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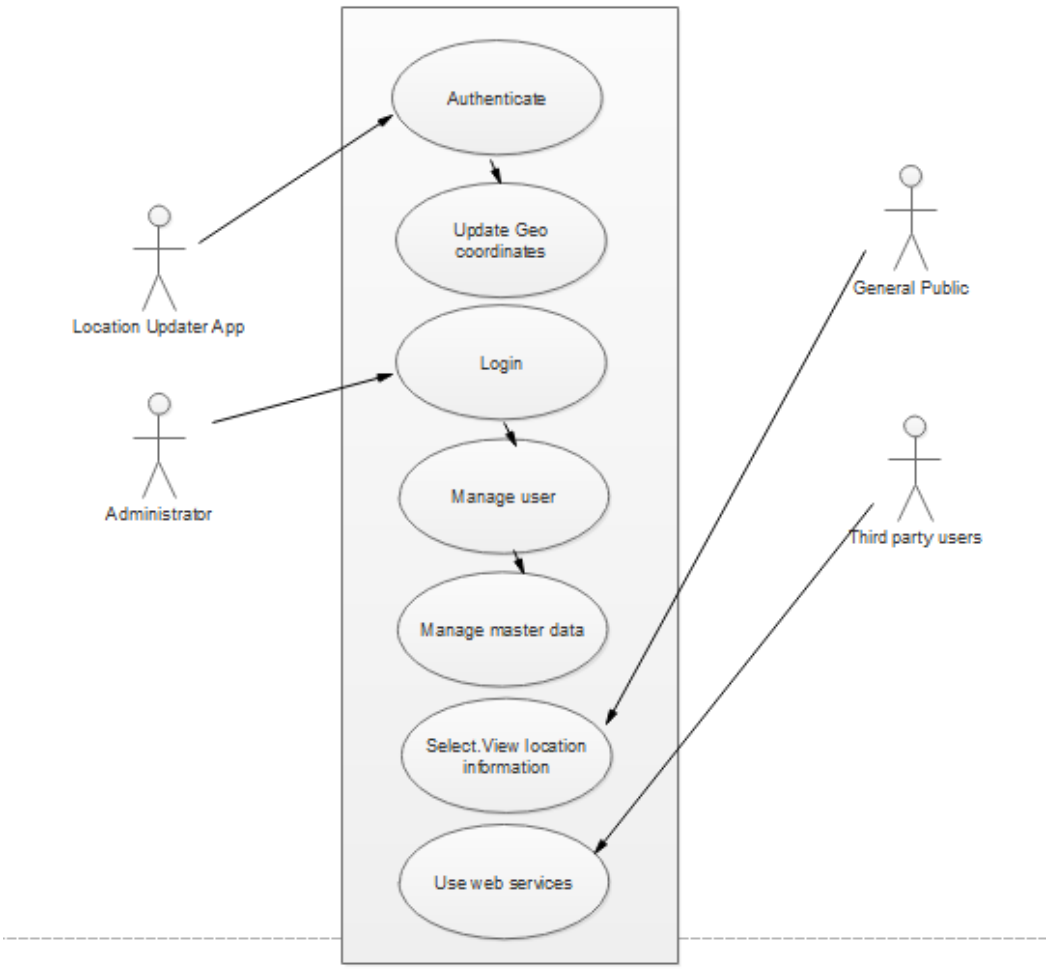
Appendixes

Appendix A – Use Case Diagrams



Use Case Diagrams of the TrackIT System

Figure 5.3 - Use case diagram for TrackIT system

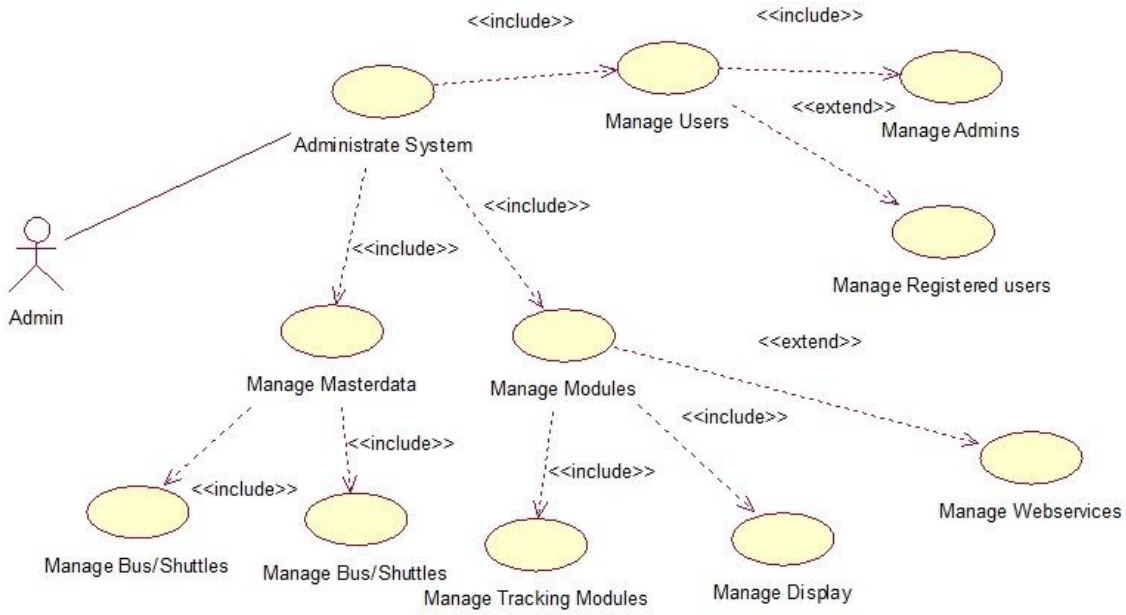


Figure 5.4 – Admin use case

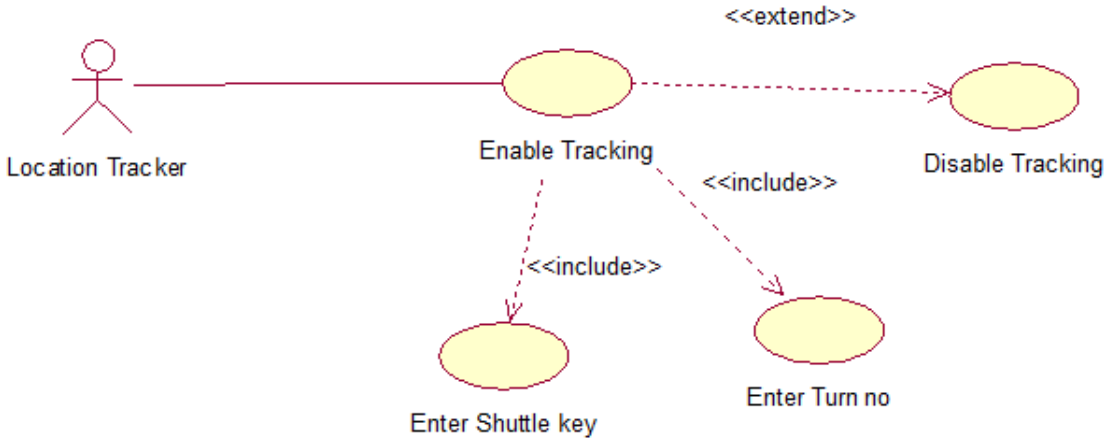


Figure 5.5 – Location Tracker

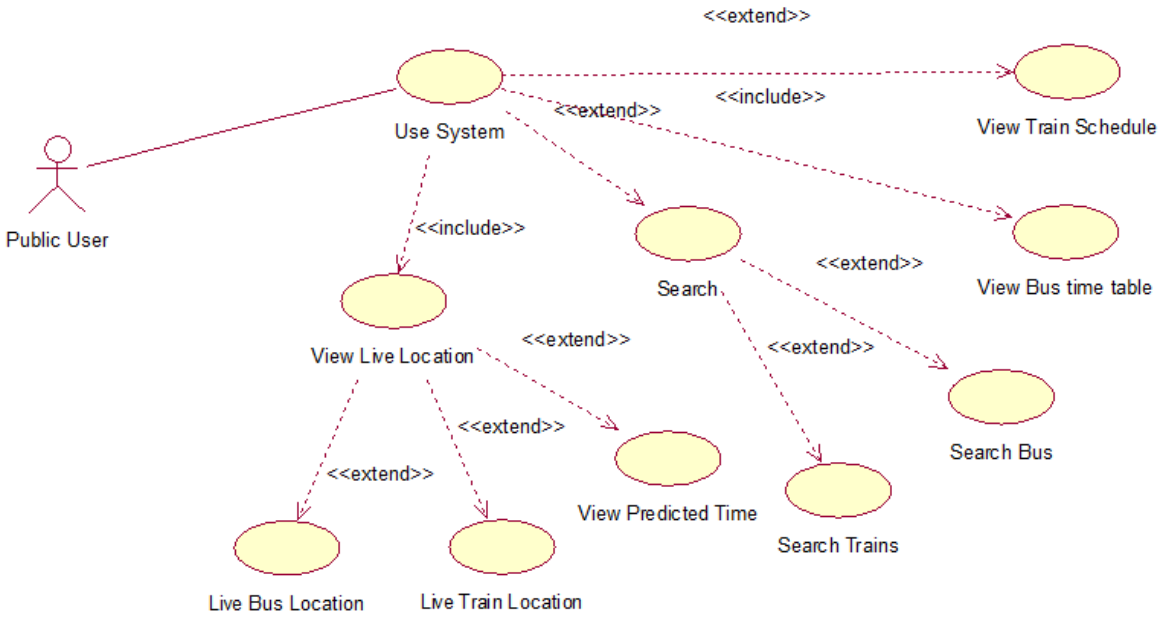


Figure 5.6 – Public user/passenger

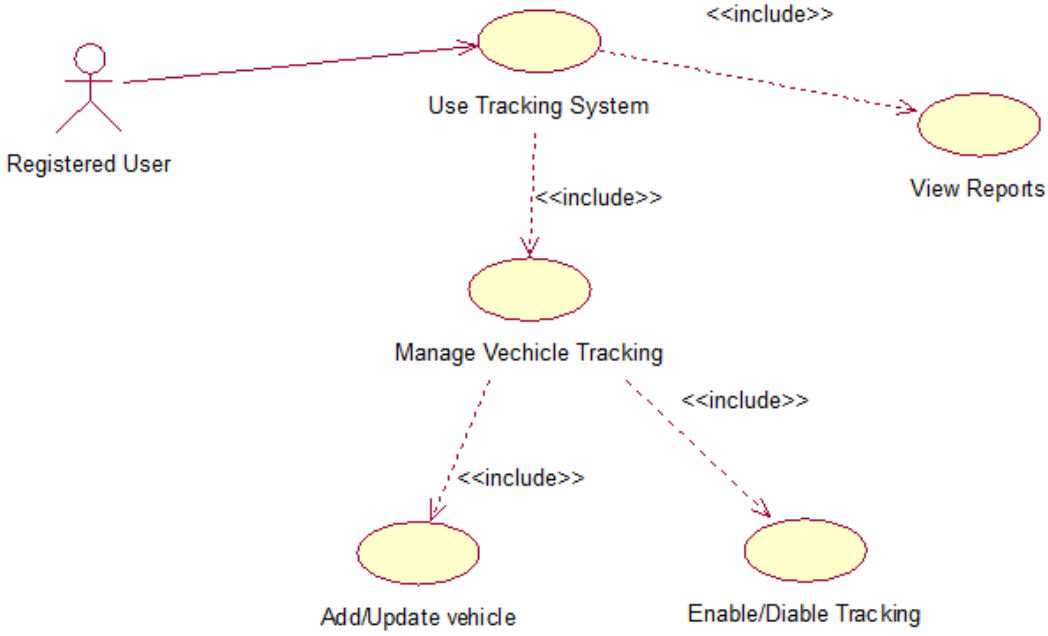


Figure 5.7 – Registered user/Vehicle owner

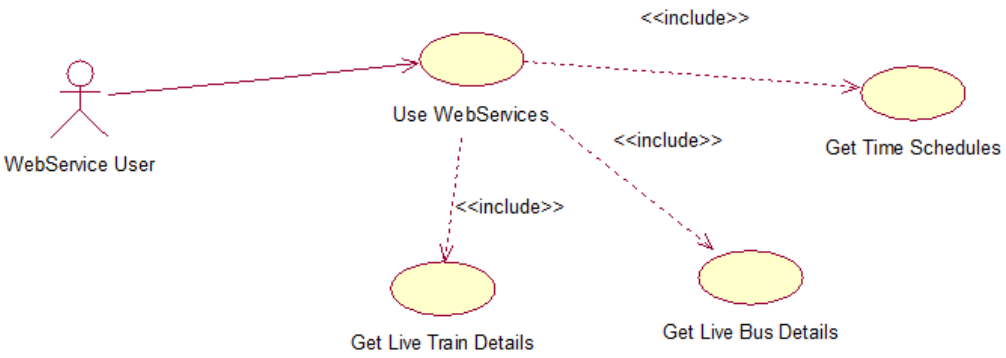


Figure 5.8 – Web service

Appendix B – Sequence Diagrams

Sequence Diagrams of the system

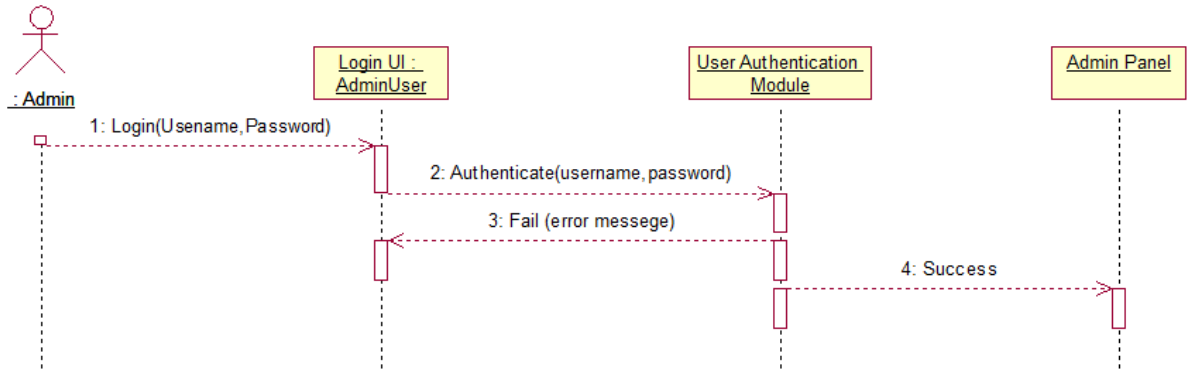


Figure 5.9 – Sequence diagram for Admin Login use case

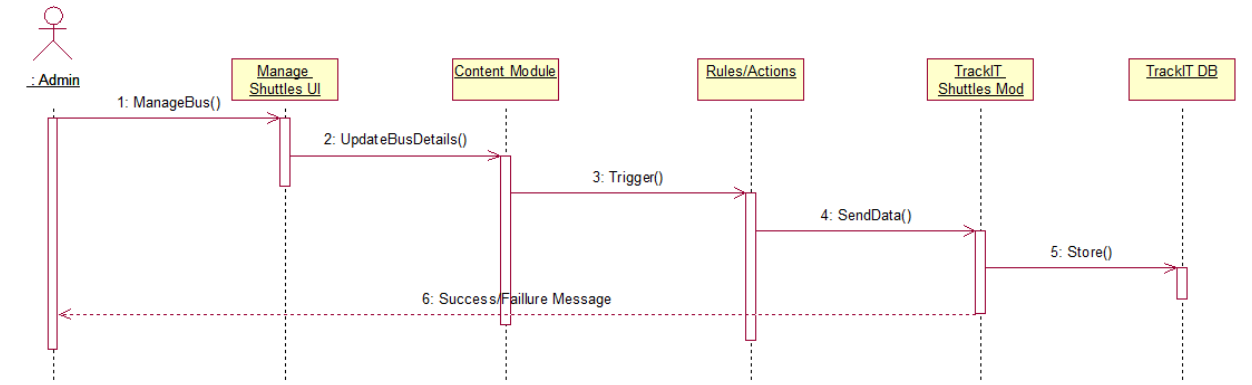


Figure 5.10 – Sequence diagram for manage buses use case

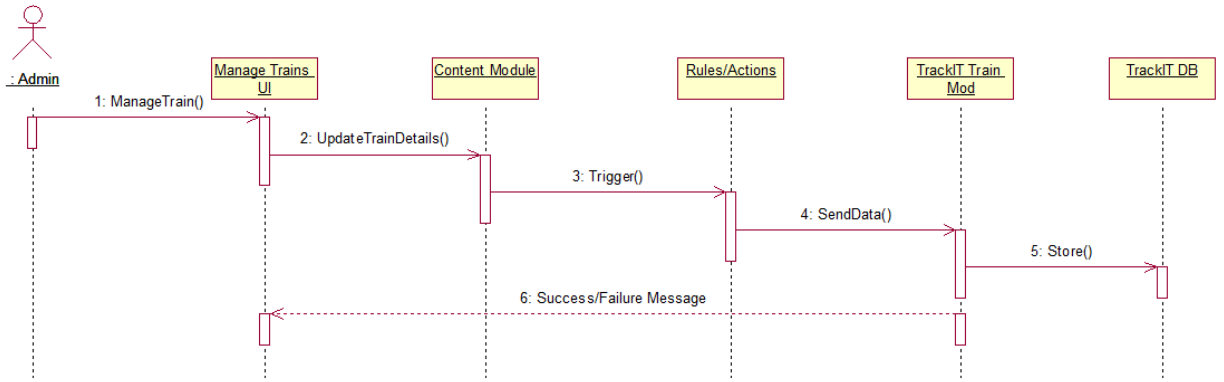


Figure 5.11 – Sequence diagram for manage trains use case

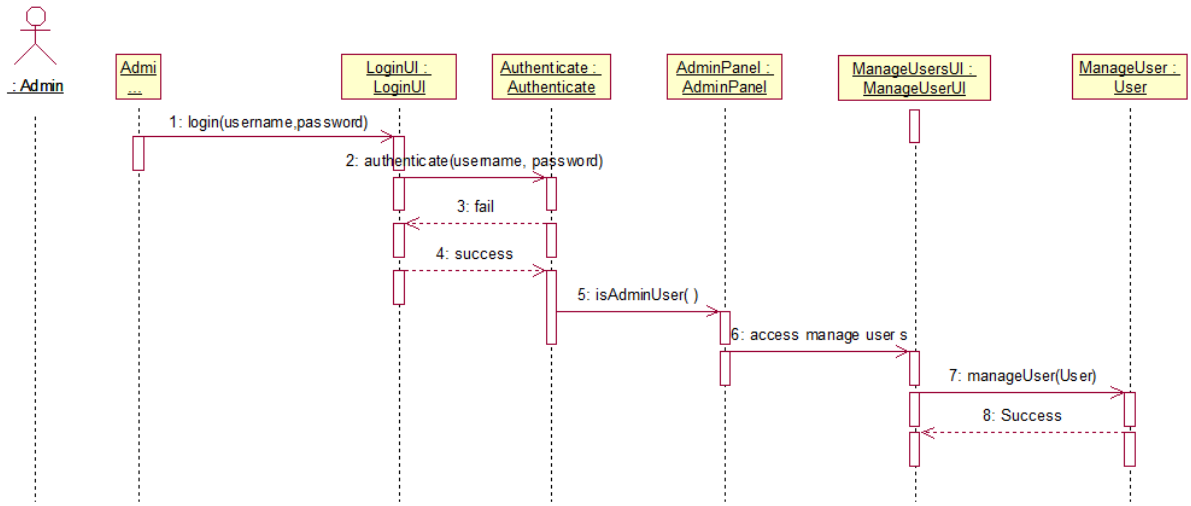


Figure 5.12 – Sequence diagram for manage users use case

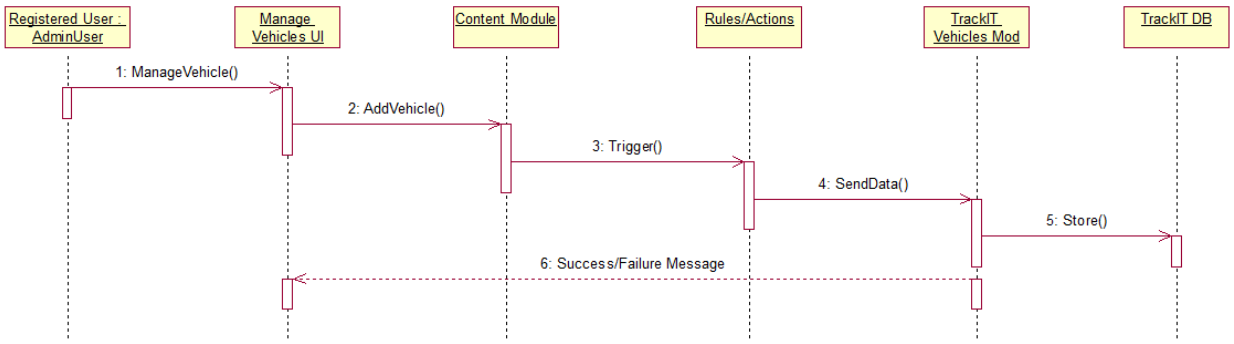


Figure 5.13 – Sequence diagram for manage vehicles use case

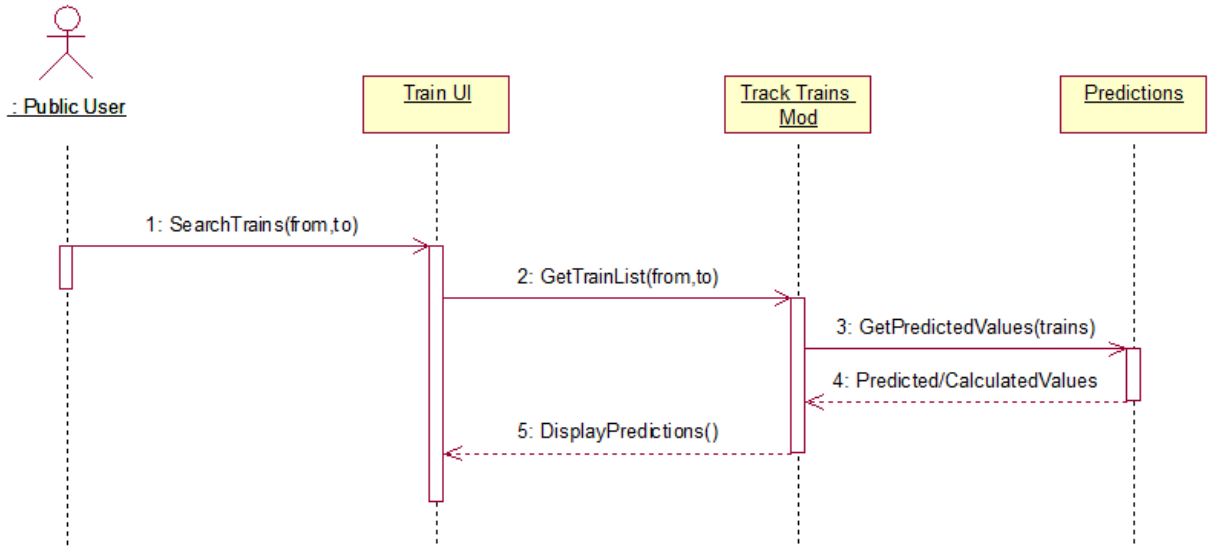


Figure 5.14 – Sequence diagram for search train use case

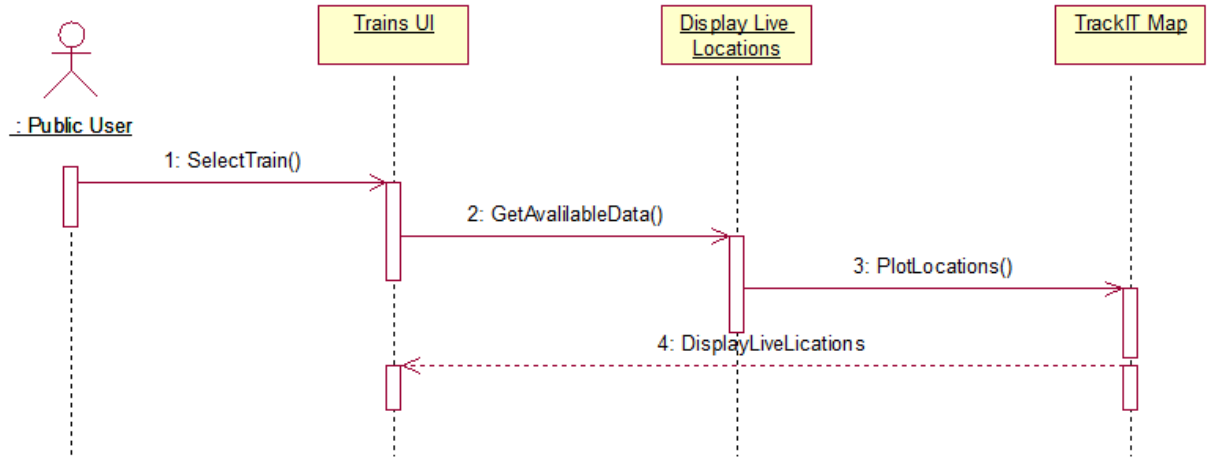


Figure 5.15 – Sequence diagram for view live train location use case

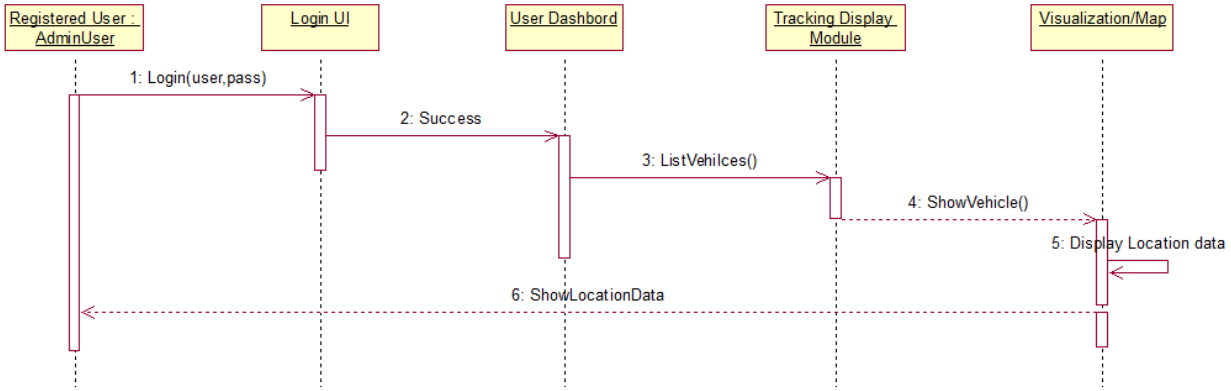


Figure 5.16 – Sequence diagram for view vehicle tracking use case

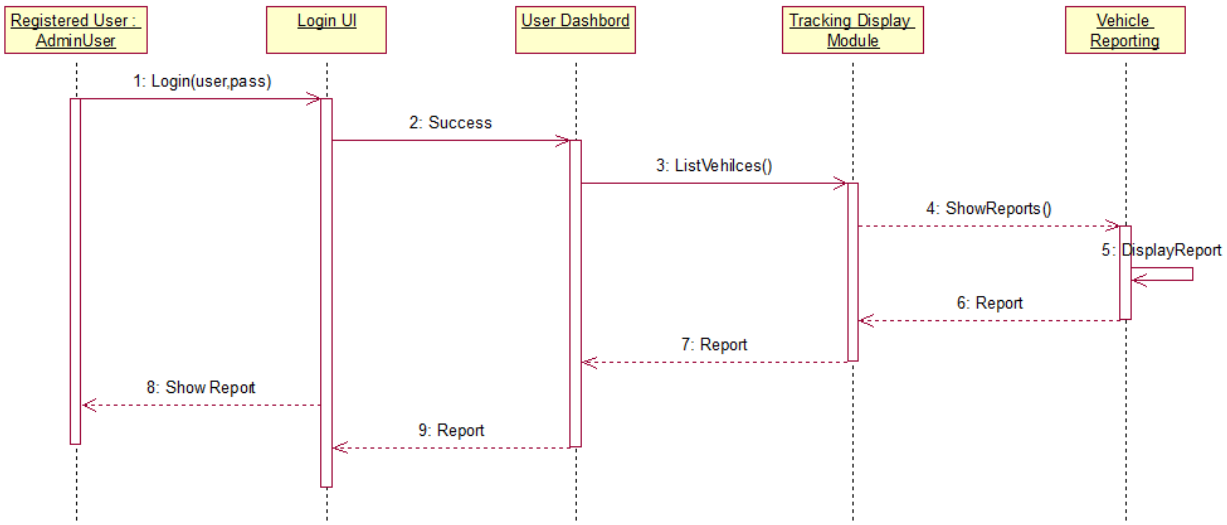


Figure 5.17 – Sequence diagram for view vehicle reports use case

Appendix C – Database Diagrams

Database Diagrams of the system

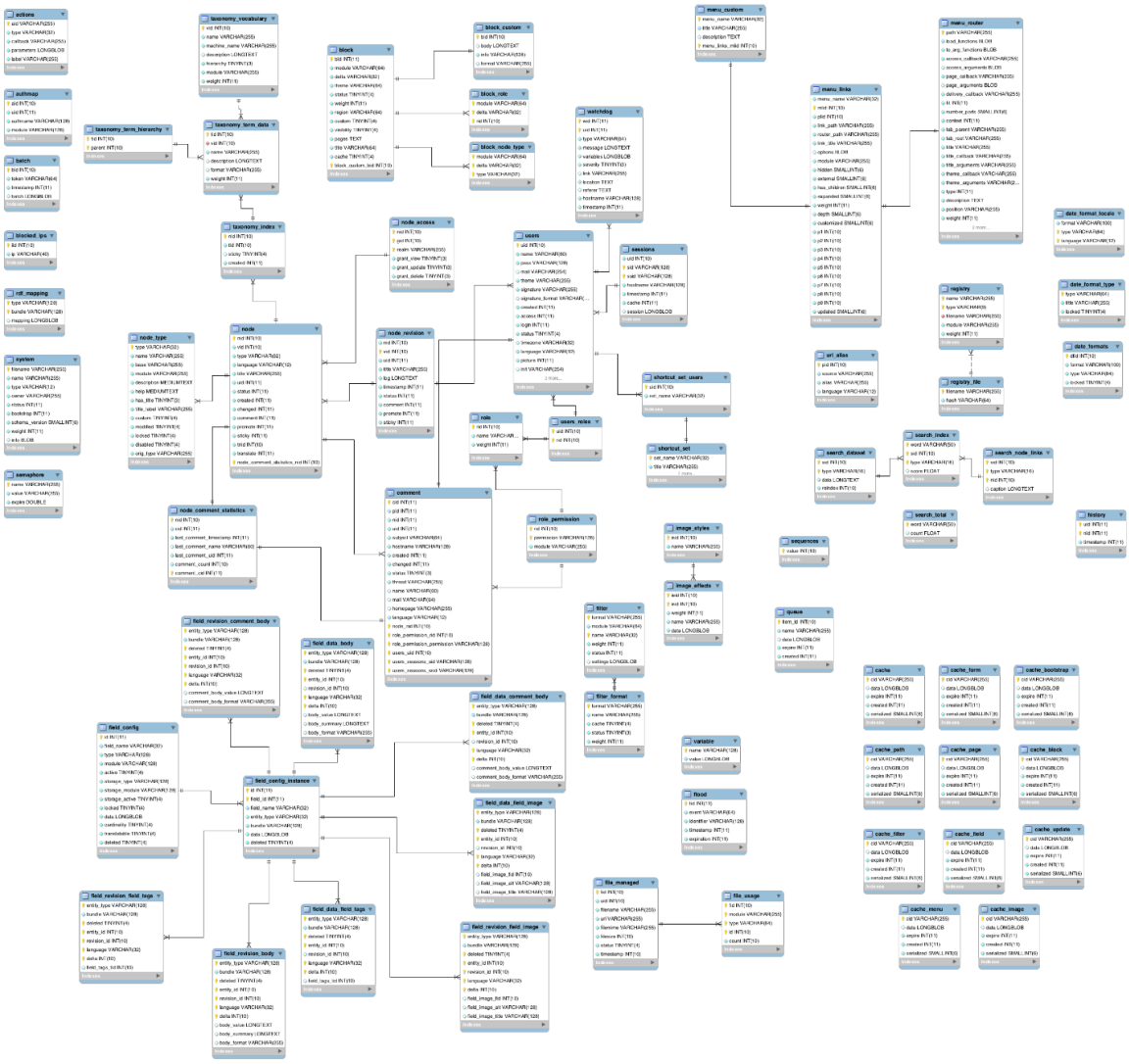


Figure 5.18 – Database diagram of the core system

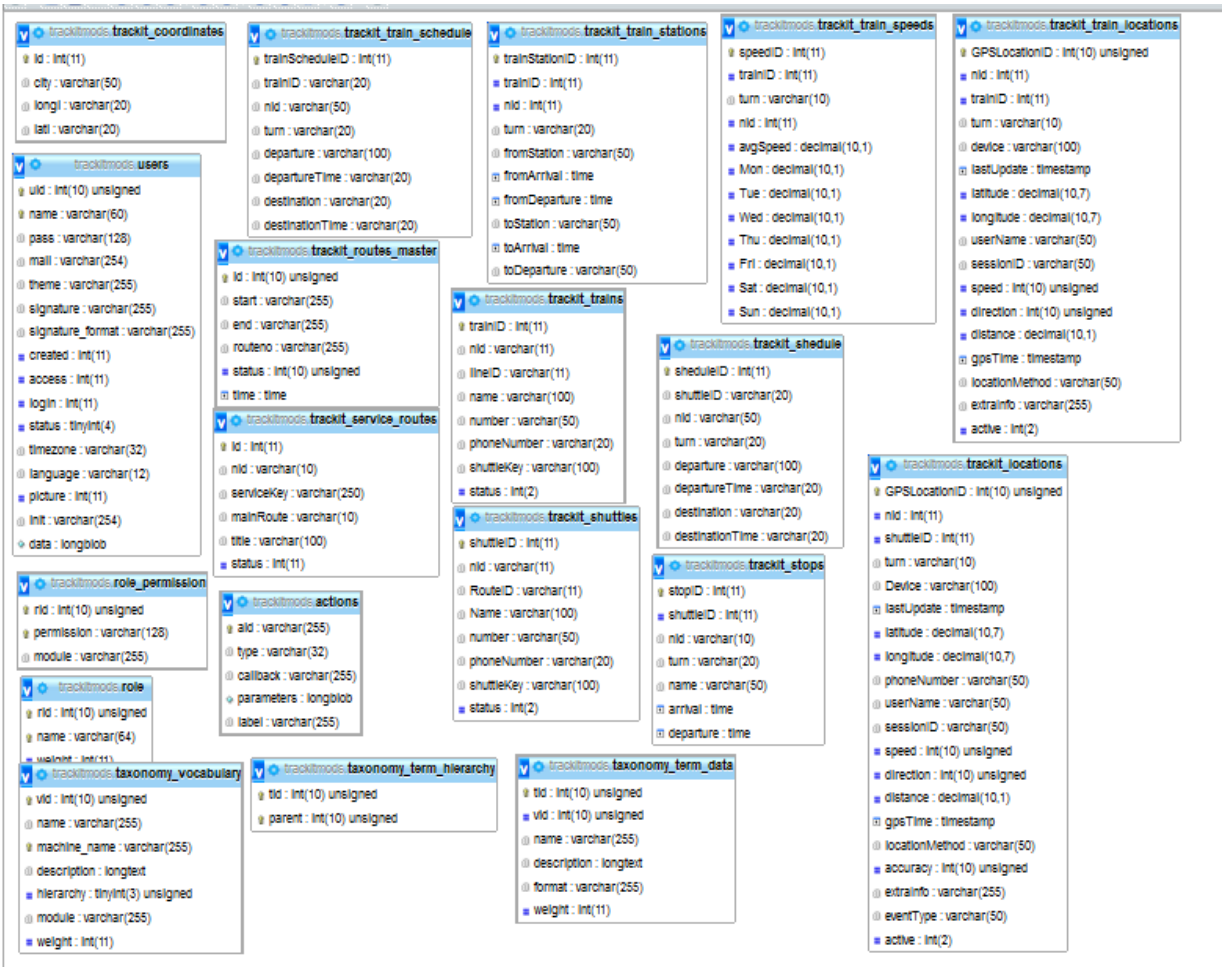


Figure 5.19 – Table structures of custom modules

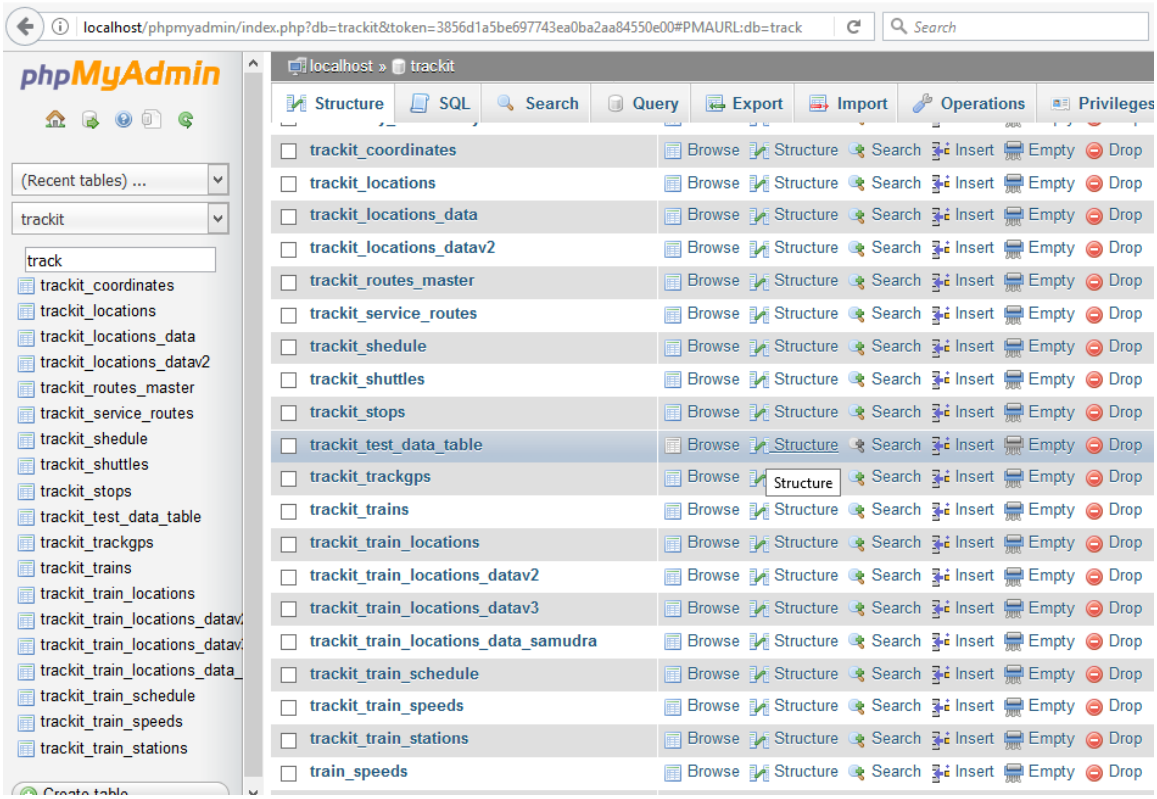


Figure 5.20 – Database administration interface - PhpMyAdmin

Appendix D – User Module

User Module Interfaces

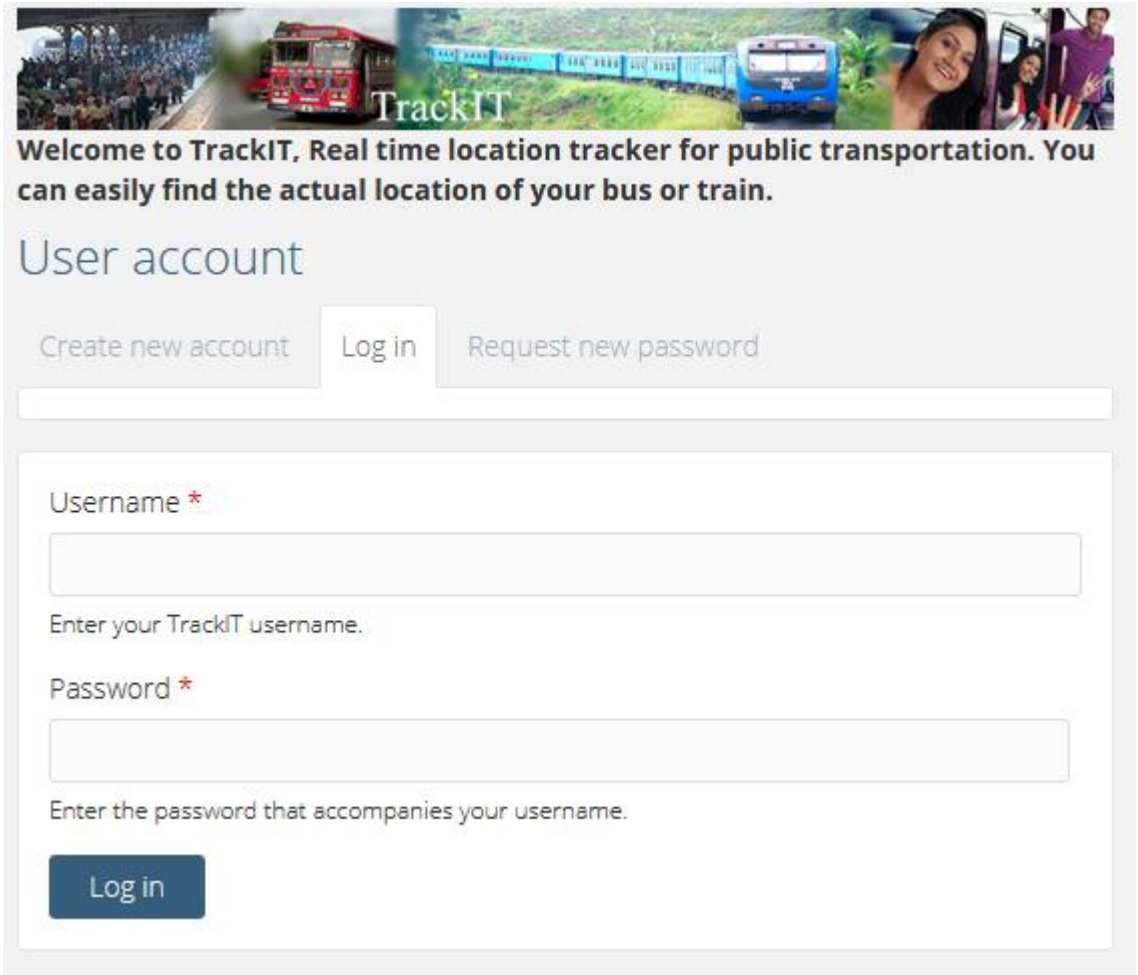


Figure 6.7 – Log in page

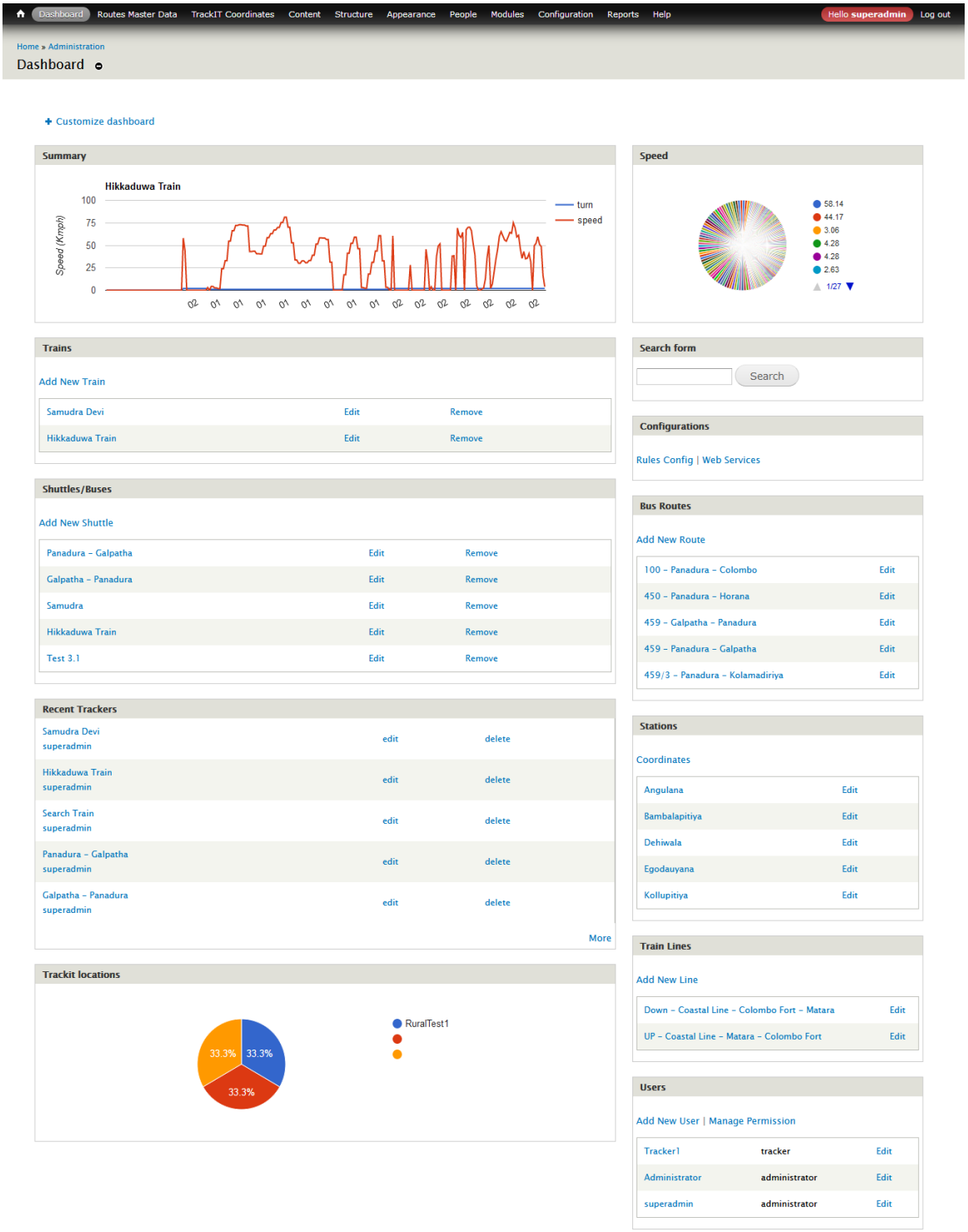


Figure 6.8 – Administration Dashboard

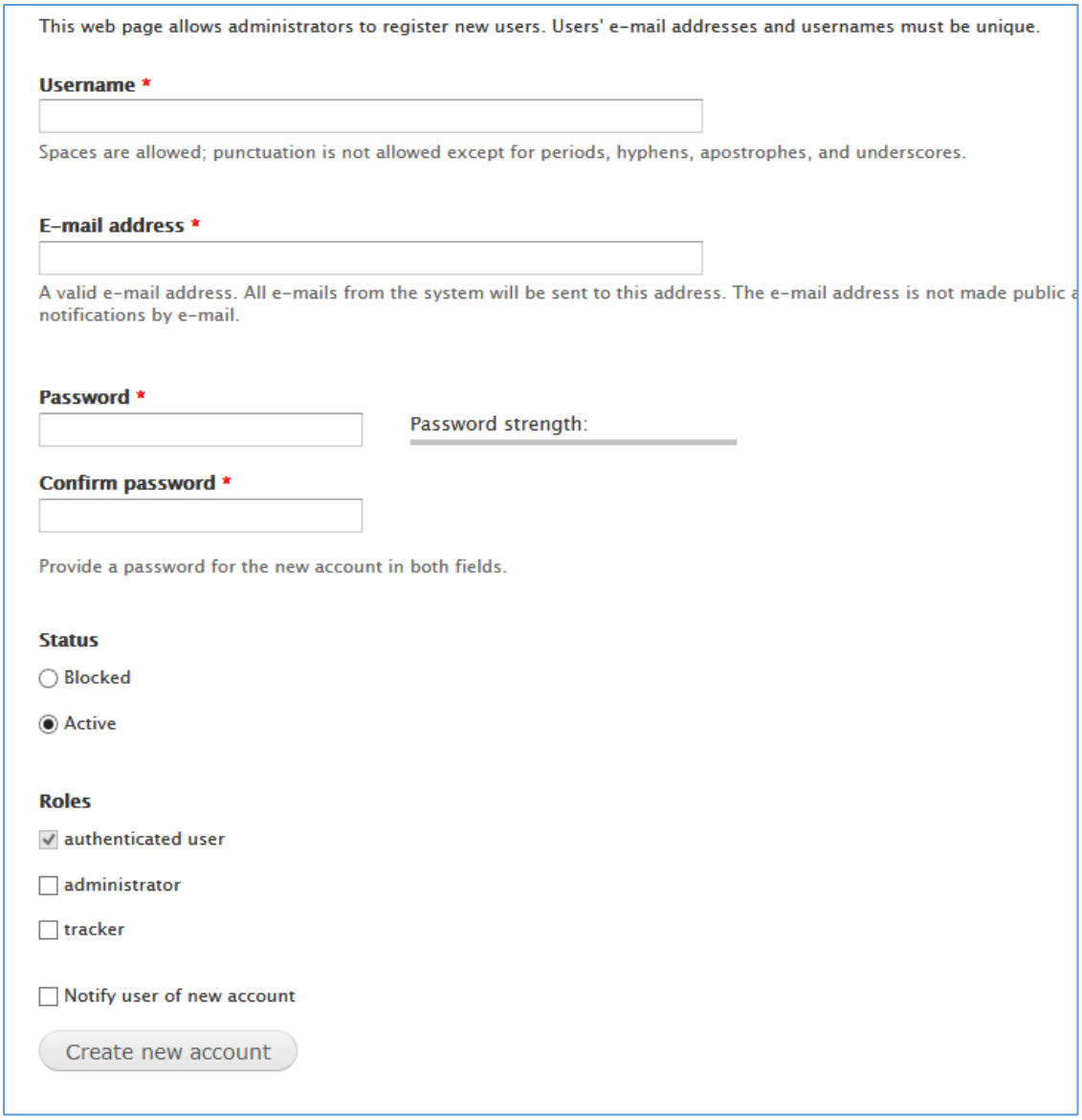
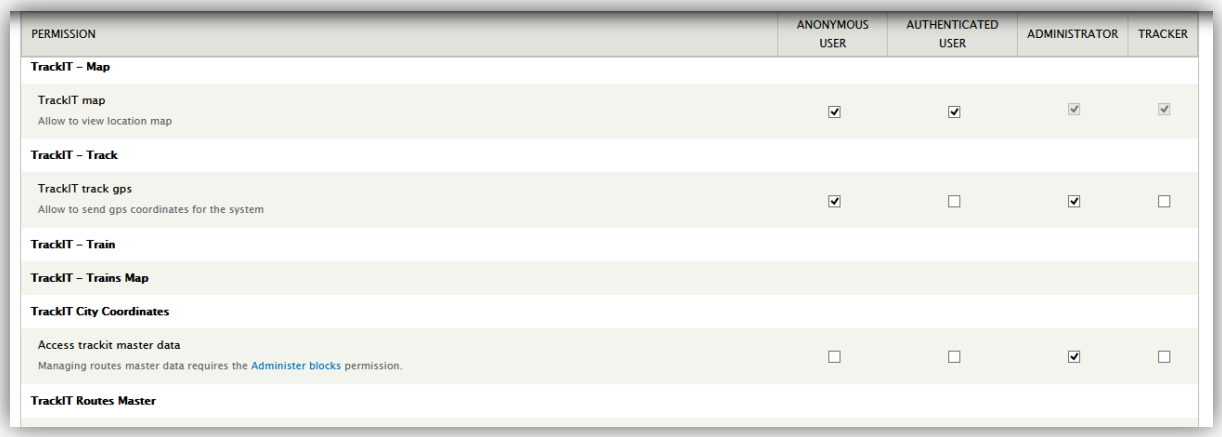


Figure 6.9 – Add new administrator users



PERMISSION	ANONYMOUS USER	AUTHENTICATED USER	ADMINISTRATOR	TRACKER
TrackIT – Map				
TrackIT map Allow to view location map	☑	☑	☑	☑
TrackIT – Track				
TrackIT track gps Allow to send gps coordinates for the system	☑	☐	☑	☐
TrackIT – Train				
TrackIT – Trains Map				
TrackIT City Coordinates				
Access trackit master data Managing routes master data requires the Administer blocks permission.	☐	☐	☑	☐
TrackIT Routes Master				

Figure 6.10 - Granting permission levels for different user roles

Appendix E – Track Module

Bus Tracking Interfaces

Figure 6.11 – Bus master data administration interface

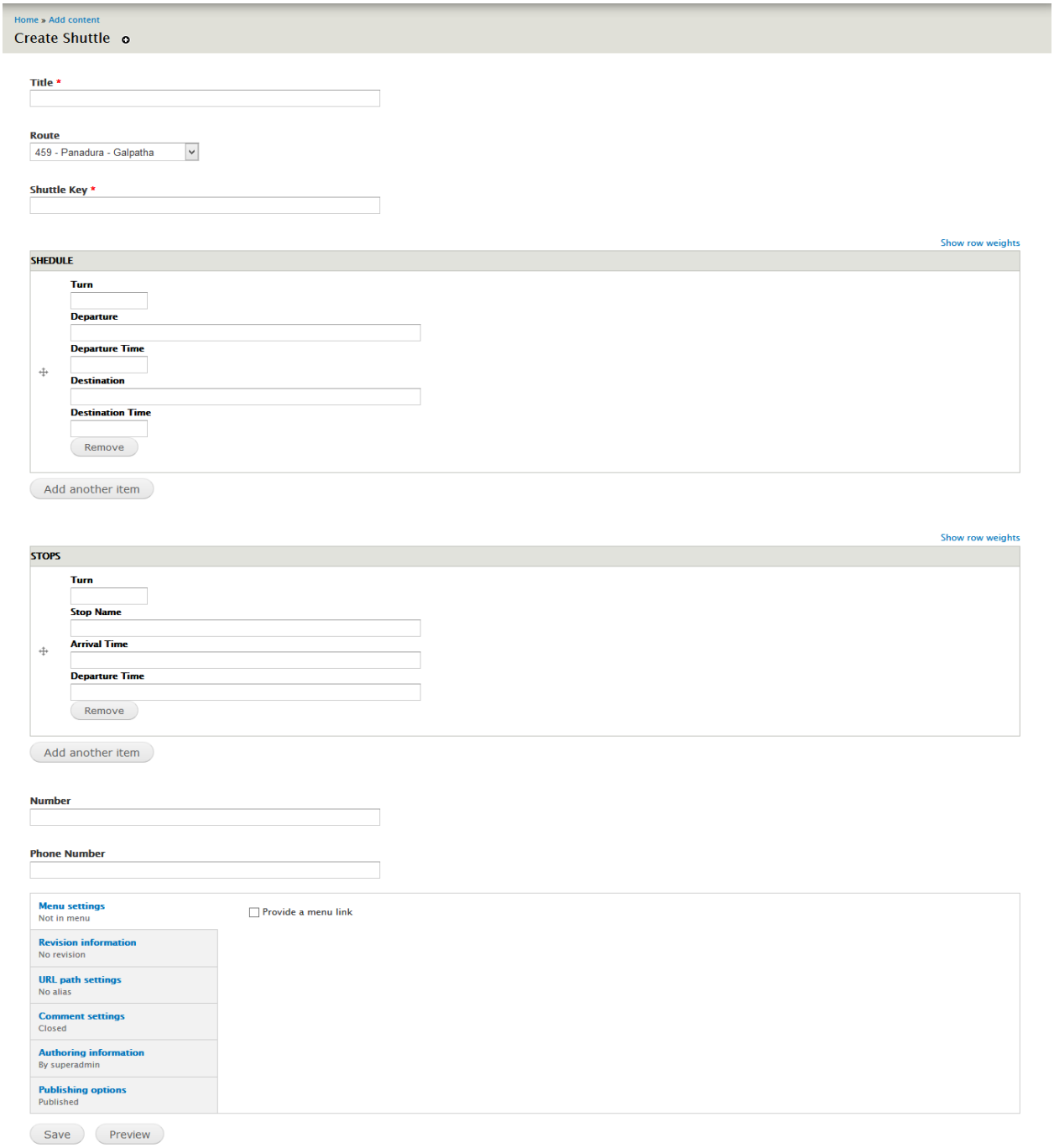


Figure 6.12 - Adding bus and time schedule

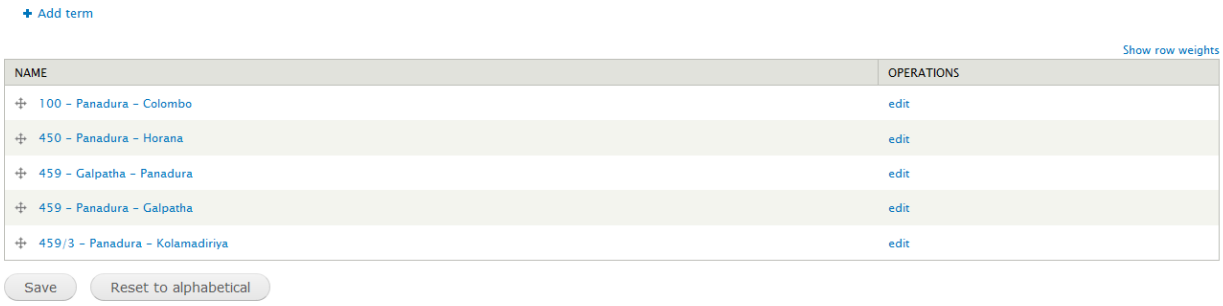


Figure 6.13 – Bus routes administration interface

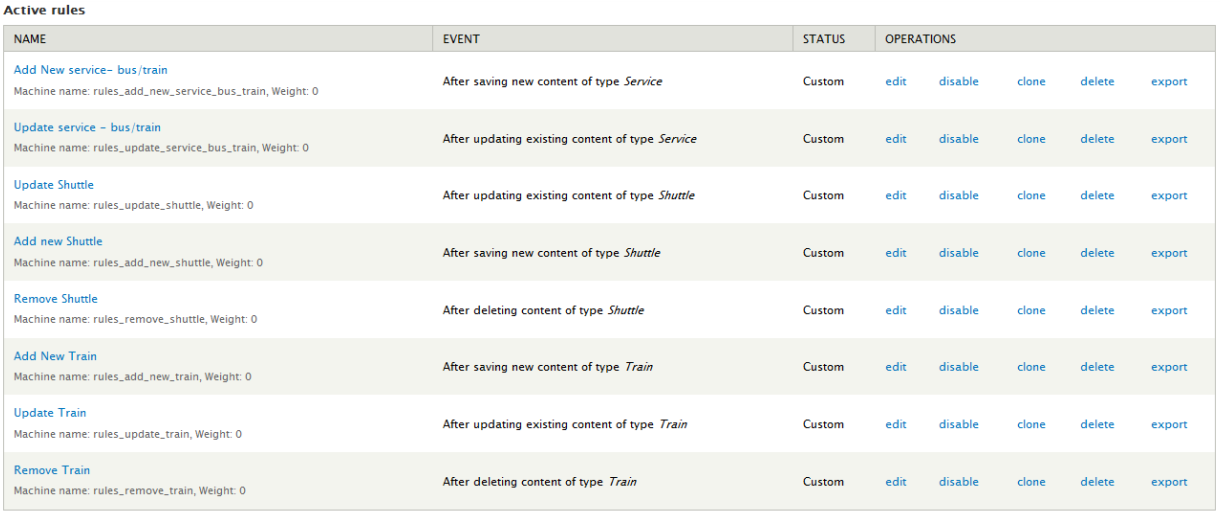


Figure 6.14 – Admin interface to manage rules when managing master data

Appendix F – Train Tracking Module

Train Tracking Interfaces

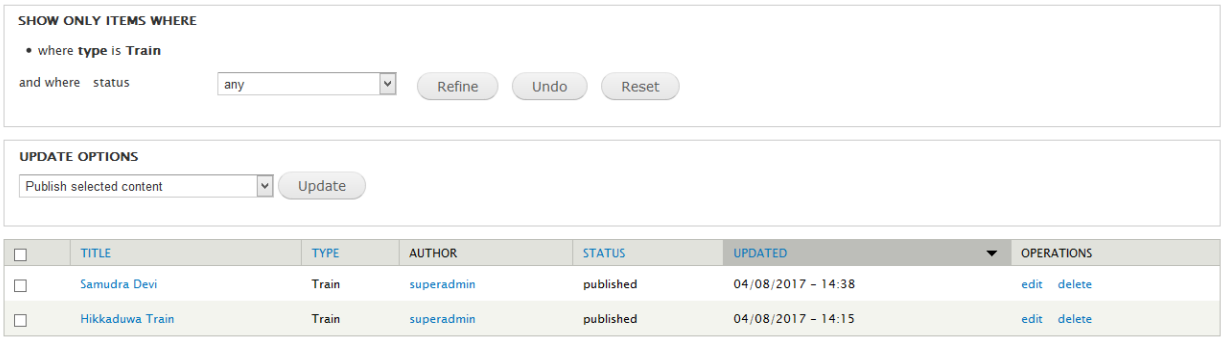


Figure 6.15 – Managing train admin interface

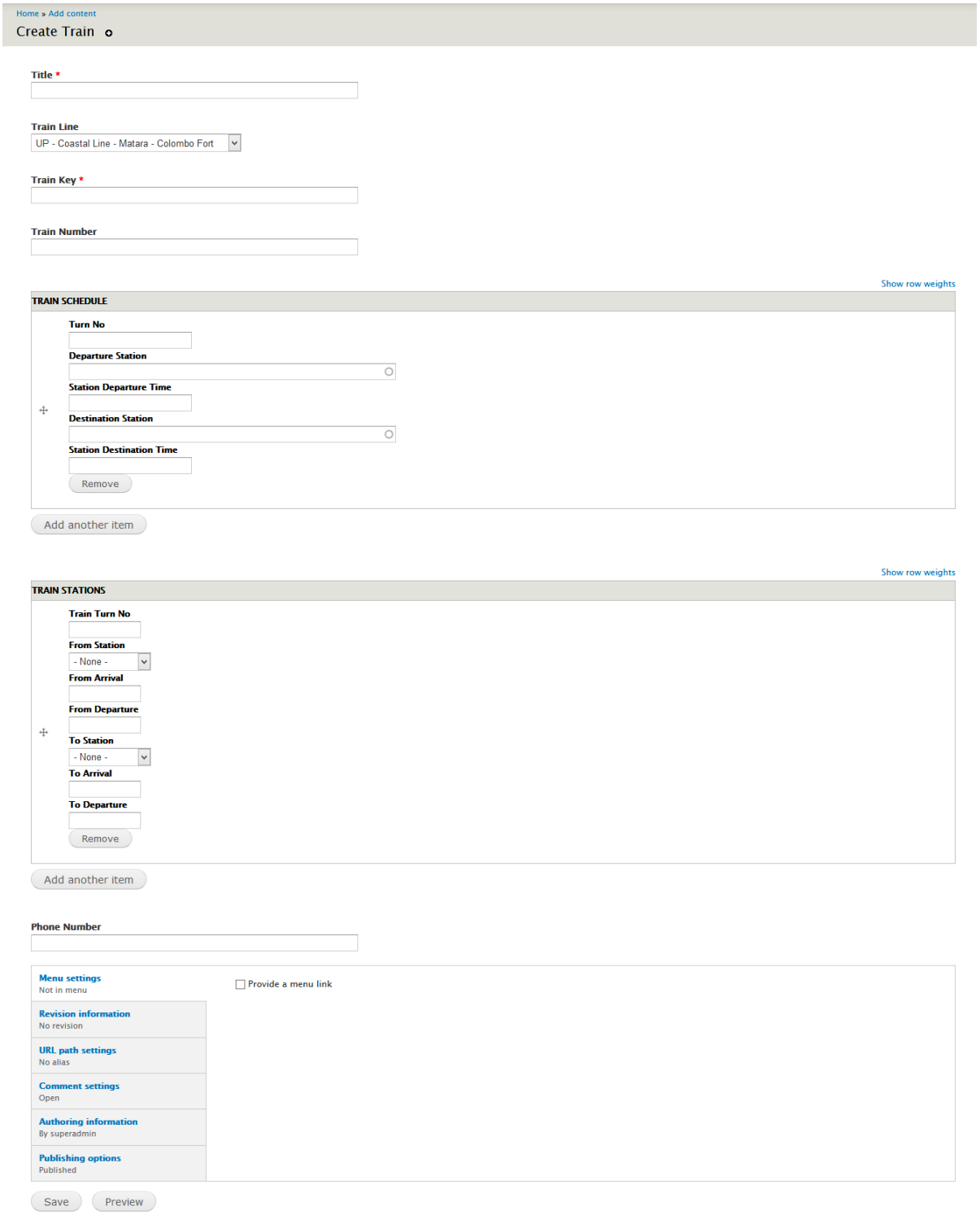


Figure 6.16 – Adding train and schedule to the system

Figure 6.17 – Train Lines interface

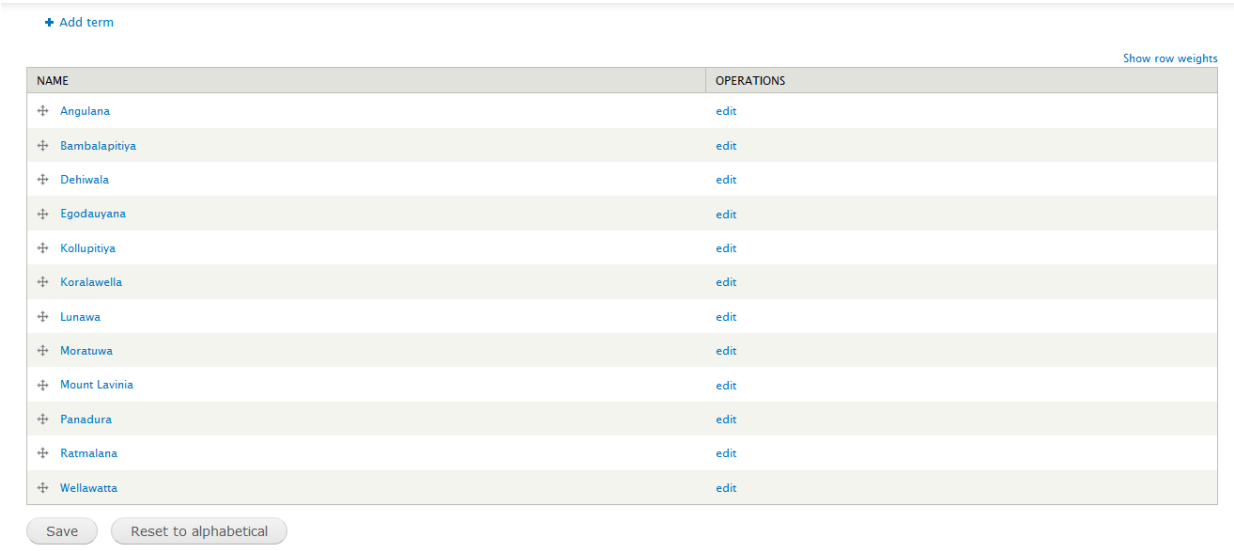


Figure 6.18 – Railway Stations

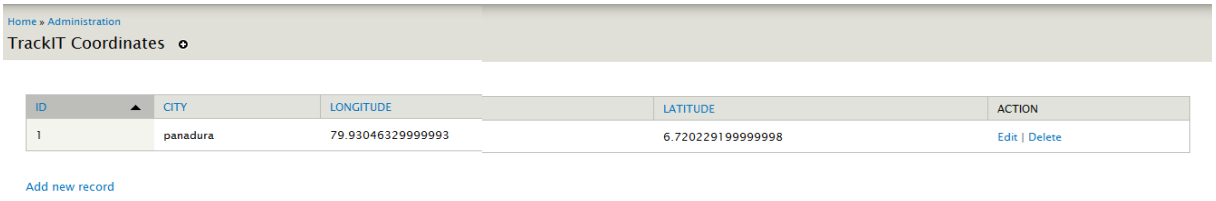


Figure 6.19 – Geo coordinates of stations

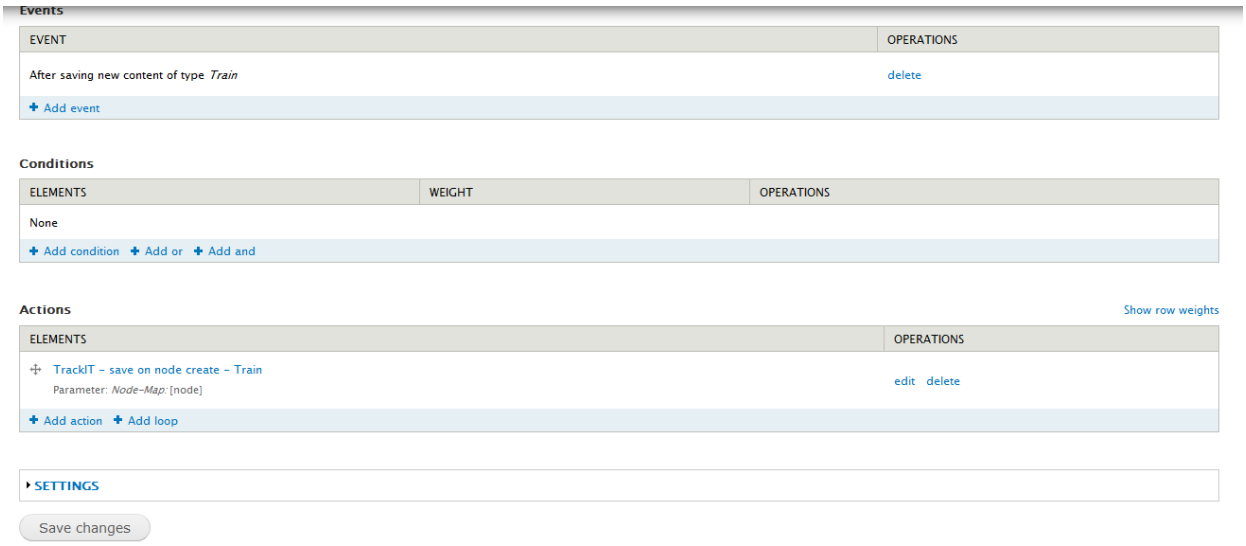


Figure 6.20 – Rules configurations to handle train master data

Appendix G – Frontend Modules

Frontend Interfaces

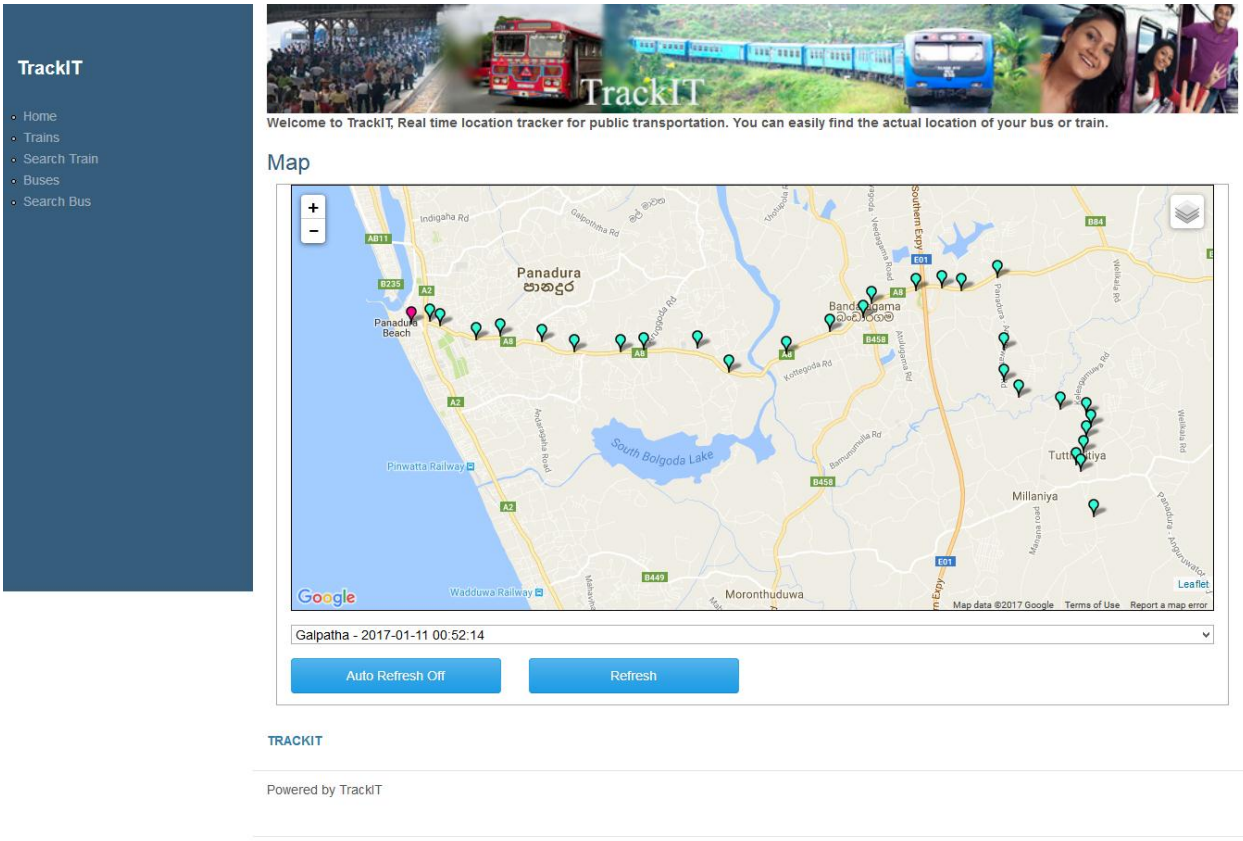


Figure 6.21 – Home page for public users

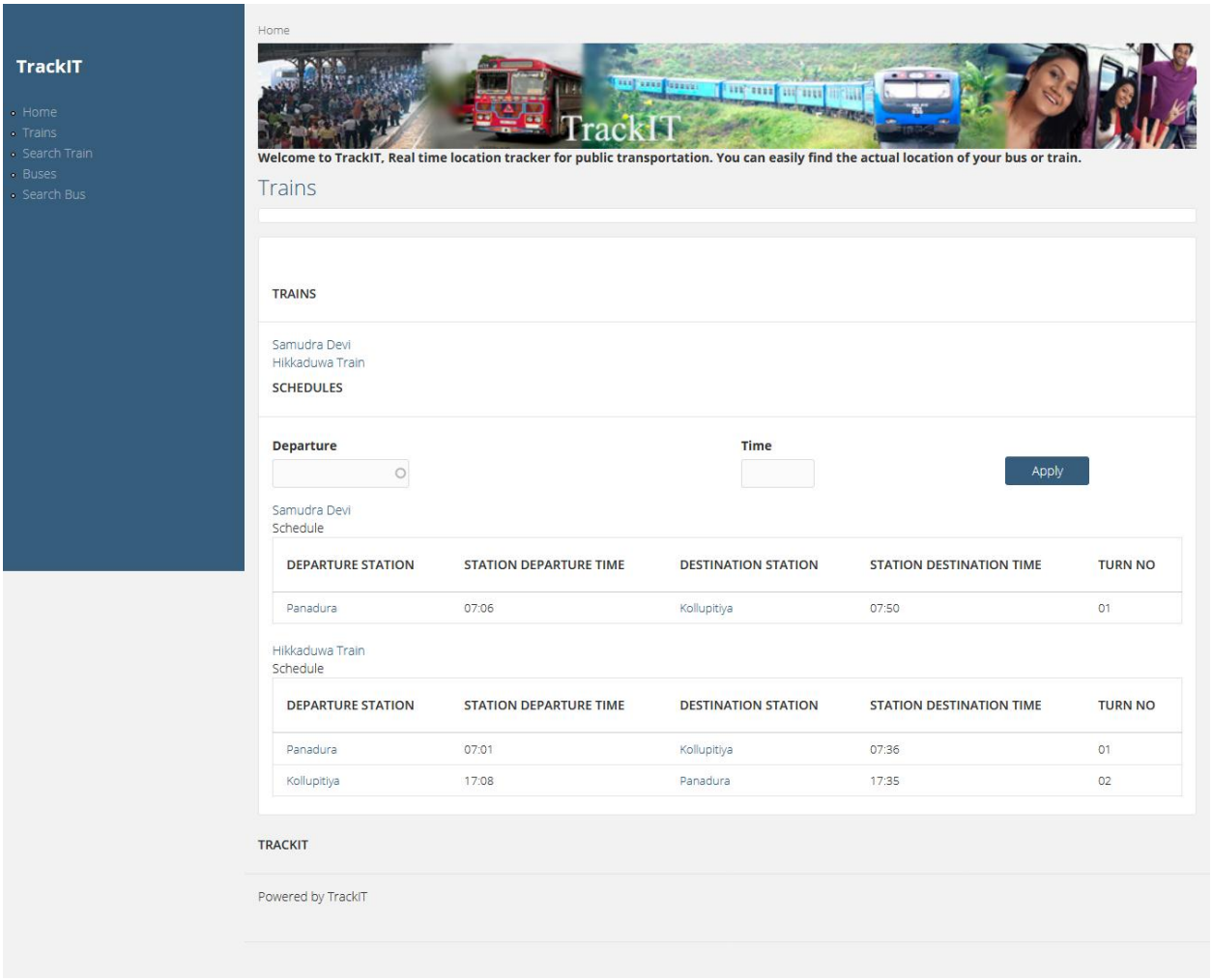


Figure 6.22 – List of Trains with schedule

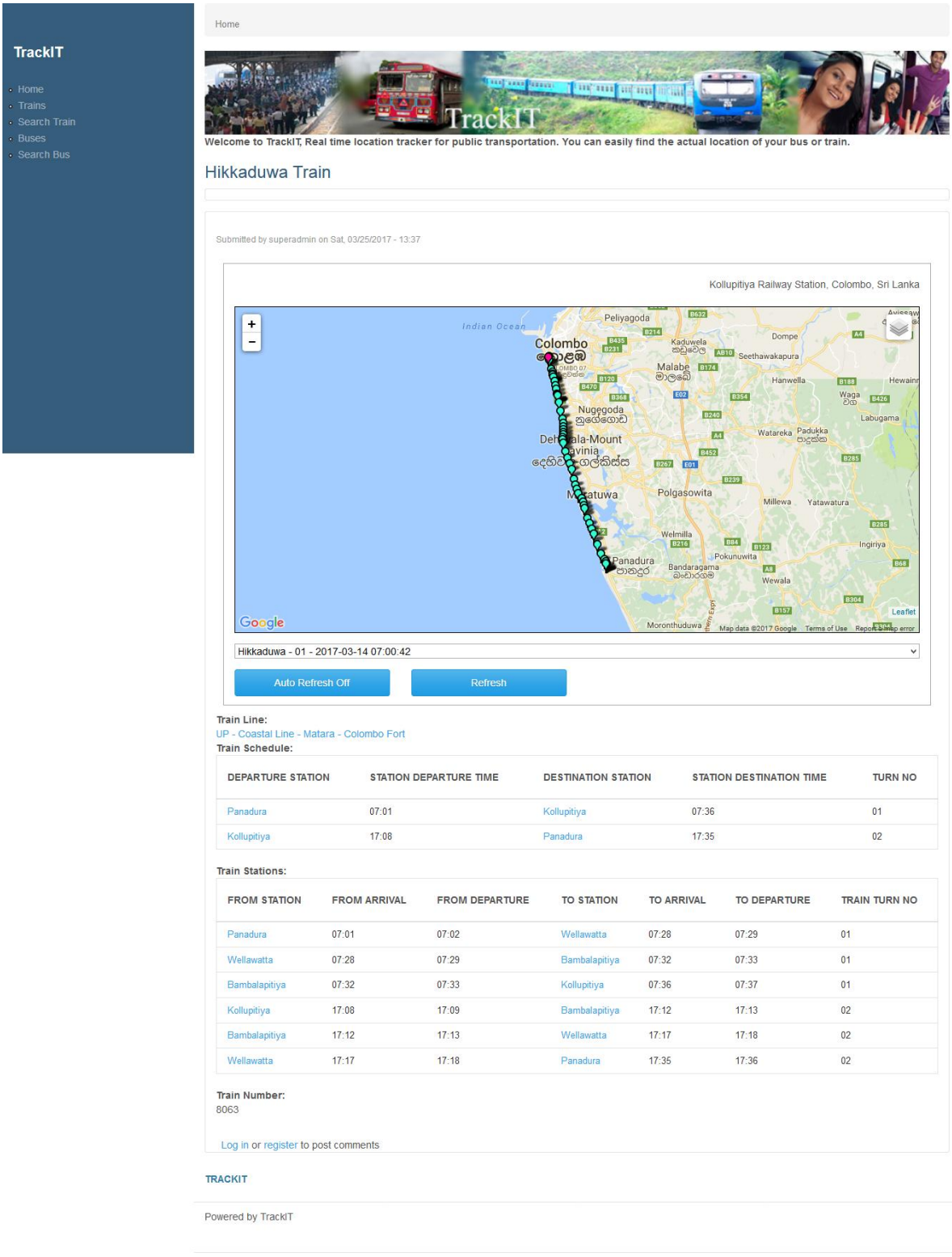


Figure 6.23– Live train details and timetable

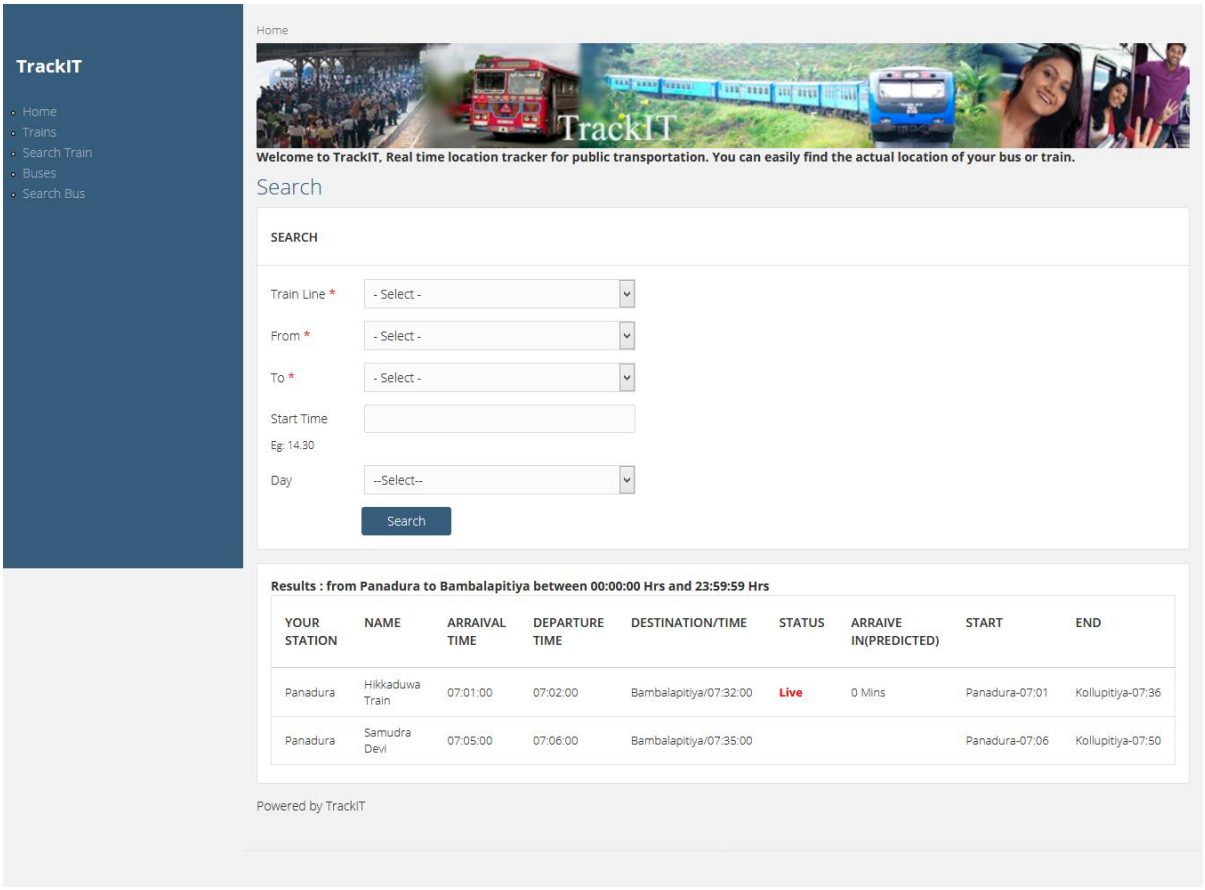


Figure 6.24 – Train Search and Search Results

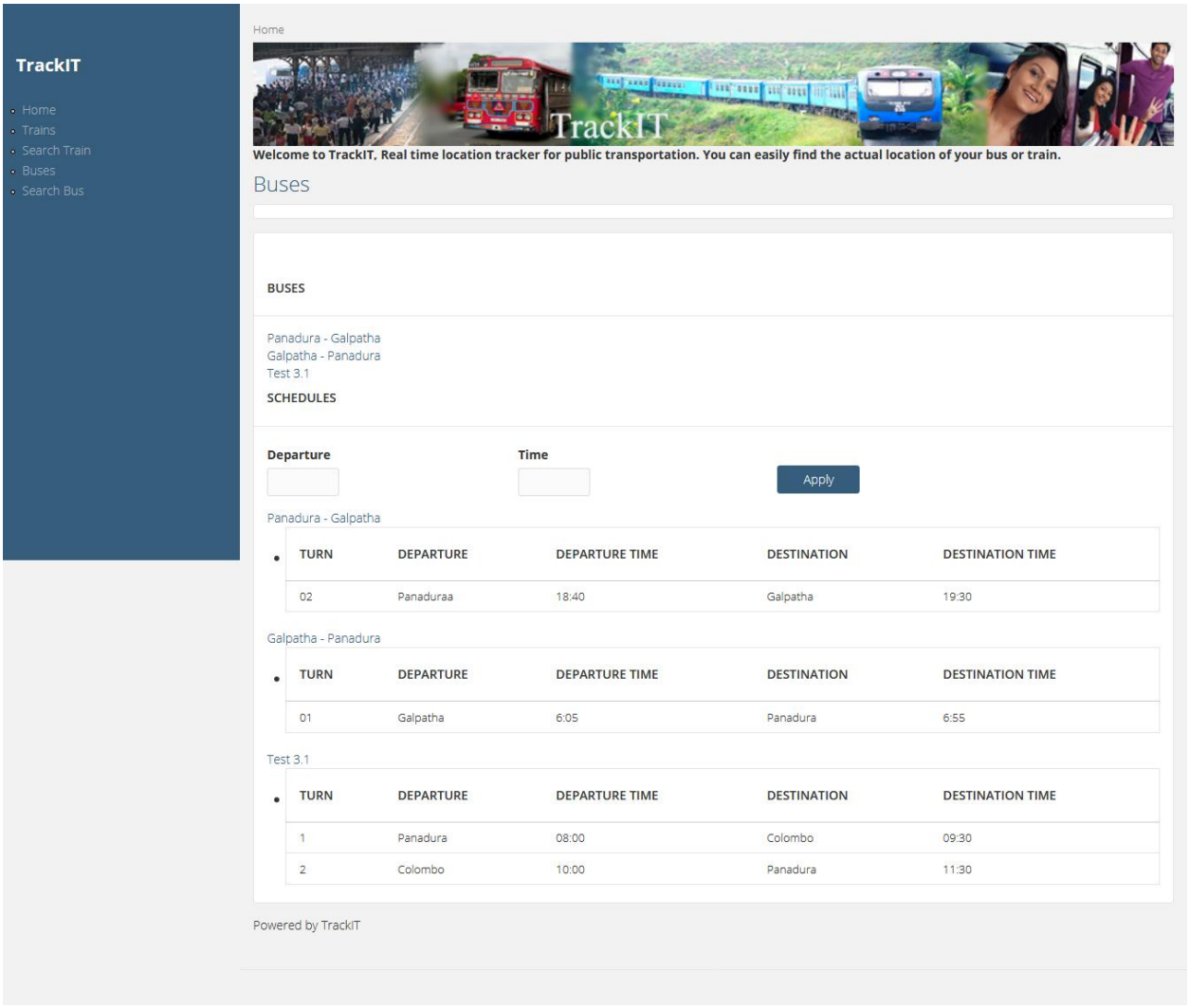


Figure 6.25 – List of buses with time schedule

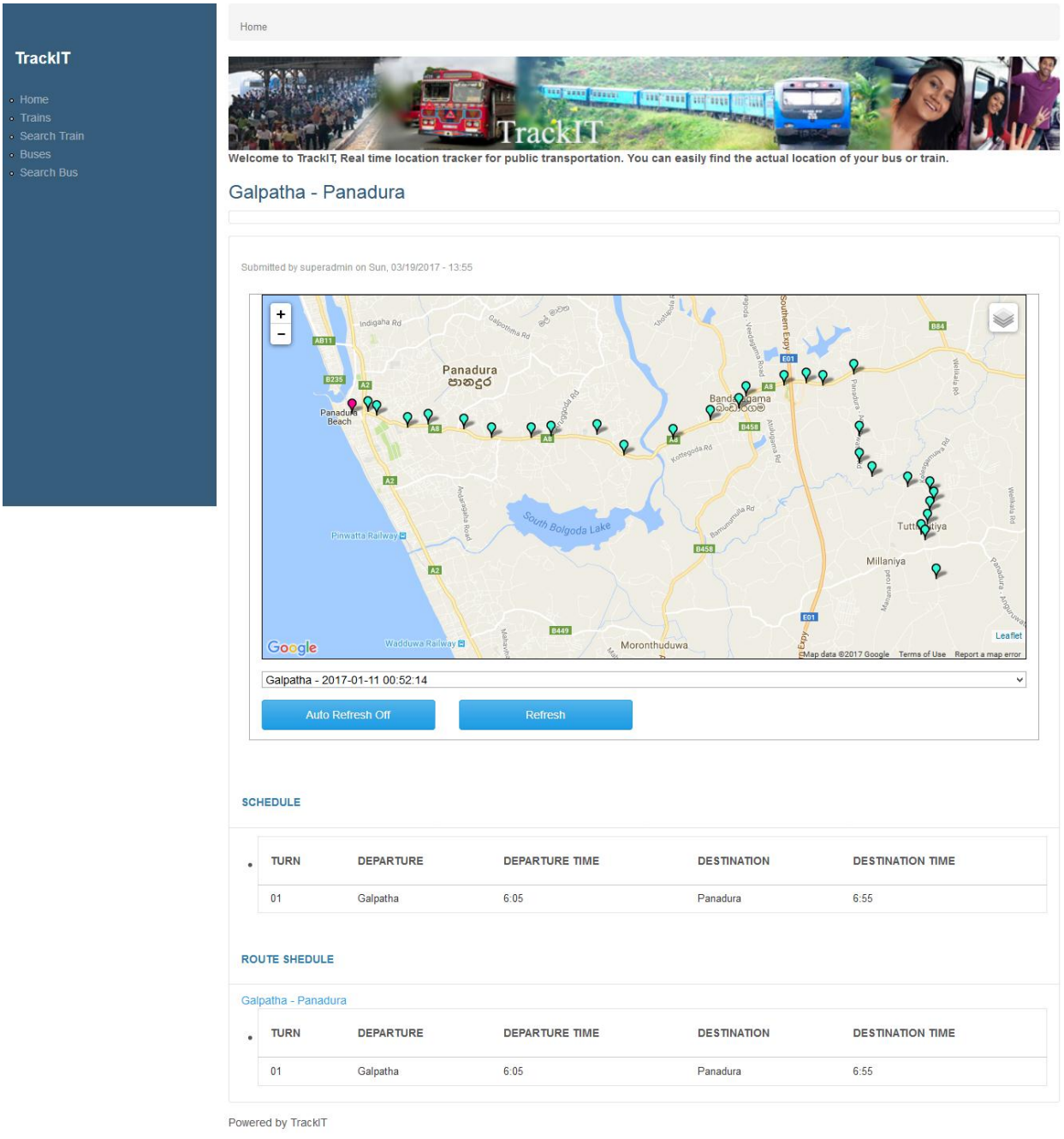


Figure 6.26 – Live map and schedule

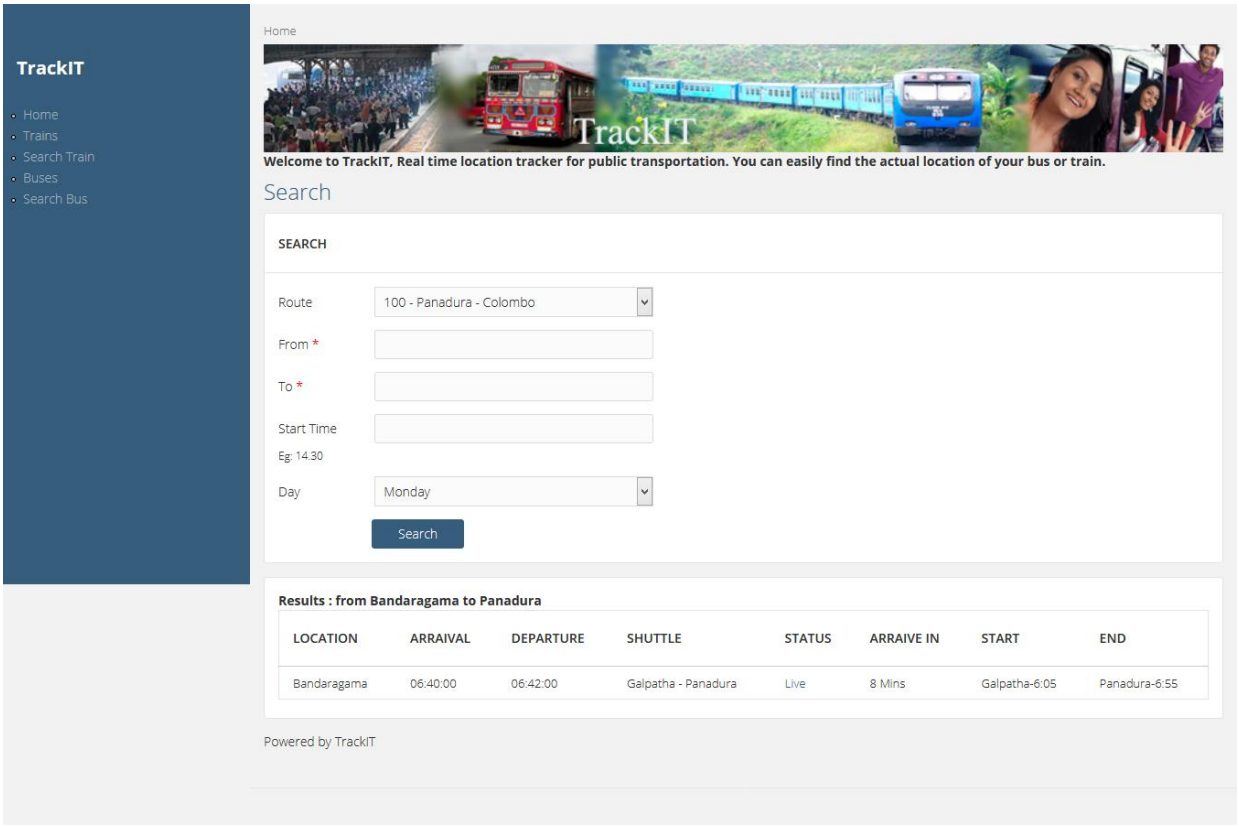


Figure 6.27 – Bus Search and Results

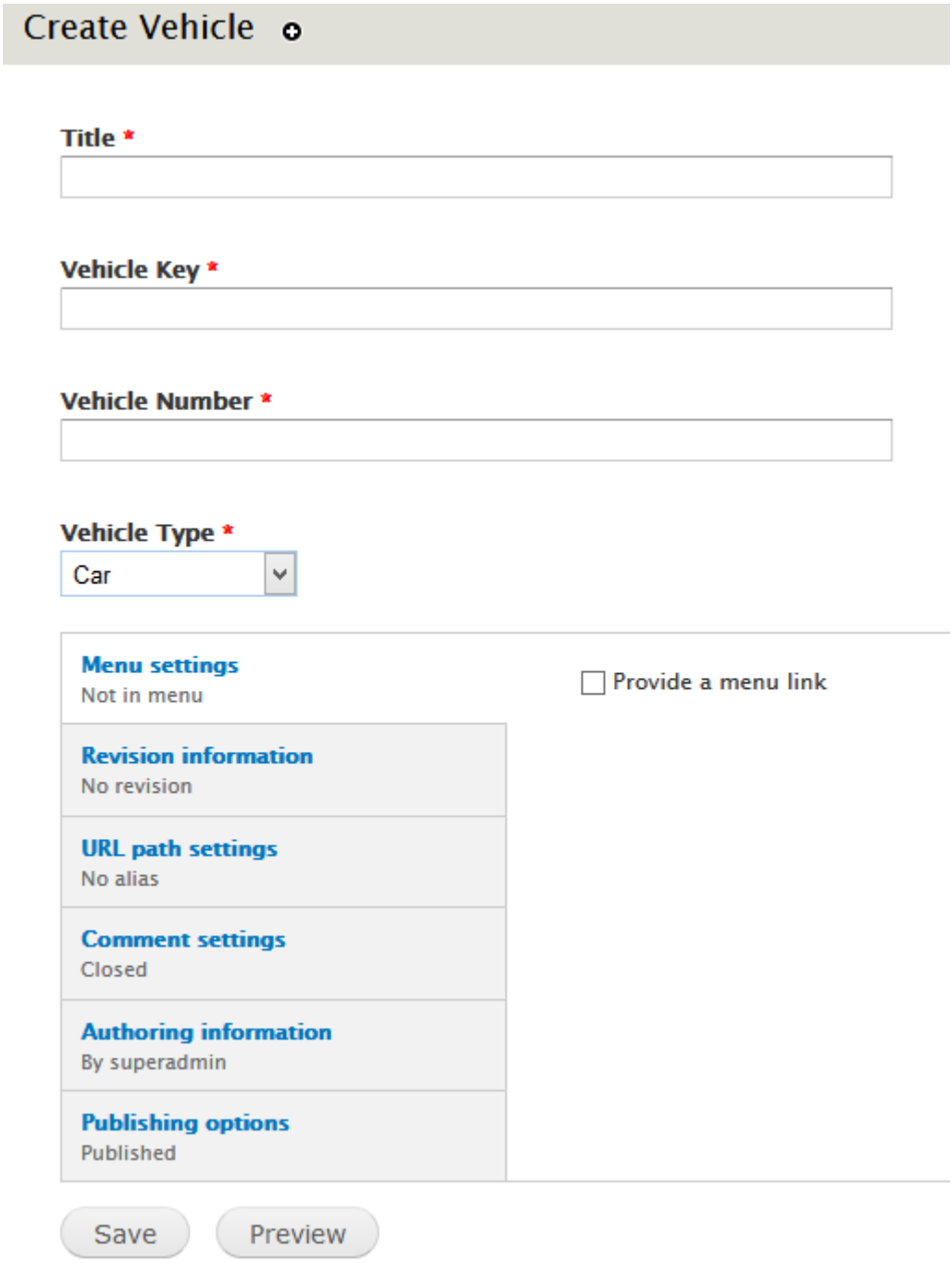


Figure 6.28 – Add vehicle to system

Appendix H – Services

Web service

```
function trackit_train_api_resource_retrieve($nid) {
  $node = node_load($nid);
  $query = db_select('trackit_train_locations_datav3', 'tr');
  $query->fields('tr', array('longitude', 'latitude', 'speed', 'gpsTime', 'turn'));
  $query->condition('nid', $nid, '=');
  $query->range(0, 2);
  $result_locations = $query->execute();
  $row_loc = array();
  while ($record = $result_locations->fetchAssoc()) {
    $row_loc[]['longitude'] = $record['longitude'];
    $row_loc[]['latitude'] = $record['latitude'];
    $row_loc[]['speed'] = $record['speed'];
    $row_loc[]['time'] = $record['gpsTime'];
    $row_loc[]['turn'] = $record['turn'];
  }

  $return_obj = array(
    'train_name' => $node->title,
    'train_id' => $node->nid,
    'locations' => $row_loc,
  );

  return $return_obj;
}
```

Figure 6.29 – Part of a code to get location updates for web service

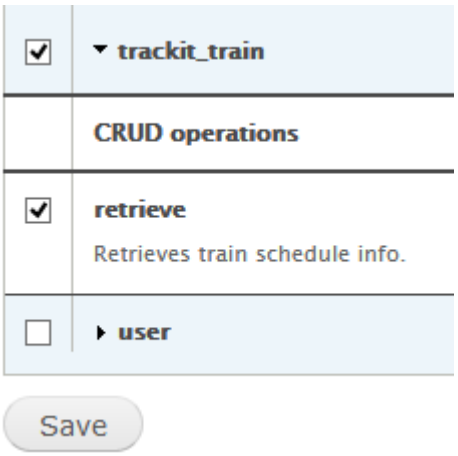


Figure 6.30 – Train data retrieval enabled in service

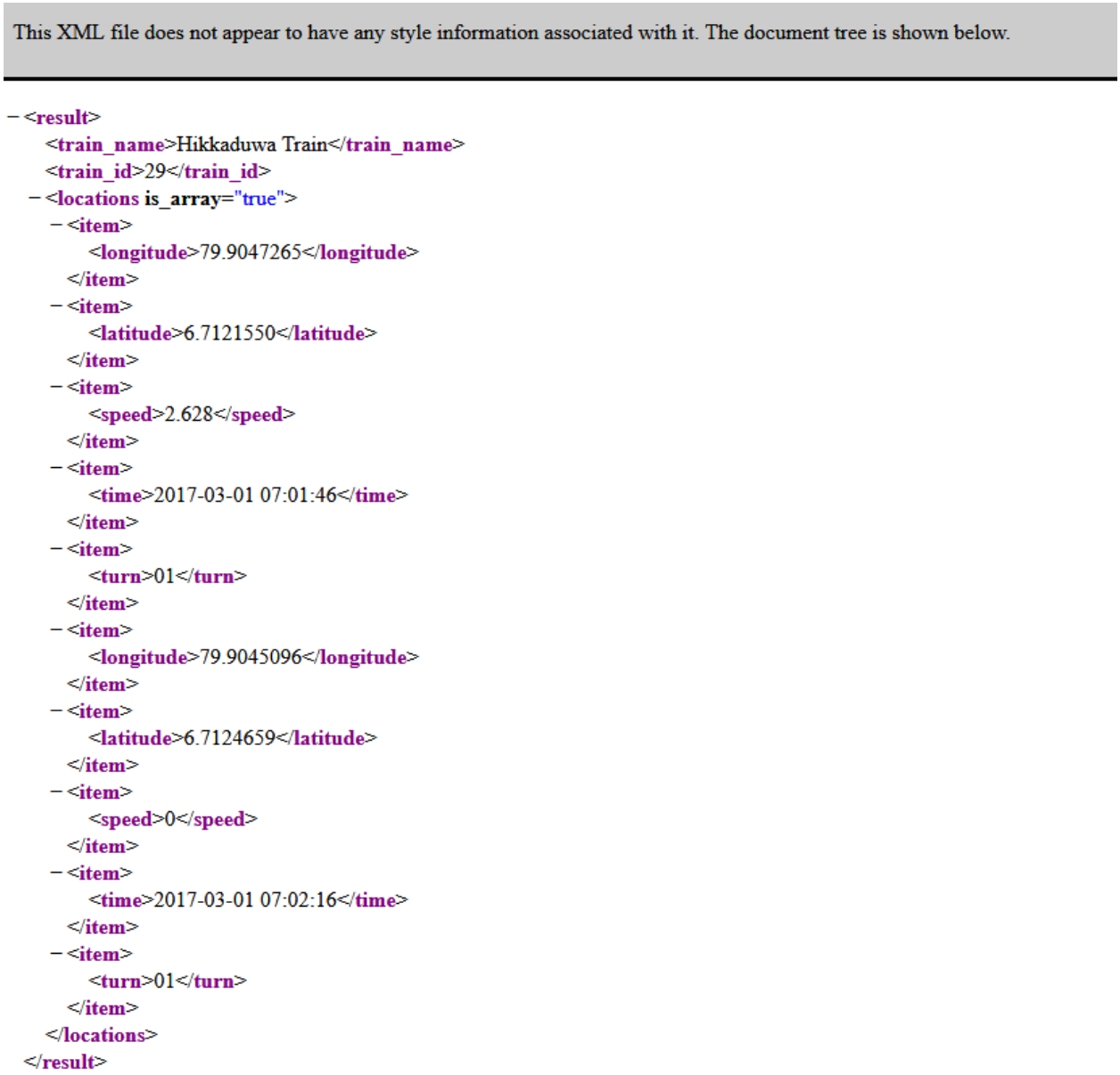


Figure 6.31 – Web service output

Appendix I – Mobile Application

Development and Interfaces

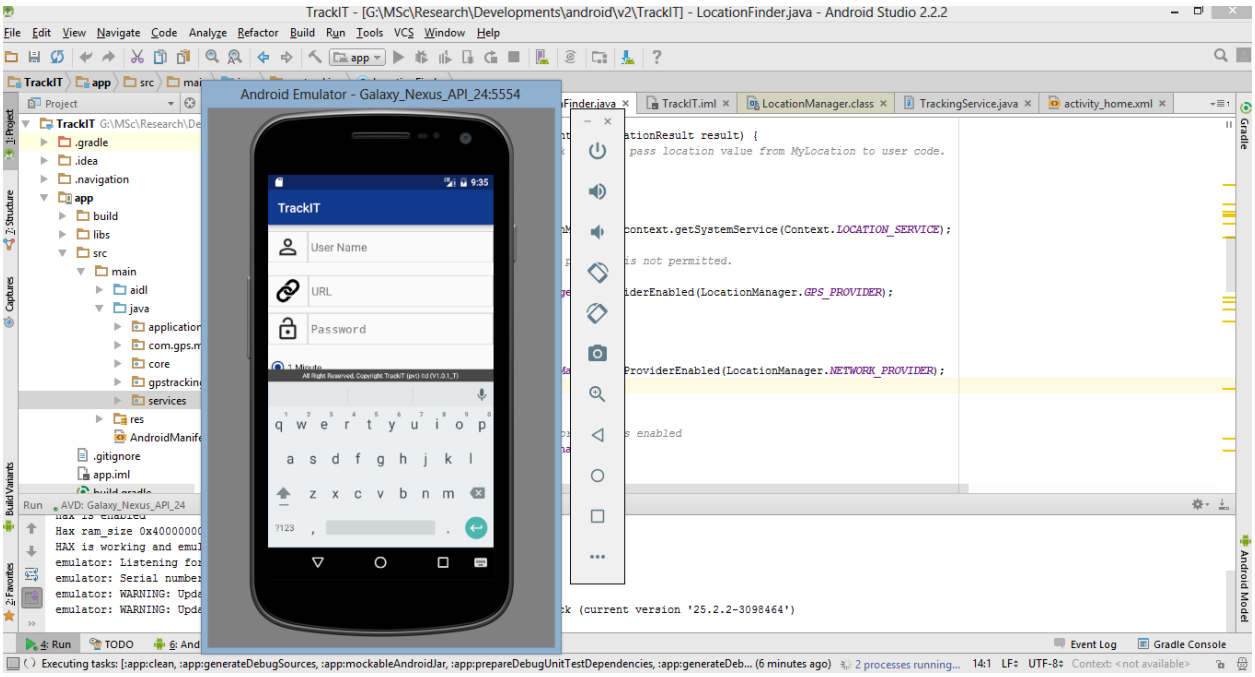


Figure 6.33 - Mobile Application development on Android Studio

```
Public void getLocation (Context context, LocationResult result) {
    location Result = result;
    this.context = context;
    turnGPSOn ();
    if (locationManager == null)
        locationManager =
(LocationManager)context.getSystemService(Context.LOCATION SERVICE);

    //exceptions will be thrown if provider is not permitted.
    try {
        gps_enabled = locationManager.isProviderEnabled(LocationManager.GPS_PROVIDER);
    } catch (Exception ex) {
        ex.printStackTrace();
    }
    try {
        network_enabled =
locationManager.isProviderEnabled(LocationManager.NETWORK PROVIDER);
    } catch (Exception ex) {
        ex.printStackTrace();
    }
    //don't start listeners if no provider is enabled
    if (!gps enabled && !network enabled)
        return;

    if (gps_enabled) {
        locationManager.requestLocationUpdates(LocationManager.GPS_PROVIDER,
Home.TIME_DURATION, MINIMUM_DISTANCE_CHANGE_FOR_UPDATES_GPS, locationListenerGps);
        return;
    }
    else if (network_enabled) {
        locationManager.requestLocationUpdates(LocationManager.NETWORK_PROVIDER,
MINIMUM_TIME_BETWEEN_UPDATES_NETWORK,
MINIMUM_DISTANCE_CHANGE_FOR_UPDATES_NETWORK,locationListenerNetwork);

        return;
    }
```

Figure 6.34 – Code segment to get location updates

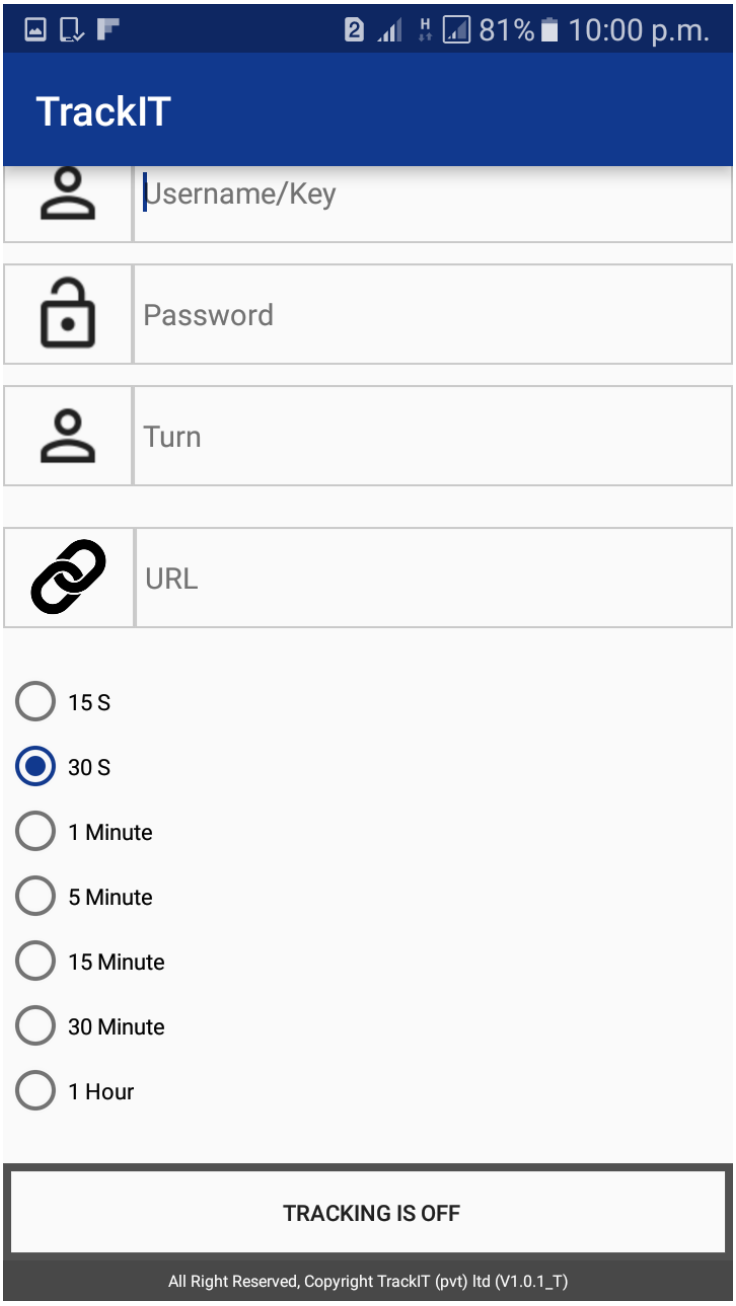


Figure 6.35 - Mobile Application installed on phone

Appendix J – Evaluation

Evaluation Forms

TrackIT Main Web Application Evaluation in terms of usability

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 - Excellent

	Question	Selectable Answers
1	How would you categorize the system in terms of navigation through the system to entering, proceeding and closing the system?	1 / 2 / 3 / 4 / 5
2	Could you understand the system functionality at the first time use?	1 / 2 / 3 / 4 / 5
3	How would you categorize the system based on speed?	1 / 2 / 3 / 4 / 5
4	How would you categorize the usefulness of the system for your daily travelling needs?	1 / 2 / 3 / 4 / 5
5	How easy to access the system through your mobile device?	1 / 2 / 3 / 4 / 5

Table 7.1 – Evaluation form to validate usability

TrackIT Main Web Application Evaluation in terms of functionality

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 - Excellent

	Question	Selectable Answers
1	Does the system provide enough information in when viewing schedule?	1 / 2 / 3 / 4 / 5
2	Does it show live location when you navigate to relevant page?	1 / 2 / 3 / 4 / 5
3	How would you categorize the accuracy predicted time based on your search results based on your experience?	1 / 2 / 3 / 4 / 5
4	When comparing with existing systems for	1 / 2 / 3 / 4 / 5

	the similar purpose, how would you categorize this system	
5	How much do you satisfied the overall functionality provided by this system?	1 / 2 / 3 / 4 / 5

Table 7.2 – Evaluation form to validate functionality

TrackIT Main Web Application Evaluation in terms of Overall Impression

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 – Excellent

	Question	Selectable Answers
1	Does system provide the final result within your expected time scope with expected quality?	1 / 2 / 3 / 4 / 5
2	Did you encounter any difficulty while accessing the system functionalities, how would you categorize system based on this feature?	1 / 2 / 3 / 4 / 5
3	Look and feel when application to be used regular basis	1 / 2 / 3 / 4 / 5
4	How do you categorize the system based on familiarity?	1 / 2 / 3 / 4 / 5
5	Rate the system based on your overall satisfaction about the system	1 / 2 / 3 / 4 / 5

Table 7.3 – Evaluation form to validate overall impression

TrackIT Location updater mobile application - Evaluation in terms of usability

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 - Excellent

	Question	Selectable Answers
1	How would you categorize the mobile application in terms of navigation through the system to entering, proceeding and closing the system?	1 / 2 / 3 / 4 / 5
2	Could you understand the functionality at the first time use?	1 / 2 / 3 / 4 / 5
3	How would you categorize the system usability in terms of starting, stopping in each trip?	1 / 2 / 3 / 4 / 5
4	How application/error messages are understandable?	1 / 2 / 3 / 4 / 5
5	How to you categorize, your attention to start/stop app in each trip?	1 / 2 / 3 / 4 / 5

Table 7.4 – Evaluation form to validate usability of mobile application

TrackIT Location updater mobile application - Evaluation in terms of functionality

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 - Excellent

	Question	Selectable Answers
1	Does the application provide enough information when start tracking and stopping?	1 / 2 / 3 / 4 / 5
2	Rate the application based on expected output/behavior	1 / 2 / 3 / 4 / 5
3	How would you categorize the application functionality based on live updates sent to main system?	1 / 2 / 3 / 4 / 5
4	When comparing with existing applications, how would you categorize this app?	1 / 2 / 3 / 4 / 5
5	How much do you satisfied the overall functionality provided by this application?	1 / 2 / 3 / 4 / 5

Table 7.5 – Evaluation form to validate functionality of mobile application

TrackIT Location updater mobile application - Evaluation in terms of Overall Impression

Selectable options- 1 - Very poor, 2 – Poor, 3 – Average, 4 - Good, 5 – Excellent

	Question	Selectable Answers
1	Does system provide the final result (Starting/Stopping) within your expected time scope with expected quality?	1 / 2 / 3 / 4 / 5
2	Did you encounter any difficulty while accessing the application functionality, how would you categorize system based on this feature?	1 / 2 / 3 / 4 / 5
3	Categorize the Look and feel when application to be used regular basis	1 / 2 / 3 / 4 / 5
4	How do you categorize the application based on familiarity?	1 / 2 / 3 / 4 / 5
5	Rate the application based on your overall satisfaction	1 / 2 / 3 / 4 / 5

Table 7.6 – Evaluation form to validate overall impression of mobile application

Evaluation Results

Main Web Application - Functionality							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	Does the system provide enough information in when viewing schedule?	0	0	12	64	0	76
2	Does it show live location when you navigate to relevant page?	0	0	6	56	20	82
3	How would you categorize the accuracy predicted time based on your search results based on your experience?	0	3	24	40	0	67
4	When comparing with existing systems for the similar purpose, how would you categorize this system	0	0	6	48	30	84
5	How much do you satisfied the overall functionality provided by this system?	0	0	30	40	0	70
					Total		379
					Percentage %		75.8

Table 7.7 – Evaluation results for main web application functionality

Main Web Application - Usability							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	How would you categorize the system in terms of navigation through the system to entering, proceeding and closing the system?	0	3	12	56	0	71
2	Could you understand the system functionality at the first time use?	0	0	24	48	0	72
3	How would you categorize the system based on speed?	0	9	18	32	0	59
4	How would you categorize the usefulness of the system for your daily travelling needs?	0	0	6	48	30	84
5	How easy to access the system through your mobile device?	0	3	36	24	0	63
					Total		349
					Percentage %		69.8

Table 7.8 – Evaluation results for main web application usability

Main Web Application - Overrall Impression							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	Does system provide the final result within your expected time scope with expected quality?	0	0	12	56	10	78
2	Did you encounter any difficulty while accessing the system functionalities, how would you categorize system based on this feature?	0	0	12	56	10	78
3	Look and feel when application to be used regular basis	0	0	12	64	0	76
4	How do you categorize the system based on familiarity?	0	0	6	56	20	82
5	Rate the system based on your overall satisfaction about the system	0	0	6	56	20	82
					Total		396
					Percentage %		79.2

Table 7.9 – Evaluation results for main web application overall impression

Mobile Application - Functionality							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	Does the application provide enough information when start tracking and stopping?	0	6	18	40	0	64
2	Rate the application based on expected output/behavior	0	0	54	8	0	62
3	How would you categorize the application functionality based on live updates sent to main system?	0	6	42	8	0	56
4	When comparing with existing applications, how would you categorize this app?	0	0	36	32	0	68
5	How much do you satisfied the overall functionality provided by this application?	0	0	54	8	0	62
					Total		312
					Percentage %		62.4

Table 7.10 – Evaluation results for mobile application functionality

Main Web Application - Usability							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	How would you categorize the mobile application in terms of navigation through the system to entering, proceeding and closing the system?	0	3	30	32	0	65
2	Could you understand the functionality at the first time use?	0	6	48	0	0	54
3	How would you categorize the system usability in terms of starting, stopping in each trip?	2	6	24	16	0	48
4	How application/error messages are understandable?	0	0	42	24	0	66
5	How to you categorize, your attention to start/stop app in each trip?	0	3	42	16	0	61
					Total		294
					Percentage %		58.8

Table 7.11 – Evaluation results for mobile application usability

Mobile Application - Overrall Impression							
User feedback data analysis - Weighted marks							
	Question	Marks					
		Very Poor	Poor	Average	Good	Excellent	Total
1	Does system provide the final result (Starting/Stopping) within your expected time scope with expected quality?	0	3	30	32	0	65
2	Did you encounter any difficulty while accessing the application functionality, how would you categorize system based on this feature?	0	6	42	8	0	56
3	Categorize the Look and feel when application to be used regular basis	0	12	18	24	0	54
4	How do you categorize the application based on familiarity?	0	0	54	8	0	62
5	Rate the application based on your overall satisfaction	0	0	42	24	0	66
		0	21	186	Total		303
		CL	41.4		Percentage %		60.6

Table 7.12 – Evaluation results for mobile application overall impression