My-TRAC

My TRAvel Companion.

Deliverable D5.5
Operators' platform

Contract No. H2020 – 777640

D5.5: Operators' platform

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Executive Summary

The following document presents the Operators' portal, a component of My-TRAC project, its functionalities and structure, the technical background and the methodology that was followed for its development and finally a user guide (with corresponding images) with detailed instructions on how to use the portal.

The portal consists of two main pages one for allowing operators to upload data and the other to download data. The first one collects information from operators that can take the form of announcements (alerts or updates) and posts (promotional messages). It provides standardized input methods for operators to provide the aforementioned information which will be sent to My-TRAC's servers, to update the recommendations provided to travellers.

Furthermore, the portal provides tools for extraction of aggregated information concerning user choices, user feedback, user habits, etc., in CSV format. The operators can use these data to improve planning and operations. User data on the portal are aggregated and contain non-sensitive data, according to GTFS regulation thus, operators will not be able to micro-target specific individuals or extract information from specific individuals. Behavioural data retrieved from the portal can efficiently enhance planning activities of the operators and improve Quality-of-Service.

The main objectives of the portal's creation are:

- provide the operators with a way to connect with My-TRAC environment
- provide real-time and historic data concerning behavioural analytics of travellers to public transport (PT) operators, which can be used to assist them with their planning operations and to optimize their services
- upload useful real-time GTFS data [1] about alerts, announcements or disruptions, to help travellers with their everyday trips and increase reliability of My-TRAC app.

The main results of the deliverable are:

- development of a web portal named My-TRAC Operators' portal
- creation of an integral tool, suited to the needs of the operators
- assistance on the improvement of PT services
- contribution to the smooth and undisturbed operation of the PT and improve travellers' experience

Abbreviations and Acronyms

P/M	Person/Month
PO	Project Officer
PT	Public Transport
WP	Work Package

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INTRODUCTION

The main goal of My-TRAC is to develop an innovative transport services platform for the rail sector, designed for public and private travellers and operators, in order to provide an improved passenger experience. My-TRAC platform will provide interfaces for both travellers and operators, the former will receive improved trip planning information customized to their needs and preferences, while the latter will benefit from receiving access to anonymized and aggregated behavioural data to improve demand forecasting models. The different components of My-TRAC are presented in Figure 1.
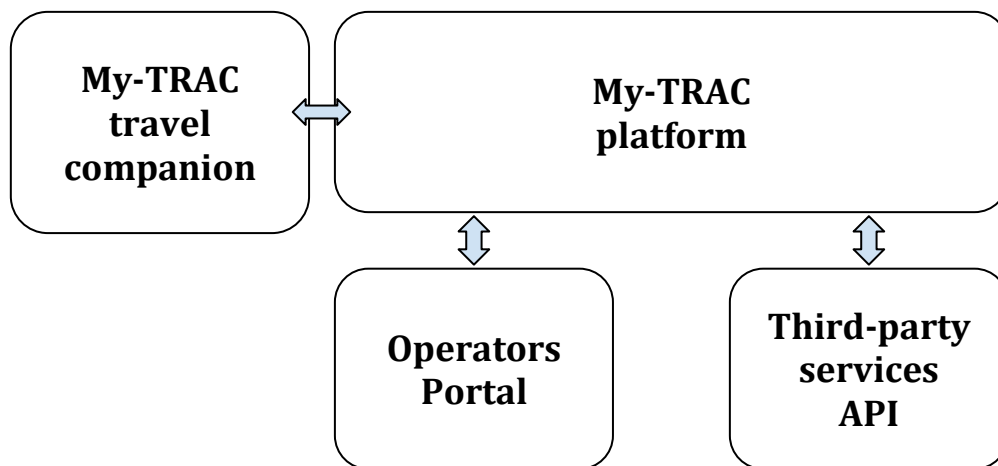

Figure 1: My-TRAC components and definitions

My-TRAC platform will connect information from various sources: (i) PT operators for schedules and actual information (i.e., delays, disruptions), (ii) MaaS providers (i.e., car-sharing, bike-sharing, taxi services), (iii) Datasets related to the service and trip (i.e., parking availability, crowd density at stations, security) and relate this information with users' preferences and state-of-mind. My-TRAC platform will personalize the information provided to the user, enhancing travellers' satisfaction and quality of service. The complexity of the aforementioned operations is immense, encompassing generation and integration of models and algorithms generated for various purposes and from different consortium partners.

From now on, to avoid confusion between My-TRAC platform and Operators' platform, the component is baptized Operators' portal.

My-TRAC Operators' portal demonstrates the aggregated/anonymized data collected by the My-TRAC app and provides interactive components for the operators to communicate with passengers through My-TRAC (e.g., to notify about a delay). The visualisation aspects and the interactive components are a significant task requiring standardized interfaces and easy-to-use modules. The implementation of the above and the development of the portal is the main concept of this deliverable.

This report aims to address Deliverable 5.5 "My-TRAC Operators' portal development", a component that is going to be integrated to My-TRAC. T5.6 is connected with other work packages and tasks of My-TRAC. More specifically D5.5 implements the requirements elicited in detail in D5.1. The original functional requirements were the basis of the development, with improvements and changes according to the project's needs. With feedback from CERTH, the UI/UX design (WP4) was implemented, in accordance to the appearance of My-TRAC app.

The main objectives of the portal's creation are:

- provide the operators with a way to connect with My-TRAC environment
- provide real-time and historic data concerning behavioural analytics of travellers to PT operators, which can be used to assist them with their planning operations and to optimize their services
- upload useful real-time GTFS data [1] about alerts, announcements or disruptions, to help travellers with their everyday trips and increase reliability of My-TRAC app.

The main results of the deliverable are:

- development of a web platform named My-TRAC Operators' Portal
- creation of an integral tool, suited to the needs of the operators
- assistance on the improvement of PT services
- contribution to the smooth and undisturbed operation of the PT and improve travellers' experience

The rest of the document is organized as follows. In Section 1. My-TRAC Operators' Portal, the portal's functionalities and structure are explained in detail, while in Section 2. Technical background the technical background and the methodology, that was followed for its development, are described. Finally, the conclusions along with the steps to be followed are presented. Moreover, an Annex is provided, with detailed instructions, for the operators, on how to use the portal.

1. My-TRAC Operators' Portal

AETHON created the Operators' portal that is going to be part of the My-TRAC project, and a useful tool for the operators. Operators' portal aims to be the gateway for PT operators to communicate with My-TRAC and vice versa. It will constitute a tool for the operators to have access and download useful travellers' behavioural data to improve strategic planning and dynamic operations, and to provide updates in the form of real-time GTFS data, informing about alerts or changes.

By using the portal, operators will have access to real-time and historic data concerning behavioural analytics of passengers and other operators' uploaded data. The data will be aggregated and anonymized, adhering to GDPR rules. Currently, operators have to conduct expensive surveys and time-consuming data analysis, to retrieve similar data. Behavioural data from the portal will assist operators to provide the passengers with travel options tailored to their preferences.

Figure 2: Operators' portal sitemappresents the sitemap (blue boxes) and the functionalities (orange boxes) of each page. Each page is explained separately below the figure:
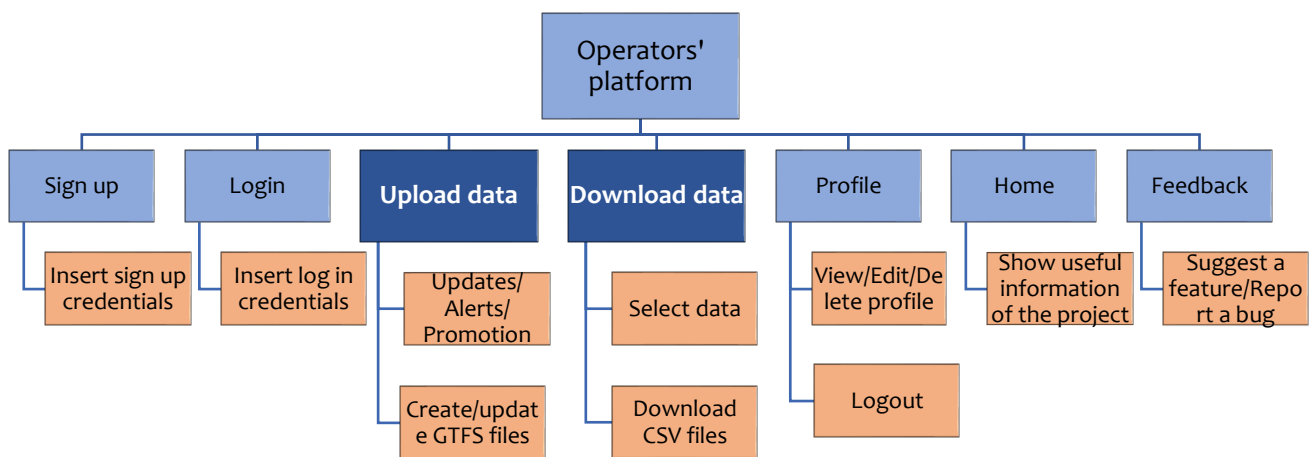

Figure 2: Operators' portal sitemap

1.   Home page

Home page is the first page that the operator encounters in the web-portal. It contains basic information about the My-TRAC project's vision and the official link to the website of My-TRAC project. It will be enriched with news and information.

2.   Signup page

In this page, the operators can be registered, in order to have access to the functionalities that the portal offers. Credentials regarding the user of the portal and the company that they represent, are required for the registration. After filling all the required fields, the operators have to wait for an email with further instructions, in order to confirm their registration. This email explains the upcoming steps needed to be followed and what kind of documents are required to be uploaded. The documents' review is important for the validity of the portal and the information inserted. Until the confirmation, the users' registration is pending. Every time a new operator is registered a profile is created in the database to store the all the provided information.

3.   Login page

After the registration (and confirmation), the user can login in order to have access to the main pages of the portal. The only credentials required are the operator's representative unique username and password. The portal is not accessible by anyone, but only from verified users.

4.   Profile page

After the successful registration, a profile for the user and the company is created, displaying all the information retrieved from the registration process. The profile is only visible to the registered operators, making it easier to revise their information and edit them anytime. All the information can be updated except from the username. There is also the possibility of uploading profile image and company's logo while the *Logout* and *Delete profile* options are also in the page. When a profile is deleted, the corresponding company is also deleted automatically.

5.   Feedback page

In the feedback page, the users can assist on the improvement of the portal, providing their opinion for the portal by suggesting a new feature that would be useful to be added or by pointing out an error that disrupts the proper functioning of the portal. In the comments box they can offer reviews, suggestions, changes and improvements. The company name and the email of the user are required, so that we are aware of the identity of the user. This communication between the operators and the portal is crucial for the continuous improvement and update of My-TRAC and to ensure the quality of the portal.

The two main purposes of the portal's creation are described in detail in the following sections.

1.1 MAIN FUNCTIONALITY #1: UPLOAD DATA

This functionality responds to one of the objectives of this deliverable, which is to upload useful real-time GTFS data about alerts, announcements or disruptions, to help travellers with their everyday trips and increase reliability of My-TRAC app. The operators enter the My-TRAC portal in order to upload useful data about the operations of the PT, such as changes on the timetable of a trip, or an urgent message that a specific train stopped working. They can choose among "Trip updates", "Service alerts" and "Promotional messages" (Figure **3**: Upload data page) depending on the kind of information to be uploaded. The first two categories are based on the GTFS real-time [1], while the last one consists a new functionality that allows operators to promote important messages to travellers through the app (users of My-TRAC). The system categorises the uploaded data (if it concerns stations, routes, delays, etc.) in the corresponding tables and stores them for future use. My-TRAC has collected the GTFS files of Belgium, Greece (Athens), the Netherlands, Catalonia (Barcelona) and Portugal (Lisbon), which allows for the presentation of a list with all the available IDs and routes that an operator would need to change or update, depending on the country. Each input assists on the more appropriate categorization and the update of the corresponding GTFS files. Some of the fields are required or conditionally required, while other are optional. Next to each field there is a help tip, explaining in detail, what needs to be filled and in what format. Depending on the choice, different input forms appear, and the operator can select which category suits best to the data that need to be uploaded (Table 1: Upload data definition). More specifically:

The *Trip updates* (Figure **4**: Trip updates form) are real-time updates on the progress of a vehicle along a trip. They usually represent fluctuations or future changes in the timetables, or even cancelled or added trips to the schedule. This form is separated in 4 sections: i) Trip Descriptor, where the updated trip is specified, ii) Vehicle Descriptor where (optionally) the vehicle of the specific trip is described, iii) Stop Time Update that constitutes the real-time update for arrival and/or departure events for a given stop on a trip and, iv) Event Time where timing information for a single predicted event is provided in the corresponding input fields, based on the GTFS Realtime Reference.

Service alerts (Figure **5**: Service alerts form) indicate some sort of incident in the PT network. They usually constitute urgent messages (and not permanent changes) that should be promoted to the travellers through the My-TRAC app which can be executed in multiple ways such as direct messages ("popups") or used to update the recommendations provided by My-TRAC models. Service alerts affect only some travellers travelling on a specific route, line or vehicle. Thus, dissemination of the service alert should involve only affected individuals. This assists on enhancing the precision of My-TRAC app, leading to better services for the travellers. Service alert form is divided in i) Alert description where details of the alert are provided, ii) Time range that specifies that the alert will be displayed within the given time range, iii) Entity selector that indicates exactly which parts of the network this alert affects and iv) Trip Descriptor where the affected trip is specified. Below, the operator can also choose the cause, the effect and the relation between the trip and the static schedule.

The *Promotional messages* (Figure **6**: Promotional messages form on the other hand, are short messages, containing advertisements or announcements that the operators wish to promote to travellers. The operators can also specify the time range and the frequency of the messages' appearance, the group age that these messages respond to and the mode choice. This way, the messages will be forwarded only to specific travellers, improving the user experience of My-TRAC users. This functionality is central for the business model of the Operators' Portal.

When the operators submit the completed fields, the GTFS files are updated/created automatically. Information about updates and future events are propagated to My-TRAC app users and even other operators, that need to stay informed about the services of each PT.

The data provided by the operators through the functionality discussed in this chapter will be fundamental for developing and improving transport models and for building a system that learns from real events which enhance My-TRAC reliability and precision.

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Figure 3: Upload data page

Figure 4: Trip updates form

Figure 5: Service alerts form

Figure 6: Promotional messages form

Table 1: Upload data definition

DATA input fields	Definition
Trip updates	
Trip Descriptor	Description of the specific trip (trip ID, route ID, direction ID, start time and start date)
Vehicle Descriptor	(optional) Description of the vehicle of the specific trip (ID, label, license plate)
Stop Time Update	Real-time update for arrival and/or departure events for a given stop on a trip (stop sequence, stop ID)
Event time	Specifications of the time of the event/update (delay, time, uncertainty)
Schedule relationship	Relation between the trip and the static schedule
Service alerts	
Alert description	(optional) Description of the alert, along with a link
Time range	The time range that covers the entire time the alert is useful to appear
Trip Descriptor	Description of the specific trip (trip ID, route ID, direction ID, start time and start date)
Entity selector	Parts of the network this alert affects
Schedule relationship	Relation between the trip and the static schedule
Cause	The cause of the alert
Effect	The effect of this alert
Promotional messages	
Message	Message that need to be promoted
Time range	The time range that covers the entire time the message is useful to be seen
Target group	Specification of age and mode that this message refers to
Frequency	The frequency of time that this message appears

1.2   MAIN FUNCTIONALITY #2: DOWNLOAD DATA

This functionality corresponds to the first objective of the deliverable "provide real-time and historic data concerning behavioural analytics of travellers to PT operators, which can be used to assist them with their planning operations and to optimize their services". It is crucial for the improvement of the PT services, to obtain this kind of data. They are usually hard to be obtained, since the collection and analysis is an expensive and time-consuming

procedure. My-TRAC app clusters travellers according to their behavioural patterns and summarizes information of the most repeated activities and actions, specifying their preferences.

The operators can retrieve real-time and historic data concerning behavioural analytics of travellers and travel patterns (e.g. how many students used the metro, during a day, for the past month). The extracted data will be based on travellers' behaviour (derived from travellers' everyday trips and preferences stated in My-TRAC app) and later they will be enriched with data collected from the pilots. The operators can download the data required in a CSV file, for further usage. They have the possibility to download the data they need by choosing route, mode and dates from a calendar. They can also select the aggregation of their data which can be based on sex, day of the week, card type and occupation (Figure **7**: Download data page, Figure **8**: Download data form). The aggregated data will be an additional source of information for the operators, for improving and updating their PT operations. The timetables, routes and general services of operators will be always up to date, offering the best experience for the travellers and users of My-TRAC app, since the operators will have a better overview of travellers' behaviour. The retrieved data can also concern crowdedness allowing the operators to allocate PT capacity more efficiently.

Figure 7: Download data page

Figure 8: Download data form

Table 2: Download data definition

DATA input fields	Definition
Route choice	(Optional) The specific route of the travellers
Mode choice	(Optional) The specific PT mode of the travellers
Date choice	Date range of the required data
Timeslot	Data presented are divided by 1, 2 or 6 hours
Aggregated on	Aggregation of travellers (can be more than one option)

2. TECHNICAL BACKGROUND

The project management method that was followed for the development of the portal was the Agile methodology, a process that encourages iterative planning and continuous adaptation to changing requirements throughout the process, by measuring and evaluating the status of a project [2].

The development of the code was continuously integrated into a shared repository, allowing the quick and easy detection of errors, leading to a rapid delivery of a high-quality project. Furthermore, pair programming was another agile technique that was implemented throughout the development, ensuring the quality and accuracy of the code through cross-examinations and thorough review.

PHP was the main programming language used for the development of the web portal, in combination with HTML for the structure and the appearance of the web pages and CSS for pages' styling like colors, fonts and layouts. Alongside with HTML and CSS, Javascript was also used for interactivity with the web pages, as the three technologies combined, constitute the core of web browsers and applications. In addition, other libraries and frameworks were integrated to improve performance such as Bootstrap and by extension StartBootstrap, which provide design templates for buttons, forms and even whole web portals.

A database was also created using *phpMyAdmin* which is a free and open source tool intended to handle the administration of *MySQL* with the use of a web browser. With this tool and the use of MySQL, the database along with the tables and their corresponding rows were created, modified or deleted. All the tables of GTFS files reside in the above-mentioned database, with the corresponding foreign keys that link the tables together.

BitBucket was used as the repository where all the different versions of the source code were stored during the portal's development. In this way, every slight change of code can be tracked and reversed.

More specifically, the source code that constitutes the Operators' portal is composed of 24 PHP scripts combined with HTML, 6 Javascript scripts and 3 CSS scripts, in total 4092 lines of written code.

CONCLUSIONS AND NEXT STEPS

The portal aims to be the gateway for Public Transport operators to communicate with My-TRAC and vice versa. With its two main services, upload and download data, the portal is expected to serve as an integral tool for operators, that is going to be useful for the smooth and undisturbed operation of the Public Transport. When the operators provide their data to the portal, they assist on the improvement of My-TRAC's app and consequently their customers' experience, while when they extract aggregated user data, they have the opportunity to update and improve their service.

The Operators' portal and its functionalities are going to be presented to Public Transport operators of Greece, the Netherlands, Spain and Portugal in the My-TRAC consortium meeting which will take place on October 25th, 2019 in Delft, the Netherlands. During this presentation, a live demo will be executed, where all the operators will enter the portal from their own computers and use it in real-time. The feedback will concern accuracy of information received and it is going to assist on the live testing and on the useful feedback from potential users of the portal, leading to the improvement of the operations of the portal and the quantification of its added value.

Operators' portal is going to be constantly updated and improved. More specifically:

- GTFS input fields will be based on real GTFS files from Belgium, Greece (Athens), the Netherlands, Catalonia (Barcelona) and Portugal (Lisbon).
- GTFS from other countries will be added, so that My-TRAC's Operators' portal will become a necessary tool for operators all over Europe (and even further!).
- GTFS files will be produced automatically, in the *Upload data* page, so that they can be stored for future use, in My-TRAC app.
- Data retrieved from the pilots, are going to be processed and lead to re-evaluation of the functionalities and operations of the portal.
- A REST API will be created to provide the data to operators in JSON format.
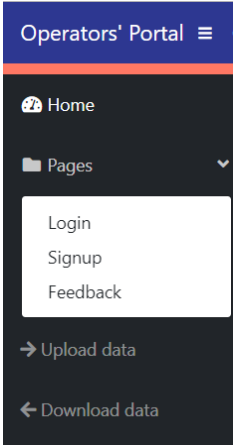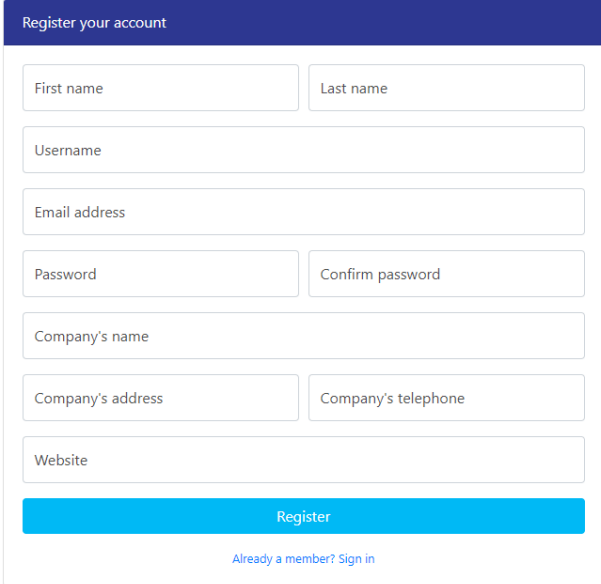
User guide

The following section presents the steps to create an account, log in, upload and download data. In other words, presents in detail the steps that a user (operator) needs to follow in order to utilize at its full potential the operators' portal.

1.1 ACCOUNT CREATION

Steps	Look and Feel	Description
Step 1 – Portal Pages	Operators' Portal ≡ 🏠 Home 📁 Pages ⌄ Login Signup Feedback → Upload data ← Download data	The available pages of the portal. Tap signup.
Step 2 – Signup page	**Register your account** First name — Last name Username Email address Password — Confirm password Company's name Company's address — Company's telephone Website **Register** Already a member? Sign in	Insert your credentials in order to get registered to the portal. Username must be unique, password and confirm password should match, email, and company's telephone website should be in the right format.

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Step 3 – Fill Sign up form		When you press "Register", error checks are made, and a message appears informing that your registration is pending.
Step 4 – Account created		When the registration is confirmed, the profile is created.

1.2   PROFILE PAGE

Steps	Look and Feel	Description
Step 1 – Upload profile photo		Choose file and upload your logo or/and image.
Step 2 – Edit profile		If you need to edit the information of your profile, press "Edit Profile", and change the field you wish.
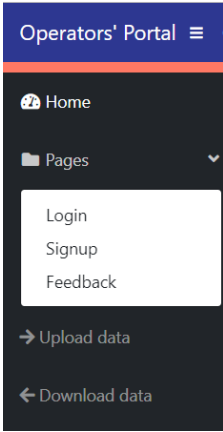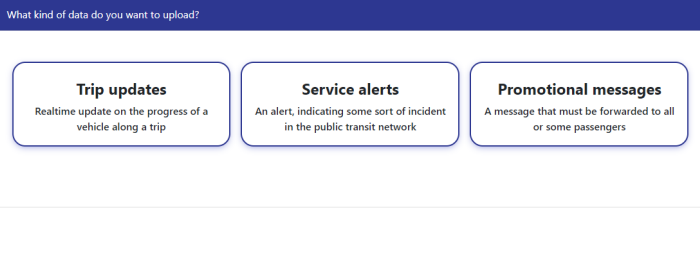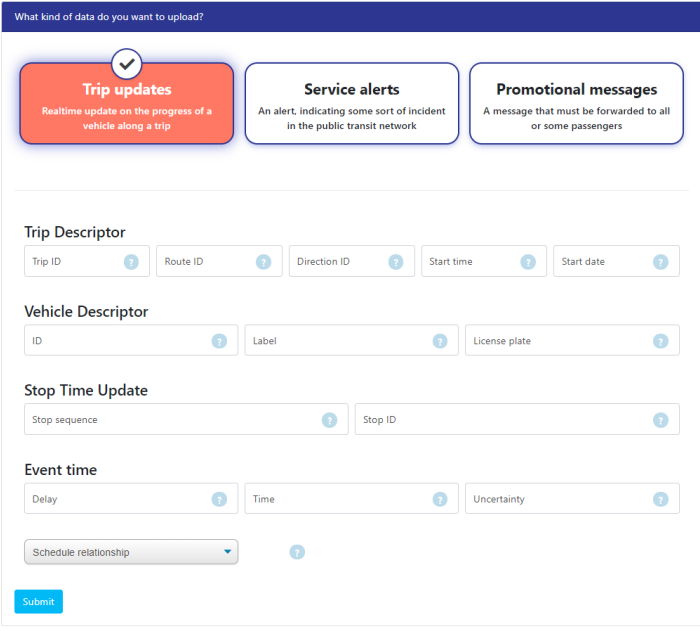
1.3 LOGIN

Steps	Look and Feel	Description
Step 1 – Enter credentials	**Login** — Username, Password, Login, Not yet a member? Forgot Password?	To login to the portal, insert your unique username and password. Tap "Login". If the credentials are correct, the login is successful. (You will be redirected to the Profile page. If the login failed or if you tap forgot password go to Step 2. If you have not been registered at all, press "Not yet a member" and you will be redirected to the Signup page. Step 3
Step 2 – Login Fail	Fill in your email, and you will receive a new password — Email address	If the credentials are not correct, messages appear to inform you about the wrong inputs. If you have forgotten an email with instructions will be sent to you.
Step 3 – Create account	**Register your account** — First name, Last name, Username, Email address, Password, Confirm password, Company's name, Company's address, Company's telephone, Website, Register, Already a member? Sign in	Create account.

1.4 UPLOAD DATA
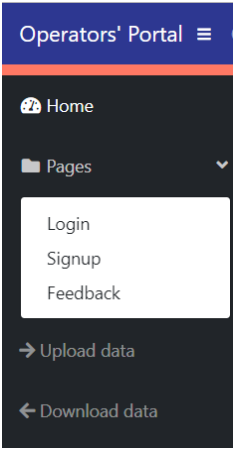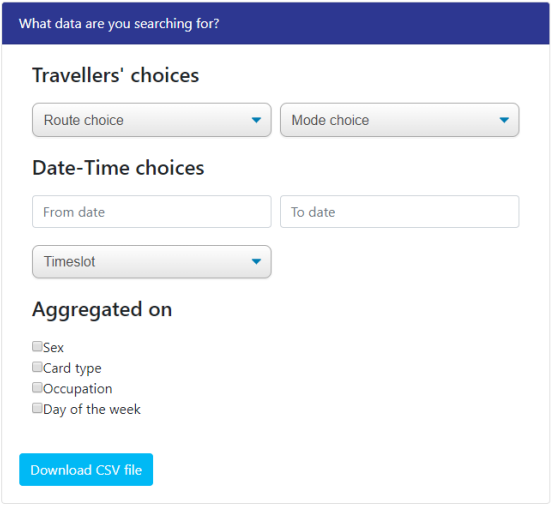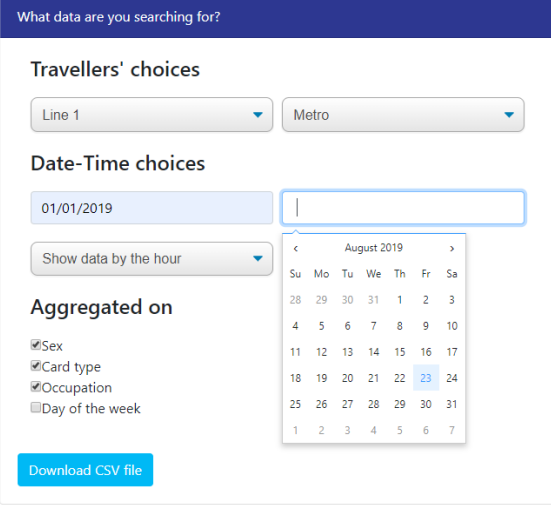
Steps	Look and Feel	Description
Step 1 – Portal Pages		Tap Upload Data.
Step 2 – Upload Data		Choose which category of data suits best, to what you need to upload. If you choose: - "Trip updates" go to Step 2; - "Service alerts" go to Step 3; - "Promotional messages" go to Step 4;
Step 3 – Trip updates		Trip updates form.

Step 4 – Service alerts		Service alerts form.
Step 5 – Promotional messages		Promotional messages form.

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1.5 DOWNLOAD DATA
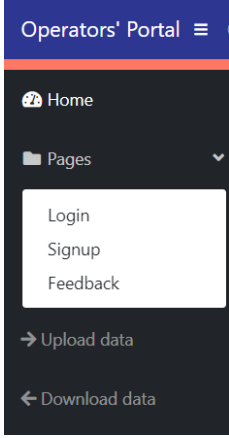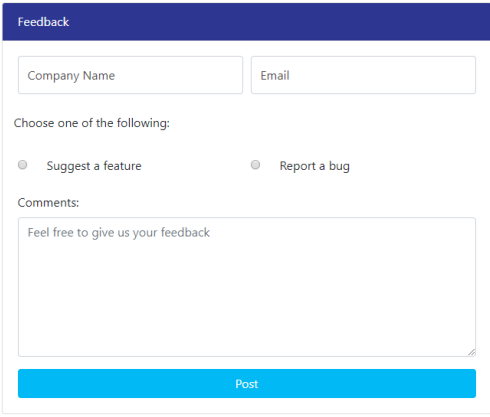
Steps	Look and Feel	Description
Step 1 – Portal Pages	Operators' Portal ≡ Home Pages ⌄ Login Signup Feedback → Upload data ← Download data	Tap Download Data.
Step 2 – Download data page	**What data are you searching for?** **Travellers' choices** Route choice ▾ Mode choice ▾ **Date-Time choices** From date To date Timeslot ▾ **Aggregated on** ☐ Sex ☐ Card type ☐ Occupation ☐ Day of the week Download CSV file	Choose any of the route choice and mode choice. Both fields are optional
Step 3 – Download data form	**What data are you searching for?** **Travellers' choices** Line 1 ▾ Metro ▾ **Date-Time choices** 01/01/2019 Show data by the hour ▾ **Aggregated on** ☑ Sex ☑ Card type ☑ Occupation ☐ Day of the week Download CSV file ‹ August 2019 › Su Mo Tu We Th Fr Sa 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 6 7	- Choose from the calendar the dates you wish to show. This field is required. - Choose the timeslot you like (1, 2, 6 hours). This field is required; - Choose the aggregation of your data (sex, card type, occupation). You can select either one or multiple aggregation options; - Press "Download CSV file" and the csv with the corresponding data will be downloaded to your PC.

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1.6 FEEDBACK

Steps	Look and Feel	Description
Step 1 – Portal Pages	Operators' Portal ☰ 🕑 Home 📁 Pages ⌄ 　Login 　Signup 　Feedback → Upload data ← Download data	Tap Feedback.
Step 2 – Feedback page	**Feedback** Company Name　Email Choose one of the following: ◯ Suggest a feature　　◯ Report a bug Comments: Feel free to give us your feedback Post	Fill in company's name and email. (If you are not registered, feedback cannot be submitted); Choose between suggesting a feature and reporting a bug; Write your feedback/comments (limit to 1000 characters) and press "Post".

REFERENCES

[1] Google LLC, "Google Transit APIs - GTFS Realtime Overview," Google LLC, 03 05 2019. [Online]. Available: https://developers.google.com/transit/gtfs-realtime/. [Accessed 26 08 2019].

[2] Team Linchpin, "Linchpinseo.com," 30 08 2019. [Online]. Available: https://linchpinseo.com/the-agile-method/. [Accessed 02 09 2019].