



## **UIL Tool - Best practices**

**R. Hueting, S. Giorgi, A. Capaccioli (DBL), M. Bánfi, T. D. Soltész (MBE)**

# Accessible user-interfaces: best practices at European and international level

## Methodological Foreword

The overall UIL Tool objective is to propose a methodological path that can provide developers and service providers with useful insights to plan, build and perform quick and intuitive exercises with users. This can be done already in the prototype phase of the service/application development and replicated several times, according the user-centred design principle “test early and often”.

To identify a proper set of accessible and inclusive icons, we suggest following three main steps, i.e.:

1. Carry out a preliminary review of similar services to explore icons use and the accessibility of interfaces;
2. Build a user-centred exercise as described in this UIL to involve users in the evaluation of icons;
3. Consolidate the review and the results of exercises that have been carried out with a more systematic survey, using the UIL survey as an example.

In this best practices collection we report a preliminary set of icons that has been evaluated in steps 2 and 3, through the analysis of digital mobility and delivery service applications conducted by the research team. The analysis included relevant screenshots of applications’ interfaces where both general icons and specific mobility icons were clearly identifiable. In addition, we explored 20 applications commonly used in Europe offering both transit (DMS) and food delivery services (DDS), plus few applications dedicated to people with visual impairments. On this quite extensive list of digital applications, we built the catalogue of 27 recurring icons and classified them following Norman Nielsen’s heuristics and Universal Design principles. The evaluation focused on the use of visual icons in mobile applications, leaving out the in-depth analysis of mobile operating systems.

## Testing guidelines

During the analysis testing personnel went through a semi-structured checklist to map the existence of inclusive interface and service solutions, where the following aspects were assessed:

- general usability;  
accessibility of main functions and settings;



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- personalisation options of the graphical user interface (e.g., showing a map on the main screen can be confusing for a visually impaired person using text-to-speech software);
- clarity of non-textual information (icons, POIs, etc.);
- (public transport) route planning;
- accessibility settings (e.g., barrier-free routes, indications for visually impaired people);
- personalisation options of the service (e.g., using only specific types of transport);
- availability of (real-time) guidance and navigation;
- real-time notifications;
- information about service availability, service changes;
- personalization accommodating specific needs;
- voice-based options;
- searching;
- navigation;
- user settings;
- saving/deleting of previous searches, itineraries, points of interest;
- saving of user-specific needs;
- balance in personalisation and amount of personal data collected;
- additional features supporting vulnerable-to-exclusion users.

According to these aspects the main findings from each application are described in the following paragraphs.

## Global routing and vehicle/ride sharing applications

Many people for everyday life use global applications during travel instead of city-specific services. The most common such solutions are built-in maps of smartphones and community-driven navigation software. Vehicle and ridesharing applications also examined here, although with less details as many of these services are not accessible in themselves (e.g., visually or mobility impaired people cannot use shared e-scooters).

### *Google Maps*

Commonly used application for searching location-based data and navigating by various transport modes (walking, cycling, driving, public transport). It provides a built-in voice-based search in many languages. It also offers offline options (by downloading detailed map parts) and many options for saving favourite places which can be later accessed faster. Navigation is provided with visual signs (even VR-like) and with detailed voice-based information (Figure 1). Public transport routes are provided with accessibility information of the PT vehicles (and this information can be also rated during the travel) – also accessible route can be planned. Accessibility information of PT vehicles can depend on available databases so it can vary among different countries and regions.



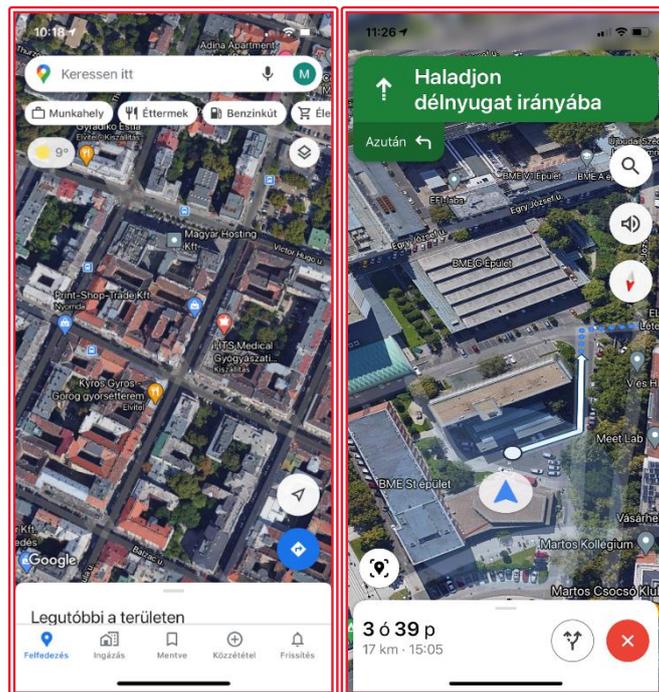


Figure 1 - Screenshots from Google Maps application

### *Maps (Apple)*

Location based search and navigation application which works well with the built-in voice control of iPhones, although its usability is limited because it manages only a handful of languages and POI database is largely limited outside the United States. Planning routes by different transport modes are available, although no accessibility information (e.g., low-floor vehicles) is provided for public transport.

### *Waze*

Waze provides navigation specifically for car-drivers, using real-time data from other users' travels. From accessibility standpoint it provides built-in voice search in many languages (uses the same database as Google Maps).

### *Uber*

Uber is a frequently used ride-hailing application which is currently banned in many countries due to uncertain regulations and debates against taxi service providers. Uber offers specific service for users with special needs, which is called Uber Assist. Drivers with appropriate certificates will drive the ordered car in order to assist the users. Other than that, the application does not provide any accessible options, most interestingly the specific need of a vulnerable user cannot be saved into the user profile.

### *Moovit*



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Moovit application covers public transport and bike (shared bike as well if available) transport for many cities all over the world. Many of these cities do not have any available local applications. It provides a useful notification option when using public transport in addition to the info about the vehicle's accessibility (Figure 2).

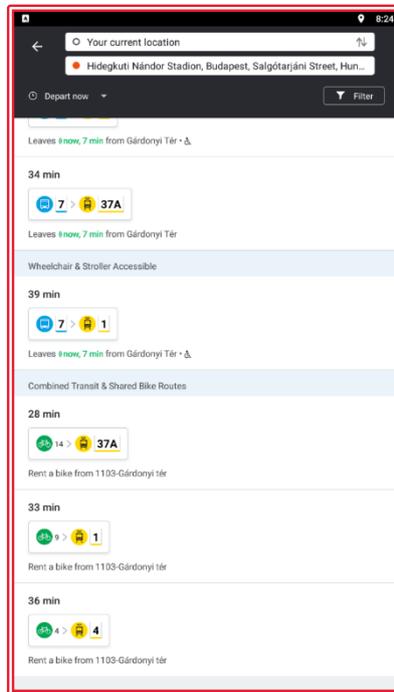


Figure 2 - Screenshot from Moovit application

## Digital delivery applications (including smart boxes)

Many digital delivery applications (Amazon, DHL, Wolt, Bolt, Alza) were tested to find good solutions for people with specific needs, but these services do not really focus on such solutions. Although some good examples were also found, which are listed below.

### *DHL application*

The application itself does not provide special functions for vulnerable groups but offers a service point finder with several options where an accessibility choice selection could be easily included (Figure 3).



The screenshot shows a mobile application interface for finding a service point. The title bar is yellow and says "Service Point". Below it, there's a "Back" button and "Advanced Search" text. The form is divided into several sections: "Select a country / region & location" with a dropdown for "HU" and a text input for "Budapest, Bercsényi u. 7. 1111 Hungary"; "Required Service" with a dropdown for "I have no DHL account and want to send an Express shipment"; "Piece limitation" with a "Weight" field and a unit dropdown for "kg", and three smaller fields for "L", "W", and "H" with a unit dropdown for "cm"; and "Opening hours" with three dropdowns for "Open before", "Open after", and "Open on". At the bottom, there is a red "Search" button and a blue "Clear filter" link.

**Figure 3 - Screenshot from DHL application**

### *Alza*

Alza provides smart boxes as an option of delivery throughout many countries. Its service-point finder also gives information about the accessibility of these boxes (Figure 4) and also, a photo of the place where the box is. Details of the pick-up boxes are only available in local language, as this info is opened on a separate form.



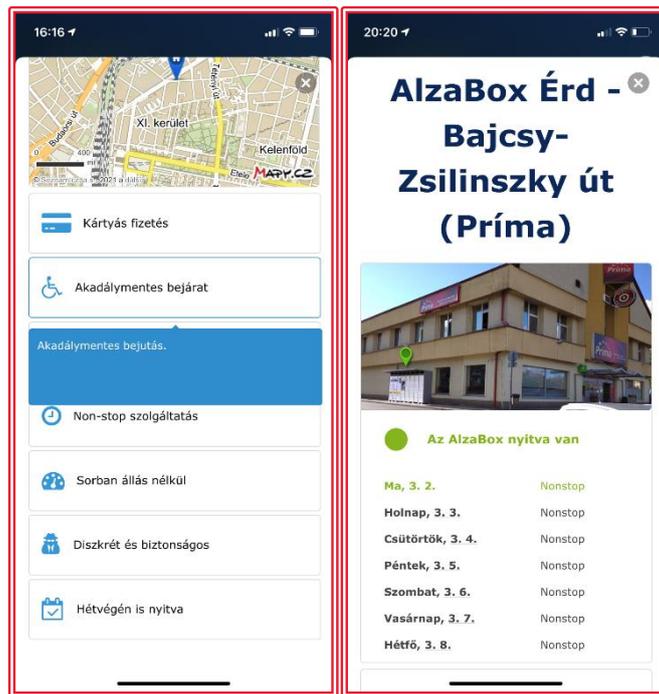


Figure 4 - Screenshots from Alza application

## Public transport applications – Europe Mediterranean Region

The countries included the Europe Mediterranean region can be seen on Figure 5.



Figure 5 - countries of the Europe Mediterranean area

### France



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The official application for Lyon’s public transport (TCL app) provides real-time information of accessibility (e.g., lifts and escalators available and unavailable on different stop of a line) on stations and also has notification options (Figure 6).

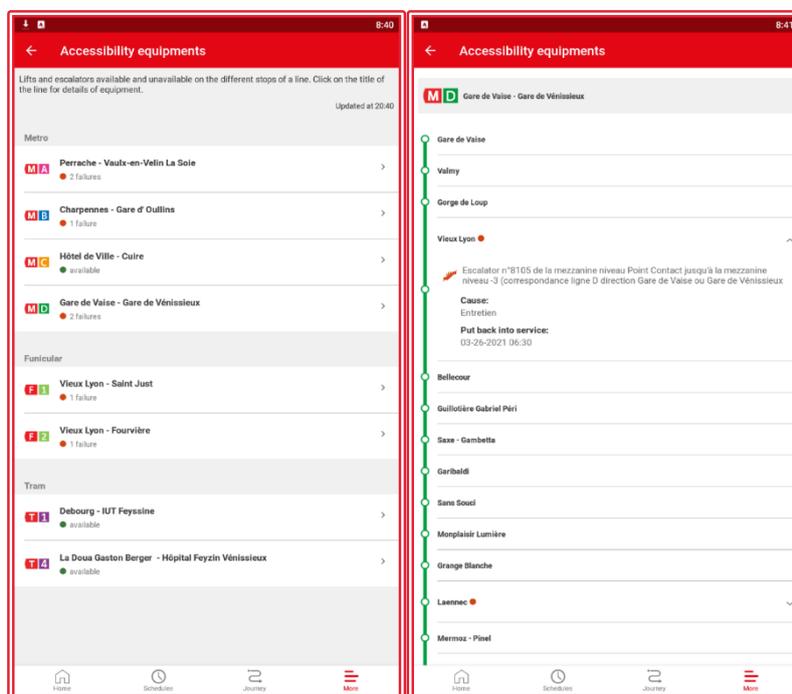


Figure 6 - Screenshots from TCL application

Unfortunately, other public transport applications in France (e.g. Next Stop Paris, Keolis TBM – Bordeaux, RTM – Marseille) are available only in French (except for Paris) and usually do not provide any information about accessibility and give no options for accessible route planning. The only good practice to be highlighted that they all provide notifications about service updates.

### Greece

In Athens, there are two different applications for public transport (OASA Telematics mostly for bus services and Μετρό και Τραμ Αθήνας – Metro kai Tram Athínas for metros and trams). Accessibility options are not provided, the latter is only available in Greek.

### Italy

In Italy the picture of applications varies greatly between cities. In Milan, ATM Milano Official App provides accessibility information and signs on a static map (including stations accessible by using wheelchair) in addition to a three-page description of inclusive use of public transport. A detailed table is also provided about the mobility impaired aiding equipment available on each station. The demand responsive service Radiobus is also integrated which may be useful for vulnerable to exclusion people for reaching public transport from areas not fitted for use with any impairment. It may be also helpful during off-peak and night periods when not all the services are operated with full frequency.



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Turin (GTT – TO Move) and Genoa (AMT Genova) applied external solutions into their application: Turin uses the web-based journey planner, Genoa’s app based generally on Google Maps. The accessibility options depend on these services, Turin’s route planner supports accessibility options (although it did not work during testing).

Rome offers a hardly reachable application, Viaggia con ATAC, and this software does not provide any accessibility options at all.

### Public transport applications – Northern European region

The countries included the Northern European region can be seen on Figure 7.

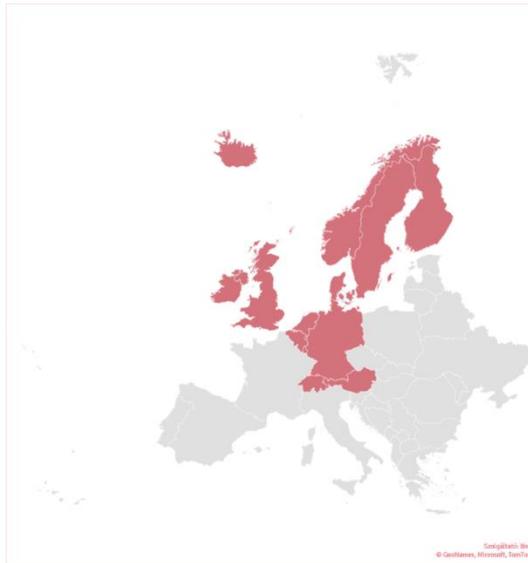


Figure 7 - countries of the Northern European region

#### *United Kingdom*

London’s all-around public transport application, TfL Go (Figure 8) provides a minimalistic design with two main buttons featured on the opening screen:

- a big icon for step-free mode;
- a big icon for service updates.

Step-free mode changes all settings to barrier-free navigation which also changes the background map, showing in original colour only the accessible stations and routes. Service updates are managed in a special way as lines are showed with their names and colours which may be difficult to identify for passengers who are not familiar with the network.



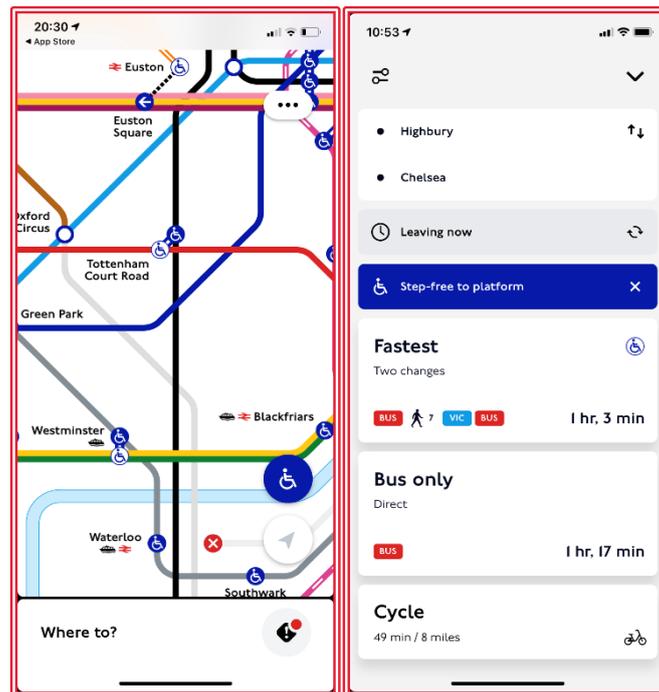


Figure 8 - Screenshots from TfL Go application

Liverpool offers the Merseytravel application for public transport users, which provides a multimodal route planner with various mobility options, e.g., the passenger would like to use stairs, escalators, elevators (Figure 9).

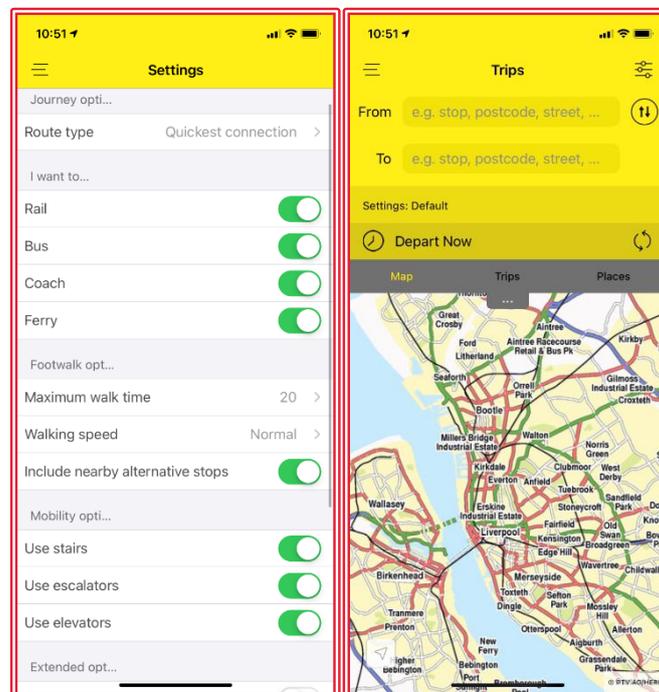


Figure 9 - Screenshots from Merseytravel application



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## Sweden

Stockholm's official public transport application is the SL-Journey planner and tickets application (Figure 10). Regarding accessibility, it offers a downloadable accessibility information leaflet, which promises accessibility as a standard. Therefore, it does not offer accessibility options at the journey planner. It features also chat and call options with customer service (and also another contact in case of security issues), but it ms to work only in Swedish. Service updates are also provided only in Swedish. As the name suggests, online ticketing is included in the application.

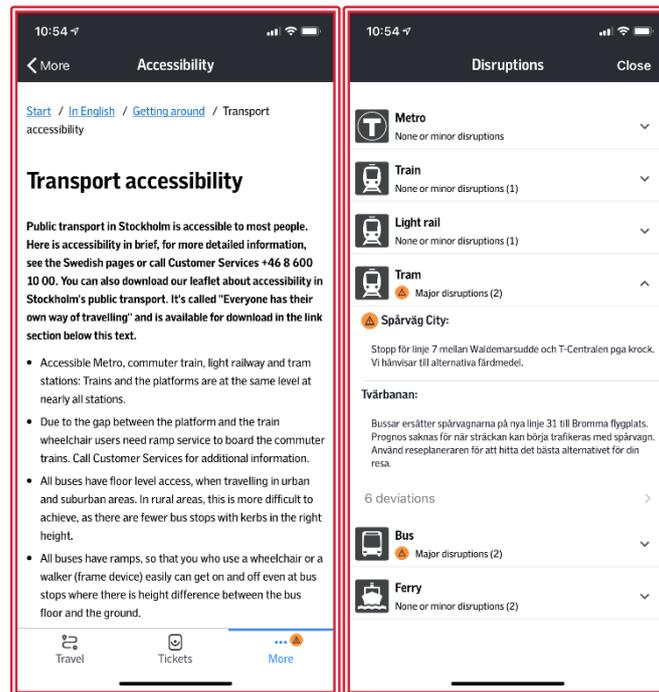


Figure 10 - Screenshots from SL journey planner and tickets application

## Germany

Germany offers many good practices from which two application were tested in details. Hamburg's HVV application (Figure 11) opens with a quick introduction which goes through the main features of the app and how to use them. The application includes a route planner with accessible connection options (if any impairment is set, the planner offers connection hubs where the transfer is available with the specified impairment) and navigates throughout the journey by alarms at hop on/off and transfer. It also features a widget function for purchasing tickets and showing tickets already purchased, making easy to find tickets when inspecting. Notifications and chosen connections can be monitored with Apple Watch. Some service updates were provided only in German.



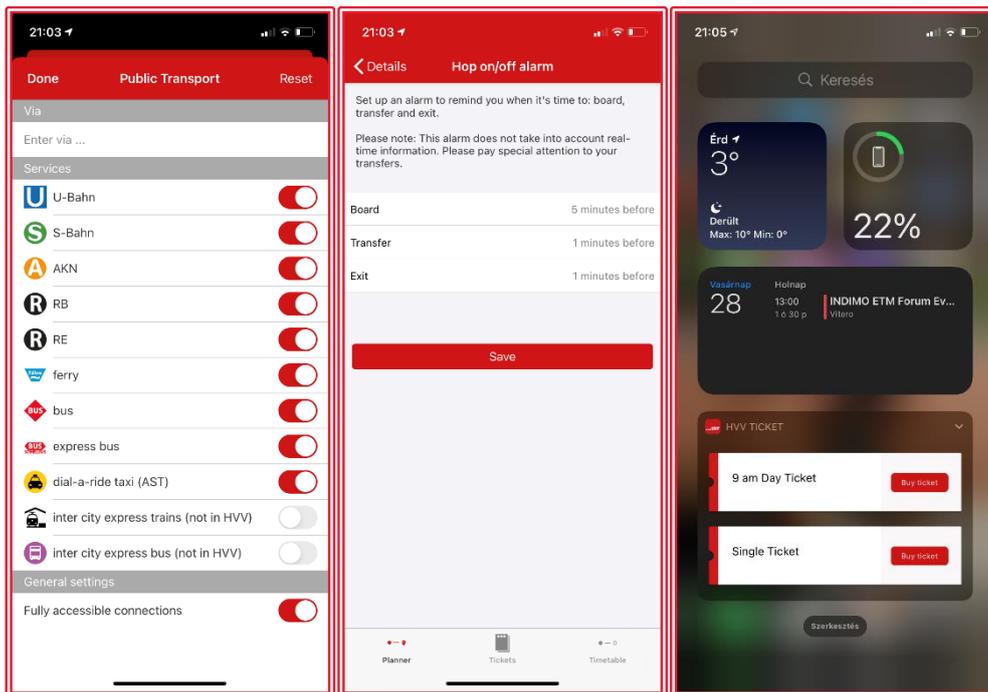


Figure 11 - Screenshots from HVV application

Berlin's BVG App (Figure 12) uses also a quick introduction opening. However, its main screen is a dashboard, which can be edited by the user selecting several options (i.e. accessibility options, walking speed, direct connections only, etc.). Concerning the accessibility options, when planning a route, the application gives a limited and a barrier-free option as well for passengers and offers a live navigation throughout the journey. It also contains ticket purchasing options for planned routes or for longer timeframes.



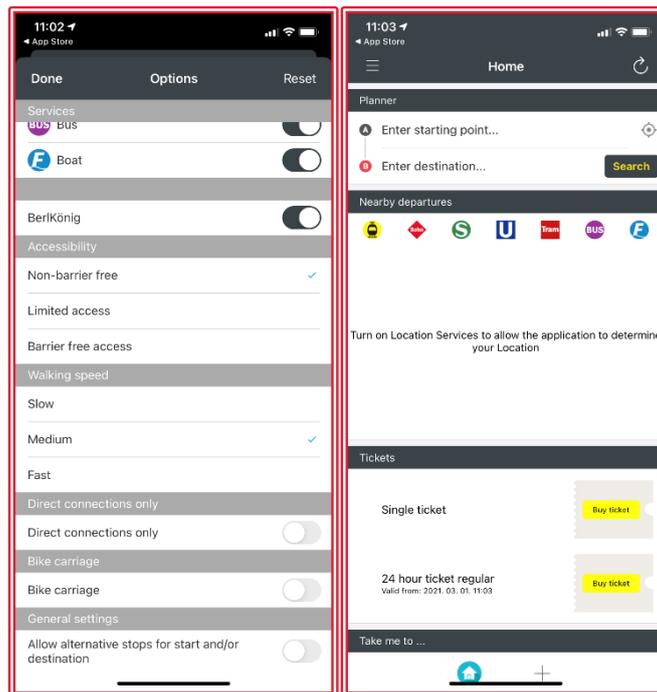


Figure 12 - Screenshots from BVG application

### Switzerland

When using public transport in Zurich (and actually in whole Switzerland) passengers can use ZVV application (Figure 13). As the German apps, it opens with a quick introduction and has an editable opening screen, which can be set to the user's preference (e.g. fully accessible connections). Enables route planning and ticket purchasing for all public transport options throughout Switzerland. It also offers many options for barrier-free travel. Real-time notifications about planned routes and service updates can be edited by lines. In settings, it allows further management of permissions (it only asks for unnecessary permissions at first opening).



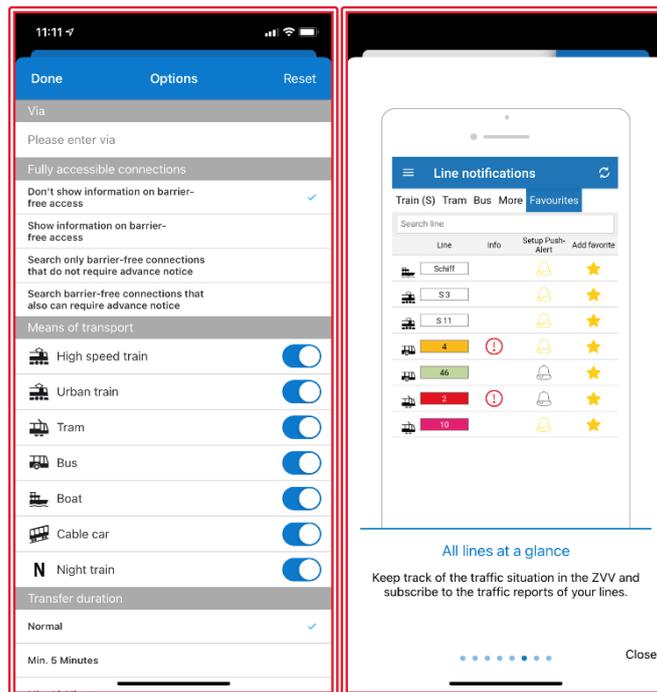


Figure 13 - Screenshots from ZVV application

## Public transport applications – Eastern European region

The countries included in the Eastern European region can be seen on Figure 14. Despite not including them on the map, the analysis of the area also included cities from Russia, Turkey, and Cyprus.

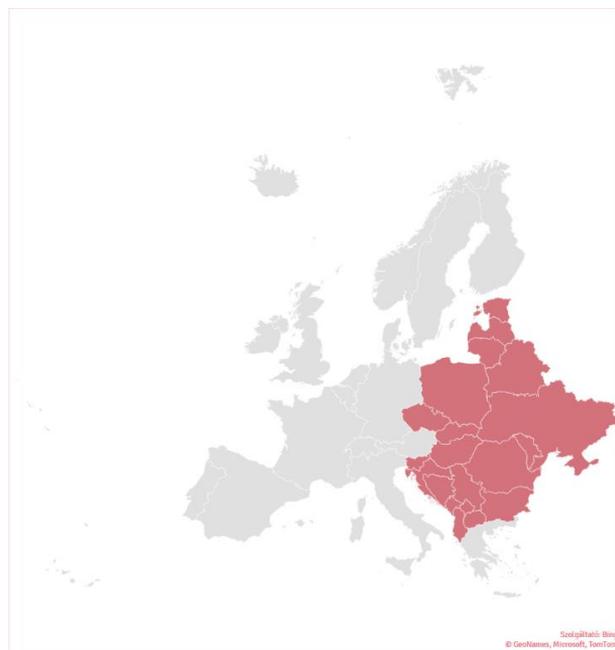


Figure 14 - countries of the Eastern European region



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## Czech Republic

In Prague the official public transport application PID Lítačka (Figure 15) offers various accessibility functions: routes can be planned with two optional filters (“low floor only” and “wheelchair accessible only”), and it also offers accessibility information about stations and vehicles. Another really useful capability is the built-in ticketing system, which covers local and regional services.

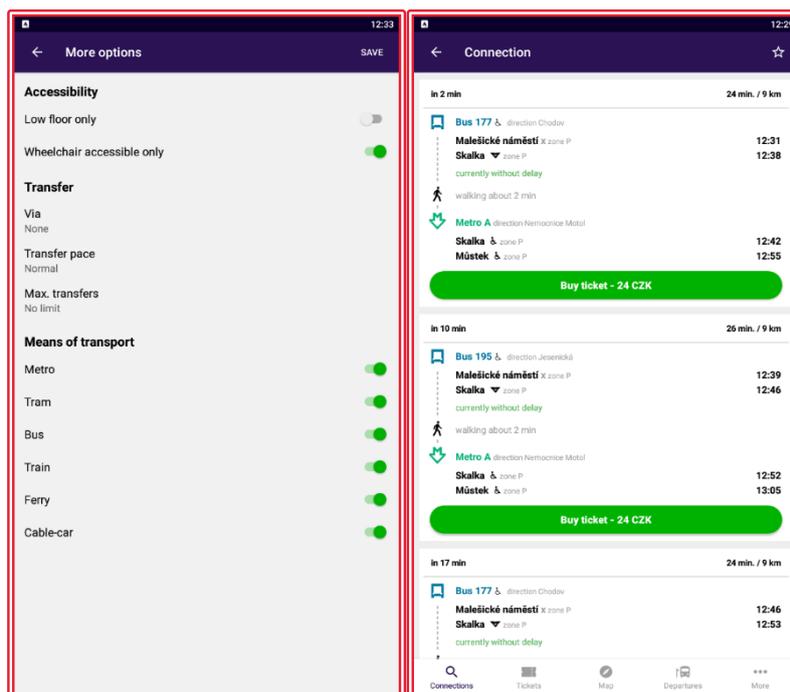
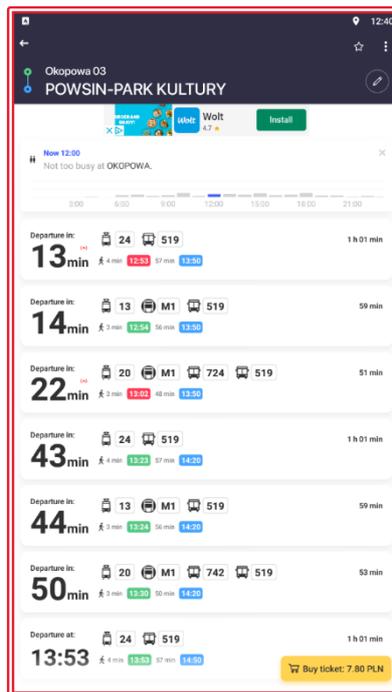


Figure 15 - Screenshots from PID Lítačka application

## Poland

In Poland, the most popular public transport application is developed by an independent company CITY-NAV sp. z o.o., and their “Jakdojade: public transport” application (Figure 16) covers many cities in Poland (e.g. Warsaw, Krakow, Katowice). It has a ticketing option (including local and regional services, as well), but otherwise its functionality ms to be limited: it has only two more features, a timetable browser (sorted by route numbers) and a route planner. The latter has an accessibility option, but there is no displayed accessibility information about vehicles or stations.





**Figure 16 - Screenshot from Jakdojade: public transport application**

### *Hungary*

In Budapest two public transport applications are used by considerable number of users. The official “BKK Futár” (Figure 17) and the non-official “Budapesti Menetrend” both access the real-time and static service data provided by the service organizer (BKK) and have similar features. The main differences between them are their interface and customization options. They offer various accessibility functions: routes can be planned with low floor option, and they also offer information of barrier-free approach of stations and vehicles. Both are available in English (and Budapesti Menetrend is also in other languages).



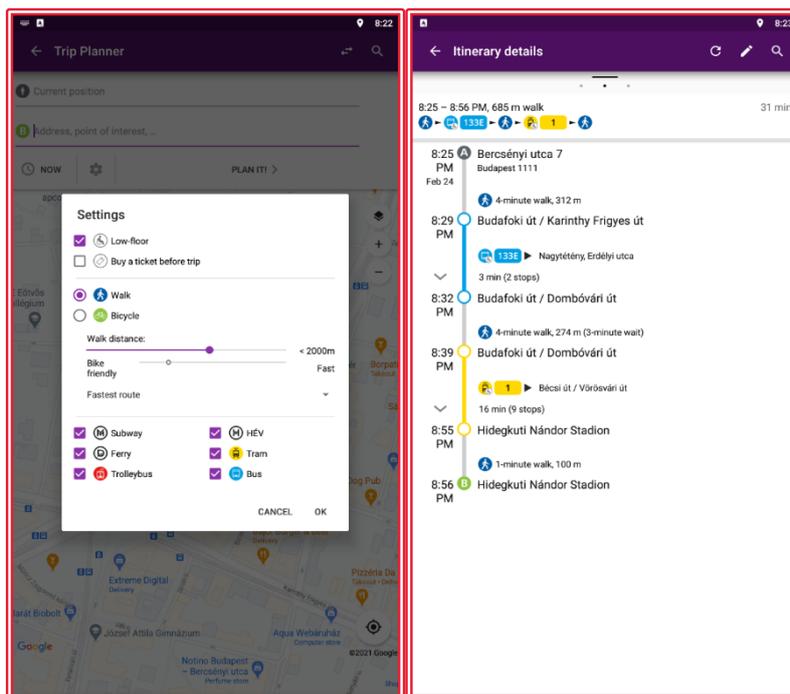


Figure 17 - Screenshots from BKK Futár application

### Romania

For Bucharest, Info Transport Bucharest application was tested. It has an accessibility option for route planning, but there is no displayed accessibility information about vehicles or stations.

### Bulgaria

In Sofia, the most popular public transport application is “Софбъс 24” (Sofbus 24), which ms to be a non-official one. Unfortunately, it is not available in English, and there was not any accessibility information found. Functionality is also limited, it does not have a route planner, only departure times can be accessed. However, it has an interesting feature: for each stop, a Google Streetview image is available, which can help their localization (Figure 18).



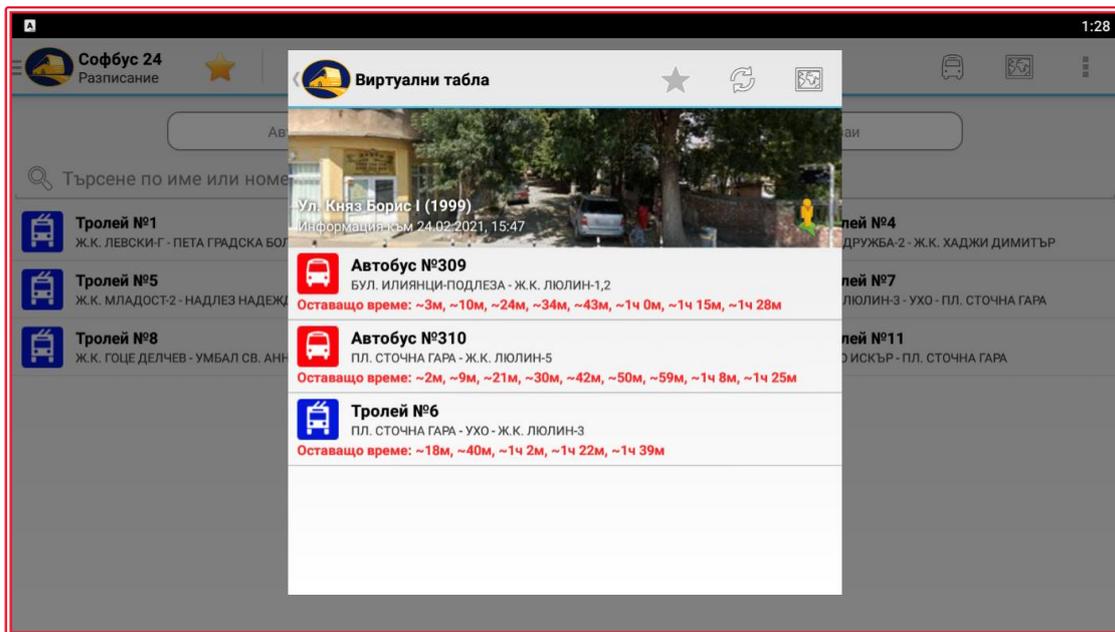


Figure 18 - Screenshot from Sofbus 24 application

## Public transport applications – USA, Canada, Oceania

The countries included in the region can be seen on Figure 19.

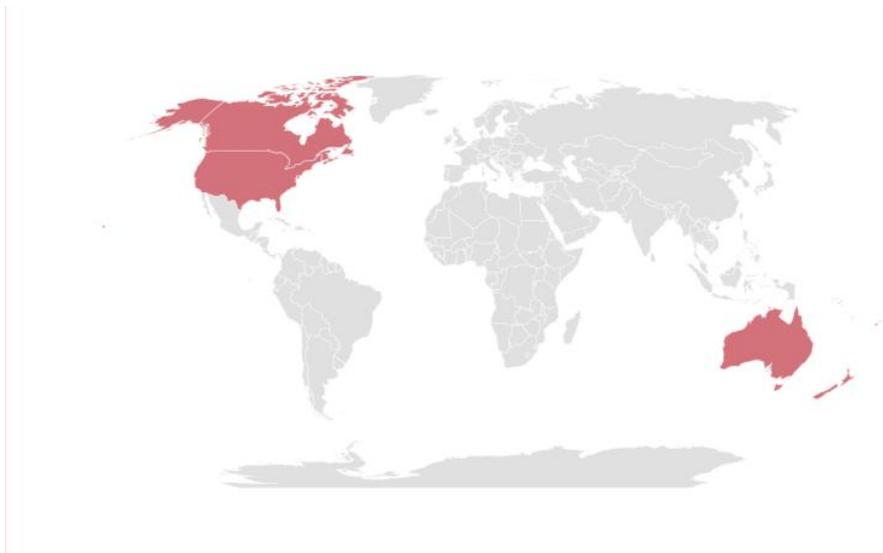


Figure 19 - countries of the USA, Canada, Oceania region

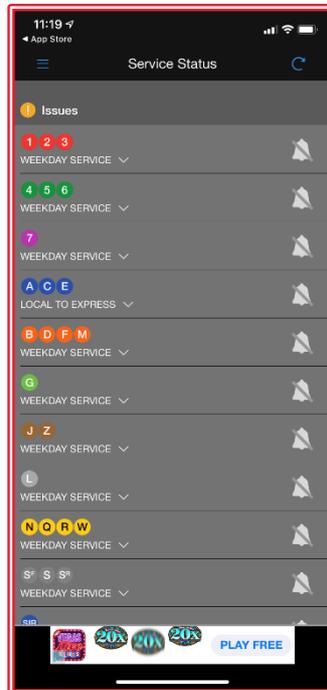
### United States

Most of the big cities in the United States do not have city specific transport applications but offer third-party solutions instead (one of those will be presented at Canada). The New York



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Subway application (Figure 20) is an exception. It has some interesting features, for example it has editable service status updates, and the background map shows accessible stations. However, it does not feature any options for accessible route planning, and many promising features are only available in the paid version (e.g., personal support, navigation on stations). The application's opening screen also offers to upgrade to this ad-free version.



**Figure 20 - Screenshot from New York Subway application**

### *Canada*

Transit application is not specified for Canadian cities, it also offers services for many cities worldwide, including more than hundred across Canada & USA (the screenshots show Los Angeles on Figure 21). Its best feature is that it allows a step-by-step navigation throughout the planned journey, although there is no option for accessible route planning.



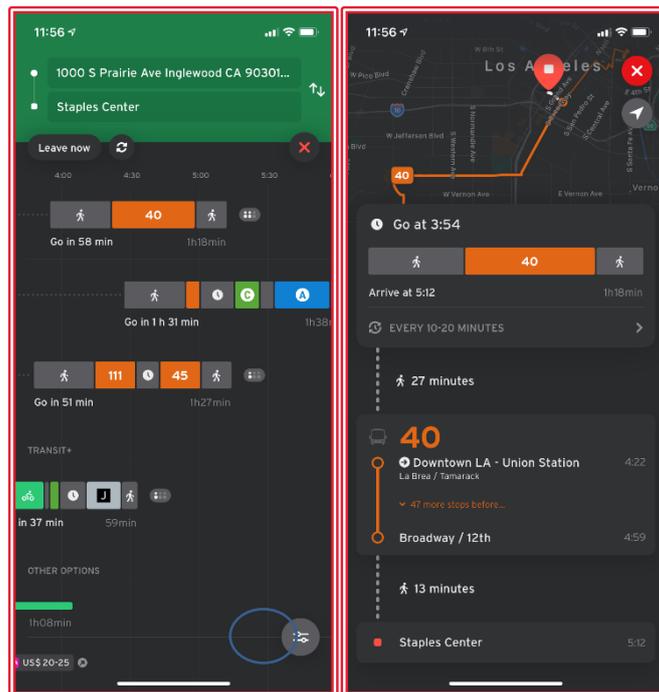


Figure 21 - Screenshots from Transit application

### Australia

Melbourne's PTV application (Figure 22) provides information about the whole Victoria region in Australia. It offers accessibility options for route planning and also tickets can be purchased for the planned routes. Notifications will be given for the whole network if alarm setting is turned on.



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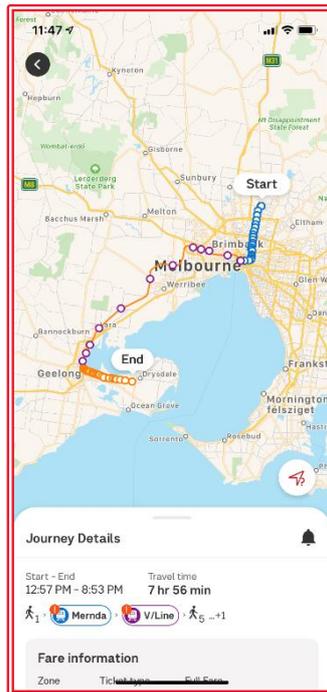


Figure 22 - Screenshot from PTV application

### *New Zealand*

New Zealand's biggest city, Auckland offers the AT mobile application (Figure 23) for its public transport users. Although it does not allow accessible route planning, it offers a virtual journey assistance throughout the trip. It features various saving options for places, stops and routes, and notifications will be based on these saved elements of interest.



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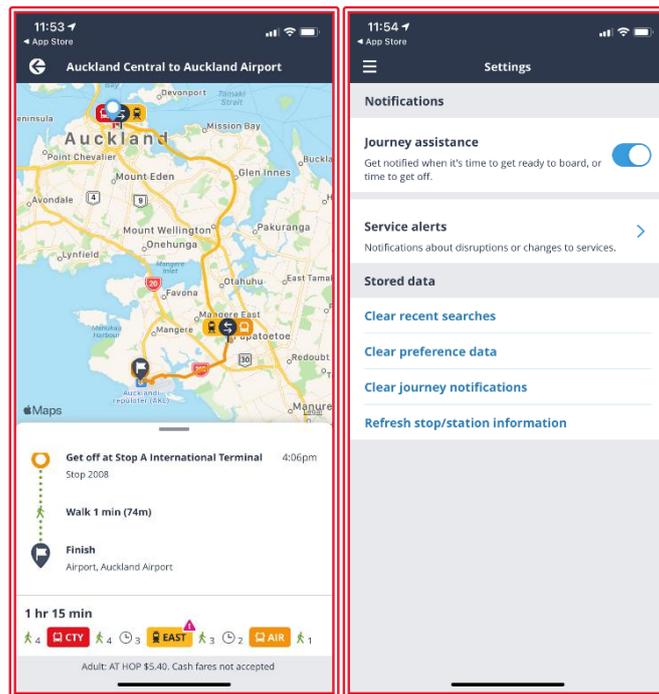


Figure 23 - Screenshot from AT mobile application

## Public transport applications – Arabic countries and Israel

Because of relatively different approach of public transport, Arabic countries (and Israel, shown on Figure 24) were analysed separately from the other countries on their respective continents.



Figure 24 - Arabic countries and Israel

### United Arab Emirates

Dubai has a pair of application for all transport modes: RTA application and S'hail reference to each other (users can access several functions from both application) and manages private and public transport related services and information respectively (Figure 25). Altogether the two apps provide a mobility as a service solution in Dubai, where users can choose in an



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interactive, customizable dashboard from the different transport modes (including taxis, public transport and even Uber).

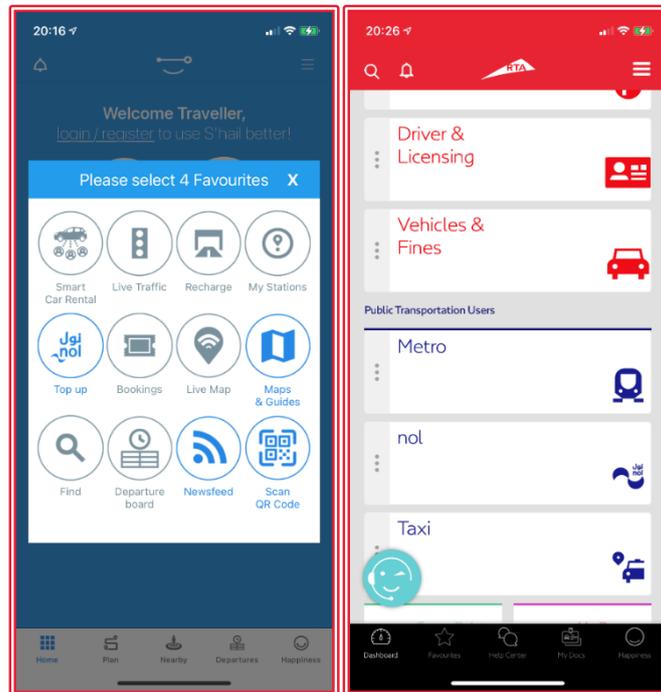
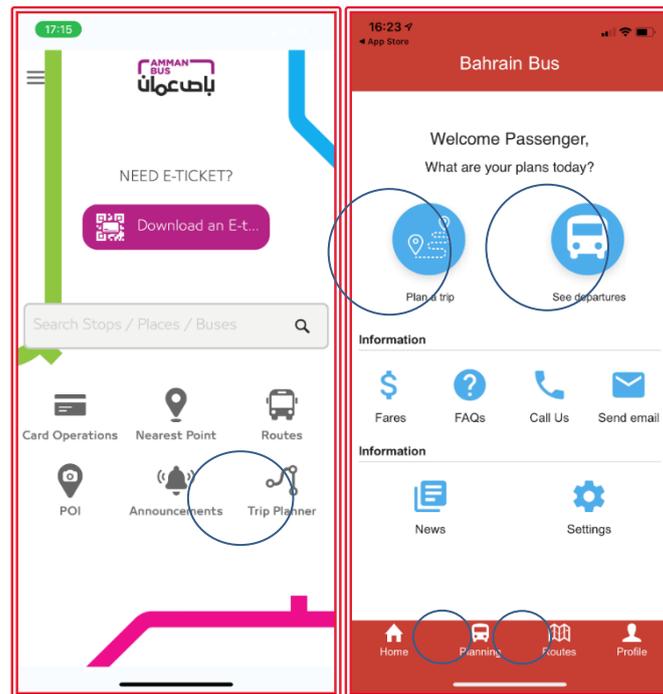


Figure 25 - Screenshots from S'hail (left) and RTA (right) applications

### *Other countries*

Most of the bigger cities of the Arabic world offer application for public transport users, and most of them use a dashboard as a starting point, where users can select the function what best fits for their habits (e.g., Qatar Rail App, Amman Bus App, Bahrain Bus App). Unfortunately, many of these dashboards operates with icons (Figure 26) which cannot be handled by text-to-speech software or if there are texts under the icons, these texts are not clickable (only the icons).

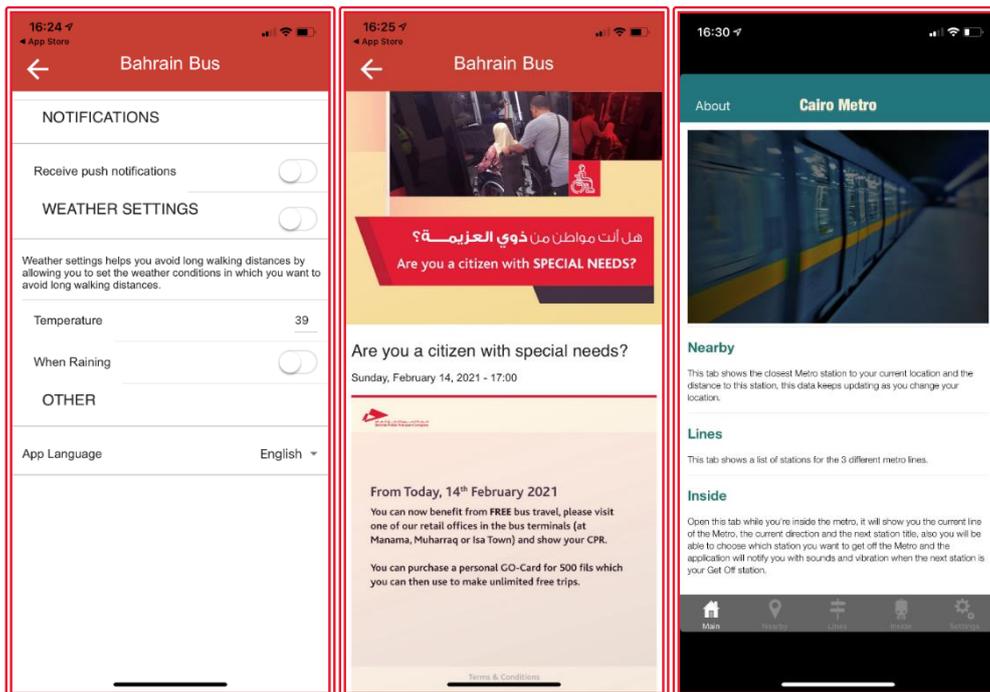




**Figure 26 - Screenshots from Ammanbus (left) and Bahrain Bus (right) applications**

During testing, positive approach were detected in the Bahrain Bus App, where users can set weather-based settings, if they would like to avoid long walking on the blazing sunshine and it also gives specific accessibility information for passengers with special needs. Cairo Metro application looks and works very simple with very few functions, but it can give real-time notification during travel about alighting and boarding (Figure 27).





**Figure 27 - Screenshots from Bahrain Bus (left & centre) and Cairo Metro (right) applications**

However, negative examples were also found, like the Israeli Egged Mobile App (Figure 28), which can be very useful for passenger, but it is only available in Hebrew, therefore, no detailed testing can be made. The use of Citybus Kuwait application starts with registration, which needs a mobile phone number, unfortunately, only a handful of area codes can be selected, none which the testers would have.



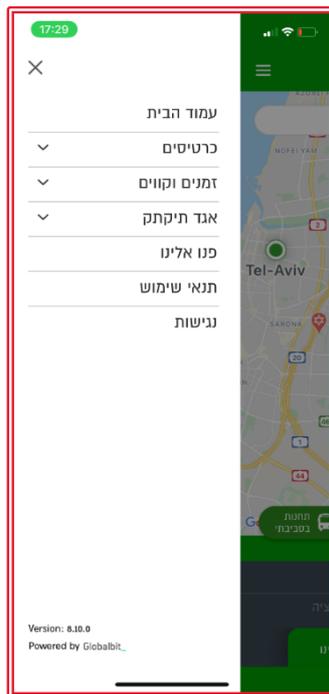


Figure 28 - Screenshot from Egged Mobile application

## Public transport applications – Asia

Asia (outside of the Arabic countries – Figure 29) shows different transport patterns in diverse cultures, however, highly populated metropolises tend to use similar approach in mobility application design.

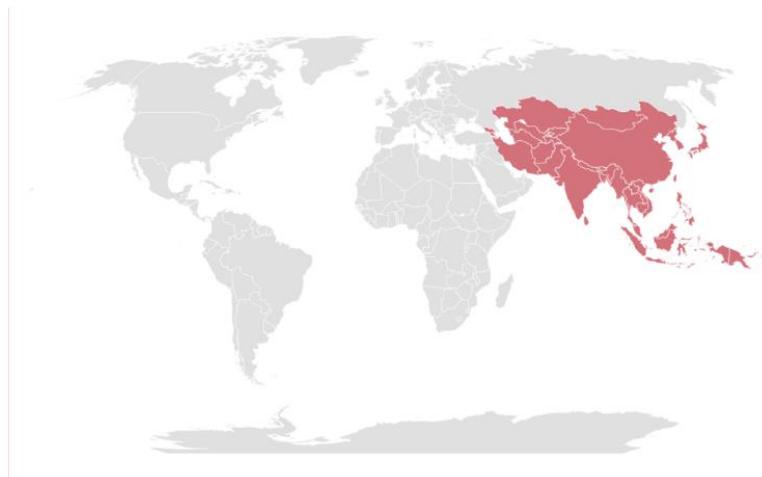


Figure 29 - countries of the Asia region

### China



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In China, a bigger need of specialized applications was expected, because many global solutions are disabled (e.g., Google). However, from Europe, only Metro Beijing/Shanghai/... Subway application were available, which is a non-official software which covers many cities with metro throughout China. It features no specific accessibility solutions but gives information from station to station during travelling by metro.

### Taiwan

In Taiwan, passengers can use Go! Taipei Metro application (Figure 30) when travelling by metro. It provides detailed facility information about each metro station and nearby bus stops including accessibility and inclusivity related elements (e.g., escalators and elevators at exits, restrooms, breast-feeding and diaper changing opportunities).



Figure 30 - Screenshots from Go! Taipei Metro application

### South Korea

KakaoMetro application (Figure 31) can be used throughout South Korea, as it includes many cities other than Seoul. It is published by an application developer company, not by the public transport operators and manages only the metro systems of the included cities (but there is also a similar application called KakaoBus for bus services). It provides detailed facility information about each station (e.g., on which side the vehicle's door will open) and has an option of voice notification at arrival when passenger uses earphones.



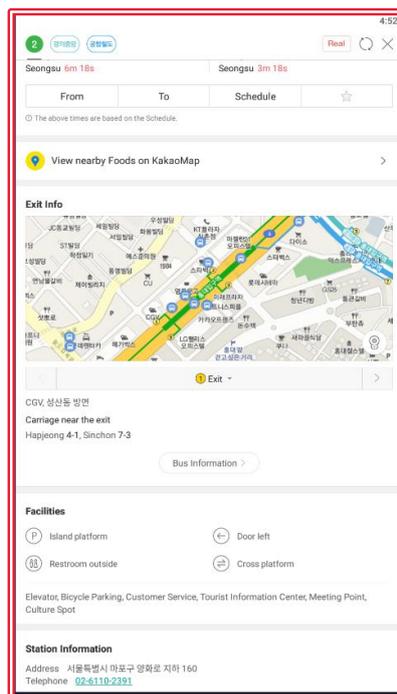


Figure 31 - Screenshot from KakaoMetro application

## Japan

JapanTaxi application covers most taxi service providers, all over Japan. Car type can be chosen, and payment is also included in the application (for most companies). It allows the use of third-party virtual assistants (e.g., Amazon Alexa).

In Tokyo, the Tokyo Subway Navigation application is the most popular, which covers the metro system, but it does not have any accessibility features. For Osaka, Osaka MetroGroup NavigationApp was tested, but unfortunately it didn't start. In Sapporo, bus services are provided mainly by Eki Bus. Their "navi" application was tested, but it neither has accessibility options (and proposes some strange questions at start about gender, age, profession, which do not seem to be connected to the service).

## Malaysia

In Kuala Lumpur there are only non-official applications available.

Kuala Lumpur MRT LRT Train Map (SGAPP) is a single static map image, while Kuala Lumpur Rail Map has some basic functions (station search, route planning), but none of them have any accessibility features.

## India

Not many of the big cities of India provide easy-to-use transport applications. One exception is Delhi's Delhi-NCR Metro application (Figure 32). Its most interesting feature is that it provides a handful of added information about stations (e.g., the level of stations, escalators) and also a station-specific contact phone number for each station.



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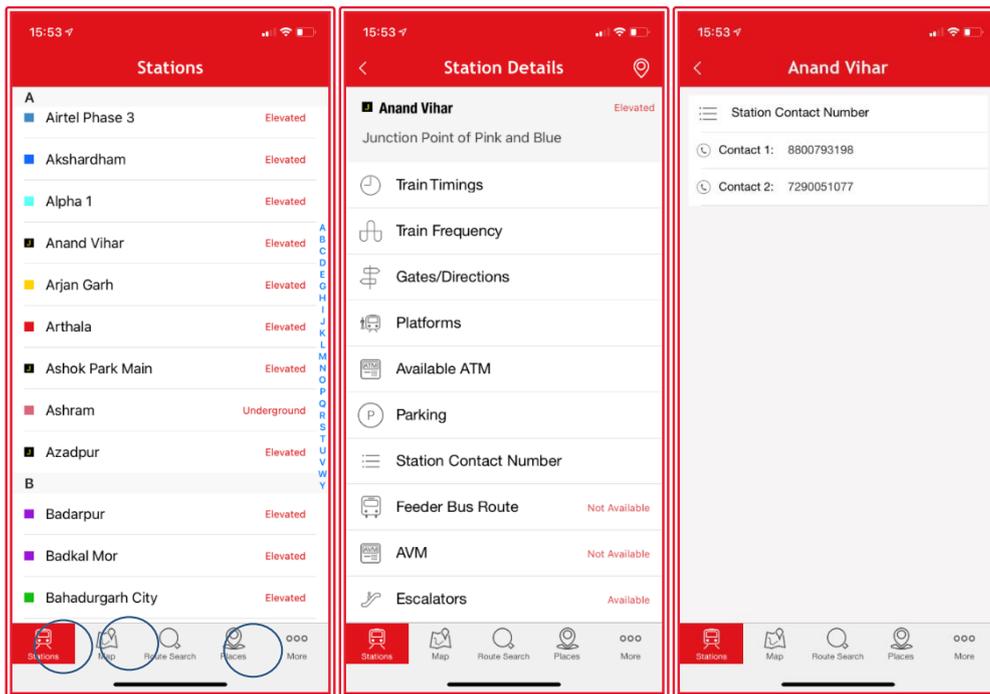


Figure 32 - Screenshots from Delhi-NCR Metro application

## Public transport applications – Central and South America

In Central and South America (Figure 33), public transport in big cities is not always as developed as needed. However, there were good practices regarding mobility applications.

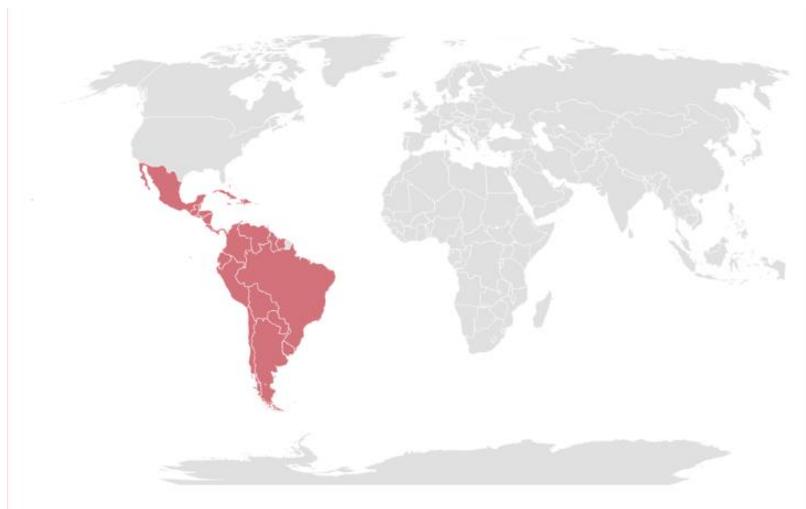


Figure 33 - countries of the Central and South America region

### Brazil

Both Brazilian metropolises have their own applications for public transport. Rio de Janeiro Metro App is non-official (developed externally, not by the PT operator) and only contains a single static map image. On the other hand, although São Paulo Metro application (Figure 34)



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manages only the metro system of the city, it provides facility information on stations (as the only accessibility information).

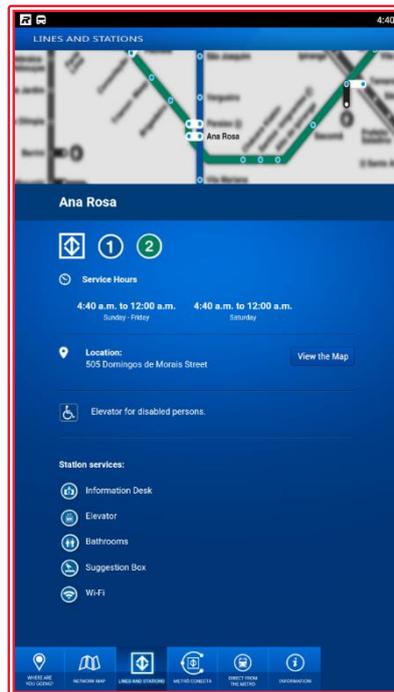
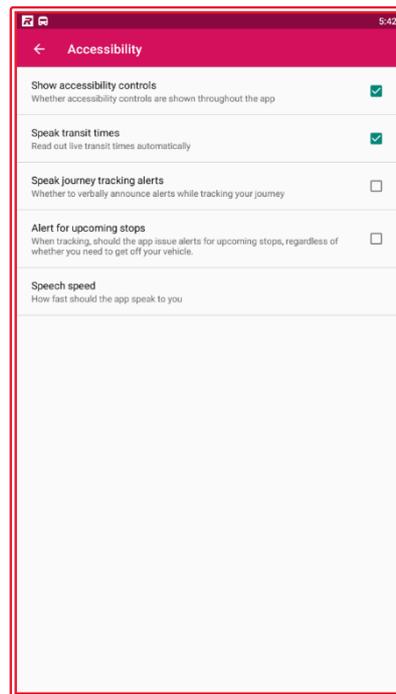


Figure 34 - Screenshot from São Paulo Metro application

### Chile

The Chilean capital, Santiago de Chile has the most user-friendly application in the region, the Transantiago Bus Checker (Figure 35). Although, it manages only buses, there is a widget available to the home screen of the smartphones, which displays departure times and there is a speak function including alerts when arriving to a chosen bus-stop.





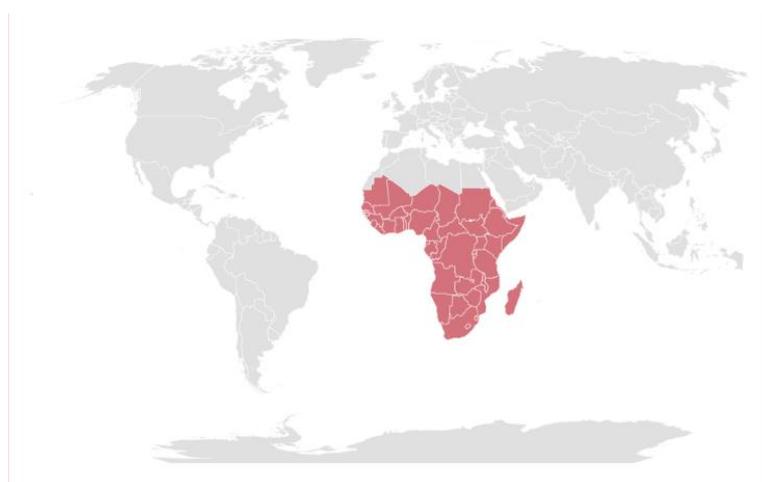
**Figure 35 - Screenshot from Transantiago Bus Checker application**

### *Other countries*

Other applications from South American metropolises (BA Cómo Llego – Buenos Aires, STM Montevideo) usually provides only a few useful functions for vulnerable to exclusion passengers, such as actual service info and accessibility info of the vehicles. STM Montevideo is only available in Spanish.

### **Public transport applications – Africa**

There are not too many examples of public transport services in Africa (Figure 36), therefore not many applications were developed for them.



**Figure 36 - countries of the African region**



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### *Gulf of Guinea*

There are many big cities in the area, but public transport means bus service in best cases. In Lagos, Nigeria, the BRT Lagos application shows the stations of the only bus rapid transport line of the city and provides only a few static information.

Other than buses, the so-called “trotro” service is available, which is a network of minibuses with demand responsible timetables (which means they will leave the stop when they are full). In Accra, Ghana the network has also numbered routes. In the Trotro application (Figure 37), passengers can plan route by these minibuses. It counts as a very useful feature as these trotro routes are not available in global applications (e.g., Google Maps).



**Figure 37 - Screenshot from Trotro application**

### *South Africa*

South Africa and its public transport service are considered the most developed throughout the region, and the applications provided shows the same. Both the Johannesburg/Pretoria based Gautrain and the Cape Town based MyCiTi applications (Figure 38) offer detailed route planning and vehicle tracking. Unfortunately, no accessibility options are available, but detailed service updates can be useful during the daily use.



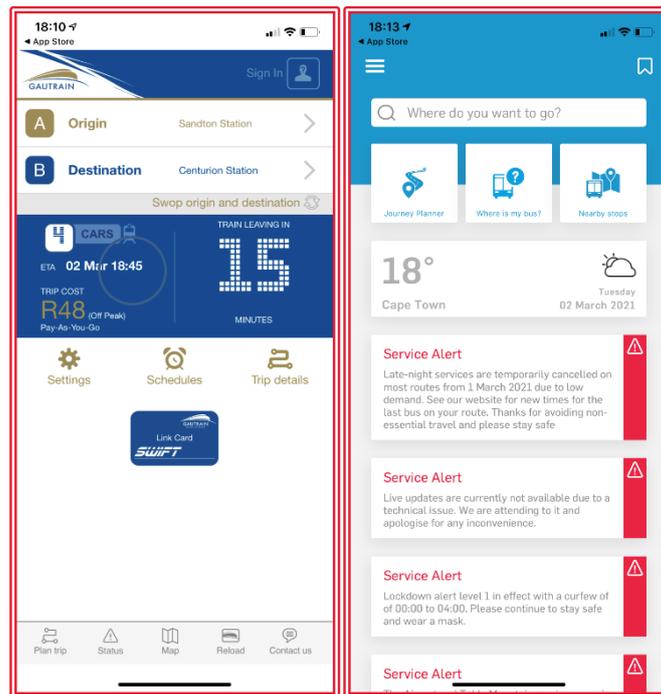


Figure 38 - Screenshots from Gautrain (left) and MyCiTi (right) applications



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