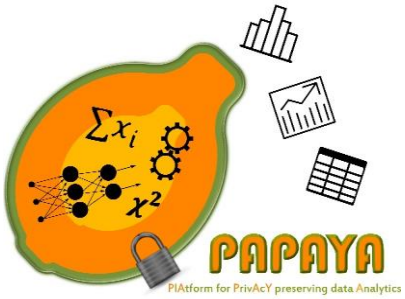

D1.3 – FIRST PROJECT PROGRESS REPORT

Work Package	WP 1, Project Management
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Revision History

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Project No. 786767

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Executive Summary

This deliverable overviews the project's first year activities, namely from May 1st 2018 to April 30th 2019. As a reminder, the main goal of PAPAYA is to design and develop a **platform of privacy preserving analytics modules** that allows the outsourcing of analytics operations into untrusted cloud servers while protecting the privacy of the data. Thanks to these newly developed platform, stakeholders will be able to ensure their clients' privacy (and be compliant with the General Data Protection Regulation) while extracting valuable and meaningful information from the analyzed data.

The first year project activities reported in this document can be summarized as follows:

- On the technical side, Work Package 2 (**WP2**) that aims at defining the project's use cases and identifying the main legal, end-user and platform requirements, has successfully ended. The project has identified five main use cases illustrating different analytics operations and privacy settings. These use cases are summarized are described in details in **deliverable D2.1.** Furthermore, a dedicated list of requirements has been produced and reported in deliverable **D2.2**. Consequently, the first project milestone **MS1: Use case definition and consolidated requirements"** is achieved. Furthermore, **WP3** aims at developing the privacy enhancing technologies for data analytics that will satisfy the requirements identified in WP2 and support the identified use cases. During the first six months of this WP, the state-of the art solutions have been reviewed in details. Moreover, initial privacy preserving analytics solutions and transparency tools have been designed and developed. Both the review of the state-of-the-art and the description of new privacy preserving analytics solutions have been reported in deliverable **D3.1.** Finally, **WP4** that has started at M6, aims at developing the integrated platform. With this aim, the main components of the architecture including the dashboard have already been identified. All the three technical deliverables are released in **M12**, as expected.
- Regarding activities related to **innovation management**, the **innovation strategy** of the project has been reported in deliverable **D1.2** which was released in M6**.** This consisted of conducting a study on market trends and identifying the key innovation points of the project. In the following six months, all partners have filled relevant questionnaires and eight innovation assets have been identified for PAPAYA.
- The first year's **dissemination and communication activities** consist of the online publication of the website (www.papaya-project.eu) (released on time at M3 and described in deliverable **D6.1**, the set-up of various social media accounts, the publication of initial flyers and posters and the definition of a dissemination plan (reported in deliverable **D6.2** released at M6) that will help the project reach the maximum possible impact.
- Finally, for the effective management and monitoring of the project, the various management procedures and guidelines have been defined and shared among consortium members through deliverable **D1.1**, released at M3.

Glossary of Terms

ATOS	Atos Spain S.A.
DC&E	Dissemination, Communication and Exploitation
DoA	Description of Actions
EURC	EURECOM
GDPR	General Data Protection Regulation
IBM	IBM Israel Science & Technology Ltd.
KAU	Karlstad University
M	Month
MCI	Mediaclinics Italia
O	Objective
ORA	Orange
PAPAYA	PlAtform for PrivAcY preserving data Analytics
PET	Privacy Enhancing Technology
SotA	State-of-the Art
UC	Use Case
WP	Work Package
Y1	Year 1

1 Introduction

1.1 Purpose and Scope

Recent advances in information technology such as the Internet of Things and/or the cloud computing paradigm enable businesses and/or organisations to collect large amounts of data and use advanced machine learning techniques in order to infer valuable insights and improve predictions. Unfortunately, these benefits come with a high cost in terms of privacy exposures given the high sensitivity of the data that are usually analysed/processed at powerful cloud servers. Given the ever-increasing of data breaches, the serious damages they cause, and the need for compliance to the European General Data Protection Regulation[1] (GDPR), companies look for secure and privacy preserving data handling practices.

The goal of the PAPAYA project is to devise and develop a **platform of privacy preserving modules** that protects the **privacy of users** on an end-to-end basis without sacrificing **data analytics functionalities**. The PAPAYA framework will integrate several privacy preserving data analytics modules each of them dedicated to specific analytics operations and to specific settings (single data owner, multiple data owners, etc.). The platform aims to be usable in the sense that it also includes proper transparency and control mechanisms through a dashboard.

During the first year of the project, the goal of the project was to first study the general problem, identify the use cases, the actors, the trust/adversary models, and the legal, user and platform requirements (WP2). Furthermore, the first year of the project also consisted of a review of the state of the art in privacy preserving data analytics and identification of the limitations of existing techniques with respect to the requirements, the use cases and the adversary model (WP3, WP4). Moreover, the design and development of new privacy enhancing technologies for data analytics and the design of the architecture of the actual PAPAYA platform have also started (WP3, WP4). Finally, in order to maximize the impact of this project, several any dissemination and communication activities have also been put in place to promote the project's objectives, innovation aspects and results (WP6).

1.2 Outline

The document first summarizes the progress in terms of technical contributions (Section 0) and innovation management (Section 2). The first year's dissemination, communication and exploitation activities are then reported in Section 3. The work carried on by all partners is further described in details in section 4, in a Work Package and Task basis. Finally, section 5 reviews the status of all project deliverables, milestones and risks relevant to the first year. Overall Scientific Progress

[1] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679&from=EN

1.3 Objectives

The main objective of PAPAYA is to design and develop a **platform of privacy preserving analytics modules** that allows the outsourcing of analytics operations into untrusted cloud servers while protecting the privacy of the data. Thanks to these newly developed privacy preserving analytics modules, stakeholders will be able to ensure their clients' privacy (and be compliant with the General Data Protection Regulation) while extracting valuable and meaningful information from the analyzed data. To facilitate user experience and enable data subjects and data controllers to exercise their rights over their data and control what is disclosed to third parties, the platform will provide **dashboards** for the different actors featuring, e.g., usable visualizations and auditing components.

In more details, the project considers the following scientific objectives:

- **O1:** Design efficient **privacy-preserving data analytics** techniques
- **O2:** Explore **different settings** (single/multiple data sources, …)
- **O3:** Enable **risk management** and **user control** of data disclosure
- **O4:** Design and develop an **integrated platform**
- **O5:** Lead an **end-to-end analysis** for different use cases regrouped in two umbrellas: analytics for **healthcare** and **mobile and phone usage** analytics

These five scientific objectives are complemented with the additional objective on dissemination and exploitation:

- **O6: Disseminate** and **exploit** the project outcomes.

In the sequel of this section, we describe the work carried out during the first year of the project towards the achievement of each scientific objective.

1.4 Design of efficient privacy preserving data analytics techniques (O1)

This objective is strongly related to the goal of WP3 (Privacy Enhancing Technologies for Data Analytics). During the first six months of the project, based on the different PAPAYA use cases described in deliverable D2.1 and the elicitation of legal, privacy and functional requirements reported in deliverable D2.2, we surveyed cryptographic tools including homomorphic encryption, secure multi-party computation, functional encryption and differential privacy (see deliverable D3.1), which are suitable to design of the privacy preserving data analytics techniques for PAPAYA. We further reviewed existing privacy preserving data analytics techniques while focusing on particular analytics operations that are used in PAPAYA use cases, namely neural network classification, collaborative neural network training, counting, clustering and isolation forests. We have identified the main shortcomings of these existing solutions with respect to the requirements identified for PAPAYA. Finally, WP3 members have already started to privacy preserving primitives for PAPAYA analytics. The preliminary design of these solutions is presented in deliverable D3.1:

- Three different **privacy preserving neural network classification** primitives are proposed. Each of them is based on a different cryptographic tool, namely, secure two-party computation, partially homomorphic encryption and fully homomorphic encryption. These solutions mainly target the privacy preserving arrhythmia detection use case (UC1).
- An existing **privacy preserving collaborative training solution based on differential privacy** is implemented and will further be adapted to the stress management use case (UC2) defined in deliverable D2.1.
- The problem of **privacy preserving counting (UC3, UC4)** and **privacy preserving clustering (UC3)** are also investigated. Some initial designs of new solutions for PAPAYA have been proposed. They use either partially homomorphic encryption or functional encryption.

1.5 Exploration of different restricted settings and design of dedicated protocols (O2)

Thanks to work carried out in WP2 during the first year of the project, PAPAYA defines five use cases, each of them targeting different settings:

- **Arrhythmia detection use case (UC1).** In this use case, sensitive health data in the form of ECG are collected by a single source and an external cloud provider that runs the PAPAYA platform detects arrhythmias from the ECG signal using neural networks. UC1 involves one data owner who also plays the role of querier when requesting the arrhythmia classification of a given ECG signal.
- **Stress detection use case (UC2).** In this use case, sensitive health data are collected from multiple sources and used to train a collaborative model (using neural networks) via the PAPAYA platform, with the ultimate goal of automatically detecting stress conditions in workers.
- **Mobility analytics use case (UC3).** In this use case, an entity that runs the PAPAYA platform measures the audience in one or several areas (using counting techniques based on bloom filters) or extracts mobility patterns (using some clustering algorithms) based on some data collected by a single source. The main difference with respect to UC1 is that UC3 involves a third party customer who can have access to the results.
- **Mobile usage analytics use case (UC4).** In this use case, sensitive data on mobile phone application usage are collected by multiple sources and used to extract analytics (such as counting or aggregation) for statistical purposes. Similarly, to UC3, UC4 involves a third party customer that can have access to the results when authorized.
- **Threat detection use case (UC5).** In this use case, data originating from several sources are processed to detect threats in systems or networks (using isolated forests and/or neural networks). The main difference with respect to the other PAPAYA use cases is the fact that the underlying data is not personal data but business confidential data and the chosen analytics operation is either isolation forests or neural networks.

Based on the identified use cases, different legal, end-user and platform requirements have been identified in WP2 and reported in deliverable D2.2. Both D2.1 and D2.2 were considered as reference documents for the design of PAPAYA privacy preserving data analytics solutions investigated in WP3.

1.6 Risk management and user-control of data disclosure (O3)

This objective is mainly related to the activities in Task 3.3 (Risk Management and Transparency for the data analytics platform) and in Task 4.3 (Dashboard for the platform). During the first year of the project, we have reviewed the state of the art on privacy-utility trade-offs. We also have conducted some work on artefacts for communicating PIA results and for visualising the consequences of using PAPAYA to data subjects. We have started the technical design of the privacy enhancing technology for making privacy-utility trade-offs transparent to data subjects and on the design of the privacy engine. The technical design of both components will be described in deliverable D3.2 which is due M15.

Furthermore, some work has been conducted on the design of the PAPAYA dashboard. . The PAPAYA dashboard consists of two independent dashboard components and a data subject toolbox. The independent dashboards target platform administrators and users (data controllers and/or data processors) of the platform, providing, e.g., auditing views and basic management operations. The data subject toolbox consists of a number of loosely coupled tools that provide vital functionality for data subjects as one would expect from a data subject dashboard. The tools are used by the user of the platform in their data subject facing applications—such as mobile apps—to provide functionality that enable data subjects to assess risks and exercise control over their personal data. The tools in the toolbox are loosely coupled and designed with ease of integration in mind to make it as easy as possible for users of the platform to provide a seamless and usable experience for data subjects. The loose coupling between tools in the toolbox (and the other components of the PAPAYA platform) also makes it easier for users to pick and choose from the tools in the toolbox based on their particular needs.

1.7 Design and development of an integrated platform (O4)

This is the main goal of WP4 (Platform Design and Development). This work package has started at month 6. Since the start of this work package, based on the use cases defined in WP2, and the potential PAPAYA privacy preserving data analytics operations under development in WP3, we have defined the main components of the PAPAYA framework and their relationships. In particular, the framework will contain components that will be running in cloud environment (such as privacy preserving Machine Learning services, IAM services, auditing services and others), and components that will be running on the client side (such as Data Subject toolbox, which will provide means for end-user privacy and usability of the platform, Key Manager, that will be responsible for management of cryptographic materials, and others). We have also identified all technologies needed to implement the platform. The architecture will be described in deliverable D4.1 that will be submitted at M15.

1.8 End-to-end analysis (O5)

The end-to-end analysis will be mainly conducted as part of the work in WP5 (Platform Validation) that will start at M24. The goal of this work package is to set up prototypes demonstrating the five use cases identified in WP2 and validating the requirements listed in deliverable D2.2. Another objective is to produce a platform guide that would help users easily operate the platform.

2 Innovation

The purpose of the innovation management task is to monitor the status of the research activities and to ensure that the outcome of the project is aligned with the market expectations. The results achieved in this first year had mainly the focus of preparing the ground for innovation monitoring and assessment throughout the project.

More specifically, the PAPAYA consortium:

- defined the innovation strategy (as of D1.2);
- collected and designed monitoring questionnaires;
- nominated an innovation director.

2.1 Innovation director responsibilities

During the kickoff of the innovation management task, the PAPAYA consortium has nominated its own innovation director (i.e., Sauro Vicini, MCI) who is in charge of keeping contacts with WP leaders and suggesting corrective measures to keep the project in a sustainable track. The innovation director drove the definition of the innovation strategy (D1.2) and constantly ensures that the whole consortium is aligned with that.

2.2 Monitoring tools

In the innovation strategy, three important aspects of the project have been selected to be periodically monitored in order to enable the innovation management to properly solve its responsibility. In particular:

- technical dimension, how the PETs are progressing;
- organizational dimension, how the consortium companies are changing;
- market dimension, which assets we want to bring to the market.

In particular, we called these aspects “dimensions” since we believe that the project success is driven by the combination of them all.

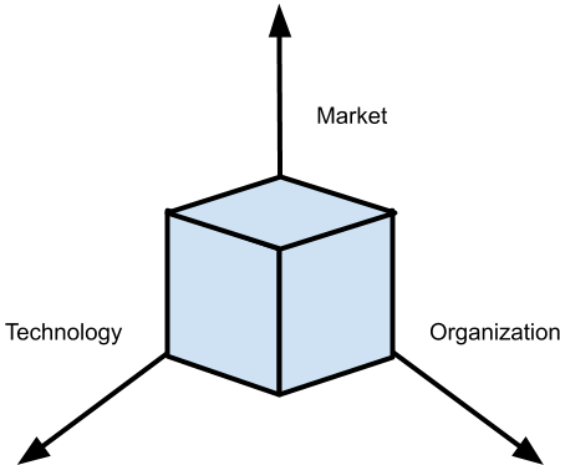


Figure 1 The three "dimensions" of PAPAYA innovation

Per each of these dimensions, we selected or designed a questionnaire to be periodically filled (once a year) by each partner of the consortium.

2.3 Innovation points identified

The first study conducted on marketability aspects already allowed us to identify key features and components in the PAPAYA ecosystem that could be exploited either individually (i.e., as a standalone component) or in thematic areas (e.g., all the components related to the platform vs. all the compliance tools). Though the project is still in its early stages, this first classification allows us to assess the value that the produced assets may have on the market.

It is expected that not all these assets will reach maturity at the end of the project, monitoring the technological improvements inside and outside the project will give guidance on which tools are still aligned to the market at the end of the project, and which may be dropped due to infeasibility (internal technological limit) or due to the changes in the market (external changes).

Table 1 PAPAYA Innovation Assets

Asset #	Asset Description	Main beneficiaries
1	Papaya platform	IBM, KAU, ATOS
2	GDPR Compliance tools	KAU, ATOS
3	Privacy engine	ATOS
4	Arrhythmia detection tool	MCI, EURC
5	Stress detection tool	MCI
6	Mobile usage statistics	ORA

7	Mobile patterns analytics tool	ORA
8	Threat detection for sensitive data	ORA

From the marketability questionnaire, selected among the others in deliverable D1.2, we extracted valuable information about each of these assets, that we briefly present using the content collected in these questionnaires:

Innovation Asset #1 – Papaya platforms (IBM, KAU, ATOS)

The PAPAYA platform provides to end users the ability to **train and run Machine Learning models** (also in a collaborative manner) or other analytics without revealing their private data to the platform and to each other. The PAPAYA platform comes with the following additional features:

1. **Privacy-utility tool for platform client**: conveys to platform clients how privacy-preserving analytics work, and enables them to explore different parameter selections;

2. **Client dashboard**: allows client to enable/disable features, to ease the integration of their data subject facing apps and to view audit logs;

3. **Operator dashboard**: allows operators to admin the platform, to manage user accounts and to view desensitized audit logs.

Innovation Asset #2 – GDPR Compliance tools (KAU, ATOS)

The PAPAYA compliance tools are a set of tools that can be used: i) by companies, to prove their accountability; ii) by data subjects, to verify the disclosure situation of their data.

The set of tools for data subjects comprises:

1. **Data disclosure visualizations:** this tool allows the data subjects to visualize the data they have disclosed to data controllers;

2. **Privacy-utility tool for data subjects:** this tool conveys to data subjects how privacy-preserving analytics work, for the inclusion on consent forms or as part of privacy policies of data controllers

3. **View of audit records:** views of audit records are available for data subjects

The set of tools for companies comprises:

1. **Enhanced PIA tool:** an enhanced version of the PIA tool from CNIL that (in terms of categories of risks it considers) puts more focus on usability

2. **View of audit records:** views of audit records are available for both platform clients and platform operator

Innovation Asset #3 – Privacy engine (ATOS)

The Privacy Engine provides to the data subject mechanisms to capture his/her privacy preferences on the collection / use of their personal and/or special categories of personal data for processing in privacy-preserving big data analytics tasks. For that purpose, the Privacy Engine transforms high-level descriptions to computer-oriented policies, allowing their enforcement in subsequent processes to only permit the process of the data that the data subject agrees with e.g. filtering and excluding certain personal attributes.

In addition, the PE provides to the data subject the mechanism exercise his/her rights derivative from the GDPR (e.g. the right to erasure his/her personal data). In order do so, the PE, allows, on one hand, to the data controller to choose the communication channel to obtain the subject desire (email, publisher/subscriber pattern, protection orchestrator, and on the other hand provides an user centric GUI to easily exercise his/her rights

Innovation Asset #4 – Arrhythmia detection tool (MCI, EURC)

This tool allows an untrusted party to perform the analysis of a person's ECG signal in a privacy-preserving way, leveraging secure platforms such as the PAPAYA one.

Innovation Asset #5 – Stress detection tool (MCI)

E-Health stress management is a service designed for privacy-compliant detection and mitigation of stress-induced anomalies in workers, coming with a sensorized shirt linked to a mobile app. Whenever the service identifies a stress condition, it suggests a proper action based on psychologists' hints.

Innovation Asset #6 – Mobile usage analytics (ORA)

This tool is provided to third parties (that would like to infer people habits with respect to their mobile usage) privacy-preserving analytics of data on mobile usage. The service is based on a combination of PETs and statistics operations.

Innovation Asset #7 – Mobile patterns analytics tool (ORA)

The tool is composed of two subparts:

- Privacy-preserving statistics on mobility

- Privacy-preserving trajectory clustering

Those two services rely on a combination of analytics operations with PETs mechanisms.

Innovation Asset #8 – Threat detection for sensitive data (ORA)

This tool detects deviations from normal behavior in IT systems (leveraging machine learning techniques for anomaly detection), preserving the confidentiality of the data used in training (that are coming from multiple sources) and/or prediction.

We want to underline that this list is not immutable: For example, the "threat detection for sensitive data" tool was not even planned during the proposal, yet, during the use case investigation, we found out that the papaya PETs could also apply in such a scenario, and that there is a market request for such a tool.

2.4 Upcoming innovation management activities

The next innovation management activities will be focused on:

1. monitoring the market in the topics that are adherent with the PAPAYA ecosystem;
2. monitoring the progress of the project and assessing its alignment with market expectation;
3. repeating the marketability questionnaires in new iterations, to update them with views that are more adherent with the components' final version.

The roadmap of innovation management monitoring tools is shown in Table 2:

Table 2 Roadmap of innovation management monitoring tools

	M12	M24	M36
Technical	technology assessment	progress in the technology readiness	final release
Market	product marketability draft	update, keep in sync with market	final release
Organizational	overview on organizational impact	update on resources acquired/planned	final release

3 Dissemination, Communication and Exploitation Activities

Dissemination, communication and exploitation (DC&E) activities consist in a continuous process that has started at the beginning of the project and goes beyond its end. The PAPAYA consortium is fully committed to generate impacts through its dissemination and exploitation efforts. The activities held in Year 1 and reported in this section manifest how involved the consortium was in these tasks.

During the first period, despite the fact that all the three tasks in WP6 were initiated, most of the activities reported here relate to task T6.1 on dissemination and communication. Indeed, as PAPAYA results are not yet available, most of the preliminary efforts were devoted to the promotion of the project, its objectives and expected results and to the creation of awareness on the need of protecting privacy in the context of data analytics. Nonetheless, some exploitation efforts have been undertaken by means of publications and synergies with other ongoing European H2020 projects.

In the upcoming stages of the project, DC&E activities will aim our attention at the publication and use of the outcomes of PAPAYA, with a greater focus on the exploitation and business plan of the project.

3.1 Scientific Publications

We report in this section, two scientific publications edited by EURC.

Publication #1

Type of scientific publication	Conference proceedings
Title of scientific publication	FHE-Compatible Batch Normalization for Privacy Preserving Deep Learning
DOI	10.1007/978-3-030-00305-0_27
ISSN or eSSN	-
Authors	Alberto Ibarrondo and Melek Önen
Title of journal or equivalent	Data Privacy Management, Cryptocurrencies and Blockchain Technology
Number, date	LNCS volume 11025
Publisher	Springer International Publishing (Lecture Notes in Computer Science)
Place of publication	Barcelona, Spain
Year of publication	2018
Relevant pages	389-404

Peer-review	Yes
Is/Will open access provided to this publication	Yes

Publication #2

Type of scientific publication	Extended abstract and poster
Title of scientific publication	A Hybrid Protocol for Private Neural Network Predictions
DOI	-
ISSN or eSSN	-
Authors	Gamze Tillem, Beyza Bozdemir and Melek Önen
Title of journal or equivalent	8th edition of ICT.OPEN, https://ict-research.nl/ict-open/
Number, date	-
Publisher	-
Place of publication	Hilversum, Netherlands
Year of publication	2019
Relevant pages	-
Peer-review	YES
Is/Will open access provided to this publication	YES

3.2 Conferences, workshops and other events

PAPAYA members have been actively promoting the project in many and diverse events listed in Table 3. Besides the attended events, PAPAYA members are currently contributing to the organization of events. At least one of these events is planned to be jointly organized with other projects. Details about these joint efforts are given in Section 4.5.

3.2.1 Scientific conferences, workshops

Participation.

Events highlighted with a thick black border in Table 3 are the scientific events attended in Y1.

Organization.

KAU is organizing a Special Track at the CBMS 2019 conference on computer-based medical systems, which will be held in Córdoba, Spain, on June 5-7, 2019. The topic of this special track tackles the issues of Privacy, Security and Informed Consent in healthcare, with a focus on current

regulations such as the GDPR. KAU (Simone Fischer-Hübner, Lothar Fritsch, Bridget Kane and John Sören Petterson), EURC (Orhan Ermis, Melek Önen) and ORA (Monir Azraoui, Sébastien Canard) are members of the program committee. The call for papers was published on November 22, 2018 and the paper submission deadline was set on February 14, 2019. At the time of writing this report, received papers are in review progress.

During the third General Meeting in Madrid, Simone Fischer-Hübner (KAU) and Melek Önen (EURC) announced the upcoming IFIP Summer School on Privacy and Identity Management 2019, which will take place in Brugg/Windisch, Switzerland, on August 19-23, 2019. This year, the summer school will embrace the topic of combining artificial intelligence and privacy, topic relevant for PAPAYA. Simone Fischer-Hübner is a member of the summer school steering committee, whereas Melek Önen is the program committee co-chair.

3.2.2 Event targeting non-scientific audience

Participation.

The orange-bordered rows in Table 3 are the events targeting a non-scientific audience.

Table 3 Events attended by PAPAYA

Name of Event	Date	Place	Partner	Audience	Comment
DPM 2018	September 7, 2018	Barcelona, Spain	EURC	Technical audience	Presentation of the paper during the session “Privacy and Cryptography”
AMUSEC Forum Aix-Marseille de la cybersécurité	October 11, 2019	Marseille, France	EURC	Business, Government, ICT security professionals, academia	Melek Önen gave a keynote speech.
Smau International: Meet the Made in Italy Innovation	October 23-24-25, 2018	Milan, Italy	MCI	Business, Professionals, Startups and ICT	MCI presented its new products whose development is related to the PAPAYA use cases
Digital Identity - Privacy threats and business opportunities, will the technology fix everything?	October 25, 2018	Rome, Italy	EURC	EC, business, government	Melek Önen gave an overview of PAPAYA. Event organized by H2020 project PoseID-on
ISSE (Information Security Solutions Europe) conference	November 6-7, 2018	Brussels, Belgium	ATOS	ICT security professionals, governments	Alberto Crespo promoted the project at this event organized by

				and legal communities	EEMA (independent European association for e-identity and security).
European Big Data Value Forum (EBDVF'18)	November 12-14, 2018	Vienna, Austria	ATOS	Industry professionals, business developers, researchers, and policy makers	Alberto Crespo participated to the workshop entitled "From data protection and privacy to fairness and trust: the way forward" and gave an overview of the PAPAYA use cases.
AEGIS cyber Round Table (side event of ICT 2018, one of the most important research and innovation events in Europe)[2]	December 5, 2018	Vienna, Austria	ATOS	Industry professionals, business developers, researchers, and policy makers	ATOS participated to the round table of "Aegis Cyber", about interaction between technology and policy in the area of data privacy, and promoted PAPAYA.
EURECOM scientific council	February 8, 2019	Sophia-Antipolis, France	EURC	Business, academia, ICT professionals	PAPAYA's preliminary results were presented during EURECOM's scientific council.
Swedish Forum of Data Protection	February 19, 2019	Stockholm, Sweden	KAU	Public sector, industry and academia	Simone Fischer-Hübner gave a talk at a seminar of the Swedish "Forum för Dataskydd"/Forum for Data Protection with 50 participants. Topic: Security & Privacy Requirements for the Cloud. The work by PAPAYA was mentioned on one slide including a logo and reference to its website.
ICT.OPEN2019	March 20, 2019	Hilversum, Netherlands	EURC	Scientific audience. Research and	EURC presented their paper in the session "Security & Privacy".

[2] After this event, PAPAYA is briefly mentioned in AEGIS's deliverable D1.5 https://tssg.org/wp-content/uploads/2019/03/AEGIS_deliverable_D1.5_v1.pdf

				professionals from ICT.	
Community of Users Thematic Group 4 – Cyber Issues	March 28, 2019	Brussels, Belgium	MCI	Public sector, industry and academia	MCI team attended the Cluster meeting of GDPR compliance, as observers.
Community of Users Thematic Group 4 – Cyber Issues	March 29, 2019	Brussels, Belgium	MCI	Public sector, industry and academia	MCI team presented a poster on PAPAYA activities in relation with the GDPR.
Salon de la Recherche	April 2-5, 2019	Châtillon, France	ORA	ICT researchers and professionals. Orange business partners	ORA presented their preliminary solution of ECG analysis (FHE based neural network) for PAPAYA.

3.3 Collaboration with other research projects

PoseID-on.

Melek Önen (EURC) and Tobias Pulls (KAU) had a first interaction (a telco) with the PoseID-on project on June 26th, 2018. During this telco, the participants had the opportunity to present their respective project. It appears from the discussions that the dashboard is the main point of interest of the interactions between PAPAYA and PoseID-on. Besides, PoseID-on is interested in how PAPAYA will design the dashboard, and how this dashboard will enable interactions with users. PAPAYA and PosedID-on will set up another meeting in the upcoming months when both projects have relevant progress to discuss. Furthermore, some initial thoughts were discussed on a possible collaboration in the organization of a workshop for both projects.

PROMETHEUS, FutureTPM, ASTRID.

On the initiative of Sébastien Canard (ORA), who is also the Technical Manager of H2020 project PROMETHEUS[3], the projects PAPAYA, PROMETHEUS and FutureTPM[4] teams have got in touch during a telco, held on November 29, 2018. The teams introduced their respective projects and discussed about the interests they share and the potential fruitful collaborations. It appeared during the telco that security and privacy in data analytics is a shared topic between the projects. The parties agreed that this collaboration could be a good opportunity for dissemination and exploitation for the three projects. Hence, the parties defined a possible line of collaboration by

[3] PROMETHEUS: http://prometheuscrypt.gforge.inria.fr/index.html
[4] FutureTPM: https://futuretpm.eu/

means of the organization of a joint workshop. A fourth H2020 project, ASTRID[5], has been included in the collaboration.

Another telco was held on January 14, 2019, to discuss a proposal for the Workshop on Security and Trust Management (STM Workshop, co-located with ESORICS), with the four projects. Between February and March 2019, the four projects decided to focus instead on the organization of a new workshop at CCS conference 2019. At the time of writing this report, the work is still in progress.

TRUSTEE.

TRUSTEE (daTa pRivacy and cloUd SecuriTy clustEr Europe) is a cluster of European projects (H2020 and FP7), which stemmed from the Common Dissemination Booster initiative[6]. TRUSTEE is coordinated by the CREDENTIAL project[7] and is dedicated to develop a portfolio of commons results and solutions in the field of security and privacy for cloud services. After some interactions between PAPAYA's and CREDENTIAL's coordinating teams, PAPAYA is now a member of the TRUSTEE cluster.

Cybersecurity pilot project: CyberSec4Europe.

During the third General Meeting in Madrid, we discussed possible synergies with the new pilot project CyberSec4Europe[8], in which both ATOS and KAU are involved. Simone Fischer-Hübner suggested that potential collaboration could be sparked with the upcoming IFIP Summer School.

3.4 Press releases and communication campaigns

Table 4 Press releases and communication campaigns

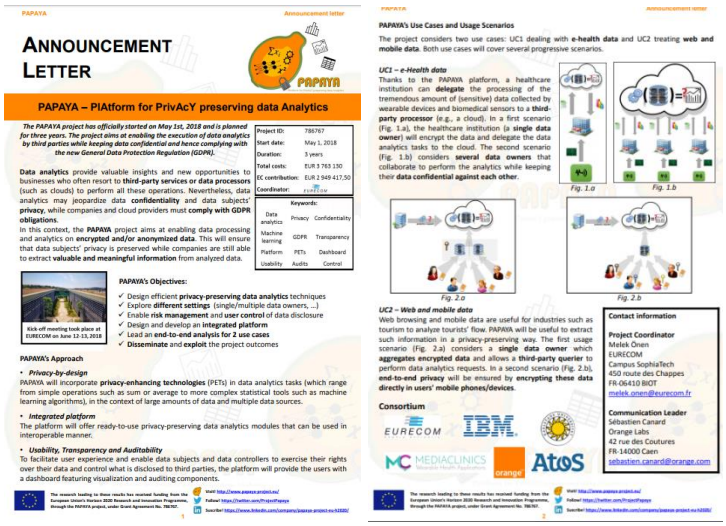
Type of communication	Description
Announcement letter (ORA, EURC)	At M3, ORA, with the help of EURC, produced an announcement letter (**Figure 2 PAPAYA announcement letter**) which communicates about the project start. The letter outlines the project context, objectives, approaches and use cases. It has been published in the PAPAYA website and social platforms.
Interview in the l'MTech blog[9] (EURC)	Melek Önen gave an interview at M2 to the l'MTech blog, the blog of the Institut Mines-Télécom, a group of French research schools, which EURC belongs to. The transcript of the interview is available both in French and in English, in the blog.

[5] ASTRID: https://www.astrid-project.eu/index.php
[6] Common Dissemination Booster: https://www.trust-itservices.com/common-dissemination-booster
[7] CREDENTIAL: https://credential.eu/
[8] CyberSec4Europe: https://www.cybersec4europe.eu/
[9] Interview in French: https://blogrecherche.wp.imt.fr/2018/06/18/papaya-plateforme-analyse-donnees-confidentielles/ and later translated in English: https://blogrecherche.wp.imt.fr/en/2018/10/25/papaya-data-analysis-platform/

Applied Crypto Group webpage[10] (ORA)	PAPAYA is mentioned in ORA's Applied Crypto Group webpage. Most of the people of the ORA team involved in PAPAYA is a member of this group. The page is in English.
MCI's webpage[11] (MCI)	PAPAYA project is described in the Research section of MCI website. The webpage, which is available in both English and Italian, outlines the context of the project, its challenges and its use cases.
ATOS Research and Innovation website[12] (ATOS)	PAPAYA appears in ATOS's Research and Innovation website. The page provides the key aspects of the project.
Press release and interview[13] (KAU)	Simone Fischer-Hübner and Tobias Pulls were interviewed at M7 for a press release, which gives the context of the project and outlines in clear and simple words the use cases we develop in the project. This press release is available both in English and in Swedish.
Interview at a Swedish radio (KAU)	Tobias Pulls gave at M7 an interview to a Swedish radio[14] (link to the interview is not provided) which lasted ten minutes.
Plans for press release	The PAPAYA consortium plans to contribute to one of the upcoming issues of ERCIM News, the quarterly magazine of the European Research Consortium for Informatics and Mathematics.

[10] Applied Crypto Group webpage; https://crypto.orange-labs.fr/projects/
[11] MCI's webpage in English: http://www.mediaclinics.it/en/papaya-2/.
In Italian: http://www.mediaclinics.it/it/papaya/
[12] ATOS Research and Innovation website: http://booklet.atosresearch.eu/node/1907
[13] KAU's press release in English: https://www.kau.se/en/cs/news/researchers-contribute-using-cloud-services-more-securely. In Swedish, the interview appears in two websites (with different texts): https://www.voister.se/artikel/2018/11/forskning-for-sakrare-moln/ and http://www.mynewsdesk.com/se/karlstads_universitet/pressreleases/forskare-ska-bidra-till-saekrare-anvaendning-av-molntjaenster-2797396.
[14] Swedish radio: https://sverigesradio.se/p4

Announcement letter (ORA, EURC)


ANNOUNCEMENT LETTER

PAPAYA – PIAtform for PrivAcY preserving data Analytics

PAPAYA's Use Cases and Usage Scenarios

Contact information

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Figure 2 PAPAYA announcement letter

3.5 Other activities to promote the project

Project's visual identity.

PAPAYA's visual identity has been defined since the very beginning of the project with:

- a logo, that is used in all dissemination and communication material,
- templates for Microsoft Word documents, PowerPoint presentations and LaTeX documents, which are used in all documents produced by the consortium (such as deliverables, meeting minutes)
- a flyer, which is distributed at all the events the PAPAYA members attend.

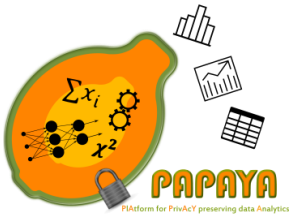

Figure 3 PAPAYA logo

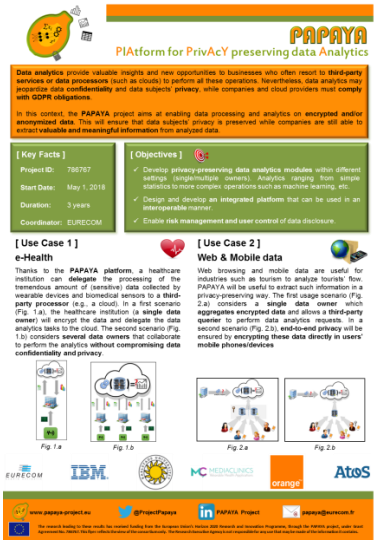

Figure 4 PAPAYA flyer

Other promotion.

At M3, Melek Önen (EURC) had a call with TeraLab, a French Big Data and Data science initiative, which is interested in PAPAYA outcomes. Melek Önen communicated about the project, its objectives, challenges, and use cases, and discussed potential collaborations.

At M11, Melek Önen (EURC) had a call with CyLon, in order to present the project.

3.6 Web presence

As part of its outreach activities, PAPAYA has established and developed its web presence via the project website[15] and social networking platforms such as Twitter[16] and LinkedIn[17]. While the website gives general information about the project, its objectives and the involved partners, we resort to the social platform to regularly report the key steps of the project, such as the events we attended, and to create a community of followers.

3.6.1 PAPAYA website

The PAPAYA website is alive since August 6th, 2018 (M4) and is maintained by ATOS. Deliverable D6.1, delivered at M3, consists of the website and an accompanying document that describes the structure and the design of the website. All PAPAYA partners contribute to the provision of relevant content to be published in the website. At the time of writing this report, the “News”

[15] PAPAYA website: https://www.papaya-project.eu/
[16] Twitter profile: https://twitter.com/ProjectPapaya
[17] LinkedIn profile: https://www.linkedin.com/company/papaya-project-eu-h2020

section[18] is the most active page of the website. That is why it appears in the website home page. As specified in the dissemination plan (D6.2), in the next periods, a blog will be maintained in the website.

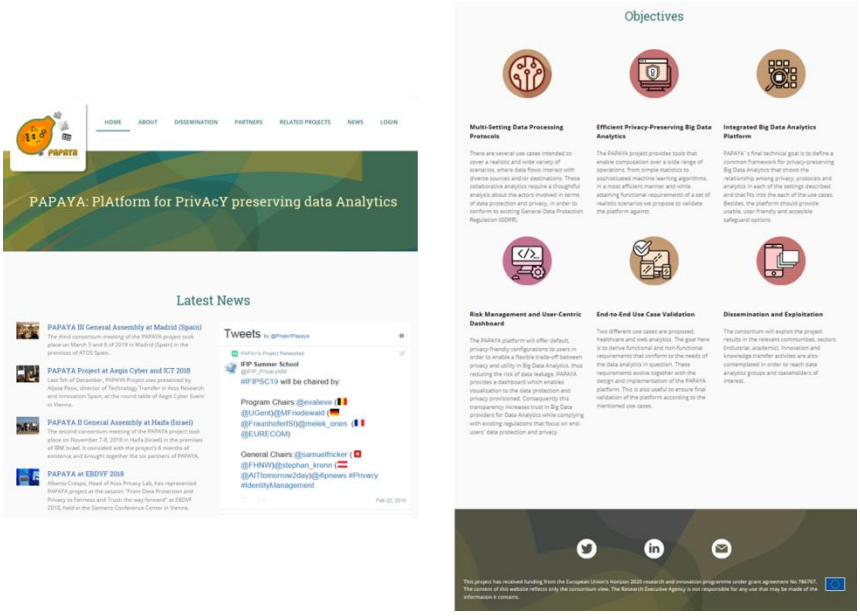

Figure 5 PAPAYA website (home page)

As part of the third PAPAYA general meeting held in Madrid, we reported some statistics about the website at M10 (March 4th, 2019). The figures are presented in Table 5. The row "Sessions" indicates the number of unique sessions (i.e. the interactions a user takes within a given period) triggered by the visitors, whereas the "Average Session Duration" specifies the average length of a session in the website. "New visitors" is the percentage of visitors that browse the PAPAYA website for the first time.

The figures in Table 5 show that in order to achieve the target for Y1 defined in deliverable D6.2 (Dissemination and Communication plan), more traffic need to be directed towards the website, in particular by means of our social media activities. Nevertheless, the numbers for the last two rows show promising performance of the website.

Table 5 PAPAYA website statistics

	M4-M10 (March 4th, 2019)	Target Y1 (from M4)
Sessions	865	2000
Users	457	1500
Average Session Duration	3:39	2:00

[18] News section: https://www.papaya-project.eu/news

New visitors	83.5%	85%

3.6.2 PAPAYA Twitter

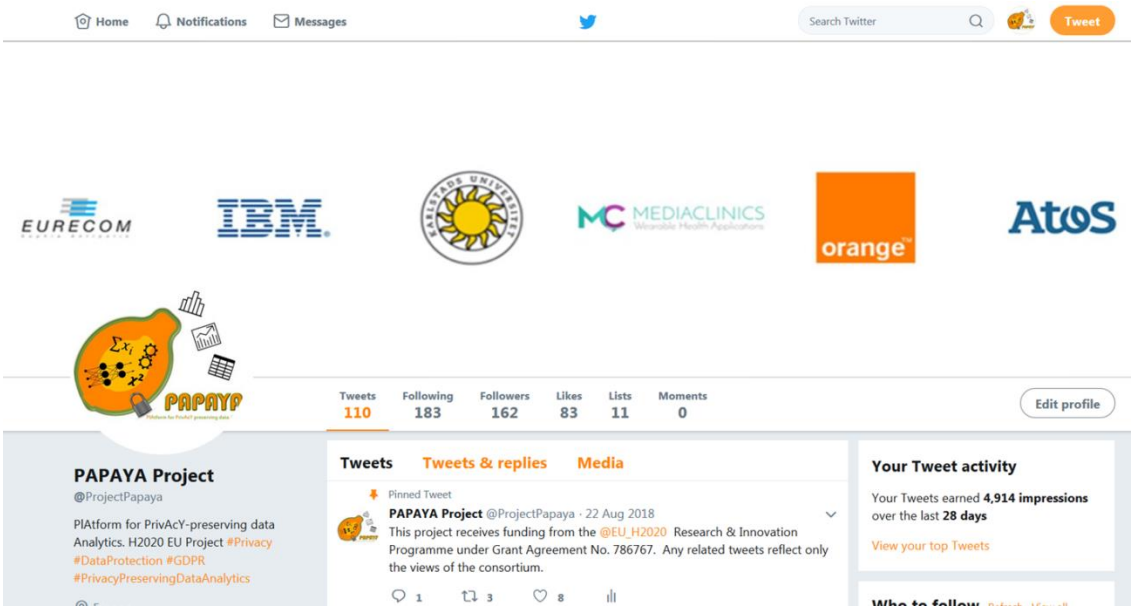

Figure 6 PAPAYA Twitter

The PAPAYA Twitter account is alive since June 25th, 2018 (M2) and is maintained by ORA. All PAPAYA partners contribute to the provision of relevant content to be published in Twitter. As part of the third PAPAYA general meeting held in Madrid, we reported some statistics about the Twitter profile at M10 (March 4th, 2019). As shown in Table 6, we reached the two objectives we set in D3.2 for Y1 in terms of number of followers and number of tweets.

Table 6 Twitter statistics

	M2-M10 (March 22nd, 2019)	Target Y1 (from M2)
Number of Followers	163	100
Number of Tweets	110	50

3.6.3 PAPAYA LinkedIn

The PAPAYA LinkedIn company page is alive since June 29th, 2018 (M2) and is maintained by ORA. All PAPAYA partners contribute to the provision of relevant content to be published in LinkedIn. As part of the third PAPAYA general meeting held in Madrid, we reported some statistics about the LinkedIn page at M10 (March 4th, 2019). Table 7 shows that we attained the objectives

that we set for Y1 in terms of number of followers and number of updates (the posts that are published on a LinkedIn page). As LinkedIn audience is more technical and commercial than Twitter, and as soon as PAPAYA results are available, LinkedIn will be a perfect channel for their dissemination and for reaching the targeted stakeholders.

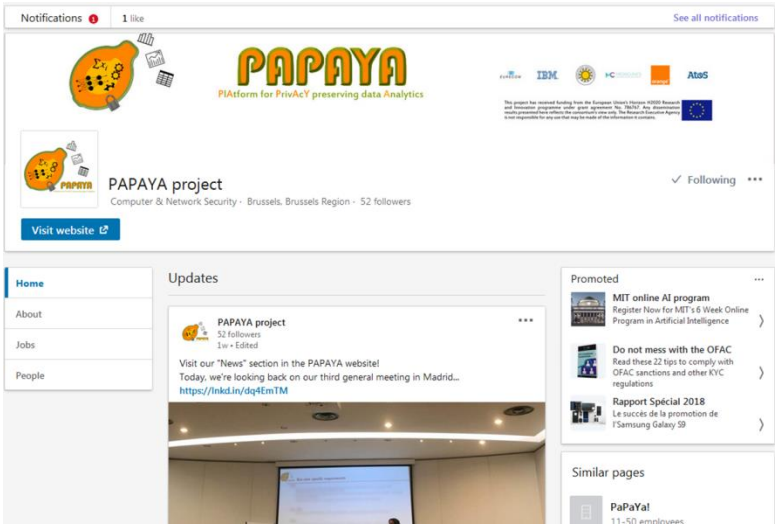

Figure 7 PAPAYA LinkedIn page

Table 7 LinkedIn statistics

	M2-M10 (March 22nd, 2019)	Target Y1 (from M2)
Number of Followers	52	50
Number of Updates	24	20

3.7 Summary of the dissemination and communication activities

The table below summarizes the activities in Y1 described in sections 4.3 too.

Table 8 Year 1 Dissemination and communication activities

Activity type	Title	Partner	Comment
Collaboration	with PoseID-on	EURC, KAU	Call and discussion on a joint workshop
Collaboration	with PROMETHEUS, FutureTPM, ASTRID	EURC, ORA	Calls and submission of a workshop proposal at CCS conference
Collaboration	with TRUSTEE	EURC	Common Dissemination Booster

Collaboration	with CyberSec4Europe	ATOS, EURC, KAU	Discussion on potential collaboration
Communication	Announcement letter	EURC, ORA	https://www.papaya-project.eu/content/papaya-announcement-letter-0
Communication	Interview with I'MTech blog	EURC	https://blogrecherche.wp.imt.fr/en/2018/10/25/papaya-data-analysis-platform/
Communication	Applied Crypto Group webpage	ORA	https://crypto.orange-labs.fr/projects/
Communication	MCI's webpage	MCI	https://www.mediaclinics.it/en/papaya-2/
Communication	ATOS research and innovation webpage	ATOS	http://booklet.atosresearch.eu/node/1907
Communication	Press release and Interview	KAU	https://www.kau.se/en/cs/news/researchers-contribute-using-cloud-services-more-securely
Communication	Interview at Swedish radio	KAU	[Link not available]
Communication	Press release at ERCIM	-	In progress
Visual identity	Logo	EURC, ORA	-
Visual identity	Templates	EURC, KAU	Microsoft Word and PowerPoint Latex
Visual identity	Flyer	EURC, ORA	https://www.papaya-project.eu/content/papaya-flyer
Web presence	Project website	ATOS, ORA	https://www.papaya-project.eu/
Web presence	Twitter	ORA	https://twitter.com/ProjectPapaya
Web presence	LinkedIn	ORA	https://www.linkedin.com/company/11765706/admin/
Other	Interview with TeraLAB	EURC	Presentation of the project
Other	Interview with Cylon	EURC	Presentation of the project

4 Progress Overview at each WP

This section describes the activities of each partner on a per Work Package, per Task basis.

4.1 Work Package 1: Project Management

WP Leader: EURC

Contributors: All partners.

4.1.1 Progress towards the objectives

This work package aims at coordinating project management activities through regular monitoring of the work carried out at each work package and following the allocated budget. During the first year of the project, different procedures, guidelines and communication tools have been defined and set up at M3 and documented in deliverable D1.1. These means have already put in place in M3 and ensure a regular monitoring of the work and financial progress. The innovation strategy and plan of the project has also been defined and documented in deliverable D1.2. Finally, deliverables D7.1 and D7.2 on ethics are also prepared and delivered on time.

4.1.2 Deviations

No deviations are detected in the first year of the project.

4.1.3 Task 1.1: Project Management and Reporting

Task Leader	EURC
Contributors	All
Overall task progress	The task is progressing successfully as planned. The different procedures defined in deliverable D1.1 (delivered in M3) have been put in practice. We had three general assembly meetings this first year in order to monitor the progress of the work carried out in each WP and the deliverables. All deliverables were submitted on time.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM arranged the kick-off of the project and organized the kick-off meeting in Sophia-Antipolis MCI: Preparation and participation in the kick-off meeting ORA: Participation to the PAPAYA kick-off meeting. Management of Orange's contributions to the project. ATOS: Overseeing administrative activities on ATOS side during project bootstrapping and setting expectations for and with the different Work Packages and partners respectively
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM submitted deliverables D1.1, D7.1, D7.2 ORA: Participation to conf calls and organization of the next plenary meeting. ATOS: Reporting the effort in the associated reports

Work carried out by beneficiaries (M7-M9)	EURC: Project management activities IBM: Organizing plenary meeting in Haifa ORA: Participation to conf calls and organization of the next plenary meeting. ATOS: Reporting the effort in the associated reports
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM submitted deliverables D1.3 and prepared the general meeting in Madrid. IBM: preparation for plenary meeting in Madrid ORA: Preparation and participation to General meeting in Madrid, monitoring of WP6 progress. Participation in the redaction and proofreading of D3.1. ATOS: contribution to D1.3 and hosting the general assembly in Madrid.

4.1.4 Task 1.2: Quality Assurance and Risk Management

Task Leader	EURC
Contributors	All
Overall task progress	The task is progressing successfully as planned.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM prepared all relevant procedures, templates for the project. D1.1 is also submitted. MCI: Contribution to the definition of the quality assurance plan ATOS: Quality assurance related to D6.1 as editor
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM is periodically monitoring all partners' activities
Work carried out by beneficiaries (M7-M9)	EURC: corresponding activities, monitoring, etc.
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM monitored the production of all Y1 deliverables. ORA : reviewing the assigned deliverables. ATOS: reviewing the assigned deliverables

4.1.5 Task 1.3: Innovation Management

Task Leader	MCI
Contributors	MCI, EURC
Overall task progress	The task is progressing as planned. Y1 activities have prepared a common framework of tools for the next years.
Work carried out by beneficiaries (M1-M3)	MCI: Starting the market analysis. Definition of the TOC for the deliverable D1.2.

Work carried out by beneficiaries (M4-M6)	EURC: EURECOM has prepared some answers to the innovation questionnaire IBM: Filling questionnaires on innovation activities MCI: Preparation and submission of deliverable D1.2 ORA: Participation to the redaction of D1.2 on Innovation Strategy and Plan, with Orange position. Answer to PO's questionnaire w.r.t. UC3.
Work carried out by beneficiaries (M7-M9)	ATOS: Filling questionnaires on innovation activities MCI : Collection of innovation questionnaires related to the market dimension, and submission to the EIPP portal.
Work carried out by beneficiaries (M10-M12)	MCI: Contributions to D1.2 in relation to innovation activities.

4.1.6 Meetings/calls in WP1

Date	Location	Reason
12-13 June 2018	Sophia-Antipolis, France	Project Kick-off meeting, WP1 slot
7-8 November 2018	Haifa, Israel	General Assembly Meeting, WP1 slot
5-6 March 2019	Madrid, Spain	General Assembly meeting, WP1 slot

4.2 Work Package 2: Use Cases and Requirements

WP Leader: KAU

Contributors: All

4.2.1 Progress towards the objectives

4.2.2 Deviations

4.2.3 Task 2.1: Use Case definition

Task Leader	MCI
Contributors	MCI, IBM, ORA, ATOS
Overall task progress	The task can be considered completed. All the usage scenarios depicted in the proposal have been described and put in use in five use cases that embraces both the e-health and the mobile analytics domains.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM participated to the discussion of UC definitions especially the ones with Orange Labs.

	IBM: We studied the project use cases and started thinking on suitable NN architecture to support the use cases MCI: Starting the definition of the specification for the healthcare use case. Participation in WP2 conference calls. ORA: Participation to the PAPAYA meetings on the use cases definition (UC3 and UC4). We have proposed several options and have presented to other partners the high-level view together with some details to have a final collective solution on the studied use cases. ATOS: Working and assisting Orange in the definition of SoTa for Private Set Intersection, Bloom filters literature as well as definition of Analysis scenario application to UC3 and UC4.
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM was heavily involved in the definition of UC3 and UC4 MCI: Continue to work on health related use cases, arrhythmia detection (UC1) and stress classification (UC2) ORA: Continue to work on the three Orange use cases: mobile operator analytics (UC3), mobile usage analytics (UC4) and threat detection (UC5) to define them with much more details (redaction of the use case structure document). ATOS: Assisting to several teleconferences to define and to refine the different Use Cases. Working on the SoTA document. Adapting the UC requirements template to be inline with the T2.2
Work carried out by beneficiaries (M7-M9)	MCI: Setup of Deliverable D2.1 TOC and use case structure definition to be commonly used by all use case partners; description in such template of health related use cases (UC1, UC2) ORA: Starting to work on Deliverable D2.1 on the use case definition and functional requirements for the three Orange use cases: mobile operator analytics (UC3), mobile usage analytics (UC4) and threat detection (UC5). ATOS: Leading, defining and reviewing the adoption and integration of the components developed by Atos within the different Use cases
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM contributed to deliverable D2.1 on the description of the single-owner architecture use case for the healthcare. EURECOM also reviewed D2.1. MCI: Conclusion and submission of deliverable D2.1 ORA: Refinement of the three use cases. Contribution to D2.1 on the specifications of the use cases UC3, UC4 and UC5. Proofreading and corrections of D2.1 after internal review. Participation to WP2 meetings. ATOS: Leading, defining and reviewing the adoption and integration of the components developed by Atos within the different Use cases

4.2.4 Task 2.2: User requirements (privacy & usability)

Task Leader	KAU
Contributors	KAU, EURC, MCI, ORA

Overall task progress	Legal and technical privacy requirements as well as end user requirements were elicited. The results are documented in the Deliverable D2.2.
Work carried out by beneficiaries (M1-M3)	KAU: Kick-off presentation and attendance, managing and attending WP2 conference calls, reading and first planning, communication MCI: Starting the definition of the user requirements. ORA: Starting the work on the mapping between the use case definition and the requirements regarding security and privacy: actors' definition, actors' role, potential threats. ATOS: ATOS compiled and provided detailed reference documentation for KAU and WP2 partners on requirements user-centric elicitation methodology in a privacy-by-design context (including techniques such as Personas and journey maps); Comparison of different tools to manage requirements and example templates to formalise them, as well as existing reference insight from legal perspective on relevant latest GDPR updates and compliance in outsourcing contexts.
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM was involved in the definition of requirements' templates IBM: KAU: Legal requirements were elicited. ORA: Work on user requirements related to the three Orange use case, especially related to privacy, with interactions with Atos partner so as to work on the PIA for mobile operator analytics use case. ATOS: Providing general information about the DPIA development (CNIL analysis, CNIL software tools, etc), leading the DPIA of the UC3, providing a first draft of the development of the analysis
Work carried out by beneficiaries (M7-M9)	KAU: Legal requirements were refined. Interview guides and consent forms eliciting end user requirements for the medical use cases were produced. Ethical review for the planned interviews was requested at KAU: High level DPIAs for medical use cases were prepared. MCI: Collaborate in organizing and execute interviews with medical staff in Italy, with particular focus on UC1. ORA: Work on Deliverable D2.2 to define the user requirements related to the three Orange use cases. Preparation of a meeting with the French CNIL to present them Orange use cases and obtain their feedback on the privacy management. We also had interactions with Atos partner so as to work on the PIA for mobile usage statistics use case. ATOS: Providing general information about the DPIA development (CNIL analysis, CNIL software tools, etc.), leading the DPIA of the UC3 and UC4 and for the components developed by Atos (PE)
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM contributed to the revision of user requirements and participated to a meeting with CNIL on GDPR compliance with respect to ORA's use cases. KAU: KAU conducted interviews with 14 medical professionals and with end users for eliciting end user requirements for the medical use cases. KAU also

	conducted DPIA for medical use cases and conducted literature studies for eliciting requirements. Besides, KAU has been the main editor for D2.2. MCI: Collaborate in organizing and execute interviews with welfare aware workers in Italy, with particular focus on UC2. ORA: Meeting with the CNIL with respect to use cases UC3 and UC4, in relation with legal constraints and potential cryptographic solutions. Dissemination of the outcomes of this meeting among project partners. Contribution to D2.2 on the specification of the requirements (CNIL interview part, PIA part). Review of D2.2. Participation to WP2 meetings. ATOS: Providing general information about the DPIA development (CNIL analysis, CNIL software tools, etc), leading the DPIA of the UC3 and UC4 and for the components developed by Atos (PE).

4.2.5 Task 2.3: Platform requirements (functional & utility)

Task Leader	IBM
Contributors	All
Overall task progress	We defined platform requirements and wrote them up in D2.2. The task is now completed.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM started to analyse the potential statistical operations in order to identify platform requirements. IBM: We started evaluation of SotA technologies to be used in the platform KAU: ORA: Additionally to the use cases definition, we have started to work on some ideas about the platform. ATOS: Proposed to update PAPAYA architecture for cooperating with IBM according to example of WITDOM architecture. Internal preliminary assessment of role of Atos components in architecture considering functional needs and dependencies
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM identified some analytics operations and suitable PETs in order to define functional requirements KAU: KAU continued its work on dashboard requirements ORA: Work on the relation between use cases and platform needs. ATOS: Analysing and designing initial requirements of the PAPAYA platform, providing initial diagrams of the possible architecture integration
Work carried out by beneficiaries (M7-M9)	EURC: Contributions to the functional requirements with respect to our WP3 PETs. IBM: Platform requirements elicitation. In particular, we identified generic platform use cases. KAU: Dashboard/platform requirement elicitation ORA: Study on the way the platform will be used on Orange use case, i.e. put the PAPAYA platform in the right place in the global architecture, and study

	the way it will be requested by actors in the use case system. This is used to define the requirements related to the platform. ATOS: Providing common requirements (CSA) and for the components developed by Atos (IAM, KM)
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM contributed to the identification of platform requirements related to WP3 PETs. IBM: Platform requirements finalization. In particular, we analysed and tuned generic platform use cases and from them we derived the platform requirements. KAU: KAU contributed to the co- authoring and editorial review for the platform requirements. ORA: Feedback on the platform requirements based on the refinement of the use cases UC3, UC4 and UC5. Review of D2.2. Participation to platform requirements meetings. ATOS: Providing common requirements (CSA) and for the components developed by Atos (IAM, KM) and summarizing the main results obtained from the PIA developed by Atos for the UC3 and UC4.

4.2.6 Meetings/calls in WP2

Date	Location	Reason
12-13 June 2018	Sophia-Antipolis, France	Project Kick-off meeting, WP2 slot
25 June 2018	Conference call	discussing ongoing work
3 August 2018	Conference call	WP2 & WP6– discussing ongoing work
17 September 2018	Conference call	discussing ongoing work
8 October 2018	Conference call	discussing ongoing work
14 October 2018	Conference call	discussing ongoing work
7-8 November 2018	Haifa, Israel	General Assembly Meeting, WP2 slot
5 December 2018	Conference call	discussing ongoing work
18 December 2018	Conference call	discussing ongoing work
5 February 2019	Conference call	discussing ongoing work, preparing interviews
21 February 2019	Conference call	discussing ongoing work, preparing D2.2
5-6 March 2019	Madrid, Spain	General Assembly meeting, WP2 slot
2 April 2019	Conference call	discussing ongoing work, finalising D2.2 review version
15 April 2019	Conference call	discussing ongoing work, addressing review comments for D2.2

4.3 Work Package 3: Privacy Enhancing Technologies for Data Analytics

WP Leader: EURC

Contributors: ATOS, EURC, IBM, KAU, ORA

4.3.1 Progress towards the objectives

All partners first started with a SotA analysis on cryptographic tools, privacy enhancing technologies, transparency and risk management tools. Once a first version of the use cases were defined, partners have started to study them and came up with the design of some privacy preserving variants of the underlying analytics operations.

4.3.2 Deviations

No deviations with regards to the work plan have been identified.

4.3.3 Task 3.1: Single-Owner privacy preserving data analytics

Task Leader	EURC
Contributors	EURC, IBM, ORA
Overall task progress	EURC, IBM and ORA have analysed the state-of-the-art related to the single-owner architecture (neural network classification, basic statistics) and have reviewed the relevant cryptographic building blocks such as homomorphic encryption and secure multi-party computation. ORA conducted some experiments on the cost for existing FHE libraries. All three partners have started to design and develop privacy preserving Neural Network classification solutions based on either homomorphic encryption or secure two-party computation or both.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM has designed a privacy preserving CNN solution based on LHE that improves an existing solution by integrating a batch normalization layer compatible with LHE. IBM: We started implementation and evaluation of CryptoNets and Gazelle schemes on CNN networks ORA: The link between use cases and privacy preserving data analytics method has started. We have also started to work on the state-of-the-art related to the single-owner case, especially from the cryptographic point of view.
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM has started to design a privacy preserving NN dedicated to arrhythmia classification from ECG data. IBM: ongoing work on implementation and evaluation of CryptoNets and Gazelle schemes on CNN networks ORA: Contribution to SOTA analysis: study of some privacy-preserving machine learning algorithms, listing of relevant articles, of existing open source libraries. Comparison between existing FHE libraries for preparation

	of D3.1, in terms of functionalities (in relation with machine learning algorithms) and efficiency (on basic operations).
Work carried out by beneficiaries (M7-M9)	EURC: Ongoing development of the privacy preserving ECG classification. Design of a new privacy preserving NN solution. IBM: ongoing work on privacy preserving classification on NN based on Gazelle ORA: Improvement and implementation of a neural network in the encrypted domain, based on FHE, to work on the ECG analysis. Work on analysis of the state of the art for FHE and privacy-preserving clustering.
Work carried out by beneficiaries (M10-M12)	EURC: A beta version of the privacy preserving ECG classification solution has been released and sent to MCI for test purposes. IBM: PP classification on NN based on Gazelle ORA: Improvement and finalization of a first version for a neural network in the encrypted domain, based on FHE, to work on the ECG analysis. Participation to the redaction of D3.1 for the state-of-the-art on FHE and on privacy-preserving counting (encrypted Bloom filters). Proofreading of D3.1 on FHE and MPC based solution for privacy-preserving neural network. Review of existing methods for privacy-preserving Bloom filters.

4.3.4 Task 3.2: Multi sources privacy preserving data analytics

Task Leader	ORA
Contributors	EURC, IBM, ORA
Overall task progress	EURC, IBM and ORA have investigated the scenario of multi sources data analytics and started the design of solutions with respect to that setting. Briefly, EURC is looking at privacy preserving clustering in the collaborative scenarios. IBM is studying attack on collaborative training models. ORA is investigating on functional encryption mechanism as a potential building block for the multi-source scenario, adding relevant properties related to use cases.
Work carried out by beneficiaries (M1-M3)	EURC: EURECOM is currently looking at suitable crypto primitives to support collaborative scenarios. IBM: We started implementation and evaluation of differential privacy approach on RNN networks ORA: The link between use case and privacy preserving data analytics method has started. We have also started to work on the state-of-the-art related to the collaborative case, especially from the cryptographic point of view.
Work carried out by beneficiaries (M4-M6)	EURC: EURECOM is currently looking at suitable crypto primitives to support collaborative scenarios with the clustering algorithms. IBM: ongoing work on implementation and evaluation of differential privacy approach on RNN networks

	ORA: First step to work on the main cryptographic component for UC4 with a combination of several cryptographic tools to obtain both usability and security.
Work carried out by beneficiaries (M7-M9)	EURC: ongoing work on the design of a 2-server privacy preserving NN solution & design of privacy preserving clustering algorithm IBM: We studied SotA on attacks on Collaborative training models ORA: Work on the way we have to adapt functional encryption for UC4 for mobile usage statistics, as use case requirements have shown that the basic concept is not enough. We have also work on the way to perform privacy-preserving counting and privacy-preserving random and isolation forest for D3.1.
Work carried out by beneficiaries (M10-M12)	EURC: Another more generic privacy preserving Neural Network classification solution has been designed and presented in deliverable D3.1. This solution relies on a 2-server architecture. EURECOM is still working on the problem of privacy preserving clustering IBM: Further investigation of attacks on Collaborative training models ORA: Participation to the redaction of D3.1 on the state-of-the-art on functional encryption, on privacy-preserving counting (functional encryption based solution), and proofreading of the D3.1 section on privacy-preserving clustering.

4.3.5 Task 3.3: Risk Management and Transparency for the data analytics platform

Task Leader	KAU
Contributors	ATOS, EURC, IBM, KAU, ORA
Overall task progress	During the first year of the project, we have reviewed the state of the art of privacy-utility trade-offs and some research and development have been conducted. Work on artefacts for communicating PIA results for visualising the consequences of using PAPAYA to data subjects is progressing. Work on the technical design of the PET for making privacy-utility trade-offs transparent to data subjects and work on the design of the policy engine have been conducted D3.2 is in preparation.
Work carried out by beneficiaries (M1-M3)	KAU: Kick-off presentation and attendance, reading and first planning, communication ATOS: Internal assessment of the Privacy Engine technology that will be part of the task ((analysis of internal technical documentation of VisiOn and preliminary assessment of foreseeable adaptations considering dependencies with visualization in T4.3)
Work carried out by beneficiaries (M4-M6)	KAU: First literature reviews and work on the technical design of the PET

	ATOS: Initial conversations to define the interface of the integration of the Privacy Engine with the Dashboard. Providing diagrams and leading teleconferences with the partners involved.
Work carried out by beneficiaries (M7-M9)	KAU: Continuous work on the technical design of the PET and first work on artefacts communicating PIA results. D3.2 is prepared. ORA: Interaction with Atos to integrate their Privacy Engine to Orange use case UC4. To prepare the meeting with the French CNIL, we have started to work on the way encryption mechanisms can be integrated in a risk analysis related to privacy requirements. ATOS: Leading the integration of the PE, IAM and KM within the general platform. Defining and stablishing first TOC and agreed roadmap for the deliverables associated to this task.
Work carried out by beneficiaries (M10-M12)	KAU: Literature work concludes continuous work on artefacts. D3.2 is progressed. ORA: Interaction with ATOS to integrate the Privacy Engine in use case UC4. ATOS: Contributing to the D3.2, defining the fine detail of the integration of the PE within the PAPAYA Platform.

4.3.6 Meetings/calls in WP3

Date	Location	Reason
12-13 June 2018	Sophia-Antipolis	Project Kick-off meeting
1 August 2018	Conference call	Monthly WP3 meeting
5 September 2018	Conference call	Monthly WP3 meeting
3 October 2019	Conference call	Monthly WP3 meeting
7-8 November 2018	Haifa, Israel	General Assembly Meeting , WP3 session
5 December 2018	Conference call	Monthly WP3 meeting
15 January 2019	Conference call	Monthly WP3 meeting
12 February 2019	Conference call	Monthly WP3 meeting
5-6 March 2019	Madrid, Spain	General Assembly meeting, WP3 session

4.4 Work Package 4: Platform Design and Development

WP Leader: IBM

Contributors: ATOS, EURC, KAU, IBM, ORA

4.4.1 Progress towards the objectives

We started by identifying the main components of the PAPAYA platform and their relationships. In addition, we identified all technologies needed to implement the platform. The next step is to write up all this in the corresponding deliverable D4.1 (due at M15) and to verify that the resulting designs meet the requirements defined in D2.2.

4.4.2 Deviations

Some of the partners, namely EURC, KAU and MCI consumed fewer resources on WP6 than expected in the work plan for the first year of the project. This is explained by the fact that the work was more focused on task T6.1 Dissemination and Communication, rather than tasks T6.2 on Exploitation and T6.3 on Market Analysis and Business Plan. Since in year 1, the PAPAYA results were still in progress, their exploitation could not yet be achieved, which explains the unbalance between the three tasks. To compensate the current underspending, partners will spend more resources on WP6 during year 2 and year 3, which coincides with more involving actions towards dissemination and exploitation of PAPAYA results, once they are mature enough. Besides, KAU has in year 1 focused on the requirement elicitation, which resulted in the D2.2 deliverable. Results from this work will be refined to be published as scientific papers in project year 2.

4.4.3 Task 4.1: Design models and architecture

Task Leader	IBM
Contributors	ATOS, EURC, IBM, KAU, ORA
Overall task progress	We identified generic usage scenarios for PAPAYA platform, as well as all the technologies we plan to employ to implement the platform and to support the usage scenarios. In addition, we defined the main software components of the platform and specified where and how they will be deployed and how they will interact with each other. We are writing up all this in the deliverable D4.1 to be submitted in M15. To summarize, the task is progressing well and will be completed on time.
Work carried out by beneficiaries (M1-M3)	WP4 has not started yet.
Work carried out by beneficiaries (M4-M6)	IBM: we started working on the PAPAYA architecture ATOS: Defining initial drafts of the Architecture of the PAPAYA framework, including the PAPAYA platform with the other PAPAYA components of the PAPAYA framework.
Work carried out by beneficiaries (M7-M9)	EURC: Contributions to the potential architecture, identification of players with respect to WP3 solutions IBM: First draft of the Functional design and architecture of the platform. In particular, we specified the main components of the platform and their

	relationships. Also, we identified all required technologies to implement the platform. ORA: Study on the integration of the PAPAYA platform in the use case architecture. ATOS: Defining initial drafts of the Architecture of the PAPAYA framework, leading the integration of the PE, KM and IAM services
Work carried out by beneficiaries (M10-M12)	EURC: EURECOM is contributing to the design of the architecture by taking into account WP3 primitives and their design. KAU: Contributions to the platform design discussions IBM: Functional design and architecture of the platform ORA: Feedback on the platform architecture, with respect to use cases (UC3 UC4)

4.4.4 Task 4.2: Development of the platform and integration of PETs

Task Leader	IBM
Contributors	ATOS, EURC, IBM, KAU, ORA
Overall task progress	ATOS and KAU has started to identify the requirements for the integration of the PE and the auditing tool, respectively.
Work carried out by beneficiaries (M1-M3)	WP4 has not started yet.
Work carried out by beneficiaries (M4-M6)	ATOS: Defining the initial interfaces of the Privacy Engine to be integrated within the rest of the PAPAYA components
Work carried out by beneficiaries (M7-M9)	ATOS: Defining the initial interfaces of the Privacy Engine to be integrated within the rest of the PAPAYA components
Work carried out by beneficiaries (M10-M12)	ATOS: Defining the initial interfaces of different components develop by Atos KAU: Work on auditing requirements and implementation.

4.4.5 Task 4.3: Dashboard for the platform

Task Leader	KAU
Contributors	ATOS, EURC, IBM, KAU, ORA
Overall task progress	The design of the different dashboards for the platform is progressing as planned. Notably, we have an understanding of how to fit the different dashboards into the overall architecture. The data subject toolbox is our answer to how to best provide a usable data subject dashboard tied to the platform.

Work carried out by beneficiaries (M1-M3)	WP4 has not started yet.
Work carried out by beneficiaries (M4-M6)	WP4 has not started yet.
Work carried out by beneficiaries (M7-M9)	KAU: work on dashboard requirements and design. ATOS: Working on communications with the partners involved on the development of the dashboard to establish the initial interfaces between the different components involved
Work carried out by beneficiaries (M10-M12)	KAU: Continuous work on dashboard requirements and design. ATOS: Working on communications with the partners involved on the development of the dashboard for the integration of the common components developed by Atos (PE, IAM, KE and PE)

4.4.6 Meetings/calls in WP4

Date	Location	Reason
7-8 November 2018	Haifa, Israel	General Assembly Meeting, WP4 session
6 December 2018	Conference call	biweekly WP4 meeting
17 December 2018	Conference call	biweekly WP4 meeting
14 January 2019	Conference call	biweekly WP4 meeting
28 January 2019	Conference call	biweekly WP4 meeting
11 February 2019	Conference call	biweekly WP4 meeting
25 February 2019	Conference call	biweekly WP4 meeting
5-6 March 2019	Madrid, Spain	General Assembly meeting, WP4 session
8 April 2019	Conference call	biweekly WP4 meeting

4.5 Work Package 6: Dissemination and Exploitation

WP Leader: ORA

Contributors: All

4.5.1 Progress towards the objectives

Dissemination and Exploitation is a transversal work package that covers the entire implementation of the project and aims at creating awareness of the project and its results and at maximizing the impacts of the project towards the relevant stakeholders.

During Year 1, attention was clearly focused on task T6.1 (Dissemination and Communication). During this period, two deliverables, namely D6.1 (Public Project Website) and D6.2 (Dissemination and Communication Plan), were delivered on time, respectively at M3 and M6. D6.1 is related to PAPAYA's website (https://www.papaya-project.eu/), delivered along with a paper document describing its design. D6.2 defines the strategy that the Consortium is adopting with respect to communication and dissemination, and identifies the target communities. The implementation of this strategy during Year 1 consisted of several activities (scientific publications, participation and organization of events, synergies with other projects, web presence, etc.). All these activities are reported in Section 4.

Even though we were more focused on T6.1, we nevertheless started to work on the two other tasks, namely, T6.2 (Exploitation) and T6.3 (Market Analysis and Business Plan). The objectives of T6.2 consist in using the PAPAYA results to create value within all participating organizations. Accordingly, the use cases partners (MCI and ORA) defined their respective use cases with respect to the potential exploitation of the PAPAYA results (WP2 and especially deliverable D2.1, delivered at M12). Besides, the initial work on Innovation Management (task T1.3 and especially deliverable D1.2 on Innovation Strategy and Plan, delivered at M6) supports the work in T6.2, in the sense that innovation management drives an effective exploitation strategy for PAPAYA. Namely, D1.2 identifies the potential stakeholders of PAPAYA results and unfolds the innovation strategy that will feed the exploitation activities. On the other hand, T6.3 aims at identifying a potential market interest for PAPAYA and possible market segments. It also defines a business plan that will lay the foundations for a successful exploitation of the PAPAYA outcomes. As in the case of T6.2, some initial market and business considerations were investigated in D1.2.

4.5.2 Deviations

N/A

4.5.3 Task 6.1: Dissemination & Communication

Task Leader	ORA
Contributors	All
Overall task progress	M3 and M6 deliverables were delivered on time. The PAPAYA partners were involved in multiple and various dissemination and communication activities, creating awareness about the project.
Work carried out by beneficiaries (M1-M3)	D6.1 PAPAYA website (ATOS, ORA) Presence in social media platforms (ORA) Communication material: ○ Logo (EURC, ORA) ○ Templates (EURC, KAU) ○ Announcement letter (EURC, ORA) Information about PAPAYA on partners' website (MCI, ORA, ATOS)

	Interview with TeraLab to present the project (EURC) Interaction with PoseID-on project (EURC, KAU)
Work carried out by beneficiaries (M4-M6)	D6.2 Dissemination plan (ALL) Scientific publication and presentation at DPM workshop 2018 (EURC) PAPAYA flyer (EURC, ORA) Participation to events: ○ AMUSEC, cybersecurity forum (EURC) ○ PoseID-on event (EURC) SMAU 2018, innovation fair (MCI)
Work carried out by beneficiaries (M7-M9)	Participation to events: ○ ISSE 2018, security event (ATOS) ○ European Big Data Value Forum (ATOS) ○ AEGIS Cyber Round Table (ATOS) Participation to Program Committee of Special Track for CBMS 2019 (KAU, EURC, ORA) Interaction with FutureTPM, PROMETHEUS and ASTRID H2020 projects and initial thoughts to organize a joint workshop (EURC, ORA) Publication and poster presentation at ICT.OPEN 2019 (EURC) Refining and updating the PAPAYA website content and functionality (ATOS)
Work carried out by beneficiaries (M10-M12)	Interview with Cylon to present the project (EURC) Participation to events: ○ Poster presentation at EURC's scientific council (EURC) ○ Swedish Forum of Data Protection 2019 (KAU) ○ Poster presentation at ICT.OPEN 2019 (EURC) ○ Program Chair of IFIP Summer School on Privacy and Identity Management ○ Community of Users event 2019 (MCI) ○ Salon de la Recherche, research event (ORA) IBM: interaction with different bodies in IBM to interest them in potential PAPAYA outcomes. KAU presented PAPAYA in a Master course at Karlstad University. ORA: Different kinds of dissemination activities, especially related to Twitter and LinkedIn accounts, and website (in relation with Atos). Participation to the Orange Research Show with our demonstrator of privacy-preserving ECG analysis based on neural network and Fully Homomorphic Encryption. ATOS: Fine-tuning and refining the website functionality. Updating the website with the provided content. Attending to events presenting the PAPAYA project concepts and main results.

4.5.4 Task 6.2: Exploitation

Task Leader	ORA
Contributors	EURC, IBM, MCI, ATOS
Overall task progress	Initial considerations with respect to exploitation were investigated both in the definition of the use cases (in relation with WP2) and in the definition of the innovation strategy (in relation with T1.3). The work on D6.4 (intermediate business plan and exploitation report) has started, with ORA proposing a table of contents and a list of items that should be integrated in the document.
Work carried out by beneficiaries (M1-M3)	MCI: The definition of use cases leads to start to study potential exploitable assets (ORA, MCI).
Work carried out by beneficiaries (M4-M6)	ORA: First thoughts about the exploitation of use cases and PAPAYA platform.
Work carried out by beneficiaries (M7-M9)	ORA: The work on D6.2 has started, with a list of items that should be integrated into this deliverable, together with a sketch of table of content for this deliverable.
Work carried out by beneficiaries (M10-M12)	IBM: Promoting potential PAPAYA outcomes to IBM security products ORA started to work on exploitation report (D6.4) and proposed a structure for it. D6.4 will also contain the outcomes of T6.3.

4.5.5 Task 6.3: Market Analysis and Business Plan

Task Leader	MCI
Contributors	All
Overall task progress	MCI initiated a roadmap for the execution of T6.3. In particular, the market analysis and the business plan must take into account the outcomes of T1.3 and the monitoring questionnaire and the requirements issued from WP2. Besides, monthly conference calls are planned towards the end of Y1 or beginning of Y2.
Work carried out by beneficiaries (M1-M3)	N/A
Work carried out by beneficiaries (M4-M6)	MCI: First definition of stakeholders and valuable assets (in relation with T1.3) ORA: First thought about the business plan related to use cases and PAPAYA platform (in relation with T1.3).
Work carried out by beneficiaries (M7-M9)	MCI: Definition of valuable and exploitable assets per each partner (in relation with T1.3) ORA: Interaction with MCI to prepare the business plan for D6.2.

Work carried out by beneficiaries (M10-M12)	MCI and ORA proposed a model of document for the business plan (business model canvas).

4.5.6 Meetings/calls in WP6

Date	Location	Reason
12-13 June 2018	Sophia-Antipolis, France	Project Kick-off meeting
06 August 2018	Conference call	Discussion on M1-M6 dissemination activities and on D6.2 Dissemination plan content
7-8 November 2018	Haifa, Israel	General Assembly Meeting, WP6 slot
5-6 March 2019	Madrid, Spain	General Assembly meeting, WP6 slot

5 Deliverables, Milestones & Risk Management

5.1 Deliverables

Table 9 shows the status of all year 1 deliverables. As shown in this table, all deliverables were submitted on time. D1.1 was updated later on according to the Project Officer's feedback providing more information on the project's milestones.

Table 9 PAPAYA Year 1 deliverables

Del. No.	Deliverable Name	WP No.	Editor	Type	Diss. Level	Due Date	Actual Delivery Date	Status	Comments
D1.1	Project Handbook	WP1	EURC	R	CO	M3	30/07/2018	Submitted on time	Updated on 25/09/2018 according to the P.O's feedback
D6.1	Public Project Website	WP6	ATOS	DEC	PU	M3	30/07/2018	Submitted on time	No further comments
D1.2	Innovation Strategy and Plan	WP1	MCI	R	CO	M6	31/10/2018	Submitted on time	No further comments
D6.2	Dissemination and Communication Plan	WP6	ORA	R	PU	M6	31/10/2018	Submitted on time	No further comments
D7.1	POPD Requirement No:2	WP7	EURC	Ethics	CO	M6	31/10/2018	Submitted on time	No further comments
D7.2	H Requirement No:5	WP7	EURC	Ethics	CO	M6	31/10/2018	Submitted on time	No further comments
D1.3	First Project Progress Report	WP1	EURC	R	CO	M12	30/04/2019	Submitted on time	No further comments
D2.1	Use case specification	WP2	MCI	R	PU	M12	30/04/2019	Submitted on time	No further comments
D2.2	Requirement Specification	WP2	KAU	R	PU	M12	30/04/2019	Submitted on time	No further comments
D3.1	Preliminary Design of Privacy preserving Data Analytics	WP3	EURC	R	PU	M12	30/04/2019	Submitted	No further comments

5.2 Milestones

Table 10 describes the status of the project with respect to the project's milestones as defined in the DoA and the internal milestones as defined in deliverable D1.1.

Table 10 PAPAYA Year 1 milestones

MS No	Milestone title	Related WP(s) & Due Date	Means of achieved verification	Status	Comments
MS1	Use Case definition and consolidated requirements	**WP2, M12**	**MS1-1, M4** UC definitions v1	Achieved	UC1 & UC3 defined
			MS1-2, M6 Platform requirements v1, UC definitions v2	Achieved	All UCs defined, Platform requirements v1 provided
			MS1-3 M8 User requirements v1, Platform requirements v2, UC definitions final.	Achieved	User Req. v1 defined, Interviews scheduled
			MS1-4, M12, Delivery of D2.1 and D2.2	**Achieved**	**D2.1 & D2.2 submitted on time**
MS2	PAPAYA platform architecture description	WP4, M15	**MS2-1, M12** SotA analysis of selected platform technologies	Achieved	This analysis will be reported in D4.1
			MS2-2, M15 PAPAYA architecture, D4.1	ongoing	
MS3	PAPAYA analytics implementation	WP3, M24	**MS3-1, M6** SotA analysis v1	Achieved	SotA on cryptographic building blocks provided
			MS3-2, M12 SotA analysis v2, PAPAYA PETS v1, D3.1	Achieved	D3.1 delivered and includes SotA analysis and PAPAYA PETs
			MS3-3, M24 PAPAYA PETS v2, D3.3	ongoing	
MS4	PAPAYA transparency method description	WP3, M24	**MS4-1, M6** SotA on visualisation	Achieved	SotA analysis on visualisation tools is finalized
			MS4-2, M15 Identification of Risk management artefacts (D3.3)	ongoing	
			MS4-3, M24 Privacy preferences, Artefact visualisation(D3.4)	ongoing	

5.3 Risk Management

Table 11 overviews the identified risks and their status at year 1.

Table 11 PAPAYA status on risk management

Risk No	Risk Description & Initial level of Likelihood	Related WP(s)	Proposed mitigation measures (DoA)	Risk Status	Comments
RT1	Requirements are too ambitious and cannot be met. (*Low)*	**WP2, WP3, WP4, WP5**	The project will keep requirements in line with the objectives, and leaders of WP3 and WP4 will constantly review the requirements.	*Low*	D2.2 has defined a list of legal, HCI and platform requirements that are in line with the objectives. Both WP3 and WP4 members reviewed this list and defined acceptance criteria for each requirement.
RT2	Some use cases are discovered to be limited. *(Low).*	**WP2, WP5**	All partners will take part in the definition and the review of the use cases. Complementary adjustments can be made continuously during the project and reviewed at the WP5 start time. Interaction with operational team by industrial use case partners will additionally be done all along the project	*Low*	D2.1 defines a set of 5 general use cases illustrating the four usage scenarios defined in the DoA. These use cases cover different architecture settings and different machine learning algorithms.
RT3	Failure to implement one or more primitives in a real setting *(Medium).*	**WP3, WP4, WP5**	WP3 partners will focus on most important requirements and innovative aspects and define a two-phase validation procedure in order to early detect any possible difficulties	*Medium*	The implementation of some of the PAPAYA privacy preserving data analytics has already started. For example, the single source privacy preserving neural network classification primitives have already been shared with use case partners.
RT4	Delay in the development of the platform (*Low).*	**WP4**	The work by WP3 and WP4 will continuously be monitored which will allow identifying any possible delays and hence taking the necessary corrective measures such as focusing on key primitives that can be validated by case studies.	*Low*	At this stage of the project, there is no delay in the development of the platform.
RT5	Time for development is underestimated (*Medium).*	**All WPs**	The project will focus on the core functionalities that can illustrate the key innovations of PAPAYA.	*Medium*	At this stage of the project there is no deviation with respect to the time for development. MCI will also join integration tasks.

RM1	Some potential conflicts regarding authorship or exploitation (*Low)*	**WP1**	The IPR strategy is defined in WP1 and provides a framework for managing authorship and results exploitation involving all partners. An early detection of such an issue will be done thanks to close and good contacts and frequent meetings.	*Low*	At this stage of the project, there are no conflicts among partners. Different innovation assets and their owners have already been defined.
RM2	Allocated resources are not sufficient (*Medium)*	**WP1**	Depending on shortage e.g. skills, expertise, etc. redistribution of the effort/costs can be proposed	*Medium*	At this stage of the project there are no significant deviations with respect to resources.
RI1	Project objectives lose relevance (*Low)*	**WP1, WP6**	T1.3 will produce an innovation strategy at the early stage to evaluate market trends. Industrial partners will bring their competences and will monitor and adapt the results in order to ensure the relevance of the solutions.	*Low*	D1.2 already describes the innovation strategy (Task T1.3) and has reported on the study of market trends at the early stage of the project. Hence, at this stage of the project, its objectives do not lose relevance.
RI2	Results produced by PAPAYA are not well exploitable (*Low).*	**WP6**	T1.3 on innovation management will continuously monitor the market trends to influence WP action plans on time to redesign or incorporate new requirements. The presence of major industrials as well as partners that are key stakeholders allows PAPAYA to cover the complete value chain which in turn guarantees a variety of exploitation tracks.	*Low*	Discussions on the exploitation report (M18) have been initiated. Each industrial partner has then started to think about its own exploitation, in term of platform and/or use case, taking as input the work that has been done during the project proposal.