Plan Overview

A Data Management Plan created using DMPonline

Title: Horizon Europe - HARMONY

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Project abstract:

Major developments in small satellite technologies coupled with the rapid commercialisation of New Space are disrupting the space landscape. A driving role rests with the telecommunication vertical, where market demands for global connectivity led to the emergence of LEO and MEO megaconstellation and are accelerating efforts for the integration of non-terrestrial with terrestrial networks. Core to this vision is an architectural paradigm shift from large monolithic satellites to an orchestrated network of multi-orbit spaceborne nodes of various sizes and capabilities. On the other hand, space missions traditionally dominated by governmental initiatives – such as Navigation (GNSS) and Earth observation (EO) – are slower in adopting the New Space spirit towards coordination and synergetic exploitation of emerging and established satellite systems. Yet these systems have had transformative impact on our daily lives along a plethora of applications and verticals. Anticipating the next New Space frontiers in commercially driven missions within these domains, a central view of HARMONY is that step change potential will be released by adopting distributed satellite architectures across a range of existing and new applications where the space environment provides unique benefits. Placing innovative space services at its core, HARMONY will adopt a cross-disciplinary & vertically integrated approach in the study of federated and fractionated satellite system architectures and the development of core underpinning technologies in a doctoral network that will nurture future European New Space leaders.

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Horizon Europe - HARMONY

Data Summary

Will you re-use any existing data and what will you re-use it for?

Existing data will be reused for the PhD projects within HARMONY. The data consist principally in simulation software and measurement data, generated in the context of other research activities.
Simulation software will be extended with additive features to take the specificities and the design constraints of future satellite systems into account. On the other hand, existing measurement data will be evaluated with new tools to gain new insights and generate new results.

What types and formats of data will the project generate or re-use?

The project will generate and re-use the following type of data:

- Simulation software:
  - Existing simulation tools consist in MATLAB functions developed by research teams from the project partners.
  - The further software tools developed within the project will also be mainly based on MATLAB.
- Measurement data:
  - Raw data files are used to store measurements. A read-me document is associated to each raw data file to provide information on how the data can be exploited.

What is the purpose of the data generation or re-use and its relation to the objectives of the project?

The purpose of data generation and re-use is to constitute a set of consolidated results/tools to validate design solutions and gain insights into the potential of innovating technologies.
The solutions developed in the context of HARMONY are building upon previous research works. These activities have enable to get an understanding of the basic design trade-offs to be made. A data re-use is necessary to build on this already existing knowledge and meet the project objectives on time. On the other hand, the data generated within HARMONY will be exploited by follow-up projects to further mature the technologies necessary for upcoming satellite systems.

What is the expected size of the data that you intend to generate or re-use?

The expected size of the data that will be re-used or generated is as follows:

- Simulation software: Max a few GB if stored data must be exploited to run some of the functions.
- Measurement data: From a few GB to around 1 TB depending on the amount of parameters collected during the laboratory experiments.

The high amount of data will be managed with high availability database systems which can be easily accessed from different sites via Sync&Share. Data which will not be actively used anymore but will need to be further stored for the sake of good scientific practice will be placed on an archive database.

What is the origin/provenance of the data, either generated or re-used?

The data generated/re-used during the project originates from simulation software enabling the detailed analysis of satellite systems technologies (from the perspective of system concepts, signal processing, and antenna design) and from laboratory experiments used to verify platform design concepts and antenna characteristics.

To whom might your data be useful ('data utility'), outside your project?

Public data generated within HARMONY can be of interest for researchers and engineers working on the following aspects in the domain of satellite systems:

- System design concepts
- Advanced signal processing solutions
- Antenna hardware design

FAIR data

2.1. Making data findable, including provisions for metadata: Will data be identified by a persistent identifier?

For data that can made publicly available, persistent identifiers will be used to make it findable.
For example, the research data repository of the project partner Unibw, AtheneForschung, uses the DataCite scheme to label the data.

2.1. Making data findable, including provisions for metadata: Will rich metadata be provided to allow discovery? What metadata will be created? What disciplinary or general standards will be followed? In case metadata standards do not exist in your discipline, please outline what type of metadata will be created and how.

To allow discovery of the data, the DataCite Metadata Schema will be used.
When applicable, a 'read-me' documentation will be provided to facilitate the reuse of the data. In the case of a simulation software, this will include procedural information on how to set the simulation parameters and run a simulation. For measurement data, the 'read-ne' documentation will provide information on the following points:

- Setup used to produce the results
- Parameters saved and their format
- If applicable, software used to collect and/or process the data.

2.1. Making data findable, including provisions for metadata: Will search keywords be provided in the metadata to optimize the possibility for discovery and then potential re-use?

Search keywords will be provided in the metadata to optimize the possibility for discovery and then potential re-use.

2.1. Making data findable, including provisions for metadata: Will metadata be offered in such a way that it can be harvested and indexed?

The DataCite Metadata Schema enables the metadata to be harvested and indexed by other data provider sites.

2.2. Making data accessible - Repository: Will the data be deposited in a trusted repository?

The high amount of data will be managed with high availability database systems which can be easily accessed from different sites via Sync&Share (e.g. TeamDrive). Data which will not be actively used anymore but will need to be further stored for the sake of good scientific practice will be placed on an archive database.
University IT teams in the HARMONY consortium will be in charge of the data backup. In particular, the AtheneForschung repository will offer storage facility for research data and a digital object identifier (DOI) will be assigned to the objects.

2.2. Making data accessible - Repository: Have you explored appropriate arrangements with the identified repository where your data will be deposited?

University IT teams in the HARMONY consortium have already arrangements with repository service providers where data will be deposited.

2.2. Making data accessible - Repository: Does the repository ensure that the data is assigned an identifier? Will the repository resolve the identifier to a digital object?

The repository service provider ensures that data is assigned a digital object identifier.

2.2. Making data accessible - Data:
Will all data be made openly available? If certain datasets cannot be shared (or need to be shared under restricted access conditions), explain why, clearly separating legal and contractual reasons from intentional restrictions. Note that in multi-beneficiary projects it is also possible for specific beneficiaries to keep their data closed if opening their data goes against their legitimate interests or other constraints as per the Grant Agreement.

Certain datasets from the HARMONY project cannot be made openly available. This restriction is due to the strong involvement in the project of industrial partners who need to protect their intellectual property.

2.2. Making data accessible - Data:
If an embargo is applied to give time to publish or seek protection of the intellectual property (e.g. patents), specify why and how long this will apply, bearing in mind that research data should be made available as soon as possible.

Embargo will be applied to the datasets before the publication of the results in high quality journals and, if applicable, before the intellectual property rights are protected via patent applications. The duration of the embargo will be set as follow:

- Duration of the review and publication process if the datasets can be published after the acceptance of the results in a high quality journal.
- If applicable, necessary waiting time to acquire priority rights for a patent application.

2.2. Making data accessible - Data:
Will the data be accessible through a free and standardized access protocol?

The free and standardized access protocol OAI-PMH (Open Archives Initiative Protocol for Metadata Harvesting) will be used to make the data accessible.

2.2. Making data accessible - Data:
If there are restrictions on use, how will access be provided to the data, both during and after the end of the project?

If restrictions apply to the datasets, access will be provided after a data use agreement has been put in place between partners.

2.2. Making data accessible - Data:
How will the identity of the person accessing the data be ascertained?

When necessary, the identity of the person accessing the data will be ascertained via login credentials.

2.2. Making data accessible - Data:
Is there a need for a data access committee (e.g. to evaluate/approve access requests to personal/sensitive data)?

There is no need for a data access committee in the context of HARMONY.

2.2. Making data accessible - Metadata:

Will metadata be made openly available and licenced under a public domain dedication CC0, as per the Grant Agreement? If not, please clarify why. Will metadata contain information to enable the user to access the data?

Metadata for publications and datasets will be made openly available and licensed under a public domain dedication CC0 or equivalent.

2.2. Making data accessible - Metadata:

How long will the data remain available and findable? Will metadata be guaranteed to remain available after data is no longer available?

The data will remain available and findable for a minimum of 10 years. The associated metadata will remain available even after data is no longer available.

2.2. Making data accessible - Metadata:

Will documentation or reference about any software be needed to access or read the data be included? Will it be possible to include the relevant software (e.g. in open source code)?

Documentation or reference about any software needed to access/read the data will be included. If the relevant software is open source, it will be included to the dataset.

2.3. Making data interoperable:

What data and metadata vocabularies, standards, formats or methodologies will you follow to make your data interoperable to allow data exchange and re-use within and across disciplines? Will you follow community-endorsed interoperability best practices? Which ones?

Datasets will be saved in .xls (or equivalent) files to facilitate the exploitation of the data in and outside the research community. Moreover, the metadata will follow the DataCite Metadata Schema.

2.3. Making data interoperable:

In case it is unavoidable that you use uncommon or generate project specific ontologies or vocabularies, will you provide mappings to more commonly used ontologies? Will you openly publish the generated ontologies or vocabularies to allow reusing, refining or extending them?

Not applicable for HARMONY project.

2.3. Making data interoperable:

Will your data include qualified references[1] to other data (e.g. other data from your project, or datasets from previous research)?

[1] A qualified reference is a cross-reference that explains its intent. For example, X is regulator of Y is a much more qualified reference than X is associated with Y, or X see also Y. The goal therefore is to create as many meaningful links as possible between (meta)data resources to enrich the contextual knowledge about the data. (Source: https://www.go-fair.org/fair-principles/i3-metadata-include-qualified-references-metadata/)

When applicable, data will include qualified references to other data to enrich the contextual knowledge about the data.

2.4. Increase data re-use:

How will you provide documentation needed to validate data analysis and facilitate data re-use (e.g. readme files with information on methodology, codebooks, data cleaning, analyses, variable definitions, units of measurement, etc.)?

Readme files will be included with the data to provide the required information on the methodology, variable definitions, units of measurement, etc....

2.4. Increase data re-use:

Will your data be made freely available in the public domain to permit the widest re-use possible? Will your data be licensed using standard reuse licenses, in line with the obligations set out in the Grant Agreement?

The protection of intellectual property will not allow to make the data freely available in the public domain. As stated in 2.2, access will be provided after a data use agreement has been put in place between partners.

2.4. Increase data re-use:

Will the data produced in the project be useable by third parties, in particular after the end of the project?

If data use agreements are put in place, the data produced in the project will be useable by third parties, in particular after then end of the project.

2.4. Increase data re-use:

Will the provenance of the data be thoroughly documented using the appropriate standards?

The use of the DataCite Metadata Schema will ensure that the provenance of the data will be thoroughly documented.

2.4. Increase data re-use:

Describe all relevant data quality assurance processes.

The quality of the generated data will be guaranted via the use of version control tools such as SVN or Git. These tools will enable to control and keep track of the data modifications.

2.4. Increase data re-use:

Further to the FAIR principles, DMPs should also address research outputs other than data, and should carefully consider aspects related to the allocation of resources, data security and ethical aspects.

The research output of the HARMONY project will also consists in research papers published in renowned conference proceedings and journal (especially from IEEE). The editors of these high quality publications follow as well strict standards for the management of metadata and offer solutions for the referencing and the access of raw research data.

Other research outputs

In addition to the management of data, beneficiaries should also consider and plan for the management of other research outputs that may be generated or re-used throughout their projects. Such outputs can be either digital (e.g. software, workflows, protocols, models, etc.) or physical (e.g. new materials, antibodies, reagents, samples, etc.).

The software used and developed in the context of HARMONY will be documented and referenced. Software exchange between partners inside and outside the project will be regulated via agreements.

Concurrent engineering methods and mission/preliminary design review documentations for the conception of distributed satellite systems will belong as well to the research outputs of the HARMONY project. The workflow, the models and the documentation produced in the context of these activities will be documented in a shared platform accessible to all partners and will be later published on Open Science platforms (e.g. Open Research Europe) if no intellectual property restriction apply.

Beneficiaries should consider which of the questions pertaining to FAIR data above, can apply to the management of other research outputs, and should strive to provide sufficient detail on how their research outputs will be managed and shared, or made available for re-use, in line with the FAIR principles.

Considerations regarding the FAIR management of the software tools used and developed in HARMONY have been discussed previously.

Allocation of resources

What will the costs be for making data or other research outputs FAIR in your project (e.g. direct and indirect costs related to storage, archiving, re-use, security, etc.) ?

Existing data management infrastructures of the beneficiaries, in line withe FAIR principles, will be used in the HARMONY project. As a consequence, the management of the data according to the FAIR principle will not entail direct costs in terms of storage and archiving. The coordination of the data management and the control of the implementation of FAIR principles will however entail personal costs which can be evaluated at 3PM for the overall project duration of 48 months.

How will these be covered? Note that costs related to research data/output management are eligible as part of the Horizon Europe grant (if compliant with the Grant Agreement conditions)

The costs related to research data/output management will be covered by the management and overhead costs if the Horizon Europe grant of the HARMONY project.

Who will be responsible for data management in your project?

The dissemination & communication manager will be in charge of the data management in the HARMONY project.

How will long term preservation be ensured? Discuss the necessary resources to accomplish this (costs and potential value, who decides and how, what data will be kept and for how long)?

Using the existing data management infrastructure of the beneficiaries, a preservation of research outputs for a minimum of 10 years will be guaranteed.

Data security

What provisions are or will be in place for data security (including data recovery as well as secure storage/archiving and transfer of sensitive data)?

Robust, managed storage with automatic backup, provided by university IT teams from the project, will be used to ensure data security and recovery.

Ethics

Are there, or could there be, any ethics or legal issues that can have an impact on data sharing? These can also be discussed in the context of the ethics review. If relevant, include references to ethics deliverables and ethics chapter in the Description of the Action (DoA).

There are so far no ethics or legal issues that could have an impact on data sharing.

Will informed consent for data sharing and long term preservation be included in questionnaires dealing with personal data?

Data generated in the context of HARMONY does not include personal data.

Other issues

Do you, or will you, make use of other national/funder/sectorial/departmental procedures for data management? If yes, which ones (please list and briefly describe them)?

No national/funder/sectorial/departmental procedures for data management will be used.