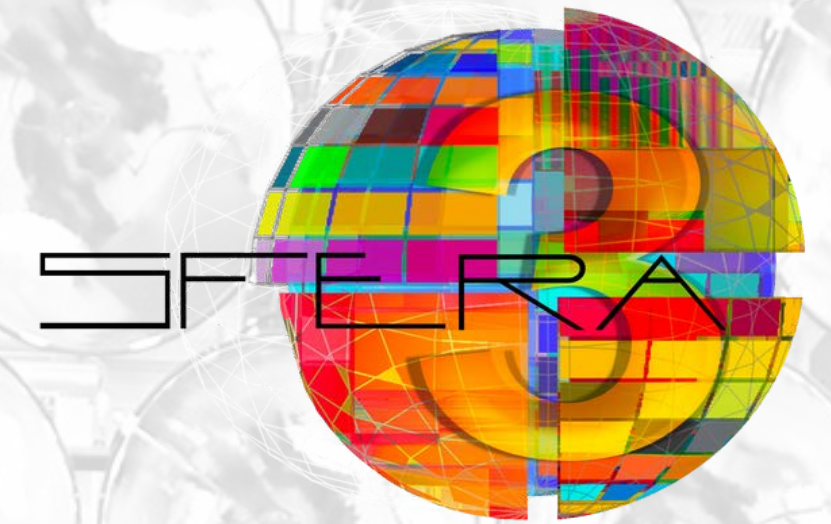




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E-infrastructure concept and proposed design

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CIEMAT-PSA



SFERA-III
Final Event

December 13, 2023 | Madrid, Spain



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The SFERA-III Workpackage 11:

- The general objective of SFERA-III WP11 (Towards a European e-Infrastructure on CST technologies) has been to support the creation of an **e-infrastructure** to provide **remote access** to the European R&D centers devoted to CST technologies for the benefit of both the research community and the industry.
- The **expected outcome** of the WP was to obtain the **detailed design engineering** and the **estimated budget** of the most suitable configuration to include the current European CST R&D centers so that it could be implemented as soon as the required budget was available.

Ciemat

ENEA

 Deutsches Zentrum
DLR für Luft- und Raumfahrt

 cnrs

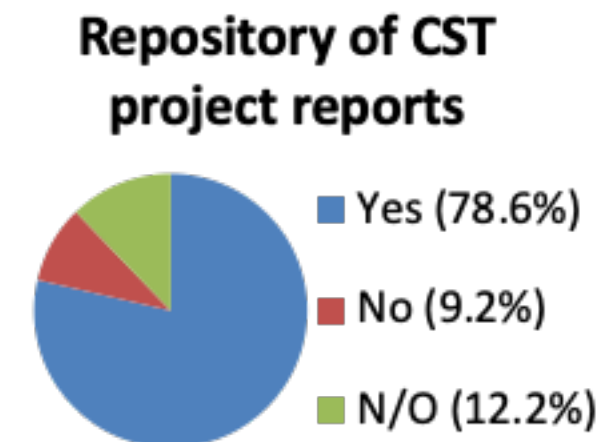
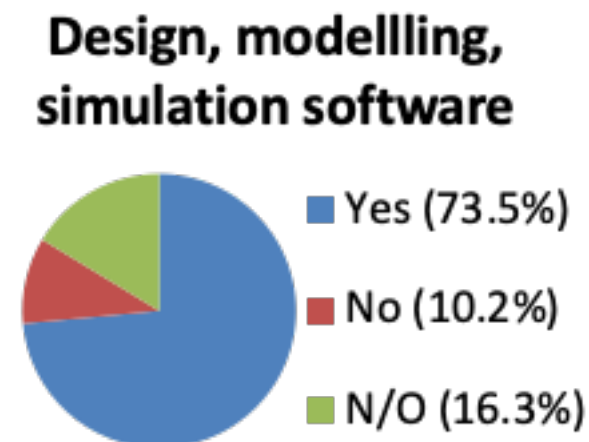
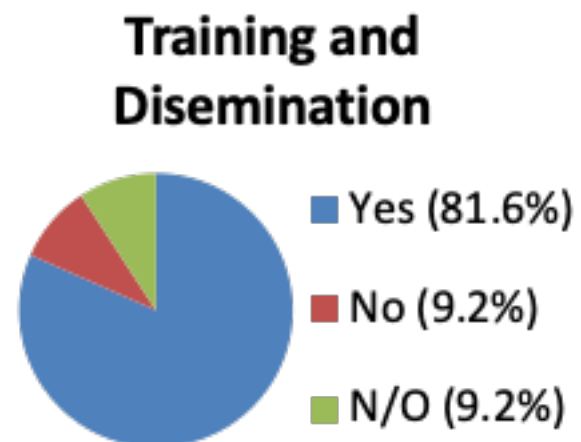
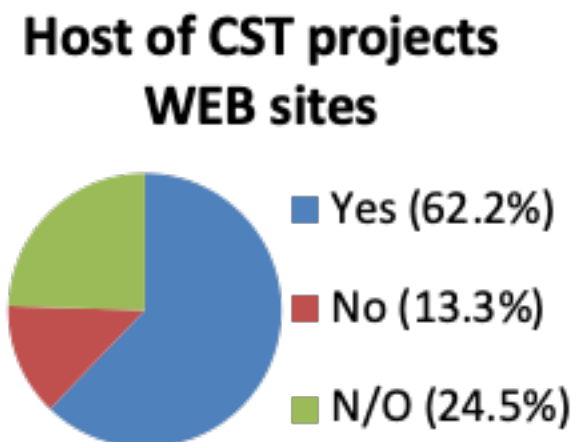
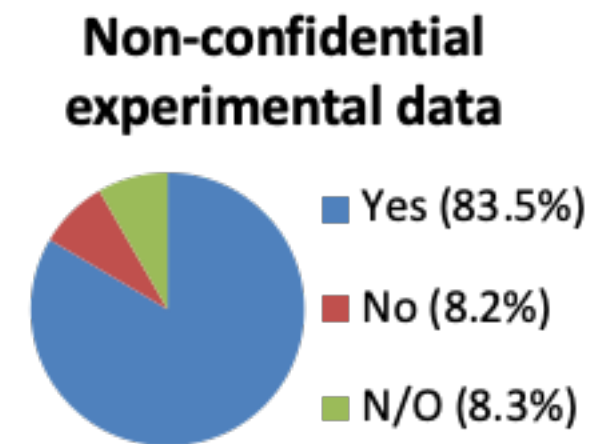
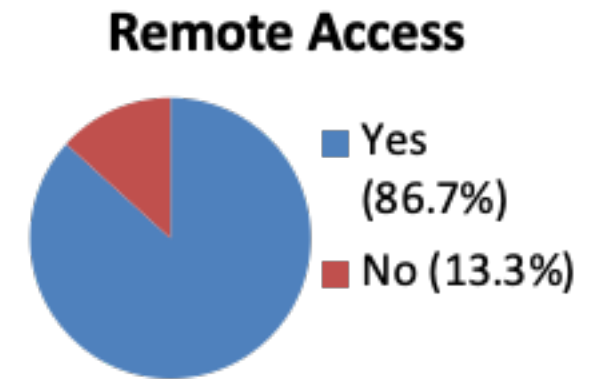
 tecnatom

The SFERA-III Workpackage 11:

Task no. - Task title	Leader	Participants short name	Main expected outcome
Task 11.1: Definition of the characteristics of the required e-infrastructure	CIEMAT	CIEMAT, DLR, CNRS, ENEA	Definition of the tools and services to be offered by the e-infrastructure
Task 11.2: Study of limitations and requirements	CIEMAT	CIEMAT, DLR, CNRS, ENEA	Identification of limitations and requirements imposed by the software/hardware currently used by the partners involved in the e-infrastructure
Task 11.3: Design of the e-infrastructure	CIEMAT	CIEMAT, DLR, CNRS, ENEA	Detailed design of the e-infrastructure, including budget

Definition of the characteristics of the required e-infrastructure

In April 2019, a survey was distributed to the stakeholders of the CST technology sector via SolarPACES and SolarConcentra. A total of 98 answers were received about the tools and services that should be offered by e-infrastructure.



Study of limitations and requirements

The subcontracted company (TECNATOM) started to review in November 2020 all the technical information delivered by CIEMAT, DLR, CNRS and ENEA about the experimental facilities that were offered for the design of the e-Infrastructure.

Bilateral Visits & Meetings with TECNATOM:

- CIEMAT-PSA: Visit on 15 March 2021
- CNRS: Visit on 28 April 2021
- DLR: Online meeting on 20 May 2021
- ENEA: Online meeting on 9 June 2021

- Partner's sites specifications
 - Available control rooms
 - Workstations and operating systems
 - SCADAs, PLCs & Databases
 - Communications
 - Network segmentation
 - Cybersecurity
 - Current status of scheduled e-infrastructure services
- Identified limitations

CIEMAT (7): HTF Loop, Solar Furnace SF-60, CRS, MOSA, Fotoreactor NOVO75, Solar system/membrane for water treatment, AQUASOL-II

CNRS (3): MSSF with "platine de fusion", MSSF with "Héliotron" and MicroSol'R

DLR (3): Synlight and Solar Furnace & Solar Simulator

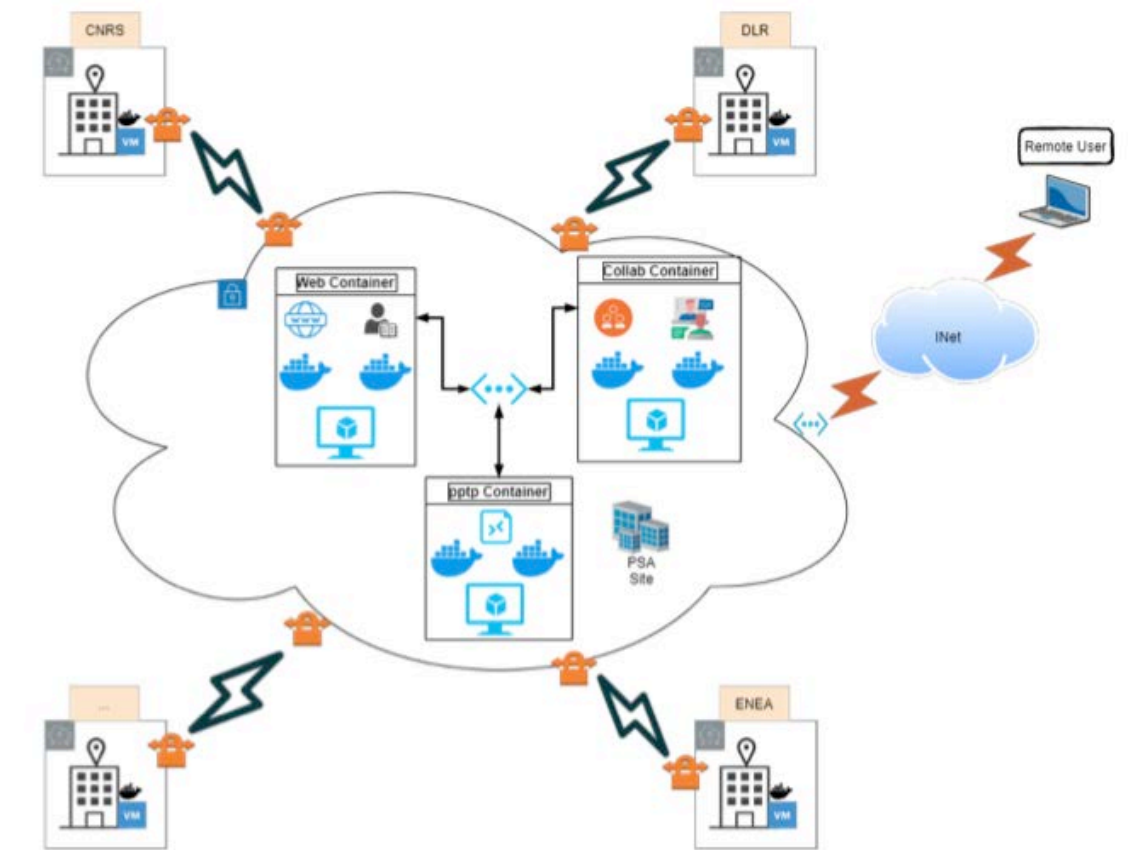
ENEA (3): PCS, ORC-PLUS and RESLAG

Design of the e-infrastructure

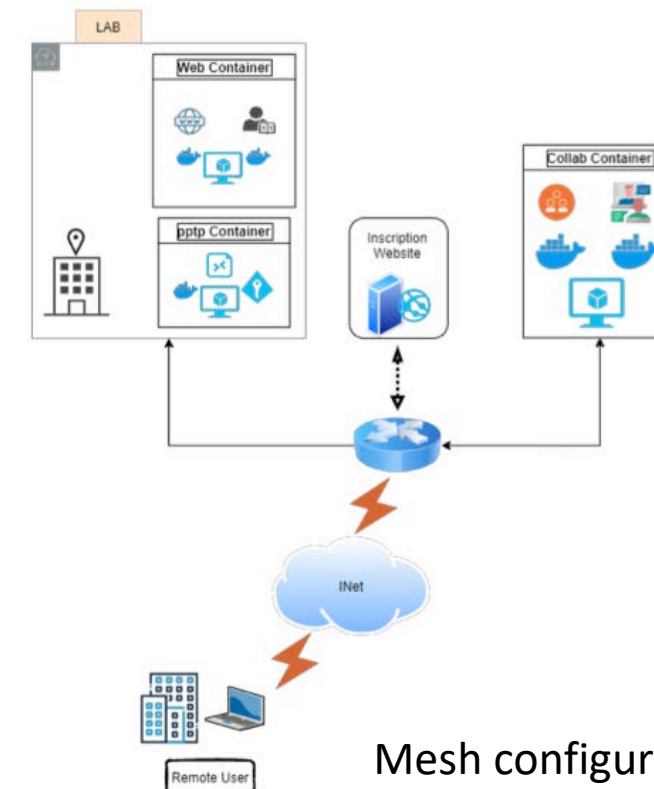
In October 2021, the result of a detailed analysis of the **state of the art of e-Infrastructures** implemented worldwide is released, and those with common characteristics to the SFERA-III e-Infrastructure were identified.

At the same time, a **first proposal for configuration and structure** is made. This structure is based on three pillars:

- The computational layer
- The services layer
- The communications architecture



Hub-spoke configuration

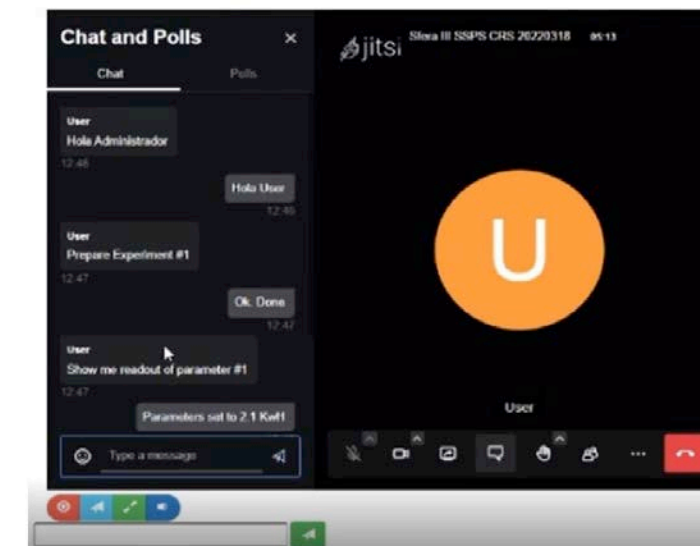
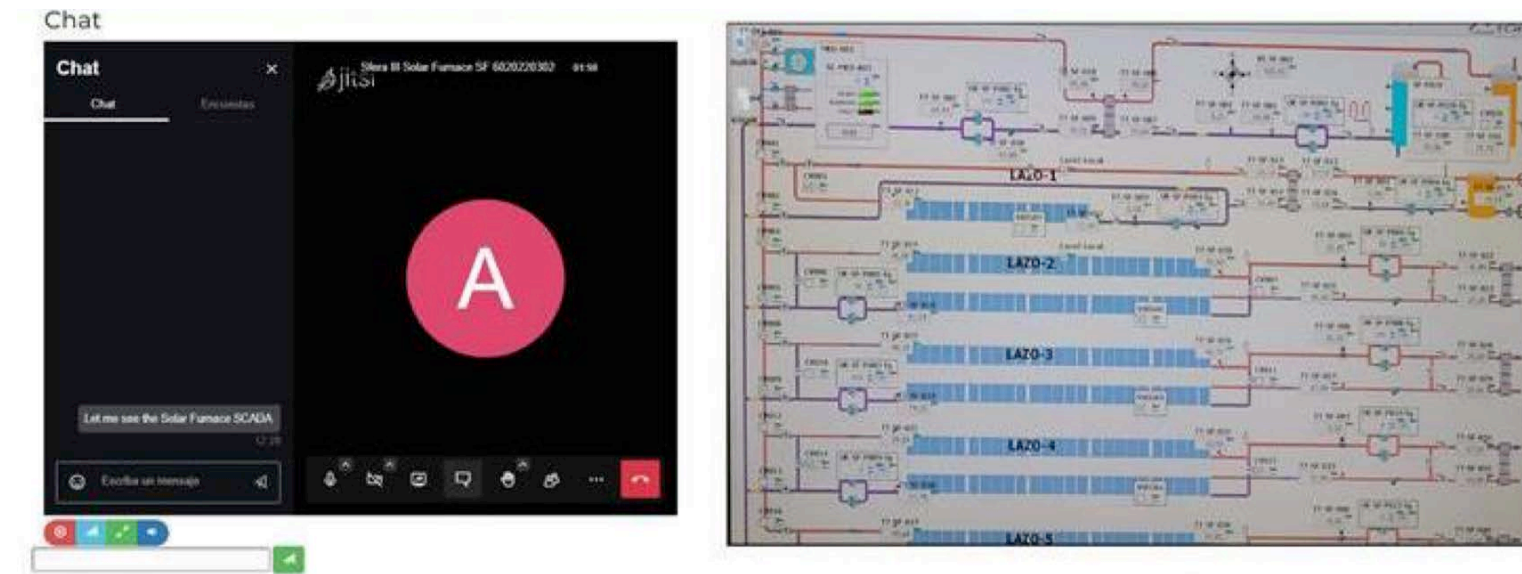


Mesh configuration

Design of the e-infrastructure

In May 2022, a **remote server with a limited functional prototype** was enabled at TECNATOM facilities to test these functionalities:

- Remote user access and management
 - Registration form, calendar, user's management by infrastructure owner
- Remote desktop and communication interfaces
 - Chat, video-chat, VPN, Remote desktop interface
- Provision of online training courses (limited version)
- Knowledge sharing repository and project websites (limited version)

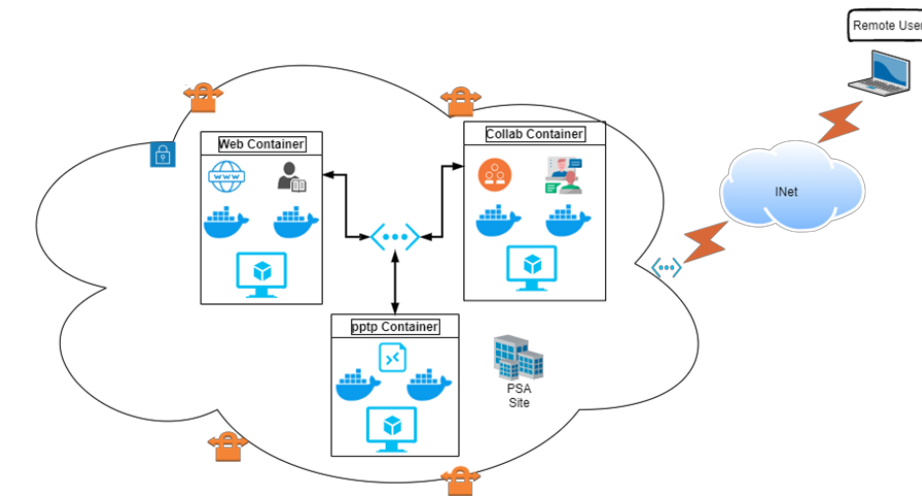


Design of the e-infrastructure

In March 2023, **the final detailed design of the e-infrastructure** was released, together with an estimated budget.

Open-source tools have been selected for the implementation of the computational and service layers.

- Computational layer:
 - Virtualization platform -> PROXMOX
 - Containers' platform -> DOCKER
- Service layer
 - Remote access -> APACHE GUACAMOLE
 - Videoconference -> JITSI
 - Video streaming -> Ant Media, Kurento Media Server, OpenVidu, Easy RTC
 - E-Learning -> Moodle, Joomla LMS, Anthology
 - Web Hosting -> Joomla, WordPress, Drupal
 - Documents & Software Repository -> NextCloud, OwnCloud



Core Node:
Hardware & setup: 87 kEUR
Software maint.: 24.2 kEUR/year



Collaborative Node:
Hardware & setup: 3.55 kEUR
Software maint.: 3.1 kEUR/year

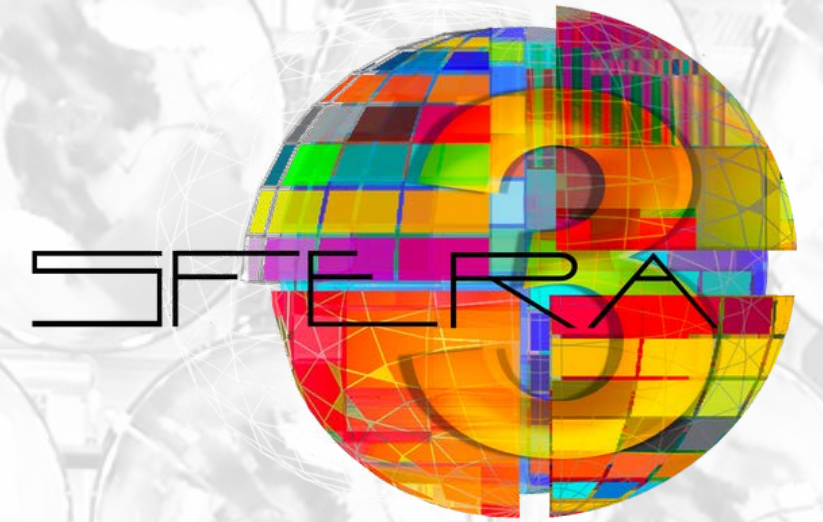
Conclusions

- The creation of the e-infrastructure will provide the ability to reduce the costs associated with conducting experiments at concentrated solar power facilities, allowing for greater flexibility in the timing of experiments
- Based on a central node and collaborative node structure, it greatly simplifies the effort required for the incorporation of new experimental sites.
- In addition, the e-infrastructure provides a single point of entry for the community to access public information on the latest projects underway, access to public information on the technology, freely distributed software, as well as a common online course platform that shortens the learning curve for newcomers in the CST field.





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Thank You

For Your Attention

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