



Rooster

Resource Scheduling Engine based on genetic algorithm
User Manual

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1 Overview

Rooster is a scheduling engine based on genetic algorithms. You can use Rooster to create your schedules according to your requirements.

Rooster can have two types of employees.

- Administrators (NON_VOLUME)
- Normal users (VOLUME)

In this system we are providing 7 constraints and four termination conditions.

Termination conditions provided

- Terminate with in user specified time limit
- Terminate with in user specified no of iteration
- Terminate if there is no progress in fitness value with in user specified time limit
- Terminate if there is no progress in fitness value with in user specified no of iterations

Constraints

- Employee working hour constraints
There is range which employee has to work for a day.
For example employee can work minimum 5 hours and maximum 7 hours.
- Continuous allocation constraints
Employees should be allocated to the sections without having free time slots between the allocation time slots.
- Lunch break constraints
Manager can specify the are the preferred lunch slots for workers. This constraint checks whether employee is kept free during the lunch time slot.
- Employee Capability constraints
When allocation employees for tasks here we consider the capabilities of the employees. These are defined by the administrators.
- Employee preferences constraints
Sometimes administrators have preferences over employees. This constraint is to allocate employees according to administrator's preferences.
- Employee priority Constraints
This constraint is to allocate employees according to the priorities.
- Shift length constraints
When allocation a employees for time slots here administrators can define what is the range that employees can work continuously.

2 Configurations

This chapter provides information for system administrators on how to configure the Rooster to run the bank scheduling prototype.


2.1 Configuration tasks of Administrators

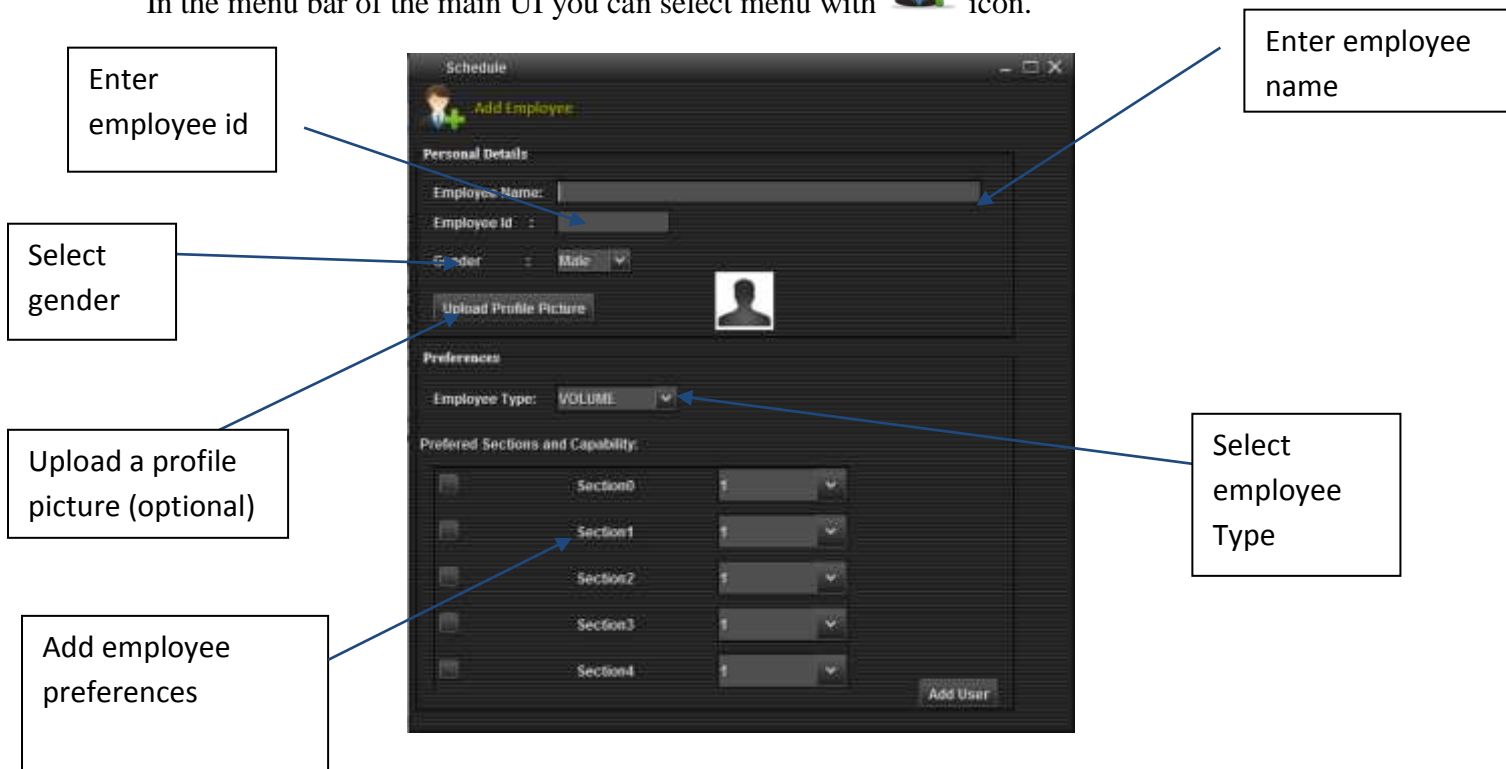
2.1.1 Administrator tasks

- Adding users to the system
- Adding tasks and requirements
- View and edit employee details and change availability of the employees
- Generate the schedule
- Monitor the rule satisfaction

2.1.1.1 Adding users to the system

After you configure the system, determine which users will have access to the system by adding them using Add user user interface.


In the menu bar of the main UI you can select menu with  icon.

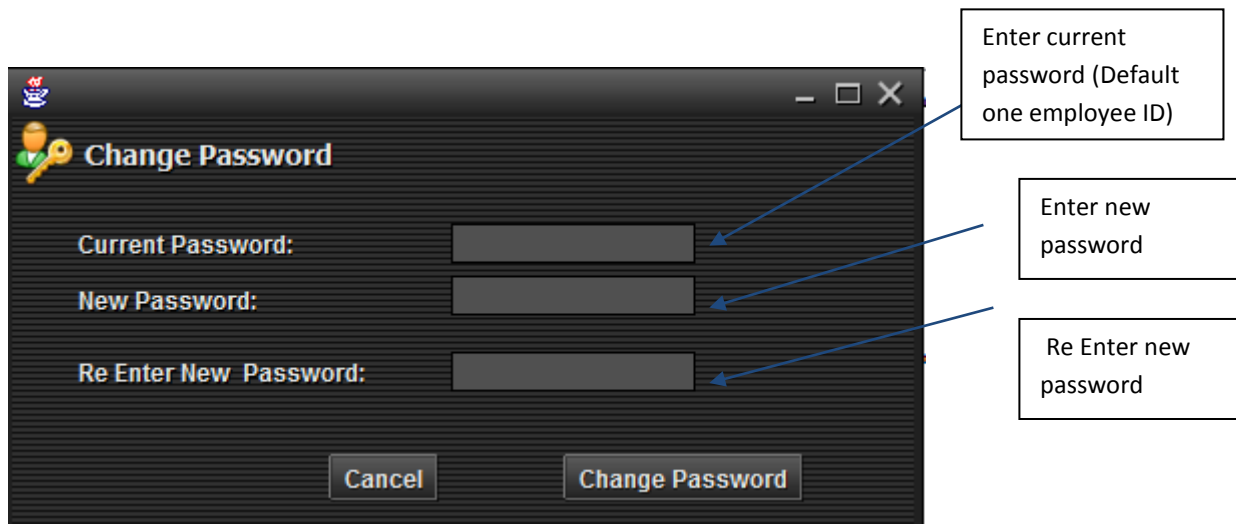


2-1 Add employee user interface

You must notify users of their user id's and password before they can access the system. Default password is set to Employee ID.


2.1.1.2 Changing password

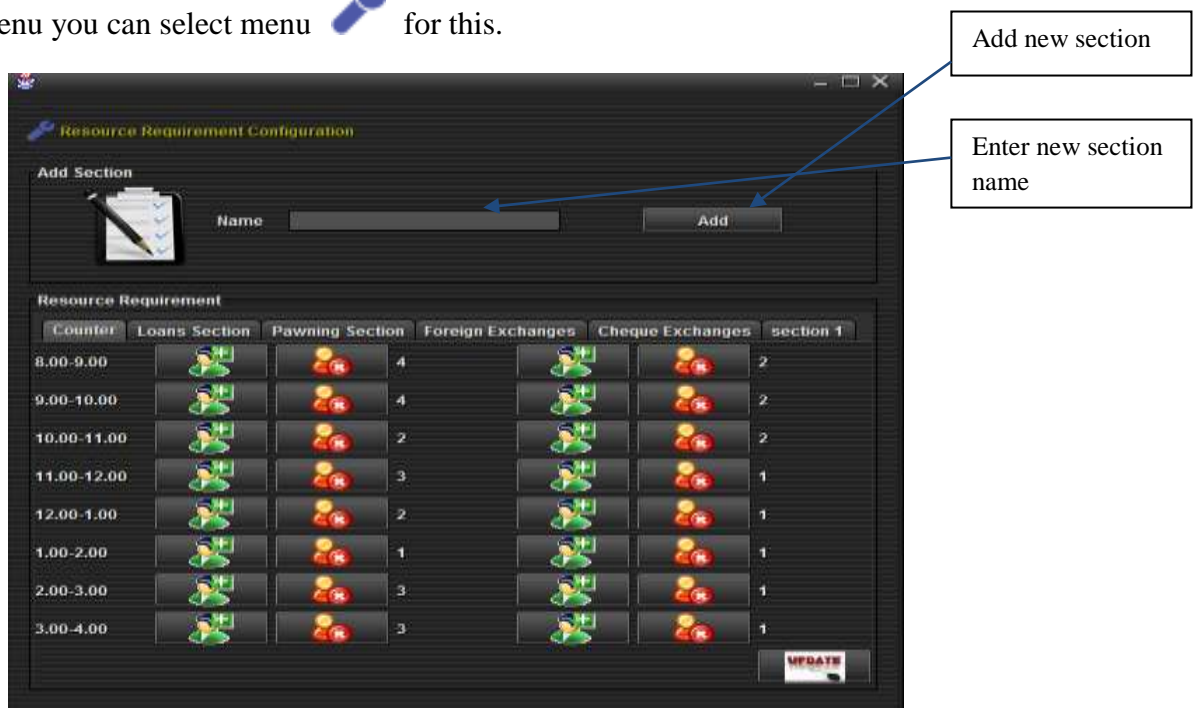
Each and every user has right to change their password after they are added to the system by the administrator. In the menu bar you can select the menu with  to change the password.





2-2 Change password UI

2.2 Adding tasks and requirements

Administrators can specify tasks and requirements for each tasks through configuration UI. In the main menu you can select menu  for this.



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By clicking on  icon you can increase the employee count needed for time slots and by clicking on  icon you can decrease the number of employees needed.

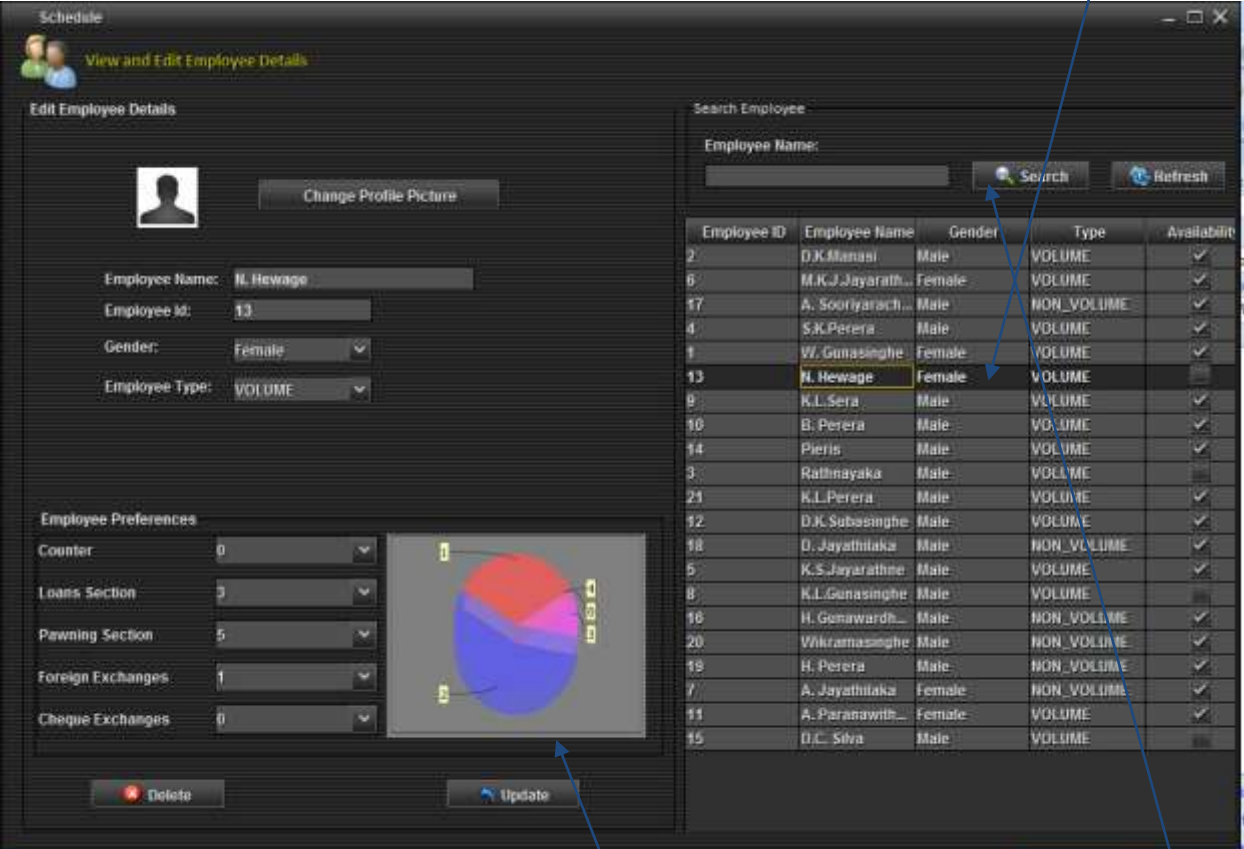
2.3 View and edit employee details and change availability of the employees

Administrators have authority to

- View employee details
- Edit employee details
- Change availability of employees

This feature is provided by View User Details UI .

Selected employee Details are loaded to Edit Employee Details Panel



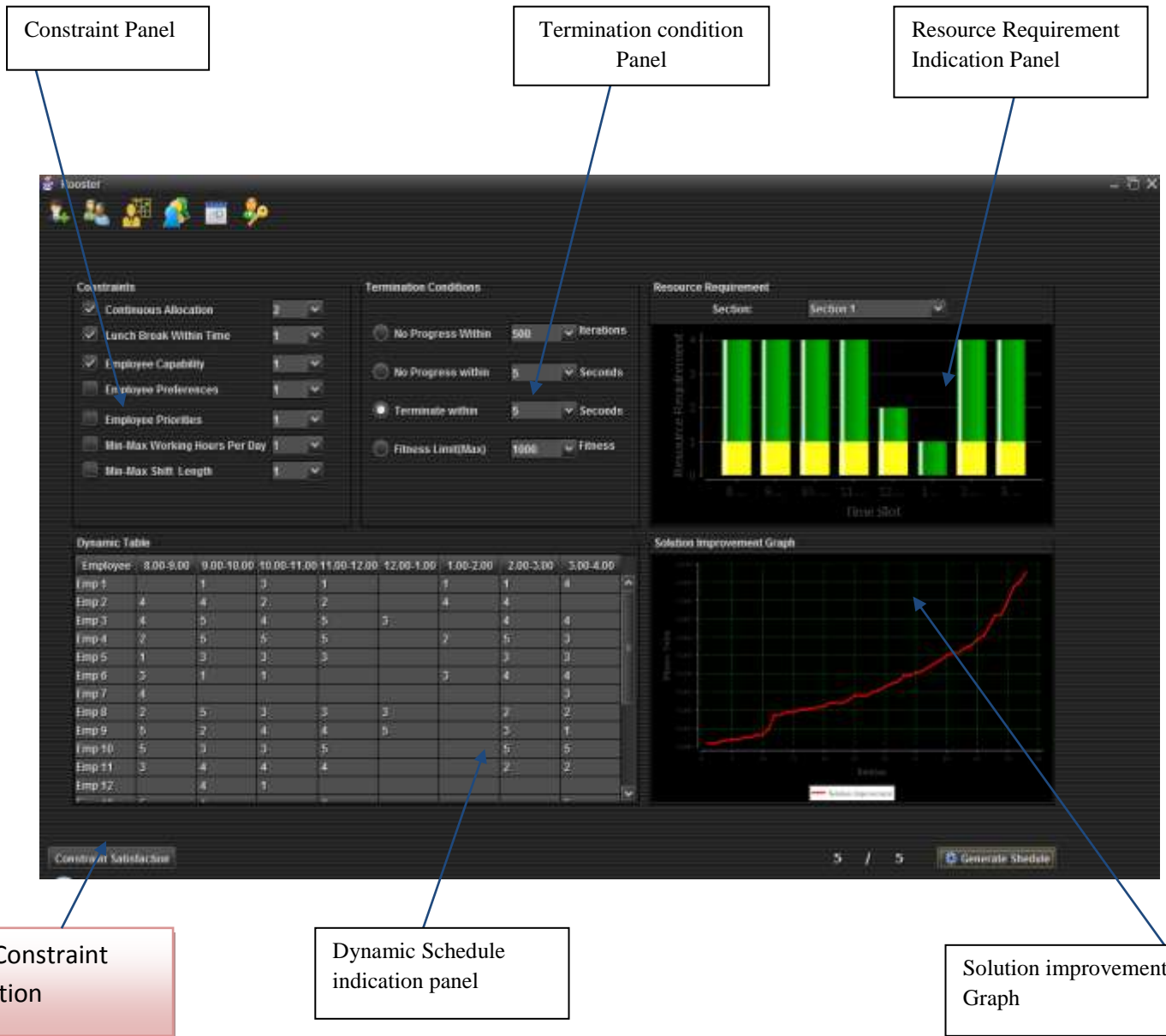
Employee ID	Employee Name	Gender	Type	Availability
2	D.K.Manasi	Male	VOLUME	✓
6	M.K.J.Jayarath...	Female	VOLUME	✓
17	A. Sooriyarach...	Male	NON_VOLUME	✓
4	S.K.Perera	Male	VOLUME	✓
1	W. Gunasinghe	Female	VOLUME	✓
13	N. Hewage	Female	VOLUME	✓
9	K.L.Sera	Male	VOLUME	✓
10	B. Perera	Male	VOLUME	✓
14	Pieris	Male	VOLUME	✓
3	Rathnayaka	Male	VOLUME	✓
21	K.L.Perera	Male	VOLUME	✓
12	D.K.Subasinghe	Male	VOLUME	✓
18	D. Jayathilaka	Male	NON_VOLUME	✓
5	K.S.Jayarathne	Male	VOLUME	✓
8	K.L.Gunasinghe	Male	VOLUME	✓
16	H. Gunawardh...	Male	NON_VOLUME	✓
20	Vikramasinghe	Male	NON_VOLUME	✓
19	H. Perera	Male	NON_VOLUME	✓
7	A. Jayathilaka	Female	NON_VOLUME	✓
11	A. Paranawith...	Female	VOLUME	✓
15	D.C. Silva	Male	VOLUME	✓

Employee Preferences are indicated by a pie chart

Search option is given to search employee by name

3 Generate and view the schedule

After adding required details to the system administrator can generate the schedule.



This is the main UI of the system. This consists five main panels.

- Constraints panel
- Termination condition
- Resource Requirement indication panel
- Dynamic Schedule Indication panel
- Solution improvement indication Graph panel

3.1.1 Constraint Panel

Options given

- Continuous allocation
Allocate employee in continuous time slots, without having gaps between working time slots.
- Lunch break with in time
Allocate employee lunch break with in pre defined time slots by administrator. For example if administrator has configured 12.00-1.00 time slot and 1.00-2.00 time slots as preferred lunch break time slots ,employees are kept free during at least in one time slot.
- Employee capability
Allocations happen according to the employee capabilities.
- Employee Priorities
Allocations happen according to employee priorities defined by the administrator.
- Min max working hours for day
Satisfy the condition of working hour constraint. Minimum and maximum hours are defined by the administrator when configuring the system.
- Min max shift length
Define a shift length range that employee can work continuously. This minimum and maximum hours also configured by the administrator when configuring the system.

*Using the combo boxes user can specify weight to each constraint. This can be done according to the user requirements.

For example if user need continuous allocation constraint to be satisfied in a considerable way user can give high weight to it rather than other constraints.

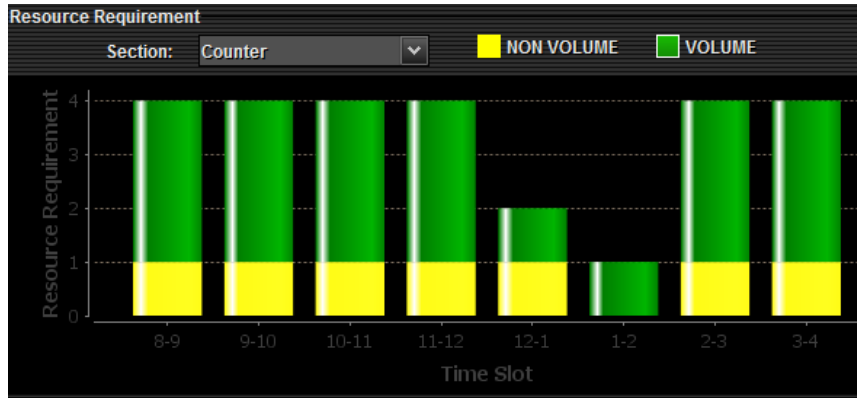
3.1.2 Termination condition panel

Here we have provided user to choose the termination condition according to their requirement. Four termination conditions are given.

- No progress in specified no of iterations
If there is no progress with in specified no of iterations, termination happens. Here we can't specify how long it will take to reach the termination condition. From the solution improvement indication graph you can visualize the progress.
- No progress in specified time limit
If there is no progress with in specified time limit, termination happens. Here also we can't specify how long it will take to reach the termination condition.
- Terminate in user specified time limit
Here termination happens with in user specified time.

- Terminate when required fitness value is reached
Termination happens when required fitness limit is reached.

3.1.3 Resource Requirement panel



This stack chart is to indicate current resource requirement for each section.

Green color represents Volume employees

Yellow color represents non volume employees

Example:

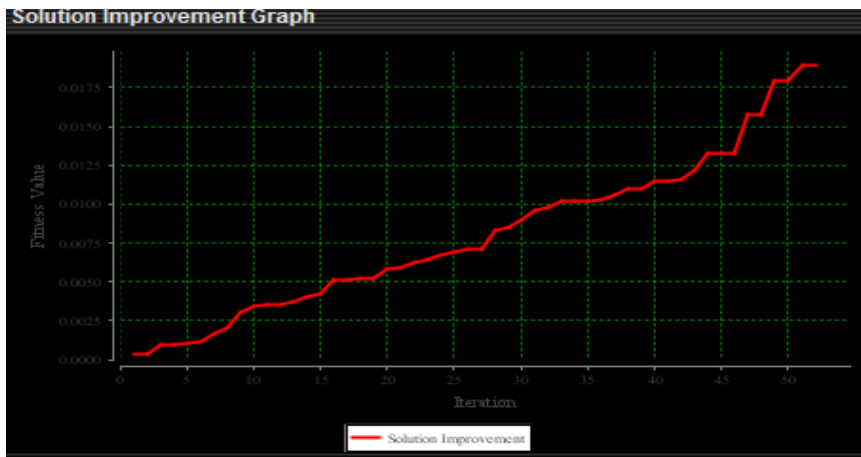
For time slot 8-9 ,for counter section total requirement of 4 employees and 1 is non volume and 3 is volume employees Dynamic Schedule Indication panel

This is also to indicate how the employee allocation is changing. This is also for indication purposes.

Employee	8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4
Emp 1			3			5	5	
Emp 2	4	4	4	5		3	3	3
Emp 3	4		5	3		3		4
Emp 4	2	4	1	4	3		1	3
Emp 5	4	3	3	3		2	3	2
Emp 6	5	2	4	5			4	4
Emp 7	3	2		4		2		1
Emp 8	5	5				4	4	4
Emp 9	3	4		5			3	
Emp 10			4	2	5			5
Emp 11	3			3	1		5	5
Emp 12	2	5	3	1		1	4	

3.1.4 Solution improvement indication Graph panel

This dynamic graph indicates how the fitness value improves with the number of iterations.



3.1.5 Constraint satisfaction check button

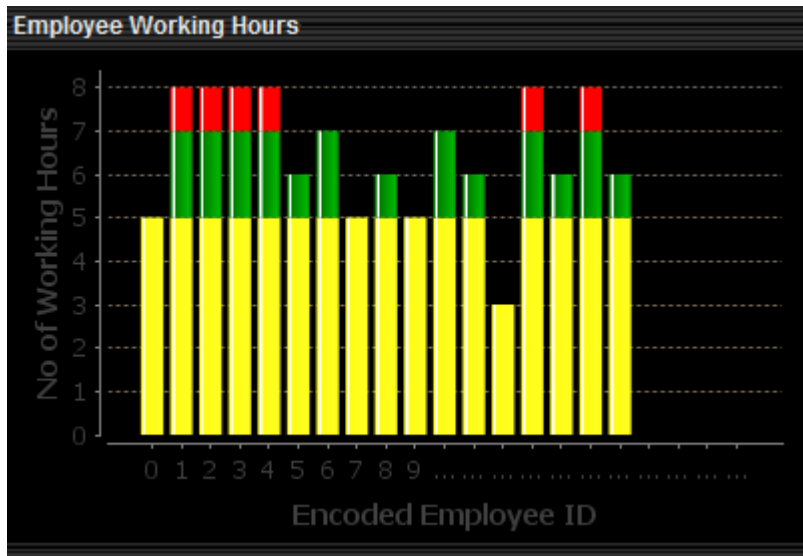
By clicking this user can check how the constraints have been satisfied in the system.



This UI contains main 3 panels

- Employee working hour rule satisfaction indication panel
- Resource requirement indication panel
- Constraint satisfaction level indication meters panel

- Employee working hour rule satisfaction indication panel

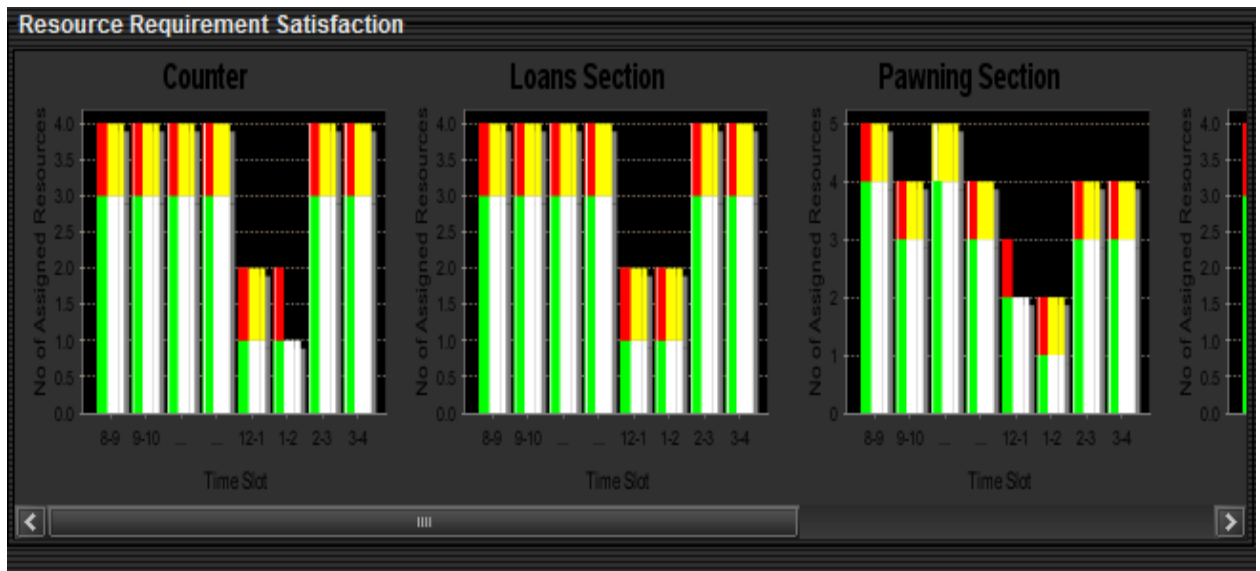


This chart indicates how the employees working hour constraint has been satisfied.

For this example minimum working hours is 6 hours and maximum is 7 hours.

Here employee 1 has assigned for 8 hours .So he is out of range.

- Resource requirement indication panel



This panel indicates how the resource requirement has been satisfied for each section.

Green color indicate volume employee requirement

White color indicate the assigned or allocated no of employees

Red color indicate the requirement of non volume employees

And yellow represents the assigned no of non volume employees

- Constraint satisfaction level indication meters panel



3.2 View the Schedule

Here we have provided two views

- Employee allocation view
- Section schedule view

3.2.1 Employee allocation view

Here is the screen shot of one generated schedule

Time Slot	Coaster	Loops Section	Prancing Section	Foreign Exchanges	Charge Exchanges
Time Slot 8:05-9:00	11 - A. Parasawithana	1 - W. Gurusanghe	9 - K.L. Sera	1 - W. Gurusanghe	12 - B. Hewage
	7 - A. Jayathilaka	12 - D.K. Subasinghe	12 - D.K. Subasinghe	9 - K.L. Sera	9 - K.L. Sera
	15 - D.C. Silva	1 - W. Gurusanghe	12 - D.K. Subasinghe	10 - B. Gunawardhana	17 - A. Jayathilaka
	3 - Rathnayaka	11 - A. Parasawithana	14 - Perera	15 - D.C. Silva	
Time Slot 9:00-10:00	10 - B. Gunawardhana	12 - D.K. Subasinghe	15 - O.C. Silva	13 - B. Hewage	9 - K.L. Sera
	15 - D.C. Silva	14 - Perera	17 - A. Sookjirachchi	7 - A. Jayathilaka	12 - B. Hewage
	3 - Rathnayaka	10 - D. Jayathilaka	10 - D. Jayathilaka	15 - D.C. Silva	7 - A. Jayathilaka
	1 - W. Gurusanghe	1 - W. Gurusanghe	6 - M.K.J. Jayarathne	6 - M.K.J. Jayarathne	4 - K.K. Perera
Time Slot 10:00-11:00	4 - K.K. Perera	10 - B. Perera	3 - Rathnayaka	12 - D.K. Subasinghe	18 - B. Perera
	25 - K.L. Perera	6 - M.K.J. Jayarathne	15 - D.C. Silva	1 - W. Gurusanghe	21 - K.L. Perera
	1 - W. Gurusanghe	13 - B. Hewage	9 - K.L. Sera	3 - Rathnayaka	
	7 - A. Jayathilaka	19 - B. Perera	1 - W. Gurusanghe	6 - M.K.J. Jayarathne	
Time Slot 11:00-12:00	15 - D.C. Silva	19 - B. Perera	10 - B. Gunawardhana	21 - K.L. Perera	4 - K.K. Perera
	11 - A. Parasawithana	13 - B. Hewage	9 - K.L. Sera	10 - D. Jayathilaka	11 - A. Parasawithana
	10 - D. Jayathilaka	11 - A. Parasawithana	3 - Rathnayaka	9 - K.L. Sera	10 - B. Perera
	4 - K.K. Perera	9 - K.L. Sera	1 - W. Gurusanghe	4 - K.K. Perera	14 - Perera
Time Slot 12:00-1:00	10 - B. Perera	19 - B. Perera	15 - D.C. Silva	17 - A. Sookjirachchi	9 - K.L. Sera
	10 - B. Gunawardhana	6 - M.K.J. Jayarathne	13 - B. Hewage	17 - A. Sookjirachchi	10 - B. Perera
	12 - D.K. Subasinghe	12 - D.K. Subasinghe	16 - H. Gunawardhana	9 - K.L. Sera	9 - K.L. Sera
	1 - W. Gurusanghe	14 - Perera	1 - W. Gurusanghe	17 - A. Sookjirachchi	9 - K.L. Sera
Time Slot 1:00-2:00	11 - A. Parasawithana	15 - D.C. Silva	13 - B. Hewage	7 - A. Jayathilaka	7 - A. Jayathilaka
	1 - W. Gurusanghe	9 - K.L. Sera	15 - D.C. Silva	4 - K.K. Perera	8 - M.K.J. Jayarathne
	19 - B. Gunawardhana	1 - W. Gurusanghe	6 - M.K.J. Jayarathne	17 - A. Sookjirachchi	10 - B. Perera

Green color labels represent volume employees and yellow color labels represent the volume employees. By clicking on the each cell of the table you can get a detailed description about

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the user.

Employee Allocation		Section Schedule			
Time Slot	Counter	Loans Section	Pawning Section	Foreign Exchange	
Time Slot 8.00-9.00	11 - A. Paranawithana	1 - W. Gunasinghe	9 - K.L.Sera	1 - W. Gunasinghe	
	7 - A. Jayathilaka	12 - D.K.Subasinghe	12 - D.K.Subasinghe	9 - K.L.Sera	
	15 - D.C. Silva	1 - W. Gunasinghe	12 - D.K.Subasinghe	16 - H. Gunawardhana	
	3 - Rathnayaka			D.C. Silva	
Time Slot 9.00-10.00	16 - H. Gunawardhana			N. Hewage	
	15 - D.C. Silva			Jaya	
	3 - Rathnayaka			D.C. Silva	
Time Slot 10.00-11.00	1 - W. Gunasinghe			K.K.J.Jayathilaka	
	4 - S.K.Perera			D.K.Su	
	21 - K.L.Perera	6 - M.K.J.Jayarathne	15 - D.C. Silva	1 - W. Gunasinghe	
	1 - W. Gunasinghe	13 - N. Hewage	9 - K.L.Sera	3 - Rathnayaka	
	7 - A. Jayathilaka	19 - H. Perera	1 - W. Gunasinghe	6 - M.K.J.J.	

3.2.2 Section schedule view

This view is to indicate how each employee is assigned for time slots and for the sections.

Employee Allocation		Section Schedule							
Employee	8:0	9:10	10:11	11:12	12:1	1:2	2:3	3:4	
1 D.K.Marasinghe									
3 Rathnayaka	Counter	Counter	Foreign Exchanges	Pawning Section				Loans Section	
4 S.K.Perera		Cheque Exchanges	Counter	Foreign Exchanges			Foreign Exchanges		
5 K.K.J.Jayarathne									
6 M.K.J.Jayarathne		Foreign Exchanges	Loans Section		Loans Section		Cheque Exchanges	Pawning Section	
7 A. Jayathilaka	Counter	Foreign Exchanges	Counter				Foreign Exchanges	Pawning Section	
8 K.L.Gunasinghe									
9 K.L.Sera	Foreign Exchanges	Cheque Exchanges	Pawning Section	Foreign Exchanges	Cheque Exchanges	Cheque Exchanges	Loans Section	Foreign Exchanges	
10 H. Perera			Loans Section		Counter		Cheque Exchanges		
11 A. Paranawithana	Loans Section			Counter			Counter	Foreign Exchanges	
12 D.K.Subasinghe	Pawning Section	Loans Section	Foreign Exchanges		Counter	Counter	Pawning Section		
13 H. Hewage	Cheque Exchanges	Cheque Exchanges	Loans Section	Loans Section	Pawning Section		Pawning Section	Cheque Exchanges	
14 Piers	Pawning Section	Loans Section		Cheque Exchanges		Loans Section		Counter	
15 D.C. Silva	Foreign Exchanges	Pawning Section	Pawning Section	Counter	Pawning Section	Pawning Section	Loans Section	Loans Section	
16 H. Gunawardhana	Foreign Exchanges	Counter		Pawning Section	Counter		Pawning Section		
17 A. Sooriyachchi	Cheque Exchanges	Pawning Section			Foreign Exchanges	Foreign Exchanges		Loans Section	
18 D. Jayathilaka		Loans Section		Foreign Exchanges			Counter	Loans Section	

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Other than that we have given chance to user to print these schedules .by clicking the icon users can get print of the schedules.

