

Optibus

User Manual

Version 1.0.000

Notice

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Getting Started

Chapter 1: About this User Manual

Manual Structure

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Typographical Conventions

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Viewing and Printing

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Notifications

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Concepts and Terminology

Most of the terminology in this manual is industry standard, however Optibus OnSchedule™ introduces some application specific concepts. This section provides a description of these concepts and how they tie into standard terminology.

For our purposes, an **Operator** operates a fleet of road vehicles to provide public transportation services. The Operator carries out scheduling based on the following standard data sources:

- » **Trips list**
- » **Stations list**
- » **Vehicle types list**
- » **Deadheads catalog**

We introduce here, the notion of a **Dataset**. A Dataset is a database that takes in these four standard data files. An Operator may this way, have several Datasets for different purposes. OnSchedule™ creates the Datasets from the four files, which the Operator supplies in conjunction with Optibus. They may be supplied in a variety of formats including Excel spreadsheet, CSV and JSON. The content and layout of these files is described in TBD.

Basic terms such as **Deadhead**, **Depot**, **Pull in**, **Pull out**, **Split**, **Changeover** are standard.

A **Route** is a very specific: It is specified by a **Sign**, an **Alternative** (often abbreviated to **Alt**) and a **Direction**.

Similarly, a **Service trip** is also defined in a very specific way: It includes route information, eligible vehicle types and start-end times. After scheduling, it will be assigned a driver duty and a vehicle.

You can open a schedule from a Dataset in one of three ways:


- » You may choose one of list of existing schedules
- » Import a schedule from a source spreadsheet
- » Create a new schedule Using the Preferences and Optimization

The way in which the OnSchedule™ vehicle and driver displays are produced is largely dependent upon on the way in which the schedule was opened.

The vehicles are displayed in a **Vehicle Gantt** in which each **row** or **block** shows the trips allocated to a vehicle for a day's work.

A vehicle block does not relate to a specific physical vehicle. It shows the trips allocated for example, to vehicle 35 for the day. In that sense, vehicle ID 35 is an abstraction: It is a set of vehicle attributes that may be matched by one or more physical vehicles. Although OnSchedule™ takes into account fleet size, vehicle types and their attributes, the allocation of a specific physical vehicle to the a vehicle ID is outside the scope of the system.

The drivers are shown in a **Driver Gantt** in which each row shows the trips allocated to a specific driver for the day.

First **optimization** is carried out by simply pressing the  button. The processing time depends on the size of the schedule but is generally of the order of minutes.

Drivers and Duties: In reality, OnSchedule™ deals with duties rather than with real drivers - personnel. The assignment of drivers to duties (dispatching) is outside the scope of OnSchedule™. Popular usage requires us to refer for example, to Vehicle Gantt and Driver Gantt rather than Duty Gantt.

Preferences for optimization: OnSchedule™ provides an extensive array of user preferences split into vehicle related, driver (duty) related, depotrelated and a miscellaneous section for everything else. The preferences reflect the diverse requirements of the industry, worldwide. New preferences are added from time to time in the wake of new customer requirements. These preferences affect the optimization outcome in a direct and visible way. Changing a preference generally requires re-optimizing

Strict and Flexible Preferences: A preference parameter can be entered as a **constraint**, being a fixed value or a fixed range of values. OnSchedule™ introduces something new: **Flexible preferences**. A value or range of values is still chosen but they are "elastic". However, there is a financial **penalty** for violating them. This leads to a more realistic optimization. Flexible preferences may be available for items not governed by legislation or regulation.

Chapter 2: Introduction

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Welcome

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Key Features

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Major Benefits

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Prerequisites

OptibusOnSchedule™ is a cloud hosted web service. It has no components installed on your computer. It is presently designed to run on the **Google Chrome** web browser.


Subsequent references to "browser" in this Manual, mean the Google Chrome browser unless otherwise stipulated. You can download the Google Chrome browser from the [Google Chrome download site](#).

Other requirements are:

- » Any operating system that can host the Google Chrome web browser (for example Windows, Linux, Unix, Mac TBD)
- » Adequate memory - 4Gb recommended
- » Fast processor - TBD
- » Graphics accelerator card - TBD
- » A large monitor: For production, at least 24". If possible, configure it as a secondary monitor dedicated to running OnSchedule™ in full screen mode.
- » Laptop users: Use best power mode possible - do not use power saving.

Chapter 3: A Quick Tour of OptibusOnSchedule™



Objectives of this Tour

To use chedule™ effectively, you must understand the work-flow for setting up and optimizing a schedule. This chapter takes you through the procedure without getting in to the profusion of available options and preferences along the way. These details are covered in **Choosing a Work Schedule** in the Technical Reference section.

The Tour has two objectives:

1. To introduce the main OnSchedule™ concepts and work-flow
2. To do an interface walk-through demonstrating the work-flow

The procedure has six main steps, covered in turn in the following sections:

1. Prepare Trips Excel files to create a Dataset
2. Open your browser and log in to the chedule™ web site
3. Create a new Dataset from the Trips Excel files
4. Open a schedule from the Dataset
5. Run the Optimizer for the first time to generate a Vehicle and Driver Gantt
6. Use basic Preferences to complete the Gantts

The Tour is based on a weekly schedule. The demonstration below, starts with the optimization of a single day - Sunday.

Having completed this Tour, you will have the background necessary to proceed to the more advanced optimization techniques using the full Preferences facilities.

Logging in to Optibus OnSchedule™

The Web address (URL) of the OnSchedule™ demonstration is supplied by Optibus together with a user name and password. Open up your browser and navigate to it. You will see the log-in window:

A login screen with a dark background. It features two input fields: 'User name' with a person icon and 'Password' with a lock icon. Below these fields is a teal 'Sign In' button.

Enter your user name and password and click on Sign In. An invalid user name or password will result in an appropriate error message.

Choosing a Dataset and Schedule

After you have logged in, you are presented a Dataset window:

The Dataset selection window has a sidebar on the left with the title 'Open' and two buttons: 'Import Dataset' and 'Back'. The main area is titled 'Datasets' and contains a search bar with the placeholder 'Enter some keywords'. Below the search bar is a table with the following data:

Name	Created By	Created At	Description
Good Town Demo dataset	dilogsys@inter.ne...	07/17/2016, 8:42:00 am	
TW_Test_002		06/20/2016, 2:24:52 pm	
TW_Test_001		06/20/2016, 11:49:10 am	

The Optibus logo is visible in the bottom left corner.

Figure 3-1: Choosing a Dataset

Click the Good Town Demo Dataset item in **Figure 3-1**. The Schedule selection window opens:

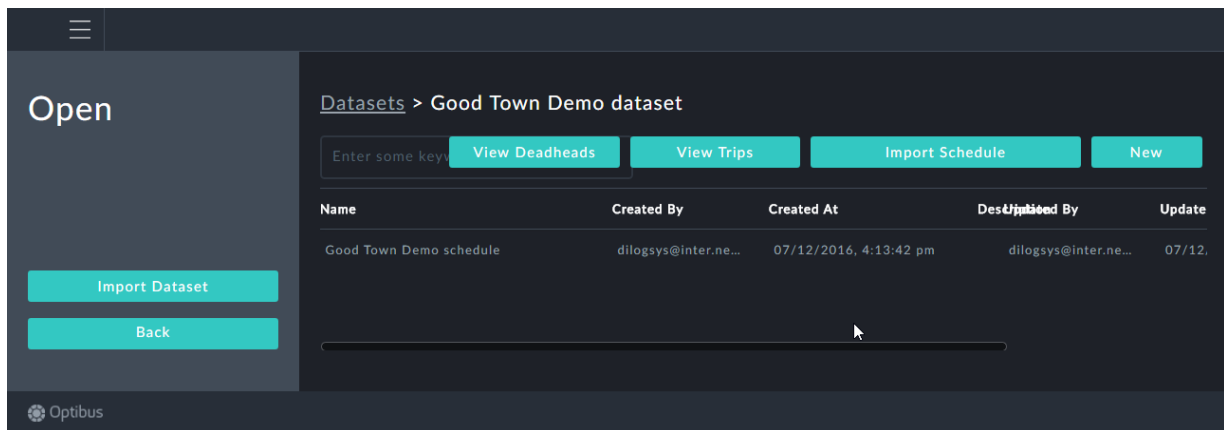


Figure 3-2: Choosing a Schedule



Note: The Dataset and Schedule are imported from data supplied by the Operator. The methods for doing this are explained in [Preparing the Source Files for a Schedule](#).

Click the Good Town Demo schedule item. After a few moments, the following window appears:



Figure 3-3: The Vehicle Gantt

A Quick Look at the Vehicle Gantt

In **Figure 3-3**, the shaded column rulers represents time and the rows represents vehicles (blocks).

The colors reflect the sign numbers. The coloring makes it very easy to get high level view of schedule quality, based on trip colors and gaps.

You can view detailed trip information by clicking a trip icon:

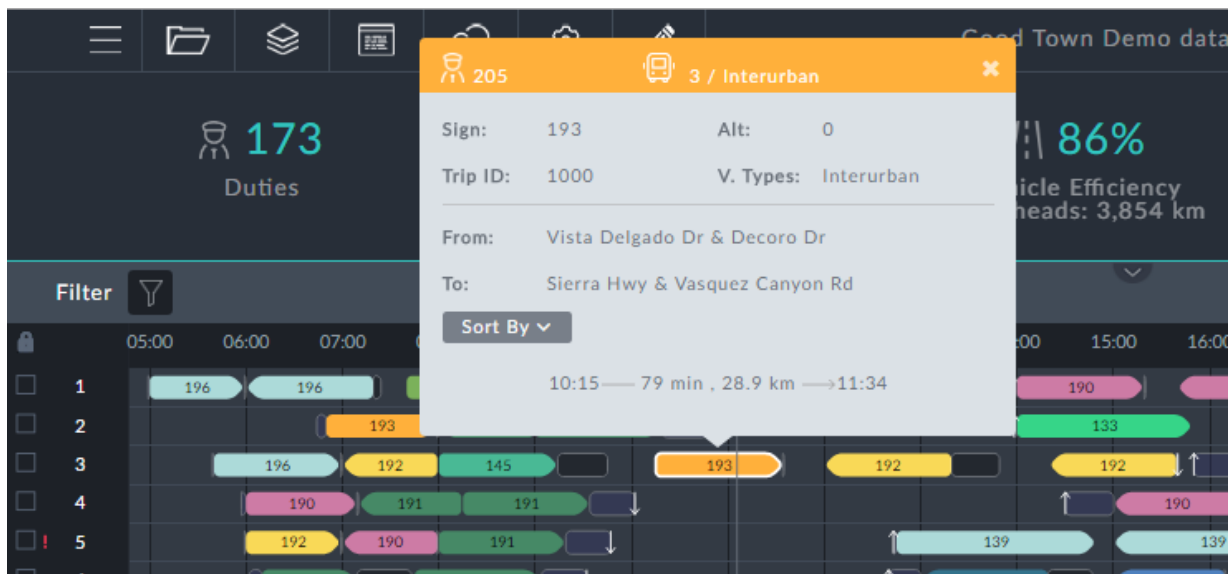


Figure 3-4: An example of trip details

In **Figure 3-4** we clicked the fourth trip (sign 193) for vehicle 3.

The Driver (Duties) Gantt

Click the driver button in the top right hand corner to see the Driver (Duties) Gantt:

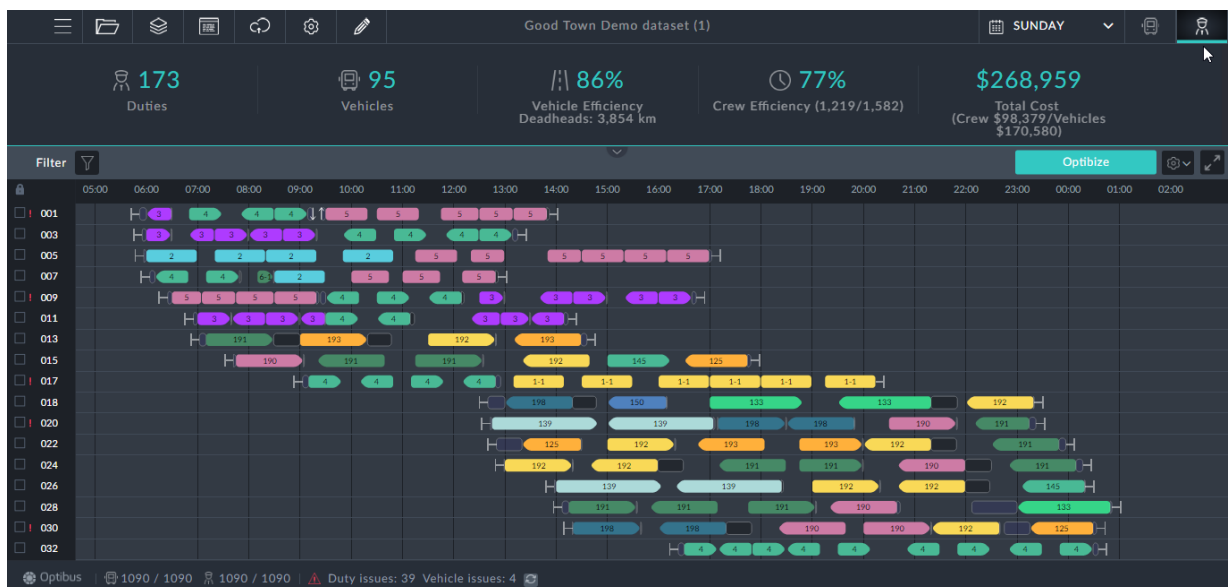


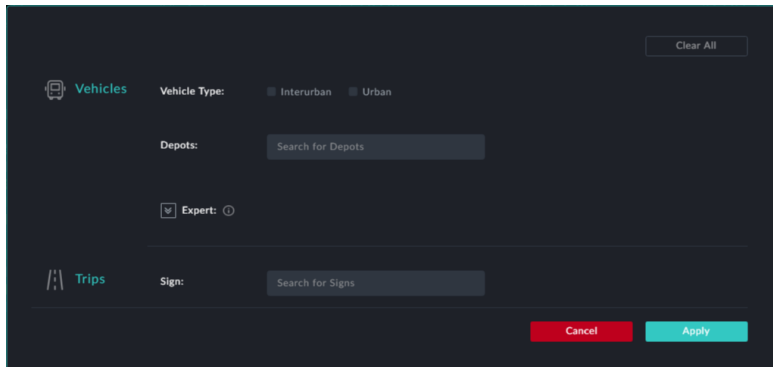
Figure 3-5: The Driver Gantt

As for the Vehicle Gantt, in **Figure 3-5**, the shaded column rulers represents time and the rows represents drivers (duties).

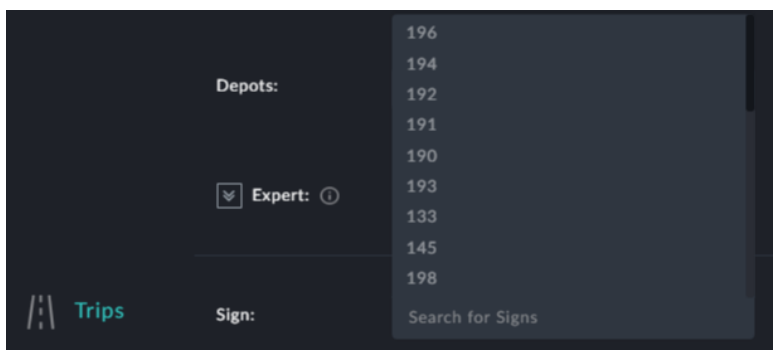
Again, the colors reflect the sign numbers.

Filtering the Gantt Views

The two Gantts show an immense amount of information. You can use the Filter button to limit the view. Suppose for example, that we want to see blocks for sign 150. On the Vehicle Gantt, open the Filter:



In the Trips **Sign** field, click over the **Search for Signs** area. You are offered a list of available signs:

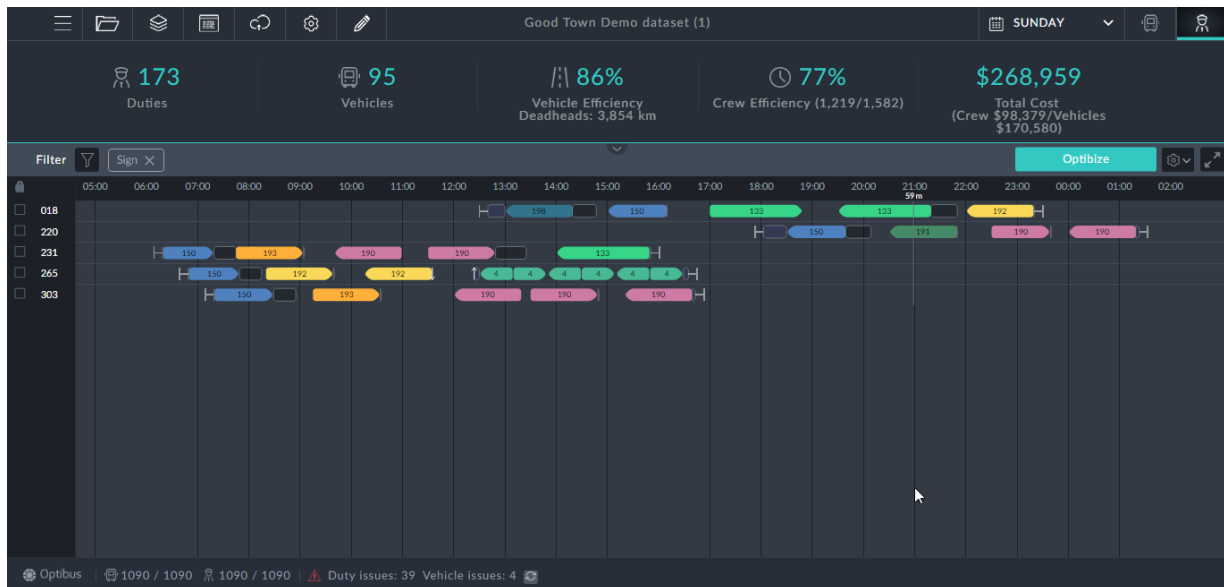


You may choose as many as you like (use the scroll bar to see more). We will choose sign 150 and click **Apply**. Here is the result:



The filter extracted all blocks including sign 150.

The choice of filters for the Driver Gantt is much more extensive, and we won't show the details here. However, if you again filter on sign 150, here is the result:



The filter extracted all drivers (duties) including sign 150 during the working day.

Key Performance Indicators (KPIs)



The top part of the display in **Figure 3-3** shows some of the KPIs. You can see all of them by clicking the  button:



Figure 3-6: Full KPIs before optimization

The KPIs are based on the active schedule. They provide objective measures of performance for the schedule. They will change, if for example, you:

- » Optimize the schedule 
- » Change your preferences and re-optimize
- » Make manual changes and re-optimize

We will illustrate each of these cases in the following sections.

First Optimization

The first optimization is very simple: On the main window, click the

Optimize button, and wait! The most obvious changes will be in the KPIs.

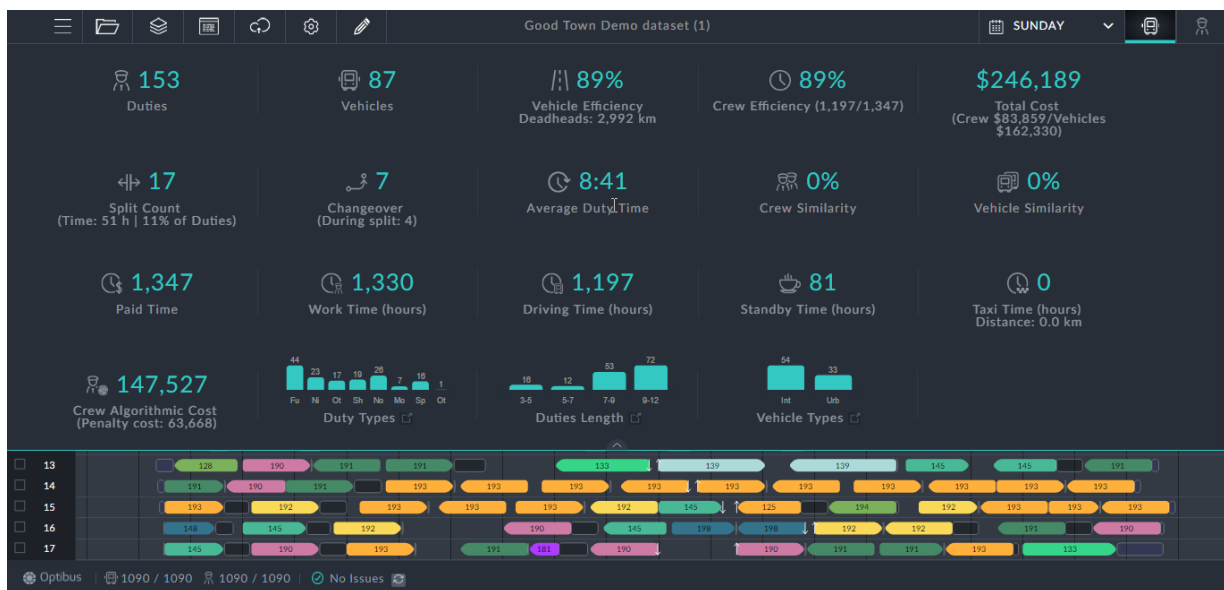


Figure 3-7: Full KPIs after optimization

Here is a convenient summary:

Table 3-1: KPI Partial Comparison - pre and post optimization

KPI	Pre Optimization	Post Optimization	Improvement
Duties	173	153	Down 20
Vehicles	95	87	Down 8
Vehicle Efficiency	86%	89%	Up 3%
Crew Efficiency	77%	89%	Up 12%
Total Cost	\$268,959	\$246,189	\$22,770
Split Count	18	17	Down 1
Changeover	16	7	Down 9
Average Duty Time	9hr 2min	8hr 41min	Down 21min

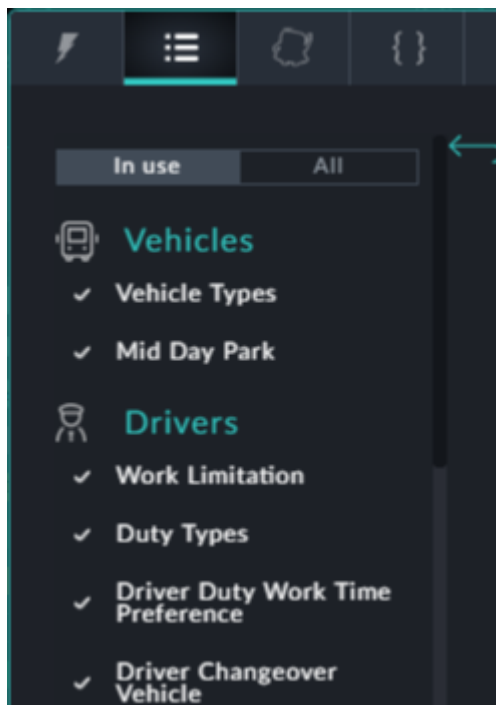
KPI	Pre Optimization	Post Optimization	Improvement
Paid Time	1582	1347	Down 235
Work Time	1564	1330	Down 234
Driving Time	1219	1197	Down 22
Standby Time	288	81	Down 207

Using Preferences to Complete the Gantts

Driver Work Limitations

We will evaluate the cost and other implications of changing driver break conditions.

In the main window, click  to open Preferences.



Under **Drivers**, open **Work Limitation**. Turn on the Breaks preference and add as an example, 1 hour of break time for every 5 work hours, as shown:

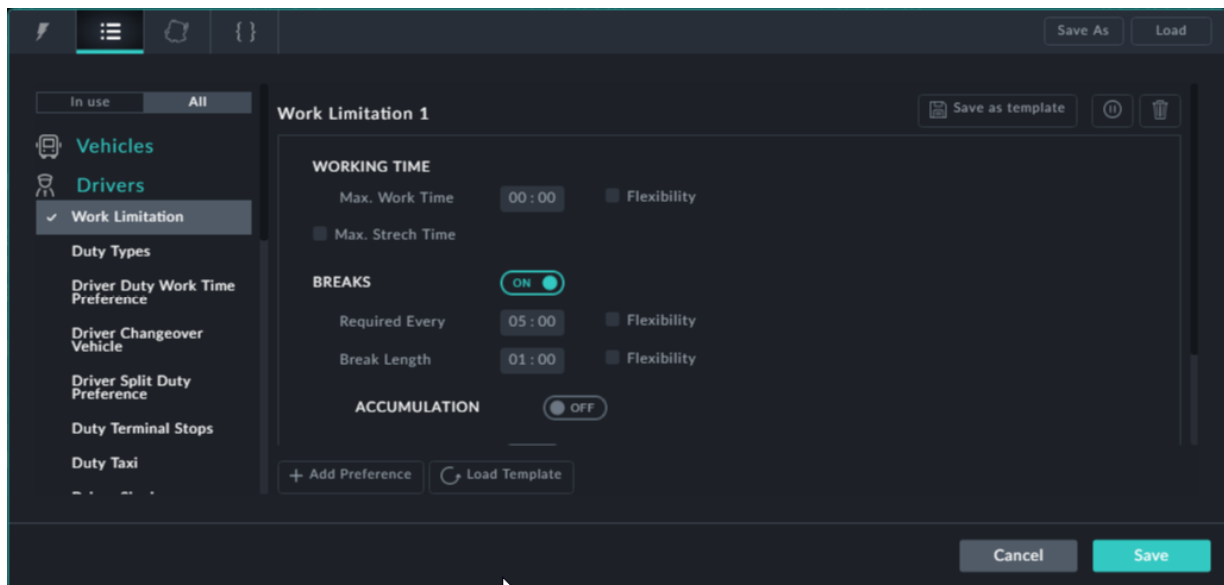


Figure 3-8: Preferences: Work Limitation

Click **Save**, and then **Optimize**. The main differences are, the number of Duties has risen from 153 to 159 and the Total Cost has gone up from \$22,770 to \$255,023.

Further, look at the Drivers Gantt, a segment of which is shown in **Figure 3-9** below:



Figure 3-9: Driver Gantt optimized with Work Limitations

Observe that:

- » Each duty has a 1-hour break after 5 hours
- » No duty is over 19 hours

We can add flexibility to this strict arrangement by allowing violation of these rules subject to penalties. Again, open **Preferences** and **Work Limitation** (**Figure 3-8**). In the Max. Work Time row, check box next to Flexibility. Change the Flexibility time to 30 min and the penalty to 20 as shown:

WORKING TIME

Max. Work Time ☒ Flexibility Penalty

Again, **Save** and then **Optimize**. To see the effect of our change, go to the Driver Gantt, open the Filter and choose Duties. Set **Duty Type** to Long as shown:

Duties Duty Type:

Duty Includes: ☐ Changeovers ☐ No ☐ Yes ☐ Splits ☐ No ☐ Yes

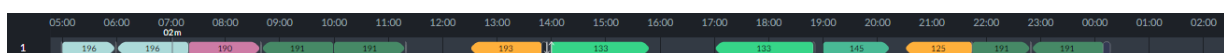
Now inspect the Driver Gantt again:



Opening any duty information box shows that the Long duties are all between 12 and 12.5 hours.

Block Homogeneity

Looking at the optimized Vehicle Gantt, you can see that vehicle 1 for example, has a variety of routes:



This presents problems for drivers, it is a cause of delays and is generally difficult to operate. How much does it cost to make the Vehicle schedule homogeneous?

We use the Preferences again to try a "What if?" exercise.

Starting with the original first-optimized schedules, we open Preferences, choose the **All** view and then **Homogenic Vehicle Schedule**.

Widespread

Depots

Adding Pre Trip and Post trip Elements

Manual Editing

Delete this text and replace it with your own content.

Generating a Weekly Schedule

Delete this text and replace it with your own content.

Technical Reference

Chapter 4: Preparing the Source Files for a Schedule

Files Required to Prepare a Schedule

When a completely new schedule is to be created,  schedule™ must import four data files to create a Dataset:


- » Trips - a complete specification of each trip
- » Stations - bus stops
- » Vehicle Types catalog
- » Idle Trips - the Deadheads catalog

In addition, a schedule may also be available for import.

The Operator in conjunction with Optibus supplies these files in the formats shown in [Source File Layouts](#).

Source File Formats

General

 schedule™ supports a variety of import formats including Excel, CSV and JSON. It also supports several proprietary integration formats. In what follows below, we will use Excel formatted examples.

Importing Excel Files

When importing Excel files, the four items above appear in one file with four labeled sheets. It is the basis for the imported Dataset and is frequently referred to as a Dataset in its own right. The Deadheads may be in a separate Excel file. The schedule, if available, is also in a separate spreadsheet. The precise structure of these files is set out in [Source File Layouts](#) below.



Note: The Dataset, Deadheads and Schedule source files may be supplied in different formats.


Locating the Source Files

We continue with Excel files. Ensure that you know the names of the source files and their locations. We will use the files shown here:

▼ e:\Optibus\UM_Demo_Dataset*.*		
Name	Ext	Size
↑ [..]		<DIR>
📁 [Exports]		<DIR>
📄 Good Town Demo dataset	xlsx	193,379
📄 Good Town Demo shcedule	xlsx	309,102

Figure 4-1: Locating the Dataset Excel file



Note: In practice, you may not always have a schedule. OnSchedule can generate a schedule for you during the first optimization based on default preferences  See TBD.

Source File Layouts

TBD - heavy stuff from Meital &c

Chapter 5: Choosing a Work Schedule

Overview

Choosing a Work Schedule is basically a two stage procedure: After logging in to the OnSchedule™ website, you first choose a Dataset from those available (**Figure 5-1**). You then choose a Schedule from the Dataset (**Figure 5-3**).

Along the way there are many options and variations, which are the subject of this section.



Note: Importing a Dataset and Schedule, or creating a new Schedule for a Dataset are covered in **Creating a Dataset and Schedule**.

Logging in to Optibus OnSchedule™

The Web address (URL) of your OnSchedule™ installation is supplied by Optibus and is customer dependent. In addition, you should have ready, a user name and password. Open up your browser and navigate to it. You will see the log-in window:

Enter your user name and password and click on Sign In. An invalid user name or password will result in an appropriate error message.



Tip: Bookmark the supplied URL for future use.

The opening Dataset Window

After you have logged in, you are presented a Dataset window:

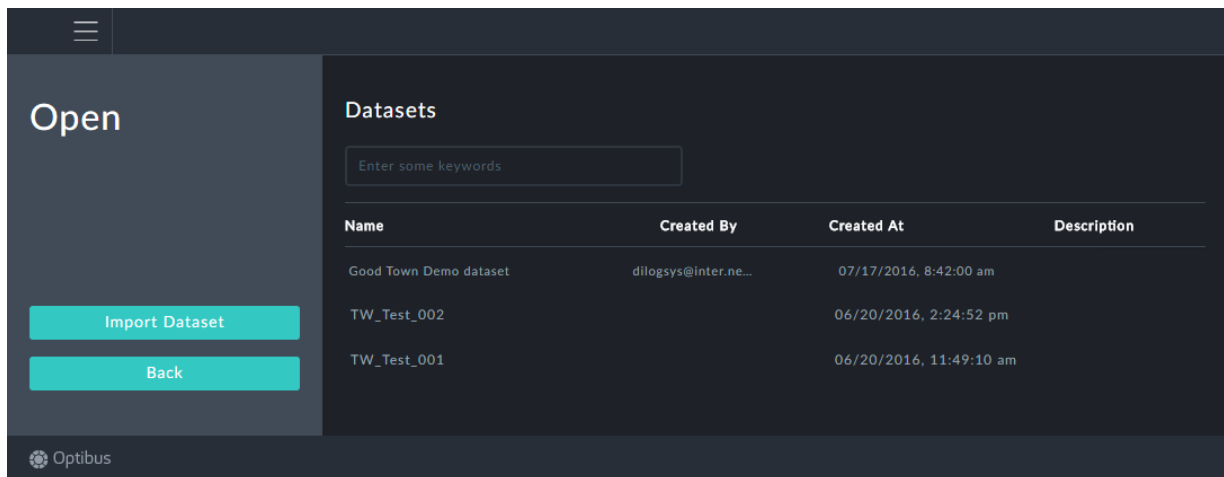
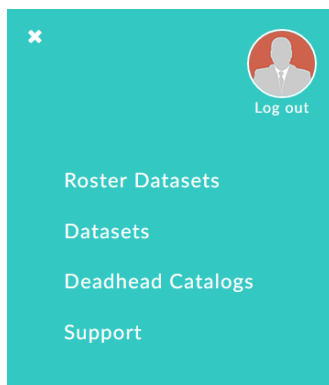


Figure 5-1: Choosing a Dataset

Use the left hand Import Dataset button to import a Dataset in the prescribed format (see [Importing a Dataset](#)). It will be added to the Dataset list.

The top left context menu button  offers the following menu:



The context menu opens from the left. Clicking the small white x at the top left corner dismisses the menu. Clicking Log out logs you out of the system.

The entries are a subset of the Gantt page context menu described in detail in [The Context Menu](#).

For immediate use, **Datasets** always drops you back to the Dataset display from where ever you are. **Support** opens a Chat with an Optibus Professional Services Engineer.



Note: **Roster Datasets** are covered in [Roster Datasets](#). The **Deadhead Catalogs** item enables you to choose or import a Deadhead Catalog. It is one of the options described in [The Schedule Display Tool Bar](#) below.



Note: Any import choice you make or any new item that you create in this section, is loaded using default preferences.

To choose a Dataset, just click it. Notice that if you mouse-over a Dataset it is highlighted, and two action buttons become available:




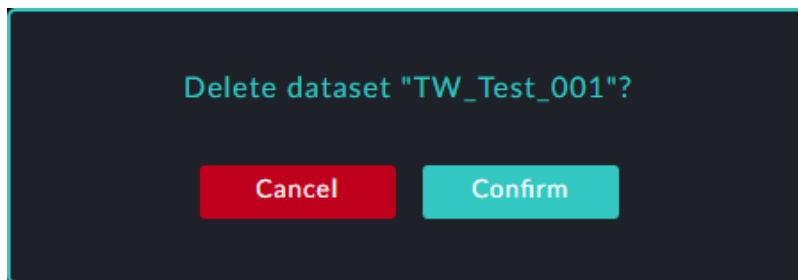

Name	Created By	Created At	Description
smallweekly		06/21/2016, 10:40:02 am	
TW_Test_002		06/20/2016, 2:24:52 pm	
TW_Test_001		06/20/2016, 11:49:10 am	 

Figure 5-2: Choosing a Dataset

The  button allows you to discard the Dataset:



The  button allows you to edit the Dataset name and description.

 A dark-themed form titled "Edit Dataset" in teal. It contains two input fields: the first is labeled "TW_Test_001" and the second is labeled "Dataset Description". At the bottom right, there are two buttons: a red "Cancel" button and a teal "Save" button.


Note: These three buttons are ubiquitous throughout the OnSchedule™ system and mean the much same thing:



is the context menu for whatever window in which it appears



is used to delete the object upon which it appears



is used to rename or edit the object upon which it appears

Choosing a Schedule

We continue, using our choice of Dataset in **Figure 5-2**. The next display allows you to select a Schedule:

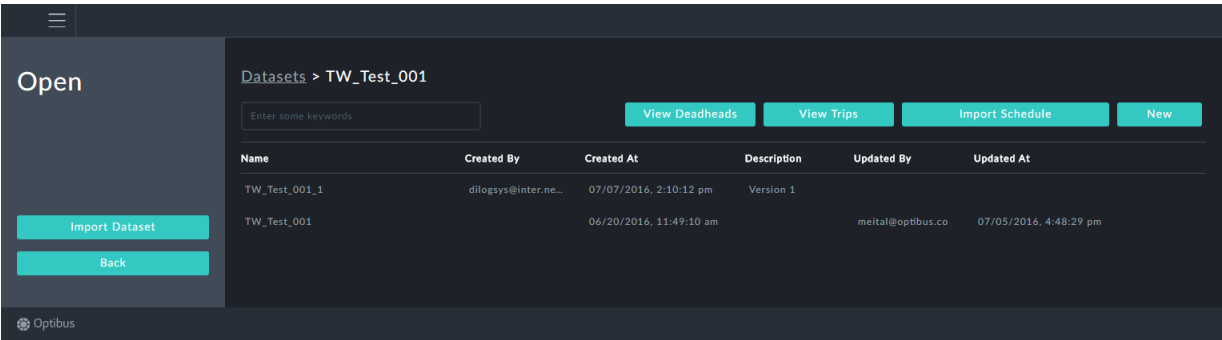



Figure 5-3: Schedule list



Note: For general navigation purposes, you are shown where you are in the system on the top left hand side of the current display page. for example, in **Figure 5-3** above, you are here:

Datasets > TW_Test_001

Following modern Web usage, you can click any item in this Web page chain to go to it.

Mouse-over to second item, which is highlighted:

Name	Created By	Created At	Description	Updated By	Updated At
TW_Test_001_1	dilogsys@inter.ne...	07/07/2016, 2:10:12 pm	Version 1		
TW_Test_001		06/20/2016, 11:49:10 am		meital@optibus.co	07/05/2016, 4:48:29 pm

Notice the four buttons on the right that become active. The edit and delete buttons work as previously described. There are two additional buttons:

The  button converts a multi  day schedule to a weekly format. See TBD.

The  button opens the **Revision** window for the highlighted item.

Revisions of a Schedule

Here is the Revisions window:

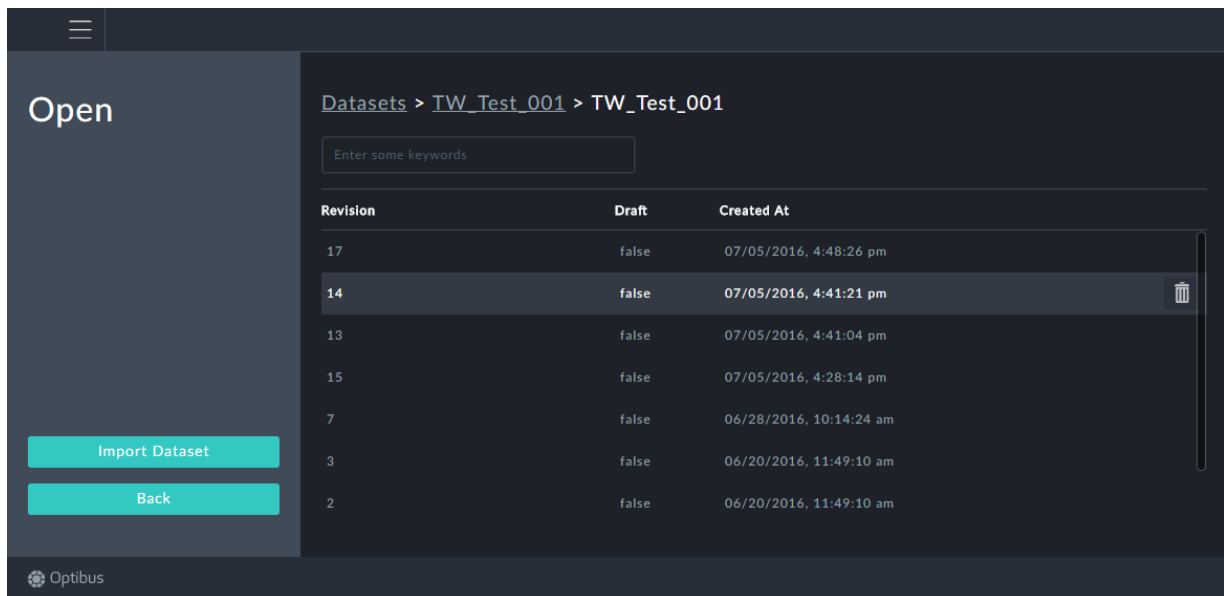


Figure 5-4: Revisions of a Schedule

A **Revision** is an automatic backup created every time you save the working Schedule. The highest numbered Revision is the latest, which you can confirm by looking at the dates.



Caution: If you select a lower Revision, make some changes to it and save it, it will acquire the highest Revision number and become current.

If in **Figure 5-4** you work on Revision 14 and save it, it becomes 19:

Datasets > TW_Test_001 > TW_Test_001		
Enter some keywords		
Revision	Draft	Created At
19	false	07/08/2016, 10:08:05 am
17	false	07/05/2016, 4:48:26 pm
14	false	07/05/2016, 4:41:21 pm
13	false	07/05/2016, 4:41:04 pm

The new Revision number is higher than the last highest but not guaranteed to be the next number (18 here).

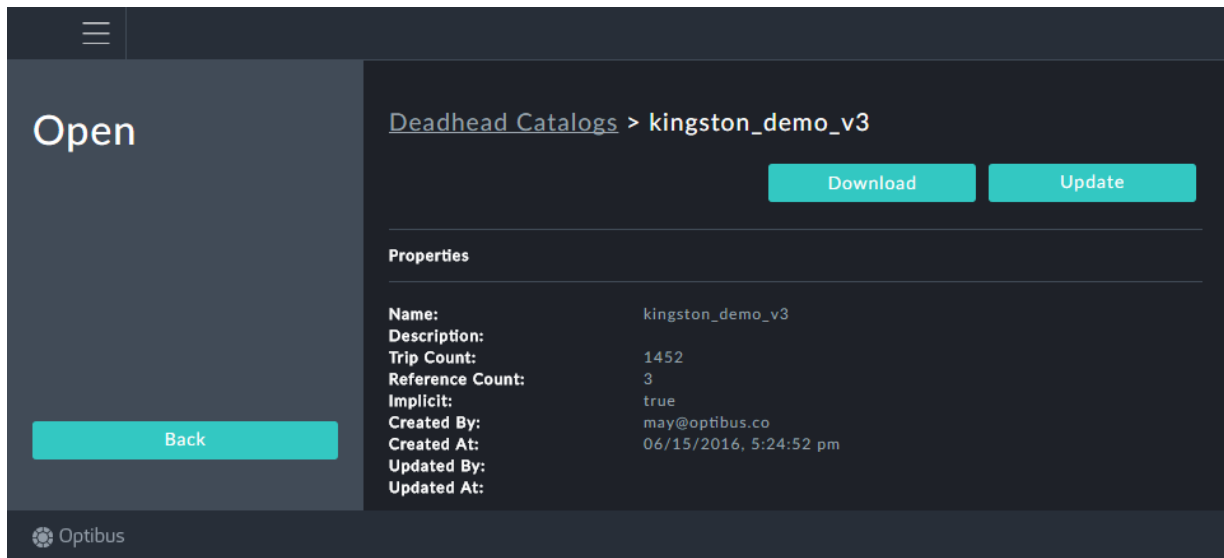
The Schedule Display Tool Bar

The Schedule display of **Figure 5-4** has a tool bar:



Figure 5-5: Schedule display tool bar

View Deadheads opens up a Deadhead catalog summary:



Download downloads a zip file containing an Excel Deadhead catalog for the Dataset you chose in **Figure 5-2**. The **Update** button enables you to upload a Deadhead catalog. It is used to update the current Schedule after optimization or manual editing. See TBD for further information about the Deadhead catalogs.

Returning to the tool bar of **Figure 5-5**

The **View Trips** button opens a display of the Excel Trips list. See TBD for further information about the Trips list.

The **Import Schedule** button opens a standard Windows Open File dialog. See TBD for the content and formatting details for a Schedule for import.

The **New** button opens a new empty schedule and displays an empty Vehicle Gantt.

Context Menu Quick Summary

Table 5-1: Context Menu Summary

Menu Item	Function	Reference
Roster Datasets	Opens the Roster Datasets selection window ¹	
Datasets	Open the Datasets selection window	

¹This option is only available to customers using the Rostering module

Menu Item	Function	Reference
Deadhead Catalogs	Import, download and update Dead-head catalogs	
Support	Open Chat with an Optibus Professional Services engineer	

Chapter 6: OnSchedule™ Main Window

The OnSchedule™ main window is shown in **Figure 6-1** below:

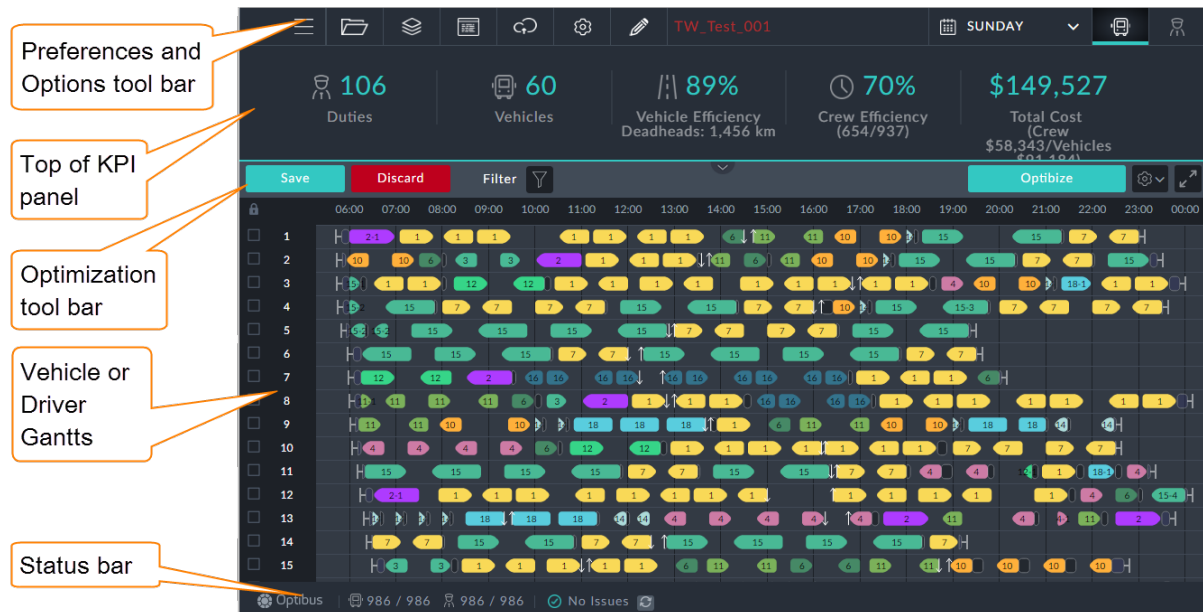


Figure 6-1: OnSchedule™ Main window

The main window is divided into four panes:











- The top pane contains a tool bar of functions to set up and control the scheduling process
- The second pane contains key performance indicators (KPIs). It is updated dynamically as schedules are added and optimized.
- The large third pane contains the vehicle or driver Gantt charts. You can view them in turn.
- The bottom pane is a status bar

Top Pane Tool Bar

The top pane provides the management functions for the application:

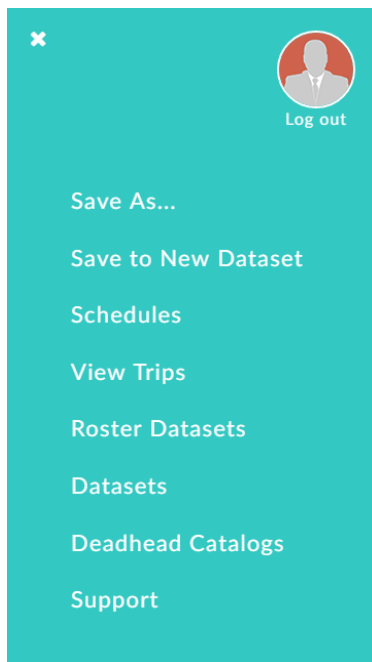


Table 6-1: Top pane tool bar

Icon	Purpose	Reference
	Opens up a pull-out context menu on the left with various save options	The Context Menu
	Returns you to the schedule Schedule selection window, one level back.	Choosing a Work Schedule
	Schedule updates	Schedule Updates
	Export schedules	Export Schedules
	Import schedules	Import Schedules
	Preferences	Setting Preferences
	Manual scheduling	Manual Scheduling
	Select a day within the current week	Select a Day Within Current Week
	Enter the vehicle scheduler (default)	Switch between Vehicle and Driver Gantt
	Enter the driver scheduler	

The Context Menu

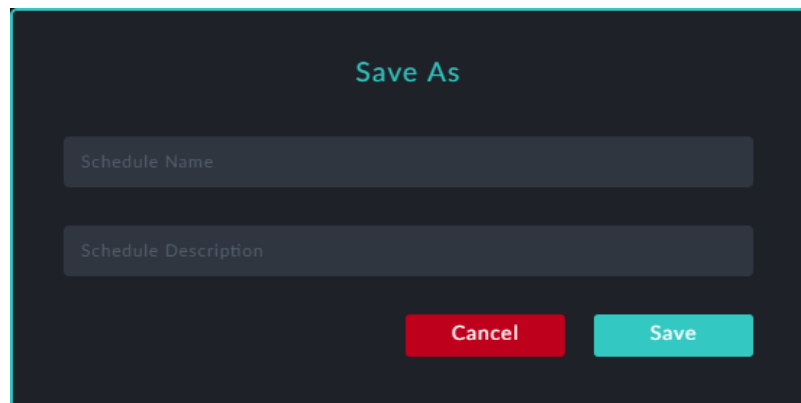
Using the Context Menu



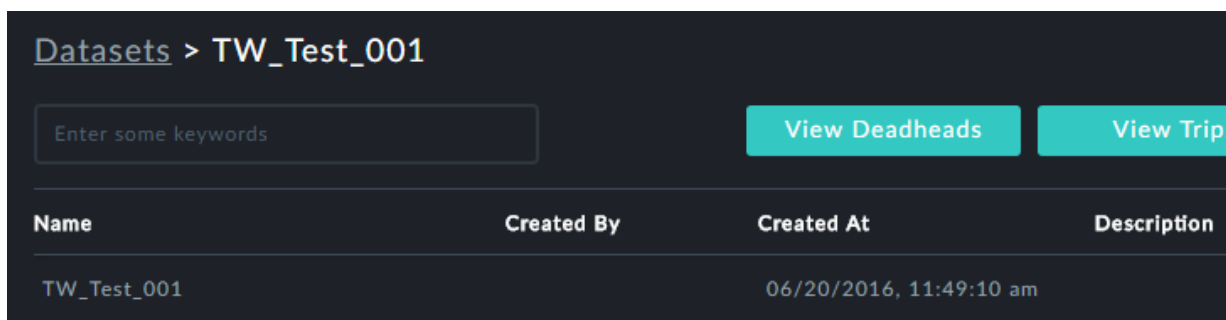
The context menu opens from the left. Clicking the small white x at the top left corner dismisses the menu. Clicking Log out logs you out of the system.

Datasets always drops you back to the Dataset display from where ever you are. **Support** opens a Chat with an Optibus Professional Services Engineer.

Save As ... opens the follows window:

A dark-themed 'Save As' dialog box is shown. It has a title bar 'Save As' in teal. Below the title bar are two text input fields: 'Schedule Name' and 'Schedule Description'. At the bottom right are two buttons: a red 'Cancel' button and a teal 'Save' button.

It creates a new copy of the current open Schedule with the entered schedule name. For example, our case has one Schedule:

A screenshot of the 'Datasets' page in the application. The breadcrumb 'Datasets > TW_Test_001' is at the top. Below it is a search bar with the placeholder 'Enter some keywords'. To the right of the search bar are two buttons: 'View Deadheads' and 'View Trips'. Below these is a table with the following data:

Name	Created By	Created At	Description
TW_Test_001		06/20/2016, 11:49:10 am	

If we enter a schedule name and description, **TW_Test_001_1** and **Version 1** respectively, the saved schedule opens. The previous display becomes:

[Datasets](#) > TW_Test_001

Enter some keywords View Deadheads View Trips

Name	Created By	Created At	Description
TW_Test_001_1	dilogsys@inter.ne...	07/07/2016, 2:10:12 pm	Version 1
TW_Test_001		06/20/2016, 11:49:10 am	

You can always see the Schedules of the current Dataset by using the **Schedules** option.

Save as ... should be distinguished from the **Save to a New Dataset** option:

Save to a New Dataset opens a similar window to **Save As ...** :

Save To New DataSet

Dataset Name

Dataset Description

Cancel Save

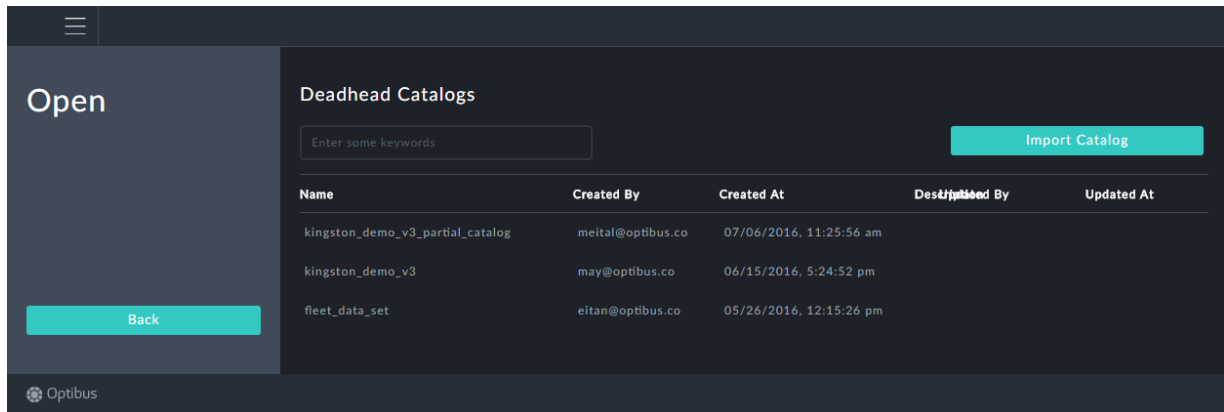
It creates a completely new Dataset, which you will see if you revert to the Datasets window. It adds your current open schedule.

The **Schedules** button takes you back to the Schedules display, [Choosing a Schedule](#)

The **View Trips** button opens a display of the Excel Trips catalog. See TBD for further information about the Trips catalog.

The **Roster Datasets** are an optional feature. If available, the button opens up a list of available roster Datasets. See [Roster Datasets](#).

The **Deadhead Catalogs** button opens a list of Deadhead catalogs for all of the available Datasets:



Choosing any one of them opens up a Deadhead summary in the same manner as we saw in [View Deadheads](#).

Context Menu Quick Summary



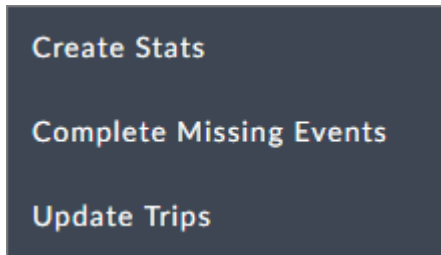
Note: Any import choice you make or any new item that you create when a Schedule is loaded, is based on user preferences.

Table 6-1: Context Menu Summary

Menu Item	Function	Reference
Save As ...	Save open Schedule with a new name	
Save to New Dataset	Creates a new Dataset and saves the open Schedule to it	
Schedules	Open the Schedules selection window	
View Trips	View Trips Excel file	
Roster Datasets	Opens the Roster Datasets selection window	
Datasets	Open the Datasets selection window	
Deadhead Catalogs	Import, download and update Dead-head catalogs	
Support	Open Chat with an Optibus Professional Services engineer	

Schedule Updates

This button opens a sub-menu of its own:

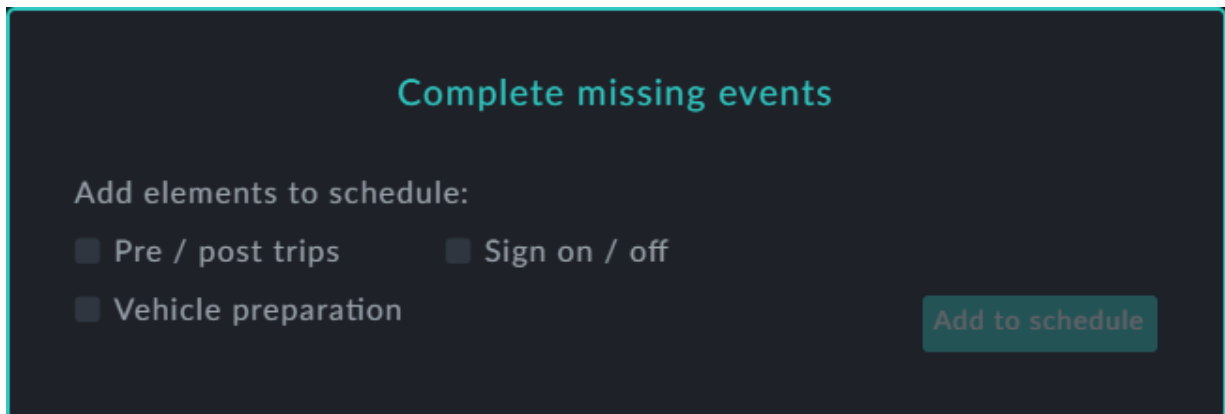


Create Stats

TBD - example before and after.

Complete Missing Events

This item opens up a choice dialog:



Check the elements required. If missing, they are auto-generated and added to the open schedule.

TBD - example before and after.

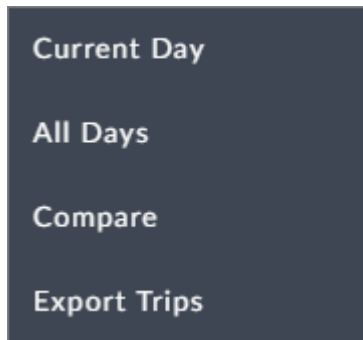
Update Trips

This item opens a standard Windows Open File dialog. (See TBD for the content and formatting details for a Trips catalog.) It applies the update to the open schedule.

TBD - example before and after.

Export Schedules

This button opens a sub-menu of its own:



Current Day

This downloads the current day schedule to a zip file.

TBD - Same format as Export?

All Days

This downloads the current week schedule to a zip file.

TBD - Same format as Export?

Compare

The Compare feature provides an extensive comparison between the currently open Schedule and any other of your choice.

TBD - Need a session!

Export Trips

A single trips Excel file is generated. It contains three pages, Trips, Places and Stops in the same format as the Operator's trip file required to create the Vehicles Gantt. See TBD for further details about the trips file.

Import Schedules

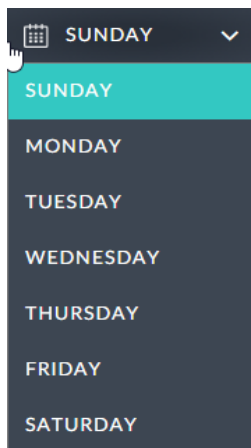
This button open a standard Windows Open File dialog.

TBD - What happens next?

Manual Scheduling

TBD - Requires a session!

Select a Day Within Current Week



This drops down a day of week choice menu. Selecting a day will load its Schedule. If there is no Schedule defined for the day, an empty Schedule will open showing an empty Vehicle Gantt.

Optimization Tool Bar

The tool bar above the vehicle and driver Gantts is used for optimization and saving results:




Following any editing change or optimization run, the tool bar changes to this:

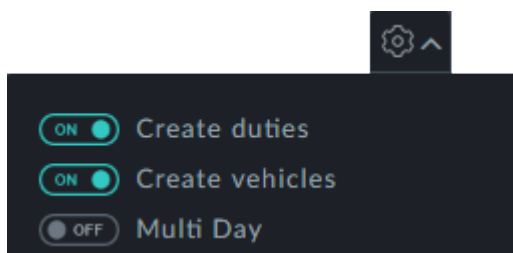



The **Save** button applies your changes or the optimization to the Schedule. The **Discard** button throws them away.

The **Filter** buttonTBD

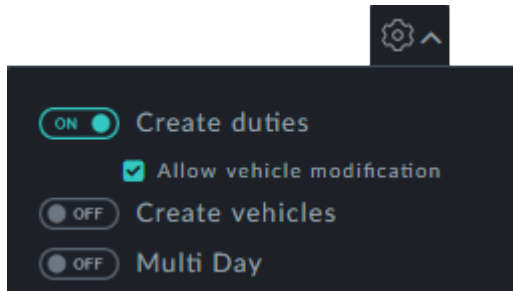
The **Optimize** button initiates an optimization run for the Schedule. The processing time depends on the size of the schedule but is generally of the order of minutes.

The  button opens a drop-down choice list associated with the Optimize button:





By default, the optimization will use the two checked items. You can check the Multi Day item to fill out a daily optimized full week of Gantt  (This is not the same as optimizing a week as a whole. See TBD about multi day optimization.)

Under certain circumstances it is appropriate to optimize in two stages: First, to create the vehicle schedule, and then to create the duties (driver schedule). In this case, you will see this:




The duties schedule can be created with or without modifying the vehicle schedule. The difference between the two can be substantial as can be seen on the Vehicle Gantt in either case. A detailed discussion of the optimization process is covered in [Optimizing a Schedule](#).

Click the  button to dismiss the menu.

The  button expands the Gantt area over the KPI area. It changes form to the  collapse button, which reverts to the normal part KPI and Gantt view.

The Key Performance indicators (KPI) Window

KPI Window Overview

In the main window (**Figure 6-1**), click the expand icon, . The full KPI area opens:

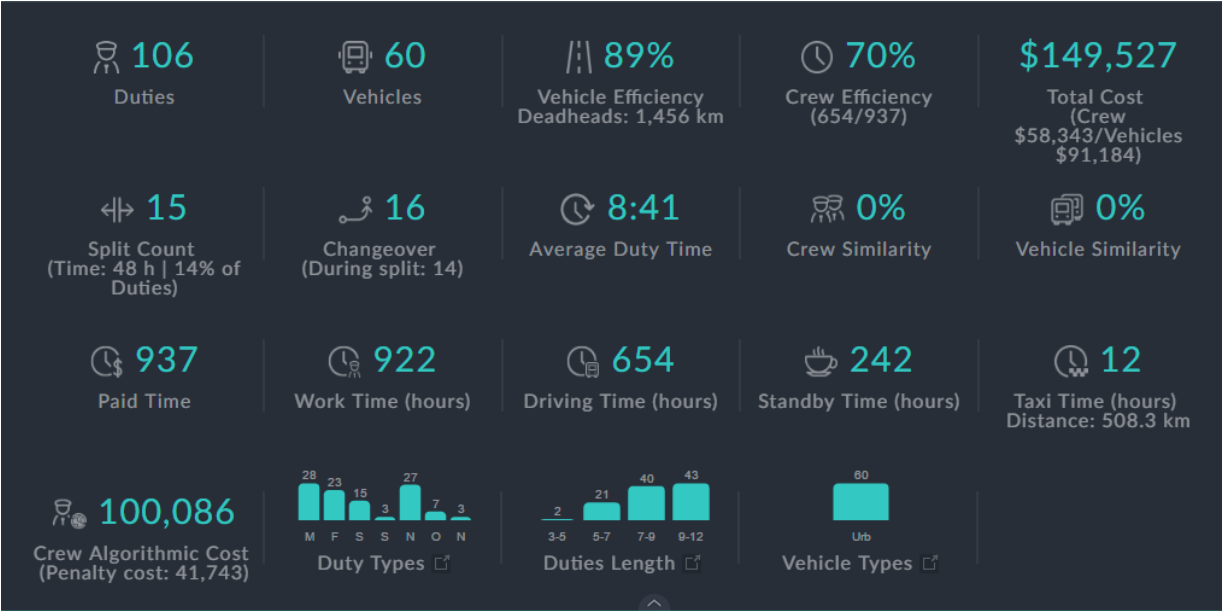



Figure 6-2: The KPI window

Clicking the  icon at the bottom of the window, reverts it.

These indicators provide a projected performance summary for the schedule. It will of course change under manual editing and optimization.

Indicator Details

Table 6-1: KPI details



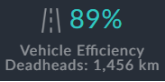
Item #	Indicator	Description
1.		Total number of driver duties
2.		Total number of vehicles
3.		Vehicle efficiency: Ratio of total service trip distance to aggregate traveled distance for the day. The difference is the deadhead distance shown on the last line. The latter distance also includes Pull ins and Pull outs.

Table 6-1: KPI details















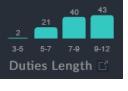
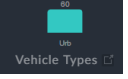
Item #	Indicator	Description
4.	 70% Crew Efficiency (654/937)	Crew efficiency: Ratio of driving time (item 13) to paid time (item 10).
5.	 \$149,527 Total Cost (Crew \$58,343/Vehicles \$91,184)	Total cost for the day: Crew cost + vehicle costs (based on running cost and an overhead contribution. See TBD.)
6.	 15 Split Count (Time: 48 h 14% of Duties)	This item shows the number of split duties, split time and the ratio of the number of split duties to the total number of duties
7.	 16 Changeover (During split: 14)	Total number of driver changeovers and the total number of driver changeovers during a split
8.	 8:41 Average Duty Time	Average driver duty time: Total work time (item 12) divided by the number of duties (item 1) in hours:minutes
9.	 0% Crew Similarity	Crew similarity: A measure of similarity between the current changed duties schedule to the previous one. See Preferences TBD.
10.	 0% Vehicle Similarity	Vehicle similarity: A measure of similarity between the current changed vehicles schedule to the previous one. See Preferences TBD.
11.	 937 Paid Time	Paid time consists of components defined by the Operator. It typically includes driving time and paid breaks and other paid elements.
12.	 922 Work Time (hours)	Actual work time usually consists of paid time and unpaid elements but not including split time.
13.	 654 Driving Time (hours)	Driving time consists of all driving events, such as service trips, deadheads, pull ins and pull out.
14.	 242 Standby Time (hours)	Standby time consists of any time not occupied by an element in the Driver Gantt. (Split time is not included.)
15.	 12 Taxi Time (hours) Distance: 508.3 km	Taxi time and distance. Recall that When a driver completes a trip, he may be required to go to a different location for his next trip or even to take a break. To get there, he may require transport such as a taxi , a shuttle or perhaps walk.

Table 6-1: KPI details

Item #	Indicator	Description
16.	 100,086 Crew Algorithmic Cost (Penalty cost: 41,743)	This is a hypothetical costing using theoretical "penalties" associated with Preferences. It provides an expert planner with a tool for assessing his choices.
17.		Distribution of driver duties by duty type. See Figure 6-3 below.
18.		Distribution of driver duties by duty paid time. See Figure 6-4 below.
19.		Distribution of driver duties across vehicle type. See Figure 6-5 below.

Driver Duty Histograms

The last three items in **Table 6-1** above expand into histograms. To see them, click the appropriate item in **Figure 6-2**.



Note: You can move between the histograms by clicking the < and > buttons on the sides of the displays.

The following three examples are drawn from several unrelated Datasets, purely for illustrative purposes:

Distribution of Driver Duties by Duty Type

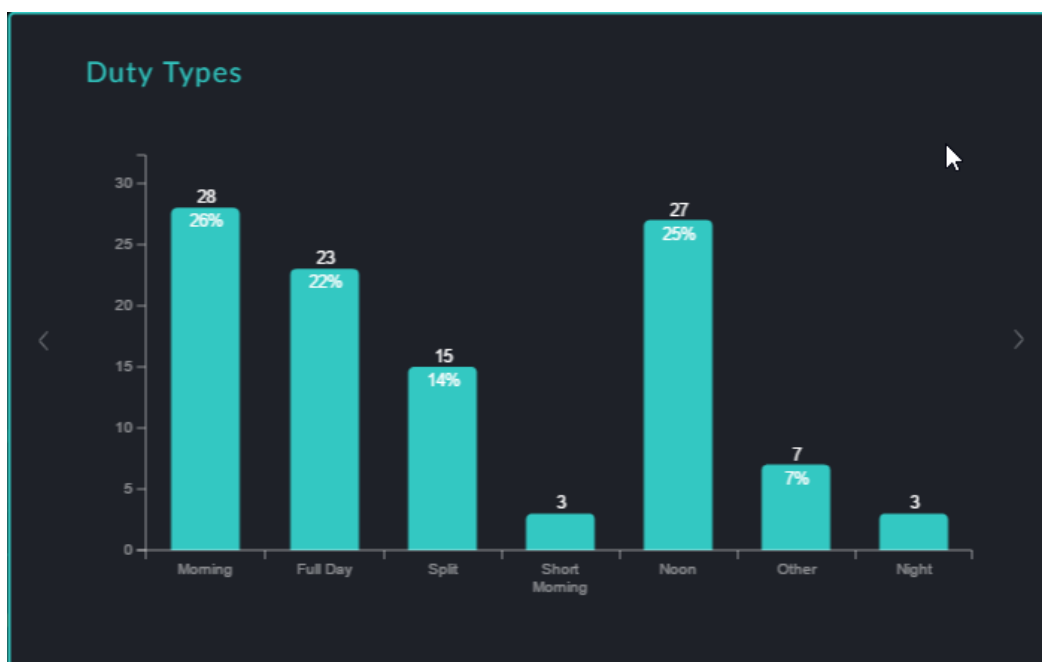


Figure 6-3: Duty by Duty Type

Recall that the Duty Type is defined by the Operator. The chart shown the number of duties and the percentage of duties per Duty Type.

Distribution of Driver Duties by Duty Paid Time

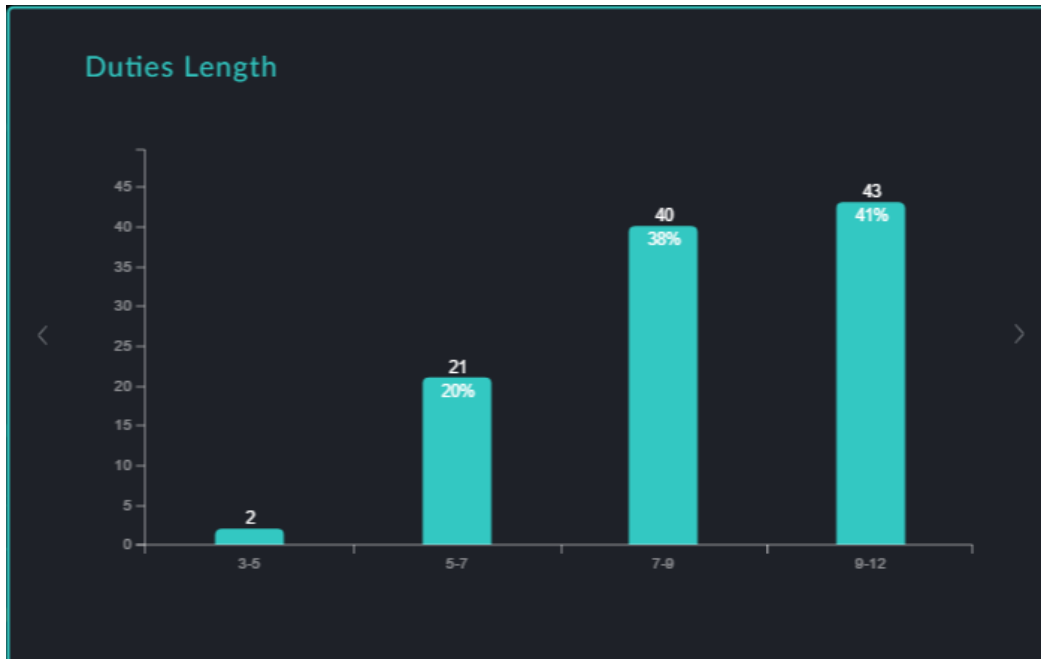


Figure 6-4: Duty by Duty Paid Time

The duty paid time intervals for this histogram are grouped by the Operator. Again, the number of duties in each interval and the percentage are shown.

Distribution of Driver Duties Across Vehicle Type

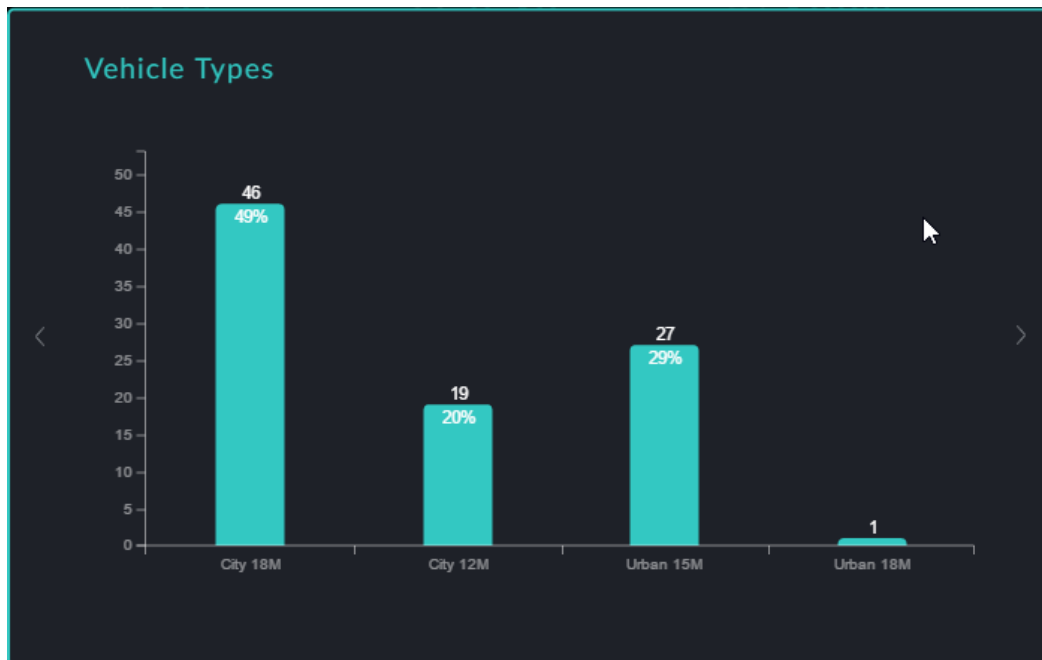


Figure 6-5: Duty by Vehicle Type


The number of vehicles and the vehicle percentages are shown by vehicle type. Vehicle types are defined by the Operator.

Vehicle Gantt

Vehicle Gantt Overview

The Vehicle Gantt is opened by default. You can always return to it from the Driver Gantt by clicking the vehicle icon in the Options tool bar.



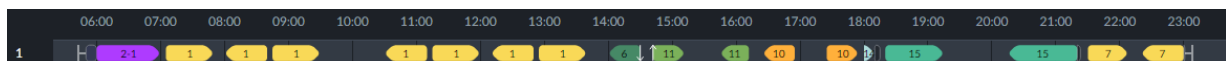
Note: If you need more space on your screen, you can hide the KPI by clicking the  button. To restore the KPI, just click it again.

The window contains a vast amount of detail, but nevertheless, it is very easy to follow. For example:

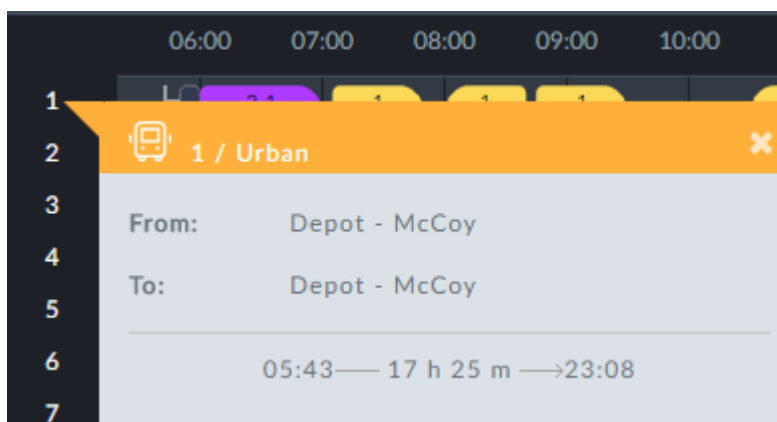


Figure 6-6: A typical Vehicle Gantt

Each numbered row on the Gantt shows the day's itinerary of one vehicle. Take for example, row 1:



First, you can see a quick row overview by left-clicking the row number:



The start and end times relate to the day's work for the vehicle. The duration is also displayed.

Let us return to the Gantt itself:

The graphic shapes are called **elements**.

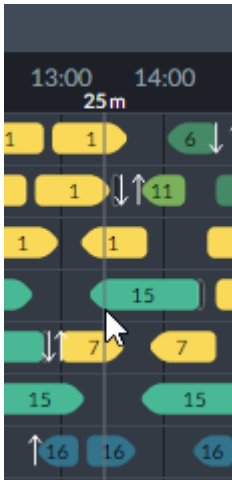
Each colored bullet shaped element represents a **service trip**.



Figure 6-7: Service trip element



Note: A service trip is a revenue-earning vehicle journey.



The number is the route **sign**. In the left hand example , the route as seen by a passenger, is 2-1. The difference between a simple number and a hyphenated number such as 2-1 will be explained shortly. Looking at the Gantt, It's **row number** is the **vehicle ID**. The position of the left end of the element is the time of the beginning of the trip and the position of right end is the time of completion. You can see the times precisely by moving the mouse horizontally along the row. A vertical cursor line indicates the time. Observe the vertical cursor line at 13:25 at the mouse position.



Note: The service trip coloring is determined by the system to make the display easy to understand. **Each sign has its own color.**

From the transport operator's perspective, a route has three parameters. Referring to **Figure 6-7** above, they are:

- A sign defining the service trip terminus points - in the example it is 2
- A direction - at which terminus the trip starts and which terminus the trip finishes determines the direction on the Gantt of the bullet shape
- An alternate number indicating a route variant. A route variant for example may add or skip stops in the base route. In the example it is 1 and the passenger sees 2-1 as shown.

Further information may be obtained by left-clicking an element. Let us take another example, left-clicking the third service trip element in row 1. An information box pops up:

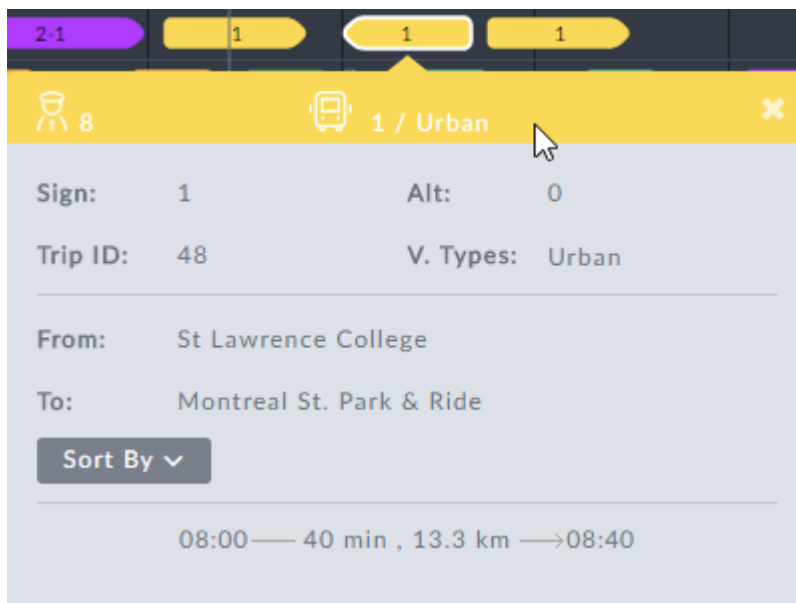


Figure 6-8: Element information box

Notice the **From: ... To: ...** locations. If you left click-the fourth item following, you will see that the **From: ... To: ...** locations are reversed - the vehicle is scheduled for a return trip.



Note: Left-clicking any active element in the display will open an information box describing it in detail. In most cases, the chosen element has a white border as seen in **Figure 6-8**.

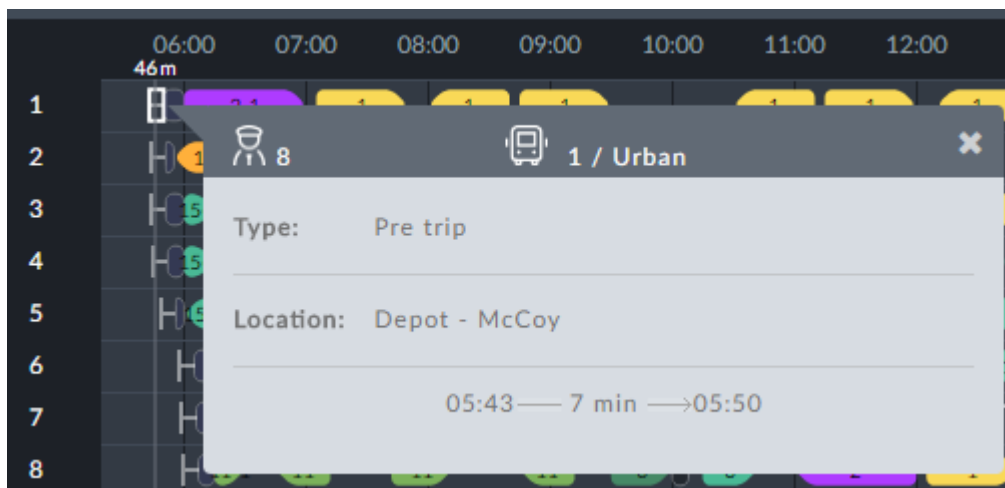
We will return to the information box in detail below.




Note: Sometimes a trip icon may be an oblong shape instead of a bullet shape. It indicates a round-trip that starts and finishes at the same terminus.

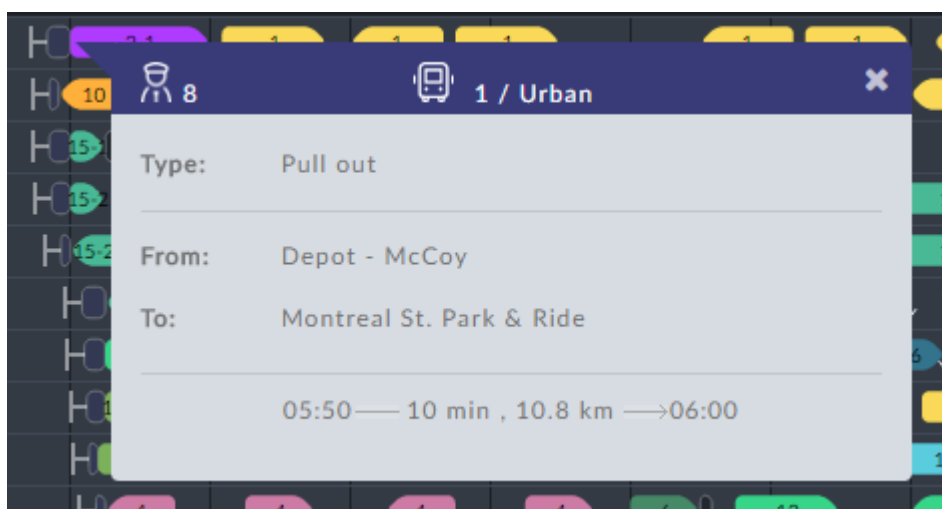
To complete your understanding of the example, we will look at several other elements appearing on row 1.

The row commences with the symbol . Left clicking it opens an information box:



The  symbol represents pre-trip activity. It may also show as **Vehicle Preparation**. This is an Operator choice.


The next graphic element looks like this:  Left clicking it shows a **Pull out** information box:

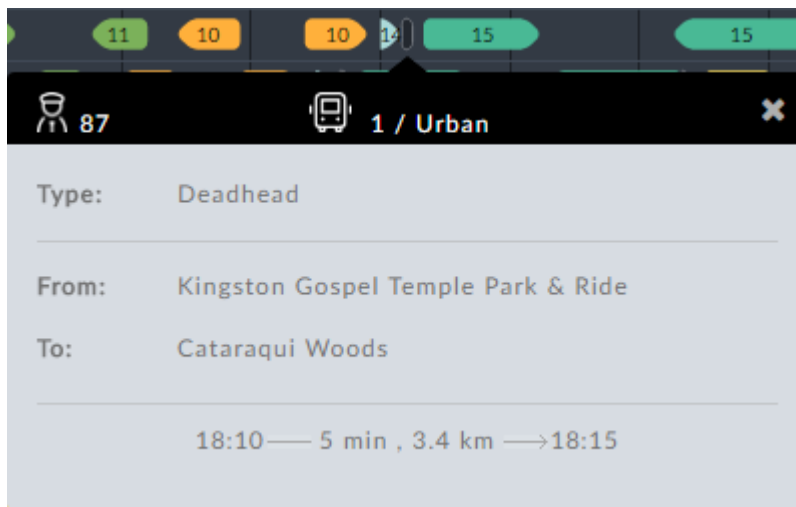


The length of the Pull out graphic reflects the time required. The same graphic at the end of a trip or at the end of a day denotes a **Pull in**.



Note: Pull out and Pull in: Moving a vehicle from a depot to the first stop of a service trip is called a Pull out. What is considered to be a "Depot" here, is determined by the Operator. In the opposite direction, a Pull in is moving a vehicle from the last terminus of a service trip back to the depot.

Once again, on the top row at about 18:13, there is a similar graphic with a black background, . Left-clicking it shows **Deadhead** information:




Again, the length of the graphic reflects the time required for the deadhead trip.

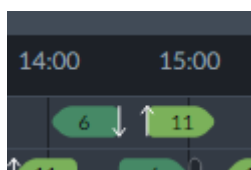


Note: A deadhead is any non-revenue earning vehicle movement other than pull out and pull in.




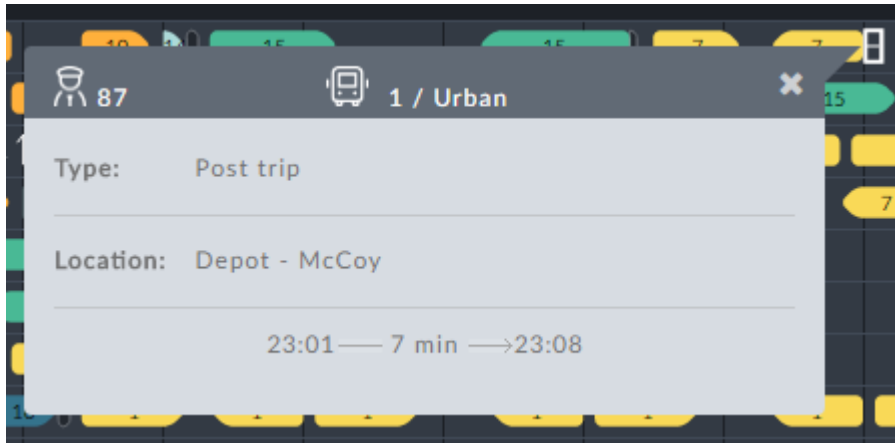
Note: Deadhead, pull out or pull in icons with a white dot in the center, for example like this,  are auto-generated by the system. You can edit them in your Deadhead Catalog (see TBD).

Look now, at the period between 14:00 and 15:15:



The down arrow to the right of sign 6 indicates that the driver has left the vehicle (for example going off-duty or taking a break). The up arrow following indicates that a **different** driver has taken the vehicle.

Finally, at the end of row 1 is a post-trip symbol, . Left clicking it, displays post-trip activity:



The Vehicle Gantt in Detail

In this section we look at the information boxes in detail.



Note: The Vehicle Gantt information boxes become active data entry panels during Manual Vehicle-only Scheduling. See TBD.



Note: An open information box may be dismissed in three ways:

- Clicking the x in the top right corner of the box
- Opening another box
- Clicking an unused area on the display

Workday Overview for a Vehicle

Left-clicking a row number pops up a work day overview for the vehicle:

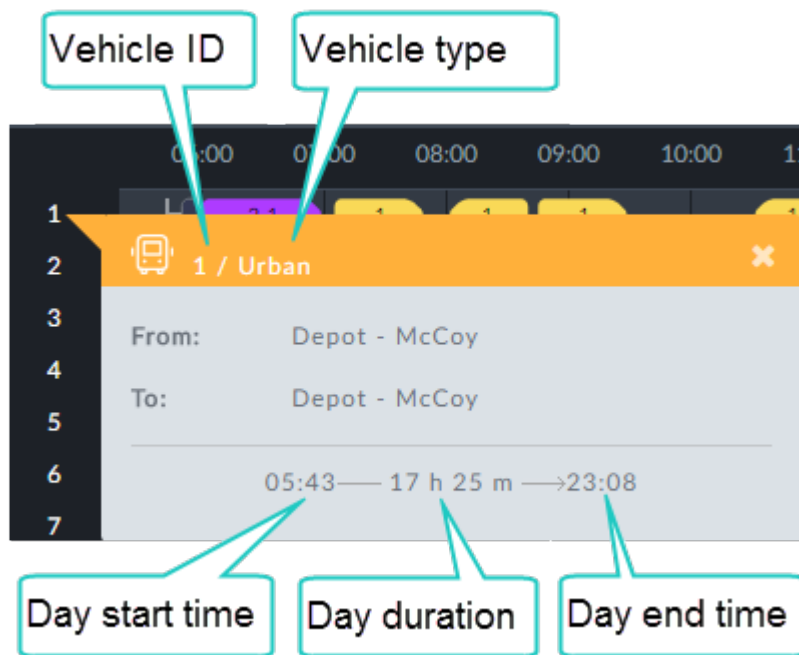
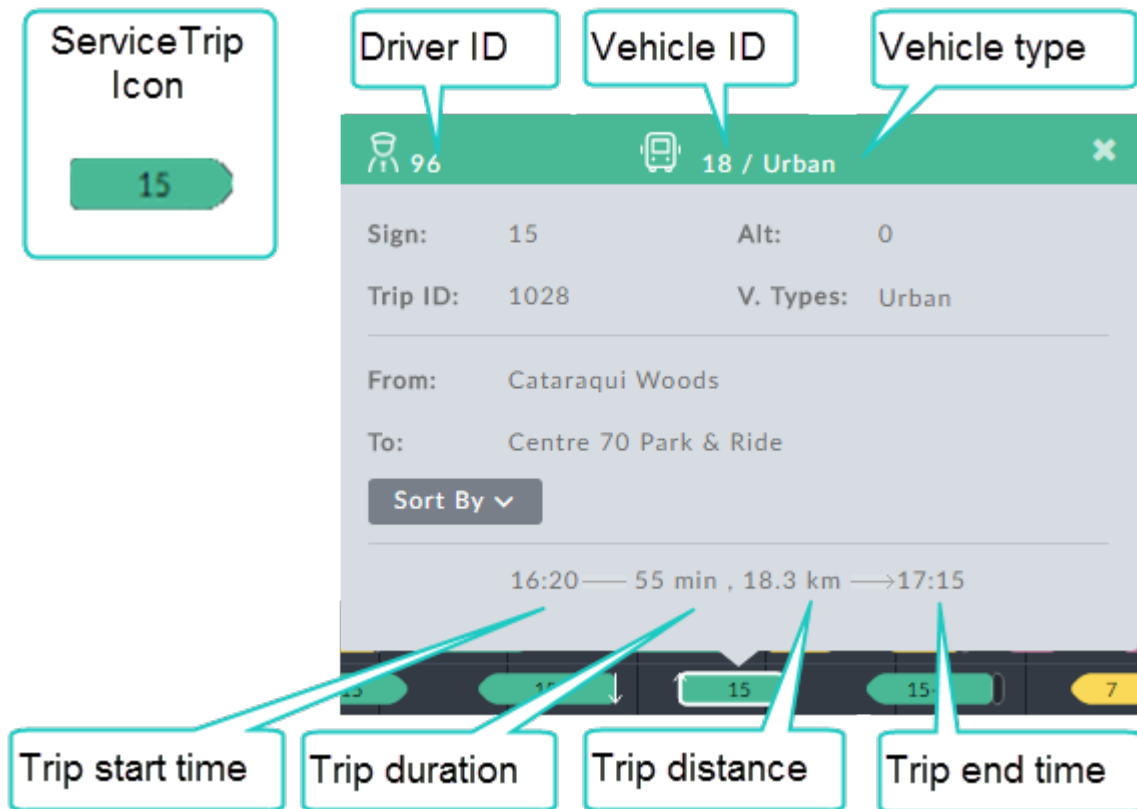


Table 6-1: Row overview information box

Information Box Item	Description
From:	Start location at the beginning of the work day
To:	The final location of the vehicle at the end of the work day

Service trip



The remaining items inside the gray area are described in **Table 6-2** below:

Table 6-2: Service trip information box

Information Box Item	Description
Sign	Route number as seen by the passengers
Alt	Alternative route: Used for route variations. A variation for example, may skip or add some stops. An Alt is one of the following: 0 or # - indicates the base route Anything else indicates an alternate route
Trip ID	Operator's trip ID. Every trip has its own unique ID
V. Types	Eligible vehicle types for this trip. Several types may be displayed.
From:	Service trip origin

Information Box Item	Description
To:	Service trip destination
Sorted by	See section Sorting the Vehicle Gantt below.



Note: *About direction:* The Operator distinguishes route direction for a service trip using the **From:/To:** fields. Visually, they determine the direction of the bullet shape on the Gantt. To show the opposite direction, you swap the **From:/To:** locations and the resulting bullet shape points in the opposite direction.

Deadhead

The image shows a 'Deadhead' information box with the following fields and callouts:

- Deadhead Icon:** A black rounded rectangle icon.
- Driver ID:** 87
- Vehicle ID:** 10
- Vehicle type:** 1 / Urban
- Type:** Deadhead
- From:** Kingston Gospel Temple Park & Ride
- To:** Cataraqui Woods
- Trip start time:** 18:10
- Trip duration:** 5 min
- Trip distance:** 3.4 km
- Trip end time:** 18:15

Table 6-3: Deadhead information box

Information Box Item	Description
Type	Information box type - Deadhead
From:	Deadhead start - typically the end point of a service trip
To:	Deadhead end - typically the start point of a service trip

Pull out

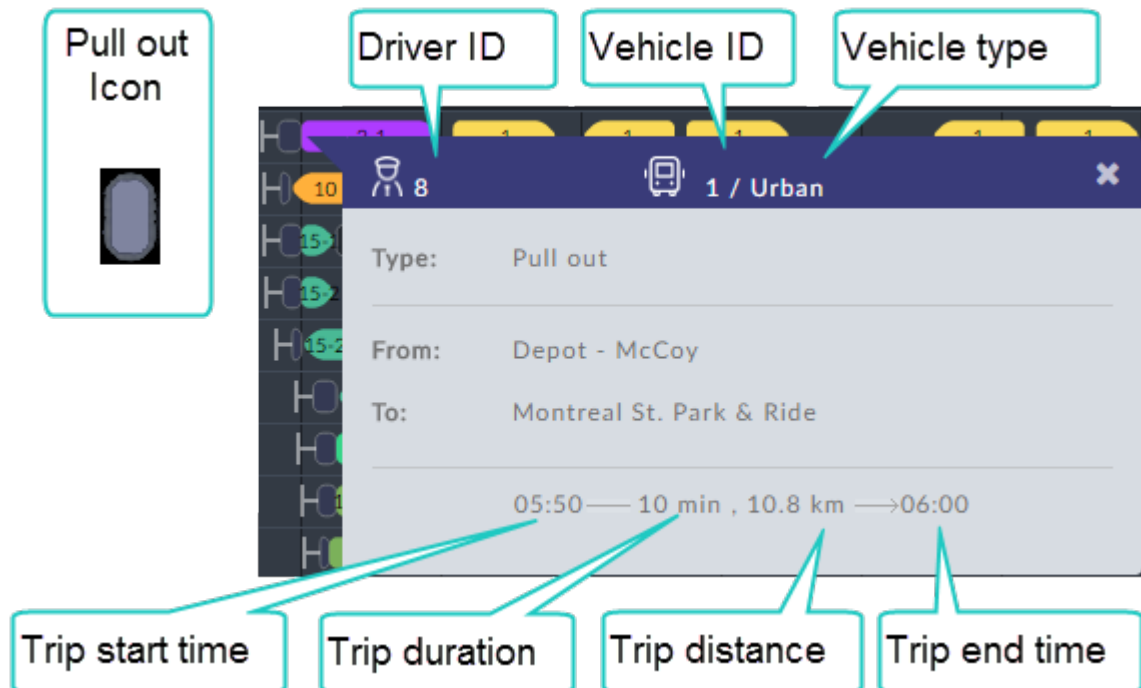


Table 6-4: Pull out information box

Information Box Item	Description
Type	Information box type - Pull out
From:	Pull out location - typically a depot
To:	Origin of first service trip

Pull in

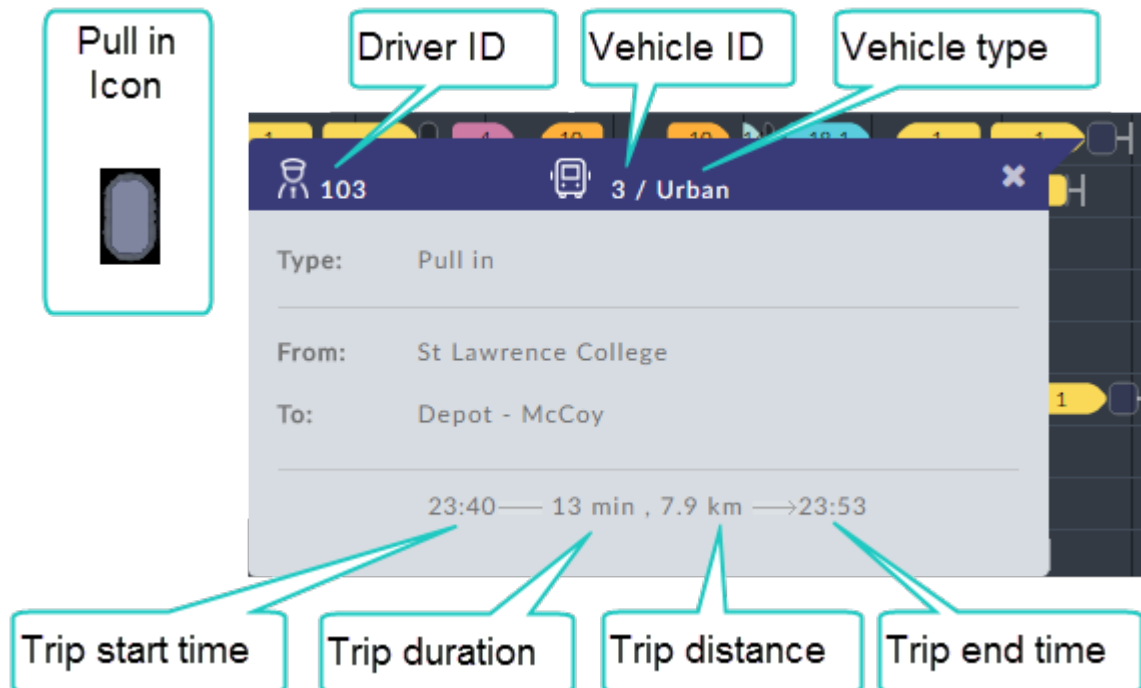


Table 6-5: Pull in information box

Information Box Item	Description
Type	Information box type - Pull in
From:	Pull in location - typically the end point of a service trip
To:	The final location of the vehicle at the end of the day, typically a depot.

Pre-trip

The Pre-trip element only appears at the beginning of a vehicle work day. It provides for all required vehicle preparation by the driver before he moves the vehicle.

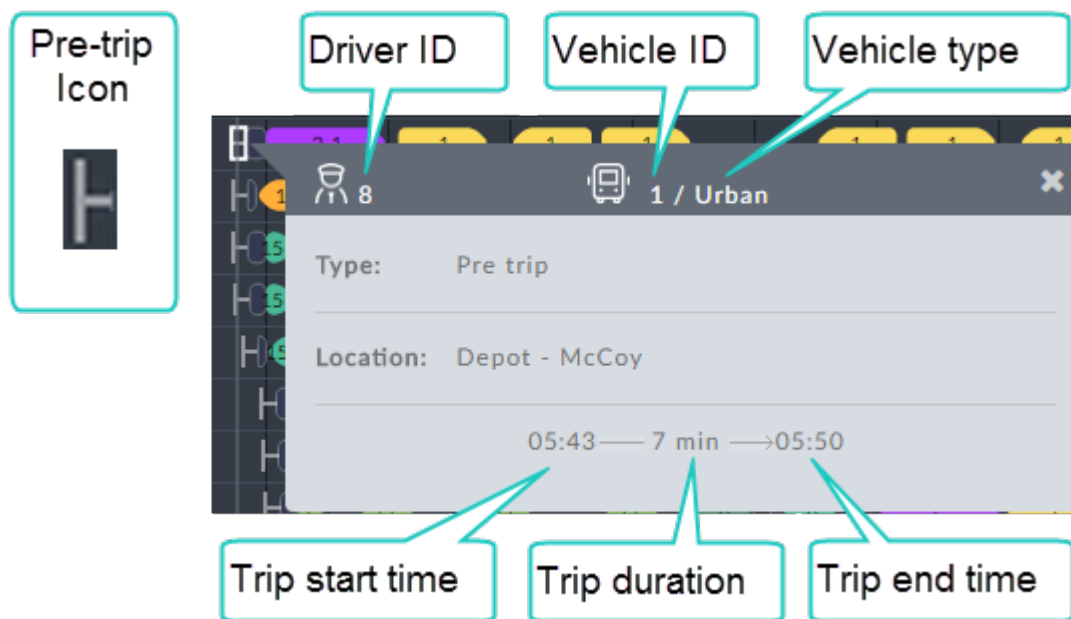


Table 6-6: Pre-trip information box

Information Box Item	Description
Type	Information box type - Pre trip
Location	Work day departure point, typically a depot

Post-trip

The Post-trip element appears at the end of a vehicle work day. It provides for all required vehicle activities by the driver after parking the vehicle and before going off-duty.

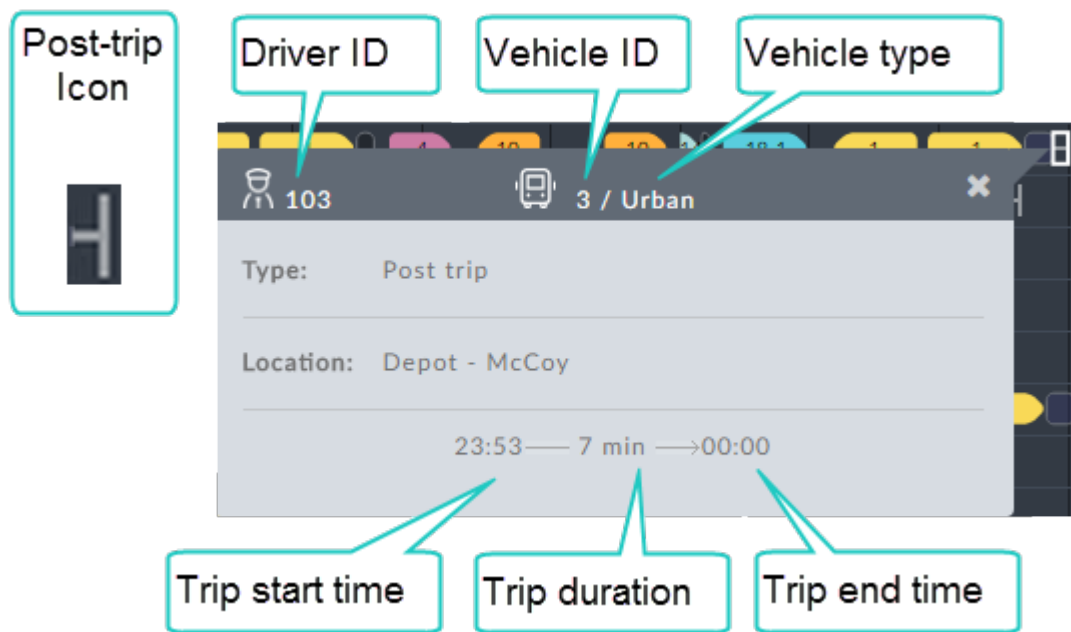
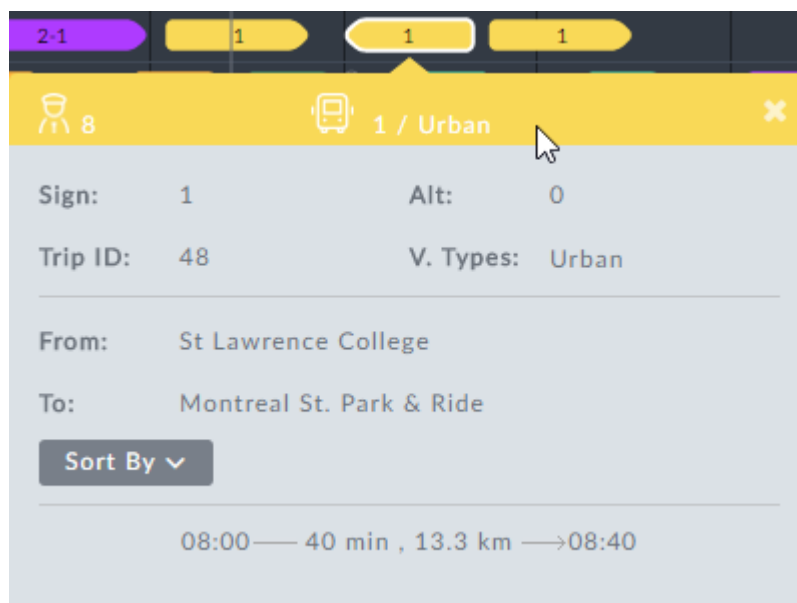


Table 6-7: Post-trip information box

Information Box Item	Description
Type	Information box type - Post trip
Location	Work day termination point, typically a depot

Sorting the Vehicle Gantt

Recall the service trip information box:



Clicking the **Sorted By** button opens the following pick list:

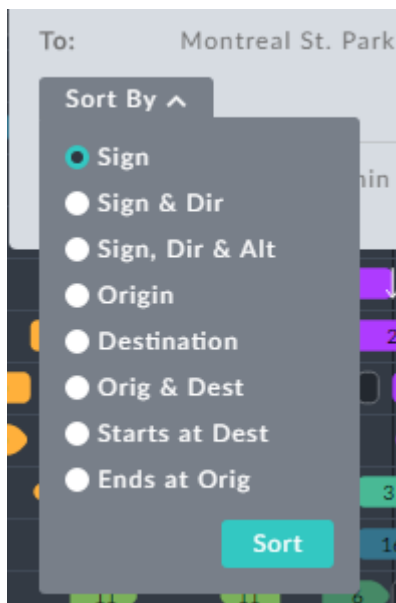


Figure 6-9: Display sort options

Explanation ...TBD

Driver Gantt

Driver Gantt Overview

Like the Vehicle Gantt, the Driver Gantt also contains a vast amount of information. We start with an example:

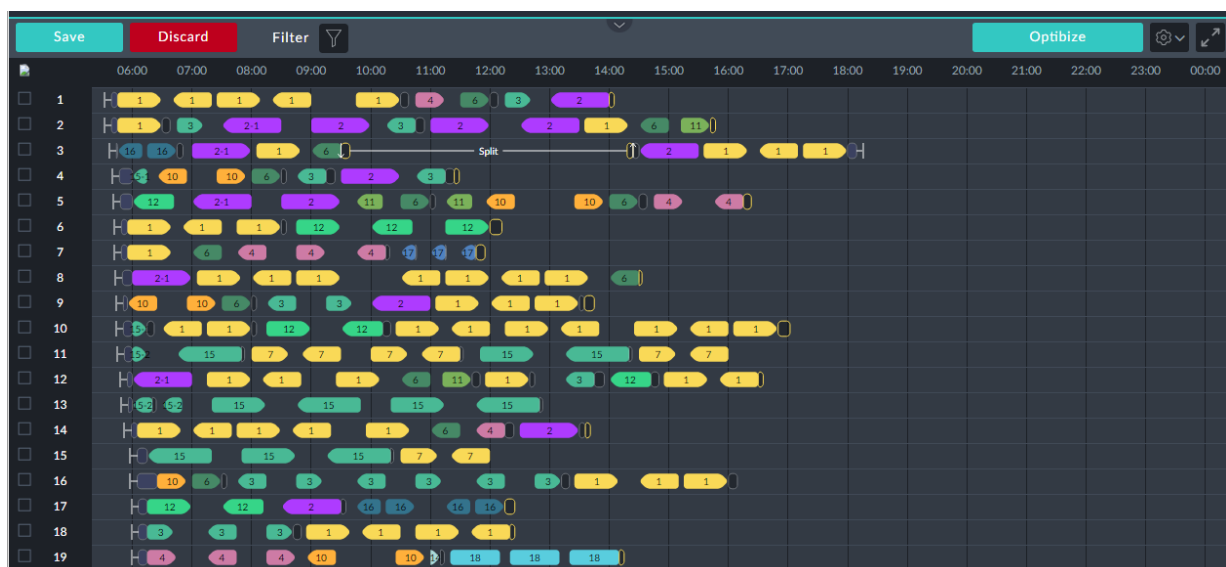


Figure 6-10: A typical Driver Gantt

For the Driver Gantt, the left hand numbering is for drivers. Thus, each numbered row on the Gantt shows the work day for one driver. otherwise the graphic elements are very

similar to those used in the Vehicle Gantt. The emphasis in this section will be on the element specific to the Driver Gantt or elements having a different meaning.


The following graphic elements are the same as those for the Vehicle Gantt:

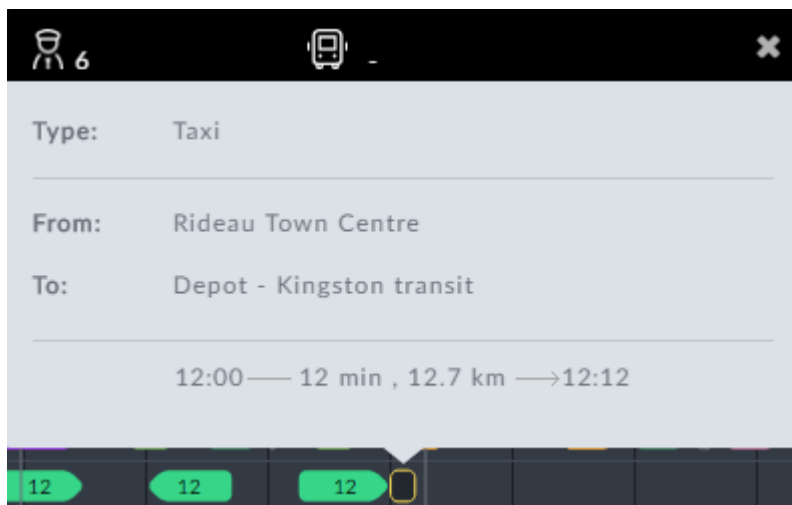
- Service trip
- Pre-trip and Post-trip
- Pull out and Pull in
- Deadhead

Up and down arrows have a different meaning in the Driver Gantt: Here they indicate a **vehicle changeover** for the same driver. The changeover may be separated by other events, as we will see below.

There are two additional elements:

When a driver completes a service trip, he may be required to leave his vehicle and then go to a different location for his next trip or even to take a break. To get there, he may require transport such as a taxi or a shuttle.

The **Taxi** icon  denotes the driver movement. It looks similar to a Deadhead icon but it has a thin yellow frame. Left clicking it opens its information box:



The box indicates that a taxi or a shuttle is required.



Note: The use or otherwise, of Taxi icons is determined in the Preferences. See TBD.

The second additional graphic describes a **Split**:

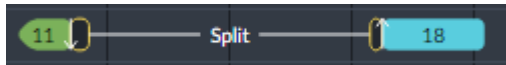


Figure 6-11: Split example



Note: The part of the driver's duty before a split is called his **first stretch** and the duty following the split, his **second stretch**.

To follow the narrative of **Figure 6-11**, we need to open the information box of each constituent element in order from left to right:

Figure 6-12: Last service trip of first stretch completed prior to split

The driver with ID as shown, has completed the service trip of **Figure 6-12**. In **Figure 6-11**, following the service trip element there is a down arrow. The driver has left the vehicle as first part of a changeover. The next element is a Taxi icon showing that the driver requires transport as shown in **Figure 6-13**:

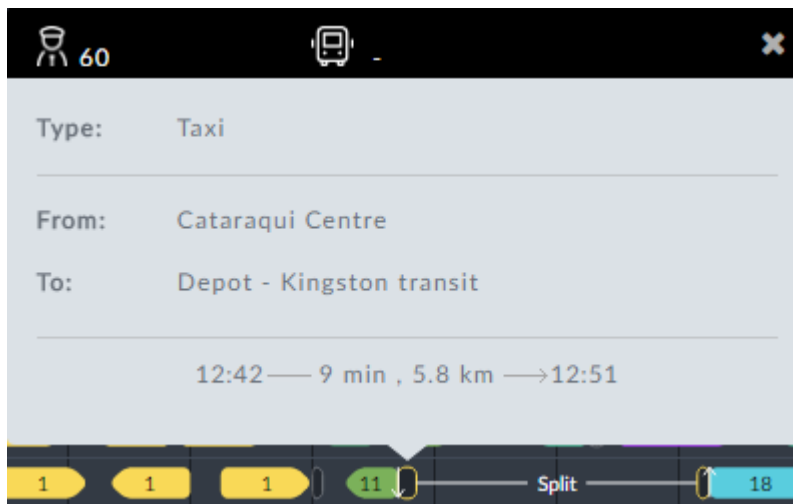


Figure 6-13: Taxi taken before split

Having arrived at the **To:** location, the driver goes off duty as shown in the split break. The driver's split break details are shown in the split break information box:

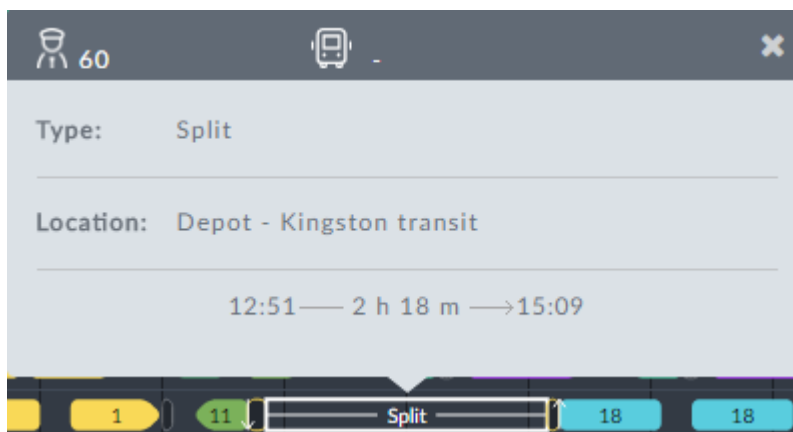




Figure 6-14: Split break information box

At the end of the break shown at the bottom of **Figure 6-14**, another Taxi icon is displayed indicating a requirement for transport to take the driver to his next duty trip. An up arrow shows the driver taking over the vehicle for the next service trip, the second part of his changeover. At this point, the procedure flow should be evident and we will not show all of the information boxes.

As for the Vehicle Gantt, each row number in the Driver Gantt has an information box. For drivers there is a difference. Left-clicking row 1 shows the following information box:

1

2  1 / Morning 

3

4 From: Depot - Kingston transit

5 To: Depot - Kingston transit

6 05:32 — 8 h 33 m —> 14:05

7

8 No Splits

9



The only new item is the No Splits indicator, showing that the duty in the line above is continuous.



Note: The **Duty Type** shown is Operator defined.

If we left-click row 3, which has a split, the information box is different:

3

4  3 / Split 

5

6 From: Depot - Kingston transit

7 To: Depot - Kingston transit

8 05:37 — 8 h —> 18:16

9

10 Split from: Depot - McCoy

11 Split to: Depot - McCoy

12

13 09:39 — 4 h 39 m —> 14:18

14

We have already encountered the contents of this box in the split narrative above: The driver comes on duty at the **From:** location and finishes his day at the **To:** location (often the same), starting and finishing as shown:

05:37 — 8 h —> 18:16

The worked hours shown in the middle are total worked hours less the split hours.

The lower **Split from: / Split to:** section shows the split break period only:

09:39 — 4 h 39 m —> 14:18

At this point, it is quite straight forward to follow the work day on the Driver Gantt for any driver.

The Driver Gantt in Detail

In this section we look at the driver specific information boxes in detail.

Workday Overview for a Driver

Left-clicking a row number pops up a work day overview for the driver:

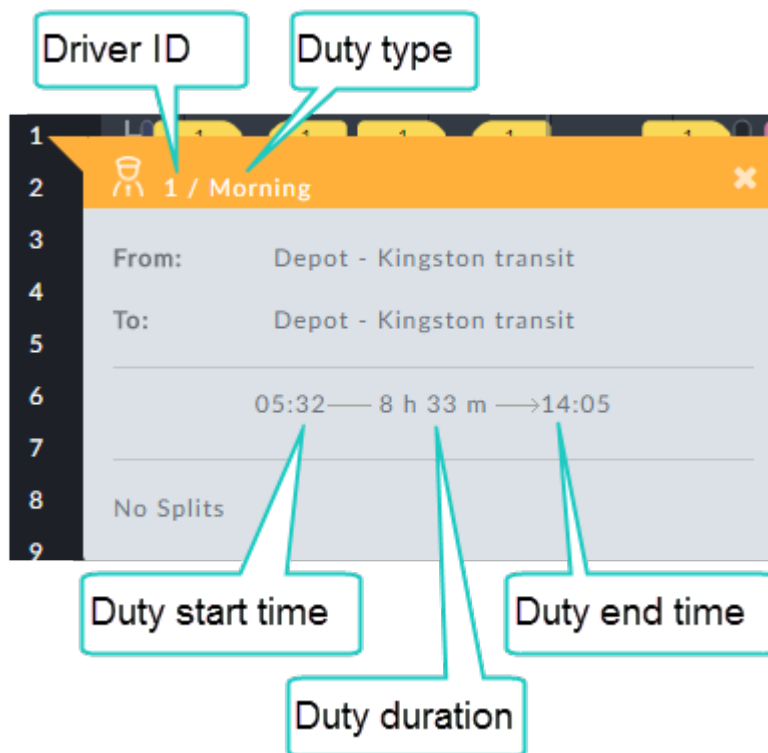


Figure 6-15: Workday Overview - no splits



Note: The **Duty Type** is Operator defined.

If the day's work is split by a rest period, the information box has extra details:

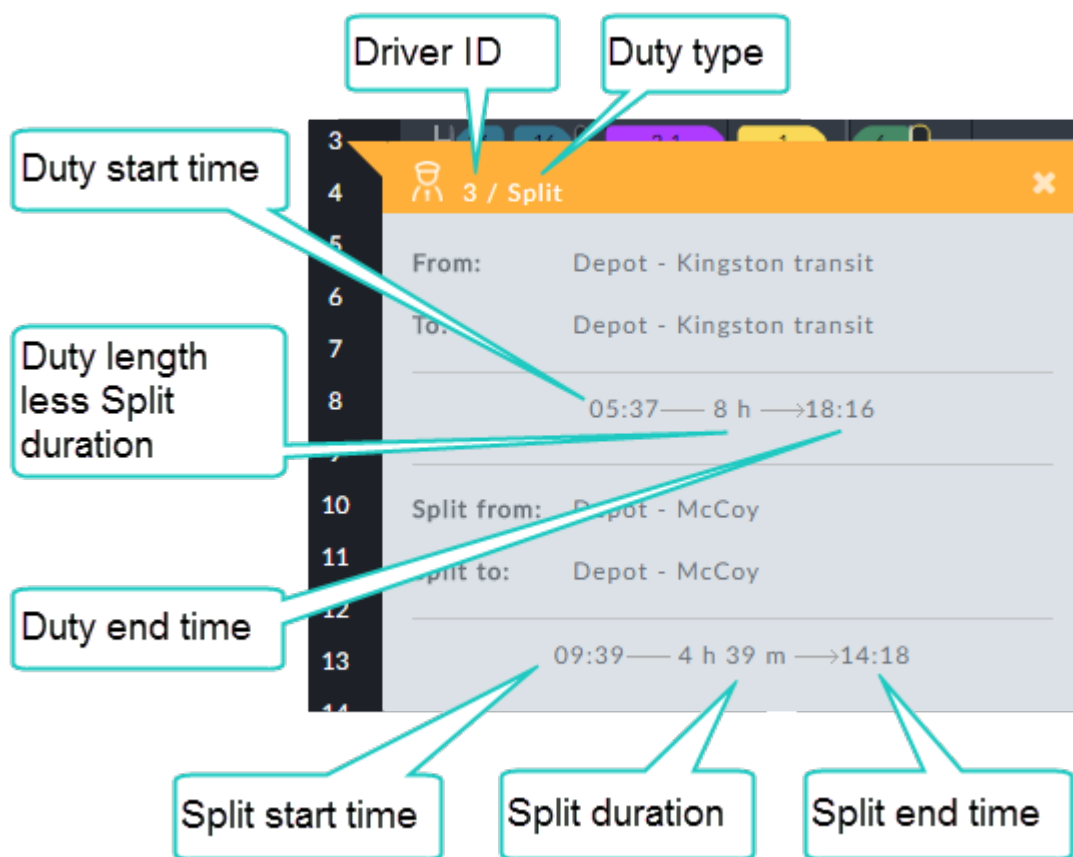


Figure 6-16: Split workday Overview

Table 6-1: Row overview information box

Information Box Item	Description
From:	Start location of the driver at the beginning of the work day
To:	The final location of the driver at the end of the work day
Split from:	Split start location
Split to:	Split end location

Split Information Box

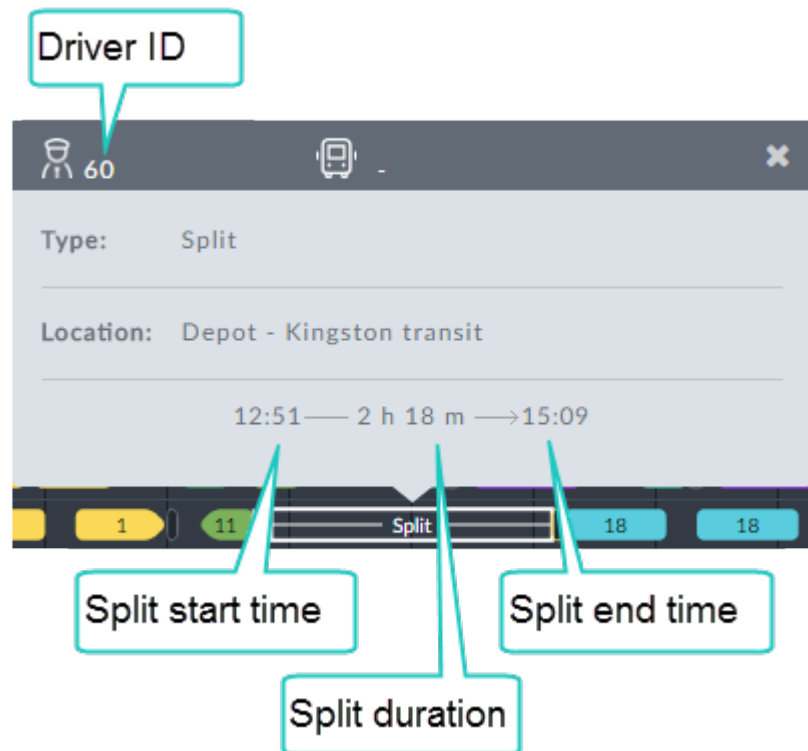


Table 6-2: Split information box

Information Box Item	Description
Type	Information box type
Location:	Split location - typically break location

Taxi

Recall that, when a driver completes a service trip, he may be required to leave his vehicle and then go to a different location for his next trip or even to take a break. To get there, he may require transport such as a taxi or a shuttle.

The taxi icon is used to represent this driver movement.

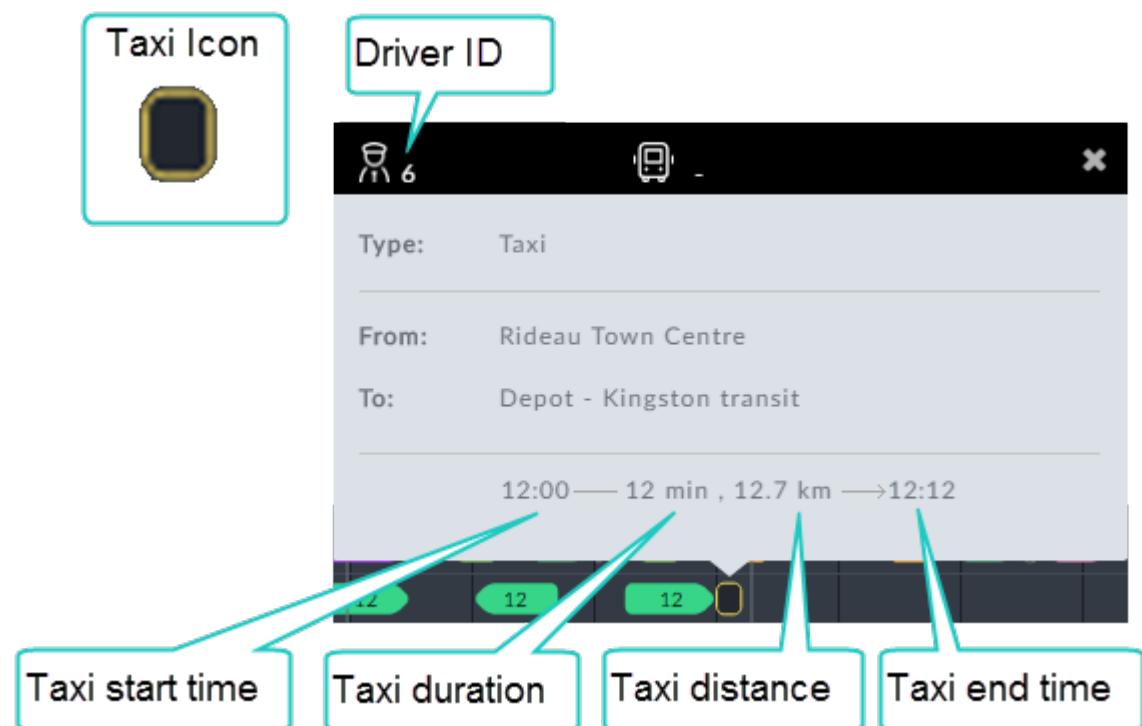


Table 6-3: Taxi information box

Information Box Item	Description
Type	Information box type -Taxi
From:	Taxi start location
To:	Taxi end location

Chapter 7: Preferences Window

Delete this text and replace it with your own content.

Vehicles

Delete this text and replace it with your own content.

Drivers

Delete this text and replace it with your own content.

Depots

Delete this text and replace it with your own content.

Miscellaneous Settings

Delete this text and replace it with your own content.

Chapter 8: Interactive Scheduling

Delete this text and replace it with your own content.

Chapter 9: Roster Datasets

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Chapter 10: Input Data Formats

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Chapter 11: Creating a Dataset and Schedule

Scope of this Chapter

There are several ways of importing files required to create a Dataset. Schedules may be imported or created using the Optimizer against an existing Dataset.

Importing a Dataset

Delete this text and replace it with your own content.

Importing a Schedule

Delete this text and replace it with your own content.

Creating a Schedule Using the Optimizer

Delete this text and replace it with your own content.

Glossary

C

Changeover

Driver changing vehicles between trips.

D

Dataset

Consists of the following catalogs:Trips, Stations, Vehicle Types, Deadheads,

Deadhead

Non-revenue earning trip

Duty

P

Post trip

Pre trip

Pull in

Trip from end point of a Service Trip to a Depot

Pull out

Trip from a Depot to start point of a Service Trip.

R

Revision

Saved schedules are stored with a revision number instead of simply being over-written.

Roster

TBD

S

Schedule

Inherits the parent Dataset catalogs and add Vehicle and Driver Gantt

Split

T

Trip

Movement of a vehicle ...

V

Vehicle

Index

Customer Response

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End Page

Delete this text and replace it with your own content.