

PUBLIC

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# End-User Information for Integration via Integration Services

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# 1 SAP Warehouse Robotics

SAP Warehouse Robotics is a product that is built on SAP BTP. You can use it to automate your warehouse operations using robots, for example, to move handling units (HUs) from source storage bins to destination storage bins.

SAP Warehouse Robotics makes integrating robots as easy as plug and play. Users of SAP Extended Warehouse Management (SAP EWM) can quickly integrate many kinds of autonomous mobile robots.

# 2 Warehouse Order Processing

For robots that are integrated with SAP Warehouse Robotics via integration services for SAP Warehouse Robotics, SAP Warehouse Robotics assigns warehouse orders to an edge node. The edge node stores the assigned warehouse orders for processing.

When a robot confirms a warehouse task at the source bin of its current warehouse order, SAP Warehouse Robotics assigns the next warehouse order to its edge node.

Here are further rules for warehouse order processing:

- If you don't activate the optimization of warehouse order assignments to a robot, SAP Warehouse Robotics checks the queue sequence of the resource group that the robot is assigned to. The first queue must be finished before SAP Warehouse Robotics selects the next queue.
  SAP Warehouse Robotics sorts the warehouse orders in a queue by the latest starting dates (LSDs). If there are no LSDs, the system sorts by the creation time of the warehouse orders.
- If you activate the optimization of warehouse order assignments to a robot, SAP Warehouse Robotics determines the distance to find the order that is geographically closest to the robot.
  But the following optimization options are available:
  - To optimize warehouse orders between all assigned queues in the queue sequence.
  - To optimize warehouse orders queue by queue in the queue sequence.

  The system first sorts the warehouse orders by latest start dates and then optimizes these orders by calculating the distance between the destination bin of the previous order and the source bin of the next order.

# 3 Settings

For robots integrated via integration services, define settings for your robots using the Define Robot Settings - Integration Services [page 5] app.

## 3.1 Define Robot Settings - Integration Services

With this app, you can define relevant settings for a robot in a warehouse. Note that this app is only applicable for robots integrated via integration services.

### Procedure

You can perform the following actions:

1. Assign robots to a warehouse.
2. Set up robots.
    1. Create a robot type to group all robots with similar physical or technical characteristics. Define the maximum number of warehouse orders that can be assigned per edge node.
    2. Assign the robot type, resource, resource type, and resource group to a robot. The resource-relevant attributes are from SAP EWM. The robot can process the warehouse orders of the resource that is mapped to it.
3. Manage robot battery.
   For each robot type, define the battery level for autonomous charging and the minimum battery level for complete charging.
   When a robot's battery level falls below the battery level for autonomous charging, it drives itself to a charging point. If the robot is still processing a warehouse order, it finishes the current warehouse order, and the system assigns the unfinished warehouse orders to the resources of other robots.
   When a robot's battery level reaches the minimum battery level to stop charging, it's ready for processing warehouse orders.
4. Define exception handling.
    1. Specify an existing queue from SAP EWM that will only contain warehouse orders with exceptions that occur to robots.
    2. Define clarification bins for robots with exceptions.

> **i Note**
>
> When defining clarification bins, keep in mind the following points about the mapped storage bins:
> - The storage bins can store the handling units (HUs) on the robots in the physical warehouse.
> - The storage bins are only for the use of SAP Warehouse Robotics.

> When there are exceptions such as destination bin errors, define enough clarification bins to store the HUs of the robots.

For more information about exception handling for clarification bins, see Monitor Robots for Integration Services [page 7].

5. Recommended: optimize order assignments.
   You can activate or deactivate the optimization of warehouse order assignments to robots in a warehouse. Once optimization is activated, the system can assign the next nearest warehouse order to a robot when the robot finishes the current order. The orders are based on the order list retrieved from SAP EWM.
   You can choose to optimize warehouse orders for all assigned queues in the queue sequence defined in SAP EWM. You can also choose to optimize warehouse orders for one queue at a time, that is, queue by queue, in the queue sequence.
   The system first sorts the warehouse orders by latest start dates and then optimizes these orders by calculating the distance between the destination bin of the previous order and the source bin of the next order.

# 4 Monitoring

In this section, you can view the current situation of robots and take corresponding actions.

## 4.1 Monitor Robots for Integration Services

With the *Monitor Robots* app, you can observe exceptions, robots and charging points in a warehouse for the integration via the integration services.

For more information about monitoring robots from fleet management systems, see Monitor Robots for Fleet Management.

### Activities

#### Exceptions

You can view all exceptions that occur to robots. The robots don't continue to work until you set the exceptions to *Solved*.

Robots integrated via integration services contain the following exception types:

- Source bin error
  A robot can't pick a handling unit (HU) from a source bin.
- Destination bin error
  A robot can't unload an HU at a destination bin.
- System error
  - System errors relevant to SAP EWM
  - System errors relevant to edge nodes, for example, no response or timeout
- Robot error
  An error is relevant to a robot itself.

For more information about how to handle the errors, see Exception Handling .

#### Robots

After you have created the robots and made the relevant settings, you must choose *Enable Use* to let the robots actively work in a warehouse.

> **i** Note
>
> If you purchased a test and demo license for SAP Warehouse Robotics, you can enable up to five robots for use.

Once you enable a robot for use, SAP Warehouse Robotics starts retrieving open warehouse orders from SAP EWM. When you disable all robots for use, SAP Warehouse Robotics stops retrieving warehouse orders.

### Charging Points

When a robot's battery level falls below the battery level for autonomous charging, it drives itself to a charging point.

If you need to use a robot but it's still charging, as soon as its battery level reaches the battery level for autonomous charging, you can manually stop the robot from charging.

If a robot doesn't have warehouse orders to process, as soon as its battery level drops below 100%, it autonomously goes to the charging point.

When a robot is on the way to a charging point, the charging point changes its status to be reserved for charging.

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