

POSEiDON

PersOnalized Smart Environments to increase Inclusion of people with DOWn's syNdrome

POSEIDON app technical user manual

Application version: 1.00

This is documentation for the final prototype of the main POSEIDON mobile app. It is meant as a comprehensive, technical documentation, not primarily targeted at end users and including information mainly of interest to technical personnel. End user guides, translated to all project languages, is made by extracting the relevant information.

The prototype mobile application offers navigation, tracking, calendar and video functionality, and connects to the context awareness middleware, which should also be installed on the device. The money-handling applications for training and shopping are additional POSEIDON apps which are installed separately but can be started from the main app. The POSEIDON app will run on any Android device with Android version 4.0 and up¹ and phone functionality (SIM card), although the user interface is designed primarily for the screen size range 5-7 inches, held in the vertical (portrait) orientation. The primary target devices are those used in the pilot trial – the Huawei Ascend G7 and Honor 5X.



The application is distributed via Google Play. Direct link:

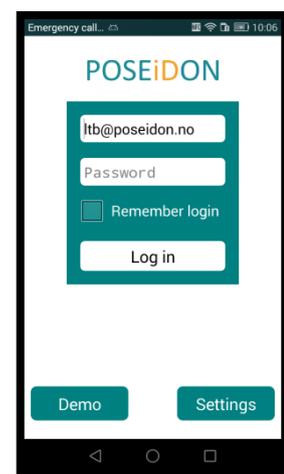
<https://play.google.com/store/apps/details?id=no.tellu.poseidon>

To find it by search in Google Play, use “poseidon tellu” to get a good match.

Make sure to enable automatic updates in Google Play, so that new versions of the application are installed automatically. Also make sure GPS positioning is enabled on the device. The project deployment documentation describes how the phone should be configured for optimal use of the POSEIDON apps.

Starting and modes

A starting screen for logging in is shown the first time the application is started. The connection to an account can be remembered, so this screen is only needed for the initial setup, and doesn't need to be seen again by the primary user. Logging in requires a correctly configured account in the POSEIDON SmartTracker service. User name and password are used for the authentication with this service. Tick “Remember login” to log in automatically the next time the application is started, bypassing this screen. If the login is successful, user data is retrieved from SmartTracker, and the tracking part of the application can send sensor and context observations there, making them available to other POSEIDON applications. A connection is established with the POSEIDON file server, synchronising media files from the cloud to local storage for quick access. The application will also connect to the calendar of the phone, which in turn should be set up to synchronise with Google Calendar.



¹ The context awareness middleware requires version 4.1 and up



The application can also be run in a demo, offline mode. This allows testing and demonstration of the application without the need for setting up an account or connecting to online services. The application will run as normal, but will not send data to SmartTracker, connect to the file server or use a real calendar. Instead you get a fixed set of demo content. The application will work without an internet connection, but the map is downloaded from Google, so without an internet connection the map may not be drawn, depending on what map tiles have previously been cached in the device.

Once a real or demo session has been established, the start screen with main menu is shown. The application is not meant to be “turned off” when in real use. When leaving the application with the phone’s home button, the POSEIDON icon stays in the notification bar, to show its presence. It will perform occasional background tasks, such as checking for new files on the file server and reporting the current position.

There is a status indicator icon in the top right of the screen. This is green when everything is functioning optimally. If it is yellow, this indicates a temporary problem or delay, such as a network connection not currently being available. If it is red, this indicates a more serious problem. A more detailed breakdown of the status is available from a system screen. Completely turning off the application can be done from the system screen (see System screen section below).

Start screen and app navigation

The start screen has the main menu for selecting app functions. The first four of these are built into the app, and each has a section in this manual. The last two are for the additional money handling applications – *Training* for the training app and *Shopping* for the shopping assistance app. These must be installed separately, and you will get a message if the app is not installed on the phone.

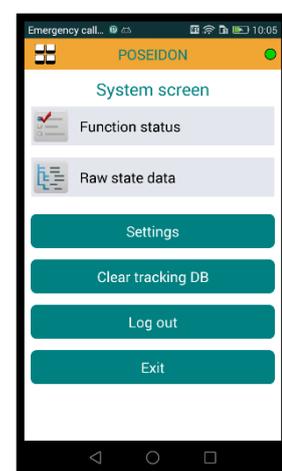
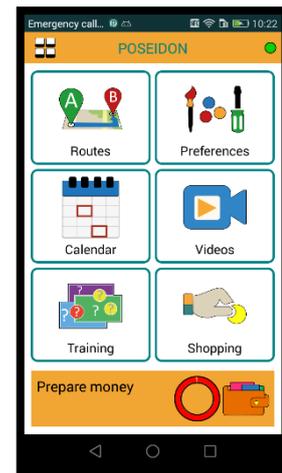
When in navigation mode, the two top elements of the menu changes. *Routes* becomes *Navigation* (getting back to the navigation screen) and *Preferences* is replaced by *Stop navigation* (turn off navigation).

Below the main menu, the current or first upcoming event of the calendar is shown. Pressing it brings up a complete, scrollable list of upcoming events.

Navigating between the screens of the application, the back button of the Android system, at the bottom of the screen, can be used to backtrack to the previous screen. At the far left on the top bar in the application, there is a start screen icon which will always take you back to the start screen.

System screen

The application has a system screen with detailed status information and other functions of a technical nature. The end users will not normally need to enter this screen, but it has status useful for diagnostics and local settings such as for GPS simulation. To enter this screen you need to press and hold the start screen icon on the top left for about a second (do a long-press), and then quickly press the status indicator. The status indicator may be hard to hit, but you can try a few times before it



deactivates and you need to long-press the start screen icon to activate it again.

Items on the main system screen:

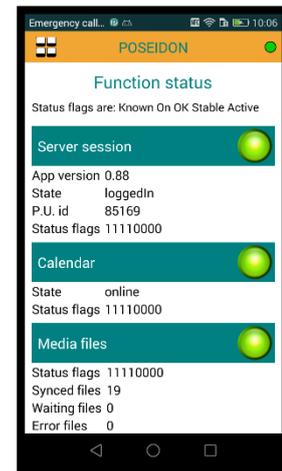
- **Function status:** The function status screen, described below, gives detailed status information.
- **Raw state data:** Shows a dump of the application's state data. This is only for technicians, with the function status screen giving a more user-friendly output of the most relevant data.
- **Settings:** Access to local settings (see setting section below).
- **Clear tracking DB:** Deletes tracking data which is stored locally. This data is automatically deleted once it is sent to the server, so this function is only for technical personnel.
- **Log out:** Exit to the login screen, logging out of the account.
- **Exit:** Shuts down the application completely (if the login is remembered, this is not lost).

Function status

This screen shows detailed status information about the application, broken down into different functions. Each function has a green/yellow/red light (grey if the function is off). The status icon always visible in the top right is the sum of all of these function statuses. If the application status is not green, the function status screen shows where there is an issue. It also gives some technical information useful to diagnosing the problem. If reporting a bug about a function, the function status screen should be consulted, and the information found there about the function in question should be included in the bug report.

Functions:

- **Server session:** The logged in session, with synchronisation of user profile. An error here indicates there is a problem with the server connection (usually a network problem). Note that the app version number can be found here.
- **Calendar:** Connection to device calendar. Possible errors are a lack of device calendar account, or calendar sync being disabled in device setting.
- **Media files:** Synchronisation of media files from cloud to local storage. If there are media not showing up, check here if there are files waiting or in error.
- **Route files:** Synchronisation of route files from cloud to local storage, and parsing of the route data.
- **Position provider:** Position tracking, with information about the last position fix. A yellow status indicates that the device is currently not able to get a good enough position fix. If status is red, make sure detailed positioning is enabled in the device settings. Note that if GPS simulation is on, this function is regarded as off (grey light), but still shows the position data produced.
- **Tracker connection:** Sending observations to the SmartTracker server. This will be in error if there is a problem reaching the server. If red, there may be a problem with the user profile.
- **Navigation:** Only on when navigation is in progress. This shows state information for navigation, for debugging.
- **Context middleware:** Connection to the context reasoner middleware. If red, there is a problem connecting to the middleware. The last received context value of each relevant context is listed, with the time it was received from the middleware.



Settings and GPS simulation

Some technical settings are available from the system screen. These are being used in the development process and testing, and not something end users should ever change.

Server session has the address of the SmartPlatform server instance. *Tracking* shows the settings for position tracking and data transfer. This is read-only, so it is only for checking/debugging this functionality.

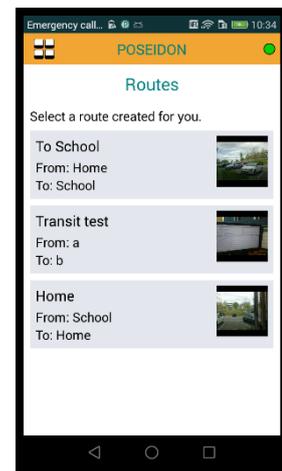
The most interesting category for testing and demonstration is *GPS simulation*. As it would be very difficult to test route navigation if we actually had to travel the route each time, we have implemented a GPS simulation module, which can be used in place of the real positioning. This can be enabled in the settings, in which case positions will be produced to match the route when navigation is activated. *Simulation speed* is a speed multiplier for the simulation, to go through the route faster than real time. The simulation includes a variable inaccuracy in the values of the position. In addition, based on the *Deviation chance* setting, the simulated movement can deviate from the route. It will then move randomly, and can also switch back to trying to get back to the route. Note that GPS simulation is independent of the online/demo modes – both real and simulated positioning can be used with both modes, and SmartTracker won't know if a position is real or simulated.

Finally, a *3D map mode* can be enabled. This is an alternative navigation user interface which has been tested, but ultimately found to be less usable than the currently used mode. See 3D map mode under Routes and navigation, below, for more information.



Routes and navigation

The POSEIDON application offers navigation using routes created by the carer. Route data is synchronised to the device from the cloud storage of the POSEIDON infrastructure. The prototype Route Creator and Home Navigation System applications can be used to set up the routes, making sure they are personalised with instructions and photos. Note that such a route has a fixed starting point, and so can only be used when starting from the planned location.



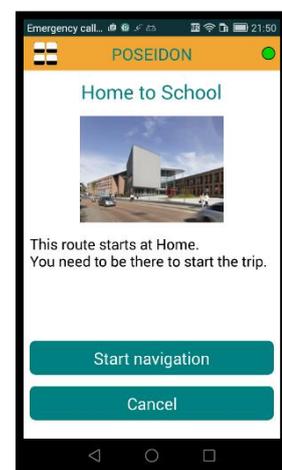
Starting a route

Navigation is started in two ways. A calendar event can specify a route, in which case the app will ask to start navigation at the start time of the event. All routes are listed when selecting *Routes* from the main menu. Selecting one, you can start navigation, being reminded that you need to be at the planned starting point.

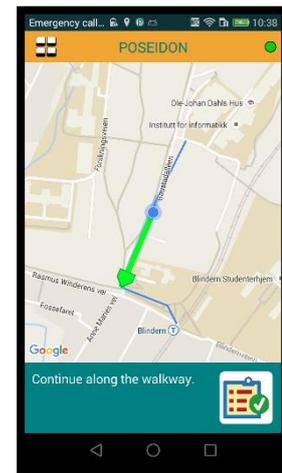
If the context middleware is installed on the phone, it will check if the user is indoors or outdoors, and wait until outdoors to start navigation. When entering navigation mode, the navigation map or instruction view is shown.

Navigation and map

In navigation the screen switches between two views, a map view and an



instruction view. The route is drawn on the map. The current position (latest position observation) is shown as a blue marker on the map, with an accuracy circle indicating the accuracy of the position. The map is kept centred on the position, but can be zoomed in and out with two fingers. Below the map there is a guidance field, showing the current instruction. Whenever there is a new instruction, the instruction view is shown, with the image and text of the instruction. The user can switch from the instruction to the map view by pressing the map icon in the bottom right, and similarly switch to the instruction view by pressing the instruction icon below the map.



A route is comprised of steps, where each step starts at a point and has an instruction to reach the next step. A green arrow is drawn on the map, from the current position to the next point on the route. When starting a step, the instruction for the step is shown. This is a photo and text. There may be an audio recording, which is played, otherwise the text instruction is read with text-to-speech (unless text-to-speech is disabled by user preference). The photo can be pressed to zoom in, using all the available space and cropping out what doesn't fit (press again to zoom back).

The steps can be organized in legs, for different modes of transport. The application supports both walk legs and transit legs (public transport). Walk legs typically have quite detailed steps, while a transit leg needs far less steps, as the user is a passenger. How to structure the route is up to the person creating it.

The navigation algorithm searches forward through the route to find the corresponding place in the route for each position observation. This makes possible finding the correct step even if the start position is located in the middle of the route.

The user should not be staring at the screen when walking around outside. A headset may be used to hear the audio instructions. Consult the screen when reaching a decision point, such as a crossroads. Check the map from time to time to make sure that the position is on the route, otherwise try to move closer to it.



The navigation process stops when reaching the destination. However, the navigation can be stopped at any point from the main menu. If the user deviates far from the route, this is detected and choices are given. If a carer phone number has been defined, the carer can be called. Or navigation can be ended.

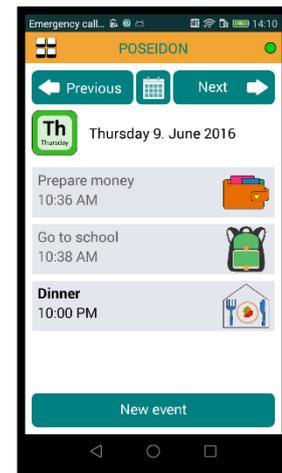
3D map mode

The application also has support for a different navigation user interface, with a 3D map view. This is not recommended for POSEIDON users, after pilot tests showed it to not work well enough and cause some confusion, but it can still be enabled in the application settings for further testing. In this mode, the map is 2D or 3D depending on how the phone is held – 3D mode when the phone is held upright and 2D when laid down. The map is always rotated to match the orientation of the phone, so that if the back/top of the phone is facing west, west will be up or into the screen. In 3D mode, the view on screen should then match the view in front of the phone. A direction indicator arrow is always shown over the map. This indicates how to turn to face the next step destination, pointing

in/up when facing correctly and otherwise showing which direction to turn. As this mode is more focussed on the map, it does not switch to the instruction view automatically on new instructions, but the instruction view is still available from the instruction icon.

Calendar and events

The POSEIDON application is also a calendar application. It connects to the calendar data provider in the phone, which in turn has access to the calendars of accounts entered in the phone, such as Google Calendar for a Google account. For the intended usage, linked with other POSEIDON applications, the phone should have a single Google account with a single calendar, and events should only be entered through other POSEIDON applications (such as the web).



The events in the calendar can be accessed with the *Calendar* function on the main menu. This lists the events of the current day, with title, icon and time. Finished events are “greyed out” (text with less contrast), while any current event is highlighted. The buttons at the top can be used to change the date, to see the events of other days. There are *Previous* and *Next* arrows to go day by day, and the small calendar button between them brings up a month view, showing a month at a time. Marked days have events – press one to see the event list for this day.

Press an event to get a detailed view, with any description entered for the event. The event text will also be read aloud (if text-to-speech is available and enabled).



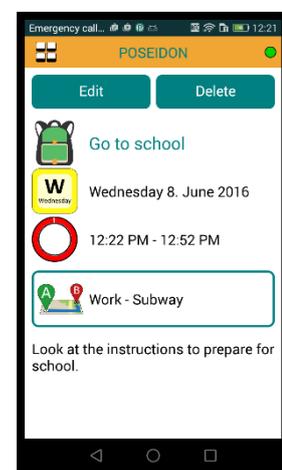
The most “current” event – started or next to start – is shown on the start screen, below the main menu. This can be pressed for an alternative listing of events, with all upcoming events for several days in a scrollable list.

The POSEIDON calendar uses special icons to indicate the days of the week. These are language-specific, and has a colour-coding of the weekdays which is unique for each country.

The time left until the start of an event is indicated with a gradually filling red circle for the last hour before the start, to give a visual indication of the time left. It starts empty one hour before the start, and then fills up during the last hour.

Events can have various types of additional information, entered through the POSEIDON web. All information is available in the detail view.

- **Icon:** An event can have an image, meant to be an icon representing the event. It is usually shown along with the title.
- **Video:** If the event has a video, there will be a button to play this in the event detail view.
- **Instruction list:** An event can have a set of instructions. Each can have a short text, an image, audio or video. These are shown sequentially at the start of an event, and can also be shown from the event detail screen. They are also read aloud, unless there is audio to play. If the event doesn't have an icon, a list icon is

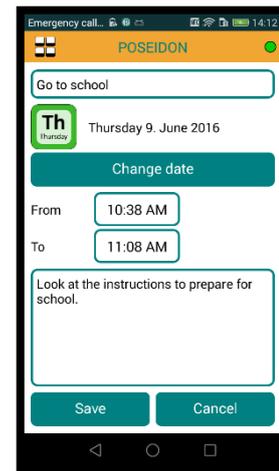


shown with its title.

- Route for navigation: An event can include a planned route. At the starting time of the event, the user will be informed. If the user confirms that the app is to provide navigation, it enters navigation mode. If the event doesn't have an icon, a route icon is shown with its title.

Entering events

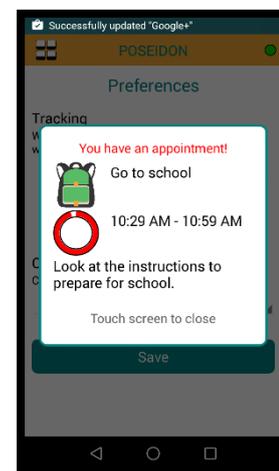
The calendar has a button for creating a new event. A title and start time must be entered. An end time can be entered; otherwise the event has no duration. Press a time field to bring up a time screen, where hours and minutes can be selected with touch input. The date is initially that of the date in the calendar when pressing the *New event* button, but may be changed using a date picker. Events cannot cover multiple dates. A description can be entered to give information about the event.



Note that some of the more advanced features of the web calendar are not available when entering or editing events in the mobile application. It can't be used to enter a recurring event, and an image, route or instruction list can't be added.

Editing and deleting events

From the detail view of an event, edit and delete actions are available. Edit has the same user interface as for a new event. Title, date, start and end time and description can be edited. Note that it's not possible to edit or delete recurring events. These are events which repeat according to some pattern, and must be managed through a more complex user interface such as that of the POSEIDON web.



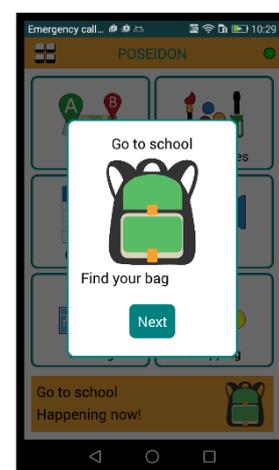
Event reminders

An event can have reminders at specific times prior to the start time of the event. This is added to the event in the web interface, and works much like in other calendar applications. The user is given a notification at the reminder time, with the event details and how long it is until the event start time. A notification is placed in the notification bar of the phone if the application is not currently on screen, and the full reminder is shown in the application when it is opened. The notification plays sound and vibrates the phone.

If the event has a route for navigation, the context middleware will be used to provide a weather-based message to the user, to remind them to wear appropriate clothes. This requires that the context middleware is installed on the phone and that the phone has an internet connection. There is only a message if the weather is categorised as needing attention, such as hot, cold or rainy. The message text itself can be specified as part of the user profile (entered through the POSEIDON web application), with default messages if a personalised one is not provided.

Notification at event start

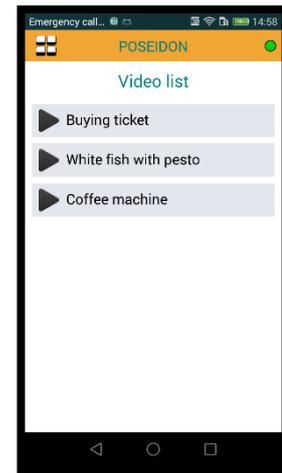
The user can be notified of any event at the start time of the event. Whether to get a notification with sound and vibration on event start or not is controlled by a setting, available in the web application. A popup in



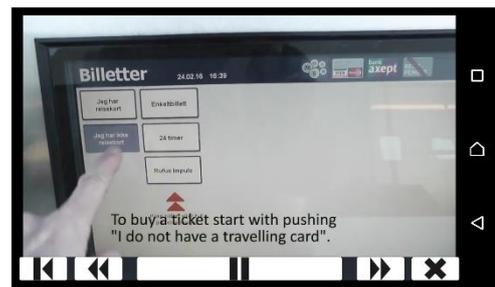
the app gives the details in any case. If the event has instructions, the button on the popup leads to the first instruction, and these are shown in sequence with presses on the button. The rest of the app is unavailable until the notification and instruction dialogs are acknowledged with the button. If the event has a route, the dialog will finally ask for confirmation to start navigation.

Video lists

A POSEIDON account can have a list of videos as part of its content. This list is configured in the web application. Two types of videos are supported. Personal video files can be uploaded through the web, and will then automatically be downloaded and stored on the device. This is meant for relatively short, instructional videos. Since these are played from local store, no network connection is used for playback. The other type is videos on YouTube. Links can be entered for any videos on YouTube. Such videos are streamed from YouTube when played, so an internet connection is needed. A setting in the user profile allows restricting video streaming to Wi-Fi connections, to save on costly data usage.



Selecting *Videos* from the main menu, the videos are listed. Just press one to play. YouTube videos are played in landscape (horizontal) mode to use all screen space, with a custom POSEIDON user interface of buttons under the video view. It has a big central play/pause button to toggle playback. The fast forward/back buttons on both sides of this skips a few seconds each time they are pressed, useful if you missed something or want to skip the next part. There is also a button to go back to the start of the video and to close the video screen.

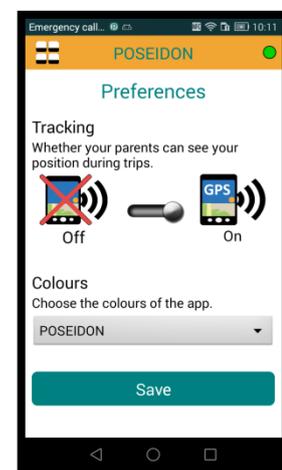


End user preferences

There are some application and service settings stored as part of the POSEIDON account. Most of these can be edited from the POSEIDON web application. The colour theme can also be changed in the app, to make this personalisation option easily available to the primary user. In addition, the application has its own privacy setting, controlling whether or not position tracking is sent to SmartTracker (making it available to secondary users).

The Preferences screen has the personalisation settings which are available in the app.

- **Tracking:** When off, position data is not sent to SmartTracker. Any location tracking done will then not be stored or processed on the server, so it won't be available for any researcher or carer to see or for any server-side service logic. Note that while earlier versions of the application (prototype 2) only tracked position during navigation, it now does so occasionally at all times, if tracking is on.
- **Colours:** This is the theme of the user interface – the colours. The default theme (POSEIDON) is based on the colour palette used in the project. The other theme currently available is a high-contrast theme, with yellow and white on a black background. The colour



theme is part of the user account and can be changed from the web.