

Fifth Generation Cross-Border Control

Deliverable D1.2

5GCroCo First Intermediate Project Report

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DISCLAIMER: *This 5GCroCo D1.2 deliverable is not yet approved by the European Commission. The review process will take place within October 2019.*

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5GCroCo First Intermediate Project Report

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Summary

This document provides an overview of the progress of 5GCroCo project from the start of the project on 1st of November 2018, to the submission of this report to the European Commission on 10th of September 2019.

The main objectives, technical progress, and the results obtained during this execution period are presented per each of the seven work packages in which the project activities have been organized. In addition, the six submitted deliverables and all milestones achieved are also listed in the document.

During this period, the use cases and user stories that will be trialed have been specified. Also, the test cases and test sites have been identified. The initial end-to-end architecture for cross-border network handover, end-to-end Quality of Service (QoS) with network slicing, Mobile Edge Computing/Cloud (MEC) and positioning architecture, have been also defined. Also, an initial application architecture has been defined and described, and responsibilities for component development have been agreed.

5GCroCo business potentials have also been described. Besides, ethical issues regarding human participation in trials have been considered. In addition, a set of procedures have been established to maximize safety during the execution of the trials and to provide an informed consent for research participants. Protection of personal data ethical issues has been also evaluated in order to minimize personal data used during the execution of the project.

The activities of 5GCroCo project have been presented in a number of events like MWC'19, EUCAD'19, ARCADE stakeholder workshop and "Project day 2019 Cross-Border Testbed Germany-France-Luxembourg" to different target audiences. In some of these events, 5GCroCo, 5G-Carmen and 5G-MOBIX, all 3 ICT-18 projects, presented themselves jointly. In addition, the three projects together organized a workshop at EUCNC'19.

5GCroCo outcomes have been also disseminated through the project website and social media, both in Twitter and LinkedIn. Specific measures have been taken to increase the awareness of the 5GCroCo project and its results within the society.

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List of Abbreviations and Acronyms

3GPP	Third Generation Partnership Project
5GAA	5G Automotive Association
5G-PPP	5G Private Public Partnership
ACCA	Anticipated Cooperative Collision Avoidance
CA	Consortium Agreement
CCAM	Cooperative and Connected Automated Mobility
E2E	End to End
EIM	Exploitation and Innovation Management
ETSI	European Telecommunications Standards Institute
EUCAD	European Conference in Connected and Automated Driving
EUCNC	European Conference in Networks and Communications
F2F	Face to Face
GA	Grant Agreement

HD	High Definition
ITU	International Telecommunication Union
IR	Internal Report
KPI	Key Performance Indicator
MEC	Mobile Edge Computing/Cloud
MNO	Mobile Network Operator
MWC	Mobile World Congress
NFV	Network Function Virtualization
OEM	Original Equipment Manufacturer
PM	Project Management
QoS	Quality of Service
RAN	Radio Access Network
SDN	Software Defined Networking
SME	Small and Medium Enterprise
ToD	Tele Operated Driving
V2X	Vehicle to Anything
WP	Work Package

1 Introduction

5GCroCo is an innovation action, partially funded by the European Commission under grant agreement 825050 and within the framework of the 5G-PPP¹ (Private Public Partnership). 5GCroCo is one of the three innovation actions funded under call H2020-ICT18-2018² of the Horizon 2020 R&D program.

5GCroCo was started on the 1st of November 2018, and gathers the effort of 24 partners from 7 countries, joining together key players from both the telco and automotive industries, along with small and medium enterprises (SMEs) and academia. It has a total budget of close to 17 million euro, and its end is planned for October 2021. The main objective of the project is to design and conduct cross-border trials of 5G technologies for Cooperative, Connected and Automated Mobility (CCAM).

1.1 Objective of the Document

This document summarizes the technical progress and results achieved from the start of the project until the delivery of this document to the European Commission on the 10th of September 2019.

1.2 Structure of the Document

The document is structured in 10 Sections. Section 1 provides a general overview to 5GCroCo project. Section 2 is about the preparation for eV2X trials and test Sites (WP2) status. Section 3 deals with the progress done in eV2X technologies and standards (WP3). Section 4 is about cross-border and large scale and small-scale pilots (WP4). Section 5 deals with the identification and validation of business potentials (WP5). Section 6 is about the progress done in the exploitation and the impact of the project (WP6). Section 7 is about the progress of the project in identifying and providing protocols to avoid or minimize ethical issues, as personal data protection, or the participation of humans during the tests and trials. Section 8 provides a list of the submitted deliverables during this period. Section 9 provides a list of milestones achieved during this period. Finally, section 10 concludes the report.

¹ <https://5g-ppp.eu> (last access, 10th September 2019)

² <https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/ict-18-2018> (last access, 10th September 2019)

1.3 5GCroCo Progress Overview

1.3.1 Project overview

5GCroCo activities are organized along **7 Work Packages** (see Figure 1.1):

- 1) **WP1** is aimed to handle all managerial activities of the project, and is led by CTTC.
- 2) **WP2** aims at defining the scenarios, use cases, and user stories that will be trialed in the project. In addition, it also aims at describing the Key Performance Indicators (KPIs) and, based on them, the definition of requirements. It also defines what trials will be conducted where. WP2 is led by BOSCH.
- 3) **WP3** describes the technical components and architectural solutions needed to make the use cases feasible in a real 5G deployment. It also identifies which partner in the 5GCroCo consortium will provide each of the necessary elements. WP3 is led by ERI.
- 4) **WP4** describes how the actual trials of 5GCroCo will be conducted. It combines the outcomes from WP2 and WP3 to design the actual tests and trials. WP4 is led by Orange.
- 5) **WP5** is aimed at studying the business opportunities that may be realized thanks to a 5G-enabled cross-border CCAM. It starts off with the analysis of the use cases of 5GCroCo, but aims in the long run to provide insights and analysis of a wider market perspective. WP5 is led by DTAG,
- 6) **WP6** is aimed at ensuring impact and dissemination. The activities of WP6 are focused on monitoring main standardization bodies along the project execution to identify possible gaps for contribution. It also aims at monitoring the progress in 5G spectrum allocation and needs, with the aim of providing recommendations for 5G deployment, from the perspective of cross-border CCAM. Finally, it aims at disseminating the activities and results of the project, as well as to ensure outreach of the project findings. WP6 is led by HWDU.
- 7) **WP7** handles all data protection policies within the project, and also covers ethical aspects. This WP was not initially designed within the project, but was added once the project started. WP7 is led by CTTC.

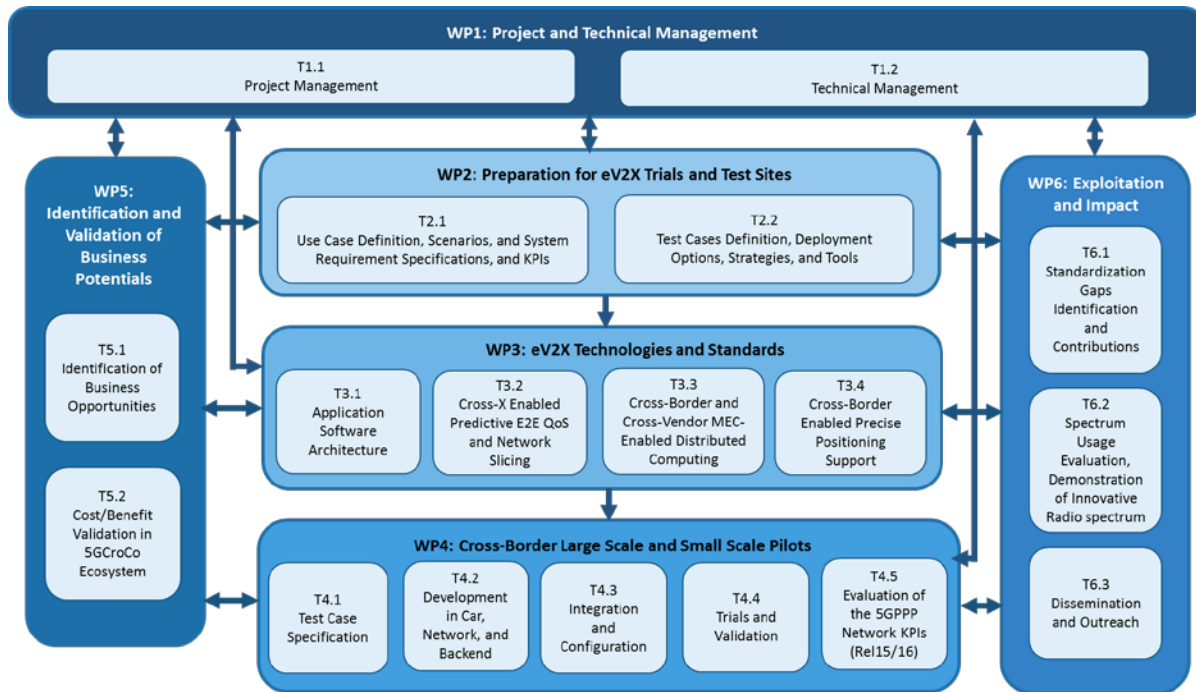


Figure 1.1: 5GCroCo Work Package Structure

1.3.2 Project Management (PM)

CTTC is the project coordinator of 5GCroCo. Dr. Jesus Alonso-Zarate is acting as Project Coordinator of 5GCroCo, with the close support from Selva Via.

During the first ten months for which 5GCroCo has been running, the project management (PM) efforts have been focused on providing the managerial tools to facilitate the successful development of the technical tasks. Moreover, PM has led the consortium agreement negotiations, which ended fruitfully with the signature of the consortium agreement by all partners in April 2019. This agreement defined the rules by which the 24 partners cooperate and work together to achieve the objectives defined in the project. PM has also monitored the progress of the project, both technically, administrative and financially.

Below follows a list of the main tasks carried out by the PM for the first 10 months of project execution:

- Regular interaction with the European Commission through its Project Officer.
- Participation and representation of 5GCroCo in 5G-PPP bodies.
- Financial management.
- Leading of the negotiation of the grant agreement, consortium agreement and subsequent amendment towards its signature by all partners.

- Design and development of 5GCroCo website (www.5gcroco.eu). A description can be found in Deliverable D1.1. News and events related to the project are periodically updated.
- Creation and continuous update of social media account content (Twitter & LinkedIn).
- Setup of the structure of the software collaborative platform, Confluence, provided by ERI to the project. Continuously addition and update of the content. All information about the project is gathered and structured in this cloud platform. All participants in 5GCroCo project have access to it contribute to its contents.
- Definition of templates for documents used during the project (deliverables, presentations, minutes).
- Definition and enforcement of procedures to ensure the quality and review process of the internal reports, deliverables, publications, contribution to standards and dissemination material.
- Definition and enforcement of procedures to internally monitor the resources allocated to the project by each partner. Collection and analysis of the information.
- Operation of email lists in order to create working groups per different areas.
- Scheduling and chairing of monthly plenary meetings to monitor and share the progress of 5GCroCo project.
- Coordination of the Project Management Team (PMT), which is formed by the Project Manager, Technical Manager, exploitation and innovation manager (EIM), and WP leaders, meets regularly two times per month, in order to closely follow the project progress and the alignment and proper coordination among work packages.
- Organization and hosting of plenary face-to-face project meetings at CTTC every 4 months.
- Monitoring of the risks and definition of countermeasures.
- Revision of all outcomes of the project.
- Creation of the External Advisory Board (EAB) and interaction with it.

All procedures defined for the project development are contained in 5GCroCo Management Handbook, which is available to all partners in the internal file sharing platform.

1.3.3 Technical Management (TM)

Technical Management is provided by Dirk Hetzer, from DTAG.

For this first period of the project, the work for technical management has focused on the following points:

- Ensure the overall technical coordination and technical content of the project.

- Monitor the quality of technical outputs in close collaboration with the technical WP Leaders.
- Coordinate the final report and technical audits of the project.
- Maintain the overall project plan to ensure the planned impact of the project.
- Steer strategic technical approach of the project in coordination with other ongoing projects within the 5G-PPP to converge to a unified definition of the specifications of 5G.
- Coordinate, review, and approve outcomes and deliverables of the project.

The coordination includes direct participations in regular calls in different work packages, F2F meeting in the project and cooperation meetings in the 5G-PPP group.

The technical management supports also the dissemination of project results in various activities / conferences (EuCNC, ITU, 5GAA, etc.).

1.3.4 Exploitation and Innovation Management (EIM)

Dr. Johannes Springer, from DTAG, is the EIM of 5GCroCo.

The main scope of innovation management has been to allow the participating organizations to respond to external or internal triggers/opportunities and use its creative efforts to introduce novel ideas or new products.

Innovation management in 5GCroCo was based on the following project-wide enabling factors:

- Build a project-wide ability to create a culture that encourages creativity and innovation.
- Establish a common knowledge to develop winning ideas that are truly customer-focused.
- Develop a common knowledge to create an action plan of how the project organizations can boost their output of breakthrough solutions or develop an innovative business model.

The innovation management is based on an “innovation process” which will address the innovation strategy and a strategic roadmap for the project in order to manage the main types of innovation: product, service, process and business model.

The Innovation Management has been strongly linked to the activities carried out in the context of the 5GAA. Work activities from 5GCroCo like Predictive QoS, MEC, or Precise Positioning, are linked with according tracks in the 5GAA.

The 3th Face-to-Face 5GCroCo meeting (celebrated in July 2019 at CTTC premises) was used for a dedicated 2-hour workshop session on Innovation Management.

2 Preparation for eV2X Trials and Test Sites (WP2)

2.1 WP Overview

WP Number	2
WP Title	Preparation for eV2X Trials and Test Sites
Leading Partner	BOSCH - Kurt Eckert
Start Month	1
End Month	21 (with interrupt from Month 9 to Month 16)
Brief Description	Two main activities are part of WP2. The objective of the first task, Task 2.1, is to complete a detailed description of the use cases to be implemented and demonstrated in 5GCroCo. In the second task, Task 2.2, the aim is to complete the definition of the test cases, define the deployment options, and select strategies and tools. This second task is split into two phases reflecting the two phases of tests and trials in the overall project.
Summary of tasks	<p>In Task 2.1, the first part of the activities, the internal report IR2.1 has been generated and released. This report contains the detailed description of the 3 use cases that will be implemented and demonstrated during the project. For each use case, different specific scenarios that will be trialed (so called user stories) have been specified. The Key Performance Indicators (KPIs) are defined in this document.</p> <p>In Task 2.2, the public Deliverable 2.1 has been generated and released. This deliverable specifies the test cases to be performed during the first phase of tests and trials that are performed in 2020, and also includes the KPIs that will be considered for measurements. Deliverable 2.1 is a public document and is available on the project website.</p>

2.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
Detailed definition of the 5GCroCo use cases	Completed	The test cases have been specified in detail in IR2.1, which is an internal report, not publicly available.
Derivation of requirements and (Key Performance Indicators) KPIs from detailed use case description	Completed	The KPIs are specified in IR2.1 and further detailed in D2.1, which is publicly available on the project website.
Definition of test cases to be performed, including test case description, mapping of test cases to test sites and detailed description of deployment options, strategies and tools.	Completed for first test phase Not Started for second test phase	The test cases for test and trial phase 1 are specified in D2.1. Also, the mapping to test sites and deployment options and strategies for this phase are specified there.

2.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	WP2 is paused from Month 9 to Month 16 and will be reactivated then.
2	WP2 is giving support to the interpretation of IR2.1 and D2.1 to the project team, and is also collaborating with the ongoing work in WP3 and the test setup definition in WP4.

2.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	Internal report IR2.1.	Three use cases have been identified in 5GCroCo to be representative for the automated driving application domain and which pose high demands to the telecommunication network side. These three use cases are: 1) Tele operated Driving (ToD), 2) High Definition (HD) map generation and distribution for autonomous driving (HD maps), and 3) Anticipated Cooperative Collision Avoidance (ACCA). In this document, these

		<p>three use cases are specified in detail together with the requirements that are imposed by them. This detailed specification is serving as the base input for the work packages WP3 and WP4 which are caring for the overall system architecture and the implementation of it, respectively. For each of the use cases, 4 detailed sub use cases, so called user stories, have been specified, which are the base for implementation, test and trials performed in the course of the project.</p>
2	Deliverable D2.1.	<p>This document specifies the test cases that are identified for each user story of each use case. The test cases are defined to demonstrate the suitability of the new features of 5G core network for automotive use cases and to prove that critical system KPIs are met. For each user story, the test cases are mapped to one or several test sites. The test sites are selected in the Metz-Merzig-Luxembourg large-scale trial area, and also amongst a set of small-scale test areas. The selection has considered the requirements arising from the function itself (suitable road setup and safety considerations) but also the capability for generating cross-border and cross-MNO scenarios. This document also defines the scope of each test case, the expected functional results and the monitored KPIs. A breakdown of the monitored KPIs into sub-KPIs is proposed when it is appropriate to root-cause the KPIs that are out of the expected range. Finally, constraints of the cellular network in each of the test sites are identified.</p>

2.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	From project month 17 to project month 21, WP2 will provide the test case specifications of the 2 nd phase of tests and trials. For this, feedback from the first test phase will be considered as far as it is available.
From 09/2020 to 10/2021	WP2 will be finished in project month 21 and thus no activities are planned after 09/2020.

3 eV2X Technologies and Standards (WP3)

3.1 WP Overview

WP Number	3
WP Title	eV2X Technologies and Standards
Leading Partner	ERI – Maciej Muehleisen
Start Month	1
End Month	36
Brief Description	The main objective of WP3 is to describe the software architecture of the applications forming the use cases and the hardware and software architecture of the required network and IT infrastructure. The focus is on technologies such as Network Slicing, predictive QoS, MEC, security, and precise positioning support across country borders, Mobile Network Operators (MNOs), telco vendors, and car Original Equipment Manufacturers (OEMs).
Summary of tasks	Two internal reports, IR3.1 and IR3.2 have been finished during the reporting period. They provide an initial application architecture (IR3.1) and an initial end-to-end, MEC and positioning network architecture (IR3.2).

3.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
D3.1: Final Application Architecture	Ongoing	IR3.1 provides the initial application architecture and allows the first implementation to start. D3.1 will be finalized in Nov. 2021 by considering experience from first trial round.

D3.2: Intermediate E2E, MEC & Positioning Architecture	Ongoing	IR3.2 provides a comprehensive network architecture with some open points that will be solved through research within WP3, trial experience in WP4 and business aspects from WP5 by Nov. 2021.
D3.3 Final E2E, MEC & Positioning Architecture	Ongoing	D3.3 builds upon D3.2 and will include experience from second trial round and description of evolution outside of project (e.g. in standardization bodies)

3.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	Solution scoping and evaluation of QoS prediction.
2	Solution scoping and evaluation of seamless MEC gateway change with 5G Core.
3	Solution scoping and evaluation of inter-MEC communication across multiple MNOs.
4	Implementation of application architecture (support to WP4).
5	Trial deployment architecture based on IR3.2 (support to WP4).
6	Identification and evaluation of business aspects (support to WP5).
7	Identification of potential standardization gaps (support to WP6).

3.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	IR3.1	Initial application architecture identifying components, partners responsible for them, and their interfaces.
2	IR3.2	Initial network architecture providing solutions for cross-border handover, cross-MNO Network Function Virtualization (NFV) and Software Defined Networking (SDN), QoS prediction, MEC, and positioning.

		Identifications of interoperability issues and potential solutions to be further refined and evaluated. Serves as input to WP4 for deployment in test sites and some implementation.
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3.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	Support WP4 in interpreting WP3 internal reports for application implementation and test site deployment. Assess difference between real commercial deployments and test site ones, especially implications for collected results. Evolve architecture based on experience from first round of trials. Support WP5 in identifying and evaluating business aspects for technologies, especially where business aspects are essential for rating and selecting solutions. Identify standardization gaps together with WP6.
From 09/2020 to 10/2021	Finish writing D3.1 (final application architecture) and D3.2 (network architecture). Support second round of trials and include the lessons learned from them in D3.3 (final network architecture) as well as progress in standardization and deployment in the last project year.

4 Cross-Border Large Scale and Small Scale Pilots (WP4)

4.1 WP Overview

WP Number	4
WP Title	Cross-Border Large Scale and Small Scale Pilots
Leading Partner	Orange – Stefan Wendt
Start Month	4
End Month	36
Brief Description	Deploy small and large scale pilots sites and roll out the 5GCroCo use cases.
Summary of tasks	WP4 tasks will specify the test case specifications and do the development in car, network, and backend. This will be followed by the by the integration and configuration of all components. Finally, trials and validations are carried out on the trial sites. The WP4 work is concluded by an evaluation of the 5GCroCo KPI.

4.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
Deploy small scale pilots in different countries.	Ongoing	The preparation and network deployment are ongoing on the different trial sites. In parallel, work on the vehicular related preparation and development is ongoing. The internal report IR4.1 contains the test case specifications.
Validate on small scale site how standardized 5G Radio Access Network (RAN) and core solutions do support end-to-end (E2E) QoS including	Not Started	The predictive QoS topic was started in WP3 and leads to architecture proposals which WP4 can implement in a second step.

highest reliability demands and prediction for upcoming failures to deliver requested QoS (predictive QoS) (based on 5GCroCo partners' proposal).		
Validate on small scale sites how standardized 5G RAN and core solutions support MEC-enabled and redundant distributed computing (based on 5GCroCo partners' proposal).	Not Started	The MEC topic was started in WP3 and leads to architecture proposals which WP4 can implement in a second step.
Validate on small scale sites how standardized 5G RAN and core solutions support local breakout operation for MEC and dedicated routing e.g. towards local road authorities (based on 5GCroCo partners' proposal).	Not Started	The local breakout topic was started in WP3 and leads to architecture proposals which WP4 can implement in a second step.
Validate on small scale sites how standardized 5G RAN and core solutions support Network Slices with QoS profiles, e.g., to handle isolated safety traffic required by autonomous driving (based on 5GCroCo partners' proposal).	Not Started	The network slicing topic was started in WP3 and leads to architecture proposals which WP4 can implement in a second step.
Validate on small scale sites how standardized 5G RAN and core solutions support security towards required clouds and servers(based on 5GCroCo partners' proposal).	Not Started	
Deploy large scale pilots to execute the automated driving use cases in the cross-border corridor France-Germany-Luxembourg, to support connected autonomous driving in cross-border, cross-MNO, cross-OEM, and cross-vendor (cross-X) environments.	Not Started	

Implement in large scale pilots End-to-end QoS including highest reliability demands and, where applicable, hard real time requirements.	Not Started	
Implement in large scale pilots innovative cloud server solutions for the roaming in multi-MNO scenarios and management of service interoperability whilst keeping V2X low latency communication.	Not Started	
Implement in large scale pilots seamlessly precise positioning support techniques into the architecture.	Not Started	

4.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	Description of technical and non-technical small scale sites and large scale corridor.
2	Use case set up for each trial site.
3	Definition of car vendor timeline for providing cars used in trials.
4	Definition of timeline for all tests / preparation to do before trials.

4.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	Internal Report IR4.1	In preparation; Release planned for end of September 2019.

4.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	Release IR4.1, establish the timeline for all tests/preparations on each small scale site; carry out those preparations and tests. After validation (put in D4.1) proceed to trial tests.
From 09/2020 to 10/2021	Finish small scale trials and produce Deliverable 4.2 with the results. Establish detail timeline on large scale corridor preparation; once large scale corridor is ready, proceed to carrying out the different use cases.

5 Identification and Validation of Business Potentials (WP5)

5.1 WP Overview

WP Number	5
WP Title	Identification and Validation of Business Potentials
Leading Partner	DTAG – Edwin Fischer
Start Month	1
End Month	27
Brief Description	This WP will identify which business opportunities exist in a challenging 5GCroCo Ecosystem (Multi-vendor for telco equipment, multi-OEM for automotive, multi-MNO, cross-border, and multiple content providers). An important effort will focus on the adaptation of existing business validation canvas to the new automotive ecosystem, including new KPIs and business model building blocks.
Summary of tasks	<ul style="list-style-type: none">• Identification of drivers in the following areas: technology, economics, environment, society, regulation, politics, etc.• Description of KPIs to validate business opportunities.• Analysis of markets in terms of: sizes, segments, competition, interrelation.• Qualitative and quantitative market assessments based on 5GCroCo relevant use cases.• Breakdown into the 5GCroCo partners ecosystem.• Market opportunity analysis and quantification considering novel data-sets available through 5G infrastructure and connected vehicles.

5.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
<p>Deliverable D5.1:</p> <p>Description of 5GCroCo Business Potentials.</p>	Completed	<p>The use cases and the KPIs defined in WP2 of 5GCroCo, coupled with the V2X technologies and standards described in WP3 of 5GCroCo, together with the existing business analyses derived within other relevant 5G consortia and projects (e.g., 5GAA, GSMA, 5G NetMobil, and 5GCAR), have been used as starting point to identify new business opportunities that exist in the challenging 5GCroCo Ecosystem (Multi-vendor for telco equipment, multi-OEM (Original Equipment Manufacturer) for automotive, multi-mobile network operator (MNO), cross-border, and multiple content providers). An important effort has been put on the adaptation of existing business validation canvas to the new automotive ecosystem, including new business oriented KPIs and business model building blocks.</p>
<p>Deliverable D5.2:</p> <p>Cost/Benefit Validation of Relevant 5GCroCo Business Potentials.</p>	Not Started	In pre-preparation

5.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	5G PPP result exchange (cooperation with other EU projects).
2	Interworking and information distribution with another WP's.
3	5GAA interworking.
4	Public presentation of 5GCroCo project results on different events.

5.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	Internal Report IR 5.1.	Delivered to the European Commission on May 2019.
2	Deliverable D5.1.	To be delivered on the 10 th of September 2019.

5.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	Start preparation towards D5.2.
From 09/2020 to 10/2021	Work on D5.2.

6 Exploitation and Impact (WP6)

6.1 WP Overview

WP Number	6
WP Title	Exploitation and Impact
Leading Partner	HWDU – Apostolos Kousaridas
Start Month	1
End Month	36
Brief Description	This work package targets to coordinate standardization, dissemination and exploitation activities of the project. WP6 coordinates technical discussions and collaboration activities with other projects and external research fora. In addition, WP6 role is to ensure that the project is aligned with other industry-related activities of the broader research community and business relevant developments in the area.
Summary of tasks	The task devoted to Standardization Gaps Identification and Contributions has started the analysis and monitoring of several standardization and pre-standardization bodies to identify the working items or study items that 5GCroCo could contribute as well as their timelines. The task devoted to Spectrum Usage Evaluation, Demonstration of Innovative Radio Spectrum has started with an analysis of the 5GCAR methodology for spectrum studies, potential extensions needed from 5GCroCo perspective have been identified and their planning for realization is under preparation. Dissemination and Outreach task has prepared a first version of dissemination material (e.g., poster, flyers, video) that will be periodically updated. Web site and social media have been established and are used to increase the awareness about 5GCroCo activities. Participation to events and preparation of joint and individual publications have already been started. 5GCroCo has participated to several events while there is a plan for next events that 5GCroC will participate.

6.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
Analyze and identify standardization gaps.	Ongoing	An initial analysis of different standardization bodies (e.g., 3GPP) as well as pre-standardization projects (e.g., 5GAA) has been included to IR6.1. In addition, detailed analysis of different standardization bodies, the relevance with 5GCroCo topics and objectives as well as the timelines of standardization bodies is ongoing in context of task 6.1 (e.g., Functional Safety(ISO), 3GPP, Network Slicing, ETSI MEC, ETSI NFV are areas/bodies that been analyzed).
Coordination of contributions to standardization bodies.	Ongoing	Based on WP2 outcomes, contributions to 5GAA are under coordination and preparation. Further contributions will be investigated based on WP3, WP4 and WP5 deliverables and outcomes.
Identify new spectrum requirements based on business opportunities and cost-benefit analysis.	Ongoing	Methodology and initial plan of T6.2 activities has been prepared. 5GCAR methodology has been reviewed and will be used as a basis and extended, according to 5GCroCo requirements and use cases.
Develop 5GCroCo project dissemination and communication strategy.	Ongoing	The dissemination and communication strategy have been prepared and reported in IR6.1 Dissemination tools e.g., web site, social media, newsletters, have been prepared.
Promote the 5GCroCo concepts and outcomes using various means, e.g., social media, blogs, international fora.	Ongoing	5GCroCo concepts, ongoing activities, and first outcomes have been promoted via the web site, the twitter and LinkedIn accounts.

Coordinate industrial/business and academic exploitation of the 5GCroCo project results and push to the market through the on-board industrial partners, network operator, and SMEs promotion campaign.	Not Started	It is expected that this activity will start after the completion of first trials and the collection of validation results.
Ensure maximum impact and visibility of the 5GCroCo project results in research fora, standards and regulatory bodies as well as business communities.	Ongoing	In the first period of the project, the focus has been on increasing the awareness of 5GCroCo objectives within various communities. 5GCroCo has participated in big events such as the ICT 18 in Vienna, MWC 2019 in Barcelona, and EuCNC 2019 in Valencia.
Participate and contribute in creating a strong and efficient collaboration framework between 5G PPP projects and other relevant 5G initiatives.	Ongoing	5GCroCo is closely collaborating with other 5G-PPP projects. For instance, the joint booth and joint workshop organized with 5G-CARMEN and 5G-MOBIX in EuCNC 2019, the common booth with 5GCAR project in MWC 2019 as well as the joint booth of 5GCroCo, 5G-CARMEN, 5G-MOBIX at the EUCAD 2019. Similar activities are under discussion and planning for future activities. In addition, 5GCroCo is participating in the steering board and technology board of the 5G-Initiative, and is active in a number of Working Groups of the 5G-PPP.
Flyers at the end of the project: > 2	Completed	2 flyers already published. A new version being prepared for MWC 2020.
Roll-out: >3	Ongoing	2 versions already produced and used in various events.
Project Website unique visitors > 1500	Completed	5GCroCo website www.5gcroco.eu traffic data is measured by Google Analytics. Data Analyzed goes from the 1 st November 2018 to 5 th July 2019. The website has received close to 10,000 unique visitors along the last 10

		months, with an average of 1,000 visitors per month. The most frequent location of unique users are: USA (15%), Spain (14%), France (13%), Germany (12%), Luxembourg (9%), and Belgium (5%).
Social Networks- Twitter followers: >200	Ongoing	319 followers by 10 September 2019.
Social Networks- YouTube followers: >150	Ongoing	8
Social Networks- YouTube viewers: >200	Ongoing	742 viewers
e-Newsletter subscribers: >500	Ongoing	10 subscribed, newsletter also distributed via twitter.
Press Releases / publication in press (by the end of the project): >10	Ongoing	1 press release at the beginning of the project. 4 appearances in press ³
Publications peer-reviewed (per year on average) ≥10	Ongoing	5 submitted, 2 of them published.
Videos (per year): 1 and 200 views	Ongoing	1 video produced and uploaded to Youtube Channel (742 viewers)
Innovation workshop (by the end of the project): ≥ 1, with 50-70 participants	Ongoing	1 st Innovation workshop during July 2019 Face to face meeting, 45 attendees.
Seminars (by the end of the project): ≥ 2, 35 participants each	Not started	
Standardization (per year) ≥ 2	Ongoing	Standardization and pre-standardization bodies analysis has been initiated in order to identify first contributions e.g., to 5GAA based on IR2.1 and D2.1 outcomes.

³ Appearances in press: <https://paperjam.lu/article/le-luxembourg-construit-leurop>, <http://www.lessentiel.lu/fr/luxembourg/story/des-voitures-autonomes-sur-nos-routes-des-2030-17927994>, <https://www.journal.lu/top-navigation/article/vernetzte-bahnen/>, <https://chronicle.lu/category/mobility/28770-luxembourg-germany-france-complete-first-tests-on-cross-border-digitised-mobility-project>

6.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	Monitoring and analysis of current activities and timelines of standardization bodies (3GPP, 5GAA, ETSI) for the different objectives of 5GCroCo project.
2	Identify potential opportunities for future contributions and coordinate contributions of available results e.g., IR2.1, D2.1, IR3.1, etc.
3	Define methodology for Spectrum Suitability Analysis.
4	Participation to international events and also planning of future participations (2 nd half of 2019 and 2020).
5	Preparation of new and updates of dissemination material (e.g., 2 nd 5GCroCo video, periodic 5GCroCo Newsletter, new fliers, etc.).
6	Organize joint publications based on first outcomes of WPs.
7	Interact with other 5GPPP projects and the 5G ecosystem.

6.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	Internal Report	Report IR6.1: Dissemination and Impact Guidelines.
2	Publication	5GCroCo overview to EUCAR Project Book.
3	Publication	5GCroCo overview to 5G Annual Journal.
4	Publication	“5G Connected and Automated Driving: Use Cases and Technologies in Cross-border Environments”, EuCNC 2019, Valencia 18-21 June, 2019.
5	Publication	“Demo: A Mobile Edge Computing-based Collision Avoidance System for Future Vehicular Networks” Computer and Networking Experimental Research using Testbeds (CNERT) workshop, held in conjunction with IEEE INFOCOM (29 April - 2 May 2019) in Paris, France.

6	Publication (submitted)	“Cooperative-Intelligent Transport Systems for Vulnerable Road Users safety”, FiCloud 2019 : The 7th International Conference on Future Internet of Things and Cloud (Invited paper).
7	Publication (submitted)	“An Automotive Cooperative Collision Avoidance Service based on Mobile Edge Computing”, AdHoc-Now 2019, 18th International Conference on Ad Hoc Networks and Wireless, Luxembourg.
9	Publication (submitted)	“Hybrid Cloud-Native Orchestration of Inter-Domain MEC Collision Avoidance for Connected Vehicles”, IEEE Conference on Network Function Virtualization and Software Defined Networks.
10	Other	1st 5GCroCo video.
11	Other	ITS World Congress, 21-25 October Singapore, Ertico Booth (5G-MOBIX, 5G-CARMEN, 5GCroCo), Video (Planned).
12	Other	EUCNC (Conference), 18-21 June 2019, Valencia, Spain, Workshop 5G-CARMEN, 5G-MOBIX, and 5GCroCo.
13	Other	Global5G Event, 17-18 June 2019, Valencia, Spain.
14	Other	ITS EU Congress - Workshop 5G Deployment for Automated Mobility.
15	Other	European Strategic Deployment Agenda (SDA), 7 May 2019, Brussels.
16	Other	ARCADE Workshop, 4 April 2019, Brussels.
17	Other	Project Day 2019, Cross-Border Testbed Germany-France-Luxembourg 3 April 2019, Schengen (Luxembourg).
18	Other	Réunion Benelux « Télécommunications », Présidence luxembourgeoise de l’Union Benelux (2019) 2 April 2019, Brussels.
19	Other	EUCAD19, 2-3 April 2019 Brussels (Joint booth with 5GCARMEN and 5GMOBIX, where a roll-up will be displayed along with a screen showing videos from 5GCARMEN and 5GCroCo) .

20	Other	NETSYS: International Conference on Networked Systems 2019 18-21 March, Munich.
21	Other	MWC, 25-28 February, Barcelona.
22	Other	Strategic Deployment Agenda Workshop, 7 February 2019, Etterbeek-Brussels.
23	Other	ICT-18, 4-6 December 2018, Vienna.
24	Other	Luxembourg 5G Conference, 29 November 2018, Luxembourg.
25	Other	Workshop 5G-PPP ICT-18 Coordination, Session 16, November 2018, Brussels.

6.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	Continue with the analysis and monitoring of different standardization and pre-standardization bodies. Organize the first contributions e.g. to 5GAA based on the outcomes from WP2 and WP3. Regarding the dissemination, the project will move from the awareness phase to the dissemination of the first results (e.g., WP2, WP3, WP4, WP5). Realize spectrum suitability analysis using WP2 outcomes to analyze the spectrum needs based on the data rate requirements, gNodes capabilities and planning by MNOs as well as real traffic data estimation by road operators.
From 09/2020 to 10/2021	Continue with the analysis and monitoring of different standardization and pre-standardization bodies. Organize the second phase of contributions e.g. to 5GAA based on the outcomes from WP2, WP3, WP4 and validation results. Update the spectrum survey, based on the latest spectrum auctions, deployments, regulation (WRC2019). Dissemination of the second phase of results collected by activities in WP3 and WP4.

7 Ethics Requirements (WP7)

7.1 WP Overview

WP Number	7
WP Title	Ethics requirements
Leading Partner	CTTC – Jesus Alonso-Zarate
Start Month	1
End Month	36
Brief Description	This WP focuses on identifying the ethics requirements that the project must comply about the security measurements during the trials, and personal data protection.
Summary of tasks	In D7.1 (delivered in M06), safety procedures to research participants in the trials were defined. During the trials, these procedures will be followed and updated if needed. D7.2 (also delivered in M06) defines procedures to follow during the project regarding the personal data collection and protection.

7.2 Objectives and Achievement

WP Objectives (as stated in the Grant Agreement)	Current Status	Description of level of achievement, indicating evidence of achievement (e.g. publications, reports, etc.)
D7.1 H-Requirements No.1	Completed	This deliverable contains a clear definition and classification of research participants and others humans involved in the trials. It defines the procedures to maximize security during the trials, and informed consent.
D7.2 POPD-Requirements No.2	Completed	This deliverable contains the identification of the data that will be collected during the project execution and which has to be treated confidentially.

7.3 Main Ongoing Activities

Activity	Description of ongoing activity
1	Monitor and update the procedures described for D7.2 for personal data protection and handling.

7.4 Main Achieved Outcomes

Outcome Number	Type	Description
1	Deliverable	D7.1 H-Requirements No.1.
2	Deliverable	D7.2 POPD-Requirements No.2.

7.5 Roadmap

Next Period	Description of main goals and planned activities
From 09/2019 to 08/2020	Update the procedures defined in D7.1 and D7.2 if needed. Monitor and ensure that the procedures defined in D7.1 and D7.2 are respected. Identify room for improvement, and update the procedures when needed.
From 09/2020 to 10/2021	Monitor and ensure that the procedures defined in D7.1 and D7.2 are respected.

8 Public Deliverables

A list of the public deliverables produced during this period (1st November 2018 - 10th September 2019) is presented below. All of them become available on the project website at most one month after its delivery date to the European Commission.

Table 8.1: Public Deliverables Presented in this Reporting Period

Deliverable (number)	Deliverable name	Work package number	Short name of lead participant	Delivery date to the European Commission
D1.1	Project Website	WP1	CTTC	30 th November 2018
D2.1	Test Case Definition and Test Site Description Part 1	WP2	RSA	30 th June 2019
D7.1	H- Requirement No.1	WP7	CTTC	30 th April 2019
D7.2	POPD- Requirement No.2	WP7	CTTC	30 th April 2019
D5.1	Description of 5GCroCo Business Potentials	WP5	VCC	10 th September 2019
D1.2	5GCroCo First Intermediate Project Report	WP1	CTTC	10 th September 2019

9 Milestones

The status of the milestones that were expected during the application phase to be achieved during the first ten months period.

Table 9.1: Milestones Achieved in this Period

#	Milestone Name	Related WP	Date	Means of Verification	Status
M1	Project Website published	WP1	1 st November 2018	D1.1	First version finished, periodically updated.
M2	Management Handbook	WP1	31 st December 2018	IR1.1	First version finished, but periodically updated if need of changes arise
M3	Dissemination and Impact Guidelines	WP6	31 st January 2019	IR6.1	Completed
M4	Signature of Grant Agreement and Consortium Agreement	WP1	4 th April 2019: Consortium Agreement signed by all partners	GA, CA	Completed
M5	Use Case Definition, Requirement and KPI Specification	WP2	31 st March 2019	IR2.1	Completed
M6	Initial Application Architecture	WP3	31 st March 2019	IR3.1	Completed
M7	Preliminary Report on Market Analysis and 5GCroCo KPIs	WP5	31 st May 2019	IR5.1	Completed
M8	Test Case Definition and Test Site Description Part 1	WP2	30 st June 2019	D2.1	Completed
M9	Initial E2E, MEC & Positioning Architecture	WP3	31 st July 2019	IR3.2	Completed
M10	Description of 5GCroCo Business Potentials	WP5	10 th September 2019	D5.1	Completed
M13	5GCroCo First Intermediate Project Report	WP1	10 th September 2019	D1.2	Completed

10 Conclusion

5GCroCo project is properly following the designed execution plan which is described in the Grant Agreement signed with the European Commission. So far, all objectives for the first reporting year have been achieved and the project is on very good track.