

Advanced and Distributed Computing



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Strengths

- Extensive experience in scientific computing, software integration, management and quality assurance.
- Participation in international scientific e-infrastructures and initiatives (WLCG, EGI, IBERGRID and EOSC).
- Operating the Portuguese WLCG Tier-2 under the CERN LHC computing MoU.
- Participation in several European projects.
- Partnership with FCCN and LNEC and collaboration with other organisations.
- Participation in the national advanced computing competence centre in EuroCC / EuroCC 2.
- Participation in the FCT roadmap of research infrastructures of strategic interest.
- Participation in the Portuguese Advanced Computing Network (RNCA).

Weaknesses

- Heavy administrative burden severely compromises the effective use of the human resources.
- Lack of compute and storage resources to address opportunities and user requirements.
- Lack of sustainability with many activities being supported on a voluntary and/or best effort basis.
- Highly overworked team.

Opportunities

- Potential for engagement with a wide range of research communities.
- Participation in activities related to High Performance Computing.
- Participation in open data and digital repositories related activities.
- Potential for industrial and e-government applications.

Threats

- Lack of resources for the LHC and other large requirements.
- Lack of sustained funding for operational costs.
- Exacerbated focus towards supercomputing at national and European levels.
- Increasingly higher competition.
- Extremely difficult to contract and retain skilled personnel.
- Uncertain future for the FCT infrastructures roadmap.

Projects and funding in 2023

LIP

Computing

	EOSC-synergy	EU	433.000€	38M	- 0%	finished
—	Tier 2	FCT	- 29.999€	24M	- 0%	in 2022
—	EuroCC	EU	296.000€	24M	- 0%	
	EuroCC 2	EU	146.000€	36M	100%	starting
	EGI-ACE	EU	196.238€	30M	35%	ends 2023
	BigHPC	FCT	249.561€	36M	2%	ends 2023
	EOSC-Future	EU	160.365€	36M	29%	ends 2023
	DT-GEO	EU	542.875€	36M	99%	started Q4 2022
	interTwin	EU	342.818€	36M	98%	started Q4 2022
	AI4EOSC	EU	350.250€	36M	98%	started Q4 2022
	iMagine	EU	222.125€	36M	95%	started Q4 2022
	FCT Polén data repository contract	FCT	19.999€	12M	100%	this year only
	EGLACE	V/A	78 020£	3014	//0%	ands 2023
	C-Scale	VA	66 873£	30101	20%	ends 2023
	iMagino		50 /15£	26M	100%	started 0/ 2022
	Google / Advancing the INCD Cloud		50.413%	30IVI	100%	starting
	Google / Advancing the INCD Cloud	UCKE			100%	starting
$\sqrt{2}$	KINGA and FCT data repository infrastructure	FCI	80.000€	12IVI	100%	this year only

Thanks !



Backup Slides



Group members and structure

	Jorge Gomes	Researcher	LIP- Projects management, computing, development and networks
	Mário David	Researcher	LIP - Cloud computing, containers, quality assurance, development, GPUs
	João Pina	Researcher	FCT contract - WLCG Tier-2, software management, user support, farm
	João Martins	Researcher	LIP - Fabric management, storage systems, computing farms, virtualization
	Nuno Dias	Researcher	LIP - Security, networks, data protection, network services, desktops
	Samuel Bernardo	Researcher	LIP - Software development & quality, AAI, cloud, federated services
	Hugo Gomes	Technician	LIP - Web development, IT support, events, multimedia, communication
	Carlos Manuel	Technician	LIP - Web development, design, events, multimedia, communication
	Miguel Viana	Engineer	LIP - HPC, monitoring, HPC tools, software integration and validation
	José Aparício	Engineer	LIP - User support, datacenter management, networks, notebooks, desktops, repairs
	Zacarias Benta	Engineer	LIP - HPC, computing farms, virtualization, user support
•	Catarina Gonçalves	Communication	LIP – Communication, dissemination, outreach
	António Pina	Researcher	University of Minho - application performance analysis, parallel programming
	António Esteves	Researcher	University of Minho - application of machine/deep learning techniques
	José Rufino	Researcher	Polytechnic Institute of Bragança - parallelization strategies for GPU algorithms
	Vitor Oliveira	Researcher	University of Minho - application of machine/deep learning techniques
	Catarina Ortigão	Administrative	INCD - administrative and managerial support
	Cesár Ferreira	Engineer	INCD - HPC, computing farms, virtualization, user support
/	João Machado	Researcher	INCD – PhD contracted in 2023

LIP staff

LIP members

INCD staff

Computing

IT infrastructure

Computing

- FCT-FCCN Lisbon datacenter
 - Main LIP computing services
 - WLCG Tier-2 for ATLAS and CMS
 - INCD computing & data services HPC/HTC/Cloud
 - University of Lisbon central datacenter
 - LIP general IT services
 - LIP datacenter at 3Is in Lisbon
 - Support to LIP Lisbon offices and laboratories
 - Local network and data backups
 - University of Coimbra Dept of Physics
 - LIP Coimbra support (recovering)
 - UTAD datacenter in Vila Real
 - 2nd INCD computing center HPC/HTC/Cloud



interTwin



- DigitalTwin co-design simulations AI HPC interoperability
 - EGI lead project with member infrastructures and user communities
 - Develop a common approach to the implementation of digital twins (DTs) that is applicable across the whole spectrum of scientific disciplines and beyond to facilitate developments and collaboration.
 - Co-design involves DT use cases for High energy physics, Radio astronomy, Astroparticle physics, Climate research, and Environmental monitoring
- in numbers:
 - 31 Partners
 - 1481 PMs
 - 36 months

- LIP participation:
 - Software release management
 - Quality and uncertainty tracing for simulation model quality

DT-GEO



- A Digital Twin for GEOphysical extremes
 - CSIC lead project in to earth sciences
 - DT-GEO aims at developing a prototype for a digital twin on geophysical extremes including earthquakes, volcanoes, tsunamis, and anthropogenic-induced extreme events. The project harnesses world-class computational and data Research Infrastructures (RIs), operational monitoring networks, and leading-edge research and academia partnerships in various fields of geophysics.
- in numbers:

OMPUL

- 19 Partners
- 1712 PMs
- 36 months

- LIP participation:
 - Implementation of workflows with udocker
 - Deployment support
 - Quality based ecosystem for software and data
 - Integration of digital assets

AI4EOSC



- Follows the activities of DEEP-Hybrid-DataCloud
 - The AI4EOSC (Artificial Intelligence for the European Open Science Cloud) delivers an enhanced set of advanced services for the development of Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL) models and applications in the European Open Science Cloud (EOSC).
- in numbers:
 - 10 Partners
 - 760 PMs
 - 36 months

- LIP participation:
 - Requirements and co-design
 - Architecture definition
 - PaaS provisioning
 - Serverless function orchestration
 - Training and inference dashbord
 - Quality assurance



iMagine



- Follows the activities that began in EOSC-hub
 - EGI lead project with member infrastructures and user communities
 - High-performance image analysis tools empowered with Artificial Intelligence (AI), and Best Practices for scientific image analysis.
 - Enable better and more efficient processing and analysis of imaging data in marine and freshwater research, accelerating our scientific insights about processes and measures relevant for healthy oceans, seas, coastal and inland waters.
- in numbers:
 - 25 Partners
 - 553 PMs
 - 36 months

- DEEP AI application development
- DEEP AI application as a service

EGI-ACE



- Follows the activities that began in EOSC-hub
 - **—** EGI lead project with member infrastructures and user communities
 - Supporting data- and compute-intensive research across borders
 - Advanced computing data processing exploiting the EGI federation
- in numbers:
 - 33 Partners
 - 1427 PMs
 - 30 months

EOSC-ACE: (2021-2023)

LIP participation:

- Software and Service management
- laaS cloud services provisioning
- DEEP learning provisioning
- OPENCoastS thematic service
- GBIF biodiversity infrastructure
- HPC integration in EOSC

Computing

EOSC-Future



- Implementing the European Open Science Cloud
 - Give European researchers access to a wide web of FAIR data and related services.
 - EOSC Future integrates, consolidates, and connects e-infrastructures, research communities, and initiatives in EOSC.
 - LIP is as third linked party to EGI.eu
- in numbers:

- 34 main partners
- 826 PMs
- 30 months

EOSC-Future: (2021-2023)

- Training
- EOSC service management: ensuring the compliance of processes and harmonization of policies and procedures across the service management cycle

EOSC-Synergy



- Expanding Capacities & Building Capabilities
 - Expand EOSC infrastructure including data repositories
 - Integrating new services and fostering service adoption
 - Development of quality assurance and assessment tools for software, services & data
 - Alignment of national EOSC related policies
 - Partners: CSIC, LIP, INCD, FCT-FCCN, LNEC, UPV, CESGA, BSC, Rediris, CIEMAT, INDRA,
 PSNC, CYFRONET, CESNET, KIT, JISC, DANS, EGI, LEGOS, UFCG
- in numbers:

omput

- 20 Partners
- 826 PMs
- 30 months

EOSC-synergy: (2019-2022) Kinished very successfully !!!

- WP3 coordination
- Software and services quality criteria
- Development of tools for quality control
- Services integration in EOSC
- Data repositories integration in EOSC
- Skills development, training

SQAaaS in EOSC-Synergy

Quality assurance as-a-Service

Computing

- Coordination of both WP3 and task 3.1
- Defining quality best practices
 - For software and services
- Development of the Jenkins Pipeline Library
 - Core component of the SQAaaS platform
 - Enables composition, validation and execution of CI/CD pipelines using Jenkins
 - Executes the steps necessary for quality assurance
 - Can be used as a standalone component
 - Is already being used outside of the project
 - Basis for a new quality oriented project



EOSC





- Development of a framework for HPC and Big Data
 - Improving management of HPC data centers and Big Data applications
 - Efficient monitoring and management of large-scale HPC systems
 - Wavecom, INESC-TEC, LIP and TACC
- in numbers:

OMPUL

- 4 Partners
- 385 PMs
- 30 months

BigHPC: (2020-2023)

- LIP participation:
 - Requirements and APIs
 - Monitoring framework
 - Virtualization and containers
 - Coordination of the integration, experimental validation and pilot





- Copernicus eoSC AnaLytics Engine
 - Federate EO infrastructure services, such as the Copernicus DIAS and others.
 - Capitalise on the European Open Science Cloud's (EOSC) capacity and capabilities to support Copernicus research and operations with large and easily accessible European computing environments.
- in numbers:

OMPUL

- 11 partners
- 189 PMs
- 30 months

C-Scale: (2021-2023)

- Support to the CREODIAS use case
- CREODIAS provides a big-data enabled
 OpenStack cloud platform for processing.
- INCD as infrastructure provider

EuroCC 2



- European network of HPC National Competence Centres
 - Promotion and awareness at national and international level
 - Orchestration and synergies across organisations, services, training
 - Support and interaction with users in academy, industry and public administration
- in numbers:

- 34 countries
- 36 months
- 62 million Euros

EuroCC 2: (2023-2025)

LIP participation:

- Awareness, communication
- Academic and public administration support

Training

