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Architecture for Scalable, Self-human-centric, Intelligent, Secure, and Tactile next generation IoT

assist-iot

D2.2 – Data Management Plan

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Work Package	WP2		

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26-Feb-2021	0.2	Addition of a section devoted to GDPR
26-Mar-2021	0.3	First version with all sections fulfilled. Integration of sections from CERTH, PRO. Document sent to SRIPAS for fine-tuning.
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Key Data

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Executive Summary

This Data Management Plan (DMP) is written in the framework of WP2 – Project Coordination and Management of **ASSIST-IoT** project under Grant Agreement No. 957258. The document is a guide to the data management procedures attached to Findable, Accessible, Interoperable, Reusable (FAIR) management principles. This document identifies the main points to be monitored and the main actions to be performed over the data handled in **ASSIST-IoT**.

DMP outlines the measures that ASSIST-IoT project is putting in place in order to meet the recommendations with resect to EU Horizon 2020 to accomplish FAIR data management and contributing also to the Horizon 2020 pilot action on open access to research data pilot. ASSIST-IoT selected this option in the Grant Agreement. The plan is considering the protection of personal data and business confidential information.

The document reviews which type of data sets will be accessed, processed and/or generated in ASSIST-IoT. The instructions for identification, retention and storage of those are also provided. The documents, software assets and publications generated by the project and made public are described in this deliverable.

ASSIST-IoT commits to make most data sets publicly available (scientific articles, deliverables, software assets) in open repositories (such as official project website, Zenodo or Researchgate) with a Document Object Identifier (DOI) and following open licensing (a type of Open Source Software License, Apache 2.0, GNU GPL or others, that enables distributing of the results to the community), correspondingly. Exceptions will be made for those results protected by Intellectual Property Rights, which will be further studied later in the project.

Iterative reviews of this plan (and advances on data identification) will be reported in the deliverables related to Risk Management.

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List of acronyms

Acronym	Explanation
AB	Advisory Board
AI	Artificial Intelligence
API	Application Programming Interface
AR/VR/MR	Augmented Reality / Virtual Reality / Mixed Reality
CA	Consortium Agreement
CERIF	Common European Research Information Format
CI/CD	Continuous Integration / Continuous Development
CMS	Customer Management System
CRUD	Create-Read-Update-Delete
DLT	Distributed Ledger Technology
DM	Data Manager
DMP	Data Management Plan
DMZ	Demilitarized Zone
DOI	Document Object Identifier
DPO	Data Protection Officer (less usual -and specified when- Data Project Officer)
DRA	DOI Registration Agency
EC	European Commission
EEA	European Economic Area
EM	Ethics Manager
FAIR	Findable, Accessible, Interoperable, Reusable
GA	Grant Agreement
HTTP	Hyper Text Transfer Protocol
IE	Innovation Element

IM	Innovation Manager
IoT	Internet of Things
IPR	Intellectual Property Rights
KER	Key Exploitable Result
N/A	Not Applicable
ORDP	Open Research Data Pilot
PC	Project Coordinator
PCC	Project Coordination Committee
PIC	Project Implementation Committee
PO	Project Officer
RIA	Research and Innovation Action
SDO	Standard Developing Organisation
SotA	State-of-the-Art
SSL	Secure Sockets Layer
TLS	Transport Layer Security
URL	Unified Resource Location

1. About this document

The scope of this deliverable is to deliver the Data Management Plan (DMP) for ASSIST-IoT. The DMP describes the data management life cycle for the data to be collected, processed and/or generated by the results of the research in the project. This document also covers the steps and procedures for the data management strategy to be applied throughout the whole duration of ASSIST-IoT. Results of the research of the project can be categorised as follows:

- Project deliverables.
- Scientific publications.
- Contributions to standards.
- Software and Applications.
- Data (often traces) collected for analysis and evaluation.
- Pilot results datasets

1.1. Deliverable context

Table 1. Deliverable context

Keywords	**Lead Editor**
Objectives	N/A
Exploitable results	Although not directly generating any Key Exploitable Result, this deliverable is crucial for the creation of ASSIST-IoT assets, as it outlines how they will need to be tagged with metadata and IPR guidelines, as well as result datasets management.
Work plan	This deliverable is the first version of DMP, falling directly under the scope of task *T2.3 – Data, knowledge and IPR management*.
Milestones	N/A
Deliverables	This deliverable will be continued (updated and enhanced) in the deliverables associated to Risk Management (D2.5, D2.6, D2.7). All WP9 deliverables, as well as software artifacts will need to comply with the provisions set out in this deliverable.
Risks	Even not related directly to any of the Risks identified in the proposal, not following this Data Management Plan could imply certain IPR risks or further troubles related with the use and dissemination of data.

1.2. The rationale behind the structure

The content of the deliverable is organised according to the template for DMPs provided by the European Commission to align with FAIR Management principles.

Section 2: Data summary aims at describing which type of research data will be collected, processed and/or generated in ASSIST-IoT, providing overall information about their types, formats, origin, utility, etc. **Section** ¡Error! No se encuentra el origen de la referencia. is the core of the document. It analyses how ASSIST-IoT's DMP will be compliant with FAIR management principles. It explains how the project plans to make data findable, accessible, interoperable and reusable, digging into the IPR, management procedures, etc. **Section 4** focuses on the day-to-day operative to be conducted in ASSIST-IoT with regards to Data Management, specifying the workplan relation and partners in charge of controlling the procedures. **Section 5** relates how far ASSIST-IoT is committing to the ORDP pilot. Section 6 provides the template for research data set description that will be used during the project. **Section 7** specifies the mechanisms to be put in place for guaranteeing security in the storage of research datasets in ASSIST-IoT. **Section 8** properly references how the personal data generated in the project will be managed, pointing to corresponding deliverables. **Section 9** reflects on Ethical aspects in general, drawing from task T2.4 of the project. Finally, **section 10** outlines the future work for the DMP, indicating the forthcoming versions of the document following a reasoned timeline.

2. Data Summary

ASSIST-IoT aims at designing, implementing and validating an open, decentralized reference architecture, associated enablers, services and tools, to support human-centric applications in multiple verticals. Instances of the architecture will be supported by key enablers, like edge/fog computing, (semi-)autonomy, distributed AI, smart devices, interoperability, Distributed Ledger Technology (DLT) atop a smart network infrastructure, with low latency capabilities, allowing execution of context-aware applications with new interaction interfaces (e.g. AR/VR/MR), etc. The solution will integrate AI-based functions transferring intelligence closer to the edge (data sources), including devices. The reference architecture will be validated in three realistic pilots: (i) port automation; (ii) smart safety of workers, and (iii) cohesive vehicle monitoring and diagnostics.

ASSIST-IoT is committed to the creation of a blueprint architecture for next generation of Internet of Things, avoiding traditional centralized paradigms and cloud-based hierarchy, instead embracing distributed approach that allows scalable transference of processing power, intelligence and self-management closer to the edge. Moreover, thanks to change of paradigm from a centralized platform to a decentralized network grid of edge nodes, ASSIST-IoT will create novel seamless human-system interactions that will use beyond-SotA, interfaces (e.g. haptic ones) that have very strong requirements in terms of low latency and contextual awareness. Beyond this objective, ASSIST-IoT will provide methodology supporting implementation of this architecture. To validate the architecture, supporting tools, and the methodology, ASSIST-IoT will be instantiated in three real-world pilots with several scenarios to demonstrate feasibility of action results for future IoT. The following sub-sections provide an overview of progress beyond SotA, resulting from completing the action.

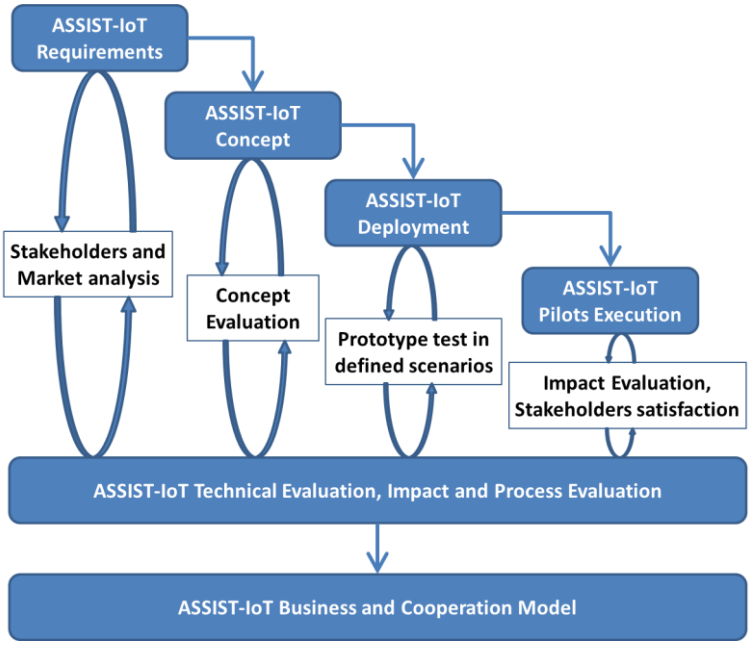

Figure 1. ASSIST-IoT evolution procedure related to Data Management

The exploitation commitment of the **ASSIST-IoT** partners, and the project's innovative results will require a careful planning of IPR issues. The **ASSIST-IoT** Consortium will adopt the applicable IPR directives and regulations for Horizon 2020 by applying the principle of equality of all the partners towards the foreground knowledge and in full compliance with the general Commission rules.

As a Research and Innovation Action (RIA), data will be collected from existing sources like scientific publications, open access datasets and standards, and generated by project partners or throughout project activities. The motivation for this is to facilitate the technological evaluation proposed by ASSIST-IoT and support its trials evaluation and showcase in the three pilots. Only data required to achieve the projects objectives will be collected, processed and/or generated. Additionally, as per the usual functioning of a Research and Innovation project, the execution of the work plan will generate research results that will need to be properly handled to comply with EC regulations and the commitments made through the Grant Agreement.

A list of planned and expected **research data sets** to be collected, processed and/or generated in ASSIST-IoT is presented below:

- **Project deliverables.** Besides being contractual commitments, the deliverables of the project will constitute the major bulk of research results (in terms of documents and proof of execution) of ASSIST-IoT. Therefore, they must be properly managed and tagged, making them widely accessible and easy to find for other researchers and general public. Most deliverables in ASSIST-IoT have been set as Public as their dissemination type, only remaining private (therefore, not findable) those of WP1. Those public will be accessible on the official website of the project, in the tab: https://assist-iot.eu/deliverables/. The timing will depend on diverse aspects, mainly related to the review from the EC reviewers and PO. For the cases that the deliverables were not yet accepted, an explanatory footnote will be included. The format will always be PDF and markers will be enabled for facilitating navigation and search. All documents will be properly referenced.

- **Scientific publications:** the scientific publications, mainly scientific papers, created by the consortium members, will contain technical results from ASSIST-IoT advances. This is a very important part of the research activities of the project, being conducted under a specific task in WP9 (T9.2). These results may be varied ranging from event/congress' proceedings, journal papers, posters, pitches/interventions. As indicated since the proposal stage, ASSIST-IoT will look for Open Access publications whenever possible. In the case of not possible (restricted), ASSIST-IoT will comply with the Green Open Access approach, i.e. making available a self-archiving, pre-print copy of the publications.

- **Other publications and outputs:**

  Besides the scientific publications mentioned above, e.g. in journals or conference proceedings, it is expected that the project will generate further publications and other project outcomes, such as:

  - Promotion material (brochures, flyers, posters, etc.).
  - Press releases and further project announcements.
  - White papers created by the consortium on particular subjects.
  - Information regarding the open call.
  - Any further publication generated by the project.

  For those, it is planned to be made available via the ASSIST-IoT website and, if needed, on external public repositories (see in sections below).

- **Contribution to standards:** standardisation constitutes an important dissemination activity in ASSIST-IoT, having assigned a specific task (T9.3, led by OPL) and directly targeted in the Objective O8 of the project. It aims to contribute to the activities in major international standardisation bodies like IEEE, ITU-T or ETSI, as well as other relevant groups/initiatives. The collaboration with these entities may generate pre-normative documents or ASSIST-IoT specifications that will be needed to manage as research result datasets, falling under the scope of DMP. ASSIST-IoT's main aim is the creation of a blueprint/reference architecture, so this contribution (in its formal delivery) will need to be also considered in this category, directly mapping to several challenges of the project.

- **Software and applications:** ASSIST-IoT plans to develop and test several enablers additionally to the architecture basis of ASSIST-IoT solution. Besides the source code and binaries, documentation of the developed applications, their specifications, and other related material will be available in the project deliverables. The technical provisions (code, Docker images and other) will be made available in prominent open communities like GitHub. The previous will be tightly subject to IPR and exploitation analysis that will take place later in the project.

- **Open pilot datasets**. Some of the datasets used in the pilots (e.g. images, sensors' data) may be made available to the open call projects to provide enablers upon or even to the wide public for experimentation. Although this will be a matter of willingness from stakeholders and data owners, the

DMP will need to consider handling these cases. These datasets may include results consisting of conclusions extracted from the application of AI mechanisms (e.g. inference of events classification depending of data input).

- **Data collected for analysis and evaluation.** A series of datasets may be generated during the project out of the interviews/feedbacks/works with different people/entities. For instance, a series of recommendations from the AB or the results of a survey conducted by experts in related fields. These results may be published separately (not only in deliverables, or not at all in them). The DMP will also need to specify how to handle the publication of such datasets.

The provisions above are preliminary, subject to be enhanced in forthcoming updates of the DMP. At the current point of the project (M6 – April 2021), it is not possible to identify, tag, catalogue and thoroughly explain all research datasets to be handled in ASSIST-IoT. Therefore, in later versions of the DMP (via the Risk Management deliverables – D2.5, D2.6, D2.7), the following information will be included, both for the listed items and for additional datasets to be identified:

- Origin of each dataset
- IPR of each dataset
- Size of the dataset
- Exact format of the dataset
- To whom could each dataset be useful

The information on the previous points will be gathered per each type of dataset following the template described in Section 6.

3. FAIR Management Principles in ASSIST-IoT

The FAIR Data Management principles aim at describing how the results (in terms of data sets) of a research should be organised in order to facilitate discovery and re-usability from other researchers. The FAIR data guidelines in the context of EC-funded projects were updated by the Commission in 2016[1].

The rationale behind adopting these principles is to create research results with longevity in mind, attaching them with metadata that will help other researchers to gain knowledge leveraging it, improving outreach and transparency.

3.1. Making data findable, including provisions for metadata

Before the signature of the Grant Agreement, the partners of ASSIST-IoT elaborated and agreed upon a Consortium Agreement (CA), formalising the interaction among partners in a sort of "legal guidelines" to be followed. Some of the clauses included in the CA reviewed the procedures under which research results will be published, ownership rules, IPR background and other relevant points.. This document was signed by all partners in November 2020 and it contains several information related to making data findable. In particular, section 8 (Results), section 9 (Access Rights) and section 10 (Non-disclosure of information).

For global openly available documentation, ASSIST-IoT will make data findable through an URL. Its publication will be made via website of the project (https://assist-iot.eu) or via other open repositories such as Zenodo or other channels of the project (e.g., Researchgate). Every document made public will be backed up at ASSIST-IoT's own private repository.

Whenever possible, the documents will be uploaded (as research results) to the portal Zenodo, with enough metadata provisions. The metadata standard preferred by ASSIST-IoT is CERIF, in particular instanced by the reference OpenAIRE. Zenodo is an OpenAIRE-compliant[2] repository, therefore efforts will be made for

[1] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf
[2] https://www.openaire.eu/zenodo/

procuring dissemination via this way (specially at the end of the project). The Project Coordination, altogether with the Dissemination Manager and Data Manager will oversee this procedure.

Additionally, the **scientific publications** (papers) will be openly available by means of an own instance of a Digital Object Identifier (DOI) repository. A DOI is a character string used to uniquely identify an object such as an electronic document. Metadata about the object is stored in association with the DOI name and this metadata may include a location, such as a URL, where the object can be found. The DOI for a document remains fixed over the lifetime of the document, whereas its location and other metadata may change. Referring to an online document by its DOI provides more stable linking than simply referring to it by its URL, because if its URL changes, the publisher need only update the metadata for the DOI to link to the new URL. A DOI name differs from standard identifier registries such as the ISBN and ISRC. The purpose of an identifier registry is to manage a given collection of identifiers, whereas the primary purpose of the DOI system is to make a collection of identifiers actionable and interoperable.

Some scientific papers produced out of ASSIST-IoT research results will have DOIs assigned by the editorial companies (e.g. IEEE, Elsevier or Springer. Others will be assigned a DOI by the portals/entities managing the repository, such as Zenodo, RiuNet or Researchgate. However, others (the least) may require that ASSIST-IoT Consortium obtains the identifier. To get a DOI, the Consortium (via the Project Coordinator, Dissemination Manager, Innovation Manager and Data Manager) will use the service offered by a DOI Registration Agency (DRA). DRAs collect metadata, assign DOI names, and offer other services such as reference linking or metadata lookup.

Unique URL identifiers will exist for any ASSIST-IoT dataset made public. This URL will be associated to the corresponding DOI of each data asset. The actual download link of the document will be found int those URLs, so that the archived publications and data can be reached through other websites as well.

ASSIST-IoT Consortium has established a **particular procedure for the creation of documents within the project:**

Table 2. Naming strategy and versioning in ASSIST-IoT documents

Document	Naming strategy
Deliverables	**ASSIST-IoT_DX.Y – [Name] _v0.0**
Example	*D2.1. – Project management and quality handbook_v1.0*
Internal Del. Evaluation	**ASSIST-IoT_DX.Y_ev_[Iterative evaluation number]**
Example	*D2.1_ev_2*
Financial Reporting *(private)*	**ASSIST-IoT_IFR_M[month]_PXX_[Partner Acronym**]
Example	*IFR_M2_P02_PRO*
Technical Reporting *(private)*	**ASSIST-IoT_ITR_Mx-My_ PXX_[Partner Acronym**]
Example	*ITR_M3-M4_P03_XLAB*
Agenda of meetings	**ASSIST-IoT_Agenda_[Type of Meeting]_YYYYMMDD**
Example	*Agenda_Plennary_20180524*
Meetings minutes	**ASSIST-IoT_Minutes_[Type of Meeting]_YYYYMMDD**
Example	*Minutes_WP4_20180524*

Ethical issues ident.: *(private)*	**EI_ PXX_[Partner Acronym] _[It. Number]**
Example	*EI_P14_CERTH_1*
Participant information sheet for Humans *(private)*	**ISH_[Type of Human]_[It. number]**
Example	*ISH_AB_1*
Certificate of informed Consent for Humans *(private)*	**ICH_[Type of Human]_[It. number]**
Example	*ISH_Interviewed_3*
Certificate of consent about personal data and GDPR *(private)*	**ICPD_Entity_[It. Number]**
Example	*ISPD_MOW_1*

Table 1. Naming conventions and templates

Where the following legend applies:

- **Type of meeting**: Acronym for the type of meetings (both physical and by other means) that can be conducted in the project:
  - Plenary
  - AB – Advisory Board meeting
  - *WP#No* – Work Package meetings
  - *TX.Y* – Task meetings,
  - etc.
- **Type of Human**: According to the cataloguing done in D1.1, there are four types of Humans regarding the context of their participation in ASSIST-IoT:
  - Interviewed/external
  - AB
  - Human
  - Open Call representative
- **Entity**: Any entity which is identified and requested to pass through the procedure for personal data protection in the context of ASSIST-IoT. Naming instructions here are more flexible, allowing to indicate any acronym or identification for the entity.

Regarding the version number, in each document is included a table called *history* that describes the date, the version number and a summary of the changes made in the version.

For the registration of data sets (matters of DMP as well), the naming and template can be found in section 6.

3.2. Making data openly accessible

Documents

The list of project deliverables catalogued as Public will be openly available at the section Publications/Deliverables of the ASSIST-IoT website: https://assist-iot.eu/deliverables/ The public project deliverables will be provided for download on the website after their approval by the consortium, submission to EC and approval by EC and external reviewers. However, as agreed with the Dissemination Leader (INFOLYSIS), in order to maximise the reuse of ASSIST-IoT research results, the deliverables will be uploaded to the website just after its submission to the EC with a marker indicating the "provisionality" of the content.

The confidential deliverables will not be available through the website and will be kept internal for the EC-ASSIST-IoT Consortium interaction.

The project deliverables on the website will be provided in the widely adopted PDF format.

Scientific publications will be usually made available for a wide public audience. Restricted access to the publications will be accepted only if there are serious reasons expressed by the consortium members or publishers of the scientific papers, or if there are some restriction issues regarding copyright from the Editorial Company (this will most likely happen, as ASSIST-IoT will be as well publishing articles in non-Open Access journals during the project). In those cases, a strategy of "green open access" will be adopted, consisting of delivering pre-print versions of the paper (before peer-review process). These pre-print versions will be released by ASSIST-IoT in the form of Technical Reports that will be published on the website (https://assist-iot.eu/publications/) and on the Researchgate group (https://www.researchgate.net/project/ASSIST-IoT). Details on the scientific publication process, target journals, conferences and other data of the scientific publication will be properly registered and reported through specific WP9 deliverables (D9.2, D9.5, D9.8) following the corresponding data protection rules.

For any document to be delivered using public repositories, ASSIST-IoT will follow here FAIR data management indications and the ORDP approach in open repositories.

Once a contribution to a standardisation/regulation body from the ASSIST-IoT project is in preparation (e.g. specification pre-normative for IEEE SA), appropriate publication means for the contribution (e.g. its availability in Open Access) will be discussed among the Consortium members, to make the corresponding decision.

Document workspace and documentation

ASSIST-IoT day-to-day work will be carried out, mainly, by an open-source web-based suite of tools named OnlyOffice**.** This free product is available online and, regarding the interest of it in ASSIST-IoT, allows several functionalities that will be useful during the execution of the project.

The features that are comprised in this suite are the following:

- Document edition, CMS
- Document management
- Calendar and tasks, people, community
- Possible to link with Drive, Box, Dropbox, OneDrive, OwnCloud

OnlyOffice instance for ASSIST-IoT consists of the Document Management server (pulled as Docker image) running in a UPV-owned machine hosted in UPV premises, under a sub-domain of the name of the project (https://onlyoffice.assist-iot.eu/). It is hosted with secure protocol web (SSL) and all users have been one-by-one authorised to access with a user-password credential in order to maximise the security of data and to complain with Ethics and quality requirements.

Regarding the daily work of the project, OnlyOffice is planned to take a major role, as the following features of the execution will be managed through the portal:

- Document edition
- Repository of versions
- File sharing

Within the OnlyOffice portal, various members of each partner have an account (associated to their mail) through which they sign in for accessing to the project management framework.

Software repository and documentation

One the most prominent goals of ASSIST-IoT is to develop enablers and test them over the architecture basis in three pilots. Documentation of the developed enablers (descriptors, results, tests, usages, validation) will be included in various deliverables of the project (mentioned about – see Documents). With regards to the software

(code, Docker images, CI/CD tools, DevSecOps tools), it will be managed during the project using a suite of tools that were determined since the very beginning of the project. **Basic tools** (enabling the coordinated development)

- **GitLab:** An allencompassing web tool that incorporates a source code repository based on Git protocol, connection with CI/CD tools, establishment of tasks, workflows and other characteristics. In ASSIST-IoT, the Gitlab portal will be the basic asset to enable collaborative IT work among technical partners. The Gitlab instance in ASSIST-IoT (https://gitlab.assist-iot.eu) is hosted and maintained by CERTH.
- **Docker**: Program enabling virtualization in containers for the particular execution of isolated operating systems or software tools, not depending of the host machine.
- **Kubernetes**:Mechanism that enables the orchestration of containerised microservices. This technology, altogether with other similar (K3s, MicroKubes, FLEDGE, Akri…) will be the basis of ASSIST-IoT deployments.

Rules for the development of code and software will be specified within WP3 and WP6 (architecture provisions and DevSecOps methodology, in particular).

- **Supporting tools** (adjacent to processes, but not essential for coding)
  - **MIRO** has been selected as the visual, collaborative tool for the joint definition of use-cases and scenarios of each pilot and for the elicitation of requirements from stakeholders. More details can be found in deliverable D3.2.
  - **MS Teams:** The tool for managing internal communication in the project, such as chats, groups, teleconferences, calendar. More information can be found in deliverable D2.1.

The tools just exposed will be available for ASSIST-IoT, and in some cases WP leaders will be able to choose whether to use them or not, according to their needs and requirements.

Software assets made public

A central aim of this consortium is to provide benefit to the European member states. ASSIST-IoT commits to integrate all results and products into adequate open-source communities, under the applicable licenses. The proposed license to be used is a type of Open Source Software License, Apache 2.0, GNU GPL or others, that enables distributing of the results to the community and the proposed communities are DockerHub[3] (for docker images) and GitHub[4] (for source code projects).

Some software assets (enablers, enabler components, et.al.) may not be made available through this cannels due to IPR restrictions or potential exploitation usage by owners (ASSIST-IoT partners). The legal and contractual reasons for those potential voluntary restrictions will be provided in forthcoming updates of the DMP (towards the end of the project).

3.3. Making data interoperable

Descriptive documentation will follow the rules that have been adopted for the project, without the specification of any standard. The data, which is in PDF format and is available at the project website, can be used by the general public only if the according law is being accomplished. A detailed table with information about recommended and accepted formats for public data sets provision can be found in Table 4. Types of data

According to the developed software, the interoperability will be determined by the final implementation of the different modules. Originally, each module will provide a REST API (with CRUD functionalities) and a containerization method, so it will be usable and self-contained. The JSON format is recommended for data exchange between the different modules. More details can be found as well in section 7.

[3] https://hub.docker.com/
[4] https://github.com/

3.4. Increase data re-use

Public project outputs such as public deliverables, papers, presentations, and project results will be available on the project website and can be reused by other projects. Some of the contributions of the project will also be available in different Standard Developing Organisations (SDOs). Some of these organisations allow open access to the general public (such as ETSI) while some other allow access only to members (Such IEEE). An indirect access to some of project results will be possible via these standard and technical organisations. However, specific rules apply for each organisation (e.g., ETSI allows access to results but they cannot be reproduced / used without permission). Specific confidential material will require direct licensing from the originating company.

Data produced within ASSIST-IoT and openly published on the website will be useable by third parties, during and after the end of the project. On use, there is a requirement for appropriate attribution back to the ASSIST-IoT project. Any modifications to the original data or results must be indicated clearly. Data will remain accessible for as long as the project website is kept open (5 years after its ending). Data obtained will remain useable indefinitely.

As the Data Management Plan is being released on M6 of the project, information about embargos or when the data will be available for re-use is still unknown. This information will be specified in future versions of the deliverable (via Risk Management deliverables D2.5, D2.6, D2.7) if required.

The data quality including all the review process and risk mitigation for all project outputs are at the time of writing described in the D2.1 - Project Management Handbook, and will be continuously tracked during the course of the project throughout D2.5/D2.6/D2.7 Risk Management documents, scheduled for M9, M18, and M27, respectively.

3.4.1. IPR Management during the project

This section contains information regarding the management plan for Intellectual Property Rights or IPR(s). To this end, the IPR types, the IPR generation process and the management of background and foreground IPRs catalogue in ASSIST-IoT project will be in accordance with the H2020 Grant Agreement and the project's Consortium Agreement (CA). IPRs include patents, patent applications and other statutory rights in inventions; copyrights (including without limitation copyrights in Software); registered design rights, applications for registered design rights, unregistered design rights and other statutory rights in designs; and other similar or equivalent forms of statutory protection, wherever in the world arising or available, but excluding rights in Confidential Information and/or trade secrets. Balancing with one of the main goals of ASSIST-IoT that is the release of every developed component within the project as open source with a type of Open Source Software License, Apache 2.0, GNU GPL or others, that enables distributing of the results to the community (as indicated in the GA), considering always the foreground provided by the partners and stated in the CA corresponding annex, and always considering the protection policies by IPR owners. Therefore, such issues have already been agreed during the elaboration of the proposal to avoid any conflict and have been further detailed within the CA between all project partners.

All the confidential data and IPR will be stored in a secure centralized server repository, where partners will share technical documents and data obtained from the research and testing throughout the project. Task 2.3 and Task 9.4 will ensure that the IPR management strategies are well defined and coherently executed while the PCC will perform the monitoring of the IPR activities and IPR work. The activity of Innovation Elements (IE) generation that can lead to IPR(s) will be actively monitored in Task 9.4. A foreground catalogue will be kept to document relevant information of each determined IE, including:

- IEid
- IE description
- IE type
- Work item(s) where IE is generated
- Background IP elements (by partner)
- Foreground IP element associated

- Partners involved
- Patent(s)
- Ownership
- Access conditions

This catalogue will be accessible by partners in project's repository OnlyOffice page. In addition, standardization and exploitation activities may include foreground IP elements that are contributing to each specific standardization activity and to each market opportunity, respectively. Therefore, the relevant foreground IP elements will also be documented within the standardization and exploitation catalogues.

With regards to its relation with the DMP, certain datasets will be part of IEs, therefore the description of those must be aligned. The Data Manager will be in charge of ensuring this consistency.

3.4.2. Access rights to background and foreground IP

All backgrounds brought to the project were properly registered in the CA and foregrounds created in the project will have to be reported by the project partners claiming the IPR ownership to the Innovation Manager and the Project Coordinator, who will then inform all consortium members. If no objections on the IPR ownership is received from the consortium within a defined period (matter of CA), the IPR will be recorded in the project document repository by the IM. As announced repeatedly across this document, public project results, such as public deliverables, will be made available for wide public for information and research purposes, whereas commercial use of the public results might require particular agreements on related IPR's, as defined in the CA.

3.4.3. Open source and standards

A central aim of this consortium is to provide benefit to the European member states. ASSIST-IoT commits to integrate all results and products into adequate open-source communities, under the applicable licenses. Furthermore, project partners work closely with the standardisation boards and it is planned to bring the working results directly into the international developments. The proposed license to be used is a type of Open Source Software License, Apache 2.0, GNU GPL or others, that enables distributing of the results to the community**.**

4. Allocation of resources

The Data Management Plan execution in ASSIST-IoT will be channelled through task T2.3 - Data, knowledge and IPR management. It started M1 and will last till the end of the project.

The leader of task T2.3 is PRO, which will also hold the role of Data Project Officer (DPO) or Data Manager (DM) of ASSIST-IoT (see next sub-section). Another relevant partner in this regard will be UPV. This institution holds the better position to guarantee security, integrity and reliability of the generated data, because UPV is hosting all the data and has an important security infrastructure. In addition, other key partners (SRIPAS – the Technical Coordinator and CERTH – Ethics Manager) will look for this aspect through the full duration of the project (M1 to M36 is the period of the task).

The estimated total resources devoted to this task are between 6 and 10 PMs from various Consortium partners, thus ensuring enough dedication of personnel towards data management, planning of protection, data security, documentation management, licensing, re-use of information, etc.

Long-term preservation of each dataset will be a matter of discussion during the execution of task T2.3. These will be analysed later in the project.

The Consortium confirms that this allocation seems proper to address compliance to FAIR management rules and ORDP recommendations.

4.1. Data Project Officer

During the writing of the proposal, two governance figures were created following the same acronym: DPO. It is the will of the Consortium partners to slightly amend (not formally, yet) this matter in order to disambiguate the term for the sake of clarity of usage during the project:

- DPO- Data Protection Officer: They are in charge of controlling the application of personal data protection regulation, clauses and practices in the execution of ASSIST-IoT. This figure, in ASSIST-IoT is held individually per entity, meaning that every partner has appointed a DPO for overseeing ASSIST-IoT execution GDPR-compliant. Additionally, each pilot (three in ASSIST-IoT) has appointed a specific PSEM (Pilot Sie Ethics Manager) that will be in charge of ensuring the personal data protection in the execution of the pilot (data generated, data collected about Humans, etc.). This figure falls clearly under the scope of Ethics (task T2.4 and WP1).
- **DPO – Data Project Officer**: They are in charge of overseeing the application of Data Management Plan procedures and steps during the project. He/she is the responsible of supervising the identification of data sets, the maintenance of the repository explained in the DMP and will apply the rest of clauses included in this document. This position is tightly related with the work asked from the Innovation Manager, specially with regards to the IPR registration and protection. This figure falls under the scope of Data Management Plan (task T2.3).

The proposition made at this point is to shift the latter (Data Project Officer) to a finer name: Data Manager. From now on, all mentions to DPO will reference the Ethics-related figure while DM (Data Manager) will reference the Data Project Officer.

PRO as Innovation Manager (**IM**) will be the responsible for data management in the project (**Data Manager**). In particular, the Data Project Officer / Data Manager personal details are:

Angel Martínez Cavero
Research and Development Project Manager
Prodevelop S.L.
Pza. D. Juan de Villarrasa, nº14 – 5
46001, Valencia, Spain
Telephone: +34 963 510 612
Email: amartinez@prodevelop.es

The DM of the project (PRO) is supported in connection to the technical aspects of data storage on the Project's repository system and/or any other tool provided by UPV to the ASSIST-IoT consortium. The person responsible for this support to the DM, the **Technical Support Officer** (TSO) is:

Ignacio Lacalle Úbeda
Research and Development engineer in the Communications Department
Universitat Politecnica de Valencia
Camino de Vera, SN, Edificio 4D, Planta 2
46022, Valencia, Spain
Telephone: +34 91 624 8802
Email: iglaub@upv.es

5. Open Research Data Pilot (ORDP)

According to the very definition by the European Commission: "*The ORD pilot aims to improve and maximise access to and re-use of research data generated by Horizon 2020 projects and takes into account the need to balance openness and protection of scientific information, commercialisation and Intellectual Property Rights (IPR), privacy concerns, security as well as data management and preservation questions*":

ASSIST-IoT indicated (via the markers in Part A) that it will adhere to the ORD pilot. This represents the willingness from the project to provide result data sets as openly available.

During this document (D2.2) and its updates (D2.5, D2.6, D2.7), the Data Manager will be indicating which data sets will finally be included in the ORD pilot and which ones will be protected. This is considered by the Commission, as it recognises that there are good reasons to keep some or even all research data generated in a project closed.

This decision will be tightly related to IPR concerns, exploitation perspectives and data protection.

5.1. ORDP Datasets

At this point of the project (M6), not much analysis has been performed over the data sets that will be processed and generated in ASSIST-IoT. From a preliminary perspective, the following data sets will be prone to be made accessible in open repositories to comply with ORDP:

- Open source software (code, Docker images, deployment descriptors) are planned to be delivered openly using a type of Open Source Software License, Apache 2.0, GNU GPL or others, that enables distributing of the results to the community. Consortium members keep the possibility of opting out in some of those, according to IPR, exploitation plan and data ownership.
- Pilot data for allowing Open Call projects and wide public to experiment. This will apply only to data which are not proprietary or commercially sensitive or do not have any ethical/legal implications will be made available. This is in line with the ORDP whereby a participant can opt out for reasons related to commercial, security or protection of personal data.
- All publications will ideally be made open access type gold (immediately accessible for free) if not certainly type green, in which case will be immediately released after the period of embargo. Note that if a peer reviewed publication contains any commercially sensitive content it will pass through IPR screening before being published and if any publishers are not "open access friendly", ASSIST-IoT can always opt to publish pre-print forms of articles as open access when allowed by the publishing companies. However, it is the commitment of ASSIST-IoT to publish any scientific outcome following the “green open access” approach.

During the execution of the project new data sets could be published. Thus, this list will be considered as a living component (see Section 6) that will be updated by the consortium after approval by the corresponding governance body. Each data set will be released being identified with a DOI.

5.2. Repositories

The description of all the data to be shared with or as part of the ORDP will be placed in a repository (see Section 6). This repository (being stored in secure servers owned by the Project Coordinator) will clearly point to all data entities shared within ORDP so that these can be accessed, mined, exploited, reproduced, etc.

These repositories have to sustain the data value and be safe in legal terms, as well as maintain for as long as possible all the stored data. Preferably, it should support analysis and track data usage, making use of a metadata system for facilitating search and discovery (see 3.1). For this reason, four main repositories will be used:

- Zenodo (https://zenodo.org/) is the repository recommended by the Open Access Infrastructure for Research in Europe (OpenAIRE).
- RiuNet (https://riunet.upv.es/) is an open access repository maintained by Universitat Politecnica de Valencia (UPV).
- ASSIST-IoT website – Publications tab (https://assist-iot.eu)
- For scientific publications, following a green open access approach, those will be also available in Reserarchgate, at group created for ASSIST-IoT (https://www.researchgate.net/project/ASSIST-IoT)

Although during the execution of the project other alternatives will be evaluated and considered.

For internal access (within ASSIST-IoT Consortium) to the data sets, no metadata system will be used, and the data sets will be stored in the document repository of the project (see deliverable D2.1), OnlyOffice instance hosted by the Project Coordinator.

6. Data management monitoring template

The first step for complying with FAIR management principles is a solid identification and registry of the datasets collected, processed and/or generated by ASSIST-IoT. While Section 2 has summarised the global data sets that may appear in the project, the template in Table 3 must be used for thoroughly describing each individual data set in ASSIST-IoT. It aims at representing all the parameters of a data set useful for data management, including size, reusability, metadata, size, etc.

Table 3. Data Monitoring Template for ASSIST-IoT DMP

Reference/name	Deliverables	**Data sharing method**		Public website (section deliverables)
Description	Public deliverables (according to GA) that will be generated during the execution of the project.	**To whom it could be useful**		Researchers, scientific community on the field
Type	Written documentation.	**Targeted audience**	**Size**	5-10 for official review by EC.
Related WPs and tasks	All WPs but WP1, which associated deliverables remain private.		**Description**	European Commission and technical reviewers
Format, standards	*DX.Y – [Name]*	**Possibility of integration and reuse of this data by external users and researchers.** **Is this a reused data set?**		Deliverables are not prone to integration but the information contained in them can be used for further researches (with the proper referencing and IPR respect).
Software	Generated after the writing of ASSIST-IoT partners. Software used can be text editors: MSWord, OnlyOffice or others.			
Estimated size	.	**Possible synergies with similar data**		N/A
Storage	In our secure repository OnlyOffice.	**Back-up**		A mirror server for backup. Backup is done every day (delta changes) and each Sunday (full backup).
Personal data included	Names of authors.	**Means for personal data protection**		Dealt with in CA.
ORDP	Yes/No	**IPR Owner / Data Owner**		Partner P0X YYY
Link where it can be accessed	https://assit-iot.eu/deliverables	**Metadata**	**Yes/No**	Yes/No
			Format	e.g. CERIF, OpenAIRE

The Data Manager (DM) will be in charge of storing (centralised management) this sheet fulfilled per each identified dataset. This duty does not entail the whole work of producing them (that should be distributed among partners), but rather supervising the procedure and keeping the registry updated.

For conducting this management, one spreadsheet has been created in the T2.3 folder of the project's repository. Each data set will be registered and described in new tabs of that spreadsheet.

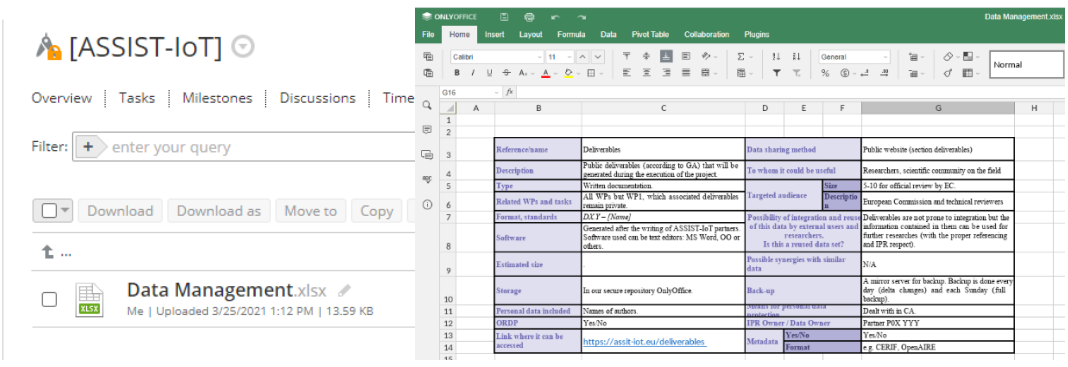

Figure 2. Data Management in centralised repository

7. Data security, storage and curation

The storage and accessibility of public available results of ASSIST-IoT research has been a matter of discussion in sections 3 and 5. Metadata provisions will be included whenever possible for the selected data sets. Additionally, the documents made accessible through the website will be stored in a secured server owned and managed by INFOLYSIS, the WP9 leader and T9.1 (communication) leader of the project.

The sharing of all non-public data within the project is carried out through a team collaboration platform provided by UPV. Access to the platform requires each individual to generate a personal username and password. Passwords are encrypted and only known to the individual herself/himself, i.e., neither the UPV nor the platform provider has access to passwords. Each individual must then be associated to the project space by the UPV administrators in agreement with the PCC/PIC teams. Only once this association has been made, the access to the project space is enabled to the user.

The choice of data formats for both private and shared documents (data sets managed by the DMP) should consider open and non-proprietary formats whenever possible. Long and short-term formats, dissemination and preservation formats must be utilised depending on the purpose, whether to analyse, store and share. Table 4 presents the most relevant formats that are considered for ASSIST-IoT.

Table 4. Types of data

Type	Recommended formats	Acceptable formats
Textual documents	Plain text, ASCII (.txt) XML (.xml) JSON (.json) Adobe PDF (.pdf)	Hypertext Mark-up Language (.html) MS Word (.doc/.docx) Software-specific formats (.odt, .ppt, .yaml)
Databases	Comma-separated values (.csv) MS Excel (.xls, .xlsx) Clear text files (.txt) Machine formats (.json)	• SQL (.sql) Other formats associated to specific database software (e.g.
Image	JPEG (.jpeg, .jpg) GIF (.gif) PNG (.png)	TIFF (.tif, .tiff) Photoshop files (.psd) BMP (.bmp)
Audio	FLAC (.flac) MPEG-1 Audio Layer 3 (.mp3)	Audio Interchange File (.aif) WAV (.wav)
Video	MPEG-4 (.mp4) OGG video (.ogv, .ogg) Motion JPEG 2000 (.mj2)	AVCHD video (.avchd)
Software	Docker images reference JAVA .jar, .war Scripts .sh, .bash, .py Project format following usual practices (https://guides.github.com/features/wikis/)	Other extensions of source code

The platform provided by UPV is OnlyOffice, which is protected by the state-of-the-art security systems. It runs at secure premises behind DMZ and firewall control, besides internal and additional security mechanisms as

SSL server implementation and authorization and access control. It additionally employs an enterprise level backup plan implemented in the event of system failure (i.e., daily delta changes back-up, and weekly full backup on the entire content of the repository). Additionally, security measures will include secure protocols (HTTPS, TLS, and SSL) and login procedures. For example, other endpoints of ASSIST-IoT data are also managed the same way: e.g. ASSIST-IoT website is hosted at secure premises in UPV with privacy and cybersecurity mechanisms embedded. Furthermore, the industrial demo sites will apply monitored and controlled procedures related to the data collection, their integrity and protection.

Finally, long-term storage and curation is planned from ASSIST-IoT coordination and several machines (physical and virtual) are especially reserved to store during and after the execution of the project to handle this request.

8. Data protection

As mentioned, certain personal data may be gathered for diverse purposes in the project (see deliverables D1.1 and D1.2). Such data are protected in accordance with the EU's General Data Protection Regulation (GDPR) (EU) 2016/679 regarding issues about data protection and privacy for all individuals within the European Union (EU) and the European Economic Area (EEA). Details about GDPR and its applicability on ASSIST-IoT are provided in deliverable D2.3.

Seven (7) personal data related key principles are defined within Article 5 of the Regulation. These are not hard rules, but rather embody the spirit of the data protection regime and have very limited exceptions.

They are:

1. **Lawfulness, fairness and transparency** - *personal data shall be processed lawfully, fairly and in a transparent manner in relation to the data subject*
2. **Purpose limitation** - *personal data shall be collected for specified, explicit and legitimate purposes and not further processed in a manner that is incompatible with those purposes; further processing for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes shall, in accordance with Article 89(1), not be considered to be incompatible with the initial purposes*
3. **Data minimization** - *personal data shall be adequate, relevant and limited to what is necessary in relation to the purposes for which they are processed*
4. **Accuracy** - *personal data shall be accurate and, where necessary, kept up to date; every reasonable step must be taken to ensure that personal data that are inaccurate, having regard to the purposes for which they are processed, are erased or rectified without delay*
5. **Storage limitation** - *personal data shall be kept in a form which permits identification of data subjects for no longer than is necessary for the purposes for which the personal data are processed; personal data may be stored for longer periods insofar as the personal data will be processed solely for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) subject to implementation of the appropriate technical and organisational measures required by this Regulation in order to safeguard the rights and freedoms of the data subject*
6. **Integrity and confidentiality** - *personal data shall be processed in a manner that ensures appropriate security of the personal data, including protection against unauthorised or unlawful processing and against accidental loss, destruction or damage, using appropriate technical or organisational measures*
7. **Accountability** - The controller shall be responsible for, and be able to demonstrate compliance with all the principles mentioned above

In addition, articles 13 through 22 define the data subjects' rights, that include:

1. **Right to be informed** – data subjects have the right to be informed about the collection and use of their personal data
2. **Right of access** - data subjects have the right to access their personal data
3. **Right to rectification** - data subjects have the right to have their inaccurate personal data rectified, or completed if it is incomplete

4. **Right to erasure** - data subjects have the right to have their personal data erased
5. **Right to restriction processing** - data subjects have the right to request the restriction or suppression of their personal data
6. **Right to data portability** - data subjects have the right to obtain and reuse their personal data for their own purposes across different services
7. **Right to object** - data subjects have the right to object to the processing of their personal data in certain circumstances
8. **Automated decision making and profiling** - data subjects have the right to not to be subject to a decision based solely on automated processing, including profiling, which produces legal effects.

ASSIST-IoT will abide by the guidelines and regulations set by GDPR and other relevant legislation, and, with the help of the Ethical Manager, all developments and actions within the project will be monitored to ensure compliance.

9. Ethical Aspects

The D1.1-H-Requirement No.1 deliverable includes the provisions from ASSIST-IoT for Humans participating (any identified way) in the project. There, an Informed Consent Template is included, which will be circulated to corresponding Humans for signature, thus ensuring GDPR and other applicable regulations compliance. The signed Informed Consents gathered will be securely kept in the private repository of the project. These consents will be registered as data sets (see Section 6) but will not be part of ORDP, therefore will not be publicly available.

The D1.2-POPD-Requirement No.2 deliverable reviews a sub-set of the concerns commented in section 8. The documents emanating from applying data protection procedures will be handled thereof according to DMP, D2.3 and D1.2.

Regarding other Ethics provisions, all the agreements taken through D2.3 are of application. In particular, the following aspects are related to Data Management Plan matters:

- Those results generated from the application of distributed learning that may include any ethical concern and that are handled by the DMP will be specifically tagged. These results will be analysed by the DM and the DPO-EM of the project with regards to storage and sharing.
- The software manuals, READMEs and other instructions for the usage of ASSIST-IoT interfaces will be catalogued as DMP data sets and will go through an Ethics inspection process by the EM. The objective is to ensure that no access to protected or personal data can be made through technological interfaces of any element of the architecture.
- For each iteration of the DMP (D2.5, D2.6, D2.7), the EM altogether with the DM (interacting with any PSEM if needed) will review the data sets registered and will evaluate those based on:
    - Key Issues associated to IoT scenarios (section 2.2 of deliverable D2.3)
    - Generic GDPR clauses
    - Confidentiality aspects as set out in section 5.2 of deliverable D2.3.
    - Measures to be put in place for safeguarding rights and freedom (table 1, section 5.2 of D2.3)
    - Provisions about anonymization of data (section 5.3 of D2.3)

* The documents generated by partners to raise Ethical concerns (see deliverable D1.1) are not considered research data sets in the context of DMP.

** The Ethics risks are not considered to be handled by the DMP-publication management.

10. Future work and conclusions

In month M6, ASSIST-IoT's Data Management Plan (DMP) has been delivered. It outlines the measures that ASSIST-IoT is putting in place to meet the requirements set for projects complying with FAIR data management and contributing to the Horizon 2020 pilot action on open access to research data (ORDP).

The DMP will need to be updated over the course of the project, as the following situations may (and some, will) occur:

- New data sets identified
- Need of enhancing the descriptions of data sets previously identified
- Consortium's policies change
- Open Call projects come into play.
- Changes in Consortium composition or external factors

The Data Management Plan has only one specifically-devoted document (this one, D2.2). The decision that WP2 members have taken is to report the updates of the DMP taking advantage of diverse documents during the project duration. Although the work of T2.3 will be continuous (living monitoring and management), these documents will serve to capture "snapshots" of the research results managed through DMP. These documents will be:

- D2.2 (this one): Data Management Plan itself. The plan guiding the task execution.
- Results of the Technical Review in M9
- D2.5 – Risk Management at M18. A specific section will be created for potential update of the DMP and for depicting the data sets registered.
- D2.6 – Risk Management at M18. A specific section will be created for potential update of the DMP and for depicting the data sets registered.
- D2.7 – Risk Management at M36, coinciding with the end of the project. A specific section will be created for potential update of the DMP and for depicting the data sets registered.
- Project Progress Report at the end of the project, in a specific section reflecting about the DMP that has been conducted during the project.

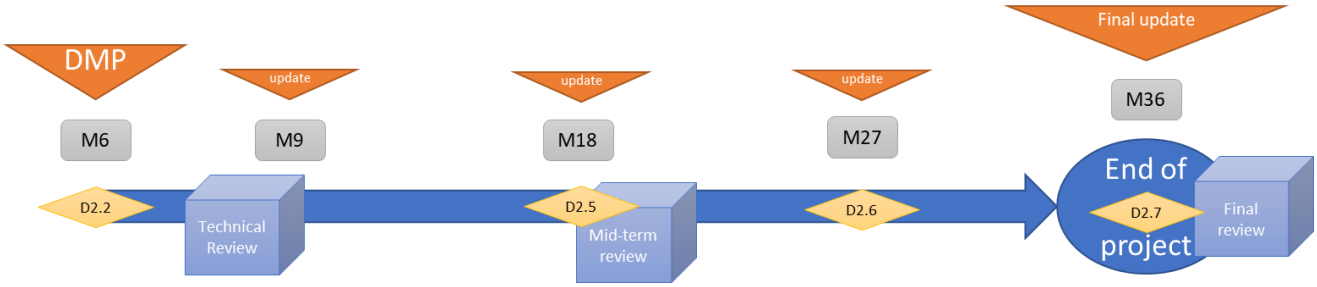

Figure 3. Timeline for updates of the DMP in ASSIST-IoT

Appendix A - Data catalogue

The definition of business scenarios and use-cases for ASSIST-IoT project is on-going. As a matter of fact, the first formalisation is taking place at the same time of delivery of this document (D3.2 is due to M6 as well). Therefore, it has not been possible to elaborate a detailed registry (following proper templates) of the data catalogue that will be managed in the project yet. Sub-sections below list the early-identified data. Those (and more) will be further elaborated later in the project.

A.1 - Pilot automation

- Route recording of every Container Handling Equipment machinery with time and position of communication/ identification by other devices within the terminal yard.
- Information about containers handled by Container Handling Equipment machinery. Timestamp and location where containers are picked up and placed.
- Location of the truck, work order information, LIDAR information, Movement recommendations.
- Video feed from Rubber Tired Gantry camera system, information about the location of containers within the terminal yard, TOS work orders, data from and commands for moving crane parts (hoist, gantry, straddle).

A.2 - Smart Safety of workers

- Location and proximity data, physiological parameter measurements, weather conditions measurements, personal identification information, training and medical records, building information, users' thermal comfort preferences, alerts and notifications.
- Identity of the user, Status of the fall arrest detector, Location of the incident.
- Location data, navigation instructions along predefined or dynamically updated routes.
- Work briefs, safety procedures, required PPE for each type of activity at any location, workers' training records.

A.3 - Vehicle monitoring

- Sensor measurements, at very high sampling frequencies describing the vehicles' operation and drift correction model parameters.
- High-resolution images, 3D point clouds and corresponding metadata and annotations.