Oracle Fusion Cloud SCM

Using Production Scheduling

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1 Intoduction

Why You Use Production Scheduling

Before answering the question, let's recap what we know about the manufacturing process. Your manufacturing application calculates start times and end times based on the work order start or completion date. The application accounts for the duration of resource usage, but it assumes that your resources have unlimited capacity; it then potentially plans to execute production for multiple work orders simultaneously.

Why Resource Constraints Must Be Considered

Let's say your shop floor has just two machines that can be used for 10 hours a day, due to defined resource or shift exceptions. You need to make 10 items by the end of today and each item takes two hours to make. This means that by your deadline, you can make just half the required number of items because of capacity constraints on your resources. Because your shop floor might be executing more than one work order at a time, daily constraints on resource capacity must considered.

How Production Scheduling Helps

Using Oracle Production Scheduling, you can consider resource capacity constraints and the changeovers on resources that occur throughout production. You can generate a feasible and executable schedule by considering resource capacity and resource availability, attribute-based changeover rules, component availability, and multistage dependencies based on work definitions and item structures. Using changeover rules you can reduce changeover times to increase throughput and reduce lateness of work orders.

How the Production Scheduling Work Area Is Enabled

To enable the Production Scheduling work area, you must perform two setup tasks.

You can perform these tasks in any order, but you must do both before a user can access the work area.

- Opt in to the Production Scheduling feature
- Assign a job role to the applicable users

Opt In to the Production Scheduling Feature

You perform this opt in one time for your overall site.

- Offering: Supply Chain Planning
- Feature: Production Scheduling

For more information regarding how to opt in to features, refer to the Using Functional Setup Manager guide, Offering Configuration chapter in the Oracle Help Center.

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Assign the Applicable Job Role to the Applicable Users

Assign a job role that includes the View Production Schedule (MSC_VIEW_PRODUCTION_SCHEDULE_PRIV) privilege to the user associated with each of your production schedulers.

For more information regarding how to assign job roles to users, refer to the Securing SCM guide, Role Provisioning chapter in the Oracle Help Center.

Related Topics

- Role Provisioning and Deprovisioning
- Overview of Configuring Offerings

Production Scheduling Tasks and Business Flows

To carry out production scheduling tasks, you must have production scheduler privileges by your enterprise. This topic is an overview of the tasks and the business flows in the Production Scheduling work area.

Locate the Work Area

Navigate to the Supply Chain Planning cluster and click Production Scheduling.

Know Your Workflow

Here's the sequence of production scheduling activities:

1. Add and set up scheduling organizations.
2. Create a schedule.
3. Refresh, solve, review, and adjust the schedule.
4. Release the schedule.

Begin Your Business Tasks

From the Production Schedules page, you can manage production schedules and scheduling organizations.

- Before creating a schedule for an organization, this organization must be defined as a scheduling organization. Click the **Manage Scheduling Organizations** button to add, manage, and delete scheduling organizations. To know more, refer to the Organization Setup chapter.

- To create a schedule, click **Create** on the Production Schedules page to define and configure your schedule. To know more, refer to the Schedule Setup chapter.

- To work with an existing schedule, use the actions menu for that schedule. To know more, refer to the Schedule Processes chapter.

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Manage Data Access for a User

Only users with data access to a specific organization can access schedules and schedule data for the corresponding organization. You can configure the data access using the Manage Data Access task in the Setup and Maintenance work area. Here are some key points to consider when you assign data access to a user.

- You can assign data access to a user via any role, not just the Production Scheduler role.

- If you are assigning data access to a user of manufacturing organization, a security context has to be defined for both inventory organization and manufacturing plant of the manufacturing organization.

- If you are assigning data access to a user of maintenance organization, a security context has to be defined for only the inventory organization of the maintenance organization.

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2 Organization Setup

Overview

You schedule production for work centers in manufacturing organizations, which we refer to as scheduling organizations in the Production Scheduling work area. Before you create a schedule for an organization, you need to add the organization as a scheduling organization. You can add and set up a scheduling organization using the **Manage Scheduling Organizations** task on the Production Schedules page.

Add or Remove Scheduling Organizations

Scheduling organizations are sourced from Oracle Fusion Cloud Manufacturing, and you manage them in the Manage Scheduling Organizations UI.

- To add a scheduling organization, click the **Add** button.
- To remove a scheduling organization, click the **Delete** button from the actions menu.

> **Note:** Removing an organization from the Production Scheduling work area does not delete it from other work areas.

Manage Organization Data

Review and manage organization data, such as attributes, changeover rules, item parameters, and resource parameters, using the actions menu. The refresh applies to information that was defined using descriptive flexfields in Oracle Fusion Cloud Manufacturing and extensible flexfields in Oracle Fusion Cloud Product Information Management

Refresh Organization Data

Use the Refresh action to retrieve the most recent attribute values for an organization. The refresh applies to manufacturing attributes, defined using descriptive flexfields for work definition operations in Oracle Manufacturing, and item attributes, defined using extensible flexfields in Oracle Product Information Management.

> **Note:** You can't refresh data before attribute groups are added using the Manage Attributes page.

Attributes

Attributes are aspects of your items or work definition operations that impact scheduling. For example, if your organization manufactures ice cream, multiple attributes, such as flavor and size, might be considered, and combinations of these attributes are referred to as attribute groups.

To manage attributes, open the actions menu for an organization and click **Attributes**.

> **Tip:** Refresh organization data after adding manufacturing and item attributes.

Manufacturing Attributes and Attribute Groups

Manufacturing attribute groups are sourced from work definition operations in Oracle Fusion Cloud Manufacturing, where they're defined as descriptive flexfields. The Manufacturing attribute values are contained in the descriptive flexfield value sets. These sets must be defined with Validation Type as Independent. In the Manufacturing Attribute Groups tab, add manufacturing attributes by clicking **Add** and selecting an attribute group.

Item Attributes and Attribute Groups

Item attribute groups are sourced from Oracle Fusion Cloud Product Information Management, where they're defined as extensible flexfields; item attribute values are contained in extensible flexfield value sets. These sets must be defined with Validation Type as Independent. In the Item Attribute Groups tab, add item attributes by clicking **Add** and selecting an item class and attribute group.

Attribute-Resource Assignments

You need to assign relevant attributes to specific resources using the Resource Attributes tab. These assignments are a prerequisite to defining changeover rules. To assign an attribute to a resource, you first select a work center. You then pick the resource and specify the attribute you're assigning. You can also dissociate an attribute from a resource using the **Delete** action.

Attribute Value Color-Coding

To support schedule analysis, you can color-code attribute values, and use the highlighting features of the Gantt Chart to focus on specific attributes across operation sequences. Here's how:

1. Open the **Attributes** page for an organization.
2. Click the **Attributes** tab.
3. Specify whether an attribute can be used for highlighting in the Gantt chart.
4. Click the **Attribute Values** button.
5. Use the color picker tool to specify the color used to highlight this attribute.

Attribute color assignments can be also defined and managed using REST services. To know more, refer to the REST API for Fusion Cloud SCM guide.

Resource Parameters

Use resource parameters to define changeover-related and constraint-related aspects of a resource. To manage resource parameters, open the actions menu for an organization and click the Resource Parameters option.

Define Resource Parameters

> **Note:** You can use the default parameter values listed at the end of this topic.

1. On the Resource Attributes page, click the **Add** button.
2. Select the work center.
3. Select a resource.
4. Select a constraint mode.

   - If you select **Constrained**, the solver will respect both calender events and resource capacity constraints.
   - If you select **Relaxed**, the solver ignores calendar events and resource capacity constraints.
   - If you select **Relaxed for capacity only**, the solver will respect only calendar events.

5. Select the changeover calculation type.

   - Use **Concurrent** when multiple attribute changes need to occur simultaneously. The solver will consider the maximum duration of all attribute-based changeover rule durations.
   - Use **Sequential** if multiple attribute value changes need to happen in sequence. The solver will consider the sum of all attribute-based changeover rule durations.

6. Select the changeover position.

   - Use **Cleanup** if attribute-based changeovers on the resource should happen when an operation ends.
   - Use **Setup** if attribute-based changeovers on the resource should happen before an operation begins.

7. Specify whether the horizon start date and time must be enforced.

   - When **Enforce horizon start** is enabled, all work order operations will be scheduled to begin after the horizon start.

     Note: This preference will be overridden if the solver was configured to respect firm work orders in the Schedule Options UI.

   - If you disable it, then firm work order operations can be scheduled to begin before the horizon start.

8. Specify whether the user-defined attribute sequence will be applied.

   - If you enable **Apply user-defined attribute sequence**, the solver uses the attribute sequence you defined using the resourceAttributeSequences REST service.
   - If the setting is left disabled, the solver devises an attribute sequence.
   - For the user-defined sequence to be applied, the schedule must be configured to use scheduling buckets using the Schedule Options UI.

   Tip: Apply the user-defined sequence to a single stage in the production process, preferably to a bottleneck stage.

9. Specify the schedule visualization of resources with more than one default units in the Gantt chart.
   - If the **Display Resource Units in Gantt Chart** check box is selected, you can view the resource usage levels of that particular resource, as well as individual work order operations that are scheduled on that resource.
   - If the **Display Resource Units in Gantt Chart** check box isn't selected, you can view only the aggregate resource usage levels in Gantt chart.

If you don't configure parameters for any resource in your schedule, the following default values will be considered:

- Changeover Calculation: Concurrent
- Changeover Position: Setup
- Constraint Mode: Relaxed

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- Horizon start date: Enforced
- User-defined attribute sequence: Not considered

Resource Groups

Use resource groups to simplify data maintenance and schedule analysis.

- Simplify changeover rule definitions using resource groups instead of resources. For example, you can use a single changeover rule for a group of resources, instead of defining rules for each resource individually.
- Focus on a set of resources for schedule analysis via the Gantt Chart. You can select a set of resources to view operations and adjust the schedule only for those resources.
- Include outside supplier resources that will be relaxed for capacity.

Tip: Limiting the number of resources displayed in the Gantt Chart will improve application performance.

Define a Resource Group

1. In the actions menu for an organization, click Resource Groups.
2. On the Resource Groups page, click Add.
3. Specify a name and description.
4. Select whether to include an outside processing supplier.
5. Save your group.

When you've created a group, add group members to it.

Define a Resource Group Member

1. In the actions menu for a resource group, click Members.
2. Specify the sequence number, to define the order in which the resource appears in the Gantt chart.
3. Select a work center.
4. Select a resource.

Resource groups can also be defined and managed using the **Supply Chain Planning/Production Scheduling Organizations/Resource Groups** REST service. To know more, refer to the REST API for Oracle Fusion Cloud SCM guide.

Changeover Rules

Use changeover rules to specify the time it will take to prepare a resource for the production of an item. Preparation activities are cleanups or setups that must be done when the item being produced on a resource changes. To manage changeover rules, open the actions menu for an organization and click the **Changeover Rules** option.

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> **Note:** Changeover rules are applied only on resources that have resource type set to equipment and default units available set to 1 in Work Definition work area in Supply Chain Execution.

Define a Changeover Rule

1. On the Manage Changeover Rules page, click **Add**.
2. Specify a sequence number to indicate when the changeover occurs. You can use decimal values.
3. Select either the resource group or the work center and resource. You can edit all fields using the REST service.
4. Select the attribute on which the changeover will occur.
5. Select the current and changed attribute values
6. Specify the duration of the changeover and the duration unit of measure.
7. Specify the cost of the changeover. It's considered when the user-defined attribute sequence is set to **Reverse**.

During schedule calculation, if multiple changeover rules are applicable between two work order operations, then the rules with a lower sequence number are applied. Hence the more specific rules with respect to resources, attributes, and attribute values should be assigned lower sequence number and the more general catch-all type rules should be assigned higher sequence number.

Changeover rules can also be defined using the **Supply Chain Planning/Production Scheduling Organizations/ Changeover Rules** REST service. To know more, refer to the REST API for Oracle Fusion Cloud SCM guide.

User-Defined Attribute Sequences

You can define an attribute sequence for use in scheduling and specify how the sequence is considered using a cycle rule.

The following settings must be enabled so that the solver considers the sequence you define:

- **Apply user-defined attribute sequence**, for applicable resources, in the Resource Parameters UI.
- **Use scheduling buckets**, in the Schedule Options UI.

Define an Attribute Sequence

1. Open the action menu for an organization.
2. Click **Resource Parameters**.
3. Set the **Apply User-Defined Attribute Sequence** value to Yes.
4. Open the action menu for the resource.
5. Click **Attribute Sequence**.
6. Click **Add**.
7. In the dialog box, select an attribute, its sequence number, and its cycle rule.
8. Click **OK**.

> **Note:** Define attribute sequences on a single production stage only to prevent contradictory scheduling behavior.

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You can also define defined attribute sequences using the Supply Chain Planning/Production Scheduling Organizations/Resource Attribute Sequences REST service. To know more, refer to the REST API for Oracle Fusion Cloud SCM guide.

Define an Attribute Value Sequence

1. Go to the **Attribute Sequence** UI.
2. Open the action menu for an attribute.
3. Click **Attribute Value Sequence**.
4. Open the action menu for an attribute value.
5. Specify the sequence number.
6. Click **OK**.

How the User-Defined Sequence Is Used

Production Scheduling considers the user-defined sequence for each scheduling bucket. The scheduling bucket in which a work order will be scheduled is based on the Need-by Date or the Need-by Override. If there are more work orders than can be accommodated in a scheduling bucket, it will continue with the sequence into the next scheduling bucket until all work orders assigned into that bucket are sequenced.

How Cycle Rules Are Used

Production Scheduling cycles through the user-defined sequence based on the sequence numbers of the attributes and attribute values. You use cycle rules to set the behavior of the user-defined sequence at the start of a scheduling bucket. A cycle rule can be set to restart, continue, or reverse.

- If you select Restart, the attribute value sequence restarts for the new scheduling bucket, in the order of the user-defined sequence. This can effect changeovers across scheduling buckets.

- If you select Continue, the attribute value sequence continues through the new scheduling bucket. This will reduce changeovers across scheduling buckets but will restart the sequence in order.

- If you select Reverse, the attribute value sequence can potentially reverse for the new scheduling bucket. This can be useful when you need to cycle up and down a user-defined sequence. For example, by going from Small to Large and then back down from Large to Small.

Note: Alternate resources must use the same cycle rule, attribute sequence, and attribute value sequence as the primary resource to prevent contradictory scheduling behavior.

Data Setup Reference for Scheduling Organizations

If you can't find data you're looking for while adding and configuring organizations to associate with a schedule, you might need to verify if it was set up in another work area. This table lists such data objects and the work areas they're set up in.

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Data Object	Work Area of Origin
Organizations	Setup and Maintenance
Manufacturing attributes	Setup and Maintenance, as descriptive flexfields.
Item attributes	Setup and Maintenance, as extensible flexfields
Work definitions	Supply Chain Execution
Resources, resource capacity and resource availability	Supply Chain Execution

Note: Only users with security privileges to access the work area of origin can verify these setups. These privileges are granted by your enterprise administrator.

Related Topics
- Overview of Flexfields

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3 Schedule Setup

Overview of Schedule Options

Use the Schedule Options page to set up your production schedule and to configure how it gets solved.

While creating a new schedule, you first define schedule options. To edit schedule options for an existing schedule, open the action menu for that schedule and click **Schedule Options**.

Set Up and Configure a Schedule

1. On the Manage Schedule Options page, specify a schedule name and a description.
2. Define the schedule scope. This includes the schedule horizon, the organization you want to schedule production for, and item catalogs and categories. Specify if you want to consider planned orders from supply planning while creating production schedules.
3. Configure schedule parameter values by defining scheduling horizons and fixed time fence settings.
4. Configure advanced schedule options by defining parameters such as resource allocation priorities and scheduling bucket specifications that drive algorithmic decisions during schedule generation.
5. Configure the schedule display by specifying which resources are displayed by default in the Gantt Chart.

Guidelines for Working with Planned Orders from Oracle Supply Planning

- The planned make orders from a supply plan in a schedule are included only if they satisfy the schedule scope criteria.

- Work orders from SCM Execution and planned orders from a supply plan or an integrated demand and supply plan are scheduled together in the same production schedule.

- You can reference a supply plan with a Fusion source in a production schedule and reference only one production schedule per organization in a supply plan.

- In the subsequent supply plan runs, the planned make orders are considered firm and released to Supply Chain Execution after they are scheduled.

- Supports unconstrained and constrained supply plans.

Schedule Scope

The scope determines what data gets considered for scheduling.

Define the Scope of Your Schedule

1. Select the scheduling organization that you want to schedule production for.

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2. Specify the schedule horizon, which is the duration of the scheduling period from the horizon start date. The horizon start date is derived using the anchor date and time.

3. Specify a horizon to allow consideration of past-due demands. Demands that were supposed to be fulfilled before the horizon start date are termed Past-Due. Past-due demands within this horizon will be considered for scheduling.

4. Specify a horizon to allow consideration of past-due supplies. Supplies that were supposed to be available before the horizon start date are termed Past-Due. Past-due supplies within this horizon will be considered for scheduling.

5. Select an item catalog.

> **Note:** You can set the Item Catalogs to be controlled at Organization level or Master level on the Manage Catalogs page in Product Information Management work area. If controlled at the Organization level, then the item category association must include the item for that specific organization and also the master organization.

6. Select item categories.

7. Specify whether to schedule maintenance work orders. If you enable this setting, only maintenance work orders will be considered in the Gantt Chart and dispatch list. Maintenance work orders are also not considered in a manufacturing schedule.

8. Specify whether to include unreleased planned make orders from Oracle Supply Planning.
   - If you enable this setting, you can reference a supply plan or integrated demand and supply plan and include its unreleased planned make orders in subsequent schedule runs.
   - The unreleased planned make orders from Supply Planning will be included only if they satisfy the schedule scope criteria.
   - After you enable this setting, you can schedule work orders from Supply Chain Execution and planned make orders from Supply Planning at the same time.

9. You can select the plan from the Plan Name drop-down list. The last run date for the plan is automatically populated.

> **Tip:** You can improve scheduling performance by reducing the number of operation-resource records considered by the application. To do so, limit the schedule horizon, the number of items, or the past-due supply horizon.

Schedule Parameters

Schedule parameters mark key horizon settings and determine scheduling behavior.

Configure Schedule Parameters

1. Specify the fixed time fence duration. Start dates of firm work orders defined in Oracle Fusion Cloud Manufacturing, and that fall within this horizon, will be respected.

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2. Specify the horizon extension type to control how the application determines the horizon start and the fixed time fence.

   ○ If you select **Rolling**, the duration of the fixed time fence stays constant while the start date shifts by a day, each day.

      - If the anchor time is midnight, and the schedule refresh is performed after midnight on the same day, the fixed time fence will be counted from midnight on that day, regardless of what time the schedule refresh is performed.
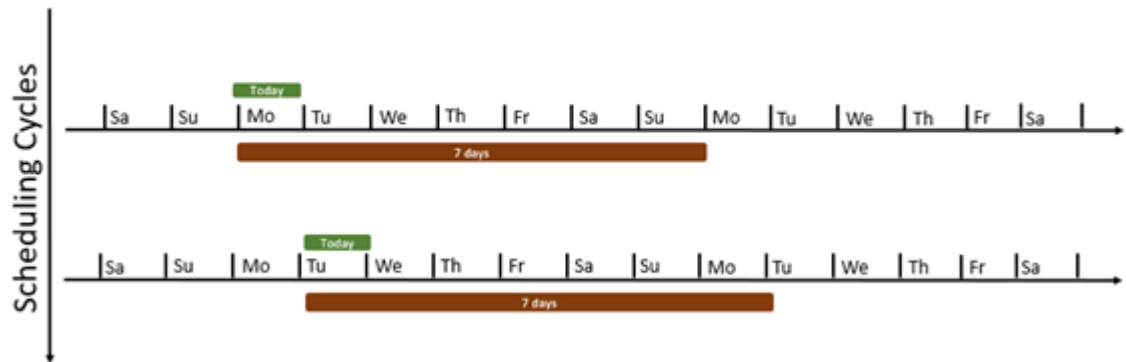
      - If the anchor time isn't midnight, let's say it's 8:00 a.m. today, and a schedule refresh is done after 8:00 a.m. today, then the horizon start and fixed time fence start is 8:00 a.m. today. But if a refresh

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is performed before 8:00 a.m. on a given day, the horizon start time fence start will be 8:00 a.m. the previous day.
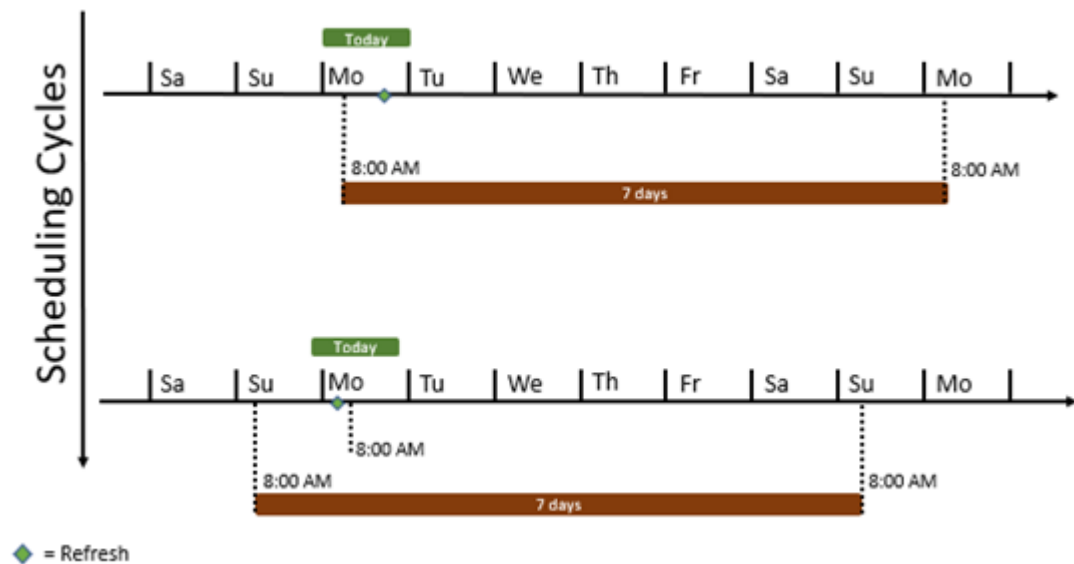
○ If you select **Dynamic**, the horizon start is the current day, and the time fence shrinks with each passing day until it reaches a time fence minimum duration. When this minimum value is reached, the time fence gets extended. If you select this extension type, you must also specify the time fence minimum duration and time fence extension duration.

- The time fence shrinkage is the difference between the fixed time fence duration and the number of days between the current day and the last day of the time fence. So if the anchor date and time is Monday 12:00 a.m., the fixed time fence duration is 7 days, and you're refreshing the schedule at Thursday 12:00 a.m., the time fence has shrunk to 4 days. If you set the minimum as 4 days and the extension as 7 days, then from Friday 12:00 a.m., the time fence will have shrunk to 3 days,

which is below the limit of 4 days, and will extend by the extension duration of 7 days. This results in a total time fence duration of 10 days.
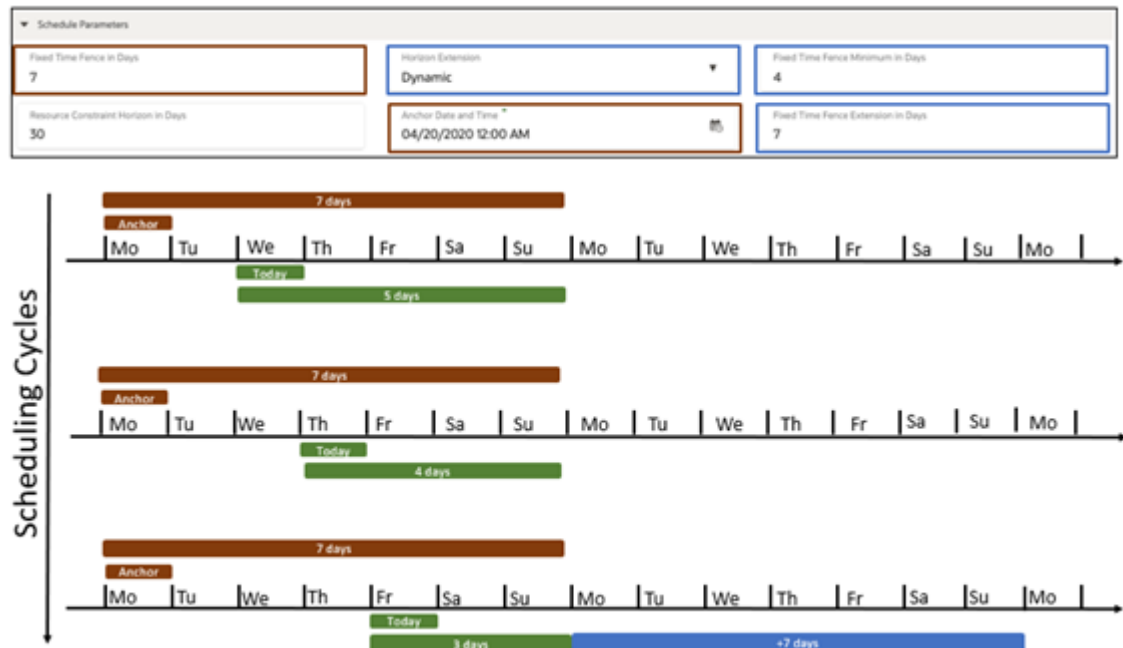
> | **Tip:** The dynamic mode works best if the fixed time fence duration is a multiple of 7.

3. Specify the resource constraint horizon, a duration that's counted from the horizon start date. Resource capacity constraints and calendar events within this horizon are respected during scheduling.
4. Select the anchor date and time, which is used to calculate the fixed time fence start, the schedule horizon start, and, if scheduling buckets are used, the scheduling bucket start date and time. The schedule horizon start and fixed time fence start will be the last time value of the anchor date and time before a schedule refresh; the scheduling bucket start will be the anchor date and time.
5. Specify the release horizon, a duration that's counted from the horizon start. Work orders with start dates within this horizon only will be released.
6. Specify the lateness tolerance in hours. Lateness tolerance is the number of hours from a Need By date by which a demand or work order is considered late by the application.
7. Specify whether to firm released work orders that begin during the fixed time fence period.
   - If the **Firm released work orders that begin during the fixed time fence period** check box is enabled, then during the schedule refresh all the released work orders within the fixed time fence are firmed.
   - When repair, solve or schedule release is run, the firm status of the other work orders remains unchanged. You can change the firm status of the work orders only through the Work Orders table.
8. Specify the work order release status settings when the schedule is published.

   - If you select Mark work orders as released, the work orders irrespective of their current status will be set to Released when the schedule is published.
   - If you select Retain current work order status, the work orders retain their current status when the schedule is published.

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Advanced Schedule Options

Advanced schedule options like resource allocation priorities and scheduling bucket specifications drive algorithmic decisions during schedule generation.

Configure Advanced Schedule Options

1. Select the resource allocation priority type, on the basis of which the solver assigns work order operations to alternate resources.

   - If you select **Earliest completion time**, work order operations are assigned to resources that allow them to be completed relatively sooner.
   - If you select **Changeover and idle time aware**, work order operations are assigned to resources such that changeover and idle time is minimized locally.

2. Specify whether to use scheduling buckets.

   If the **Use scheduling buckets** setting is enabled, the schedule horizon is divided into buckets, and the scheduling bucket starts from the anchor date and time. If you enable this setting, you must also specify the scheduling bucket size.

   > **Note:** If you want to use buckets and the horizon extension is dynamic, your bucket must align with the fixed time fence, in that the end of the fixed time fence must match the bucket limit.

3. Specify whether to use accelerated dispatching.

   If the **Use accelerated dispatching** setting is enabled, the solver uses a simplified algorithm for faster dispatching, used in scheduling models where only one production stage is constrained.

4. Specify whether to respect firm work orders within the fixed time fence.

   If the **Respect firm work orders** setting is enabled, the application schedules firm work order operations such that their assigned start dates will be respected throughout the fixed time fence. Production Scheduling may move firm work orders outside the fixed time fence in order to respect constraints.

5. Specify the duration of a scheduling bucket.

6. Select whether to prebuild relaxed upstream resources.

   When this setting is enabled, operations on a relaxed upstream resource will be scheduled regardless of when operations on a constrained downstream resource are scheduled to begin, which means upstream operations can complete well in advance of when downstream operations begin. If the setting isn't enabled, upstream operations will be scheduled to complete just as downstream operations begin.

7. Specify a prebuild maximum duration.

   It's the number of days in advance of the Need-by Date, that a work order can be scheduled for. This duration determines the bucket to use for scheduling work orders that run on resources with a user-defined attribute sequence.

   > **Note:** The prebuild maximum duration is considered only when scheduling buckets are used.

8. Select whether to use the anchor date as the horizon start date.

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If you enable this setting, the schedule horizon is no longer calculated from your local date and time but from the anchor date and time, making it constant. Then, the schedule data isn't affected by any differences between the anchor date and time and your current date and time. The past-due windows for both supplies and demands also stay constant with respect to the schedule horizon dates.

9. Specify the repair behavior you want to apply during manual scheduling.
   - If you select the **Multistage** check box, then the repair reschedules all work order operations in the work definition. This repair behavior minimizes the work order's make span but can lead to overlap of upstream and downstream operations with other work order operations. Multi-stage repair works well in scheduling models in which only the manufacturing stage on which you performed manual scheduling changes is constrained.
   - If you select the **Single-stage** check box, then the repair reschedules only work order operations that were modified during manual scheduling. This repair behavior is preferred if the work order has upstream or downstream operations that run on constrained resources. In some cases, the upstream or downstream operations are rescheduled to ensure start-after-end precedence constraints within the work order.

10. Specify if changeovers should be inserted between operations with same attribute values.
   - If the **Insert changeovers between work orders with same attribute values** check box is selected, changeovers will be inserted between different work orders even if their operation attribute values are the same.
   - If the **Insert changeovers between work orders with same attribute values** check box isn't selected, then changeovers will only be inserted if the operation attribute values are different.

11. Specify if resource calendar during changeovers must be respected.
   - If the **Respect resource calendar during changeovers** check box is selected, resource downtimes will be considered while performing production changeovers such as setups and cleanups.
   - If the **Respect resource calendar during changeovers** check box isn't selected, production changeovers may be performed during resource downtimes.

Schedule View Settings

Schedule view settings determine the data that is to be displayed in the Gantt chart in the schedule view UI.

Configure View Settings

1. Select a default resource group for display in the Gantt chart; you can switch to another resource group later from the Gantt chart toolbar.

   Note: Limiting the number of resources to be displayed might improve application performance.

   Note: The selection of a default resource group can be done only after refreshing the schedule.

2. Specify the default display horizon in terms of days. This allows to set the number of days the Gantt chart considers to display data when you open the schedule view.
3. Specify how the labels for work order operations in the Gantt chart will be displayed. These are different combinations of item, work order, and operation that can be used as display label.
   - Work order and operation

- Work order and item
- Item and work order
- Item and operation

4. Specify how the resource labels will be displayed in the Gantt chart, Dispatch List, and Resource Utilization. Select any of these options that will be used as a resource label.
   - Resource code
   - Resource name

Data Setup Reference for Schedule Options

If you can't find values you're looking for while configuring a schedule, you might need to verify if they were set up in another work area. This table lists such data objects and the work areas they're set up in.

Data Object	Work Area of Origin
Scheduling organizations	Production Scheduling, added from the Manage Scheduling Organizations UI.
Items, item structures, item catalogs, and item categories	Product Information Management
Calendars and calendar constraints	Supply Chain Execution
Resources, resource capacity, and resource availability	Supply Chain Execution
Work Orders	Supply Chain Execution
Work Definitions	Supply Chain Execution

Note: Only users with security privileges to access the work area of origin can verify these setups. These privileges are determined by your enterprise administrator.

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4 Schedule Processes

Overview of Schedule Actions

You can begin scheduling after your schedule has been set up.

Refresh and Solve a Schedule

Open the actions menu of a schedule to refresh or to refresh and solve a schedule.

- Click **Refresh** to update schedule data.
- Click **Refresh and Solve** to update schedule data and generate a new schedule.

You can review a schedule after either action, by clicking **Open** in the action menu. You can also solve the schedule using the **Solve** button in the schedule view.

> **Note:** You must refresh a schedule after its last release, or else changes to the schedule for some work orders made after that release may not get released in the next one.

Analyze and Adjust a Schedule

In the actions menu for a schedule, click **Open** to enter the schedule view. Here's how you analyze and adjust a schedule:

1. Review schedule analytics.
2. Adjust the schedule using the interactive features of the Gantt chart and the focused data views.
3. Click **Repair** to implement your adjustments. It's best that you repair the schedule after every adjustment.

If you need to undo all your manual adjustments and repairs since the last solve process, click **Solve**.

Release a Schedule

Use release actions to review the number of work orders slated for release, and to release the schedule to your manufacturing application.

1. Click the **Release Schedule** button in the schedule view.
2. Review work order metrics.
3. Click **Release**.

Duplicate a Schedule

1. In the actions menu for a schedule, click **Duplicate** to open the Duplicate a Schedule dialog box.
2. Enter an unique name and description of the duplicated schedule.
3. To copy only the schedule options of the original schedule, select the **Copy schedule options only** check box.
4. Click **Duplicate**.

Refresh and Solve Actions

Use the Refresh action to update your schedule data, such as work order data, attribute data, and resource capacity and availability. You can refresh a schedule at any time.

- A refresh discards the existing scheduling solution to make way for the new data, so if you need to retain an existing solution, release the schedule before refreshing it.

- A schedule refresh only updates the schedule with new data from Oracle Fusion Cloud Manufacturing, and the work order operations you see in the Gantt chart will be as retrieved from Manufacturing.

- Pegging links are accurate only after a solve action.

If you want the solver to automatically generate a new solution after a refresh, click **Refresh and Solve**.

Tip: If you need to review a refreshed schedule before solving it, click the Refresh action, then open the schedule to review it. You can then solve it using the Solve action in the schedule view.

Schedule Analysis and Adjustment

Analysis and Adjustment Using the Gantt Chart

Review schedule analytics and use the Gantt Chart to review detailed aspects of your schedule using various filtering and highlighting features, and to perform manual schedule adjustments.

Analyze

- Before working with the Gantt Chart, you can review these analytics:

  - **Late Work Orders:** Number of work orders and planned orders scheduled for completion after their need-by dates.
  - **Changeover Time:** Sum of all changeover time durations.
  - **Labor Utilization:** Percentage of labor resource usage
  - **Equipment Utilization:** Percentage of equipment resource usage.

- Here are few things you need to know about color shades on the Gantt chart:
  - On work center resources that are setup with default units greater than one, the work order operations cannot be seen individually on the Gantt chart. In such cases, the resource usage is indicated via different colors. The darker shades of the color are used to denote heavier usage of resources.
  - Darker shade of the color used for work orders is used for planned orders from Oracle Supply Planning in the Gantt chart.

- In the Gantt chart toolbar, select a resource group. Use the **Resource Group** list to specify whether to review data for all resources or for a group of resources for schedule analysis.

  > **Note:** When the Default Units Available value for a work center resource is more than 1, you can review resource levels using colors in the Gantt chart. Individual operations aren't displayed.

- Identify late work orders, using the **Highlight Late** action.

- Identify firm work orders, using the **Highlight Firm** action.

- Identify supplies and demands, using the **Show Supplies** action and the **Show Demand** action.
    - The Supplies row in the Gantt chart displays the purchase orders and inbound transfer orders.

    - The Demands row in the Gantt chart displays the sales orders and outbound transfer orders.

    - View downstream and upstream pegging links for the supplies and demands.

- Identify specific work orders or items. Use the **Filter By** and **Filter Value** fields to identify specific work orders or work orders that produce specific items. More information is displayed when you hover over an operation in the Gantt chart.

  > **Note:** The Filter By values Asset and Type apply to Maintenance work orders only.

- Identify operations by attribute. Use the **Highlight Attribute** options to select an attribute in order to highlight all work orders or items defined with that attribute. For example, if your attribute is Pack Size, then all operations with the Pack Size attribute will be highlighted, and those with the same pack size value will be displayed in the same color that was assigned to that size.

- Identify task dependencies. Select any operation, supply, or demand to view its pegged upstream and downstream operations, supplies, or demands. Solid lines indicate successive operations within the same work order routing. Dashed lines indicate inventory relationships between supplies and operations, between operations belonging to different work orders, operations and demands, or supplies and demands. Dashed lines can indicate these scenarios:
    - A producing work order feeding one or more downstream consuming work orders or demands.

    - A consuming work order receiving components from one or more upstream work orders or supplies.

    - A supply feeding one ore more demands.

    - A demand receiving components from multiple supplies.

Straight vertical lines indicate highly synchronized production, and diagonal lines indicate less synchronized production. These lines are also called pegging links and are visible only when the **Show Pegging Links** button is selected.

> **Note:** The **Show Pegging Link** button should be selected to view the pegging links for work orders.

- Identify and review idle times, changeovers, and downtime events.

- Identify the start and end of schedule horizon. The first solid vertical line represents the start of the schedule horizon; the second solid vertical line represents the end of the schedule horizon.

- Identify the end of the fixed time fence and end of the resource constraint horizon. The first dashed vertical line represents the end of the fixed time fence; the second dashed vertical line represents the end of the resource constraint horizon.

- If the **Display of Resource Units in Gantt Chart** check box is selected on the Resource Parameters page, you can view the resource usage levels of that particular resource, as well as individual work order operations that

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are scheduled on that resource. If the check box isn't selected on the Resource Parameters page, then you can view only the aggregate resource usage levels.

Adjust

You can change resource assignments and manage downtime events in the Gantt Chart.

- Change the resource or start time for an operation.

  a. Move an operation from a resource to an alternate resource by dragging and dropping it, or move it backward or forward in time on the same resource. You can also select a sequence of operations to drag and drop.

    > **Note:** For resource offloading to work within Production Scheduling, the resource sequence number of the work order operation must match the resource sequence number of the work definition operation in the Supply Chain Execution work area.

    > **Note:** Phantom components with resource alternates in their work definition may not be offloaded by the system. This may be because phantom explosion process in Work Execution during work order creation can introduce inconsistencies in resource sequence numbers.

  b. Specify the operation start time and click **Save**. If you selected multiple operations, specify the new start time of the first operation in the sequence.
  c. Click **Repair** to ensure that the schedule accommodates the adjustment. Here are some things to consider when you do a repair after a drag and drop operation:
    - Dropped operations are scheduled one after the other without any time gap.
    - For constrained resources with default units available set to one, any overlaps among the moved operations will be resolved and changeovers will be inserted as per the defined changeover rules.
    - If operations were offloaded, then only the target resource will be rescheduled and not the original resource.

- Manage downtime events and availability.

  o Add a downtime event.

    i. Right-click on the schedule.
    ii. Click **Add Downtime**.
    iii. Enter the resource or resource group, start date, start time, end date and end time.
    iv. To modify downtime over a specific period of the schedule horizon, select **Recurrence** check box. You can define recurrence only if the events have duration of up to 24 hours.

        a. Enter the **Start On** date and the **End By** date. The period should be within the schedule horizon.
        b. Select the weekdays for which the downtime has to be applied.
    v. Click **OK**
  o Remove downtime event
    i. Right-click on the schedule.
    ii. Click **Remove Downtime**
  o Add availability
  o
    i. Right-click on the schedule.

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      ii. Click **Add Availability**

     iii. Enter the resource or resource group, start date, start time, end date and end time.

     iv. To modify downtime over a specific period of the schedule horizon, select **Recurrence** check box. You can define recurrence only if the events have duration of up to 24 hours.

        a. Enter the **Start On** date and the **End By** date. The period should be within the schedule horizon.

        b. Select the weekdays for which the availability has to be added.

     v. Click **OK**

     vi. Click **Solve** to ensure that the schedule accommodates the new resource availability and new downtime.

> **Note:** The solve process discards manual adjustments to work order operations, including those saved using the **Repair** action, and calculates a new schedule.

> **Note:** In order to ensure predictable repair solve results, avoid performing both drag & drop actions in the Gantt chart and resequencing actions in the Dispatch List involving the same work order operations. Repair the schedule after Dispatch List resequencing and also after Gantt chart drag & drop actions.

Analysis and Adjustment Using the Dispatch List

Use the dispatch list to review and manage operation start times and sequences on a specific resource.

Analyze

Select a resource from the resource list, and review operation details for each work order. Filter for relevant columns by using the View By field to review only scheduling attribute data, customer service data, maintenance work order data, or work order operation data. For more work order information, you can click the View Work Order icon in the Work Order Column to view the work order in the Supply Chain Execution work area.

Adjust

Here are the list of actions you can do to influence scheduling using the dispatch list.

- Change the sequence of work order operations. Use the sequence arrows to move an operation or block of consecutive operations ahead of or behind other operations. Repair the schedule to save your sequence.

  > **Note:** Production Scheduling will attempt to schedule contiguous operation-resources on the same resource only if the same set of resources and resource alternates are defined.

- Change an operation's start time. Double-click the Start Time cell for a work order and specify the date and time. Repair the schedule to save this change.

- Override the need-by date. Double-click the Need-by Override cell for a work order and specify the date and time; then solve the schedule to save the override. The solve process uses the new date to target the work order's completion. The override date isn't released to your manufacturing application when you release the schedule.

- Change the alternate resource of a selected work order operation. Double-click the Alternate Resource cell for the work order operation and select the required alternate resource from the drop-down list.

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If the following conditions are satisfied, offloading of work order operation with alternate resources can be completed:

- Alternate resource for a work order must be defined in the corresponding work definition resource record.
- Work Order is not firm in SCM Work Execution and the work order operation has not been transacted.

Note: Null value for an alternate resource indicates that offload is not allowed for the corresponding work order operation.

Note: The solve process discards manual adjustments to work order operations, including those saved using the repair process, and calculates a new schedule.

Note: In order to ensure predictable repair solve results, avoid performing both drag & drop actions in the Gantt chart and resequencing actions in the Dispatch List involving the same work order operations. Repair the schedule after Dispatch List resequencing and also after Gantt chart drag & drop actions.

Analysis and Adjustment Using Work Orders

Use the Work Orders table to review and adjust work orders. Unreleased planned make orders from Oracle Supply Planning are included in the table if a supply plan or an integrated demand and supply plan is referenced within the schedule.

If the **Include unreleased planned make orders from supply plan** check box is enabled before the production schedule is run, the unreleased planned make orders from Oracle Supply Planning are included in the Work Orders table.

You can also filter records by work orders or produced items. For more work order information, you can click the View Work Order icon in the Work Order Column to view the work order in the Supply Chain Execution work area.

Analyze

Here are things you need to know when you review and analyze the work orders using the Gantt chart:

- Review start and end times for each work order with their need-by dates to understand whether they will be completed on time.

- The work orders can have statuses as released and unreleased while planned orders can have status only as planned.

- A work order's need-by-date in Oracle Production Scheduling is set to the work order's need-by-date in Work Execution, if it is populated. If it is not populated, then the work order's need-by-date in Production Scheduling is set to the work order's planned completion date in Work Execution.

- A planned order's need-by-date in Production Scheduling is set to the planned order's need-by-date in Supply Planning, if it is populated. If it is not populated, then the planned order's need-by-date in Production Scheduling is set to the planned order's new schedule date in Supply Planning. For firm planned orders, the need-by-date in Production Scheduling is always set to the new schedule date in Supply Planning.

Adjust

Here are the fields that you can edit in order to influence scheduling.

- Need-By Override Date.

- Earliest Start Date.

- Firm Status

- Select for Release

> **Note:** Need-By Override and Earliest Start dates aren't released to the manufacturing application.

Analysis and Adjustment Using On-Hand Inventory

Use the On-Hand Inventory table to review item on-hand inventory.

- You can filter data by items, item descriptions, or by a selection in the Gantt chart. Selection in the Gantt chart is only possible on single-capacity resources.

- When you select an item in the table, its consuming operations are highlighted in the Gantt chart. Highlighting is possible on single-capacity resources only. This readily helps you note the scheduling impact of unexpected supply delays.

  > **Note:** Filtering data by Gantt chart selection and operation highlighting are accurate only after a solve action.

- An item is not listed in the table if the On-Hand Quantity, On-Hold Quantity, and Shortage Quantity value are zero for the item. The item is listed only if one of the values is greater than zero.

- Inventory lots are displayed in the on-hand inventory table. You can only view up to 25 inventory lots in the table. All the other inventory lots can be accessed through the deep links from the items. Click the **View Item Quantities** icon to view item quantity information and all inventory lots in the Inventory Management work area.

Open the Inbound Supplies Table

1. In the Production Scheduling work area, on the Production Schedules page, click the required schedule.
2. In the Details section, select **Inbound supplies** from the **View** drop-down list.

Analyze

Use the On-Hand Inventory View to review on-hand supply, on-hold supply, and supply shortages for items.

- If there is more demand than supply, say, due to the cancellation of a work order, a shortage quantity is reported. The operations that consume shortage quantity are scheduled after the shortage resolution date considering item's lead time. These operations are highlighted separately on the Gantt chart.

  > **Note:** The highlighting for items with shortage inside the fixed time fence is not accurate and should be ignored.

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- Hold date is the date when an inventory lot that's currently on hold comes off hold and can be consumed. Inventory lots are listed only if their hold date is after the horizon start. All other inventory lot quantities are aggregated and displayed as the on-hand quantity.

Adjust

To override the lead time of items that have shortages:

1. Double-click the **Override for Lead time (Days)** cell in the On-hand inventory table.
2. Specify the new lead time in the **Override for Lead time (Days)** cell. The new shortage resolution date based on the new lead time is displayed in the Shortage Resolution On field.
3. Click **Solve** to solve the schedule if you're ready to solve, otherwise continue on to other adjustments.

The solve process considers the new shortage resolution date during subsequent solves.

> **Note:** The override value isn't released to Supply Chain Execution when you release the schedule.

Analysis and Adjustment Using Inbound Supplies

Use the Inbound Supplies table to review the impact of inbound material constraints on the schedule. You can adjust dates and add supplies to influence schedule results and evaluate different inbound supply scenarios.

- You can filter data by items, orders, suppliers, supplier numbers, or by a selection in the Gantt chart. Selection in the Gantt chart is only possible on single-capacity resources.

- When you select an order in the table, its consuming operations are highlighted in the Gantt chart. Highlighting is possible on single-capacity resources only. This readily helps you note the scheduling impact of unexpected supply delays.

> **Note:** Filtering data by Gantt chart selection and operation highlighting are accurate only after a solve action.

Open the Inbound Supplies Table

1. In the Production Scheduling work area, on the Production Schedules page, click the required schedule.
2. In the Details section, select **Inbound supplies** from the **View** drop-down list.

Analyze

Review inbound quantities and their requested dates for purchase orders or transfer orders to know whether they'll arrive on time. Orders are included for scheduling based on the schedule options.

- Purchase orders are included if their requested date falls within the schedule horizon and the horizon to include past-due supplies. Click the deep link to view the corresponding Purchase order details in Oracle Fusion Cloud Procurement. The link is accessible only if you have logged in as a user with Purchase Analysis role.

- Transfer orders are included if their Expected Delivery date or Need-By date falls within the schedule horizon and the horizon to include past-due supplies.

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- For In-transit shipments, the Expected Receipt Date in Supply Chain Execution is used to determine availability and inclusion in the Production Schedule.

Adjust

Here's what you can change to influence the schedule result and evaluate different inbound supply scenarios.

- To change the request dates of an existing supply:
    a. Double-click the content in the **Override for Requested Date cell.**
    b. Specify the new date and time in the **Override for Requested Date** cell.
    c. Click **Solve** to solve the schedule if you're ready to solve, otherwise continue on to other adjustments.

- To add new supplies for items manually:
    a. In the Inbound supplies table, click the **Add** button.
    b. In the Add Supply dialog box, specify the item, quantity and requested date.
    c. Click **Solve** to solve the schedule if you're ready to solve, otherwise continue on to other adjustments.

    The solve process uses the new supply of the item, and schedules dependent work order operations accordingly.

Consider these two points when making your adjustments:

1. Supplies you add manually exist only in Production Scheduling and not in Supply Chain Execution. As a result, deep links for these supplies are not displayed
2. Override for Requested Date values and inbound supplies that are added manually are not released to Supply Chain Execution.

Analysis Using Demand

Use the Demand table to review the impact of outbound sales orders and transfer orders on the schedule.

- You can filter data by items, orders, customer, customer numbers, or by a selection in the Gantt chart. Selection in the Gantt chart is only possible on single-capacity resources.

- When you select an order in the table, its producing operations are highlighted in the Gantt chart. Highlighting is possible on single-capacity resources only. This readily helps you note the scheduling impact of unexpected manufacturing delays.

Note: Filtering data by Gantt chart selection and operation highlighting are accurate only after a solve action.

Analyze

Review demand quantities and their requested dates for sales orders or outbound transfer orders to know whether they'll be met on time. Orders are included for scheduling based on the schedule options.

- Sales orders are included if their requested ship date falls within the schedule horizon and the horizon to include past-due demands.

- Transfer orders are included if their scheduled ship date or requested delivery date falls within the schedule horizon and the horizon to include past-due demands.

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Analysis Using Resource Utilization Chart

You can review how resources or resource groups are utilized over time with the Resource Utilization chart. For example, you can make informed decisions about adding or removing shifts for a resource with the help of this chart.

To view the Resource utilization chart for a schedule:

1. In the Production Scheduling work area, on the Production Schedules page, click the required schedule.
2. In the Details section of the schedule, select **Resource utilization** from the **View** drop-down list.
3. Select the required resource or resource group from the **Resource or Resource Group** drop-down list.
4. Select the **Day** or **Week** option from the **View By** drop-down list.

   The Day option displays results in daily time buckets; the Week option displays results in weekly time buckets.

Analyze

Each bar in the chart displays the runtime, changeovers, and downtime percentages for each resource or resource group. You also can view the idle time, downtime, changeovers and runtime in hours for each resource or resource group in the tooltip.

Release Analysis and Actions

Click the Release Schedule button in the schedule view page to view the number of work orders for release and to find the release action that sends the schedule to your manufacturing or maintenance application.

Work Order Metrics

Review these metrics about the work orders you're about to release:

- **Work Orders:** Number of work orders and planned orders in the schedule.

- **Selected for Release:** Number of work orders selected for release.

Release and Integration

To release a schedule, click the **Release** button. The following data in your manufacturing application is updated with released information:

- Work order header start and end times

- Work order operation start and end times

- Work order operation resource assignments

- Work order status changes to **Released** if the schedule option release status setting is set to Mark work orders as released on the Schedule Options page. If not, the work orders status is retained.

- Firm status for non-firm work orders within the fixed time fence horizon, now marked as firm, provided that the **Firm work orders that begin during the fixed time fence period** setting was enabled during schedule configuration.

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Guidelines to Release a Schedule

Here are some guidelines you must know before you release a schedule:

- If the schedule wasn't refreshed after the previous release, changes to the schedule for some work orders may not be released.

- After each Solve and Repair process, if the start date of a work order falls within the Release Horizon, the work order is automatically selected for Release. Using the Selected for Release switch in the work order table, you can select or deselect individual work orders for release.

- Work orders in Pending Approval status aren't updated in SCM execution.

- Planned orders from Oracle Supply Planning won't be released to SCM Execution.

5 Troubleshooting and Best Practices

Troubleshoot Production Scheduling Setup Issues

The data you use in Oracle Production Scheduling is sourced from other products like Oracle Fusion Cloud Manufacturing and Oracle Fusion Cloud Product Management. If you can't find data while setting up organizations and schedules, that's possibly because this data wasn't set up in their source work areas. Refer to the data setup reference topics at the end of every chapter for information about the work areas the data covered in that chapter is set up in.

Access to these work areas is granted by your enterprise administrator by means of roles, privileges, and additional security entitlements.

> **Tip:** Provide your administrator the information in the data setup reference topics so that they can help you find answers to specific setup-related questions easily.

For an exhaustive list of security roles, privileges, and other access entitlements refer to the Security Reference for Supply Planning.

Troubleshoot Production Scheduling Performance Issues

If your production scheduling requests take too long to complete, it's possibly because of the schedule or organization configuration. This topic covers best practices and related configuration settings to optimize scheduling performance.

Reduce the Scope

Use the Schedule Options UI to limit the scope of the production schedule to what is essential.

- Specify a short schedule horizon. For example, if a schedule is generated every day, and the longest lead times are less than a week, then having a schedule horizon of several months adds no value, but unnecessarily increases the data volume and the size of the schedule.

- Select only those item categories that need to be included in the schedule.

  > **Note:** In the Product Information Management work area, item categories can be defined with scheduling needs in mind. This would allow for scope definitions with items that are actually relevant to scheduling. Access to the Product Information Management work area is managed by your administrator.

Limit Resource Constraints to Bottleneck Resources

Use the Resource Parameters UI to control the constraint mode of a resource. Use the **Constrained** value for such cases, and for others use **Relaxed** or **Relaxed for capacity only**. The default mode is Relaxed.

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Use a Resource Constraint Horizon

In the Schedule Options UI, specify a resource constraint horizon to specify the length of time during which capacity constraints are enforced. The horizon is calculated from the schedule horizon's start date. Beyond the constraint horizon period, constrained resources will be considered relaxed.

Review the Number of Records for Production Scheduling Objects

Use REST services to retrieve and review the volume of data you're working with for specific production scheduling objects, like items, resources, and work orders.

Review Request Logs for Production Scheduling Processes

A log file is created during production scheduling processes, like refreshes, solves, and releases. To view details of any process warnings or errors, copy the process request ID from the Production Schedules page and use it to search for the request log file in the Scheduled Processes UI.

Download Binary Schedule Files to Share with Oracle Support

If you need to file a service request with Oracle Support, you can be asked to attach binary schedule files to your service request. These files help in analysis and troubleshooting for your service request.

You can download the Refreshed Schedule and Solved Scheduled binary schedule files from the Schedule Administration page in the Production Scheduling work area. On the Action menu of a schedule, select Schedule Administration to access the Schedule Administration page of that schedule.