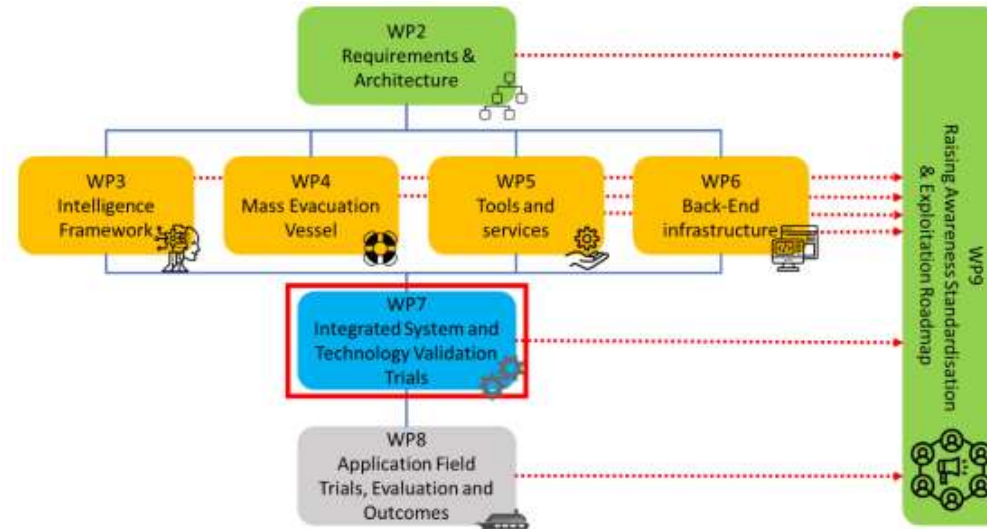


UNIVERSITY OF THE
AEGEAN

 **ANEK LINES**

ÖL
ÖSTERREICHISCHER
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WP7 in a nutshell (1/2)



1. Integration process following a predefined **methodology and schedule**
2. Integrated **evaluation methodology** (functional, utility, security and data protection)
3. **Evaluation services** at various stages: design, test installation and trial assessment
4. **Software integration and tools** (bug reporting, issue tracking, software testing...)
5. Integration of the software modules into an **end-to-end PALAEMON platform**
6. **System-oriented and functional test cases** against the integrated platform prototypes
7. **Quality assurance** during the development and integration processes

WP7 in a nutshell (2/2)

Task	Task name	Leader
T7.1	PALAEMON Communications Platform	
T7.2	Encryption and Authentication Mechanisms	
T7.3	Uniform Data Exchange Modules – Interoperability Layer	
T7.4	VDES Deployment	
T7.5	Integration of PALAEMON Prototype System	
T7.6	PALAEMON Ecosystem testing	

WP7 – Work distribution (M19-M44)

		Y2						Y3						Y4													
		Q3		Q4		Q1		Q2		Q3		Q4		Q1		Q2		Q3									
		M19	M20	M21	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33	M34	M35	M36	M37	M38	M39	M40	M41	M42	M43	M44
WP7	PALAEMON Integrated System and Technology Validation Trials	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36								
Task 7.1	PALAEMON Communication Platform	19	20			23	24	25	26	27	28	29	30	31	32	33	34	35	36								
Task 7.2	Encryption and Authentication Mechanisms	19	20			23	24	25	26	27	28	29	30	31	32	33	34	35	36								
Task 7.3	Uniform Data Exchange Modules - Interoperability Layer	19	20			23	24	25	26	27	28	29	30	31	32	33	34	35	36								
Task 7.4	VDES Deployment	19	20			23	24	25	26	27	28	29	30	31	32	33	34	35	36								
Task 7.5	Integration of PALAEMON Prototype System	19	20	21	22	23	24		26	27	28	29	30	31	32	33	34	35	36								
Task 7.6	PALAEMON Ecosystem Testing				22	23	24						30	31	32	33	34	35	36								

- ▶ WP7 original duration: 30 months [M13, M32]
- ▶ RP1: D7.4 – Software development and integration methodology
- ▶ Tasks extended till month 42 after last amendment

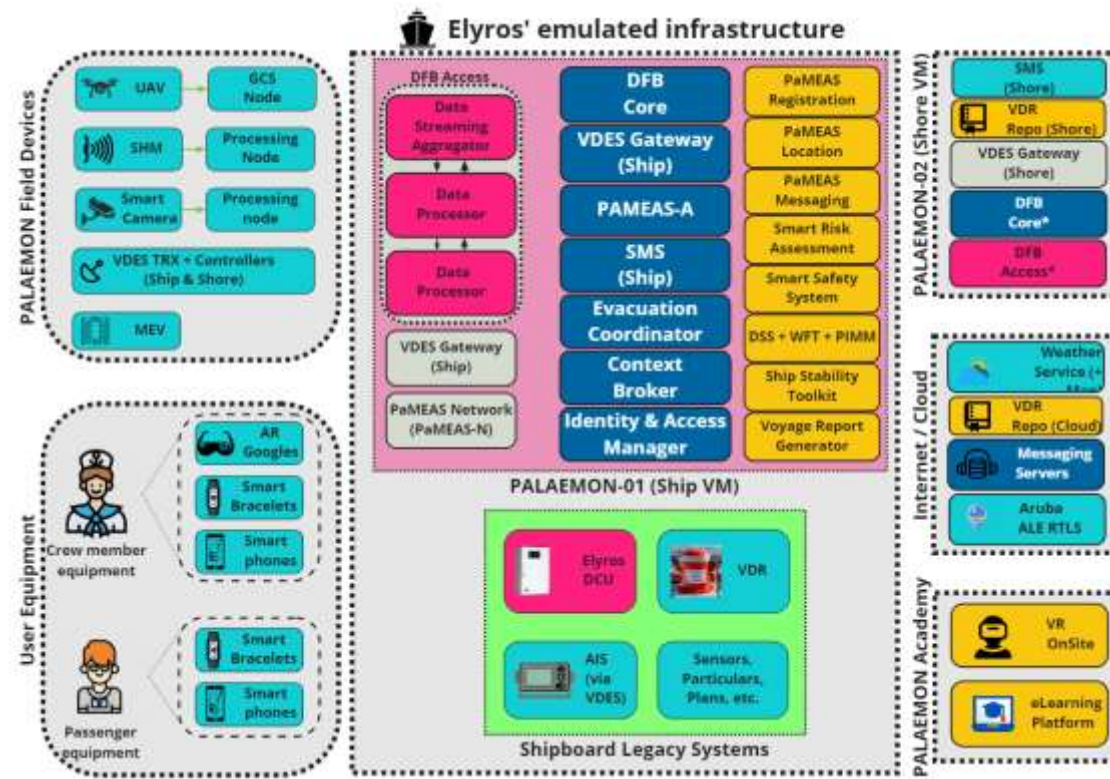
T7.1 – PALAEMON Communications Platform (1/2)

Task leader: ATOS

Main outcomes

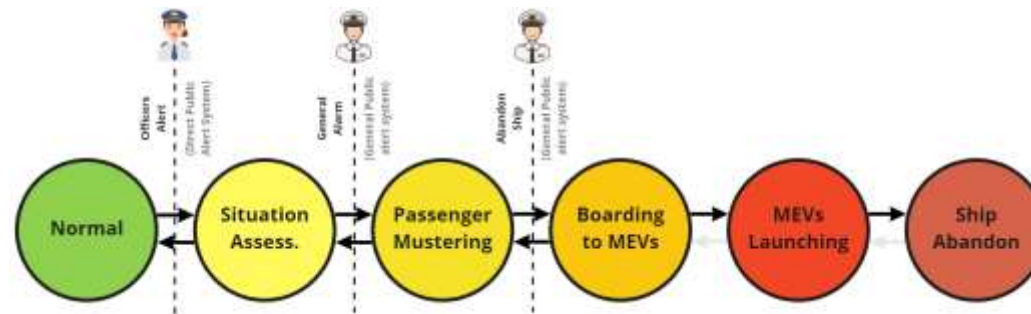
A. PALAEMON Communications Platform

- ▶ Deployment view
- ▶ Physical view
- ▶ Security view
- ▶ Individual components (final specification)



B. Ship Evacuation Process redefined

- ▶ Real-world to PALAEMON system translation



T7.1 – PALAEMON Communications Platform (1/2)

Task leader: ATOS

Main outcomes

- D. Implementation of PALAEMON Evacuation Coordinator
 - ▶ Evacuation Status broadcast
 - ▶ Component status tracker
- E. Implementation of Voyage Report Generator
 - ▶ Collection of all data from the PALAEMON System
 - ▶ Video + Data
 - ▶ PDF Report
 - ▶ Delivery to DPA (mail + cloud repo)

The screenshot shows the PALAEMON Evacuation Coordinator interface. At the top, it displays 'Evacuation status' with buttons for 'Normal status', 'Situation Assessment', 'Passenger mustering', 'Boarding to NCVs', and 'RCV Launching'. Below this is the 'Component status' section, which contains a table with the following data:

Component	ID(s)	#Components	Operation mode	Last message
Smart Risk Assessment Platform	srp	1	0	2022-11-28 10:38:16.176000
VDES App	VDES App	1	1	2022-11-28 10:38:22.284200000
Smart brackets	S00001 S00002	2	0	2022-11-28 10:38:16.176000
Smart Cameras	camera-01 camera-02 camera-03 camera-04	4	0	2022-11-28 10:38:16.176000
Voyage Report Generator	VDR	1	1	2022-11-28 10:38:22.284200000
PALAEMON Location	--	--	--	--
Ship Health Monitoring	SHM	1	1	2022-11-28 10:38:16.176000
Smart Safety System	SSS	1	1	2022-11-28 10:38:16.176000
Ship Stability Tracker	SST	1	1	2022-11-28 10:38:16.176000
Power + Dis + WPT	--	--	--	--

The screenshot shows a cloud storage interface for the 'palaemon-reports' folder. The folder contains 12 objects. The following table lists the files shown in the interface:

Name	Last Modified	Size
VDR_Elyria_demo (Lzip)	Thu Oct 27 2022 14:59:50 GMT+0200	4.1 MB
Annual Overview of Marine Casualties and Incidents 2021.pdf	Thu Oct 27 2022 15:00:04 GMT+0200	5.8 MB
Elyria_2022-10-27_1412_B0H6E0HHEBUkgEH.zlp	Thu Oct 27 2022 16:12:11 GMT+0200	483.7 KB
Elyria_2022-11-03_1630_Ap03UkxvrlngZ3Lzlp	Thu Nov 03 2022 17:31:07 GMT+0100	499.9 KB
Elyria_2022-11-07_1702_AFDqk4Lamr5nWzlp	Mon Nov 07 2022 16:02:34 GMT+0100	499.9 KB
Elyria_2022-11-09_1150_BekEp5m0APna.zip	Wed Nov 09 2022 12:58:54 GMT+0100	900.2 KB
Elyria_2022-11-09_1318_85m0Fuy34ZFDn8Lzlp	Wed Nov 09 2022 14:28:27 GMT+0100	496.5 KB
Elyria_2022-11-28_1331_422XG34FdwUyX8bzlp	Mon Nov 28 2022 16:31:56 GMT+0100	550.6 KB
Elyria_2022-11-28_1706_AH0DkMwep47Kzlp	Mon Nov 28 2022 18:06:43 GMT+0100	510.0 KB
Elyria_2022-11-29_0909_WPVGTFunMcWbysLzlp	Tue Nov 29 2022 10:09:25 GMT+0100	510.2 KB
Elyria_2022-11-29_1020_867d0P7ZjHkVnR.zlp	Tue Nov 29 2022 11:20:37 GMT+0100	510.0 KB
Elyria_2022-11-29_1116_AHF79N8DNVWETHDzlp	Tue Nov 29 2022 12:16:35 GMT+0100	856 MB



T7.2 – Encryption and Authentication Mechanisms (1/2)

Task leader: THALIT

Main outcomes

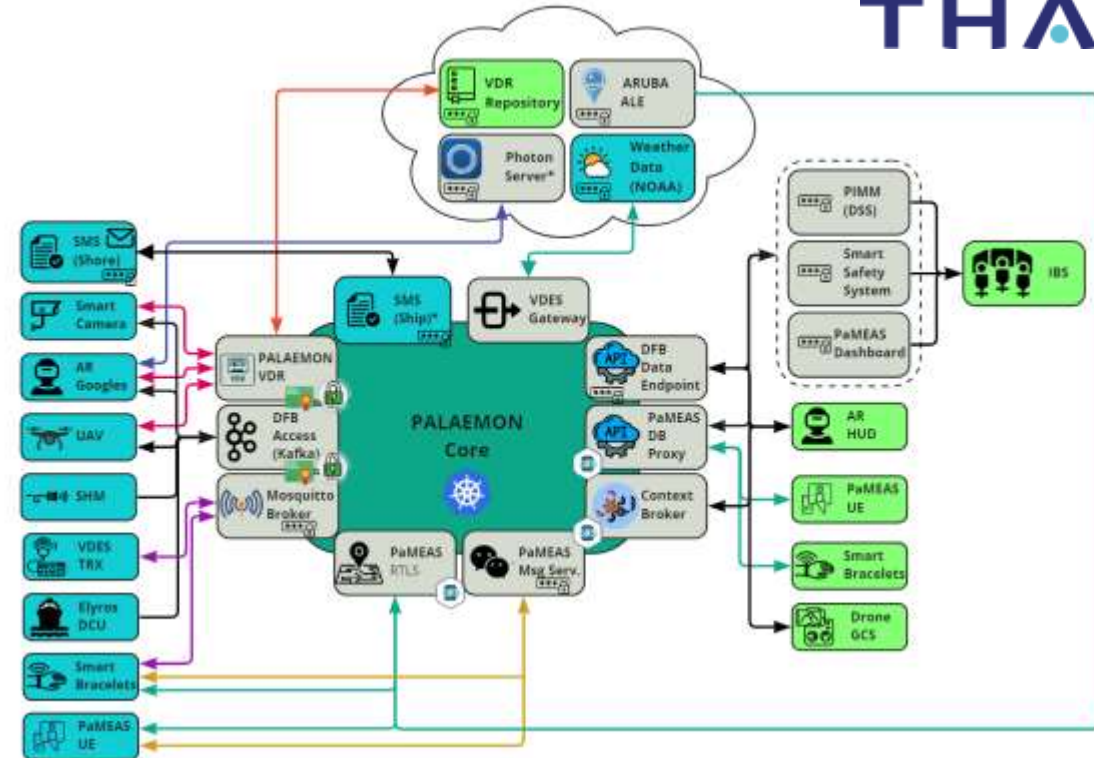
A. Multi-layered security approach

- ▶ Docker
- ▶ Kubernetes
- ▶ Kafka
- ▶ Keycloak (User-based access)
- ▶ Inverse proxy

B. Different access (Authentication & Authorization) methods

- ▶ SSL Certificates
- ▶ Oauth 2.0 (Keycloak)
- ▶ User & (strong) password

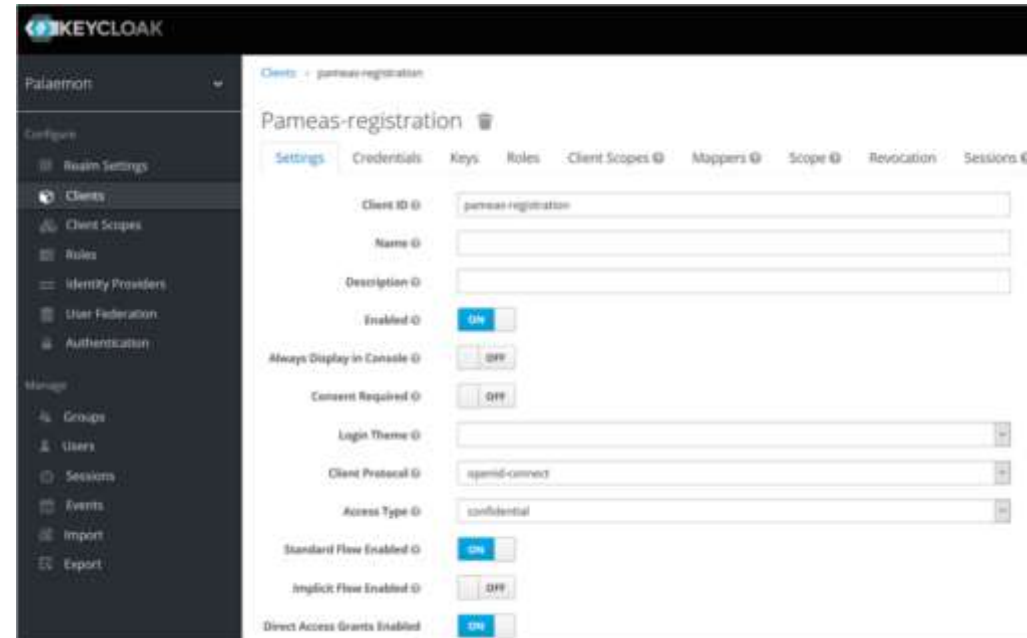
THALES



Task leader: THALIT

Main outcomes

- C. Security aspects related to **People Management System - PaMEAS** (100% GDPR compliant)
 - ▶ Registration and embarkation
 - ▶ Personal data anonymization
 - ▶ DB Proxy (dedicated API)
- D. Design, deployment and setup of **Identity and Access Management** component
 - ▶ Realms & Clients
 - ▶ Oauth 2.0 token generation



Task leader: ATOS

Main outcomes

- A. Analysis of all data exchanged across the platform
- B. Definition of the PALAEMON Information Model (based on NGSI-LD standard)

```

Weather forecast information (raw)
1 {
2   "Timestamp": "2020-01-01 17:00:00",
3   "combDirectionDegrees": 5.68,
4   "combPeriod": 3.83,
5   "combSWHMeters": 0.74,
6   "currentsDirectionDegrees": 45.0,
7   "currentsSpeedKnots": 0.05832,
8   "hum%": 64.2,
9   "iceCover": 0.0,
10  "mslhPa": 1031.24,
11  "sea": true,
12  "swellDirectionMeters": 17.89,
13  "swellPeriod": 4.22,
14  "swellSWHMeters": 0.64,
15  "tempCelciusDegrees": 13.28,
16  "visKm": 24.135,
17  "wavesDirectionDegrees": 330.48,
18  "wavesPeriod": 2.76,
19  "wavesSWHMeters": 0.39,
20  "windDirectionDegrees": 322.31,
21  "windSpeedKnots": 11.788639999999998
22 }
    
```

```

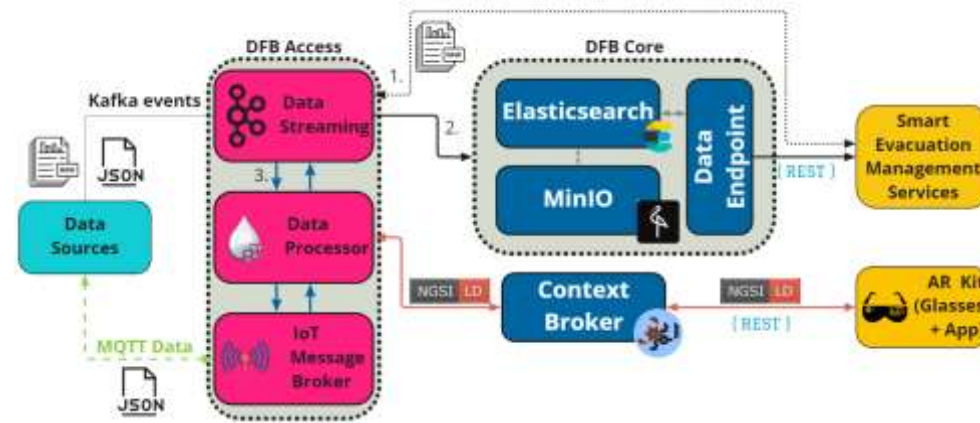
Weather forecast information (NGSI-LD output)
1 {
2   "id": "urn:ngsi-ld:SeaCondition-Elyros",
3   "type": "SeaConditions",
4   "dataProvider": "DANAOS API",
5   "dateObserved": "2020-01-01T17:00:00Z",
6   "location": {
7     "coordinates": [0, 1],
8     "type": "Point"
9   },
10  "surfaceTemperature": 13.28,
11  "waveHeight": 0.39,
12  "wavePeriod": 2.76,
13  "combDirectionDegrees": 5.68,
14  "combPeriod": 3.83,
15  "combSWHMeters": 0.74,
16  "currentsDirectionDegrees": 45,
17  "currentsSpeedKnots": 0.05832,
18  "hum%": 64.2,
19  "iceCover": 0,
20  "mslhPa": 1031.24,
21  "sea": true,
22  "swellDirectionMeters": 17.89,
23  "swellPeriod": 4.22,
24  "swellSWHMeters": 0.64,
25  "visKm": 24.135,
26  "wavesDirectionDegrees": 330.48,
27  "windDirectionDegrees": 322.31,
28  "windSpeedKnots": 11.7886,
29  "@context": [
30    "https://smartdatamodels.org/context.jsonld",
31    "https://uri.etsi.org/ngsi-ld/v1/ngsi-ld-core-context.jsonld",
32    "https://raw.githubusercontent.com/smart-data-models/
33    dataModel.Weather/master/context.jsonld" ]
    }
    
```

Task leader: ATOS

Main outcomes

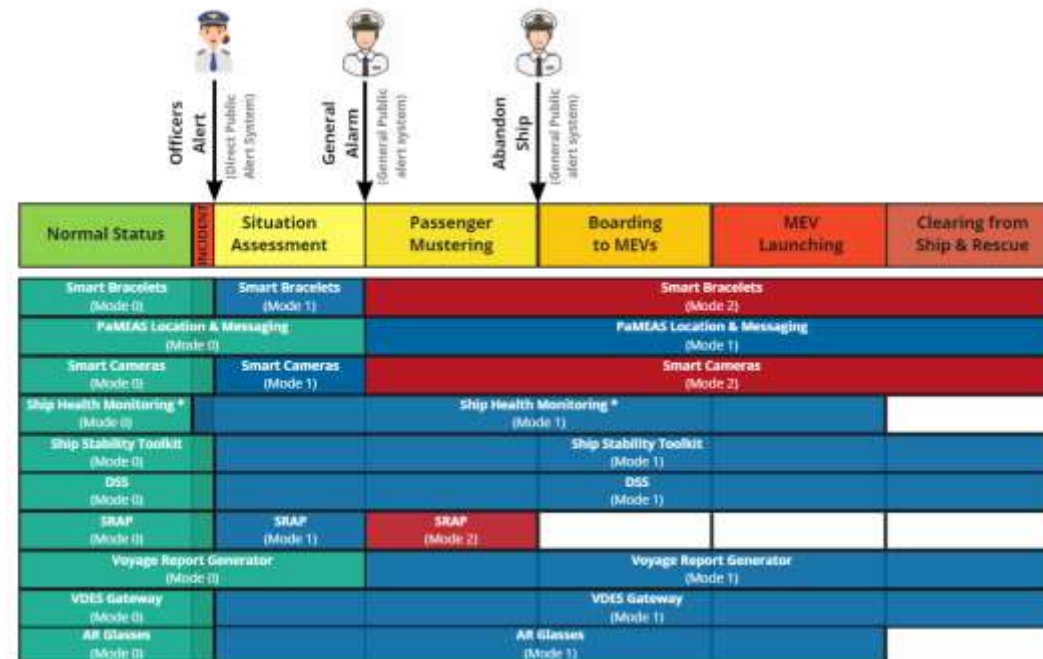
C. On-the-fly transformation of data from raw to PALAEMON Information Model

- ▶ MQTT / Kafka ingestion
- ▶ NiFi + JOLT transformers
- ▶ Connection with Data Fusion Bus



D. Definitive Definition and Implementation of components' Evacuation Operation Modes

- ▶ Dynamic component behaviour

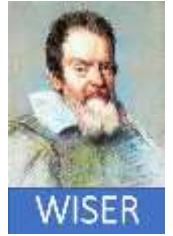


T7.4 – VDES Deployment (1/2)

Task leader: WISER

Main outcomes

- A. Design and development of **three (3) working VDES Prototypes**
 - ▶ HW requirements from VDES standard
 - ▶ Low Noise Amplifier Module
 - ▶ Software Defined Radio
 - ▶ VDES Gateway application
- B. **Demonstration of the communication** via radio links, supporting the exchange of data in normal and emergency-based scenarios
 - ▶ Ship + Shore + AIS transmitter (3rd prototype)
 - ▶ AIS overhearing and transmission
 - ▶ VDES Gateway
(VDES ↔ [MQTT ↔ Kafka] ↔ PALAEMON)



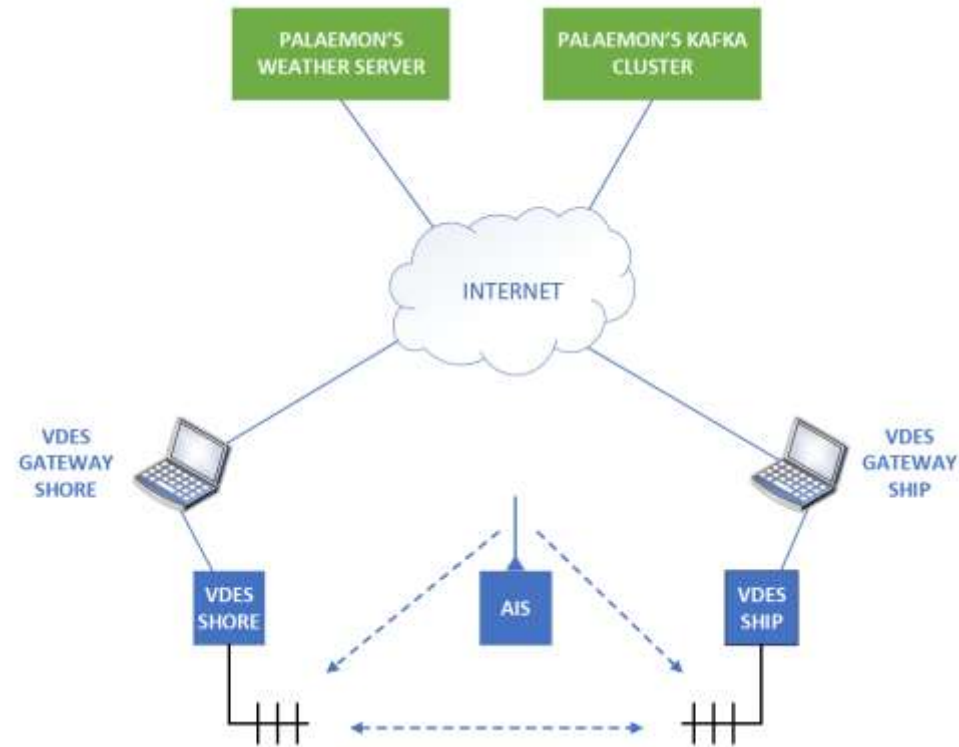
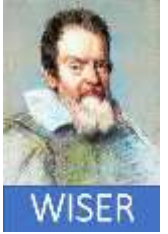
T7.4 – VDES Deployment (2/2)

Task leader: WISER

Main outcomes

c. Full integration with the PALAEMON Platform

- ▶ AIS (ship position, etc.)
- ▶ Weather data (via external service powered by DANAOS)
- ▶ Distress signal



Outgoing signals (VDES)

Time	Ship Name	Position	Incident Type	Assistance?	# Passengers	#Crew	#Injured	Damage %
2021-01-26T18:25:00+01:00	Costa Concordia	42.3717	Contact - Breach - Blackout	None	4229	1023	0	75%
2021-01-26T18:25:00+01:00	Costa Concordia	42.3717	Contact - Breach - Blackout	None	4229	1023	0	75%
2021-01-26T18:25:00+01:00	Costa Concordia	42.3717	Contact - Breach - Blackout	None	4229	1023	0	75%
2021-01-26T18:25:00+01:00	Costa Concordia	42.3717	Contact - Breach - Blackout	None	4229	1023	0	75%
2021-01-26T18:25:00+01:00	Costa Concordia	42.3717	Contact - Breach - Blackout	None	4229	1023	0	75%
2022-10-13T15:21:48+02:00	Ship for VDES Demo	43.549484	Contact	None	1234	789	56	42%
2022-10-13T15:21:48+02:00	Ship for VDES Demo	43.549484	Contact	None	1234	789	56	42%
2022-10-13T15:31:08+02:00	Ship for VDES Demo	43.549484	Contact	None	1234	789	56	42%
2022-10-13T15:32:08+02:00	Ship for VDES Demo	43.549484	Contact	None	1234	789	56	42%
2022-10-13T15:33:08+02:00	Ship for VDES Demo	43.549484	Contact	None	1234	789	56	42%

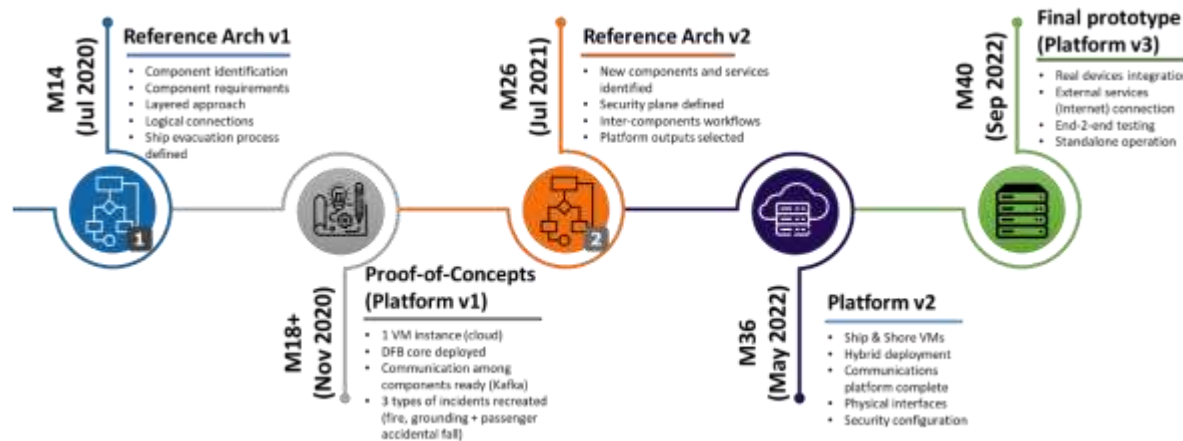
T7.5 – Integration of PALAEMON Prototype System

Task leader: ATOS



Main outcomes

- A. Adaptation from PALAEMON Reference Architecture (WP2) to a **real-world infrastructure**
- B. Definition and implementation of **three (3) major releases** of the platform



- C. Final version executed on a **cloud-based environment**, emulating a real ship hardware infrastructure
- D. **Compilation of stakeholders** with direct interplay with the PALAEMON System
- E. Fully-fledged **Smart evacuation scenario** tested (emulated environment)

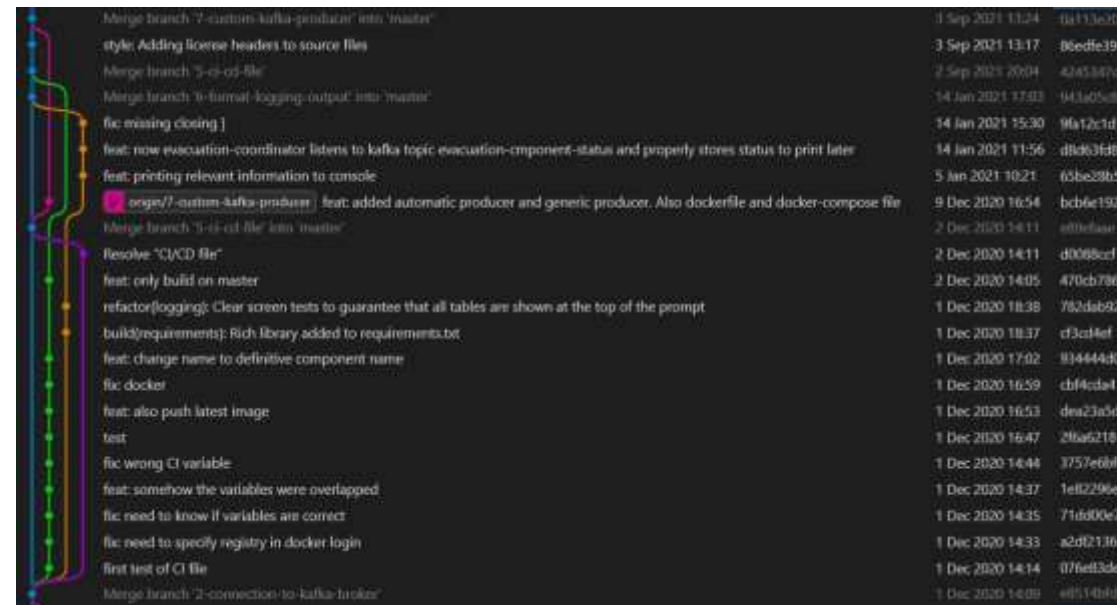
Task leader: ATOS

Main outcomes

A. Software Development and Integration Methodologies implemented

- ▶ Containers (Docker + Compose)
- ▶ Orchestration (Kubernetes)
- ▶ Open-source (GitLab repo)
- ▶ Issue tracking (GitLab)
- ▶ Continuous integration / continuous deployment

Name	Namespace	Pods	Replicas	Age	Conditions
bootstrap-deployment	db	1/1	1	2y4d	Available Progressing
db-admin-ui-deployment	db	1/1	1	2y3d	Available Progressing
ec-connector-deployment	db	1/1	1	4h1	Available Progressing
ec-proxy-deployment	db	1/1	1	67m	Available Progressing
ecui-core	db	1/1	1	8h	Available Progressing
grafana-deployment	db	1/1	1	480z	Available Progressing
gta-exporter-1-deployment	db	1/1	1	480z	Available Progressing
kafka-1-deployment	db	1/1	1	62m	Available Progressing
kapow	db	1/1	1	25d	Available Progressing
libara-deployment	db	1/1	1	30z	Available Progressing
messagito	db	1/1	1	27m	Available Progressing
ngro-deployment	db	1/1	1	2y1d	Available Progressing
nl	db	1/1	1	34z	Available Progressing
nl-registry	db	1/1	1	33m	Available Progressing
prometheus-deployment	db	1/1	1	480z	Available Progressing
vs	db	1/1	1	22z	Available Progressing
watcher-deployment	db	1/1	1	26z	Available Progressing



B. Constant interaction

- ▶ + 180 alignment meetings
- ▶ Integration days

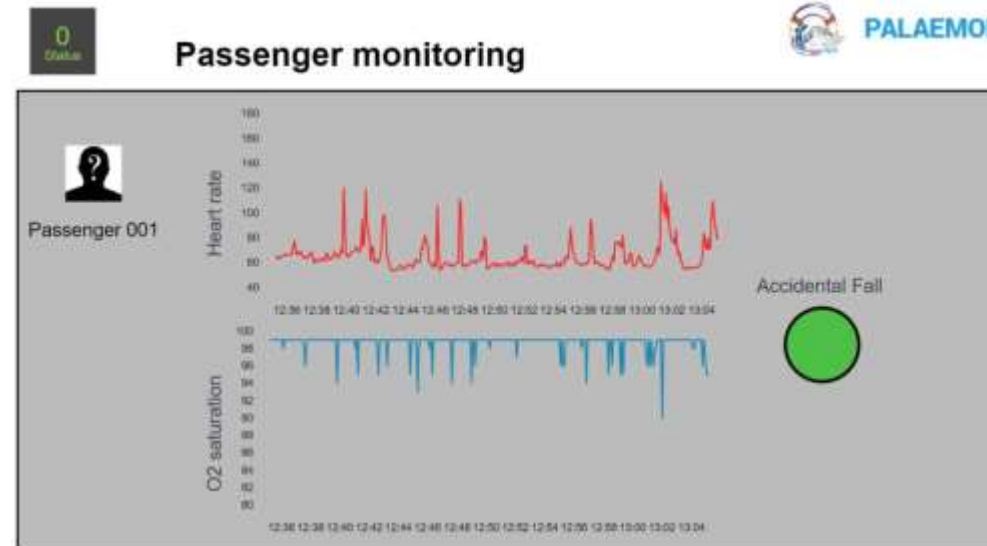


T7.6 – PALAEMON Ecosystem Testing (2/2)

Task leader: ATOS

Main outcomes

- C. Definition of the Evacuation Messaging protocol
 - ▶ Discovery / heartbeat
 - ▶ Status change broadcast
- D. Validation campaign over transversal services and tools
 - ▶ PIMM
 - ▶ Kibana
 - ▶ Evacuation Coordinator...
- E. Individual verification of the main software components



Incident type: Fire

Decision Support Center

Video Streaming Center

Incident Assessment

Ship Stability Toolkit

Current Weather

Suggested Actions

Risks

Possible outcomes

The screenshot shows a dashboard for an incident response. It includes a 'Ship Stability Toolkit' with a ship diagram, a 'Weather Forecast Toolkit' with current weather and suggested actions, and a 'Situation Assessment Recommendation' section. The 'Possible outcomes' section contains two bar charts showing the distribution of deaths and injuries under different conditions.

WP7 – Deliverables

Del No.	Deliverable title	Leader	Type	Diss. level	Due date	Submission Date
D6.6*	PALAEMON Communications Platform (V2)	ATOS	DEM	CO	M32	M37 01/06/2022
D7.1	Encryption and Authentication Mechanisms (V2)	THALES	DEM	CO	M32	M39 02/08/2022
D7.2	Uniform Data Exchange Modules – Interoperability Layer (V2)	ATOS	DEM	CO	M32	M38 11/07/2022
D7.3	Deployment of VDES (V2)	WISER	DEM	CO	M36	M44 27/01/2023
D7.5	System Integration & Final PALAEMON Prototype (V2)	ATOS	DEM	CO	M32	M44 27/01/2023
D7.6	Test Cases and overall system testing results (V2)	ATOS	Report	PU	M36	M44 27/01/2023
D7.7	Public release WP7	ATOS	Report	PU	M36	M44 27/01/2023

* Allocated in WP6

DoW – General delay dragged from core technical WPs. Deliverables

- T6.6: PALAEMON Communications Platform V2 (DEM, CO, **M32** M37)
- D7.1: Encryption and Authentication Mechanisms V2 (DEM, CO, **M32** M39)
- D7.2: Uniform Data Exchange Modules – Interoperability Layer V2 (DEM, CO, **M32** M38)
- D7.3: Deployment of VDES V2 (DEM, CO, **M36** M44)
- D7.5: System Integration & Final PALAEMON Prototype V2 (DEM, CO, **M32**, M44)
- D7.6: Test Cases and Overall System Testing Results (R, PU, **M36** M44)
- D7.7: Public Release WP7 (R, PU, **M36** M44)

UoR - Deviations from RP2 planned PM figures

- ❑ No official figures ready for WP7



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Thank you

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'The opinions expressed in this document reflect only the author's view and reflects in no way the European Commission's opinions. The European Commission is not responsible for any use that may be made of the information it contains.'

The logo for Atos, consisting of the word "Atos" in a bold, blue, sans-serif font.