



# 5GMOBIX

5G for cooperative & connected automated  
MOBility on X-border corridors

## D1.6

### Interim Data Management Plan

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[www.5g-mobix.com](http://www.5g-mobix.com)

## Authors

Authors in alphabetical order		
Name	Organisatio	Email
Sadeq ZOUGARI	AKKA	sadeq.zougari@akka.eu
Mandimby RANAIVO RAKOTONDRAVELONA	AKKA	mandimby-nirina.ranaivo- rakotondravelona@akka.eu
Djibrilla AMADOU KOUNTCHE	AKKA	djibrilla.amadou-kountche@akka.eu

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<b>Reviewer 2</b>	Oscar Agustín Castañeda Aguadero (DEKRA)	09/10/2020
<b>Reviewer 3</b>	Juana Baños Polglase (DEKRA)	09/10/2020

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## ABBREVIATIONS

Abbreviation	Definition
ADAS	Advanced Driver Assistance Systems
BSM	Basic Safety Message
CAM	Cooperative Awareness Message
CBC/TS	Cross-Border Corridor / Trial Site
CCAM	Cooperative, Connected and Automated Mobility
CERN	European Council for Nuclear Research
CNIL	National Commission on Informatics and Liberty
CPM	Cooperative Perception Message
CTS	Central Test Server
C-ITS	Cooperative ITS
DENM	Decentralised Environmental Notification Message
DMP	Data Management Plan
DoA	Description of Action
DPIA	Data Protection Impact Assessment
DPO	Data Protection Officer
EC	European Commission
EDM	Edged Dynamic Map
FAIR	Findable, Accessible, Interoperable and Reusable
FESTA	Field Operational Test Support Action
FOT	Field Operational Tests
GA	General Assembly
GDPR	General Data Protection Regulation
gNB	gNodeB (Next Generation NodeB)
HDMAP	High Definition Map



HMI	Human Machine Interface
ITS	Intelligent Transport System
KPI	Key Performance Indicator
LDM	Local Dynamic Map
MCM	Manoeuvre Cooperation Message
MEC	Multi-access/Mobile Edge computing
OBU	On-Board-Units
ORDP	Open Research Data Pilot
PCO	Points of Control and Observation
PGW	Packet Data Network Gateway
POPD	Protection of Personal Data
PU	Public
RAT	Radio Access Technology
RSU	Road Side Unit
SPAT	Signal Phase and Timing message
TCP	TCP
TMT	Technical Management Team
ToC	Table of Content
UCC/US	Use Case Category / User story
UDP	User Datagram Protocol
UE	User Equipment
V2X	Vehicle To X
VRU	Vulnerable Road Users
WP	Work Package

## EXECUTIVE SUMMARY

The Data Management Plan is an important document for efficient data management. It describes the data management life cycle for the data to be collected, processed and/or generated by a Horizon 2020 project and the process of making research data findable, accessible, interoperable and re-usable (FAIR).

This document is the deliverable D1.6 – Interim Data Management Plan of 5G-MOBIX. The Initial Data Management Plan of 5G-MOBIX (D1.4) described the processes used to manage the data produced in 5G-MOBIX. This version includes a description of Data Protection Impact Assessment (DPIA), describes the high-level organisation applied in 5G-MOBIX to address GDPR requirements and declares the creation of 5G-MOBIX ZENODO public repository (<https://zenodo.org/communities/5g-mobix>).

As this deliverable is a living document, the final version D1.7 (M44, i.e. June 2022) will outline the details of all datasets involved in 5G-MOBIX and the adopted solution to comply with the different data protection regulations.

Data in 5G-MOBIX are produced during the trials (WP4) using the specification from WP2, based on the methodology from WP5 and are used during the evaluation phase (WP5). The exploitation of these data complies with the General Data Protection Regulation (GDPR) and, where applicable, with the data protection regulations of China, Korea and Turkey. A subset of 5G-MOBIX datasets will be published for research purposes according to the Open Research Data Pilot (ORDP). These potential datasets are used to assess both network capabilities in an UCC/US-agnostic manner and user perceived performance in the context of specific CCAM use cases/applications considered in 5G-MOBIX.

This document is organized as follows. Section 1 briefly presents 5G-MOBIX and describes the purpose of this document and its intended audience. Section 2 details 5G-MOBIX data management methodology, data measurement approach and data categories. Section 3 provides a concrete identification of datasets to be shared by each trial site. Section 4 gives insights about the Open Research Data Pilot under H2020 guidelines. Section 5 describes how shared data by 5G-MOBIX are made Findable, Accessible, Interoperable and Reusable and available in ZENODO repository. Section 6 describes the allocation of resources related to FAIR and the collection, the management and sharing of research data. Section 7 proposes a six steps approach to enforce data protection in 5G-MOBIX. The different Data protection regulation and their corresponding agencies are identified for the Non-EU Countries (China, Korea and Turkey). Section 8 describes data protection principles to enforce data protection mechanisms. Finally, Section 9 concludes this deliverable.

## 1. INTRODUCTION

### 1.1. 5G-MOBIX concept and approach

5G-MOBIX aims to showcase the added value of 5G technology for advanced Cooperative, Connected and Automated Mobility (CCAM) use cases and to validate the viability of the technology to bring automated driving to the next level of vehicle automation (SAE L<sub>4</sub> and above). To do this, 5G-MOBIX will demonstrate the potential of different 5G features on real European roads and highways and create and use sustainable business models to develop 5G corridors. 5G-MOBIX will also utilize and upgrade existing key assets (infrastructure, vehicles, components) and the smooth operation and co-existence of 5G within a heterogeneous environment comprised of multiple incumbent technologies such as ITS-G5 and C-V2X.

5G-MOBIX will execute CCAM trials along cross-border (x-border) and urban corridors using 5G core technological innovations to qualify the 5G infrastructure and evaluate its benefits in the CCAM context. The Project will also define deployment scenarios and identify and respond to standardisation and spectrum gaps.

5G-MOBIX will first define critical scenarios needing advanced connectivity provided by 5G, and the required features to enable some advanced CCAM use cases. The matching of these advanced CCAM use cases and the expected benefits of 5G will be tested during trials on 5G corridors in different EU countries as well as in Turkey, China and Korea.

The trials will also allow 5G-MOBIX to conduct evaluations and impact assessments and to define business impacts and cost/benefit analyses. As a result of these evaluations and international consultations with the public and industry stakeholders, 5G-MOBIX will identify new business opportunities for the 5G enabled CCAM and propose recommendations and options for its deployment.

Through its findings on technical requirements and operational conditions, 5G-MOBIX is expected to actively contribute to standardisation and spectrum allocation activities.

### 1.2. Purpose of the deliverable

This deliverable materializes an interim version of the Data Management Plan elaborated by 5G-MOBIX. The purpose of this document is to provide an overview of the dataset types present in the project and to collect the main data management policy adopted by the Consortium.

The data management plan defines how data in general and research data in particular, will be handled during the research project, and will make suggestions for the after-project time. It describes what data will be collected, processed or generated, which methodologies and standards shall be followed during the collection process, whether and how these data shall be shared and/or made open, not only for the

evaluation needs, but also to comply with the ORDP requirements, and how they shall be curated and preserved. A first list of potential datasets that the project will make available is described.

This deliverable will be updated accordingly to the evolution of the project. Three versions are planned:

- The initial version (D1.4, Mo6, i.e. April 2019) outlined the data management plan according to the current, at that time, development of the project. It identified a first set of data categories, data types and metadata that will be involved in the project and proposed the data management process that will be followed in the next developments. This process includes also how the data owners will contribute to further versions of this deliverable in order to complete their dataset descriptions (definition and purpose, sharing, standard, preservation, etc.). A list of potential datasets to be shared by the project to assess network capabilities in an UCC/US-agnostic manner and to assess user perceived performance was provided.
- The second version D1.6 (M24, i.e. October 2020) updates the data flows description and includes documentation of DPIA. A clear organisation of the different roles of the parties (i.e. data controllers, joint-controllers, data processors) implemented by each CBC/TS is outlined. Besides, the description of the categories of processed data and categories of personal data according to Article 30 of the GDPR are provided.
- The final version D1.7 (M44, i.e. June 2022) will outline the details of all datasets involved in 5G-MOBIX and identify all dataset that will be shared after the end of the project.

### 1.3. Intended audience

The dissemination level of D1.4 is 'public' (PU) and available to members of the consortium, the Commission (EC) services and those external to the project.

This document is primarily intended to serve as an internal guideline and reference for all 5G-MOBIX beneficiaries, especially the governance bodies such as the General Assembly, the Steering Committee, the Technical Management Team, and the Advisory Board.

## 2. DATA IN 5G-MOBIX

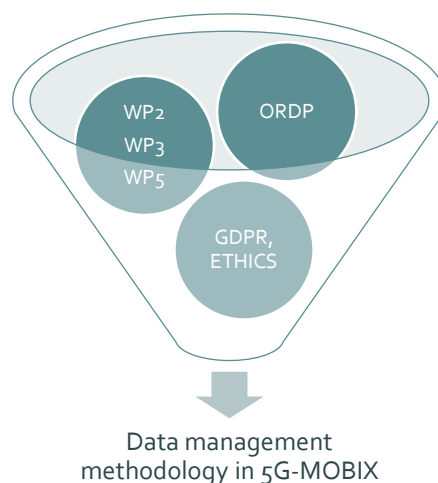
### 2.1. Data management methodology in 5G-MOBIX

The aim of this section is to provide a first categorization of the processed data and to identify a list of the data types that will be generated. It also provides recommendations on data collection and sharing processes during the project and beyond.

5G-MOBIX will collect different categories of data to measure the benefit of the 5G technologies on the selected CCAM use cases categories along multiple corridors and trial sites. 5G-MOBIX will consider the FESTA<sup>1</sup> methodology, which provides an extensive set of recommendations for developing an experimental procedure for Field Operational Tests. The data will be defined during a close collaboration, between WP5 (Task 5.2), WP2 (Task 2.5) and WP3 (Task3.3 and Task 3.5). These tasks will set the quality requirements for the data to be collected and to be used in the technical evaluation.

From raw data, a large amount of derived data will be produced to address multiple research needs. Derived data will follow a set of transformation: cleaning, verification, conversion, aggregation, summarization or reduction. In any case, data must be well documented in order to facilitate and foster sharing, to enable validity assessments and to enable its usage in an efficient way.

The 5G-MOBIX data collection process and data management is built upon requirements or methodologies coming from several processes defined in WP2 – “Specifications”, WP3 – “Development, integration and roll out” and WP5 – “Evaluation” or guidance rules (ORPD, GDPR, ETHICS):



**Figure 1: Overview of 5G-MOBIX data management**

<sup>1</sup> <http://fot-net.eu/Documents/festa-handbook-version-7>

The evaluation requirements in WP5 – “Evaluation” define the minimum data that must be collected in order to perform the evaluation process towards the end of the project. Deliverable D2.5 – “Initial evaluation KPIs and metrics” defines the KPIs and the metrics targeted for each use case category and user story. High level requirements defined in Task 2.5 and Task 5.1 will be converted into specific and detailed specification of data format, data size, data currency, data units, data file, and data storage. Deliverable D5.1 – “Evaluation methodology and plan” describes the evaluation methodology which specifies the measurement methodology to be used. The evaluation data collection and management task defines the data collection, harmonization, and storage and sharing requirements. Deliverable D3.5 – “Report on the evaluation data management methodology and tools” will describe the evaluation data management methodology to be used.

The Open Research Data Pilot (ORDP) defines the requirements related to data sharing of research data. Requirements related to ORDP are defined in this document to guarantee that the collected data will be provided in compliance with the European Commission Guidelines on Data Management in Horizon 2020<sup>2</sup>. Those requirements are defined in Section 4 and Annex 1 – Open Research Data Pilot (ORD Pilot).

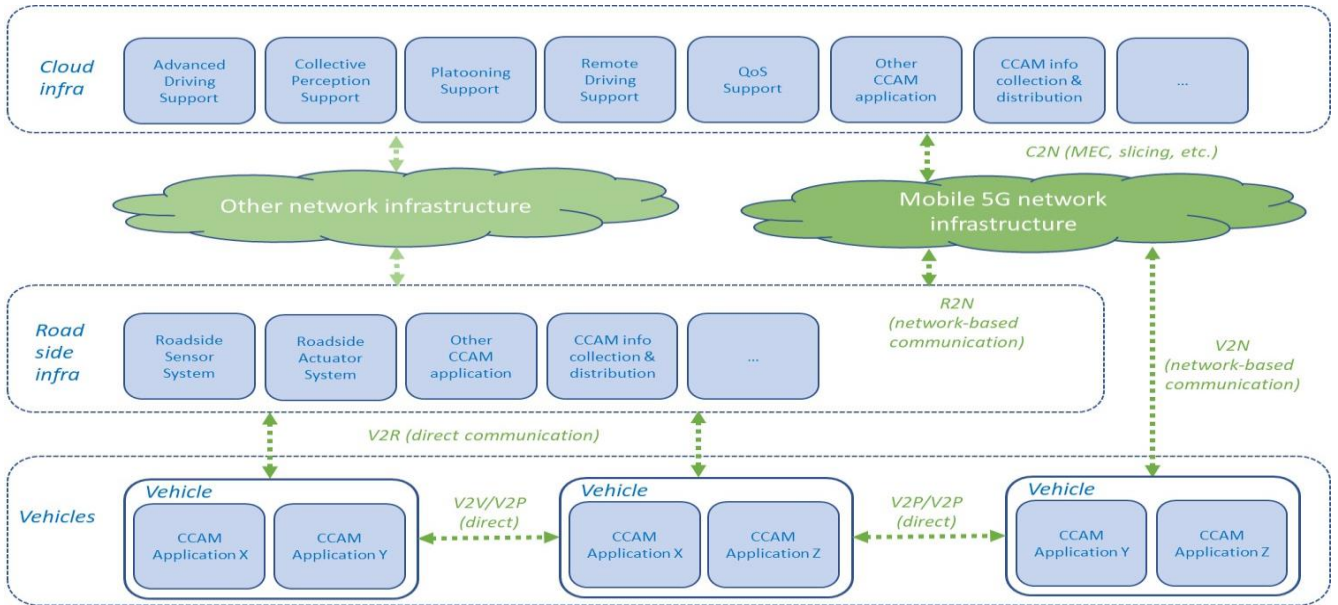
The processing of these data will comply with the different data protection regulations that apply on 5G-MOBIX such as the GDPR and No-EU countries data protection regulations. Those regulations and the ethical aspects are presented in Section 7. All these processes will be refined during the course of the project and must be rigorously followed.

## **2.2. Data Flows in 5G-MOBIX**

Figure 2 depicts the high-level architecture of CCAM infrastructure that will be instantiated by each CBC/TS to support their User Stories.

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<sup>2</sup> [https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management\\_en.htm](https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/data-management_en.htm)

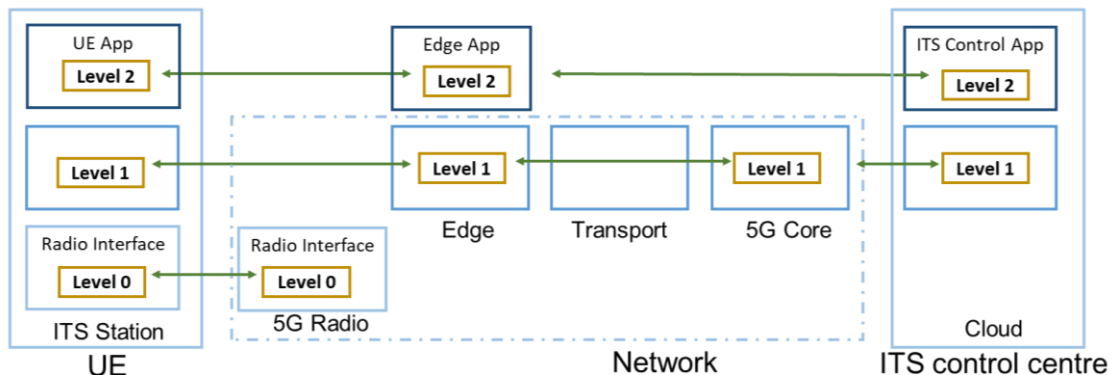


**Figure 2: 5G-MOBIX High level CCAM reference architecture**

For a 5G-MOBIX system under test composed by ITS stations, network and ITS control centre, a precise location of points of control and observation (PCOs) where measurements must be taken has been made, as depicted in Figure 3, and reported in D5.1. The PCOs are organised in three PCO levels, referring to the architecture layer where the data collection is performed:

- Level 0: at the access layer of the mobile network architecture (LTE or 5G)
- Level 1: at the transport layer, typically the TCP/IP network and transport layers
- Level 2: at the application layer where ITS application messages and content (e.g., video) are exchanged

The measurements and logging of information at the different PCOs will allow the computation of mandatory KPIs needed for the assessment of network capabilities in an UCC/US-agnostic manner and the assessment of user perceived performance on an end-to-end basis, in a UCC/US-specific manner.



**Figure 3: PCO levels in the system under test**

The dashed links of Figure 2 show the bidirectional data flows that link 5G-MOBIX sub/systems. Only part of these data flows will be collected, stored during the trial activities and evaluated as depicted in Figure 4. Indeed, after identifying the data collection points, collected data measurements will be stored in several local temporary data storage units. A process of harmonization, quality checking and data formatting will be done at the level of each CBC/TS before transferring the data to the centralized server. The Data Manager at each CBC/TS should be appointed to control this process and to perform all mandatory data quality check operations using a common data quality check tool developed by the project. Finally, thanks to this process, all the data stored at the central test server are good candidates for data sharing of research data according to ORDP initiative.

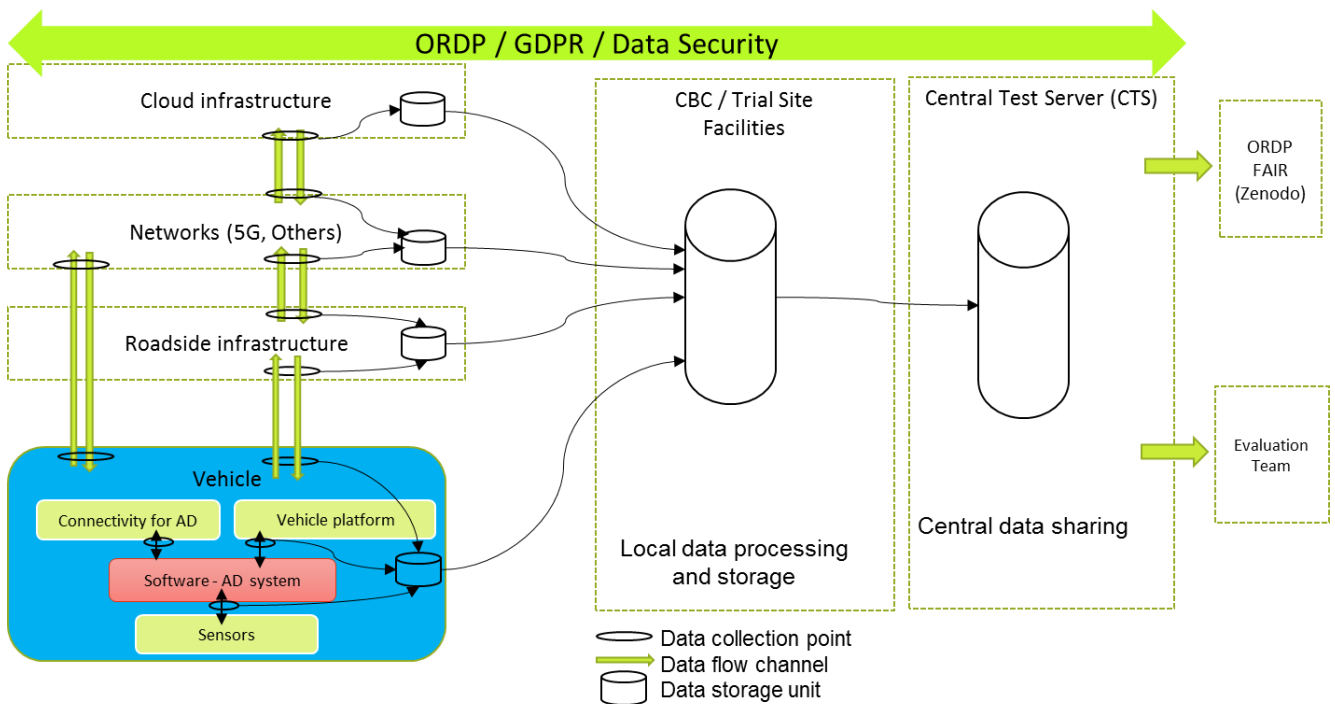


Figure 4: Data flows in 5G-MOBIX

## 2.3. Datasets Categories

Different categories of datasets will be produced during the project:

- **Context data:** data that describe the context of an experiment on a 5G-MOBIX UCCS/US (see D2.1 – “5G-enabled CCAM use cases specifications”)
- **Acquired and derived data:** data that contain all the collected information related to UCC/US-agnostic measurements or to an experiment on a 5G-MOBIX UCC/US.

### 2.3.1. Context Data



Context data are any information that helps to explain observation during a study. Context data can be collected generated or retrieved from existing data, and will provide the environment set up for testing vehicles, devices and users in a test scenario or a test session. The following list outlines the kind of information to be collected as contextual data:

- Type and number of vehicles;
- Type and number of users: tester, driver, developer, passenger, pedestrian, bystander;
- Details about: road, weather, safety limitations, number of safety interventions, etc.

### 2.3.2. Acquired and Derived Data

Acquired data are all data collected to be analysed during the trials. Derived data are created by different types of transformation including data fusion, filtering, classification, and reduction. Derived data are easy to use and contain derived measures and performance indicators referring to a time period when specific conditions are met. This category includes measurements from sensors mounted on vehicles, 5G infrastructures and services and subjective data collected from either the users or the environment. A first categorization of these data is described in the following subsections and will be refined in the coming versions of this deliverable.

#### 2.3.2.1. In-vehicle measurement data

In-vehicle measurement data are the data collected from vehicles, using either their original in-car sensors or sensors added for 5G-MOBIX purposes:

- **Vehicle attributes** are measures that describe the mobility of the vehicle. Examples of measures are longitudinal speed, longitudinal and lateral acceleration, yaw rate, and slip angle.
- **In-vehicle systems state** can be accessed by connecting to embedded controllers. It includes continuous measures like engine revolutions per minute (RPM) or categorical values like ADAS and active safety systems activation.
- **Vehicle positioning:** Measurements of geographical location of a vehicle will be collected by different navigation systems such as RTK GPS/IMU based positioning, DGPS, etc.
- **Sensors data** are the environment data that can be obtained by advanced sensors like RADARs, LIDARs, Cameras, simple optical sensors, etc. These sensors are described and presented in more details in the deliverable D2.4– “5G augmented vehicle specifications”.
- **Media:** Mostly consist of high definition live video stream data shared with a remote site in real-time but also index files used to synchronize the other data categories. They are often collected from the Road Side Units.
- **Tele-operation** and **remote driver actions** define the actions and data that enable a remote driver or a V2X application to operate a remote automated driving vehicle and take over control of the vehicle thanks to localisation, real-time high definition live video stream and 3D bird’s eye view of vehicle sensors data.

- **Radio Access Technologies:** Data such as the Link Quality Indicator for the RATs used in the OBU for example for 3/4G, 5G, Wi-Fi, LTE-V2X.
- **V2X application message:** Data generated, stored and sent through V2X communication service (trajectories, sensor data, brake commands, manoeuvre, etc.).

#### 2.3.2.2. CCAM infrastructure data

CCAM Infrastructure data are generated by the Cloud and Road Side Infrastructures used in 5G-MOBIX and displayed in Figure 2. Some examples are listed below.

- **Road side measurements** are the vehicle's counting speed measurement and positioning, using radar, rangefinders, inductive loops or pressure hoses. In 5G-MOBIX systems, it can also contain more complex information remotely transferred from vehicles to Road Side Units (Edged Dynamic Map (EDM), Path planning).
- **ITS messages** including CAM, DENM, CPM, MCM or other types of ITS messages exchanged via V2X protocols.
- **Sensors data** including LIDAR data, video, Road Side information, Road Side messages etc.

#### 2.3.2.3. 5G infrastructure data

5G infrastructure data are generated by the 5G infrastructure described in deliverable D2.2- "5G architecture and technologies for CCAM specifications". Different logging information will be collected at several PCO levels and include:

- **Signalling traces** corresponding to low-level network signalling information (PCO level o) related to particular network events generating transitions between UE's states, triggering procedures execution such as Registration, RRC connection establishment and release, handover, etc.
- **Network and communication information** referring to data specific to network characteristics. They can be collected at multiple PCO levels:
  - Level 0: Low-level network information regarding, for instance the data exchanged by the UE and the network infrastructure to set up and maintain communication.
  - Level 1: Higher level network information including parameters such as Mobile Network Code (MNC), Mobile Country Code (MCC), RAT (LTE, NR, etc.), cellular ARFCN<sup>3</sup>, Physical Cell Identity (PCI), Cell ID, eNB ID, gNB ID, LTE Tracking Area Code (TAC), Received Signal Strength Indicator (RSSI), Reference Signal Received Power (RSRP), Reference Signal Received Quality (RSRQ), Signal Noise Ratio (SNR), Channel Quality Indicator (CQI) or Timing Advance (TA).

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<sup>3</sup> Absolute radio-frequency channel number

- **Network performance measurements** correspond to instantaneous value of network metrics that are measured at defined rates to assess the network performance indicators. They are collected at multiple PCO levels:
  - Level 1: Examples of metrics are throughput, delay, jitter, packet loss rate, round trip time (RTT).
  - Level 2: Application level metrics such as application data rate.

#### 2.3.2.4. Other data

- **5G-MOBIX users' data:** 5G-MOBIX users' data are all the data generated by the different categories of users targeted by the project to obtain knowledge and comprehension to assess the user acceptance of 5G technology (Demographic information, transport habits, questionnaires).
- **Experimental conditions:** Experimental conditions are the external factors which may have an impact on participants' behaviour. They may be directly collected during the experiment or integrated from external sources. Typical example is traffic density.

## 2.4. Metadata

The Data Sharing Framework defined by FOT-NET project<sup>4</sup> defines metadata as '**any information that is necessary in order to use or properly interpret data**'. This section reviews the relevant metadata standards developed or used in the previous and ongoing field operational tests (FOT) and naturalistic driving studies (NDS) as a basis for the development of the metadata specifications of the trial data. Such standards will help the analysis and re-use of the collected data within 5G-MOBIX to determine how the raw data was collected and processed in order to perform data analysis, modelling and interpretation.

These standards serve to establish the 5G-MOBIX's metadata into four different categories as follows.

- **5G-MOBIX pilot design and execution** documentation, which corresponds to a high-level description of a data collection: its initial objectives and how they were met, description of the test site, etc.
- **Descriptive** metadata, which describes precisely each component of the dataset, including information about its origin and quality. This includes 5G technologies metadata described in Table 3.
- **Structural** metadata, which describes how the data are being organized.
- **Administrative** metadata, which sets the conditions for how the data can be accessed and how this is being implemented.

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<sup>4</sup> <http://fot-net.eu/wp-content/uploads/sites/7/2017/04/FOT-Net-D3.1-Data-Sharing-Framework-v1.0.pdf>

Full details of these metadata categories can be found in the Deliverables of the FOT-Net Data project such as D4.1<sup>5</sup> – “Data Catalogue” and D4.3<sup>6</sup> – “Application of Data Sharing Framework in Selected-Cases” which can be found at the project website<sup>7</sup>.

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<sup>5</sup> <http://fot-net.eu/wp-content/uploads/sites/7/2017/05/FOT-Net-Data-D4.1-Data-Catalogue-v3.pdf>

<sup>6</sup> <http://fot-net.eu/wp-content/uploads/sites/7/2017/04/FOT-Net-D4.3-Application-of-Data-Sharing-Framework-in-Selected-Cases-v1.pdf>

<sup>7</sup> <http://fot-net.eu/Documents/fot-net-data-final-deliverables/>

## 3. 5G-MOBIX SHARED DATASET DESCRIPTION

### 3.1. Potential datasets

During the trials as described in D5.1, different measurements and logging information must be made to enable the computation of mandatory KPI needed for the assessment of network capabilities in an UCC/US-agnostic manner and the assessment of user perceived performance on an end-to-end basis, in a UCC/US-specific manner. The following tables summarize the potential datasets that will be used for the technical evaluation and made available by the project. Indeed, for each trial site, multiple datasets will be collected at different points of control and observation (PCO) and at specific architecture layer (Lo: Access, L1: Transport, L2: Application). This table includes the relationship between the selected dataset and the identified x-border issues the trial site experiment is targeting to address. In D2.1, Cross-Border Issue Analysis describes the classification into categories of different issues present at the cross-border areas when operating advanced CCAM applications (Telecommunication, Application, Security and Data Privacy and Regulation). This table will be updated in the next versions of the DMP and will include details on the information to be logged.

**Table 1: Potential dataset to assess user perceived performance**

Trial Site	Use Case Categories	User Stories	Traffic flow type	PCO	PCO level	Cross-border issues <sup>8</sup>
ES-PT	Advanced Driving	Complex manoeuvres in cross-border settings	CAM, DENM	MEC, RSU, UE	Lo, L1, L2	TR1, TC1, AC1, AI1
ES-PT	Advanced Driving	Automated shuttle remote driving across borders	CAM, DENM	Shuttle (OBU), Smartphone (VRU), RSU (camera), MEC	Lo, L1, L2	TR1, TC1, AC1, AI1
FR	Advanced Driving	Infrastructure-assisted advanced driving	CAM, CPM, MCM, Road Side Video streaming, Lidar	OBU, RSU, MEC V2X application server	L2	TN1, TN3, AP1, AC1, TN2, TH2

<sup>8</sup> Reference to the associated X-border issues as identified and listed in D2.1

NL	Advanced Driving	Cooperative Collision Avoidance	C-ITS Messaging	OBU, gNB, MEC	L1, L2	TC2, TR2
CN	Advanced Driving	Cloud-assisted advanced driving	RSI, RSM, SPAT, MAP, BSM	OBU, gNB, RSU, MEC, Cloud	L2	SO1
GR-TR	Vehicles Platooning	Platooning with "see what I see" functionality in cross-border settings	Platoon, SWISA (Video), Lidar	HMI, OBU, RSU, Vehicle controller Unit, LEVIS client / Cloud	L1, L2	AC1
DE	Vehicles Platooning	eRSU-assisted platooning	EDM, C-V2X message	RSU1, Core2, OBU	L1, L2	TR1, TN2, AC1, AC2,
CN	Vehicles Platooning	Cloud-assisted platooning	MAP, VIDEO, BSM, CAPM	RSU, MEC, Cloud	L2	SO1
ES-PT	Extended Sensors	Complex manoeuvres in cross-border settings: HD maps and Public transport with HD media services and video surveillance	CAM, Sensor, HDMAP	UE, ITS Centre	L0, L1, L2	TC1, AI1, AP2, TR1
GR-TR	Extended Sensors	Extended sensors for assisted border-crossing	Vehicle, Sensor, Video, Application	OBU, App server, gNB, Packet gateway	L1, L2	TC2, AC2, TR1, TN4, AI3, TH2, TH3, TC1, AP1, SP2, SO1
DE	Extended Sensors	EDM-enabled extended sensors with surround view generation	Video, LDM, EDM, C-V2X message	OBU	L1	TS1, AI1, AC1, AC2

FI	Extended Sensors	Extended sensors with redundant Edge processing	Video, Context information, Detected objects, Edge node status	OBU, MEC, gNB	L2	SP2, AI2, ST2, TC2, TS2, AP1, RC2, RC3
NL	Extended Sensors	Extended sensors with CPM messages	CPM	UE, Edge	L1, L2	TR2, TC2, AC1
ES-PT	Remote Driving	Automated shuttle remote driving across borders	4K streaming, Messages (Cockpit, Shuttle)	Cockpit, UE (shuttle), MEC, Camera	L0, L1, L2	TC1, AI1, TR1, AC1
FI	Remote Driving	Remote driving in a redundant network environment	Vehicle data, motion state video, remote driving command	Video client & server, OBU, remote control centre	L2	TR1, TH1, AC1
NL	Remote Driving	Remote driving using 5G positioning	Vehicle sensor data, vehicle position, motion state, Video stream, remote driving command, Localization	OBU, Remote driving station	L1, L2	AC1, TR2, AC1, AG1

CN	Remote Driving	Remote driving with data ownership focus	Vehicle's information, Video, remote control messages, MAP	OBU, RSU, Cloud	L2	SO1
KR	Remote Driving	Remote driving using mmWave communication	Video FHD stream, Camera control, Vehicle control, Raw sensor	OBU	Lo	
ES-PT	Vehicle QoS Support	Public transport with HD media services and video surveillance	Video stream, cockpit control	Server Tablets, Camera, ITS Centre	Lo, L1, L2	TC1, AP2, TR1
KR	Vehicle QoS Support	Tethering via Vehicle using mmWave communication	any data (video stream, online gaming)	Vehicle UE	L1, L2	

Table 2 details the dataset that will be shared by the project to assess network capabilities. This table will be updated in the last version of the DMP and will include details on the information to be logged.

**Table 2: Potential datasets to assess network capabilities in an UCC/US-agnostic manner**

Trial Site	PCO	PCO level	Synthetic traffic	Protocol	Targeted KPI
All Trial sites	UE, MEC, Core network, ITS	Lo, L1, L2	Yes, No (optional)	ITS-G5, UDP, TCP	KPI1.1 User Experienced Data rate KPI1.2 Throughput KPI1.3 End-to-end latency KPI1.4 Control plane Latency KPI1.5 User plane Latency KPI1.6 Reliability KPI1.8 Network Capacity



	control centre,  GNb,  PGW,  Cloud Server				KPI1.9 Mean Time to Repair KPI2.1 NG-RAN Handover Success Rate KPI2.2 Application Level Handover Success Rate KPI 2.3-Mobility Interruption Time
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### 3.2. General data description

This section provides guidelines for the description of the different types of datasets to be collected and shared by 5G-MOBIX after the end of the project with respect to ORDP which aims to improve and maximize access to and re-use of research data generated by Horizon 2020 projects. As the nature and extent of these datasets can evolve during the project, more detailed descriptions will be provided in the next version of the DMP (M44).

The descriptions of the different datasets, including their reference, file format, standards and metadata and archiving and preservation to be used are given below.

Table 3 provides a template that shall be used to describe the datasets.

**Table 3: 5G-MOBIX Dataset description template**

Dataset Reference	Each dataset will have an identifier that will be generated by the combination of the name of the project, the trial site, the use case category and user story in which it is generated and the datatype: "5G-MOBIX_Trial-Site_UCC_US_Datatype".
Dataset Name	Name of the dataset.
Dataset Description	Each dataset will have a full data description explaining the data provenance, origin and usefulness. Reference may be made to existing data that could be reused.
Standards and metadata	The metadata attributes list to be used to explore the dataset.
File format / data format	Standard file type of the log file for example csv, xml Type of formatting of the payload of a log item, for example: uper, xer, json Structure and definition of log parameters that can be logged in a log item
Data Sharing (access right and License)	Explanation of the sharing policies related to the dataset between the next options: <b>Open:</b> Open for public disposal.

	<p><b>Embargo:</b> It will become public when the embargo period applied by the publisher is over. In case it is categorized as embargo, the end date of the embargo period must be written in DD/MM/YYYY format.</p> <p><b>Restricted:</b> Only for project internal use.</p> <p>Each dataset must have its distribution license.</p> <p>Provide information about personal data and mention if the data is anonymized or not. Indicate if the dataset entails personal data and how this issue is taken into account.</p> <p><b>License:</b> Example of type of licenses (cf. <a href="https://opendefinition.org/licenses/">https://opendefinition.org/licenses/</a>)</p>
Archiving and Preservation	The preservation guarantee and the data storage during and after the project (for example databases, institutional repositories, public repositories, etc.).

## 4. PARTICIPATION IN THE OPEN RESEARCH DATA PILOT

5G-MOBIX has agreed to participate in the Pilot on Open Research Data in Horizon 2020 and uses the specific Horizon 2020 guidelines associated with open access to ensure that the results of the project provide the greatest impact possible.

5G-MOBIX will ensure the open access<sup>9</sup> to all peer-reviewed scientific publications relating to its results and will provide access to the research data needed to validate the results presented in deposited scientific publications.

The following lists the minimum fields of metadata that should come with a 5G-MOBIX project-generated scientific publication in a repository:

- The terms: "European Union (EU)", "Horizon 2020"
- Name of the action (Research and Innovation Action)
- Acronym and grant number (5G-MOBIX, 825496)
- Publication date
- Length of embargo period if applicable
- Persistent identifier

When referencing open access data, 5G-MOBIX will include, at a minimum, the following statement demonstrating EU support (with relevant information included into the repository metadata):

*"This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement No 825496".*

The 5G-MOBIX consortium will strive to make many of the collected datasets open access. When this is not the case, the data sharing section for these datasets will describe why access has been restricted (See the row Data Sharing in Table 3). A concrete identification of datasets to be shared by each trial site had permitted to define 5G-MOBIX's potential datasets as described in section "3.1 Potential datasets" .

In regard to the specific repositories available to the 5G-MOBIX consortium, numerous project partners maintain institutional repositories that will be listed in the following DMP version, where project scientific publications and in some instances, research data will be deposited. The use of a specific repository will depend primarily on the primary creator of the publication and on the data in question.

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<sup>9</sup> [http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access\\_en.htm](http://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access_en.htm)

Other project partners will not operate publicly accessible institutional repositories. When depositing scientific publications, they shall use either a domain specific repository or use the EU recommended service OpenAIRE (<http://www.openaire.eu/>) as an initial step to finding resources to determine relevant repositories.

Project research data shall be deposited to the online data repository ZENODO<sup>10</sup>. It is a free service developed by CERN under the EU FP7 project OpenAIRE plus (grant agreement no.283595).

The repository shall also include information regarding the software, tools and instruments that were used by the dataset creator(s) so that secondary data users can access and then validate the results.

The 5G-MOBIX data collections will be accessed in ZENODO repository at the following link: <https://zenodo.org/communities/5g-mobix>.

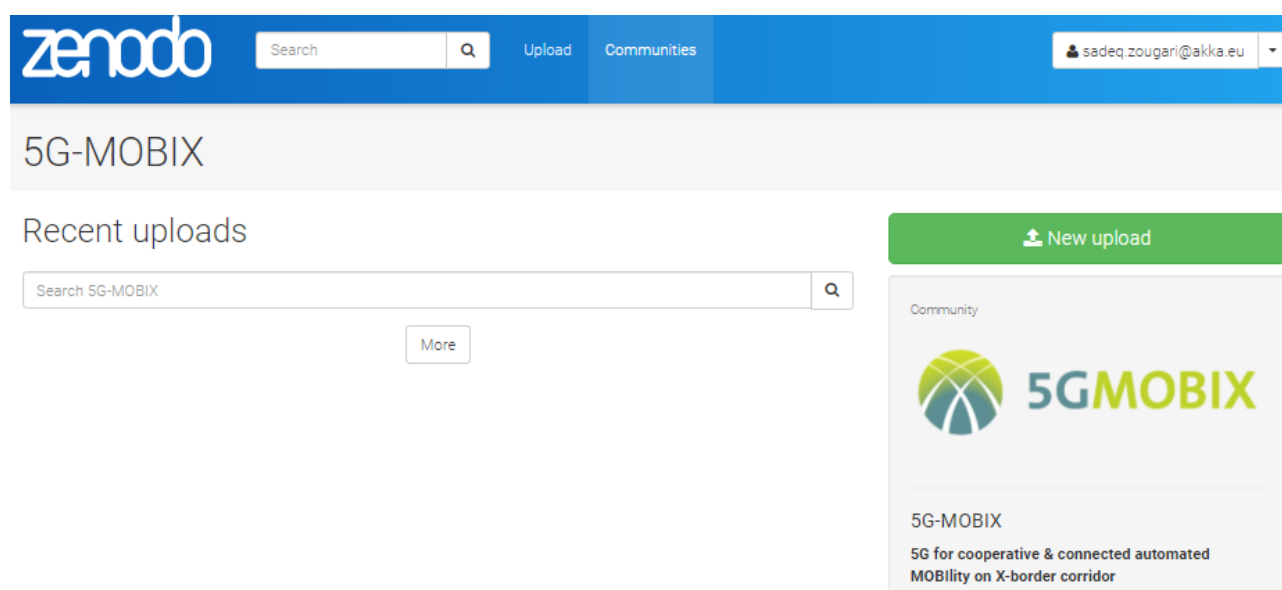


Figure 5: 5G-MOBIX repository in ZENODO

In summary, as a baseline, 5G-MOBIX partners shall deposit:

- Scientific publications – on their respective institute repositories in addition (when relevant) to the 5G-MOBIX ZENODO repository
- Research data – to the 5G-MOBIX ZENODO collection (when possible)
- Other project output files – to the 5G-MOBIX ZENODO collection (when relevant)

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<sup>10</sup> <https://zenodo.org/>

This version of the DMP does not include the actual metadata about the Research Data being produced in 5G-MOBIX project. Details about technical means and services for building repositories and accessing to this metadata will be provided in the next version of the DMP. A template document is defined in Table 3 and will be used by project partners to provide all requested information.

## 5. FAIR DATA MANAGEMENT PRINCIPLES

The data that will be generated during and after the project should be FAIR<sup>11</sup>, that is, Findable, Accessible, Interoperable and Reusable. These requirements do not affect implementation choices and do not necessarily suggest any specific technology, standard, or implementation solution.

The FAIR principles were generated to improve the practices for data management and data curation, and FAIR aims to describe the principles in order to be applied to a wide range of data management purposes, whether it is data collection or data management of larger research projects regardless of scientific disciplines.

With the endorsement of the FAIR principles by H2020 and their implementation in the guidelines for H2020, the FAIR principles serve as a template for data lifecycle management and ensure that the most important components for lifecycle are covered.

This is intended as an implementation of the FAIR concept rather than a strict technical implementation of the FAIR principles. 5G-MOBIX will implement several actions described below to carry on the FAIR principles.

### **Making data findable, including provisions for metadata:**

- The datasets will have very rich metadata to facilitate the findability. Open data format (csv, xml) will be used.
- All the datasets will have Digital Object Identifiers provided by the public repository (ZENODO).
- The reference used for the dataset will follow a format like the following: "5G-MOBIX\_Trial-Site\_UCC\_US\_Datatype\_XX" (XX: identifier to be added for similar datasets).
- The standards for metadata will be defined for each dataset as described in Section 2.4.

### **Making data openly accessible:**

- The datasets that will be openly available will be described according to Table 3.
- The datasets for evaluation will be accessible via 5G-MOBIX centralized server.
- The datasets will be made available using a public repository (e.g. ZENODO) after the project.
- Table 3 will be used to explain the methods or software used to access the data. Basically, no software is needed to access the data.
- The data and their associated metadata will be deposited in a public repository or either in an institutional repository.
- The Data Sharing row in Table 3 will outline the rules to access the data if restrictions exist.

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<sup>11</sup> [https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access\\_en.htm](https://ec.europa.eu/research/participants/docs/h2020-funding-guide/cross-cutting-issues/open-access-data-management/open-access_en.htm)

**Making data interoperable:**

- The metadata vocabularies, standards and methodologies will depend on the public repository and use the recommendations in section 2.4.
- 5G-MOBIX is defining a common data format on the basis of contributions from projects like InterCor<sup>12</sup>, AUTOPILOT<sup>13</sup> and C-MobILE<sup>14</sup>. This work is being developed in close collaboration between Task 5.1 “Evaluation methodology and plans”, Task 5.2 “Technical Evaluation”, Task 3.5 “Evaluation data collection and management” and Task 2.5 “KPI and evaluation data”. The goal is to have the same format across CBC/TSs which will enable the development of common data quality check tools and enable partners responsible for the evaluation dealing with the same format across all pilot sites.

**Increase data re-use (through clarifying licenses):**

- All data producers will license their data to allow the widest reuse possible. Examples of licenses are available at <https://opendefinition.org/licenses/>.
- By default, the data will be made available for reuse. If any constraints exist, an embargo period will be mentioned in the Data Sharing row of Table 3 to keep the data for only a period of time.
- The data producers will make their data available for third parties within public repositories. The data will be reused for the scientific publications’ validation purpose.

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<sup>12</sup> InterCor (Interoperable Corridors): <https://intercor-project.eu/>

<sup>13</sup> C-MobILE (Accelerating C-ITS Mobility Innovation and deployment in Europe): <https://c-mobile-project.eu/>

<sup>14</sup> InterCor (Interoperable Corridors): <https://intercor-project.eu/>

## 6. ALLOCATION OF RESOURCES

The costs to make the data FAIR in 5G-MOBIX shall be handled by each partner who will generate its data according to WP5 – “Evaluation” and Task 2.5 – “KPI and evaluation data specification” requirements.

In the project, Sadeq ZOUGARI (AKKA) plays the role of Data Manager and liaises with the TMT about the data management issues. The Data Manager leads data management plan tasks and participates in the project coordination in terms of the evaluation data collection, storage and handling, as well as their publication as part of the ORDP.

All research data collected as part of this project is owned by the data producers or partners involved in the corridors and trial sites. The partners in 5G-MOBIX will take the responsibility for the collection, management, and sharing of the research data. Quality assessment will be the responsibility of the data manager of each trial site.



## 7. DATA PROTECTION REGULATIONS AND ETHICAL ASPECTS

### 7.1. GDPR application in 5G-MOBIX

#### 7.1.1. Terminology<sup>15</sup>

Personal data means any information related to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly using identifiers, physical, physiological data. The involvement of data subject in 5G-MOBIX is described in D8.2 – "POPD - Requirement No.2".

Processing means any operation or set of operations which is performed on personal data or on sets of personal data. Article 4 gives an extensive set of such processing. Furthermore, data processing in 5G-MOBIX will exploit the data described in Section 2.3 and using the KPIs defined in deliverables D2.1 – "5G-enabled CCAM use cases specifications" and D2.5 – "Initial evaluation KPIs and metrics" in order to evaluate the outcomes of the project.

Controller determines the purposes and means of the processing of personal data. An identification of the controllers in 5G-MOBIX will be carried out for the next versions of this deliverable.

Processor means a natural or legal person, public authority, agency or other body that processes personal data on behalf of the controller.

#### 7.1.2. Data subject's rights

According to Article 7 of the GDPR, a lawful basis for processing of personal data exists when the data subject has given clear consent to process his/her personal data for a specific purpose.

In 5G-MOBIX, mechanisms will be implemented to provide the following rights to the data subject which are described in more detail in the section III of the GDPR (Articles 15-21).

#### 7.1.3. Controller's and Processor's obligations

In 5G-MOBIX project, the identified data controllers and data processor should follow the requirements in the section IV of the GDPR. An organisation model is depicted in next Figure 6 where Data controllers or joint-controllers and data processors are being identified per UCC/US and CBC/TS. A complete view is provided in Table 8.

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<sup>15</sup> definitions are drawn from the Article 4 of the GDPR

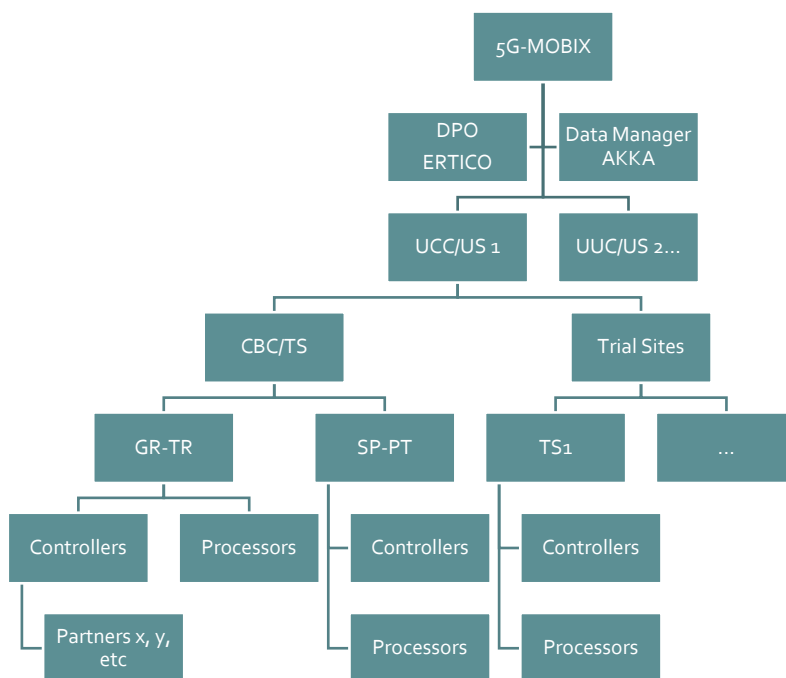


Figure 6: GDPR data controllers and data processors organization model in 5G-MOBIX

## 7.2. An approach to comply with GDPR in 5G-MOBIX

The approach proposed to handle the GDPR in 5G-MOBIX project consists in identifying all the concerned parties and the actions they need to take in order to comply with the regulation. This approach will enforce that personal data collected in 5G-MOBIX shall be (Article 5):

- Processed lawfully, fairly and in a transparent manner in relation to individuals;
- Collected for specified, explicit and legitimate purposes and further processed for scientific purposes;
- Adequate, relevant and limited to what is necessary for the purposes for which they are processed;
- 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;
- 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.

Since the project declares that the research involves personal data collection and/or processing, each data processor under the control of the data controller and the data protection officer will declare how GDPR rules are fulfilled in a separate document using Table 5 and Table 6.

More specifically, this approach consists of six steps, each of which is described in the following sections.

### 7.2.1. Appointing a Data Protection Officer for 5G-MOBIX

The first step consists of appointing a Data Protection Officer (DPO) and defining his/her mission in 5G-MOBIX. This step and the DPO role are described in D8.2 - POPD-Requirement No. 2 - Section 4.4.1.

### 7.2.2. Cartography of the Data processing

During this step, a complete cartography of the personal data processing will be made by each of 5G-MOBIX partners handling personal data at CBC/TS. 5G-MOBIX partners will use the template provided in Section 7.2.2.1 to establish such cartography. This cartography includes:

- All the types of personal data processing that are implemented at the cross-border corridors and the trial sites
- All the categories of personal data to be processed during the trials
- The objectives for which these processing is done
- The actors (internal or externals) which are processing the data
- The data flows in order to identify transfer of data outside of the EU

The table below summarizes the important questions to be asked by each 5G-MOBIX partner.

**Table 4: Records of processing activities**

Question	Description
<b>Who</b>	<ul style="list-style-type: none"> <li>• the name and contact details of the controller and, where applicable, the joint controller, the controller's representative and the data protection officer;</li> <li>• the name and contact details of the processor or processors and of each controller on behalf of which the processor is acting, and, where applicable, of the controller's or the processor's representative, and the data protection officer;</li> <li>• the categories of recipients to whom the personal data have been or will be disclosed including recipients in third countries or international organisations;</li> </ul>
<b>What</b>	<ul style="list-style-type: none"> <li>• a description of the categories of data subjects and of the categories of personal data;</li> <li>• the categories of processing carried out on behalf of each controller;</li> </ul>
<b>Why</b>	<ul style="list-style-type: none"> <li>• the purposes of the processing;</li> </ul>
<b>Where</b>	<ul style="list-style-type: none"> <li>• where applicable, transfers of personal data to a third country or an international organisation, including the identification of that third country or international organisation and, in the case of transfers referred to in the second subparagraph of Article 49(1), the documentation of suitable safeguards;</li> </ul>

<b>When</b>	<ul style="list-style-type: none"> <li>where possible, the envisaged time limits for erasure of the different categories of data;</li> </ul>
<b>Up to When</b>	
<b>How</b>	<ul style="list-style-type: none"> <li>where possible, a general description of the technical and organisational security measures referred to in Article 32(1).</li> </ul>

### 7.2.2.1. GDPR templates used for 5G-MOBIX data processing

The information requested in this section is in line with the requirements to maintain data processing records under the GDPR (Table 4) and is specific to personal data. This template comes from previous work (EU/Autopilot project). All data controllers must also keep records of dataset descriptions according to the Data Management Plan.

#### 7.2.2.1.1. Data controllers

In each trial site, a Data controller should be appointed and will liaise with the DPO. The data controller should complete the template described in Table 7 as described in D8.2 - POPD-Requirement No. 2.

Table 5: Data processing - record keeping template

<b>1</b>	<b>Contact details of Data Controller</b> (and, if applicable, joint controller, the controller's representative and the data protection officer)
Name	
Email	
Company address	
Telephone	
<b>2</b>	<b>Purpose of processing</b>
<b>3</b>	<b>Description of categories of data subjects and of the categories of personal data</b>
<b>4</b>	<b>Categories of recipients to whom the personal data have been or will be disclosed including recipients in third countries or international organisations</b>
<b>5</b>	<b>Where applicable, transfers of personal data to a third country or an international organisation, including the identification of that third country or international organisation</b>

<b>6</b>	<b>Where possible, the envisaged time limits for erasure of the different categories of data</b>
<b>7</b>	<b>Where possible, a general description of the technical and organisational security measures for</b>
a	<i>the pseudonymisation and encryption of personal data —</i>
b	<i>the ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and services —</i>
c	<i>the ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident —</i>
d	<i>a process for regularly testing, assessing and evaluating the effectiveness of technical and organisational measures for ensuring the security of the processing —</i>

#### 7.2.2.1.2. Data processors template

The following template is a guideline to be completed by each data processor as described in D8.2 - POPD-Requirement No. 2.

**Table 6: Data processing - record keeping template**

<b>1</b>	<b>Contact details of Data Processor</b> (and controller on behalf of which the processor is acting, and, where applicable, of the controller's or the processor's representative, and the data protection officer)
	<i>Data Processor(s)</i>
	<i>Email</i>
	<i>Company address</i>
	<i>Telephone</i>
	<i>Data Controller</i>
	<i>Email</i>
	<i>Company address</i>
	<i>Telephone</i>
<b>2</b>	<b>Categories of processing carried out on behalf of the Controller</b>
<b>3</b>	<b>Where applicable, transfers of personal data to a third country or an international organisation, including the identification of that third country or international organisation</b>

<b>4</b>	<b>Where possible, a general description of the technical and organisational security measures for</b>
a	<i>the pseudonymisation and encryption of personal data —</i>
b	<i>the ability to ensure the ongoing confidentiality, integrity, availability and resilience of processing systems and services —</i>
c	<i>the ability to restore the availability and access to personal data in a timely manner in the event of a physical or technical incident —</i>
d	<i>a process for regularly testing, assessing and evaluating the effectiveness of technical and organisational measures for ensuring the security of the processing —</i>

### 7.2.3. Action to be undertaken

Based on the previous step, the following actions should be undertaken in order to mitigate data privacy risk related to personal data processing at each CBC/TS:

- Ensure that only necessary data requested for the data processing are collected and processed
- Identify the lawfulness of the data processing (e.g. informed consent)
- Provide informed consent compliant to the GDPR (Articles 12, 13, 14)
- Assure that the third parties know and implement the GDPR
- Provide the mechanisms to support the rights of the data subjects
- Verify the security mechanisms that are implemented

Important care must be taken in order to:

- Identify whether the processing leads to mass-surveillance or identification of a data subject.
- Implement the necessary mechanisms to transfer data outside the EU. Indeed, China, Korea and Turkey have their own data protection regulations (and Authorities). However, these countries are not compliant with the GDPR. Therefore, when applicable, the proper data transfer mechanisms should be implemented such as:
  - Contractual Clauses for Transfers between two data controllers
  - Binding corporate rules (see Article 47)
  - Derogations for specific situations (see Article 49)

### 7.2.4. Data Privacy Impact Assessment

This step consists in conducting a Data Privacy Impact Assessment (DPIA) to evaluate the risks of the processing identified during the previous step. For each CBC/TS a DPIA is considered in order to:

- Identify the risks related to the previously identified data processing

- Determine solutions that will be implemented by 5G-MOBIX partners in order to mitigate the risks.

The following questions/responses will cover the objectives of the DPIA, why is it necessary for 5G-MOBIX and how to conduct it?

### **What is a Data Protection Impact Assessment (DPIA)?**

According to the Article 35 of the GDPR, the Data Protection Impact Assessment (DPIA) is the process of assessing “the impact of the envisaged processing operations on the protection of personal data”. It consists in identifying the potential risks that the data controller’s future processing poses to personal data. It helps to mitigate these risks, protecting “the rights and freedoms of natural persons”. At the end, it demonstrates the compliance of a data controller’s processing with the GDPR.

In short, a DPIA should:

- Identify all envisaged data processing with their purposes
- Evaluate the necessity and proportionality of the processing operations
- Assess the risks to “the rights and freedoms”
- Describe the measures to mitigate the risks and to ensure data protection

### **Why is a DPIA necessary in 5G-MOBIX?**

According to the Article 35 of the GDPR, a DPIA is necessary “where a type of processing in particular using new technologies (...) is likely to result in a high risk to the rights and freedoms of natural persons”. More specifically, the Article 29 Working Party—which has been now replaced by the European Data Protection Board (EDPB)—has published an [official guideline](#) on how to qualify a high risk. In that aim, this document provides a list of criteria that indicate the necessity of a DPIA. One of them relates to “innovative use or applying new technological or organisational solutions”. 5G-MOBIX is an innovative project where new technologies are deployed and tested at quite large scale (cross-border corridors). Additionally, according to the same document, “the geographical extent of the processing activity” is enough to qualify a processing as “large scale”. Moreover, in some use cases, the monitoring of public area (public roads) by the automated vehicles or the RSUs—even if it is not systematic—may need more in-depth analysis on the potential impact on the rights and freedoms of the data subjects as it may fall within the criteria of “automated-decision making with legal or similar significant effect”. Finally, S. Rizou et al<sup>16</sup> have studied the interaction between the 5G and IoT network applications and the GDPR. They raise awareness about the challenges posed by the 5G and the IoT technologies regarding the GDPR compliance.

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<sup>16</sup> S. Rizou, E. Alexandropoulou-Egyptiadou and K. E. Psannis, "GDPR Interference With Next Generation 5G and IoT Networks," in IEEE Access, vol. 8, pp. 108052-108061, 2020, doi: 10.1109/ACCESS.2020.3000662.

### How to conduct a DPIA?

The Article 35 of the GDPR provides information on what is expected in a DPIA. In order to facilitate this task and help the data controller, some tools are available.

The UK's Information Commissioner's Office (ICO) has provided a [template](#) that serves as a guideline for conducting a DPIA.

For a more user-friendly way to carry out a DPIA, the French organisation CNIL has developed an open-source software that helps through the whole process of DPIA from the information harvesting regarding the data processing to the submission for evaluation and the validation. The software can be downloaded from its official [web page](#).

#### 7.2.5. Implementing organisational measures

During this step, the procedures are implemented for 5G-MOBIX in order to provide the protection of the personal data according to the GDPR:

- Training of the personnel in order to raise awareness about GDPR
- Implement the mechanisms for data subject to retrieve their data, erase their data and other rights
- Implement mechanisms for data breaches

#### 7.2.6. Documentation

This final step concerns the provision of a clear documentation of the whole data protection procedure that has been implemented:

- Data processing register
- The DPIA
- Data transfer documents (Contractual Clauses for Transfers, Binding corporate rules and Derogations for specific situations)
- Informed consent (See D8.2 – “POPD – Requirement No. 2.”)
- Internal procedures about personal data processing and other trainings documents

### 7.3. Data protection regulation in the Non-EU Countries

Article 3 of the GDPR states that:

- This regulation applies to the processing of personal data in the context of the activities of an establishment of a controller or a processor in the Union, regardless of whether the processing takes place in the Union or not.



- This regulation applies to the processing of personal data of data subjects who are in the Union by a controller or processor not established in the Union, where the processing activities are related to:
  - The offering of goods or services, irrespective of whether a payment of the data subject is required, to such data subjects in the Union; or
  - The monitoring of their behaviour as far as their behaviour takes place within the Union.
- This regulation applies to the processing of personal data by a controller not established in the Union, but in a place where Member State law applies by virtue of public international law.

Therefore, for the trial sites in the three Non-EU countries (China, Korea and Turkey) a clarification is made about the interactions between the GDPR and the data protection regulations in those countries. Towards this end, Table 7 identifies these regulations.

Table 7: Data protection regulations in China, Korea and Turkey<sup>17</sup>

Country	Data protection Authority	Description of the Law	Compatibility with GDPR
China	<a href="http://law.moj.gov.tw/Eng/LawClass/LawAll.aspx?PCode=lo050021">http://law.moj.gov.tw/Eng/LawClass/LawAll.aspx?PCode=lo050021</a>	The Personal Data Protection Act (hereinafter, the "PDPA") is enacted to regulate the collection, processing and use of personal data so as to prevent harm on personality rights, and to facilitate the proper use of personal data.	These countries have national legislations on the protection of personal data and a data protection authority recognized by the International Conference of Data Protection and Privacy Commissioners ( <a href="https://icdppc.org/">https://icdppc.org/</a> ) but are not compliant with GDPR.
Korea	Authority: Personal Information Protection Commission  Address: 209 Sejong-ro Jongno-gu Seoul 110-760 Korea  URL: <a href="http://www.pipc.go.kr/cmt/main/english.do">http://www.pipc.go.kr/cmt/main/english.do</a>	The purpose of this act is to prescribe matters concerning the management of personal information in order to protect the rights and interests of all citizens and further realize the dignity and value of each individual by protecting personal privacy, etc. from collection, leakage, misuse and abuse of individual information.	

<sup>17</sup> The source used to filled this table is from the CNIL (<https://www.cnil.fr/fr/la-protection-des-donnees-dans-le-monde>)

<b>Turkey</b>	Authority: Personal Data Protection Authority  Address: Nasuh Akar Mah. Ziyabey Cad. 1407. Sok. No:4 06520 Balgat-Çankaya/Ankara  URL: <a href="https://www.kvkk.gov.tr/">https://www.kvkk.gov.tr/</a>		
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#### 7.4. Ethical Aspects

Ethical issues related to the protection of personal data (POPD) in 5G-MOBIX will be addressed in D8.2 – “POPD – Requirement No. 2.”

## 8. DATA SECURITY

The data produced during the execution of 5G-MOBIX project will be stored per CBC/TS in local servers and in a central server for the whole project. According to the previous section, those data are made compliant with the GDPR. This section describes some security principles that are implemented in order to protect against any type of modification. Also, a more thorough management of the servers could be made using the ISO 27001 standards or the BSI-Standards<sup>18</sup>. The security principles are listed below:

- **Authentication:** All the users wanting to get access to the 5G-MOBIX data servers should be authenticated. Also, proper means are used to authenticate the servers. An authentication system will be used to handle the authentication of the users during the course of the project.
- **Authorization:** The access to 5G-MOBIX data servers is only available to the authenticated and authorized users. These categories and the rights of those users are defined and enforced. The appropriate access control policies and mechanisms (including physical access control) shall be identified for each trial site and project wide to provide the authorization.
- **Accounting:** In 5G-MOBIX any access and modification to a resource by any user is securely logged in order to prevent users from denying that data files were accessed, altered or deleted, when auditing.
- **Confidentiality:** The data stored in 5G-MOBIX servers should be encrypted during transmission and storage.
- **Communication Security:** Access to 5G-MOBIX servers should be done through encrypted communication channels such as HTTPS and IPsec.
- **Data Integrity:** The data collected during 5G-MOBIX should be protected from malicious and accidental modifications by any users during their transmission or their storage. Cryptographic mechanisms such as hash functions and digital signatures shall be used.
- **Availability:** This security principle assures that the 5G-MOBIX servers should be available for 5G-MOBIX users during the defined interval of service. Also, regular backups of the data should be made.

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<sup>18</sup> [https://www.bsi.bund.de/EN/Publications/BSIStandards/BSIStandards\\_node.html](https://www.bsi.bund.de/EN/Publications/BSIStandards/BSIStandards_node.html)

## 9. CONCLUSION

This deliverable (and its scheduled updates) provides an overview of the data that 5G-MOBIX project produces, together with the related data processes and requirements that need to be taken into consideration. Section 3 provides a table template for the description of the datasets to be shared after the end of the project. It includes detailed description, standards, methodologies, and sharing and storage methods. A concrete list of potential datasets used to assess network capabilities in an UCC/US-agnostic manner and to assess user perceived performance is described.

Since 5G-MOBIX participates in the Pilot on Open Research Data in Horizon 2020, specific Horizon 2020 guidelines associated with 'open access' are described to ensure that the results of the project provide the greatest impact possible. Besides, 5G-MOBIX will ensure the open access to all peer-reviewed scientific publications relating to its results and will provide access to the research data needed to validate the results presented in deposited scientific publications.

Moreover, D1.6 describes the FAIR data management principle and defines several actions to carry on the FAIR principles. Additionally, in Section 7, a six-step approach to comply with GDPR on 5G-MOBIX is described, that identifies the concerned parties, the actions to be undertaken and provides templates to be used by CBC/TS. Besides, data transfer with Non-EU countries (China, Korea and Turkey) and the interactions between the GDPR and the data protection regulations are clarified.

To conclude, the Data Management Plan is a living document that will be updated from its creation to the end of the 5G-MOBIX project. A third version of the DMP will be created at M<sub>44</sub> named D1.7.

## **Annex 1 – Open Research Data Pilot (ORD Pilot)**

Open access refers to the online provision of scientific information that is free of charge to the end-user and reusable. This scientific information handles the peer-reviewed scientific research articles/publications and the research data underlying publications.

Under the H2020, the project must also aim to deposit the research data needed to validate the results presented in the deposited scientific publications, known as “underlying data”. In order to effectively supply this data, projects need to consider at an early stage how they are going to manage and share the data they create or generate under H2020 guidelines on data management and with respect of 5G-MOBIX grant agreement.

“The Commission is running a flexible pilot under Horizon 2020 called the Open Research Data Pilot (ORD pilot). The ORD pilot aims to improve and maximize 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, commercialization and Intellectual Property Rights (IPR), privacy concerns, security, as well as data management and preservation questions.”

“By extending the pilot, open access becomes the default setting for research data generated in Horizon 2020.

However, not all data can be open. Projects can therefore opt out at any stage (either before or after signing the grant) and so free themselves retroactively from the obligations associated with the conditions – if:

- participation is incompatible with the obligation to protect results that can reasonably be expected to be commercially or industrially exploited
- participation is incompatible with the need for confidentiality in connection with security issues
- participation is incompatible with rules on protecting personal data
- participation would mean that the project's main aim might not be achieved
- the project will not generate / collect any research data or
- there are other legitimate reasons (you can enter these in a free-text box at the proposal stage).”

After depositing publications beneficiaries must ensure open access to those publications via the chosen repository.

“The two main routes to open access are:

- Self-archiving / 'green' open access – the author, or a representative, archives (deposits) the published article or the final peer-reviewed manuscript in an online repository before, at the same time as, or after publication. Some publishers request that open access is granted only after an embargo period has elapsed.

- Open access publishing / 'gold' open access - an article is immediately published in open access mode. In this model, the payment of publication costs is shifted away from subscribing readers. "

In the research context, examples of data include statistics, results of experiments, measurements, observations resulting from fieldwork, survey results, interview recordings and images. The focus is on research data that are available in digital format and stored in a public repository. Normally, users can access, mine, exploit, reproduce, and disseminate openly accessible research data free of charge as explained in the following figure.

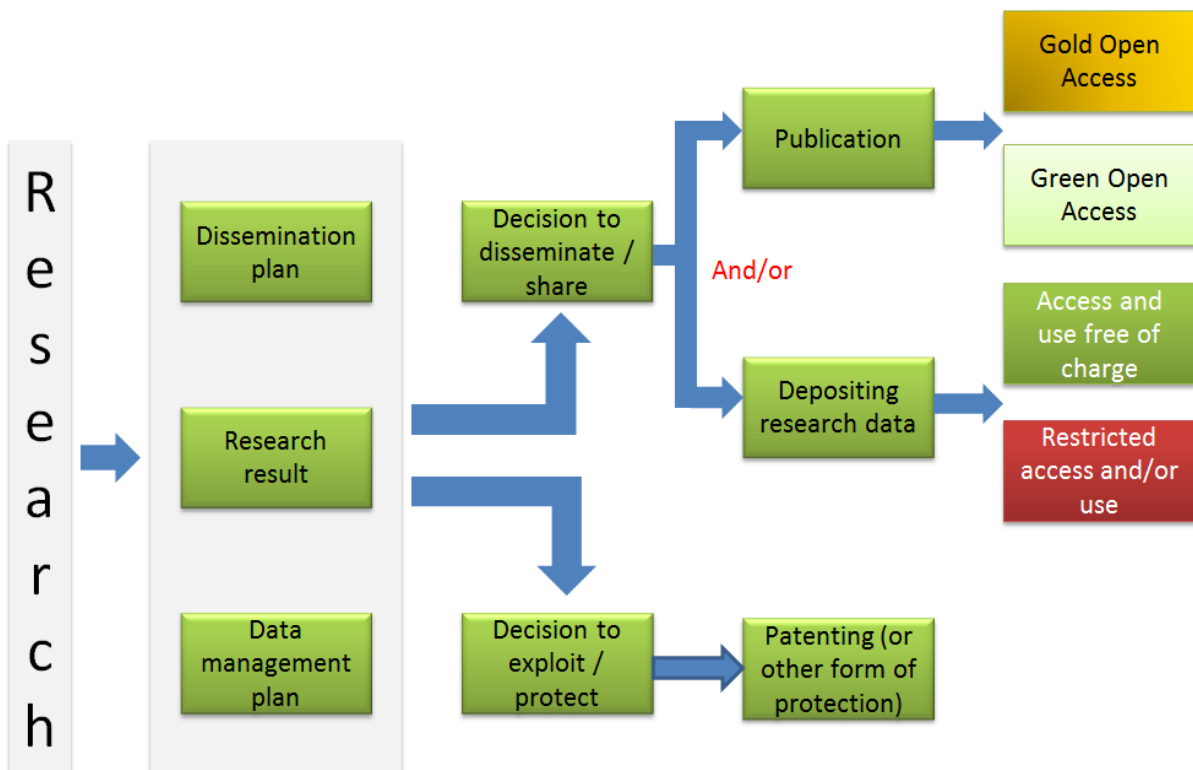


Figure 7: Principles of H2020 open access to research data

## Annex 2 – Data management organisation

This section provides a description of the organisation of the different roles of the parties (i.e. data controllers, joint-controllers, data processors) in 5G-MOBIX. For data privacy reason, only the names of the entities are identified in the following table.

Table 8: List of data controller / joint controllers and data processors in 5G-MOBIX

Use Case Category	User Scenario	Trial Site	Leader	Data Controller/ Joint controllers	Data processors	Will you collect any personal data? (Yes/No)
UCC-1: Advanced Driving	Complex manoeuvres in cross-border settings	ES-PT	CTAG	CTAG	CCG CTAG	YES, User acceptance tests cases. (Demographic information/transport habits for elaborating profile of the sample, in any case it would not be sensible personal data. All participants would have an ID, in the informed consent it would be the name/surname of participants and the assigned ID. Contact information (email/phone number). Video recording)
	Infrastructure-assisted advanced driving	FR	VEDECOM	VEDECOM	AKKA VEDECOM	NO personal data is collected
	Cooperative Collision Avoidance	NL	VTT	VTT	VTT, TNO	NO personal data is collected
	Cloud-assisted advanced driving	CN	DUT (DALIAN)	* <sup>19</sup>	*	*
	Automated shuttle driving across borders	ES-PT	CTAG	CTAG	CCG CTAG	YES, User acceptance test cases. (Demographic information/transport habits for elaborating profile of the sample, in any case it would not be sensible personal data. All participants would have an ID, in the informed consent it would be the name/surname of participants and the assigned ID. Contact information (email/phone

<sup>19</sup> Missing data will be provided in the last version of the data management plan.

						number). Video recording)
	Last mile automated shuttle- VRU	ES-PT	CTAG	CTAG	CCG CTAG	YES, User acceptance test cases. (Demographic information/transport habits for elaborating profile of the sample, in any case it would not be sensible personal data. All participants would have an ID, in the informed consent it would be the name/surname of participants and the assigned ID. Contact information (email/phone number). Video recording)
UCC-2: Vehicles Platooning	Platooning with "see what I see" functionality in cross-border settings	GR-TR	FORD / ICCS / TÜBİTAK	FORD / ICCS / TÜBİTAK	FORD / ICCS / TÜBİTAK	For Platooning Application, no personal data is evaluated or stored.  For the see-what-I-see and truck routing applications, a video stream will be shared from the trial site, but this video will not be stored anywhere.
	eRSU-assisted platooning	DE	TUB	TUB	TUB	No personal data is evaluated or stored. The video stream is directly evaluated at the RSU. The video data is not saved but only buffered in the recording RSU to apply object detection. Afterwards only the detected objects are shared on abstract level (e.g. Car, Bicycle, Pedestrian, etc.) with vehicles passing by the DE TS area.
	Cloud assisted platooning	CN	DUT (DALIAN)	*	*	*
UCC-3: Extended Sensors	Complex manoeuvres in cross-border settings: HD maps	ES-PT	CTAG	CTAG	CTAG ALSA	Yes, from travellers. (Questionnaires answers are anonymous).
	Complex manoeuvres in cross-border settings: Public Transport with HD media services and video surveillance					
	Extended sensors for assisted border	GR-TR	WINGS	WINGS	WINGS	Yes, User location, autonomous vehicle license plate number



UCC-4: Remote Driving	crossing					
	EDM-enabled extended sensors with surround view generation	DE	VALEO	VALEO VICOMTECH	VICOMTECH VALEO	<p>NO personal data are ever collected or evaluated.</p> <p>The transmitted surround view video may contain readable licence plates of other cars, recognizable faces of pedestrians and similar personal data.</p> <p>However, the video data is not saved but only buffered in the recording car before sending (typically tens of milliseconds). In the receiving car the video is only displayed, i.e. also not saved.</p> <p>For the evaluation of the test cases only odometers data of the involved test vehicles is used. No data of third parties is collected or evaluated.</p>
	Extended sensors with redundant Edge processing	FI	AALTO	AALTO	AALTO, S4	Yes. Video footage taken from cameras deployed outside vehicles. The videos images may be considered to have personal data if footage includes recognizable faces of persons, readable number plates of other cars etc.
	Extended sensors with CPM messages	NL	TNO	TNO	TNO/KPN/SSI BV	No personal data is collected or evaluated
	Automated shuttle remote driving across borders	ES-PT	CTAG	CTAG	CCG CTAG	YES, User acceptance test cases. (Demographic information/transport habits for elaborating profile of the sample, in any case it would not be sensible personal data. All participants would have an ID, in the informed consent it would be the name/surname of participants and the assigned ID. Contact information (email/phone number). Video recording)
	Remote driving in a redundant network environment	FI	S4, AALTO	AALTO	AALTO, S4	Yes. Video footage taken from cameras deployed inside vehicles. The videos images may be considered to have personal data if footage includes recognizable faces of persons, readable number plates of other cars etc.

	Remote driving using 5G positioning	NL	TUE	TNO	SISSBV TUE/KPN	/	No personal data is collected or evaluated. The video data is streamed to the remote server screen but not stored in the remote server.
	Remote driving with data ownership focus	CN	DUT(DALI AN)	*	*	*	*
	Remote driving using mmWave communication	KR	KATECH	KATECH	KATECH		No personal data is collected or evaluated. The video data is streamed to the remote server screen but not stored in the remote server.
UCC-5:Vehicle QoS Support	Public transport with HD media services and video surveillance	ES-PT	CTAG	CTAG	CTAG ALSA		No
	Tethering via Vehicle mmWave communication	KR	ETRI	ETRI	ETRI		No personal data is collected or evaluated.
Horizontal Task	Central Test Server	FR	AKKA	AKKA	AKKA		Yes. Data access to CTS is restricted to a list of users from Trial partners who are identified by the following information: username, full name, password, email and role (ADMINISTRATOR, DATA PROVIDER, and EVALUATOR). User's information is only used to allow the connection to the CTS. No additional processing is done using this data.