HOPE technik

INNOVATE | ENGINEER | DELIVER

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RoMi-H AMR Training

29 October 2024

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TEAM

SI: HOPE TECHNIK

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- Solomon, Zen, Gabriel

TTSH Project Team

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Synapxe/IT

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- Synapxe MDOTS rep – Stanley

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AGENDA

01	Intro to RoMi-H & AMR	5 mins
02	Using RoMi-H Web UI	10 min
03	Kitchen Workflow Nursing	5 min
04	DOs & DON'Ts	5 mins
05	Troubleshooting	5 mins
06	Support Plan	**5 mins**

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01
Intro to RoMi-H & AMR

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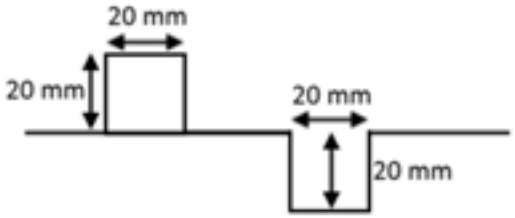
OPERATION SURFACE

- MiR robots are designed for indoor transportation only.
- Do not attempt to drive outside at any point of time. (The warranty shall not be coverd for any damage occured due to any outdoor operations.)
- The operation surface must be smooth and clean:
  - Oil or water on the floor would significantly lower the performance of the robot's wheels and prompt to cause accidents.
  - Driving the robot through water could damage internal parts and should be avoided.

Floor Gaps and Door Sills

- The MiR can traverse small gaps, cross wires or door sills along the operation floor.
- The maximum traversable distance is 20 mm (0.8 in).
- The maximum traversable height is also 10mm(0.4 in) / 20 mm (0.8 in).
- If larger gaps or objects are passed, the robot may get stuck with wheels on both sides of the object, unable to continue without human intervention.



EXTERNAL HARDWARE

On/off button (blue)
Scanner reset button (yellow)

SENSORS FOR MIR250

Collaboration between the robot's internal and external sensors ensures that the robot can navigate in the environment

Four (4) ultra sonic sensors reduce blind angles and risk of driving into pallets

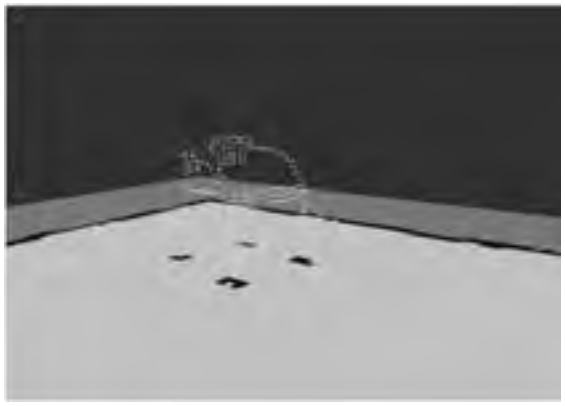
Two (2) SICK S300
FoV: 360° at 200 mm height

Two (2) RealSense™Detection 3D cameras
FoV: Detects objects up to 1800 mm high and distance of 1200 mm, 118° horizontal view

WHAT THE ROBOT SEES

- Below a Real life example can be seen. All 3 pictures show the same location.

This is what a human sees.
A chair in the corner of a room.

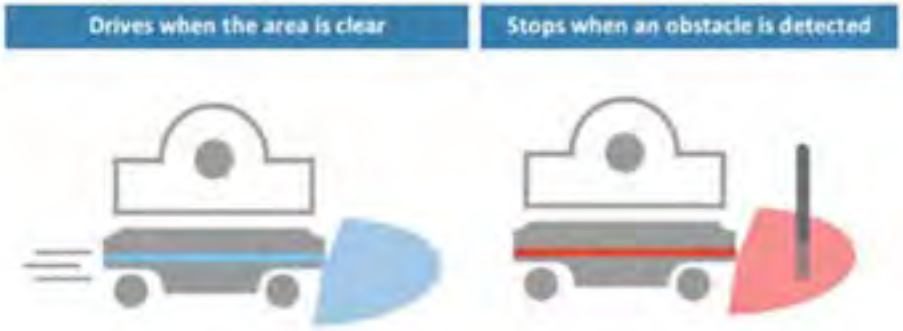


This is what a MiR sees with the front camera.
A cloud of dots projected above the map.

This is what a MiR sees with the laser scanners.
Red dots fitted on top of the black lines of the map.

Emergency Stop Issues

- AMR enters protective stop automatically to ensure the safety of nearby personnel.
  - Remove the object nearly by protective field or walk away from AMR. The robot will resume its operating state after two seconds.



  - AMR finishes the startup process and will enter protective stop. Press the flashing resume button to bring robot out of protective stop.

TURNING ON/OFF THE AMR

Turning **ON** the AMR

- Press the Power button (Red Box) to turn on the AMR
- It will take roughly 2 minutes to be on
- Ensure the Key is selected in "Autonomous" (Blue Box) Mode
- The default should be "On" and in "Autonomous" mode
- AMR finishes the startup process and will enter a protective stop
- Press the flashing reset button (Green Box) to bring the robot out of the protective stop

Turning **OFF** the AMR

- Press and hold the Power Button (Red Box) until the lights of the button start to toggle
- Once it starts to toggle, you can stop holding onto the power button
- It will take roughly 2 minutes for the AMR to be off
- Once the light of the power button has stop toggling, this would indicate that the AMR is off

LIGHT INDICATIONS

Red	Emergency stop
ue (blinking)	Mapping
Purple	Goal / Path blocked
Green	Waiting for job

- The lights are located on the front and the two sides of the AMR

TECHFOX

HOST
A Sonepar Company

WHEN IN DOUBT, RESTART THE AMR

Power Button

Reset Button

1. Remove the Grey Cover
2. Turn the AMR OFF by holding the **power button (red box)** until it starts to blink in **red**
3. Then **turn ON** again by pressing the **power button (yellow box)**
4. After Startup, remember to **press** the flashing **reset button**
5. Ensure the grey cover is put up

02
Using AMR and RoMi-H Web UI

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LOGGING IN

01
Go to RoMi-H web dashboard URL in your browser

02
Login using your ADID credentials

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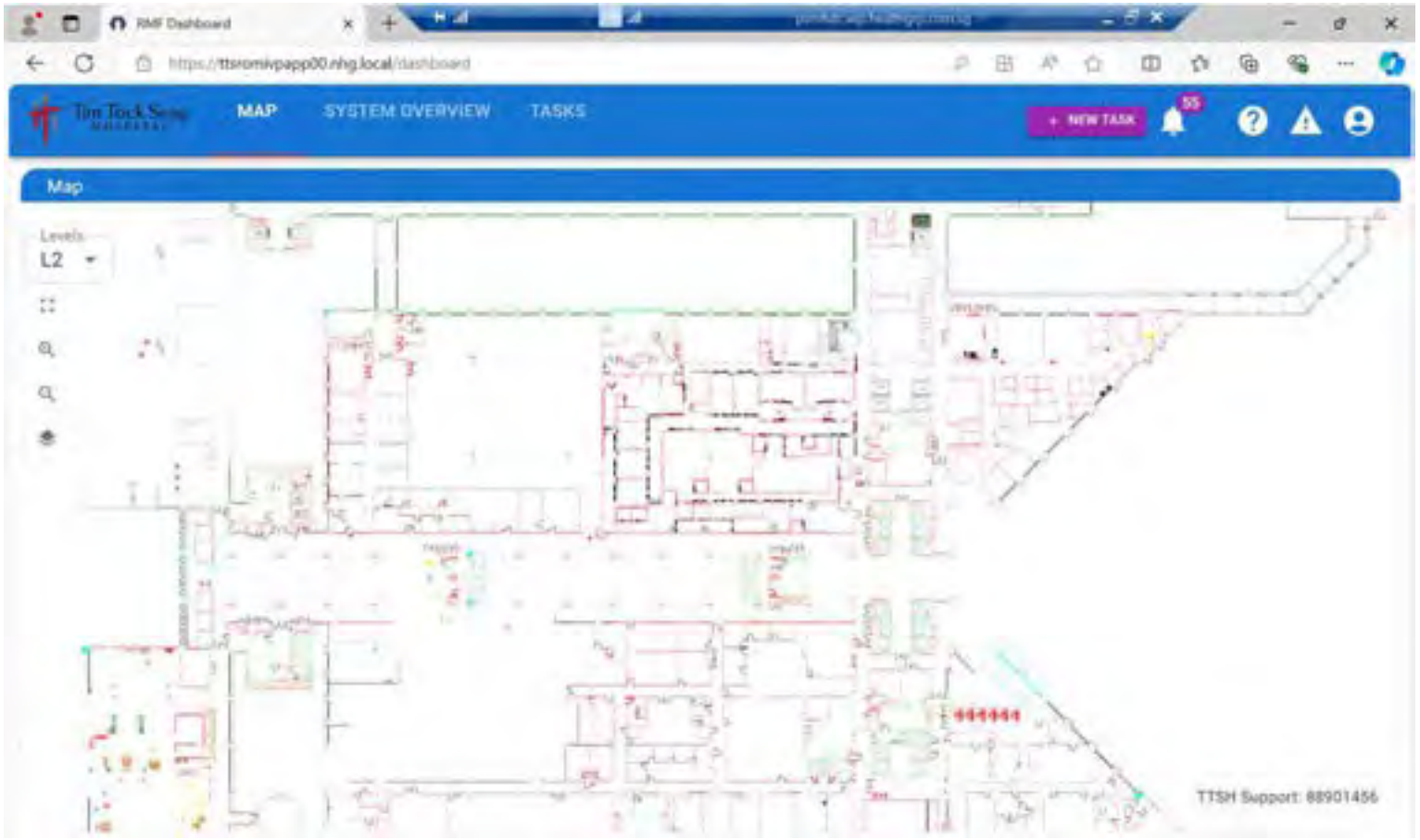
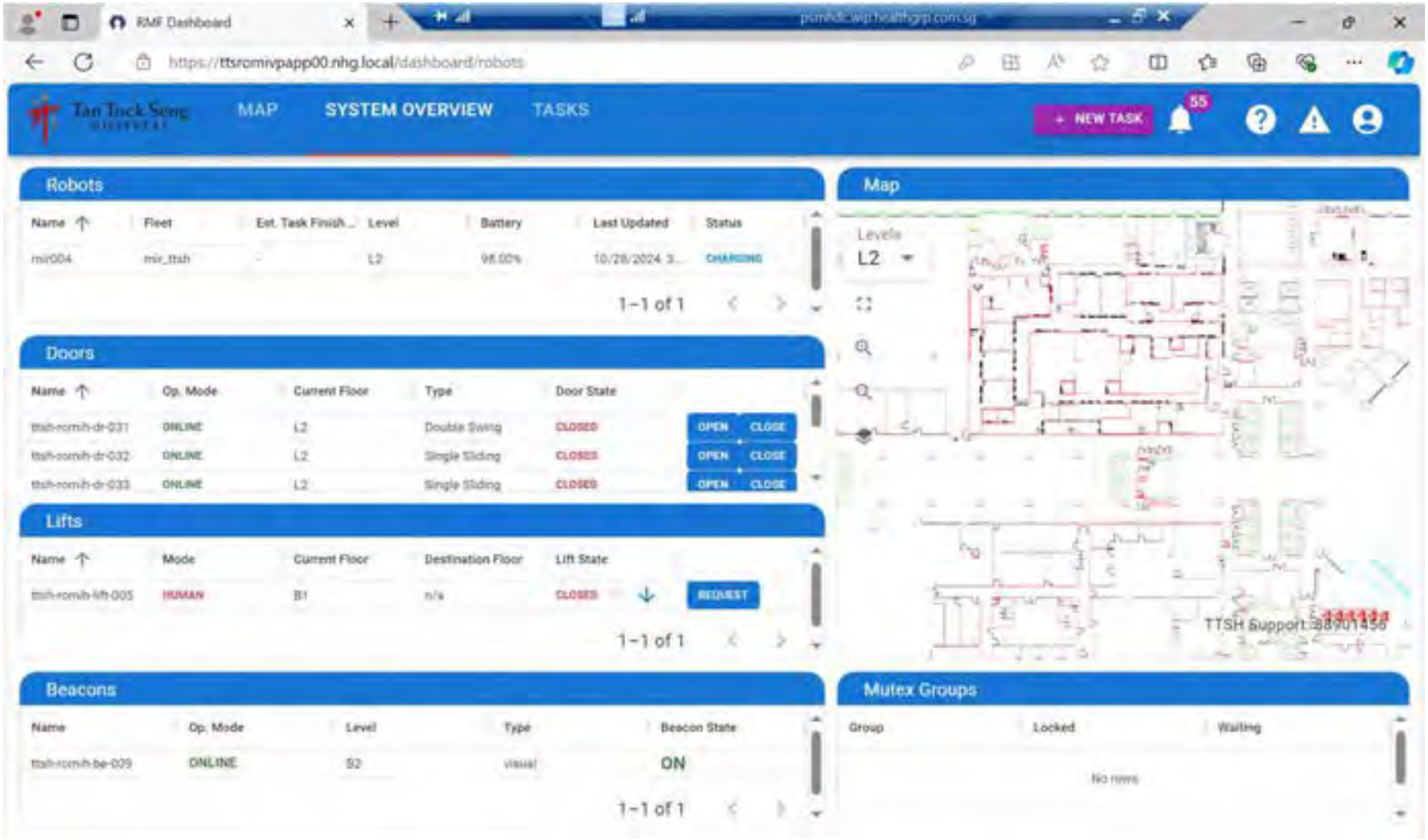
MAP PAGE

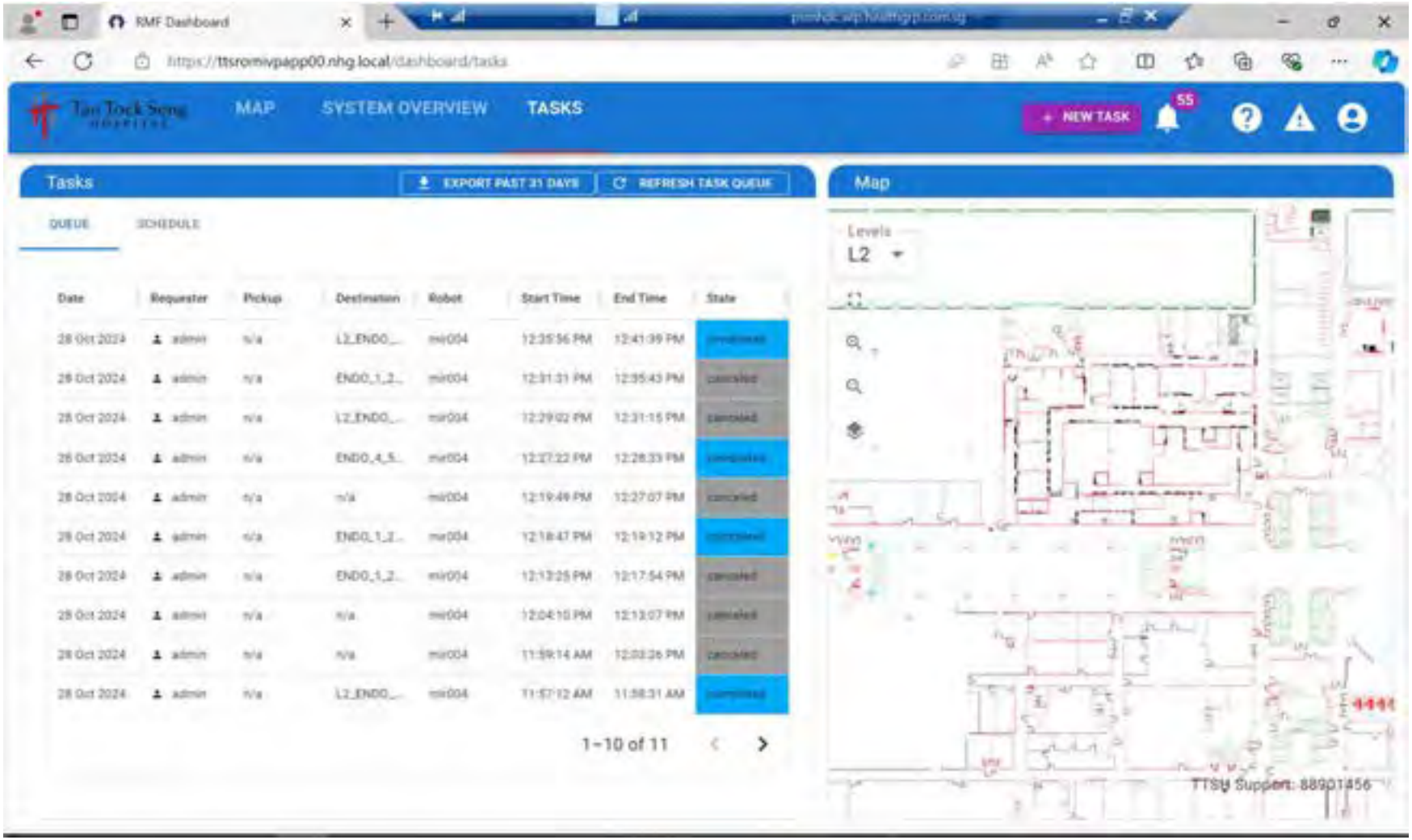


The overview of the buildings is displayed at this MAP Page

SYSTEM OVERVIEW PAGE



TASKS PAGE


RMF Dashboard
https://ttsromivpapp00.nhg.local/dashboard/tasks
Tan Tock Seng Hospital
MAP
SYSTEM OVERVIEW
TASKS
+ NEW TASK
55
Tasks
EXPORT PAST 31 DAYS
REFRESH TASK QUEUE
QUEUE
SCHEDULE
Date
Requester
Pickup
Destination
Robot
Start Time
End Time
State
1–10 of 11
Map
Levels
L2
TTSH Support: 88901456

CREATING A TASK

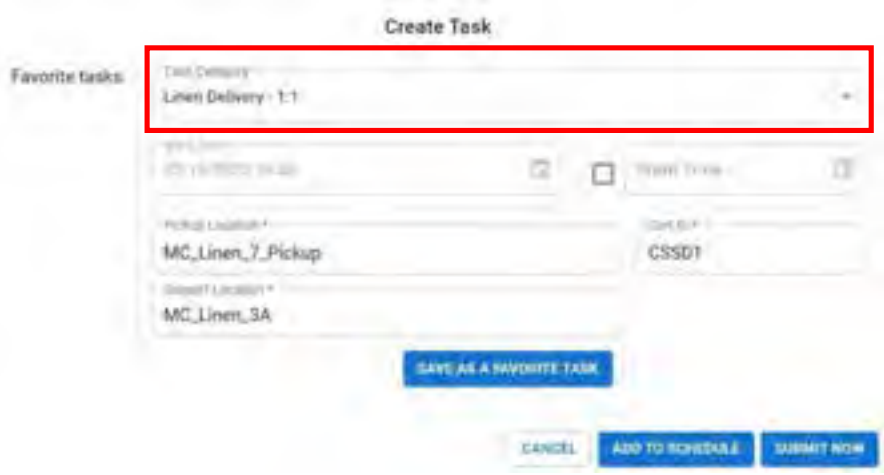
Kitchen Delivery

01: Start by clicking the **NEW TASK** button.

02: Select the type of task request you would like to initiate

03: Input the **pickup** location and **dropoff** location

04: Click **Submit Now**



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Kitchen Delivery: FLOW OF EVENTS

When the robot is carrying out a delivery task, it will go through the following steps to complete the task:

01: Robot will move to the specified pickup lot and stop in front of it

02: Robot will try to dock under the kitchen cart

03: Robot will latch onto the cart and move to the specified dropoff lot

04: Robot will release the latch and exit from under the cart, then return to its charger

*Video for demonstration purposes only. Kindly ensure the cart's door are closed before operating. For demonstration purpose, the video runs 1.5x the original speed.

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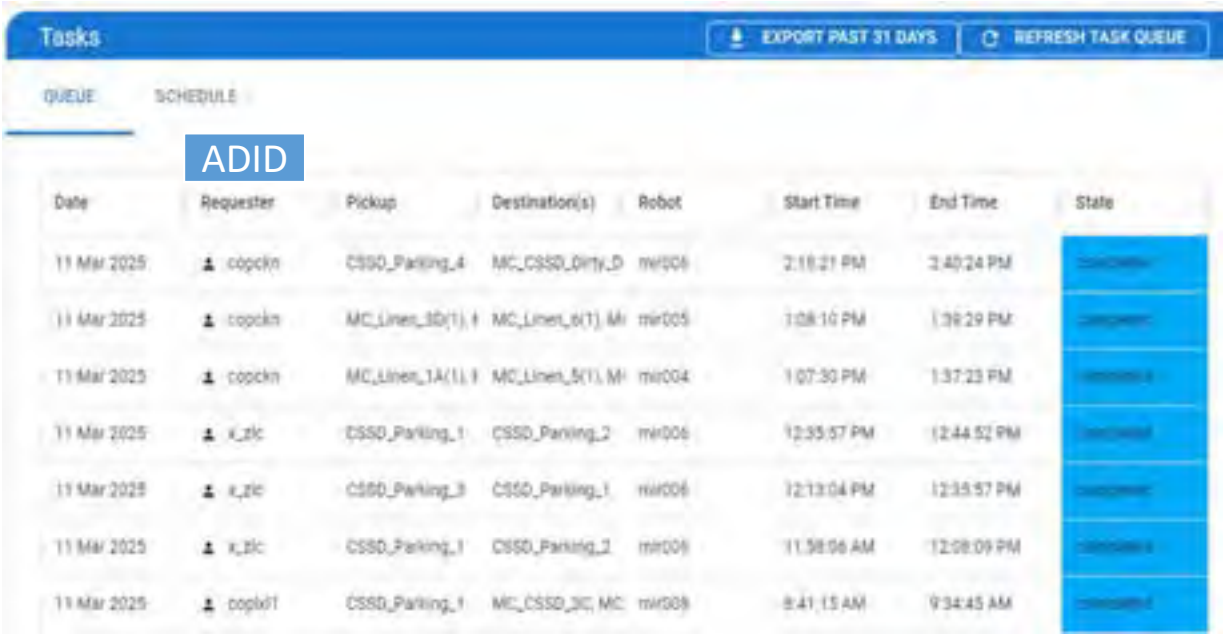
VIEW QUEUE TASK



View Queued Tasks

In the Task tab, users can easily view all their queued tasks in a table format. This provides an overview of upcoming tasks and helps manage workflows effectively.

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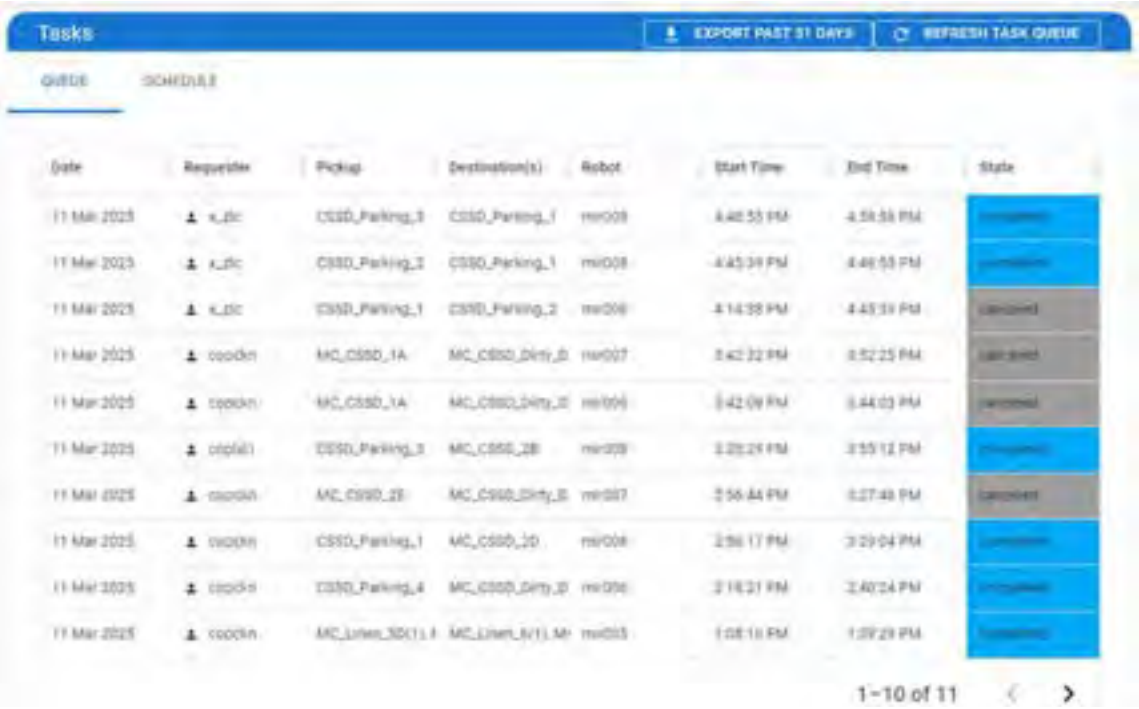
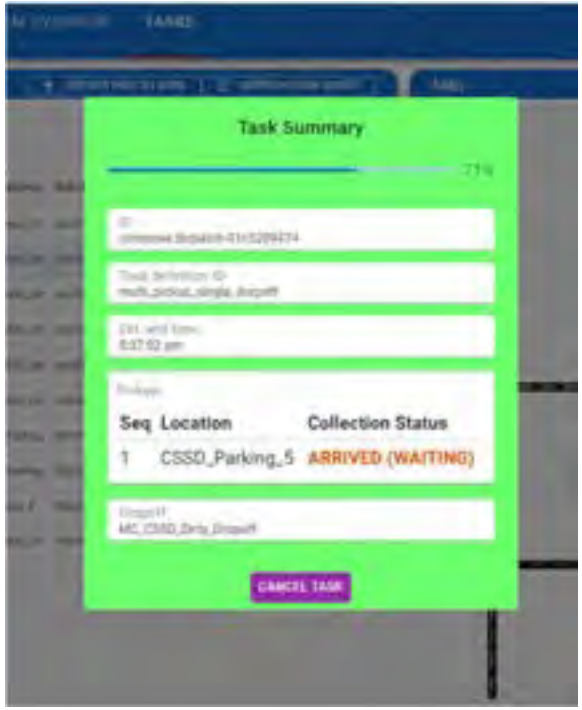
TASK CANCELLATION





01: Go to the **"Task"** tab

02: **Select the task** that you would like to cancel

03: Click the "**CANCEL TASK**" button in the task inspector

TASK STATE

cancelled	grey	#E7E6E6	When task is cancelled
queued	Orange	#FF9900	When the task is in the queue
Completed	Green	#00B050	When the task is completed
Underway	yellow	#FFFF00	When the task is on-going
Underway (stale)	Red	#FF0000	When the task is taking longer than expected (AMR is stuck in the mid of on-going task)
Queued (stale)	Red	#FF0000	When the task is expected to be started, but not started

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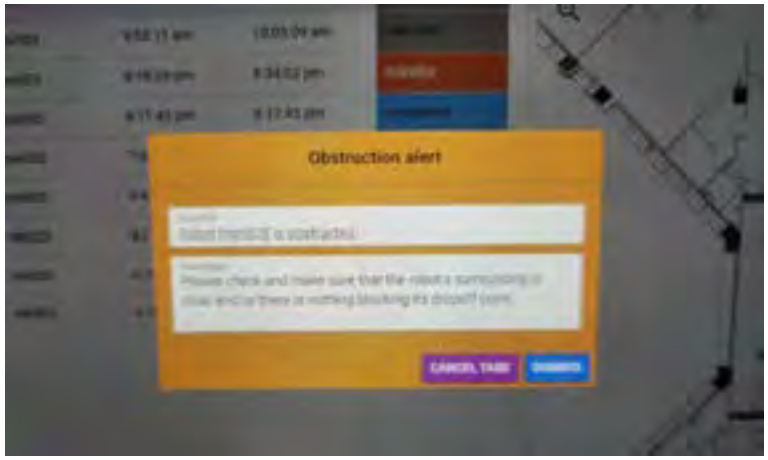
TYPES OF ALERTS (Error Messages)



User will see “Obstruction Alert” when AMR is blocked by obstacles and unable to proceed along the planned path.

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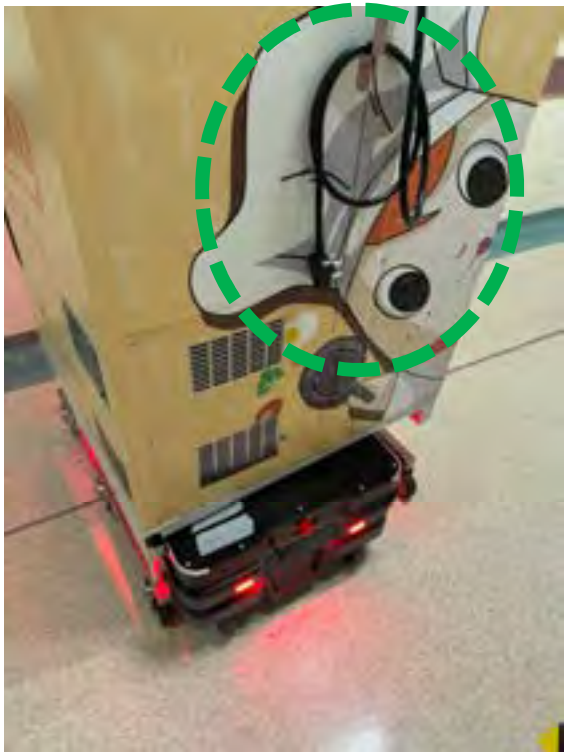
KITCHEN CARTs



- Ensure the Yellow Cart's charger are nicely rolled up and hanged at the back of the cart
- Floor tape marks the robot parking and charging zones in (**yellow and black**). These areas must remain clear of any obstructions to ensure smooth operations and easy access for the robots.

KITCHEN CARTS AT WARD

Once AMR reaches the destination dropoff, **5 mins countdown starts**. Staff are to take out the meals within 5 mins. Otherwise, the cart shall move on to next dropoff point.

Kick-sensor can be activated to send off the cart earlier as soon as unloading is done, staff doesn't require to wait for full 5 mins.

For emergency cases, staff can e-stop to stop the AMR from moving to next point and "reset" and release the AMR.

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EO1

KICK-SENSOR

Purpose: The kick sensor offers a quick, hands-free, and hygienic way for medical staff to prompt the robot to continue its task as soon as loading or unloading is finished, eliminating the need to wait for a preset timer. This accelerates workflow, allows personnel to remain focused on patient care, and ensures robot interaction meets clinical hygiene standards. Below is the steps to activate the kick-sensor.

Functionality: The kick sensor uses two proximity sensors at knee height to detect a leg swipe, which serves as a signal to bypass the robot's waiting period and proceed immediately to the next task.

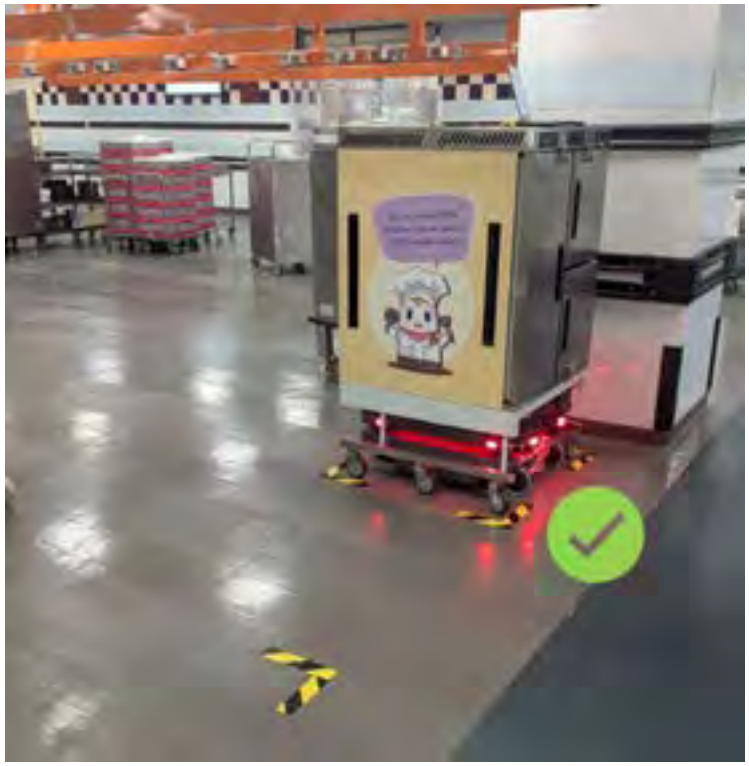
- Ensure that both sensor light turns green to be activated

- Video on how to use the kick sensor

Slide 29

EO1 SH:
What is the purpose of the kick sensor? If it is would be good to title the slide e.g. ‘how to start the AMR’- to include the purpose in so that it’s easier for users to follow
Enzali Oo, 2025-02-25T05:20:02.339

DOS: DESIGNATED PARKING ZONES FOR ROBOTS



Keep Zones Clear

- Yellow floor tape marks the robot parking and charging zones. These areas must remain clear of any obstructions to ensure smooth operations and easy access for the robots.

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DOS AND DON'TS : ENSURE CART DOORS ARE PROPERLY LOCKED AND SECURED

Make sure that cart doors are locked in before sending them out for deliveries. If doors are loose, they may swing out and cause accidents. Items inside the carts may also fall out

DOS: PROVIDE SPACE FOR THE ROBOTS

Keep hallways and lobbies clear

- Ensure clear routes for the robots to move through in the known high-traffic areas. Refer to the planned robot lanes.
- The robots require sufficient space to travel from one point to another, especially when they have carts latched on.

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DOS: PROVIDE SPACE FOR THE ROBOTS

Keep hallways and lobbies clear

If robot appears paused with goal blocked (switching between purple and blue light), please remove items from the robot's path.

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DOS AND DON'TS: LEAVING EQUIPMENT TOO CLOSE TO THE DROP-OFF LOT

Do not leave equipment too close to the drop-off lots

- If the robots detect any obstacles blocking the drop-off positions, they will get stuck and be unable to complete their tasks

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LEVEL 0 – SELF-HELP TROUBLESHOOTING

Self-Help - Troubleshooting on the following scenarios,

1. **Missing Carts**
2. **Wrong Carts**
3. **Waypoints/Goal Obstructed**
4. **Carts Latching Fail**
5. **Queued task not executed**

Issue cannot be resolved will be reported to FRC. Example such as:

1. AMR cannot move, localization issues
2. Lost connection to WIFI
3. AMR stuck in lift, lift cannot be released back to operation mode
4. UI not accessible to users
5. Not limited to the above

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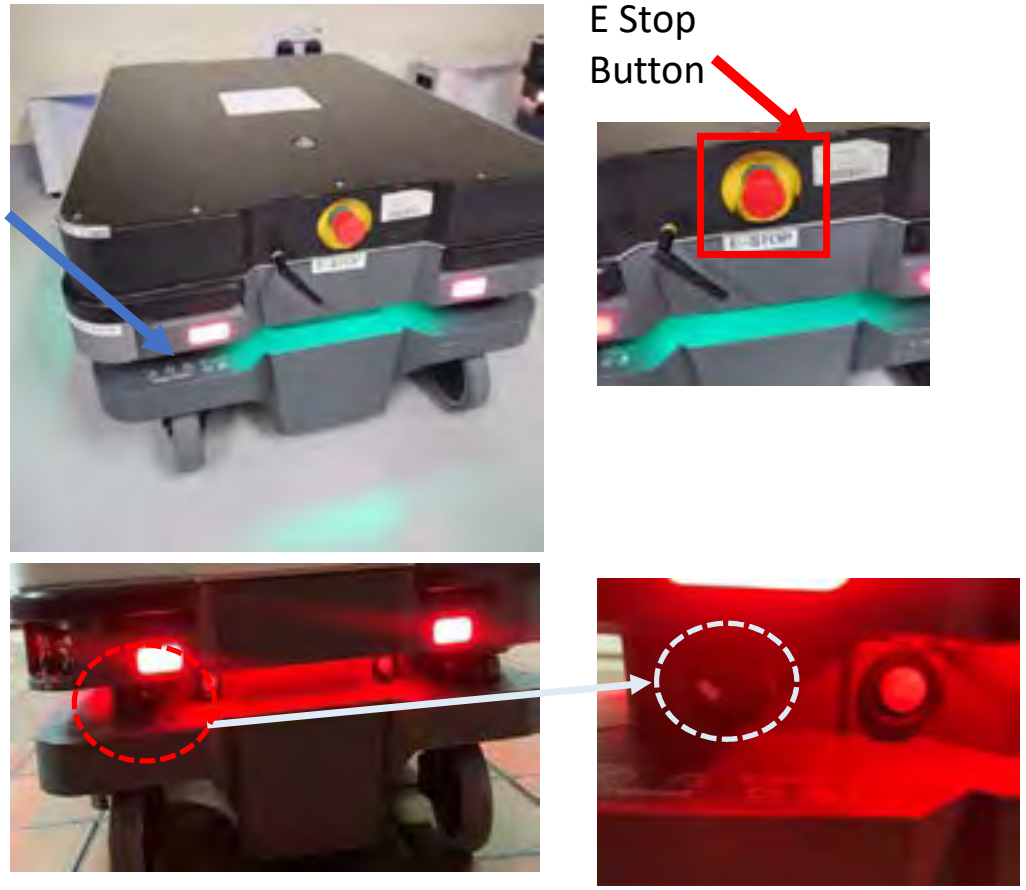
HANDLING ROBOT OBSTRUCTIONS AND EMERGENCIES



If the robot becomes stuck or unresponsive for an extended period, or in the case of an emergency, follow the instruction below,

i. press the **E-stop button** to halt the robot
ii. Turn the manual release switch **to clockwise** (right) to change to manual mode to move it when necessary
iii. After repositioning the robot, turn the manual release switch to **anticlockwise** to turn back to auto mode.
iv. Then press "**reset**" button.

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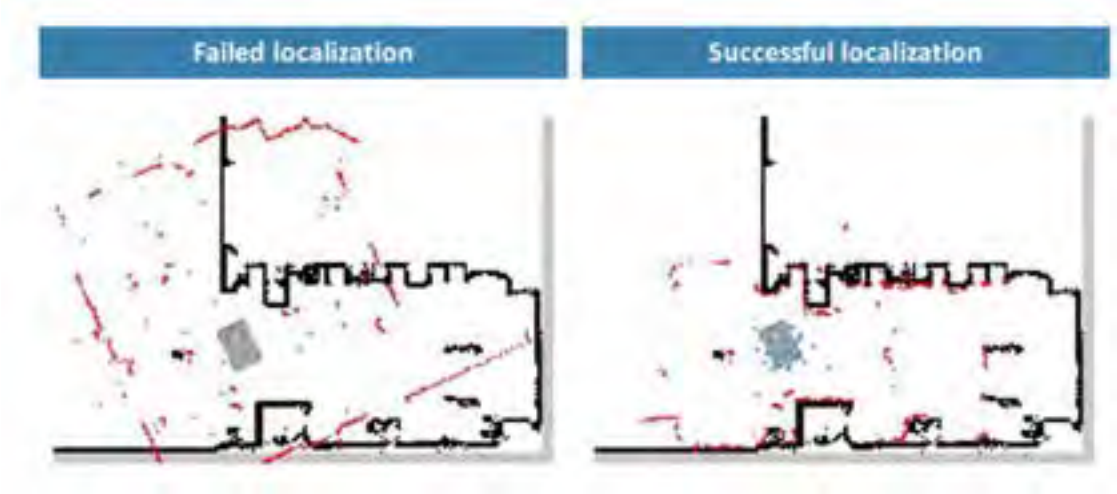
Localisation Issues

The AMR cannot determine a position where the red lines (laser scanner data) align with the black lines on the map.



The AMR must be able to detect the static landmarks that are marked on the map to be able to approximate its current position. Make sure there are not too many dynamic obstacles around the AMR.

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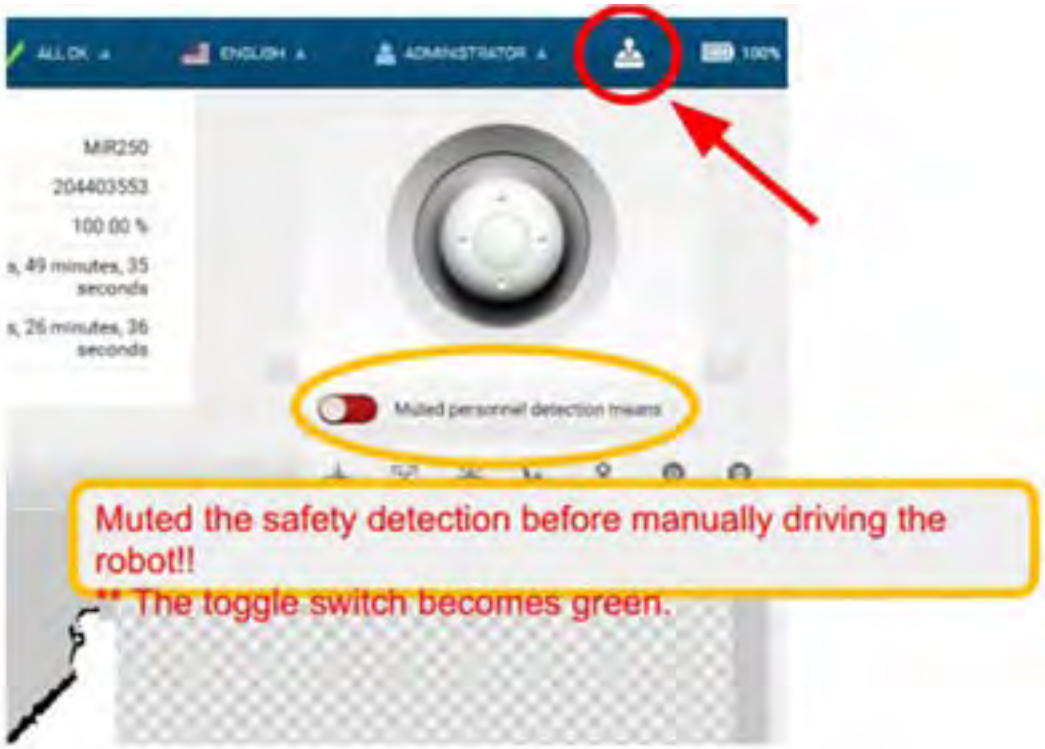
HANDLING ROBOT OBSTRUCTIONS AND EMERGENCIES (via MIR UI)



Manual Control of the Robot via MiR UI

To move the robot using joystick control, log in to the MiR UI and access the joystick feature.

Normally, it is safer not to mute the safety detection. However, if the robot is stuck against a wall or a safety sensor is triggered, you may need to mute safety detection by toggling it on (the switch will turn green).

Use this feature with caution, as muting safety detection can be dangerous.

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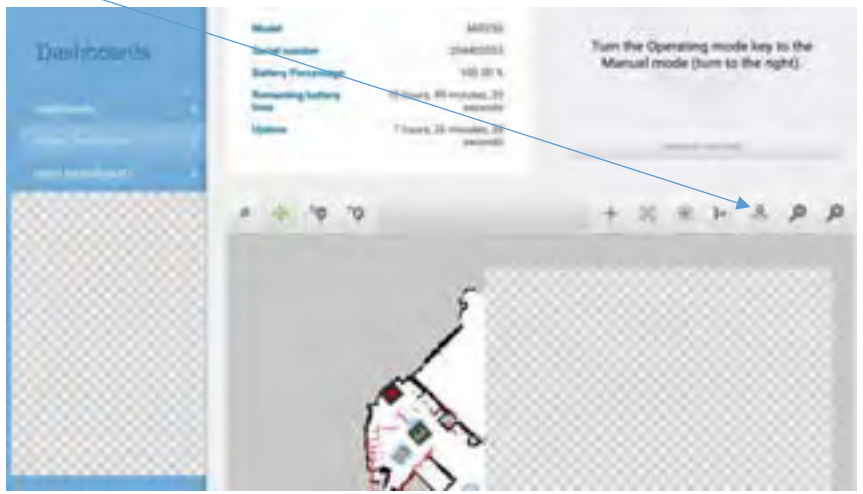
Localisation Issues

To re-adjust localization,

- From MiR UI dashboard with map, set the start position and orientation of AMR and press "adjust AMR position" again to recover from localization issues.



Other common issues

- AMR initial position was placed incorrectly on the map.
- Wrong map was used.
- Sometimes, the laser scanners or IMU need to be calibrated.

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RMF UI VS MIR UI: FUNCTIONALITY AND ACCESS DIFFERENCES

RMF UI

- **Purpose**: Main interface for operating the RMF system.
- **Functions**:
  - Create and manage tasks.
  - Monitor task progress and statuses.
  - View robot and hospital device statuses.
- **Access**: Used daily by operators; easy access for regular operations.
- **Control**: Provides high-level management and monitoring but limited control over individual robot functions.

MiR UI

- **Purpose**: Interface built specifically for the MiR robot.
- **Functions**:
  - Detailed robot control and configuration.
  - Advanced settings for diagnostics and manual operation.
- **Access**: Restricted; requires network access to the MiR's internal interface.
- **Control**: Allows for granular control of the robot but not used for everyday operations.

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SUPERUSER ONLY

ROBOT DECOMMISSION

- Robot decommission is interpreted as taking AMR off the (RoMi-H) RMF web.
- AMR can be decommissioned based on various scenarios, below are some common scenarios,
  - ❖ Hardware maintenance period
  - ❖ RMF UI go offline – resulting in AMR to go offline
- If an AMR needs to be decommissioned, please follow the steps to decommission it and ensure that no new task is assigned to that AMR. (continued next slide)

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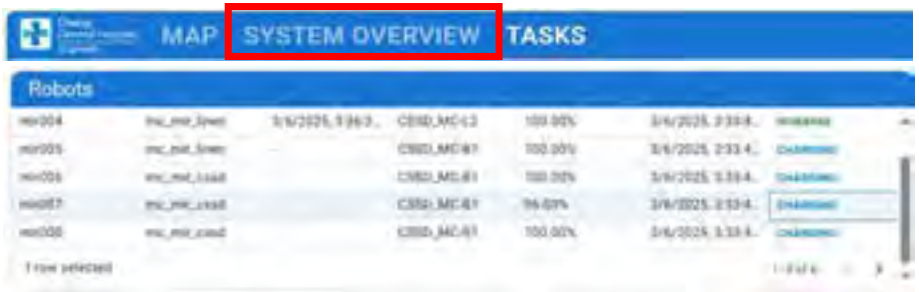
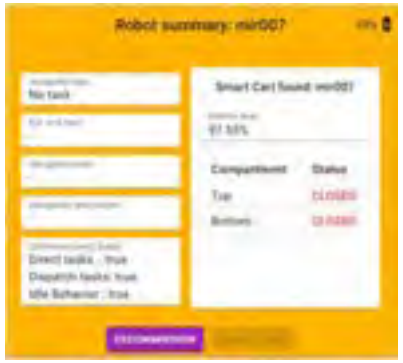
DECOMMISSION (Instruction)

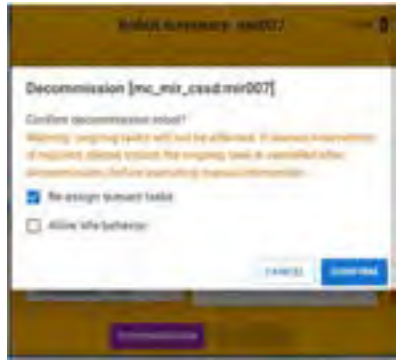
01 02



03



04



05

01: Go to the **SYSTEM OVERVIEW** tab

02: **Select the AMR** in the Robots Panel by left clicking on the row with the name of the AMR.

03: Click on the **DECOMMISSION button**

04: **Re-assign queued tasks**: **default checked, Allow idle behavior**: **default not checked**

05: Click "**Confirm**" to confirm your choice, the robot status in the Robots Panel will display **DECOMMISSIONED**.

ROBOT RECOMMISSION

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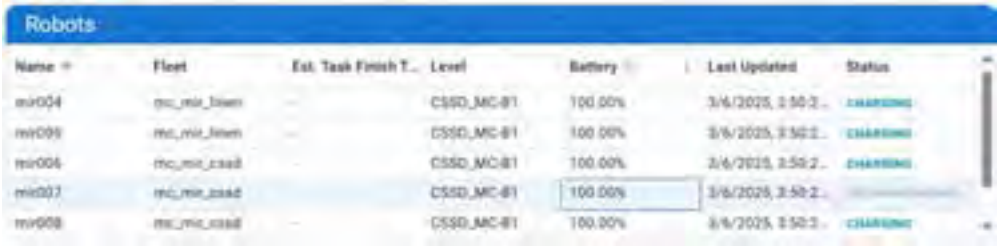
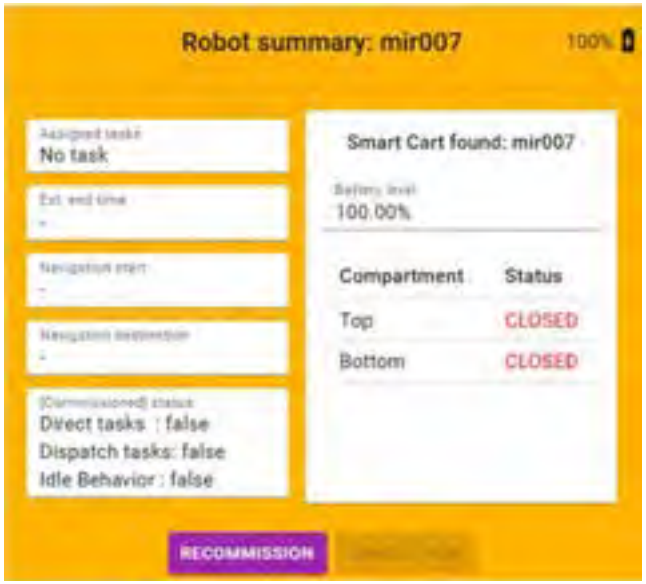
01

02



03



04

01: Go to the **SYSTEM OVERVIEW** tab

02: In the ROBOTS panel, click on the **decommissioned robot**, that you like to recommission

03: Click on the **RECOMMISSION** button

04: Click on the **CONFIRM** button

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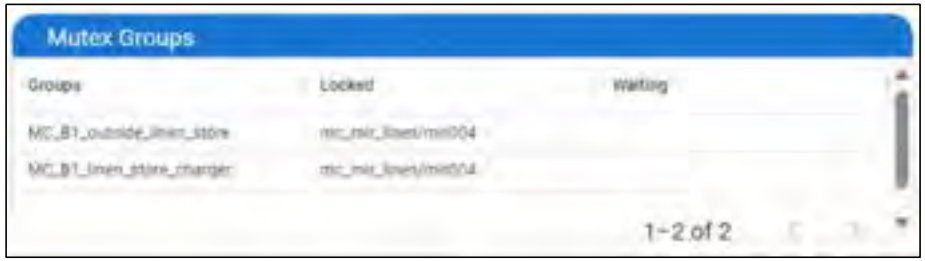
MANUALLY RELEASE THE MUTEX GROUP

01

03



04

01: Go to the **SYSTEM OVERVIEW** tab, Current locked Mutex Groups are listed in **Mutex Groups** panel

02: Click on the Mutex group, the table will display the robot that has locked the particular mutex group

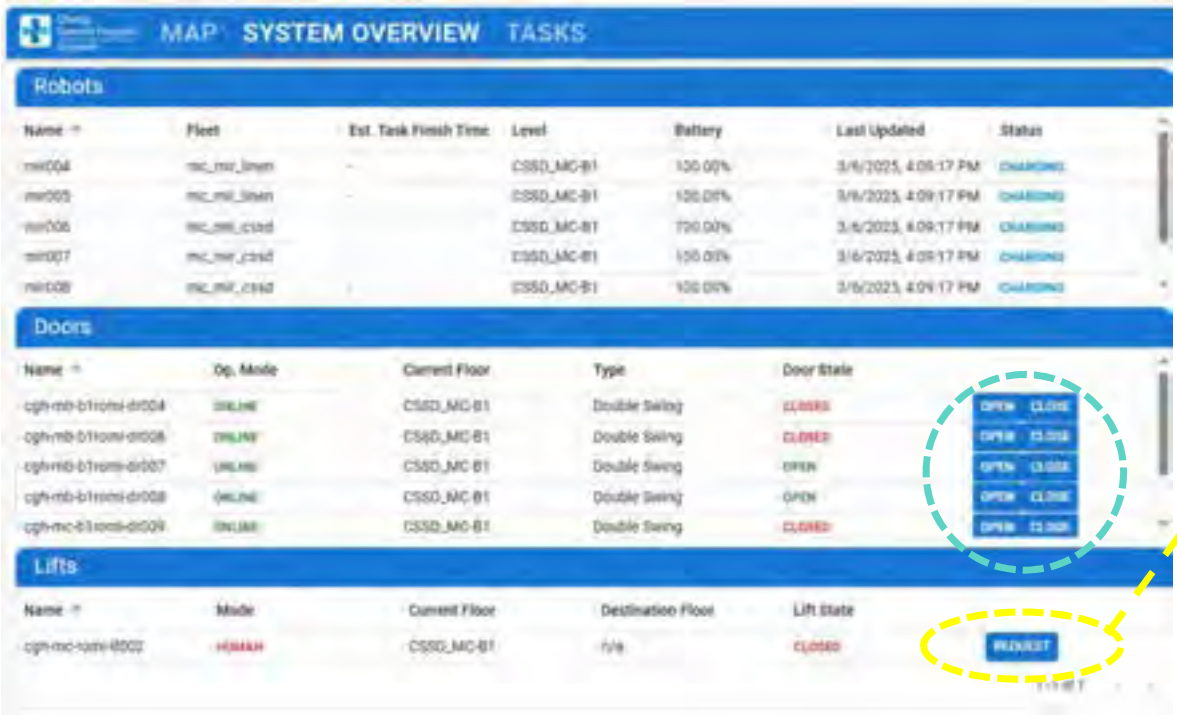
03: To unlock a group, click on the row, which will bring up the confirmation dialog box

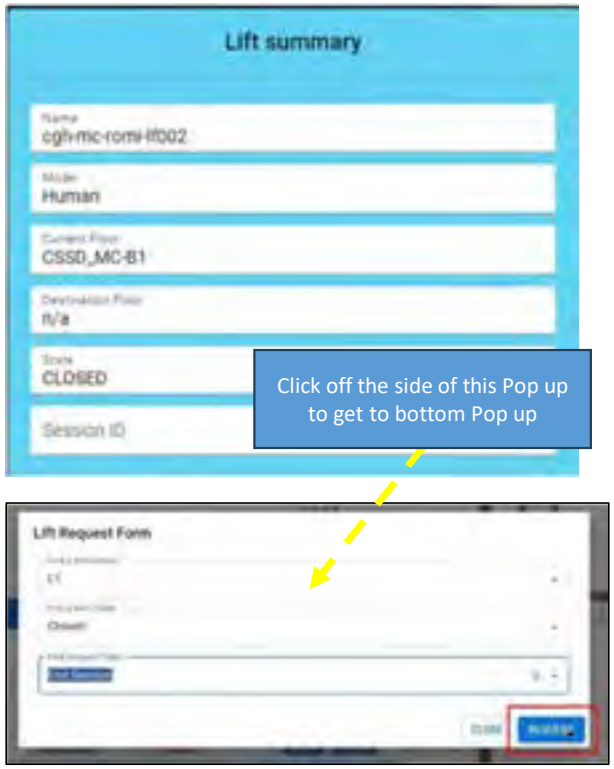
04: Click **CONFIRM UNLOCK** to release the lock. The waiting robot will acquire the mutex group lock and start to move.

TESTING DOORS & LIFT

SUPERUSER ONLY

- Under the system over page, the user can monitor the status of all beacons, doors, and lifts in real-time.
- To control the Door, simply press the "Open" or "Close" button.
- To control the lift, press "Request" and fill in the required information as shown on the right.





05
TTSH AMR SUPPORT PLAN (KIV)

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POST Go-Live AMR Support

WhatsApp group, “Kitchen AMR users” will be created with Kitchen users to contact TTSH AMR Project Team and SI Project Team for AMR issues.

TTSH AMR HOPE TECHNIK 24HR SUPPORT CONTACT

Support Ticket on WebSite

For urgent cases and in the event the provided number are uncontactable emergency: +

FRC contact number: +65 **** ****(KIV)

For Service Report (Same day submission within 2 hours) - Please send to the following:

1. Sing_Heng_SOH@ttsh.com.sg
2. Tianci_LUAN@ttsh.com.sg
3. stanley.wan@synapxe.sg
4. muthuganapathy@synapxe.sg
5. CC the respective user: Depending on the issue is raised from which department
    - Endo (POC) Pei_Yee_LIM@ttsh.com.sg
    - Kitchen POC)
    - Pharmacy (POC)

For Incident Report & SLA report (monthly reports)- Please send to the following:

1. Sing_Heng_SOH@ttsh.com.sg
2. Tianci_LUAN@ttsh.com.sg
3. stanley.wan@synapxe.sg
4. muthuganapathy@synapxe.sg

VENDOR SUPPORT

Channel of flow on AMR escalation process when a fault arise:

1. Self Help - Nursing and Kitchen/Pharmacy staff will be the first line of response as they have the line of sight of the AMRs.

Basic troubleshoot of AMRs:

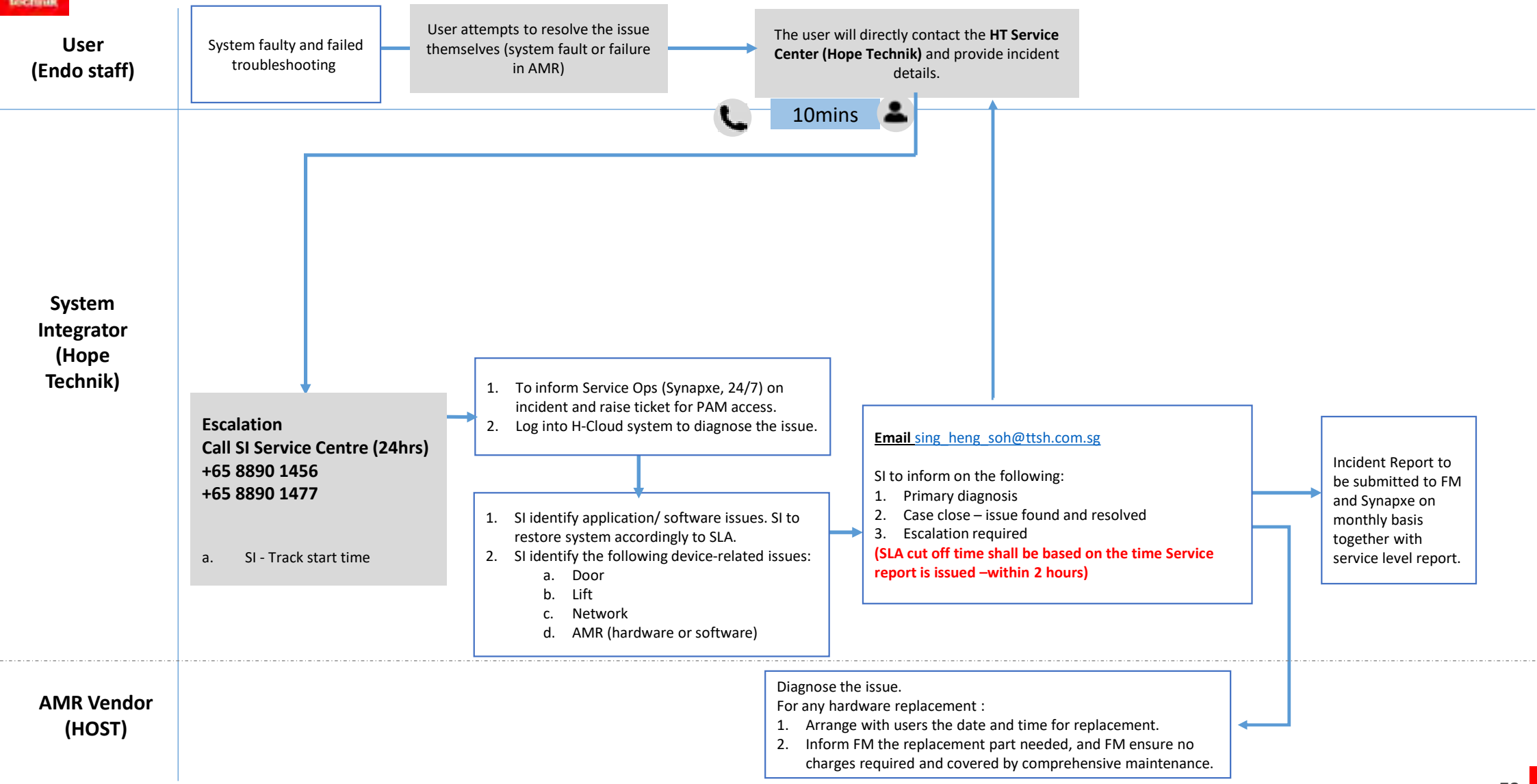
a. Missing Carts [ensure the assigned pickup lot has physical correct cart]
b. Wrong Carts [ensure the user refer to the cart SmartCart UI display before putting the items]
b. Goal Obstructed [go to the location and ensure the obstacle is removed]
c. Latching Fail [ensure the cart is aligned on the designated lot, if still fails to latch, then report to SI. If there any abnormality, ensure the MiR is e-stopped]

Issue cannot be resolved will be reported to HT.

Example such as:

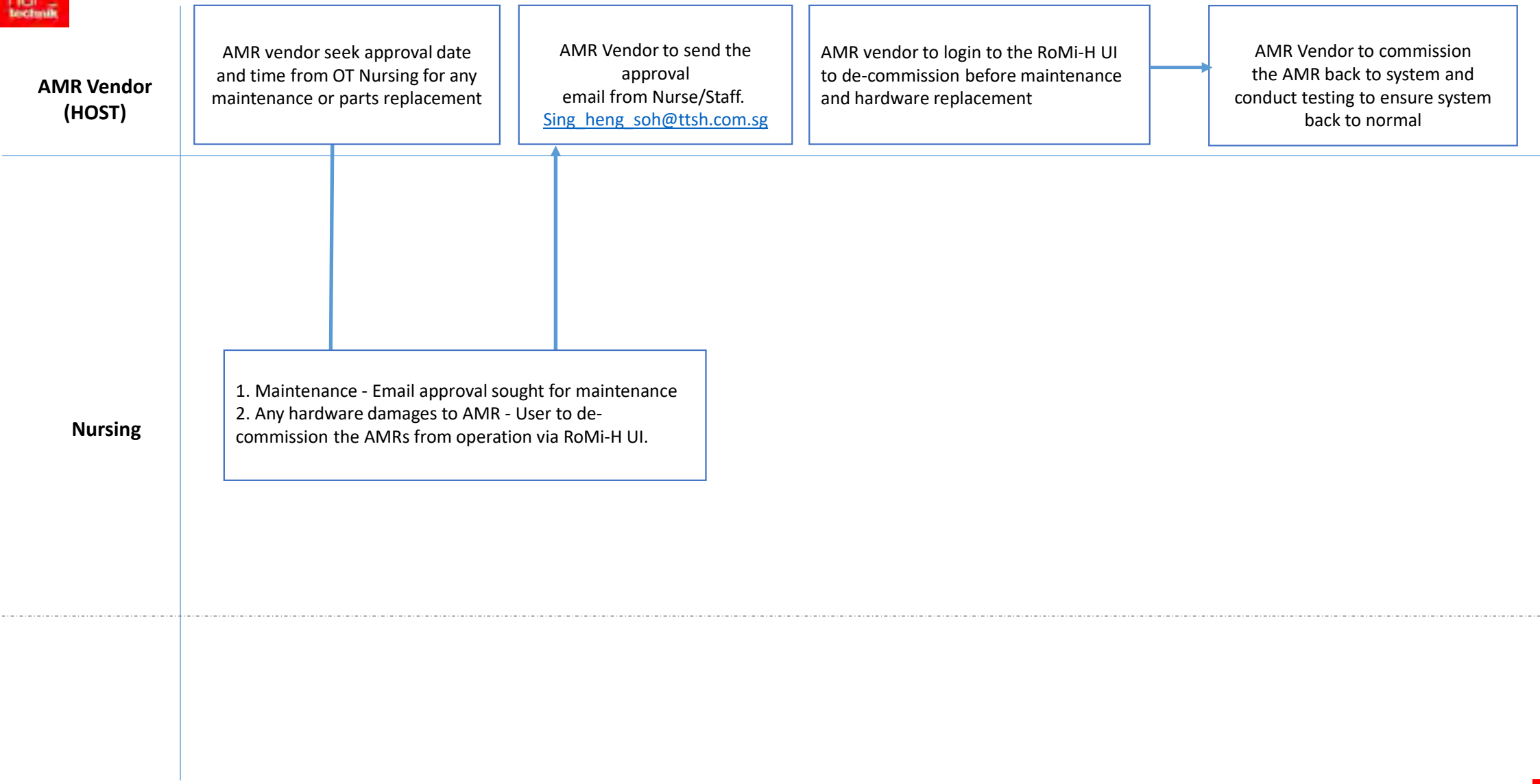
1. AMR cannot move, localization issues
2. Lost connection to WIFI
3. AMR stuck in lift, lift cannot be released back to operation mode
4. UI not accessible to users
5. Not limited to the above

TTSH AMR ESCALATION APPROACH



COMMERCIAL-IN-CONFIDENCE

TTSH AMR ESCALATION APPROACH **(HARDWARE MAINTENANCE AND REPLACEMENT)**



COMMERCIAL-IN-CONFIDENCE

TTSH AMR ESCALATION APPROACH **(RE-SET THE PASSWORD TO BE DONE WITH MAINTENANCE OF MIR)**

Service Account are used for AMRs to connect to the Wi-Fi system.
Password change is required yearly. Once Password is changed in Citrix system, the MIRs service account password is required to change on MIR UI.

FM

To change service account password when AMR Vendor is performing hardware maintenance. (twice a year)

Login to Citrix to change the service account password for 3 MIRs in OT when AMR not in operation.
(please note that the change of password must be done during non-operation timing)

Email AMR Vendor the changed password

AMR Vendor (HOST)

Downtime of the AMRs

AMR Vendor to change password during maintenance check for all 3 MIRs

Vendor change the service account password using MIR UI

AMR Vendor to report back to FM once password is changed