



**PAROMA-MED**

[www.paroma-project.eu](http://www.paroma-project.eu)

**Privacy Aware  
Privacy Preserving  
Distributed  
Robust Machine  
Learning**

# Newsletter



**Issue 1 – June 2023**



This project has received funding from the European Union Horizon 2020 research and innovation programme under grant agreement No. 101070222



**PAROMA-MED**

Editorial

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## Message from the project coordinator

Dear Reader,

With great pleasure, I welcome you to the inaugural edition of the PAROMA-MED newsletter. This newsletter aims at bringing the project insights, and glimpse of the activities for last 12 months.

In this ever-evolving landscape, the safeguard of personal information has become central, and the more we can help the knowledge and tools to protect every patients' data from cyberattacks and misuse, the more we are fulfilling our goal. As the number of attack surfaces grow, the next data breach is always closer and more dangerous, and we are working hard to develop specific technologies to avoid any possible vulnerability and risks within this domain, while at the same time trying to use the information to advance the research on specific topics.

In this newsletter, we are definitely committed to deliver content that is of interest and enjoyable to read. We hope that you will enjoy reading it as much as we liked writing it!

Stay secure, stay protected, stay informed!

Sincerely,

Alessandro Bassi

# Trends



**PAROMA-MED**

# & Challenges

MDR

GDPR  
25 May  
2018

Data Act  
(DA)  
proposal -  
On 23  
February  
2022

DGA came into force  
on 23 June 2022 and,  
following a 15-month  
grace period, will be  
applicable from  
September 2023.

DMA published  
on 12 October  
2022 and  
entered into  
force in 1  
November 2022

DSA published  
on 27 October  
2022 and came  
into force on 16  
November  
2022.

proposal for  
the European  
Health Data  
Space (EHDS)  
on 2. May  
2022

AI framework  
regulation  
could enter  
into force late  
2022/early  
2023 in a  
transitional  
period

## Complexity of Data management

New regulations, not only GDPR but, as we can see in the picture, a full array of European Guidelines and regulations to be all considered with the highest attention.

Standards:

- HL7
- FHIR
- IEEE SDC 11073
- 80001

For socio-economic reasons care models have been changing globally from centralized to distributed patient-centric care systems enabling sharing of data, in a secure and privacy assured way

While the ecosystem is very challenging due to the fact that

- Data are typically not liquid / mobile
- HIS are dating back many decades, typically do not hold any facilities to address modern GDPR requirements for the use of patient data (such as asking patients permission to use or share their data)

This silosation is driven by security and privacy concerns and fear of liability. As we are experiencing a completely new paradigm, HIS (hospital-information systems) are progressively discontinued. Future systems are distributed, more suitable to share data and to collaboratively leverage on the usage of the most evolved technologies (e.g., AI/ML) and hence the evolution of the project **PAROMA-MED**.

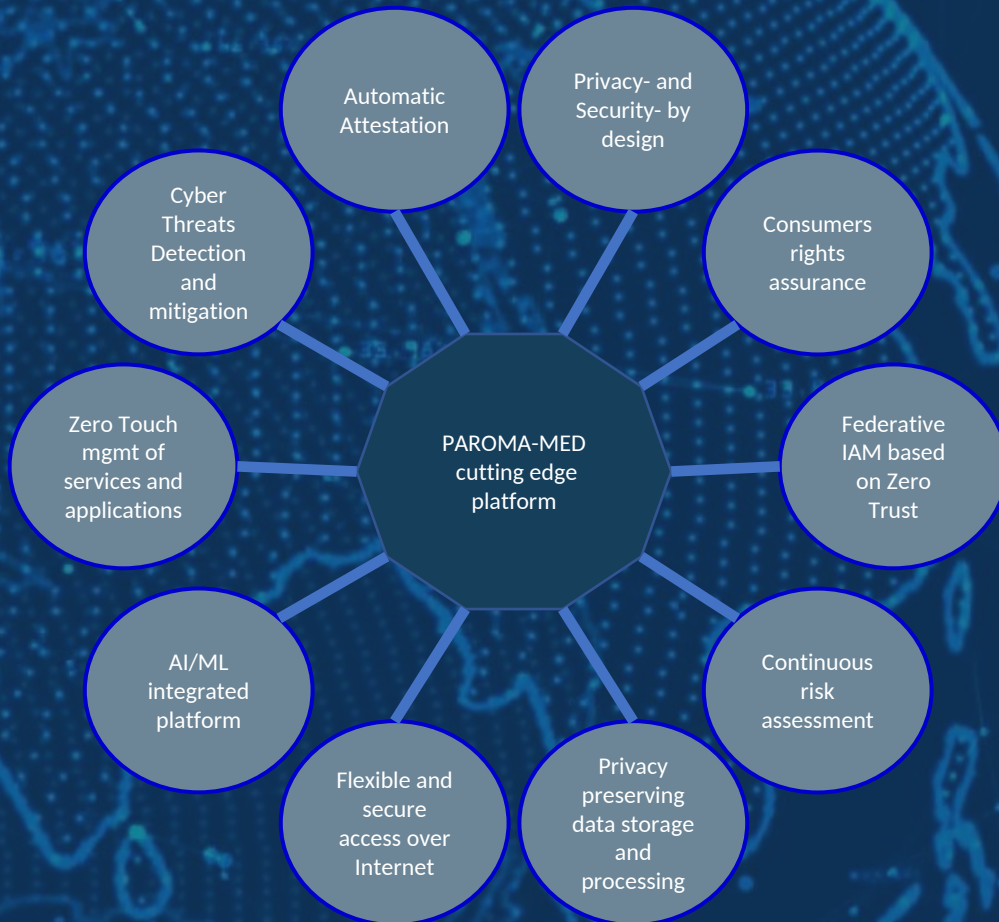


# PAROMA-MED

## Objectives

PAROMA-MED is focusing about a platform-based hybrid-cloud framework for privacy and security assured services and applications in federative cross-border environments.

The project is leveraging on cutting edge technologies, tools and services to include:



Beyond the state of the art

Local AI vs Cloud based

Secure Computation

Watermarking / CryptoWatermarking



Data Protection

Federated Learning

Security & Privacy



# Image – based qualitative assessment of cardiac anatomy

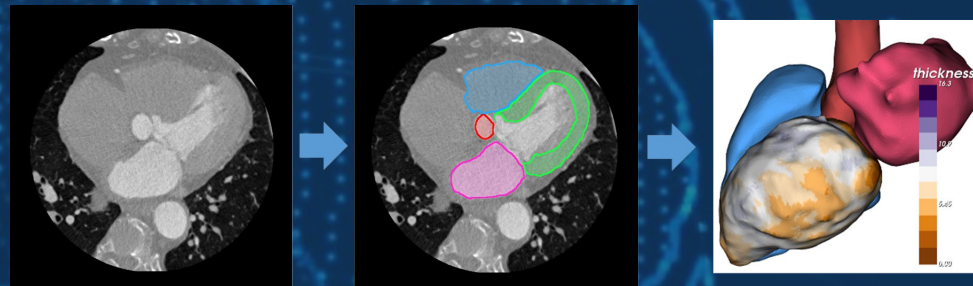
### Characterization of myocardial wall thinning from cardiac Computed Tomography (CT) images.

This descriptor has demonstrated to be a descriptor of interest to diagnose different cardiac diseases and plan the treatment, including:

- I. ventricular tachycardia (VT) ablation, to provide surrogates of VT sources that the electrophysiologist has to treat using radiofrequencies ablation;
- II. revascularization in case of coronary artery diseases: to predict function regaining after revascularization.

Recent and rapid advances in machine learning and artificial intelligence are finding increasingly important applications in the healthcare domain: diagnosis, treatment planning, therapy guidance, outcome prediction... In particular, works on automatic image processing based on deep learning techniques are particularly promising for the medical field.

In Paroma-Med, one use-case is dedicated to the qualitative assessment of cardiac anatomy, based on cardiac imaging, namely the characterization of myocardial wall thinning from cardiac Computed Tomography (CT) images.



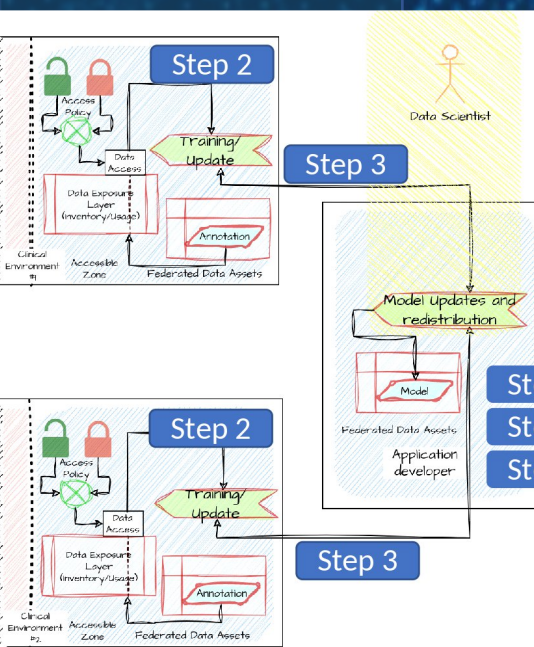
### AI Approach

This landscape has been recently dramatically changed with the development of AI approaches, especially deep-learning methods. Based on databases of images with associated reference segmentations, these methods automatically optimize a complex model, a convolutional neural network (CNN), to generate segmentations from input images.

# Use case



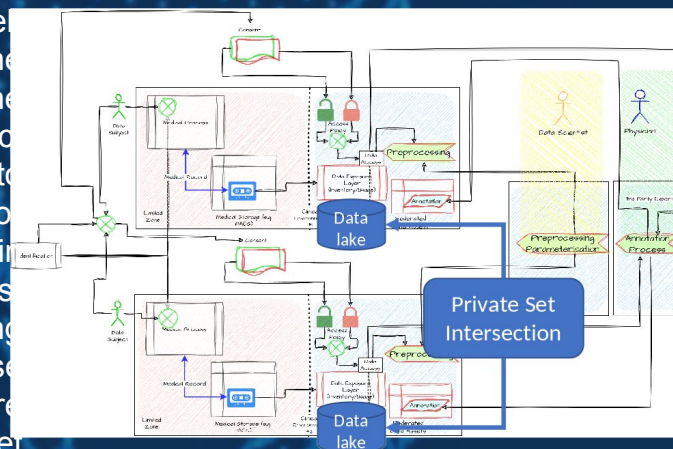
## Federated Learning (FL)



In this context of the significant Image – based qualitative assessment of cardiac anatomy use-case, where data cannot be shared or centralized, federated learning (FL) is the best option. FL is a ML approach that allows multiple data-owners to collaboratively train a ML model without sharing their own training data. Classic FL algorithms follow the following steps: 1) central server sends the latest model parameters to the nodes; 2) Each local model is updated based on the latest parameters and local data; 3) Updated model parameters are communicated back to the global model; 4) The central server combines update from each model and retrain the global model which is a new model; 5) Restart from step 1. The process is summarized in this figure.

While FL is flexible and resolves data governance and ownership issues, it does not itself guarantee security and privacy unless combined with other methods.

Indeed, when using a machine learning (ML) model information can leak on the learning data, even if the ML objective is to generalize as much as possible the information. It is possible, for example, to reconstruct elements of the learning sample. It is also possible to learn global properties about the learning sample or to determine whether or not an individual is present in the learning base by using the outputs of the models. FL has then to be enriched with privacy-preserving technologies. In Paroma-Med we propose to use secure multi-party computation (SMPC). There are several schemes for SMPC and private set intersection (PSI) is one of them, PSI allows efficient comparison and analytics of encrypted data sets.





# PAROMA-MED

## News

# The consortium recently met in Austria!

Between 4<sup>th</sup> and 5<sup>th</sup> July 2023, the PAROMA-MED partners gathered in Vienna, Austria!



The meeting was arranged by our project partner 6G Health Institute GnbH, Research Institute for Digital Transformation in Healthcare, <https://6ghi.info/en/>.



### Consortium Meeting in Vienna

The third consortium meeting in 2023, after Heidelberg 23<sup>rd</sup> and 24<sup>th</sup> January and Genoa 4<sup>th</sup> and 5<sup>th</sup> May, marked the end of the first activity year of the EU-funded project “PAROMA-MED”. While the first 12 months mainly saw the design and development of specifications and architecture, the upcoming months will see a progressive increasing focus on the implementation phases of different building blocks and their validation. On 4<sup>th</sup> July 2023, all partners met at the beautiful Museumsquartier location in Vienna Austria, to report on the status of their tasks and jointly discuss together the best strategies and the most appropriate decisions for an excellent continuation of the project from a technical and non-technical point of view.

### Collaborations with other Projects

PAROMA-MED mentioned on the DataVaults website / Sister Projects section [Liaisons and Relevant Links - DataVaults](#)



# Dissemination



**PAROMA-MED**

## IEEE FUTURE NETWORKS WORLD FORUM

The 5G WORLD FORUM is now the  
**IEEE  
Future Networks™**  
WORLD FORUM • 2022

On 12 October 2022, PAROMA-MED concept and planned approach were presented during IEEE Future Networks World Forum in the “S6: Symposium on Security for 5G and Future Networks” in the

context of the paper “Federated machine learning through edge ready architectures with privacy preservation as a service”.

This paper presents the details of a novel approach, based on edge and advanced privacy preserving solutions, that accelerate the adoption of personal data federation for the benefit of the evolution of valuable advanced AI models. The approach focuses on the establishment of high degree of trust between data owner and data management infrastructure so that consent in data processing is given by means of functional and enforceable options applicable at all levels of workloads and processes. The overall set of solutions will be delivered as an open-source set of implementations in the context of the PAROMA-MED project. To know more about the paper, follow the link: <https://paroma-med.eu/wp-content/uploads/2022/12/paroma-med-fnwf-2022-1.pdf>

## Digital health, IoT technologies for the workforce support

On 23rd Feb 2023 Project coordinator Alessandro Bassi, EURESCOM presented project PAROMA-MED – Privacy Aware and Privacy Preserving Distributed and Robust Machine Learning for Medical Applications at the event digital health, IoT technologies for the workforce support” in Treviso.

He introduced project PAROMA-MED that aims to develop, validate and evaluate a platform – based hybrid-cloud delivery framework for privacy- and security-assured services and applications in federative cross-border environments. The presentation led to interesting talks and discussion at the event .







# PAROMA-MED

## Deliverables

- WP1
  - D1.1 “Requirements and Use Case Definition” - Report that provides the functional and not functional requirements for the realization of the project concepts, and also the details of the Use Cases (T1.1).
- WP2
  - D2.1 “Access and Privacy Control Architecture and Models” - Report that presents the models and the resulting architecture for access and privacy control within the PAROMA architecture. The documentation about the implementation will be part of deliverable D2.3.
- WP5
  - D5.1 “Roadmap for communication, dissemination, standardization activities” - Report that provides an overview of the strategy and the main actions to be implemented for communication, dissemination, standardization, clustering. It describes relevant targets for communication/dissemination, together with the appropriate means to reach them. The roadmap will be updated yearly according to the specific achievements and relevant changes in context and objectives.
  - D5.2 “Setup of communication and dissemination media” - Report about the first communication and dissemination activities, such as the public website and leaflet; it includes the project vision, objectives, activities, expected outcomes and benefits, and points of contact. Project accounts on selected social media.
  - D5.3 “IPR management” – “This report provides the list of background knowledge inside the Consortium, identifying specific IPR, and reporting on internal agreements for sharing knowledge and software tools.”
- WP6
  - D6.1 “Data management plan” - Defines the rules for the project participants to ensure data is findable, accessible, interoperable and re-usable, and governed by the applicable data security and ethics standards.
  - D6.3 “Ethics requirements” - Report on all measures that will be implemented in the project to comply with ethics requirements: REQ Humans, REQ Personal Data, REQ Artificial Intelligence
- WP7
  - D7.1 “Project management handbook” - This report includes description of all necessary project management procedures (reporting, approvals, etc.) to be performed by consortium members and lay down the needed project management structure and corresponding project bodies..



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## Contacts

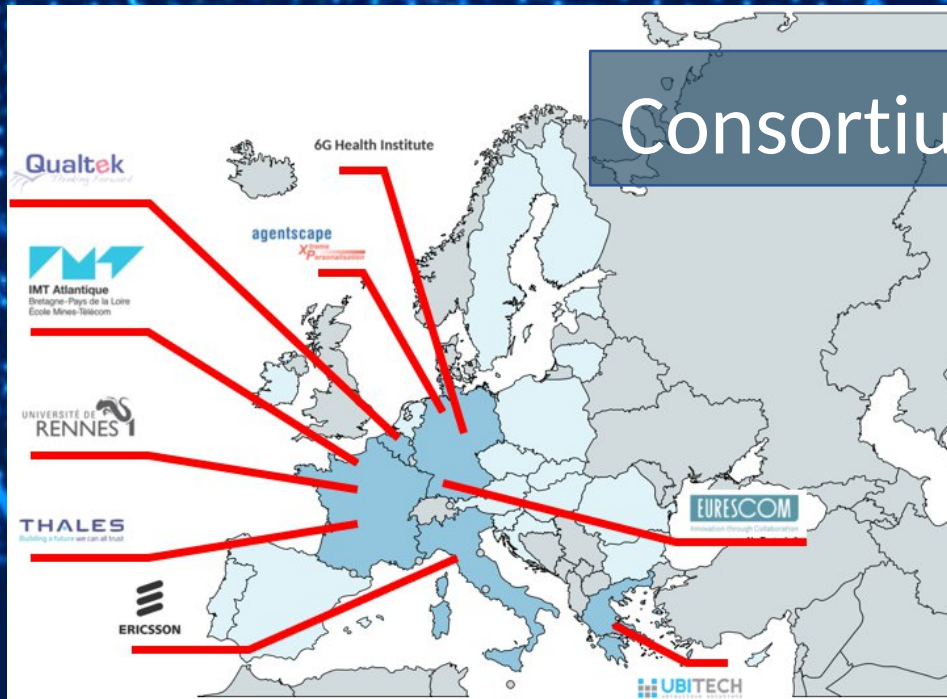


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EU Contribution	4 280 497.50
Funding Scheme	RIA



## Socials



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