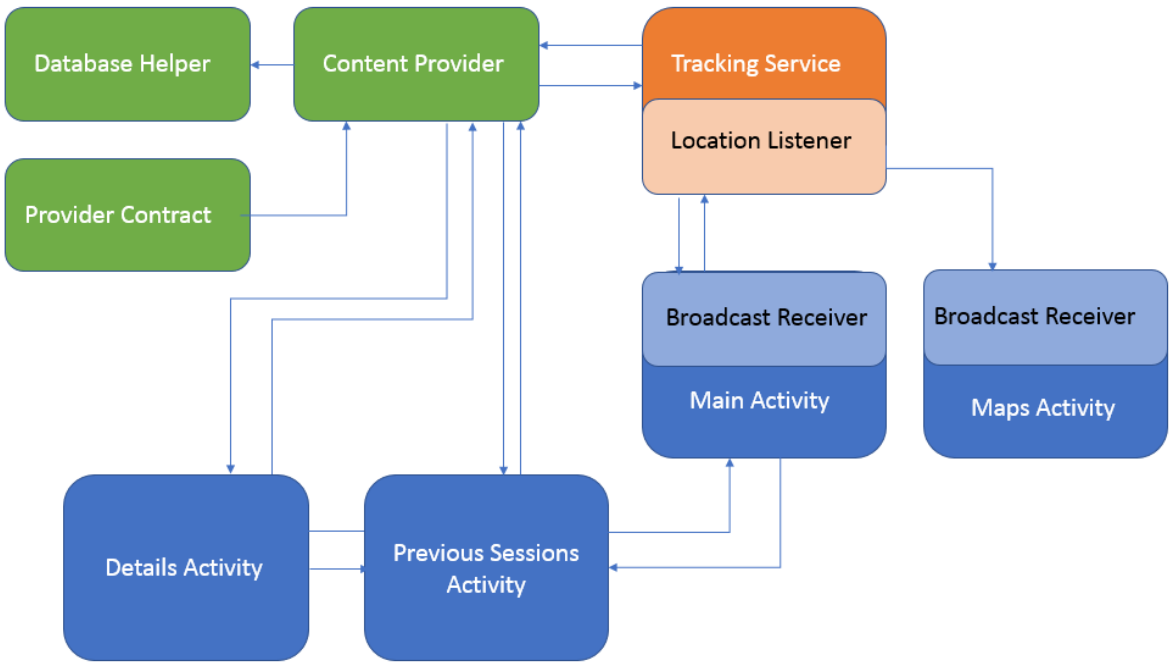
Coursework 2 Report

Overview of the System

Once the application is started, the user is greeted with multiple elements. First elements that the user sees are a number of buttons, which are labelled as “Start Running”, “Stop Running”, “Display Location” and “Show Previous Records”. As the name suggests, “Start Running” starts the tracking progress and “Stop Running” stops the session that the user has started. “Display Location” takes the user to a map activity where user can see their current position on the map and go back to the main activity with a back button. “Show Previous Records” takes the users to an activity which has a List View that displays the data about the previous sessions. Inside the same activity, the user can also sort the previous session data with respect to the data’s date, distance and duration and finally go back to the main activity with a back button. The list view on the activity also contains an onClick listener, where the user can browse for more details about the session on a separate activity, go back to the details activity mentioned before, and if desired can delete the session data.

Apart from the buttons, the main activity contains a number of displays that shows information about the session that user have started. There are four main components that the user can observe; the average speed during the session, the maximum speed that has been achieved throughout the session, the duration of the session and finally, the total distance travelled during the session. When “Start Running” button is pressed, values of the components mentioned before update automatically whenever the user changes location. These values are reset and logged to the database when the user presses the “Stop Running” button.

Architecture Behind the Application



Components of the System (Activity, Class, and Service Descriptions)

Tracking Service

There are two main functionalities of the Tracking Service. First one is containing a location receiver that retrieves location data (such as latitude, longitude and time) with a location object, and broadcasting the data to Map Activity and Main Activity after performing calculations on the data. Second one is binding to the main activity where the methods inside the service can be manipulated.

To broadcast to the Main Activity there are four main calculations that the listener performs. The first one is the calculation for total session duration, where a total duration variable is incremented on every location change. Before the broadcast to the Main Activity, the total duration value (which is stored in epoch seconds) is converted into a date format with convertDuration() method in the following pattern: “hours:minutes:seconds”. The second calculation being performed by the listener is the total distance calculation where the distance is stored as kilometres. In order to read the metres, the kilometre value is kept as a float with three decimal points, where rounding is done with the round() method. The third and the fourth calculations are the calculations for average speed and maximum speed, in which the values are rounded to a single decimal point and stored as meters per second.

For broadcasting to the Maps Activity, the listener gets the latitude and longitude values from location object and stores the values in a double array. Later on the array is sent with the broadcast.

The binder allows the creation and termination of notifications, management of location listener and insertion of the data calculated by the location listener to the database. When the Start Button at the Main activity is pressed, binder creates a notification that lets the user that the tracking process has started and initialises the location listener. Similarly, when the stop button is pressed, the notification gets destroyed and location listener is stopped. Apart from those, upon pressing the button, binder inserts the data calculated by the location manager to the database. Before inserting the data, the binder also adds up another data to insert by getting the epoch time of the last location change and converting it to a date format in the following pattern: "dd/mm/yyyy - hh:mm:ss". Epoch time itself is also inserted in the database for the use of Previous Sessions Activity.

Main Activity

Main activity is used for starting and ending running sessions, as well as tracking the progress in the meanwhile. The progress components (which are mentioned in the overview) are updated in every location change. This is done by a broadcast receiver located inside the activity, where the data calculated by the location listener on the Tracking Service is received and used for updating the components. Apart from the receiver, main activity contains the start and stop buttons to manipulate the service as described above, a Display Location button to load Maps Activity and a Show Previous Sessions button to launch another activity to access to the historical data.

Maps Activity

The maps activity contains another broadcast receiver to retrieve latitude and longitude data from the location listener inside the service. Once this data is received, the map object is called and used for placing a marker on the current location of the user. The position of the marker updates whenever the user changes locations.

Previous Sessions Activity and Details Activity

Previous Sessions contains a list view that is populated by the data stored in the database. At the first glace the data is sorted in a descending time order to allow the user to see their previous sessions,

however there are different sorting options provided for the user to manipulate the data in the desired way.

The list view has three main components to show the historical record: total distance traversed during the session, the total duration of the session and the date when the data was added. The user can sort the data in a descending order with respect to the total distance or total duration. The data can also be sorted with respect to the date (in ascending or descending order), where the stored epoch value is the key for this sorting process. If the user desires to browse more information about the sessions, the list items also contain an onClick listener to load the data into Details Activity

Details activity uses the data ID as it's key to load the data. Once loaded, the user can see the Average Speed and Maximum Speed values for the session, in parallel to Total Distance, Session Duration and Session Date. If desired, the user can also delete the record from Details Activity.

Breakdown of the Data

_id	avgSpeed	maxSpeed	totalDistance	totalDuration	date	time
Filter	Filter	Filter	Filter	Filter	Filter	Filter
3	0.0	0.0	0.0 kilometers	00:00:10	17/11/2018 - ...	1542490996000
4	13.399999618...	18.799999237...	0.265 kilomet...	00:01:01	17/11/2018 - ...	1542491047000
5	14.0	18.799999237...	0.373 kilomet...	00:01:08	17/11/2018 - ...	1542491054000
6	20.0	61.900001525...	1.423 kilomet...	00:00:49	17/11/2018 - ...	1542491404000
7	19.799999237...	61.900001525...	1.618 kilomet...	00:01:01	17/11/2018 - ...	1542491416000

The detailed breakdown of the data can be seen above. The tracker database mainly stores data that is displayed to the user, however in parallel, it stores the epoch time and id's that are used as keys in Previous Sessions and Details Activities.

Database Helper

The database helper is mainly used for creating the database, the database tables. Database helper also provides additional functionalities such as keeping track of the table versions in case of an update.

Database Content Provider and Provider Contract

The Provider Contract establishes a contract between the content provider and the activities that require access to the information stored inside the database/Tracking Service. The class stores the URI's and the database table field/column names. URI's are used together with the Content Provider to allow abstraction of the database. The column names are used in query, insert or delete operations to identify the selection.