

IP4MaaS

Deliverable D5.6 Final report on Liberec demonstration execution

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1. Executive Summary

The purpose of the deliverable 5.6, titled "Final report on Liberec demonstration execution," is to provide a comprehensive overview of the timeline, preparation, and execution details of the Liberec demonstration and Long-distance demo. This demonstration was conducted as part of the IP4MaaS project under the Shift2Rail Joint Undertaking, focusing on selected functionalities of the IP4 ecosystem.

The testers from the Liberec region were recruited to test the functionalities of the Travel Companion app. The testers were provided with a link to download and install the newest version of the application. Subsequently, the testers used the application for creating a multimodal travel solution according to their requirements and preferences. After the demo execution, testers were asked to provide feedback on the selected functionalities through an online User Satisfaction Index (USI) questionnaire, developed as part of Task T3.2 "User satisfaction with IP4 solutions" in WP3 as well as they were asked to fill out an internal questionnaire developed by KORID to raise awareness of passengers' requirements and preferences of public transport in Liberec region.

During the Liberec demo, the Long-distance demo was carried out. Long-distance demo represented a cross-border demonstration between two ongoing demonstrations in Liberec and Warsaw. The testers who participated in the Long-distance demo were employees of Liberec demo partners not directly involved in the project activities. They tested the Travel Companion app functionalities in the cross-border conditions. They also attended a collaboration meeting/workshop with the Warsaw demo team, where they discussed the IP4MaaS project, the IP4 ideas and ongoing demonstrations.

Deliverable 5.6 outlines the various activities carried out during the coordination and preparation of the Liberec demonstration and the Long-distance demo. It reports on the contributions of the Liberec demo team to the process of the technological integration and provides insights into the internal testing of the integrated functionalities and the tools used. Additionally, the report presents the outcomes and findings derived from the Liberec demonstration activities.

2. Abbreviations and acronyms

Abbreviation / Acronym	Description
CFM	Calls for Members
ER JU	Europe's Rail Joint Undertaking
GTFS	General Transit Feed Specification
IP4	Innovation Programme 4
MaaS	Mobility as a Service
OC	Open Call
S2R JU	Shift2Rail Joint Undertaking
TC	Travel Companion
USI	User Satisfaction Index
WP	Work Package
WPL	Work package leader

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6. Background

As mentioned, the present document constitutes the Deliverable D5.6 “Final report on Liberec demonstration execution” of the T5.6 “Liberec demonstration” of the WP5 in the framework of the The IP4MaaS project (GA 101015492, S2R-OC-IP4-01-2020) under the Innovation Programme 4 (IP4) of the Shift2Rail Joint Undertaking, executed in cooperation with Call for Members Consortia COHESIVE (GA 777599, S2R-CFM-IP4-02-2017), CONNECTIVE (GA 777522, S2R-CFM-IP4-01-2017) and ExtenSive (GA 101015462, S2R-CFM-IP4-01-2020) also being a part of the Shift2Rail Joint Undertaking and connected with the IP4MaaS Consortium by means of the Collaboration Agreement.

More specifically, the results and conclusions of the WD execution presented in this document will also contribute to T5.1 of the IP4MaaS project – “Coordination of demonstration executions” and the corresponding Deliverable D5.1 “Results of the demonstrations”. Finally, they contribute as well to WP6 D6.2 “Performance assessment”.

7. Objective/Aim

This deliverable has been prepared to provide a general overview of the IP4MaaS project and detailed information about the Liberec demonstration, which is a part of this project. The Liberec demonstration involved three partners that took part in the demo (OLTIS Group, KORID LK, UNIZA). Before the demo, the following targeted goals were set:

- to achieve better and smoother travelling within Liberec region;
- to improve integration of all public transport modes;
- to improve quality and comfort of services provided by TSPs;
- to shift the travellers from private car transport to public transport;
- to make public transport more available and flexible;
- to disseminate the knowledge about the IP4MaaS project across all sectors.

The deliverable describes all the activities carried out within the Liberec demonstration, it means all phases from the preparation phase to the evaluation phase, incl. information about the user engagement strategy, the internal testing, the identified issues, lessons learned, etc. In a similar range of information, it also describes the Long-distance demo.

8. General information about demonstration site

The Liberec region is located in the northern part of the Czech Republic and is the second smallest region in the Czech Republic. The Liberec region, as a higher territorial self-governing unit, was established in 2000. It covers an area of 3.163 km², which represents approximately 4% of the Czech Republic territory. The region has a population of around 450 000 permanent residents. Administratively, the region is divided into 4 districts and 215 municipalities, of which 39 have the city status.

The Liberec region shares borders with the German federal state of Saxony (Sachsen) to the northwest, and the Lower Silesian Voivodeship (Województwo dolnośląskie) in Poland to the northeast.



Figure 1: Liberec region map

The Liberec region has a rich industrial tradition. In the past, it had a thriving glass, textile, and engineering industry, but these sectors are now declining. The textile industry is represented by various companies specialising in control systems and end customer products. The automotive industry, taking advantage of its proximity to the Škoda automobile factory, is the dominant sector in the region, along with related industries such as machinery, electrical equipment, and rubber/plastic manufacturing. Several automotive companies are located in the Liberec region. These companies employ a significant portion of the region's workforce and actively participate in providing transportation for their employees, either through public transport or specialised shuttle services.

The city of Liberec serves as the regional capital and is also the largest city in the region. The city is situated in the southern part of the region and has almost 105 000 inhabitants. The city offers many employment and educational opportunities as well as a number of interesting tourist attractions for both national and international visitors.

The main goals of demo were:

- achieve better and smoother travelling within the region by enhancing transportation infrastructure and services;
- improve the integration of all public transport modes, ensuring seamless connections and convenient transfers for passengers;
- enhance the quality and comfort of services provided by transportation service providers (TSPs) to meet the expectations of passengers;
- encourage a shift from private car transport to public transport by promoting its advantages in terms of convenience, sustainability, and reduced traffic congestion;
- make public transport more available and flexible, adapting to the needs and preferences of passengers, including diverse schedules and route options;
- disseminate knowledge about the IP4MaaS project across all sectors, fostering collaboration and understanding of the project's objectives and benefits;

These mentioned goals aim to create a more efficient, sustainable, and passenger-friendly transportation system in the Liberec Region.

9. Demo preparation

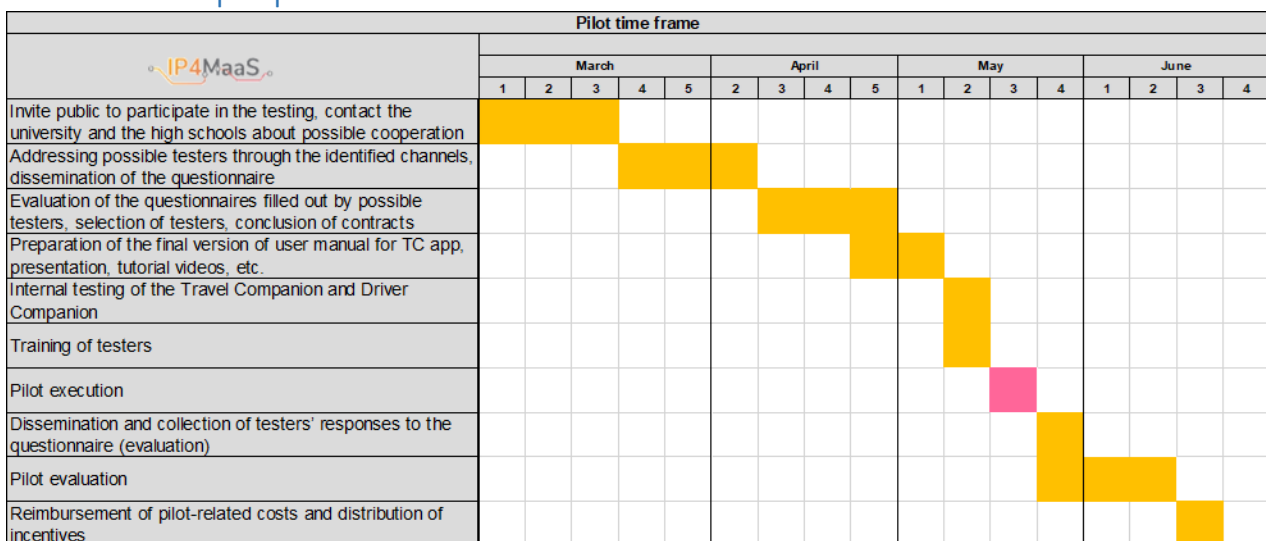


Figure 2: Timeline of Liberec demo

The general information about preparation phase, preparation activities, highlighted part of the timeline for this phase (according to the timeline), risk measures, stakeholders' tasks, etc. will be described below.

9.1. Demonstrated functionalities

The Travel Companion app is the product developed under the framework of Shift2Rail IP4 projects (ATTRACKTIVE, CONNECTIVE, COHESIVE, MaaSive and ExtenSive), so the Travel Companion app is the result of these research projects. The Travel Companion app connects many software solutions and functionalities in order to provide multimodal mobility services to the testers. The Travel Companion app was used as a user interface application through which many functionalities developed by CFMs could be tested within the Liberec demonstration.

The functionalities can be divided into the two main groups:

- Passive
 - Improvements done within the CFMs projects and automatically integrated in the system
 - No technical action was required from the OCs
- Active
 - Improvements done within the CFMs projects
 - Certain requirements (data and services) for TSPs to integrate and test functionalities

Some of these functionalities were for travellers and some for TSPs. The functionalities planned and subsequently tested during the Liberec demo are listed with their description in the following tables (*Table 1* and *Table 2*).

Table 1: List of passive functionalities tested in Liberec demo

Functionalities	Target user	Description
Travel Companion	Traveller	The app itself. Testing tool.
Travel Companion Web-Portal	Traveller	Possibility to test the Travel Companion app in a web environment, i.e. no need to install the application. Specifically, it should be possible to test features such as Journey Planning, Booking, Issuing, Payment, Gmail registration.
Guest user	Traveller	Testing the Travel Companion app in "guest" mode, i.e. without the need for logging, where only a limited number of functionalities are available, namely Journey Planning, Booking, Navigation, Home (ticket purchase according to current position), experience and report.

Preferences and Profiles	Traveller	Possibility to set different preferences for different profiles (e.g. private for family and work), i.e., which travel solutions the app will offer with different sets of preferences.
Trip sharing	Traveller	The ability to share a trip with another user, i.e., make it easier for the other person to search (skip this step) and allow them to purchase the ticket(s) for the selected travel solution directly.
Travel Arrangement	Traveller	Ability to provide a travel solution for another user.
Navigation	Traveller	A form of such a travel "guide". The navigation works based on "Logical Position", i.e. the positions where the passenger should be according to the timetable. It provides information such as the name of the stop, the arrival time to the next stop, the remaining time until the departure of the next connection. The navigation includes a map and messages for the passenger - more comfort when travelling.
Traveller's feedback	Traveller	Possibility for the user to provide feedback, e.g. on delays, stops, stations, car equipment, conductor behaviour, etc. It means the possibility to express immediate satisfaction with the travelling.

Table 2: List of active functionalities tested in Liberec demo

Functionalities	Target user	Description
Journey Planner / Offer Builder	Traveller	Travel solutions' offer. The core and main functionality of the Travel Companion app testing.
Improved Intermodal Travel / Individual Last Mile	Traveller	The travel solution including individual transport modes as a main part of the solution or scooters/bikes for the first and last mile - i.e. MaaS. Journey Planner finds and offers a travel solution according to multiple criteria (Pareto-optimization).
Smart Locations	Traveller	Trip planning taking into account travel preferences for the busiest places. Extension of the set of preferences that the user can set - i.e. set preferred/most utilised stops.

Booking	Traveller	Ability to book selected travel solution(s).
Issuing	Traveller	Issuance of ticket for selected travel solution(s).
Validation and Inspection	Traveller	Ability to validate ticket(s). Validation application accepts tickets issued by the Travel Companion app.
Trip tracking	Traveller	Provision of "real-time information" of events affecting traveller(s) on the journey. Users will be notified e.g. of train delays.
Alternatives calculation	Traveller	Alternative solution(s) offer. Based on event from Trip tracking functionality.
Asset manager	TSP	The TSP can insert and describe its web service(s) online for the next implementation to the IP4 ecosystem.

9.2. User engagement strategy

When it comes to the user engagement strategy, KORID, as leader of the user engagement strategy, used best practice from previous demo executions, especially from Athens 1st and 2nd Phase and Padua Phase 2.

Objectives:

- **Diverse user groups:** This objective included broad coverage of all age and gender segments.
- **Widespread coverage of the region:** This objective was set to involve users not only from agglomerations but also from rural parts of the region.
- **Quality feedback from testers:** This objective included not only responsible fulfilment of the conditions for testing but also a sufficiently representative number of testers and their feedback.

Tools for achieving objectives and their implementation:

- **Central information source:** Website www.ip4maas.cz (hereinafter referred to as the website). For the consistency of the information provided, a website was prepared to which all other information channels from social networks and other websites were linked.
- **Use of social networks:** Facebook, Twitter, Instagram linked to the website. KORID has high traffic on its social networks and all of them have been used.
- **Establishing the team for the demo:** The definition of responsible persons for individual streams. The time for preparation and implementation of the demo was very short. Therefore, a project team consisting of experts in creating websites, mobile applications,

recruiting testers, training testers, etc. was established a month in advance during regular internal coordination meetings.

- **Appropriately chosen incentive:** In order to obtain quality performance during testing and good feedback in the form of filled-in questionnaires, fixed-term agreements were concluded with precisely defined conditions for work performance and the corresponding reward upon their fulfilment.
- **Simple administration for participation in the testing:** The only one step was needed to participate. In particular, filling out (from editable PDF) and concluding an employment contract and picking up a tester card in the envelope at one of the KORID client centres.
- **Utilization of KORID customer centres in the regions:** For concluding contracts with testers, KORID has designated 3 contact points in the largest cities of the region, where it was possible to conclude an employment contract. Diversification of interested applicants within the entire Liberec region is thus ensured.
- **The exact rules for testing and payment of the reward:** The rules and also the conditions were specified in the contract, i.e. fill out the questionnaires, making several multimodal trips with the Travel Companion app, etc. were the condition for the payment of the reward.
- **Chip travel cards for testers:** To ensure the clearing of fare revenue among TSPs, the testers were equipped with standard chip travel cards for check-in including a weekly network ticket valid for the whole region. Check-in records linked to the Travel Companion login name were the subject of statistical analysis of the testers' journeys. Outputs from these check-in records were used to analyse travel usage of the Travel Companion app.
- **Informing TSPs:** 14 days before the start of the demo execution, information about the demo was provided to all TSPs. All TSPs (19) included in the demo execution were informed in advance about the progress so that their employees (drivers, conductors, inspectors) were able to check in the testers with the test cards and they knew everything they needed about the Travel Companion app and IP4MaaS project in general.

Recruitment of testers:

The campaign was divided into 3 phases over 28 days, ending on the day of the start of testing (D-day):

- **Information about the prepared demo (D-28):** A website was launched with information about the project, about MaaS as a future trend in citizen mobility and about the demo operation of the Travel Companion app in the Liberec region as one of six demonstrations in Europe.
- **Offer to participate in testing including incentives (D-14):** Information about demo testing was placed on the website. Those interested could download the contract from the website, fill it out and conclude it at one of the 3 clients centres.
- **Ongoing control of concluded contracts (D-7):** To reach comprehensive coverage of all segments, especially age and gender indicators, the contracts were evaluated and, in a limited extent, other persons with a low representation in the segment were targeted via word-of-mouth.
- **Publication of the application download link (D-3):** The testers were allowed to download

the application in advance to familiarize themselves with it.

- **Instructions for travelling in the Liberec region (D-1):** As part of the objectivity of the feedback, the testers who do not use public transport and are not familiar with the tariff were also included in the testing. These instructions allowed them to familiarize with the rules of travelling and check-in methods in the tariff system.

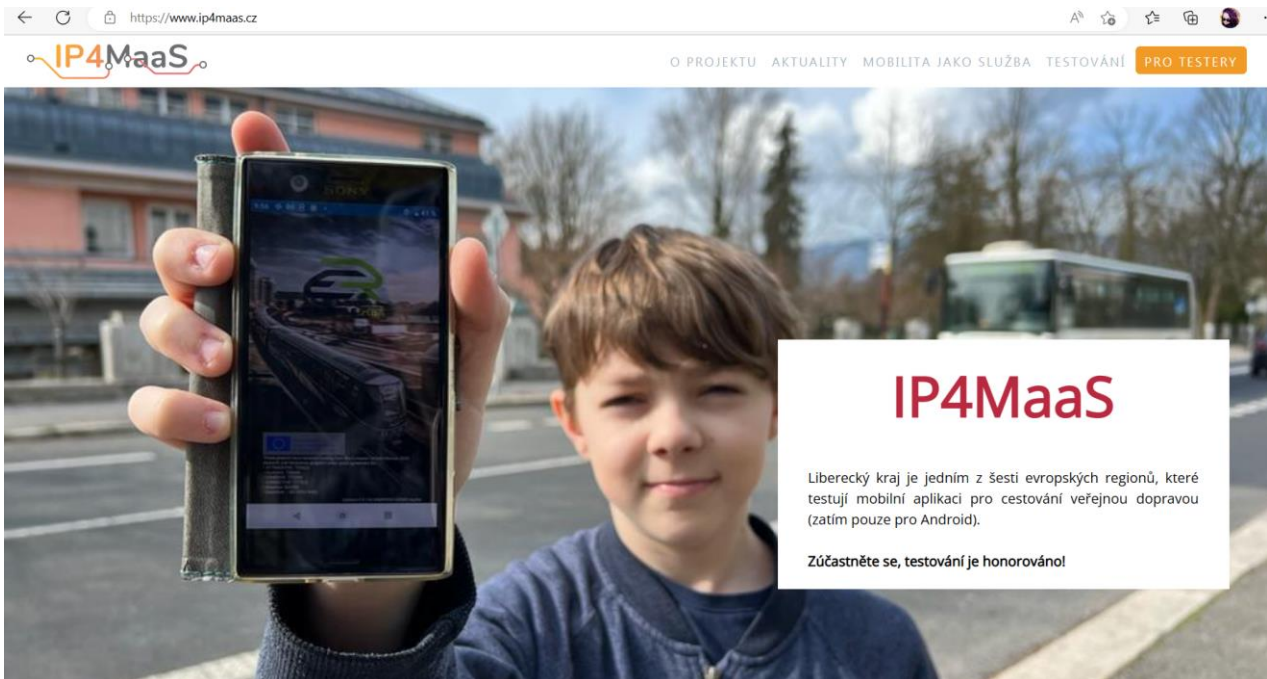


Figure 3: Liberec website – homepage (www.ip4maas.cz)

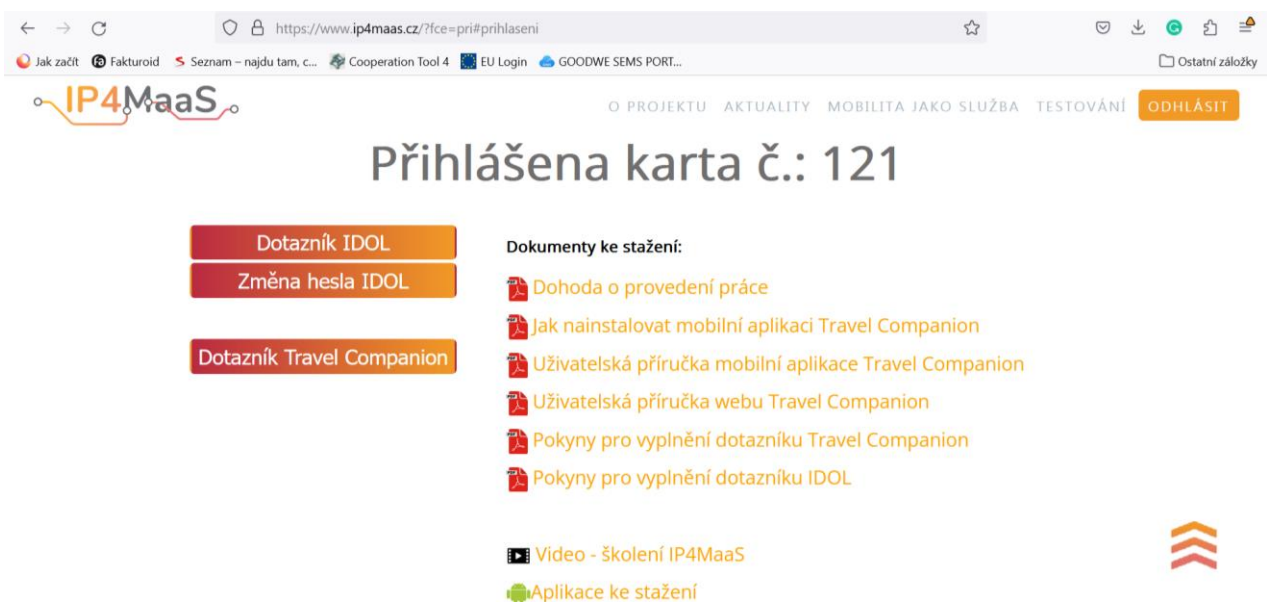


Figure 4: Liberec website – testers section (www.ip4maas.cz)

9.3. Internal coordination

For the seamless achievement of the determined goals of the Liberec demonstration and goals of the IP4MaaS project overall, it was necessary to ensure proper coordination among all Liberec demo partners and also proper coordination among demo partners, task leaders and WP leaders together with the CFM projects. Very important purpose of internal coordination was to distribute responsibilities among all demo partners on the basis of opportunities and localizations of them.

The main tool for ensuring the coordination of Liberec demo partners were coordination calls through (via) available calling apps, such as Teams, mail correspondence and check-list as a background.

The coordination calls were the tool for the responsibilities distribution among Liberec demo partners, information change about the demo progress and occurred issues, as well as tool for partners' coordination and proper co-working. The coordination calls were undertaken every two weeks from the beginning of the demo preparation phase. Approximately 6 weeks before the Liberec demo, the frequency of coordination calls raised from biweekly calls to 1 - 2 times in a week, because more precise partners' organisation was needed.

Check-list IP4M - CFM					
Task	Demosite	Deadline	Status	Responsible partner	Comment
Integration of Trenitalia's PICO API	Padua	31.03.2023	Ongoing	CFM	integrated, tested
Demonstration of the functionality S3 - Plan data provisioning for TSPs (Busitalia)	Padua	31.03.2023	Ongoing	FST	integrated, tested
KORID GTFS data (one dataset)	Liberec	24.03.2023	Pending	OLTIS	need for merge
Integration of CRWS (Shopping)	Liberec	28.04.2023	Ongoing	CFM	integrated, working, limited by GTFS data
Integration of KORID ticketing	Liberec	28.04.2023	Ongoing	CFM	integrated, working, limited by GTFS data
Integration of KORID pTT (CRWS wrapper)	Liberec	29.03.2023	Ongoing	CFM	integration ongoing, waiting to be tested
Decision on JP provider (jakdojade vs. CRWS)	Long-distance	28.04.2023	Pending	OLTIS	decided to use CRWS, scope to be checked
AMS GTFS data cleaning	Long-distance	24.03.2023	Pending	OLTIS	geo-coordinates, stop names
AMS integration (Booking & Ticketing)	Long-distance	28.04.2023	Ongoing	CFM	integrated, limited by GTFS data
Integration of PKP functionalities (Booking & Ticketing)	Long-distance	28.04.2023	Not started	CFM/OLTIS	lack of time for integration
Integration of jakdojade	Warsaw	28.04.2023	Ongoing	CFM	integrated, need to be tested
Integration of Nextbike	Warsaw	28.04.2023	Ongoing	OLTIS	to decide whether it will be integrated - under investigation
GPP GTFS data correction	Osijek	12.05.2023	Ongoing	GPP Osijek	GPP Osijek is working on it.
Integration of OTP (Shopping)	Osijek	12.05.2023	Ongoing	CFM	integrated
Integration of Nextbike (Booking)	Osijek	12.05.2023	Ongoing	INDRA	INDRA to define for what precisely do they need API key.
BusUp integration (Shopping)	Barcelona	19.05.2023	Ongoing	INDRA	New GTFS sent on 10/3 by BusUP, mail under title of IP4MaaS, feedback on the app from BCN partners, GTFS data set causing errors
FlexiTransport integration	Barcelona	19.05.2023	Ongoing	INDRA	analyzed

Figure 5: Example of used check-list

Imaginative background of internal coordination was check-list (see Figure 5), in which all Liberec demo activities and tasks progress were detected in real time. The check-list was a very good tool for controlling the deadlines of tasks as well. In the check-list were:

- determined all tasks,
- contributed demosite,
- deadline of the specific task,
- status of task's realisation, i.e.:
 - not started,
 - ongoing,
 - pending,
 - not solved,

- completed,
- responsible partner,
- description of the task/detailed information about the status.

All demo partners or CFM projects, marked the status of all activities on the basis of their progress. Information from the check-list was also discussed during the coordination calls between Liberec-demo partners and WP5 leader and CFM, or via mail correspondence.

An internal check-list was also created for the same purpose with the similar information. It was checked during each coordination call.

Every Liberec demo partner had assigned responsibilities which it was necessary to carry out, particularly:

- OLTIS:
 - leader of WP5 and Liberec demonstration,
 - providing all inputs necessary for integration (API documentation, endpoints, GTFS data, etc.),
 - translation of all materials for testers,
 - internal coordination,
 - internal testing of the Travel Companion app and reporting to CFM.
- UNIZA
 - internal testing of the Travel Companion app,
 - checking of prepared documents and other materials for Liberec demo,
 - proceeding of outcomes from Liberec demo,
 - Liberec demo evaluation.
- KORID:
 - internal questionnaire,
 - incentives for testers,
 - user engagement strategy,
 - Liberec demo execution.

9.4. Internal testing

Prior to conducting the Liberec demos, an internal testing phase was organised, in which all demo partners involved in the Liberec demo (OLTIS, UNIZA, KORID) participated. This internal testing took two weeks. The internal testers utilised the Travel Companion app to explore and test its functionalities, which were scheduled to be tested in the Liberec demo. The primary objective of the internal testing was to uncover any bottlenecks and issues present in the Travel Companion app.

All issues identified during the internal testing were documented in a shared Excel sheet titled "Internal testing Liberec" (see *Figure 6*) written in Czech language, which was made available to all partners for reference. In this document testers could have defined the details of detected issues, such as:

- **description of problem** – short description of the particular issue,
- **example of problematic ride** – particular example of ride, where the detected issue occurred (origin; destination; date; time),
- **screenshot(s) of detected issue**,
- **current status of detected issue** – three options could have been selected (ongoing, in progress or solved) on the basis of coordination with CFM.

Additionally, regular calls were held among the demo partners to discuss any other issues that were identified. OLTIS submitted some of these issues to the Mantis Tool, which served as the reporting tool between OLTIS and CFM projects.

IP4MaaS - TC app							
#	Problém	Relace				Obrázek	Stav problému
		Z	Do	Datum	Čas		
1	Dlhé načítavanie - pri prihlasovaní, hľadani cestovného riešenia, aj iné relácie (pretrváva)	Liberec, aut. nádr.	Waszawa Zach. / West	3.5. 2023	13:30		Pretrváva
2	Unknow line - našlo cestovné riešenie s unknow line, problém pretrváva (vyskytlo sa znova) KORID	Liberec, aut. nádr. * Frýdlant žst * Staré Pekárny	Waszawa Zach./West *Liberec *Hrádek n. Nisou	3.5. 2023 *4.5. * 6.5.	13:30:00 *2:00 *12:50		Vyriešene

Figure 6: Example issues recorded in the issue log (internal testing)

Identified issues reported to CFM side through the Mantis tool

- Trip alarm – error
 - The alarm could not be set in the version 157 of the Travel Companion app. The issue was closed as “fixed” thanks to the version 156 where the alarm worked properly.
- My trips - unrelated trips
 - Several demo partners were experiencing the rides related to previous demos, both in the IP4MaaS and the Ride2Rail projects. This issue had been fixed on CFM side and after it didn’t happen anymore.
- Tickets aren’t issued
 - In specific cases, the tickets weren’t issues for the ride. This problem could not be solved due to time constraints. The testers have been notified of this issue and also some of the testers reported on it.

9.5. Training sessions

The training sessions took place online through MS Teams on 10/05/2023 and 11/05/2023 in the afternoon so that workers and students could also participate. The training was prepared with the cooperation of KORID, OLTIS and UNIZA in the form of a training presentation and videos. The „How to Install Travel Companion Mobile App“, „Travel Companion Mobile App User Guide“ and

„Travel Companion Website User Guide“ were provided for testers just prior to the date of training. In particular, 24 participants took part in the first run of the training and 32 participants in the second run. These training sessions resulted in 6 testers’ questions asked by e-mails and 8 testers’ questions asked by phone. The 1st and the 2nd training session were recorded with the permission of the participants. The 2nd recording was included on the website www.ip4maas.cz/available for download .

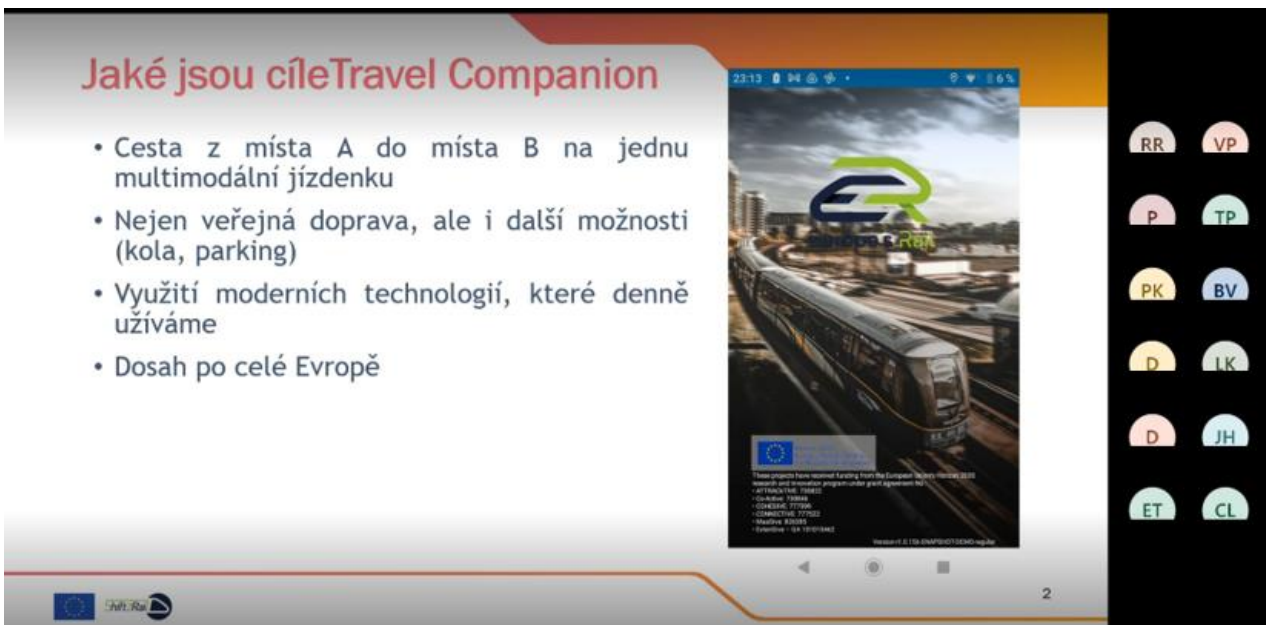


Figure 7: Training session (the second round)

10. Demo execution

The demo execution took place from **15/05/2023** 0:00 to **19/05/2023** 24:00. In particular, 100 contracts were concluded with the testers when 99 testers with the concluded contract filled out the USI survey. One tester didn’t complete the survey and for this reason the incentive wasn’t provided. The value of the incentive was set at an amount €37. In addition to the testers with the concluded contract, another 24 testers participated in the demo execution, i.e. testing of the Travel Companion app and filling out the survey, without being awarded, e.g. employees not involved in IP4MaaS from KORID and other demo partners and they didn’t need a test card. As already mentioned above, in addition to the Travel Companion questionnaire, the testers also filled out a questionnaire on satisfaction with travelling by public transport in the Liberec region and with their requirements for MaaS elements. The questionnaires were filled out by 112 testers, in particular 99 with concluded contract and the rest without a contract. The testers were prompted to record their knowledge and experience in a table “FAQ sheet” to avoid duplication of feedback or uncertainty as to whether the error also occurs with others or whether there is an error in using the application. The FAQ sheet was also used by the members of the IP4MaaS team to communicate more general information (they created a question and then answered it). During testing, the Travel Companion app didn’t work for several hours. The testers were informed about it through information channels and the demo team was in touch with CFM to solve the problem

as quickly as possible. Instructions for completing were published during the last day of the demo. On the same day, both questionnaires were made available. The deadline for filling them in was 26/05/2023. Subsequently, the incentives were paid out in the way the testers chose.

11. Demo evaluation

The demo execution was very successful, and it fulfilled the expectations of all involved partners. As it is mentioned above, there were several issues that arose during the testing phase (mainly on technical aspects regarding the app), however most of which were resolved prior to the actual launch of the demo. This fact was ensured mainly due to regular communication. The communication was ensured at the level of the Liberec demonstration, at the level of the whole WP5 (among partners), but there was also regular communication between Liberec demo leader and CFM side. The Liberec demo was about testing the Travel Companion app by independent testers who use public transport in the Liberec region on a daily basis. A total of 112 testers took part in the Liberec demo. They had the opportunity to test the app for 1 week. Throughout the demo period, the testers had access to a shared file. They could ask responsible people any questions they had. The testers in the Liberec demo used the public transport for many different reasons. Traveling to school/work was one of the most important reasons. This may be influenced by the age structure of the testers. The following figures summarize the results of the basic characteristics according to the answers of the testers.

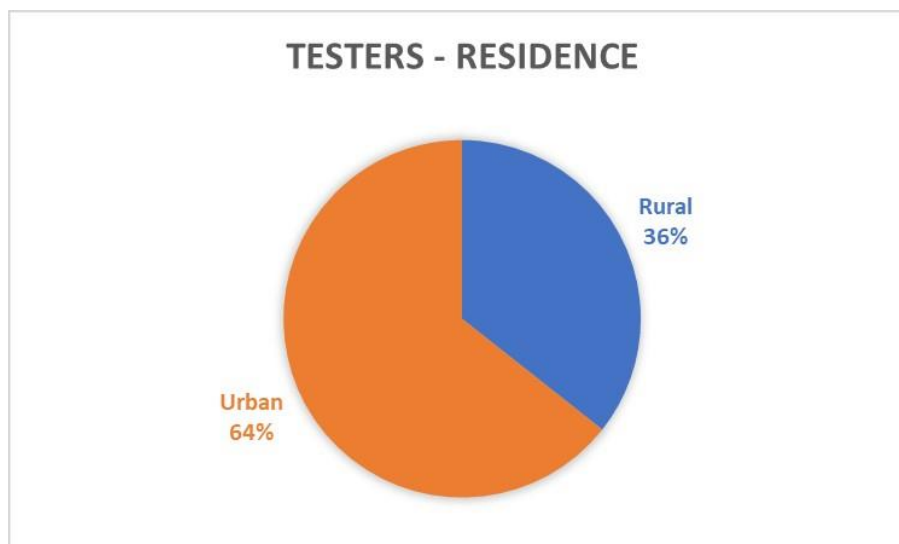


Figure 8: Demo evaluation – testers’ residence

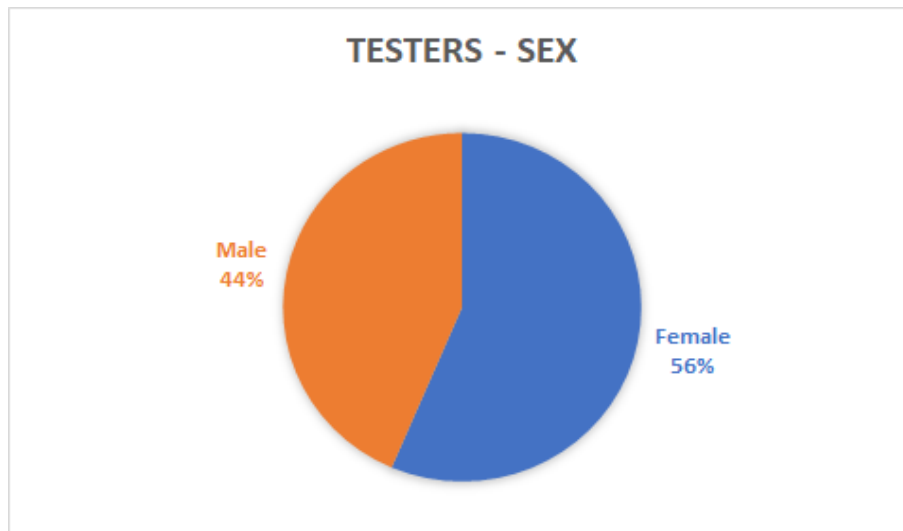


Figure 9: Demo evaluation – testers’ sex

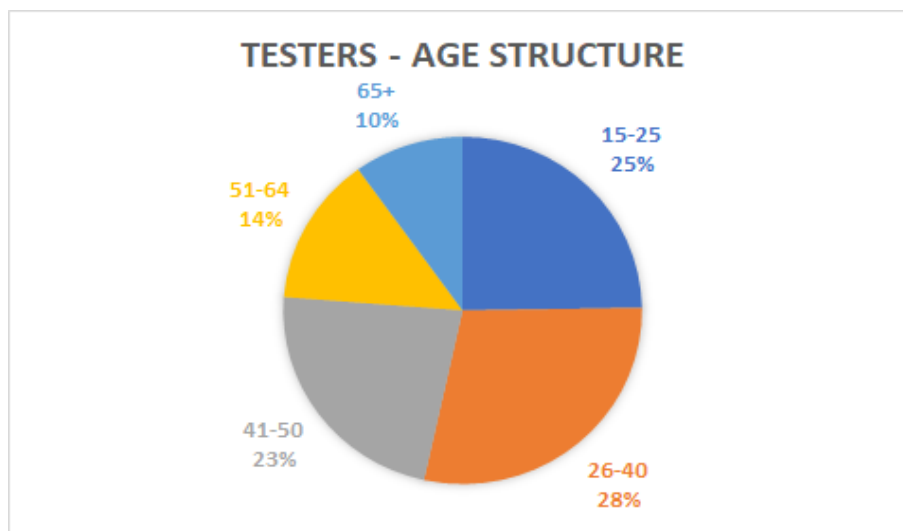


Figure 10: Demo evaluation – testers’ age structure

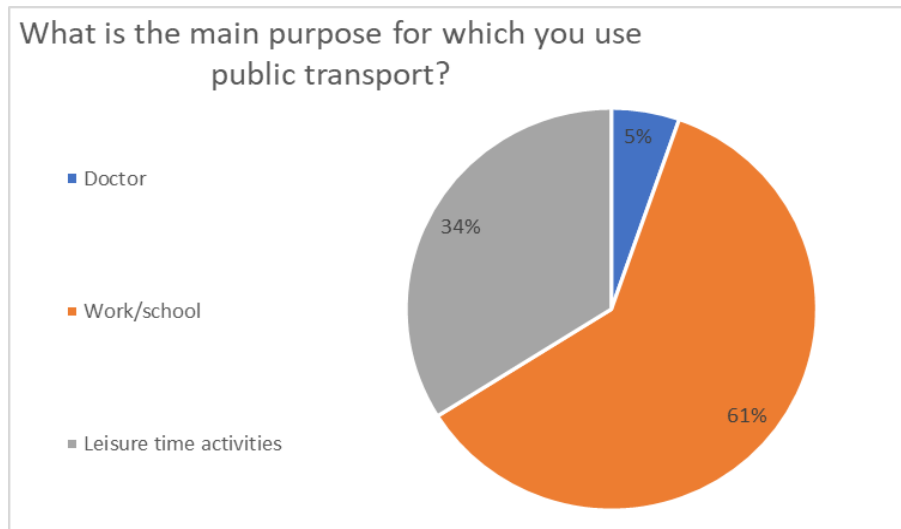


Figure 11: Demo evaluation – testers’ reasons for travelling

The Liberec region has a border with Poland and Germany to the north and is surrounded by three other Czech regions. Each region has its own integrated transport system. Integrated transport systems involve the combining of different transport service providers and different modes of transport. It helps to maximise ease and efficiency for the user in terms of time, cost, comfort, safety, accessibility and convenience.

Inhabitants of Liberec region are also forced to use the integrated transport system adjacent to IDOL (the product name of the Integrated Transport System in Liberec region), as they often travel between different regions. However, most testers use only IDOL (up to 60.80%). 12.80% of testers use the integrated transport system of the Central Bohemian Region, where the capital of the Czech Republic, Prague, is located. The figure below shows the details.

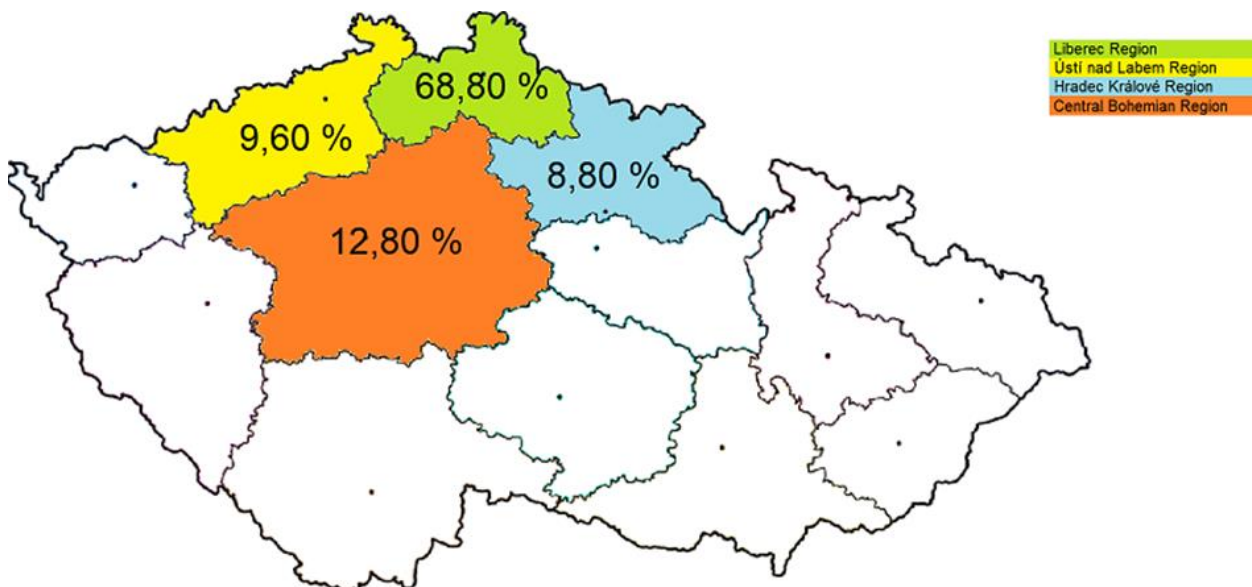


Figure 12: Demo evaluation – testers’ percentage ratio of integrated transport systems

The testers also had the opportunity to do an assessment of the overall quality of service provision in the Liberec region. The indicator "frequency of connections" was rated as the best. The detailed results of the assessment of the quality of public transport in the Liberec region are shown below (1 - the best score, 5 - the worst score).

Table 3: Demo evaluation – public transport quality indicators

Frequency of connections	2,49
Quality of the fleet	2,63
Punctuality and adherence to transfer links	2,71
Willingness of service staff	2,79
Comfort at stops and stations	3,01

Based on an internal questionnaire, the most frequent reasons that discourage users from using public passenger transport were identified.

Based on an internal questionnaire, it was also possible to obtain data on the perceptions of the testers. The following table shows the most common reasons that discourage users from using public transport.

Table 4: Demo evaluation – factors discouraging people to use public transport

It doesn't operate when I need it	25,84%
Too close contact with others	18,18%
It is slow	17,70%
It is far to the bus stop	12,94%
Reluctance or aggressiveness of staff	9,09%
Neglected interior of vehicles and not clean	8,13%
It is unreliable	5,26%
Barrier-free entry to or exit from the vehicle	2,87%

On the other hand, the low price of public transport was identified as the most common reason that encourages people to use public transport.

Table 5: Demo evaluation – factors encouraging people to use public transport

It is cheap	34,42%
I can work and relax during travelling	26,98%
I have no other choice	22,33%
It is safe	13,02%
I like social contact	3,26%

The several indicators were achieved in the Liberec demo. The testers during the Liberec demo made 2036 trips using Travel Companion. Only 1 TSP has been integrated into the IP4 ecosystem for Liberec, but this TSP (KORID) covers many carriers. As KORID is perceived as the transport authority in the Liberec region, it coordinates many carriers whose services were tested during the Liberec demo.

The detailed results of the Liberec demo are presented in the following table.

Table 6: Demo evaluation – achieved results within Liberec demo

Average number of transport modes per trip	3
Number of TSP integrated	1
Number of shopped offers	2 036
Number of trips booked per day	66
Number of issued ticket per day	87
Number of sent Traveller's feedback per day	4
Number of created Travel Arrangement per demo	7

Most of the time the testers used the company Dopravní podnik měst Liberec a Jablonec nad Nisou (TSP providing the city transport in the capital of the Liberec region) for travelling during the Liberec demo.

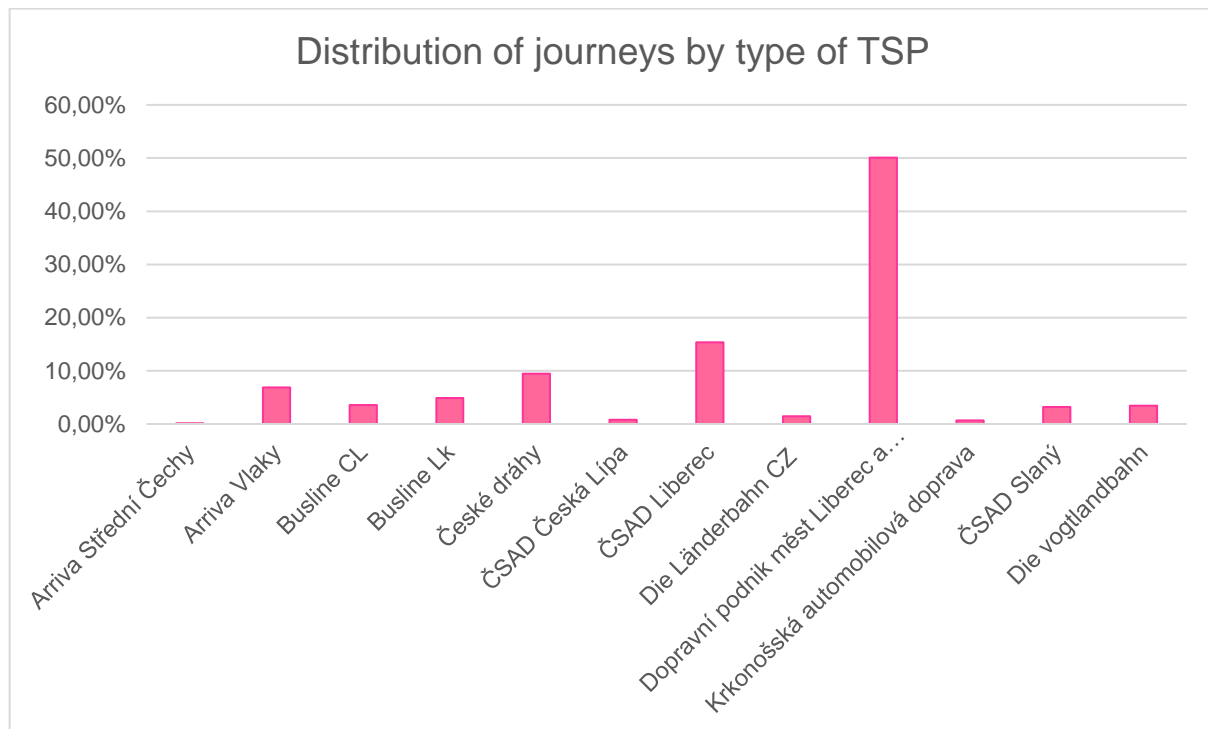


Figure 13: Demo evaluation – percentage of the use of different TSP

12. Long-distance demo

The following chapters describe the preparation, implementation and evaluation of the Long-distance demo.

12.1. General information about the long-distance demo

The purpose of the Long-distance demo was to test multimodal cross-border connections between 2 ongoing demonstrations in Liberec and Warsaw, which were realised with the usage of the Travel Companion app as a part of IP4 ecosystem. Another purpose was to test the multimodal itineraries across Europe.

When it comes to the number of testers, 10 testers participated in the Long-distance demo. The testers were employees of Liberec demo partners not directly involved in the project, of whom 3 testers were from UNIZA, 3 testers were from OLTIS and 3 participants were from KORID. All testers tested selected IP4MaaS functionalities in cross-border conditions as well as took part in the collaboration meeting with the Warsaw demo team during the execution.

12.2. Demo preparation

There were several services planned to be integrated: long-distance buses (AMS services) and trains in Poland (as Czech trains are integrated in CRWS service). After initial analysis solution of integration was proposed:

- Long-distance buses: integration of AMS (which is a reservation service for long-distance buses in the Czech Republic) with timetable data provided in GTFS format. This was fully implemented. Moreover, the Flixbus connections were also added to AMS (they are not available in AMS in standard conditions, several transborder and Polish inland connections were manually added to the test environment).
- Trains in Poland: OLTIS obtained access to Bilkom2 API test environment provided by PKP Informatyka (a subsidiary of PKP, which is a member of S2R), but for capacity reasons it wasn't integrated: neither trip planning nor issuing. Instead of, timetable data was integrated from CRWS service.

The last mile connections were provided thanks to the already implemented integration in both demonstrations.

As already mentioned above, the main aim of the Long-distance demo was to test the ability to integrate long-distance connections into the IP4 ecosystem and resolve collisions between different TSPs. As a result, the decision to test it only by internal testers was taken. Other arguments for that model are that open testing would be more expensive and administratively difficult, or there would be little or no interest from testers, should the tickets be paid by them. Furthermore, there was no need to train testers (internal testers were already well versed in the Travel Companion app). Also, the USI survey was neither prepared nor collected because the group of 10 people were interviewed directly. Also, Liberec and Warsaw demo USIs were provide enough details about the usage of the application in the specific environments. The long-distance demo scenario was not initially included in the project and was not planned for IP4MaaS. The possibility to perform a long-distance demo between two demo sites was explored and confirmed during the project lifetime.

12.3. Demo execution

The Long-distance demo execution took place from **17/05/2023** to **18/05/2023** as a part of Liberec demo execution according to the specific travel scenario (see in *Table 7*).

Table 7: Long-distance demo – travel scenario

17.05.			
From		To	
Liberec	08:35	Szklarska Poręba Górna	10:21
Szklarska Poręba Górna	10:36	Wrocław Główny	13:39
Wrocław Główny	15:09	Warszawa Centralna	19:49
18.05.			

From		To	
Warszawa,,dw.Zachodni PKS	12:30	Liberec,,aut.nádr	20:10

Apart from some technical issues with application during demo, the trip was calm and without major delays. The meeting with the Warsaw demo team took place on Thursday (18/05/2023) in Warsaw, where experiences of demos were shared. The tested functionalities were similar to those in the entire Liberec demo execution, including app version, functionalities, etc.

The figures below summarize the Long-distance demo, including specific screenshots from the Travel Companion app while travelling.

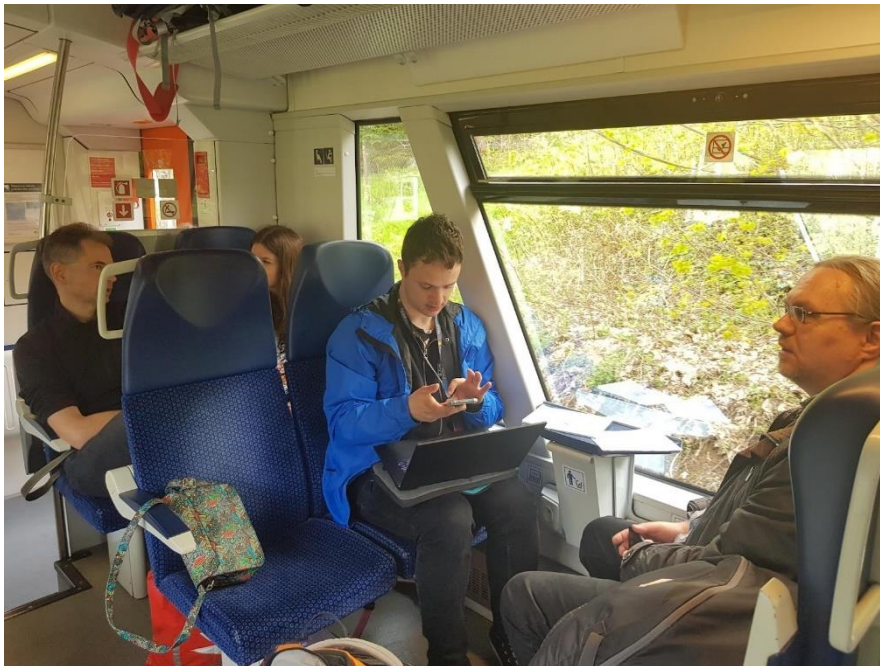


Figure 14: Long-distance demo – execution (testers in the train from Liberec to Szklarska Poręba)

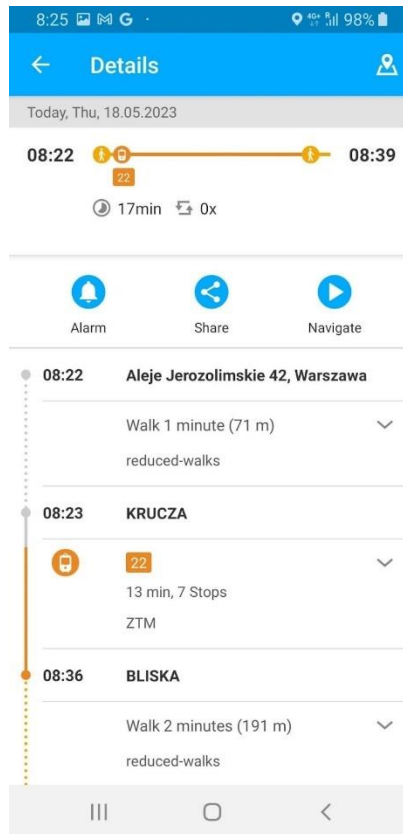


Figure 15: Long-distance demo – execution (example of the trip in Warsaw)



Figure 16: Long-distance demo – execution (meeting with Warsaw demo team in ZTM premises)

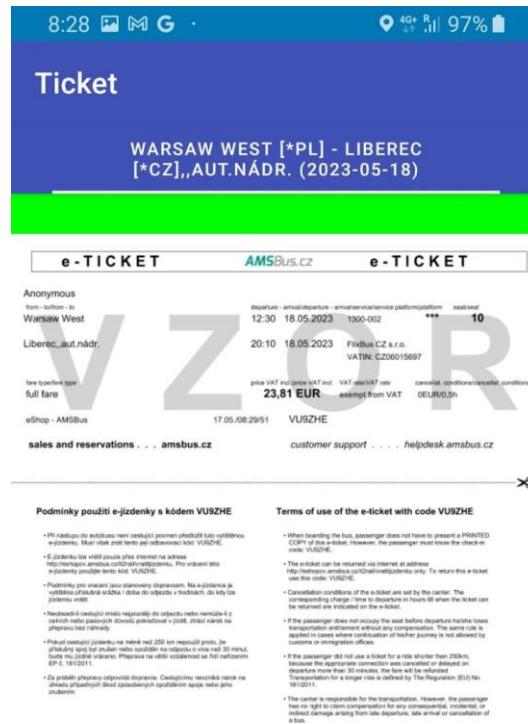


Figure 17: Long-distance demo – execution (AMS e-ticket)

12.4. Demo evaluation

The long-distance demo proved, in general, that it is possible to create an app integrating different TSPs in different countries and provide unified information for travellers (all other Ride2Rail or IP4MaaS demos were in local territory) on multi-modal international travel, with booking all of the needed tickets and other functionalities. The app itself provided a lot of different useful options all of which were also usable in the Long-distance demo.

The main issue encountered during the long-distance demo was the issue with train itineraries: the trains appeared as “Unknown lines”. The reason was that CRWS service (used successfully in the Liberec demonstration) was to be used in trains - however, CRWS required another endpoint for that. CFMs asked (for integration purposes) if the dataset could be merged into one GTFS dataset, which was done, but it resulted that only CRWS endpoint could be used, which didn’t contain the trains needed. CFM’s request was based on the time-consuming process of TSP addition – and as no issuing was planned, it seemed easier. The addition of new TSP should be as easy as possible to provide a smooth experience for them and it should reduce the amount of work necessary to add new ones – this may be crucial for all users.

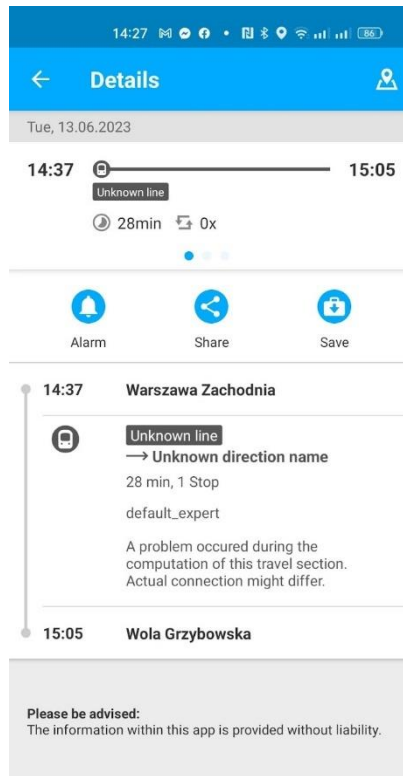


Figure 18: Long-distance demo – execution (example of “Unknown line” issue)

13. Conclusions

As it was mentioned above, Liberec demonstration was one of six demonstrations in the IP4MaaS project whose purpose was to test the Travel Companion app. For that purpose, real data has been integrated through several services. The testers with different levels of experience both with the transport system in the Liberec region and with the use of mobile apps have been recruited to have diverse feedback from testers.

The demo partners, especially who had the first experience with the IP4 idea and the S2R IP4 projects, positively highlighted the idea of customer-first approach, new and inspirational functionalities and verification of abilities, procedures in recruiting testers and working with them and USI survey itself which enabled sophisticated system for receiving feedback from the testers. When it comes to the specific feedback from the testers, the following can be mentioned:

Positive:

- Complexity (a wide range of transport options);
- Great idea (suitable for future use);
- Support for modal split and multimodal mobility;
- Support for eco-friendly transport solutions.

Negative:

- Long-loading time;
- Strange, incomplete and nonsensical travel solutions;
- Instability, login issues.

If the demo(s) considered from an integration point of view, further investigation and discussion should take place about the architecture of integrating services. During the demo, an error in the IDOL dataset resulted in “unknown lines” in ZTM, because it integrated Warsaw’s suburban trains into the dataset. The next question is the utilization of GTFS data and more in general the formats required from a TSP to be integrated. In fact, all searches are done in metanetwork based on provided GTFS data (which may happen not to be up-to-date, not all parties may produce them, etc.). GTFS data may also not reflect all local specificities (which was also spotted during internal testing of long-distance: metanetwork found a connection, where on particular leg either boarding or alighting was forbidden). TSPs may tend to actualise their services and corresponding APIs, rather than sending GTFS data to central databases. Central databases are prone to errors, as there needs to be some administration of them, maintenance and regular updates. Maybe it should be done via corresponding APIs in the future. The central database should only contain instructions on how to use different services and i.e. their type and territorial priority (so, in that area, prioritise that service).

If the main outputs from the preparation and implementation of the demo can be summarized, the IP4 idea itself was received positively by the testers. They would appreciate the possibility of using such an application as the Travel Companion in the future with all functionalities.



Considering that IP4 projects are research projects, it is obvious that the implementation of the Travel Companion app into real operation would require a certain amount of work, but it is precisely this type of project that makes it possible to come up with new ideas, and then testing with real testers with a wider range of experience makes it possible to verify the meaningfulness of these ideas.

14. References

Integrated transport system. In: *Designing Buildings: The construction wiki* [online]. [cit. 2023-07-04]. Available from: https://www.designingbuildings.co.uk/wiki/Integrated_transport_system