Deliverable D4.2
Demonstration Execution Plan, C-REL

Project acronym:	IP4MaaS
Starting date:	01/12/2020
Duration (in months):	30 months
Call (part) identifier:	S2R-OC-IP4-01-2020
Grant agreement no:	101015492
Due date of deliverable:	November 2021 (M12)
Actual submission date:	09-12-2021
Responsible/Author:	AETHON Engineering
Dissemination level:	PU
Status:	Final

Reviewed: Yes

This Project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No 101015492.

Document history		
Revision	***Date***	***Description***
1	07-06-2021	First issue
2	03-08-2021	Created TOC
3	12-11-2021	Draft shared with partners for review
4	27-11-2021	Incorporated comments
5	30-11-2021	Final draft shared with official reviewers
6	08-12-2021	Final version
7	17-05-2022	Integration of comments after deliverable rejection
8	20-05-2022	Integration of comments from partners
9	25-05-2022	Integration of comments from official reviewers
10	31-05-2022	Resubmission of updated deliverable

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Disclaimer

This current version of the document of the execution planning of the 1st phase's demonstration has been updated in order to take into account the latest developments (May 2022), therefore differentiations have been conducted since the submission of all previous documents of the IP4MaaS project and the first version of this document. Due to technical and administrative obstacles that have identified since the submission date of the first version of D4.2, and the time needed to be tackled, it was decided by the consortium that two out of three demo sites (namely Padua and Barcelona) that were initially scheduled for the 1st phase demonstration (C-REL) will be moved from 1st phase to 2nd phase pilots, thus one demo site, Athens, will conduct the 1st phase demonstration during the first two weeks of July 2022, while the rest of the demo sites will conduct only the 2nd phase's demonstrations during March-April-May 2023.

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1 Executive Summary

The IP4MaaS Project aims at demonstrating the benefits of Innovation Programme 4 (IP4) through pilot demonstrators of collective and shared mobility services in six different European cities: Athens, Barcelona, Padua, Liberec, Osijek, and Warsaw. The technologies have been created within IP4 Shift2 Rail Joint Undertaking (S2R JU), developed within the COHESIVE[1] project and tackle various aspects of traveller experience, meaning the interoperability of Transport Service Providers' (TSPs) services, travel shopping, booking & ticketing, trip tracking, travel companion technologies and business analytics [1].

IP4MaaS outcomes will impact on existing complementary projects COHESIVE and CONNECTIVE[2] as well as on the CFM project MaaSive[3], aiming at developing passenger service platform specifications for an enhanced multi-modal transport eco-system including Mobility as a Service (MaaS). The relevant expected impact of this complementary topic is related to the integration of urban sprawl underpinned by the opportunities that the digitalization of transport e.g., MaaS brings. This is particularly relevant for the implementation of truly user-centric services for co-modality in multimodal journeys integrating public transport, shared mobility, micro-mobility as well as private and on demand approaches [1].

IP4MaaS has adopted an iterative approach for the demonstrations. There are two iterations, C-REL (Core Release) and F-REL (Final Release). The first iteration initially involved Padua, Athens and Barcelona, due though to limitations from CFMs' side and technical limitations from certain TSPs side, it will involve Athens, while the second iteration will include all demonstration locations.

This document constitutes the Deliverable D4.2 "Demonstration Execution Plan, C-REL" of the IP4MaaS Project. It delivers a detailed plan for the preparation and execution of the C-REL phase of the demonstrations. D4.2 provides:

- A meaningful roadmap based on the work done by WP2 and WP3 of the project and specifically deliverables D2.1, D2.2, D3.1, while also complemented by and complementing D3.2.
- An overview of the technologies of the IP4 Ecosystem that are available for the 1st Phase of the Demonstrations, as well as those under development for utilization in the 2nd Phase.
- Information regarding the available solutions and the in-house development of the operators in C-REL.
- The representative travel solutions and use cases for the demo site.
- An overview of the KPIs for respective requirements in order for utilizable solutions to be provided for each demo site.
- A hierarchy of priorities across the operational, semantic, and technical levels of the technologies to be demonstrated.
- A roadmap with expected outcomes (technical solutions/components) and their connection with the complementary projects.
- A clear structure for the preparation and the execution of the C-REL demonstration, which will be performed in 6 separate phases.

[1] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=COHESIVE
[2] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=CONNECTIVE
[3] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=MaaSive

- A detailed description of the essential components of the C-REL demonstration: time plan, role assignment, risks & mitigation measures.
- An overview of the F-REL demonstrations.
- A description of the roles and responsibilities of each stakeholder.
- A description of the activities that are to be performed by of the Integration Committee, the Data Committee, and the Management Committee.

This document will be the guide for executing the C-REL demonstrations in WP5. It will be updated for the 2nd phase of the demonstrations in M20 (D4.3, "Demonstration Execution Plan and Technology Integration Plan, F-REL", due July 2022).

2 Abbreviations and acronyms

Abbreviation / Acronym	Description
CFM	Calls for Members
DL	Dissemination and exploitation leader
DoA	Description of the Action
EL	Ethical leader
EU	European Union
FS	Financial Statement
GA	Grant Agreement
H2020	Horizon 2020
IP4	Innovation Programme 4
LoS	Letter of Support
MaaS	Mobility as a Service
OC	Open Call
PB	Project Board
PC	Project coordinator
PM	Project manager
PMO	Project Management Office
PMT	Project Management Team
PO	Project Officer
PTO	Public Transport Operator
QAC	Quality Assurance Committee
RU	Railway Undertaking
S2R JU	Shift2Rail Joint Undertaking
TL	Technical leader
TRL	Technology readiness level
TSP	Transport Service Provider
TMC	Technical Management Committee
WP	Work Package
WPL	Work package leader

3 Background

The IP4MaaS[4] project aims to design, execute, monitor and assess demonstrations in order to test technologies developed under the Innovation Programme 4 (IP4)[5] of the Shift2Rail[6] Joint Undertaking and advance the uptake of Mobility as a Service (MaaS) schemes.

In particular, the IP4MaaS project is a complementary project for ExtenSive[7], a project which is also part of the Shift2Rail Joint Undertaking and aims to provide complementary and continuous solutions already started within previous projects, namely MaaSive[8], ATTRACKTIVE[9] and CO-ACTIVE, [10]in order to enhance traveller experience and improve travel services in the areas of travel shopping, trip tracking, booking and ticketing. Consequently, the outcomes of the IP4MaaS project, and in particular the C-REL demonstrations outcomes, will also provide input to ExtenSive and its' F-REL Demonstrations and vice versa.

IP4MaaS project will act as a "man-in-the-middle" project with respective to the CFM projects and TSPs and will be using input from COHESIVE[11], CONNECTIVE[12] and other CFM projects (extended to OC projects per the objectives of S2R-CFM-IP4-01-2020 if requested).

Expected outcomes of IP4MaaS also include outcomes from MaaSive, another project which is part of the Shift2Rail Joint Undertaking and that it continued and complemented the work accomplished within previous projects, namely ATTRACKTIVE and CO-ACTIVE, in the same areas such as ExtenSive (the areas of travel shopping, trip tracking, booking and ticketing), plus the development of the Travel Companion, which will be tested during the IP4MaaS pilots and which provides the aforementioned services to the travellers within one mobile application.

Thus, the functionalities of the existing IP4 ecosystem IP4MaaS utilizes and tests in both C-REL and F-REL are outcomes of these two aforementioned projects, and the outcomes of IP4MaaS will be provided to other projects to improve IP4 functionalities even further and overcome identified limitations.

The present document constitutes the Deliverable D4.2 "Demonstration Execution Plan, C-REL" in the framework of WP4, Task 4.1 of IP4MaaS. The primary aim of this document, as stated in the Grant Agreement (GA), is to create a detailed plan for the integration of technologies, preparation and the execution of the demonstrations, focusing on the C-REL phase. Besides the timeline, the plan presents the risks and mitigation measures associated with the demonstrations, the requirements (data collection, KPI measurements, validation criteria for successful demonstration execution) and the stakeholders' roles and responsibilities. D4.2 will also describe the operations of the three committees established by IP4MaaS (Integration Committee, Data Committee, Management Committee), that will support and monitor the execution of the demonstrations.

D4.2 is linked to the Technology Integration Plan, D4.1, which provides specific information about the integration process. This deliverable contributes to WP5 of the IP4MaaS project, setting all the necessary guidelines for the execution of the demonstrations.

[4] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=S2R_IP4MaaS
[5] https://shift2rail.org/research-development/ip4/
[6] https://shift2rail.org/about-shift2rail/
[7] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=EXTENSIVE
[8] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=MaaSive
[9] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=ATTRACKTIVE
[10] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=CO-ACTIVE
[11] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=COHESIVE
[12] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=CONNECTIVE

4 Objective/Aim

This document has been prepared to provide to WP5 of IP4MaaS project the necessary elements for executing the demonstrations. The objective of the Demonstration Execution Plan is twofold, since the aim is to produce a roadmap that includes expected outcomes (i.e., technical solutions/components) and covers the requirements of both IP4MaaS and CFM partners from a technical standpoint, while also constructing a timeline that fits the objectives and constraints of all parties.

D4.2 "Demonstration Execution Plan, C-REL" will:

1. Produce a detailed plan for the C-REL demonstration.
2. Set clear goals for the execution of the demonstrations.
3. Establish a timeline for the execution of the demonstrations.
4. Identify the risks and mitigation measures associated with the execution of the demonstrations.
5. Align the goals of the demonstration with the KPIs produced in WP3.
6. Set clear roles and responsibilities for all the members participating in the demonstrations.

Essentially, Deliverable 4.2 is the basis, on which the demonstration preparation, coordination, and execution will rely. The schedule, role assignment, risks, and technicalities in D4.2 concern the first Demonstration Phase (C-REL): December 2021 (M13) until July 2022 (M20), when the C-REL takes place.

5 Methodology

This chapter outlines the methodology used for creating the Demonstration Execution Plan for the 1st phase of the demonstrations (Athens). The same methodology will also be used for the 2nd phase of the IP4MaaS pilots.

Task 4.1 utilises the findings of WP2 and WP3 (specifically D2.1, D2.2 and D3.1, also complemented by the D3.2) and partners' restrictions and aggregates them to produce D4.1 and D4.2, as shown in Figure 1. Those findings are based on the datasets, and thus information generated through a series of specific actions, as stated in the deliverable D1.4 "Data Management Plan, Version 2". These actions were, as the aforementioned data management plan states, conduction of surveys of available technologies of each TSP and organization of workshops with TSPs.

The surveys of available technologies (D2.1) served the purpose of defining the KPIs, set the APIs and defining the functionalities in each demonstration scenario, while the workshops helped in defining demonstration scenarios (D2.2), defining the KPIs and the USI questionnaires (D3.1 in T3.1, D3.2 in Task 3.2).

These actions generated data (raw documents) that in their turn generated valuable information regarding available functionalities, users' needs and expectations per each user journey, as well as pain points and areas of potential improvements from the point of view of both the TSPs' and travellers' sides [2].

The outcome of those surveys is stated in D3.1, "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL" and are refined in the updated version D3.2.

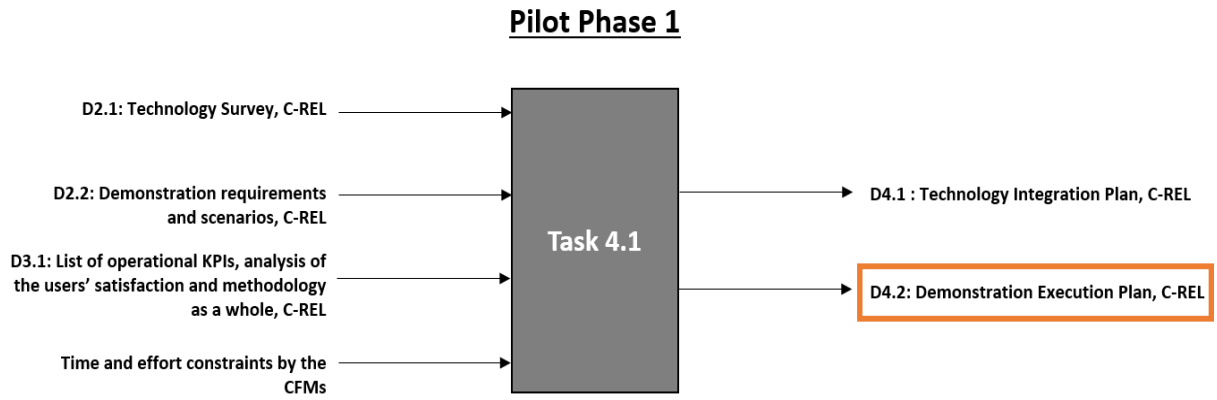

Figure 1: T4.1 inputs and outputs

WP2 identifies available TSPs' technologies and creates a map of assets, identifies needs and expectations of Travelers and TSPs and defines the most suitable demonstration scenarios per each demo site. WP3 develops a list of operational KPIs and develops a conceptual framework to manage all this information. This information, combined with CFMs' time restrictions (regarding technical tasks), lays the foundations for the planning process and the organisation of the activities that will lead to successful demonstrations.

To set specific and realistic targets for the integration and pilot activities and narrow down to the technologies that will finally be demonstrated in the demo sites, several factors should be taken into account. These factors, namely IP4 available Technologies, TSP available services, scenarios, demo site goals, demonstration iterations and integration constraints, act as a "sieve" that

gradually filters the technologies of the initial pool of technologies and ends up to the final technologies that will be demonstrated. This process is depicted in Figure 2.

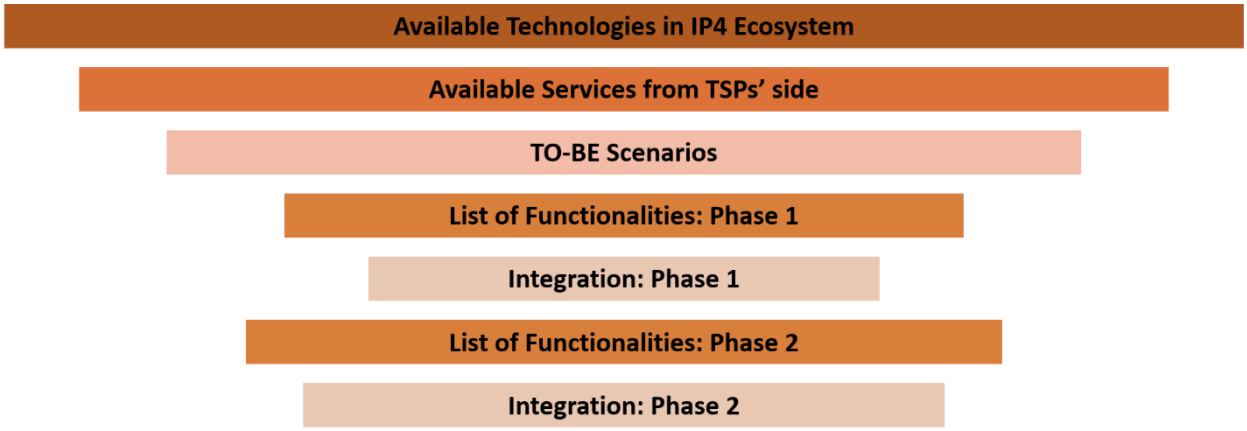

Figure 2: Filtering process

The filtering process is composed of the following steps:

1. The IP4 Ecosystem has a large pool of technologies, and not all of them will be demonstrated in IP4MaaS. For this reason, CFM partners have provided a list of technologies that are available for the IP4MaaS demonstrations.
2. The IP4MaaS TSPs have certain limitations with regards to the services they can offer. So, the list of technologies to be demonstrated is further decreased.
3. Every demo site has a specific scope. Within this scope, the IP4MaaS consortium has selected the most representative travel solutions (scenarios) for each demo site. The technologies compatible with the scenarios will be tested (not all). Thus, the set of technologies for each demo site is reduced even more.
4. Some IP4 technologies will be tested in Demo Phase 1 (Athens, C-REL), while others will be tested in Demo Phase 2 (All demo sites, F-REL). Therefore, the technologies for the C-REL demonstrations become even fewer.
5. Finally, issues, incompatibilities, and difficulties that might arise during the integration phase (considering the knowledge collected from past projects) may reduce the list of technologies to be demonstrated.

Hence, through this filtering process, the technologies that will be demonstrated in IP4MaaS are extracted and finalised. In D4.2, this process applies to the C-REL demonstrations (see section 0). The exact same approach will be used for the F-REL demonstrations in D4.3.

6 Demonstration Sites & Phases

This chapter describes the overview and the primary expected outcomes for the six Demonstration Sites, namely Padua, Athens, Barcelona, Liberec, Warsaw, Osijek. The partners involved in the Demonstration Execution are presented in Figure 3.

The reason for splitting into 2 phases the demonstrations is the need to assess the results from C-REL demonstration and consider the utilisation of new functionalities and tools that are still under development by the ExtenSive project, thus the first phase will provide the necessary outputs and feedback to the ExtenSive and complement its' efforts and goals that wishes to achieve. This way also agility is being increased, especially in providing feedback to the other demo sites and either place mitigation measures for new risks identified or resolve unknowns during demo planning. In addition, all involved partners of all complementary projects that either provide input or expect outputs from IP4MaaS may that way stay constantly up to date of all respective activities and results.

As agreed with the complementary CFM projects MaaSIVE and ExtenSive, C-REL will focus on the Athens demo site, to make possible the overall scheduling of integration activities in the Shift2Rail IP4 ecosystem.

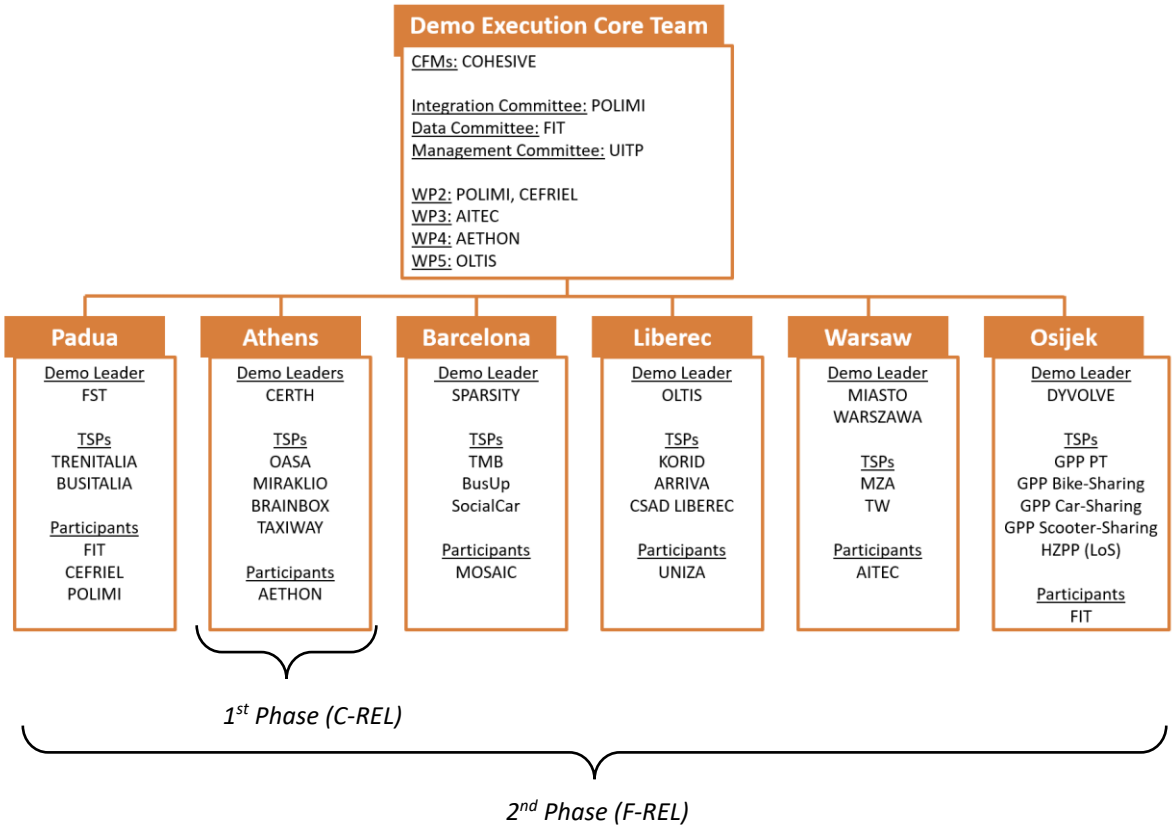

Figure 3: Demonstrations' structure

6.1 Demo sites and operators

The Demonstrations of IP4MaaS cover 6 different countries, namely **Spain, Italy, Greece, Croatia, Czech Republic, and Poland**. The project will test a large pool of mobility solutions, both in urban and rural areas, since it aims at enhancing the connectivity of rural, urban, and peri-urban areas

through different modes of transport.

The Operators that will participate in the IP4MaaS Demonstrations represent several means of transport and constitute:

- **One Railway Undertaking (RU),** Trenitalia SpA, involved through FSTechnology fully owned by the FSI Group, a company in charge of the whole range of ICT services that enables transport mobility operations for Trenitalia and BusItalia. Other three RUs have signed a LoS for the participation in local demo sites.
- **Six Public Transport Operators**, involving bus, tram, trolley, and metro: TMB, MZA, TRAM Warsaw, OASA, MIRAKLIO, GPP.
- **Two Transport Authorities**, acting as coordinators of public transport services in cities and regions involved in the demonstrations: KORID, MIASTO Warsaw.
- **Three ridesharing, taxi and MaaS operators:** Taxiway, BrainBox and Social Car* (more details on it in the following sections).
- **Two demand responsive transport operators:** BusUp and AMTU (subcontractor of Sparsity).

More details about these Operators and the demo sites will be presented in the following sections.

6.1.1 Padua

Padua is one of the demo sites in the project that entails both rural and suburban areas. It is located at the centre of a densely populated area and a hub of many commercial, educational, and professional activities, close to major cities of northern Italy. Mobility of people within and outside of the city is provided in considerable measure by Train and Bus services operated by companies of the FSI Group. For this reason, the FSI Group, through its fully owned FSTechnology company (FST), has selected it as a living lab location for the analysis of advanced transport solutions. FST is involved in IP4MaaS as the demonstration leader of the Padua demonstration site to foster the Integration of the following operators:

- **Trenitalia**: national train operator.
- **BusItalia** Veneto: bus operator in the Veneto region.

The additional partners of the Padua demo site are FIT, CEFRIEL, and POLIMI. The Demo Site targets workers and students in their daily routes. The primary aim is to develop mobility planning while offering travelers different multimodal services. All mobility options in the Padua area should be integrated into mobility packages that meet customers' needs to ensure a seamless movement across the urban and rural areas of the city. The main expected innovation is the improvement of services offered by the FS Group through the integration of IP4 technical features.

6.1.2 Athens

The demo site is located within the Athens agglomeration and focuses on the main terminal positions of the metro and suburban rail where multiple modes are available. The demonstration of Athens will take place in an urban environment and will include multiple modes. A prevalent issue within this demo location is the lack of connectivity at the level of networks and services between the transport modes to support tourists and commuters.

The PTOs and TSPs involved in the IP4MaaS Athens demonstration site are:

- **OASA**: is the responsible planning authority, coordinating, and financing the public transport system in the Athens metropolitan area, covering buses, trams, trolleys, and metro (3 lines).
- **MIRAKLIO**: is the public transport operator responsible for the buses operating within the Municipality of Heraklion, Attica.
- **BRAINBOX**: is a company offering bike and car-sharing services.
- **TAXIWAY**: is a company providing taxi services.

Supporters are TrainOSE, a long-distance suburban railway operator, and Welcome Pickups, a touristic services provider (sightseeing rides, guided tours, transfers, pickups, touristic information), by signing a Letter of Support (LoS). These two supporters will not have active participation in the 1st Phase demonstrations. The Demonstration Leader of Athens location is CERTH, and the participant is AETHON.

The objective of the Athens demo site is the enrichment of multimodality by providing integrated services through a single application that tourists and commuters can use. The main expected innovation consists of the dynamic reconfiguration of the MaaS provider.

6.1.3 Barcelona

The Barcelona demo site includes both the urban area of Barcelona and the suburban area surrounding it. This site focuses on travels having as origin or destination the residential areas of Barcelona and the medium-sized cities in the metropolitan area of Barcelona.

The PTO and TSPs involved in the IP4MaaS Barcelona demonstration site are:

- **TMB** (*Transports Metropolitans de Barcelona*): is one of the main public transport operators managing metro and several bus lines in the urban metropolitan area of Barcelona.
- **BusUp:** provides bus ride-sharing services and on-demand services for commuting from large metropolitan areas to industrial areas. BusUp provides services to companies located in suburban/rural areas, usually lacking a suitable public transport offer, with a sustainable and economic means of transport for their employees.
- **Social Car**: a car-sharing and car renting company operating in Spain. SocialCar also allows private users to share their vehicles as car-sharing vehicles. Some changes of the effort distribution have been conducted as Social Car has been facing serious issues that do not allow them to be involved as they should in the project. Therefore, Social Car's role will be reduced in terms or services' integration and Sparsity has performed all necessary actions for subcontracting AMTU and let them be part of the demonstration as an additional TSP.
- **AMTU**: an on-demand minibus provision company in Catalunya, identified by Sparsity, since SocialCar, the car-sharing and car-renting company, informed the consortium that due to internal issues they cannot confirm the initially planned level of involvement and thus will not be integrated in Phase 2. So, in the following roadmap please keep in mind that this will be updated and AMTU will be involved as an additional TSP, while Social Car will have limited involvement.

The additional IP4MaaS partners involved in the Barcelona demonstration site are SPARSITY (demonstration site leader) and MOSAIC. The key goal of the demonstration is to incentivize

multimodal travel and shared modes of transport targeting: (i) users traveling from the same starting point to different destinations in Barcelona, and (ii) users traveling from different starting points to the same destination in the suburban/rural area of Barcelona. The main anticipated innovation is the orchestration of individual mobility offers and services in one seamless journey, that includes urban and peripheral areas.

6.1.4 Liberec

The demonstration site of Liberec includes Liberec Region in the Czech Republic, with possible extension to the entire area of Borderland CZ/D/PL. The demonstration focuses on enabling and improving travel solutions in the cross-border section to serve many different cases of traveling.

The PTO and TSPs involved in the IP4MaaS Liberec demonstration site are:

- **KORID LK:** the regional Transport Authority. It coordinates the public transport services in Liberec Region.
- **ČSAD Liberec:** It operates mainly regional bus transport under a public service obligation in the territory of the Liberec district, as well as several cross-border transport lines and, to a lesser extent, long-distance domestic transport.
- **ARRIVA VLAKY:** Rail operator and one of the largest transport companies in Europe.

The last two operators (ČSAD Liberec and ARRIVA VLAKY) are not directly involved in the project, but they have signed a LoS and offer their support to include their transport services. The Demo site leader is OLTIS. The additional participant in the demo is UNIZA. The demo planning phase will seek the involvement of other local PTOs, cross-border regional authorities and municipalities. The main expected innovation is the overcoming of barriers to cross-border ticketing unification and the improvement of services provided by the dispatching centre.

6.1.5 Warsaw

This demonstration site focuses on the Warsaw metropolitan area, in Poland. The demo will be realised on public transport nodes which integrate different types of mobility. The demo is focused on the Młociny transport hub, in North of Warsaw. This transport hub is the Interchange building connecting the P + R car park with the bus, tram and subway terminus. Młociny transport hub is mainly used by the inhabitants from North districts of Warsaw (Bielany, Białołęka) and neighbouring communes (Warszawa Zachód, Nowy Dwór Mazowiecki, Legionowo).

The TSPs and the involved authority of Warsaw in the IP4MaaS Warsaw demonstration site are:

- **MZA** (Miejskie Zakłady Autobusowe): the largest bus operator in the Warsaw Metropolitan Area.
- **TRAM WARSZAWA (TW):** a municipal tram operator in Warsaw Metropolitan Area.
- **ZTM:** it is not a TSP but the Public Transport Authority and budgetary unit of the city of Warsaw, responsible for the management and supervision of the aforementioned public transport operators, ZTM signs multiannual contracts with the aforementioned TSPs.

The main objectives of the demonstrations are to trigger the implementation of MaaS and to improve the current Ecosystem by adopting new technologies. What the project considers an innovation in this location is the reflection of current organizational and social changes in Warsaw on the mobility Ecosystem.

6.1.6 Osijek

The demonstration site of Osijek focuses in the rural area in the Osijek-Baranja County in Croatia. The PTO and TSPs participating in the Osjek Demo Site are:

- **GPP Osijek:** tram and bus urban transport. It operates in the City of Osijek wider administrative area, providing transport services with its 12 Bus and 2 Tram lines. It also manages e-bike, car, and scooter sharing.
- **HŽ Putnički prijevoz:** Croatian national Railways.

HŽPP, the national rail operator, is not directly involved in the project but offered support to also integrate information on available train solutions. The additional IP4MaaS partners involved in the Osijek demonstration site are DYVOLVE (demonstration site leader) and FIT.

The main target group is commuters, and especially students, traveling daily to the city of Osijek. The main purpose of the demonstration site is to test the added value of the IP4 solutions in connecting current PT services and new services.

6.2 Demo phases

The IP4MaaS project follows an iterative approach that consists of 2 demonstration phases. The iterations are named C-REL (core release) and F-REL (final release).

Taking into consideration the time restrictions presented to IP4MaaS, as well as limitations in resources and in the technical aspect, it was decided that the 1st Demo Phase will be executed only in Athens, while the 2nd Phase will involve all 6 demo sites (Padua, Athens, Barcelona, Liberec, Warsaw, Osijek).

The 1st demo phase of IP4MaaS in Athens will run in parallel with the demonstrations of Ride2Rail.[13]The coordination between the 2 projects is necessary since the demonstrations will be executed by the same audience, even though the projects are focusing on different aspects and functionalities.

The 1st phase demonstration will last for two weeks, while those of the 2nd phase will run for 1 week due to time limitations.

The demonstration for the 1st Demo Phase in Athens will be carried out during the first two weeks of July 2022, along with the pilot of the Ride2Rail (R2R) project[14], while the demonstration of the technologies for the 2nd Demo Phase in all six demo sites will be as follows:

- Barcelona: March 2023 (week 1)
- Padua: March 2023 (week 3), along with the respective pilot of the R2R project
- Athens: March 2023 (week 5)
- Liberec: April 2023 (week 3)
- Warsaw: April 2023 (weeks 3-4)
- Osijek: May 2023 (week 2)

The timeline of all demonstration sites, for IP4MaaS, Ride2Rail (which runs almost in parallel with IP4MaaS until a certain point), ExtenSive (deployment, F-REL and closeout), along with the overview of the components that will be demonstrated are depicted in the following figure (Figure

[13] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=S2R_RIDE2RAIL
[14] https://ride2rail.eu/pilots/

4), as provided from the CFMs. Figure 5 provides the legend for Figure 4. Both figures refer to the functionalities that need effort from the side of the CFMs, in order to analyze, integrate and test, not the passive functionalities or any other that do not require effort from CFMs' side. For further descriptions and additional information regarding the timeline for each demo site and its specific components, please also see section 7.2.

Please note that at the time of compiling this deliverable, the CFMs cannot fully commit to the exact dates planned for the F-REL, and the timelines are more of a rough estimation and may be used as a working base. The timeline will be finalized once all the data collected for the F-REL have been properly analyzed and the technologies have been integrated.

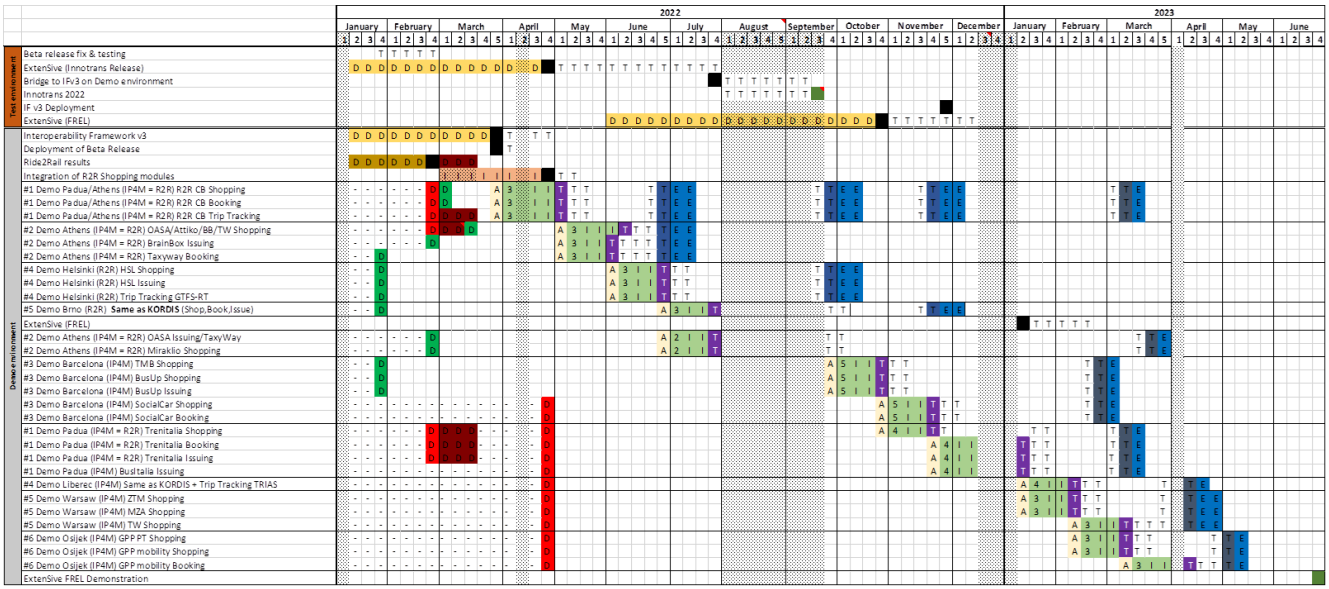

Figure 4: Integration, testing and demonstrations roadmap (R2R & IP4MaaS, plus ExtenSive FREL)

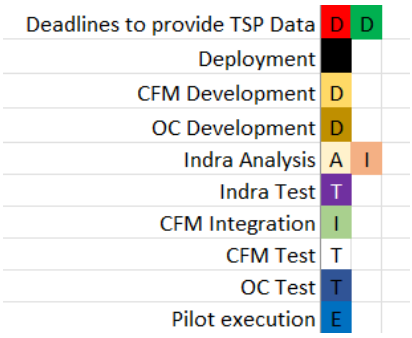

Figure 5: Figure's 4 Legend

7 Overview of the IP4 Technologies, TSPs' Services, Scenarios, and KPIs

This chapter will consolidate, expand, and refine the findings of WP2 and WP3, and specifically D2.1, D2.2, and D3.1. It is divided into four subchapters and is relevant to the pyramid that is described above. Each subchapter includes three parts, the available IP4 solutions, the feasibility of integrating the IP4 enablers according to the Operators' offerings, the suitable Use Cases of the demonstrations, and the summary of functionalities for the pilot of the 1st Phase, namely Athens.

7.1 Available IP4 Technologies

The first step for defining the elements that will be demonstrated across demo sites is the registration of the technologies available in the S2R IP4 Ecosystem and their level of Technological Readiness Level (TRL) [3]. Table 1: IP4 Functionalities lists all the available IP4 functionalities with their corresponding TRL levels shared by the CFM partners, as well as those still under development. The list also indicates for each functionality the respective end user (traveler or the TSP) and the status of each functionality (ready or still under development). Note that, in the case of the Athens demo site that will conduct C-REL and F-REL demonstrations, the functionalities that will be demonstrated during the 1st phase (certain functionalities from ID 1 to ID 25 in the list) will also be demonstrated during the 2nd phase, along with all the additional integrated functionalities. Each respective functionality has a specific degree of TRL, and those available for the 1st Demo Phase and will be demonstrated in the 2nd Demo Phase stand either at level 5 or level 6. TRL 5 technologies are validated in a relevant environment. TRL 6 technologies are demonstrated in a suitable environment. The goal of the IP4MaaS Project is to establish systems prototypes in an operational environment, i.e., TRL 7.

Some functionalities have been excluded from this list, since they have been deemed not testable in the context of IP4MaaS, while others (those which will be demonstrated in F-REL, from ID P1 all the way to ID S7) have yet to be released. All technical requirements for all functionalities are in Annex (Table 18).

For a more detailed planning of each demonstration (analysis, integration, testing by CFMs and OCs of each component) please also see Figure 4 under section 6.2.

The aim is to use each functionality at least once in at least one demo site (overall). The technologies are classified based on the extent of effort required from the Transport Service Providers (TSPs):

- Passive: No technical action is required from the TSPs to use these functions. Improvements done within ExtenSive and automatically integrated in the system, as the deliverable D2.3 also informs (D2.3 "Demonstration Requirements and Scenarios, F-REL".
- Active: Specific TSPs requirements (data and services) are required to use these functions. Improvements done within ExtenSive (see also D2.3).
- Only selected TSP: Special functionalities that require high integration effort and specific data & services. Only one TSP (from all pilot sites), the one that can fulfill all technical requirements, can demonstrate this functionality (see also D2.3).

Table 1: IP4 Functionalities [4]

ID	IP4 Technologies	TRL	User	Availability	P/A
1	Journey Planner / Offer Builder	6	Traveller	Ready	Active

2	Booking	6	Traveller	Ready	Active
3	Issuing	6	Traveller	Ready	Active
4	Ancillary service	6	Traveller	Ready	Active
5	Mobility packages	5	Traveller	Depends on TSPs	Active
6	Validation and Inspection	N/A	Traveller	N/A	Active
7	Trip tracking	6	Traveller	Ready	Active
8	Alternatives' calculation	6	Traveller	Ready	Active
9	Location based experiences (LBE)	6	Traveller	Ready	Active
10	Navigation	6	Traveller	Ready	Passive
11	Traveler's feedback	5	Traveller	Ready	Passive
12	Trip sharing	6	Traveller	Ready	Passive
13	Group travelling	6	Traveller	Ready	Active
14	Travel Arrangement	6	Traveller	Ready	Passive
15	Travel companion Web-Portal	5	Traveller	Ready	Active
16	Guest user	5	Traveller	Ready	Passive
17	Preferences and Profiles	5	Traveller	Ready	Passive
18	Best price optimization	5	Traveller	Ready	Active
20	Travel Companion for Kids	5	Traveller	Ready	Active
21	Asset manager	5	TSP	Ready	Active
22a	Contractual Management Market Place (CMMP)	5	TSP	Ready	Active
22b	Business analytics	5	TSP	Ready	Active
24	LBE editor	6	TSP	Ready	Passive
25	Inspection with Fraud Control	6	TSP	Ready	Active
P1	Digital Onboarding	7	Traveller	Availability: 31 January 2023	Passive
P5	Web Portal (Payment, Registration with Gmail and Purchase Mobility Packages)	7	Traveller	Availability: 31 January 2023	Passive
P6	CMMP (Manual Inclusion of Products and new Registration Process)	7	TSP	Availability: 31 July 2022	Passive
P7	CRM Portal	7	TSP	Availability: 31 January 2023	Passive
P8	Collaborative Space (Traveller)	7	Traveller	Availability: 31 July 2022	Passive
P9	Collaborative Space Portal (TSP)	7	TSP	Availability: 31 July 2022	Passive
A1	Trip Planning Hierarchy	7	Traveller	Availability: 31 January 2023	Active
A2	Dynamic Display of Map Content	7	Traveller	Availability: 31 July 2022	Active
A3	Smart Locations	7	Traveller	Availability: 31 January 2023	Active

A5	Improved Intermodal Travel	7	Traveller	Availability: 31 January 2023	Active
A6	Improved Travel Shopping	7	Traveller	Availability: 31 January 2023	Active
A7	Individual Last Mile	7	Traveller	Availability: 31 July 2022	Active
A8	LBE Score Sharing	7	Traveller	Availability: 31 July 2022	Active
A9	Meeting Point	7	Traveller	Availability: 31 January 2023	Active
A10	Specific Messages	7	Traveller	Availability: 31 July 2022	Active
A11	Travellers Orchestration and Supervision	7	Traveller	Availability: 31 July 2022	Active
A12	Siri SX based pTT	7	Traveller	Availability: 31 July 2022	Active
A13	pTT CEP Rule Editor	7	TSP	Availability: 31 July 2022	Active
A14	SaaS Siri SX based pTT	7	PST	Availability: 31 January 2023	Active
A15	Distributed Ledger – Transaction Anchoring	7	TSP	Availability: 31 January 2023	Active
S1	Enrolment Token Generator System	7	TSP	Availability: 31 July 2022	Only selected TSP
S2	Event Detection	7	TSP	Availability: 31 July 2022	Only selected TSP
S3	Plan Data Provisioning for TSPs	7	TSP	Setup of TSP: 31 July 2022 Update plan data: 31 January 2023	Only selected TSP
S4	Incident Messages	7	Traveller	Availability: 31 January 2023	Only selected TSP
S5	Adding Travel Shopping Service to TSP	7	TSP	Availability: 31 January 2023	Only selected TSP
S6	Distributed Ledger – TSP Inclusion	7	TSP	Availability: 31 January 2023	Only selected TSP
S7	Intermodal Fare Optimization	7	Traveller	Availability: 31 January 2023	Only selected TSP

7.2 TSPs' Available Services

In the context of WP2, under the Task T2.1, questionnaires were distributed to all involved TSPs from all demo sites. The questionnaires collected information about the services already provided by the IP4MaaS TSP partners. All available services were then described in D2.1 "Technology Survey C-REL". For more information regarding all TSPs from all demo sites and their available services (APIs, token etc.) can be found in the said document. This was the basis for pinpointing available services that had the potential of further development, improvement, and testing.

Out of the IP4 technologies presented in Table 1, the TSPs' services available for the 1st Demo Phase [5] are summarised for Athens demo site in the following subchapter 7.2.1: Athens , along with requirements fulfilled in order to be successfully developed and integrated.
In the next subchapters (7.2.2 and on, for all six demo sites) an overview is being provided for the rest of the demo sites and their respective TSPs and their progress in developing and integrating functionalities to demonstrate in F-REL, complementing the roadmap of requirements, timelines and outcomes depicted in Figure 4, in section 6.2.

Please note that in regards of all F-REL demo sites the roadmap and all the functionalities to be demonstrated will be finalized and provided in the D4.3 "Demonstration Execution Plan, F-REL", (due end of July 2022), in accordance with all the latest developments and progress from both CFMs and OCs' side.

The Integration Committee (more about the said committee in another section of this deliverable), in order to monitor the integration progress and facilitate the dissemination of information to all involved partners, has compiled an IP4MaaS IP4 Functionalities Matrix, where for all demo sites the respective functionalities have been listed, along with their status. The Matrix is being constantly updated, in accordance with the latest developments of the functionalities and the progress of each demo site's TSP and demo leader. All latest developments have been provided from the Integration Committee, as per the role dictates and is being described further in this document.

7.2.1 Athens

Table 2 depicts the available services that initially have been identified in WP2 as the IP4 solutions to the areas of potential improvement for the said demo site, as well as their Integration requirements of the functionalities to be tested in the 1st Phase of the Athens demo during July 2022. Those services that have been identified then have been developed and enhanced further and all necessary data have been provided to the CFMs for analysis and integration. This subchapter also provides an overview of the F-REL and the progress so far in regard to the additional functionalities to be demonstrated during the 2nd phase, as well as an overview in regard to MIRAKLIO, which has provided almost all necessary data but has been moved to F-REL, in order to save integration time and manage to move the 1st phase demonstration two weeks earlier in July 2022. Only exception the LBEs, which will be only service MIRAKLIO will provide during C-REL. The objective of moving the demonstration earlier is to secure an adequate number of users; the initial targeted time was the last weeks of July, which actually meant to perform the demonstration in the middle of summer-vacation period.

According to the CFMs' pilot integration planning (see also Figure 4, section 6.2 of this deliverable), since the requirements have been fulfilled (data, API and any other documentations) for each component from the side of all three participating TSPs, the next steps that are currently taken

are the following, in order to ensure that all proper actions have been taken, all tests have been conducted and the final functionalities that will be demonstrated have been successfully integrated, are functional and provide utilizable solutions to the end users (travellers):

- Analysis has been conducted, integration process follows from CFMs' side is soon going to be concluded, in total requires 3 to 4 weeks.
- According to the plan the integration process will be concluded:
    - for Brainbox Issuing and Taxiway Booking, during the first week of June Indra can conduct the appropriate tests,
    - for all three TSPs the shopping component's integration will be concluded at the end of first week of June 2022, then Indra will conduct the tests for two weeks.
- Until the end of June 2022, the last tests will be conducted from the CFMs' side and if all are a go then OC tests (tests from the open calls) will follow.
- The C-REL pilot will start on the first week of July 2022 and last for two weeks.

At the time this report was under preparation it had been decided, after internal discussions, discussions with all CFMs and technical partners and after taking CFMs analysis into account, to postpone the participation of MIRAKLIO (Journey Planner - Shopping), the service of Issuing for OASA and Taxiway, as well as the Validation service for Taxiway, in order for the CFMs to integrate the already developed functionalities in time for the conduction of the pilot which has been set to take place during the first two weeks of July. MIRAKLIO during the 1st phase demonstration will be demonstrating only the Location Based Experiences (LBE) along its bus route.

As the TSPs of Athens pointed out, these actions may be necessary as a mitigation measure against an outside significant external factors that could jeopardize the engagement of a good number of users and cannot be influenced by anyone, such as the summer vacations of the locals (thus their absence from the city), the transition of tourists from Athens to the islands and the expected heatwaves that usually occur during summer, may have a smaller impact and thus the pilot may achieve higher user engagement, compared to the last weeks of July.

The timeline with all the integration process planning is also depicted in the following Figure 6. Legend for the symbols is also included.

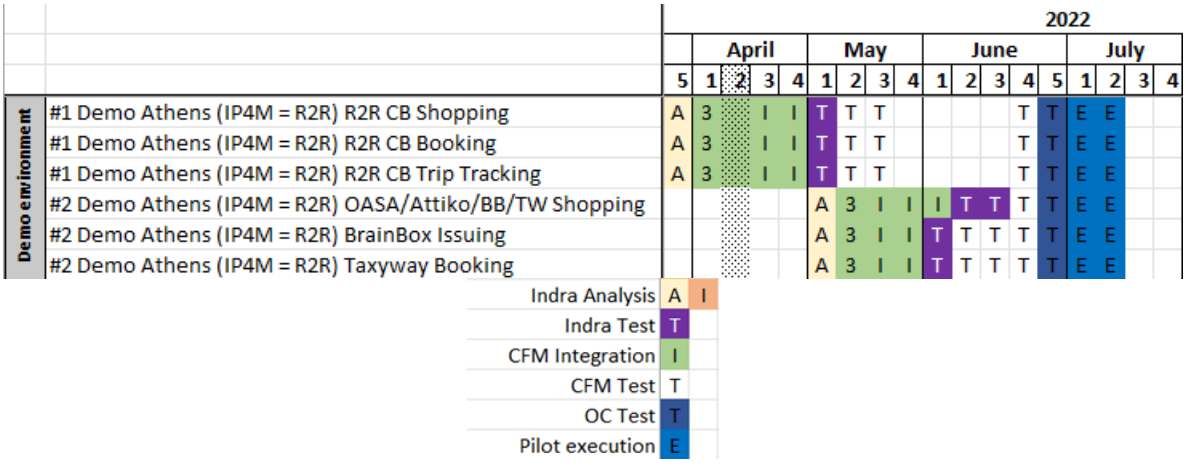

Figure 6: Athens Integration Planning CREL

For Athens, the main challenges at the technical level are the following, according to partners' timeline they are expected to be tackled before the demonstration of F-REL:

- Public transport does not require a booking service, as booking is not possible for buses/metro, therefore this functionality is not applicable for the bus route of the Municipality of Iraklio (MIRAKLIO) and the metro/buses of OASA. Booking will be demonstrated by Taxiway,
- OASA's ATHENA card and ticketing system cannot be directly integrated due to legal, contractual, and practical reasons. Nevertheless, issuing is under development for all TSPs, Taxiway as well as OASA and Brainbox. Only exception is the bus service of MIRAKLIO, since this is a service offered free of charge. This fact deems this service non-applicable. Each TSP has a different way to deploy the issuing (as already agreed with the CFMs). The development process is still ongoing for OASA and Taxiway.
- In addition, the bike sharing scheme uses a top-up e-wallet payment method, therefore it is not possible to integrate this system directly within Travel Companion, which expects a standard PT ticketing scheme. The user will be able to just purchase a ticket/coupon for a bike, but the procedures of actual booking, paying unlocking a bike will be performed with the use of the Brainbox's application. The Travel Companion will allow the user that plans his/her trip and wishes to use their bike sharing service to download a PDF file that will include a link to Brainbox's app, as well as instructions on how to use the said app and purchase a ride.
- The Issuing service for taxis (Taxiway) would entail the generation of a token/QR code on the booking. Furthermore, a fixed rate taxi trip purchase solution is envisaged: Taxiway will divide the Athens city into zones and then the taxi company will internally decide to offer specific fixed prices to the users that wish to be served within specific zones. That way the user may know beforehand, when he/she plans the journey, the exact amount of money a ride will cost within a specific zone of Athens. In order to put this concept in operation for Taxiway, there are some business issues still to be resolved, both the involved TSP and demo leader CERTH are working on resolving this issue. This is an ongoing activity.
- In the case of OASA, the operator already has a rechargeable contactless card-based ticket that can be purchased at stations or online. The loading of the tickets on the card can be done at the stations, at automatic vending machines, or through the Athena card mobile application; there have been several discussions to integrate this service with the Travel Companion, but it has been concluded that this is not possible due to several serious technical and administrative issues. An alternative solution has been devised: if the user wishes to purchase OASA tickets, then he/she could do it with the following manner: the Travel Companion will generate a QR code voucher that may be exchanged for an Athena Card at OASA offices. The user will then use Athena Card for his/her desired trips.
- Travel entitlement validation (start/end renting) for Brainbox: Bike sharing use is only possible for registered end users. This is because of the liability of the user for damages/theft/vandalism of the bikes. Bikes' unlocking and locking functionality is not being foreseen in Travel Companion.
- Last but equally important, a QR code-based ticketing technology requires both certain hardware and software infrastructure investments, in order to be successfully adapted and functional.
- Mobility Packages and CMMP are anyway moved to 2nd phase as standard format required by CFMs to develop products in the packages is not available. Mobility packages require in

general business agreements in place and win-win business models, which are under investigation. There is a possibility that at the 2nd phase the manual development of products will be available by the CFMs.

Moreover, all necessary GTFS data, APIs, documentations, credentials have been provided to the Integration Committee, which has uploaded them into the Asset Manager, in order to facilitate the exchange of information between the operators and the CFMs. More information can also be found in the D4.1, "Technology Integration Plan, C-REL.". The Table 3: Athens F-REL IP4 Functionalities gives an overview of those functionalities that are moved to the 2nd phase to be demonstrated, as agreed between the partners of Athens and the CFMs.

Table 2: IP4 Technologies - Athens (C-REAL)

ID	IP4 Technologies	Requirements	OASA	Brain box	Taxi way	MIR AKLI O
1	Journey Planner/ Offer Builder	• GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport • Journey planner web-service (API) • Web-service providing fares (API)	√	√	√	To F-REL
2	Booking	Web-service allowing booking (API)	×	x	√	×
3	Issuing	Web-service allowing to issue tickets (API) – [The web service will allow to issue vouchers; the end users will use vouchers to get tickets]	To F-REL	√	To F-REL	×
5	Mobility packages	Mobility packages defined through the CMMP	To F-REL	To F-REL	To F-REL	×
6	Validation and Inspection	Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by the TSP	To F-REL	√	To F-REL	×
9	Location based experiences	Location-based experience using LBE editor (24)	√	×	×	√
10	Navigation	Integration of IP4 Journey Planner solution (Passive)	√	×	×	To F-REL
11	Traveller's feedback	N/A (Passive)	√	×	×	To F-REL
12	Trip sharing	Integration of IP4 Journey Planner solution (Passive)	√	√	√	To F-REL
15	Travel companion Web-Portal	• Shopping services • Booking services • Issuing services	√	√	√	×
16	Guest user	N/A (Passive)	√	√	√	To F-REL
17	Preferences and Profiles	N/A (Passive)	√	√	√	To F-REL
21	Asset manager*	Data or web-services to be integrated	To F-REL	To F-REL	To F-REL	To F-REL

22 a	CMMP	Description of products (e.g., daily/monthly subscriptions) in NeTEx format.	**To F-REL**	**To F-REL**	**To F-REL**	×
24	LBE editor	N/A (Passive)	√	×	√	**To F-REL**

**The Asset Manager is ready, the first stage is that POLIMI, which is the member of the Integration Committee, makes use of this tool and all necessary information from TSPs are provided via that tool. The Asset Manager facilitates the exchange of information for F-REL between TSPs and CFMs. The TSPs will have a chance to use it, if they express such a wish, during the 2nd demo phase, in order to provide later on their feedback via the TSPs surveys. This applies to all TSPs of all the demo sites in F-REL.*

For Athens C-REL demonstration and the aforementioned table please note, whenever a TSP matches the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs for analysis, integration and testing), it appears with a "√" symbol (it also means that even though the analysis and integration is not yet complete, the functionalities' integration is feasible) whereas, when the requirements are not met, it appears with a "×" symbol, meaning that, if the planning stays as is, those functionalities may not be demonstrated during the 1st phase. The requirements need to be met are included in Table 2.

Also note that the technologies in green have been identified in WP2 as the IP4 solutions to the areas of potential improvement for each demo site.

The functionalities that could not be developed and integrated for none of the three TSPs have been removed from the list. The cells containing N/A correspond to passive functions, thus not requiring any prerequisite or effort from the operators. Those that have been moved to second phase of the demonstrations have the note "To F-REL". If the "To F-REL" is green ("To F-REL") it means that the technical requirements have already been fulfilled.

As for F-REL demonstration, Table 3 provides an overview of the additional functionalities that have been moved to the 2nd phase and are to be demonstrated by the three TSPs (OASA, BrainBox, Taxiway), as well as an overview for MIRAKLIO, while Table 4: MIRAKLIO's functionalities shows the functionalities MIRAKLIO is already set to be demonstrated, since all necessary data have already been provided for analysis and integration. Since MIRAKLIO has been moved to F-REL (week 5 of March 2023), almost all its' functionalities have been moved to this respective phase. The symbols are the same as in Table 2, "**√**" means that the requirements have either been fulfilled and the functionalities are ready, or that all necessary data has been provided, integration has yet to be completed from the CFMs' side, but their successful utilization is feasible. "**Ongoing**" means that the respective functionality will be demonstrated but, at the time this document is compiled, discussions are still being carried out regarding OCs' ideas, desires and needs, as well as possibilities and clarifications on the information MIRAKLIO needs to provide before the pilot.

The roadmap for the F-REL in Athens, as depicted in Figure 4, section 6.2, is as follows:

- For successfully integrating and utilizing OASA's and Taxiway's Issuing, as well as MIRAKLIO's Journey Planner and Shopping:
    a. Indra Analysis: during the last week of June 2022.
    b. CFMs Integration: during the first three weeks of July 2022.
    c. Indra Test: last week of July 2022
    d. CFMs Test: last week of September 2022 – first week of October 2022
    e. Final CFMs Test on integrated functionalities: 3rd week of March 2023

f. OC Test: 4th week of March 2023

g. Execution of the pilot-demonstration of the outcomes: 5th week of March 2023

In general, according to the Integration Committee, which monitors the progress of the technologies integration and has knowledge of each demo site's status, the Athens demo site for the 1st phase seems to be a consolidated situation and currently test cases are being complied, in order to test the technologies prior to the pilot in July 2022.

Table 3: Athens F-REL IP4 Functionalities

		FUNCTIONALITY	OASA	Miraklio	Brainbox	Taxiway
2nd phase functionalities	Active	A1 – Trip Planning Hierarchy	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A2 – Dynamic Display of Map Content	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A3 – Smart Locations	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A4 – Secure Price and Tariff Information				
		A5 – Improved Intermodal Travel	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A6 – Improved Travel Shopping	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A7 – Individual Last Mile	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A8 – LBE SCORE sharing	OK 2nd phase	OK 2nd phase		OK 2nd phase
		A9 – Meeting Point				
		A10 – Specific messages	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A11 – Travellers Orchestration and supervision	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		A12 – Siri SX based pTT				
		A13 – pTT CEP Rule editor				
		A14 – SaaS Siri SX based pTT				
		A15 – Distributed Ledger – Transaction Anchoring	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
	Passive	P1 – Digital OnBoarding				
		P2 – E-Wallet				
		P3 – Purchase an offer using PayPal				
		P4 – Asynchronous provision ETE				
		P5 – New funct. Web Portal - Payment,Gmail,Mobility package				
		P6 – New funct. CMMP - Manual inclusion of products	OK 2nd phase		OK 2nd phase	OK 2nd phase
		P7 – Customer Relation Management (CRM)				
		P8 – Collaborative space (traveller)				
		P9 – Collaborative space portal (TSP)				
	Selected TSP	S1 – Enrolment Token Generator System				
		S2 – Event Detection		On-analysis OC		On-analysis OC
		S3 – Plan Data Provisioning for TSPs	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		S4 – Incident Messages		On-analysis OC		On-analysis OC
		S5 – Adding Travel Shopping Service to TSP (SaaS)	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		S6 – Distributed Ledger – TSP Inclusion	OK 2nd phase	OK 2nd phase	OK 2nd phase	OK 2nd phase
		S7 – Intermodal Fare Optimization	OK 2nd phase		OK 2nd phase	OK 2nd phase

Table 4: MIRAKLIO's functionalities

ID	IP4 Technologies	Requirements	Status
1	Journey Planner/ Offer Builder	• GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport • Journey planner web-service (API) • Web-service providing fares (API)	√
9	Location based experiences	Location-based experience using LBE editor (24)	Ongoing
10	Navigation	Integration of IP4 Journey Planner solution (Passive)	√

11	Traveller's feedback	N/A (Passive)	√
12	Trip sharing	Integration of IP4 Journey Planner solution (Passive)	√
16	Guest user	N/A (Passive)	√
17	Preferences and Profiles	N/A (Passive)	√
21	Asset manager	Data or web-services to be integrated	√

7.2.2 Padua

The reason Padua has been moved to F-REL is due to the NDA needed to be signed between Trenitalia (provided by FST), UITP and probably the CFMs in order for the GTFS data and APIs to be provided by Trenitalia, which are crucial for the functionalities to be demonstrated. Those APIs are not open, and this NDA is necessary to provide access to CFMs. FST is currently working on the matter in order to provide the Trenitalia's API access and GTFS files to the CFMs. This activity is ongoing and expected to be resolved soon. Time is needed for the integration and testing of the functionalities when the aforementioned data and documentation are finally provided, as well as a mitigation measure, in order for this delay not to pose a threat to the Ride2Rail pilots. Since Trenitalia has yet to provide GTFS files and APIs, the CFMs are unable to make accurate predictions regarding the time the integration will be completed.

Another significant technical issue related to the Padua demo site is there is not an API available for the BusItalia operator and therefore it is not possible to integrate any functionality foreseen for the 1st phase of the pilots, mainly Journey Planner/ Offer Builder, issuing, booking, shopping and all other services depended on the Journey Planner. Only the bus routes that can be covered after, or in parallel, with the train can be shared by Trenitalia. Since BusItalia does not have a service providing trips/tariffs, it was therefore concluded that the TSP could not be integrated for the 1st phase of pilots. There are discussions ongoing with IP4MaaS partners for the creation of a JP for Busitalia, while Busitalia and their technical advisors work towards providing fares for the itineraries.

Furthermore, the TSPs of Padua cannot configure their products offerings in NeTEx format, which is a requirement for the function CMMP, a tool for the Operators. The creation of Mobility Packages presupposes the definition of products in the CMMP. Thus, Mobility Packages and CMMP cannot yet be tested. Those issues are expected to be resolved in order for Padua to conduct the F-REL demonstration.

The F-REL demonstration of Padua will take place during the 3rd week of March 2023.

According to the CFMs' pilot integration planning, after the provision of all necessary data and documentations from FST for BusItalia and TrenItalia, the next steps that need to be taken as shown in Figure 4 in section 6.2 of this deliverable, in order to ensure that all proper actions have been taken, all tests have been conducted and the final functionalities that will be demonstrated have been successfully integrated, are functional and provide utilizable solutions to the end users (travellers).

The roadmap for the F-REL in Padua, as also depicted in Figure 4, section 6.2, is as follows:

1. For Trenitalia Shopping functionality:
    a. Indra Analysis: last week of October 2022.

b. CFM Integration: first three weeks of November 2022.
c. Indra Test of Integration outcomes: 4th week of November 2022.
d. CFMs Test: last week of November 2022-two last weeks of January 2023.

2. For Trenitalia Booking & Issuing – BusItalia Issuing:
   a. Indra Analysis: 4th week of November 2022.
   b. CFM Integration: last week of November 2022-first two weeks of December 2022.
   c. Indra Test: 2nd week of January 2023.
   d. CFM Test: last two weeks of January 2023.

— Once all outcomes are ready:
   a. Final CFMs Test: 1st week of March 2023.
   b. OC Test: 2nd week of March 2023.

Execution of pilot-demonstration of components: 3rd week of March 2023.

7.2.3 Barcelona

AMTU, an on-demand minibus service company that was added in the participating TSPs' list, has all the necessary documentations and data to be integrated and has the same deadline as all the other TSPs. According to the latest information provided by the Integration Committee, AMTU has its own application.

The compatibility of the technical services is still under discussion between the OC and CFM partners. More specifically, these are:

- Journey Planner: BusUp does not have a Journey Planner as it does not need it because it operates at fixed lines with specific clients. The company provides only routes information, which is available only for users from registered companies. There is the possibility of extending this to non-corporate users, but this must be discussed internally.
- Booking and Issuing: NFC technology (card or smartphone) will probably be operative for TMB in the following months. However, the booking and ticketing system is not owned by TMB but by the public transport authority of Barcelona (AMB). TMB QR-based digital tickets are valid only on buses. For the metro, the QR-code is used to collect the tickets from the vending machines. Currently, no digital ticket can be validated and inspected on the metro (no physical infrastructure available).
- Trip Tracking: BusUp has information regarding the real-time position of the vehicle. TMB has not provided access to its tracking information systems. Information about disruptions and status cannot be retrieved for the IP4MaaS project.

The available offerings of Barcelona's TSPs cannot support Issuing. Mobility Packages have a dependency on Issuing in the sense that without it, they can be defined but not bought. Nevertheless, Barcelona demo site has decided to test CMMP, configure mobility products and proceed to the sale of the packages in the 2nd phase.

For a better depiction of the roadmap, as it is currently planned, please see also Figure 4 under section 6.2, where it depicts not only the time plan but also includes the technical requirements/actions that need to be conducted in order to ensure that the final solution is utilizable and functional.

1. For TMB Shopping, BusUp Shopping and BusUp Issuing integration:
   a. Indra analysis: during the last week of September 2022.

b. CFM Integration: first three weeks of October 2022.
c. Indra test: last week of October 2022.
d. CFM test: first two weeks of November 2022.

2. SocialCar's (and probably AMTU's) Shopping and Booking will be integrated after the following stages have been completed:
    a. Indra analysis: last week of October 2022.
    b. CFM Integration: first three weeks of November 2022.
    c. Indra test: 4th week of November 2022.
    d. CFM test: 5th week of November 2022.

— Once all outcomes are ready, prior to demonstration:
    a. Final CFM test: 3rd week of February 2023.
    b. OC test: last week of February 2023.
    c. Pilot execution: 1st week of March 2023.

7.2.4 Liberec

For the Liberec demo site, the Journey Planner and the Offer Builder functionalities will use the same service as in the Shift2MaaS and the Ride2Rail projects, as confirmed by the CFMs, JP has already been integrated the IP4 ecosystem. Therefore, since GTFS files, API service and API documentation have already been provided and access is already available, no new risks have been identified so far, at the time this document is being compiled. Pending components to be integrated, as initially stated they will be, are Trip Tracking (TRIAS), which has been developed, and Alternatives Calculation. In addition, if Booking and Issuing functionalities can be used from the previous project Shift2MaaS, they need to be adapted and re-integrated. The Asset Manager is soon going to be updated.

The roadmap for the F-REL in Liberec, as also depicted in Figure 4, section 6.2, is as follows:

— For KORID Shopping, Booking, Issuing and Trip Tracking (TRIAS) integration:
    a. Indra analysis: 2nd week of January 2023
    b. CFM integration: during last weeks of January, until end of first week of February 2023.
    c. Indra test: 2nd week of February 2023.
    d. CFM test: last two weeks of February 2023.

— Once all aforementioned actions have been conducted and all outcomes are ready:
    a. Final CFM test: last week of March 2023.
    b. OC test: 2nd week of April 2023.
    c. Demonstration execution: 3rd week of April 2023.

7.2.5 Warsaw

According to the latest information from the Public Transport Authority of Warsaw and involved technical partners regarding Warsaw's demonstration, the booking functionality is not applicable to the Warsaw's TSPs, i.e. ZTM, MZA and TW, nevertheless the development of the functionality of issuing and downloading tickets is ongoing in order to attempt to be demonstrated during F-REL. ZTM is the public transport authority and is the only entity that provides the GTFS data, which are already provided and uploaded in the Asset Manager. In addition, the TSPs initially did not have the functionality that allows the user to retrieve the fares associated with a trip via the use

of Journey Planner. Since the CFMs have yet to receive the required data, they have made a rough estimation of the timeline of the components to be analysed, integrated and tested, as well as the timeline for the demonstration by taking into account all limitations. The roadmap in Figure 4, in section 6.2 of this deliverable, in essence provides this rough estimation with the basis that all that entail Travel Shopping functionality (and to which this feature is interdepended) will be provided in time. All new information and the finalized roadmap, if changes occur in that aspect, with all components and timeline will be provided in D4.3 for F-REL.

Please also note that the demonstration's timeframe for this site may be modified by one week (it is a scenario still under consideration), due to the Easter Holidays and the disruption to user engagement that may cause. Therefore, both the matrix of the functionalities that have the "green light" to be demonstrated and the timeline will be finalized and available in D4.3, "Demonstration Execution Plan, F-REL".

The roadmap for the F-REL in Liberec, as also depicted in Figure 4, section 6.2, is as follows:

1. The ZTM Shopping and MZA Shopping analysis, integration and testing will be conducted in parallel with Liberec's.
2. For the integration of TW Shopping:
    a. Indra Analysis: 2nd week of February 2023.
    b. CFM Integration: last two weeks of February 2023, 1st week of March 2023.
    c. Indra Test: 2nd week of March 2023.
    d. CFM Test: until end of March 2023.

— Once all components are ready:

    a. OC test: 2nd week of April 2023.
    b. Demonstration execution: last two weeks of April 2023 (week 3-week 4).

7.2.6 Osijek

In Osijek, GPP is currently working on the technical requirements of several functionalities, regarding the Journey Planner OLT is working on a solution similar to Liberec. All necessary data, such as the GTFS data, are not public but they have been uploaded in the Asset Manager, along with the credentials so the CFMs can access them.

The service of sharing mobility is unavailable; therefore, Trip Sharing may not be possible to be demonstrated. Furthermore, it is still unclear whether the TSP has a web service that provides fare information for suggested trips to the end user (traveller) or not. In addition, there is no booking service, since the TSP provides public urban transport, therefore Booking functionality may not be demonstrated during the 2nd phase pilot.

On the other hand, the provider's staff have the means to conduct inspection and validation of tickets, the vehicles are also equipped with a control mechanism, with the ability to provide audio and visual signals during each passenger's entry.

In addition, the Osijek TSP also has API available that can provide real-time (RT) information about any delays that might occur, as well as precise information regarding the exact route and the exact vehicle that may be delayed.

GPP may also be able to deliver data in any given format for the Adding/Updating Travel Shopping Service functionality, for this and several other functionalities that are still under development the CFMs will provide clarifications and exact specifications in due time.

For a better depiction of the roadmap of the demonstration please see also Figure 4 under section

6.2, where it depicts not only the time plan but also includes the technical requirements/actions that need to be conducted in order to ensure the final solution is utilizable and functional, in particular those for Travel Shopping and Mobility Shopping.

The roadmap for the F-REL in Liberec, as also depicted in Figure 4, section 6.2, is as follows:

1. For the GPP Shopping and Mobility Shopping integration:
    a. Indra analysis: 2nd week of February 2023.
    b. CFM Integration: last two weeks of February 2023, until end of 1st week of March 2023.
    c. Indra test: 2nd week of March 2023.
    d. CFM test: weeks 3 and 4 of March 2023.
2. For GPP Mobility Booking successful integration:
    a. Indra analysis: 2nd week of March 2023.
    b. CFM integration: last three weeks of March 2023.
    c. Indra test: 2nd week of April 2023.
    d. CFM test: 3rd week of April 2023.

— Once all components are ready and all aforementioned stages complete:

    a. Final CFM test: last week of April 2023.
    b. OC test: 1st week of May 2023.
    c. Demonstration execution: 2nd week of May 2023.

You will note in the roadmap in Figure 4, in Section 6.2 that the ExtenSive F-REL Demonstration is at the end of June 2023, while the last demonstration for IP4MaaS is Osijek's (1st week of May).

The C-REL (Athens) will provide data, new risks that may be identified a.so. to F-REL demonstrations and at the end of those, the outcomes will be used for the necessary assessment of the outcomes (data collected during the pilots, stored in Cloud Wallet and, assessment of the collected surveys from TSPs and surveys from travellers, as well as input for the ExtenSive, that has an aim to improve and enhance those IP4 functionalities, and thus the services to transport providers and travellers alike.

7.3 Scenarios and Use Cases

The results from Table 2 recognised the Integration Activities that are relevant and feasible. This is the first level of sorting in T4.1. Essentially, 16 potential Functionalities were initially identified, 7 of which still need to be analysed. This section moves to the 2nd level of filtering regarding the Demonstration Scenarios (D2.2) [6]. This subchapter focuses on the outcomes that have been collected from T2.3. Specifically, through interviews with the TSPs involved in IP4MaaS during the activities of WP2, which determined their needs and expectations regarding the new travel experiences enabled by S2R IP4 services and tools. The primary outcome of the D2.2, except for the Technical Demonstration Requirements, was the TO-BE Travel Experiences, which relied upon the High-Level User Journeys and the AS-IS User Journey Maps. The former represents a type of demonstration journey, identified by a title, described by high-level information, and exemplified by specific user journeys. At the same time, the latter expands a user journey describing the current travel experience. The use cases included in the TO-BE User Journey Maps define demonstration scenarios for the demo site of Athens (C-REL) by considering the selected IP4 solutions and the involved TSPs. This chapter matches the most representative travel solutions for each demo site with the feasibility of integrating the desired functionalities. The use cases for Athens described will be used for both phases and updated during the Integration process, leading

to feasible solutions according to the available functionalities.

Regarding the 2nd Demo Phase, the TO-BE Scenarios will be finalized in parallel with the demo leaders' workshops. The use-cases 2nd Demo Phase will be presented in the F-REL version of the Demonstration Execution Plan, scheduled for M20 (D4.3, due July 2022).

Since Padua and Barcelona were initially scheduled to take part in the 1st phase of the demonstrations, corresponding uses cases were created, therefore, besides Athens, we included the already created use cases for Padua and Barcelona in Annex 2 (Table 19, Table 20) regardless of their postponement and moving those two demo sites to the 2nd phase. Those two sets of uses cases, as mentioned above, will be accordingly updated, adjusted if the need arises, and utilized during F-REL. The respective Demonstration Execution Plan for F-REL (D4.3) will be enriched and updated accordingly for all demo sites.

7.3.1 Athens

Table 5 relies on the main findings of D2.2 for Athens, containing information about the High-level User Journey, the User Journey, the selected Travel Solutions, and the detailed Use Cases of the final TO-BE Scenarios. Furthermore, it expands the overview of Use Cases, explaining each one's feasibility based on the IP4 Enabler they correspond to. *Guest User* and *Preferences/Profiles* are added to the table since they are associated with the usage of other functionalities (e.g., journey planning) through the Travel Companion.

At the time this document is being compiled each demo site leader is compiling additional test cases to be used by the CFMs, in order to become familiar with each demo site and test the functionalities prior to the demonstrations. The test cases will be scenarios of door-to-door transport, as close to reality as possible, entailing all involved TSPs and every involved mode of transport the TSPs provide, as well as specific details such as starting point and destination point, each station/stop of interchange, date and time of departure, time of arrival of the traveller, distances to be covered on foot by the traveller to reach each point/mode. Thus, the CFMs can conduct tests and assess the success of integration of the functionalities (Pass/fail status).

Table 5: Use Cases for Athens demonstration site (C-REL)

High-Level User Journey	User journey	Travel Solution	Overview of Use Cases	Feasibility	IP4 Enablers
Traveling to and from the Northern sector of Athens for work/education and recreation. Expected target users: Commuters (work, education, leisure)	**Origin:** Keramikos station **Destination:** OAED School (Iraklio)	Taxi (**Taxiway**) → Bus (**OASA**) → Metro (**OASA**) → Local PT service (**MIRAKLIO**) Transfer Points: 1. Asomaton bus st. 2. Omonoia bus st. (change to metro) 3. Iraklio	*A-UCA1: The user can plan, through the Travel Companion, an integrated travel solution*	Yes	Journey Planner
			A-UCA2: The user can select, through the Travel Companion, the planned travel solution and directly book the taxi ride, pay travel entitlements, and buy a ticket for the metro leg in a unique transaction	Partially	Booking/ Issuing
			A-UCA3: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion	No	Mobility Packages/ CMMP
			A-UCA4: The Trip Sharing Functionality of the Travel Companion can be used to extend the trip planning and booking with a family member	Yes	Trip Sharing
			A-UCA5: The user receives a voucher which can be then exchanged with a digital ticket (usable through the ATHENA card) that can be validated and used to access the metro	Yes	Validation and Inspection
			A-UCA6: The user carries the ATHENA card and is always available for inspection	Yes	Validation and Inspection
			A-UCA7: The Travel Companion notifies the user in real-time about possible disruptions to the metro	No	Trip Tracking
Traveling to Kerameikos district (touristic area) TSP involved: OASA, MIRAKLIO,	**Origin:** Keramikos Metro station **Destination:** El.	W/C(shared=**Brainbox**) → Metro (**OASA**) → Bus (**OASA**) → W Transfer Points: 1. Syntagma bus station	*A-UCB1: The user can plan, through the Travel Companion, an integrated travel solution with buses, metro, and bike solution*	Yes	Journey Planner
			A-UCB2: The user can select, through the Travel Companion, the planned travel solution, opt to download the bike-sharing application (through which can book a bike) and buy a voucher which can be exchanged with a ticket for the metro leg in a	Yes	Booking/ Issuing

Taxiway, Brainbox, Welcome pickups Expected target users: Tourists	Venizelos Airport		*unique transaction*		
			A-UCB3: The user is proposed with this travel solutions only if there are bikes available; otherwise, the Travel Companion will directly propose alternative solutions	No	Alternatives Calculation
			A-UCB4: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion to support the combined usage of public transport and bike rides	No	Mobility Packages/ CMMP
			A-UCB5: The Travel Companion notifies the user in real-time about possible bike availability	No	Journey Planner
			A-UCB6: The Travel Companion offers an integrated navigation functionality offering to the user directions on how to use the correct metro or bus stop	Yes	Navigation
			A-UCB7: If the waiting times are long, the user can use the Travel Companion's location-based experiences to access quiz games and commercial offers	Yes	Location-Based Experiences/LBE Editor
Traveling to a metro station located in a rural area of Attica TSP involved: OASA, Taxiway, Brainbox Expected target users: Commuters (work/leisure)	**Origin:** Keramikos Metro station **Destination:** The Mall Athens	W → Metro (**OASA**) → W/C/Electric car (shared=**Brainbox**) Transfer Points: 1. Omonoia metro st. 2. Neratziotisa metro st	*A-UCC1: The user can plan, through the Travel Companion, an integrated travel solution*	Yes	Journey Planner
			A-UCC2: The user can select, through the Travel Companion, the planned travel solution and buy a voucher which can then be exchanged with a ticket for the metro leg	Yes	Booking/ Issuing
			A-UCC3: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion to support the combined usage of public transports	No	Mobility Packages/ CMMP
			A-UCC5: The Travel Companion offers an integrated navigation functionality offering to the user directions on how to use the correct metro or bus stop	Yes	Navigation
			A-UCC6: Through the Travel Companion, the user can provide feedback about delays, cleanliness of the stations, disruptions, crowdedness, etc.	Yes	Traveller's Feedback

7.3.2 All other demo sites

The findings of D2.2 provide also High-Level User stories for Padua and Barcelona, as well as selected Travel Solutions, and the detailed Use Cases of the final TO-BE Scenarios. Furthermore, it expands the overview of Use Cases, explaining each one's feasibility based on the IP4 Enabler they correspond to. For the rest of the demo sites (namely Osijek, Warsaw, Liberec) all the necessary information is being compiled. As in the case of Athens, the corresponding demo leaders of all demo sites, Padua and Barcelona included, are in the process of preparing sets of test cases for each demo site, including all involved TSPs and their modes of transport (some cases entail one TSP, while others multiple TSPs and thus multiple modes of transport). The test cases will contain all essential information, in order to be as realistic, accurate and probable to be followed by the users during the demonstrations as possible. Departure point and destination point will be defined, the TSPs and modes involved, time of departure, as well as all specific steps a traveler must take in order to reach his/her final destination, i.e., specific station/stop for boarding on and off a transport mode, which station must reach in order to change modes if that is necessary, even the walking distance to and from a certain stop/station to complete the journey and reach the final destination.

7.4 Definition of KPIs for C-REL

WP3 defined Key Performance Indicators (Operational KPIs: quantitative and objective, measured on a periodic basis in an automatic way) s for the TSPs and travellers, as well as their specific metrics, WP3 is also designing the methodology for ultimately calculating the Efficiency rate from datasets of those defined KPIs and User Satisfaction Indexes (USI surveys for travellers and TSPs, that aim to assess their satisfaction after the demonstration of COHESIVE's functionalities, quantitative but subjective, measured only one time per traveller through surveys), which will be processed as part of the assessment in WP6. The outcomes will be validated during the action of the Data Committee (WP4) with the participation of demo responsible partners (more about the data Committee and its' role further on, in section 8.1.1: Committees).

This chapter focuses on the validation of the KPIs that were identified by WP3, specifically from D3.1 [7]. D3.1, "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL" provided a provisional list of relevant Key Performance Indicators (KPIs) to be considered in the assessment of each demonstration, defined by considering CFMs recommendations, indicators from other projects such as Shift2MaaS[15][16] project and other literature review technical documents. This list of defined potential operational KPIs is being used in the planning of the demonstrations (Task 4.1), as the Grand Agreement states under Task 3.2.
As for the measurement of them, an API will be utilized by the Operators and TSPs, in order to collect data for the KPIs' calculation. The API is being developed in Task 5.1, the implementation of this API, for which more information can be found in the next paragraph, and the collection of KPIs from all demonstrators will be conducted in T5.2 to T5.7, meaning from M17 to M30 and will be reported by the D6.3 in M30. More details regarding their measurement in section 1.1 of this deliverable.

[15] https://Shift2MaaSprojects.shift2rail.org/s2r_ip4_n.aspx?p=S2R_SHIFT2MAAS
[16] https://projects.shift2rail.org/s2r_ip4_n.aspx?p=S2R_SHIFT2MAAS

This chapter describes the overview of metrics that are relevant to the demo sites. IP4MaaS makes use of certain KPIs from D4.1 of Shift2MaaS' respective list for the evaluation from strategic, technical and exploitation point of view of the IP4 functionalities [7]. IP4MaaS also included KPIs that are valid to measure the gain/benefit of IP4 functionalities offered by TSPs from operational and performance point of view. Some other KPIs listed in Shift2MaaS were considered in USI questionnaires. KPIs are validated in an iterative process, involving demo leaders and responsible partners of the assessment.

The list of KPIs for the Demo site depends on the functionalities that will be integrated and collected for the respective pilot location and emerges from the analysis done in subchapter 1.1. These operational KPIs will be collected automatically by Indra (ExtenSive project partner) who will send the information to a repository provided by the IP4MaaS project after the pilot, the Cloud Wallet. The KPIs will be updated and described in the D3.2, "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL", which will introduce a summarizing table with a final list of KPIs and their respective metrics.

Finally, these operational KPIs will be analysed by applying Machine Learning techniques in the WP6- Performance and impact assessment (Task 6.2.- Performance assessment M19-28). These KPIs, after refinement and after taking all the input from CFMs - ExtenSive partners into account, are all listed in Annex (Table 21), along with their metrics for each IP4 Functionality to be demonstrated, in accordance with D3.1 and D3.2 ("List of operational KPIs, analysis of the users' satisfaction and methodology as a whole" for C-REL and F-REL respectively).

Meanwhile, a user engagement strategy has been created, in order to engage travellers and TSPs so they may fill in certain user satisfaction surveys (User Satisfaction Index, USI questionnaires, created under Task 3.2), in order to assess the satisfaction of the users, travellers and TSPs. The Deliverable D4.4 "User Engagement Strategy per each demonstrator" defines the strategy per each demo site. The User engagement strategy will be executed in the Tasks 5.2 to 5.7 for all demonstrators from M17 to M21. Results of this data collection process will be reported by the D6.3 in the M30. For an overview of the surveys, please also consult the respective section in D3.1 "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL".

Meanwhile please note that, as the D1.4 states, OLT will also collect, during the execution of the demonstrations, datasets regarding the APIs developments to connect the TSPs' computer systems to the IP4 Tools, which will assist in the computational performance assessment. So far, as this document is being compiled, the main KPI is the achievement of successfully integrating functionalities (technical requirements fulfilled, documentations and data provided to the CFMs) and the value is either "YES" or "NO", as it can be seen in Summary.

7.4.1 Athens – Identified Operational KPIs

The potential Key Performance Indicators (KPIs) for the respective functionalities of the Athens demo site (as listed in the Table 2) that will be demonstrated during the C-REL pilot are depicted in Table 6, in accordance with the KPIs introduced in D3.1 (C-REL), and the updated list of KPIs in D3.2 and CFMs' latest input and comments on the kind of data can be stored and processed. The last column states if the respective

The D3.1 and D3.2, which introduce and update the operational KPIs respectively, provide quantifiable KPIs and their metric for all functionalities, active and passive ones, in this deliverable we will focus on the technologies that will be demonstrated in C-REL, a list which has been compiled, modified and refined with WP3 Leader's collaboration and assistance, as well as the Data Committee's, and with valuable insight from the CFMs. The CFMs will provide the data from their repositories (i.e., Cloud Wallet) for the calculation of those KPIs. Please also see D3.2 for the full list of KPIs that will be considered in the assessment of each demonstration, along with the User Satisfaction Index Surveys, to calculate the Effectiveness and thus feed both the demonstrations' performance (WP5), as well as the performance assessment (WP6).

Table 6: KPIs for Athens Site

#	IP4 Technologies	Linked to traveler/TSP	KPIs	UNITS	Validation from CFMs
1	Journey Planner (JP)/ Offer Builder	Traveler	Number of involved modes of transport in the trip (multimodality)	Average number of transport modes per trip	Yes
2	Journey Planner (JP)/ Offer Builder	Traveler	TSP Web-services acting as JP integrated into the IP4 ecosystem	Number of TSP integrated	Yes
3	Journey Planner (JP)/ Offer Builder	Traveler	A successful proposal or solution accepted by travellers (due to integration of transport modes)	Number of travel solutions shown per day	Yes
4	Journey Planner (JP)/ Offer Builder	Traveler	Available travel solutions or options issued by TSP for travellers to reach their destination (due to the integration of transport modes)	Number of travel solutions shown per day	Yes
5	Booking	Traveller	Number of offers booked per day	Number of trips booked per day	Yes
6	Issuing	Traveler	TSP web-services for issuing process integrated into the IP4 ecosystem	Number of TSP integrated	Yes
7	Issuing	Traveller	Successful issuing of multimodal travel solutions	Number of issued offers per day	Yes

8	Validations and Inspection	Traveller	Total number of Ticket(s) validated	Number of tickets validated per day	Yes
9	Location-based Experiences	Traveller	Number of users using the entertainment services	Number of users per day	Yes
10	Location-based Experiences	Traveller	Time using the entertainment services	Number of seconds per connection	Yes
11	Navigation	Traveller	Number of connections to the Navigation function	Number/day	No
12	Navigation	Traveller	Time of connection to the Navigation function	Seconds of connection/day	No
13	Traveller's Feedback	Traveller	Number of feedbacks received	Number/day	No
14	Trip Sharing	Traveller	Number of trips shared by more than one traveller	Number of trips shared	Yes
15	Guest User	Traveller	Number of connections without a password	Number/day	No
16	Preferences and Profiles	Traveller	Number of profiles handled	Number/day	No
17	Preferences and Profiles	Traveller	Number of features handled	Number/day	No

7.4.2 Other demo sites – KPIs for F-REL

The document D3.2 "List of Operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL" defines a final list of operational KPIs that will serve as indicators and will allow the evaluation of the functionalities demonstrated. This final list of KPIs will be utilized for the analysis of users' satisfaction, for both the TSPs and travellers. The list of D3.2 includes KPIs for all functionalities, the aim was to have at least one quantifiable KPI for each service, thus for each demo site the list of KPIs will be customized, like it was done in the case of Athens, in D4.3, "Demonstration Execution Plan, F-REL" (M20). There, all updates and latest developments will be incorporated and for each respective demo site a separate list of specific KPIs will be provided, since each demo site will have a differentiated list of services that will demonstrate.
The final list of KPIs, as mentioned above, can be find in D3.2, it has also been added in this document for the reader's convenience and completeness' reasons, in Annex 3, Table 21.

7.5 KPIs Measurement - Efficiency

As mentioned previously, those data for the calculation of the quantified KPIs in the table above will be collected automatically by the CFMs who will send the information to a cloud repository. The data collected during the execution of the demonstrations will be the basis of analysis and assessment and the outcomes will provide an assessment of the performance and impact of IP4 tools.

As the D3.1 and D3.2 state in the respective section, all the KPIs will be dimensionless handled to calculate the Effectiveness rate as detailed both in the GA and the D3.1 [7] by dividing between the maximum value belonging to each specific KPI, getting a dimensionless value between 0 and 1. Thus, the higher the value (closer to 1), the better and a higher gain of benefit (a dimensionless value close to 1 will always be better than a value close to 0). The value "1" will indicate that a certain functionality is fully operational all the time, efficient and has been used by all the users.

Please also consult the documents D3.1 and D3.2 for a complete overview of the methodology used, as well as of the Effectiveness as a metric of how these technologies meet TSPs' and travellers' expectations and needs.

Meanwhile, the data from the USI questionnaires will also be assessed and analysed, in accordance with each participant's profile (age range that he/she belongs to, economical level, cultural level etc.) that he/she fills in the questionnaire (with respect to GDPR regulations). Please note that within WP3 a method was also established to define user groups based on certain socio-demographic profiles, as well as criteria to define user groups with special needs and expectations [1].

According to D4.4, the involved TSPs altogether for all 6 demonstration sites are 16 (13 partners, plus 3 supporters) in total, the target is all TSPs to fill in the respective surveys. Regarding the travellers, a targeted number of travellers engaged in the demonstrations and involved in the conversational survey is approx. 900-1200 (estimated 150-200 pre demo site on average).

For the Athens C-REL in particular the involved TSPs will be 4 (since MIRAKLIO's Journey Planner has been moved to F-REL), OASA expects to attract a total sample of 100-150 users during the 2 weeks of the demonstration, however Brainbox and Taxiway, due the nature of their services and the fact that they are local entities (unlike OASA which covers almost all the region of Athens),

their amount of clients is much smaller compered to OASA. Therefore, the expected number of engaged users who will test the application of the Travel Companion, and thus the available IP4 technologies, is much smaller (please also consult the D4.4 for more details regarding the user engagement strategy per each demonstrator). Therefore, a targeted total of approx. 400 users (customers that will make use of any of the three TSPs) seems not so feasible. After discussions both along the Athens demo site partners and the consortium, a more feasible target for the C-REL seems to be 100-150 users in total. Nevertheless, please note that the partners involved in the Athens C-REL demonstration are analysing how to encourage travellers to take part, make use of the services and answer the surveys, thus achieving a balanced number of respondents and collecting a sufficient amount of filled in questionnaires [9].

The measured KPIs, the USI questionnaires and the evaluation of their outputs will be in their turn valuable inputs to other projects, such as ExtenSive and the COHESIVE project, along with all the use cases and the real data collected and will enable the assessment of the ability of the technology developed within IP4 to face diverse environments, as well as identifying needs and expectations of future travellers. In addition, as the latest DoA version states, updated due to the IP4MaaS Amendment the data collection tools for KPIs and USIs and the data analysis tools developed in the context of this project will be automated and designed in such a way that it will be able for them to remain active even after the IP4MaaS project's closeout, meaning that in essence IP4MaaS will provide, in real time upon the request of operators, an effectiveness rate (please also see D3.2 for the precise methodology and formula for its calculation) for multiple profiles for each technological innovation of COHESIVE and for each TSP.

7.6 Key KPIs per IP4MaaS C-REL Objectives

In the following Table 7: Key KPIs (CREL) certain KPIs are being listed, as well as Target Value per KPI and the way those will be measured. It is a specific target list of KPIs and their metric for the C-REL demonstration and it is in alignment with the KPIs of impact related to IP4MaaS' objectives in general, which can be found in the Grant Agreement [1] and in the latest version of the Description of the Action (DoA) of the IP4MaaS project [8], in Annex I – Part B, under section 2.1.2. The aforementioned values have been taken into account, meaning the number of participating TSPs (3), the expected number of engaged users (approx. 400 in total), the margin of doubt regarding their actual participation in both testing the services and filling in the surveys. The targeted commuters are tourists and regular commuters as well.

Table 7: Key KPIs (CREL)

KPI	UNITS	TARGET VALUE	MEASUREMENT
Successfully onboarded TSPs by CFMs	Number of TSPs	3 TSPs	Measured through the KPIs of D6.1 "Assessment methodology" (due M21)
Execution of envisioned demonstration in Athens site	Demo site	1 demo site	Measured through the KPIs of D6.1 "Assessment methodology" (due M21)

Successful execution of stakeholder workshop	Number of workshops	1 workshop (IT-TRANS in May 2022, Karlsruhe)	Plan is reported in D7.2 "Dissemination and communication strategy and activities" Material from the event
Successful organization of local dissemination event	Number of participants	≥120 participants	Measured by registration forms reported in D7.5 "Exploitation strategy" (due M31)
Multiple integration issues determined and solved	Ratio of resolved issues/total of issues encountered	≥70% of determined issues are resolved	Reported in D4.5 "Report on the actions of the Integration, Data and Management Committees" (due M31)
Multiple meetings between demo sites and CFMs facilitated by IP4MaaS	Number of meetings	≥6 meetings with CFMs	Reported in D4.5 "Report on the actions of the Integration, Data and Management Committees" (due M31) and in D5.1 "Results of demonstrations" (due M31)
User (traveler) satisfaction from the piloting of technologies	Number of engaged users (travellers)	In total approx. 400 travellers engaged, and USI surveys filled in	Measured in T6.3 "Impact assessment" (M24-M31) and reported in D6.3 "Performance and impact assessment" (due M31)
Average efficiency rate of each use-case	Efficiency rate	Calculation of the efficiency rate for at least the three aforementioned use cases	The measurement will be conducted through the methodology developed in D3.2 "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL" and reported in D6.3 "Performance and impact assessment" (due M31)

7.7 Summary

This subchapter presents the final list of the Functionalities that have the potential to be demonstrated in the 1st Phase, in Athens, after considering the technical requirements, the available services of the Operators in IP4MaaS, and the TO-BE Scenarios. The "YES" value indicates whether the basic "KPI" has been fulfilled, that of successfully providing all necessary data, files, documentation etc. necessary for analysis and integration of the technologies, and thus being ready for the C-REL. The indication "FREL" means that all requirements are fulfilled, the KPI is a "YES" but due to constrictions the respective technology has been moved to F-REL, where it will be properly demonstrated.

With the demonstrations, Shift2Rail Joint Undertaking aims to increase the Technology Readiness

Level to level 7, improving the current transport solutions across Europe. Table 8 is formulated according to the most recent updates and information the IP4MaaS partners have collected regarding the demo situation. Moreover, the functionalities have been updated according to the Collaboration Meeting with the CFMs, where the technical issues were clarified.

MIRAKLIO's Journey Planner and thus the TSP itself has been essentially moved to F-REL, thus all the files and data already provided will be utilized in the 2nd phase.

The similar tables for the Pilots of the 2nd Phase will be updated in the Deliverable, the "Demonstration Execution Plan and Technology Integration Plan, F-REL," in M20. IP4MaaS will focus, in the case of Athens, on selecting the unused functionalities during the 1st Phase of pilots during the 2nd Phase.

Table 8: Functionality Matrix and Status

				Athens			
#	**IP4 Technologies**	**Passive/ Active**	**User**	**OASA**	**MIRAKLIO**	**Brainbox**	**Taxiway**
1	Journey Planner/Offer Builder	Active	Traveller	YES	YES - FREL	YES	YES
2	Booking	Active	Traveller				YES
3	Issuing	Active	Traveller	YES - FREL		YES	YES - FREL
4	Ancillary service	Active	Traveller				
5	Mobility packages	Active	Traveller				
6	Validation and Inspection	Active	Traveller	YES		YES	YES - FREL
7	Trip tracking	Active	TSP				
8	Alternative calculation	Active	Traveller				
9	Location based experiences	Active	Traveller	YES	YES		
10	Navigation	Passive	Traveller	YES	YES - FREL		
11	Traveller's feedback	Passive	Traveller	YES	YES – FREL	YES	YES
12	Trip sharing	Passive	Traveller	YES	YES – FREL	YES	YES
13	Group travelling	Active	Traveller				
14	Travel Arrangement	Passive	Traveller				
15	Travel companion Web-Portal	Active	Traveller				
16	Guest user	Passive	Traveller	YES	YES - FREL	YES	YES

17	Preferences and Profiles	Passive	Traveller	YES	YES - FREL	YES	YES
18	Best price optimization	Active	Traveller				
19	Commuter detection	Active	Traveller				
20	Travel Companion for Kids	Active	Traveller				
21	Asset manager	Active	Traveller	YES	YES - FREL	YES	YES
22a	CMMP	Active	TSP				
22b	Business analytics	Active	TSP				
23	Trip Tracking CEP configuration	Active	TSP				
24	LBE editor	Passive	TSP				
25	Inspection with Fraud Control	Active	TSP				

8 Demonstration execution roles and timeline – (1st Demo Phase)

After the identification of the technologies that will be tested in each demo site, this chapter provides the detailed time schedule of the demonstrations, as well as the roles and responsibilities assignment for all the entities that have an active role in the demonstrations.

The activities will be performed are separated in 6 separate phases:

1. Preparation phase
2. In-house development & Administrative tasks
3. Integration & Administrative tasks
4. Testing
5. Demo preparation
6. Demo execution

The six phases have been further discussed with our Call for Member partners, in order to adjust their start dates and duration. This resulted in a more realistic and feasible schedule both for the IP4 Consortium and the CFM partners.

8.1 Demonstration preparation and execution phases

The 6 demonstration phases are presented in Table 9.

Table 9: Demonstration phases

Phases	1. Preparation phase	2. In-house development & Administrative tasks	3. Integration & Administrative tasks	4. Testing	5. Demo preparation	6. Demo execution
Description	This phase will enable the dialogue between the stakeholders (CFMs and TSPs), involve the Committees and the demo leaders, examine the tasks in detail, identify risks and prepare the technology integration process	This phase is technical and includes some preparatory development activities from both CFMs and TSPs to facilitate the technology integration. Administrative tasks that need to be done simultaneously are also included in this phase.	This phase will monitor the progress of the technology integration plan, facilitate the communication, data exchange, and coordination between CFMs and TSPs, maintain and update a technical activities' backlog and resolve any integration problem that may arise	This phase will test the usability of the technologies that have been integrated, identify potential issues, and resolve them at an early stage, ensuring the smooth execution of the demonstrations	This phase includes all the activities required before the demo execution: the user engagement, the delivery of the application to be used (.apk), the exact planning and timeline of the activities and the preparation of the questionnaire for the participants	This phase includes the demo execution activities and the data collection that will be used in WP7 for the assessment of the demonstrations
Time	6 weeks	10-12 weeks	7-8 weeks	4 weeks	4 weeks	2 weeks

The following subchapters describe the roles of the actors involved in the demonstrations in detail.

8.1.1 Committees

In general:

- The **Integration Committee** will monitor the progress of the technology integration plan in collaboration with CFM projects.
- The **Data Committee** has two main goals. First, it is responsible for handling data exchanges between IP4MaaS TSPs and CFM projects in the scope of integration and demo activities. Second, it is responsible for the data collection during demos to feed the assessment pillar.
- The **Management Committee** will be responsible for the management and coordination actions of the demos, acting on behalf of the project board for low-level decision actions (time-sensitive decision making).

Moreover, the Committees will act as the link between demo site partners and CFMs and be responsible for disseminating knowledge across the

demo sites (Figure 7: IP4MaaS Committees and Demo Sites).

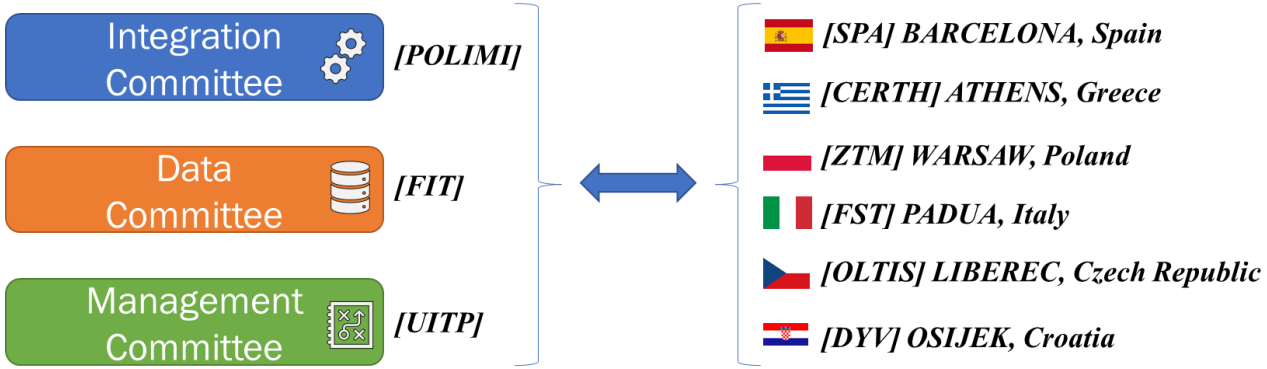

Figure 7: IP4MaaS Committees and Demo Sites

The Committees' role is described in Table 10, Table 11 and Table 12.

Table 10: Integration Committee role

Phases	Preparation phase	In-house development & Administrative tasks	Integration & Administrative tasks	Testing	Demo preparation	Demo execution
Integration Committee	• Monitor the activities of Integration Preparation • Keep the Technology Integration Plan up to date (requirements, specific tasks, risks) • Facilitate communication and coordination between CFMs and demo partners • Organise periodic meetings with demo partners • Organise workshops between CFMs and TSPs • Present the Technology	• Monitor the preparatory development activities • Ensure the implementation of the necessary tasks • Facilitate communication and coordination between CFMs and demo partners • Execute periodic meetings with demo partners • Execute workshops between CFMs and TSPs • Identify problems and track issues both from the CFMs' side and demo partners' side	• Monitor the progress of the Technology Integration • Facilitate communication and coordination between CFMs and demo partners regarding integration tasks • Execute periodic meetings with demo partners • Execute workshops between CFMs and TSPs • Identify problems and track issues both from the CFMs' side and demo partners' side • Transfer knowledge across demo sites	• Resolve integration issues that may arise • Report to Management Committee	• Resolve integration issues that may arise • Report to Management Committee	• Resolve integration issues that may arise • Report to Management Committee

	Integration Plan to CFMs and demo partners and inform them in detail about the next steps • Report to Management Committee	• Transfer knowledge across demo sites • Maintain shared documentation for integration activities • Report to Management Committee	• Maintain a backlog of integration activities for all demo partners • Collect information regarding obstacles determined for integrating technologies and provide it to T4.1 to update the Technology Integration Plan and WP2 to update requirements and scenarios. • Report to Management Committee			

Table 11: Data Committee role

Phases	Preparation phase	In-house development & Administrative tasks	Integration & Administrative tasks	Testing	Demo preparation	Demo execution
Data Committee	• Facilitate data exchange between TSPs and CFMs' technology providers • Create shared documentation (e.g., using SVN or SharePoint) allowing demo partners and CFMs to log information • Monitor data requirements and availability from CFMs and TSPs • Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations • Update the backlog with the progress of data exchanges • Update and fine-tune the KPIs of TSPs and travelers: - Retrieve data sources for updating KPIs - Fine-tune performance KPIs - Determine the final list of KPIs and impact indicators for each demo site	• Facilitate data exchange between TSPs and CFMs' technology providers • Maintain shared documentation • Monitor data requirements and availability from CFMs and TSPs • Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations • Update the backlog with the progress of data exchanges • Align IP4 data requirements with TSP data availability • Participate in user engagement workshops to facilitate data	• Facilitate data exchange between TSPs and CFMs' technology providers • Maintain shared documentation • Monitor data requirements and availability from CFMs and TSPs • Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations • Update the backlog with the progress of data exchanges • Align IP4 data requirements with TSP data availability • Participate in user engagement workshops to facilitate data exchange	• Facilitate data exchange between TSPs and CFMs' technology providers • Maintain shared documentation • Monitor data requirements and availability from CFMs and TSPs • Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations • Update the backlog with the progress of data exchanges • Report to Management Committee	• Validate the User Satisfaction Index survey • Validate the final list of KPIs to be monitored and the subject of performance assessment in WP6 across all pilot sites • Validate user engagement plan/strategies (provided by WP4) • Organise data collection activities during demonstrations • Maintain shared documentation • Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations • Update the backlog with the progress of data	• Conduct the User Satisfaction Index survey • Collect data during demonstrations • Provide data collected to be used by WP6 • Provide the data exchanges backlog to WP4 for reporting • Report to Management Committee

	- Align the KPIs across all demo sites - Assess the feasibility of measurement and success-showing potential • Co-create and participate in user engagement workshops to facilitate data exchange • Report to Management Committee	exchange • Report to Management Committee	• Report to Management Committee		exchanges • Report to Management Committee	

Table 12: Management Committee role

Phases	Preparation phase	In-house development & Administrative tasks	Integration & Administrative tasks	Testing	Demo preparation	Demo execution
Management Committee	• Monitor the execution of the activities planned • Timeline supervision • Monitor the risk management plan regarding demos' execution, implementation of mitigation actions, and activation of contingency plans • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge • Coordinate the execution of workshops • Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)	• Monitor the execution of the activities planned • Timeline supervision • Manage risks, implement mitigation actions and activate contingency plans (if needed) • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge • Coordinate the execution of workshops • Coordinate actions between the different stakeholders of the	• Monitor the execution of the activities planned • Timeline supervision • Manage risks, implement mitigation actions and activate contingency plans (if needed) • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge • Coordinate the execution of workshops • Coordinate actions between the different stakeholders of the	• Monitor the execution of the activities planned • Timeline supervision • Manage risks, implement mitigation actions and activate contingency plans (if needed) • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge	• Monitor the execution of the activities planned • Timeline supervision • Manage risks, implement mitigation actions, and activate contingency plans (if needed) • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge	• Monitor the execution of the activities planned • Timeline supervision • Manage risks, implement mitigation actions and activate contingency plans (if needed) • Monitor the risk of identifying issues (lack of data/documentation etc.) at a later stage for the demo sites in F-REL, put in place relevant mitigation plans • Intervene to resolve barriers that might emerge • Coordinate actions between the different

	• Collaborate and co-plan activities with the outreach pillar • Collaborate with other projects (e.g., CFMs, Ride2Rail) • Monitor Integration and Data Committees' activities	demos (Committees, Demo Leaders, CFMs, TSPs) • Collaborate and co-plan activities with the outreach pillar • Collaborate with other projects (e.g., CFMs, Ride2Rail) • Monitor Integration and Data Committees' activities	demos (Committees, Demo Leaders, CFMs, TSPs) • Collaborate and co-plan activities with the outreach pillar • Collaborate with other projects (e.g., CFMs, Ride2Rail) • Monitor Integration and Data Committees' activities	• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs) • Monitor Integration and Data Committees' activities	• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs) • Collaborate with other projects (e.g., CFMs, Ride2Rail) • Monitor Integration and Data Committees' activities	stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs) • Collaborate and co-plan activities with the outreach pillar • Collaborate with other projects (e.g., CFMs, Ride2Rail) • Monitor Integration and Data Committees' activities

8.1.2 CFM project partners

CFMs' role is described in Table 13.

Table 13: CFMs' role

Phases	Preparation phase	In-house development & Administrative tasks	Integration	Testing	Demo preparation	Demo execution
CFMs	• Request information about the web-services and APIs. • Communicate with TSPs, Demo Leaders and Committees • Exchange data with TSPs • Participate in workshops	• Execute the preparatory development tasks • Communicate with TSPs, Demo Leaders and Committees • Exchange data with TSPs • Participate in workshops	• Execute the integration tasks • Communicate with TSPs, Demo Leaders and Committees • Exchange data with TSPs • Participate in workshops	• Support the resolution of the integration issues that may arise • Communicate with TSPs, Demo Leaders and Committees	• Deliver the latest version of the Travel Companion	

8.1.3 TSPs

TSPs' role is described in Table 14.

Table 14: TSPs' role

Phases	Preparation phase	In-house development & Administrative tasks	Integration	Testing	Demo preparation	Demo execution

TSPs	• Provide the information requested (about business logics, policies, practices, documentation, legacy systems, and more) • Exchange data with CFMs • Communicate with CFMs, Committees and Demo Leaders • Participate in workshops	• Execute the development tasks • Exchange data with CFMs • Communicate with CFMs, Committees and Demo Leaders • Participate in workshops	• Execute the integration tasks providing sufficient documentation and APIs • Exchange data with CFMs • Communicate with CFMs, Committees and Demo Leaders • Participate in workshops	• Execute the testing task and provide feedback • Communicate with CFMs, Committees and Demo Leaders	• Engage partners for the demonstrations according to the actions determined in the user engagement strategy (D4.4) • Communicate with Committees and Demo Leaders	• Support the demonstration execution • Communicate with Committees and Demo Leaders

8.1.4 Demo Leaders

Demo Leaders' role is described in Table 15.

Table 15: Demo Leaders' role

Phases	Preparation phase	In-house development & Administrative tasks	Integration & Administrative tasks	Testing	Demo preparation	Demo execution
Demo Leaders	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for the demo sites • Provide information and	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for the demo sites • Provide information	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for the demo sites • Provide information	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for	• Facilitate communication between CFMs and TSPs • Have a clear picture of the situation (requirements, resources, constraints) in the demo sites • Act as a link and provide all the necessary information about the demo sites to CFMs and Committees • Coordinate actions within demo sites • Monitor the execution of the activities planned for

	feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites	and feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites	and feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites	the demo sites • Provide information and feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites	the demo sites • Provide information and feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites	the demo sites • Provide information and feedback to the Committees to be shared across all demo sites • Identify and resolve issues within demo sites

8.1.5 WP4 and WP5 Leaders

WP4 & WP5 Leaders' role is described in Table 16.

Table 16: WP4 & WP5 Leaders' role

Phases	Preparation phase	In-house development & Administrative tasks	Integration & Administrative tasks	Testing	Demo preparation	Demo execution
WP4	• Monitor the Operation of the Committees • Co-create and participate in user engagement workshops • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations	• Monitor the Operation of the Committees • Participate in user engagement workshops to facilitate data exchange • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations	• Monitor the Operation of the Committees • Participate in user engagement workshops to facilitate data exchange • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations	• Monitor the Operation of the Committees • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations	• Monitor the Operation of the Committees • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations	• Monitor the Operation of the Committees • Receive input to update the Demonstration Execution Plan (F-REL) for the second phase of the demonstrations
WP5	• Coordinate on a technical and organisational level the demonstration executions, both internally (among the six demonstration sites) and externally (with complementary IP4 projects) • Inform each pilot site about the	• Monitor the in-house development tasks • Ensure the proper implementation of the Technology Integration Plan • Organise workshops for IP4 consortia and	• Monitor the integration tasks • Ensure the proper implementation of the Technology Integration Plan • Organise workshops for IP4 consortia and	• Monitor the testing execution • Resolve issues across and within demo sites • Transfer knowledge across demo sites	• Organise in detail the demonstration execution • Carry out the actions determined in the user engagement strategy by D4.4	• Monitor the demonstration execution • Meetings with PTOs and TSPs to gather their feedback during the demonstration execution

	requirements, goals, benefits, barriers, expectations, and components to be demonstrated. • Inform CFM projects about the limitations, barriers, constraints, and capabilities of each PTO and TSP. • Ensure the proper implementation of the Demonstration Execution Plan and the Technology Integration Plan • Organise workshops for IP4 consortia and TSPs to determine solutions for effective execution of the demonstrations • Understand and map business logic of PTOs and TSPs (policies and practices) • Analyse legal framework in countries of the demonstration sites. • Determine and implement data sharing schemes between CFMs and TSPs • Support WP2 with the API documentation	TSPs to determine solutions for effective execution of the demonstrations • Troubleshoot connection issues so that the IP4 Ecosystem IT tools for PTOs and TSPs such as booking, ticketing, shopping, etc., can be used for demonstration. • Support CFM projects in troubleshooting operational issues with connection to APIs and services of PTOs and TSPs • Support TSPs, Demo Leaders and Committees	TSPs to determine solutions for effective execution of the demonstrations • Troubleshoot connection issues so that the IP4 Ecosystem IT tools for PTOs and TSPs such as booking, ticketing, shopping, etc., can be used for demonstration. • Support CFM projects in troubleshooting operational issues with connection to APIs and services of PTOs and TSPs • Support TSPs, Demo Leaders and Committees	• Support TSPs, Demo Leaders and Committees	• Coordinate actions within demo sites • Transfer knowledge across demo sites • Support TSPs, Demo Leaders and Committees	• Meetings with CFMs to disseminate feedback from PTOs and TSPs • Coordinate actions within demo sites • Support TSPs, Demo Leaders and Committees

8.2 Athens Demonstration Site

The timeline for the Athens Demonstration is shown in Figure 6: Athens Integration Planning CREL in Section 7.2.1, the following Figure 8 depicts the 6 demo phases as described in the previous section. Demonstrations for the Athens location will occur during the first two weeks of July 2022. The Preparation phase has begun approx. mid-January 2022, three weeks before the In-house development. The first two stages are crucial and determine the feasibility of integrating the functionalities stated in Table 8: Functionality Matrix and Status. The demonstration site of Athens is expected to complete its objective and enrich multimodality by integrating three different Operators for the C-REL demonstration with various means of transport in a single application, the Travel Companion. Initially it was planned to have four (4) integrated TSPs, due, though, to limitations in time and resources, the fourth TSP, MIRAKLIO, has been essentially moved to F-REL (its Journey Planner, with the only exception of the Location Based Experiences, which will be the only service available during C-REL), in which we envision to reach the initial goal, integrating all four operators successfully.

For additional details regarding the analysis, integration, and testing of the technologies to be demonstrated, please also consult Figure 4.

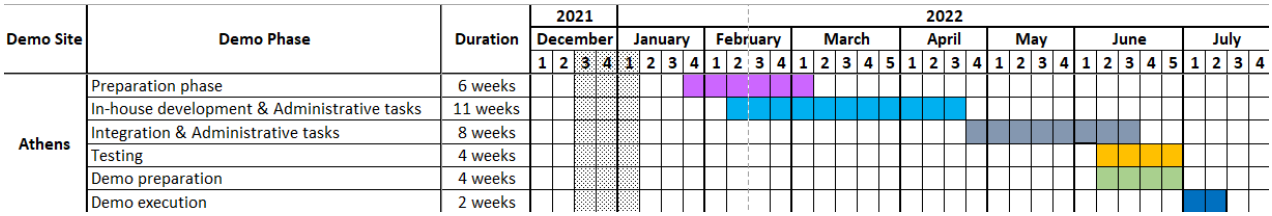

Figure 8: Athens Demo Timeline (C-REL)

9 Risks and Mitigation Measures

This deliverable aims to create a preliminary list of identified risks, mitigation measures, and contingency plans for executing the IP4MaaS demos. Specifically, the objective of risk management is to reduce the probability and the impact of threats towards achieving pilots' results. This chapter outlines how risk management activities will be performed, recorded, and monitored throughout the project's life and provides templates and practices for recording and prioritizing risks. In this chapter, the risk management activities that IP4MaaS will perform concerning the scope of the deliverable (IP4MaaS pilots) are described, together with roles and responsibilities. The identified list of Risks, Mitigation Measures, and Contingency Plans are illustrated in Table 17.

Table 17: Risks, Mitigation Measures, and Contingency Plans

	Risk Description	Relevant to	Demo Site	Probability	Risk Mitigation Measures and Contingency Plans
1	*Lack of collaboration with other projects and misalignment with the Demonstrations of Athens and Padua that will run at the same time with R2R*	Demo Execution	Athens Padua	Low	**RM:** The issue that might be created from this risk concerns the availability of the technical teams to execute integrations in both pilots and poor communication of requirements for the demonstrations leading to delays and misalignment. This risk will be mitigated by proper time planning of the pilots' technical

					activities as implemented by the Data and Integration committees.
					CP: Misalignment of pilots will not incur significant issues if it does not affect overall pilot execution (which is not foreseen). Nonetheless, a pilot may be postponed for the second phase in case of occurrence.
2	*Demonstration scenarios are not realistic*	Demo Execution	All	Medium	**RM:** Both members and supporting TSPs will be involved in the activity to validate the compatibility between scenarios and the demonstration sites' constraints
					CP: The demonstration scenarios are revised after the first iteration; the revision will consider any criticalities that emerged in the first iteration, including lack of realism
3	*Use Cases for the Demonstration Sites are not coherent with the Functionalities to be Integrated*	Demo Execution	All	Medium	**RM:** WP4 Task Leaders will conduct workshops with the Demo Partners and the TSPs to gain insights into their services' particularities
					CP: IP4MaaS partners will need to revise the final Use Cases defined for the Demo Sites after the Integration Phase, considering the most feasible options
4	*User data (e.g., USI) is affected by external barriers (e.g., COVID-19)*	Demo Execution	All	Medium	**RM:** D4.4 is specifically designed to tackle this risk, and it will incorporate ways to tackle the issues of reduced travelers' mobility
					CP: IP4 technologies evaluated by users in simulated scenarios
5	*The emergence of technical difficulties during In-house Development*	In-house Development	All	Medium	**RM:** The Integration and Data Committees will employ constant communication with TSPs to clearly define the requirements and technical adaptation that are needed from their side
					CP: Partners of IP4MaaS may actively support TSPs on a technical level to enable the advancement and changes in their offerings
6	*Inability to implement and/or integrate IP4 technologies due to issues arising during Integration and Testing Phase*	Integration Phase	All	High	**RM:** The Integration Committee will maintain and update a technical activities' backlog
					CP: Omit the Functionalities that cannot be Integrated into the first Phase of the Demonstrations for the second Phase
7	*The number of functionalities to be tested for Phase 1 is less than planned*	Demo Execution	All	Medium	**RM:** The Committees will play an active role in facilitating CFMs & TSPs communication across the pilot locations to ensure the requirements are well understood for both phases
					CP: Reduce the scope of the demos and prepare in advance for a larger array of Demonstrations in the Second Phase
8	*The KPI goals that are set cannot be aligned*	All Phases	All	Medium	**RM:** Collaboration with WP3/WP6 in sync between WPs. Standardise the values of KPIs
					CP: Use existing data to create new KPIs in cooperation demo partners and WP3

9	*Demo Partners and TSPs cannot attract the desired number of users (e.g., 400 travelers)*	Demo Preparation	All	Low	**RM:** WP4 will conduct several workshops with demo partners from M13 to clearly define the strategies to attract users during the pilots **CP:** Limit the number of users needed for the 1st Phase, preparing for a full-scale demo at the 2nd Phase
10	*Delayed collection feedback from demo partners*	Demo Preparation	All	Medium	**RM:** Ensure that WP4 partners include demo leaders throughout the Demo Execution Planning **CP:** Delegate the information collection to the committees and update F-REL accordingly
11	*Lack of collaboration with other IP4 projects hinders the activity of surveying existing IP4 technologies*	Demo Execution	All	Medium	**RM:** Research into IP4 projects' deliverables will be executed to provide an initial list before engaging the consortium to streamline and focus the communication (e.g., technologies may be excluded through said research). **CP:** The project officer will be engaged to provide a link with other IP4 projects and their consortium.
12	*The Travel Companion is not available in all necessary languages.*	Demo Execution	All	Medium	**RM:** Work with the demo partners to translate key information and cover as much people as possible **CP:** Test the technologies with the users that are more affluent in English**.** Organize an event in each demo site prior to the demonstration to introduce the app and its' features to the public.
13	*External factors affect the execution of the pilots*	All	All	Medium	**RM:** Specific risk cannot be mitigated due to being based on external factors. **CP:** Virtual pilot activities will be designed and executed. Project extension may be requested to address changing requirements.
14	*Unavailability or disengagement of TSPs' technical departments hinders pilot execution*	Demo Preparation, Testing, and Demo Execution	All	Medium	**RM:** CFMs and IP4 projects will be requested to provide a clear list of benefits from technology implementation and usage to convince all TSPs' departments of the added value of IP4MaaS pilots. **CP:** TSPs will be formally requested to provide the necessary assistance by the coordinator and, potentially, the Project Officer. CFMs will be asked to offer more in-depth assistance towards the integration and training of TSPs.
15	*Incomplete or sub-par testing leads to issues during execution*	Testing and Demo Execution	All	Medium	**RM:** Technical partners of CFMs will be requested to deliver test cases already used and indicators that will allow effective testing and solidify the testing executing in IP4MaaS. **CP:** Testing indicators and test cases will extend into demo execution, amending the integration and demo plans accordingly.
16	*Issues for testing the services of BusUp publicly as the business model of BusUp is contract based*	Testing and Demo Execution	Barcelona	Medium	**RM:** Conduct a contract with BusUp in order to be able to follow the legal requirements of their services **CP**: Demonstrate the feasibility of booking a seat at BusUp but not allow external users to perform

					a real trip
17	*Lack of user participation in the demonstration (users: commuters, workers, and students)*	Demo Execution	Padua	Medium	**RM:** Municipality of Padua engagement to organize dissemination events and communication activities to advertise the demonstration (local newspaper, local tv channel, social media)
					CP: Small-scale demonstration or simulation in a lab can be a solution.
18	*The services that are being developed in Athens do not meet the requirements*	All	Athens	Medium	**RM:** Constant monitoring of the In-house development of Athens. The demo leader of Athens should be informed and technically assist the Operators.
					CP: The functions that require these services will not be demonstrated in Athens demo site.
19	*Issues identified at a later stage in the F-REL pilots that have not been fully analyzed in D2.2*	In-house Development, Integration Phase, Demo Preparation	Osijek Warsaw Liberec	Medium	**RM:** The Management Committee of the project constantly monitors the demo sites and all phases of the demonstrations, will also facilitate collaboration meetings, if necessary, between CFMs and demo leaders-TSPs.
					CP: Re-assessment of the functionalities' matrix both internally (demo site) and in collaboration with the CFMs, services with issues that cannot be tackled will be removed from the matrix and won't be demonstrated.

10 Conclusions

This document constitutes the deliverable D4.2 “Demonstration Execution Plan, C-REL” of the IP4MaaS project. The primary objective of the document is the creation of a detailed plan, which will guide the execution of the C-REL Demonstration for Athens. This deliverable has provided a summary of the information collected from D2.1, D2.2, and D3.1 regarding the 1st Demo Phase and a detailed plan with the activities to be performed.

Precisely, the deliverable summarises for the demo site of the 1st Demo Phase:

- The available services of the TSPs
- The scenarios to be demonstrated
- The KPIs for the demonstration’s assessment

The demonstration preparation and execution will be carried out in 6 separate phases:

1. Preparation phase
2. In-house development & Administrative tasks
3. Integration & Administrative tasks
4. Testing
5. Demo preparation
6. Demo execution

Each actor’s role and responsibilities have been defined for each phase. The IP4MaaS TSPs will be guided by the Demo Site Leader, which will coordinate the demo site. The Committees will have a very active role during the demonstrations, both the C-REL and the F-REL, facilitating the communication between stakeholders, as well as resolving issues, identifying risks, placing appropriate mitigation measures, and transferring knowledge across demo sites. WP5 Leaders will be in charge of monitoring the demonstrations’ execution overall, while WP4 Leaders will have a supportive role. CFMs will perform mainly development and integration tasks.

D4.2 also includes a specific timeline, as well as risks, mitigation measures, and contingency plans for the demonstrations.

D4.2 “Demonstration Execution Plan, C-REL,” combined with D4.1 “Technology Integration Plan, C-REL,” creates a holistic plan for coordinating and executing the C-REL demonstrations of IP4MaaS. The demonstration execution and technology integration plans will be updated to reflect changes in demonstration requirements (e.g., new releases, new integration activities), amend issues, and focus on F-REL demonstrations. The revised plans will be presented in D4.3, “Demonstration Execution Plan and Technology Integration Plan, F-REL,” in M20. D4.2 is also linked with D4.5, “Report on the actions of the Integration, Data and Management Committees,” an all-inclusive deliverable covering the whole spectrum of Integration, Data, and Management Committees actions.

11 References

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12 Annexes

12.1 Annex 1

Table 18: IP4 technologies and their technical requirements (full list)

ID	IP4 Technologies	Technical Requirements
1	Journey Planner / Offer Builder	Public Transport (GTFS) Shared Mobility (Service Areas: multi-polygon GeoJSON) Basic mode of transport (Car, bike) Journey Planner web-service (API) Web-service providing fares (API)
2	Booking	Web-service allowing booking (API)
3	Issuing	Web-service allowing to issue tickets (API) (QR Code, images, PDF, URL link)
4	Ancillary service	Web-service (API) allowing to list available services, book said services (optional) & issue available services
5	Mobility packages	Usage of Shift2Rail operators portal to configure products in Netex format
6	Validation and Inspection	Means to validate/inspect issued tickets (Hardware Validators, validation apps)
7	Trip tracking	Web-service (API) providing Real Time information is format: TRIAS, GTFS-RT, Siri-SX
8	Alternatives' calculation	Journey Planning and Trip Tracking service integrated
9	Location based experiences (LBE)	Usage of LBE Editor to build experiences. Information needed: stops names, coordinates, text of quiz/information, photos, 3D models, videos and others.
10	Navigation	N/A
11	Traveler's feedback	N/A
12	Trip sharing	N/A
13	Group travelling	N/A
14	Travel Arrangement	N/A
15	Travel companion Web-Portal	Shopping, Booking, Issuing services integrated
16	Guest user	N/A
17	Preferences and Profiles	N/A
18	Best price optimization	Best price service
20	Travel Companion for Kids	Journey Planning integrated
21	Asset manager	Data or web-services to be integrated
22a	Contractual Management Market Place (CMMP)	Products to be integrated (Netex format)
22b	Business analytics	Provision of transport data to be analysed
23	Trip Tracking CEP configuration	Trip tracking integration with real time data in Siri-SX

24	LBE editor	Will be provided from CFMs to the TSPs that wish to try it.
25	Inspection with Fraud Control	Issuing service integrated QR Code (UIC or VDV) ATTENTION: License fee (to be validated)
P1	Digital OnBoarding	N/A
P5	Web Portal (Payment, Registration with Gmail and Purchase Mobility Packages)	N/A
P6	CMMP (Manual Inclusion of Products and new Registration Process)	N/A
P7	CRM Portal	N/A
P8	Collaborative Space (Traveller)	N/A
P9	Collaborative Space Portal (TSP)	N/A
A1	Trip Planning Hierarchy	GTFS Data Journey Planning API
A2	Dynamic Display of Map Content	POIs (CSV, ESRI-Shape, GeoJSON, XML)
A3	Smart Locations	Stations (GTFS format) Optional: Addresses, POIs
A5	Improved Intermodal Travel	GTFS Data Journey Planning API
A6	Improved Travel Shopping	GTFS Data Journey Planning API
A7	Individual Last Mile	GTFS Data Journey Planning API
A8	LBE Score Sharing	LBE game developed using the LBE Editor (assets and scenario)
A9	Meeting Point	Use TSP Orchestration and Supervision Tool 3D plan of the station 2D plan of the station List of the station's POIs or meeting POIs
A10	Specific Messages	Use Orchestration and Supervision Tool
A11	Travellers Orchestration and Supervision	Use Orchestration and Supervision Tool
A12	Siri SX based pTT	TSP integrated to TD 4.2 and 4.3 demonstrators Siri-SX event source, notifying network pertrubations (Siri 2.0 Siri-SX compliant, using only mandatory fields) Transport network description (GTFS) TSP has defined its impact generation process based on its provided Siri-SX events
A13	pTT CEP Rule Editor	Siri-SX based pTT running (fulfills requirements of A12)
A14	SaaS Siri SX based pTT	Siri-SX based pTT running (fulfills requirements of A12)
A15	Distributed Ledger – Transaction Anchoring	Registration in CMMP
S1	Enrolment Token Generator System	API for issuing products, Metadata structure (optional), Embodiment configuration information

S2	Event Detection	Real Time Events (format TBD*)
S3	Plan Data Provisioning for TSPs	TBD*
S4	Incident Messages	GTFS Data Journey Planning API RT Information
S5	Adding Travel Shopping Service to TSP	TBD*
S6	Distributed Ledger – TSP Inclusion	Deployment of Distributed Ledger Note (TSP shall volunteer to instantiate a GL node)
S7	Intermodal Fare Optimization	Best price service (TBD*)

*TBD = to be defined

12.2 Annex 2

Table 19: Use Cases for Padua demonstration site

High-Level User Journey	User journey	Travel Solution	Overview of Use Cases	Feasibility	IP4 Enablers
Traveling to Venice University (Ca' Foscari) TSPs involved: Trenitalia, Busitalia Veneto Expected target users: commuters (workers, students)	**Origin:** Montegalda **Destination:** Venice Ca' Foscari University Campus	Bus (BusItalia) → Train (Trenitalia) → Walking Transfer Points: 1. Padua central station 2. Venice St. Lucia	*P-UCA1: The user can plan, through the Travel Companion, an integrated travel solution involving a bus ride from Montegalda to the Padua central station, and a train leg to Venice St. Lucia*	No	Journey Planner
			P-UCA2: The user can select, through the Travel Companion, the planned travel solution and directly book and buy the bus leg with BusItalia and the train leg with Trenitalia in a unique transaction	No	Booking/ Issuing
			P-UCA3: The user, through the Travel Companion, can visualise, book, and buy ancillary services for the planned solution	No	Ancillary Services
			P-UCA4: Mobility Packages are defined through the CMMP by BusItalia and Trenitalia stakeholders to offer integrated rates for bus and train to commuters	No	Mobility Packages/ CMMP
			P-UCA5: The user can access through the Travel Companion the digital tickets (e.g., QR code) that can be validated and used to access both the bus and the train	No	Validation/Inspection
			P-UCA6: The Travel Companion notifies the user in real-time about possible disruptions to the bus she/he is supposed to get.	No	Trip Tracking
			P-UCA7: In case of disruption of the first leg, the user can use the Travel Companion application to cancel the bus and train bookings and directly plan an alternative travel solution	No	Alternatives Calculation
			P-UCA11: Through the Travel Companion, the user can provide feedback about delays, cleanliness of the stations, disruptions, crowdedness, etc.	Yes	Traveller's Feedback

Traveling home from Arcella to Padua rural area TSP involved: Trenitalia, Busitalia Veneto Expected target users: commuters (workers)	**Origin:** Arcella **Destination:** Trebaseleghe	Bus (BusItalia) → Train (Trenitalia) → Walking Transfer Points: 1. Piombino Dese	*P-UCB1: The user can plan, through the Travel Companion, an integrated travel solution involving a bus ride from Arcella to the Padua central station, and a train leg to Camposampiero*	No	Journey Planner
			P-UCB2: Friends of the user, usually traveling to/from work in Padua by car, may be interested in joining. A user can use the Trip Sharing functionality of the Travel Companion to notify friends about her/his 65ommutons for the next day.	Yes	Trip Sharing
			P-UCB3: The user can select, through the Travel Companion, the planned travel solution and directly book and buy the bus leg with BusItalia and the train leg with Trenitalia in a unique transaction	No	Booking/ Issuing
			P-UCB4: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion (train and bus, or train and parking) to reduce the usage of cars in Padua city	No	Mobility Packages/ CMMP
			P-UCB5: Group Travelling Functionality can be used by a user to directly purchase tickets also for friends interested in joining her/him on the same travel solution	Yes	Group Travelling
			P-UCB6: The user can access through the Travel Companion the digital tickets (e.g., QR code) that can be validated and used to access both the bus and the train	No	Validation/Inspection
			P-UCB7: The Travel Companion notifies the user in real-time about possible disruptions to the bus she/he is supposed to get.	No	Trip Tracking
			P-UCB8: In case of disruption of the first leg, the user can use the Travel Companion application to cancel the bus and train bookings and directly plan an alternative travel solution	No	Alternatives Calculation
			P-UCB9: Through the Travel Companion, the user can provide feedback about delays,	Yes	Traveller's Feedback

			cleanliness of the stations, disruptions, crowdedness, etc.		
			P-UCB10: The Travel Companion provides navigation information during the travel on the time of arrival/next arrival time for the train and information on the intermediate stops to be performed before reaching the destination	Yes	Navigation

Table 20: Use Cases for Barcelona demonstration site

High-Level User Journey	User journey	Travel Solution	Overview of Use Cases	Feasibility	IP4 Enablers
Traveling from a suburban area to the UPC campus in Barcelona TSP involved: TMB, BUSUP, Social Car Expected target users: 66ommuter (workers, students), 66ommuter66nt to conferences/meetings/events held by UPC	**Origin:** Sabadell Central station **Destination:** Les Corts (UPC Campus)	Private Car/ Car Sharing (**Social Car**) → Metro (**TMB**) → **W/C/MM** Transfer Points: Any Metro station or Sants Estació or Plaça d'Espanya	*B-UCA1: The user can plan, through the Travel Companion, an integrated travel solution involving a SocialCar ride from Sabadell to the Sants Estacio station, and a metro leg to Jordi Girona – John M Keynes*	No	Journey Planner
			B-UCA2: The Trip Sharing functionality of the Travel Companion can be used by a user to notify friends about her/his travel solution. The user can arrange a shared car ride with friends that are interested in reaching Sants Estacio, so the environmental impact of the ride is reduced	Yes	Trip Sharing
			B-UCA3: The user can select, through the Travel Companion, the planned travel solution and directly book the car with SocialCar and buy a TMB ticket for the metro leg in a unique transaction	No	Booking/ Issuing
			B-UCA4: The travel solution is proposed to the users only if SocialCar cars are available nearby its starting position; otherwise, the Travel Companion will offer alternative solutions	No	Alternatives Calculation
			B-UCA5: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion (car and public transport, or car and parking) to reduce the usage of vehicles in Barcelona city center	Yes	Mobility Packages/ CMMP
			B-UCA6: The Travel Companion notifies the user in real-time about possible disruptions to the metro they are supposed to get.	No	Trip Tracking
			B-UCA7: Travelers sharing the car leg can help in reducing the number of private vehicles and facilitate parking at the Sants Estacio.	Yes	Trip Sharing
			B-UCA8: The user receives a digital ticket (e.g., QR code) that can be validated and used to access the metro	No	Validation/Inspection

			B-UCA9: The Travel Companion provides navigation information during the travel on the time of arrival/next arrival time for the metro and information on the intermediate stops to be performed before reaching the destination	Yes	Navigation
			B-UCA10: The digital ticket is saved in the Travel Companion and always available for inspection. The user in the app can view previously performed trips.	No	Validation/Inspection
			B-UCA11: Through the Travel Companion, the user can provide feedback about delays, cleanliness of the stations, disruptions, crowdedness, etc.	Yes	Traveller's Feedback
Traveling from Barcelona to suburban industrial areas for work TSP involved: TMB, BUSUP, Social Car Expected target users: 67ommuter (workers)	**Origin:** Barcelona Area **Destination:** Sant Cugat del Vallès (Can Sant Joan, Business Area)	W/MM/C → Bus (TMB) → DRT (BusUp) → W/MM/C Transfer Points: Calabria 16, Entença 68, Entença 19, Entença 320, Pg. Sant Juan Bosco 6	*B-UCB1: The user can plan an integrated travel solution involving a bus leg from different locations in Barcelona to the BusUp bus stop through the Travel Companion.*	Yes	Journey Planner
			B-UCB2: BusUp can offer available seats also to Travel Companion users not employed by registered companies. Travelers working in similar locations can now plan solutions involving a shared bus ride to reach the destination reducing private vehicle usage.	Yes	Journey Planner
			B-UCB3: The user can select, through the Travel Companion, the planned travel solution and directly purchase the TMB ticket for the bus leg and book the BusUp ride	Partially	Booking/ Issuing
			B-UCB4: The user is proposed with this travel solution only if seats for a BusUp ride are available; otherwise, the Travel Companion will directly offer alternative solutions	No	Alternatives Calculation
			B-UCB5: Mobility Packages are defined through the CMMP by relevant stakeholders and offered to users through the Travel Companion to support the combined usage of public transport and shared bus rides reducing the number of private vehicles used to commute outside Barcelona	Yes	Mobility Packages/ CMMP
			B-UCB6: The Travel Companion notifies the user in real-time about possible disruptions to the different legs of the travel solution that she/he is performing (integrating TMB and BusUp real-time events)	No	Trip Tracking
			B-UCB7: In case of disruption of the first leg, the user can use the Travel Companion application to cancel the BusUp and directly plan an alternative travel solution, possibly reaching a different transfer point through TMB services	No	Alternatives Calculation
			B-UCB8: The Travel Companion offers navigation information during the travel on the intermediate stops for the legs and the time of arrival/next arrival time for the second leg	Yes	Navigation
			B-UCB9: Tickets are available on the Travel Companion for boarding and inspection on the TMB bus and/or during the BusUp ride	No	Validation/Inspection
			B-UCB10: Through the Travel Companion, the user can provide feedback about delays, cleanliness of the stations, disruptions, crowdedness, etc.	Yes	Traveller's

					Feedback

12.3 Annex 3

Table 21: List of operational KPIs for each functionality

Number	Innovative Technology (IP4)	Linked to Traveler/TSP	KPI	Units	Already validated by CFMs?
1	Journey Planner (JP)/ Offer Builder	Traveler	Number of involved modes of transport in the trip (multimodality)	Average number of transport modes per trip	Yes
1	Journey Planner (JP)/ Offer Builder	Traveler	TSP Web-services acting as JP integrated into the IP4 ecosystem	Number of TSP integrated	Yes
1	Journey Planner (JP)/ Offer Builder	Traveler	A successful proposal or solution accepted by travellers (due to the integration of transport modes)	Number of travel solutions shown per day	Yes
1	Journey Planner (JP)/ Offer Builder	Traveler	Available travel solutions or options issued by TSP for travellers to reach their destination (due to the integration of transport modes)	Number of travel solutions shown per day	Yes
2	Booking	Traveler	Number of offers booked per day	Number of trips booked per day	Yes
3	Issuing	Traveler	TSP web-services for issuing process integrated into the IP4 ecosystem	Number of TSP integrated	Yes
3	Issuing	Traveler	Successful issuing of multimodal travel solutions	Number of issues per day	Yes
4	Mobility package's	Traveler	Number of mobility packages offered	Number/year	No
5	Validation and inspection	Traveler	Total number of Ticket(s) purchased	Number of tickets validated per day	Yes
6	Trip tracking	Traveler	TSP locations (stations, platforms) available for navigation	Number of TSP locations	Yes
6	Trip tracking	Traveler	Successful delivery of notifications on the status of a planned trip	Number of successful notifications per day	Yes
7	Alternative's calculation	Traveler	Service offerings to travellers (in case of disruption)	Number of services per day	Yes
8	Location-	Traveler	Number of users using the	Number of	Yes

	based experience		entertainment services	users per day	
8	Location-based experience	Traveler	Time using the entertainment services	Number of seconds per connection	Yes
9	Navigation	Traveler	Number of connections to the Navigation function	Number/day	No
9	Navigation	Traveler	Time of connection to the Navigation function	Seconds of connection/day	No
10	Traveller's feedback	Traveler	Number of feedbacks received	Number/day	No
11	Trip Sharing	Traveler	Number of trips shared by more than one traveler	Number of trips shared	Yes
12	Guest user	Traveler	Number of connections without a password	Number/day	No
13	Preferences and profiles	Traveler	Number of profiles handled	Number/day	No
13	Preferences and profiles	Traveler	Number of features handled	Number/day	No
14	Group traveling	Traveler	Number of connections to the group traveling function	Number/year	No
14	Group traveling	Traveler	Number of travelers involved	Number/year	No
15	Asset manager	TSP	Number of services integrated by a TSP	Number/year	No
16	Contractual management marketplace	TSP	Number of mobility packages handled	Number/year	No
16	Contractual management marketplace	TSP	Number of involved stakeholders	Number/year	No
17	Business analytics	TSP	Number of connections to Business analytics by TSP	Number/day	No
17	Business analytics	TSP	Time connected to business analytics by TSP	Seconds of connection/day	No
18	CEP configuration	TSP	Number of configurations	Number/year	No