

# Crew Schedule Similarity

## Prerequisite for Use

This Preference requires that you have an initial customer schedule currently loaded.

## Work-flow to Use Crew Schedule Similarity

- » Use **Load Template** to set up and modify the preference for one of several conditions
- » Only one instance of the preference is permitted

## Preference Overview

Using this preference, you can control the level of disruption to staff during a schedule change and indeed use it in stages to move from the supplied schedule to a fully optimized schedule.

This preference deals with **crew schedule similarity**. In what follows in this preference, when we refer to a **schedule**, the intention is the **driver schedule** as seen in the Drivers Gantt.



**Tip**

Crew schedule similarity, should be run in conjunction with vehicle schedule similarity. Vehicle schedule similarity should either be run first or in conjunction with crew schedule similarity. See [Schedule Similarity](#).

Optibus OnSchedule™ uses two criteria of similarity. The new **drivers schedule** is similar to the previous one if **either one** of the following hold:

- » **Trip ID similarity:** Consecutive trip IDs are substantially maintained.

A new schedule is *Trip ID similar* to an existing schedule if the Trip IDs of any two consecutive trips is maintained.

For example: If Trip ID X is followed by Trip ID Y in the current schedule and Trip ID X is still followed by Trip ID Y in the new schedule, this is considered to be *Trip ID similar* and no penalty is imposed.

If however, if Trip ID X is followed by Trip ID Y in the current schedule but in the new schedule, Trip ID X is followed by a different Trip ID Z, this is considered to be a violation of Trip ID Similarity. Penalties will always be imposed for violations of Trip ID similarity.



The optimization takes the trips pairwise but no more.

» **Trip start time similarity:** Trip start times are substantially maintained.

This is best illustrated by an example. Suppose that -

1. Trip ID X is followed by Trip ID Y in the current schedule
2. Trip Y starts at 09:30
3. Trip start time deviations of more than 10 minutes are considered to be violations of Trip Start Time similarity
4. We require for trip similarity, that the trip following Trip ID X in the new schedule commence no earlier than 09:20 and no later than 09:40 and the route is the same as that of Trip Y.
5. A penalty *will be imposed* if either one of the following situations occur in the new schedule:
  - The route of the trip following Trip X has changed from the route of Trip Y in the original schedule
  - The route of the trip following Trip X remains the same as the original Trip Y but commences earlier than 09:20 or later than 09:40

Otherwise, we have maintained Trip Start Time Similarity for Trip X and the following trip.

### About the imposition of penalties:

The idea of "substantially" is implemented by applying a cost penalty for deviations from the original schedule as described above. Thus, if you impose a low penalty, you are effectively saying, "I would like the new schedule to be similar, but similarity is less important than my other preferences ." In this case, the optimized schedule may be quite different from the original. If on the other hand, you impose a high penalty for deviations, you are effectively saying, "I would like the new schedule to be similar to the original, if necessary at the expense of my other preferences . In this case, the optimized schedule may not look very different from the original.


To demonstrate the crew similarity, we will use the fourth template below, **Schedule Similarity - by trip id**. It is the simplest to understand: It sets out to maintain Trip ID similarity. Its only parameter is the penalty. We also set vehicles schedule Trip ID similarity using a penalty of 50 resulting in vehicle trip ID similarity of 51% (see **Table 1-1** in **Schedule Similarity**.)

Here are results of setting increasing penalties as expressed by several KPIs:

Table 1-1: Crew Schedule Similarity - KPI Partial Comparison for various penalties

KPI	Customer Schedule	First Optimization with veh. sim. penalty 50 & sim. = 51%	Penalty			
			5	30	50	100
Duties	173	168	167	169	169	169
Vehicles	95	87	87	87	87	87
<b>Crew Similarity</b>	<b>N/A</b>	<b>N/A</b>	<b>67%</b>	<b>67%</b>	<b>68%</b>	<b>69%</b>
<b>Vehicle Similarity</b>	<b>N/A</b>	<b>51%</b>	<b>52%</b>	<b>53%</b>	<b>53%</b>	<b>53%</b>
Total Cost	268,959	257,375	257,347	257,357	257,332	261,541

It is interesting to note that vehicle similarity rises slightly with increasing penalty. This is due to allowing the duties optimization to modify the vehicles schedule. Further, when vehicle schedule similarity is significant (over 50%), crew similarity is also fairly high and only changes marginally with increasing penalty.



These results are for a specific schedule and are indicative only.

## Templates Available from Optibus

Table 1-2: Templates Summary

Template Name	Purpose	Reference
Crew Schedule Similarity - by route group & trip id	Create a new schedule to be <b>Trip ID - similar</b> to the supplied schedule but restricted to a nominated route group.	<a href="#">Crew Schedule Similarity - by route group &amp; trip id</a>
Crew Schedule Similarity - by route group & time	Create a new schedule to be <b>Trip Start Time - similar</b> to the supplied schedule for the nominated route group. It attempts prevent trip start time deviations of more than the specified time.	<a href="#">Crew Schedule Similarity - by route group &amp; time</a>
Schedule Similarity - by route & time	Create a new schedule to be <b>Trip Start Time - similar</b> to the supplied schedule for the nominated route. It attempts prevent trip start time deviations of more than the specified time.	<a href="#">Schedule Similarity - by route &amp; time</a>

Template Name	Purpose	Reference
Crew Schedule Similarity - by trip id	Create a new schedule to be <b>Trip ID - similar</b> to the supplied schedule.	<a href="#">Crew Schedule Similarity - by trip id</a>

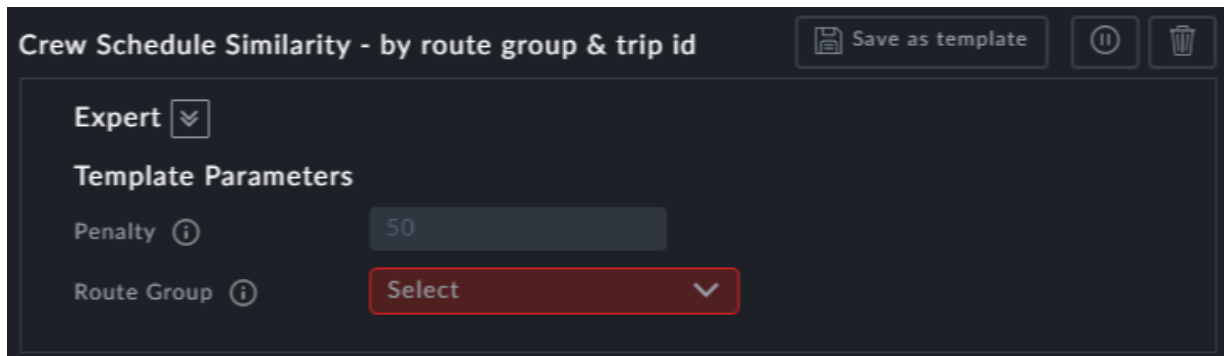
## Crew Schedule Similarity - by route group & trip id

### Purpose:

Create a new schedule to be **Trip ID - similar** to the supplied schedule but restricted to a nominated route group.

**Prerequisites:** You should have already defined your route groups. See Miscellaneous Preferences, [Route Groups](#).

### Opening Dialog:



Crew Schedule Similarity - by route group & trip id

Save as template

Expert

Template Parameters

Penalty ⓘ 50

Route Group ⓘ Select

### Points to note:

- » **Route Group:** The **Route Group** field is mandatory
- » **Penalty:** A high similarity carries a high penalty
- » You cannot create additional instances of this template

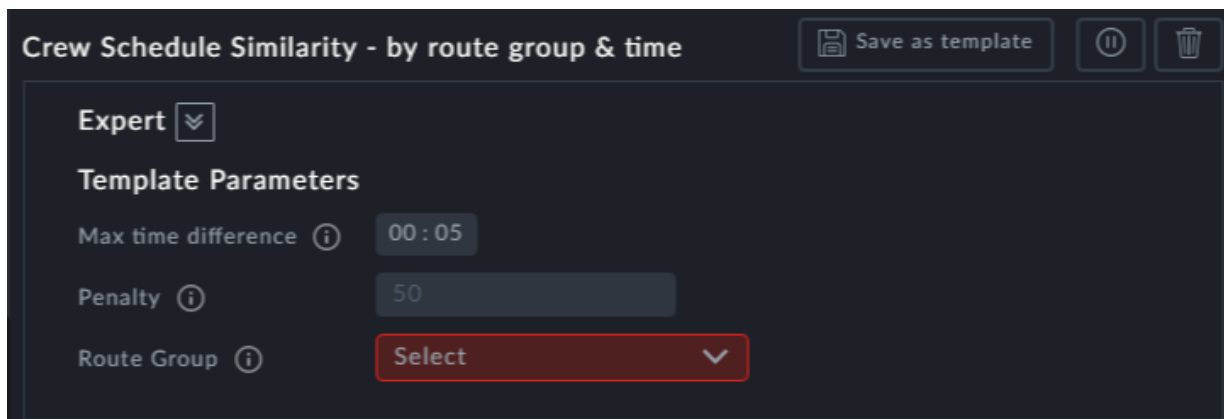
## Crew Schedule Similarity - by route group & time

### Purpose:

Create a new schedule to be **Trip Start Time - similar** to the supplied schedule for the nominated route group. It attempts prevent trip start time deviations of more than the specified time.

**Prerequisites:** You should have already defined your route groups. See Miscellaneous Preferences, [Route Groups](#).

### Opening Dialog:



### Points to note:

- » **Max time difference:** This is the maximum time deviation between the start time of a trip on a specific route as between the original schedule and the optimized schedule - that can be considered *Start Time Similar*
- » **Penalty:** The penalty is imposed when the **Max time difference** is exceeded. A high similarity carries a high penalty
- » **Route Group:** The **Route Group** field is mandatory
- » You cannot create additional instances of this template

## Schedule Similarity - by route & time

### Purpose:

Create a new schedule to be *Trip Start Time - similar* to the supplied schedule for the nominated route. It attempts prevent trip start time deviations of more than the specified time.

**Prerequisites:** None.

### Opening Dialog:

Schedule Similarity - by route & time

Save as template

Expert

Template Parameters

Max time difference ⓘ 00 : 05

Penalty ⓘ 50

Figure 1-1: Schedule Similarity by route and time

**Points to note:**

- » **Max time difference:** This is the maximum time deviation between the start time of a trip on a specific route as between the original schedule and the optimized schedule - that can be considered *Start Time - similar*.
- » **Penalty:** The penalty is imposed when the **Max time difference** is exceeded. A high similarity carries a high penalty
- » You cannot create additional instances of this template

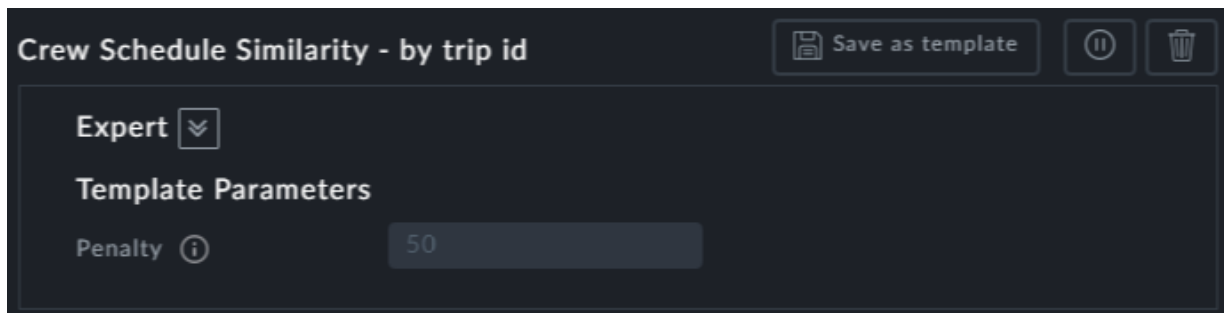
## *Crew Schedule Similarity - by trip id*

### **Purpose:**

Create a new schedule to be **Trip ID - similar** to the supplied schedule.

**Prerequisites:** None.

### **Opening Dialog:**



Crew Schedule Similarity - by trip id

Save as template

Expert

Template Parameters

Penalty 50

### **Points to note:**

- » **Penalty:** A high similarity carries a high penalty
- » You cannot create additional instances of this template