



# D1.3 Data Management Plan

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Founding Members





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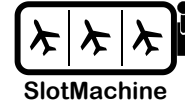
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01.01.01	2021-03-22	Final version	C. Fabianek	DMP release ready to deliver to SJU

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# SlotMachine

## A PRIVACY-PRESERVING MARKETPLACE FOR SLOT MANAGEMENT

This Data Management Plan is part of a project that has received funding from the SESAR Joint Undertaking under grant agreement No 890456 under European Union's Horizon 2020 research and innovation programme.



### Abstract

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The document is the Data Management Plan (DMP) of the SlotMachine project. This document describes how the data collected or generated by the SlotMachine project will be handled during and after the project closure, describes which standards and methodology for data collection and generation will be followed, and whether and how data will be shared.

SlotMachine employs blockchain technology and secure multi-party computation to extend the existing User-Driven Prioritisation Process (UDPP) solution with the possibility to keep private the participating airlines' confidential information such as the cost structure of flights. Technology will allow for secure, auditable transactions without the need for a central broker, whereby stakeholders will be able to enter slot swapping transactions without disclosing information to other participants. By demonstrating the feasibility of a privacy-preserving platform for swapping ATFM slots, the foundation can be laid for the development of a product that will be an essential element in the aviation industry in the future. It contributes to better use of existing resources at airports, higher efficiency of airlines, lower emissions, and shorter delays for passengers.



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# 1 Introduction

Annex 1 of the Grant Agreement (GA - 890456) [1] provides the contractual baseline of the project by means of the Description of the Action. It contains a high-level description of what the project is aiming to achieve and how and which additional outputs will be produced in terms of Deliverables.

Figure 1 depicts the general data lifecycle foreseen in the SlotMachine project:

- Various stakeholders define dataset requirements (described in section 1.3)
- A data engineer generates the respective datasets and makes those datasets available in data containers (see chapter 3)
- The SlotMachine prototype will be developed and iteratively updated using these dataset and feeds back insight to refine datasets
- Public access to generated data is also provided through the above-mentioned data containers

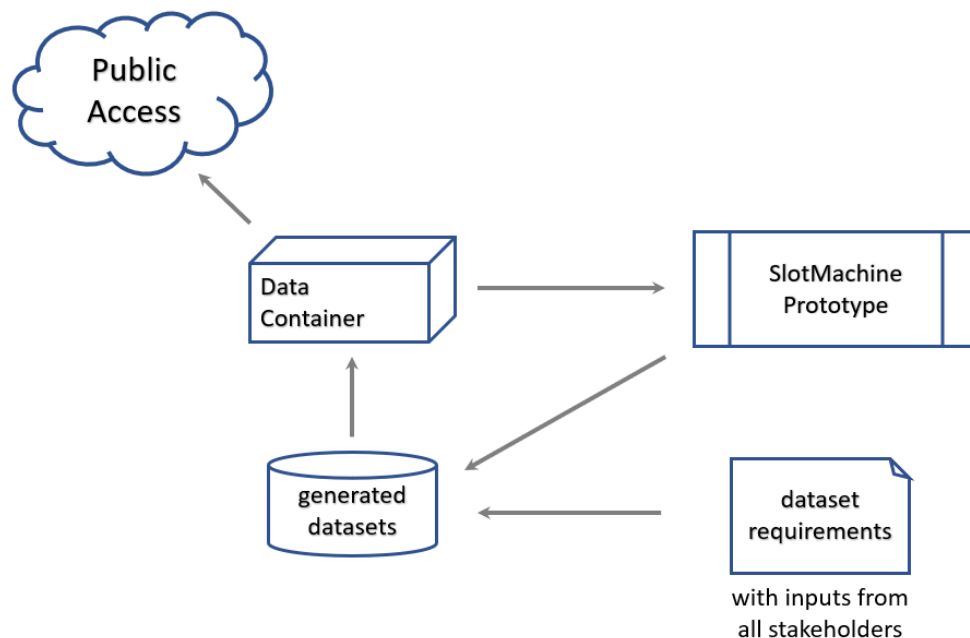
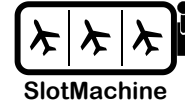


Figure 1: Data Lifecycle

## 1.1 Document maintenance

The Project Management Plan (DMP) [2] has been produced at the beginning of the project as a contractual deliverable. Its main purpose is however to be a living document in which information can be made available on a finer level of granularity through updates as the implementation of the project progresses and when significant changes occur.

The Project manager oversees the DMP update. The DMP should be updated or verified at least before the end of the last reporting period.



In the current – first – version of the DMP relevant datasets were identified and general procedures of data management are described. In later revisions additional data sets and more detailed procedures might get added.

## 1.2 Applicable Reference material

Unless otherwise stated in this deliverable, the execution of the project will be fully compliant with the latest version of the S2020 Project Handbook [3].

## 1.3 Rules reminder on communication or dissemination of project results

Any communication or dissemination of the project results (in any form, including electronic) will display the SJU logo and the EU emblem, and will include the following text:

*“This project has received funding from the SESAR Joint Undertaking under grant agreement No 890456 under European Union’s Horizon 2020 research and innovation programme”.*

When displayed together with another logo, the SJU logo and the EU emblem will have appropriate prominence.



## 2 Data Summary

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### 2.1 Project objectives and related Data Collection

SlotMachine has the following detailed objectives:

- **Objective #1:** Development of a novel slot swapping platform to improve utilization of available resources at airports and reduce cost for airlines
- **Objective #2:** Research and development for a secure and trustworthy system for slot swapping which employs an evolutionary algorithm in conjunction with the PrivacyEngine in a privacy-preserving way
- **Objective #3:** Realization of a proof-of-concept implementation of the SlotMachine Platform Demonstrator, which offers privacy-preserving slot management

All objectives involve data collection and in the following section, these objectives will be recalled each time whenever required when depicting involved data.

### 2.2 Data Description

For Objective #1 data is identified as follows:

- Resource description of airports and airlines
- Example slot configurations and demonstration of successful reordering, i.e., show cases of improved utilization through slot swapping

For Objective #2 data is identified as follows:

- Metainformation to tag private (sensitive) and non-private data
- Edge cases to demonstrate usefulness of genetic algorithms
- Datasets in various sizes to demonstrate performance capabilities of the PrivacyEngine

For Objective #3 data is identified as follows:

- Real-world data or data generated on real-world constraints
- Results and performance analysis records

### 2.3 Data Utility

The data will be used, during the project execution, as main input for each WP to trigger software development and solution prototyping and validation. There will be software scripts and programs (e.g. Java code or python script) that will be developed to allow data transformation and AI model implementation and assessment.

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## 3 FAIR Data

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### 3.1 Making Data Findable, Including Provisions for Metadata

Data compiled for the purpose of testing and demonstration of the SlotMachine prototype will be created in an iterative way and made available publicly. The technical framework of Docker containers is used to package data together with metadata: Semantic Container<sup>1</sup> provides a platform for sharing commercial and non-commercial data. To make data discoverable, metadata is provided through API endpoints<sup>2</sup>. A description of the metadata attributes can be found in the current version of the Semantic Container Design Document<sup>3</sup>.

### 3.2 Making Data Openly Accessible

Semantic Container can store and provide open, closed, and semi-closed data. It is up to the data providing container operator (data controller) to decide if and how data is made accessible to defined recipients.

In case data is shared between 2 parties the following mechanisms are used to provide access control:

1. OAuth 2.0: OAuth is an open standard for access delegation and Semantic Container use the Authorization Framework based on Bearer Token Usage as described in RFC 6750.
2. Usage Policy matching: two actors can exchange data if and only if the receiving container (data controller) has a Usage Policy that is equal or a subset of the providing container (data subject). A semantic reasoner is used to evaluate compliance between the Usage Policies. Note: Usage Policies are based on the policy language as defined by the SPECIAL project<sup>4</sup> in a specific deliverable [4].
3. Digital Watermarking: a unique digital fingerprint can be applied to the provided data, i.e., any data request results in a dataset with insignificant errors that uniquely identifies the recipient of the data set; in case such a dataset is leaked and appears in an unintended location, the actor who originally requested and leaked the dataset can be identified

The datasets listed in chapter 2 are publicly available at the following endpoints:

- Resource description of airports and airlines:  
no data is available at the current project status
- Example slot configurations to demonstrate reordering:  
no data is available at the current project status

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<sup>1</sup> <https://www.ownyourdata.eu/semcon/>

<sup>2</sup> <https://api-docs.ownyourdata.eu/semcon/>

<sup>3</sup> <https://www.ownyourdata.eu/semcon/design>

<sup>4</sup> <https://www.specialprivacy.eu>





- Metainformation to tag private (sensitive) and non-private data:  
no data is available at the current project status
- Edge cases to demonstrate usefulness of genetic algorithms:  
no data is available at the current project status
- Datasets demonstrate performance capabilities of the PrivacyEngine:  
no data is available at the current project status
- Real-world data or data generated on real-world constraints:  
no data is available at the current project status
- Results and performance analysis records:  
no data is available at the current project status

### 3.3 Making Data Interoperable

To make data interoperable the Semantic Container platform provides a standardized API described above and inter-container data operations generate a well-defined provenance trail based on the W3C Prov-Ontology<sup>5</sup>.

### 3.4 Data Re-use & Licensing Data

All data, data operations, and the Docker container itself are cryptographically hashed and the information is written into the public Ethereum blockchain for auditability using the OwnYourData Notary service<sup>6</sup>.

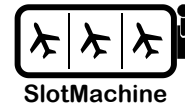
Data compiled in the course of the SlotMachine project is licensed under the CC-BY-SA 4.0 licence<sup>7</sup>. If data providers provide data that is licensed by third parties, they are responsible for disclosing and specifying the licensing terms.

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<sup>5</sup> <https://www.w3.org/TR/prov-o/>

<sup>6</sup> <https://notary.ownyourdata.eu>

<sup>7</sup> <https://creativecommons.org/licenses/by-sa/4.0/deed.en>



## 4 Allocation of Resources

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### 4.1 Estimated Costs

At the current state of the project, only a first estimation of costs is possible that occur for the data management task during the project runtime: Containers storing data for the SlotMachine project are hosted on the Frequentis network and access to the data is covered by the project budget. Data access is guaranteed for the entire duration of the project and beyond at least 1 year after the end of the project.

Other services for Semantic Containers like notary and validation are foreseen to be provided by OwnYourData at no charge.

### 4.2 Responsibilities

The consortium partner FREQUENTIS is responsible for implementing the DMP and ensures that it is reviewed and revised during the project runtime.

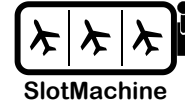
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The project will only be responsible for storing, preserving, and backing up the datasets mentioned in chapter 2 of this document. Any other data created and managed by project partners in the course of development and testing SlotMachine will be the responsibility of the respective partner (i.e., data controller).

### 4.3 Long Term Preservation

For long-term preservation of a dataset it is recommended to “commit” a container and store the resulting Docker image either on a public repository (e.g., <https://dockerhub.com>) or in a private repository. See the Semantic Container Design document for a description on how to commit, backup, and restart a container.



## 5 Data Security

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Storing data in a container provides only a very basic level of security through Authorization. It is up to the data controller to perform regular backup and setup a recovery strategy. This is taken care for at Frequentis through standard IT procedures.

Risks related to data security are not relevant since all data is made publicly available as described in section 3.4 Licensing Data.



## 6 Legal and Ethical Aspects

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### 6.1 Data Protection

Whenever personal data is processed, the compliance with the principles of data protection are to be proven by the controller. These principles encompass, for instance, data minimisation, meaning to only process the data necessary for the pursued purpose. Privacy by design indicates to create data processing technically already in favour of strong protection of personal data.

Data generated and used for the SlotMachine project does not include any personal data.

Datasets generated from inviting experts to the Advisory Board are handled separately and are covered by the FREQUENTIS GDPR-compliant data management principles.

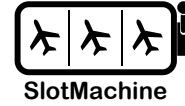
### 6.2 Measures to Ensure Ethical and Legal Standards

All measures are taken to ensure the use of legal and ethical unquestionable datasets in the course of the project.

### 6.3 Privacy and Trust

Issues of privacy and trust amongst data trading participants need to be identified by the data controller. The following list of indicators leading to negative levels of privacy and trust can be used as guideline:

- an inconsistent level of protection for natural persons and private data;
- divergences in the handling and storage of data hampering the free movement of personal data;
- a lack of knowledge regarding data sharing;
- difficulties in determining the trustworthiness of data suppliers;
- lack of knowledge of the law leading to potential violations;
- and inconsistent levels of protection for members across participating organisations.



## 7 References

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- [1] SlotMachine Grant Agreement Description of Action - GA-890456-SlotMachine
- [2] SlotMachine - D1.1 Project Management Plan (PMP), v01.02.00
- [3] Project Handbook (Programme Execution Guidance) for ER projects - v03.00.00, dated 14<sup>th</sup> March 2018
- [4] SPECIAL - D2.1 Policy Language V1, [SPECIAL\\_D21\\_M12\\_V10.pdf \(specialprivacy.eu\)](https://specialprivacy.eu/SPECIAL_D21_M12_V10.pdf)

