# Deliverable D4.3
# Demonstration Execution Plan, F-REL

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| 2 | 20-06-2022 | Update of demo sites, IP4 enablers per demo site and per TSP, KPIs in the respective section and in Annex 3, Effectiveness Rate, Timeline per demo site, demonstration phases |
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***Disclaimer***

*This current version of the document of the execution planning of the 2nd phase's demonstration takes into account the latest developments; therefore, differentiations have been conducted since the submission of all previous documents of the IP4MaaS project and the first version of this document.*

*In April 2022, the coordinator of the IP4MaaS project and the Management Committee member submitted Amendment n.1 for IP4MaaS. All details have been previously agreed upon internally in the consortium, with Call For Members (CFM), and the Project Officer. Therefore, there are some differentiations compared to older documents of the project. The amendment was submitted for two main reasons:*

1. *Extension of the project by one (1) month to align the project end with the complementary CFM project ExtenSive end and to be able to perform project dissemination activities at the UITP Global Summit scheduled for June 4-7, 2023, in Barcelona (Barcelona is also one of the demo sites of IP4MaaS), as well as during the UITP Global summit month, which coincides with the end of the project, thus allowing wider dissemination of IP4MaaS' results.*
2. *A shift of effort (PMs) between Social Car and Sparsity Technologies SL. Due to internal reasons, well explained in the documentation, SOCIAL CAR could not guarantee the planned level of involvement, and the consortium decided to implement an alternative solution to include another Barcelona-based transport provider, AMTU, as a subcontractor of SPARSITY to achieve the goals and KPIs of Barcelona demo site and, consequently, of the project. In addition, SPARSITY requested a shift of budget from "Other Direct Costs" to "Personnel" due to the unspent travel budget due to COVID and the organization of some meetings as "virtual". The shifted amount will allow SPARSITY to have more resources dedicated to planning, executing, and monitoring, and monitoring the demo in Barcelona and supporting demo actors.*

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# 1 Executive Summary

The IP4MaaS Project aims to demonstrate the benefits of Innovation Programme 4 (IP4) through pilot demonstrators of collective and shared mobility services in six different European countries' 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 implementing truly user-centric services for co-modality in multimodal journeys integrating public transport, shared mobility, micro-mobility, and 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 involved Athens, while the second iteration will include all demonstration locations.

This document constitutes the Deliverable D4.3 "Demonstration Execution Plan, F-REL" of the IP4MaaS Project. It delivers a detailed plan for preparing and executing the F-REL phase of the demonstrations. The demonstration execution and technology integration plan has been updated to reflect changes in requirements for demonstration (e.g., new releases, new integration activities) or amend issues with demonstrations. D4.3 provides the following:

- An updated meaningful roadmap based on the work conducted in WP2, WP3, and WP4 of the project, and specifically deliverables D2.1, D2.2, D2.3, D3.2, a revised version of D4.1, and a revised version of the D4.2. The roadmap for the F-REL demonstrations was also produced with the contribution of the Management, Data, and Integration Committees that have initiated their work and facilitated the exchange of information.
- An overview of the technologies of the IP4 Ecosystem that are available for the demonstrations, as well as those under development for utilization in the 2nd Phase.
- An overview of the demo sites and the partaking TSPs, the demo leaders of each demo site, and the technologies of the IP4 Ecosystem that are available will be demonstrated during the 2nd phase of the demonstrations from each TSP.
- The respective travel solutions and use cases for each demo site.
- An overview of the operational KPIs for the respective functionalities that will be demonstrated during F-REL, as they have been identified, as well as an overview of the methodology to be used to measure them. In addition, an overview is provided regarding the Effectiveness Rate Calculation, which will be calculated with the utilization of the KPIs and the User Satisfaction Index (USI) surveys.

[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 hierarchy of priorities across the technologies' operational, semantic, and technical levels is 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 execution of the F-REL demonstrations will be performed in 6 separate phases.
- A detailed description of the essential components of the F-REL demonstrations: time plan, role assignment, risks & mitigation measures.
- A description of the roles and responsibilities of each stakeholder.
- A description of the activities being performed by the Integration Committee, the Data Committee, and the Management Committee.

This document will be the guide for executing the F-REL demonstrations in WP5.

# 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 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]. This project is also part of the Shift2Rail Joint Undertaking. It aims to provide complementary and continuous solutions already started within previous projects, namely MaaSive[8], ATTRACkTIVE[9] , and CO-ACTIVE, [10]to enhancing traveller experience and improve travel services in travel shopping, trip tracking, booking, and ticketing. Consequently, the outcomes of the IP4MaaS project, particularly the C-REL (see also deliverable D4.2) and the outcomes of the F-REL demonstration, will also provide input to ExtenSive and its' F-REL Demonstrations.

IP4MaaS project will act as a "man-in-the-middle" project respective to the CFM projects and TSPs and will use 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 ATTRACkITVE 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 previous 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 D4.3 "Demonstration Execution Plan, F-REL" 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 execution of the demonstrations, focusing on the F-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.

D4.3 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 executing 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 the IP4MaaS project the necessary elements for executing the demonstrations of the F-REL. 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.

D4.3 "Demonstration Execution Plan, F-REL" will:

1. Produce a detailed plan for the F-REL demonstrations that will take place in all six (6) demonstration sites: Padua, Athens, Barcelona, Warsaw, Osijek, and Liberec.
2. Set clear goals for the execution of the demonstration.
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 4.3 is the basis on which the demonstration preparation, coordination, and execution will rely. The schedule, role assignment, risks, and technicalities in D4.3 concern the second Demonstration Phase (F-REL).

# 5 Methodology

This chapter outlines the methodology used for creating the Demonstration Execution Plan for the 2nd phase of the demonstrations. The methodology was first introduced in D4.2, followed for the 1st phase (C-REL, see also D4.2, "Demonstration Execution Plan, C-REL").

Task 4.1 utilizes WP2 and WP3 (specifically D2.1, D2.2, D2.3, D3.1, and D3.2) and partners' restrictions and aggregates them to produce D4.1 and D4.2 and this deliverable, D4.3. Those findings are based on the datasets and, thus, the 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, conducting surveys of available technologies of each TSP, and organizing workshops with TSPs.

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

WP2 identifies available TSPs' technologies, creates a map of assets, identifies the 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 organization of the activities that will lead to successful demonstrations.

Several aspects should be taken into account 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. 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 in the final technologies that will be demonstrated. This process is depicted in Figure 1.

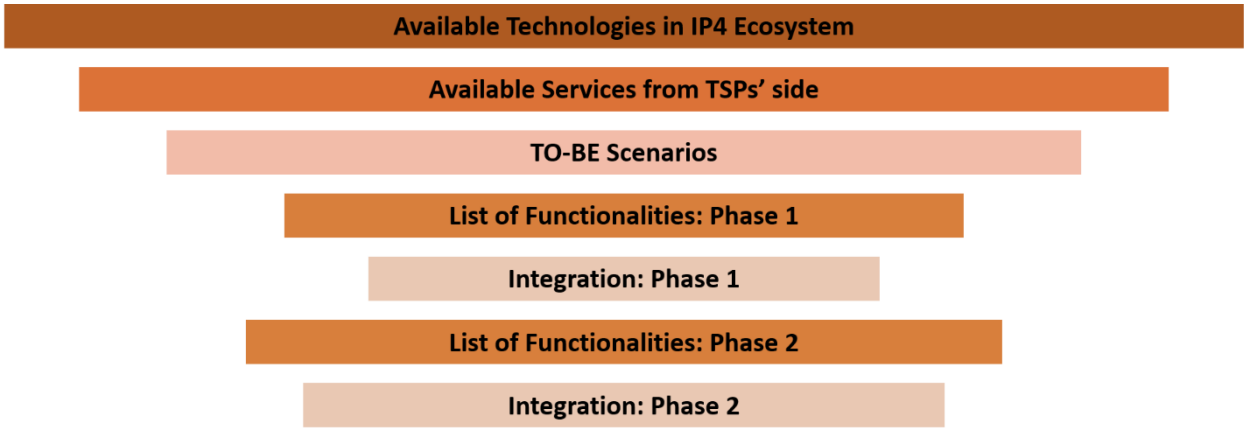


**Figure 1: Filtering process**

The filtering process is composed of the following steps:

1. The IP4 Ecosystem has a large pool of technologies; 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 regarding 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 were 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 became 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 in the final phase of the demonstrations.

Hence, the technologies that will be demonstrated in IP4MaaS are extracted and finalized through this filtering process.

# 6 Demonstration Sites & Phases

This chapter describes the overview and the expected primary outcomes for the six Demonstration Sites: Padua, Athens, Barcelona, Liberec, Warsaw, and Osijek. The partners involved in the Demonstration Execution are presented in Figure 2.

The reason for splitting into 2 phases the demonstrations is the need to assess the results from the C-REL demonstration and to consider the utilization 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 increasing, especially in providing feedback to the other demo sites and placing mitigation measures for new risks identified or resolving unknowns during demo planning. In addition, all involved partners of all complementary projects that either provide input or expect outputs from IP4MaaS may stay updated continuously on all respective activities and results.

As agreed with the complementary CFM projects MaaSIVE and ExtenSive, to make possible the overall scheduling of integration activities in the Shift2Rail IP4 ecosystems, C-REL focused mainly on the Athens demo site (D4.2) while D4.3 focuses on the second iteration of demonstrations, where all demo sites and their respective partners are involved.

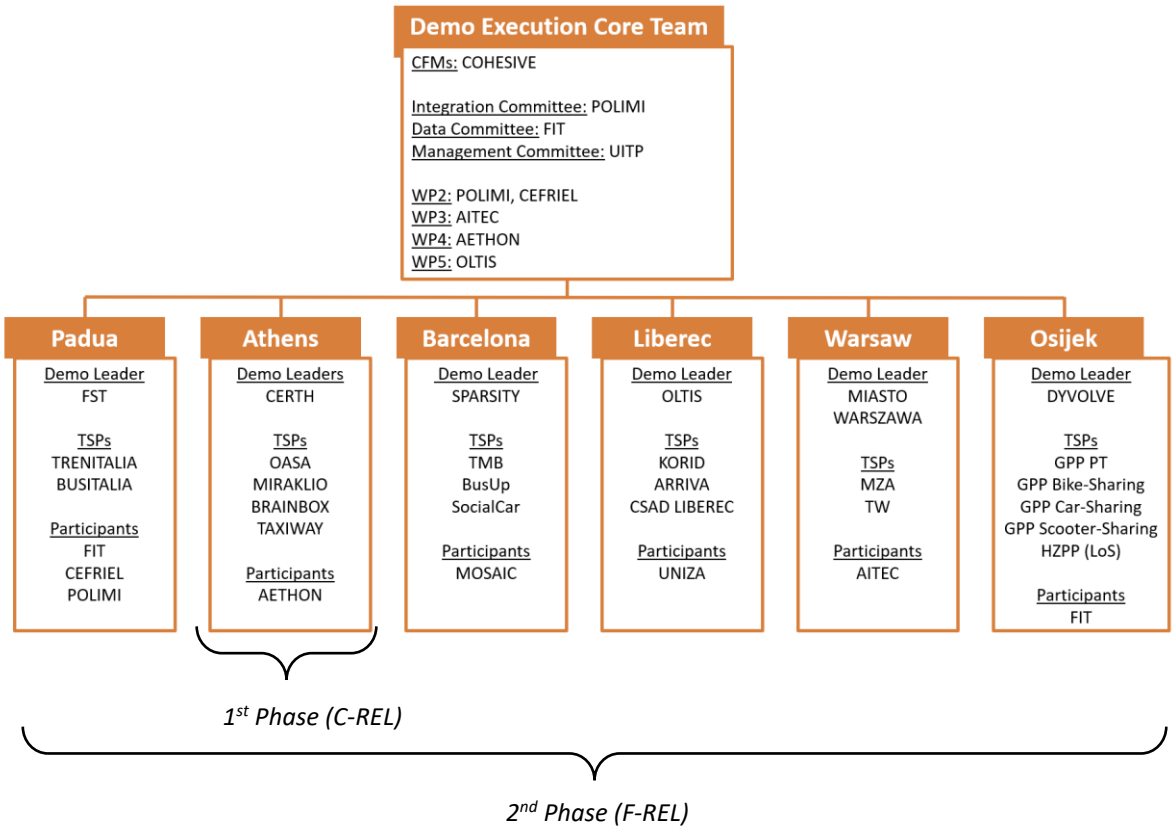


**Figure 2: Demonstrations' structure**

## 6.1 Demo sites and operators

The Demonstrations of IP4MaaS cover six different countries, namely **Spain, Italy, Greece, Croatia, the 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 entire range of ICT services that enables transport mobility operations for Trenitalia and BusItalia. The other three RUs have signed a LoS to participate 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.
- **Two demand responsive transport operators:** BusUp and AMTU (subcontractor of Sparsity).

The following sections will present more details about these Operators and the demo sites.

### 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 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 FS Technology company (FST), has selected it as a living lab location to analyse 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 improving services offered by the FS Group through integrating 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 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 2nd Phase demonstrations. The Demonstration Leader of the 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 leading 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 offers services to companies in suburban/rural areas, generally lacking convenient public transport offer, with sustainable and economical 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 in 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 of 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 with 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. AMTU is also managing the first public platform for Mobility

as a Service (MaaS), known as FlexiTransport Catalunya. AMTU (subcontractor of SPA) was included later in the project with the service of FlexiTransport to partially substitute the services of Social Car.

The additional IP4MaaS partners involved in the Barcelona demonstration site are SPARSITY (demonstration site leader) and MOSAIC. The fundamental 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 primary anticipated innovation is the orchestration of individual mobility offers and services in one seamless journey, including urban and peripheral areas.

### 6.1.4 Liberec

The demonstration site of Liberec includes the 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 travel cases.

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 offered 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, municipalities, and ridesharing (BlablaCar) services. The main expected innovation is overcoming barriers to cross-border ticketing unification, and improving 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 on public transport nodes that integrate different types of mobility. The demo is focused on the Młociny transport hub the 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 TSPs as mentioned earlier.

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

### 6.1.6 Osijek

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

- **GPP Osijek:** tram and bus urban transport. It operates in the City of Osijek wider administrative area, providing transport services with 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 also to integrate information on available train solutions. The additional IP4MaaS partners engaged in the Osijek demonstration site are DYVOLVE (demonstration site leader) and FIT.

The leading target group is commuters, and especially students, traveling daily to the city of Osijek. The primary 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 the technical aspect, a decision was taken, and the 1st Demo Phase was executed only in Athens, while the 2nd Phase will involve all six demo sites (Padua, Athens, Barcelona, Liberec, Warsaw, Osijek). For additional information on the C-REL demonstration execution plan, please refer to document D4.2.

The 1st demo phase of IP4MaaS in Athens ran in parallel with the demonstrations of Ride2Rail.[13] It lasted for two weeks, while those of the 2nd phase will run for one week due to time limitations, apart from Warsaw.

The demonstrations 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 both the IP4MaaS and the Ride2Rail project (which runs almost in parallel with IP4MaaS until a certain point), as well as the complementary project ExtenSive, along with the overview of the components that will be demonstrated, are depicted in

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

the following figure (Figure 3), as provided from the CFMs.

Figure 4 provides the legend for Figure 3. Both figures refer to the functionalities that need effort from the side of the CFMs, to analyze, integrate and test, not the passive functionalities or any other that do not require action 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. The demonstration preparation and execution phases have been adjusted to this roadmap the CFMs; accordingly, it will be elaborated in sections 8.1 and 8.2.

Please also note that, at the time this deliverable is being compiled, an IP4MaaS project Amendment has been conducted, by the Management Committee, in order to extend the project by one (1) additional month, as agreed in a Collaboration Meeting between CFMs and all partners involved in R2R and IP4MaaS projects that took place in March 2022, in order to align IP4MaaS' timeline to the complementary project ExtenSive and its' project activities and in parallel to organize the appropriate project events for dissemination of the outcomes to the public, such as performing dissemination activity at the UITP Global Summit, this way the project will not finish as initially planned (M30, May 2023) but in June 2023 (M31). It is expected to be officially approved.

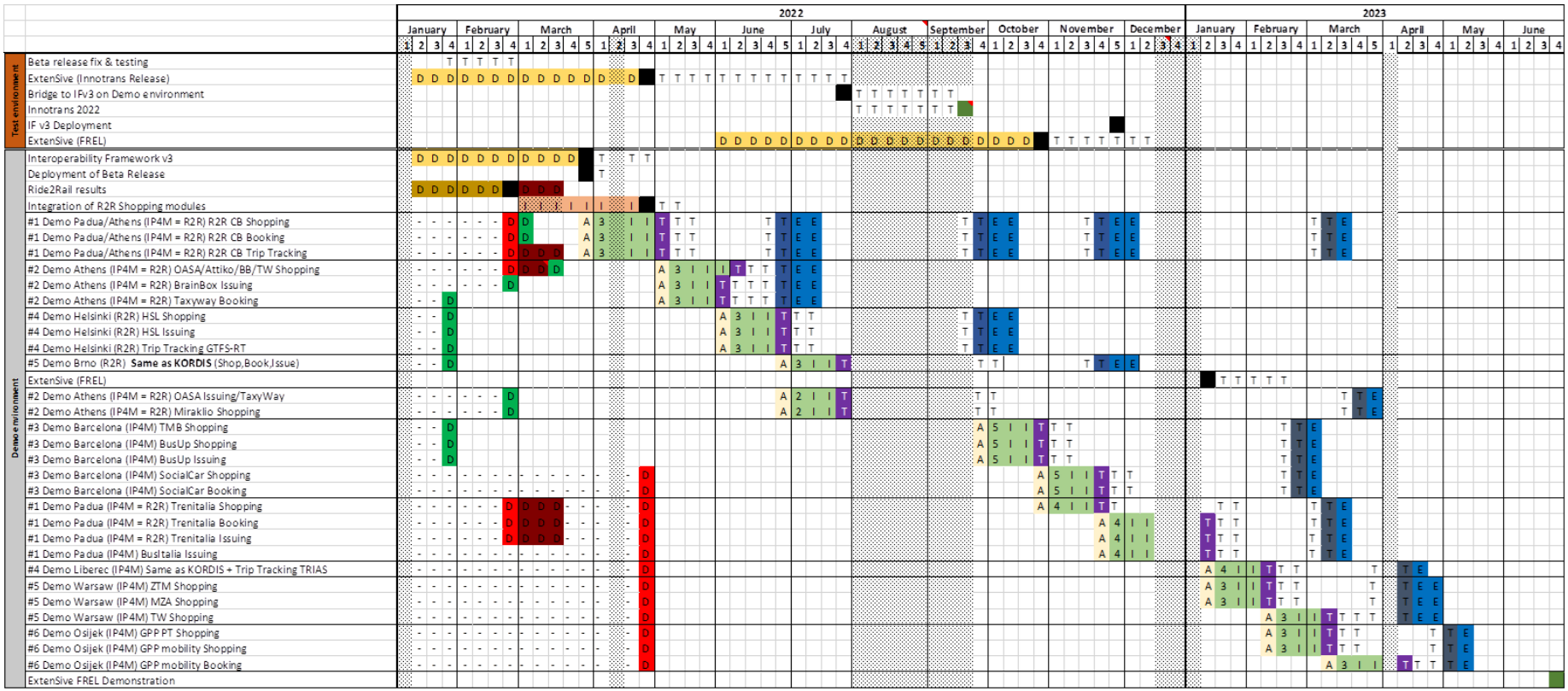


**Figure 3: Integration, testing, and demonstrations roadmap (R2R & IP4MaaS, plus ExtenSive F-REL)**

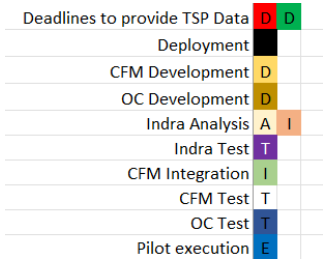


**Figure 4: Figure's 3 Legend**

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

This chapter will consolidate, expand, and refine the findings of WP2 and WP3, specifically D2.1, D2.2, D2.3, and D3.1. and D3.2. It is divided into six sections and is relevant to the pyramid described above. This chapter provides an overview regarding the available IP4 solutions, the finalized status of the IP4 enablers according to the Operators' offerings, regarding being integrated and ready to be demonstrated, the suitable Use Cases of the demonstrations, the KPIs to be measured, the Effectiveness rate, the methodology for assessing the data gathered during the demonstrations, and the summary of functionalities for the pilot of the 2nd phase of the demonstrations.

## 7.1 IP4 Technologies to be demonstrated

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]. Passive: No technical action is required from the ***TSPs*** *to use these functions.* ***Improvements*** are ***done*** within ExtenSive and automatically integrated with 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 D2.3).

For more elaborated descriptions of enabled user experiences for IP4 Solutions, please also consult D2.3, "Demonstration requirements and scenarios F-REL."
Table 1: IP4 Functionalities lists all the available IP4 functionalities with their corresponding TRL levels shared by the CFM partners and 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 conducted the C-REL and will also take part in the F-REL demonstrations, the functionalities that were 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. If you wish to see which specific functionalities were demonstrated during the C-REL, please refer to D4.2. Each respective functionality has a particular degree of TRL, and those that were 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 were planned to be demonstrated in F-REL, from ID P1 all the way to ID S7) have yet to be released, please also see the notes underneath the list. Therefore, some technical requirements are not yet known. All known technical requirements for all functionalities are in Annex 1(Table 32).

For more detailed planning of each demonstration (analysis, integration, testing by CFMs and OCs of each component), please also see Figure 3 under section 6.

The aim is to use each functionality at least once in all demo sites (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 are done within ExtenSive and automatically integrated with 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 D2.3).

For more elaborated descriptions of enabled user experiences for IP4 Solutions, please also consult D2.3, "Demonstration requirements and scenarios F-REL."

**Table 1: IP4 Functionalities [4]**

| ID | IP4 Technologies | TRL | User | Availability | P/A |
|---|---|---|---|---|---|
| **1** | Journey Planner / Offer Builder | 6 | Traveler | Ready | Active |
| **2** | Booking | 6 | Traveler | Ready | Active |
| **3** | Issuing | 6 | Traveler | Ready | Active |
| **4** | Ancillary service | 6 | Traveler | Ready | Active |
| **5** | Mobility packages | 5 | Traveler | Depends on TSPs | Active |
| **6** | Validation and Inspection | N/A | Traveler | N/A | Active |
| **7** | Trip tracking | 6 | Traveler | Ready | Active |
| **8** | Alternatives' calculation | 6 | Traveler | Ready | Active |
| **9** | Location based experiences (LBE) | 6 | Traveler | Ready | Active |
| **10** | Navigation | 6 | Traveler | Ready | Passive |
| **11** | Traveler's feedback | 5 | Traveler | Ready | Passive |
| **12** | Trip sharing | 6 | Traveler | Ready | Passive |
| **13** | Group travelling | 6 | Traveler | Ready | Active |
| **14** | Travel Arrangement | 6 | Traveler | Ready | Passive |
| **15** | Travel companion Web-Portal | 5 | Traveler | Ready | Active |
| **16** | Guest user | 5 | Traveler | Ready | Passive |
| **17** | Preferences and Profiles | 5 | Traveler | Ready | Passive |
| **18** | Best price optimization | 5 | Traveler | Ready | Active |
| **20** | Travel Companion for Kids | 5 | Traveler | 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 | Traveler | Availability: 31 January 2023 | Passive |
| **P5** | Web Portal (Payment, Registration with Gmail, and Purchase Mobility Packages) | 7 | Traveler | 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 (Traveler) | 7 | Traveler | Availability: 31 July 2022 | Passive |
| **P9** | Collaborative Space Portal (TSP) | 7 | TSP | Availability: 31 July 2022 | Passive |
| **A1**** | Trip Planning Hierarchy | 7 | Traveler | Availability: 31 January 2023 | Active |
| **A2** | Dynamic Display of Map Content | 7 | Traveler | Availability: 31 July 2022 | Active |
| **A3** | Smart Locations | 7 | Traveler | Availability: 31 January 2023 | Active |
| **A5** | Improved Intermodal Travel | 7 | Traveler | Availability: 31 January 2023 | Active |
| **A6** | Improved Travel Shopping | 7 | Traveler | Availability: 31 January 2023 | Active |
| **A7** | Individual Last Mile | 7 | Traveler | Availability: 31 July 2022 | Active |
| **A8** | LBE Score Sharing | 7 | Traveler | Availability: 31 July 2022 | Active |
| **A9** | Meeting Point | 7 | Traveler | Availability: 31 January 2023 | Active |
| **A10** | Specific Messages | 7 | Traveler | Availability: 31 July 2022 | Active |
| **A11** | Travelers Orchestration and Supervision | 7 | Traveler | Availability: 31 July 2022 | Active |
| **A12** | Siri SX based pTT | 7 | Traveler | 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 | Only selected TSP |

| | | | | | |
|---|---|---|---|---|---|
| | | | | Update plan data: 31 January 2023 | |
| **S4** | Incident Messages | 7 | Traveler | 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 | Traveler | Availability: 31 January 2023 | Only selected TSP |

**P in the ID stands for Passive Functionality*
*** A in the ID stands for Active Functionality*
**** S in the ID stands for Only Selected TSP Functionality, meaning that those S functionalities are special, require significant effort to be integrated, and can be selected by only 1 TSP to be demonstrated.*

## 7.2 TSPs' Available Services

In the context of WP2, under 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 described in D2.1 "Technology Survey C-REL". The document can be found for more information regarding all TSPs from all demo sites and their available services (APIs, token, etc.). This was the basis for pinpointing available services with the potential for further development and improvement.

Out of the IP4 technologies presented in Passive: No technical action **is** *required from the TSPs to* ***use*** these ***functions.*** Improvements are done within ExtenSive and automatically integrated with 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 D2.3).

For more elaborated descriptions of enabled user experiences for IP4 Solutions, please also consult D2.3, "Demonstration requirements and scenarios F-REL."
Table 1: IP4 Functionalities , the TSPs' services available for the 2nd Demo Phase are summarized in the following sections. In the said sections, an overview is being provided for all the demo sites and their respective TSPs, as well as their progress in developing and integrating functionalities to demonstrate in F-REL, complementing the roadmap of requirements, timelines, and outcomes depicted in Figure 3, in section 6.2. The goal is to have all those components ready to be tested during the pilots by the end users (travelers)to collect feedback and assess the benefits and thus the value produced for the S2R JU, its program, and complementary projects.

The Integration Committee (more about the said committee in another section of this deliverable), 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 per the latest developments regarding the functionalities and the integration progress for each demo site's TSP. All latest developments have been provided by the Integration Committee, as per the role dictates and are being described further in this document. Thus, this document, D4.3, is the most up-to-date and contains the final list of functionalities to be demonstrated during F-REL.

### 7.2.1 Athens

**Error! Reference source not found.** depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during March 2023, week 5.

**Table 2: IP4 Technologies of OASA, BrainBox, Taxiway, MIRAKLIO - Athens**

| 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<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ | √ | √ | √ |
| 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] | √ | √ | √ | × |
| 5 | Mobility packages | Mobility packages defined through the CMMP | √ | √ | √ | × |
| 6 | Validation and Inspection | Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by the TSP | √ | √ | √ | × |
| 9 | Location-based experiences | Location-based experience using LBE editor (24) | √ | × | × | √ |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ | × | × | √ |
| 11 | Travelers' feedback | N/A (Passive) | √ | × | × | √ |
| 12 | Trip sharing | Integration of IP4 Journey Planner solution (Passive) | √ | √ | √ | √ |
| 15 | Travel companion Web-Portal | • Shopping services<br>• Booking services<br>• Issuing services | √ | √ | √ | × |
| 16 | Guest user | N/A (Passive) | √ | √ | √ | √ |
| 17 | Preferences and Profiles | N/A (Passive) | √ | √ | √ | √ |
| 21 | Asset manager* | Data or web-services to be integrated | √ | √ | √ | √ |
| 22a | Contractual Management | Description of products (e.g., daily/monthly subscriptions) in NeTEx format. | × | √ | √ | × |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Market Place (CMMP) | | | | | |
| 24 | LBE editor | N/A (Passive) | √ | × | √ | √ |
| P5 | New functionalities Web Portal (Payment, Registration with Gmail, and Purchase Mobility Packages) | N/A (Passive) | √ | √ | √ | √ |
| P6 | New functionalities CMMP (Manual inclusion of Products and new registration process | N/A (Passive) | √ | √ | √ | × |
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ | √ | √ | √ |
| A2 | Map Content | POIs (CSV, ESRI-Shape, GeoJson, XML) | √ | √ | √ | √ |
| A3 | Smart Locations | • Stations (GTFS format)<br>• Optional: Addresses, POI | √ | √ | √ | √ |
| A5 | Improved Intermodal Travel | • GTFS data<br>• Journey Planning API | √ | √ | √ | √ |
| A6 | Improved Travel Shopping | • GTFS data<br>• Journey Planning API | √ | √ | √ | √ |
| A7 | Individual Last Mile | • GTFS data<br>• Journey Planning API | √ | √ | √ | √ |
| A8 | LBE SCORE sharing | LBE game developed using the LBE editor (assets and scenario) | √ | × | √ | √ |
| A10 | Specific messages | Use Orchestration and supervision tool | √ | √ | √ | √ |
| A11 | Travelers Orchestration and supervision | Use Orchestration and supervision tool | √ | √ | √ | √ |
| A15 | Distributed Ledger –Transaction Anchoring | Registration in CMMP | √ | √ | √ | √ |
| S6 | Distributed Ledger – TSP Inclusion | Deployment of Distributed Ledger node | √ | √ | √ | √ |
| S7 | Intermodal Fare Optimization | Best Price Service (to be defined further) | √ | √ | √ | × |

**POLIMI, which is a 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, to provide feedback*

*later on via the TSPs surveys. This applies to all TSPs of all the demo sites in F-REL. More on the Asset Manager in D2.3, "Demonstration requirements and scenarios F-REL."*
*This note applies to all the following tables of the IP4 solutions for all demo sites.*

In the table mentioned above, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol indicates also that either both the analysis and integration are complete or that the investigation has been concluded, the functionalities' integration is feasible, and the respective functionality will be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.
Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible are indicated with an "×" symbol. The functionalities that could be neither developed nor integrated for none of all the TSPs have been removed from the list.
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. For additional details on those solutions, please consult D2.2 and D2.3, which provide an updated picture of the software services available in each demonstration site for integration in the Shift2Rail digital ecosystem.

For the 1st demo phase and following the CFMs' pilot integration planning (see also Figure 3, section 6.2 of this deliverable), the following steps have already been taken to ensure that all proper actions have been taken, all tests have been conducted, and the final functionalities to be demonstrated during that first pilot have been successfully integrated. This sequence of specific actions also aimed to ensure that the functionalities were functional and that, in the end, utilizable solutions were provided to the end users (travellers). Since they were already integrated, those functionalities are also set to be demonstrated during the 2nd demo phase.

A. For OASA, Brainbox, and Taxiway's Shopping, the analysis was conducted during the first week of May 2022
B. Then the integration process followed from CFMs' side and required approx. 3 to 4 weeks.
C. According to the plan, the integration process was concluded:
    - For Brainbox Issuing and Taxiway Booking on the last week of May 2022, so during the first week of June, Indra conducted the appropriate tests,
    - For OASA, Taxiway and for Brainbox, the shopping component's integration was concluded at the end of the first week of June 2022 then Indra conducted the tests for two weeks.
D. Until mid of June 2022, the last tests were conducted from the CFMs' side, and the OC tests (tests from the open calls) followed until the end of June. The OCs received the first version of the Travel Companion application in mid-June to familiarize themselves with and conduct their tests. Tests were conducted until approx. 27 of June, the final version of the TC was delivered to distribute to the engaged users.
E. The C-REL pilot started at the beginning of July 2022 and lasted for two weeks (until 22 of July).

The roadmap for the F-REL in Athens, as also depicted in Figure 3, section 6.2, is as follows:
For successfully integrating and utilizing OASA's and Taxiway's Issuing, as well as MIRAKLIO's Shopping:

A. The necessary data were provided to the CFMs via the Asset Manager until the end of April 2022.
B. Indra Analysis: during the last week of June 2022.
C. CFMs Integration: during the first three weeks of July 2022.
D. Indra Test: last week of July 2022
E. CFMs Test: last week of September 2022 – first week of October 2022
F. Final CFMs Test on integrated functionalities: 3rd week of March 2023
G. OC Test: 4th week of March 2023
H. Execution of the pilot demonstration of the outcomes: 5th week of March 2023

### 7.2.2 Padua

Table 3: IP4 Technologies of Busitalia & Trenitalia - PaduaTable 3 depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during March 2023, week 3.

**Table 3: IP4 Technologies of Busitalia & Trenitalia - Padua**

| ID | IP4 Technologies | Requirements | Busitalia | Trenitalia |
|---|---|---|---|---|
| 1 | Journey Planner/ Offer Builder | • GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ | √ |
| 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] | x | √ |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ | √ |
| 11 | Travelers' 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 | √ | √ |
| P8 | Collaborative space (traveler) | N/A (Passive) | √ | √ |
| P9 | Collaborative space portal (TSP) | N/A (Passive) | √ | √ |
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ | x |
| A6 | Improved Travel Shopping | • GTFS data | √ | x |

| | | | | |
|---|---|---|---|---|
| | | • Journey Planning API | | |
| A10 | Specific messages | Use Orchestration and supervision tool | √ | √ |
| A11 | Travelers Orchestration and supervision | Use Orchestration and supervision tool | √ | √ |
| S3 | Adding Travel Shopping Service to TSP | TBD | √ | **x** |
| S5 | Adding Travel Shopping Service to TSP | TBD | √ | **x** |

In the table mentioned above, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol also indicates that either the analysis and integration are complete or that the analysis has been concluded and the functionalities' integration is feasible, and the respective functionality is going to be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.
Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible are indicated with an "**×**" symbol. The functionalities that could be neither developed nor integrated for none of all the TSPs have been removed from the list.
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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services available in each demonstration site for integration into the Shift2Rail digital ecosystem.

A significant technical issue related to the Padua demo site is that there is not an API available for the BusItalia operator. Therefore, it is impossible to integrate any functionality foreseen, 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 faces these constraints, it was decided that it was the ideal TSP to test the functionality S3 and S5, Adding Travel Shopping Service to TSP, enabling the said provider to create a Journey Planner. For more information regarding the TSP and the documentation, please consult D2.3, "Demonstration requirements and scenarios F-REL."

The F-REL demonstration of Padua will take place during the 3rd week of March 2023, along with the respective pilot of the R2R project.

According to the CFMs' pilot integration planning, after the provision of all necessary data and documentation from FST for BusItalia and Trenitalia, the following steps need to be taken, as shown in Figure 3 in section 6.2 of this deliverable, to ensure that all proper actions have been taken, all tests have been conducted. 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 3, 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

Table 4 depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during March 2023, week 1.

**Table 4: IP4 Technologies of TMB, BusUp, AMTU - Barcelona**

| ID | IP4 Technologies | Requirements | TMB | BusUp | AMTU |
|---|---|---|---|---|---|
| 1 | Journey Planner/ Offer Builder | • GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ | √ | √ |
| 2 | Booking | Web-service allowing booking (API) | × | √ | × |
| 5 | Mobility packages | Mobility packages defined through the CMMP | × | √ | √ |
| 6 | Validation and Inspection | Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by the TSP | × | √ | √ |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ | √ | × |
| 11 | Travelers' feedback | N/A (Passive) | √ | √ | √ |
| 12 | Trip sharing | Integration of IP4 Journey Planner solution (Passive) | √ | √ | √ |
| 15 | Travel companion Web-Portal | • Shopping services<br>• Booking services<br>• Issuing services | × | √ | × |
| 16 | Guest user | N/A (Passive) | √ | √ | √ |
| 17 | Preferences and Profiles | N/A (Passive) | √ | √ | √ |
| 20 | Travel Companion for Kids | N/A (Passive) | × | √ | × |

| | | | | | |
|---|---|---|---|---|---|
| 21 | Asset manager* | Data or web-services to be integrated | √ | √ | √ |
| 22a | Contractual Management Market Place (CMMP) | Description of products (e.g., daily/monthly subscriptions) in NeTEx format. | √ | √ | √ |
| P1 | Digital Onboarding | N/A (Passive) | √ | √ | √ |
| P5 | New functionalities Web Portal (Payment, Registration with Gmail, and Purchase Mobility Packages) | N/A (Passive) | × | √ | × |
| P6 | New functionalities CMMP (Manual inclusion of Products and new registration process | N/A (Passive) | √ | √ | √ |
| P8 | Collaborative Space (Traveler) | N/A (Passive) | √ | √ | √ |
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ | √ | √ |
| A5 | Improved Intermodal Travel | • GTFS data<br>• Journey Planning API | × | × | √ |
| A6 | Improved Travel Shopping | • GTFS data<br>• Journey Planning API | √ | √ | √ |
| A7 | Individual Last Mile | • GTFS data<br>• Journey Planning API | × | × | √ |

In the aforementioned table, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol also indicates that either the analysis and integration are complete, or that the analysis has been concluded and the functionalities' integration is feasible, and the respective functionality is going to be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.

Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible, are indicated with an "×" symbol. The functionalities that could be neither developed nor integrated for none of the all the TSPs have been removed from the list.

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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.

AMTU, an on-demand minibus service company that was added to the participating TSPs' list has all the necessary documentation and data to be integrated and has the same deadline as all the other TSPs. At the time this document is compiled the Amendment n.1 for IP4MaaS has been submitted and is expected to be approved, in which it is stated that a shift of effort (PMs) between Social Car and Sparsity Technologies SL is being conducted. Due to internal reasons, well explained in the documentation, SOCIAL CAR could not guarantee the planned level of involvement, and the consortium decided to implement an alternative solution to include another Barcelona-based transport provider, AMTU, as a subcontractor of SPARSITY, to achieve the goals and KPIs of Barcelona demo site and, consequently, of the project

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

- 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. The QR code for the metro is used to collect the tickets from the vending machines. 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. Therefore, the Trip Tracking service is not going to be demonstrated.
- 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, the Barcelona demo site has decided to test CMMP, configure mobility products and proceed to the sale of the packages in the 2nd phase.

For more information regarding the TSP and the documentation, please also consult D2.3, "Demonstration requirements and scenarios F-REL."

For a better depiction of the roadmap as it is currently planned, please see also Figure 3 under section 6.2, which depicts not only the time plan but also includes the technical requirements/actions that need to be conducted to ensure that the final solution is utilizable and functional.
Please note that this timeline was provided by the CFMs still considering Social Car before the Amendment was submitted; therefore, the exact dates are still to be finalized.

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 as well) 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, before 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

Table 5 depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during April 2023, week 3.

**Table 5: IP4 Technologies of KORID, Liberec**

| ID | IP4 Technologies | Requirements | KORID |
|---|---|---|---|
| 1 | Journey Planner/ Offer Builder | • GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ |
| 2 | Booking | Web-service allowing booking (API) | √ |
| 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] | √ |
| 6 | Validation and Inspection | Means to validate/inspect tickets (i.e., hardware validators or validation apps) to be provided by the TSP | √ |
| 7 | Trip Tracking | Web-service (API) providing Real Time information is the format: TRIAS, GTFS-RT, Siri-SX | √ |
| 8 | Alternatives Calculation | Journey planning and Trip tracking service integrated | √ |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ |
| 11 | Travelers' feedback | N/A (Passive) | √ |
| 12 | Trip sharing | Integration of IP4 Journey Planner solution (Passive) | √ |
| 14 | Travel Arrangement | N/A (Passive) | √ |
| 15 | Travel companion Web-Portal | • Shopping services<br>• Booking services<br>• Issuing services | √ |
| 16 | Guest user | N/A (Passive) | √ |
| 17 | Preferences and Profiles | N/A (Passive) | √ |
| 21 | Asset manager* | Data or web-services to be integrated | √ |
| P5 | New functionalities Web Portal (Payment, Registration with Gmail, and Purchase Mobility Packages) | N/A (Passive) | √ |

| | | | |
|---|---|---|---|
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ |
| A3 | Smart Locations | • Stations (GTFS format)<br>• Optional: Addresses, POI | √ |
| A5 | Improved Intermodal Travel | • GTFS data<br>• Journey Planning API | √ |
| A6 | Improved Travel Shopping | • GTFS data<br>• Journey Planning API | √ |
| A7 | Individual Last Mile | • GTFS data<br>• Journey Planning API | √ |

In the aforementioned table, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol also indicates that either the analysis and integration are complete, or that the analysis has been concluded and the functionalities' integration is feasible, and the respective functionality is going to be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.
Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible, are indicated with an "×" symbol. The functionalities that could be neither developed nor integrated for none of the all the TSPs have been removed from the list.
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. For additional details on those solutions, please consult D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.

Please 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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.
KORID/OLTIS provides the services available in the Liberec demonstration site. As the table mentioned earlier shows, in Liberec, there is good coverage of the typical travellers' services (journey planning, booking, ticketing, trip tracking).

For the demo site of Liberec, the Journey Planner and Offer Builder will have the same access as in Shift2MaaS and Ride2Rail projects, as confirmed by the CFMs. It is already integrated with 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. For more information regarding the TSP and the documentation, please also consult D2.3, "Demonstration requirements and scenarios F-REL."

The roadmap for the F-REL in Liberec, as also depicted in Figure 3, 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 the last weeks of January until the end of the first week of February 2023.
    c. Indra test: 2nd week of February 2023.

d. CFM test: last two weeks of February 2023.

— Once all actions mentioned above 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

Table 6 depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during April 2023, weeks 3-4.

**Table 6: IP4 Technologies of ZTM, MZA & TW - Warsaw**

| ID | IP4 Technologies | Requirements | ZTM | MZA | TW |
|---|---|---|---|---|---|
| 1 | Journey Planner/ Offer Builder | • GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ | √ | √ |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ | √ | √ |
| 11 | Travelers' feedback | N/A (Passive) | √ | √ | √ |
| 12 | Trip sharing | Integration of IP4 Journey Planner solution (Passive) | √ | √ | √ |
| 14 | Travel Arrangement | N/A (Passive) | √ | √ | √ |
| 16 | Guest user | N/A (Passive) | √ | √ | √ |
| 17 | Preferences and Profiles | N/A (Passive) | √ | √ | √ |
| 21 | Asset manager* | Data or web-services to be integrated | √ | √ | √ |
| P1 | Digital Onboarding | N/A (Passive) | √ | √ | √ |
| P8 | Collaborative Space (Traveler) | N/A (Passive) | √ | √ | √ |
| P9 | Collaborative space portal (TSP) | N/A (Passive) | √ | √ | √ |
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ | √ | √ |
| A5 | Improved Intermodal Travel | • GTFS data<br>• Journey Planning API | √ | √ | √ |
| A6 | Improved Travel Shopping | • GTFS data<br>• Journey Planning API | √ | √ | √ |
| A7 | Individual Last Mile | • GTFS data<br>• Journey Planning API | √ | √ | √ |

| | | | | | |
|---|---|---|---|---|---|
| A10 | Specific messages | Use Orchestration and supervision tool | √ | √ | √ |
| A11 | Travelers Orchestration and supervision | Use Orchestration and supervision tool | √ | √ | √ |
| S7 | Intermodal Fare Optimization | Best Price Service (to be defined further) | √ | √ | √ |

In the table mentioned above, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol also indicates that either the analysis and integration are complete, or that the analysis has been concluded and the functionalities' integration is feasible, and the respective functionality is going to be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.
Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible, are indicated with an "×" symbol. The functionalities that could be neither developed nor integrated for none of the all the TSPs have been removed from the list.
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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.
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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.

Jakdojade is a third-party company that developed a Journey Planner that can be integrated, thus making the demonstration of the components feasible for F-REL, and all the documentation is already uploaded into Asset Manager. As the TSPs mostly deal with urban transport, no booking or issuing is available, nor is the integration of such services applicable to them. For more information regarding the TSP and the documentation, please also consult D2.3, "Demonstration requirements and scenarios F-REL."

Please also note that the demonstration's timeframe for this site may be modified by one week (a scenario still under consideration) due to the Easter Holidays and the disruption to user engagement that may cause. Therefore, the roadmap displayed in the previous chapter and described below is to be considered mainly as a rough estimate

The roadmap for the F-REL in Liberec, as also depicted in Figure 3, 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: the last two weeks of February 2023, and the 1st week of March 2023.
    c. Indra Test: 2nd week of March 2023.
    d. CFM Test: until the 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

Table 7 depicts the Integration requirements of the Functionalities to be tested in the 2nd Phase of the Athens demo during April 2023, week 2.

**Table 7: IP4 Technologies of GPP - Osijek**

| ID | IP4 Technologies | Requirements | GPP PT | GPP SM |
|---|---|---|---|---|
| 1 | Journey Planner/ Offer Builder | • GTFS files/Service Areas (multi polygon GeoJSON) and basic mode of transport<br>• Journey planner web-service (API)<br>• Web-service providing fares (API) | √ | × |
| 10 | Navigation | Integration of IP4 Journey Planner solution (Passive) | √ | √ |
| P7 | CRM Portal | N/A (Passive) | √ | √ |
| A1 | Trip Planning Hierarchy | • GTFS data<br>• Journey Planning API | √ | × |
| A5 | Improved Intermodal Travel | • GTFS data<br>• Journey Planning API | √ | × |
| A6 | Improved Travel Shopping | • GTFS data<br>• Journey Planning API | √ | × |
| A7 | Individual Last Mile | • GTFS data<br>• Journey Planning API | √ | × |

GPP operates in the City of Osijek wider administrative area, providing public transport services (PT) with its 12 Bus and 2 Tram lines. It also manages e-bike, car, and scooter sharing (SM), as mentioned in this document's previous section. Some functionalities could not be integrated for all thus for accuracy reasons, the services have been split into the table as mentioned earlier into two columns, displaying which components can and will be demonstrated for each service (PT, public transport service, and SM, shared mobility service) and which will not.

In the table mentioned above, whenever a TSP matched the criteria for integrating a function (that has fulfilled the respective technical requirements and all data has been provided to the CFMs), it appears with a "√" symbol. This symbol also indicates that either the analysis and integration are complete, or that the analysis has been concluded and the functionalities' integration is feasible, and the respective functionality is going to be demonstrated. It also applies to passive functionalities; no requirements are needed to be fulfilled, and the respective TSP agrees to demonstrate it since it complies with its goal and the demo site's objectives.
Those functionalities that are not applicable for a TSP or, due to technical gaps, the integration was not feasible, are indicated with an "×" symbol. The functionalities that could be neither developed nor integrated for none of the all the TSPs have been removed from the list.
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. For additional details on those solutions, please consult D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.
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. For additional details on those solutions, please consult D2.2 and D2.3, which provides an updated picture of the software services that are available in each demonstration site for integration into the Shift2Rail digital ecosystem.

A Journey Planner is available based on the same technology used for the Liberec demonstration site. In addition, there is no booking service since the TSP provides urban public transport; therefore, Booking functionality may not be demonstrated during the 2nd phase pilot.

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 still under development, the CFMs will provide clarifications and exact specifications in due time. For more information regarding GPP TSP and the documentation, please also consult D2.3, "Demonstration requirements and scenarios F-REL."

For a better depiction of the roadmap of the demonstration, please see also Figure 3 under section 6.2, which depicts not only the time plan but also includes the technical requirements/actions that need to be conducted 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 3, 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 the 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's 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 stages mentioned above 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 3, 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 components (data collected during the pilots and stored in Cloud Wallet). Furthermore, the

evaluation of the collected surveys from TSPs and surveys from travellers as well as the 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 will contribute to assessing the degree of benefit the components provide to the end users (travellers and TSPs).

## 7.3 Scenarios and Traveller Experiences

The results from Table 2 recognised the Integration Activities that are relevant and feasible. This is the first level of sorting in T4.1. This section moves to the 2nd level of filtering regarding the Demonstration Scenarios (D2.2, "Demonstration requirements and scenarios C-REL") [5]. More specifically, through interviews with the TSPs involved in IP4MaaS during the activities of WP2, their needs, and expectations regarding the new travel experiences enabled by S2R IP4 services and tools were determined.

In Deliverable D2.2 and D2.3, a set of TO-BE User Journey Maps were produced, representing new travel experiences enabled by the integration of IP4 technologies and TSP services. These maps were developed starting from a first high-level analysis of each demo-site and its transportation system, identifying a set of user journeys (available routes), and developing a set of AS-IS demo site paint a clear picture of the current multimodal travel opportunities highlighting problems and areas for potential improvement. The produced TO-BE User Journey Maps have then enabled the definition of demonstration scenarios and their requirements, each defined by selecting from the TO-BE User Journey Maps a specific travel experience enabled by IP4 solutions.
The previous deliverable, D4.2 "Demonstration Execution Plan, C-REL" matched the most representative travel solutions for Athens's demo site with the feasibility of integrating the desired functionalities. The use cases since then were updated during the Integration process, and the CFMs asked from the respective OCs of each demo site to compile test cases based on those initial High-Level Journeys and scenarios, leading to feasible solutions according to the available functionalities.

The F-REL list of the demonstration scenarios was developed starting from the inputs gathered for C-REL, which were revised and adapted to fit better the new requirements and functionalities, the adaptation as the D2.3 describes, was achieved through describing the enabled user experiences, updating the TO-BE scenarios, and conducting TO-BE scenarios design workshops to analyse the interest and impact of IP4 solutions on the demonstration sites, develop the said demonstration scenarios, and finally defining demonstration scenarios and requirements.

For more information regarding the High-Level Journeys, the AS-IS and TO-BE scenarios, as well as the TSPs, the first and last legs of each journey that were considered, the IP4 Enablers that the TSPs expressed interest in demonstrating, and how the following information was compiled, please also consult D2.2 and D2.3, which provide the whole methodology and all the essential details.

Note that as the time towards the first pilot (C-REL) approached, and as the functionalities' integration progressed and completed, the CFMs requested from all the demonstration sites partners to provide test cases which were concrete descriptions of the successful integration during the pilot executions. Therefore, each demo site leader compiled additional test cases to be used by the CFMs in order to become familiar with each demo site and test the functionalities prior toto become familiar with each demo site and testing the functionalities before 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 transportation 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 traveler, distances to be covered on foot by the traveler to reach each point/mode. Thus, the CFMs can conduct tests and assess the success of the integration of the functionalities (Pass/fail status). All those additional test cases for all the demonstration sites can be found in Annex 2.

### 7.3.1 Athens

The demo site is located within the Athens agglomeration, Greece, and focuses on the main terminal positions of the metro and suburban rail, where multiple modes are available. The main objective of this demonstration scenario is to enhance multimodality by providing integrated services, including all the different TSPs and modes, through a single application that can be used by both tourists and commuters alike. The services are trying to cover trips from central Athens to metro stations outside the city centre for day-to-day commuters, trips from touristic hubs such as any other station for tourists, and trips from rural areas to any other central metro station to cover commercial points for shopping or leisure.

Table 8 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 have associated with using other functionalities (e.g., journey planning) through the Travel Companion. The feasibility is either “yes” (technically feasible and the TSP has a high interest), “no” (regardless of the interest, it is not technically feasible), or “partially” if only certain TSPs and not all can demonstrate in the respective demonstration site such functionality, or an exception “On Analysis”, which means that at this point it is still unclear if and how the corresponding component can be demonstrated and thus possible to be used.

**Table 8: Use Cases for Athens demonstration site**

| 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<br><br>Expected target users: Commuters (work, education, leisure) | **Origin:** Keramikos station<br>**Destination:** OAED School (Iraklio) | Taxi (**Taxiway**) → Bus (**OASA**) → Metro (**OASA**) → Local PT service (**MIRAKLIO**)<br>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* | On Analysis | 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 | **Origin:** Keramikos Metro station<br>**Destination:** El. | W/C(shared=**Brainbox**) → Metro (**OASA**) | *A-UCB1: The user can plan, through the Travel Companion, an integrated travel solution with buses, metro, and bike solution* | Yes | Journey Planner |

| | | | | | |
|---|---|---|---|---|---|
| area)<br><br>TSP involved: OASA, MIRAKLIO, Taxiway, Brainbox, Welcome pickups<br><br>Expected target users: Tourists | Venizelos Airport | → Bus (**OASA**) → W<br>Transfer Points:<br>1. Syntagma bus station | *A-UCB2: The user can select, through the Travel Companion, the planned travel solutions, 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 unique transaction* | Yes | Booking/ Issuing |
| | | | *A-UCB3: The user is proposed with this travel solution 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* | On Analysis | 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 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<br><br>TSP involved: | **Origin:** Keramikos Metro station<br>**Destination:** The Mall Athens | W → Metro (**OASA**) → W/C/Electric car (shared=**Brainbox**)<br>Transfer Points: | *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 |

| | | | | | |
|---|---|---|---|---|---|
| OASA, Taxiway, Brainbox<br><br>Expected target users:<br>Commuters (work/leisure) | | 1. Omonoia metro St. 2. Neratziotisa metro st | *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* | On Analysis | Mobility Packages/ CMMP |
| | | | *A-UCC5: The Travel Companion offers an integrated navigation functionality offering 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 Padua

This demo site is located within the area surrounding Padua, Italy, focusing on rural and suburban areas and targeting workers and students that comprise a large proportion of the regular commuters. The main objective of this demonstration scenario is to improve mobility planning while offering the customers different multimodal services by enhancing the management services of the FSI Group. These multimodal services need to be made available to customers by assimilating all mobility options within the Padua area into mobility packages centred around the specific requirements of the citizens, with the final goal of connecting urban and rural areas through multimodal mobility services.

Table 9 relies on the main findings of D2.2, 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.

**Table 9: Use Cases for Padua demonstration site**

| High-Level User Journey | User journey | Travel Solution | Overview of Use Cases | Feasibility | IP4 Enablers |
|---|---|---|---|---|---|

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|---|---|---|---|---|---|
| Traveling to Venice University (Ca' Foscari)<br><br>TSPs involved: Trenitalia, Busitalia Veneto<br><br>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* | Yes | 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* | Partially | 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 | Traveler's Feedback |
| | | | *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* | Partially | Journey Planner |

| | | | | | |
|---|---|---|---|---|---|
| Traveling home from Arcella to Padua rural area<br><br>TSP involved: Trenitalia, Busitalia Veneto<br><br>Expected target users: commuters (workers) | **Origin:** Arcella **Destination:** Trebaseleghe | Bus (BusItalia) → Train (Trenitalia) → Walking Transfer Points: 1. Piombino Dese | *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 45 commuters 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* | Partially | 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* | No | 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, cleanliness of the stations, disruptions, crowdedness, etc.* | Yes | Traveler's Feedback |
| | | | *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 |

### 7.3.3 Barcelona

This demo site covers the urban and suburban areas of Barcelona, Spain. It 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 demonstrator's main objective is to incentivize multi-modal travel and shared modes of transport, targeting users traveling from the same starting point to different destinations in Barcelona, and users traveling from different starting points to the same destination in the suburban/rural area of Barcelona. On one hand, people going to the same destination in Barcelona could benefit, in the first mile, from sharing rides with other passengers with a similar starting point, and going to different destinations in Barcelona. On the other hand, people working in the same area outside Barcelona could reach, through public transport, a shared transfer point in Barcelona and then benefit from shared rides to reach their destination.

Table 10 relies on the main findings of D2.2, 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.

**Table 10: 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<br><br>TSP involved: TMB, BUSUP, Social Car/AMTU<br><br>Expected target users: commuters (workers, students), | **Origin:** Sabadell Central station<br>**Destination:** Les Corts (UPC Campus) | Private Car/ Car Sharing (**Social Car/AMTU**) → Metro (**TMB**) → **W/C/MM**<br>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* | Yes | 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 the starting position; otherwise, the Travel Companion will offer alternative solutions* | No | Alternatives Calculation |

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|---|---|---|---|---|---|
| commuters to conferences/meetings/events held by UPC | | | *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 reduce 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* | Partially | 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 | Traveler's Feedback |
| Traveling from Barcelona to suburban industrial areas for work<br><br>TSP involved: TMB, BUSUP, Social Car/AMTU<br><br>Expected target users: commuters (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* | Partially | 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 | Traveler's Feedback |

### 7.3.4 Liberec

The demo site of Liberec focuses on the Liberec Region in the Czech Republic, with possible extension to the entire area of Borderland CZ/D/PL comprising Liberec, Zittau, and Bogatynia regions. The demonstration site focuses on empowering travel solutions in the cross-border section to serve countryside high school students commuting to Liberec and tourists from outside the region. It also includes a cross-demonstration site scenario for users traveling from Liberec to Warsaw.

According to D2.3, for each of the Osijek, Liberec, and Warsaw demonstration sites, a TO-BE workshop was executed by CEFRIEL (the partner responsible for the compilation of D2.2 and D2.3 documents), one workshop per respective site to extend the methodology described in D2.3, gather information about interest levels of the sites for each Travel Experience and create respective TO-BE scenarios, which are going to be the Use Cases for each of those sites.
Therefore, the following table was compiled (Table 11), which relies on the main findings of D2.2 ("Demonstration requirements and scenarios C-REL" and its Annex IV "AS-IS TO-BE Maps") and D2.3 ("Demonstration requirements and scenarios F-REL"), consisting of Use Cases and explanation of their

feasibility based in the IP4 Enabler they correspond to, both from the technical aspect and the interest of the TSP.

**Table 11: Use Cases for Liberec demonstration site**

| High-Level User Journey | User journey | Travel Solution | Overview of Use Cases | Feasibility | IP4 Enablers |
|---|---|---|---|---|---|
| Traveling to the hospital in Liberec<br><br>TSP involved: KORID (bus), ARRIVA vlaky) (Train), KORID (Tram)<br><br>Expected target groups: commuters | **Origin:** Nový Bor, T.G.Masaryka Bus Station **Destination:** Regional hospital (Liberec) | **Bus (KORID)** from Nový Bor, T.G.Masaryka bus station → Jablonné v Podjestedi to take the **train (ARRIVA vlaky)** → Nádraží (Liberec) to take the **tram (KORID)** → Šaldovo Náměstí → walking to Regional hospital (Liberec) | *L-UCA1: Calculate multimodal travel solutions from an origin to a destination integrating different TSPs, including offers price calculation* | Yes | Journey Planner |
| | | | *L-UCA2: Calculate door-to-door multimodal travel solutions also covering the first and last mile of a trip and considering private transport to cover a leg of the trip.* | Yes | Journey Planner/ Improved Intermodal Travel/ Individual Last Mile |
| | | | *L-UCA3: Set up personal preferences. To suggest specific travel solutions, utilize the user preferences about locations (stations, POIs, etc.).* | Yes | Journey Planner – Preferences and Profiles |
| | | | *L-UCA4: Book online all the payable parts of the planned journey.* | Yes | Booking |
| | | | *L-UCA5: Mobility Packages are defined through the CMMP by relevant stakeholders. Integrated tickets/mobility packages, including external bike/car sharing services or parking credit, are available to the end user.* | No | Mobility Packages/ CMMP |
| | | | *L-UCA6: Pay for and get the digital tickets for the booked trip.* | Yes | Issuing |
| | | | *L-UCA7: Have the app visualize the ticket in QR Code format to ease the validation and inspection process.* | Yes | Validation and Inspection |
| | | | *L-UCA8: Have the app provide navigation information such as where to get on or off, departure and arrival times, etc.* | Yes | Navigation |
| | | | *L-UCA9: Integrate real-time information for different TSPs and receive notifications for the planned multimodal trip, as well as real-time updates regarding delays and cancellations for the selected travel* | Yes | Trip Tracking |

| | | | | | |
|---|---|---|---|---|---|
| | | | *solutions. The user may need directions on when to get off, how to reach the next stop, and the subsequent arrival time for the next leg.* | | |
| | | | *L-UCA10: Share the bus ride with other passengers.* | Yes | Trip Sharing |
| | | | *L-UCA11: If a disruption happens, be provided with alternative solutions combining different means of transport.* | Yes | Alternatives Calculation |
| Trip through the historical beauties of the Liberec region<br><br>TSPs involved: KORID – TL (Train), ČSAD Liberec (Bus)<br><br>Expected target users: Tourists | **Origin:** Zittau, Bahnhofstraße 29<br>**Destination:** Hejnice,,au t.st. monastery | **Train (KORID – TL)** from Zittau → Liberec → **train (KORID)** → Frýdlant v Čechách Bus Station → **Bus (- ČSAD Liberec)** → Hejnice Bus Station → Walking to Hejnice monastery | *L-UCB1: The user can plan an integrated travel solution. The traveler can calculate multimodal travel solutions from an origin to a destination, door-to-door, integrating different TSPs, including offers price calculation.* | Yes | Journey Planner/ Improved Intermodal Travel/ Individual Last Mile |
| | | | *L-UCB2: Possibility of accessing a limited set of travel services without the need to create an account which matches one of the travelers' profiles, especially this particular target group, that of the tourists that visit the monuments in the Liberec region.* | Yes | Guest User |
| | | | *L-UCB3: Book in advance ancillary services (e.g., Wi-Fi, meals, etc.) before the tourist even goes to the train station and starts the journey.* | No | Ancillary Services |
| | | | *L-UCB4: Set up personal preferences. To suggest specific travel solutions, utilize the user preferences about locations (stations, POIs, etc.).* | Yes | Journey Planner – Preferences and Profiles |
| | | | *L-UCB5: Book online all the payable parts of the planned journey.* | Yes | Booking |
| | | | *L-UCB6: Mobility Packages are defined through the CMMP by relevant stakeholders' Integrated tickets/mobility packages, including external bike/car sharing services, or parking credit, are available to the end user.* | No | Mobility Packages/ CMMP |
| | | | *L-UCB7: Pay for and get the digital tickets for the booked trip.* | Yes | Issuing |

| | | | | | |
|---|---|---|---|---|---|
| | | | *L-UCB8: The app visualizes the ticket in QR Code format to ease the validation and inspection process.* | Yes | Validation and Inspection |
| | | | *L-UCB9: The app provides navigation information such as where to get on or off, departure and arrival times, etc., especially when switching from Train (KORID) to bus (ČSAD) to continue the trip.* | Yes | Navigation |
| | | | *L-UCB10: Integrate real-time information for different TSPs and receive notifications for the planned multimodal trip, as well as real-time updates regarding delays and cancellations for the selected travel solutions. The user may need to get directions on when to get off, how to reach the next stop, and the subsequent arrival time for the next leg.* | Yes | Trip Tracking |
| | | | *L-UCB11: Share the bus ride with other passengers.* | Yes | Trip Sharing |
| | | | *L-UCB12: If a disruption happens, be provided with alternative solutions combining different means of transport.* | Yes | Alternatives Calculation |
| | | | *L-UCB13: Through the Travel Companion, the user can provide feedback about delays, cleanliness of the stations, disruptions, crowdedness, etc.* | Yes | Traveler's Feedback |
| | | | *L-UCB14: A user more familiar with the area and the transportation modes and routes can arrange a trip for a different user (visitor that wishes to go sight-seeing)* | Yes | Travel Arrangement |
| Business trip to Warsaw<br><br>TSPs involved: Tram (KORID), Train (KORID, KORID, Koleje Dolnoslas | **Origin:** Jablonec nad Nisou, Zlatá ulička 154 **Destination:** Służewiec business area in Warsaw | **Tram (KORID)** from Nový Svět → transfer point Jablonec nad Nisou → **Train (KORID, Koleje Dolnoslaskie)** → Transfer to **train (Koleje** | *L-UCC1: The user needs an app that integrates services of both the Liberec and Warsaw areas, meaning all services of different TSPs may be found in one application, so he/she can plan the trip from one area to the other, from the first leg to the last (business area in Warsaw). It is essential for the pilot's execution.* | On Analysis | Journey Planner/ Improved Intermodal Travel/ Individual Last Mile |
| | | | *L-UCC2: The travelers so far were required to use multiple apps for the Liberec part, the legs in the middle, and the final part in the Warsaw area; it's essential to have the ability to book and buy online all the payable parts of the planned journey.* | On Analysis | Booking /Issuing |

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|---|---|---|---|---|---|
| kie), Train (PKP Intercity), Tram Warsaw (WTP)<br><br>Expected target users: Businessmen who are familiar with traveling between Jablonec and Nisou and Warsaw | | **Dolnoslaskie)** at Szklarska Poreba Go station → **Train (PKP Intercity)** from Wroclaw Glowny) → Change to **Tram (WTP)** at Warszawa Centralna) → Konstruktorska tram stop → walking to Służewiec business area | *L-UCC3: Mobility Packages are defined through the CMMP by relevant stakeholders. When the traveler plans this long trip to Warsaw, it would have a positive impact (and it is within the scope of the pilots) to have the option of having integrated tickets/ mobility packages, including mobility sharing services or parking credit for the first or last leg of the journey* | On Analysis | Mobility Packages/ CMMP |
| | | | *L-UCC4: Integrated navigation functionality enabling the traveler to use and switch, as seamlessly as possible, to different modes and/or operators at transfer points. The end users need to use one instead of multiple apps to get directions on when to get off, how to reach the next stop, and the subsequent arrival time for the next leg (possible transfer points in both Liberec and Warsaw areas: Nový Svět; Brandl; Jablonec n.N.dol.n.; Szklarska Poreba Go.; Wroclaw Glowny; Warszawa Centralna or Jablonec nad Nisou; P+R Železný brod; Železný Brod; Pardubice hl.n.; Warszawa Centralna).* | On Analysis | Navigation |
| | | | *L-UCC5: The Travel Companion notifies the user in real-time about possible disruptions to train/bus/tram that the user is supposed to take, as they initially planned through the same application, especially at transfer points.* | Yes | Trip Tracking |
| | | | *L-UCC6: If the waiting times at transfer points are fairly long, the user may use Location Based Experiences to access quiz games and commercial offers.* | No | Location Based Experiences |
| | | | *L-UCC7: If a disruption happens, be provided with alternative solutions combining different means of transport.* | Yes | Alternatives Calculation |

### 7.3.5 Warsaw

The Młociny transport hub, situated north of Warsaw, is the main focus of the Warsaw demonstration site. It is an interchange building connecting the P+R car park with the public transport modes, i.e., bus, tram, and subway. This transport hub provides parking spaces for cars while also has a connection to the bus depot and the waiting room at a bus station with a loop, and a roofed tram terminus enabling the uninterrupted flow of passengers from the subway to the city and the suburban buses and vice versa. At the same time, it also has commercial premises, travelers' services, and technical services. In addition, there are also bike sharing stations that provide bikes between the months of March and November. Those services

mentioned above, and infrastructure makes the hub attractive to travelers, commuters, workers, and students alike. The main objectives of the demonstrations are to trigger MaaS principle implementation and to improve the current ecosystem by adopting new technologies.

As mentioned in the previous section, a TO-BE workshop was executed by CEFRIEL for this demo site in order to extend the methodology described in D2.3, gather information about the interest levels of the sites for each Travel Experience and create respective TO-BE scenarios, which are going to be the Use Cases for each of those sites.
Therefore, the following table (Table 12) was compiled, which relies on the main findings of D2.2 ("Demonstration requirements and scenarios C-REL" and its Annex IV "AS-IS TO-BE Maps") and D2.3 ("Demonstration requirements and scenarios F-REL"), consisting of Use Cases and explanation of their feasibility based in the IP4 Enabler they correspond to, both from the technical aspect and the interest of the TSP.

**Table 12: Use Cases for Warsaw demonstration site**

| High-Level User Journey | User journeys | Travel Solution(s) | Overview of Use Cases | Feasibility | IP4 Enablers |
|---|---|---|---|---|---|
| Traveling from the the suburban area nearby Warsaw or from huge residential area to the Uniwersytet Kardynała Stefana Wyszyńskiego (UKSW) campus<br><br>TSP involved: MZA (Miejskie Zakłady Autobusowe) (bus), | **Origin:** Raszyn **Destination:** UKSW Campus | Private Car from Raszyn→ reach P+R Aleja Krakowska to switch to Tram **(TW)** → Metro Centrum, switch to metro **(MW)** → Metro Młociny, change to Bus **(MZA)** → Młociny UKSW → Walking → UKSW campus | *W-UCA1: The user can access a limited set of travel services without the need to create an account. The TSP can also reach a wider group of passengers* | Yes | Guest User |
| | | | *W-UCA2: The traveler has the option of setting different travel preferences according to other travel profiles for the same account since there are multiple ways to reach the campus.* | Yes | Preferences and Profiles |
| | | | *W-UCA3: The user so far was using Jakdojade, a third-party app to calculate routes, which sometimes lacked information about specific ones. The Travel Companion may provide the ability to calculate door-to-door multimodal solutions, covering even the first and last leg of the trip, as well as the pricing and thus provide offers to the traveler, including P+R (park and ride services, which perfectly fit the Młociny transport hub). Also, travelers working/studying in similar locations can now plan solutions involving a shared bus ride to reach the destination reducing private vehicle usage.* | Yes | Journey Planner/ Improved Intermodal Travel/ Individual Last Mile |

| | | | | | |
|---|---|---|---|---|---|
| TW (TRAM WARSZAWA) (tram), MIASTO WARSZAWA (metro)<br><br>Expected target groups: Commuters (workers and students) | | | *W-UCA4: Since there is the availability of multimodal trips with different combinations of modes/transfer points/distance etc., the traveler can choose the best route with optimized tariffs* | Yes | Intermodal Fare Optimization |
| | | | *W-UCA5: The user can share the planned route with another user (co-worker or fellow student) and coordinate efficiently, making more students and personnel of the campus choose public transport and avoid traffic jams that they surely encounter during their daily trips to and from the campus. They can park their cars at P+R Aleja Krakowska and switch to other modes.* | Yes | Trip Sharing |
| | | | *W-UCA6: The user, after planning the journey, can book and purchase his/her ticket via the same app and not with the use of additional certified apps.* | No | Booking/ Issuing |
| | | | *W-UCA7: Real-time updates about delays and disruptions are announced not only via speakers and tables but also notifications from the app, even before reaching the transfer point to switch to bus/tram/metro. That way, waiting times are reduced at transfer points.* | No | Trip Tracking |
| | | | *W-UCA8: Have the app provide navigation information such as where to get on or off, departure and arrival times, etc., so the traveler may switch modes with ease throughout the whole journey (especially at transfer points)* | Yes | Navigation |
| | | | *W-UCA9: If a disruption happens, the traveler is provided with alternative solutions combining different means of transport since different routes exist that can take the worker/student to the campus.* | No | Alternatives Calculation |
| Passengers traveling from residential areas in Warsaw to Agricultural University (SGGW). | **Origin:** Dąbrówka Wiślana **Destination:** SGGW Campus | W/C → Bus **(MZA)** → Metro **(MW)** → Bus **(MZA)** → Walking **Transfer Points:** 1. Dąbrówka Wiślana 2. Metro | *W-UCB1: The user can access a limited set of travel services without the need to create an account. The TSP can also reach a wider group of passengers* | Yes | Guest User |
| | | | *W-UCB2: The traveler has the option of setting different travel preferences according to other travel profiles for the same account since there are multiple ways to reach the campus.* | Yes | Preferences and Profiles |
| | | | *W-UCB3: The user so far was using Jakdojade, a third-party app to calculate routes, which sometimes lacked information about* | Yes | Journey Planner/ Improved |

| | | | | | |
|---|---|---|---|---|---|
| TSPs involved: MZA (bus), TW (tram), MIASTO WARSZAWA (metro)<br><br>Expected target users: Commuters (workers and students) | | Młociny 3. Metro Służew 4. SGGW – Rektorat | *specific ones. The Travel Companion may provide the ability to calculate door-to-door multimodal solutions, covering even the first and last leg of the trip, as well as the pricing and thus provide offers to the traveler, including P+R (park and ride services, which fit perfectly the Młociny transport hub)* | | Intermodal Travel/ Individual Last Mile |
| | | | *W-UCA4: Since there is the availability of multimodal trips with different combinations of modes/transfer points/distance etc., the traveler can choose the best route with optimized tariffs* | Yes | Intermodal Fare Optimization |
| | | | *W-UCA5: Travelers working/studying in similar locations can now plan solutions involving a shared ride to reach the destination reducing private vehicle usage. The user can share the planned route with another user (co-worker or fellow student) and coordinate efficiently, making more students and personnel of the campus choose public transport and avoid traffic jams that they surely encounter during their daily trips to and from the campus. They can park their cars at P+R Aleja Krakowska and switch to other modes.* | Yes | Trip Sharing |
| | | | *W-UCA6: The user, after planning the journey, can book and purchase his/her ticket via the same app and not with the use of additional certified apps.* | No | Booking/ Issuing |
| | | | *W-UCA7: Real-time updates about delays and disruptions are announced not only via speakers and tables but also via notifications from the app, even before reaching the transfer point to switch to bus/tram/metro. That way, waiting times are reduced at transfer points.* | No | Trip Tracking |
| | | | *W-UCA8: Have the app provide navigation information such as where to get on or off, departure and arrival times, etc., so the traveler may switch modes with ease throughout the whole journey (especially at transfer points)* | Yes | Navigation |
| | | | *W-UCA9: If a disruption happens, the traveler is provided with alternative solutions combining different means of transport since different routes exist that can take the worker/student to the campus.* | No | Alternatives Calculation |

### 7.3.6 Osijek

The demonstration site of Osijek mainly targets the rural area in Osijek-Baranja County in Croatia. Commuters, especially students who travel daily to the city of Osijek and the campus of UNIOS and are the leading target group for the demonstration site. The main objective of the demonstration site is to test the added value of the IP4 solution in connecting current PT services and new services currently in implementation (e-car sharing and bike & e-bike sharing schemes) to offer a seamless multimodal experience to travelers.

The following table (Table 13Table 12) was compiled, which relies on the main findings of D2.2 ("Demonstration requirements and scenarios C-REL" and its Annex IV "AS-IS TO-BE Maps") and D2.3 ("Demonstration requirements and scenarios F-REL"), consisting of Use Cases and explanation of their feasibility based in the IP4 Enabler they correspond to, both from the technical aspect and the interest of the TSP.

**Table 13: Use Cases for Osijek demonstration site**

| High-Level User Journey | User journeys | Travel Solution(s) | Overview of Use Cases | Feasibility | IP4 Enablers |
|---|---|---|---|---|---|
| Traveling from rural areas nearby the City of Osijek to the UNIOS student campus in Osijek<br><br>TSP involved: GPP Osijek (Tram), HŽPP (HZ Putnicki Prijevoz) (Train)<br><br>Expected target groups: Commuters (students, employees) | **Origin:** Čepin **Destination:** Student Campus Osijek | Private Car/ridesharing from Čepin → Čepin Railway Station → Train (**HŽPP**) → Transfer point: Railway Station Osijek Dravski most → change to Tram (**GPP**) → Student Campus Osijek | *O-UCA1: The user can access a single platform to plan a journey involving train (HŽPP) for the itinerary between the stations of Čepin and Osijek Dravski most, GPP tram, and/or shared mobility for the first (to Čepin station) and last leg (to campus) of the trip. Since the train departures from Čepin are not as frequent as public transport, the user can calculate the route and make estimations regarding their arrival at Čepin Train Station.* | Partially | Journey Planner/ Journey Planning – Improved Intermodal Travel & Individual Last Mile |
| | | | *O-UCA2: The traveler has the option of booking and purchasing a digital ticket for the train itinerary (from Čepin to Railway Station Osijek Dravski most) and for the tram leg (from Osijek Dravski most to Student Campus Osijek) on one app.* | No | Booking/ Issuing |
| | | | *O-UCA3: Real-time notifications regarding any occurring disruptions (delays/cancellations) on the specific planned journey, not just the HŽPP train itinerary, as well as notifications in case of no sharing mobility vehicles are available at a given station.* | No | Trip Tracking |

| | | | | | |
|---|---|---|---|---|---|
| | | | *O-UCA4: The user has the app provide navigation information such as where to get on or off (Transfer Point: Railway station Osijek Dravski most) departure and arrival times, etc.* | Yes | Navigation |
| Traveling to the Osijek city center<br><br>TSPs involved: GPP Osijek (Bus, Bike/E-bike Sharing)<br><br>Expected target users: daily commuters (students, employees, retired people, visitors (people coming to the city center for leisure or recreational activities) | **Origin:** Bijelo Brdo **Destination:** Square Ante Starčević | Private Car/ Ridesharing from Bijelo Brdo → switch to bus (**GPP**) at Bus Station – Bijelo Brdo Teslina centar Sjever → Reach Vukovarska/ Zeleno polje → Bike/ E-bike sharing (**GPP**) to Square Ante Starčević | *O-UCB1: The user can access a single app to conduct his/her door-to-door planning and calculate the entire travel solution.* | Partially | Journey Planner/ Journey Planning – Improved Intermodal Travel & Individual Last Mile |
| | | | *O-UCB2: The traveler has the option of booking and purchasing a digital ticket for the bus itinerary (from Bus Station Bijelo Brdo Teslina centre Sjever to Vukovarska/ Zeleno polje) and pay the bike-sharing ride via an app.* | No | Issuing |
| | | | *O-UCB3: The user wishes to book a bike in advance and not only when reaching the station of Vukovarska/ Zeleno polje.* | No | Booking |
| | | | *O-UCB4: The user can open the app, plan the journey, get offers and purchase integrated tickets/ mobility packages that support the combined usage of public transport (bus) and sharing mobility (bike/e-bike).* | No | Mobility Packages/ CMMP |
| | | | *Real-time notifications regarding any occurring disruptions (delays/cancellations) on the specific planned journey for the bus leg and notifications in case of no sharing mobility vehicles are available at a given station.* | No | Trip Tracking |
| | | | *O-UCB6: An integrated navigation functionality is available during the trip, so the user will know when to get off the bus and where the bike-sharing station is located at Vukovarska/ Zeleno polje.* | Yes | Navigation |
| | | | *O-UCB7: If the user finds no available bikes when he/she reaches the Vukovarska/ Zeleno polje bike sharing station, he/she may search via the app for alternative means of shared mobility (e-scooter or car) and plan an alternative route.* | No | Alternatives Calculation |

| | | | | | |
|---|---|---|---|---|---|
| | | | *O-UCB8: A tourist wishes to include a touristic attraction in his/her travel solution.* | No | Profile & Preferences – Smart Locations |

## 7.4 Definition of KPIs for F-REL

WP3 defined KPI (Operational KPIs: quantitative and objective, automatically measured on a periodic basis) for the TSPs and travellers, as well as their specific metrics; WP3 has also defined the methodology for ultimately calculating the Effectiveness 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 validating the KPIs identified by WP3, specifically from D3.1 [6], as well as D3.2. 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[14][15] project and other literature review technical documents. Then the deliverable D3.2 "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL" illustrates the final list of operational KPIs analysis of the users' satisfaction for both Transport Service Providers (TSPs) and travellers with the new approach. Moreover, the methodology of this deliverable focuses on the calculation of Effectiveness. This list of defined potential operational KPIs is being used in the planning of the demonstrations (Task 4.1), as the Grant Agreement states under Task 3.2.
As far as their measurement is concerned, 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 are in section 7.4.2 of this deliverable.

This chapter describes the overview of metrics relevant to six demo sites regarding these operational KPIs. IP4MaaS uses specific KPIs from D4.1 of Shift2MaaS' respective list for the evaluation from strategic, technical, and exploitation points of view of the IP4 functionalities [6]. IP4MaaS also included KPIs valid to measure the gain/benefit of IP4 functionalities offered by TSPs from an 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 assessment partners.

The list of KPIs for each demo site depends on the functionalities that will be integrated and demonstrated during each respective pilot and emerge from the analysis done in section 0 and on the KPIs the WP3 defined during its work. The following lists for all the demo sites provide an overview of those KPIs based on the outcomes of the WP3 and the progress in validating them so far by the CFMs' side, as stated in D3.2. These operational KPIs will be collected automatically by the CFMs (ExtenSive project partners), who will send the information to a repository provided by the IP4MaaS project after the pilot. The KPIs have been updated and described in the D3.2, "List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, F-REL," which introduces a summarizing table with a final list of all KPIs and their respective metrics. Nevertheless, since some of the KPIs lack final validation, the WP3 is in constant touch with the CFMs to validate all the KPIs and/or modify the list of KPIs if deemed necessary. This document

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

and the following section contain the KPIs and the latest updates regarding them, as they were provided at the time this deliverable was compiled.

For each KPI, we have also included in the following tables for each demo site their units, as well as their validation status (whether they have been already validated from CFMs), as provided by the D3.2 and the latest progress in WP3's work. The CFMs will share raw data once they have accumulated them and stored them in their repositories during the pilots for WP6 to conduct an assessment, calculate the KPIs, and -by also considering the outcomes from the filled out USIs- ultimately extract valuable information and draw conclusions on the impact and benefits. 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). After refinement and after taking all input from CFMs and ExtenSive partners into account; these KPIs are listed in Annex 3 (Table 38), along with their metrics for each IP4 Functionality to be demonstrated.

### 7.4.1 Athens – Identified Operational KPIs

The potential KPIs for the respective functionalities of the Athens demo site (as listed in **Error! R eference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 14: KPIs for Athens Site, including both the functionalities first introduced during C-REL and those that will be demonstrated during F-REL, in accordance with the KPIs initially introduced in D3.1 (C-REL) and enriched/refined in D3.2 (F-REL). In grey those KPIs which will be collected and analysed during the Phase 1 of the pilots which only involved the Athens demo site.

**Table 14: KPIs for Athens Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Booking | Traveler | Number of offers booked by travelers | Number of booked offers | Validated by CFMs |
| Issuing | Traveler | Successful issuing of multimodal travel solutions | Number of issued offers | Validated by CFMs |
| Mobility Packages | Traveler | Number of mobility packages offered | Number/year | Not yet validated by CFMs |
| Validations and Inspection | Traveler | Total number of Ticket(s) purchased | Number of tickets validated per day | Validated by CFMs |

| | | | | |
|---|---|---|---|---|
| Location-based experience | Traveler | Number of experiences launched during the demo | Number of experiences | Validated by CFMs |
| Location-based experience | Traveler | Average time per connection (in seconds) per each TSP during the demo | Number of seconds per connection | Validated by CFMs |
| Location-based experience | Traveler | Number of entertainment services offered during the demo | Number of services | Validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |
| Traveller's feedback | Traveler | Number of feedbacks received | Number/day | Not yet validated by CFMs |
| Trip Sharing | Traveler | Number of trips shared by more than one traveler | Number of trips shared | Validated by CFMs |
| Guest user | Traveler | Number of connections without a password | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of profiles handled | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of features handled | Number/day | Not yet validated by CFMs |
| Asset manager | TSP | Number of IP4 Service types covered by the demo | Number | Validated by CFMs |
| Contractual management marketplace | TSP | Number of mobility packages handled | Number/year | Not yet validated by CFMs |
| Contractual management marketplace | TSP | Number of involved stakeholders | Number/year | Not yet validated by CFMs |

### 7.4.2 Padua - Identified Operational KPIs

The potential KPIs for the respective functionalities of the Padua demo site (as listed in Table 3**Error! Reference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 15, in accordance with the first-introduced KPIs identified in D3.1 and mostly in accordance with D3.2, which subsequently enriched/refined that initial list.

**Table 15: KPIs for Padua Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Booking | Traveler | Number of offers booked by travelers | Number of booked offers | Validated by CFMs |
| Issuing | Traveler | Successful issuing of multimodal travel solutions | Number of issued offers | Validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |
| Traveller's feedback | Traveler | Number of feedbacks received | Number/day | Not yet validated by CFMs |
| Trip Sharing | Traveler | Number of trips shared by more than one traveler | Number of trips shared | Validated by CFMs |
| Guest user | Traveler | Number of connections without a password | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of profiles handled | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of features handled | Number/day | Not yet validated by CFMs |
| Asset manager | TSP | Number of IP4 Service types covered by the demo | Number | Validated by CFMs |

### 7.4.3 Barcelona - Identified Operational KPIs

The potential KPIs for the respective functionalities of the Barcelona demo site (as listed in the Table 4**Error! Reference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 16, in accordance with the first-introduced KPIs identified in D3.1 and mostly in accordance with D3.2, which subsequently enriched/refined that initial list.

**Table 16: KPIs for Barcelona Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Booking | Traveler | Number of offers booked by travelers | Number of booked offers | Validated by CFMs |
| Mobility Packages | Traveler | Number of mobility packages offered | Number/year | Not yet validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |
| Traveller's feedback | Traveler | Number of feedbacks received | Number/day | Not yet validated by CFMs |
| Trip Sharing | Traveler | Number of trips shared by more than one traveler | Number of trips shared | Validated by CFMs |
| Guest user | Traveler | Number of connections without a password | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of profiles handled | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of features handled | Number/day | Not yet validated by CFMs |
| Asset manager | TSP | Number of IP4 Service types covered by the demo | Number | Validated by CFMs |
| Contractual management marketplace | TSP | Number of mobility packages handled | Number/year | Not yet validated by CFMs |
| Contractual management marketplace | TSP | Number of involved stakeholders | Number/year | Not yet validated by CFMs |

### 7.4.4 Liberec – Identified Operational KPIs

The potential KPIs for the respective functionalities of the Liberec demo site (as listed in the Table 5**Error! Reference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 17, in accordance with the first-introduced KPIs identified in D3.1 and mostly in accordance with D3.2, which subsequently enriched/refined that initial list.

**Table 17: KPIs for Liberec Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Booking | Traveler | Number of offers booked by travelers | Number of booked offers | Validated by CFMs |
| Issuing | Traveler | Successful issuing of multimodal travel solutions | Number of issued offers | Validated by CFMs |
| Validations and Inspection | Traveler | Total number of Ticket(s) purchased | Number of tickets validated per day | Validated by CFMs |
| Trip Tracking | Traveler | TSP locations (stations, platforms) available for navigation | Number of TSP locations | Validated by CFMs |
| Trip Tracking | Traveler | Successful delivery of notifications on the status of a planned trip | Number of successful notifications per day | Validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |

| | | | | |
|---|---|---|---|---|
| Traveller's feedback | Traveler | Number of feedbacks received | Number/day | Not yet validated by CFMs |
| Trip Sharing | Traveler | Number of trips shared by more than one traveler | Number of trips shared | Validated by CFMs |
| Guest user | Traveler | Number of connections without a password | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of profiles handled | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of features handled | Number/day | Not yet validated by CFMs |
| Asset manager | TSP | Number of IP4 Service types covered by the demo | Number | Validated by CFMs |

### 7.4.5 Warsaw – Identified Operational KPIs

The potential KPIs for the respective functionalities of the Warsaw demo site (as listed in the Table 6Table 5**Error! Reference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 18, in accordance with the first-introduced KPIs identified in D3.1 and mostly in accordance with D3.2, which subsequently enriched/refined that initial list.

**Table 18: KPIs for Warsaw Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |
| Traveller's feedback | Traveler | Number of feedbacks received | Number/day | Not yet validated by CFMs |
| Trip Sharing | Traveler | Number of trips shared by | Number of | Validated by |

| | | | | |
|---|---|---|---|---|
| | | more than one traveler | trips shared | CFMs |
| Guest user | Traveler | Number of connections without a password | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of profiles handled | Number/day | Not yet validated by CFMs |
| Preferences and profiles | Traveler | Number of features handled | Number/day | Not yet validated by CFMs |
| Asset manager | TSP | Number of IP4 Service types covered by the demo | Number | Validated by CFMs |

### 7.4.6 Osijek – Identified Operational KPIs

The potential KPIs for the respective functionalities of the Osijek demo site (as listed in the Table 7Table 5**Error! Reference source not found.**) that will be demonstrated during the F-REL pilot are depicted in Table 19, in accordance with the first-introduced KPIs identified in D3.1 and mostly in accordance with D3.2, which subsequently enriched/refined that initial list.

**Table 19: KPIs for Osijek Site**

| IP4 Technology | Linked to traveler/TSP | KPIs | UNITS | Validation Status |
|---|---|---|---|---|
| Journey Planner (JP)/ Offer Builder | Traveler | Number of involved modes of transport in the trip (multimodality) | Number of transport modes per trip | Validated by CFMs |
| Journey Planner (JP)/ Offer Builder | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Validated by CFMs |
| Navigation | Traveler | Number of connections to the Navigation function | Number/day | Not yet validated by CFMs |
| Navigation | Traveler | Time of connection to the Navigation function | Seconds of connection/day | Not yet validated by CFMs |

## 7.5 KPIs Measurement - Effectiveness

As mentioned previously, the data for calculating the quantified KPIs in the table above (their units, for example, the average number of involved modes/TSPs used by the travellers via the Travel Companion app) will be collected automatically by the CFMs during the pilots.

The next example in Table 20 shows how this data collection per each operational KPI will be finally carried out according to the CFMs' validation during the pilots. The example displays how the data collection was carried out for the phase 1 of the pilots, which only involved the Athens' demo site:

**Table 20: Data collection per each KPI example**

| **Pilots Phase 1: Athens Demo site** | | |
|---|---|---|
| **IP4 Functionality** | **Operational KPI** | **Mean to collect data** |
| *Asset manager* | Number of "IP4 Service types" covered by the services per each TSP | Asset Manager database |
| *Journey Planning* | Average number of modes involved in the journey | Sharing access to the THALES' Collaborative space portal |
| | Average number of shopped offers | |
| *Booking* | Number of booked offers | |
| *Issuing* | Number of issued offers | |
| *Location Based Experience (LBE)* | Number of entertainment services offered | Sharing file from CS GROUP data base |
| | Number of experiences launched during the demo | |
| | Average time of connection | |
| | Total number of connections | |

After each pilot, the CFMs will send the information to repositories provided by the IP4MaaS project. 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 states in the respective section, all the KPIs will be dimensionless. They will be handled to calculate the Efficiency rate (currently renamed Effectiveness) as detailed both in the GA and the D3.1 [6] by dividing the maximum value belonging to each specific KPI, getting a dimensionless value between 0 and 1. Specifically, the raw data collected and stored will be used to calculate the KPIs. Then those measured units will be converted into a KPI that is dimensionless and can take a value that ranges between the minimum 0 and the maximum 1 [6], by conducting a division between the measuring unit and the biggest value measured for each specific KPI linked to a specific functionality among those demonstrated in the particular demo site, all the User Journeys and all the TSPs. Thus, the higher the value (closer to 1), the better. The value "1" will indicate that the particular functionality is fully operational all the time, efficient, and has been used by all the users.
D3.1 can be consulted for a complete overview of the KPIs, from their identification and definition to the methodology of evaluation, as well as D3.2 for the final list of KPIs (due end of April 2022). In D3.2, the rate has been updated and renamed Effectiveness.

Meanwhile, the data from the USI questionnaires will also be assessed and analysed, in accordance with each participant's profile vector (gender, income level, living area, traveling with dependency, professional status, disability or impairment and familiarity with technology) that he/she fills in the questionnaire (concerning GDPR regulations). Please note that within WP3, a method was also established to define user groups based on specific socio-demographic profiles, as well as criteria to define user groups with special needs and expectations to build up equity for all people to have acceptable accessibility to transport systems.

Apart from assessing the users' satisfaction regarding the demonstrated technologies, those questionnaires and the outcome of their assessment will assist in predicting future usages and innovations for the IP4 technologies and the discovery of fields that can be further improved and enhanced. They will also enable us to calculate the effectiveness of specific technological innovations (interoperability framework, travel companion app) to match the needs and expectations of the user profiles and those of specific TSPs.

The involved TSPs all together for all six demonstration sites are 14; the target is for all TSPs to fill in the respective surveys. Regarding the travellers, a targeted number of travellers engaged in the demonstrations and in the conversational survey is approx. 900-1200 (estimated 150-200 per demo site on average). Please also consult D4.4 regarding user engagement.

The measured KPIs, the USI questionnaires and the evaluation of their outputs through the *Effectiveness* metric 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 for multiple profiles for each technological innovation of COHESIVE and for each TSP.

## 7.6 Key KPIs per IP4MaaS F-REL Objectives

In the following Table 21, certain KPIs are listed, as well as the Target Value per KPI and the way those will be measured. It is a specific target list of KPIs and their metric for the F-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 [7], in Annex I – Part B, under section 2.1.2. The values, as mentioned above, have been considered, meaning the number of participating TSPs, the expected number of engaged users, and the margin of doubt regarding their actual participation in both testing the services and filling in the surveys. The targeted commuters differ from demo site to demo site since each has a slightly different objective. For more information regarding the exact objectives for each demo site, please consult D2.3, and for more information regarding the targeted end users, please consult the High-Level Journeys tables in section 7.3.

**Table 21: Key KPIs (F-REL)**

| KPI | UNITS | TARGET VALUE | MEASUREMENT |
|---|---|---|---|
| Successfully onboarded TSPs by CFMs | Number of TSPs | 14 TSPs | Measured through the KPIs of D6.1 “Assessment methodology” (due M21) |
| Execution of envisioned demonstration in all demo sites | Demo site | Six demo sites | Measured through the KPIs of D6.1 “Assessment methodology” (due M21) |
| Successful execution of dissemination activity | Number of workshops | One event, UITP Global Summit (4-7 June 2023, Barcelona) | The plan is reported in D7.2 “Dissemination and communication strategy and activities” Material from the event |
| Successful organization of local dissemination events | 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 (travelers) | Approx. 200 travelers engaged, and USI surveys filled in per demo site, in total min. 900 USIs filled in. USIs from all TSPs to be collected | Measured in T6.3 “Impact assessment” (M24-M31) and reported in D6.3 “Performance and impact assessment” (due M31) |
| Average effectiveness rate of each use-case | Effectiveness rate | Calculation of the effectiveness rate for at least the total | The measurement will be conducted through the methodology developed in D3.2 “List of operational KPIs, analysis of the users’ |

| | | | |
|---|---|---|---|
| | | number of Use Cases (High-Level Journeys) of all sites | satisfaction and methodology as a whole, F-REL" and reported in D6.3 "Performance and impact assessment" (due M31) |

## 7.7 Summary

This section presents the final list of the functionalities to be demonstrated in the 2nd phase in all demo sites after considering the technical requirements, the available services of the Operators in IP4MaaS, and the TO-BE Scenarios. “Yes” indicates that either the functionality has been successfully integrated and all data and documentation have been provided and updated in the Asset Manager, or it is passive and requires no effort from the side of TSPs. The indication “On Analysis” means that some requirements have been fulfilled and that the CFMs, in collaboration with the TSPs, are working on finding a solution to overcome some technical difficulties for the functionality to be 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 22** is formulated according to the most recent updates and information the IP4MaaS partners have collected regarding the demo situation. The services that any TSP from any demonstration site will not demonstrate have been completely removed; thus, **Table 22** includes those that will be demonstrated by at least one TSP. **YES** means it will be demonstrated (technical requirements are fulfilled), **NO** implies that it won’t (technical requirements not fulfilled), and **N/A** means that this service was non-applicable for that certain TSP. NO implies that the interest for the respective functionality was too low for that service to be demonstrated, i.e., it would not benefit the TSPs/passengers and did not fit in the demo site’s objectives.

**Table 22: Functionality Matrix and Status**

| | | Osijek | | Warsaw | | | Liberec | Barcelona | | | Padua | | Athens | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | IP4 Technologies | GPP PT | GPP SM | ZTM | MZA | TW | KORID | TMB | BusUp | AMTU | Trenitalia | Busitalia | OASA | MIRA KLIO | Brain box | Taxi way |
| 1 | Journey Planner/Offer Builder | YES | NO | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES |
| 2 | Booking | N/A | NO | N/A | N/A | N/A | YES | N/A | YES | NO | YES | N/A | N/A | N/A | YES | YES |
| 3 | Issuing | NO | NO | NO | NO | NO | YES | NO | NO | NO | YES | NO | YES | N/A | YES | YES |
| 5 | Mobility packages | N/A | N/A | NO | NO | NO | NO | NO | YES | YES | NO | NO | YES | N/A | YES | YES |
| 6 | Validation and Inspection | NO | N/A | NO | NO | NO | YES | NO | NO | NO | NO | NO | YES | N/A | YES | YES |
| 7 | Trip tracking | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 8 | Alternative calculation | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 9 | Location based experiences | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| 10 | Navigation | YES | YES | YES | YES | YES | YES | YES | YES | NO | YES | YES | YES | YES | YES | YES |

| | | Osijek | | Warsaw | | | Liberec | Barcelona | | | Padua | | Athens | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | IP4 Technologies | GPP PT | GPP SM | ZTM | MZA | TW | KORID | TMB | BusUp | AMTU | Trenitalia | Busitalia | OASA | MIRA KLIO | Brain box | Taxi way |
| 11 | Travelers' feedback | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 12 | Trip sharing | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 14 | Travel Arrangement | NO | NO | YES | YES | YES | YES | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| 15 | Travel companion Web-Portal | NO | NO | NO | NO | NO | YES | NO | YES | NO | NO | NO | YES | YES | YES | YES |
| 16 | Guest user | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 17 | Preferences and Profiles | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 20 | Travel Companion for Kids | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO | NO | NO | NO |
| 21 | Asset manager | NO | NO | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES | YES |
| 22a | CMMP | N/A | N/A | NO | NO | NO | NO | YES | YES | YES | NO | NO | NO | N/A | YES | YES |
| 24 | LBE editor | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| P1 | Digital Onboarding | NO | NO | YES | YES | YES | NO | YES | YES | YES | NO | NO | NO | NO | NO | NO |

| | | Osijek | | Warsaw | | | Liberec | Barcelona | | | Padua | | Athens | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | IP4 Technologies | GPP PT | GPP SM | ZTM | MZA | TW | KORID | TMB | BusUp | AMTU | Trenitalia | Busitalia | OASA | MIRAKLIO | Brainbox | Taxiway |
| P5 | New Functionalities Web Portal | NO | NO | NO | NO | NO | **YES** | NO | **YES** | NO | NO | NO | **YES** | **YES** | **YES** | **YES** |
| P6 | New Functionalities CMMP | **N/A** | **N/A** | NO | NO | NO | NO | **YES** | **YES** | **YES** | NO | NO | NO | **N/A** | **YES** | **YES** |
| P7 | CRM Portal | **YES** | **YES** | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO |
| P8 | Collaborative Space (traveler) | NO | NO | **YES** | **YES** | **YES** | NO | **YES** | **YES** | **YES** | **YES** | **YES** | NO | NO | NO | NO |
| P9 | Collaborative Space (TSP) | NO | NO | **YES** | **YES** | **YES** | NO | NO | NO | NO | **YES** | **YES** | NO | NO | NO | NO |
| A1 | Trip Planning Hierarchy | **YES** | **NO** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **NO** | **YES** | **YES** | **YES** | **YES** |
| A2 | Map Content | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | **YES** | **YES** | **YES** | **YES** |
| A3 | Smart Locations | NO | NO | NO | NO | NO | **YES** | NO | NO | NO | NO | NO | **YES** | **YES** | **YES** | **YES** |
| A5 | Improved Intermodal Travel | **YES** | **NO** | **YES** | **YES** | **YES** | **YES** | NO | NO | **YES** | NO | NO | **YES** | **YES** | **YES** | **YES** |
| A6 | Improved Travel Shopping | **YES** | **NO** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **YES** | **NO** | **YES** | **YES** | **YES** | **YES** |

| | | Osijek | | Warsaw | | | Liberec | Barcelona | | | Padua | | Athens | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | IP4 Technologies | GPP PT | GPP SM | ZTM | MZA | TW | KORID | TMB | BusUp | AMTU | Trenitalia | Busitalia | OASA | MIRA KLIO | Brain box | Taxi way |
| A7 | Individual Last Mile | YES | NO | YES | YES | YES | YES | NO | NO | YES | NO | NO | YES | YES | YES | YES |
| A8 | LBE Score Sharing | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| A10 | Specific Messages | NO | NO | YES | YES | YES | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| A11 | Travelers Orchestration and Supervision | NO | NO | YES | YES | YES | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| A15 | Distributed Ledger – Transaction Anchoring | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | YES | YES | YES |
| S3 | Adding Travel Shopping Service to TSP | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO |
| S5 | Update Travel Shopping Data for TSP | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | YES | NO | NO | NO | NO |

| | | Osijek | | Warsaw | | | Liberec | Barcelona | | | Padua | | Athens | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # | IP4 Technologies | GPP PT | GPP SM | ZTM | MZA | TW | KORID | TMB | BusUp | AMTU | Trenitalia | Busitalia | OASA | MIRAKLIO | Brainbox | Taxiway |
| S6 | Distributed Ledger – TSP Inclusion | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | NO | **YES** | **YES** | **YES** | **YES** |
| S7 | Intermodal Fare Optimization | **NO** | **NO** | **YES** | **YES** | **YES** | NO | NO | NO | NO | NO | NO | **YES** | **N/A** | **YES** | **YES** |

# 8 Demonstration execution roles and timeline – (2nd Demo Phase)

After identifying 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 assigned to all the entities that have an active role in the demonstrations.

The activities that will be performed are separated into six 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 to adjust their start dates and duration. This resulted in a more realistic and feasible schedule for the IP4 Consortium and the CFM partners.

## 8.1 Demonstration preparation and execution phases

The six demonstration phases are presented in Table 23Table 23. The duration of each phase has been estimated as accurately as possible, given that many factors can influence the processes involved, i.e., expiration of GTFS data, issues, bugs, etc., or any other unforeseen occurrence that may arise. Therefore, the Management Committee monitors and constantly checks the Risk Registry and updates accordingly and/or implements the appropriate mitigation measures in collaboration with all partners, while the Data and Integration Committees, along with WP4 and WP5, ensure that the transfer of knowledge is conducted swiftly and efficiently with the CFMs, to tackle any of the arising issues. The depiction of the phases has been adjusted and is aligned with the roadmap the CFMs provided (see Figure 3) and can be seen in Figure 6 in section 8.2.

**Table 23: 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. At this stage the Committees have the duty to facilitate the exchanges of information, ensure everyone is up to date, all exchanges are clear and conducted in a timely manner among all partners and CFMs involved. | 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. The Asset Manager is to be kept up-to-date and all technical requirements of each component to be assessed and fulfilled in order for these components to be integrated later on and, in the end, | This phase will monitor the progress of the technology integration plan, facilitate the communication, data exchange, and coordination between CFMs, demo leaders, and TSPs, maintain and update a technical activities' backlog and resolve any integration problem that may arise. The Asset Manager will be the primary tool utilized for a smooth exchange of information; WP4 and WP5 Leaders will ensure all their relevant tasks are being conducted promptly and support each other-coordinate accordingly. The Committees facilitate all exchanges of information | 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. At first, the CFMs will conduct tests by using the test cases the demo sites have provided and resolve issues that may arise. Then the first .apk of the Travel Companion will be provided for the demo leaders and TSPs to test, provide feedback, and report | This phase includes all the activities required before the demo execution: the user engagement, the delivery of the application to be used (.apk), along with User Guide and Terms & Conditions documents, the exact planning and timeline of the activities, and the preparation of the questionnaire for the participants, end users and TSPs alike. During this phase, a checklist is being compiled and checked regularly within meetings with WP4 and WP5 Leaders, the respective demo leader, and TSPs for each demo site. | This phase includes the demo execution activities and the data collection that will be used in WP6 for the assessment of the demonstrations. The Travellers and TSPs USIs are to be filled in and collected, the data to be stored during the pilots in the CFMs' repositories; at the end of the demonstrations, the incentives are to be provided to all engaged end users that |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | demonstrated in the respective demo sites. | and support the respective processes. | bugs via a platform the CFMs will provide to assess and resolve. Then the final .apk of the app will be provided for the demo site partners to conduct tests and ensure that this final version is functioning correctly prior to distributing it to the public to use during the demonstration. | | participated and provided their feedback via the USI questionnaires. |
| ***Time (approx..)*** | 6 weeks | 10-12 weeks | 7-8 weeks | 4 weeks | 4 weeks | 1-2 weeks |

The following sections 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 5).

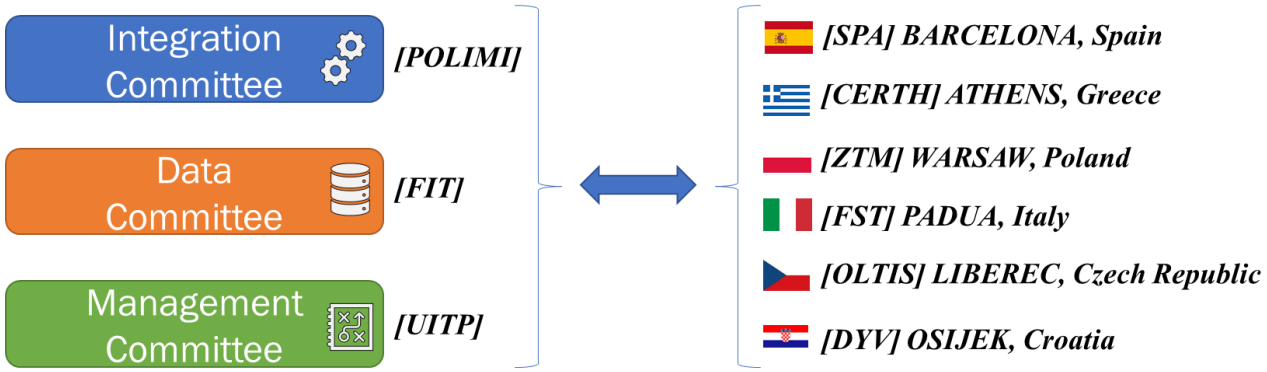


**Figure 5: IP4MaaS Committees and Demo Sites**

The Committees' role is described in Table 24: Integration Committee role, Table 25: Data Committee role, and Table 26: Management Committee role.

**Table 24: 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<br>• Keep the Technology Integration Plan up to date (requirements, specific tasks, risks)<br>• Facilitate communication and coordination between CFMs and demo partners<br>• Organise periodic meetings with demo partners<br>• Organise workshops between CFMs and TSPs<br>• Present the Technology Integration Plan to CFMs and demo partners and inform | • Monitor the preparatory development activities<br>• Ensure the implementation of the necessary tasks<br>• Facilitate communication and coordination between CFMs and demo partners<br>• Execute periodic meetings with demo partners<br>• Execute workshops between CFMs and TSPs<br>• Identify problems and track issues both from the CFMs' side and demo partners' side<br>• Transfer knowledge across demo sites | • Monitor the progress of the Technology Integration<br>• Facilitate communication and coordination between CFMs and demo partners regarding integration tasks<br>• Execute periodic meetings with demo partners<br>• Execute workshops between CFMs and TSPs<br>• Identify problems and track issues both from the CFMs' side and demo partners' side<br>• Transfer knowledge across demo sites<br>• Maintain a backlog of integration activities for all demo partners<br>• Collect information regarding | • Resolve integration issues that may arise<br>• Report to Management Committee | • Resolve integration issues that may arise<br>• Report to Management Committee | • Resolve integration issues that may arise<br>• Report to Management Committee |

| | | | | | | |
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| | them in detail about the next steps<br>• Report to Management Committee | • Maintain shared documentation for integration activities<br>• Report to Management Committee | obstacles determined for integrating technologies and provide it to T4.1 to update the Technology Integration Plan and WP2 to update requirements and scenarios.<br>• Report to Management Committee | | | |

**Table 25: 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<br>• Create shared documentation (e.g., using SVN or SharePoint), allowing demo partners and CFMs to log information<br>• Monitor data requirements and availability from CFMs and TSPs<br>• Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations<br>• Update the backlog with the progress of data exchanges<br>• Update and fine-tune the KPIs of TSPs and travellers:<br>- Retrieve data sources for updating KPIs<br>- Fine-tune performance KPIs<br>- Determine the final list of KPIs and impact indicators for each demo site<br>- Align the KPIs across all demo sites<br>- Assess the feasibility of measurement and success-showing potential<br>• Co-create and participate in user engagement workshops to facilitate data exchange<br>• Report to Management Committee | • Facilitate data exchange between TSPs and CFMs' technology providers<br>• Maintain shared documentation<br>• Monitor data requirements and availability from CFMs and TSPs<br>• Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations<br>• Update the backlog with the progress of data exchanges<br>• Align IP4 data requirements with TSP data availability<br>• Participate in user engagement workshops to facilitate data exchange<br>• Report to | • Facilitate data exchange between TSPs and CFMs' technology providers<br>• Maintain shared documentation<br>• Monitor data requirements and availability from CFMs and TSPs<br>• Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations<br>• Update the backlog with the progress of data exchanges<br>• Align IP4 data requirements with TSP data availability<br>• Participate in user engagement workshops to facilitate data exchange<br>• Report to | • Facilitate data exchange between TSPs and CFMs' technology providers<br>• Maintain shared documentation<br>• Monitor data requirements and availability from CFMs and TSPs<br>• Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations<br>• Update the backlog with the progress of data exchanges<br>• Report to | • Validate the User Satisfaction Index survey<br>• Validate the final list of KPIs to be monitored and the subject of performance assessment in WP6 across all pilot sites<br>• Validate user engagement plan/strategies (provided by WP4)<br>• Organise data collection activities during demonstrations<br>• Maintain shared documentation<br>• Monitor exchanges between CFMs and TSPs and disseminate the knowledge to other demo locations<br>• Update the backlog with the progress of data exchanges<br>• Report to Management Committee | • Conduct the User Satisfaction Index survey<br>• Collect data during demonstrations<br>• Provide data collected to be used by WP6<br>• Provide the data exchanges backlog to WP4 for reporting<br>• Report to Management Committee |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Management Committee | Management Committee | Management Committee | | |

**Table 26: 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<br>• Timeline supervision<br>• Monitor the risk management plan regarding demos' execution, implementation of mitigation actions, and activation of contingency plans<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate the execution of workshops<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)<br>• Collaborate and co-plan activities with the outreach pillar<br>• Collaborate with other projects (e.g., CFMs, Ride2Rail)<br>• Monitor Integration and Data Committees' activities | • Monitor the execution of the activities planned<br>• Timeline supervision<br>• Manage risks, implement mitigation actions, and activate contingency plans (if needed)<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate the execution of workshops<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)<br>• Collaborate and co-plan activities with the outreach pillar<br>• Collaborate with other projects (e.g., CFMs, | • Monitor the execution of the activities planned<br>• Timeline supervision<br>• Manage risks, implement mitigation actions, and activate contingency plans (if needed)<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate the execution of workshops<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)<br>• Collaborate and co-plan activities with the outreach pillar<br>• Collaborate with other projects (e.g., CFMs, | • Monitor the execution of the activities planned<br>• Timeline supervision<br>• Manage risks, implement mitigation actions, and activate contingency plans (if needed)<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs) | • Monitor the execution of the activities planned<br>• Timeline supervision<br>• Manage risks, implement mitigation actions, and activate contingency plans (if needed)<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)<br>• Collaborate with | • Monitor the execution of the activities planned<br>• Timeline supervision<br>• Manage risks, implement mitigation actions, and activate contingency plans (if needed)<br>• 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<br>• Intervene to resolve barriers that might emerge<br>• Coordinate actions between the different stakeholders of the demos (Committees, Demo Leaders, CFMs, TSPs)<br>• Collaborate and co-plan activities with the outreach pillar<br>• Collaborate with |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Ride2Rail)<br>• Monitor Integration and Data Committees' activities | Ride2Rail)<br>• Monitor Integration and Data Committees' activities | • Monitor Integration and Data Committees' activities | other projects (e.g., CFMs, Ride2Rail)<br>• Monitor Integration and Data Committees' activities | other projects (e.g., CFMs, Ride2Rail)<br>• Monitor Integration and Data Committees' activities |

### 8.1.2 CFM project partners

CFMs' role is described in Table 27.

**Table 27: 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.<br>• Communicate with TSPs, Demo Leaders, and Committees<br>• Exchange data with TSPs<br>• Participate in workshops | • Execute the preparatory development tasks<br>• Communicate with TSPs, Demo Leaders, and Committees<br>• Exchange data with TSPs<br>• Participate in workshops<br>• Update User Guide or any other documents if necessary | • Execute the integration tasks<br>• Communicate with TSPs, Demo Leaders, and Committees<br>• Exchange data with TSPs<br>• Participate in workshops | • Support the resolution of the integration issues that may arise<br>• Communicate with TSPs, Demo Leaders, and Committees<br>• Check issues blocking the pilots, analyse and implement fixes if and wherever needed | • Deliver the latest version of the Travel Companion, along with the User Guide, instructions, and any additional material (i.e., LBE .apk) | • Stay in contact with TSPs and demo leaders, exchange information, and monitor the issues that may arise and be reported in the provided bug log.<br>• Collect data in the repositories to provide after the end of the pilots for the measurement of KPIs and assessment |

### 8.1.3 TSPs

TSPs' role is described in Table 28.

**Table 28: TSPs' role**

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

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

### 8.1.4 Demo Leaders

Demo Leaders' role is described in Table 29.

**Table 29: 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<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for the demo sites<br>• Provide information and | • Facilitate communication between CFMs and TSPs<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for the demo sites<br>• Provide information | • Facilitate communication between CFMs and TSPs<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for the demo sites<br>• Provide information | • Facilitate communication between CFMs and TSPs<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for | • Facilitate communication between CFMs and TSPs<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for | • Facilitate communication between CFMs and TSPs<br>• Have a clear picture of the situation (requirements, resources, constraints) in the demo sites<br>• Act as a link and provide all the necessary information about the demo sites to CFMs and Committees<br>• Coordinate actions within demo sites<br>• Monitor the execution of the activities planned for |

| | | | | | | |
|---|---|---|---|---|---|---|
| | feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites | and feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites | and feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites | the demo sites<br>• Provide information and feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites | the demo sites<br>• Provide information and feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites<br>• Provide updates during the meetings with WP4-WP5 Leaders regarding the progress of preparations and the respective site's checklist | the demo sites<br>• Provide information and feedback to the Committees to be shared across all demo sites<br>• Identify and resolve issues within demo sites |

### 8.1.5 WP4 and WP5 Leaders

WP4 & WP5 Leaders' role is described in Table 30.

**Table 30: 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<br>• Co-create and participate in user engagement workshops<br>• Receive input to update the Demonstration Execution Plan for the second phase of the demonstrations<br>• In collaboration with WP5, organize and facilitate a meeting for the exchange of | • Monitor the Operation of the Committees<br>• Participate in user engagement workshops to facilitate data exchange<br>• Participate in meetings, provide information regarding the Demonstration Execution Plan, and communicate information to all partners involved. | • Monitor the Operation of the Committees<br>• Participate in user engagement workshops to facilitate data exchange<br>• Participate in meetings, provide information regarding the Demonstration Execution Plan, and communicate information to all partners involved. | • Monitor the Operation of the Committees<br>• Participate in meetings, provide information regarding the Demonstration Execution Plan, and communicate information to all partners involved.<br>• Support the WP5 and the demo leaders and TSPs' exchange of information if needed | • Monitor the Operation of the Committees<br>• Participate in meetings, provide information regarding the Demonstration Execution Plan, and communicate information to all partners involved.<br>• Support the WP5 and the demo leaders and TSPs' exchange of information if needed | • Monitor the Operation of the Committees<br>• Ensure the Demonstration Execution Plan is being followed<br>• Participates in meetings and supports WP5 if needed |

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| | knowledge and experience between Athens that conducted the C-REL demonstration and the rest of the demo sites | • Support the WP5 and the demo leaders and TSPs' exchange of information if needed | • Support the WP5 and the demo leaders and TSPs' exchange of information if needed | | • Participate and support WP5 during the preparatory meetings before the demonstrations | |
| ***WP5*** | • Coordinate on a technical and organizational level the demonstration executions, both internally (among the six demonstration sites) and externally (with complementary IP4 projects)<br>• Inform each pilot site about the requirements, goals, benefits, barriers, expectations, and components to be demonstrated.<br>• Inform CFM projects about each PTO and TSP's limitations, barriers, constraints, and capabilities.<br>• Ensure the proper implementation of the Demonstration Execution Plan and the Technology Integration Plan<br>• Organise workshops for IP4 consortia and TSPs to determine solutions for effective execution of the demonstrations<br>• Understand and map | • Monitor the in-house development tasks<br>• Ensure the proper implementation of the Technology Integration Plan<br>• Organise workshops for IP4 consortia and TSPs to determine solutions for effective execution of the demonstrations<br>• 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.<br>• Support CFM projects in troubleshooting operational issues with connection to APIs and services of PTOs and TSPs<br>• Support TSPs, Demo Leaders, and Committees | • Monitor the integration tasks<br>• Ensure the proper implementation of the Technology Integration Plan<br>• Organise workshops for IP4 consortia and TSPs to determine solutions for effective execution of the demonstrations<br>• 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.<br>• Support CFM projects in troubleshooting operational issues with connection to APIs and services of PTOs and TSPs<br>• Support TSPs, Demo Leaders, and Committees | • Monitor the testing execution<br>• Resolve issues across and within demo sites<br>• Transfer knowledge across demo sites<br>• Support TSPs, Demo Leaders, and Committees<br>• Organize and facilitate meetings with demo site partners in order to ensure the respective checklist is being constantly updated, the status of each procedure is being properly logged, deadlines are being respected, roles for all partners are clear, the preparatory actions are being followed, and all information is swiftly and communicated to all involved<br>• Coordinate actions within demo sites | • Organise in detail the demonstration execution<br>• Carry out the actions determined in the user engagement strategy by D4.4<br>• Coordinate actions within demo sites<br>• Transfer knowledge across demo sites<br>• Support TSPs, Demo Leaders, and Committees | • Monitor the demonstration execution<br>• Meetings with PTOs and TSPs to gather their feedback during the demonstration execution<br>• Meetings with CFMs to disseminate feedback from PTOs and TSPs<br>• Coordinate actions within demo sites<br>• Support TSPs, Demo Leaders, and Committees |

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| | the business logic of PTOs and TSPs (policies and practices)<br>• Analyse legal framework in countries of the demonstration sites.<br>• Determine and implement data sharing schemes between CFMs and TSPs<br>• Support WP2 with the API documentation<br>• In collaboration with WP4, organize and facilitate a meeting for the exchange of knowledge and experience between Athens that conducted the C-REL demonstration and the rest of the demo sites | | | | | |

## 8.2 F-REL Demonstrations' Timeline

The timeline for all six demonstration sites is shown in Figure 3 in Section 0; the following Figure 6 depicts the six demo phases as described in the previous section. The timeline has been depicted in the following figure, also respecting the timeline provided by the CFMs, which we saw in Figure 3. Specific preparatory actions, both technical and administrative, have already been, conducted to a certain degree since the deadline for the provision of data, documentation, etc. was end of April 2022. Until the time the F-REL demonstrations start, the Asset Manager's stored information, such as credentials, GTFS data, APIs, documentation, etc., needs to be updated whenever it is required. The first two stages are crucial and determine the feasibility of integrating the functionalities stated in Table 22. The demonstration sites are expected to complete their objectives as stated in this document and in D2.2 and D2.3, as well as enrich multimodality by integrating, in most cases, multiple Operators with various means of transport in a single application, the Travel Companion.

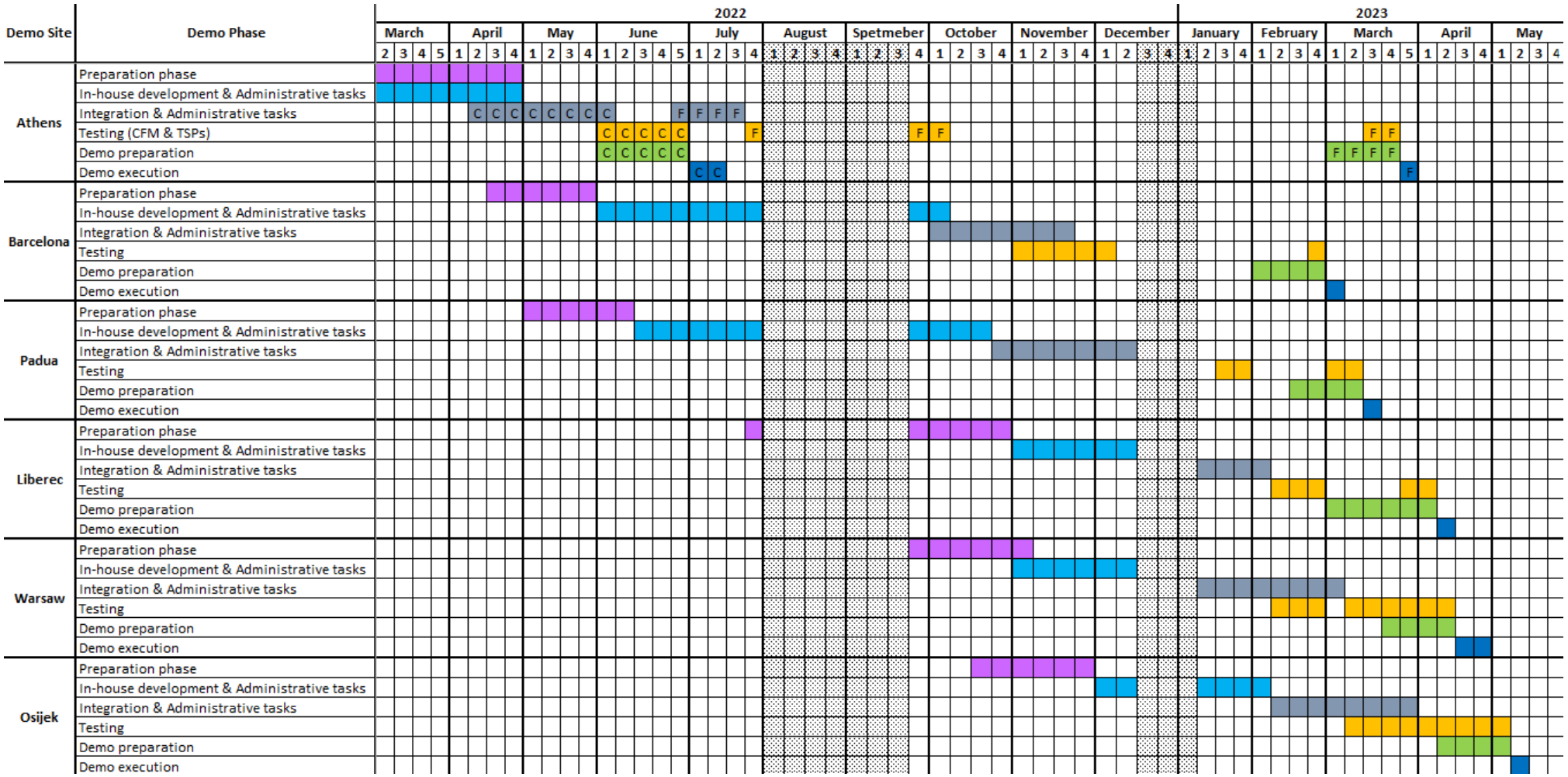


**Figure 6: F-REL Demos Timeline**

# 9 Risks and Mitigation Measures

This deliverable aims to create a list of identified risks, mitigation measures, and contingency plans for executing the IP4MaaS demos. Specifically, risk management aims to reduce the probability and 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 31: Risks, Mitigation Measures, and Contingency Plans.

**Table 31: 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 properly planning 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 a 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 adaptations 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* | Integration Phase | All | High | **RM:** The Integration Committee will maintain and update a technical activities' backlog |

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| | *IP4 technologies due to issues arising during the Integration and Testing Phase* | | | | **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 with 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 in 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 essential-critical information and cover as many people as possible |
| | | | | | **CP:** Test the technologies with the users that are more affluent in English**.** Organize an event at each demo site before 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. |

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| 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 technology implementation and usage benefits to convince all TSPs' departments of the added value of IP4MaaS pilots.<br>**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 toward 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 execution in IP4MaaS.<br>**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<br>**CP**: Demonstrate the feasibility of booking a seat at BusUp but not allowing 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)<br>**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.<br>**CP:** The functions that require these services will not be demonstrated at the Athens demo site. |
| 19 | *Issues identified at a later stage in the F-REL pilots that have not been fully analyzed in D.2.2* | In-house Development, Integration Phase, Demo Preparation | Osijekk Warsaw Liberec | Medium | **RM:** The Management Committee of the project constantly monitors the demo sites and all phases of the demonstrations, and will also facilitate collaboration meetings, if necessary, between CFMs and demo leaders-TSPs.<br>**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 D4.3 “Demonstration Execution Plan, F-REL” of the IP4MaaS project. The document's primary objective is to create a detailed plan, which will guide the execution of the F-REL Demonstration for all six demo sites: Osijek, Warsaw, Liberec, Barcelona, Athens, and Padua. This deliverable has provided a summary of the information collected from D2.1, D2.2, D2.3, D3.1, and D3.2, regarding the 2nd Demo Phase and a detailed plan of the activities to be performed.

Precisely, the deliverable summarises for the demo site of the 2nd 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 respective Demo Site Leader, which will coordinate the demo site. The Committees will have a very active role during the demonstrations, 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 monitor the demonstrations’ execution overall, while WP4 Leaders will have a supportive role. CFMs will perform mainly the development and integration tasks.

D4.3 also includes a timeline, as well as risks, mitigation measures, and contingency plans for the demonstrations.

D4.3 “Demonstration Execution Plan, F-REL,” which is a revision of D4.2, “Demonstration Execution Plan, C-REL”, enriched, adapted, and updated accordingly so it will provide, combined with the Technology Integration Plan (D4.1), a holistic plan for coordinating and executing all the F-REL demonstrations of IP4MaaS. It has been compiled and enriched to such an extent and in such detail so that it may reflect changes in demonstration requirements (i.e., new releases, new integration activities, changes in timelines, changes regarding the KPIs etc.), amend issues, and focus completely on F-REL demonstrations. D4.3 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 Annex 1

**Table 32: IP4 technologies and their technical requirements (full list)**

| ID | IP4 Technologies | Technical Requirements |
|---|---|---|
| **1** | Journey Planner / Offer Builder | Public Transport (GTFS)<br>Shared Mobility (Service Areas: multi-polygon GeoJSON)<br>Basic mode of transport (car, bike)<br>Journey Planner web-service (API)<br>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) allows listing available services, book said services (optional)<br>& issue available services |
| **5** | Mobility packages | Usage of Shift2Rail operator's 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 the 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.<br>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 | It will be provided from CFMs to the TSPs that wish to try it. |

| | | |
|---|---|---|
| **25** | Inspection with Fraud Control | Issuing service integrated<br>QR Code (UIC or VDV)<br>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 (Traveler) | N/A |
| **P9** | Collaborative Space Portal (TSP) | N/A |
| **A1** | Trip Planning Hierarchy | GTFS Data<br>Journey Planning API |
| **A2** | Dynamic Display of Map Content | POIs (CSV, ESRI-Shape, GeoJSON, XML) |
| **A3** | Smart Locations | Stations (GTFS format)<br>Optional: Addresses, POIs |
| **A5** | Improved Intermodal Travel | GTFS Data<br>Journey Planning API |
| **A6** | Improved Travel Shopping | GTFS Data<br>Journey Planning API |
| **A7** | Individual Last Mile | GTFS Data<br>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<br>3D plan of the station<br>2D plan of the station<br>List of the station's POIs or meeting POIs |
| **A10** | Specific Messages | Use Orchestration and Supervision Tool |
| **A11** | Travelers Orchestration and Supervision | Use Orchestration and Supervision Tool |
| **A12** | Siri SX based pTT | TSP integrated to TD 4.2 and 4.3 demonstrators<br>Siri-SX event source, notifying network perturbations (Siri 2.0 Siri-SX compliant, using only mandatory fields)<br>Transport network description (GTFS)<br>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,<br>Metadata structure (optional),<br>Embodiment configuration information |
| **S2** | Event Detection | Real Time Events (format TBD*) |

| | | |
|---|---|---|
| **S3** | Plan Data Provisioning for TSPs | TBD* |
| **S4** | Incident Messages | GTFS Data<br>Journey Planning API<br>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 Annex 2

**Table 33: Test Cases - Athens**

| | | |
|---|---|---|
| Test description | Name | Journey planning, including OASA (Metro) |
| | ID (UC_ID/TC_ID) | ATHENS_TC_01 |
| | (Short) description | The user asks for a journey including Metro |
| | Test case responsible | CERTH AND OASA |
| | Pre-condition(s) | The user needs to have an account and needs to be logged in<br>The user asks for a journey that includes the metro mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Kerameikos Metro Station, Athens<br>Stop: "The Mall Athens" (38.04493964537796, 23.790406347004854).<br>Nearest metro station: Neratziotisa metro St. |
| | Expected Result | Mobility Response, including Public Transport |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |

| | | |
|---|---|---|
| Test description | Name | Journey planning, including OASA (PT) |
| | ID (UC_ID/TC_ID) | ATHENS_TC_02 |
| | (Short) description | The user asks for a journey including public transport |
| | Test case responsible | CERTH AND OASA |
| | Pre-condition(s) | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes PT mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Palaio Faliro (Ag. Alexandrou Sq) (37.925714, 23.692029) (Nearest bus stop: Phloisbos)<br>Stop: Heraklion (Central Square near Metro Station Line 1 - 38.04650612190097, 23.766718510021896) |
| | Expected Result | Mobility Response, including Public Transport |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |

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|---|---|---|
| Test description | Name | Journey planning, including OASA (Bike- BrainBox) |
| | ID (UC_ID/TC_ID) | ATHENS_TC_03 |

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| | (Short) description | The user asks for a journey including a shared bike |
| | Test case responsible | CERTH, OASA & BRAINBOX |
| | Pre-condition(s) | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes bike mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Keramikos metro station<br>Stop: Army Monument to the Fallen Paratroopers (37.821651908362035, 23.77291938618505) (Nearest bus stops: Peuko 37.84267233669524, 23.757799563317505) |
| | Expected Result | Mobility Response, including Bike |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |

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|---|---|---|
| Test description | Name | Journey planning, including OASA (Taxiway) |
| | ID (UC_ID/TC_ID) | ATHENS_TC_04 |
| | (Short) description | The user asks for a journey including a taxi |
| | Test case responsible | CERTH & TAXIWAY |
| | Pre-condition(s) | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes taxi mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Port of Piraeus (nearest metro station: Piraeus)<br>Stop: Keramikos metro station |
| | Expected Result | Mobility Response, including Bike |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |
| | Notes | |

| | | |
|---|---|---|
| Test description | Name | Journey planning multimodal trip |
| | ID (UC_ID/TC_ID) | ATHENS_TC_05 |
| | (Short) description | The user asks for a journey including various modes |
| | Test case responsible | CERTH, OASA, TAXIWAY, MIRAKLIO |

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| | **Pre-condition(s)** | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes transportation to Athens |
| | **Trigger** | Search trip |
| | **Input Data Description** | Start 1: Keramikos station<br>Stop 1: Asomaton bus stop (37.97985540783483, 23.718636495846155)<br><br>Start 2: Asomaton bus stop (37.97985540783483, 23.718636495846155)<br>Stop 2: Omonoia bus stop (Omonoias bus stop 37.98328984817949, 23.72772757289707)<br><br>Start 3: Omonoia metro station<br>Stop 3: Heraklion metro station<br><br>Start 4: Heraklion metro station<br>Stop 4: OAED School (Iraklio (38.05706671550687, 23.774389791302173) |
| | **Expected Result** | Mobility Response includes multiple modes |
| | **Sequence** | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |

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|---|---|---|
| **Test description** | **Name** | **Journey planning multimodal trip, map selection** |
| | **ID (UC_ID/TC_ID)** | ATHENS_TC_06 |
| | **(Short) description** | The user asks for a journey including various modes, selecting points on the map |
| | **Test case responsible** | CERTH & TAXIWAY |
| | **Pre-condition(s)** | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes transportation in Athens |
| | **Trigger** | Search trip |
| | **Input Data Description** | Start 1: Port of Piraeus (nearest metro station: Piraeus)<br>Stop 1: Syggrou-Fix metro station |
| | **Expected Result** | Mobility Response including multiple modes |
| | **Sequence** | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button |

| | | |
|---|---|---|
| **Test description** | **Name** | **Book Taxiway offer** |
| | **ID (UC_ID/TC_ID)** | ATHENS_TC_07 |
| | **(Short) description** | Verify whether the result of booking an offer is shown in “My Trips” |

| | | |
|---|---|---|
| | Test case responsible | CERTH, TAXIWAY & OASA |
| | Pre-condition(s) | The user needs to have an account and needs to be logged in<br>User asks for a journey that includes taxi mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Keramikos Metro station<br>Stop El. Venizelos Airport |
| | Expected Result | 1) Offers with given date and time are displayed<br>2) Booking confirmation displayed in TC PA<br>3) Booking confirmation of trip with a TSP stored in “My Trips” in TC PA |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button<br>7) User selects journey to get offer<br>8) User books offer |

| | | |
|---|---|---|
| Test description | Name | Book BrainBox offer (fake book) |
| | ID (UC_ID/TC_ID) | ATHENS_TC_08 |
| | (Short) description | Verify whether the result of booking an offer is shown in “My Trips.” |
| | Test case responsible | CERTH, OASA, AND BRAINBOX |
| | Pre-condition(s) | The user needs to have an account and requires to be logged in<br>User asks for a journey that includes bike mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Municipality of Iraklio (Neo Iraklio) (Nearest metro station Heraklion)<br>Stop: Stavros Niarchos Foundation Cultural Center (SNFCC) (Nearest bus stops: Peisistratou or Ōnaseio) |
| | Expected Result | 1) Offers with given date and time are displayed<br>2) Booking confirmation displayed in TC PA<br>3) Booking confirmation of trip with a TSP stored in “My Trips” in TC PA |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button<br>7) User selects journey to get offer<br>8) User books offer |

| | | |
|---|---|---|
| | Name | Book BrainBox Issuing |

| | | |
|---|---|---|
| Test description | ID (UC_ID/TC_ID) | ATHENS_TC_09 |
| | (Short) description | Verify whether the result of booking an offer is shown in “My Trips” |
| | Test case responsible | CERTH, OASA & BRAINBOX |
| | Pre-condition(s) | The user needs to have an account and requires to be logged in<br>The user asks for a journey that includes bike mode |
| | Trigger | Search trip |
| | Input Data Description | Start: Keramikos district (nearest metro station: Keramikos)<br>Stop: “The Mall Athens” (38.04493964537796, 23.790406347004854).<br>Nearest metro station: Neratziotisa metro St. |
| | Expected Result | 1) Offers with a given date and time are displayed<br>2) Booking confirmation displayed in TC PA<br>3) Booking confirmation of trip with a TSP stored in “My Trips” in TC PA |
| | Sequence | 1) User starts journey planning module in Travel Companion<br>2) User enters Starting Point<br>3) User enters End Point<br>4) User enters Departure Date of Journey<br>5) User enters Departure Time of Journey<br>6) User starts request by pressing SEARCH-button<br>7) User selects journey to get offer<br>8) User books offer |

| | | |
|---|---|---|
| Test description | Name | LBE experience 1 MIRAKLIO |
| | ID (UC_ID/TC_ID) | ATHENS_TC_10 |
| | (Short) description | Verify if Location Based Experiences appear when the user selects "Experiences for me" along the journey in MIRAKLIO |
| | Test case responsible | AETHON, MIRAKLIO |
| | Pre-condition(s) | The user is logged in<br>The user has installed the experiences on the used mobile phone<br>The GPS is activated for the list of experiences to be displayed. |
| | Trigger | The user goes to the "Experiences for me" - Selects LBE |
| | Input Data Description | Journey with a TSP (MIRAKLIO's bus) providing LBEs along its route<br>Start: Metro station "Heraklion" (38.04636967615981, 23.766150357664614)<br>Stop: The municipal Football Court (38.054044881367616, 23.777525610279163) |
| | Expected Result | LBEs are displayed along the bus route to the user, from start to stop |
| | Sequence | 1) The user reaches OASA Station "Heraklion" metro station and boards off<br>2) The user chooses "Experiences for me"<br>3) The user walks 2 minutes from the metro station to bus stop "Town Hall" and boards the bus<br>4) The user along the journey clicks on the LBEs near him along the journey<br>5) The user boards off at "Gephyra" bus stop<br>6) The user walks 2 minutes from the "Gephyra" bus stop to the Municipal Football Court (38.054044881367616, 23.777525610279163) |

| | | |
|---|---|---|
| Test description | Name | LBE experience 2 PORT to CENTRE of ATHENS |
| | ID (UC_ID/TC_ID) | ATHENS_TC_11 |

| | | |
|---|---|---|
| | (Short) description | Verify if Location Based Experiences appear when the user selects "Experiences for me" along the journey around Athens |
| | Test case responsible | CERTH, OASA |
| | Pre-condition(s) | The user is logged in<br>The user has installed the experiences on the used mobile phone<br>The GPS is activated for the list of experiences to be displayed. |
| | Trigger | The user goes to the "Experiences for me" - Selects LBE |
| | Input Data Description | Journey with a TSP (OASA) providing LBEs along its route<br>Start: Port of Piraeus (nearest metro station: Piraeus)<br>Stop: Thisio metro station |
| | Expected Result | LBEs are displayed along the route to the user, from start to stop |
| | Sequence | 1) The user reaches the OASA metro station in Pireaus (metro station Piraeus)<br>2) The user chooses "Experiences for me"<br>3) The user walks and boards on the train<br>4) The user along the journey clicks on the LBEs near him along the journey<br>5) The user boards off at "Thisio" metro station |

| | | |
|---|---|---|
| Test description | Name | Trip Sharing |
| | ID (UC_ID/TC_ID) | ATHENS_TC_13 |
| | (Short) description | Share a trip with another User |
| | Test case responsible | |
| | Pre-condition(s) | The User has an account and is logged in.<br>The other User, as the receiver of the shared trip, has also an account.<br>There is a planned trip that the User wants to share. |
| | Trigger | The User wants to share a trip with another User |
| | Input Data Description | Other user e-mail address |
| | Expected Result | The User successfully shares a trip with another registered User. The other User receives a notification about the shared trip and can see the trip in their own “My trip” overview. |
| | Sequence | User uses the Personal Shopper to request and receive travel solutions<br>• User selects a travel solution to see the trip details<br>• User selects the “Share” button and enters the e-mail address of the registered user with whom this trip shall be shared<br>• The other User receives a notification about the shared trip<br>• In the “My trips” view of the Personal Application, the other User can see the shared trip under its own category |

| | | |
|---|---|---|
| Test description | Name | Guest User |
| | ID (UC_ID/TC_ID) | ATHENS_TC_14 |

| | | |
|---|---|---|
| | (Short) description | Use journey planning functionality without login |
| | Test case responsible | |
| | Pre-condition(s) | |
| | Trigger | |
| | Input Data Description | Start point in Athens<br>Stop point in Athens |
| | Expected Result | Successfully complete all the described steps, getting trip results |
| | Sequence | 1. User opens TC PA and uses it as a guest user by selecting SKIP LOGIN option<br>2. On sidebar menu, Persona A selects TRIP PLANNER tab and begins to search for a new a trip<br>3. Persona A inputs Starting Point, Destination Point, and Date and presses SEARCH |

**Table 34: Test Cases - Barcelona**

| No.[1] | Date [1] | TSP [1] | Functionality [2] | Origin [1] | Destination [1] | Departure [1] | Operator [1] |
|---|---|---|---|---|---|---|---|
| 1. | 19/05/2022 | TMB | Journey Planning | Pl. Catalunya | Santa Eulàlia | 24.6, 17:28 | TMB-metro |
| 2. | 19/05/2022 | TMB | Journey Planning | Maria Cristina | Pl. Catalunya | 27.6, 18:04 | TMB-metro |
| 3. | 19/05/2022 | TMB | Journey Planning | Còrsega - Llúria | Les Corts - Vallespir | 27.6, 13:45 | TMB-bus |
| 4. | 19/05/2022 | TMB | Journey Planning | Gran Via - Parc del Clot | Gran Via - Casanova | 28.6, 13:40 | TMB-bus |
| 5. | 19/05/2022 | TMB | Journey Planning | Les Corts | La Sagrada Familia | 1.7,14:48 | TMB-metro |
| 6. | 20/05/2022 | TMB | Journey Planning | Les Corts | Josep Tarradellas Barcelona-El Prat Airport | 2.7,14:50 | TMB-metro & Bus |
| 7. | 20/05/2022 | TMB | Journey Planning | Plaça d'Espanya | Josep Tarradellas Barcelona-El Prat Airport | 3.7, 14:50 | TMB-bus |
| 8. | 20/05/2022 | TMB | Journey Planning | Collblanc | La Pau | 5.7, 17:00 | TMB-metro |
| 9. | 20/05/2022 | TMB | Journey Planning | La Pau | Collblanc | 5.7, 17:02 | TMB-metro |
| 10. | 20/05/2022 | TMB | Journey Planning | Sants Estació | Llacuna | 11.7, 15.02 | TMB-metro |

1: To be filled out by OC

**Table 35: Test Cases - Padua**

| No. [1] | Date [1] | TSP [1] | Functionality [2] | Origin [1] | Destination [1] | Departure [1] | Operator [1] |
|---|---|---|---|---|---|---|---|
| 1. | 25/05/2022 | BusItalia Veneto | Journey Planning | Torri di Quartesolo | Venice | 25.05.2022 h 7.05 | BusItalia Veneto |
| 2. | 25/05/2022 | BusItalia Veneto | Journey Planning | Montegalda | Venezia | 25.05.2022 h 6.39 | BusItalia Veneto |
| 3. | 25/05/2022 | BusItalia Veneto | Journey Planning | Arcella | Loreggia | 25.05.2022 h 7.19 | BusItalia Veneto |
| 4. | 25/05/2022 | BusItalia Veneto | Journey Planning | Camposampiero | Arcella | 25.05.2022 h 7.40 | BusItalia Veneto |
| 5. | 25/05/2022 | BusItalia Veneto | Journey Planning | Padova | Venezia | 25.05.2022 h 7.42 | BusItalia Veneto |
| 6. | 25/05/2022 | BusItalia Veneto | Journey Planning | Torri di Quartesolo | Padova | 25.05.2022 h 7.45 | BusItalia Veneto |
| 7. | 25/05/2022 | BusItalia Veneto | Journey Planning | Vicenza | Padova | 25.05.2022 h 8.04 | BusItalia Veneto |
| 8. | 25/05/2022 | Trenitalia | Journey Planning | Treviso | Venezia | 25.05.2022 h 13.27 | Trenitalia |
| 9. | 25/05/2022 | Trenitalia | Journey Planning | Padova | Venezia | 25.05.2022 h 7.10 | Trenitalia |
| 10. | 25/05/2022 | Trenitalia | Journey Planning | Rovigo | Padova | 25.05.2022 h 7.27 | Trenitalia |
| 11. | 25/05/2022 | Trenitalia | Journey Planning | Rovigo | Venezia | 25.05.2022 h 8.08 | Trenitalia |
| 12. | 25/05/2022 | Trenitalia | Journey Planning | Vicenza | Venezia | 25.05.2022 h 8.03 | Trenitalia |
| 13. | 25/05/2022 | BusItalia Veneto | Journey Planning | Trebaseleghe | Padova | 25.05.2022 h 6.55 | BusItalia Veneto |
| 14. | 25/05/2022 | BusItalia Veneto | Journey Planning | Abano Terme | Padova | 25.05.2022 h 6.37 | BusItalia Veneto |
| 15. | 25/05/2022 | Trenitalia | Journey Planning | Camposampiero | Padova | 25.05.2022 h 7.16 | Trenitalia |

1: To be filled out by OC

**Table 36: Test Cases - Liberec**

| No. [1] | Date [1] | TSP [1] | Functionality [2] | Origin [1] | Destination [1] | Departure [1] | Operator [1] |
|---|---|---|---|---|---|---|---|
| 1. | 09/05/2022 | KORID | Journey Planning | Jedlová | Liberec | 24.6., 7:37 | ARRIVA vlaky s.r.o. - more connections |
| 2. | 09/05/2022 | KORID | Journey Planning | Mimoň | Liberec,Šaldovo nám. | 27.6., 9:48 | various - more |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | connections |
| 3. | 09/05/2022 | KORID | Journey Planning | Mimoň | Liberec | 29.6., 7:48 | České dráhy a.s. |
| 4. | 09/05/2022 | KORID | Journey Planning | Nový Bor,aut.nádr. | Liberec,aut.nádr. | 30.6., 17:40 | ČSAD Liberec, a.s. |
| 5. | 19/05/2022 | KORID | Journey Planning | Liberec,Prům.zóna JIH | Bogatynia,Liceum | 28.6.,14:15 | ČSAD Liberec, a.s. |
| 6. | 19/05/2022 | KORID | Journey Planning | Frýdlant v Čechách | Hejnice,aut.st. | 29.6., 5:47 | various - more connections |
| 7. | 19/05/2022 | KORID | Journey Planning | Bogatynia,Liceum | Frýdlant,aut.nádr. | 30.6., 4:27 | ČSAD Liberec, a.s. - more connections |
| 8. | 19/05/2022 | KORID | Journey Planning | Jablonec n. Nisou,,aut.nádr. | Železný Brod,sokolovna | 28.6., 5:22 | BusLine s.r.o. |
| 9. | 19/05/2022 | KORID | Journey Planning | Stráž p. Ralskem,,aut.st. | Šaldovo náměstí | 26.6., 10:45 | various - more connections |
| 10. | 19/05/2022 | KORID | Journey Planning | Liberec | Česká Lípa hl.n. | 27.6., 13:02 | České dráhy a.s. |
| 11. | 19/05/2022 | KORID | Journey Planning | Hrádek n. Nisou,,aut.nádr. | Zittau,Bahnhof | 26.6.,7:40 | ČSAD Liberec, a.s. |
| 12. | 19/05/2022 | KORID | Journey Planning | Chrastava,aut.nádr. | Mimoň,aut.st. | 24.6., 15:16 | ČSAD Liberec, a.s. - more connections |
| 13. | 19/05/2022 | KORID | Journey Planning | Harrachov, Nový Svět,Na mýtě | Jablonec n.N.dol. n. | 23.6., 11:25 | various - more connections |
| 14. | 19/05/2022 | KORID | Journey Planning | Liberec | Turnov | 24.6., 8:05 | ARRIVA vlaky s.r.o. |
| 15. | 19/05/2022 | KORID | Journey Planning | Pavlovice škola | Mnichovo Hradiště,nám. | 27.6., 7:14 | various - more connections |

1: To be filled out by OC

**Table 37: Test Cases - Warsaw**

| No. [1] | Date [1] | TSP [1] | Functionality [2] | Origin [1] | Destination [1] | Departure [1] | Operator [1] |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Raszyn (“Sportowa” – bus stop) | P+R Al. Krakowska | 27.05.2022/9:09 AM | MZA/BUS 703 |
| 2. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | P+R Al. Krakowska | Wiatraczna | 27.05.2022/9:19 AM | TW/TRAM 9 |
| 3. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Centrum | Metro Młociny | 27.05.2022/9:53 AM | Warsaw Metro/line 1 |
| 4. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Młociny | Młociny-UKSW | 27.05.2022/10:16 AM | MZA/BUS 114 |
| 5. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Rondo Wiatraczna | Rogalińska | 30.05.2022/10:01 AM | TW/TRAM 24 |
| 6. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Centrum | Metro Młociny | 30.05.2022/10:23 AM | Warsaw Metro/line 1 |
| 7. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Młociny | Młociny-UKSW | 30.05.2022/10:46 AM | MZA/BUS 114 |
| 8. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Dąbrówska Wiślana | Metro Młociny | 31.05.2022/12:13 PM | MZA/BUS 511 |
| 9. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Młociny | Metro Kabaty | 31.05.2022/12:36 PM | Warsaw Metro/line 1 |
| 10. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Służew | Ursynów Płn. | 31.05.2022/01:10 PM | MZA/BUS 193 |
| 11. | 27/05/2022 | ZTM (MIASTO STOŁECZNE | Journey Planning | Nowodwory | PKP Służewiec | 02.06.2022/5:02 PM | TW/TRAM 17 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | WARSZAWA) | | | | | |
| 12. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Słodowiec | Metro Kabaty | 02.06.2022/5:31 PM | Warsaw Metro/line 1 |
| 13. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Służew | Ursynów Płd. | 02.06.2022/5:58 PM | MZA/BUS 401 |
| 14. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Rondo Wiatraczna | Szczęśliwice | 03.06.2022/7:00 PM | MZA/BUS 521 |
| 15. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Centrum | Metro Młociny | 03.06.2022/7:19 PM | MZA/BUS 166 |
| 16. | 27/05/2022 | ZTM (MIASTO STOŁECZNE WARSZAWA) | Journey Planning | Metro Młociny | Młociny-UKSW | 03.06.2022/7:40 PM | MZA/BUS 114 |

1: To be filled out by OC

# 13 Annex 3

**Table 38: List of operational KPIs per functionality, as identified in WP3**

| Innovative Technology (IP4) | Linked to Traveler/TSP | KPI | Units | Already validated by CFMs? |
|---|---|---|---|---|
| **Journey Planner (JP)/ Offer Builder** | Traveler | Number of involved modes of transport in the trip (multimodality) | Number per day | Yes |
| **Journey Planner (JP)/ Offer Builder** | Traveler | Available travel solutions or options issued by TSP for travelers to reach their destination (due to the integration of transport modes) | Number of Shopped offers | Yes |

| | | | | |
|---|---|---|---|---|
| **Booking** | Traveler | Number of offers booked by travellers | Number of booked offers | Yes |
| **Issuing** | Traveler | Successful issuing of multimodal travel solutions | Number of issued offers | Yes |
| **Mobility packages** | Traveler | Number of mobility packages offered | Number/year | No |
| **Validation and inspection** | Traveler | Total number of Ticket(s) purchased | Number of tickets validated per day | Yes |
| **Trip tracking** | Traveler | TSP locations (stations, platforms) available for navigation | Number of TSP locations | Yes |
| **Trip tracking** | Traveler | Successful delivery of notifications on the status of a planned trip | Number of successful notifications per day | Yes |
| **Alternative's calculation** | Traveler | Service offerings to travelers (in case of disruption) | Number of services per day | Yes |
| **Location-based experience** | Traveler | Number of experiences launched during the demo | Number of experiences | Yes |
| **Location-based experience** | Traveler | Average time per connection (in seconds) per each TSP during the demo | Number of seconds per connection | Yes |
| **Location-based experience** | Traveler | Number of entertainment services offered during the demo | Number of services | Yes |
| **Navigation** | Traveler | Number of connections to the Navigation function | Number/day | No |
| **Navigation** | Traveler | Time of connection to the Navigation function | Seconds of connection/day | No |

| | | | | |
|---|---|---|---|---|
| **Traveller's feedback** | Traveler | Number of feedbacks received | Number/day | No |
| **Trip Sharing** | Traveler | Number of trips shared by more than one traveler | Number of trips shared | Yes |
| **Guest user** | Traveler | Number of connections without a password | Number/day | No |
| **Preferences and profiles** | Traveler | Number of profiles handled | Number/day | No |
| **Group traveling** | Traveler | Number of connections to the group traveling function | Number/year | No |
| **Group traveling** | Traveler | Number of travelers involved | Number/year | No |
| **Asset manager** | TSP | Number of IP4 Service types covered by the demo | Number/year | No |
| **Contractual management marketplace** | TSP | Number of mobility packages handled | Number | Yes |
| **Contractual management marketplace** | TSP | Number of involved stakeholders | Number/year | No |
| **Business analytics** | TSP | Number of connections to Business analytics by TSP | Number/day | No |
| **Business analytics** | TSP | The time connected to business analytics by TSP | Seconds of connection/day | No |
| **CEP configuration** | TSP | Number of configurations | Number/year | No |

# 14 References


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[4] COHESIVE, "Pilot Planning, Functionalities for 1st pilots phase - 2022".

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[6] AITEC, "D3.1, List of operational KPIs, analysis of the users' satisfaction and methodology as a whole, C-REL," *WP3,* 2021.

[7] UITP, "IP4MaaS Annex I - Part B - DoA V4," 2022.

[8] POLIMI, "D2.1, Technology survey, CREL," *WP2,* 2021.

[9] AITEC, "Deliverable D 4.4: User Engagement Strategy per each demonstrator," AITEC, 2022.