6G AI-Native Integrated RAN-Core Networks

Deliverable D1.2
Data Management Plan

This work has been supported by the 6GARROW project which has received funding from the Smart Networks and Services Joint Undertaking (SNS JU) under the European Union's Horizon Europe research and innovation programme under Grant Agreement No 101192194 and from the Institute for Information & Communications Technology Promotion (IITP) grant funded by the Korea government (MSIT) (No. RS-2024-00435652).

Date of delivery:	31/03/2025	Version:	0.1
Project reference:	101192194	Call:	HORIZON-JU-SNS-2024-STREAM-B-01-06
Start date of project:	01/01/2025	Duration:	36 months

Document properties:

Document Number:	D1.2
Document Title:	Data Management Plan
Editor(s):	Nicolas CASSIAU (CEA)
Authors:	Nicolas Cassiau (CEA)
Contractual Date of Delivery:	31/03/2025
Dissemination level:	PU
Status:	Final
Version:	1.0
File Name:	6GARROW_D1.2

Revision History

Revision	Date	Issued by	Description
v0.1	17/02/2025	6GARROW WP1	First version
v1.0	31/03/2025	6GARROW WP1	Final version

Abstract

This Data Management Plan (DMP) outlines the strategic framework for the collection, management, preservation, and sharing of data generated during the 6GARROW project. Developed at the project's inception, the DMP ensures that data are handled to maximize their value, accessibility, and reusability, while safeguarding sensitive information and adhering to legal and ethical standards. Recognizing the dynamic nature of research, the DMP is designed to be adaptable, allowing for updates in response to evolving project objectives, technological advancements, regulatory changes, and stakeholder feedback. The plan emphasizes adherence to the FAIR data principles—making data Findable, Accessible, Interoperable, and Reusable—to contribute to knowledge advancement and innovation. As a living document, the DMP will be periodically reviewed and revised, with changes documented and communicated to stakeholders to maintain transparency and trust.

Keywords

Data management plan, FAIR data, security, ethics.

[1] SEN = Sensitive, only members of the consortium (including the Commission Services). Limited under the conditions of the Grant Agreement

PU = Public

Executive Summary

The Data Management Plan (DMP) for the 6GARROW project serves as a comprehensive guide for the systematic handling of data throughout the project's lifecycle. Developed at the project's inception, the DMP is designed to ensure that data are managed in a way that maximizes their value, accessibility, and reusability, while also safeguarding sensitive information and adhering to legal and ethical standards.

Key Objectives

- Data Collection and Management: Establish clear protocols for data collection, storage, and management to ensure data integrity and security.
- Data Preservation: Implement strategies for long-term data preservation to facilitate future access and reuse.
- Data Sharing and Accessibility: Promote data sharing by adhering to the FAIR data principles, ensuring that data are Findable, Accessible, Interoperable, and Reusable.
- Compliance and Ethics: Ensure compliance with relevant legal, ethical, and funding agency requirements regarding data management.

Adaptability and Review

Recognizing the dynamic nature of research, the DMP is designed to be adaptable. It allows for updates in response to evolving project objectives, technological advancements, regulatory changes, and stakeholder feedback. This flexibility ensures that data management practices remain aligned with the project's goals and the broader scientific community's standards.

Stakeholder Engagement

The DMP emphasizes transparency and stakeholder engagement. Changes to the plan will be documented, with rationales provided for significant updates. Stakeholders, including project team members, funding agencies, and data users, will be informed of these updates to maintain trust and ensure collaborative success.

Contribution to Knowledge and Innovation

By adhering to the FAIR data principles, the 6GARROW project aims to contribute significantly to the advancement of knowledge and foster innovation. The DMP lays the groundwork for responsible data management, ensuring that the project's data resources are valuable assets to the scientific community.

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Acronyms and abbreviations

Term	Description
DMP	Data Mangement Plan
FAIR	Findable, Accessible, Interoperable, Re-Use

1 Introduction

This Data Management Plan (DMP) is a foundational document developed at the beginning of the 6GARROW project. It serves as a strategic framework for the collection, management, preservation, and sharing of data generated throughout the project's lifecycle. The DMP is designed to ensure that data are handled in a manner that maximizes their value, accessibility, and reusability, while also safeguarding sensitive information and complying with legal and ethical standards.

Recognizing the dynamic nature of research projects, this DMP is not a static document. It is subject to changes and updates as the project progresses. Such modifications may arise from evolving project objectives, advancements in technology, shifts in regulatory requirements, or feedback from stakeholders. The flexibility to adapt the DMP is crucial for addressing unforeseen challenges and opportunities, ensuring that data management practices remain aligned with the project's goals and the broader scientific community's standards.

The development of this DMP involved a collaborative effort among project team members, drawing on their expertise and insights to establish robust data management practices. It reflects a commitment to the FAIR data principles—making data Findable, Accessible, Interoperable, and Reusable. By adhering to these principles, the 6GARROW project aims to contribute to the advancement of knowledge and foster innovation through the effective sharing and reuse of data.

2 Data summary

1.1 What is the purpose of the data collection/generation and its relation to the objectives of the project?

Research Data

The purpose of collecting and generating research data is to empirically validate the performance and feasibility of 6G technologies. This data is crucial for understanding how new technologies perform under various conditions and for identifying areas for improvement. It directly supports the project's objectives by providing the evidence needed to advance 6G research, optimize network performance, and develop innovative solutions that meet future communication demands.

Software and Code

The development and management of software and code are essential for simulating 6G network scenarios, analyzing data, and automating processes. This supports the project's objectives by enabling efficient testing and validation of 6G concepts, facilitating rapid prototyping, and ensuring that the project can adapt to new findings and technologies. It also contributes to the reproducibility and scalability of research outcomes.

Documentation

Documentation serves to record methodologies, protocols, and procedures, ensuring that research activities are transparent, reproducible, and verifiable. It relates to the project's objectives by providing a clear framework for conducting research, facilitating knowledge transfer among team members and partners, and supporting the dissemination of findings. Comprehensive documentation is also vital for compliance with project standards and guidelines.

Results and Outputs

The generation of results and outputs is aimed at translating research activities into tangible findings that can inform the development of 6G technologies. These outputs are critical for evaluating the success of the project's objectives, such as enhancing network performance, reducing latency, and increasing data throughput. They also serve as the basis for publications, presentations, and contributions to standardization efforts.

Metadata

Metadata provides essential context for understanding and using the project's data effectively. It facilitates data discovery, interoperability, and reuse, which are crucial for collaborative research and

the integration of 6G technologies into existing frameworks. By ensuring that data is well-described and accessible, metadata supports the project's objectives of advancing 6G research and fostering innovation.

Collaborative Materials

Collaborative materials, such as joint publications and workshop materials, are produced to share knowledge, findings, and innovations with the broader research community and stakeholders. They play a key role in disseminating the project's outcomes, fostering partnerships, and influencing the direction of 6G research and standardization. This aligns with the project's objectives of promoting collaboration and advancing the state of 6G technologies.

Standardization Contributions

Contributions to standardization bodies like 3GPP and ETSI aim to ensure that the innovations and findings from the 6GARROW project are considered in the development of global 6G standards. This is crucial for the widespread adoption and implementation of 6G technologies. By actively participating in standardization efforts, the project supports its objectives of shaping the future of telecommunications and ensuring interoperability and compatibility of 6G technologies.

Dissemination Materials

Dissemination materials are created to communicate the project's findings, innovations, and implications to a wide audience, including researchers, industry stakeholders, and policymakers. They are essential for raising awareness of 6G technologies, fostering engagement with the project's outcomes, and encouraging the adoption of 6G standards. This supports the project's objectives of advancing 6G research and facilitating the transition to next-generation networks.

1.2 What types and formats of data will the project generate/collect?

The 6GARROW project is poised to generate and collect a diverse array of data types and formats, each serving distinct purposes and catering to various stakeholders. As the project advances, the specific nature and scope of the data will become more defined, allowing for a more detailed understanding of its potential applications. This section provides an initial overview of the types and formats of data that the project is expected to produce, highlighting their relevance and utility.

Raw Data

Types: Sensor data, network traffic data, performance metrics, and environmental data.

Formats: CSV, JSON, XML, and binary formats for efficient storage and processing.

Processed Data

Types: Analyzed network performance metrics, simulation results, and statistical summaries.

Formats: Excel spreadsheets, SQL databases, and visualizations in formats like PNG, JPEG, or interactive dashboards.

Simulation Data

Types: Results from network simulations, e.g. latency, throughput, and error rates.

Formats: NetCDF, HDF5, and proprietary simulation software formats.

Code and Software

Types: Source code for simulations, data analysis scripts, and software tools.

Formats: Source code files (e.g., Python, C++), Jupyter notebooks, and containerized applications (e.g., Docker).

Documentation

Types: Methodologies, protocols, and procedural guides.

Formats: PDF, DOCX, and Markdown files for easy sharing and version control.

Metadata

Types: Descriptive information about datasets, including data provenance, collection methods, and data quality.

Formats: JSON-LD, RDF, and XML for semantic interoperability.

Collaborative Materials

Types: Joint publications, research papers, and workshop presentations.

Formats: PDF, PPTX, and LaTeX documents.

Standardization Contributions

Types: Drafts, proposals, and technical reports for standardization bodies.

Formats: DOCX, PDF, and standardized templates required by bodies like 3GPP and ETSI.

Dissemination Materials

Types: Brochures, infographics, and educational videos.

Formats: PDF, MP4, and web-based formats for online distribution.

1.3 Will you re-use any existing data and how?

The 6GARROW project may re-use existing data to enhance its research and development efforts, leveraging prior work to build upon established findings and methodologies. This approach can save time, reduce costs, and provide a broader context for new research. Here's how existing data might be re-used and managed:

Identification of Relevant Data

Sources: Public datasets from research institutions, industry partners, and standardization bodies like 3GPP and ETSI.

Criteria: Data relevance, quality, and compatibility with project objectives will be assessed to ensure it meets the necessary standards for integration.

Data Integration

Methods: Data will be integrated using data transformation and normalization techniques to ensure consistency and compatibility with new data collected by the project.

Tools: Data integration tools and platforms, such as ETL (Extract, Transform, Load) processes, will be employed to streamline this process.

Data Management

Documentation: Comprehensive metadata will be created to document the origin, structure, and usage rights of existing data, ensuring transparency and traceability.

Version Control: Existing data will be managed using version control systems to track changes and updates, maintaining data integrity.

Legal and Ethical Considerations

Compliance: The project will ensure compliance with data usage agreements, licensing terms, and ethical guidelines when re-using existing data.

Privacy: Any personal or sensitive information within existing datasets will be anonymized or handled according to privacy regulations.

Collaboration and Sharing

Partnerships: Collaborations with data providers will be established to facilitate data sharing and access, fostering a cooperative research environment.

Open Data: Where possible, the project will contribute to open data initiatives, sharing re-used data with the broader research community to promote transparency and innovation.

1.4 What is the origin of the data?

The data used in the 6GARROW project originates from a variety of sources, each contributing unique insights and value to the project's objectives of advancing 6G research and technology.

Understanding the origin of the data is crucial for ensuring its relevance, quality, and compliance with legal and ethical standards. Here's an overview of the potential data origins:

Primary Data Collection

Field Experiments: Data collected from field trials and experiments conducted by the project team to test 6G technologies in real-world scenarios.

Simulations: Data generated from network simulations designed to model and predict the performance of 6G systems under various conditions.

Secondary Data Sources

Academic Research: Data from published academic papers and research studies related to 5G and emerging 6G technologies.

Industry Partners: Data shared by industry partners involved in the development and deployment of 6G technologies, providing practical insights and benchmarks.

Public Datasets

Government and Regulatory Bodies: Data from government agencies and regulatory bodies that provide insights into spectrum usage, policy frameworks, and technological standards.

Open Data Initiatives: Publicly available datasets from open data platforms that offer valuable information on telecommunications infrastructure and usage patterns.

Standardization Bodies

3GPP and ETSI: Data and technical specifications from standardization bodies like 3GPP and ETSI, which are critical for ensuring interoperability and compliance with global standards.

Historical Data

Legacy Systems: Data from existing 4G and 5G networks that can be used to benchmark and compare the performance of 6G technologies.

1.5 What is the expected size of the data?

At this stage of the 6GARROW project, the exact size of the data generated and used remains uncertain. As the project progresses, this document will be refined to provide more precise estimates based on actual data collection and usage patterns. This section outlines the anticipated factors influencing data size and the implications for data management strategies.

The expected size of the data in the 6GARROW project is anticipated to be substantial, given the complexity and scale of 6G technology research and development. Several factors contribute to the large volume of data, including high-resolution simulations, extensive field trials, and the integration of diverse data sources. Here's an overview of the possible data size and its implications:

Simulation Data

Volume: Network simulations for 6G technologies can generate terabytes of data, especially when modeling large-scale networks with high fidelity.

Impact: Requires robust data storage solutions and efficient data processing capabilities to handle and analyze the data effectively.

Field Trial Data

Volume: Field trials may produce terabytes of data, particularly when capturing detailed performance metrics over extended periods.

Impact: Necessitates scalable storage infrastructure and advanced data management practices to ensure data integrity and accessibility.

Integration of Diverse Data Sources

Volume: Combining data from academic research, industry partners, and public datasets can significantly increase the overall data size.

Impact: Demands sophisticated data integration tools and techniques to harmonize and manage heterogeneous data formats and structures.

Data from Standardization Bodies

Volume: Technical specifications and datasets from bodies like 3GPP and ETSI can add to the data volume, especially when used for compliance and interoperability testing.

Impact: Requires careful version control and documentation to manage updates and changes in standards.

Historical and Legacy Data

Volume: Incorporating data from existing 4G and 5G networks can further expand the dataset, providing valuable benchmarks and insights.

Impact: Involves data cleansing and transformation processes to ensure compatibility with new data formats.

Data Management Strategies

- Scalable Storage Solutions: Implementing cloud-based storage or distributed file systems to accommodate the growing data size.
- Efficient Data Processing: Utilizing big data analytics platforms and parallel processing techniques to handle large datasets.
- Data Governance: Establishing clear data governance policies to manage data quality, security, and compliance.
- Data Lifecycle Management: Developing strategies for data retention, archiving, and deletion to optimize storage usage and maintain data relevance.

1.6 To whom might it be useful ('data utility')?

The data generated and utilized in the 6GARROW project holds significant potential for a wide range of stakeholders. As the project evolves, the specific applications and benefits of the data will become clearer, allowing for more targeted utility assessments. This section outlines the primary groups and sectors that may find the data particularly useful.

Telecommunications Industry

Network Operators: Data can help optimize network performance, enhance service delivery, and support the deployment of new technologies.

Equipment Manufacturers: Insights from the data can drive innovation in hardware and software solutions tailored for 6G networks.

Academic and Research Institutions

Researchers: Access to comprehensive datasets can facilitate cutting-edge research in telecommunications, signal processing, and network optimization.

Students: Educational institutions can use the data for teaching and training purposes, providing real-world examples for learning.

Government and Regulatory Bodies

Policy Makers: Data can inform policy decisions related to spectrum allocation, infrastructure development, and digital inclusion.

Regulators: Insights can aid in the development of standards and regulations to ensure fair and efficient use of telecommunications resources.

Technology Companies

Startups and Innovators: Access to data can spur innovation in areas such as IoT, AI, and edge computing, leveraging 6G capabilities.

Tech Giants: Large technology firms can use the data to enhance their services, improve connectivity solutions, and develop new applications.

Public Sector and Municipalities

Smart City Initiatives: Data can support the development and management of smart city infrastructure, improving urban living through enhanced connectivity.

Emergency Services: Enhanced communication networks can improve response times and coordination during emergencies.

Healthcare Sector

Telemedicine Providers: Improved network capabilities can enhance the delivery of remote healthcare services, making them more reliable and accessible.

Healthcare Researchers: Data can support research into new medical technologies and applications enabled by 6G.

Consumer Electronics and Consumer Good

Device Manufacturers: Insights can guide the development of new consumer electronics that leverage 6G technology for enhanced performance.

End Users: Consumers can benefit from improved connectivity, faster data speeds, and new services enabled by 6G networks.

3 FAIR data

The FAIR data principles are essential guidelines that ensure data is Findable, Accessible, Interoperable, and Reusable. These principles are particularly crucial for the 6GARROW project, which aims to produce and utilize data in a manner that maximizes its value and utility for various stakeholders.

3.1 Making data findable

This section focuses on the Findability aspect of the FAIR principles, addressing how the data produced and used in the project will be discoverable, identifiable, and locatable.

Digital Object Identifiers (DOIs)

Purpose: DOIs provide a persistent and unique identifier for datasets, ensuring that they can be reliably located and cited over time.

Implementation: 6GARROW prioritizes assigning DOIs to as many datasets as possible. This practice facilitates their discovery and citation in both academic and professional contexts. By doing so, we adhere to best practices in data management and significantly enhance the visibility of the project's outputs.

Versioning

Purpose: Versioning ensures that changes to datasets are tracked and documented, allowing users to access specific versions as needed.

Implementation: The project will implement a version control system for datasets – when relevant – with clear documentation of updates and modifications. This will include version numbers and timestamps, enabling users to identify and retrieve the appropriate version of a dataset for their needs.

Metadata

Purpose: Comprehensive metadata enhances the discoverability of datasets by providing detailed information about their content, context, and usage.

Implementation: The project will develop standardized metadata schemas to describe datasets intended to be shared, including information such as title, author, keywords, and data provenance. Metadata will be made available in machine-readable formats to facilitate automated discovery and integration with other systems.

Data Repositories

Purpose: Centralized data repositories serve as hubs for storing and sharing datasets, improving their accessibility and findability.

Implementation: The 6GARROW project utilizes established data repositories that support FAIR principles, ensuring that datasets are indexed and searchable. These repositories provide user-friendly interfaces and search functionalities to aid in data discovery.

Search and Indexing

Purpose: Effective search and indexing mechanisms are essential for enabling users to locate datasets quickly and efficiently.

Implementation: The project will explore advanced search technologies and indexing services to enhance the discoverability of datasets. This includes the use of keyword tagging, semantic search capabilities, and integration with external search engines.

3.2 Making data accessible

The FAIR data principles emphasize not only the findability of data but also its accessibility. Accessibility ensures that once data is found, it can be accessed and used by both humans and machines, under well-defined conditions. In the 6GARROW project, a comprehensive strategy is in place to ensure that data and project deliverables are accessible to a wide audience, while also respecting privacy and proprietary constraints. This section outlines the measures taken to enhance the accessibility of project outputs, including public dissemination, controlled access to sensitive materials, and efforts to make data and software publicly available.

Public Dissemination of Project Outputs

Strategy: The 6GARROW project is committed to the open dissemination of its findings and deliverables. This includes making all project outputs, such as research papers and reports, freely available on the project website and on Zenodo.

Implementation: Dissemination papers and other public documents will be accessible without charge, ensuring that the knowledge generated by the project can reach a broad audience, including researchers, practitioners, and the general public.

Controlled Access to Private Documents

Strategy: While the project aims for maximum openness, certain documents may contain sensitive or proprietary information that requires restricted access.

Implementation: Private documents will be stored in a secure, project-shared repository. Access to these documents will be controlled and granted on a need-to-know basis, ensuring that sensitive information is protected while still being available to authorized project members and stakeholders.

Efforts to Make Data and Software Public

Strategy: The project endeavors to make its data and software outputs publicly available, recognizing the value of open science and the potential for broader impact.

Implementation: Where possible, datasets and software developed during the project will be released under open licenses, facilitating their use and reuse by the wider community. This effort is subject to considerations of data sensitivity, intellectual property rights, and the readiness of the data and software for public release.

Use of Open Licenses

Strategy: To facilitate the reuse of project outputs, open licenses will be applied where appropriate.

Implementation: Open licenses, such as Creative Commons for documents and open-source licenses for software, will be used as often as possible to clearly communicate the terms under which data and software can be used, modified, and shared.

Technical and Legal Considerations

Strategy: Ensuring accessibility involves addressing both technical and legal challenges, including data privacy laws and intellectual property rights.

Implementation: The project will navigate these challenges by implementing robust data management practices, conducting legal reviews, and engaging with stakeholders to ensure compliance with relevant regulations and agreements.

3.3 Making data interoperable

Interoperability is a cornerstone of the FAIR data principles, ensuring that data can be integrated with other datasets, exchanged, and reused across various platforms, disciplines, and borders. The 6GARROW project is committed to enhancing the interoperability of its data outputs, facilitating seamless data exchange and re-use among researchers, institutions, organizations, and countries. This section outlines the strategies and standards adopted by the project to achieve interoperability, including the use of standardized data and metadata vocabularies, adherence to open formats, and the promotion of interdisciplinary data integration.

Adoption of Standardized Data Formats:

Approach: The project prioritizes the use of open and widely accepted data formats to ensure that datasets can be easily accessed and utilized by diverse software applications.

Implementation: Formats such as CSV for tabular data, JSON and XML for structured data, and HDF5 for complex datasets will be employed. These formats are chosen for their broad compatibility with data analysis tools and programming languages.

Use of Standardized Metadata Vocabularies

Approach: To facilitate the understanding and integration of datasets across disciplines, the project will utilize standardized metadata vocabularies.

Implementation: Metadata will be annotated using established vocabularies such as Dublin Core for general metadata, Schema.org for web-based datasets, and discipline-specific ontologies where applicable. This ensures that metadata is both machine-readable and understandable across different fields.

Compliance with Open Standards and Protocols

Approach: The project commits to adhering to open standards and protocols to enhance data interoperability.

Implementation: Protocols such as OAI-PMH for metadata harvesting and APIs for data access will be implemented, allowing for the seamless exchange of data and metadata between systems.

Promotion of Interdisciplinary Data Integration

Approach: Recognizing the value of interdisciplinary research, the project aims to facilitate the combination of datasets from different origins.

Implementation: By employing common data models and ontologies, the project will enable the integration of datasets across disciplines, fostering new insights and innovations.

Engagement with the Research Community

Approach: To ensure the relevance and applicability of interoperability standards, the project will engage with the broader research community.

Implementation: Feedback from researchers and stakeholders will be sought to continuously refine data formats, vocabularies, and methodologies, ensuring they meet the evolving needs of the scientific community.

3.4 Increase data re-use

Reusability is a fundamental aspect of the FAIR data principles, ensuring that data can be effectively utilized by others beyond the original research context. The 6GARROW project is dedicated to maximizing the reusability of its data outputs, enabling broad access and application by third parties, including researchers, institutions, and organizations. This section outlines the project's approach to data licensing, availability, quality assurance, and long-term reusability, addressing potential restrictions and the rationale behind them.

Data Licensing for Broad Reuse

Approach: When possible, the project will adopt open data licenses that facilitate the widest possible reuse of data.

Implementation: When possible, licenses such as Creative Commons Attribution (CC BY) will be used, allowing others to distribute, remix, adapt, and build upon the data, even commercially, as long as they credit the original creation. This approach ensures that data can be freely used and shared, promoting innovation and collaboration.

Timely Data Availability

Approach: Data will be made available as soon as possible to maximize its utility and impact.

Implementation: Non critical data will be released upon project completion, with a potential short embargo period if necessary to allow for the publication of research findings or the filing of patents. Any embargo will be clearly justified and kept to a minimum to balance the interests of data producers and users.

Third-Party Usability

Approach: Data will be prepared and documented to ensure usability by third parties, even after the project's conclusion.

Implementation: Comprehensive metadata, data dictionaries, and user guides will be provided to facilitate understanding and application of the data by external users.

Long-Term Reusability

Approach: The project is committed to ensuring that data remains reusable for the foreseeable future.

Implementation: Non critical data will be stored in durable, non-proprietary formats and deposited in reputable data repositories that guarantee long-term preservation and access.

Data Quality Assurance

Approach: Rigorous data quality assurance processes will be implemented to ensure the reliability and accuracy of data for reuse.

Implementation: Data will undergo validation, verification, and documentation processes, including the use of standardized protocols and checks to identify and correct errors.

Restrictions on Data Reuse

Approach: While the project aims for maximum openness, certain data may have restrictions on reuse.

Implementation: Restrictions will be applied only when necessary to protect sensitive information, comply with legal requirements, or respect the rights of data subjects. The nature and duration of any restrictions will be clearly communicated to potential users.

4 Allocation of resources

The shared space is operated by Fraunhofer HHI free of charge for project partners. This space will remain available 3 years after the end of the project. After this period data will be stored at partners premisses.

Domain registration for project website (https://6garrow.com) costs 310 € annually and will be covered by University of Oulu and Yonsei University. Website will remain online for at least 3 years after the end of the project.

The resources for long-term preservation will be discussed during the project, and this deliverable will be updated accordingly.

5 Data security

Data security is a critical component of any DMP. Ensuring the security of data involves implementing measures to protect data from unauthorized access, breaches, and other forms of compromise.

Key Considerations for Data Security

The 6GARROW project will consider the following measures – or a set of them – for guaratying data security:

- Data Classification: Identification and classification of data based on sensitivity and confidentiality. This helps in applying appropriate security measures to different types of data.
- Access Control: Implementation of strict access control measures to ensure that only authorized personnel have access to sensitive data. This includes using authentication mechanisms such as passwords, biometrics, or multi-factor authentication.
- Data Encryption: Encryption of data both at rest and in transit to protect it from unauthorized access. Encryption ensures that even if data is intercepted or accessed without permission, it remains unreadable.
- Data Anonymization: For data that needs to be shared or published, the project would consider anonymizing or de-identifying it to protect the privacy of individuals or sensitive information.
- Regular Audits and Monitoring: Conducting regular security audits and continuous monitoring to detect and respond to potential security threats or breaches promptly.
- Incident Response Plan: Developping and maintaining an incident response plan to address data breaches or security incidents effectively. This plan should outline the steps to be taken in the event of a security breach.
- Compliance with Regulations: Ensuring compliance with relevant data protection regulations and standards, such as GDPR, HIPAA, or other applicable laws, to protect data and avoid legal repercussions.
- Training and Awareness: Providing regular training and awareness programs for all personnel involved in data handling to ensure they understand the importance of data security and the best practices to follow.

Strategies for Data Security

The 6GARROW project will consider the following strategies – or a set of them – for guaratying data security:

- Use of Secure Infrastructure: Deployment of data on secure servers and networks with robust firewalls, intrusion detection systems, and other security measures.
- Regular Software Updates: conservation of all software, including operating systems and applications, up to date with the latest security patches to protect against vulnerabilities.
- Backup and Recovery: Implementation of regular data backup procedures and ensure that recovery plans are in place to restore data in case of loss or corruption.
- Data Minimization: Collection and retainment only of the data necessary for the project's objectives to reduce the risk of exposure.

6 Ethical aspects

The project has been designed and structured in such a way that it inherently avoids potential ethical dilemmas or legal constraints that could otherwise hinder the sharing of data.

Ethical Considerations

- Informed Consent: If the data involves human subjects, informed consent will be obtained in a manner that explicitly covers data sharing. Participants will be made aware of how their data will be used, stored, and shared, ensuring transparency and respect for their autonomy.
- Anonymization and De-identification: By anonymizing or de-identifying data, the project will mitigate ethical concerns related to privacy and confidentiality. This process involves removing or altering personal identifiers so that individuals cannot be readily identified, thus protecting their privacy.

- Data Minimization: Collecting only the data necessary for the project's objectives will reduce ethical concerns. By minimizing data collection, the project limits the potential for misuse or unintended consequences.
- Ethical Review and Oversight: The project will undergo rigorous ethical review by an ethics advisor, ensuring that all ethical considerations are addressed and that the project complies with ethical standards.

Legal Considerations

- Compliance with Regulations: The project will comply with relevant data protection and privacy laws, such as the General Data Protection Regulation (GDPR) in the EU. Compliance ensures that data sharing practices are legally sound.
- Data Sharing Agreements: Legal agreements or contracts are in place to govern data sharing. These agreements outline the terms and conditions under which data can be shared, ensuring that all parties adhere to legal requirements.
- Jurisdictional Considerations: The project has considered jurisdictional issues, ensuring that data sharing practices are consistent with the laws of all relevant jurisdictions. This involves choosing data storage locations or sharing partners that comply with the strictest applicable laws.
- Intellectual Property Rights: The project has addressed intellectual property rights, ensuring that data sharing does not infringe on any proprietary rights or patents. This involves obtaining necessary permissions or licenses.