# Return Link Service Test Bed demonstrator platform and web applications for new SAR Galileo Services

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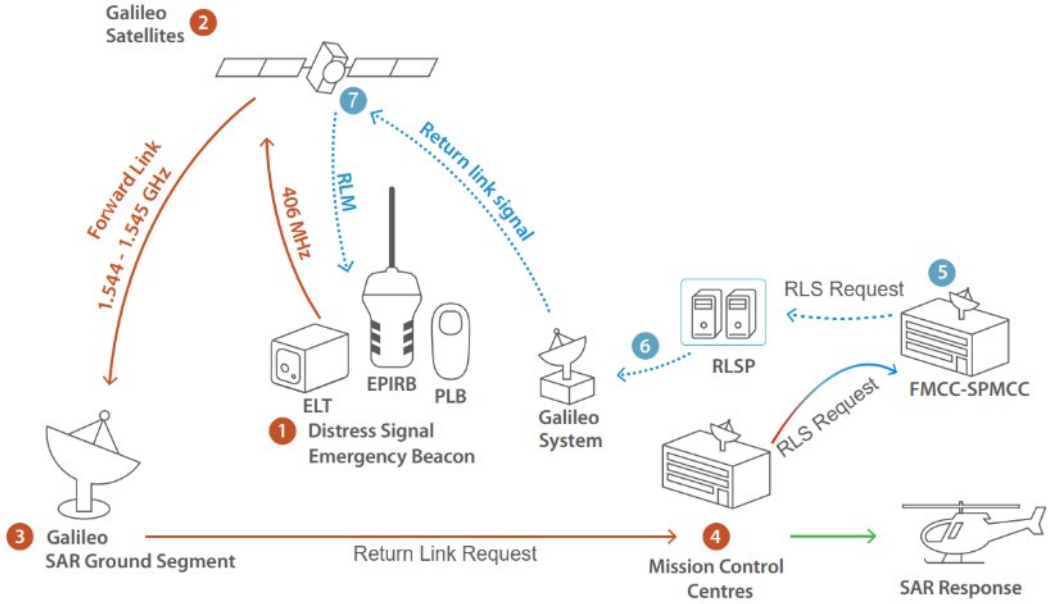
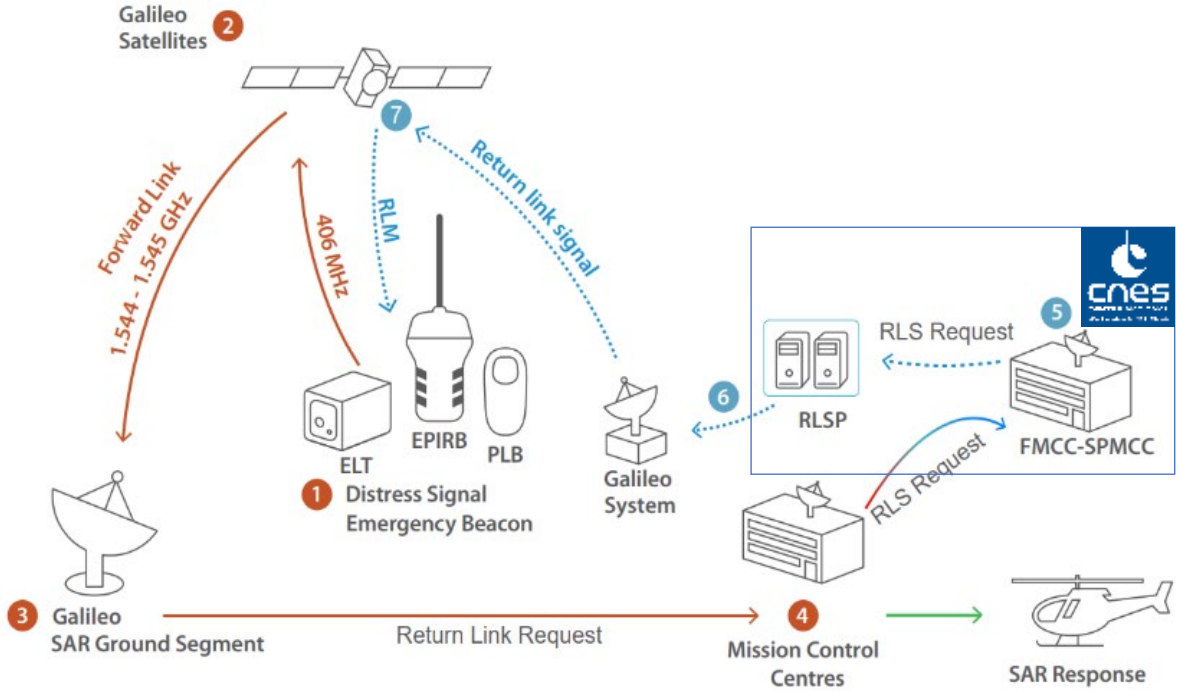
# SAR/GALILEO CONTRIBUTION TO COSPAS-SARSAT

- **Cospas-Sarsat: International satellite-based Search and Rescue (SAR) system**
- SAR/Galileo Initial Service (**Forward Link**) declared in **December 2016**:
  - An operational SAR/Galileo Ground Segment
  - SAR payloads on-board of Galileo satellites
- SAR/Galileo Enhanced Service declared in **January 2020** including **Return Link** functionality
- **EUSPA** entrusts to **CNES** the operation of **SAR/Galileo Forward Link and Return Link services**



# SAR/GALILEO RETURN LINK SERVICE

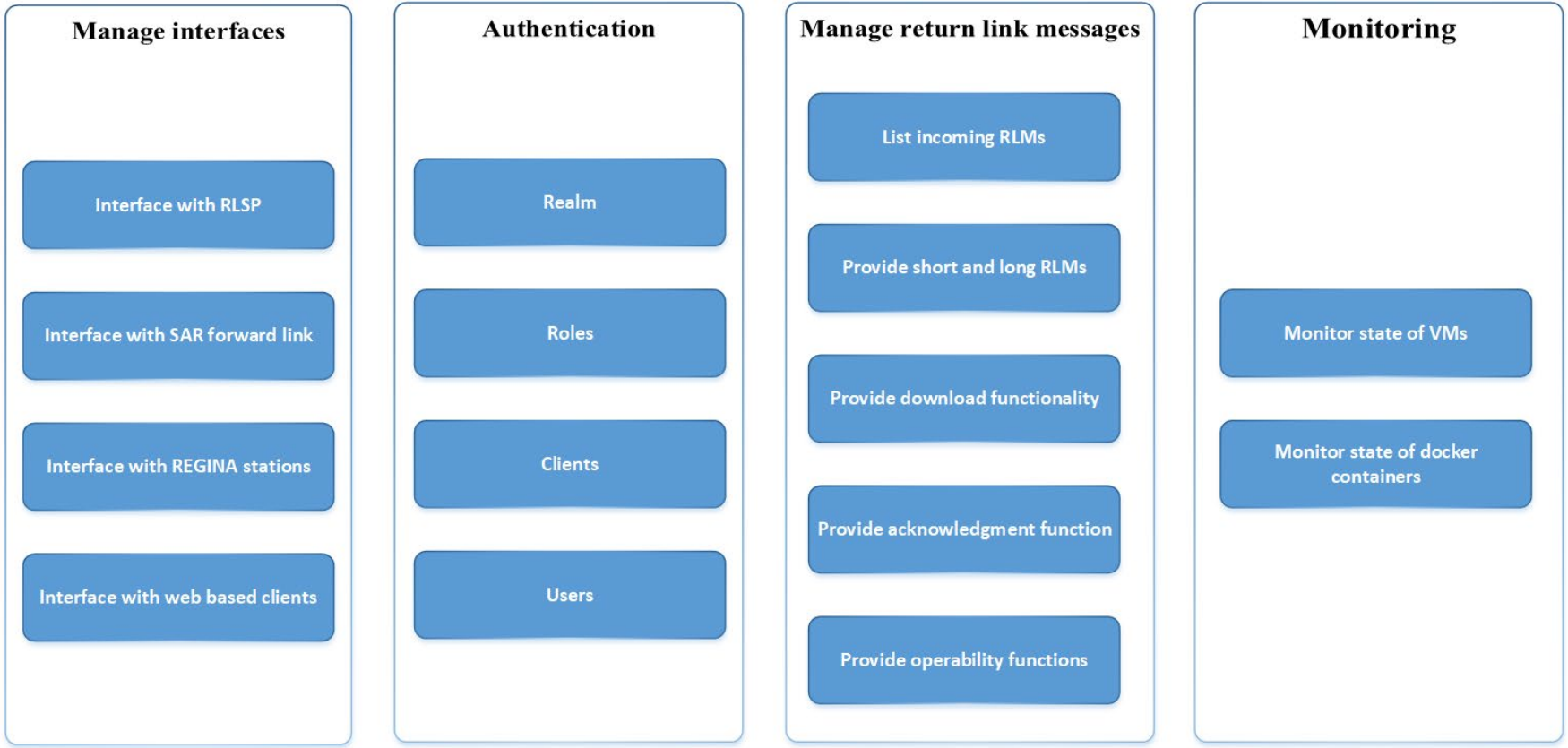
- **Worldwide service** provided by **Galileo only**
- RLM broadcasted to distress beacons in SAR dedicated data bits on the Galileo E1 signal


## SAR/Galileo Data Service Provider for Return Link Service

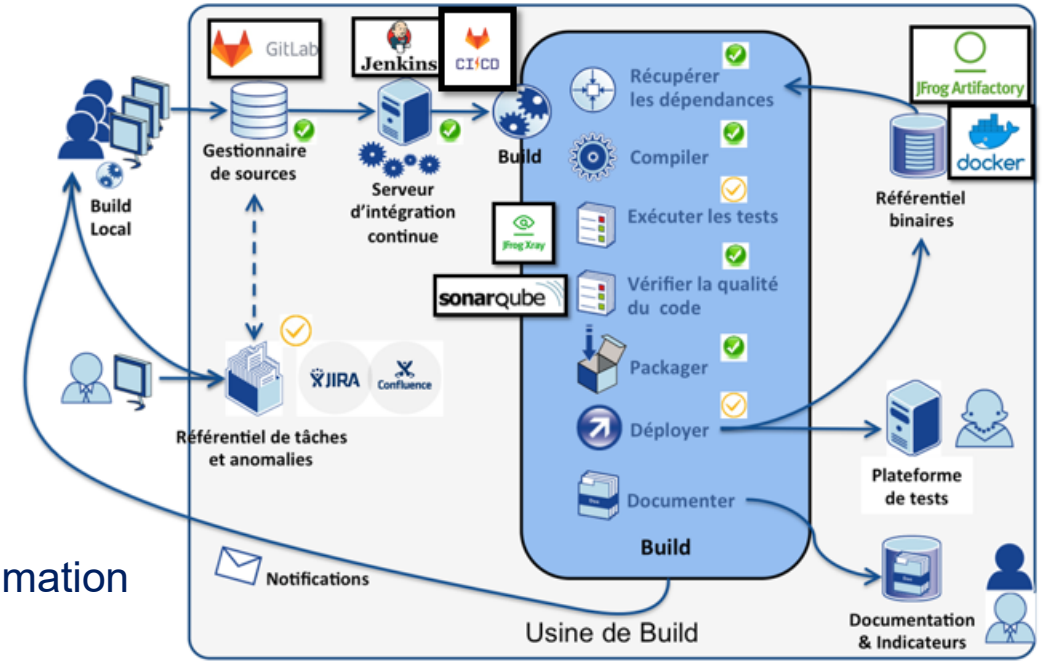
- Coordination of Operations & Maintenance
- Service Performance monitoring
- SAR/Galileo interface with the Cospas-Sarsat
- Technical support for the Service evolutions

# RLS TEST BED



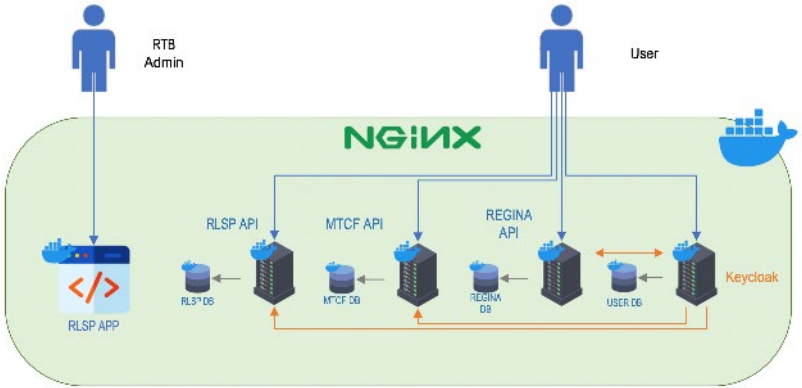
# RLS TEST BED – TECHNOLOGIES AND AGILE

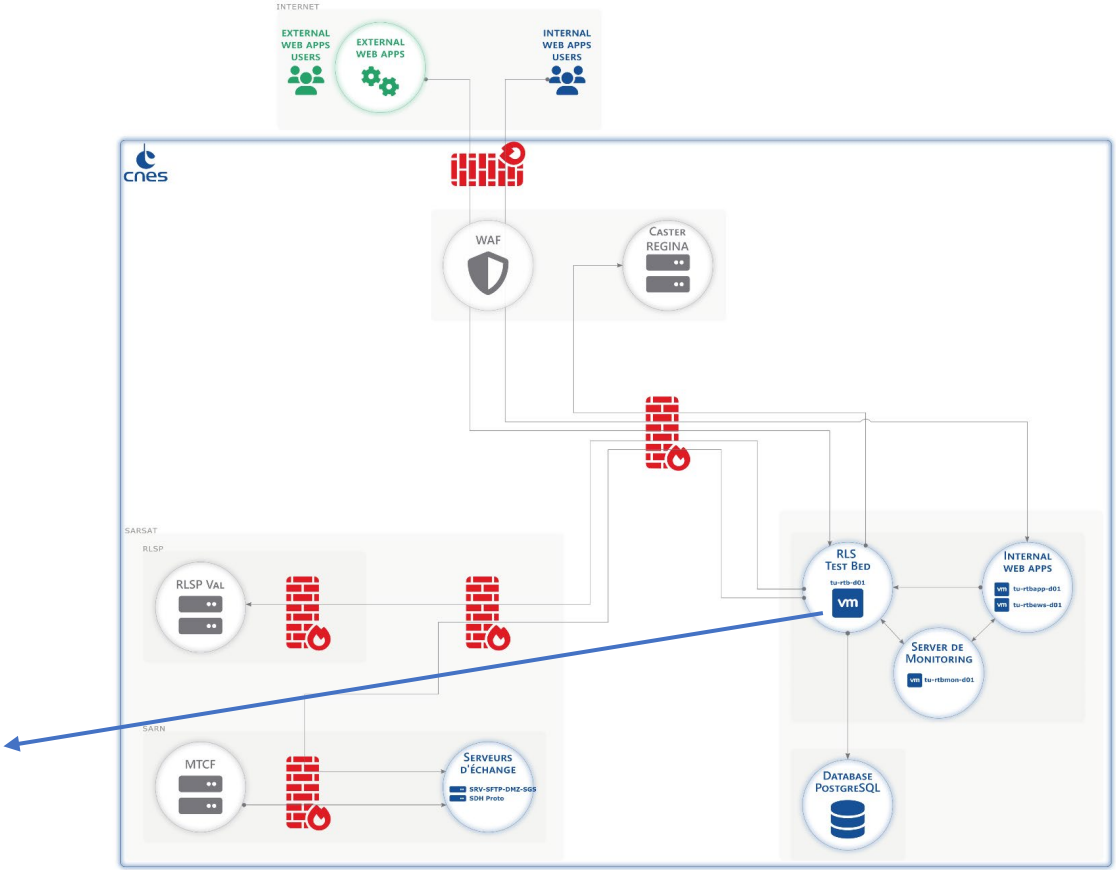
- **Agile** (SCRUM method)
- Sprints of 3 weeks duration
- CNES **software factory tools**:
  - Gitlab
  - Artifactory
  - Jenkins
  - SonarQube
  - Jira
  - Confluence
- Fibonacci sequence method of items estimation



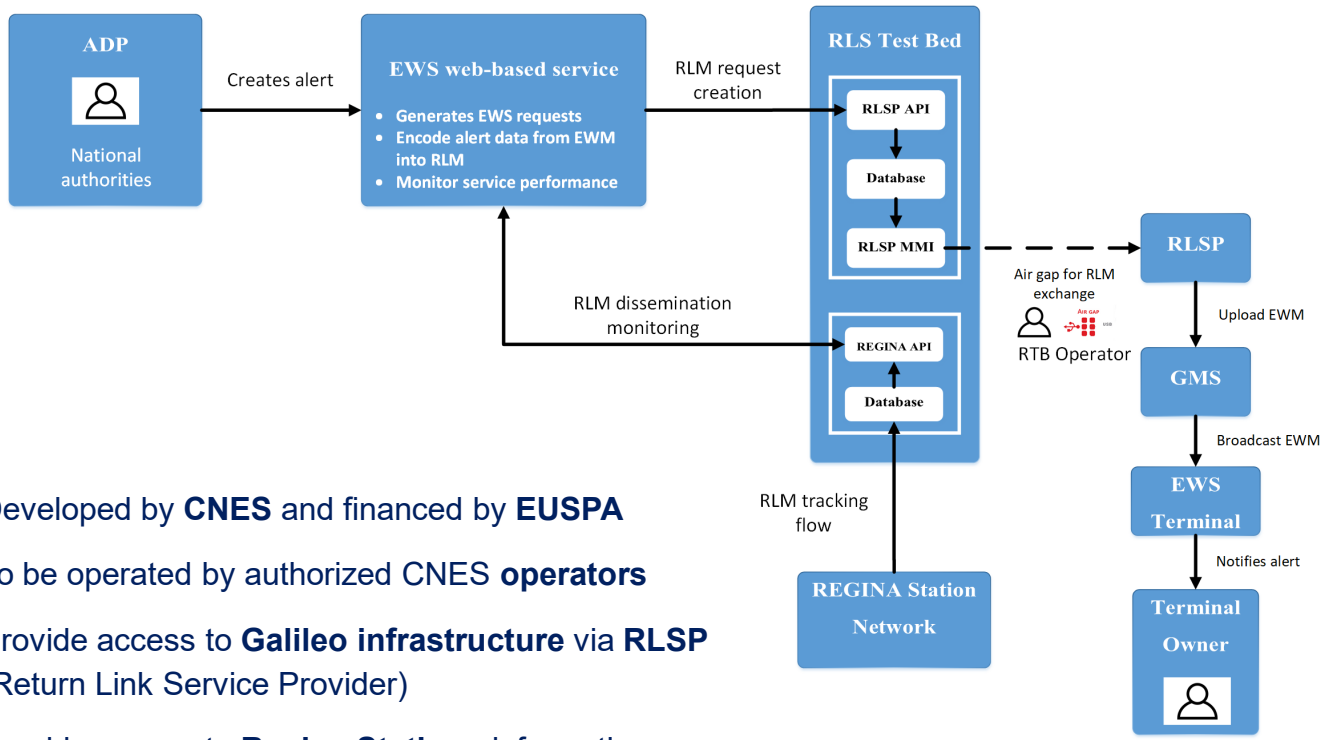
# RLS TEST BED – ARCHITECTURE

- **Virtualised** platform based on **Docker**
- Interface between SGS means and internet
- **Security protection**
  - Architecture physically protected with WAF and firewalls
  - Security hardening by applying CNES security rules for exposed elements: Docker, Keycloak and Nginx



# RTB FOR EMERGENCY WARNING SATELLITE SERVICE (EWSS)





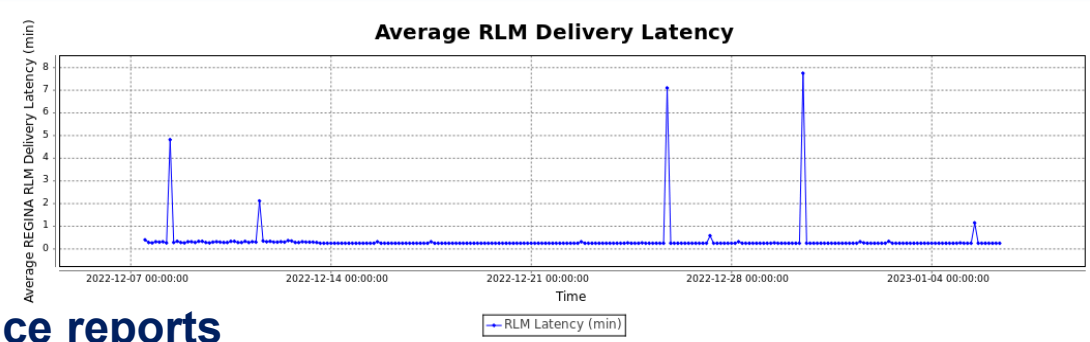
- Developed by **CNES** and financed by **EUSPA**
- To be operated by authorized CNES **operators**
- Provide access to **Galileo infrastructure** via **RLSP** (Return Link Service Provider)
- Provide access to **Regina Stations** information

# RLS GLOBAL MONITORING WITH REGINA

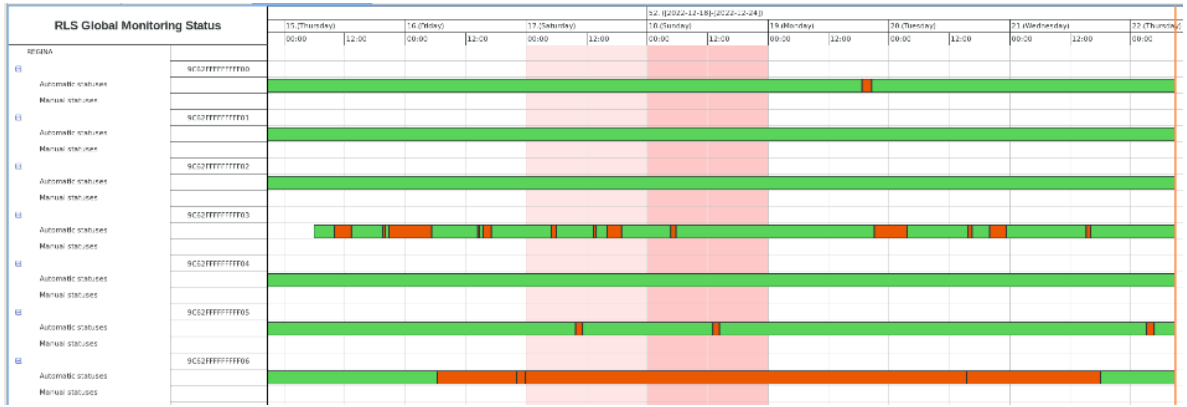
- **CNES-IGN worldwide network of GNSS receivers**
- Used for RLS global monitoring since the **1st quarter of 2022**
- **16 REGINA stations**
- REGINA mission centre located in CNES Toulouse

# RLS GLOBAL MONITORING WITH REGINA

- Computed and monitored RLS Key Performance Indicators:
  - **Galileo RLM delivery latency** (return link path only)
  - **Probability of RLM delivery**




- **Daily checklists** and **monthly performance reports**
- RLS monitored by an **automated 24/7** tool sending alarms on RLS status to on-call SGDSP operators

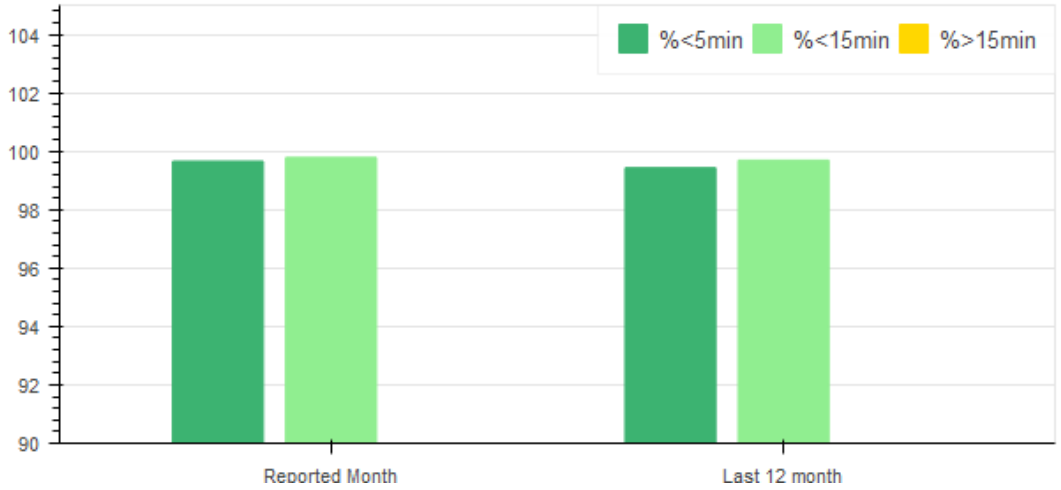



## REGINA receivers status

- Status files provided by REGINA mission centre
- Monitored by SAR/Galileo Data Service Provider

# RLS PERFORMANCES BASED ON REGINA DATA

| Percentage of RLM received – November 2023 (Target: 99%) | Percentage of RLM received (average over the year) |
|---|---|
| **100.0%** | **99.98%** |



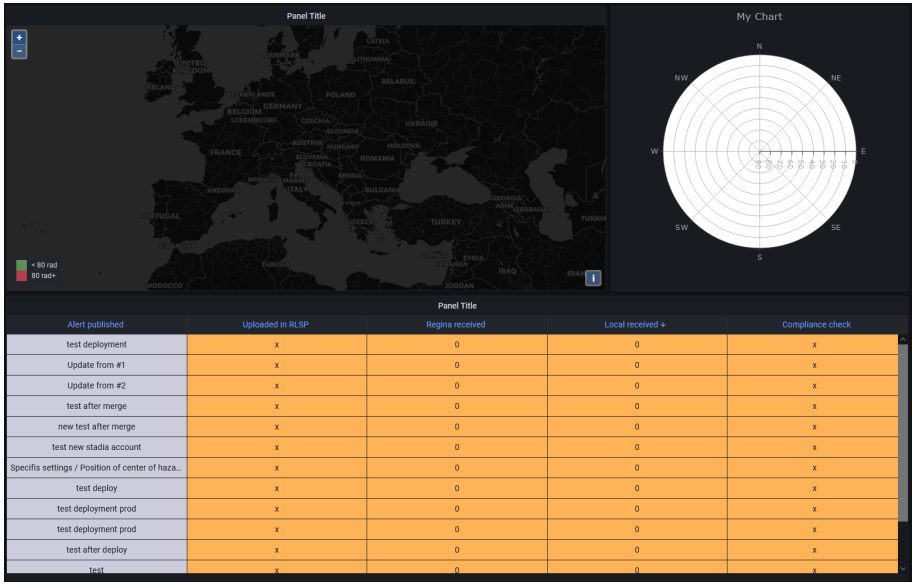

RLM delivery latency proportions reported on November 2023

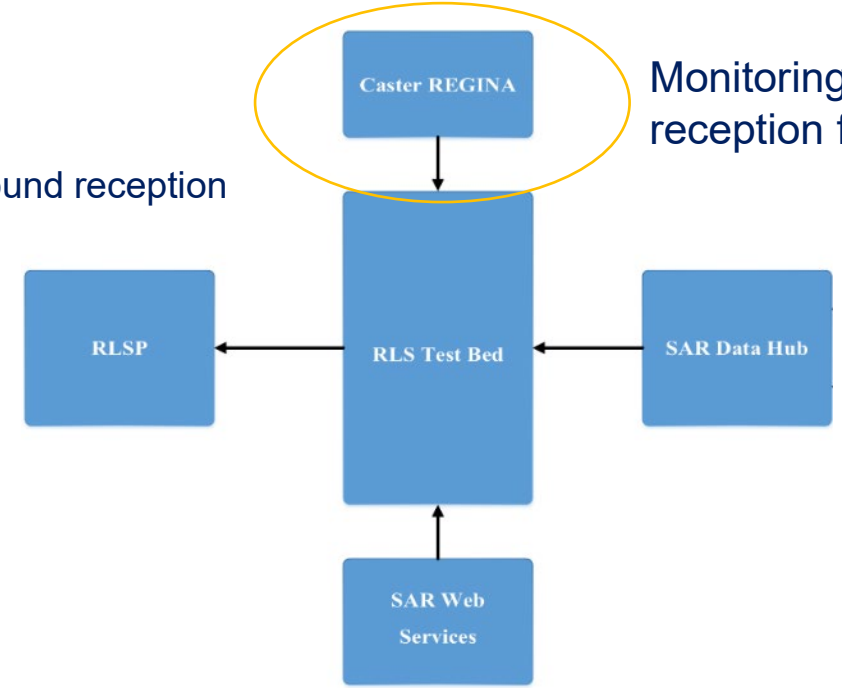
Worldwide RLS provision performances

- ✓ Target of 99% of RLM delivery probability per month is achieved
- ✓ Target of 99% of RLM delivery within 15 min per month achieved
- ✓ Most of RLMs are delivered within 5 min

# EWSS MONITORING WITH REGINA

- Monitored by National Authorities during demonstrations
- Provides Galileo constellation status and information on ground reception



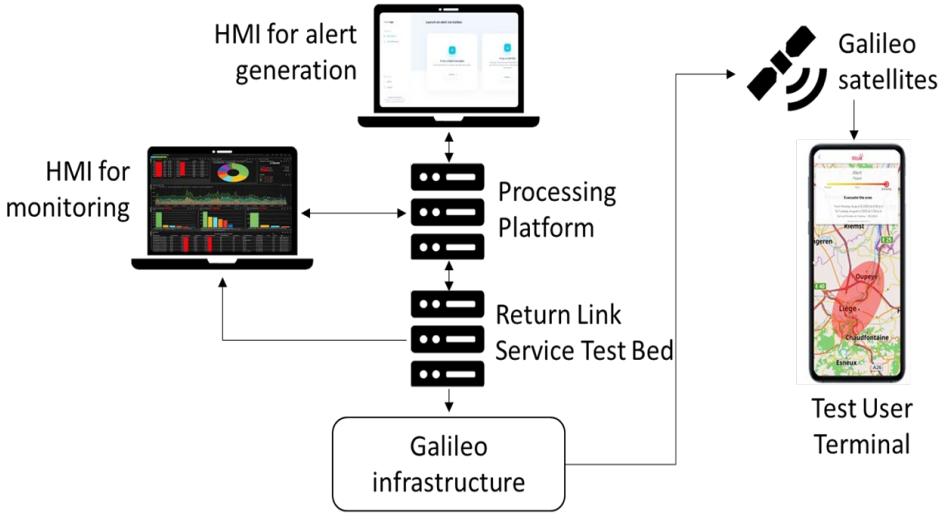

Monitoring of RLM reception for EWSS

# STELLAR: EWSS PROJECT

- Project funded by the European Union, and managed by European Commission DG DEFIS (led by Telespazio France)

Funded by the European Union

- Main objectives:
  - Consolidate EWSS concepts
  - Develop EWSS demonstrator interfacing with real Galileo infrastructure
  - Perform Demonstrations with EU national alert authorities
  - Prepare introduction of the service in Galileo 1st Generation




## CNES role

- Hosting entity and operator of the **SAR Galileo Service Center**
- **Future operator** of **Galileo EWSS service center** as provider and operator of RLSP and RTB

# AWARE: EWSS PROJECT

- HORIZON-EUSPA-2021-SPACE Grant (led by Telespazio France)
- Main objectives:
  - To develop a Galileo EWSS module for fixed Public Warning Devices
  - To demonstrate the whole chain on various use cases (natural disaster, urban emergency, industrial catastrophe)
  - To provide feedback on advanced EWSS concepts
  - To analyse and demonstrate synergies between Copernicus EMS and Galileo EWSS

Funded by the European Union

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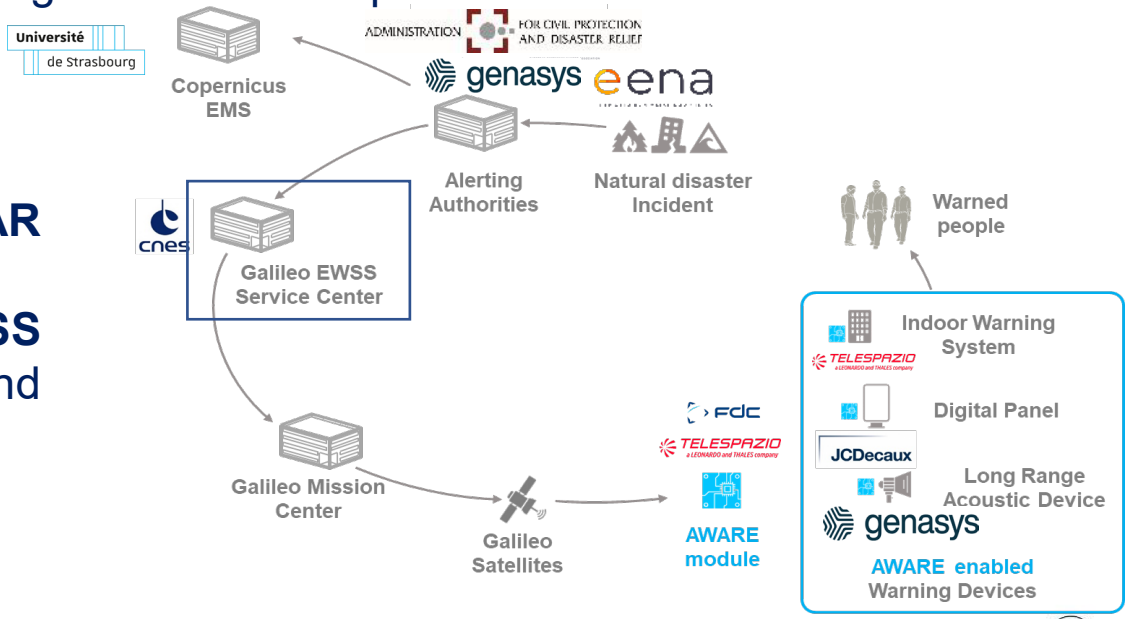

# CONCLUSION

- **Agile methodology** adapted to implement the needs in a short-time period
- RLS Test-Bed:
    - **Virtualized and scalable** design
    - Pre-operational mean to integrate new Galileo services into a **closed-secure environment**
- REGINA: **Worldwide** Galileo RLS-based Service monitoring system
- CNES**: Key stakeholder** on **demonstration capabilities** related to European Space Programme projects. Entrusted by **EUSPA** to be the **future operator of the Galileo EWSS**

# Thank you for your attention

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