MOBILE INDUSTRIAL ROBOTS

MiR100 Web Interface

User Guide

Version 1.1

MiR100 1.1

Introduction - MiR100

MiR100 is an automatic vehicle that transports items internally in production companies, hospitals, warehouses, malls and other places.

Through a web interface, the user specifies a destination for the delivery of the goods. MiR100 can be set up to run a specific route (bus), come on demand (taxi), deliver goods (mail).

MiR100 has a map, which is build when the vehicle is first put in service. While driving, MiR100 automatically avoids obstacles (people, furniture) that are not on the map. MiR100's internal map contains defined positions (office, hall, John's place,…).

This user guide describes the Mir100 Web Interface for controlling the vehicle and building the map as well as other administrative tasks and information.

Specification

Load area:	600 x 800 mm - ½ EU pallet
Load weight:	100 kg
Run time:	13 hours or 20 km
Maximum speed:	5.4 km/h

Background knowledge and koncepts for operation of MiR100

MiR100 Web Interface

The vehicle is controlled and configured from a web interface through a browser. Control and configuration of the vehicle is described in this guide which is mainly targetting administrators and superusers.

Any MiR100 vehicle has its own web server which is accessible either through the internal network of the vehicle of through the network of the customer site.

Web adress for the internal network of the vehicle: mir.com.

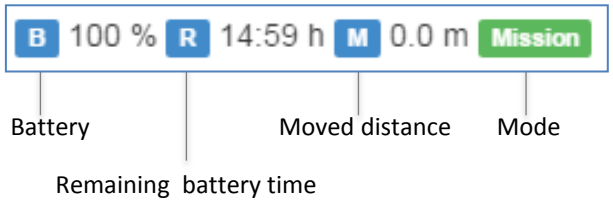
Compatible browsers: IE 10 and11, Firefox, Chrome.

MiR100 Modes

The vehicle has different modes that determine which commands are available and the behaviour of the vehicle:

- No map – the vehicle is waiting the assignment of a specific area or new map.
- Ready – the vehicle is ready for maneuvering by joystick or an operation pattern can be started.
- Operation patterns: taxi, mail, bus – these defines the daily driving at the customer site. The user receives and deliveres goods.
- Map – creation and editing of a map of a specific area.
- Pause – waiting.

MiR100's operating status and mode are shown at the bottom of the page:



Objects on the floor:

MiR100 "sees" objects of 5 cm and above and avoids them.

The rest is passed over.

Area, Map, Mission

When MiR100 is run in for the first time, areas with accompanying maps are created – eg. Ground Floor, Hall. For each area a number of positions are created – eg. John Smith's office.

On start-up of MiR100 for daily usage an area is selected and the robot mode is set to mission.

The mission decides how MiR100 performs its transportation tasks and moves from position to position. MiR100 is delivered with predefined as well as configurable missions:

- Taxi
- Route

When the vehicle reaches a position, the MiR100 executes a number of actions determined by the current mission.

Taxi

The vehicle's destination is provided either through MiR Web Service or directly on the robot. The vehicle then determines the route from its current position to the new destination and starts moving.

Route

The vehicle runs a route between positions. At each position, packages can be loaded and a text or mail message can be sent to recipients.

After finalising the route the vehicle either returns to the central station or starts over.

Mission

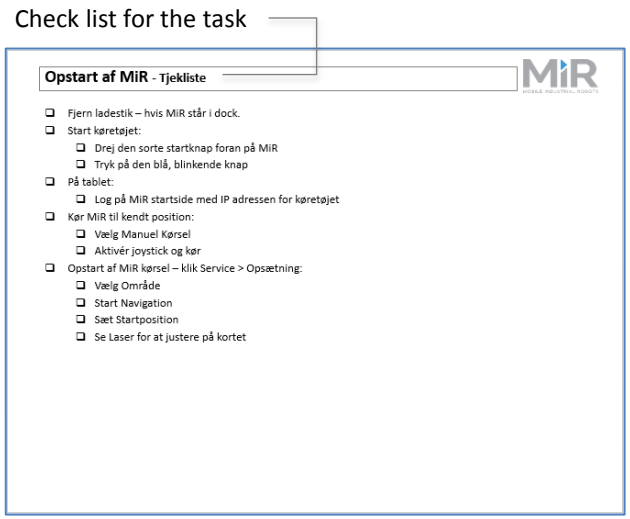
The Mission interface is used for controlling the robot's queue of missions to execute. Each mission consists of a number of *actions* such as ”go to position”, ”make sound”, ”call elevator”.

Introduction to User Guide

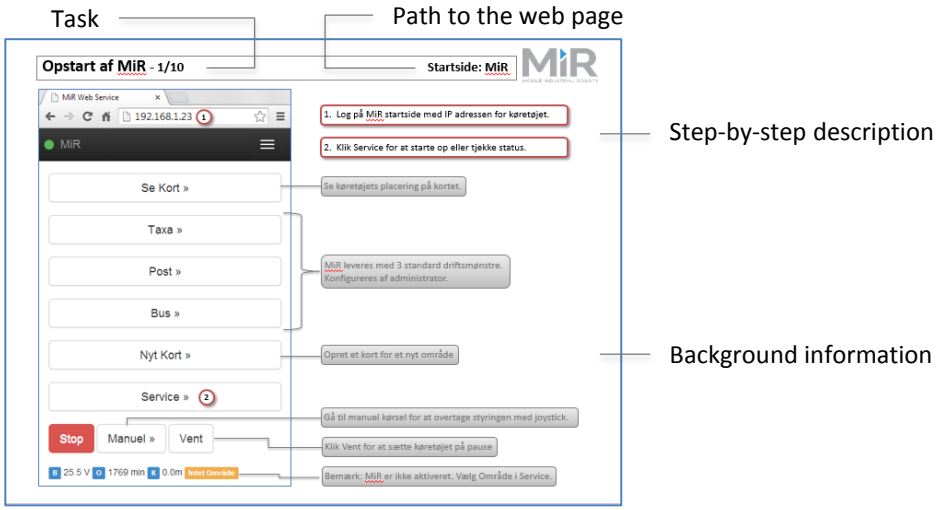
This user guide is divided into the following sections:

- Starting up of MiR100
- Taxi service by MiR100
- Route service by MiR100
- Mission queue
- Manually driving using joystick
- Creating a new map
- Editing a map - Administrator
- MiR100 status – Administrator
- MiR100 configuration - Administrator

Each section is introduced by a check list which is then elaborated by a picture and step-by-step description of the task:



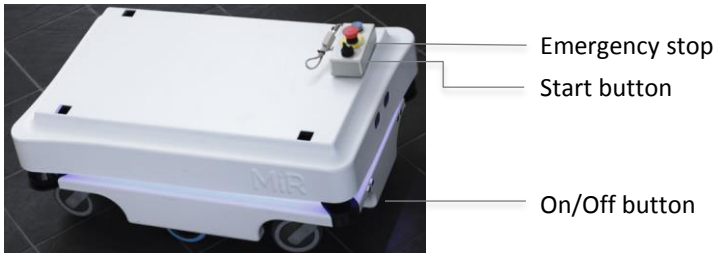
Check list for a task



Step-by-step procedure

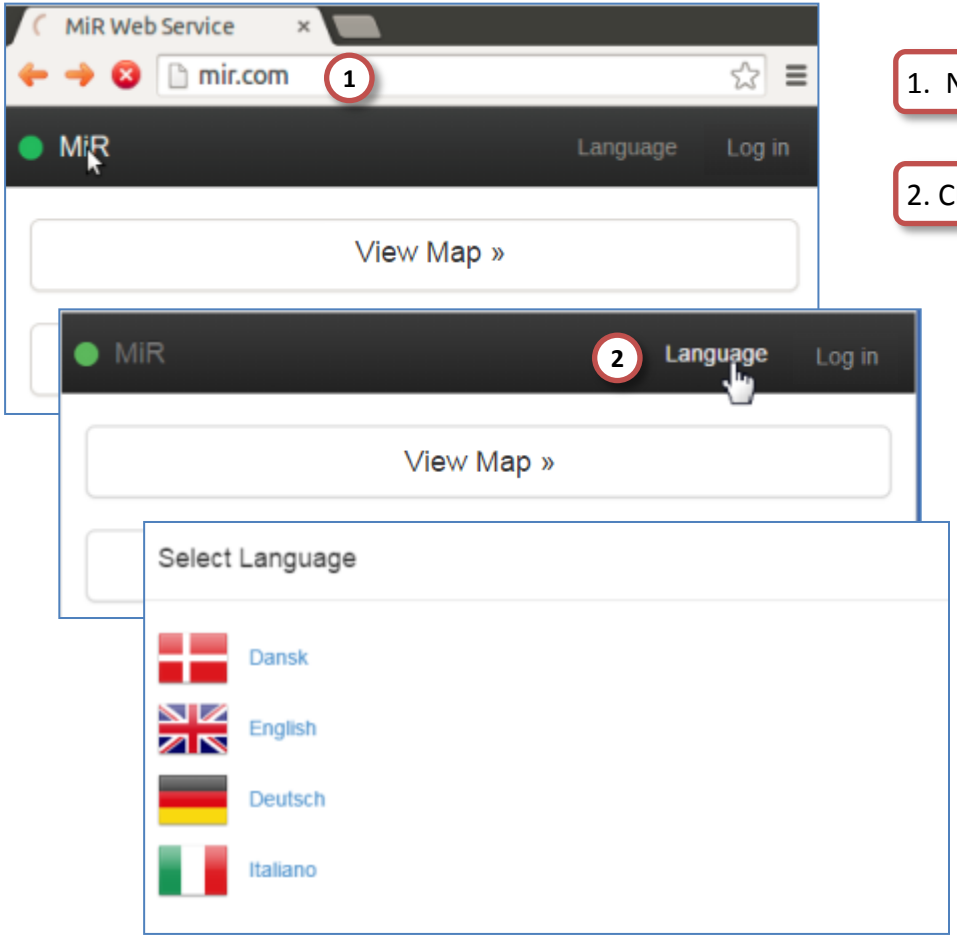
Start up of MiR100 – Check list

- ❑ Remove charger – if MiR100 is docked.
- ❑ Start up the vehicle:
  - ❑ Turn the black starter knop in the front of MiR100
  - ❑ Push the blue, blinking button
- ❑ On tablet:
  - ❑ Go to MiR100 start page mir.com and log in
- ❑ To start up MiR100 driving – click Service > Choose Area
  - ❑ Set start position of the vehicle
  - ❑ Adjust map



Start up of MiR100 - 1/7

Start page: MiR

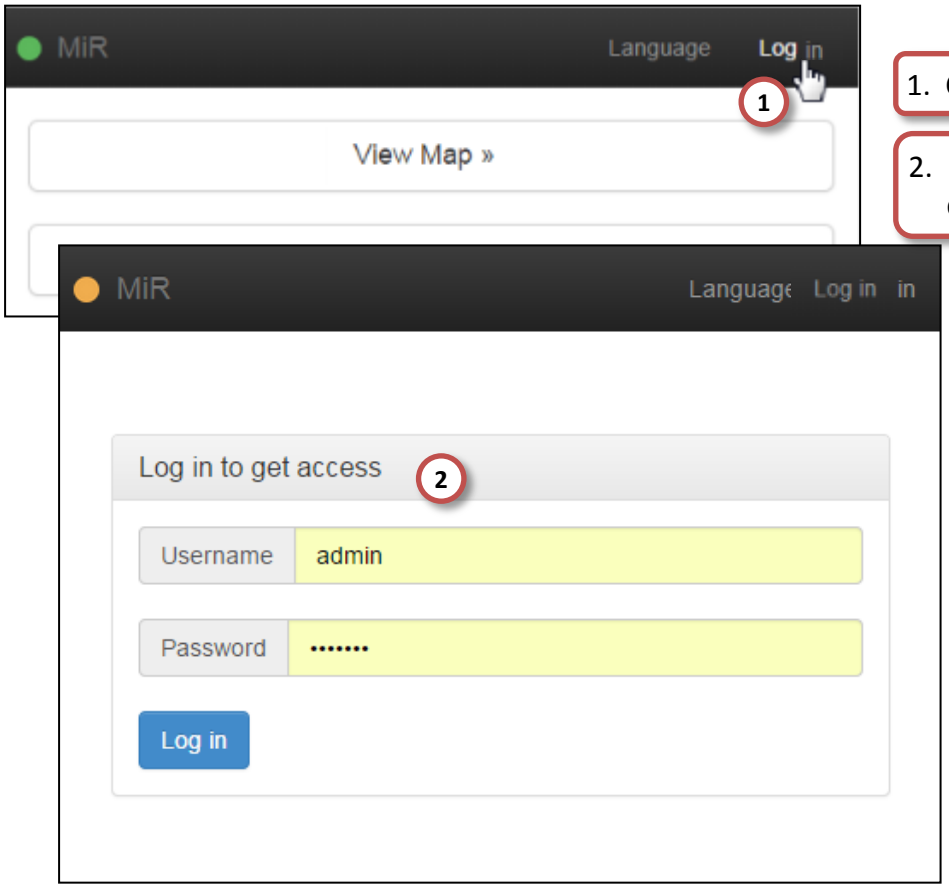


1. Navigate to MiR start page.

2. Choose language – Language.

Start up of MiR100 - 2/7

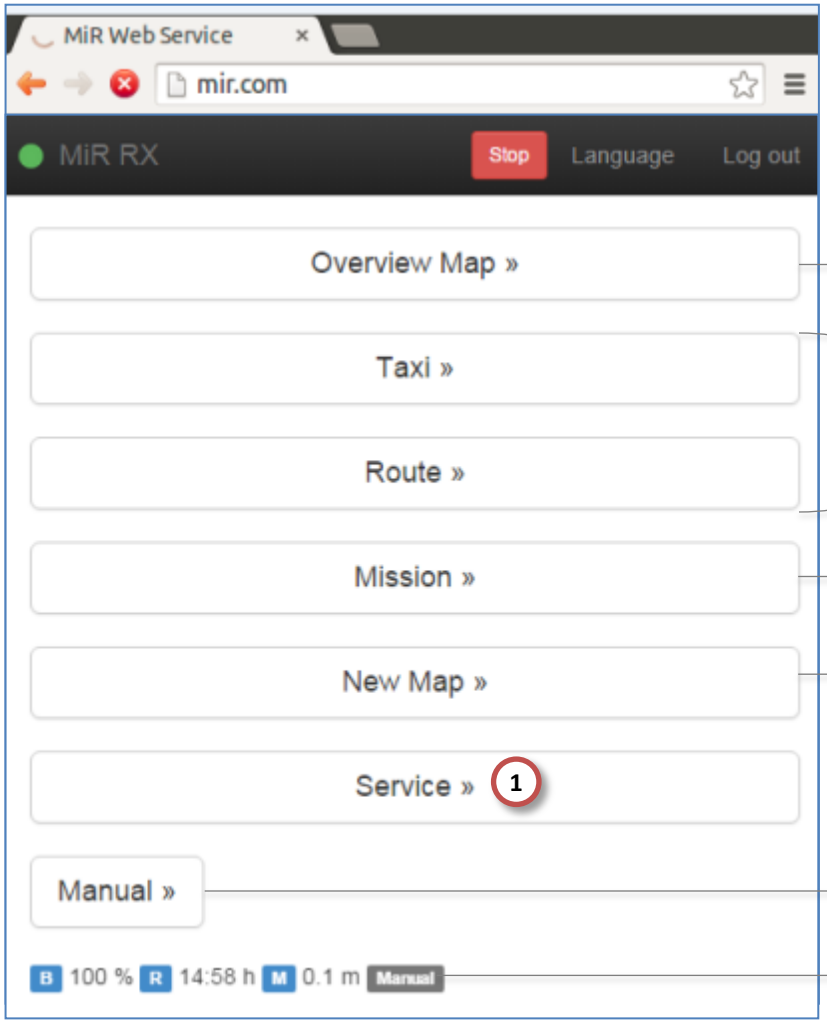
Start page: MiR



1. Click Log in.
2. Log in with user name and password – this user guide describes tasks for the administrator role.

Start up of MiR100 - 3/7

Start page: MiR



Has now logged in.

1. Click Service to start up or check status.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

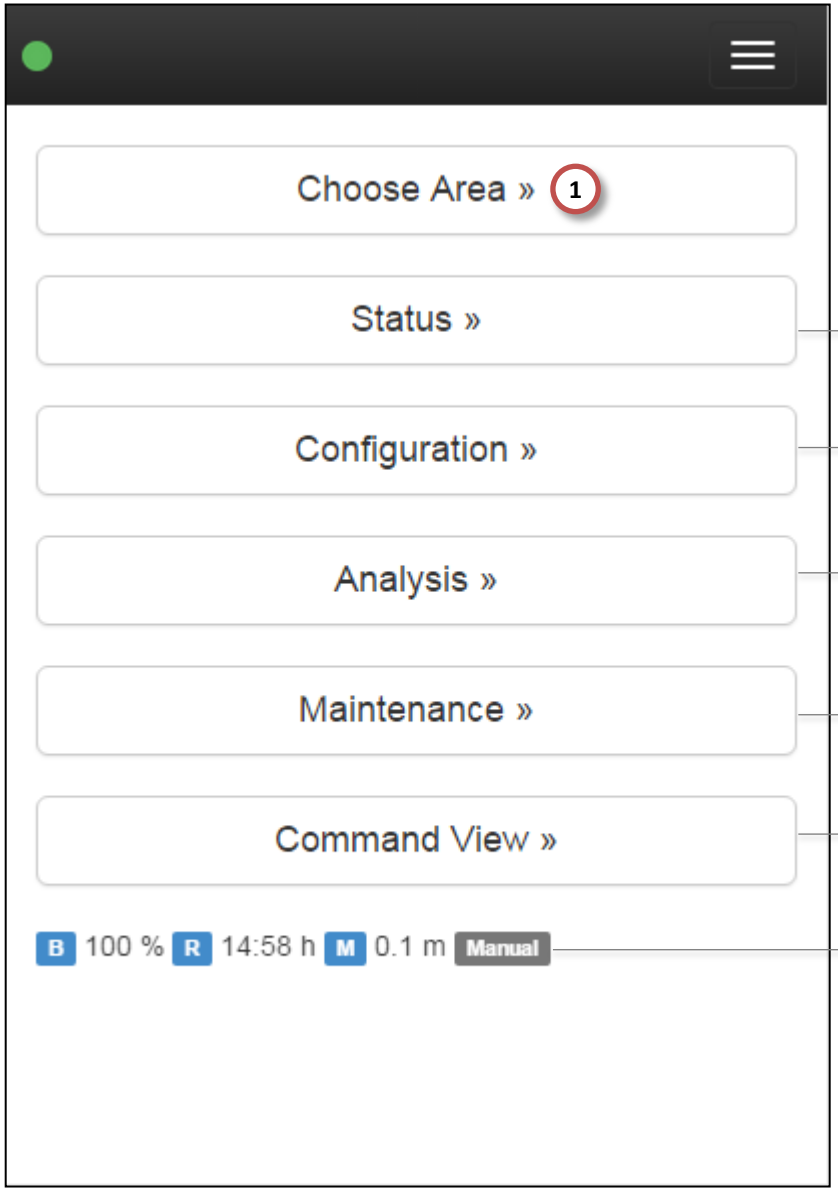
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Start up of MiR100 - 4/7

MiR > Service



1. Choose the area - the vehicle is physically located here.

Log, status, system information.

Basic setup – rarely used.

Overview over driving – location, distance, status.

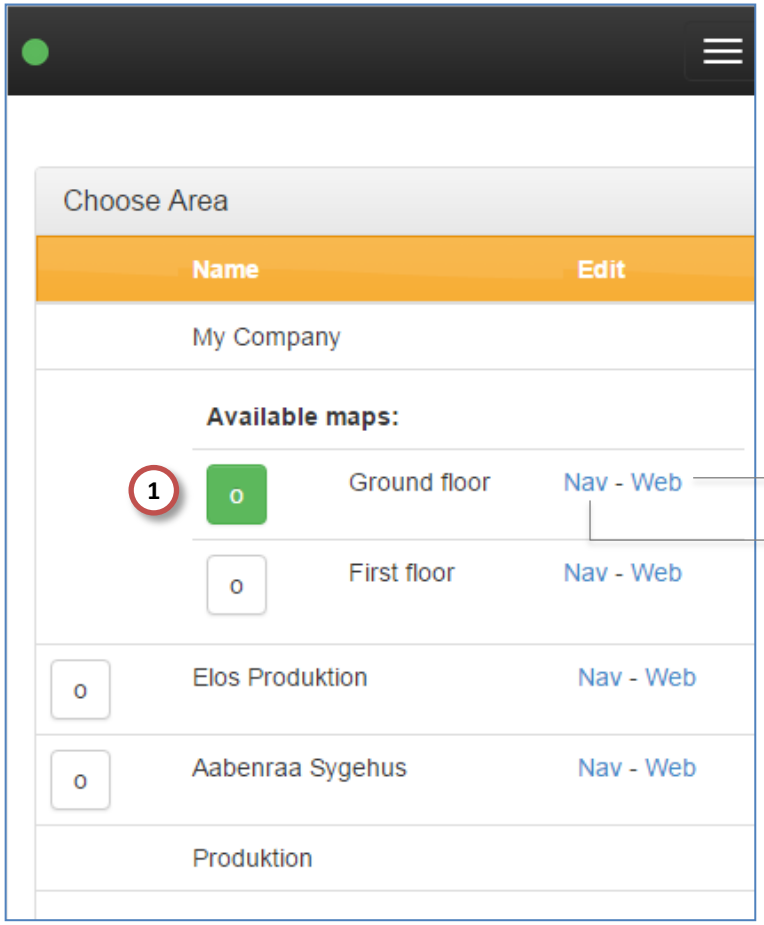
Backup, restore, remote access, wifi.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

Start up of MiR100 - 5/7

MiR > Service > Choose Area



1. Activate area by clicking the square.

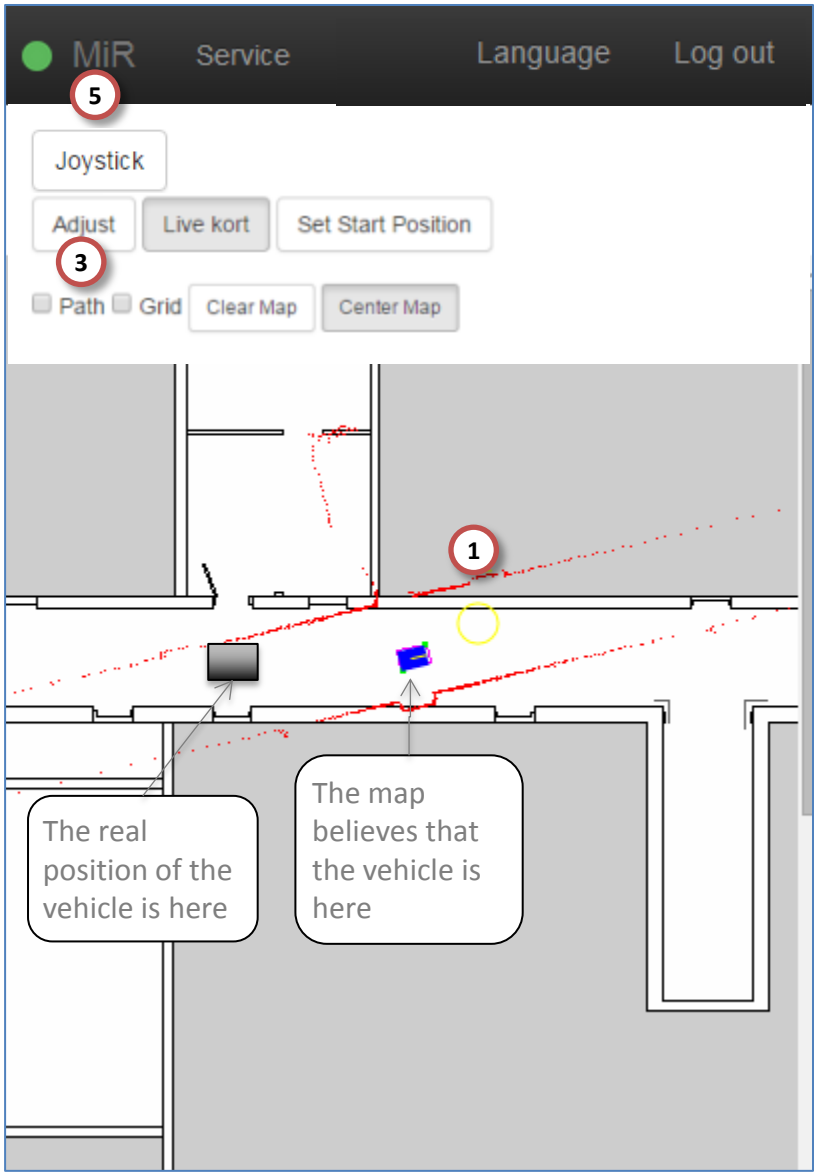
Automatically enters command view for synchronizing the exact location of the vehicle with the map.

Edit the look of the map – not the navigation area.

Edit the map for MiR100 – edit allowed navigation area.

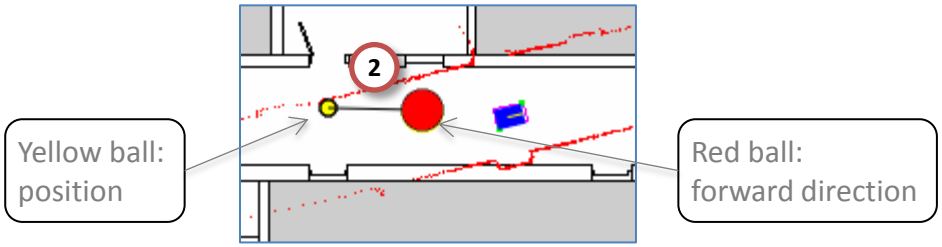
Start up of MiR100 - 6/7

MiR > Service > Command View



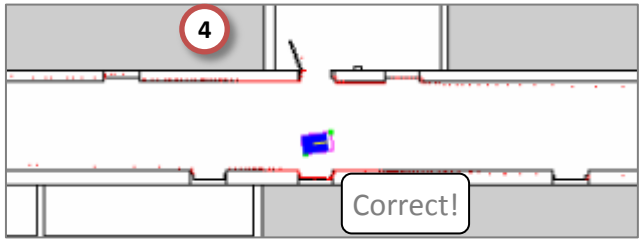
1. Red lines (the sensors of the vehicle) must match the black lines of the map. Done in step 2.

2. Mark the real location of the vehicle on the map: **click and drag the mouse** – like driving using joystick.



3. Update the map. Click Adjust.

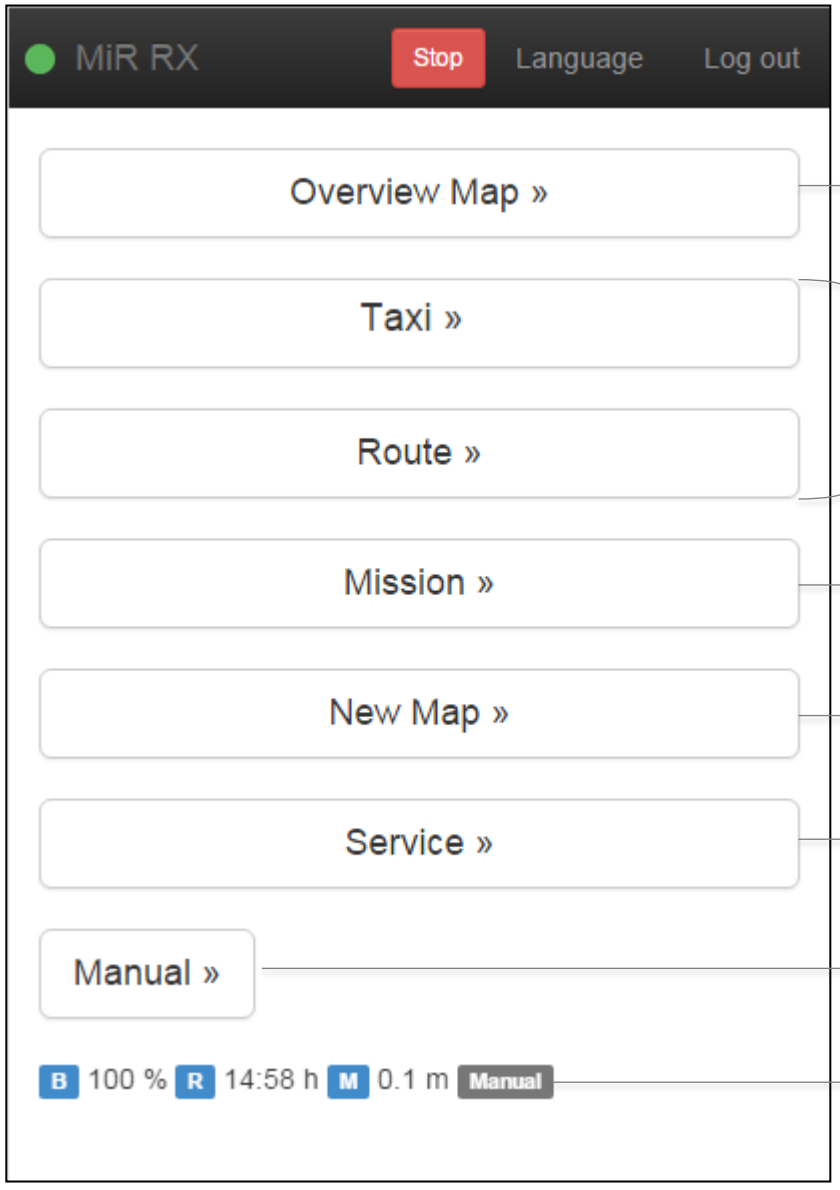
4. The vehicle and the map are now in sync.



5. Go back to the MiR start page.

Start up of MiR100 - 7/7

Start page: MiR



MiR100 is now started and ready for driving.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

Create a map of a new area.
You must be logged in to see this button.

Click Service to start up MiR100 or check status.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

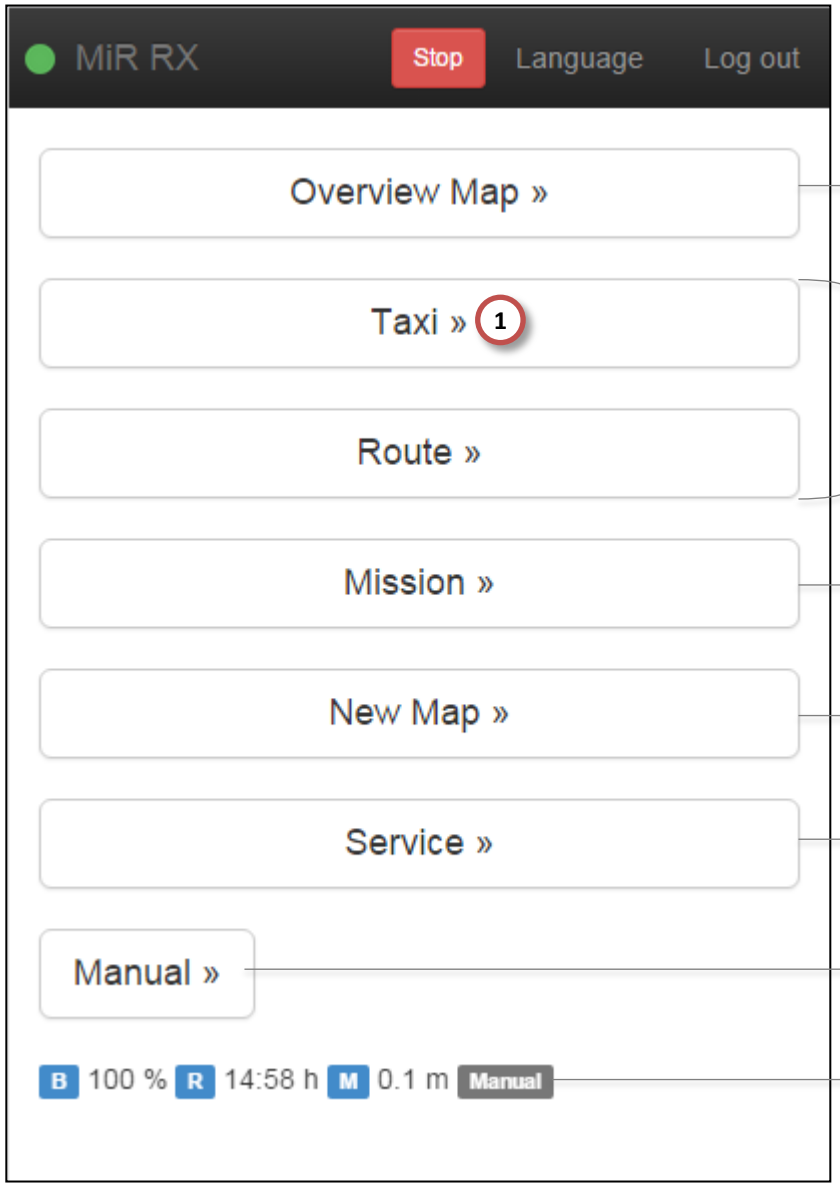
Taxi Service by MiR100 – Check list

- ❑ From the start page, select an operation pattern (Taxi)
- ❑ Start taxi service, then choose position
- ❑ Look at the Taxi page: next target, remaining distance, location on map…

- ❑ For administrator:
  - ❑ Edit and Create taxi positions

Taxi by MiR100 - 1/6

Start page: MiR



1. Click Taxi to start up taxi pattern by MiR100.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

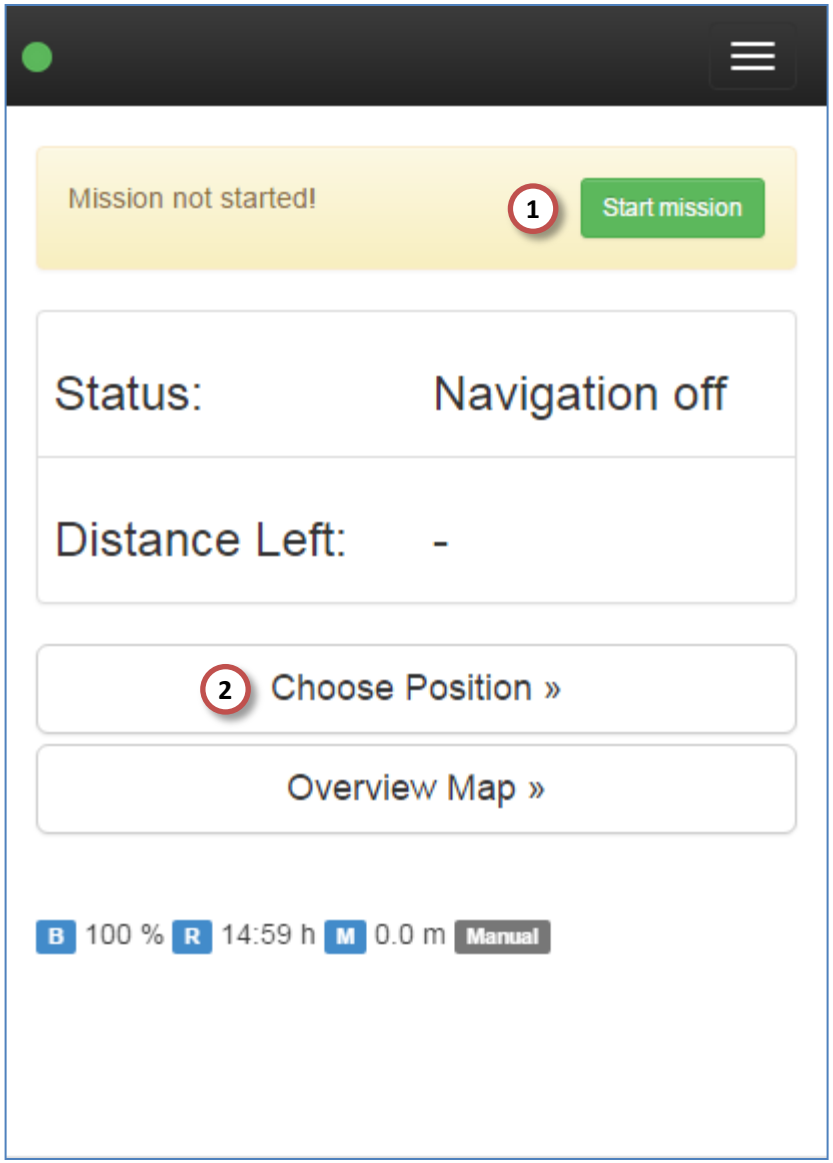
Create a map of a new area.
You must be logged in to see this button.

Click Service to start up MiR100 or check status.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Taxi Service by MiR100 - 2/6



1. Start mission – if not already started.

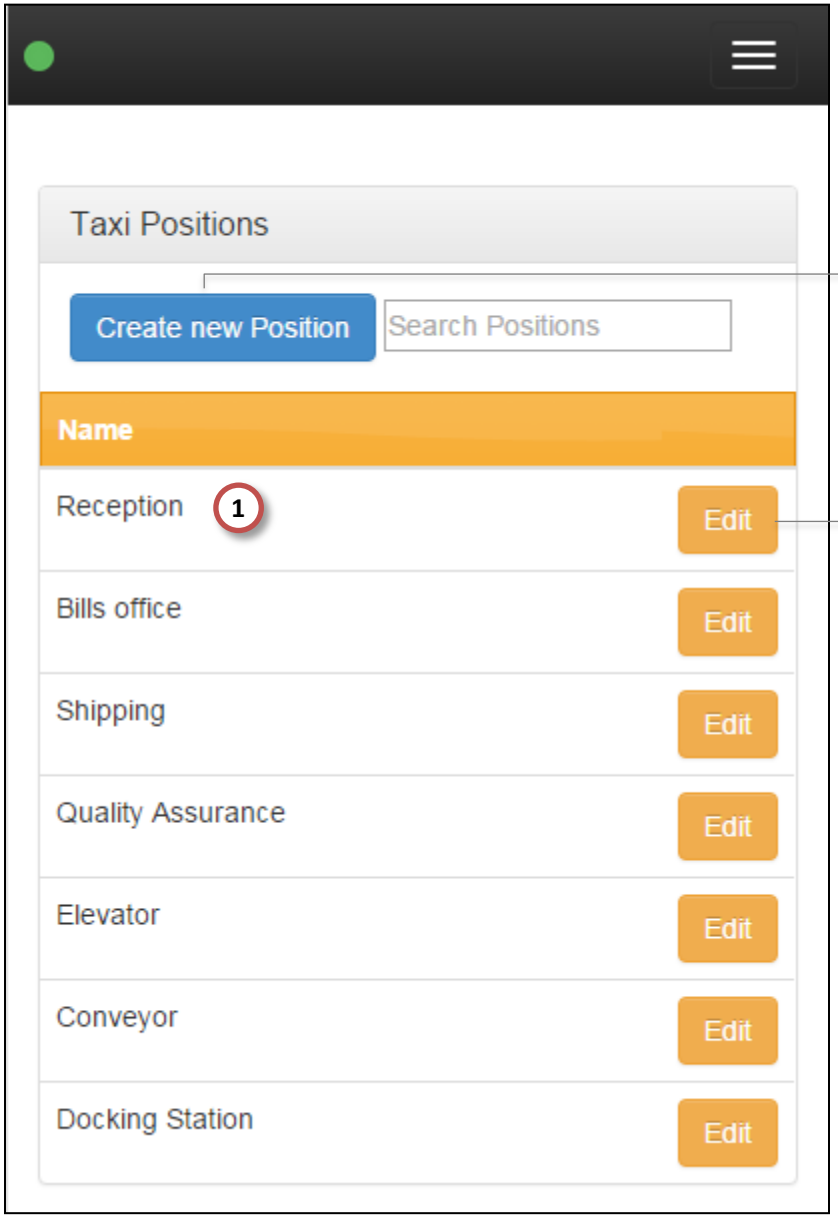
2. Choose Position – this is the destination.

MiR100's colors:

Green:	Waiting for job
Turquoise:	Driving to target
Purple:	Can't find target
Yellow-purple:	Skidding
Blue:	Joystick driving

Taxi Service by MiR100 - 3/6

MiR > Taxi > Choose Position

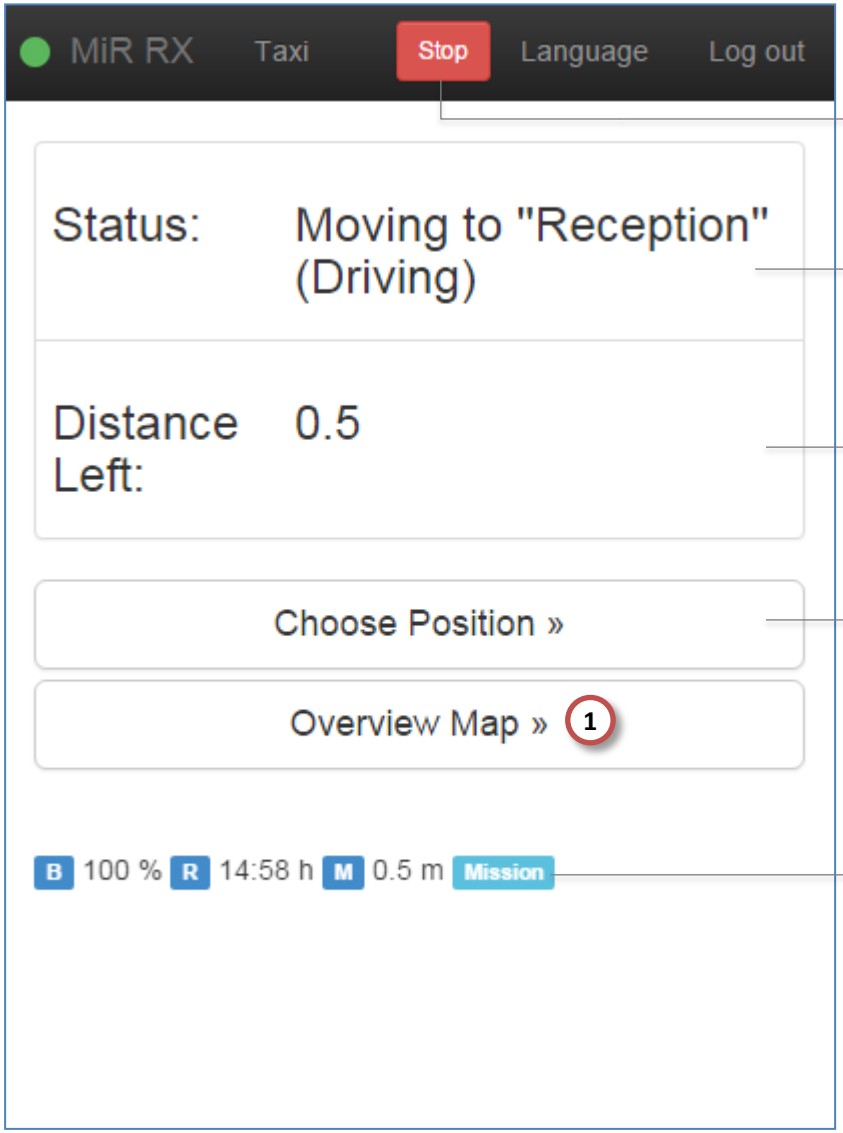


1. Select which position to drive to, eg Reception.

The vehicle starts driving and the Taxi page is automatically shown.

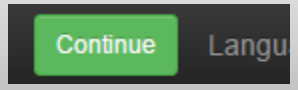
Only administrators can create and edit positions.

Taxi Service by MiR100 - 4/6



1. See the position of the vehicle on the map…

Stop and pause mission when necessary.
Then: Click Continue to resume mission.



When taxi service is active, Status shows the next destination of the vehicle…

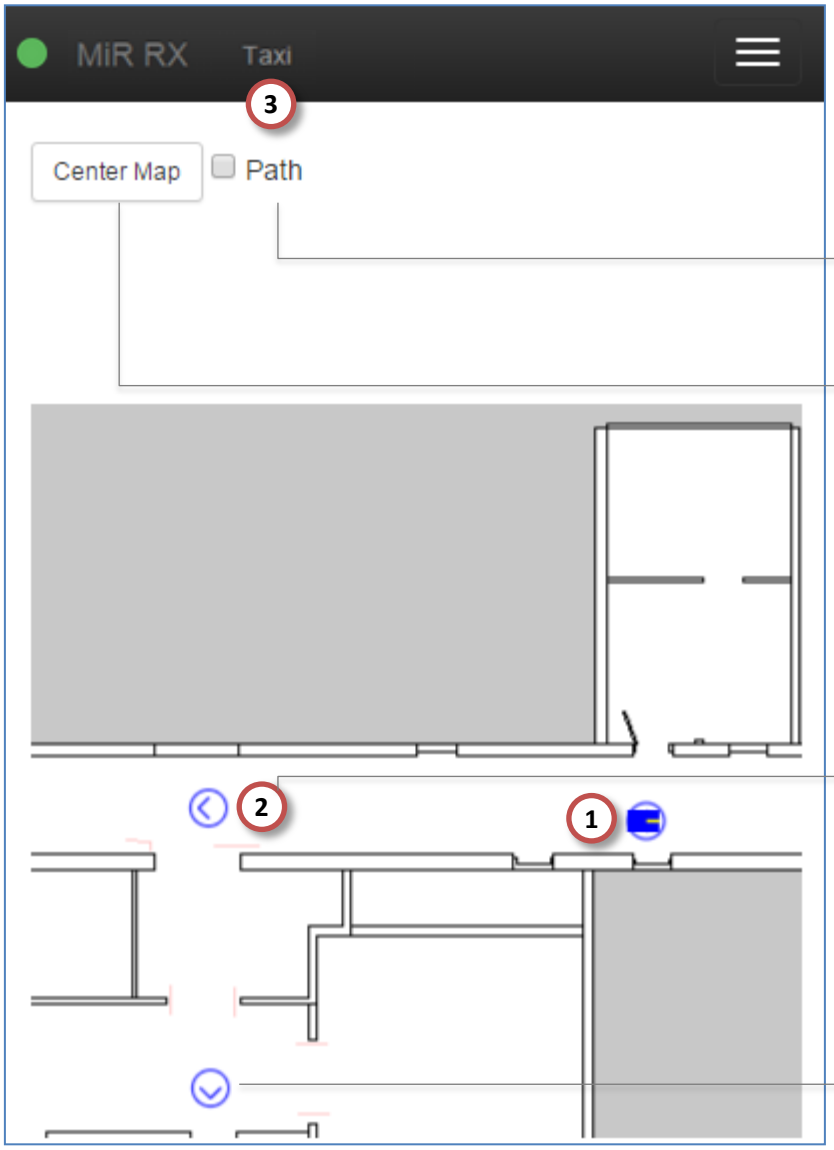
..and how many meters remain to reach the target.

Choose next destination.

MiR100 now runs a mission.

Taxi Service by MiR100 - 5/6

MiR > Taxi > Overview Map



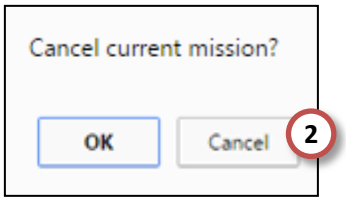
1. *See the position of the vehicle on the map…*

2. Click a position and select Go to Position to set a new destination.
   If robot is moving, click Cancel to change destination.

3. Return to MiR > Taxi – ready for a new destination.

Show planned path to next position

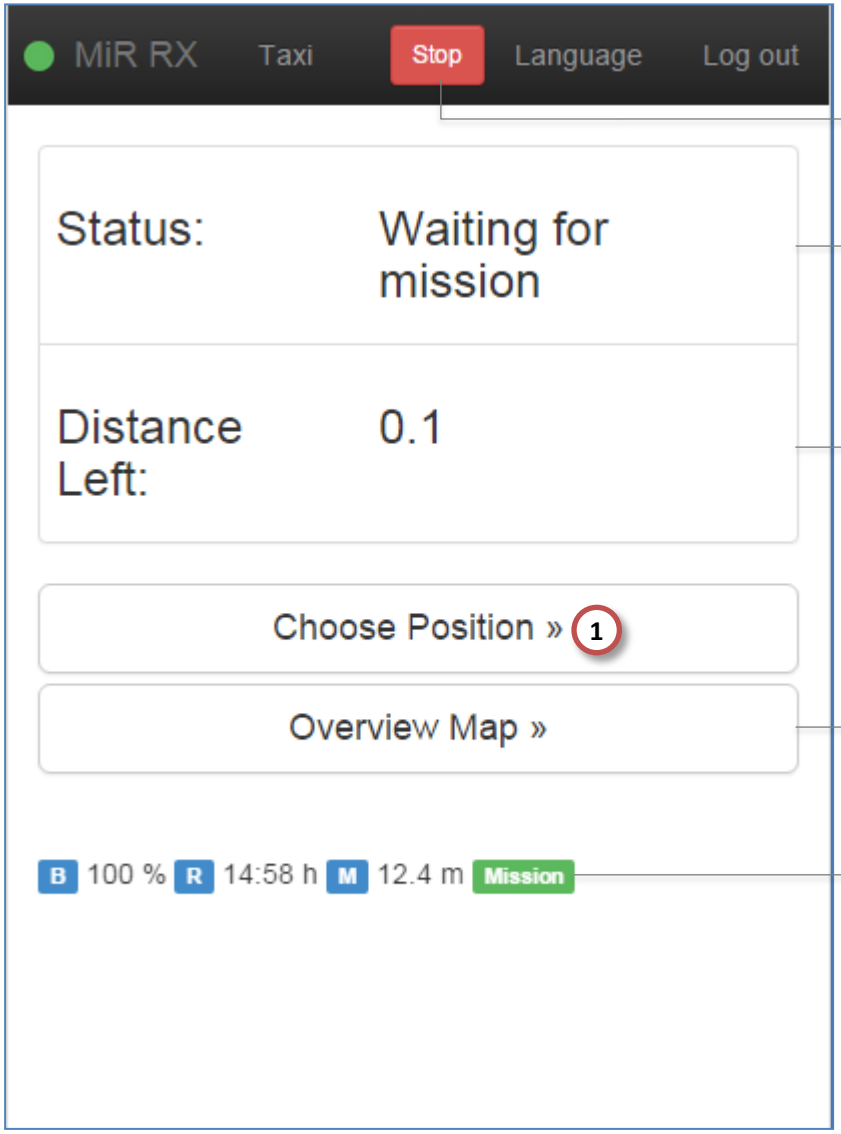
Click to center the map on the vehicle.



Position and orientation – blue circle and forward direction.

Taxi Service by MiR100 - 6/6

MiR > Taxi



1. Create and edit positions.

Stop mission when necessary.
Then: Go to start page for Joystick driving or new mission.

When taxi service is active, Status shows the next destination of the vehicle…

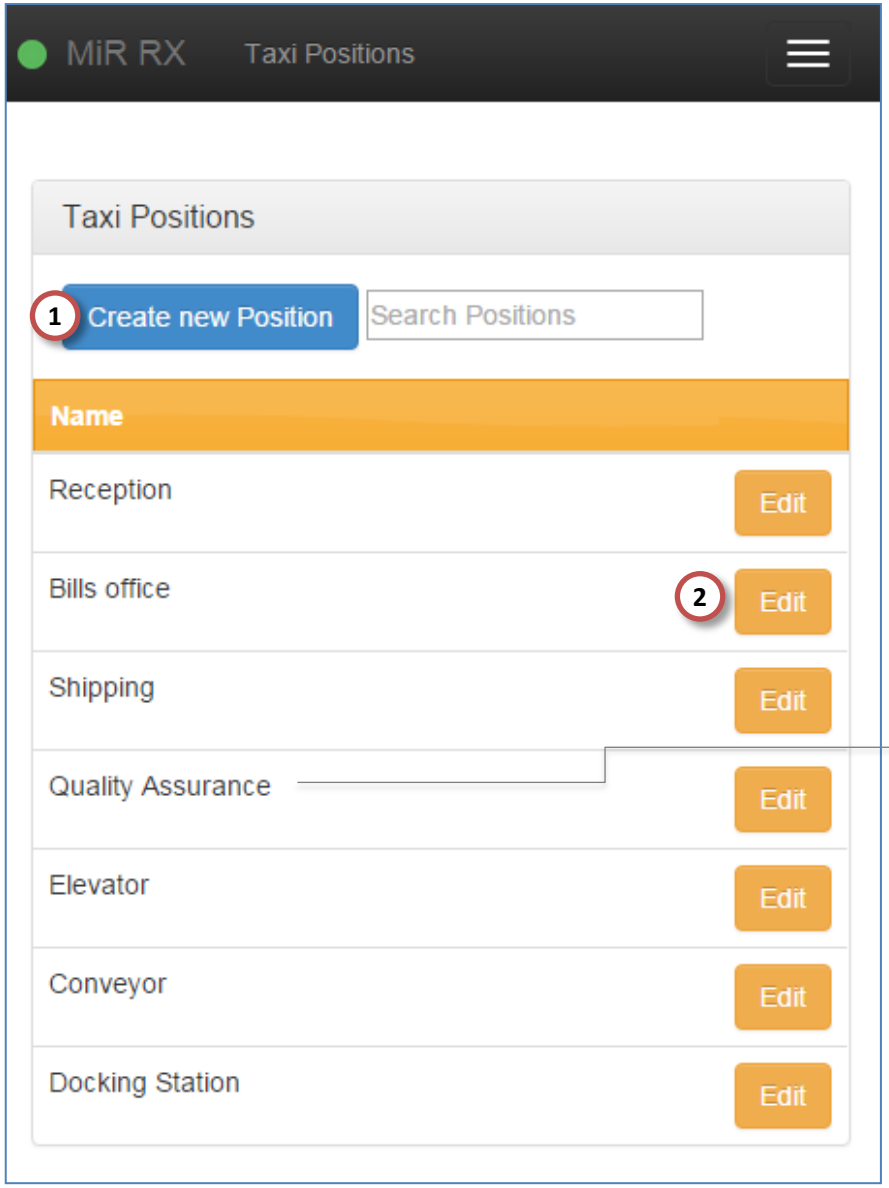
..and how many meters remain to reach the target.

See the position of the vehicle on the map…

MiR100 is waiting for a mission.

Taxi Service - Administrator 1/2

MiR > Taxi > Choose Position



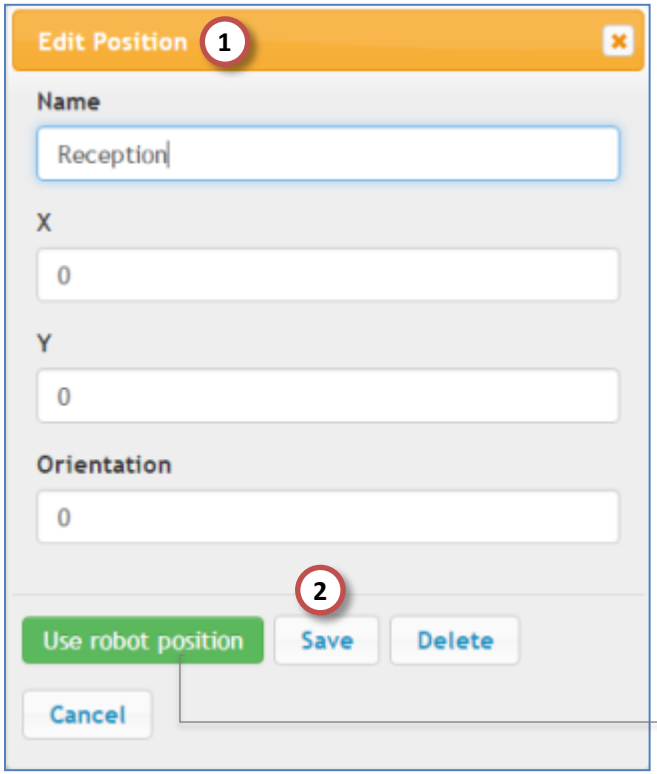
1. Create a new taxi position.

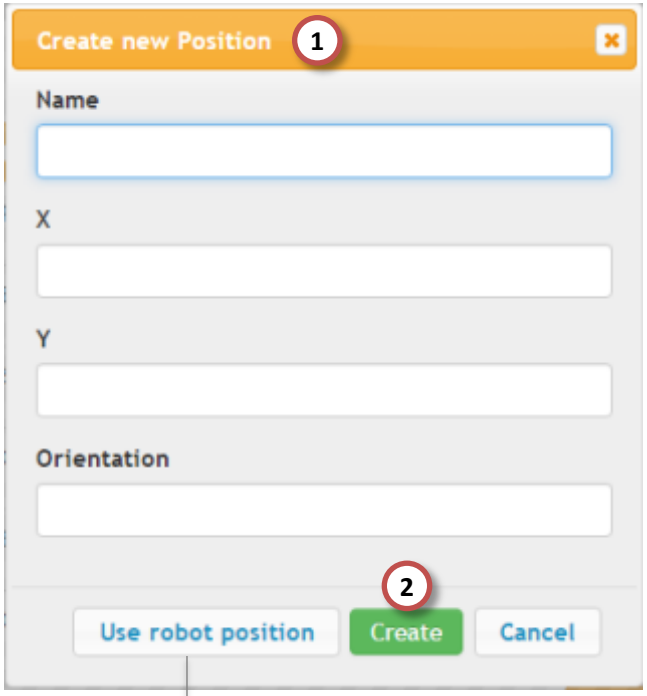
2. Edit an existing taxi position.

Click a position, eg. Quality Assurance.
The vehicle starts driving and the Taxi page is automatically shown.

Taxi Service - Administrator 2/2

MiR > Taxi > Choose Position > Edit/Create





1. Fill in all fields.

2. Accept the changes – click Save or Create button.

3. Go back to MiR > Taxi - ready for a new destination.

Use an existing position as a starting point - fields are automatically filled in and can be edited.

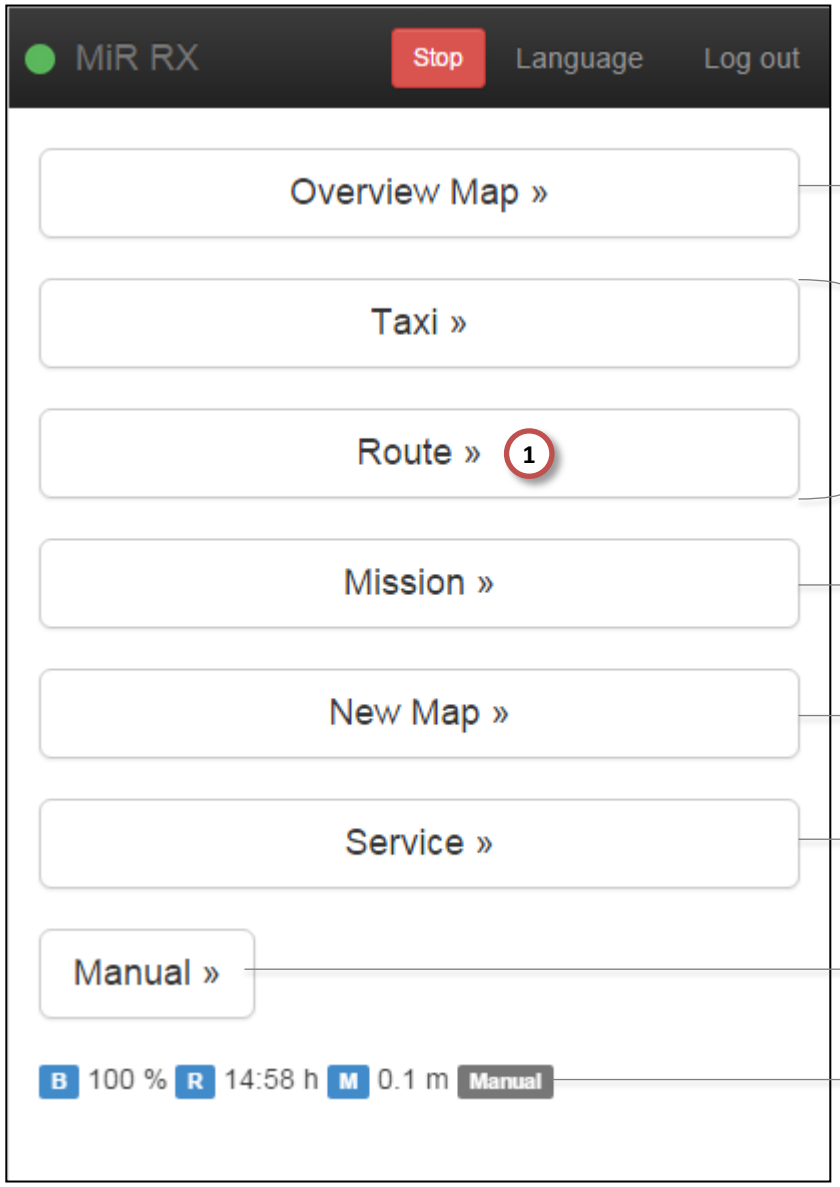
Route by MiR100 – Check list

- ❑ From the start page, select Route to plan and add a mission to the queue
- ❑ Add packages and set the initial position
- ❑ Decide optional behaviour: Run the route without packages, use package types, …

- ❑ For administrator:
  - ❑ Edit and Create route, stops, packages

Route by MiR100 - 1/6

Start page: MiR



1. Click Route to set up and start a route mission.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

Create a map of a new area.
You must be logged in to see this button.

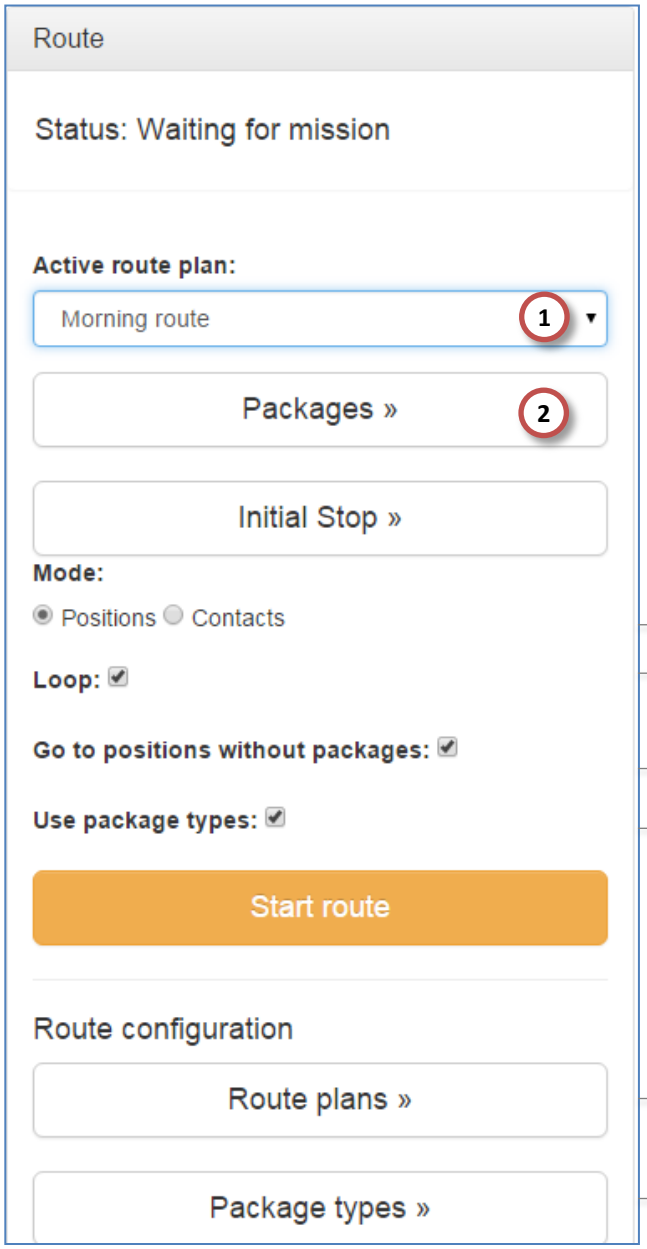
Click Service to start up MiR100 or check status.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Route by MiR100 - 2/6

MiR > Route



1. Select a route.

2. Add packages.

Select destination type: Positions on map or Contacts with mail/phone. (Manage positions and contacts in MIR > Service > Configuration)

Check Loop to make the vehicle run the route continuously.

Check here to just stop at each destination – no waiting for package reception.

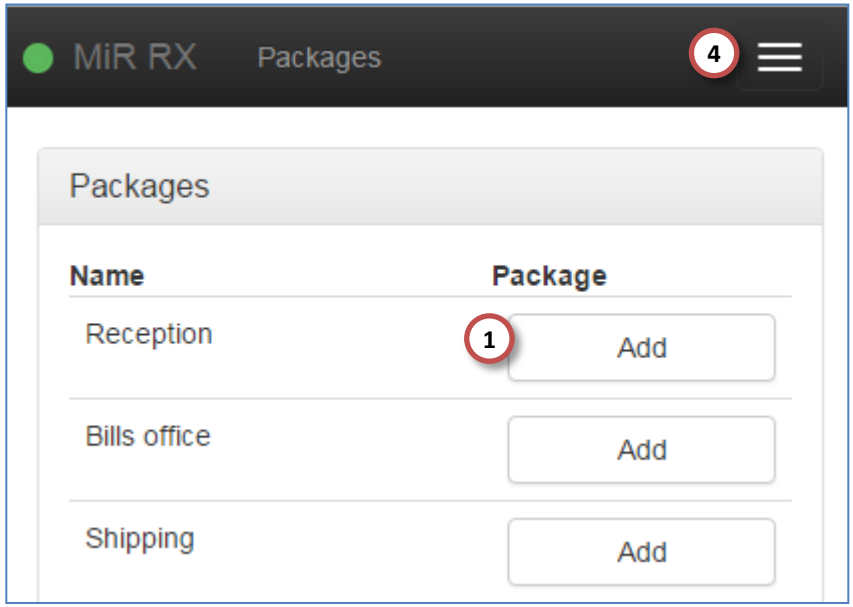
Package types are shown on the tablet on the robot.

Create and edit route name and stops.

Create and edit package types.

Route by MiR100 - 3/6

MiR > Route > Add Packages

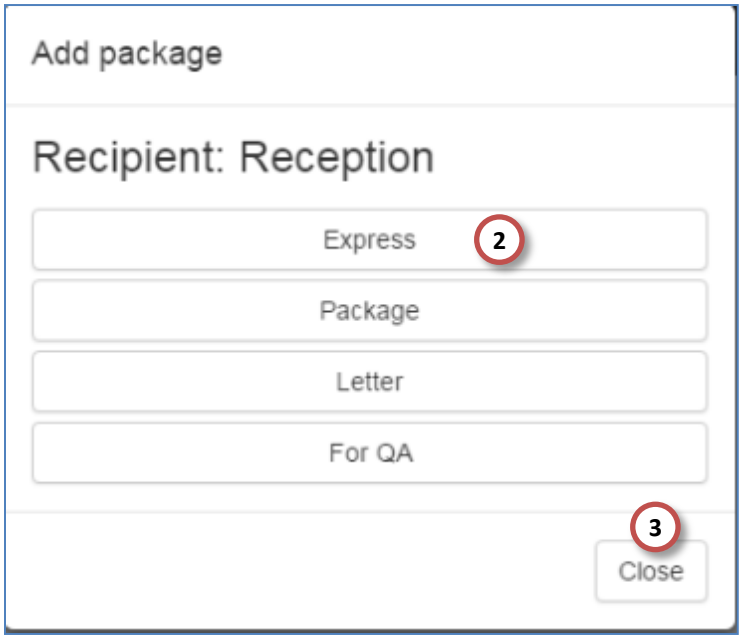


1. Click Add to add package types to each stop.

2. Click a package type to add it.

3. Close the window and add more packages to stops.

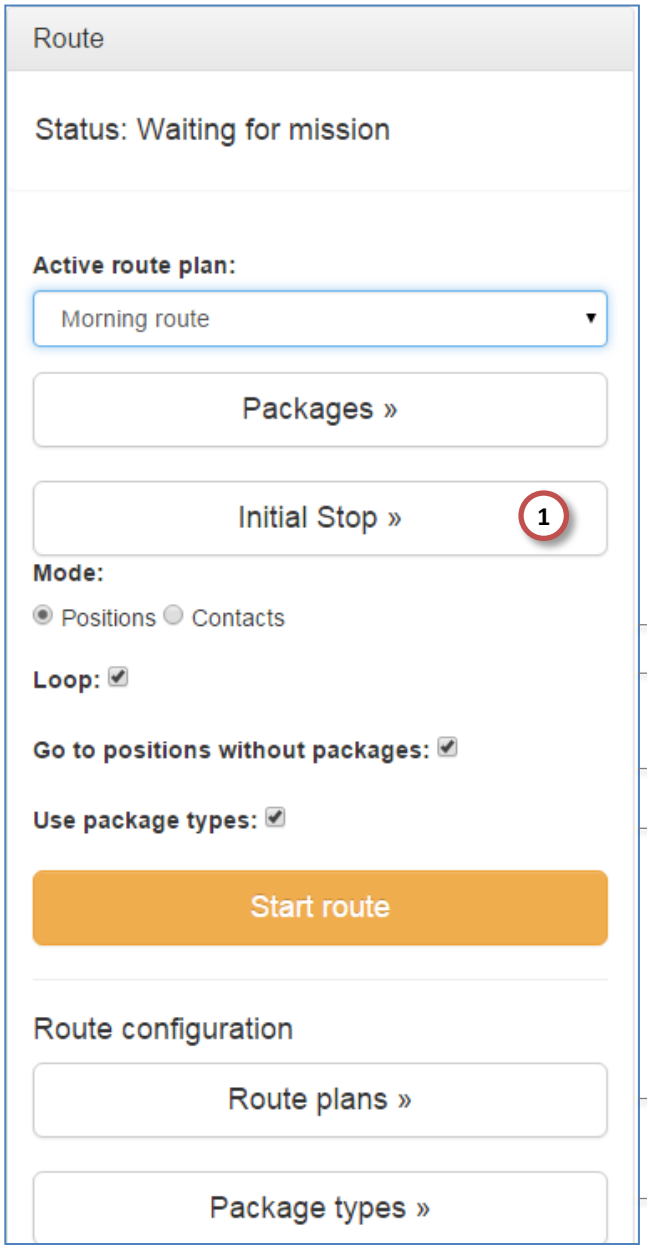
4. Go back to MIR > Route.



The tablet on the robot shows the package type and the user receives it by clicking the tablet.

Route by MiR100 - 4/6

MiR > Route



Packages have now been added to the route stops.

1. Set the initial stop.

Select destination type: Positions on map or Contacts with mail/phone. (Manage positions and contacts in MIR > Service > Configuration)

Check Loop to make the vehicle run the route continuously.

Check here to just stop at each destination – no waiting for package reception.

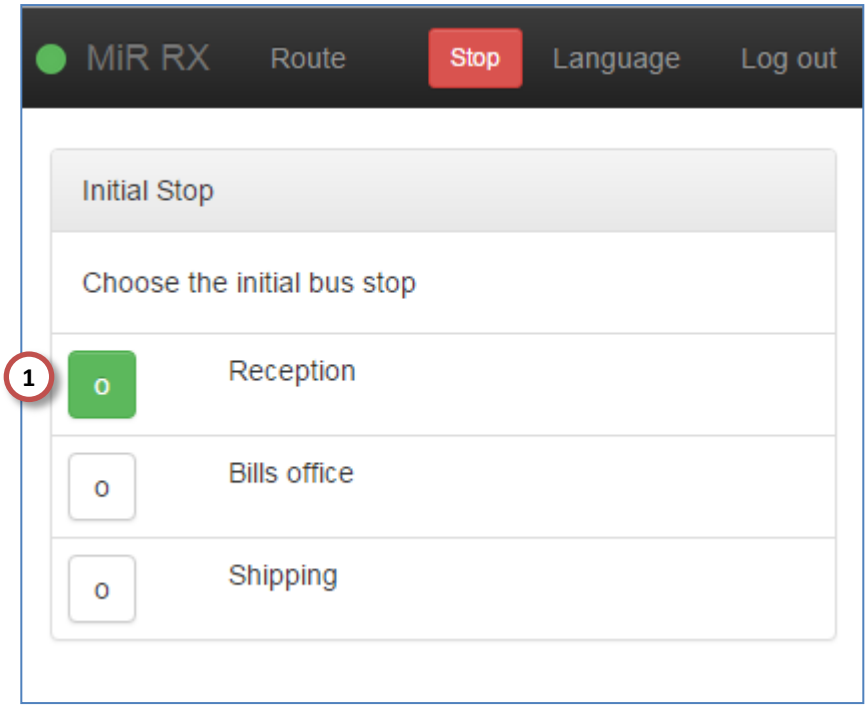
Package types are shown on the tablet on the robot.

Create and edit route name and stops.

Create and edit package types.

Route by MiR100 - 5/6

MiR > Route > Set Initial Stop

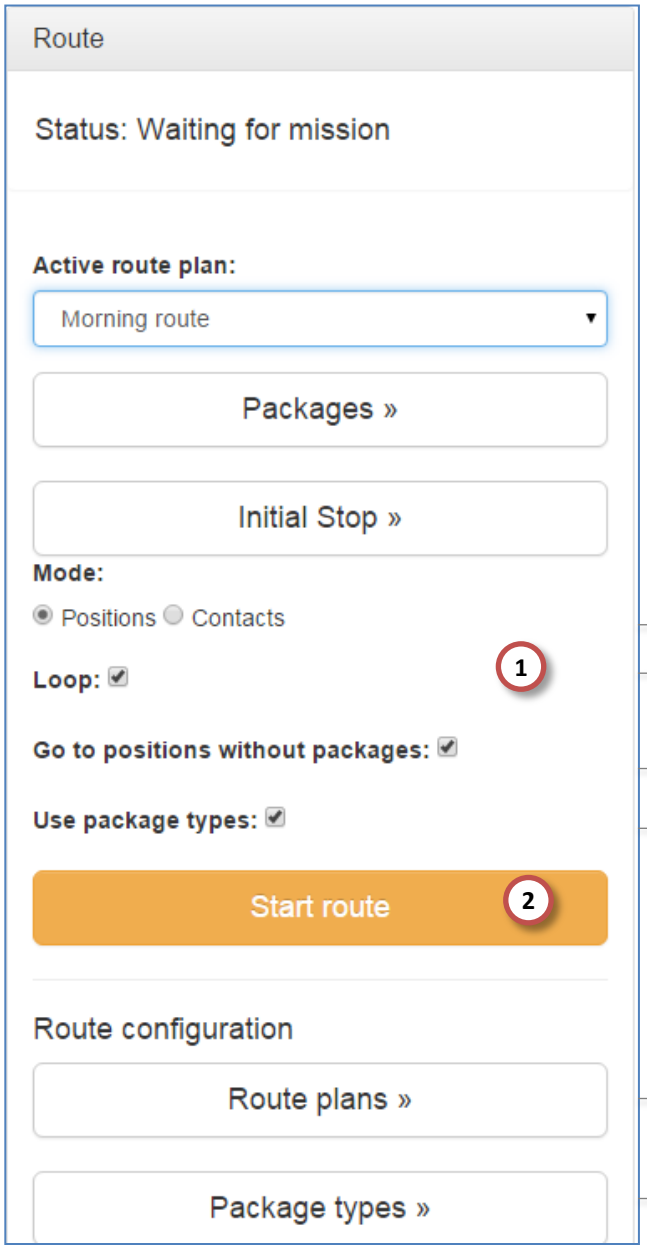


1. Set the initial stop by clicking the square.

2. Go back to the Route page.

Route by MiR100 - 6/6

MiR > Route



Ready to start moving.

1. Select options.

2. Click Start route to add route to the mission queue.

Select destination type: Positions on map or Contacts with mail/phone. (Manage positions and contacts in MIR > Service > Configuration)

Check Loop to make the vehicle run the route continuously.

Check here to just stop at each destination – no waiting for package reception.

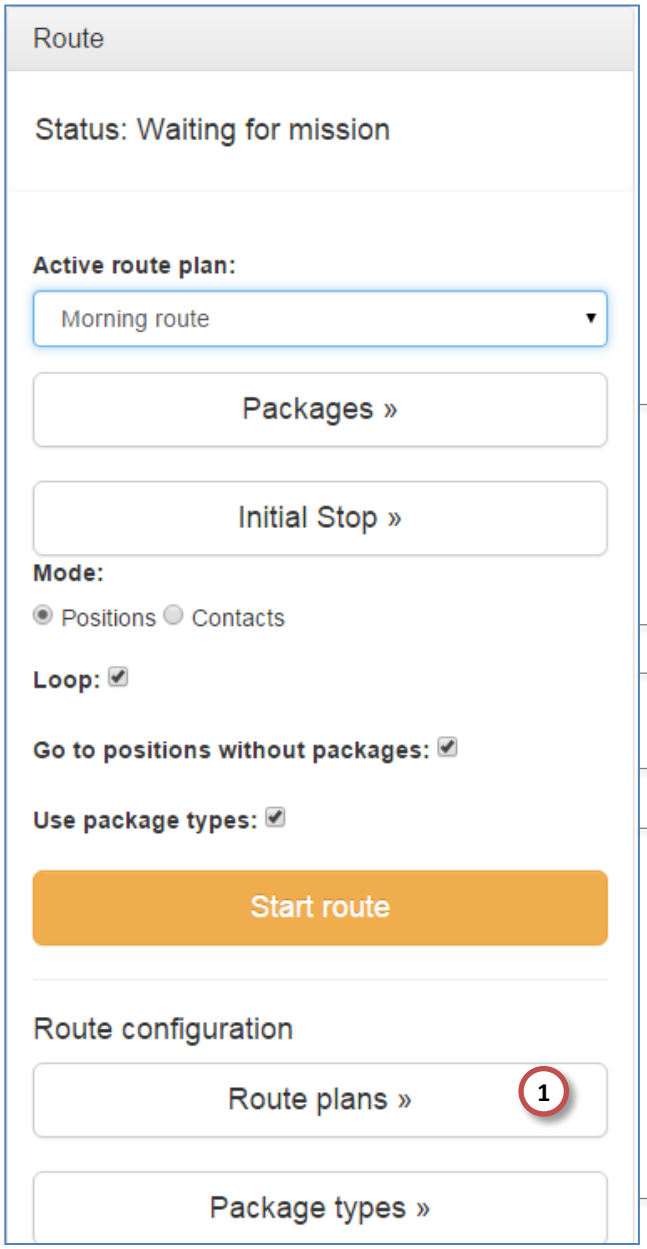
Package types are shown on the tablet on the robot.

Create and edit route name and stops.

Create and edit package types.

Route by MiR100 - Administrator 1/7

MiR > Route



Configure the route plan and package types.

1. Click Route plans to add a new route or edit an existing.

Add or remove packages on the current route.

Select destination type: Positions on map or Contacts with mail/phone.
(Manage positions and contacts in MIR > Service > Configuration)

Check Loop to make the vehicle run the route continuously.

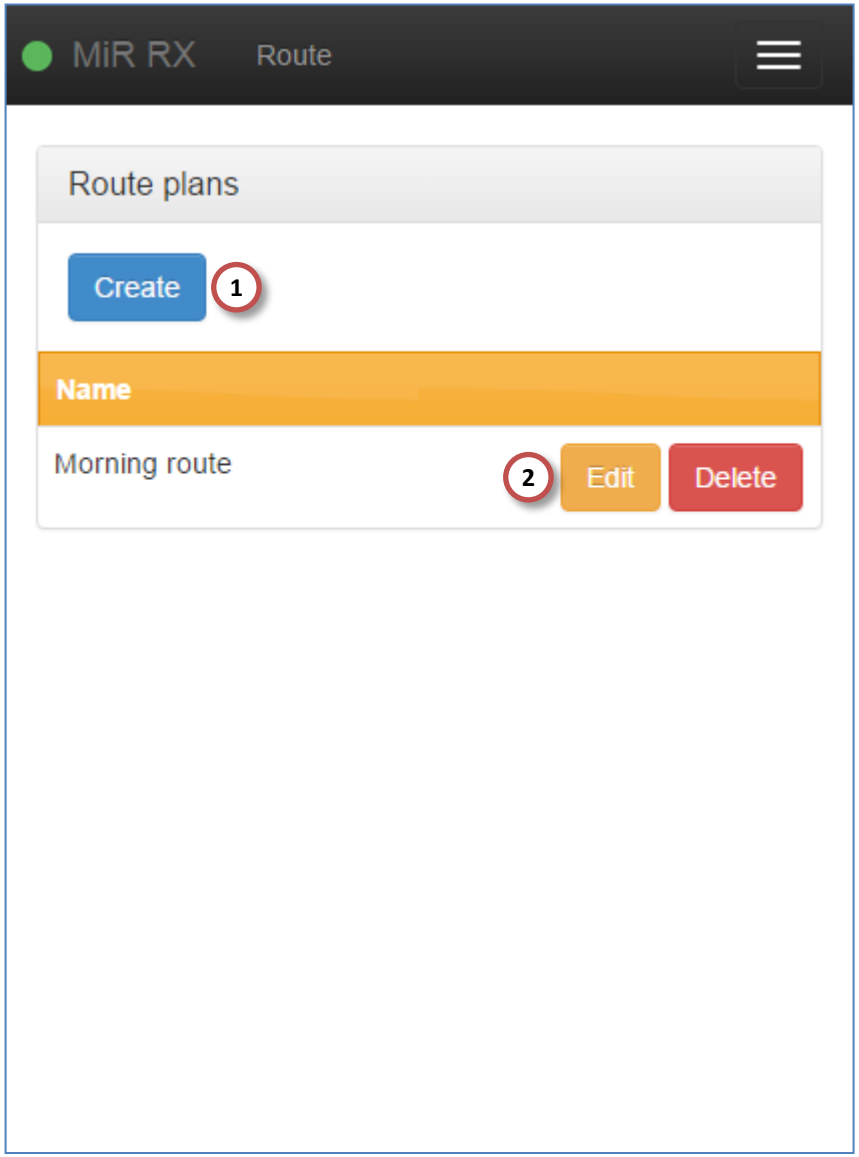
Check here to just stop at each destination – no waiting for package reception.

Package types are shown on the tablet on the robot.

Create and edit package types.

Route by MiR100 - Administrator 2/7

MiR > Route > Route plans

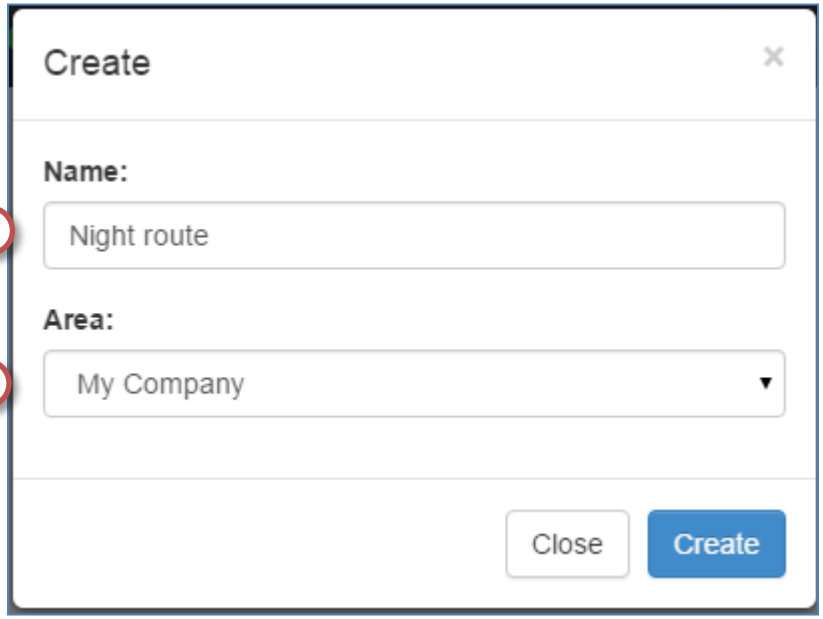


1. Create to a new route.

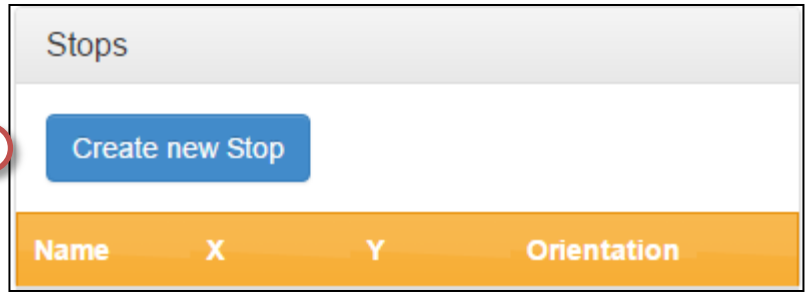
2. Edit an existing route.

Route by MiR100 - Administrator 3/7

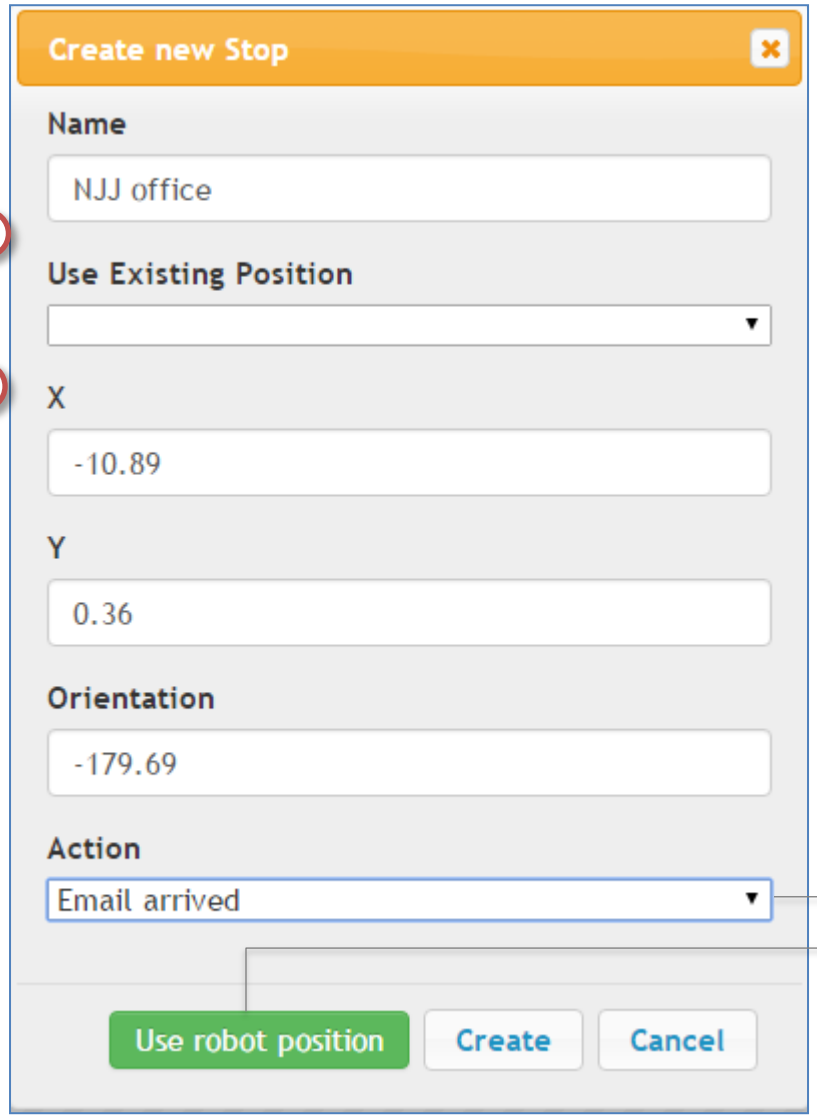
MiR > Route > Route plans > Create/Edit



1. Write a name for the route and select an area.



2. The Stops window pops up. Click Create new stop.



1. Fill in all fields.

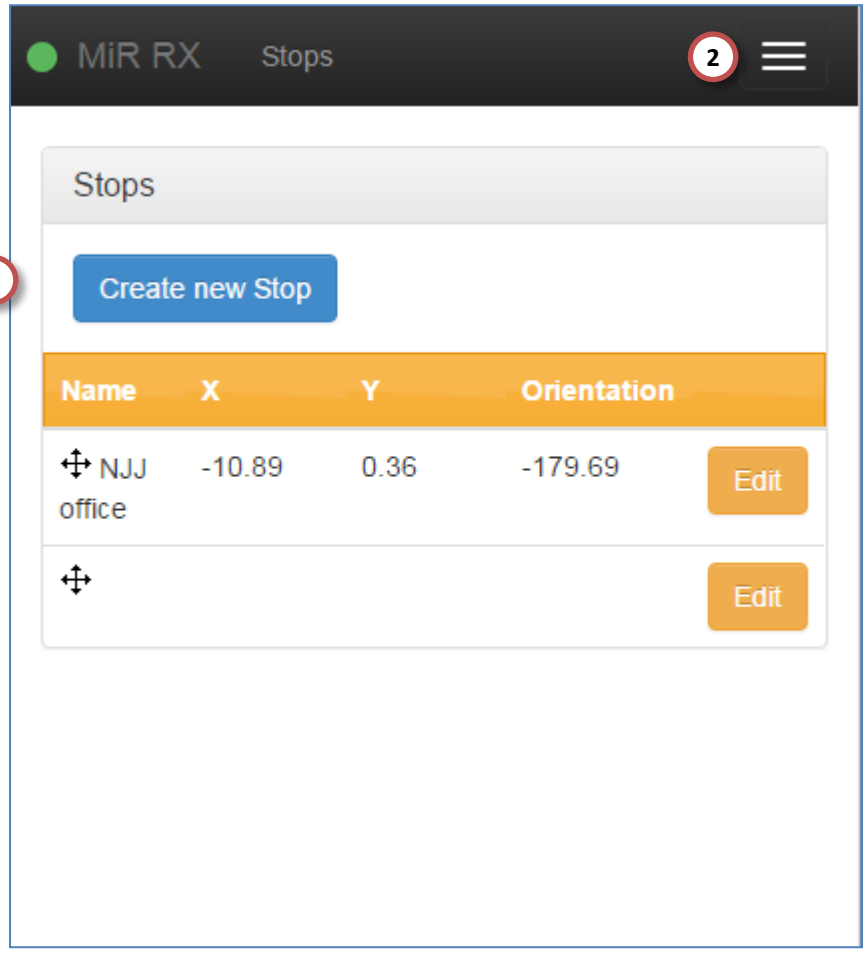
2. Click Create. Automatically returns to Create new stop.

Optionally add actions to the stop. (Manage actions in MIR > Service > Configuration > Missions)

Use an existing position as a starting point - fields are automatically filled in and can be edited.

Route by MiR100 - Administrator 5/7

MiR > Route > Route plans > Create/Edit

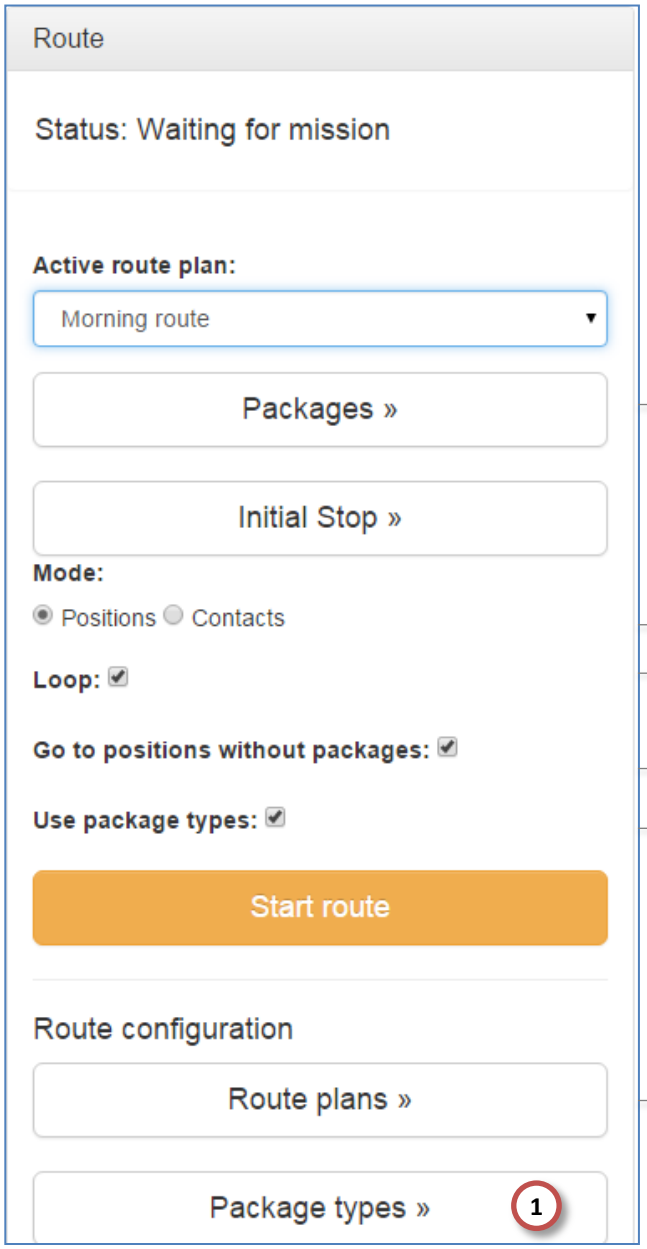


1. Continue to built the route by creating new stops and edit existing.

2. Return to MIR > Route.

Route by MiR100 - Administrator 6/7

MiR > Route



1. Click Package types to edit and create.

Add or remove packages on the current route.

Select destination type: Positions on map or Contacts with mail/phone.
(Manage positions and contacts in MIR > Service > Configuration)

Check Loop to make the vehicle run the route continuously.

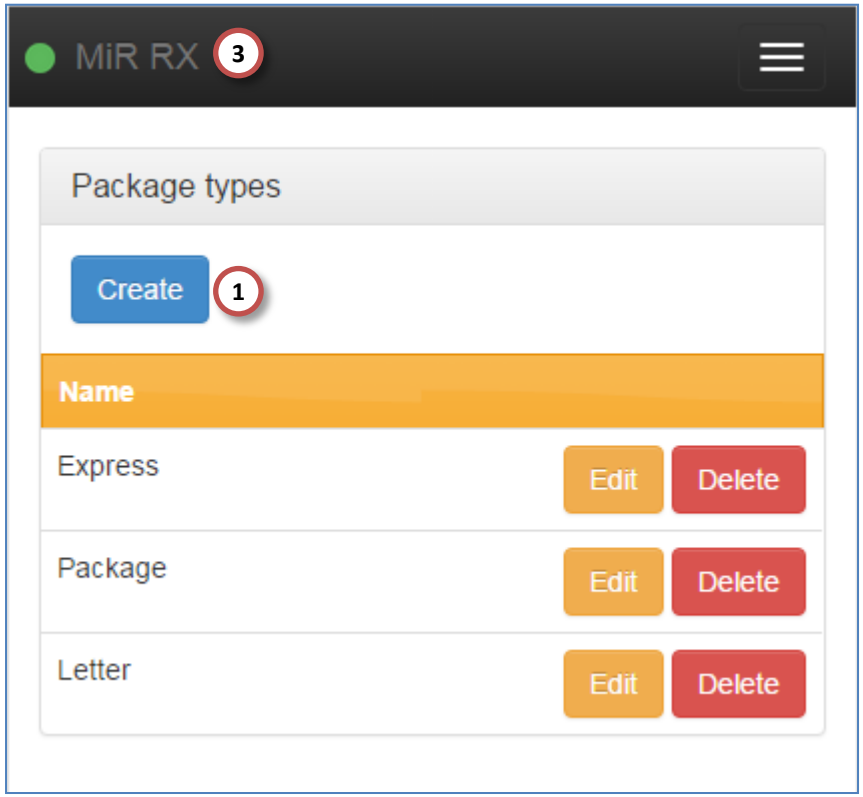
Check here to just stop at each destination – no waiting for package reception.

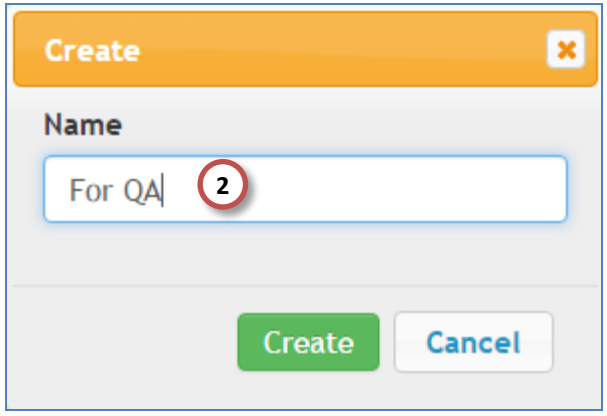
Package types are shown on the tablet on the robot.

Create and edit routes and stops.

Route by MiR100 - Administrator 7/7

MiR > Route > Package Types





1. Create or Edit a package type

2. Fill in the name and click Create.

3. Return to MIR start page.

Package types are shown on the tablet on the robot.

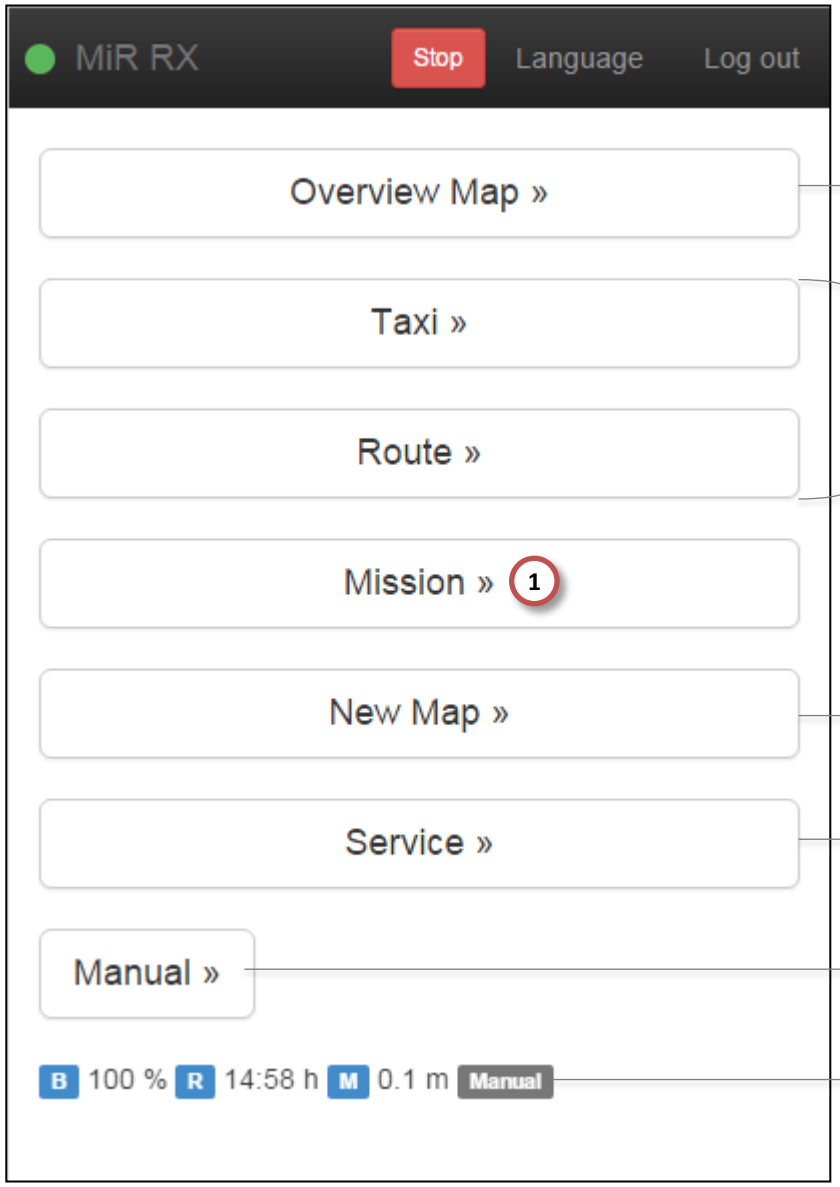
Mission by MiR100 – Check list

A mission is a number of actions such as: Move To Position, Play Sound, Relative Move. A missions control the vehicle's movement and behaviour.

- ❑ From the start page, select Mission
- ❑ Add missions to the queue
- ❑ Delete missions
- ❑ View active mission
- ❑ View log of executed missions

Mission by MiR100 - 1/10

Start page: MiR



1. Click Mission to control the mission queue.

View the location of the vehicle on the map

Predefined mission types

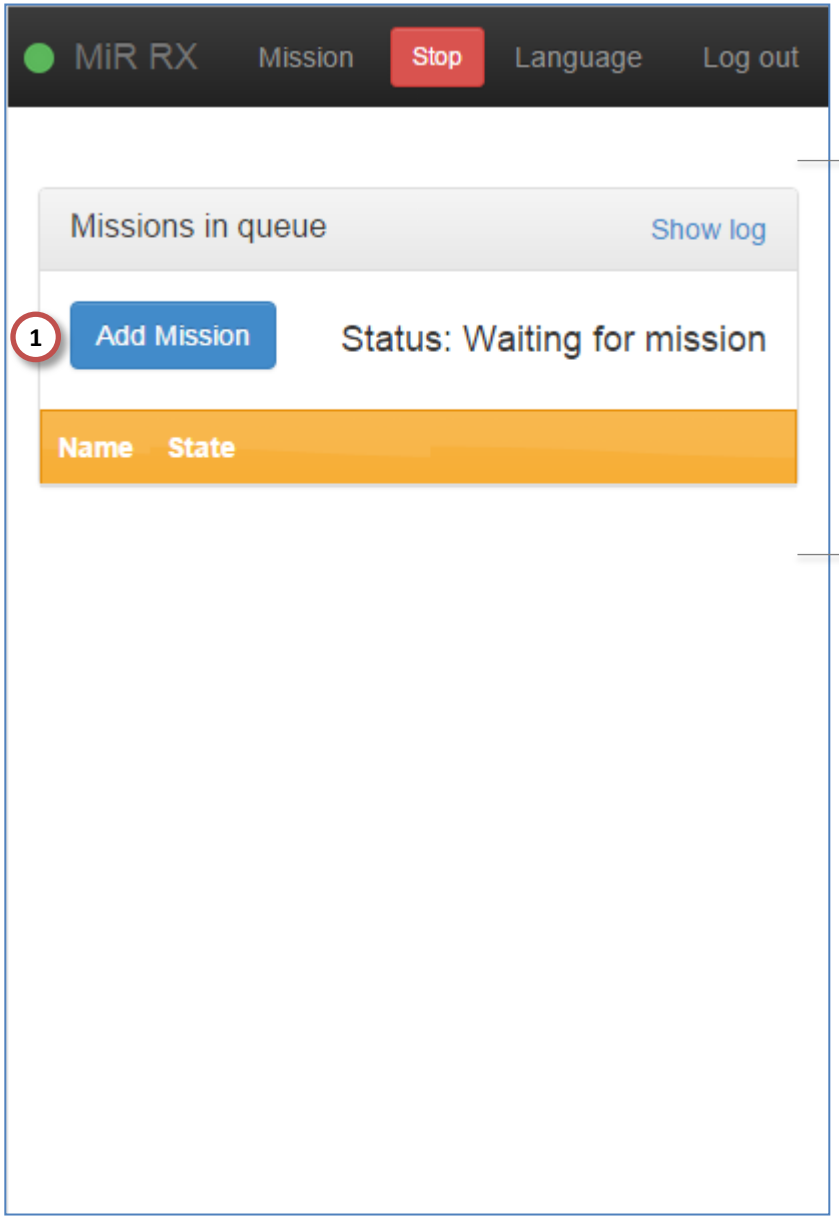
Create a map of a new area.
You must be logged in to see this button.

Click Service to start up MiR100 or check status.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Mission by MiR100 - 2/10



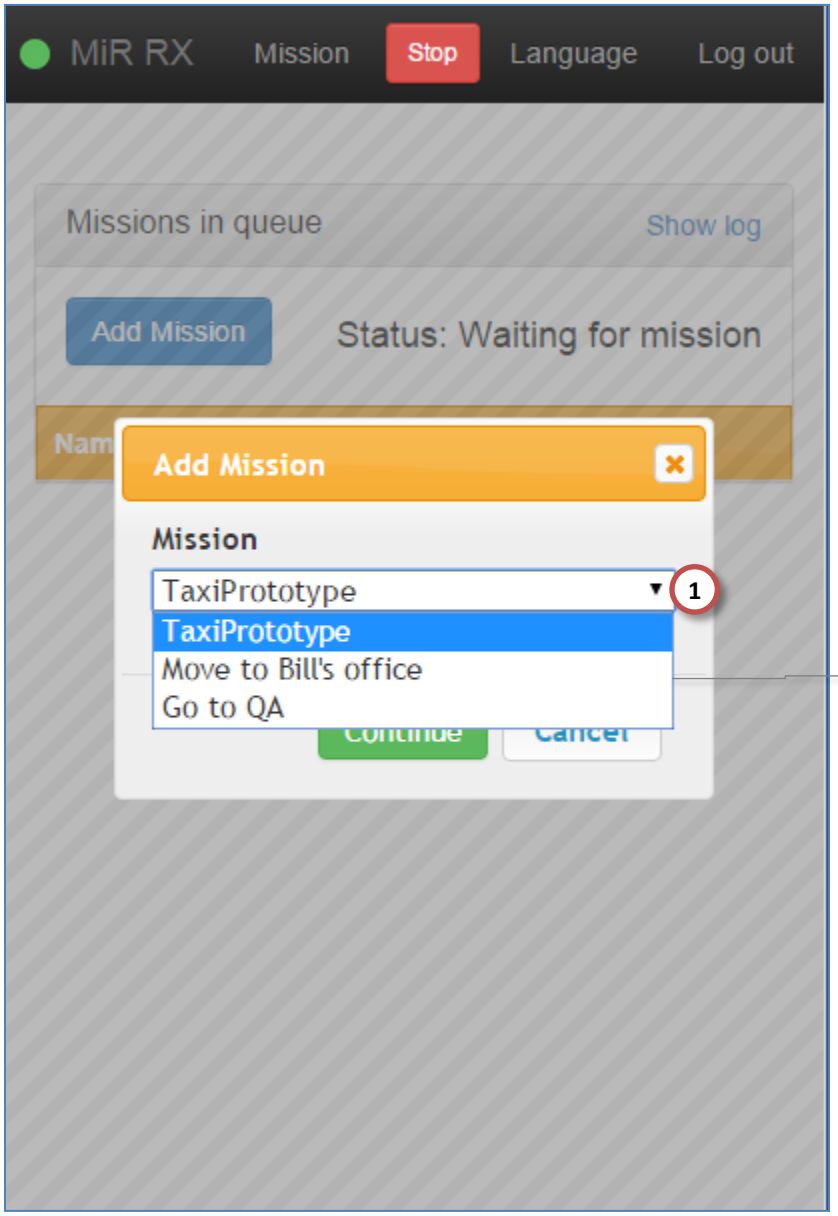
1. Add mission to queue.

Active mission will be shown here.

Queued missions will be shown here.

Mission by MiR100 - 3/10

MiR > Mission > Add Mission



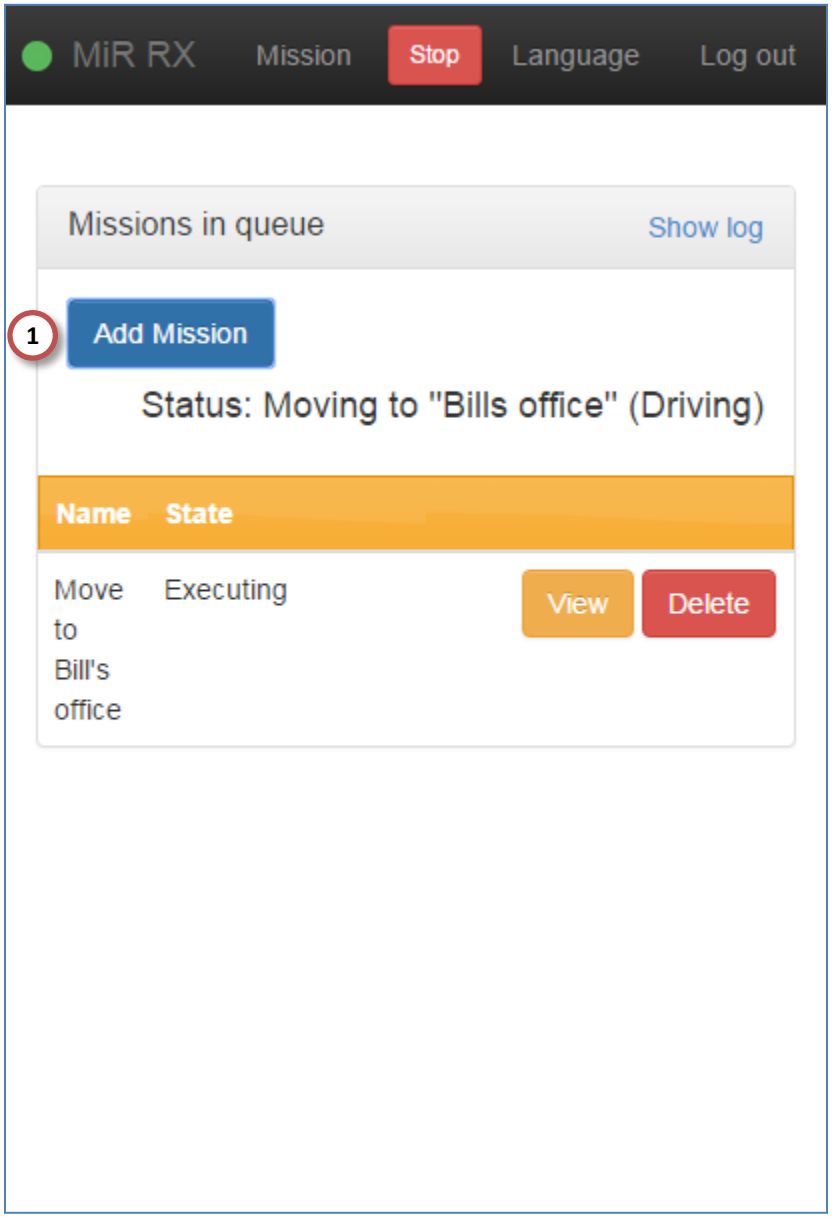
1. Select missions to put in queue.

The mission is immediately put to the queue and started if no other mission is running.

Missions are created in Service > Configuration > Missions.

Mission by MiR100 - 4/10

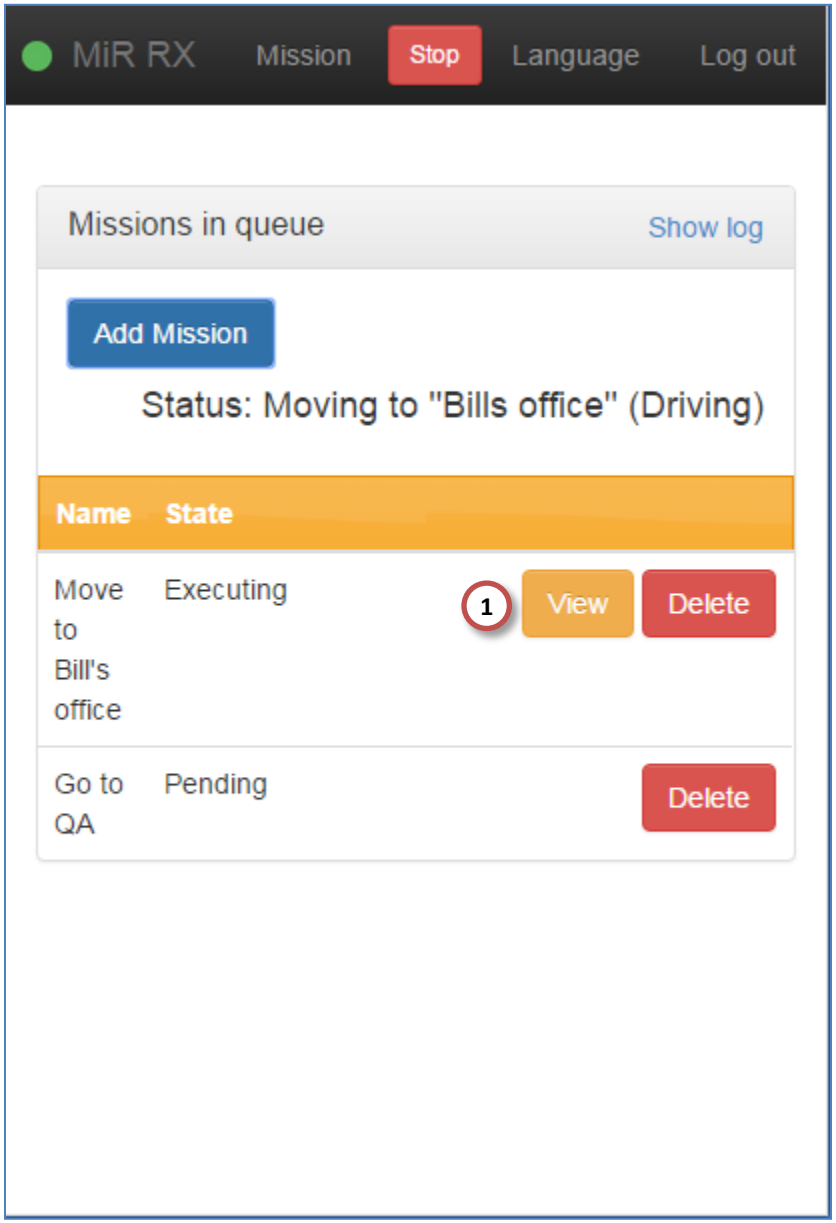
MiR > Mission



1. Add another mission to the queue while a current mission is running.

Missions are created in Service > Configuration > Missions.

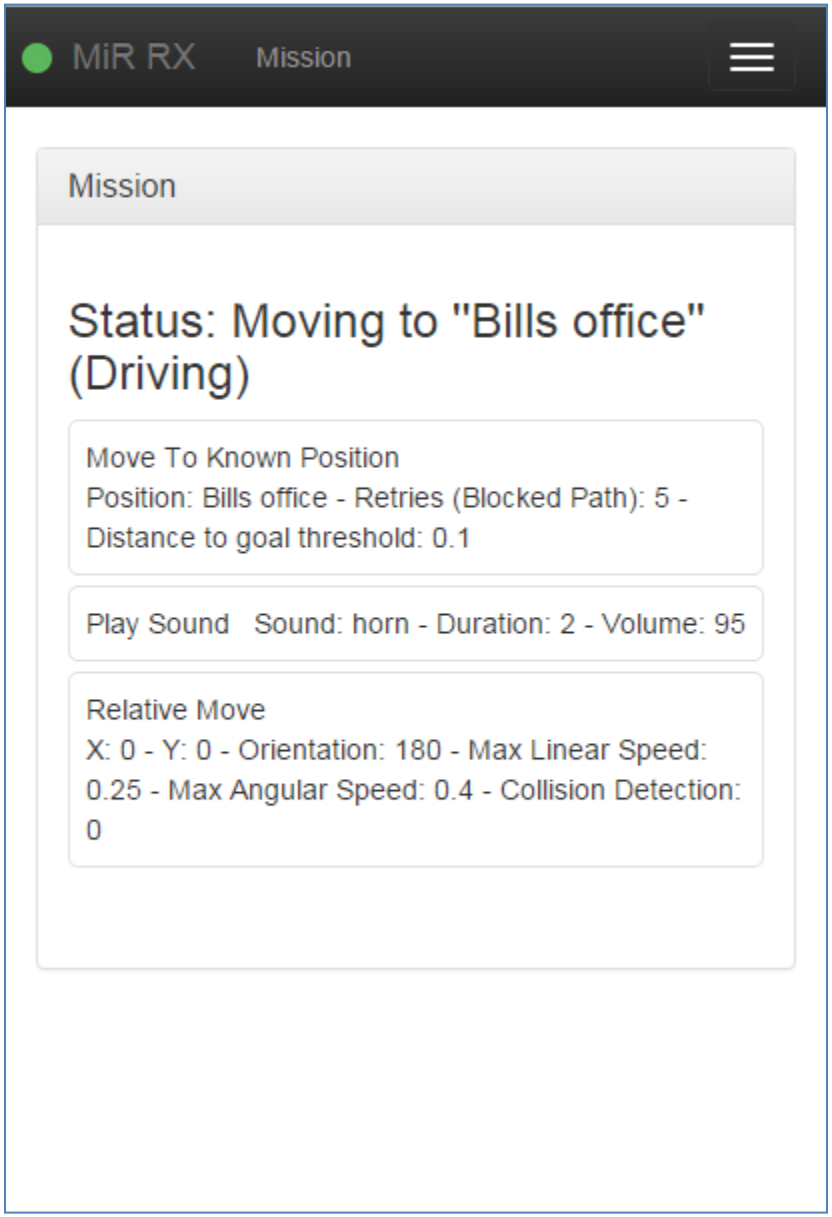
Mission by MiR100 - 5/10



1. View the current mission.

Mission by MiR100 - 6/10

MiR > Mission > View



1. After looking at the mission, go back to Mission.

A mission is built as a list of actions:

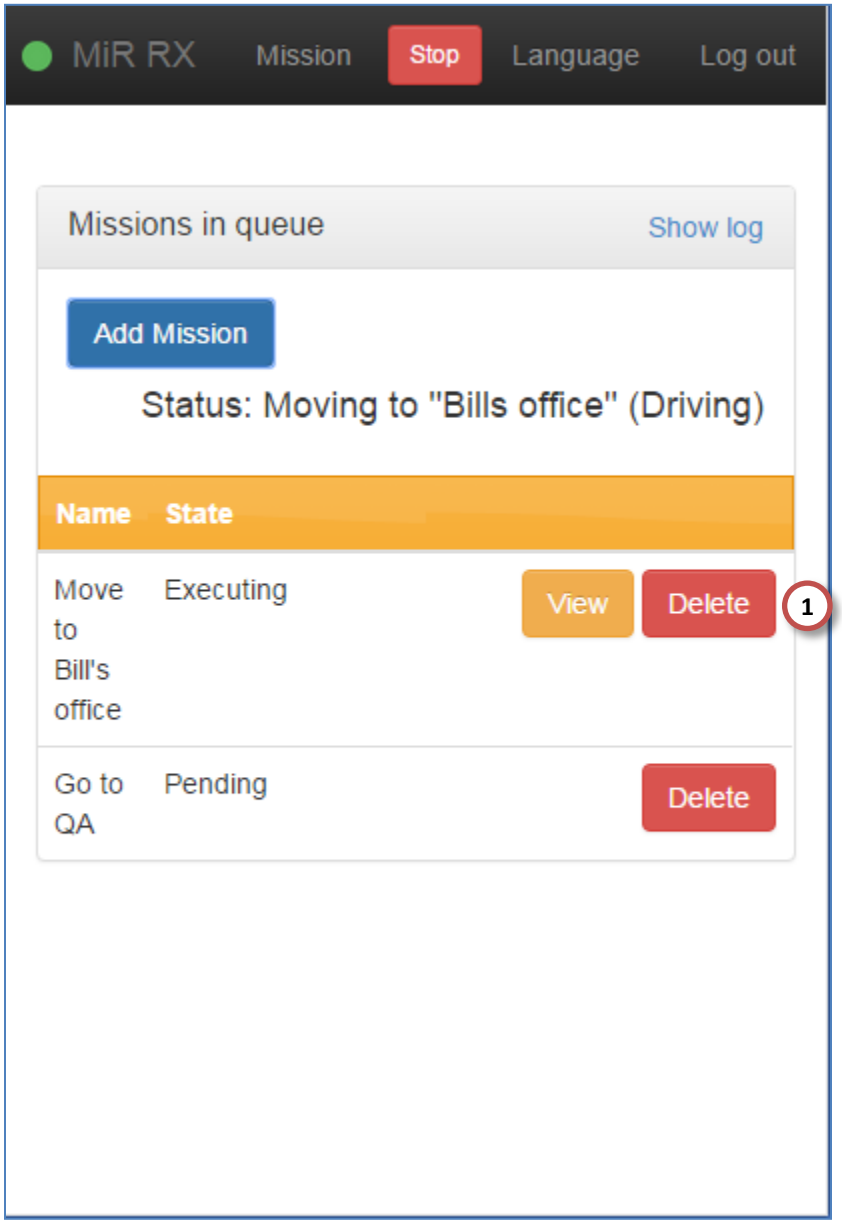
- Move To Known Position
- Play Sound
- Relative Move

These are examples of actions.

Missions are created in Service > Configuration > Missions.

Actions are delivered by MIR.

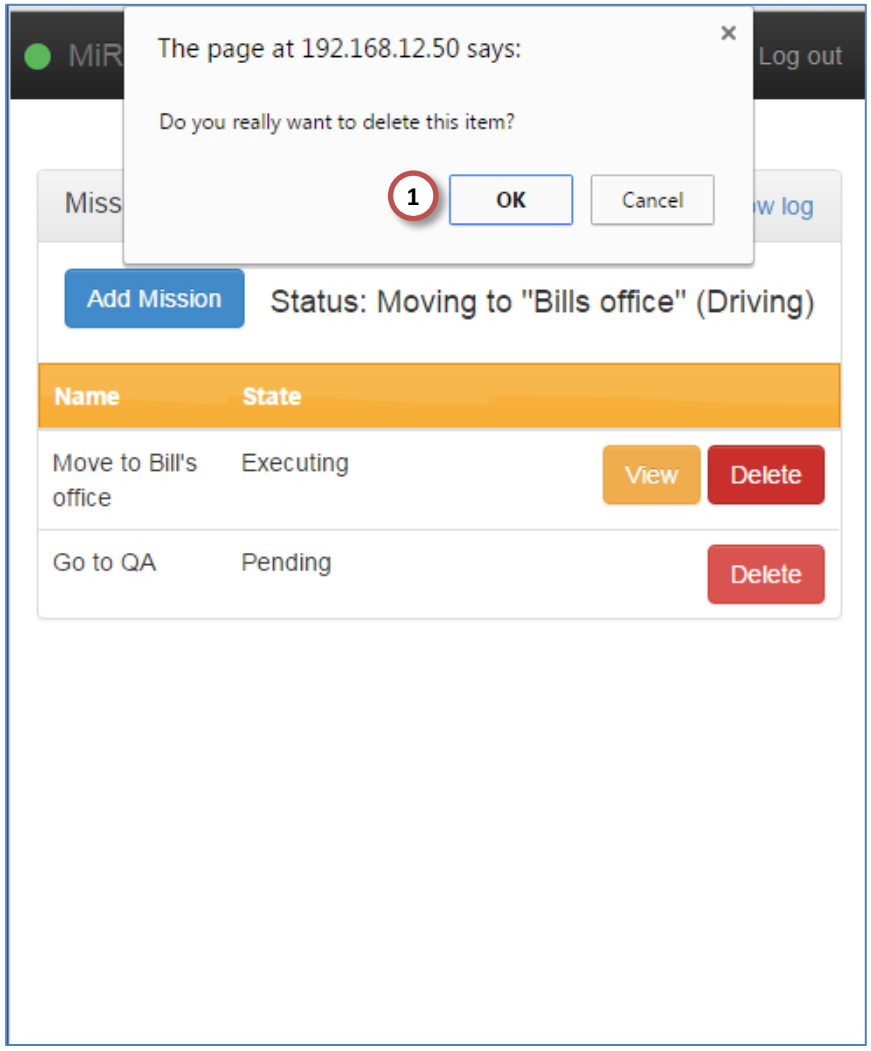
Mission by MiR100 - 7/10



1. Delete the active mission.

Mission by MiR100 - 8/10

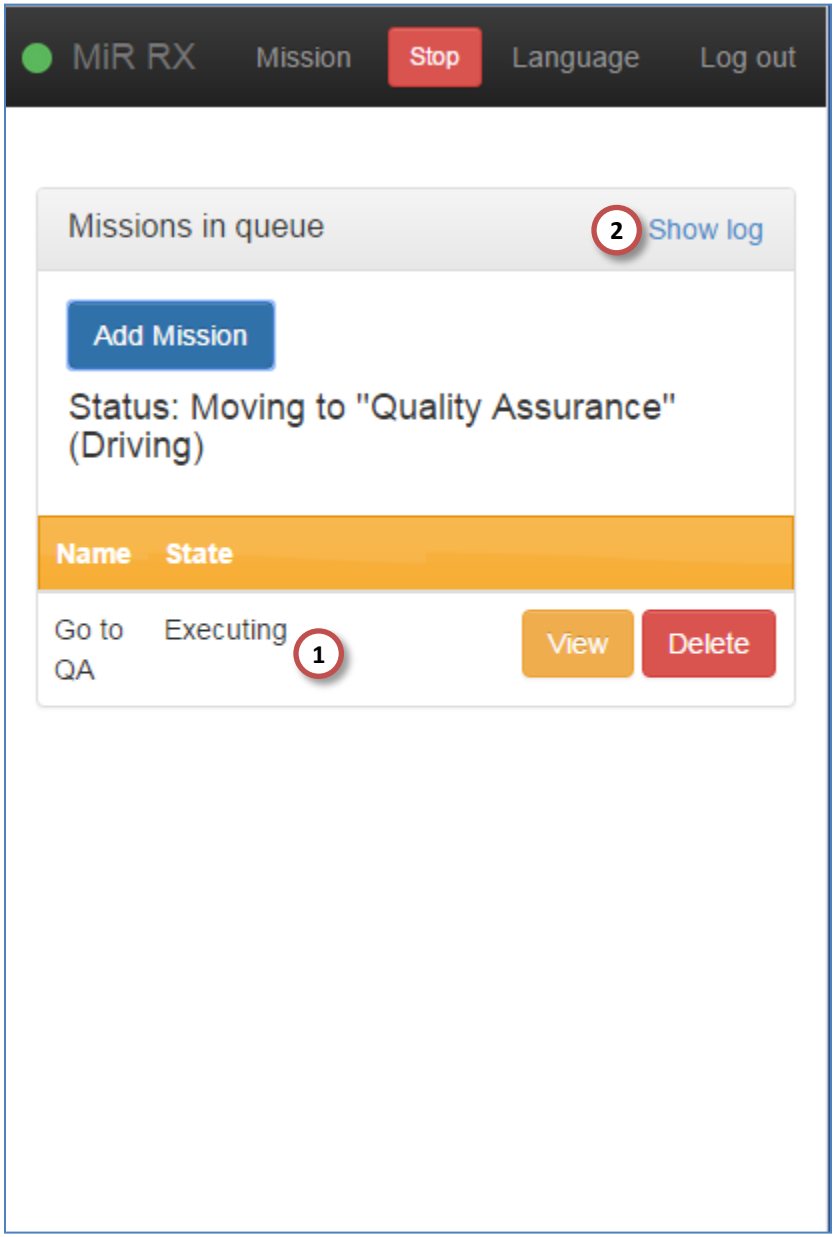
MiR > Mission > Delete



1. Click OK to accept deleting the mission.

When deleting an active mission, the vehicle will stop its current movement, calculate a new path and start the next mission.

Mission by MiR100 - 9/10

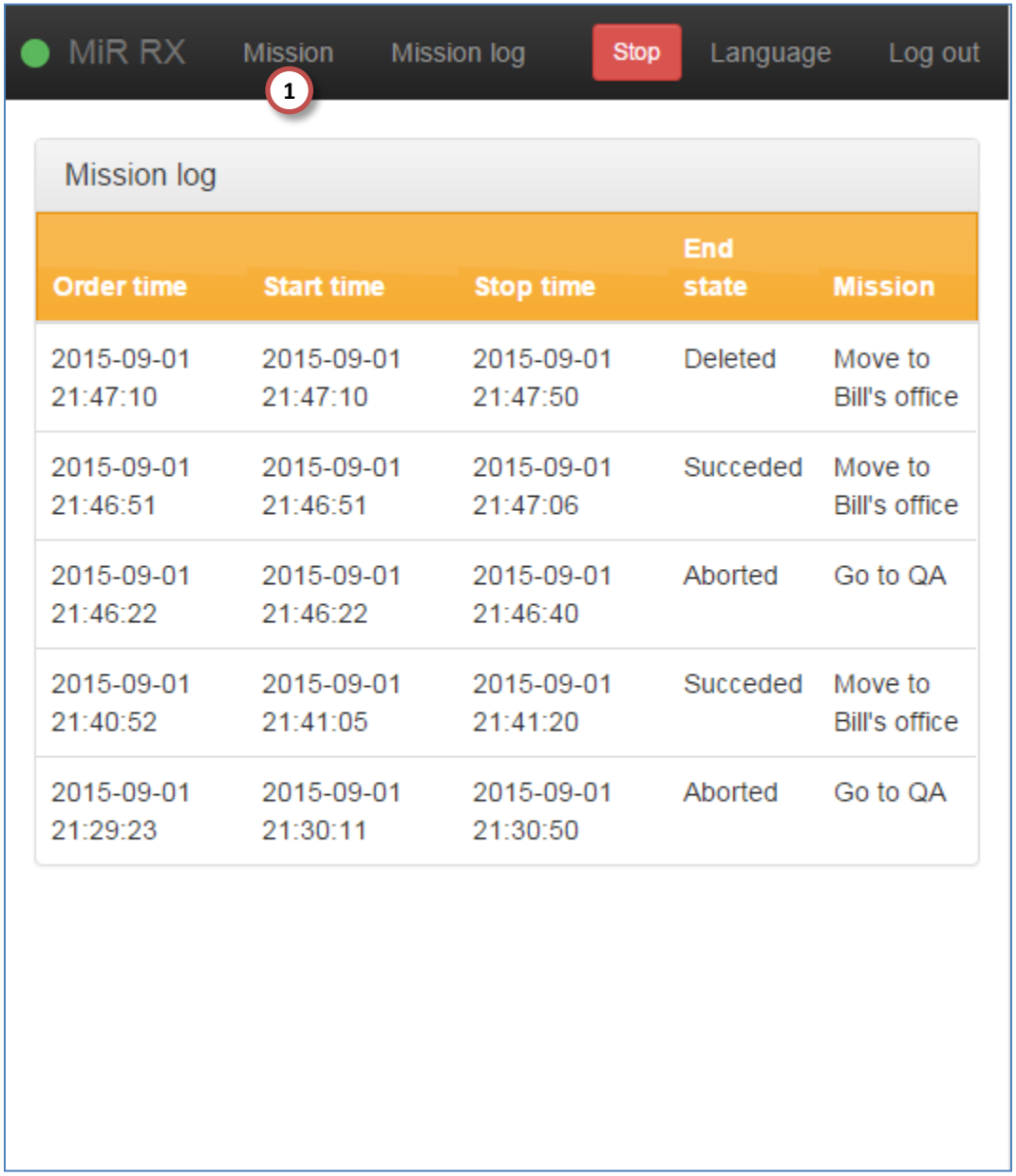


1. After deleting a mission, the next mission will automatically start.

2. Click Show log for to see the end state of previous missions.

Mission by MiR100 - 10/10

MiR > Mission > Show log



1. After looking at the log, go back to MIR start page.

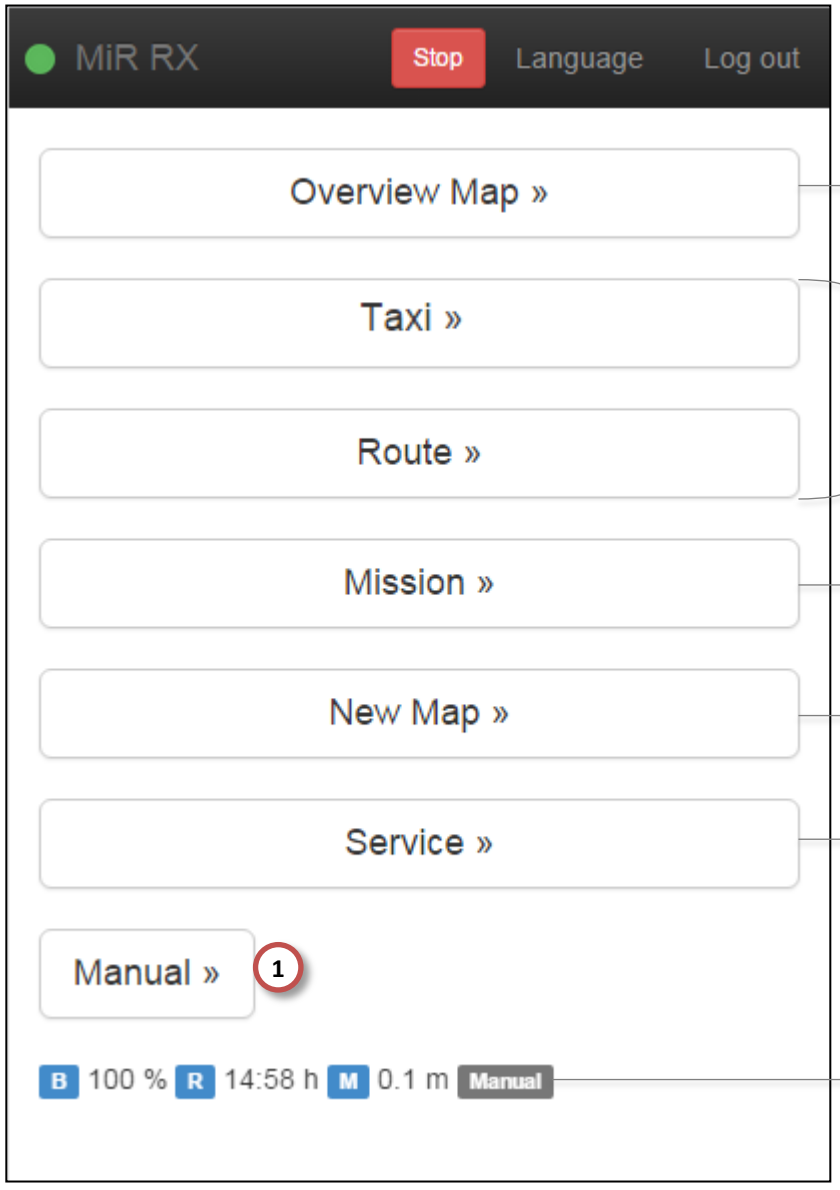
The log is useful for analysing the outcome of missions – see End State.

Manual Driving Using Joystick – Check list

- ❑ From the start page, select Manual driving
- ❑ Activate joystick
- ❑ After completion of driving – return to the start page

Manual Driving Using Joystick - 1/2

Start page: MiR



1. Go to Manual driving to take control using joystick.

View the location of the vehicle on the map

Predefined mission types

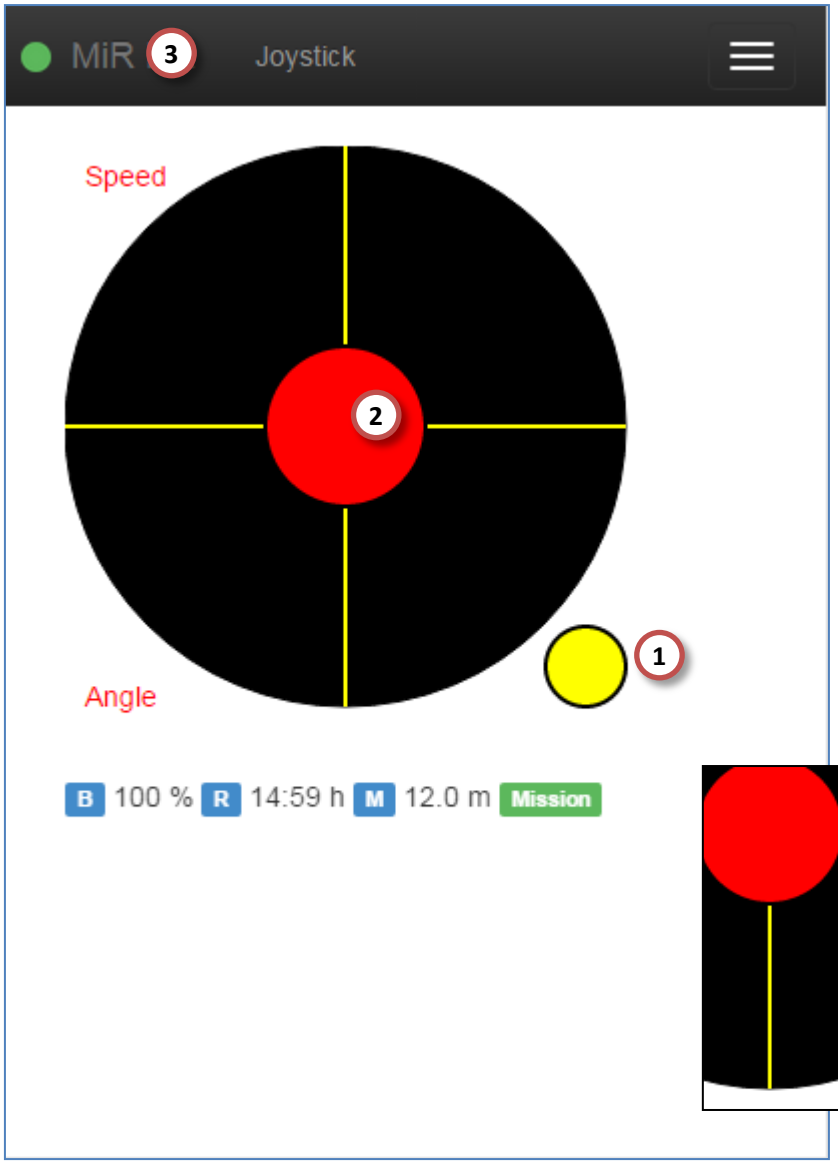
Controlling the mission queue

Create a map of a new area.
You must be logged in to see this button.

Click Service to start up MiR100 or check status.

Note: MiR100 is on Manual. Select Area in Service to activate.

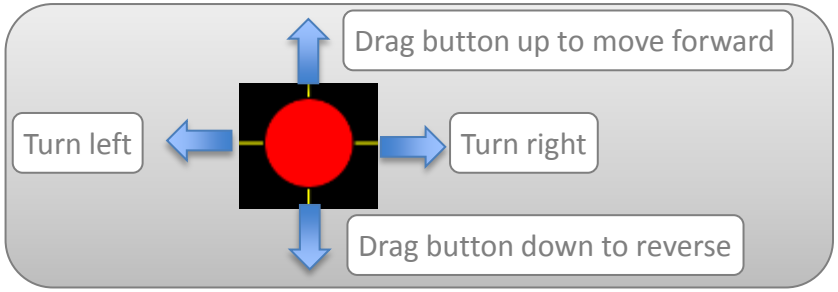
Manual Driving Using Joystick - 2/2

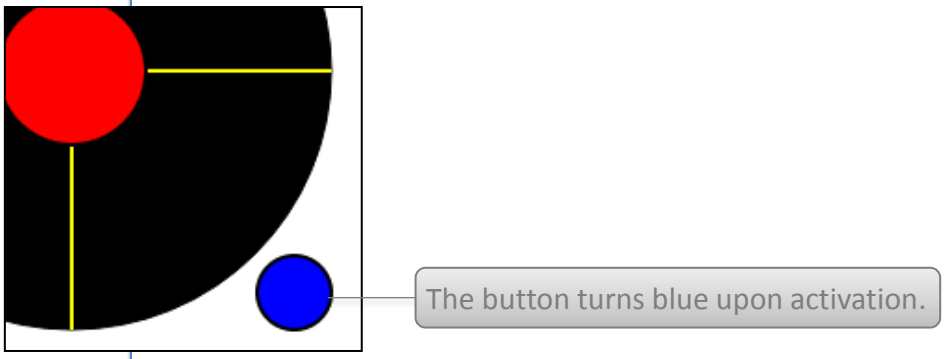


1. Activate joystick – click the lower right buton.

2. Guide the vehicle using the middle red button.

3. Go to the start page after completing manual driving.



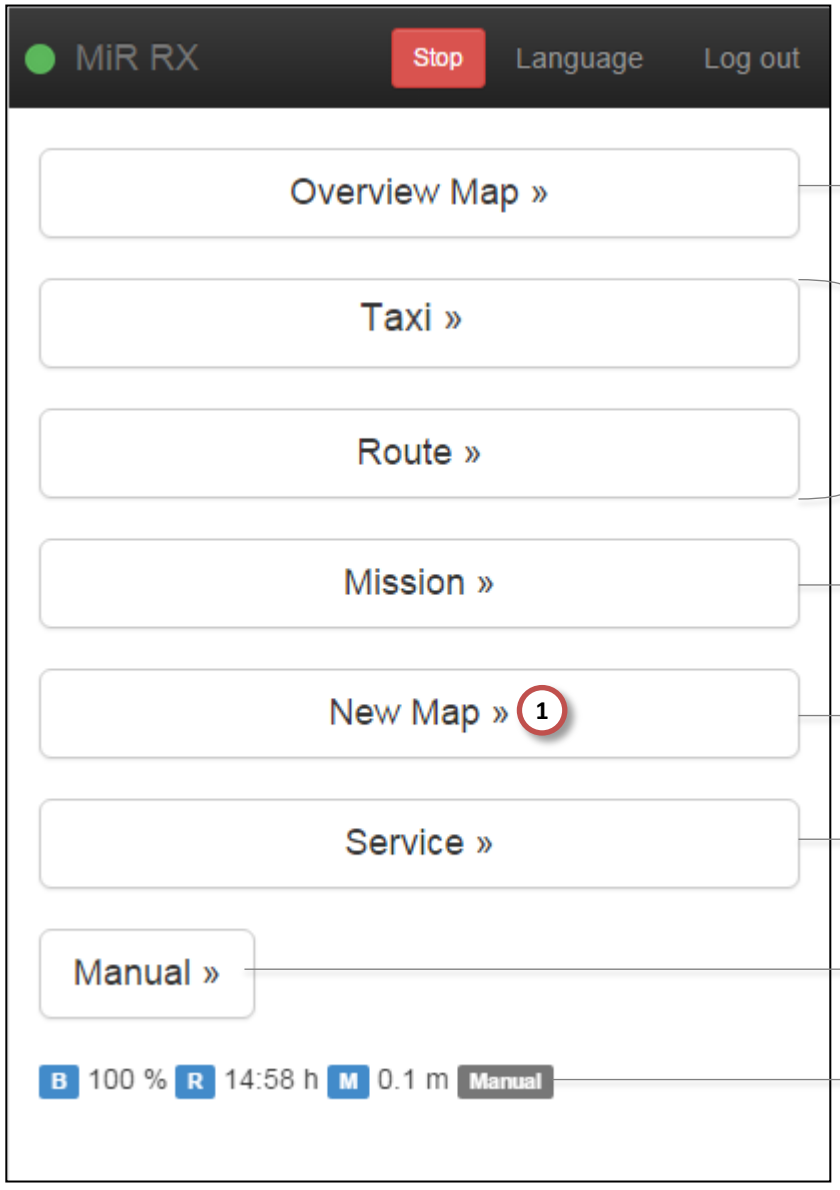


Create New Map – Check list

- ❑ From the start page, click New Map
- ❑ Choose existing area or create a new area
- ❑ Start mapping
  - ❑ Guide MiR100 through the area using joystick
  - ❑ During driving, create positions for operation (Taxi, Route)
- ❑ After completion of mapping – save the map and go to the start page or create more maps for the area

Create New Map - 1/7

Start page: MiR



1. Create a map of a new area.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

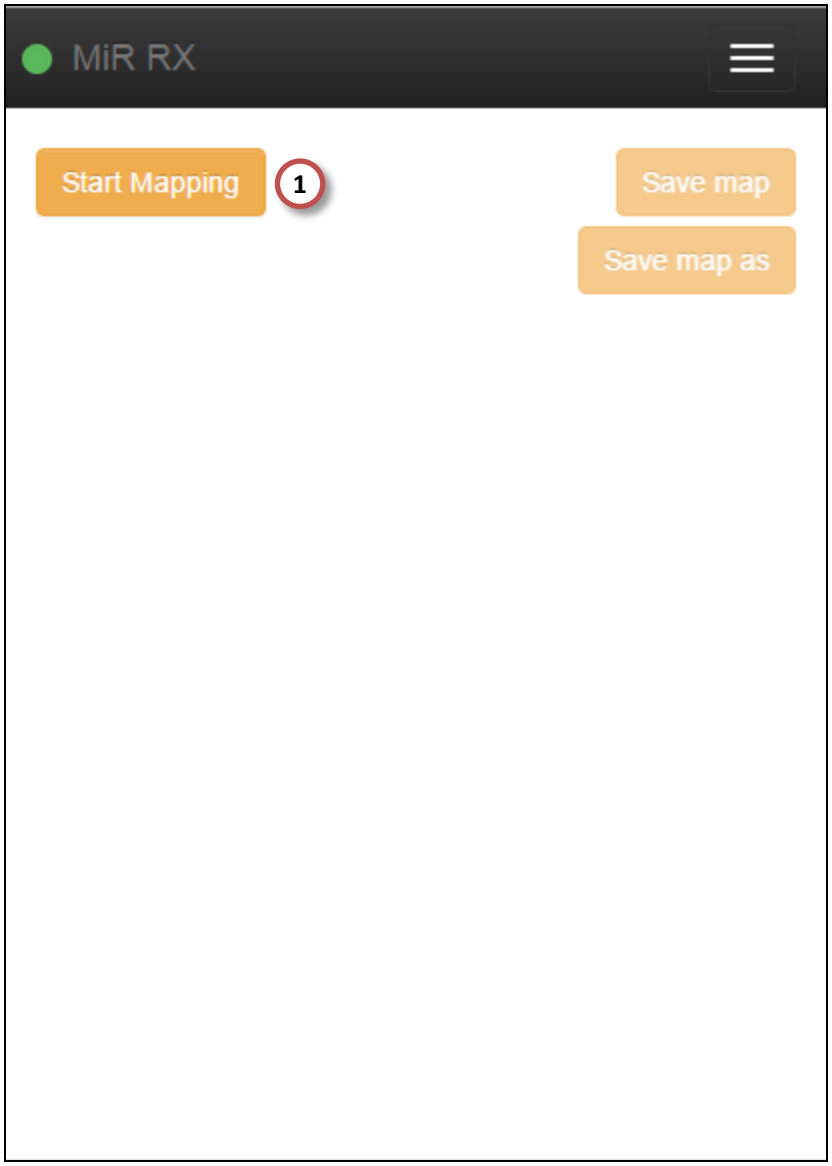
You must be logged in to see this button.

Click Service to start up MiR100 or check status.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

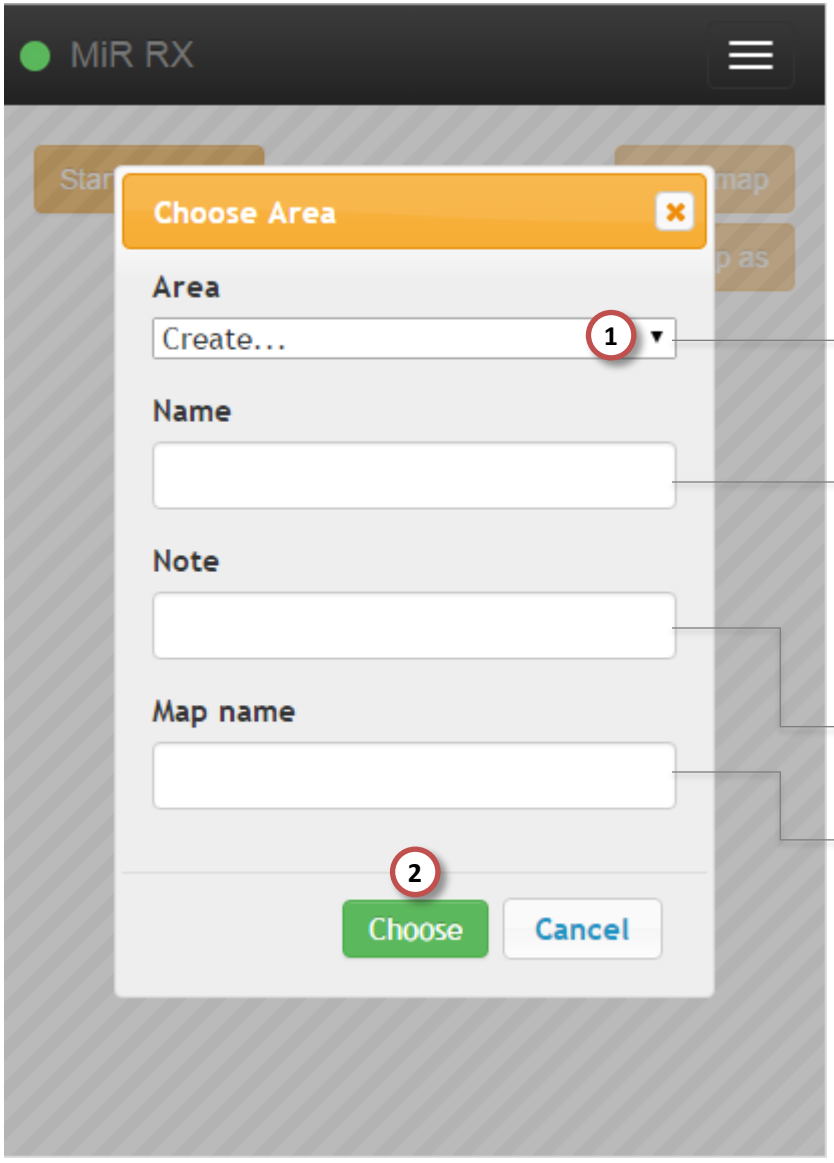
Create New Map - 2/7



1. Start mapping with MiR100 – must be done before MiR100 can drive in a new area.

Create New Map - 3/7

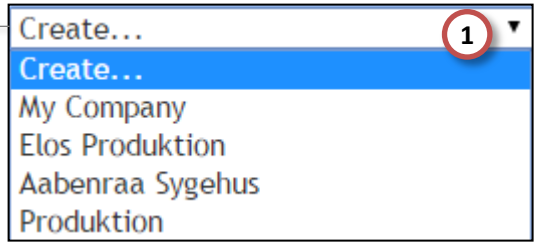
MiR > New Map > Start Mapping



1. In the pop-up window, choose an area or create a new area by filling in the fields.

2. Accept by clicking Choose.

Automatically goes to mapping.

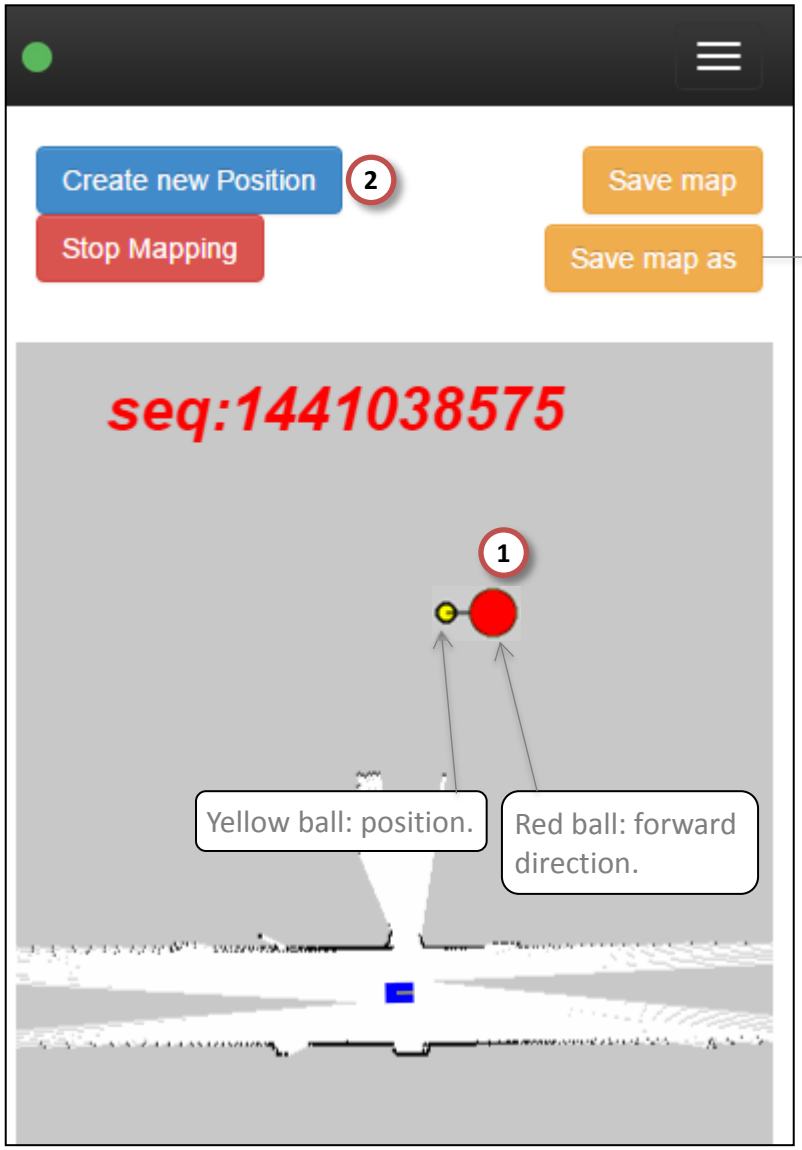


Name of new area.

Map note – this note is shown in the Choose Area page.

Name of new map.

Create New Map – 4/7



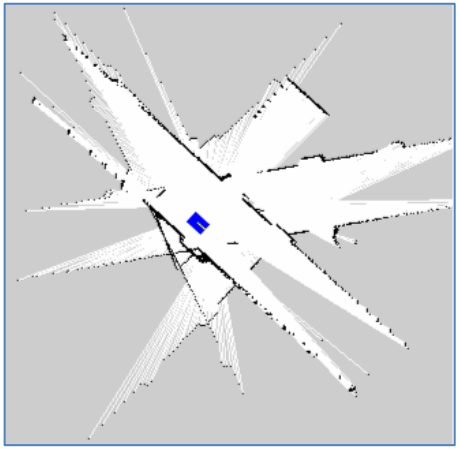
1. Click the map and drag the mouse like driving using joystick – the vehicle moves around the area..

2. Create a position for later use in operation.

Save the map with a new name.

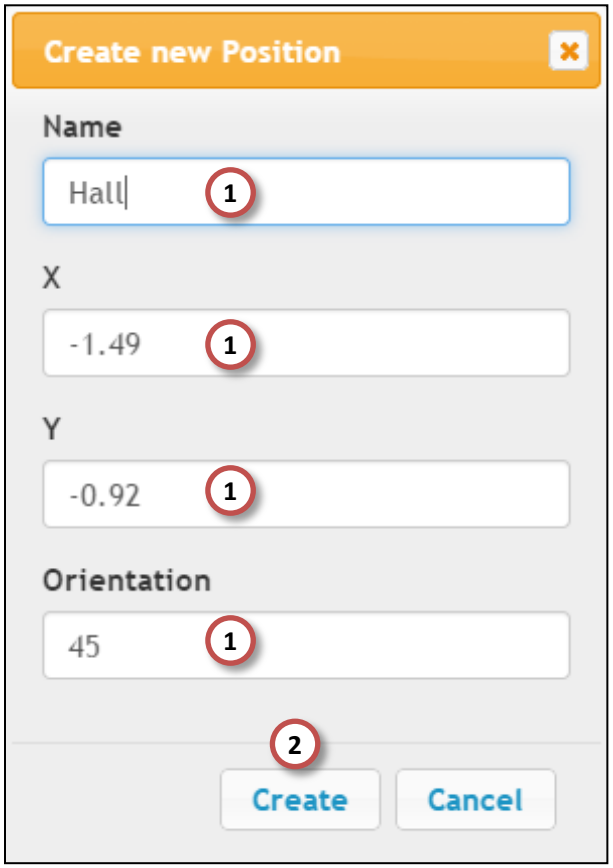
The map displays what MiR100's sensors see.

A failed map can occur in case of too strong mouse movements or when moving close to the boundary of the map:



Create New Map - 5/7

MiR > New Map > Mapping > Create New Position



1. Fill in Name – X, Y and Orientering is given but can later be edited.

2. Click Create to save the position.

Automatically goes back to mapping.

Create New Map - 6/7

1. Save the map.

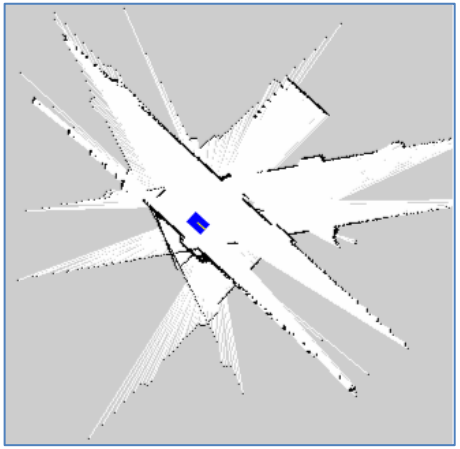
2. Stop mapping.

Save the map with a new name.

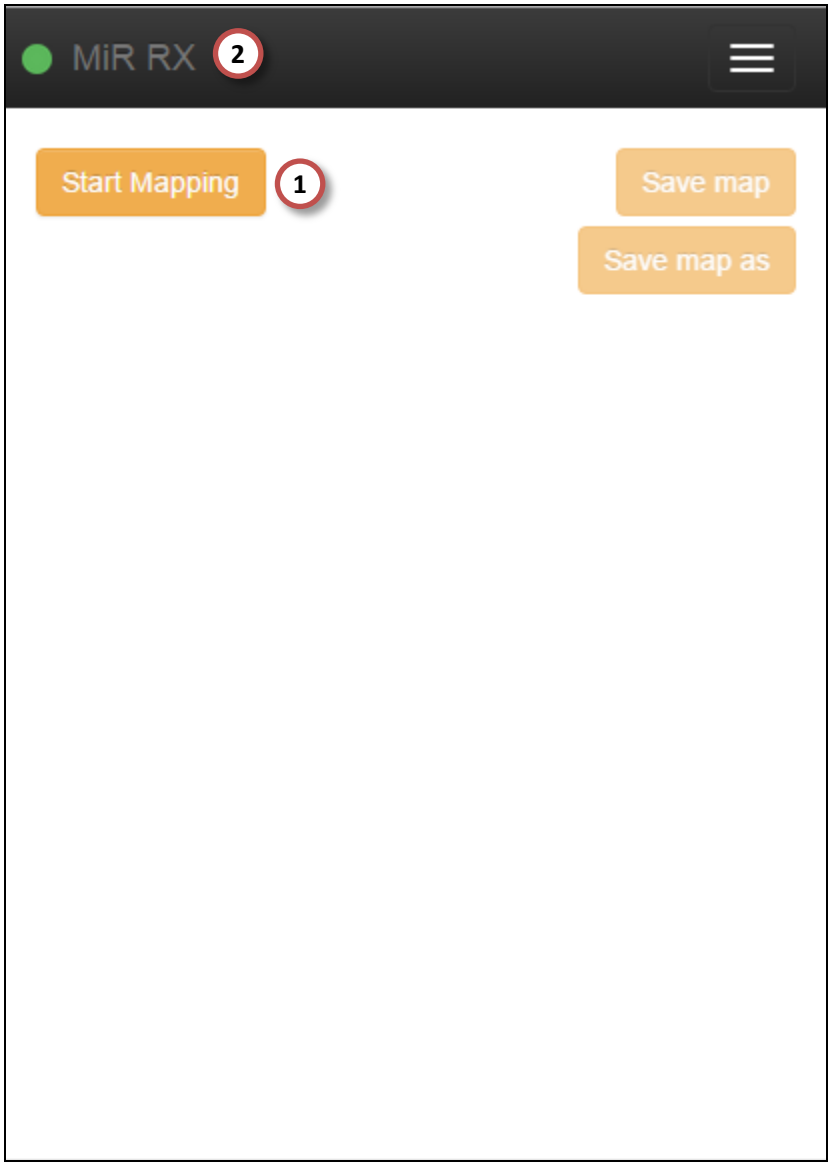
Create as many new positions as needed.

The map displays what MiR100's sensors see.

If too strong mouse movements:



Create New Map – 7/7



1. Create more maps for the same area (e.g. first floor).
2. Go MiR start page.

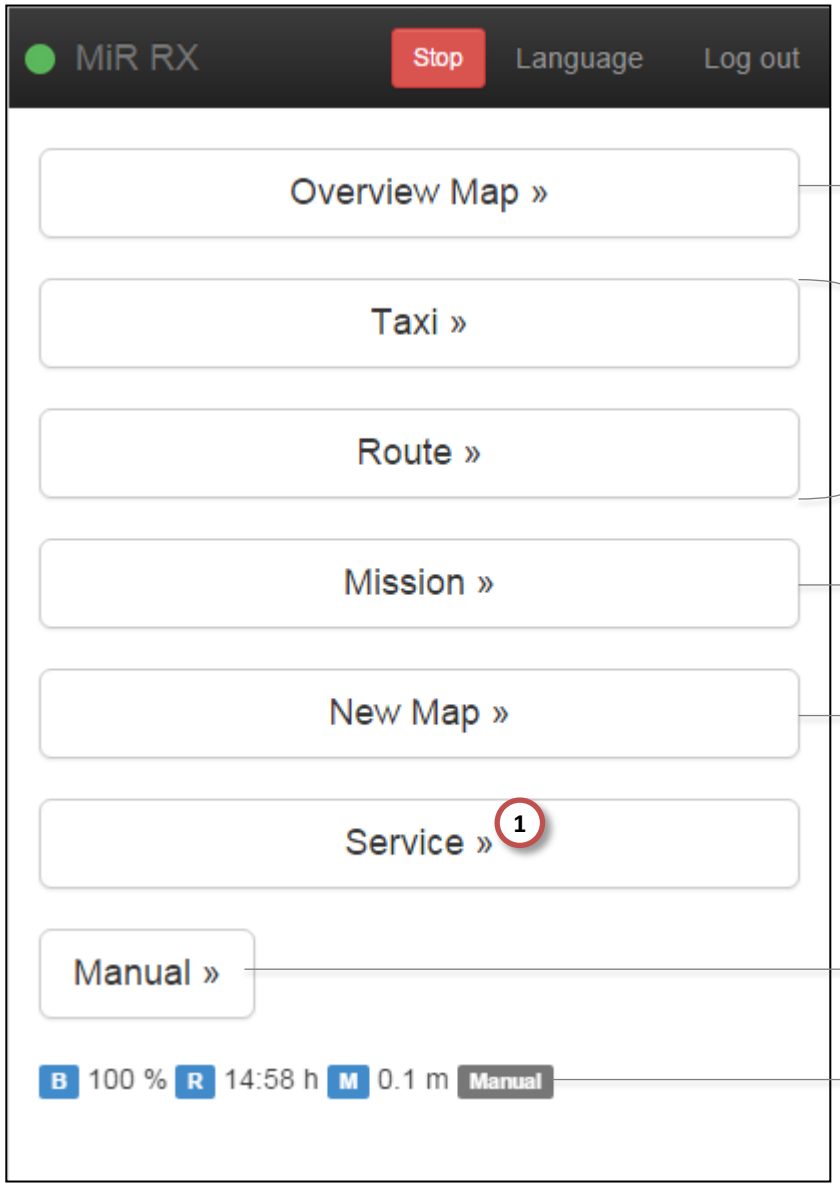
Edit Map – Check list

- ❑ From the start page, select Service > Configuration > Choose Area to edit a specific map
- ❑ Edit either the appearance of the map (Nav) or MiR100's navigation on the map (Web).
- ❑ Draw lines to specify forbidden areas, walls, free areas.

- ❑ Tip: Save the map before editing by downloading to your PC.
- ❑ Tip: A downloaded map can be edited in a picture editing tool.
- ❑ Tip: Get a map by uploading it from your PC.

Edit Map – Administrator 1/6

Start page: MiR



1. Click Service to navigate to Setup menu in order to edit the map.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

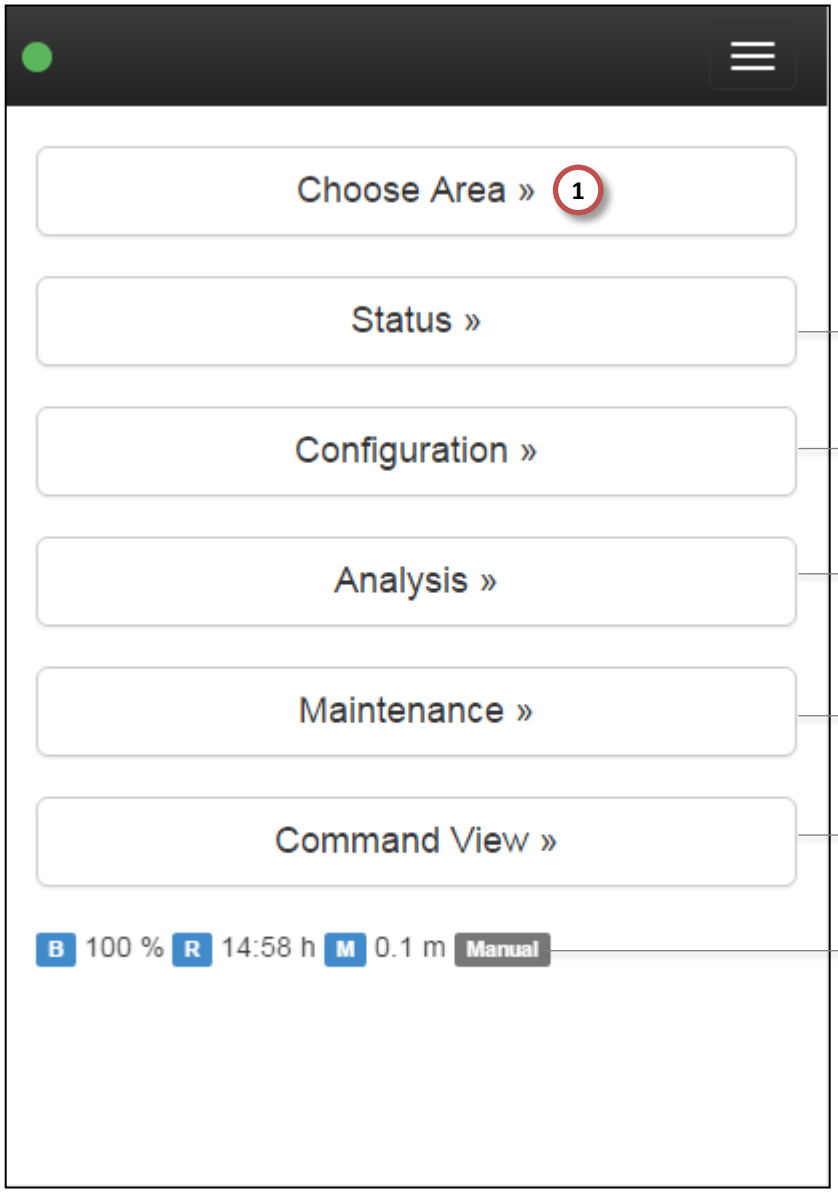
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Edit Map – Administrator 2/6

MiR > Service



1. Go to Choose Area.

Log, status, system information.

Basic setup – rarely used.

Overview over driving – location, distance, status.

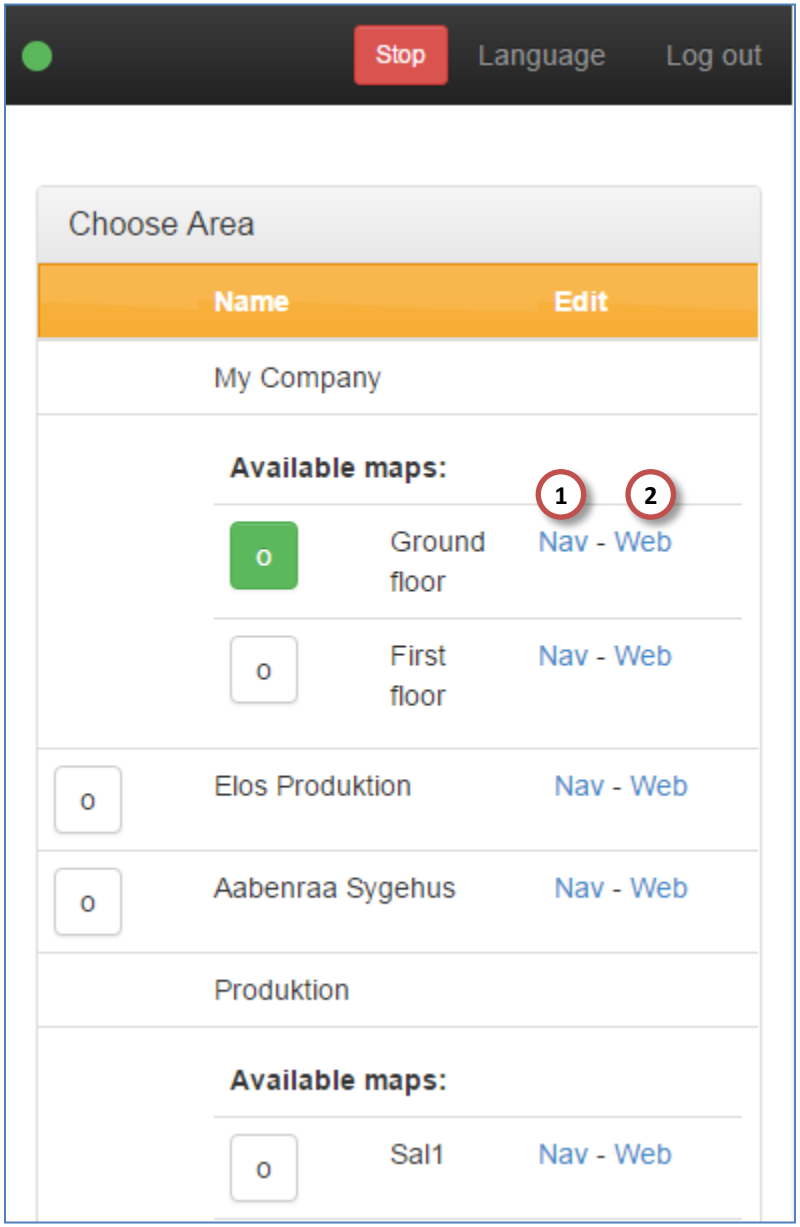
Backup, restore, remote access, wifi.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

Edit Map - Administrator 3/6

MiR > Service > Choose Area



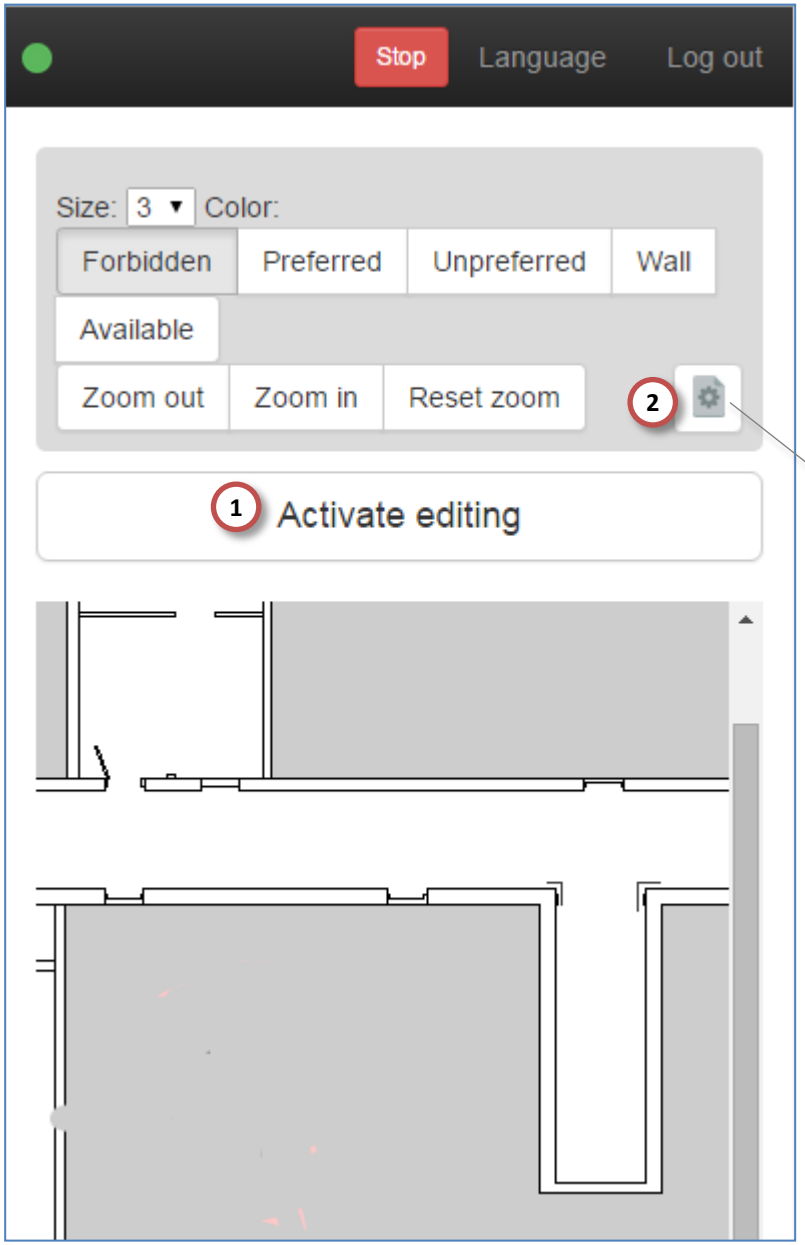
1. Click Nav to edit the look of the map.
OR
2. Click Web to edit the allowed navigation area.

Nav and Web have the same commands and are described as one during the following pages..

The map with the green square is the current active map.

Edit Map - Administrator 4/6

MiR > Service > Choose Area > Nav/Web



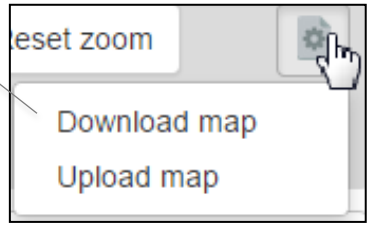
1. Click Activate editing. MiR100 is now in editing mode.

2. To edit the map in an external editor:

   a. Download the map and save it locally (backup).

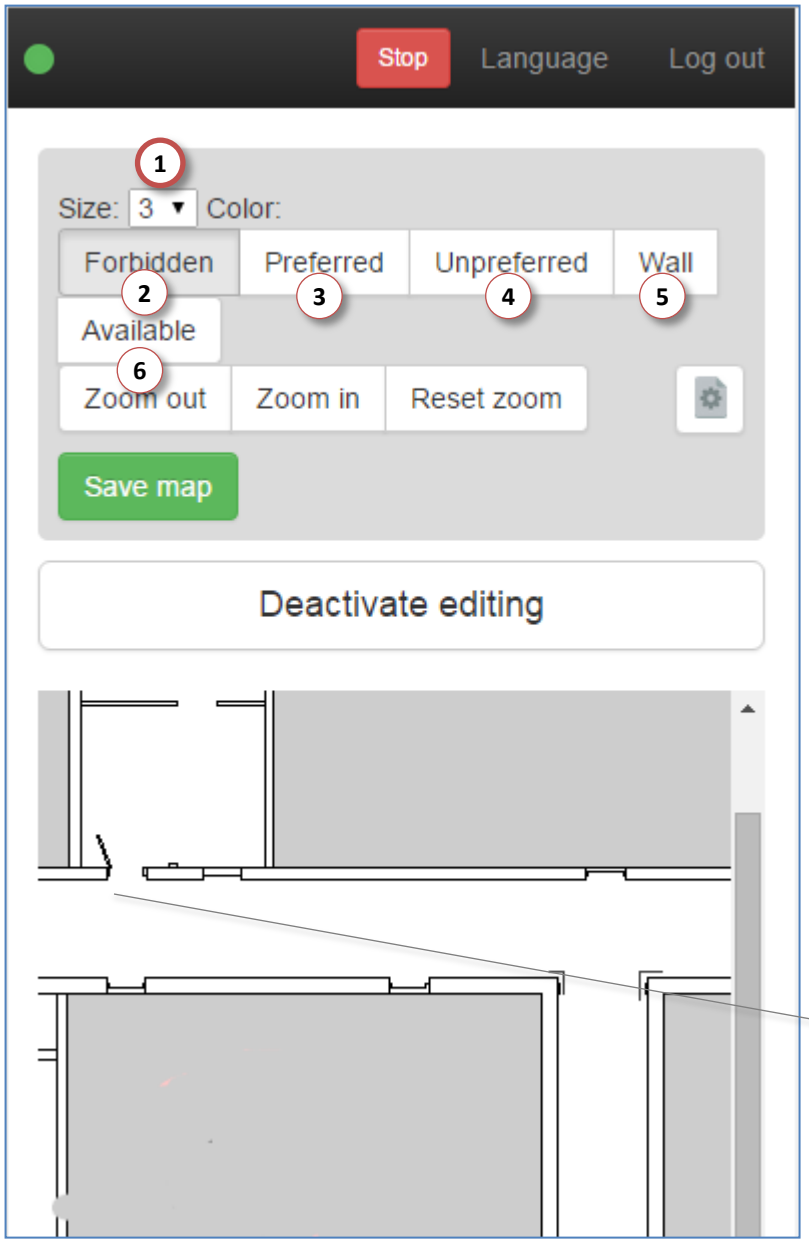
   b. Edit the map using a picture editing tool (use the correct colors – see next page).

   c. Upload the map to add it back into MiR100 again.



Edit Map - Administrator 5/6

MiR > Service > Choose Area > Nav/Web



1. To edit the map directly from the MiR page:
   Select line thickness. 1 = thin.

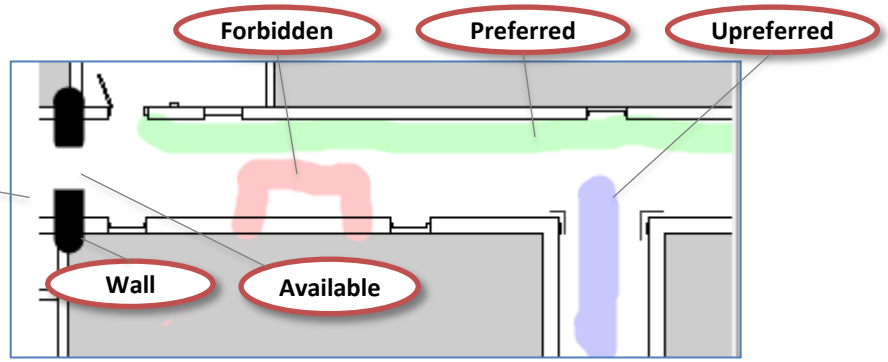
2. Forbidden: red line. MiR100 does not go here.

3. Preferred: green line. MiR100 strives to drive here.

4. Unpreferred: purple line. MiR100 strives not to drive here.

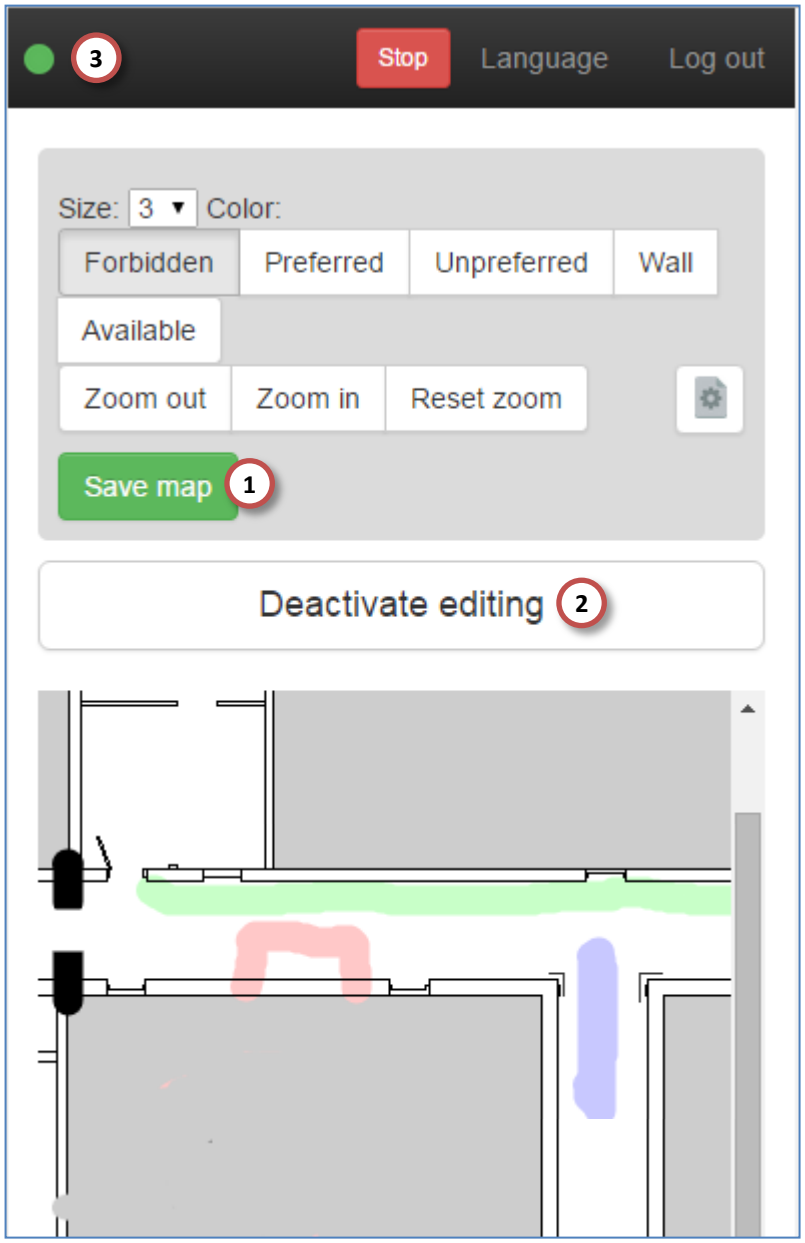
5. Wall: black line. MiR100 treats the line as a wall.

6. Available: white line. ”Erasor” that removes existing and editing lines.



Edit Map - Administrator 6/6

MiR > Service > Choose Area > Nav/Web



1. When editing is satisfactory: Click Save map.

2. Deactivate editing to stop MiR100's editing mode..

To reload the map and undo editing BEFORE SAVING: Press F5.

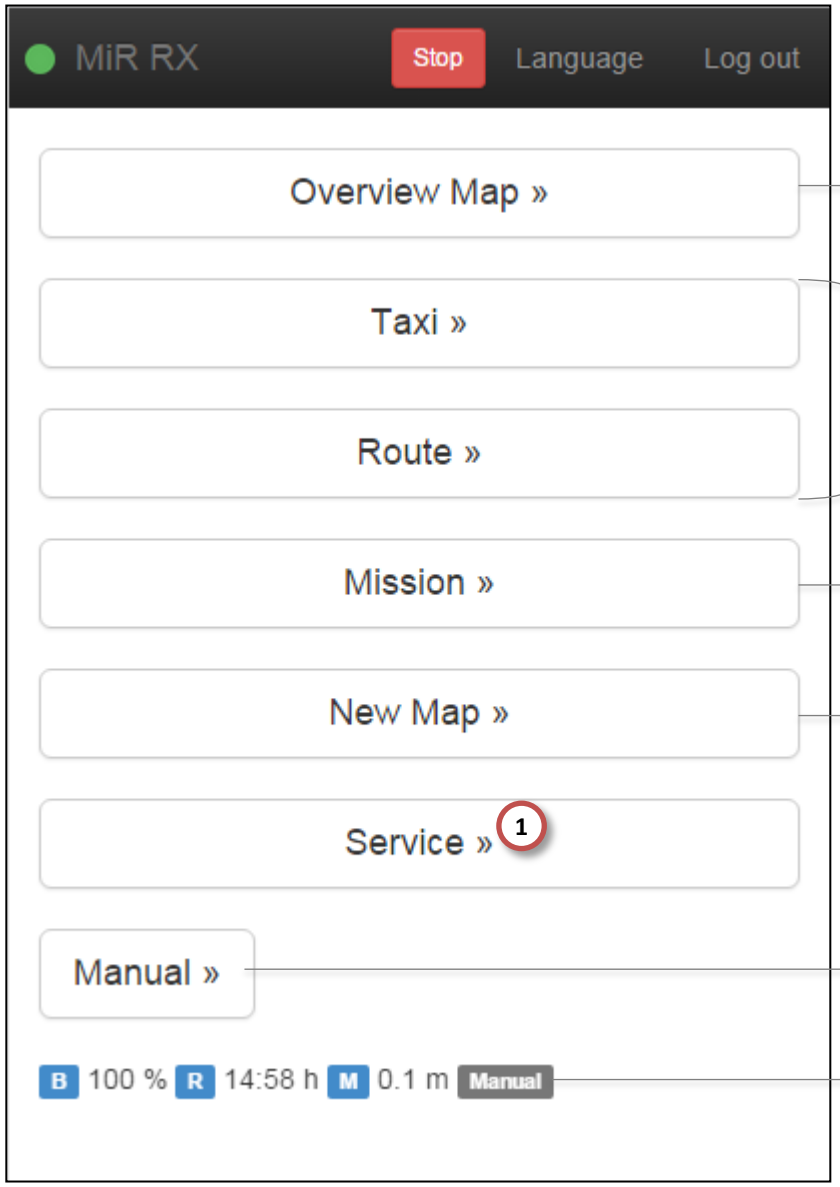
3. Go back to MiR start page.

Adjust the Position of the Vehicle on the Map – Check list

If the vehicle has been moved physically so that its location in reality and on the map no longer matches, the position must be adjusted on the map.

- ❑ From the start page, click Service
- ❑ Select Command View
- ❑ After adjustment – return to the start page

Adjust the Position of the Vehicle on the Map - 1/3 Start page: MiR



1. Click Service to navigate to the Setup menu in order to synchronize the map and the vehicle positions.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

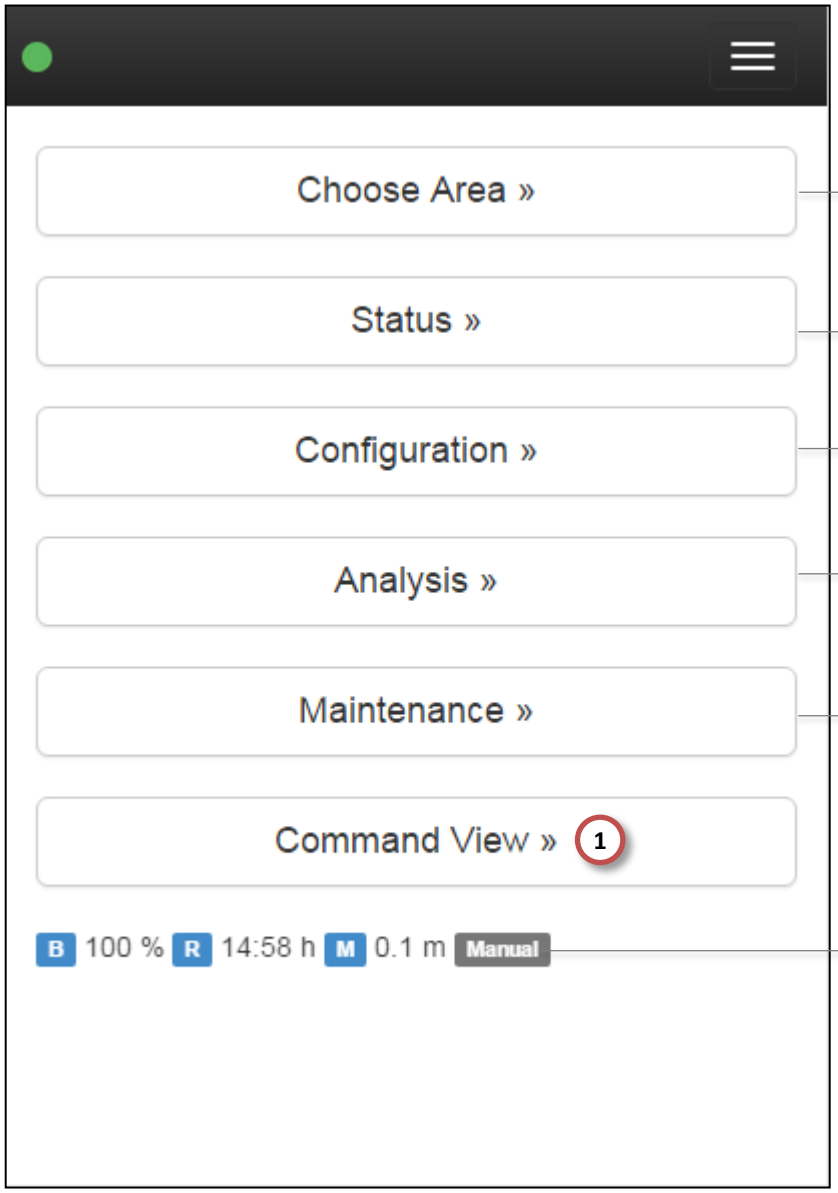
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

Adjust the Position of the Vehicle on the Map - 2/3

MiR > Service



1. Select Command view.

Choose area, start up MiR100, see and edit map.

Log, status, system information.

Basic setup – rarely used.

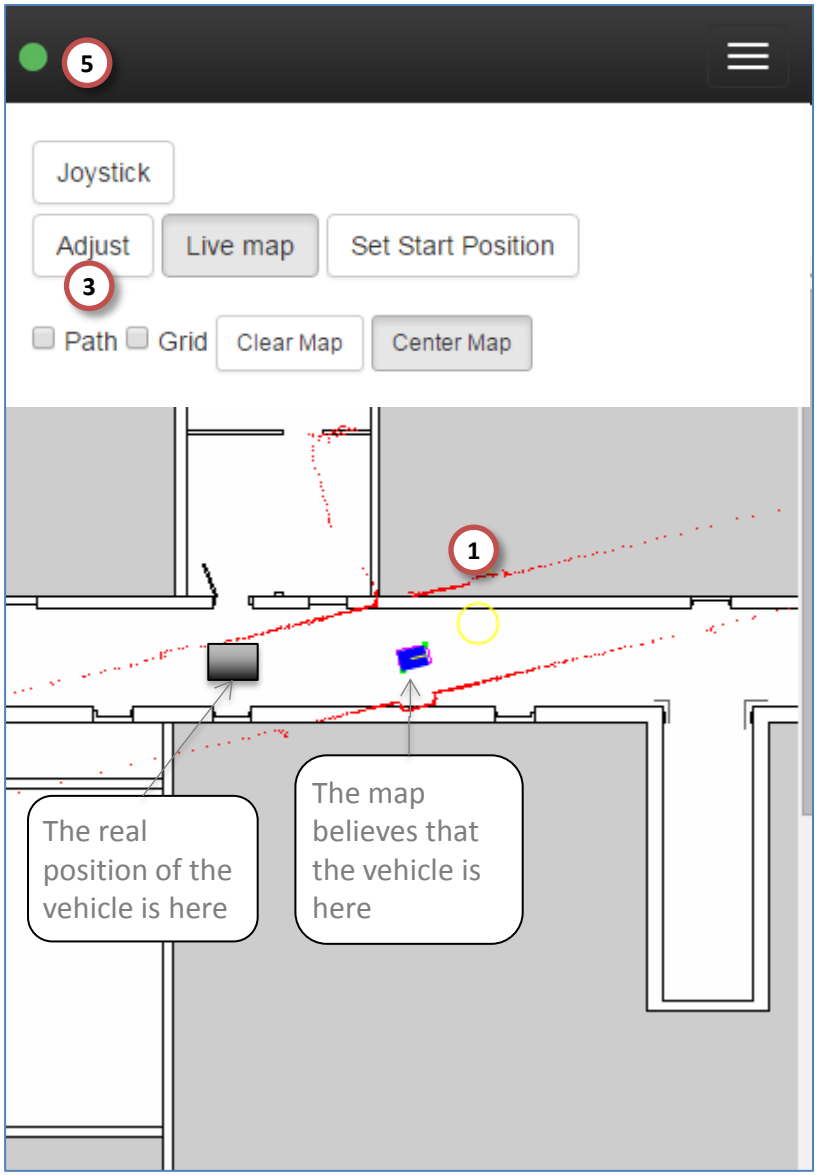
Overview over driving – location, distance, status.

Backup, restore, remote access, wifi.

Note: MiR100 is on Manual. Select Area in Service to activate.

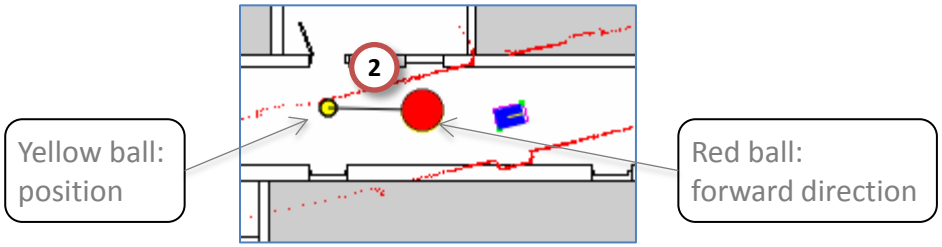
Adjust the Position of the Vehicle on the Map - 3/3

MiR > Service > Command View



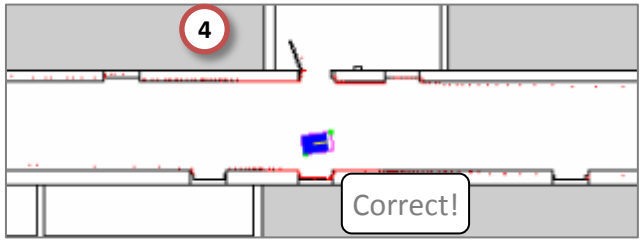
1. Red lines (the sensors of the vehicle) must match the black lines of the map. Done in step 2.

2. Mark the real location of the vehicle on the map: **click and drag the mouse** – like driving using joystick.



3. Update the map. Click Adjust.

4. The vehicle and the map are now in sync.



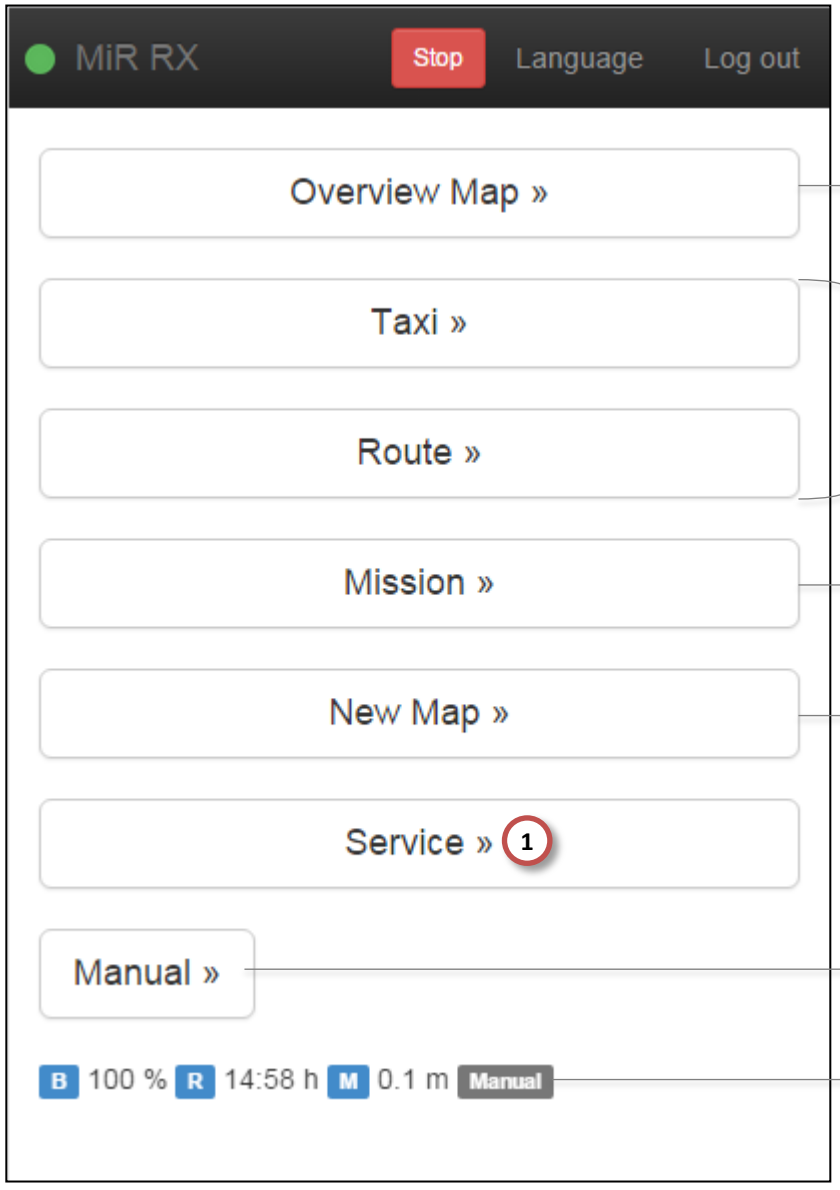
5. Go back to the MiR start page.

MiR100 Status – Administrator Check list

- From the start page, select Service > Status > Diagnostics to see the status of physical components:
  - Component
  - Hardware ID
  - Seq
  - Key Values
- From the start page, select Service > Status > ROS Log to see the conditions of the system:
  - Comments and information
  - Warnings
  - Errors
- From the start page, select Service > Status > Topics to see the internal messages of the system:
  - Robot pose
  - Odometry topic
  - Cmd Vel
  - AMCL covar
  - MC/encoder

MiR100 Status – Administrator 1/8

Start page: MiR



1. Click Service to navigate to the Status menu.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

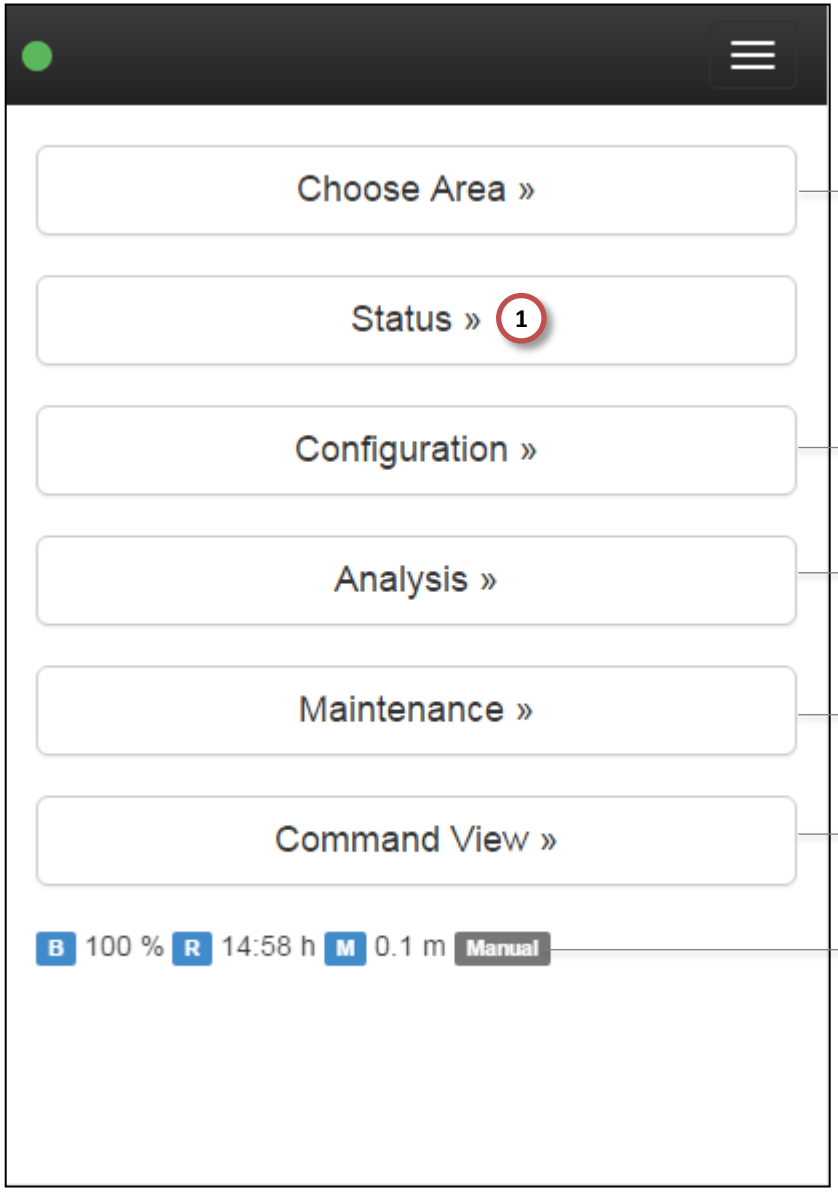
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Status – Administrator 2/8

MiR > Service



1. Click Status to see log, status, system information.

Choose area, start up MiR100, see and edit map.

Basic setup – rarely used.

Overview over driving – location, distance, status.

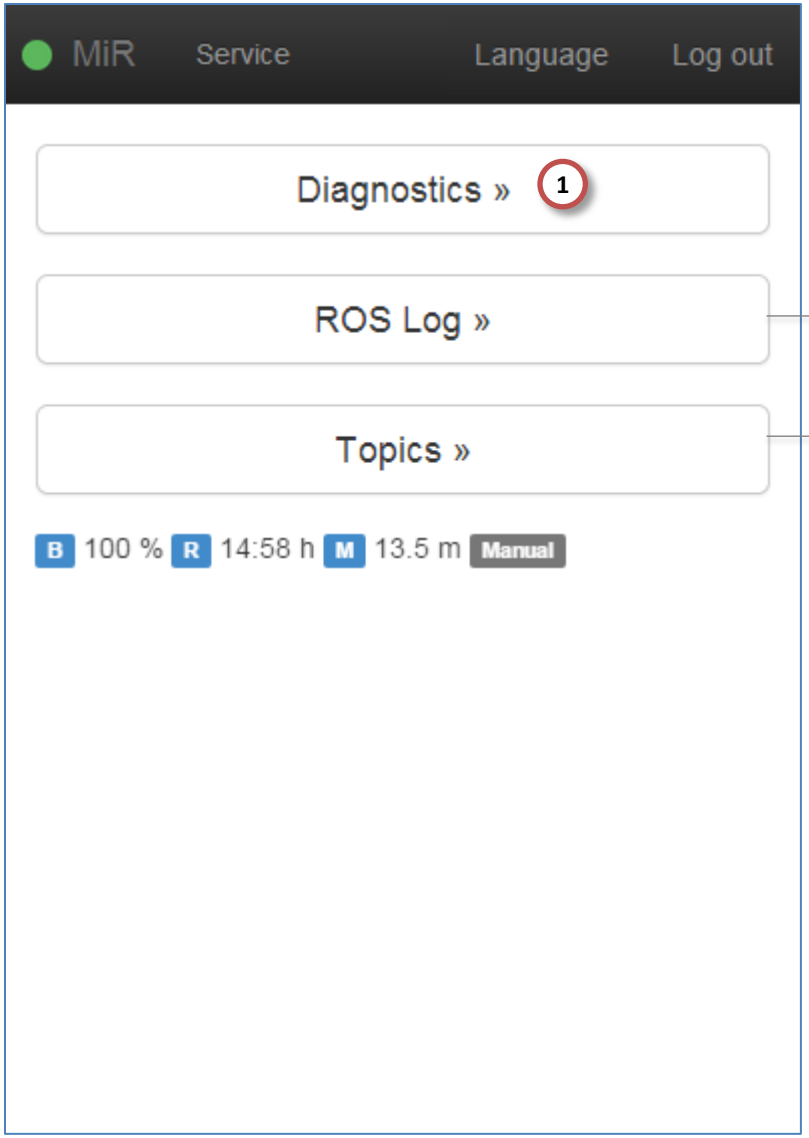
Backup, restore, remote access, wifi.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Status – Administrator 3/8

MiR > Service > Status



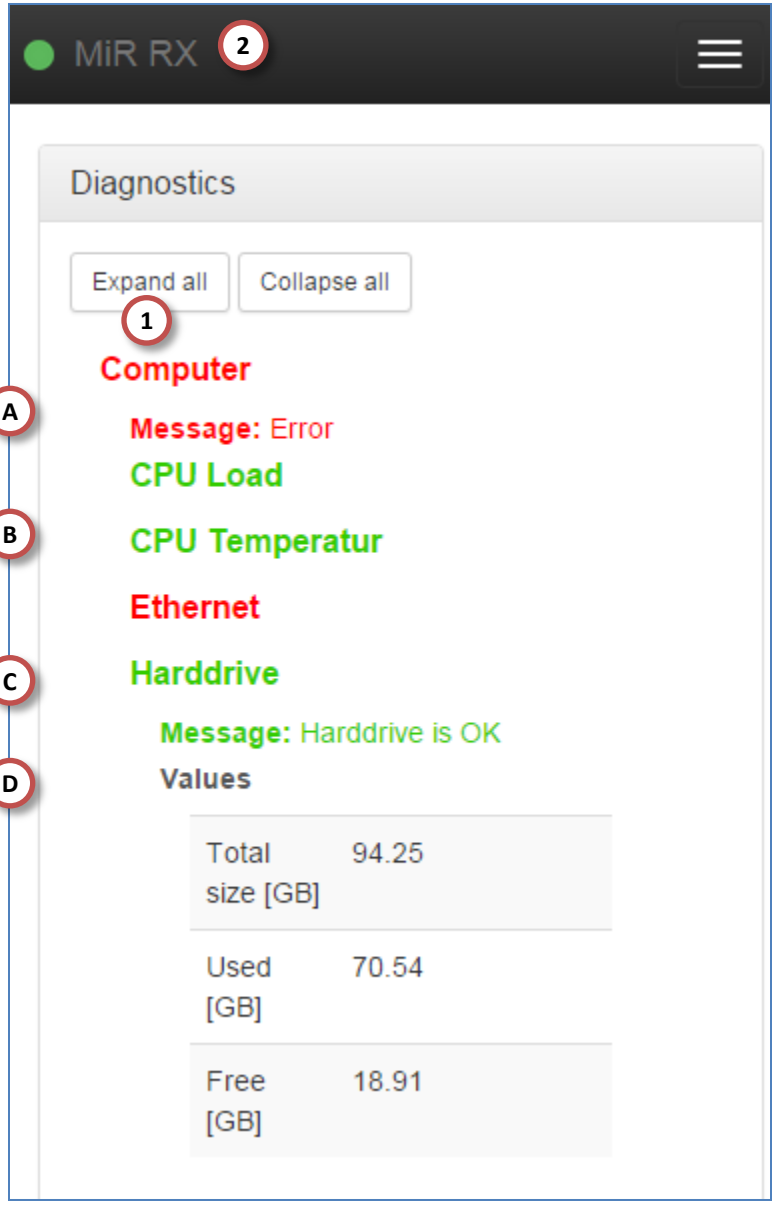
1. Click Diagnostics to see status of physical components (motor control, laser,...)

Status of the conditions of the system. A service technician uses ROS log for troubleshooting.

Shows the content of internal messages.

MiR100 Status – Administrator 4/8

MiR > Service > Status > Diagnostics



1. Shows all physical components of the system:
   - Motor control
   - Laser
   - Teensy (ultrasound and gyro)
   - Xtion (3D camera)
   - CPU load

A. Message color:
Green: OK
Yellow: Warning
Red: Lost connection or critical error

B. Component:
Specific unit (eg front or rear laser..

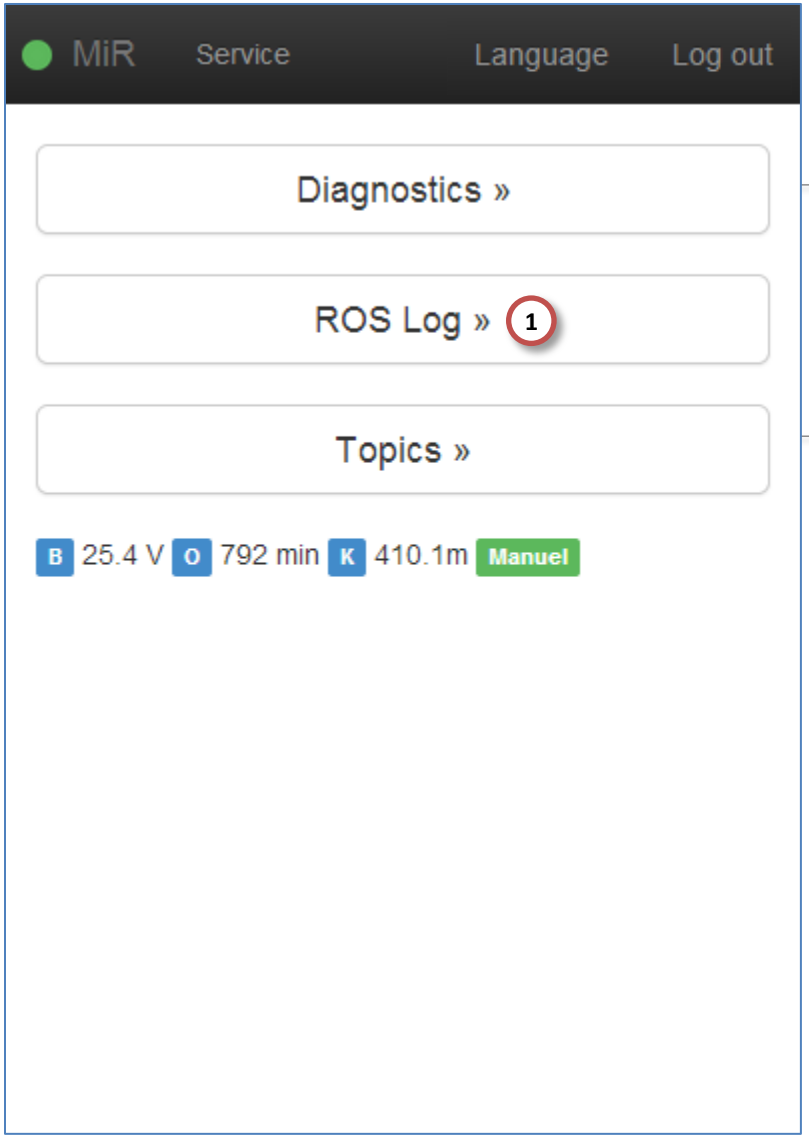
C. Hardware ID:
Type of unit (eg a laser).

D. Key Values:
Each unit has a specific status. Shown here: motor control. Error number description is found in the service manual for MiR100.

2. Go back to Status.

MiR100 Status – Administrator 5/8

MiR > Service > Status



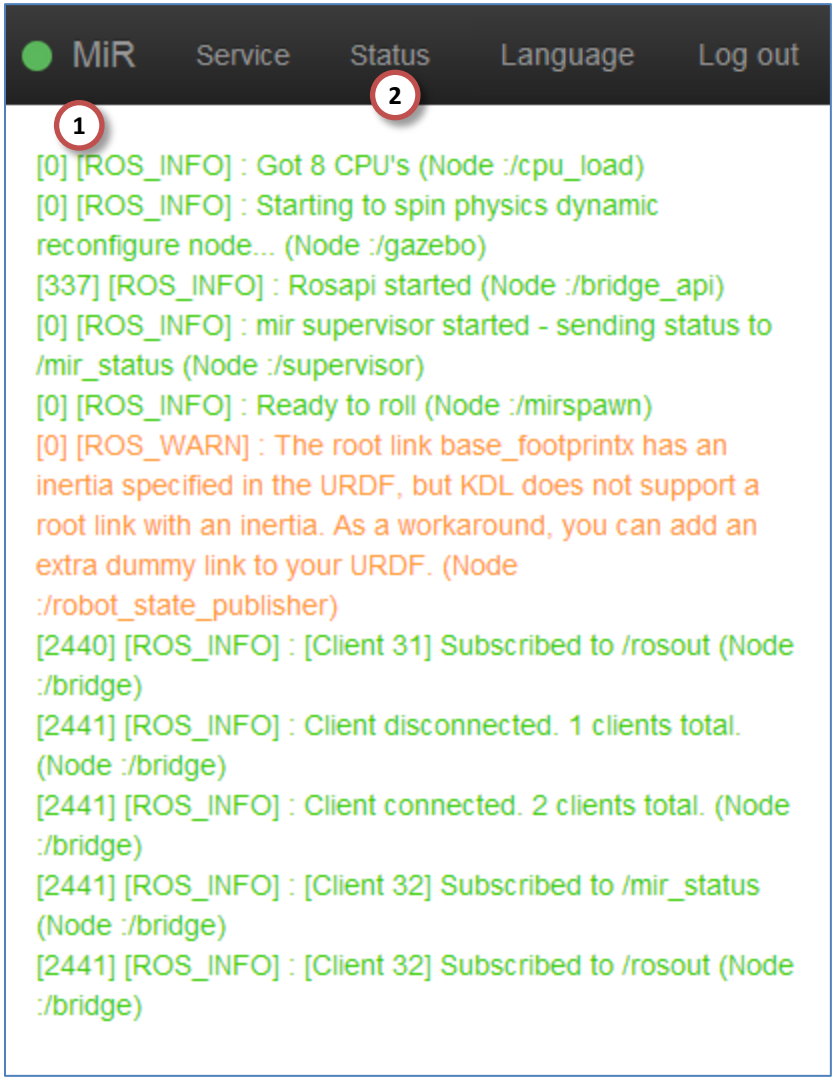
1. Click ROS Log to see the conditions of the system.

Status of physical components (motor control, laser,...)

Shows the content of internal messages.

MiR100 Status – Administrator 6/8

MiR > Service > Status > ROS Log



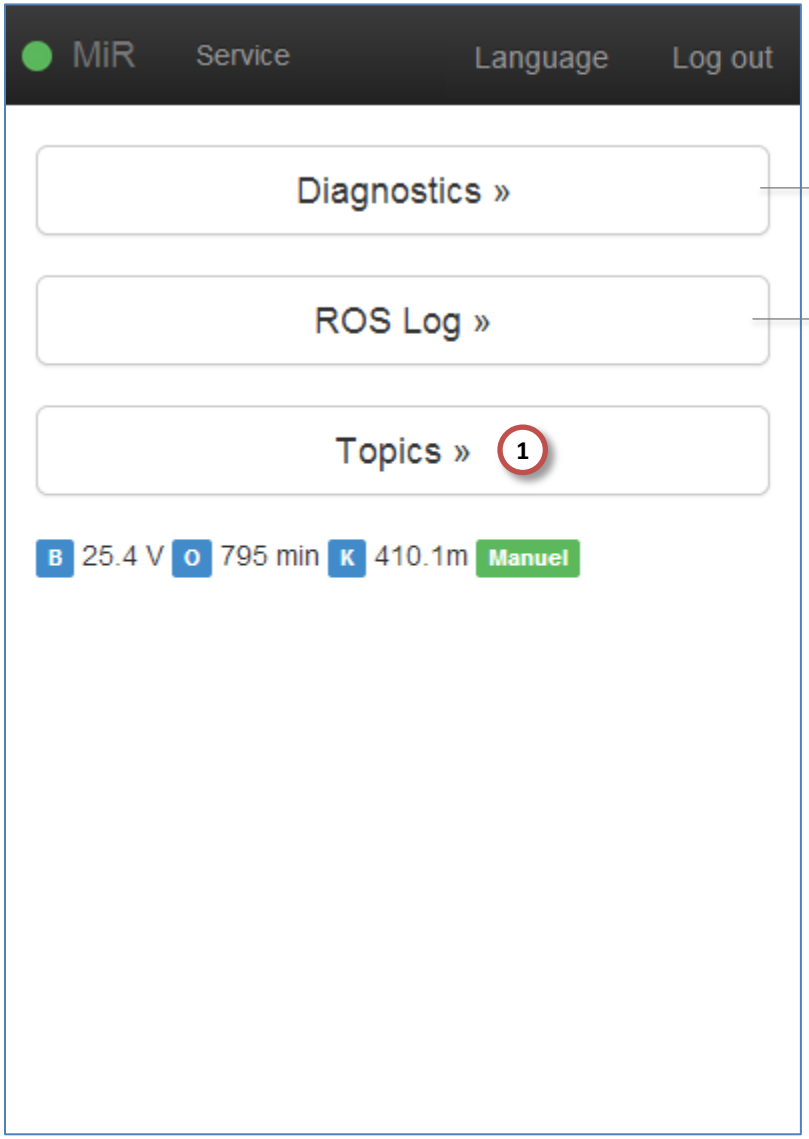
1. Internal ROS log.

Message color:
Green [ROS_INFO]: Comments and information
Rust [ROS_WARN]: Warning
Red [ROS_ERROR]: Error

2. Go back to Status.

MiR100 Status – Administrator 7/8

MiR > Service > Status



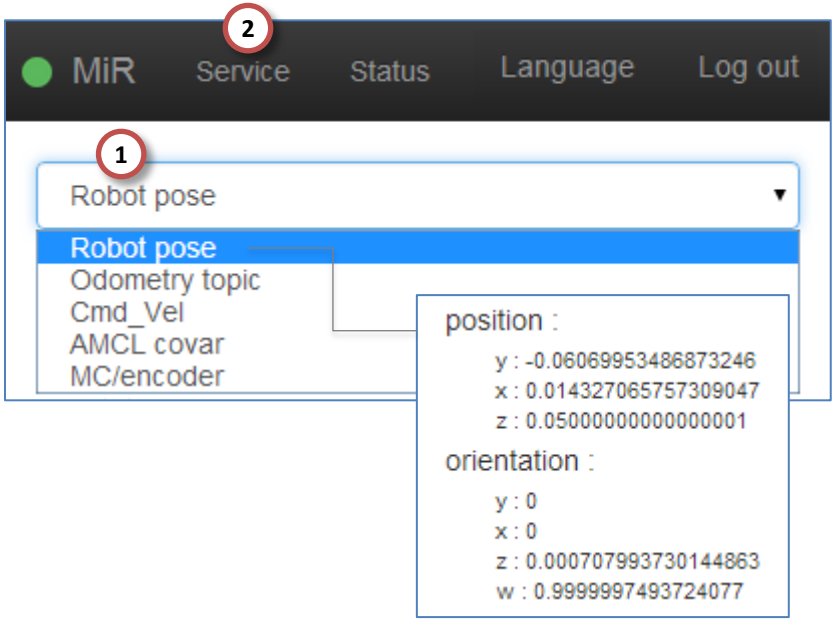
1. Click Topics to see internal system messages.

Status of physical components (motor control, laser,...)

Status of the conditions of the system. A service technician uses ROS log for troubleshooting.

MiR100 Status – Administrator 8/8

MiR > Service > Status > Topics



1. Displays the content of internal messages.

Robot Pose:
The current position and orientation of the vehicle (pose) relative to all external and internal maps and sensor input. This position is used for ongoing navigation.

Odometry topic
The current position of the vehicle relative to the odometry of the vehicle. This position is a part component of the overall navigation.

Cmd_Vel
Velocity command that is sent to the motor control as a forward speed and rotational velocity.

AMCL covar
Accordance between the calculated position of the vehicle's internal map and its sensor inputs. Based on walls, openings and other characteristics the vehicle analyses at which position it is located. The smaller the co-variance (*covar)* the better accordance. (*AMCL = Addaptive Monte Carlo Localization* = the name of a particle filter method. This is a probability method.)

MC/encoder
(*Motor Control*) Provides counter positions (*encoder*) for the right and left motors.

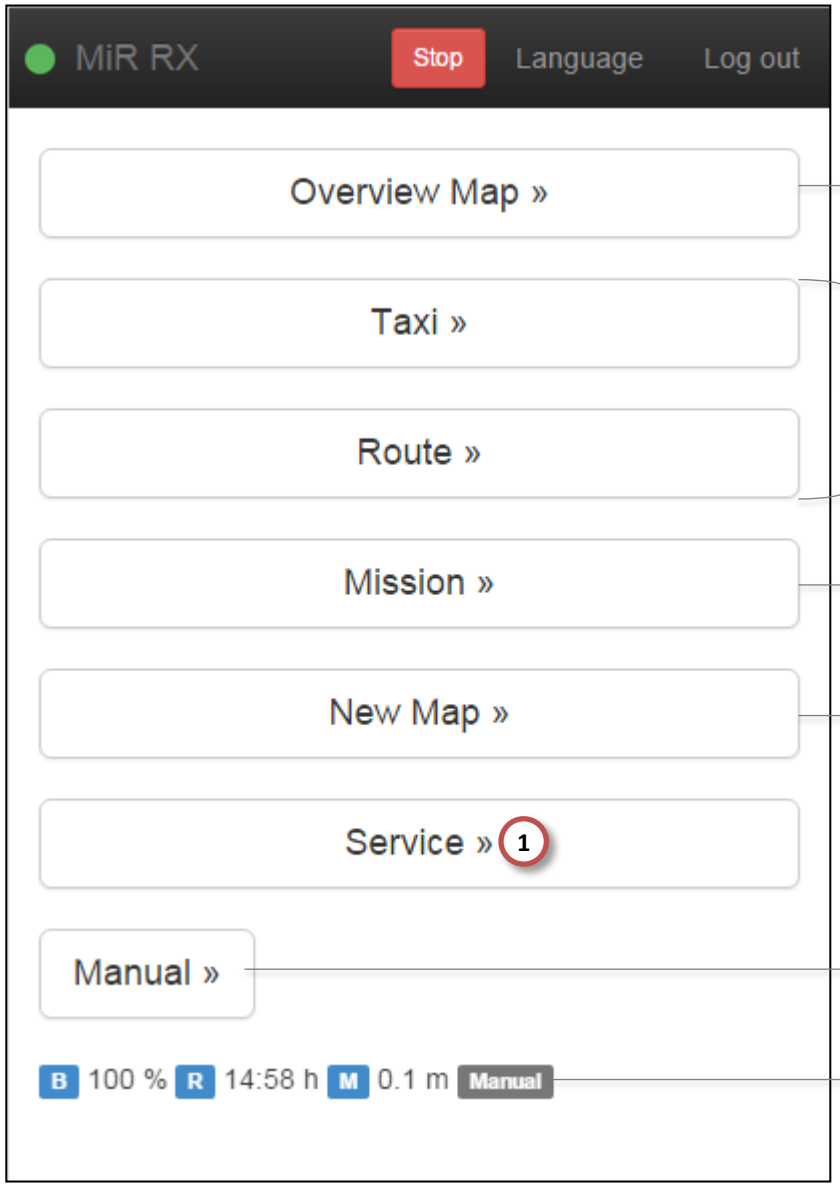
2. Go back to Service.

MiR100 Configuration – Administrator Check list

- ❑ From the start page, select Service > Configuration to see status and edit:
  - ❑ Software modules
  - ❑ Positions
  - ❑ Contacts
  - ❑ Sounds
  - ❑ Missions
  - ❑ Maps
  - ❑ Areas
  - ❑ PLC Registers
  - ❑ Manual functionality (sounds, light)
  - ❑ System settings

MiR100 Configuration – Administrator 1/33

Start page: MiR



1. Click Service to navigate to the Configuration menu.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

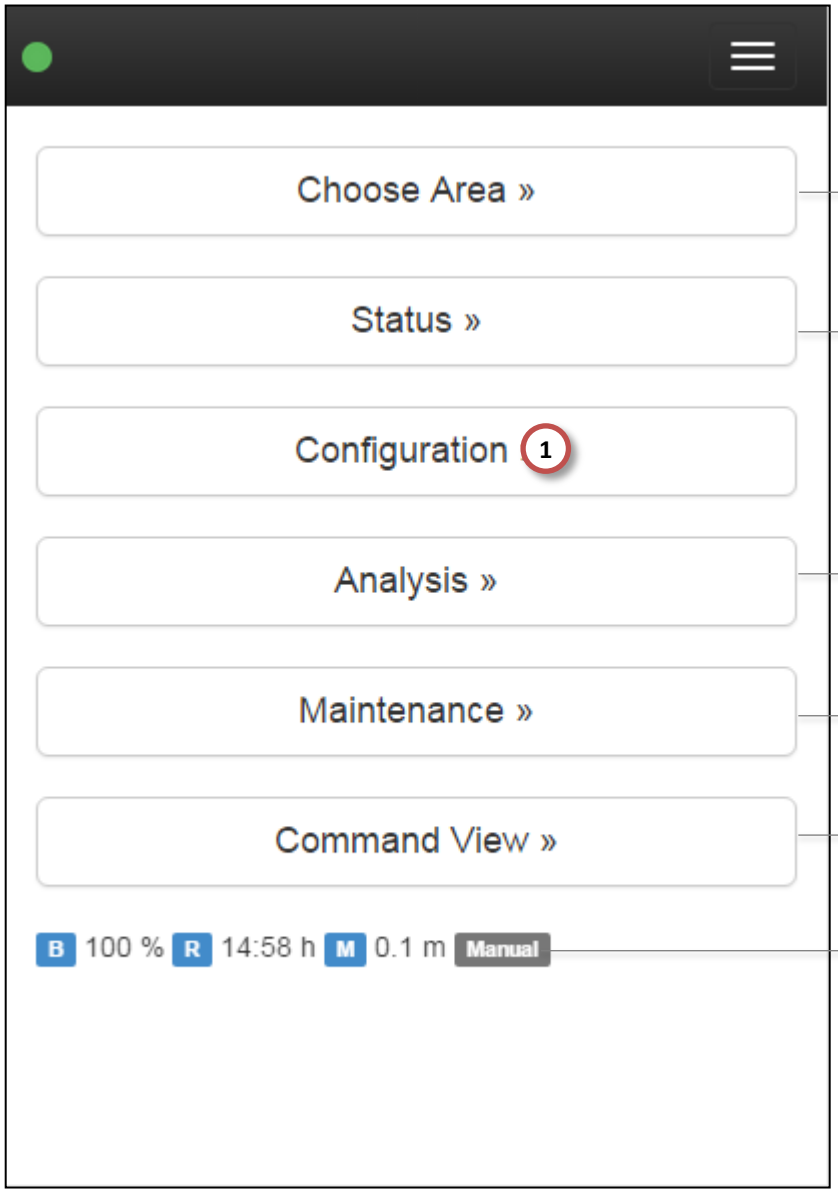
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Configuration – Administrator 2/33

MiR > Service



1. Select Configuration for setting up positions, light, sound, map, system.

Choose area, start up MiR100, see and edit map.

Log, status, system information.

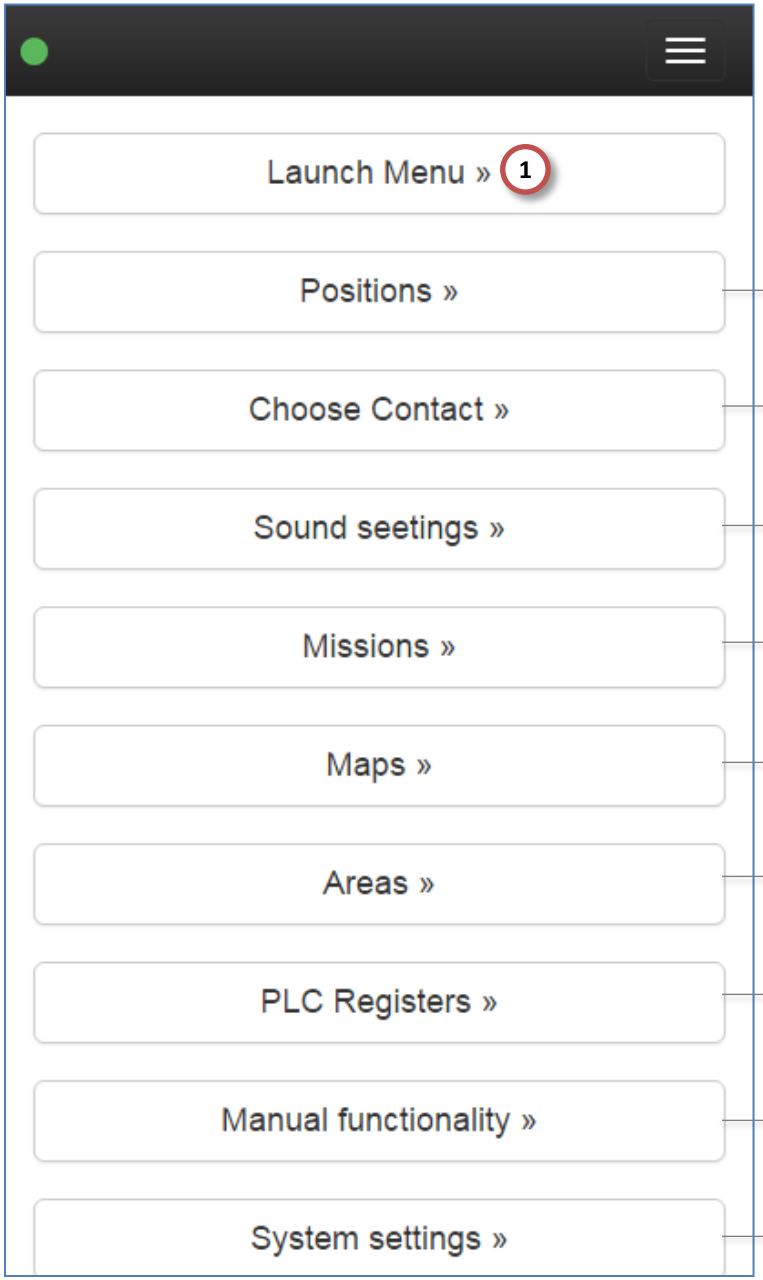
Overview over driving – location, distance, status.

Backup, restore, remote access, wifi.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Configuration – Administrator 3/33 MiR > Service > Configuration

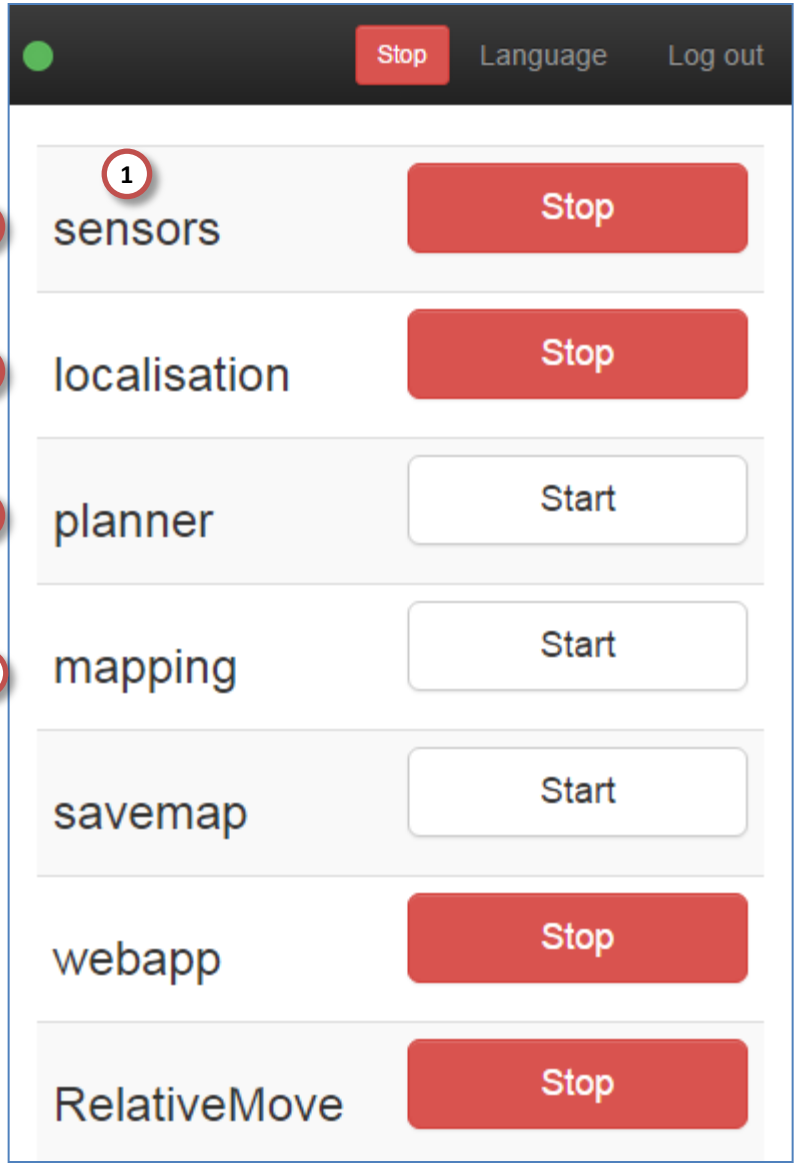


1. Click Launch Menu to see the list of the vehicle's constituent elements that can be started/stopped.

- Positions » — Create and Edit positions for operation patterns.
- Choose Contact » — Manage contacts: name, mail, phone.
- Sound seetings » — Create sounds.
- Missions » — Build missions as sequences of actions.
- Maps » — Edit map metadata (origo, name, resolution).
- Areas » — Manage areas: name, maps.
- PLC Registers » — Interface with PLC devices: conveyors, machines.
- Manual functionality » — Real time activation of light, speed, sound.
- System settings » — MiR settings: email, ROS parameters, hardware setup.

MiR100 Configuration – Administrator 4/33

MiR > Service > Configuration > Launch Menu



Continue...

1. Constituent elements (software modules) of the vehicle systems, which can be started/stopped directly from MiR web interface.

A. sensors:
Handles data from laser and camera.

B. localisation:
AMCL navigational system and odometry. Theses systems calculates the position of the vehicle for that area of the map where it's currently located.

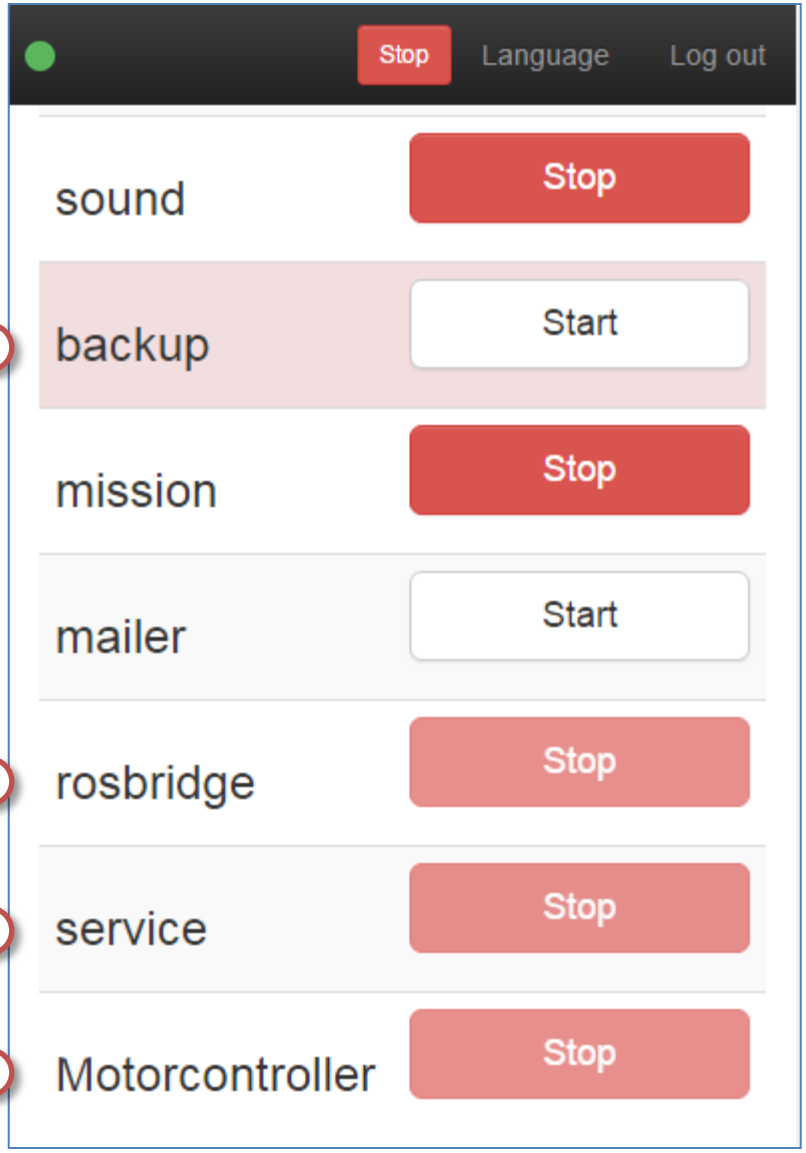
C. planner:
Path planning. Consists of two parts: a global *planner* that does the general route planning between two positions and a local *planner* that causes the vehicle to follow the global route and also take into account the surrounding environment so that the vehicle avouds dynamic obstacles based on sensor input. Eg. people are avoided by the vehicle..

D. mapping:
This module is activate during mapping of a new area. It gathers walls, obstacles, positions and creates MiR100's internal map based on manual driving of the vehicle. This module can be regarded as an operation pattern.

MiR100 Configuration – Administrator 5/33

MiR > Service > Configuration > Launch Menu

Continued…



E

F

F

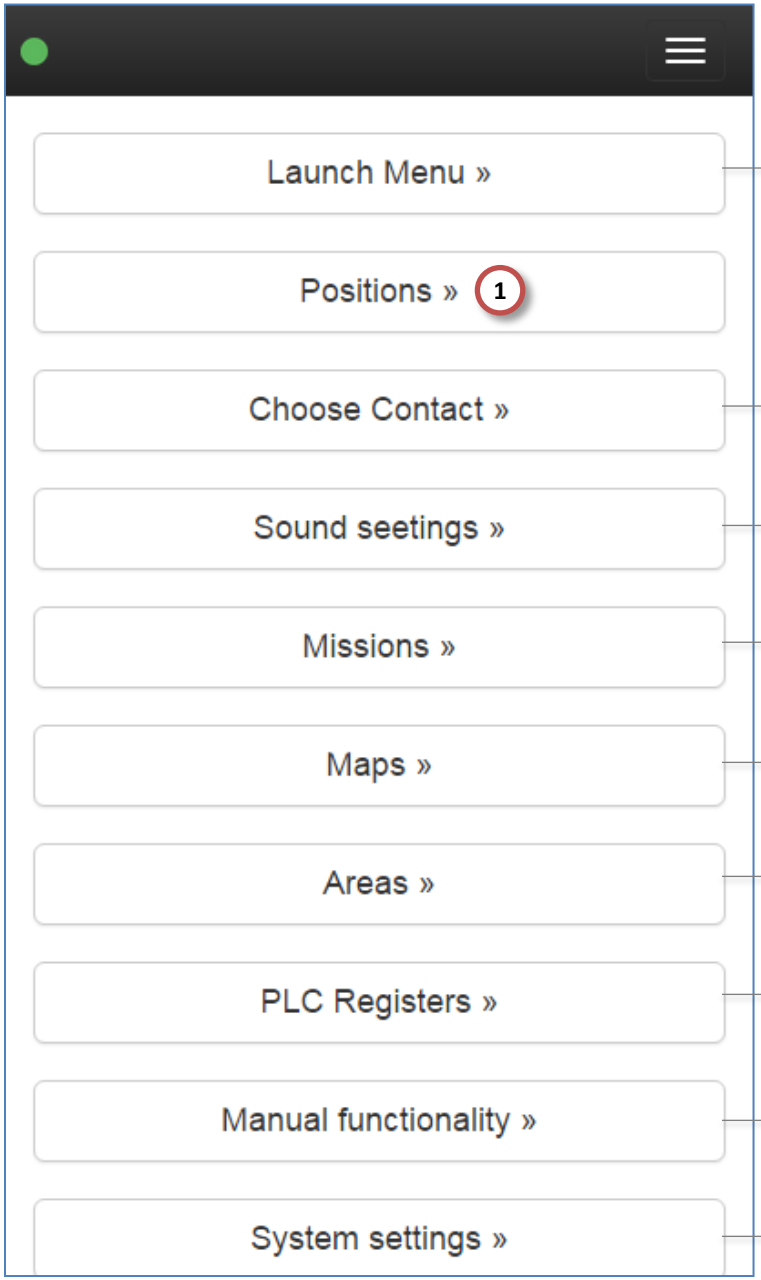
F

E. Backup – pink background:
A module is shown with pink background when it has failed to start or stop unexpectedly.

F. Modules – read only buttons:
If a module's start/stop button is set to read only it cannot be stopped and is shown for information only.

Go back to MiR > Service > Configuration.

MiR100 Configuration – Administrator 6/33 MiR > Service > Configuration



1. Create and Edit positions for operation patterns.

Constituent elements that can be started/stopped.

Manage contacts: name, mail, phone.

Create sounds.

Build missions as sequences of actions.

Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

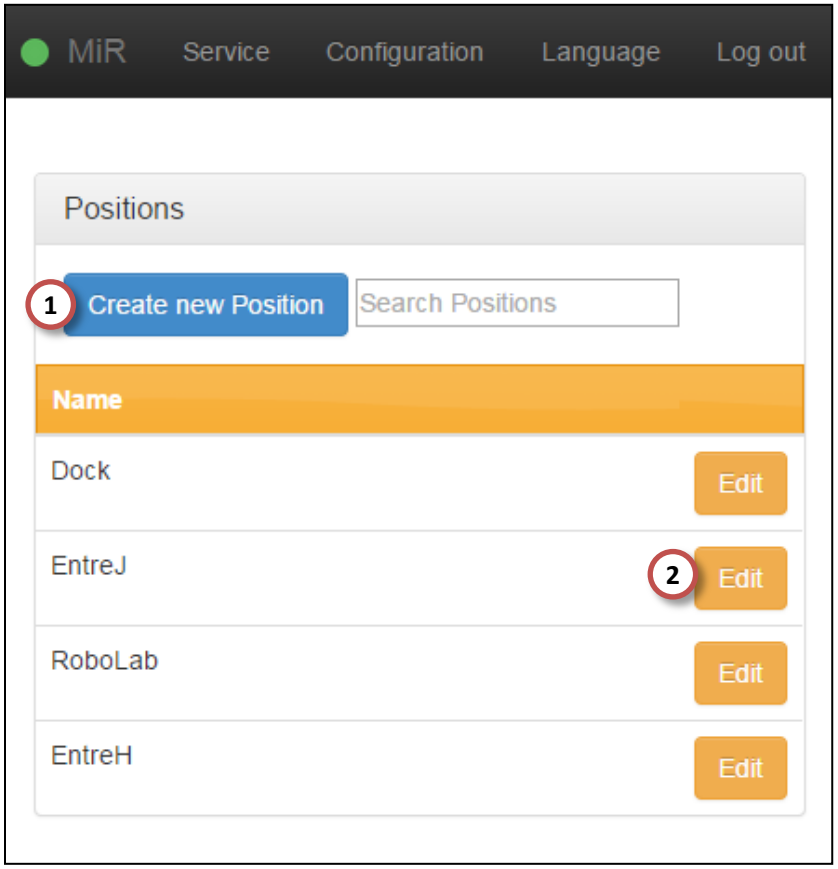
Interface with PLC devices: conveyors, machines.

Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.

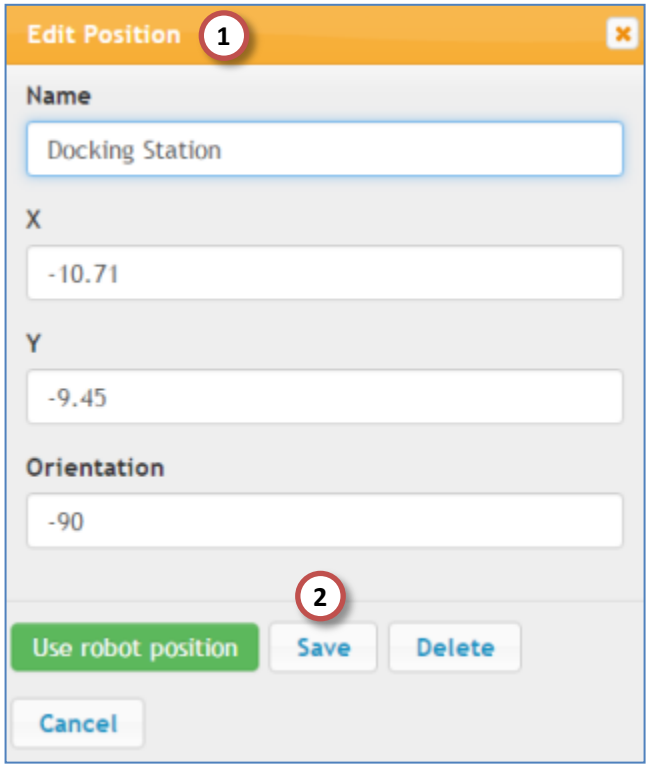
MiR100 Configuration – Administrator 7/33

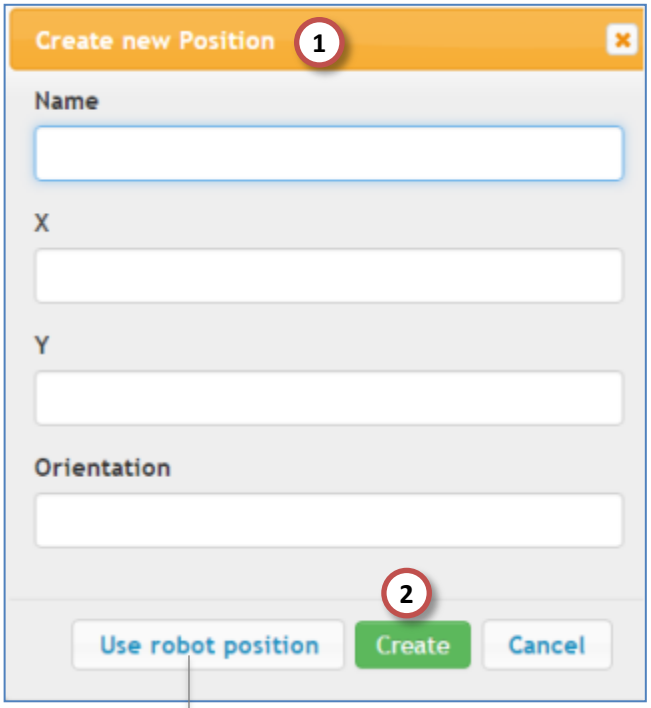
MiR > Service > Configuration > Positions



1. Create a new position or...

2. Edit an existing position.





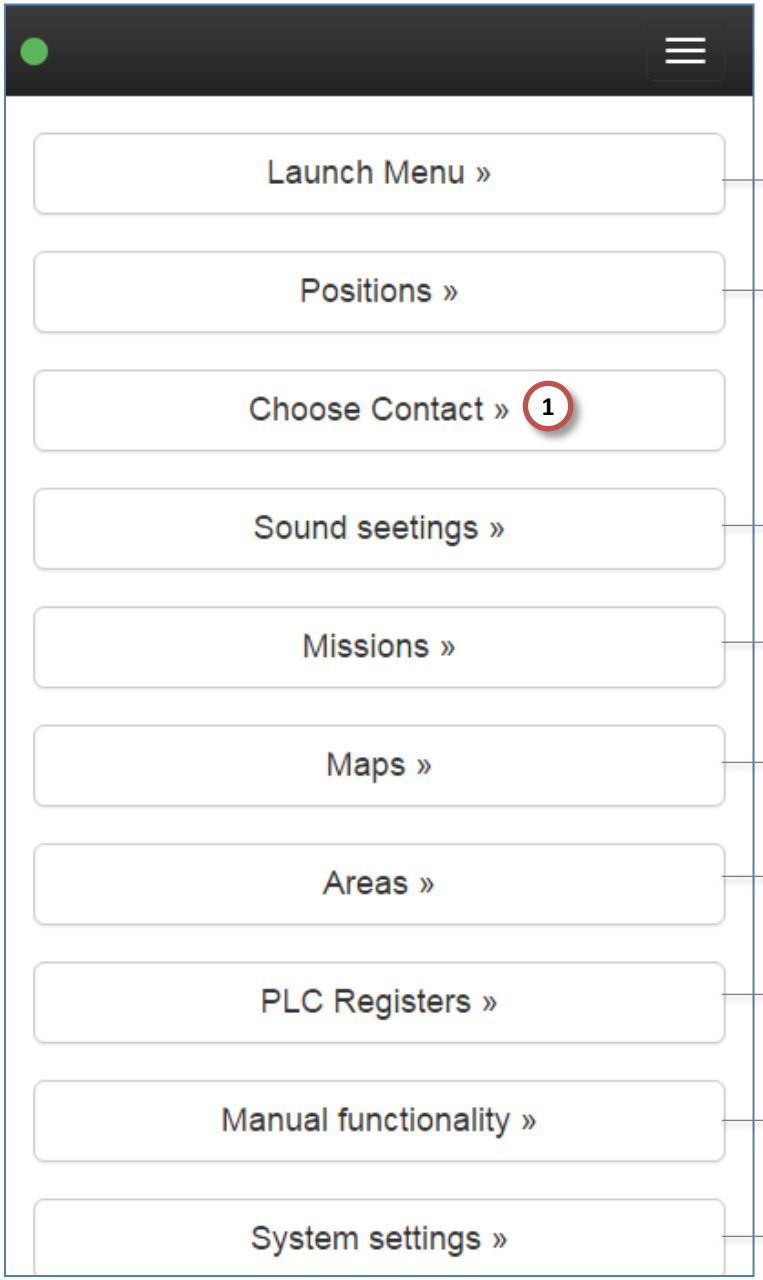
1. Fill in all fields.

2. Accept the changes – click Save or Create button.

3. Go back to MiR > Service > Configuration.

Use an existing position as a starting point - fields are automatically filled in and can be edited.

MiR100 Configuration – Administrator 9/33 MiR > Service > Configuration



1. Click Choose Contact to create and edit name, mail, phone.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Create sounds.

Build missions as sequences of actions.

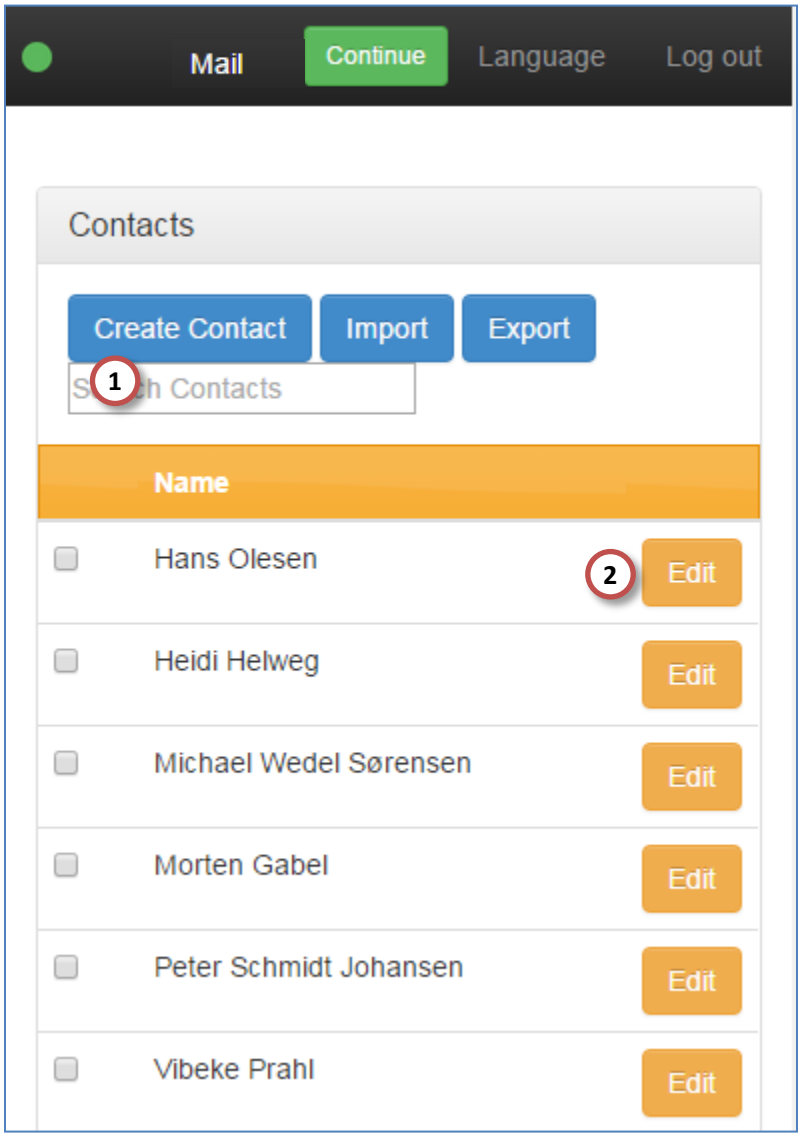
Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

Interface with PLC devices: conveyors, machines.

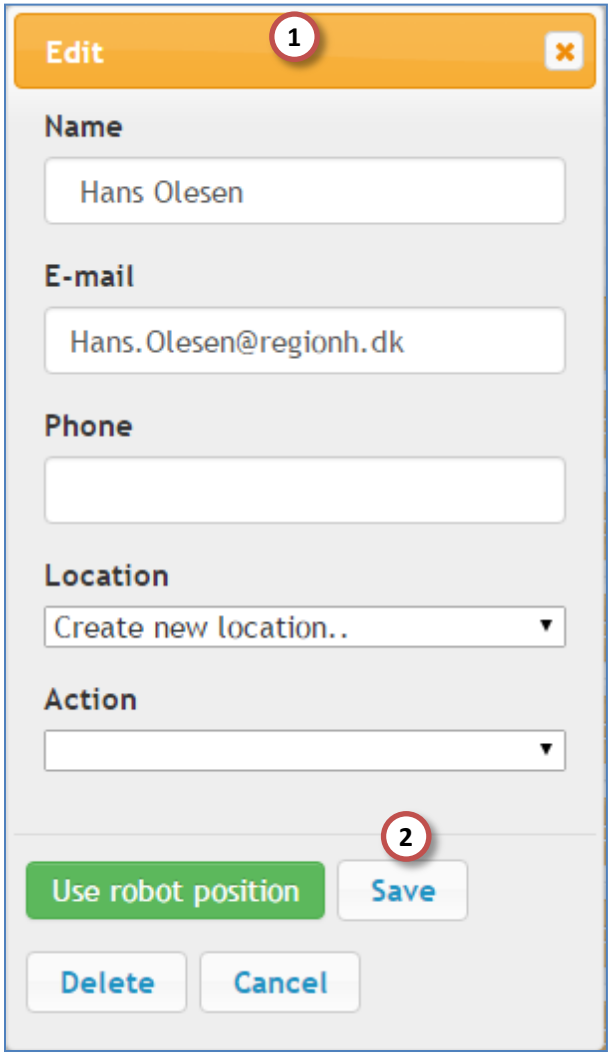
Real time activation of light, speed, sound.

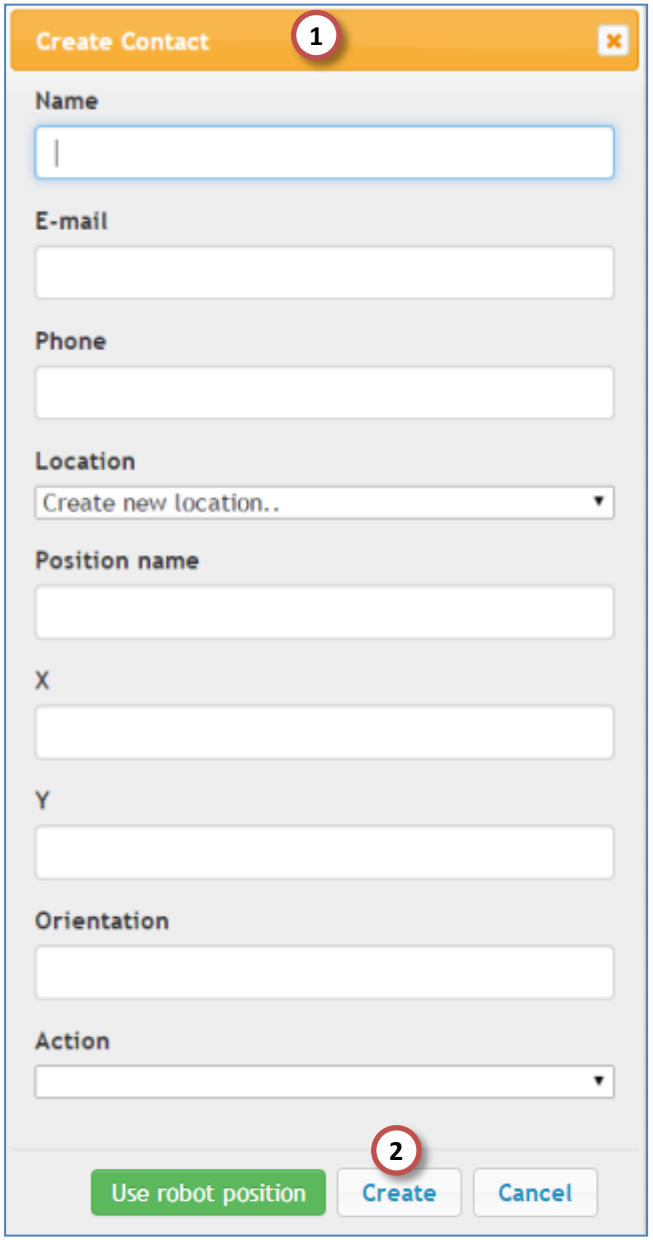
MiR settings: email, ROS parameters, hardware setup.



1. Create a new contact.

2. Click Edit to update or delete a contact.



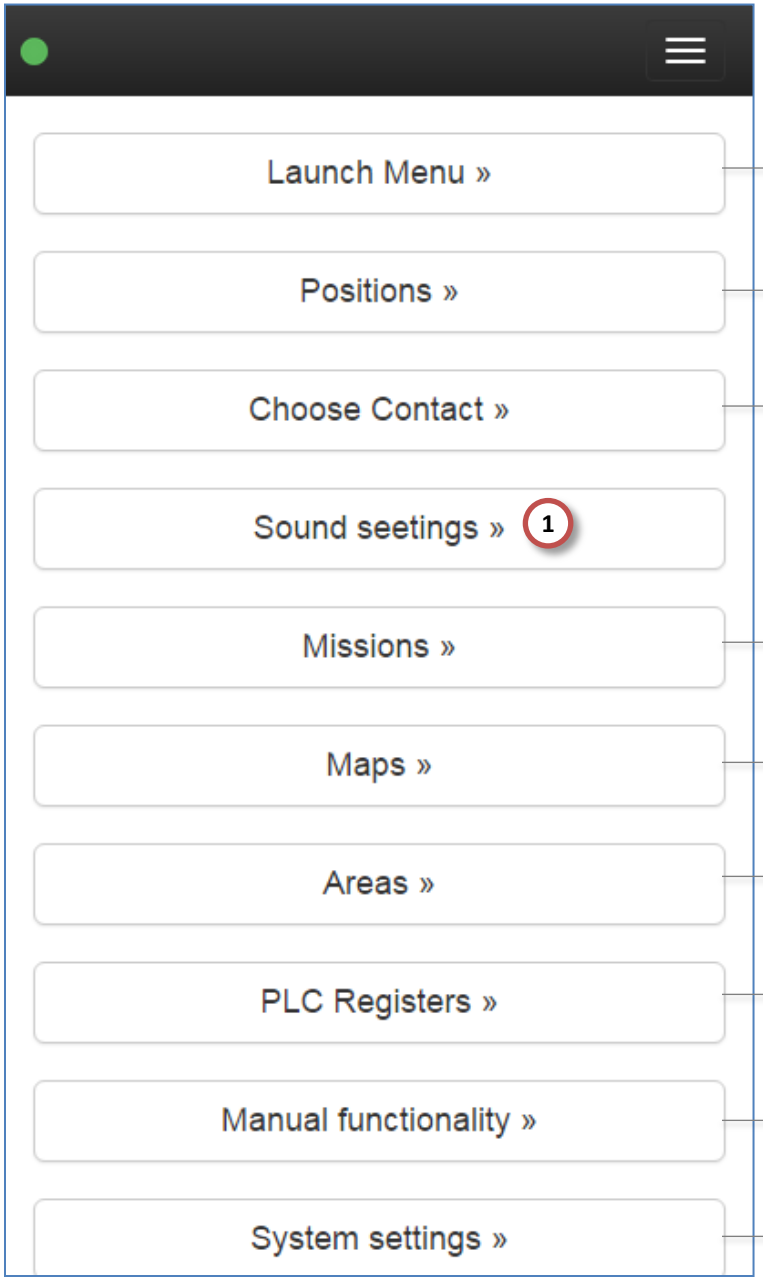


1. Fill in all fields.

2. Accept the changes – click Save or Create button.

3. Go back to Service > Configuration

MiR100 Configuration – Administrator 12/33 MiR > Service > Configuration



1. Click Sound settings to create and edit sounds.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Build missions as sequences of actions.

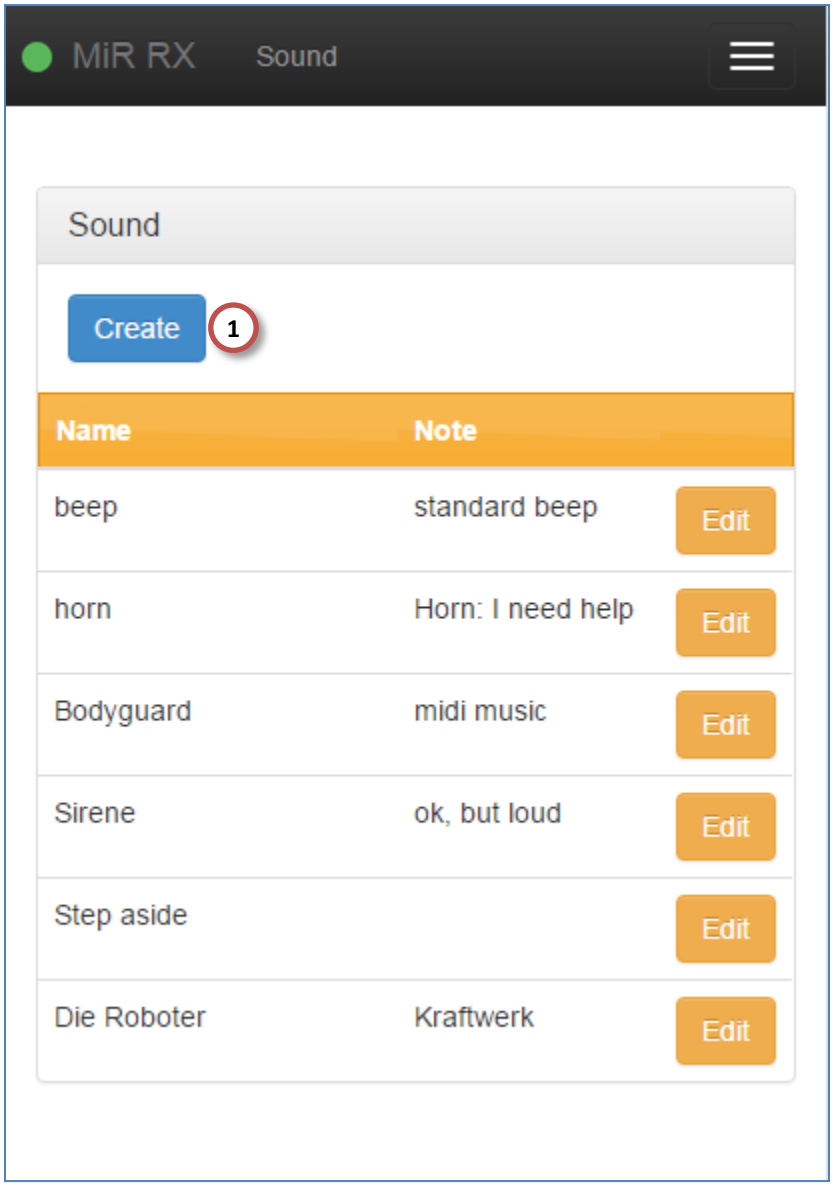
Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

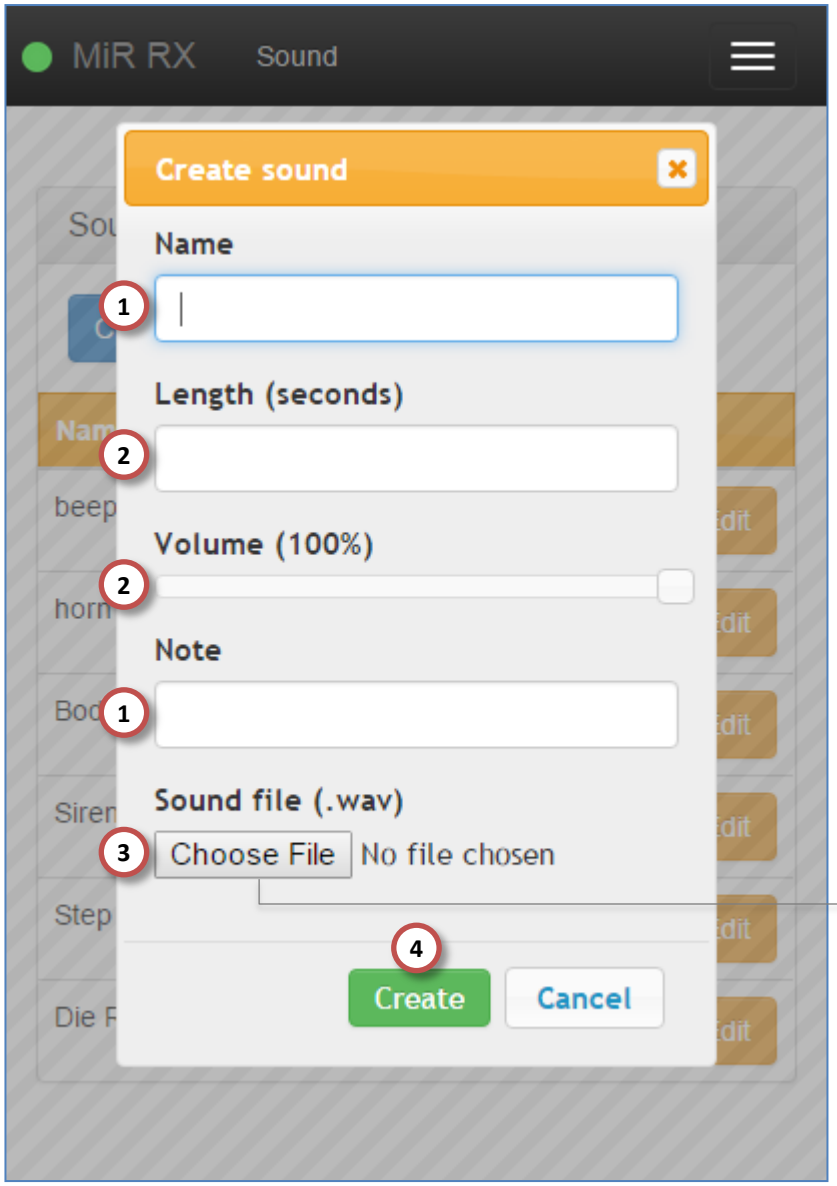
Interface with PLC devices: conveyors, machines.

Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.

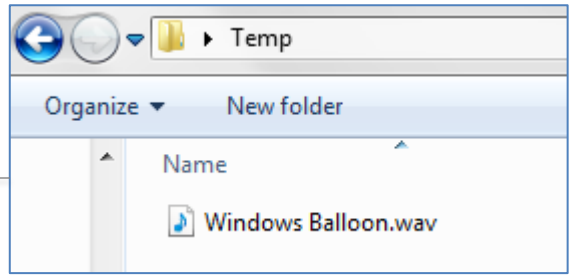


1. Click Create to add a new sound.

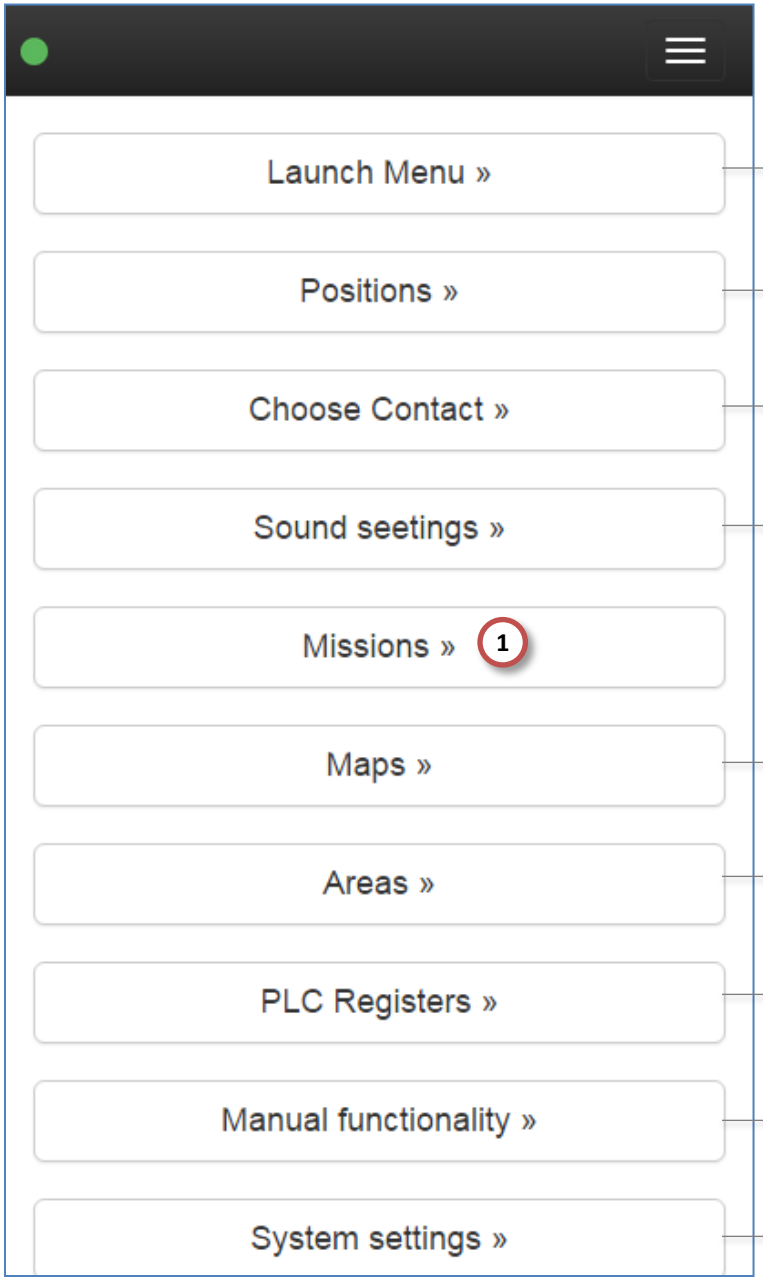


1. Fill in Name and Note.
2. Set duration and volume.
3. Select a sound file.
4. Click Create to save the sound.
5. Go back to MiR > Service > Configuration.

This new sound can now be used in an Action.



MiR100 Configuration – Administrator 15/33 MiR > Service > Configuration



1. Click Missions to build operation patterns as sequences of actions.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

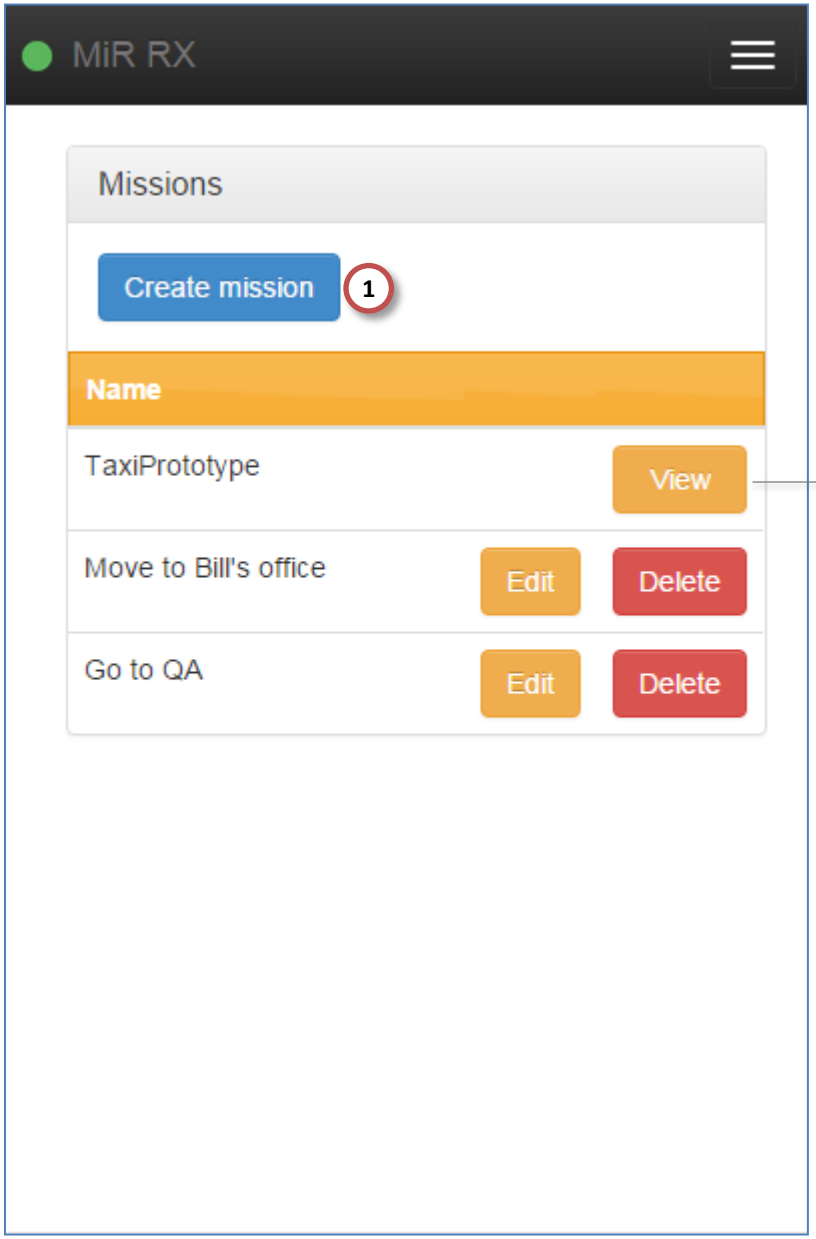
Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

Interface with PLC devices: conveyors, machines.

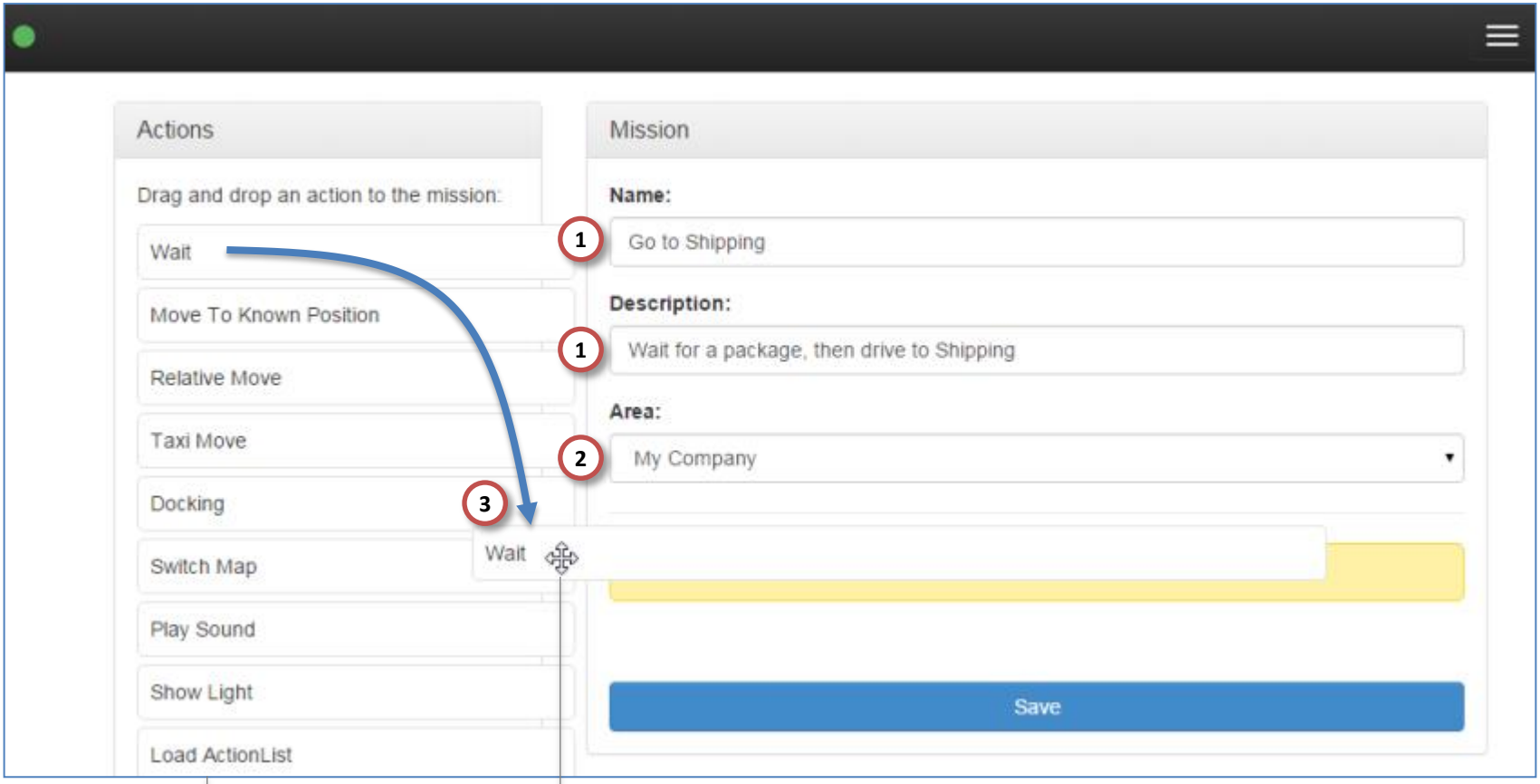
Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.



1. Click Create mission.

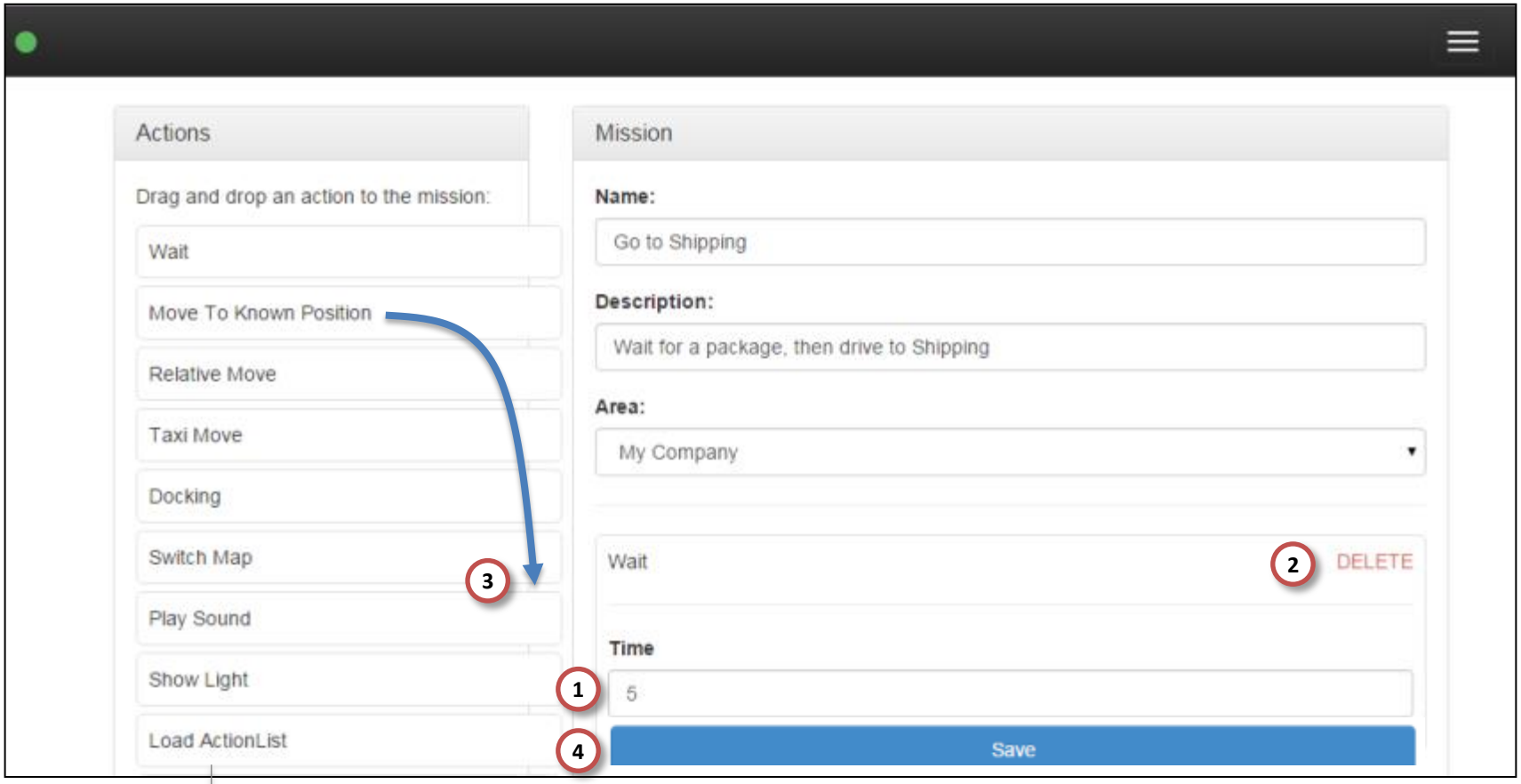
TaxiPrototype is an in-built mission for use as a template.



The cursor changes when dragging.

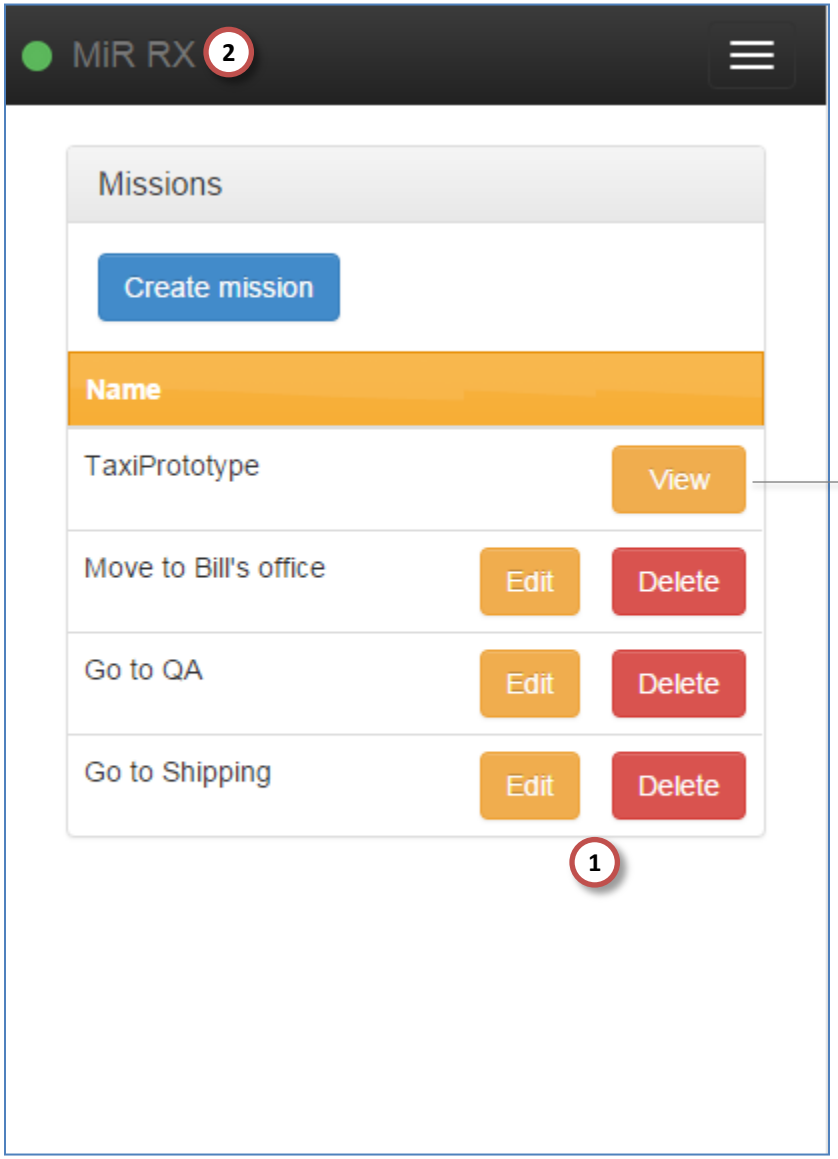
Actions are pre-defined building blocks. See separate documentation.

1. Write Name and Description.
2. Select Area.
3. Drag actions to the mission.



Actions are pre-defined building blocks. See separate documentation.

1. Actions can have parameters to be filled in.
2. Delete the action.
3. Drag more actions to the mission.
4. Save the mission. Automatically returns to Missions.

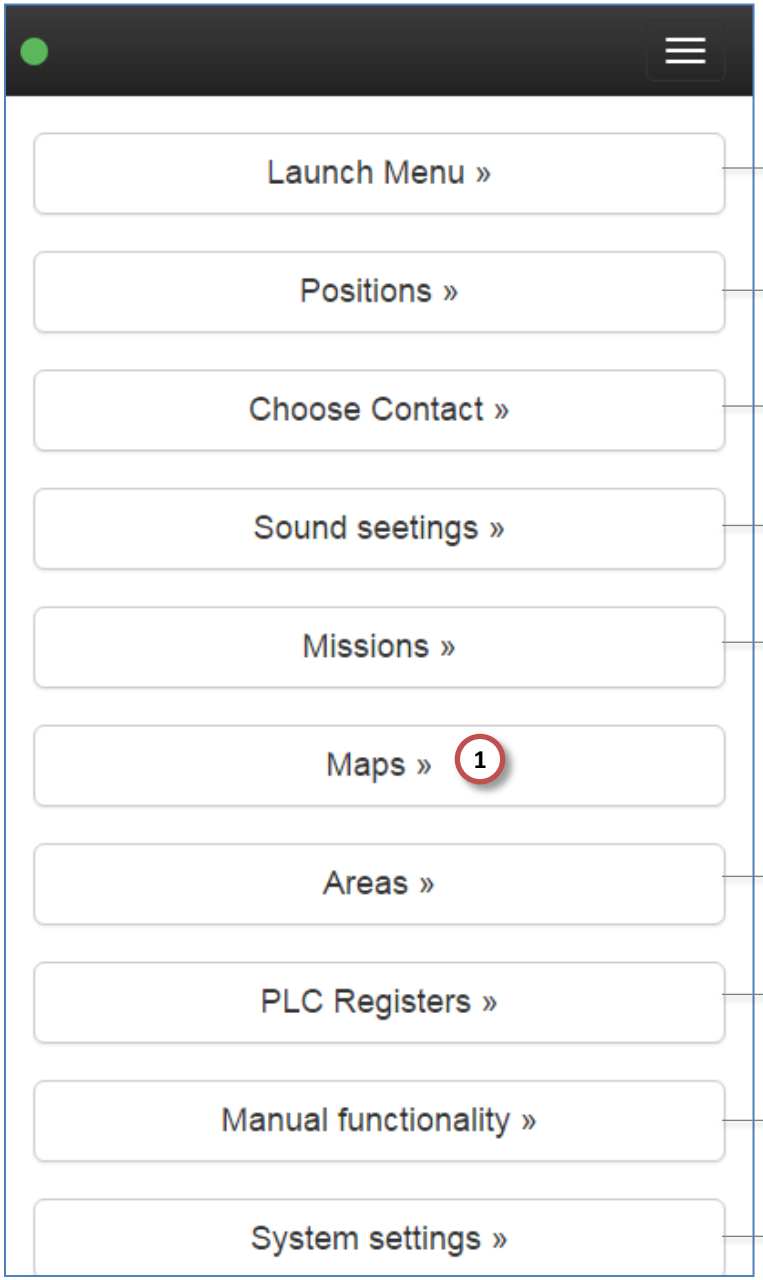


1. Edit, Delete, Create missions as needed.

2. Go back to MiR > Service > Configuration.

TaxiPrototype is an in-built mission for use as a template.

MiR100 Configuration – Administrator 20/33 MiR > Service > Configuration



1. Click Maps to edit map metadata (origo, name, resolution).

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

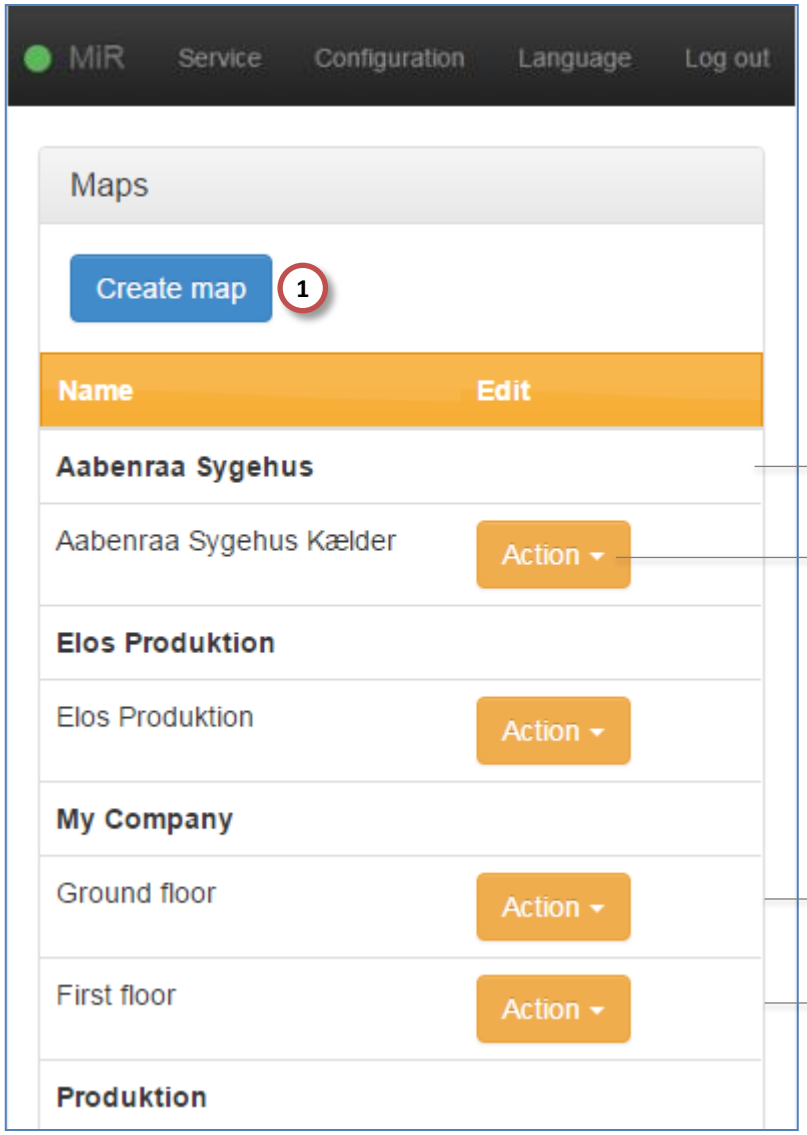
Build missions as sequences of actions.

Manage areas: name, maps.

Interface with PLC devices: conveyors, machines.

Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.



1. Click Create map to add a new map to an area.

Area.

Nav
Web
Map data
Area events

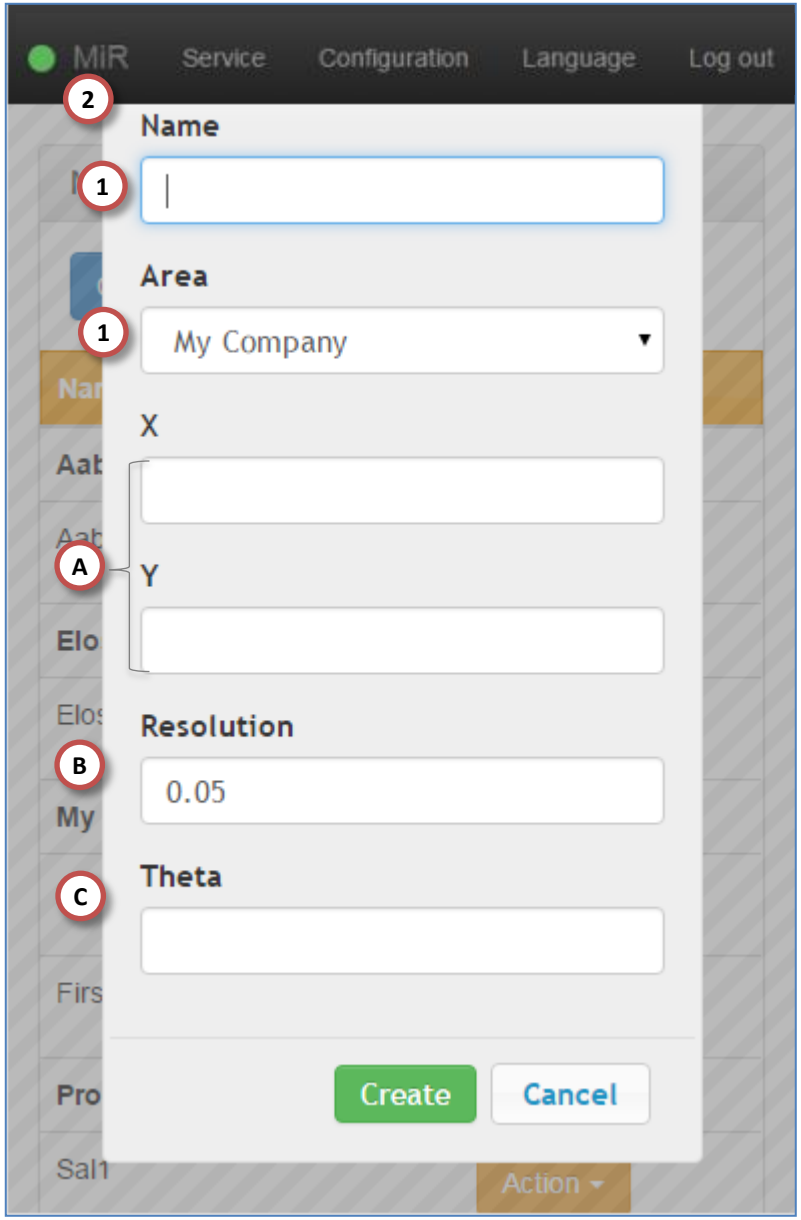
Edit the look of the map.

Edit the allowed navigation area.

Edit Name, Origo, Resolution

Create sections of special robot behaviour (e.g. slow)

An area can have multiple maps.



1. Edit the map metadata:

The map is described by:

- Name
- Area
- Origo, X Y
- Resolution (*pixels to meters in reality*)
- Angle (*Origin Theta*)

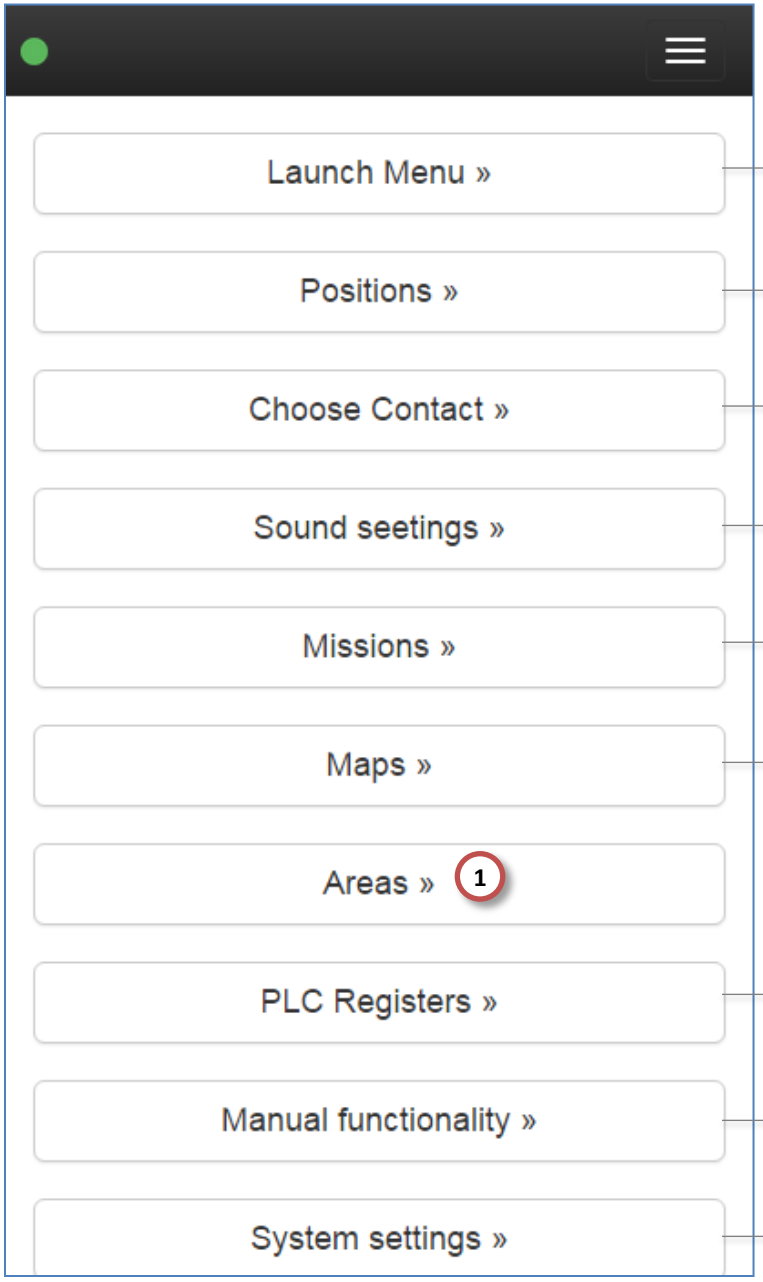
A. Origo X Y:
Point of origin for the map. Often, the origo is given as the point of origin belonging to a docking station.

B. Resolution
0,05: each pixel on the map corresponds to 5 cm in reality.

C. Origin Theta
Angle of the vehicle (360 degrees) – 0 degrees is when the forward direction of the corresponds to the x-axis of the map.

2. Go back to MiR > Service > Configuration.

MiR100 Configuration – Administrator 23/33 MiR > Service > Configuration



1. Click Areas to create and edit area metadata.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

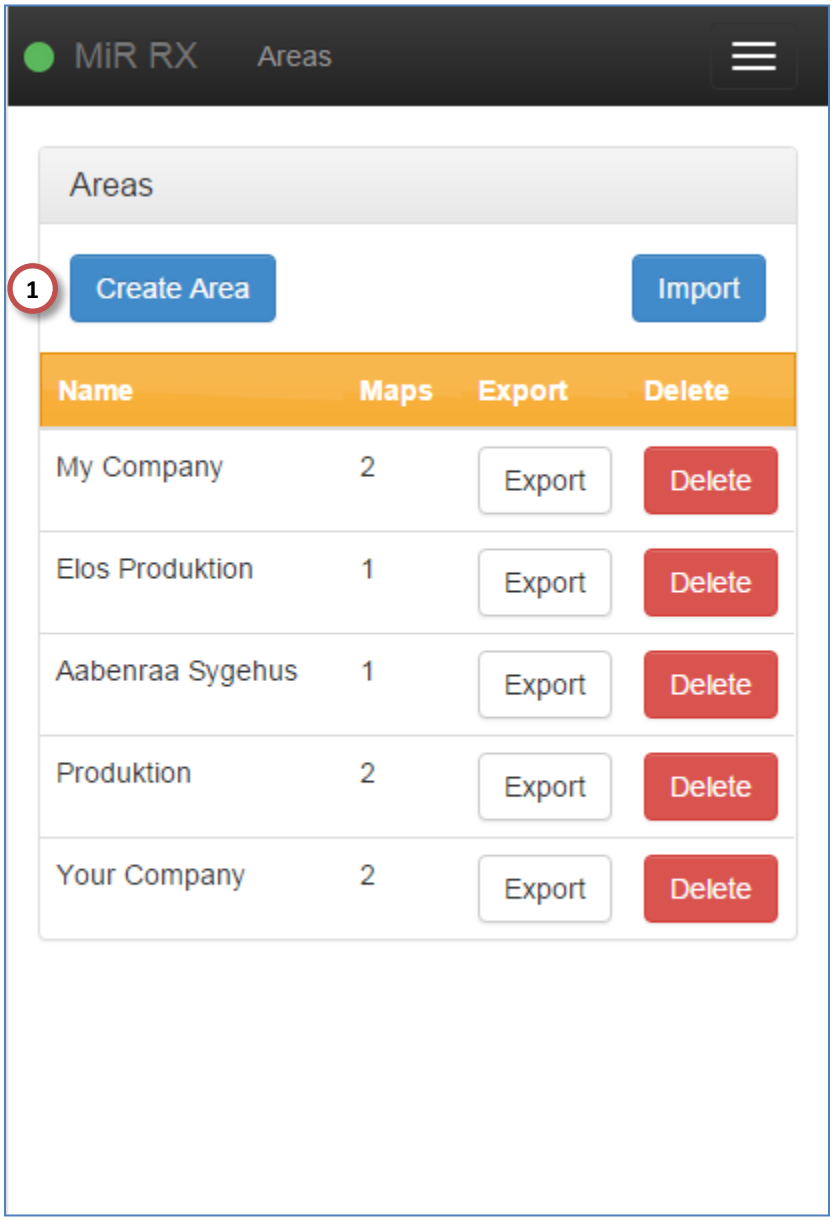
Build missions as sequences of actions.

Edit map metadata (origo, name, resolution).

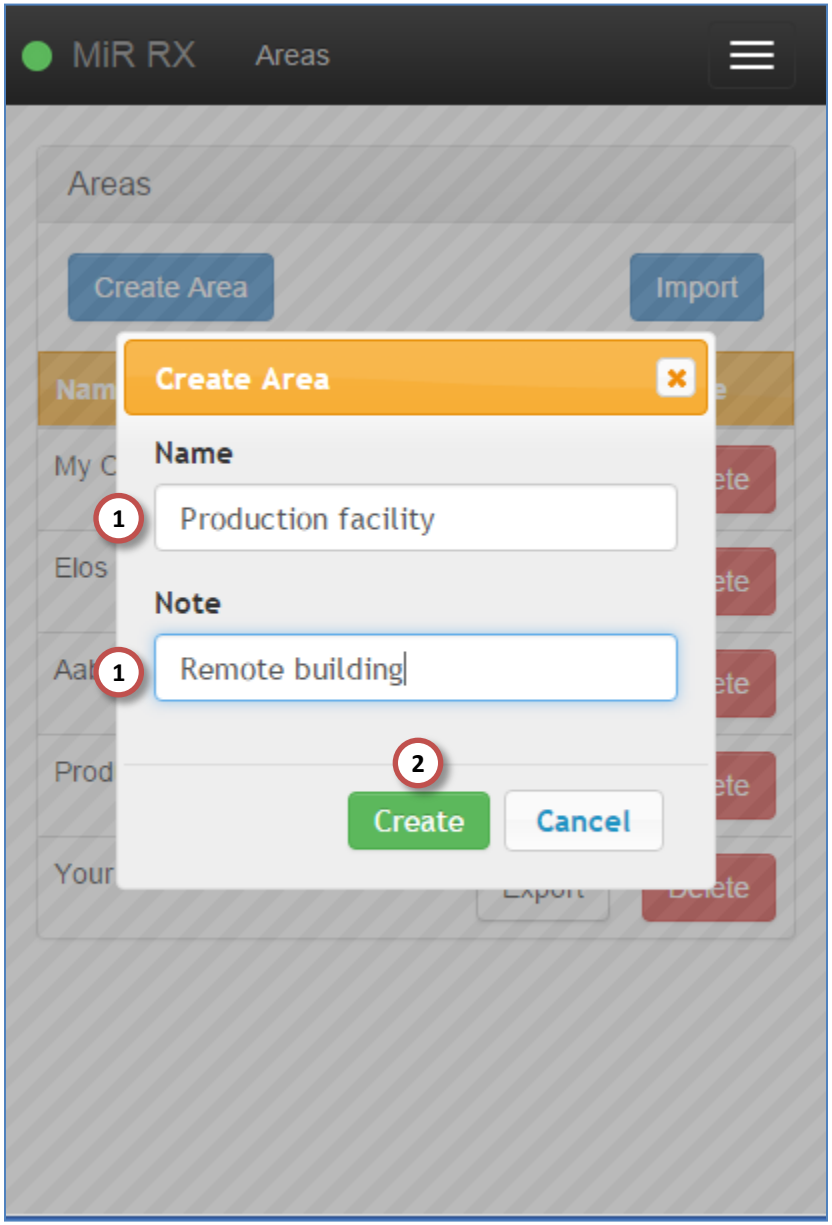
Interface with PLC devices: conveyors, machines.

Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.

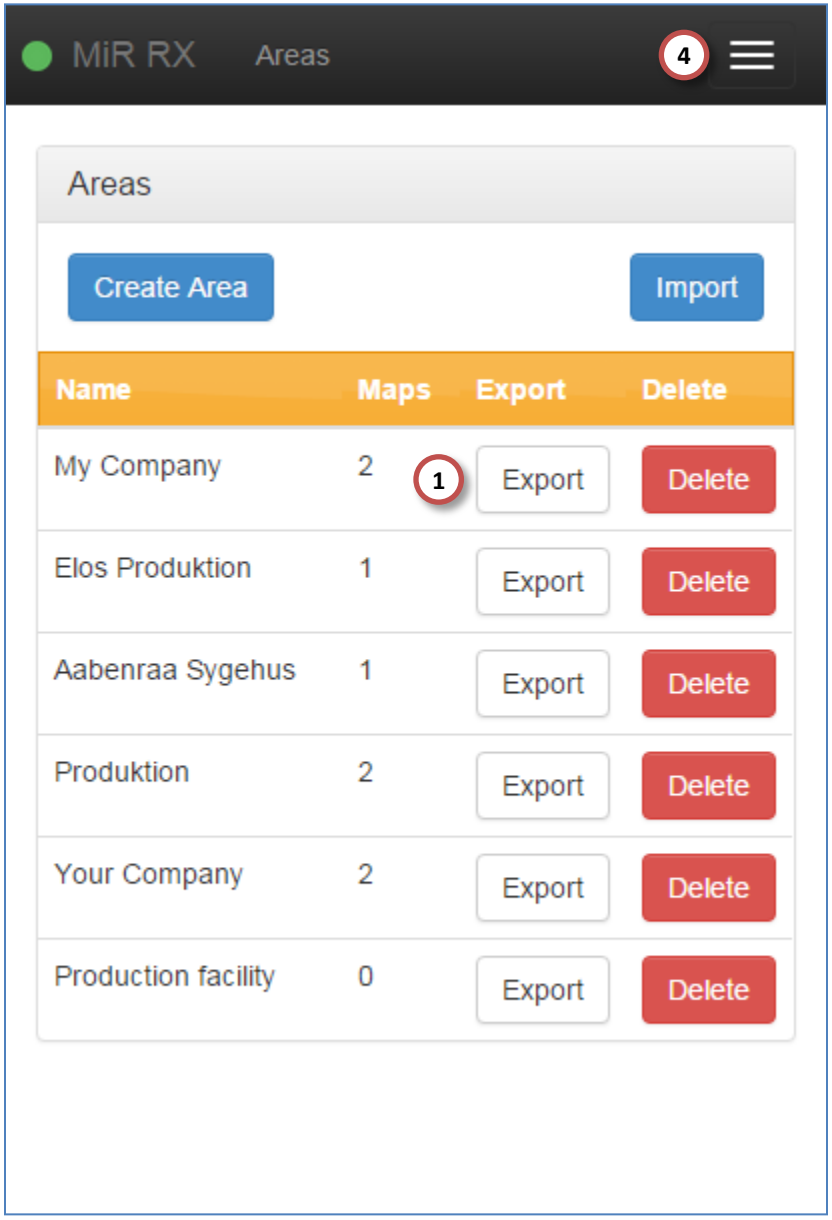


1. Click Create Area to add a new area.



1. Fill in Name and Note.
2. Click Create to save the area.

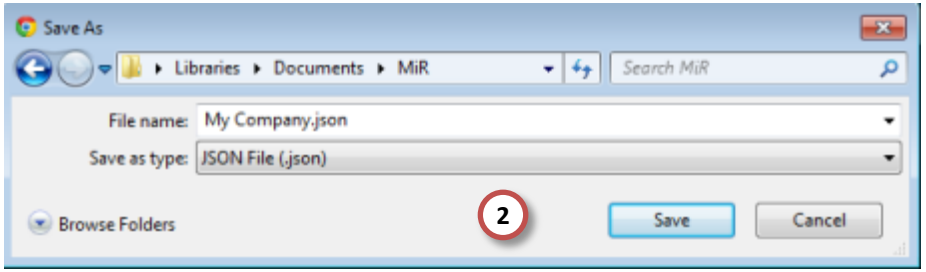
Maps and missions can now be added to this new area.



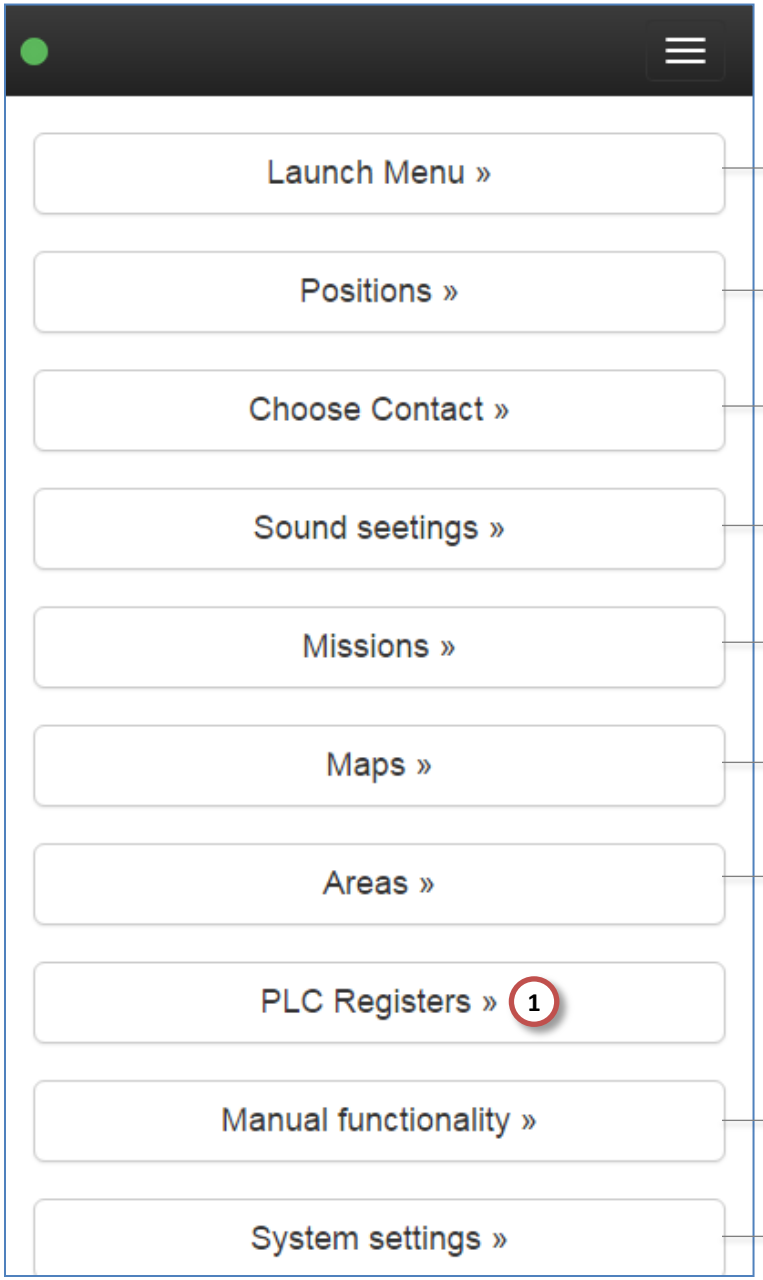
1. Click Export to save the area to a file.
2. In the browser, select a location and click Save.
3. Click Import to load a file.
4. Go back to MiR > Service > Configuration.

The Export/Import functions make it easy to copy an area from one robot to another.

The JSON file contains: Area, maps, positions.



MiR100 Configuration – Administrator 27/33 MiR > Service > Configuration > PLS Registers



1. Click PLC registers to create and edit values for PLC-controlled devices.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

Build missions as sequences of actions.

Edit map metadata (origo, name, resolution).

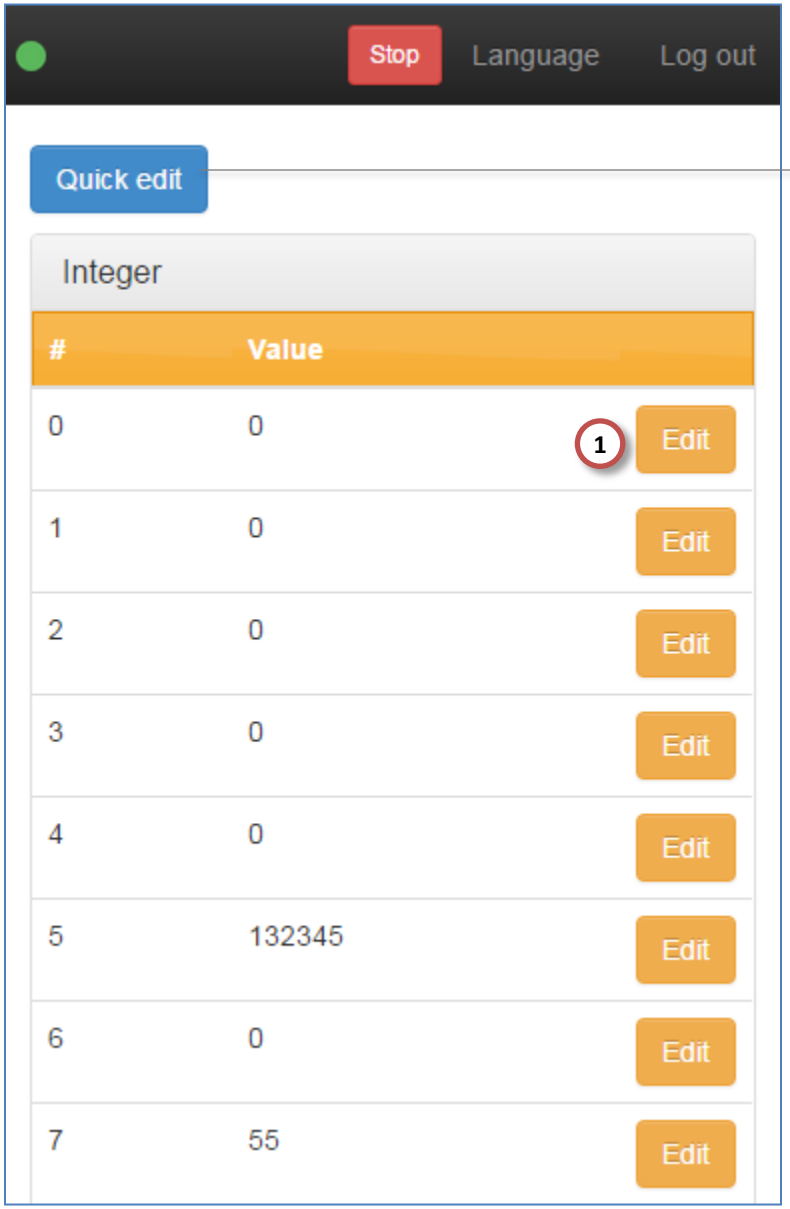
Manage areas: name, maps.

Real time activation of light, speed, sound.

MiR settings: email, ROS parameters, hardware setup.

MiR100 Configuration – Administrator 28/33

MiR > Service > Configuration > PLC Registers



1. Click Edit to change values.

Use Quick Edit to enter a register # instead of scrolling.

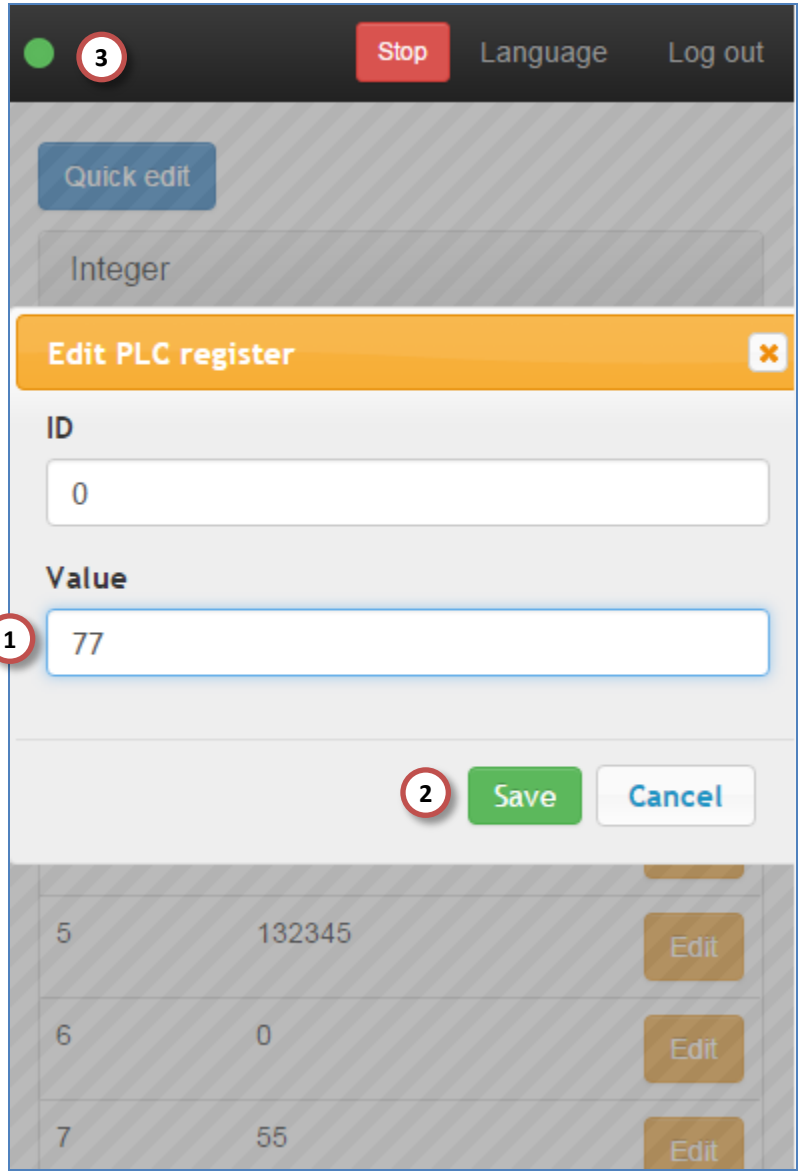
The robot has 200 registers.
First 100: integer
Next 100: float

Registers are shared by actions that: set a value, wait for a value, read a value.

Registers can be accessed locally through a serial interface and externally through a REST interface via wifi connecting to a remote computer.

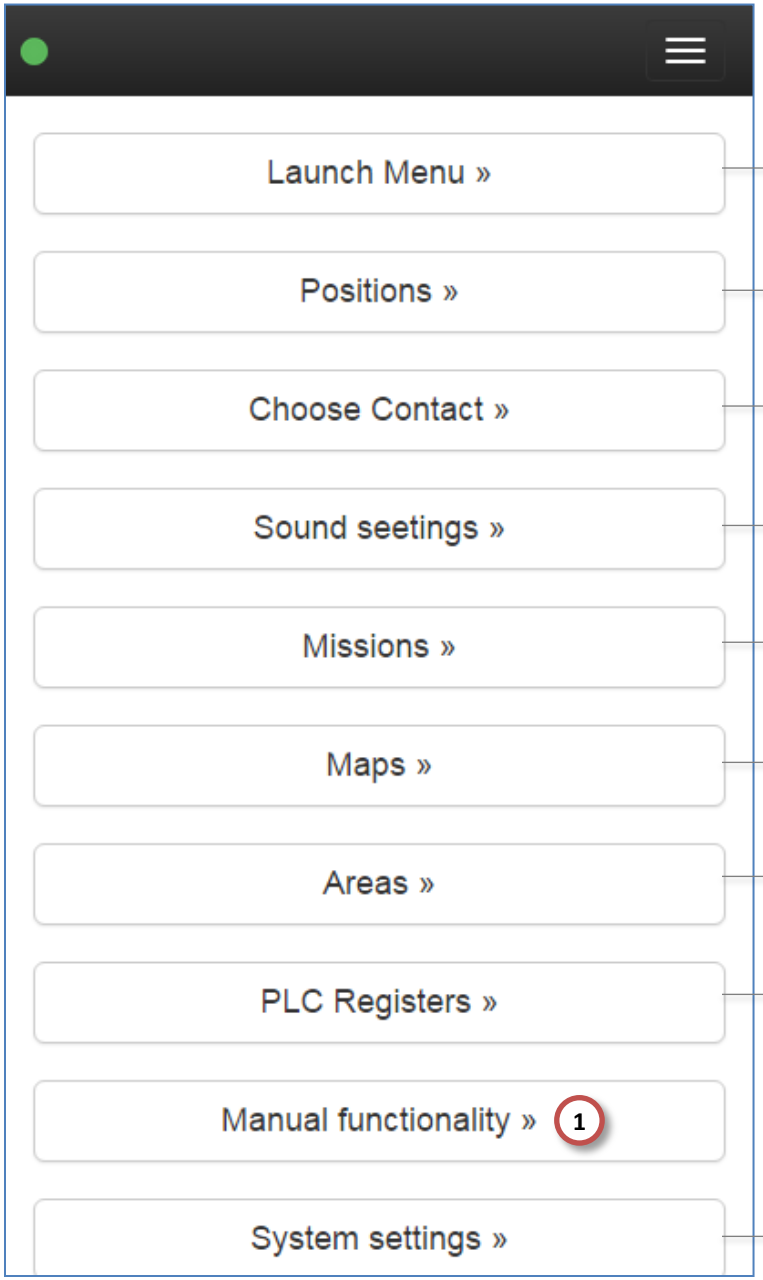
Registers are used for hand-shake signals – for example for communication between robot and a conveyor PLC.

Quick Edit: Go to know # - avoid scrolling



1. Fill in value.
2. Click Save.
3. Go back to MiR > Service > Configuration.

MiR100 Configuration – Administrator 30/33 MiR > Service > Configuration



1. Click Manual functionality for real time activation of light, speed, sound. Especially useful for demos.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

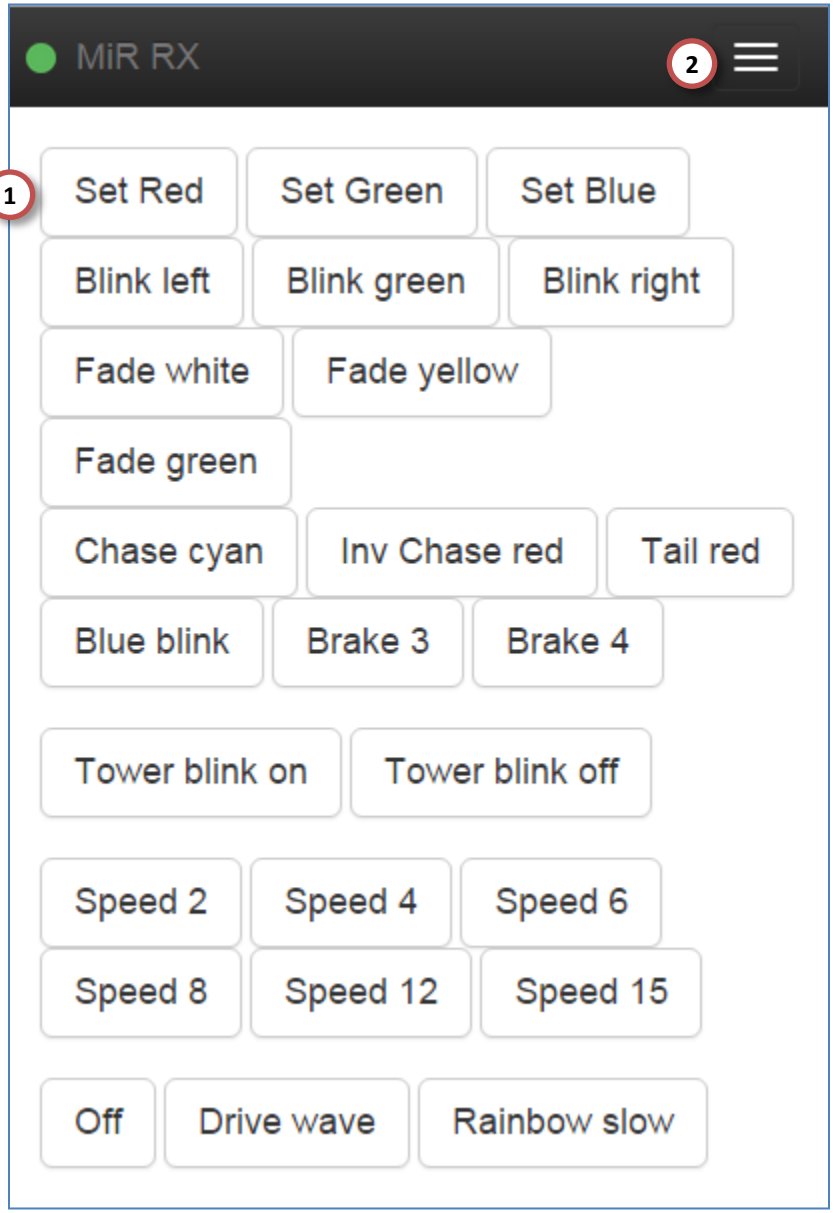
Build missions as sequences of actions.

Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

Interface with PLC devices: conveyors, machines.

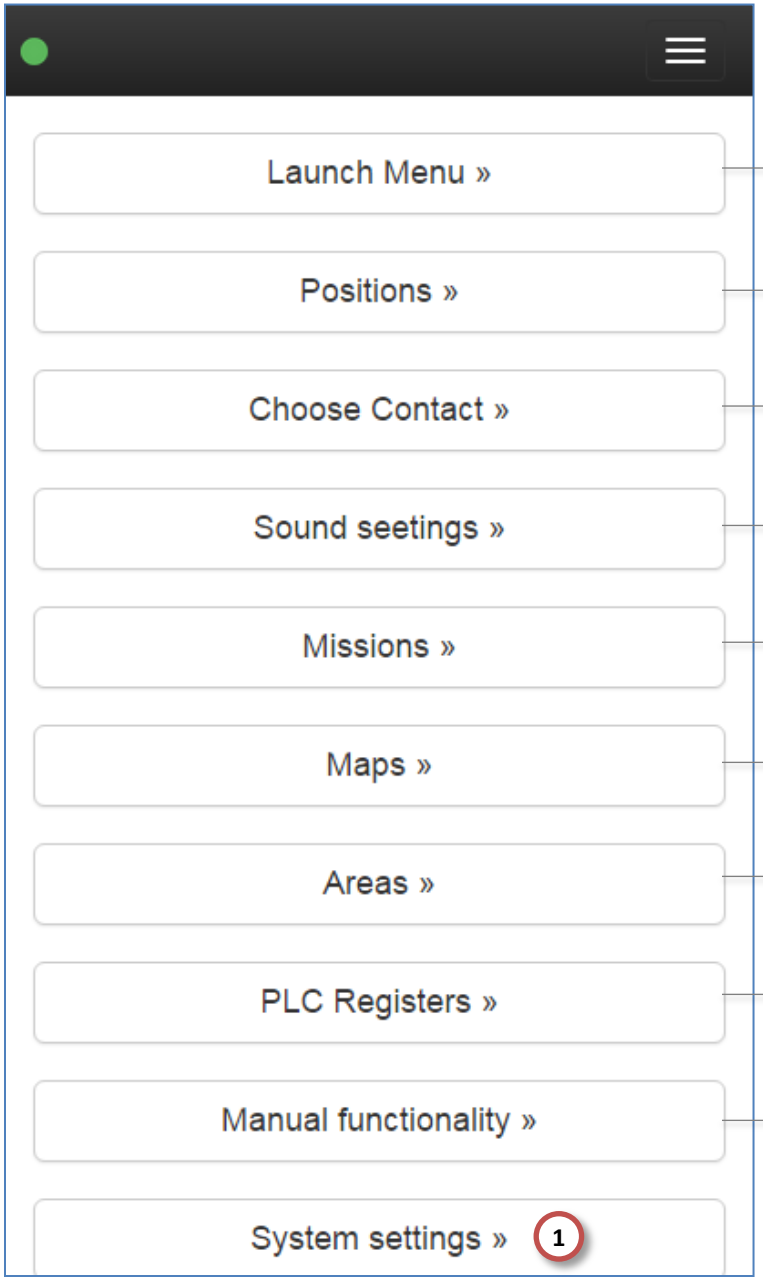
MiR settings: email, ROS parameters, hardware setup.



1. Click a behaviour to invoke real time activation of light, speed, sound on the vehicle.

2. Go back to MiR > Service > Configuration.

MiR100 Configuration – Administrator 32/33 MiR > Service > Configuration



1. Click System settings to manage MiR settings: email, ROS parameters, hardware setup.

Constituent elements that can be started/stopped.

Create and Edit positions for operation patterns.

Manage contacts: name, mail, phone.

Create sounds.

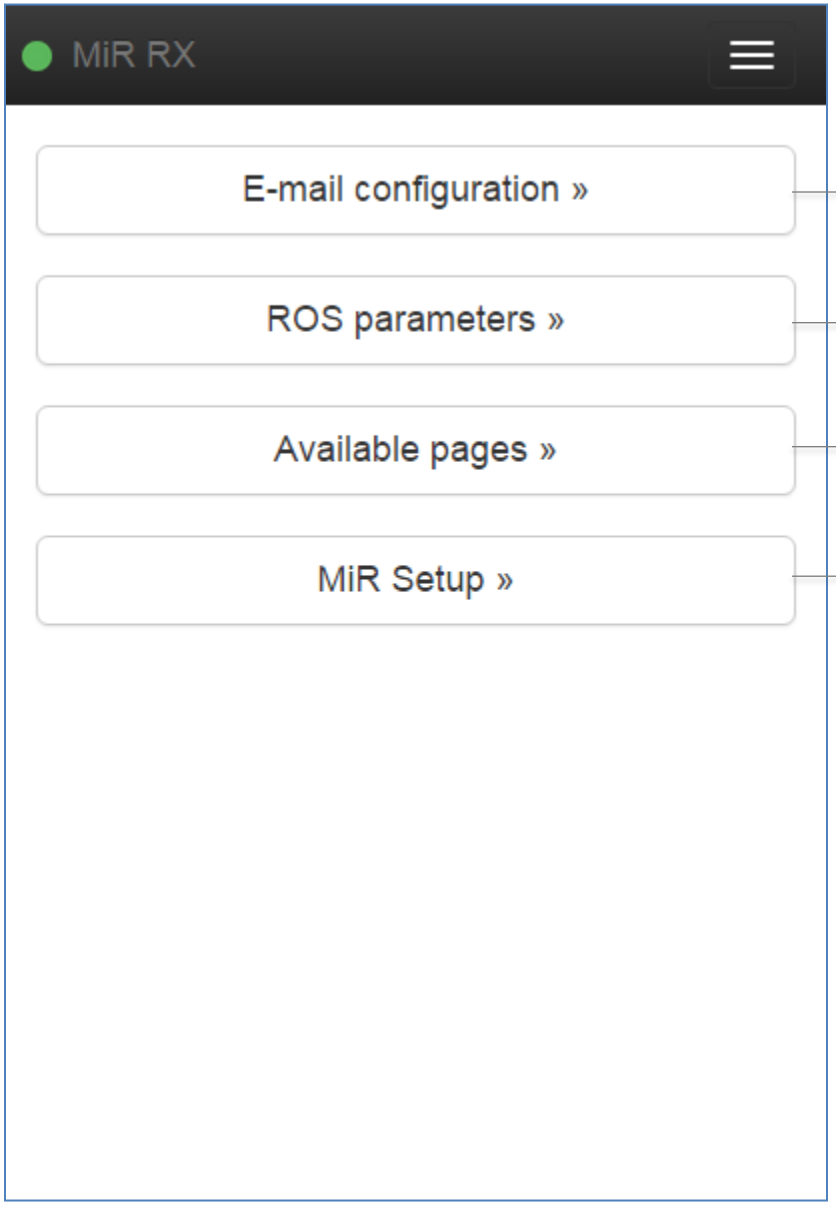
Build missions as sequences of actions.

Edit map metadata (origo, name, resolution).

Manage areas: name, maps.

Interface with PLC devices: conveyors, machines.

Real time activation of light, speed, sound.



System Settings are described in a separate document. Below is given a short note.

Configure e-mail address, name, server, security for each vehicle.

Control and optimize parameters such as distance to reached destination, cameras on/off.

Configure which pages to show on MiR Web Interface.

Set up robot name and laser scanners before putting the robot to operation.

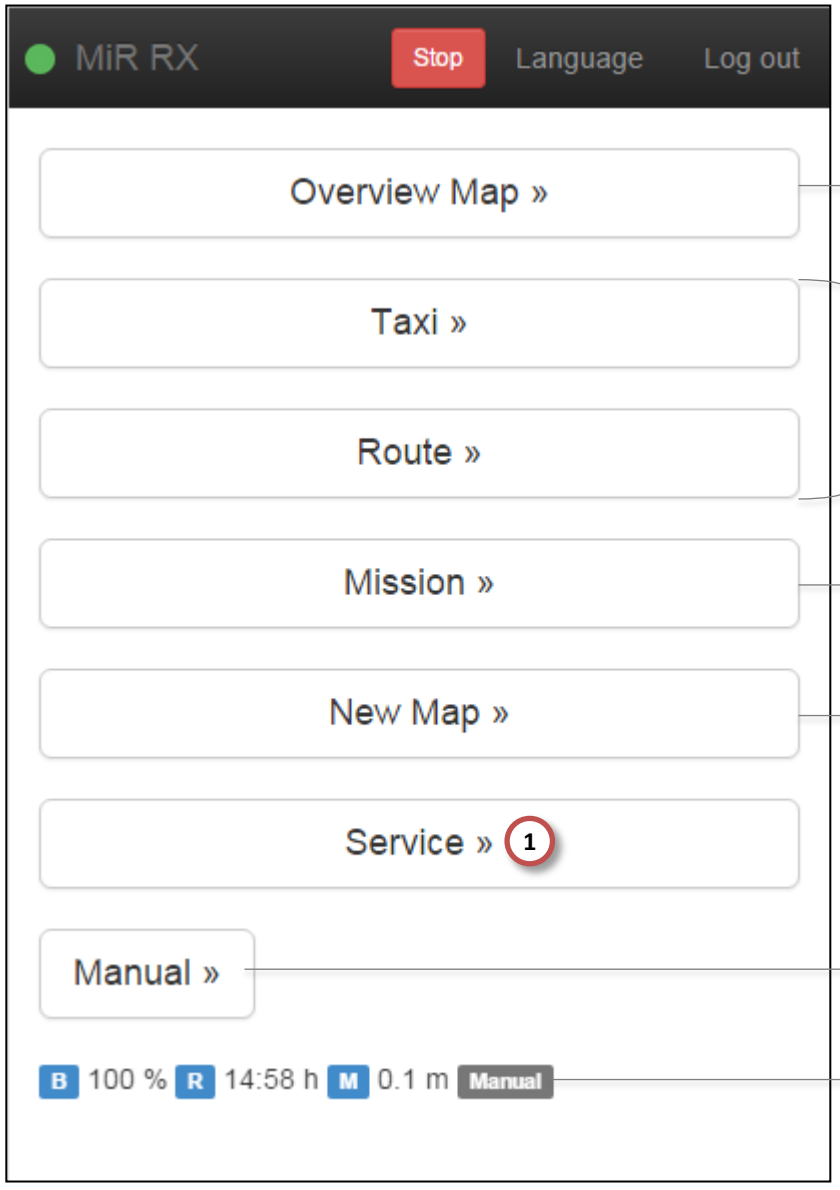
Go back to MiR start page.

MiR100 Analysis – Administrator Check list

- From the start page, select Service > Analysis to get an overview over the operation of the vehicle during a specific period.
  - Log Analysis – various analyses and collections of logged data during a specified period of time.
  - Job route overview – shows for each operation pattern the end condition and the path on the map during a specified period of time.

MiR100 Analysis – Administrator 1/8

Start page: MiR



1. Click Service to navigate to the Analysis menu.

View the location of the vehicle on the map

Predefined mission types

Controlling the mission queue

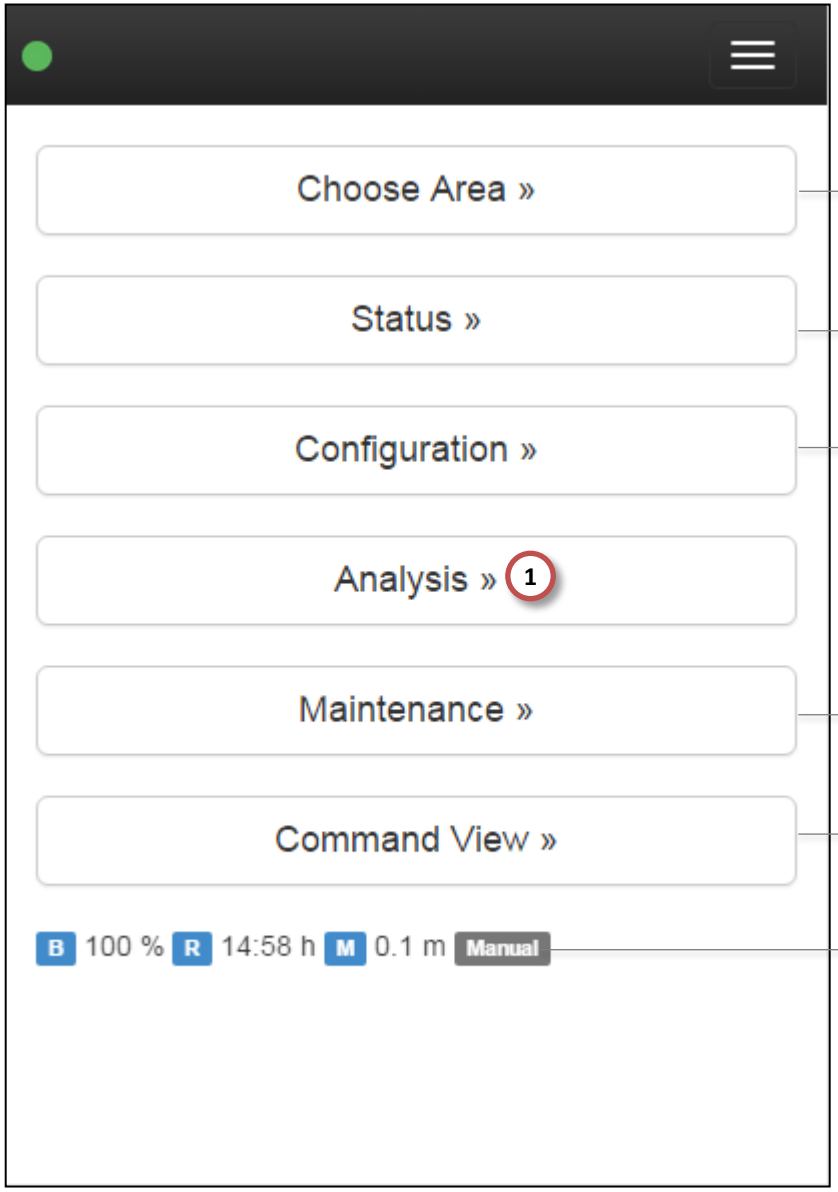
Create a map of a new area.
You must be logged in to see this button.

Go to manuel driving to take control using joystick.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Analysis – Administrator 2/8

MiR > Service



1. Click Analysis to get an overview over driving – location, distance, status.

Choose area, start up MiR100, see and edit map.

Log, status, system information.

Basic setup – rarely used.

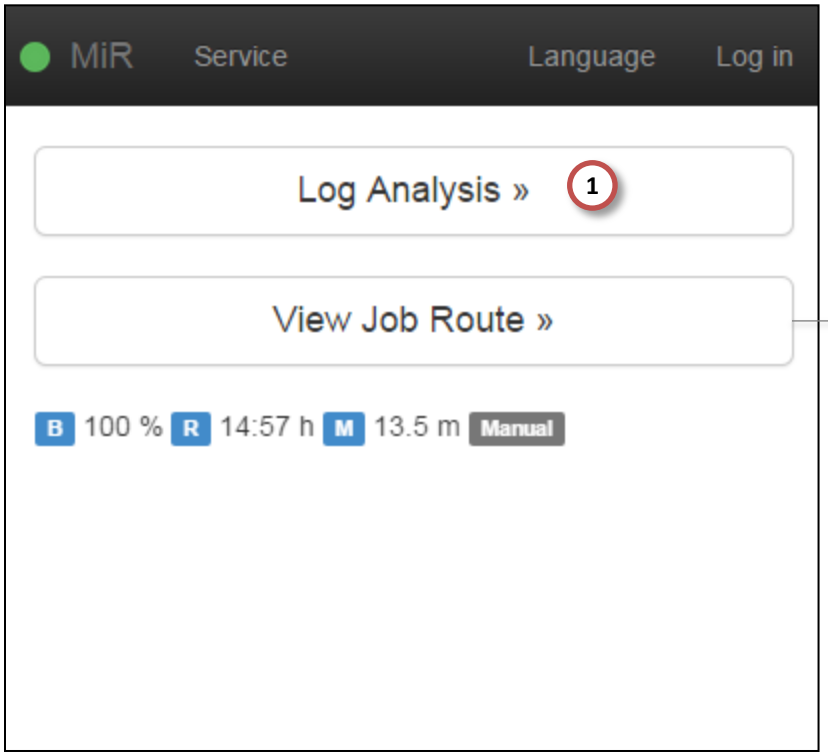
Backup, restore, remote access, wifi.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Analysis – Administrator 3/8

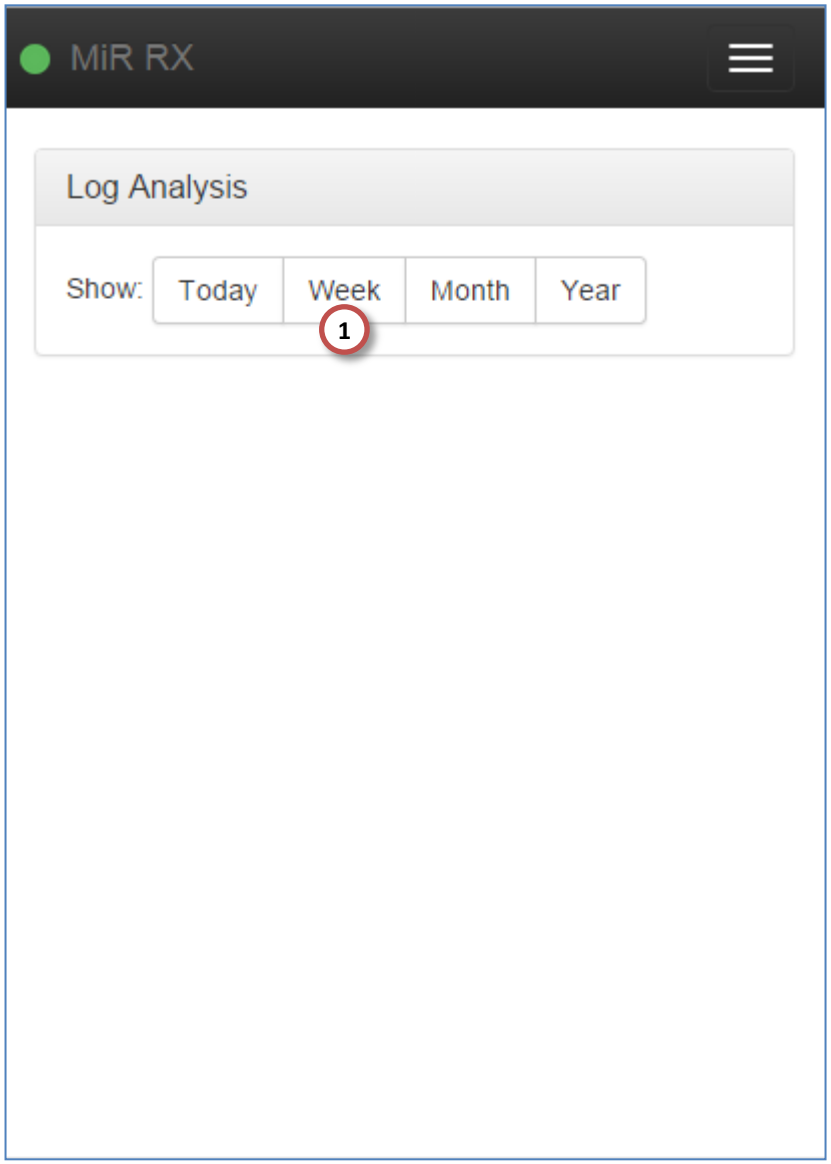
MiR > Service > Analysis



1. Click Log Analysis to view logged data graphically over a period of time.

1. Click View Job Route to see driving status over a specified period of time.

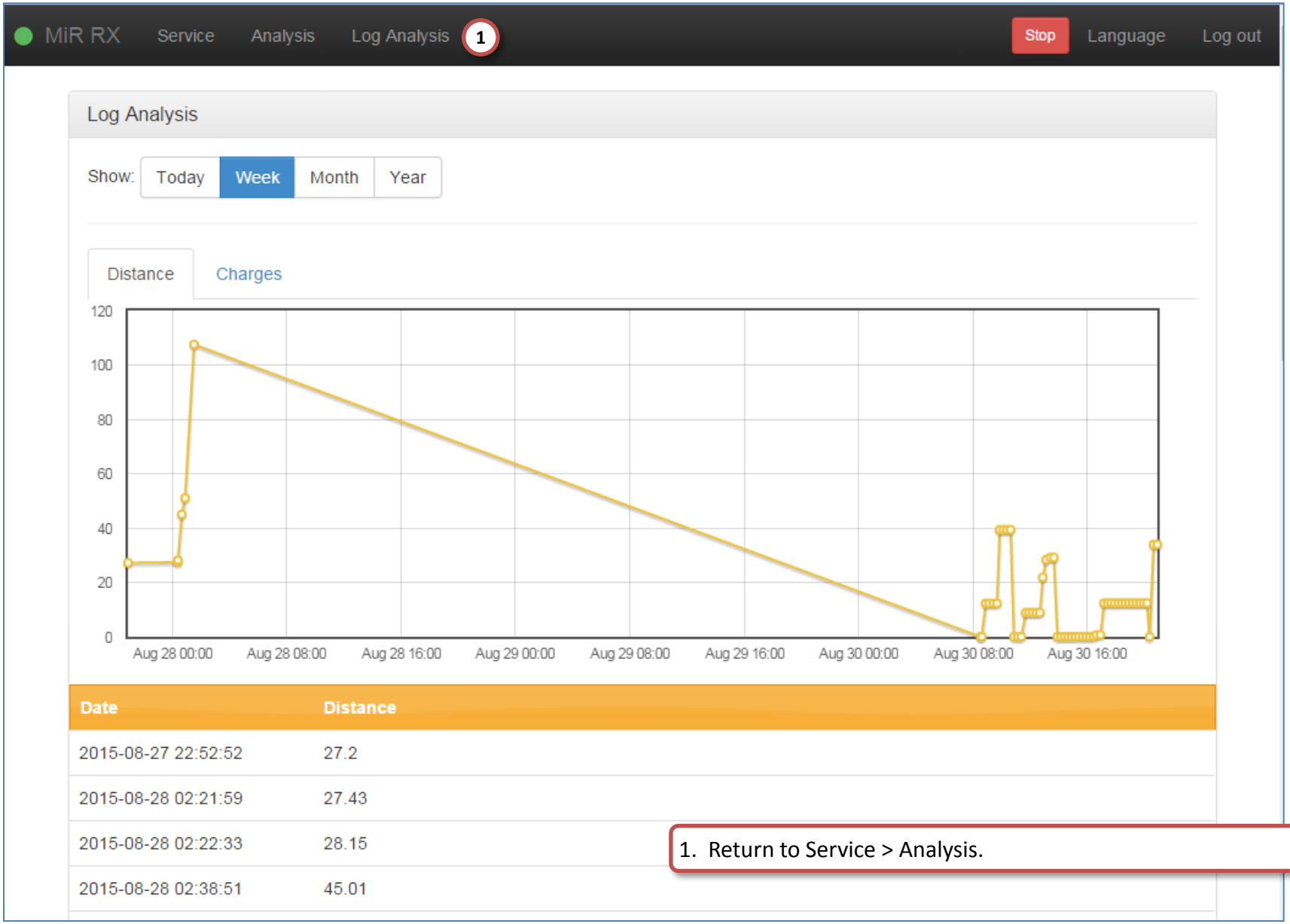
MiR100 Analysis – Administrator 4/8 MiR > Service > Analysis > Log Analysis



1. Select a period of time for viewing log data.

MiR100 Analysis – Administrator 5/8

MiR > Service > Analysis > Log Analysis > Search

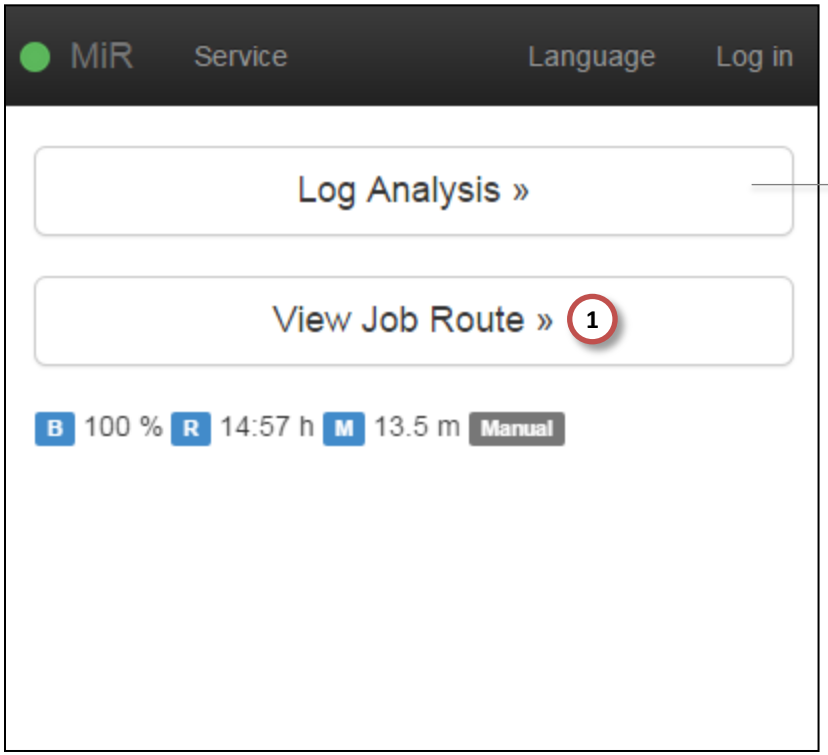


Date	Distance
2015-08-27 22:52:52	27.2
2015-08-28 02:21:59	27.43
2015-08-28 02:22:33	28.15
2015-08-28 02:38:51	45.01

1. Return to Service > Analysis.

MiR100 Analysis – Administrator 6/8

MiR > Service > Analysis

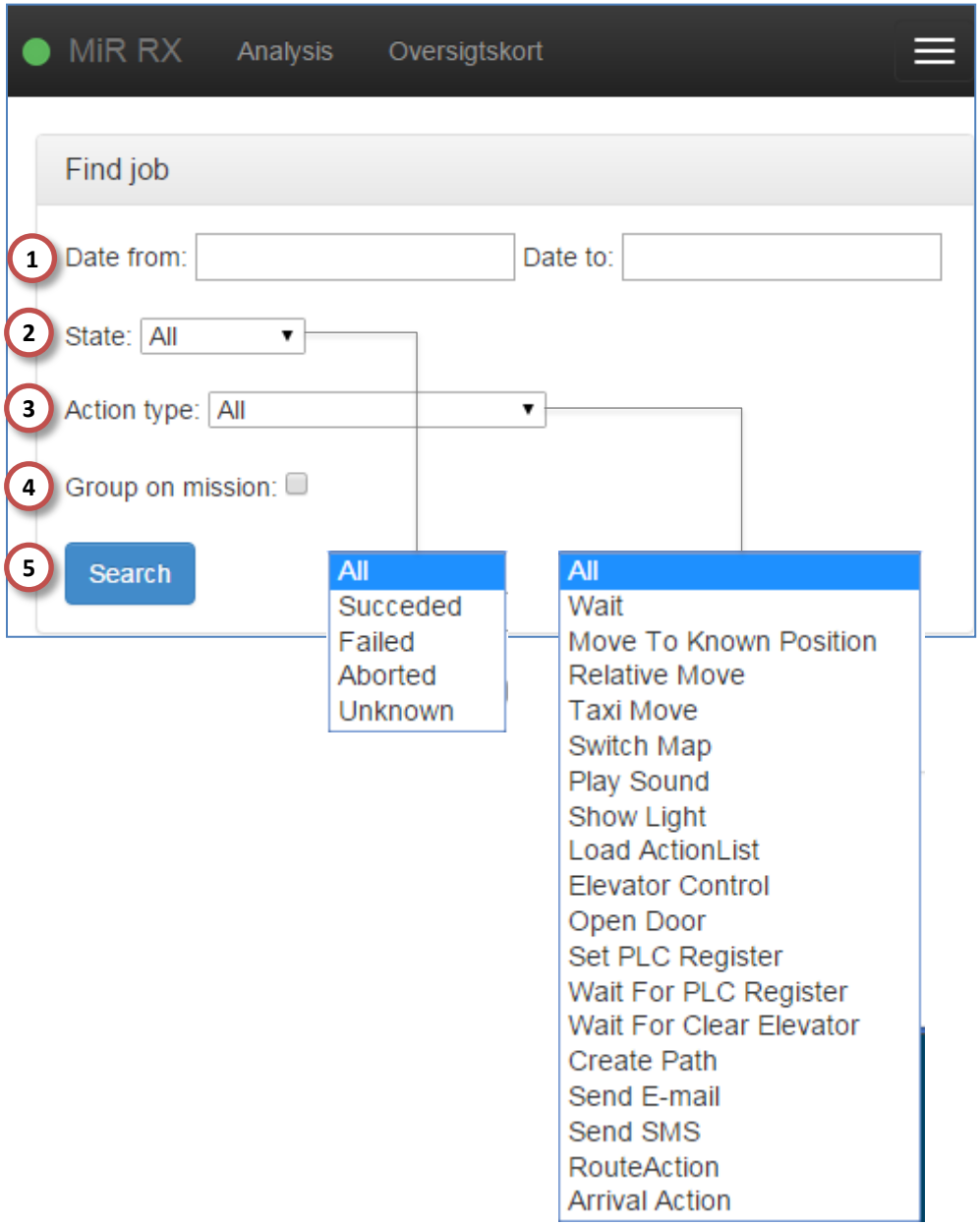


1. Click View Job Route to see driving status over a specified period of time.

See analyses of various logged data over a period of time.

MiR100 Analysis – Administrator 7/8

MiR > Service > Analysis > View Job Route



1. Specify time interfal for the analysis.
   Hour and Minute are optional – typically used within a single day.

2. Leave the State field blank to see all operations and their end conditions.
   OR select a specific end condition.

3. Narrow the search further by selecting a specific action.

4. Select Group on mission to see only missions – not actions.

5. Click Search.

See an example search result on the next page.

MiR100 Analysis – Administrator 8/8

MiR > Service > Analyse > View Job Route > Search

MiR Service Analysis Language Log in

5

Find job

Date from: 2015-09-01 00:00 Date to: 2015-09-01 23:59

State: All

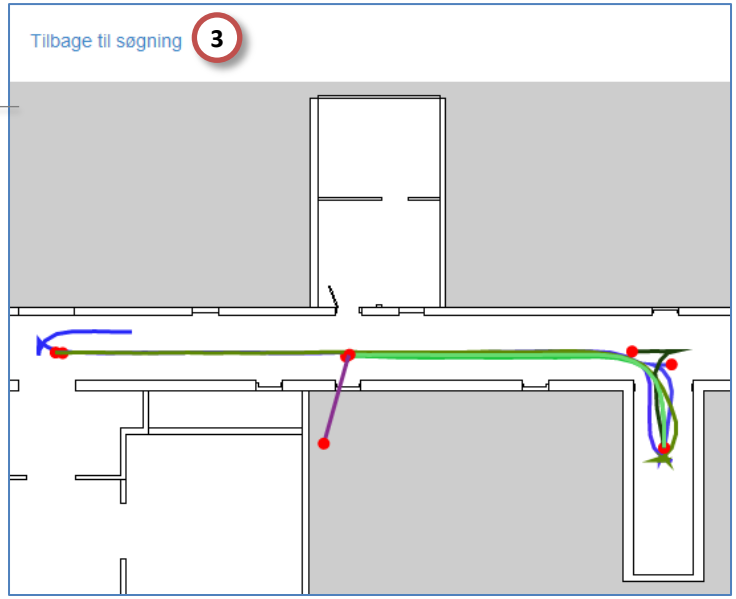
Action type: All

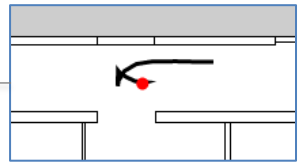
Group on mission:

1 Search View all results on map 2

	ID	Type	State	Created
4 Show	438	Taxa	InTransit	2014-12-12 15:30:29
Show	437	Taxa	GoalReached	2014-12-12 15:29:51
Show	435	Taxa	InTransit	2014-12-12 15:15:36
Show	434	Bus	GoalReached	2014-12-10 11:00:53
Show	433	Bus	GoalReached	2014-12-10 11:00:22
Show	432	Bus	GoalReached	2014-12-10 10:59:37
Show	431	Bus	GoalReached	2014-12-10 10:58:27

1. The search returned taxi and bus operations for the specified period of time.
2. Show operations on map. Red dots: start position.
3. Return to the search to show a single path.
4. Show a single path.
5. Return to Service.



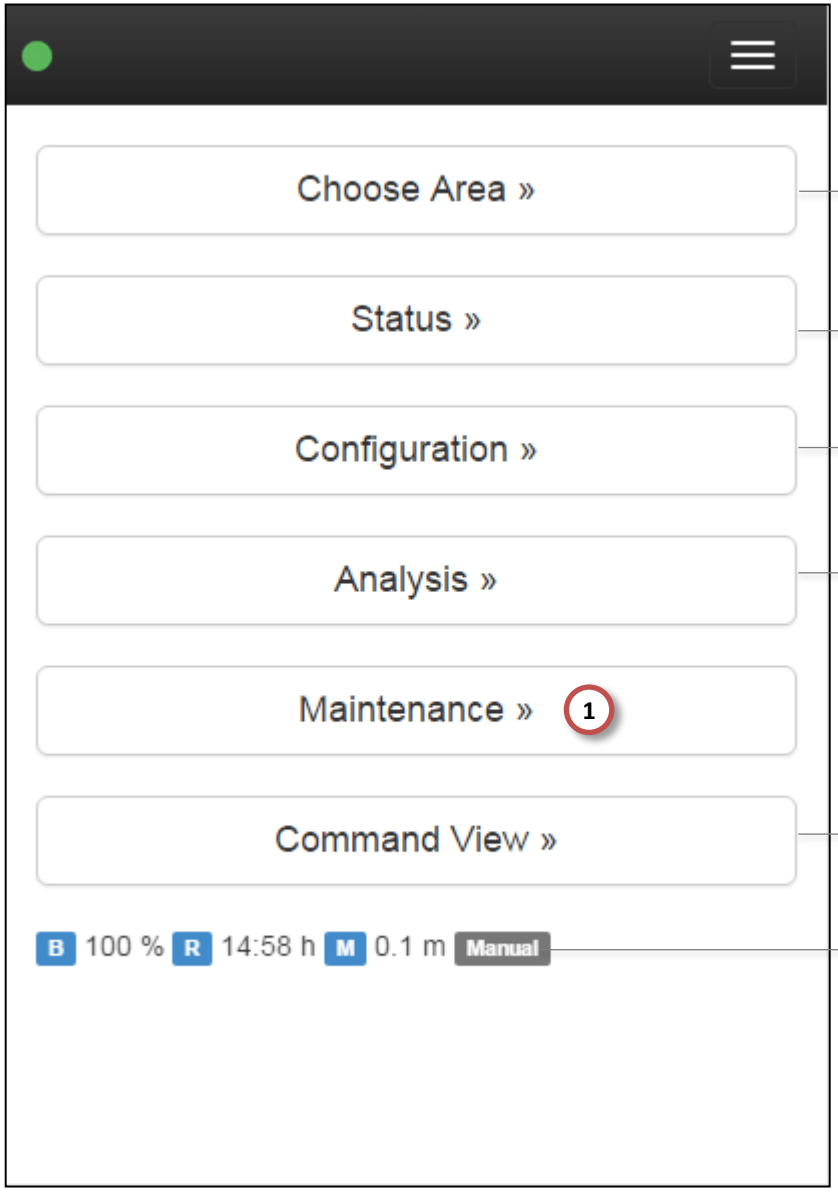


MiR100 Maintenance – Administrator Check list

- From the start page, select Service > Maintenance to backup current data and restore from a previously saved backup. Maintenance also manages remot access and wifi setup.
  - Backup/Restore – save or get data.
  - Remote access – manage remote access and wifi for each vehicle.

MiR100 Maintenance – Administrator 1/6

MiR > Service



1. Select Maintenance for managing backup, restore, remote access, wifi.

Choose area, start up MiR100, see and edit map.

Log, status, system information.

Basic setup – rarely used.

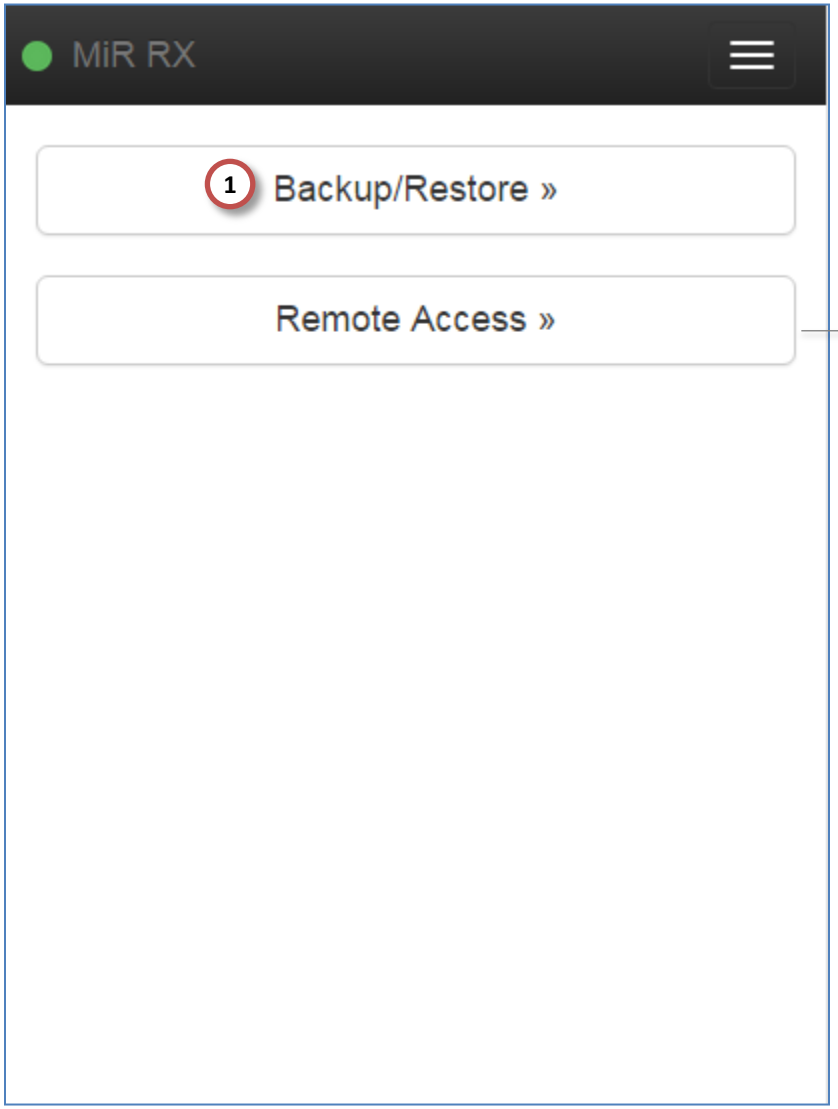
Overview over driving – location, distance, status.

Synchronizing the exact location of the vehicle with the map.

Note: MiR100 is on Manual. Select Area in Service to activate.

MiR100 Maintenance – Administrator 2/6

MiR > Service > Maintenance

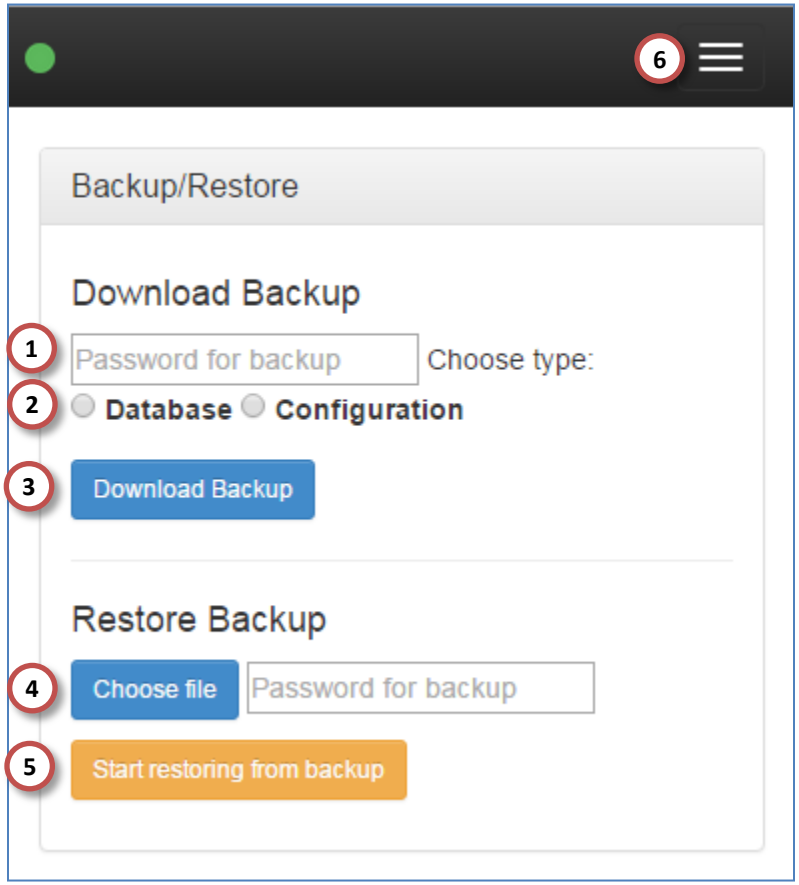


1. Select Backup/restore to either save a backup of current data or load a previously saved backup.

Remote access, wifi, local network for the vehicle.

MiR100 Maintenance – Administrator 3/6

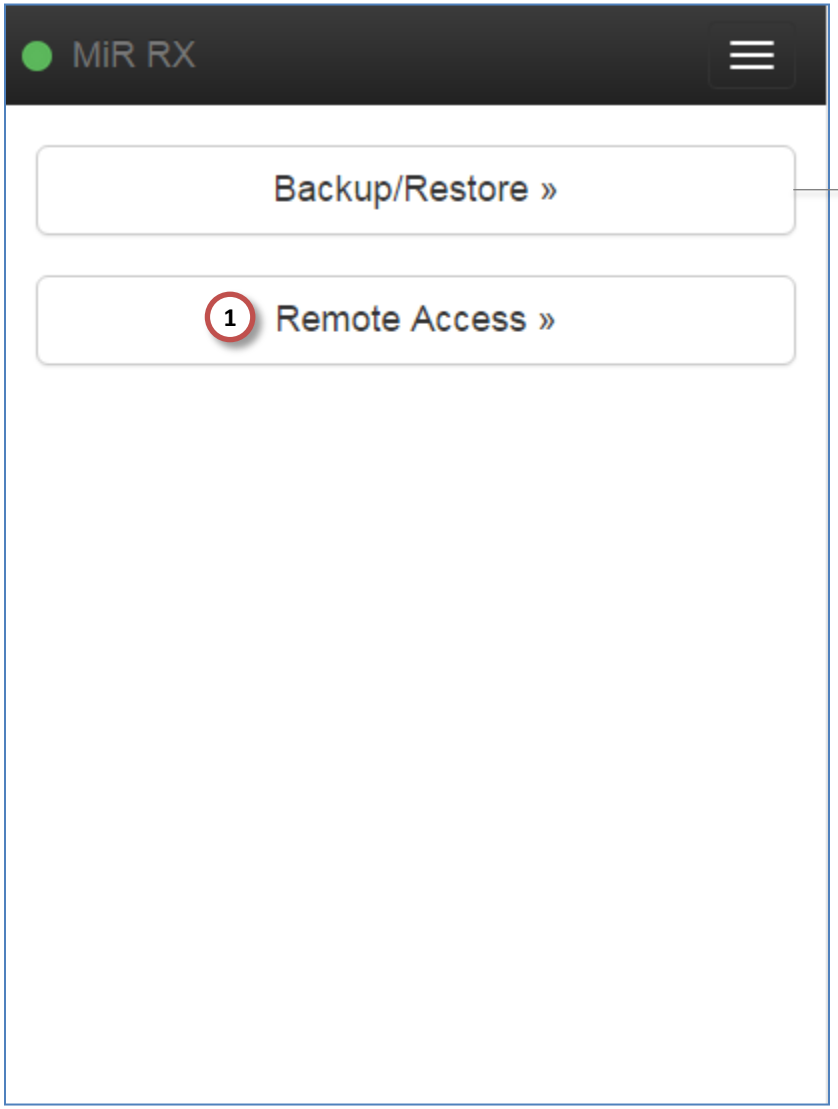
MiR > Service > Maintenance > Backup/Restore



1. Write a password for the backup.
2. Database: saves area, maps, missions, - all data for the vehicle.
2. Configuration: saves sounds, actions, missions – saves data for MiR Webinterface.
3. Click Download Backup to save data to a selected location.
4. To restore data from backup, click Choose file. Write the password and select location.
5. Click Start restoring from backup and wait for the data to load.
6. Return to Service > Maintenance.

MiR100 Maintenance – Administrator 4/6

MiR > Service > Maintenance

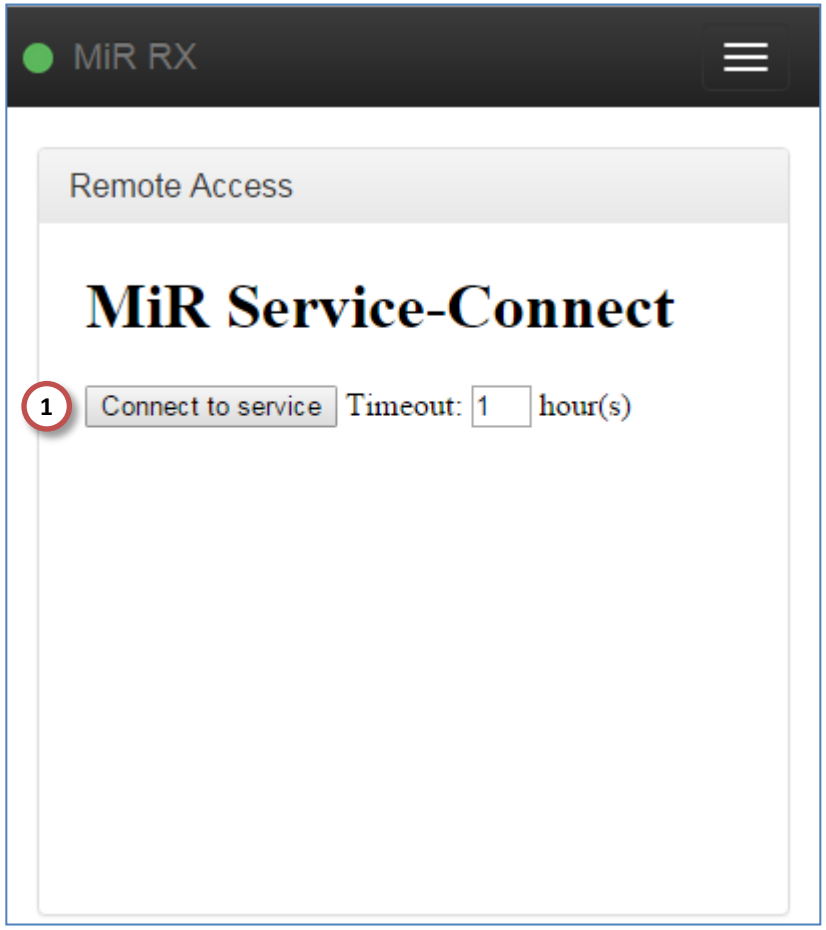


1. Select Remote Access to manage remote access, wifi, local network for the vehicle.

Save a backup of current data or load a previously saved backup.

MiR100 Maintenance – Administrator 5/6

MiR > Service > Maintenance > Remote Access

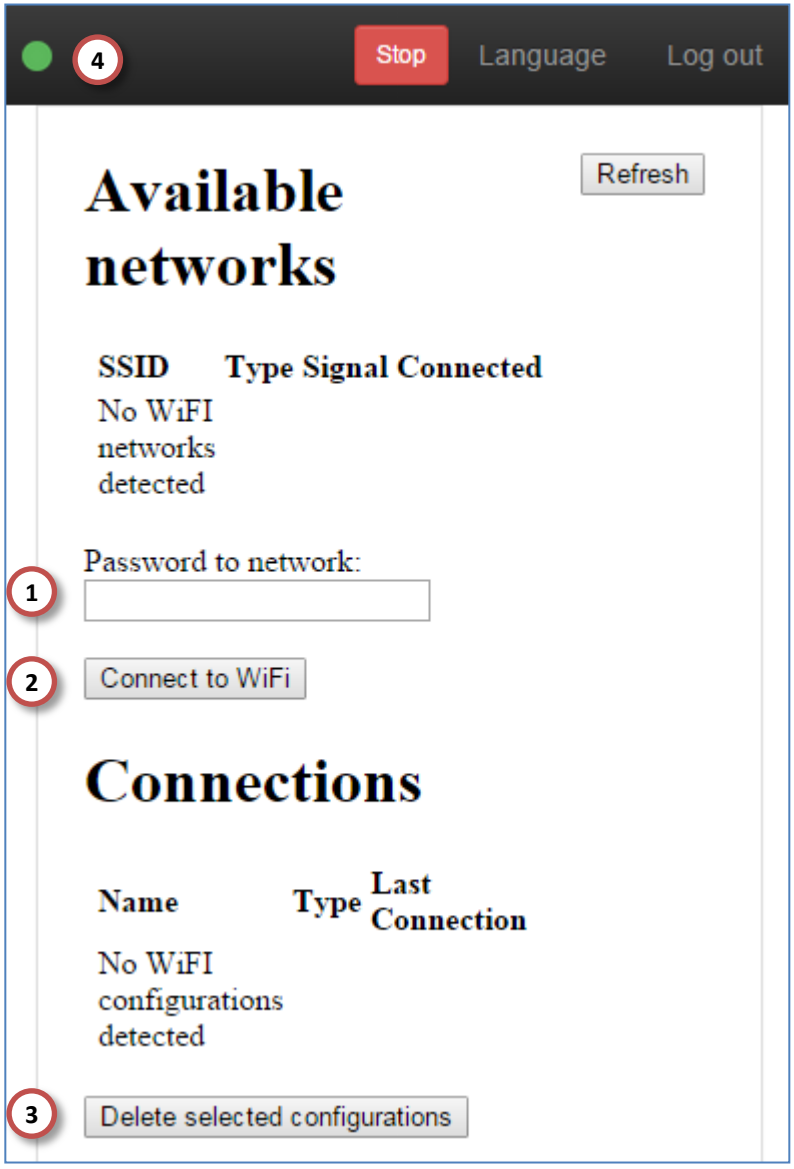


1. Click Connect to service to manage remote access, wifi, local network for the vehicle.

Continues…

MiR100 Maintenance – Administrator 6/6

MiR > Service > Maintenance > Remote Access



1. Use this page to set up wifi and connections.

4. Return to MiR start page.