

R12.x Oracle Advanced Supply Chain Planning Fundamentals

Volume 2 - Student Guide

D60079GC10

Edition 1.0

August 2011

D73710

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This book was published using: Oracletutor****

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Preface

Profile

Before You Begin This Course

- Basic knowledge of planning
- Basic knowledge of Oracle applications navigation

Prerequisites

- Oracle Inventory
- Oracle Engineering Bills of Material.

How This Course Is Organized

R12.x Oracle Advanced Supply Chain Planning Fundamentals is an instructor-led course featuring lecture and hands-on exercises. Online demonstrations and written practice sessions reinforce the concepts and skills introduced.

Related Publications

Oracle Publications

Title	Part Number
Oracle Advanced Planning Implementation and User's Guide, Release 12	B31553-01

Additional Publications

- System release bulletins
- Installation and user's guides
- Read-me files
- International Oracle User's Group (IOUG) articles
- *Oracle Magazine*

Typographic Conventions

Typographic Conventions in Text

Convention	Element	Example
Bold italic	Glossary term (if there is a glossary)	The algorithm inserts the new key.
Caps and lowercase	Buttons, check boxes, triggers, windows	Click the Executable button. Select the Can't Delete Card check box. Assign a When-Validate-Item trigger to the ORD block. Open the Master Schedule window.
Courier new, case sensitive (default is lowercase)	Code output, directory names, filenames, passwords, pathnames, URLs, user input, usernames	Code output: debug.set ('I', 300); Directory: bin (DOS), \$FMHOME (UNIX) Filename: Locate the init.ora file. Password: User tiger as your password. Pathname: Open c:\my_docs\projects URL: Go to http://www.oracle.com User input: Enter 300 Username: Log on as scott
Initial cap	Graphics labels (unless the term is a proper noun)	Customer address (<i>but</i> Oracle Payables)
Italic	Emphasized words and phrases, titles of books and courses, variables	Do <i>not</i> save changes to the database. For further information, see <i>Oracle7 Server SQL Language Reference Manual</i> . Enter user_id@us.oracle.com, where <i>user_id</i> is the name of the user.
Quotation marks	Interface elements with long names that have only initial caps; lesson and chapter titles in cross-references	Select "Include a reusable module component" and click Finish. This subject is covered in Unit II, Lesson 3, "Working with Objects."
Uppercase	SQL column names, commands, functions, schemas, table names	Use the SELECT command to view information stored in the LAST_NAME column of the EMP table.
Arrow	Menu paths	Select File > Save.
Brackets	Key names	Press [Enter].
Commas	Key sequences	Press and release keys one at a time: [Alternate], [F], [D]
Plus signs	Key combinations	Press and hold these keys simultaneously: [Ctrl]+[Alt]+[Del]

Typographic Conventions in Code

Convention	Element	Example
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Caps and lowercase	Oracle Forms triggers	When-Validate-Item
Lowercase	Column names, table names	SELECT last_name FROM s_emp;
	Passwords	DROP USER scott IDENTIFIED BY tiger;
	PL/SQL objects	OG_ACTIVATE_LAYER (OG_GET_LAYER ('prod_pie_layer'))
Lowercase italic	Syntax variables	CREATE ROLE <i>role</i>
Uppercase	SQL commands and functions	SELECT userid FROM emp;

Typographic Conventions in Oracle Application Navigation Paths

This course uses simplified navigation paths, such as the following example, to direct you through Oracle Applications.

(N) Invoice > Entry > Invoice Batches Summary (M) Query > Find (B) Approve

This simplified path translates to the following:

1. (N) From the Navigator window, select **Invoice** then **Entry** then **Invoice Batches Summary**.
2. (M) From the menu, select **Query** then **Find**.
3. (B) Click the **Approve** button.

Notations:

(N) = Navigator

(M) = Menu

(T) = Tab

(B) = Button

(I) = Icon

(H) = Hyperlink

(ST) = Sub Tab

Typographical Conventions in Oracle Application Help System Paths

This course uses a “navigation path” convention to represent actions you perform to find pertinent information in the Oracle Applications Help System.

The following help navigation path, for example—

(Help) General Ledger > Journals > Enter Journals

—represents the following sequence of actions:

1. In the navigation frame of the help system window, expand the General Ledger entry.
2. Under the General Ledger entry, expand Journals.

3. Under Journals, select Enter Journals.
4. Review the Enter Journals topic that appears in the document frame of the help system window.

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Constrained Plans

Chapter 8

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Constrained Plans

8

Constrained Plans

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe concepts**
- **Describe constraints**
- **Describe demand priority rules**
- **Describe aggregation levels**
- **Describe constraint planning details**
- **Describe calendars**
- **Describe plan options**
- **Review constrained plans**

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Module Overview: Topics

Module Overview: Topics

- **Constrained plans**
- **Constraints**
- **Demand priority rules**
- **Aggregation levels**
- **Constraint planning details**
- **Calendars**
- **Plan options**

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Topic Overview: Constrained Plans

Topic Overview: Constrained Plans

- **Enforce capacity constraints**
- **Enforce demand due dates**
- **Decision rules**
- **Plan type comparison**

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Enforce Capacity Constraints

Enforce Capacity Constraints



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Capacity Constraints

The planning run generates a plan that does not violate manufacturing, supplier, and transportation capacity or result in material shortages.

Supplies may be late and the plan may violate demand due dates if necessary to respect capacity constraints. You review late replenishment exception messages to see where the planning engine violates demand due dates.

Enforce Demand Due Dates

Enforce Demand Due Dates



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Demand Due Dates

The planning run may overload resource and supplier capacity (violate capacity constraints) as needed to respect demand due dates.

For example, the planning engine may schedule a job to use two resource units when there is normally only one resource unit available or it may schedule a job on a resource when the resource is on break or on its non-work time. The supplier capacity may be overloaded or the purchase requisition may be scheduled within lead-time.

Decision Rules

Balanced supply and demand...

...across the supply chain

Respects constraints...

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Decision Rules

Decision rules are additional instructions to the planning engine on using substitutes and alternates to produce the supply with fewer constraint violations. It can automatically select alternate routings, resources, bills of material, items, and sources. Decision rules are an additional feature on both enforce capacity constraints and enforce demand due dates constrained plans.

The decision rules are:

- **Use alternate sources:** Use primary sources as far as possible and use alternate sources (rank 2 or higher) only if necessary.
- **Use alternate BOM/routings:** Use primary routing as far as possible and use alternate only if necessary.
- **Use alternate resources:** Use primary resource as far as possible and use alternate resource only if necessary.
- **Use end item substitutions:** Use primary item and end item substitute, when enabled, prior to creating new planned orders.
- **Use substitute components:** Use primary components as far as possible and use substitute component only if necessary.

With decision rules you can do the following:

- Intelligently select alternatives with the minimum data input prerequisites possible. You can run a supply chain plan that automatically selects alternate routings, BOM, resources, suppliers, internal sources, end-items and components with the minimum amount of input.
- Enforce a specified sequence of decision-making actions (which may mimic a planner's problem resolution thought process.) The sequence in which the planning engine looks for supply using standard Oracle Application functions is transparent to the user. (For example you may specify substitutes for a given component but not alternate sources.). You can specify a global decision rule when more than one supply source can satisfy the demand. (For example if you have specified both substitutes and alternate sources, you can choose one over the other.)
- Make easier APS planning decisions because the decision-making process is more transparent. You can select alternates when the primary source of supply is unable to satisfy the demand. In doing so, you can express your preference as business rules, such as: the alternate resource should be used before looking for alternate supply and substitute components.
- Restrict planning to a universe of authorized decision-making actions (for example, permit exploration of alternate routings and substitute items but not of sourcing or permit substitute components but do not permit end item substitution, even though rules are specified for the given items at the source level.
- You specify the sequence in which the planning engine evaluates substitutes and alternates. You do not need to use cost-based optimization to select substitute components, alternate bills of material/routings and alternate sources.

Plan Type Comparison

Plan Type Comparison

Constrained - Enforce capacity constraints

- Demands may be late
- Resource capacity, supplier capacity respected
- Lead time, planning time fence respected

Constrained - Enforce demand due dates

- Demands on time
- Resource capacity, supplier capacity violated
- Lead time, planning time fence violated

Constrained - with decision rules

- May be Enforce capacity constraints (ECC) or Enforce demand due dates (EDD)
- Substitutes/alternates selected based on decision rules

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Topic Overview: Plan Options

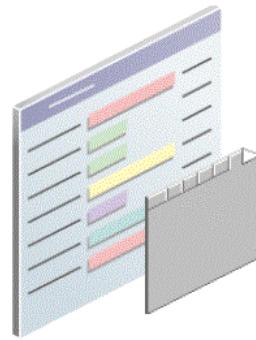
Topic Overview: Plan Options

Constraints tabbed region

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Constraints Tabbed Region

Constraints Tabbed Region



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Constraints Tabbed Region

When setting constrained plan options, set:

- Plan options in the Main, Aggregation, and Organization tabbed regions as you would for unconstrained plans
- Constraint-specific plan option in the Constraints tabbed region

When setting constrained plan options in the Constraints tabbed region, make note of the following:

- **Constrained Plan:** Select this to invoke constrained planning.
- **Enforce Demand Due Dates or Enforce Capacity Constraints:** Specify the primary enforced constraint.
- **Resource Constraints, Supplier Capacity Constraints, and Enforce Purchasing Lead-Time Constraints:** Indicate the manufacturing, supplier, and lead time constraints that you want enforced.
- **Scheduling tabbed region:** The scheduling horizon has the same duration as the short range of the planning horizon. You can further divide the scheduling horizon by indicating how many days you want to schedule in minutes and how many in hours and the balance in days.

- **Calculate resource requirements area:** Do not attend to this area; all constrained plans calculate resource requirements.
- The resource and material constraints Yes or No flags should be set to Yes to indicate that you want this plan to consider resource constraints, material constraints, or both.
 - Note that you can change the settings for different ranges of the planning horizon. For example, within one plan you can account for both material and resource constraints in the short term (Yes, Yes in the first column), only resource constraints in the mid term (Yes, No in second column), and generate a traditional resource requirements plan over the long term (No, No in the third column).
 - One restriction is that a Yes cannot appear to the right of a No within the same row. In effect, this is saying that for one plan, you cannot switch off capacity constraints in the near term and then switch them back on again for the longer term.
 - Enforce Purchasing Lead-times: Select this to instruct the planning engine to enforce purchasing lead-time constraints over the plan horizon.

Topic Overview: Constraints

Topic Overview: Constraints

- **Constraints**
- **Material**
- **Labor**
- **Lead time**
- **Enforced and non-enforced constraints**
- **Profile option examples**

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Constrained Planning

Constrained Planning

Constrained planning recognizes constraints during plan generation that otherwise would require manual adjustments and iterations of unconstrained plans.

Set plan options to consider:

- **Resource constraints**
- **Supplier capacity constraints**
- **Purchasing lead time constraints**

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Constrained Planning

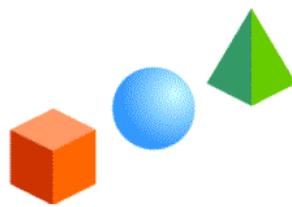
Implementation for constraint-based planning is the same as implementation for unconstrained planning, plus a small number of additional plan options need to be selected. Oracle constraint-based planning is designed to produce plans with minimal implementation effort.

Examples of constraints:

- **Material constraint:** A supplier can provide up to 500 units of a component item for each day during the time period between June 1 and August 31.
- **Material constraint:** A supplier makes deliveries only on Mondays.
- **Resource constraint:** A work center department has two identical machines that are available every workday from 7:00 am to 3:00 p.m. Routings state how much machine time is consumed during the setup and production of items routed through the work center.
- **Resource constraint:** Transportation of wheat to a seaport is limited by the availability of railroad cars during July.

Material

Material



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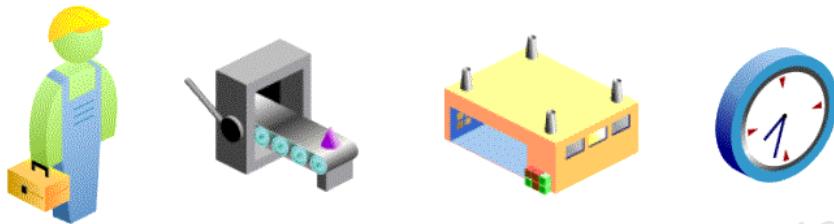
Material

The material constraints are:

- **Bills of material:** Effectivity dates of components
- **Engineering changes:** Effectivity dates if components
- **Substitute components:** Possible substitutes
- **Order modifiers:** Additional supply quantities
- **Requirement integer quantities:** Whole number dependent demand
- **Lead times:** Time to manufacture, supply, and transfer material
- **Supplier capacity:** Capacity that you have arranged with your supplier
- **Tolerance fences:** Percent overage the supplier is willing to accept

Labor

Labor



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Labor

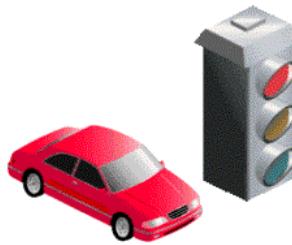
The labor constraints are:

- **Routings:** Effectivity dates and alternates
- **Resources:** Availability and alternates
- **Shifts:** Availability of resources
- **Workday calendar:** Availability of resources
- **Resource efficiency and utilization:** Increased resource usage times
- **Transportation resources:** Ability to move material

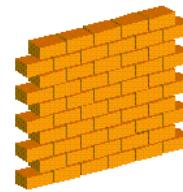
Enforced and Non-enforced Constraints

Enforced and Non-enforced Constraints

- **Enforce Capacity Constraints**
- **Enforce Demand Due Dates**



**Non-enforced
constraint**



**Enforced
constraint**

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Enforced and Non-enforced Constraints

Oracle Advanced Supply Chain Planning lets you prioritize how you enforce capacity constraints or demand due dates. You can enforce one and only one of these two types of constraints at a time. The selected check box represents an enforced constraint while the unselected check box represents a non-enforced constraint.

Non-enforced Constraints do not restrict the solution. An exception message is generated with the solution exceeds a non-enforced constraint by the value specified on the named Exception Set.

If you choose to Enforce Demand Due Dates, then resources may be overloaded to satisfy demand due dates. In this case, due dates are the enforced constraint. Oracle ASCP returns resource and material capacity overloaded exception messages indicating the overloaded resources.

If you choose Enforce Capacity Constraints, then resources are loaded to their limit to satisfy demand. In this case, capacity is the enforced constraint. Unsatisfied demands are late. In this case, Oracle ASCP returns late demand exception messages.

The planning engine issues exception messages related to both enforced and non-enforced constraints.

Enforced and Non-enforced Constraints Example

Enforced and Non-enforced Constraints Example

		Planning Period				
		1	2	3	4	5
Demand	75	75				
Material Capacity	50	50	50	50	50	
Resource Capacity	60	60	60	60	60	

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Enforced and Non-enforced Constraints Example

This example demonstrates the difference between enforced and non-enforced constraint optimization.

Enforced Constraints Example

Enforced Constraints Example

- Enforce capacity constraints = Yes
- Material and resource constraints = Yes

	Planning Period				
	1	2	3	4	5
Demand	75	75			
Demand Fulfilled	50	50	50		
Material Capacity	50	50	50	50	50
Resource Capacity	60	60	60	60	60

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Non-enforced Constraints Example

Non-enforced Constraints Example

- Enforce capacity constraints = No
- Material and resource constraints = Yes

	Planning Period				
	1	2	3	4	5
Demand	75	75			
Demand Fulfilled	75	75			
Material Capacity	50	50	50	50	50
Resource Capacity	60	60	60	60	60

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Enforced and Non-enforced Constraints Example Summary

Enforced and Non-enforced Constraints Example Summary

- **Enforced constraints do not exceed capacity limits**
- **Non-enforced constraints can exceed capacity limits if that will reduce total costs**

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Enforced and Non-enforced Constraints Example Summary

Enforced constraints result in late fulfillment of demand but does not exceed capacity limits.

Profile Option Examples

Profile Option Examples

- **Time fence behavior**
- **Collections and release to transaction data**
- **End-item substitution behavior**
- **Flexfield setups**
- **Planning calculations**
- **Planned order details**
- **Pegging behavior**
- **Detailed resource scheduling behavior**

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Profile Option Examples

There are many profile options that you use to control the planning process. You should review the profile options when you:

- First implement Oracle Advanced Supply Chain Planning
- Plan to use a new plan type
- Are investigating unexpected plan output

There are several profile options that control time fence behavior, for example MRP: Create Time Fence.

- Set to Yes to create a natural time fence based on firm work orders, purchase orders, flow schedules, and shipments. When set to No, the planning engine does not create a time fence.
- The planning engine honors the item attribute Planning Time Fence regardless of the value of this profile option

There are several profile options that control collections and release to transaction data , for example MSC: Auto-Release Compression Days Tolerance.

- Indicates the number of compression days allowed for the automatic release of planned orders.

There are several profile options that control end-item substitution behavior, for example MSC: Choice of Item for Which to Create Supplies in Substitute Relationship.

- Determines the item for which Oracle Global Order Promising and Oracle Advanced Supply Chain Planning creates planned supplies when item substitution relationships are specified.
- When set to Follow Item Attribute and the item attribute Create Supply for all the substitute items in the substitution chain is No, no supplies are created.
- When you have a substitution chain A --> B --> C, and this profile option is set to Highest Level Item, it is expected that Oracle Advanced Planning creates supply for item C. Item C must be enabled in the organization where you are trying to create supply. If item C is not enabled in the organization, Oracle Advanced Planning creates supply for item B (the next highest level item in the substitution chain) and does not create supply for item C.

There are several profile options for flexfield setups, for example MSC: Priority for Substitute Items Flexfield Attribute.

- This profile option stores the name of the flexfield column that contains the value in the corresponding table.
- Flexfield attribute profile options store the name of the flexfield column that contains the value in the corresponding table. For example, if the Aggregate Resource Name is stored in column ATTRIBUTE1, the profile option MSC: Aggregate Resource Name Flexfield Attribute will contain the value 1.

There are several profile options that control planning calculations, for example MSC: Supplier Capacity Accumulation (multiplier).

- This profile option is a multiplier to ASL Lead Time. The planning engine uses it to derive the date when capacity accumulation begins for a supplier.
- If profile option MSC: Purchase Order Dock Date Calculation Preference is Promise Date, Oracle suggests that you set this profile option to 0 so that suppliers accumulates capacity within their lead time.
- This is a site level profile option.

There are several profile options that control planned order details, for example MSO: Allow Partial Demand Completion.

- Enables supply orders to individually schedule for partial satisfaction of a demand when demand is split across several supply orders. Valid values include:
 - **All End Demands:** Enable Partial Demand Satisfaction for all independent demands (forecasts, sales orders, and MDS entries).
 - **Sales Orders:** Enable Partial Demand Satisfaction for all Sales Order demand only.
 - **None:** Schedules all supplies to coincide with completion date (latest supply date) to meet demand.
- This functionality can be enabled for all independent demands or only for Sales Orders.

There are several profile options that control pegging behavior, for example MSO: Demand Window Size.

- During priority pegging, demands are sorted based on the demand priority within the demand window. After these demands are fully pegged, Oracle Advanced Supply Chain

Planning sorts all demands in the next window by priority. This is stated as the number of calendar days including non-workdays. With a value of 10, the first demand window is between the start date of the plan or the first demand date +10 days. The default (Null) is treated as 1 in the Planning Engine.

There are several profile options that control detailed resource scheduling output, for example MSO: Enforce Resource Sequence Contiguity.

- This profile option determines whether resources within a specific operation need to be scheduled contiguously. Use this profile option to improve the planning engine's scheduling performance.
- Values are:
- Yes: The planning engine requires activities within an operation, such as resource requirements, to be contiguous. No slack time is permitted between each resource.
- No: The planning engine does not require activities within an operation, such as resource requirements, to be contiguous. This implies that slack time between resources is allowed. Performance improves because the planning engine does not enforce contiguity.

Quiz

Quiz

Constraints cannot exceed capacity limits.

- 1. True**
- 2. False**

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Answer: 2. False: Non-enforced constraints can exceed capacity limits if that will reduce total costs

Topic Overview: Demand Priority Rules

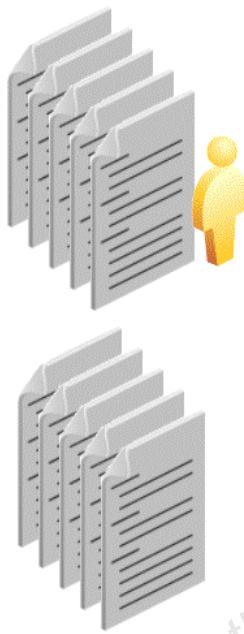
Topic Overview: Demand Priority Rules

- **Demand priority**
- **Demand priority rules**
- **Constrained planning rules**

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Demand Priority

Demand Priority



Priority 1

Priority 2

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Demand Priority

You can set an internal priority for demands in the source instance; lower numbers indicate a higher priority. In some methods of planning and pegging, the planning process plans supplies and assigns supplies to demands with higher priority first.

Demand Priority Rules

Demand Priority Rules

Demand Priority Rule A

1. Sales orders and MDS entries

2. Schedule date

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Demand Priority Rules

In ASCP, planning decision-making occurs sequentially in the following phases:

- Selection of alternates (routings, substitute components, internal source organizations, suppliers) if you use decision rules
- Pegging of supplies (on-hands, scheduled receipts, and planned order supplies) to demands
- Detailed scheduling of individual operation steps on resources

In the detailed scheduling phase, demand quantities that are pegged to planned order supplies are considered in internal priority order. Demands with higher internal priority get the first opportunities to take up available resource and material capacities; demands with lower internal priorities can only use remaining resource and material capacities and are therefore more likely to be satisfied late.

The internal priorities described above are different than the external priorities that can be attached to sales orders and master demand schedule entries in the source instance. Internal priorities are generated for a plan on the basis of a priority rule that you attach to the plan in the Main tab of the Plan Options form. Selecting Sales orders and MDS entries as the first priority

in the demand priority rule instructs the planning engine to use the internal demand priorities from the source instance.

Constrained Planning Rules

Constrained Planning Rules

- **Respect demand priority across demand types**
- **Respect sourcing allocations**
- **Use primary bills of material, not alternate BOMs**
- **Use primary items, not substitute items**
- **Use primary routings, not alternate routings**
- **Alternate resources are considered**

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Constrained Planning Rules

Constraint-based planning respects demand priority rules across demand types. If no priorities have been specified, or if orders have the same priority, constrained planning uses this order:

1. Sales orders
2. Forecast demand
3. Safety stock replenishment

Constrained planning respects sourcing allocations set up on the sourcing rules and bills of distribution.

Constrained planning uses primary bills of material only. It does not consider alternate bills of material. In optimized plans, you can consider alternate bills of material.

Constrained planning uses primary items and components, not substitutes. In optimized plans, you can use substitute items.

Constrained planning uses primary routings, not alternate routings. In decision rule and optimized plans, you can evaluate alternate routings.

Primary and alternate resources are considered in Constrained planning as well as in optimized planning when the alternate is set up in the Operations Resource Information flexfield.

Quiz

Quiz

The higher the demand priority number, the higher the priority.

- 1. True**
- 2. False**

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Answer: 2. False: The higher the demand priority number, the lower the priority.

Topic Overview: Constraint Planning Details

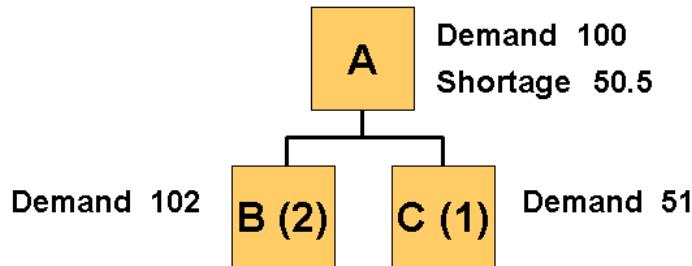
Topic Overview: Constraint Planning Details

- Requirement integer quantities
- Shared supplies
- Partial demand satisfaction
- Computational burden
- Coproducts
- By-products

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Requirement Integer Quantities

Requirement Integer Quantities



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Requirement Integer Quantities

Use requirement integer quantities to instruct the planning engine only to pass dependent demand requirement quantities that are whole numbers. You set the instruction for each component of each assembly in each organization.

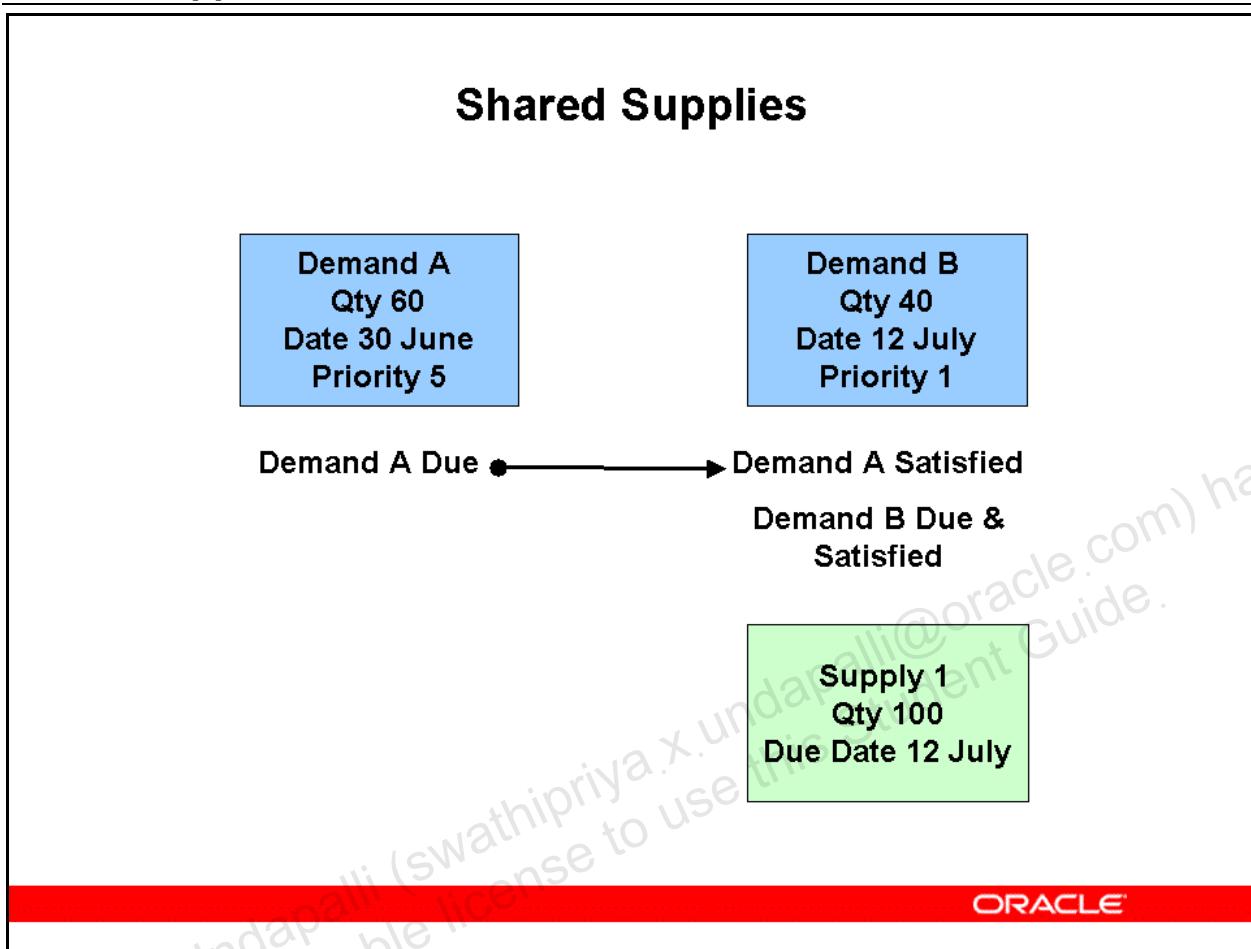
The order modifier item attribute Round Order Quantities instructs the planning engine that when it calculates a fractional quantity for an assembly supply order, it should round the assembly supply order quantity up to the next highest whole number. Fractional supply order quantities occur because of:

- Fractional bill of material quantities
- Process yield
- Shrinkage
- Coproduct relationship percentages
- MRP-planned safety stock
- Component yield

From the extra supply order quantities, the planning engine creates fractional dependent demands on the components to match those extra supply order quantities and carries pegging in fractional quantities through the lower bills of material levels. Pegging to fractional demand

quantities is both inaccurate and difficult to understand when you actually make the components and subcomponents in whole number quantities.

Shared Supplies



Shared Supplies

Shared supplies are scheduled receipts, firm planned orders, and planned orders that peg to more than one end item demand.

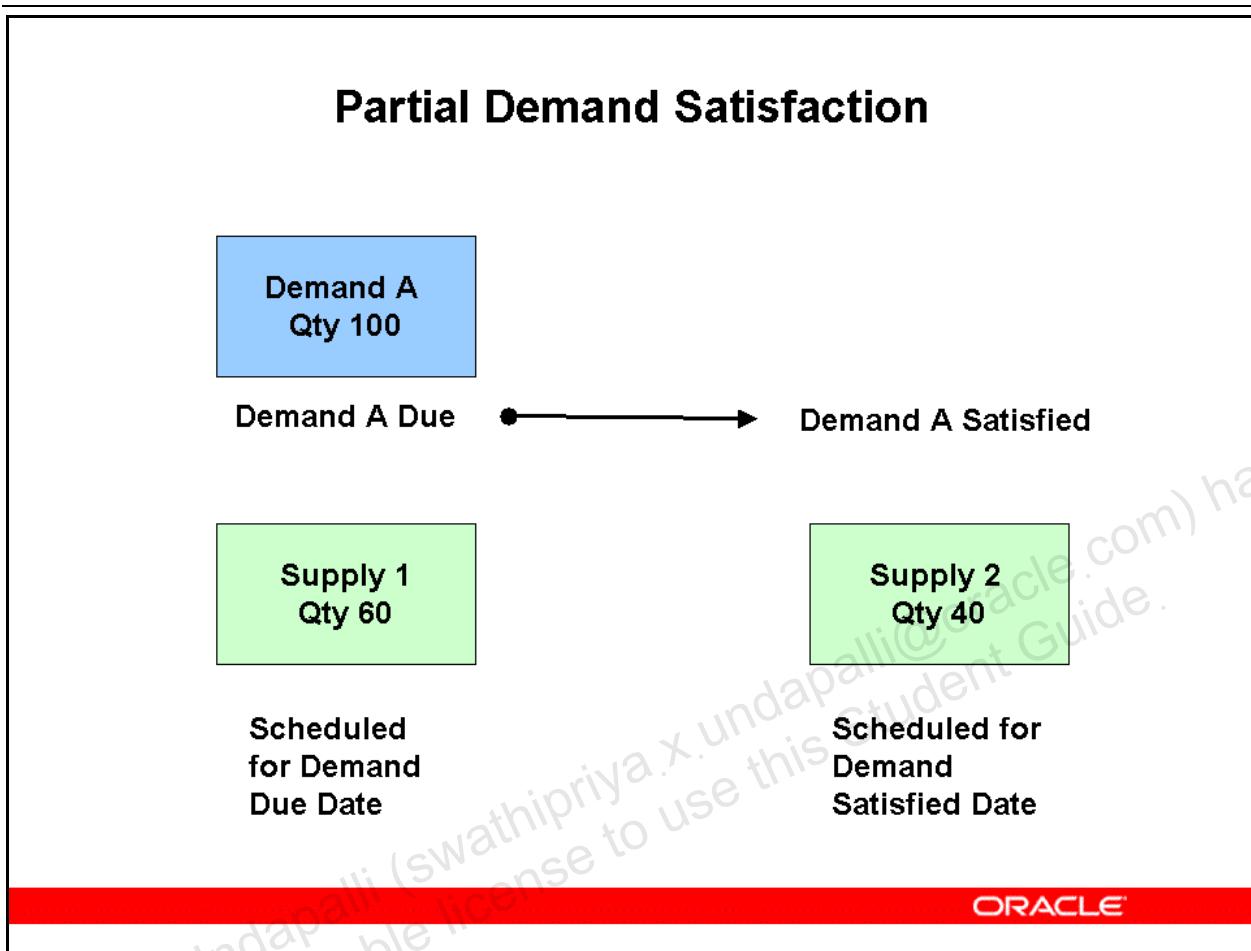
The planning engine schedules a shared supply based on the due date of one of the demands and that shared supply may be late with respect to the other demands that are also pegged to it.

If multiple demands that are pegged to one shared supply are in the same demand slice, the planning engine always reschedules the shared supply.

The rescheduling:

- Attempts to meet all demands on time
- Attempts to meet higher priority demands early or just in time
- Selects lower priority demands to be late, if necessary
- Occurs only if the reschedule can fit within available supplier capacity and within lead times, depending on constraints

Partial Demand Satisfaction



Partial Demand Satisfaction

When multiple planned order supplies are required to satisfy a demand, ASCP schedules all supplies that can be completed by the due date for the due date, and the remaining supplies for the demand satisfied date.

This allows the supplies that can be completed on time to be released, executed, and shipped as a partial order shipment to the customer.

The Partial Demand Satisfaction capability applies only to the end demand (independent demand). For the dependent demand, it is not cost effective and beneficial to complete part of the order quantity and then carry this inventory up to the time when it is needed.

In the diagram, Supply 2 is both later than Supply 1 and late to satisfy Demand A.

Computational Burden

Computational Burden



Unconstrained



Constrained

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Computational Burden

Finite-capacity scheduling is computationally much more complex than the infinite-capacity planning performed in older versions. Therefore, formulating the planning problem so that it is less computationally intensive is worthwhile.

The computational burden of a planning problem increases with the number of scheduled resources, the number of items, and the number of demands.

Ways to decrease the number of resources include:

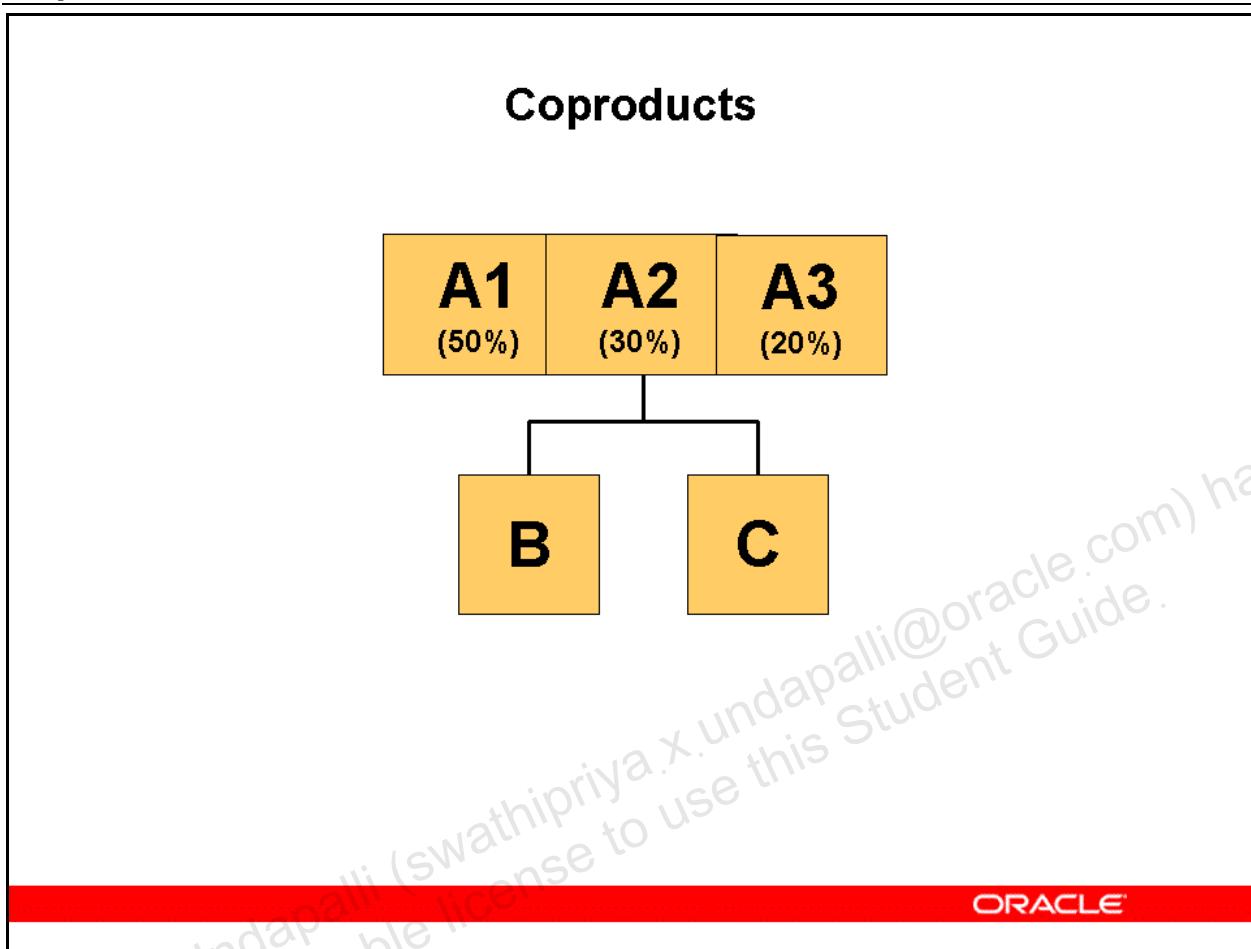
- Leave non-critical (non-constraint) resources out of routings. For example, an entire cell in a cellular manufacturing system might be modeled as a single resource instead of as a group of resources.
- Set planned resources to bottleneck resources and include only key constraint resources in the bottleneck resource group.

Ways to decrease the number of items include:

- Enable each item in as few organizations as possible because each combination of item-organization counts as a separate item.
- Maximize the use of item aggregation (to the product family level) in the plan options.

- Set the Planned Items option in the Main tab of the Plan Options window to something other than All Planned Items. For example, set it to Demand Schedule Items Only.
- Ways to decrease the number of demands include:
 - Maximize the use of time aggregation (larger time buckets) in plan options. This collapses multiple demands occurring within a larger time bucket to a single demand at the end of the time bucket.
 - Maintain long-term forecasts in larger time buckets (for example, weeks or periods) instead of shorter time buckets such as days. This reduces the number of MDS demands once the forecast is loaded into an MDS for input to the planning process.

Coproducts



Coproducts

This feature is available with the integration of APS and Oracle Shop Floor Management (OSFM).

In some production environments, an item may turn into one or more parent items depending on the process control, test results, raw material quality, etc. Such a relationship is defined by defining coproducts. OSFM allows you to specify multiple possibilities of assemblies (parents) that may be derived from a single part.

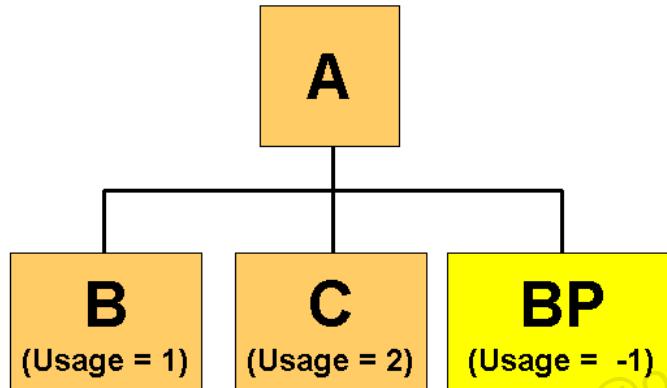
With APS and OSFM integration, you can calculate supply for multiple assemblies based on the demand for any one of the possible coproduct assemblies. You can generate and release planned orders for the assembly for which you realized demand. You can view coproduct supplies being generated for the rest of the items in coproduct relationship. This enables you to track the production for all the coproducts. The same applies if the planned order is converted into a lot-based job.

Oracle ASCP collection program collects the coproducts information into the planning server which is then used by the planning engine.

The use of coproducts is an advanced topic within Oracle Advanced Supply Chain Planning.

By-Products

By-Products



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By-Products

You can define negative usages for component items on a bill of material in Oracle Bills of Material. You can add by-products to discrete jobs using Oracle Work in Process.

Oracle ASCP includes by-products on standard and non-standard discrete jobs and components with a negative usage on a bill of material when netting supply and demand. Oracle ASCP considers this type of component requirement as supply available on the job completion date.

The use of by-products is an advanced topic within Oracle Advanced Supply Chain Planning.

Quiz

Quiz

Component items with negative uses represent:

- 1. Co-products**
- 2. By-products**
- 3. Shared supplies**
- 4. Partial demand**

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Answer: 2. By-products

Topic Overview: Calendars

Topic Overview: Calendars

Shipping/receiving/supplier/carrier calendars

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Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Defaulting hierarchy for calendars

- For supply or demand orders, ASCP looks for valid calendars using defaulting hierarchies
- Calendars at Site level used if specified
- Calendars at Carrier level used if specified
- 24 * 7 Calendar used if no calendar specified

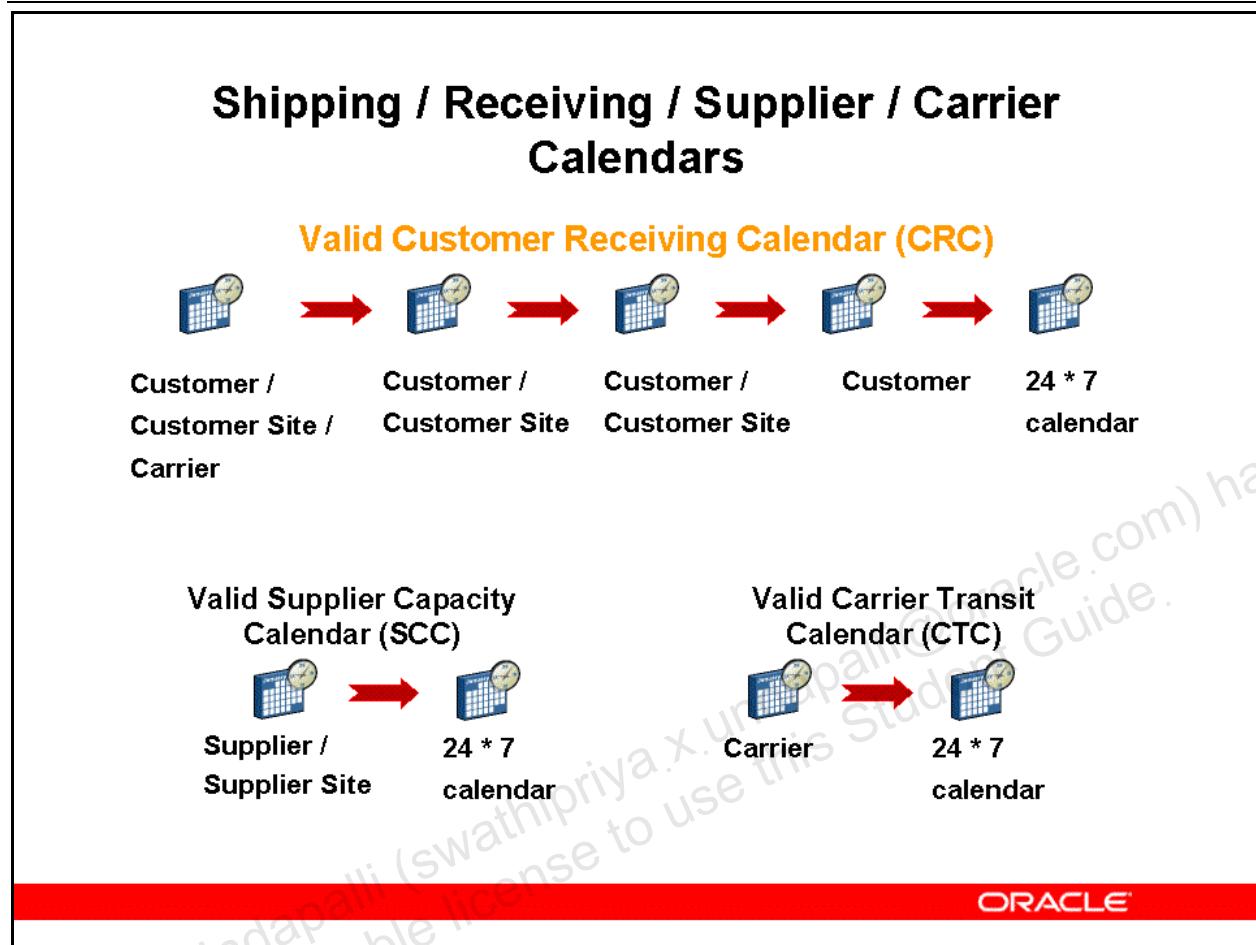


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Shipping /Receiving / Supplier / Carrier Calendars

A defaulting hierarchy is provided so that more detailed level information can override higher level information. The slide also shows the details of the hierarchy used to determine the valid supplier shipping calendar going from the most detailed level information on the left side to the less detailed information on the right side. The way this diagram should be interpreted is that if for example a Supplier/Supplier Site/Carrier shipping calendar is not specified, ASCP will look for a Supplier/Supplier Site shipping calendar. If that is not specified it then looks to see if a Supplier/Carrier calendar is specified and so on until finally it just defaults to a 24*7 calendar.

Shipping / Receiving / Supplier / Carrier Calendars



Shipping /Receiving / Supplier / Carrier Calendars (continued)

The defaulting hierarchies are shown from

- Customer Receiving Calendars
- Supplier Capacity Calendars
- Carrier transit calendars

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Valid Organization Shipping Calendar (OSC)



Valid Organization Receiving Calendar (ORC)



Note: A manufacturing calendar (OMC) will always exist for an organization

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Shipping /Receiving / Supplier / Carrier Calendars (continued)

The defaulting hierarchies are shown for

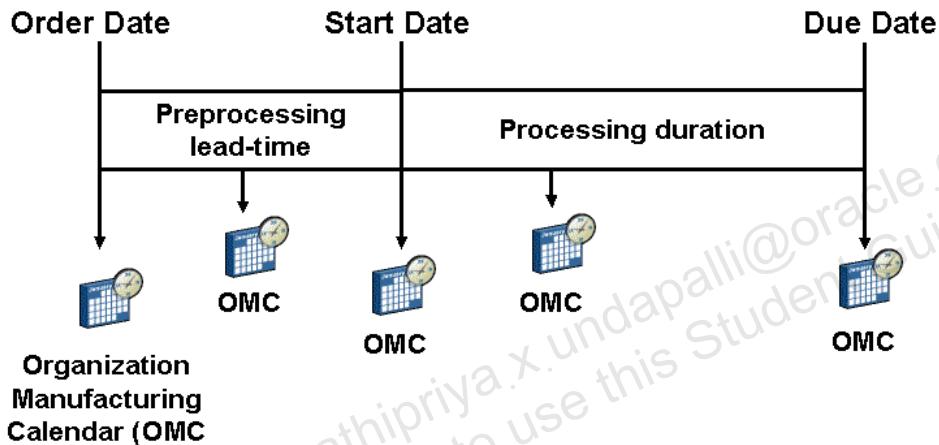
- Organization Shipping Calendars
- Organization Receiving Calendars

Since the default if no shipping/receiving calendars are specified is to look at the Org Manufacturing Calendar and an org manufacturing calendar always needs to exist for every org, users wanting a shipping/receiving calendar that is 24*7 need to explicitly define one that is 24*7 if the org manufacturing calendar is not 24*7.

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Effect of calendars on planning output – Make Orders



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Shipping /Receiving / Supplier / Carrier Calendars (continued)

The vertical arrows indicate specific dates on an order.

The gray rectangles indicate lead times.

When ASCP plans orders:

- The dates have to fall on specific calendars depending on the type of order as well as the type of date
- The lead times have to be properly expanded to account for non working days on specific calendars.
- The calendars driving the placement of dates and the expansion of lead times are indicated using the arrows

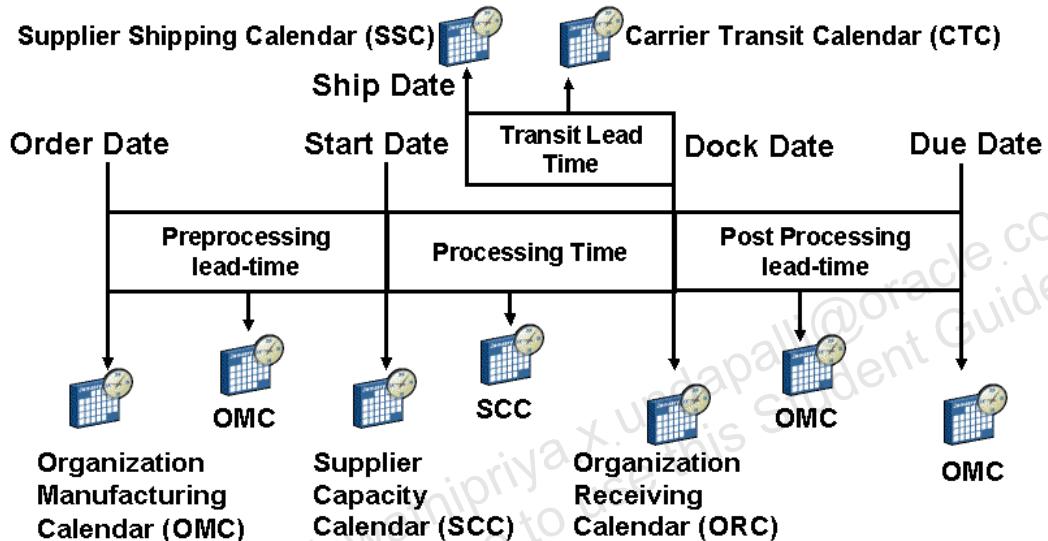
Processing duration calculated using:

- Fixed plus variable lead times for unconstrained plans or if no routing specified
- Processing times on the routings for constrained plans

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Effect of calendars on planning output – Buy Orders



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Shipping /Receiving / Supplier / Carrier Calendars (continued)

Processing time is calculated using

- Processing time on the ASL if defined and if Supplier is specified on the order.
- Processing time on the Item Master if ASL processing time is not specified or if no supplier is specified for the order

The transit lead time is calculated using the “Default Ship Method” between the Supplier and the Organization.

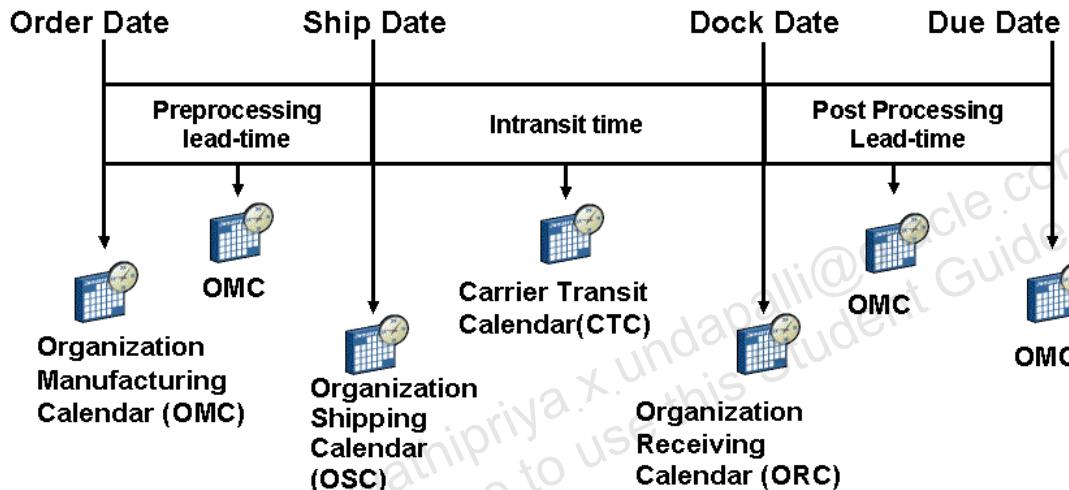
It is assumed by user procedure that the Processing Time is inclusive of the transit lead time.

If you set processing lead time smaller then in-transit lead time, the ship date may show before the start date.

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Effect of calendars on planning output – Transfer Orders



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Shipping /Receiving / Supplier / Carrier Calendars (continued)

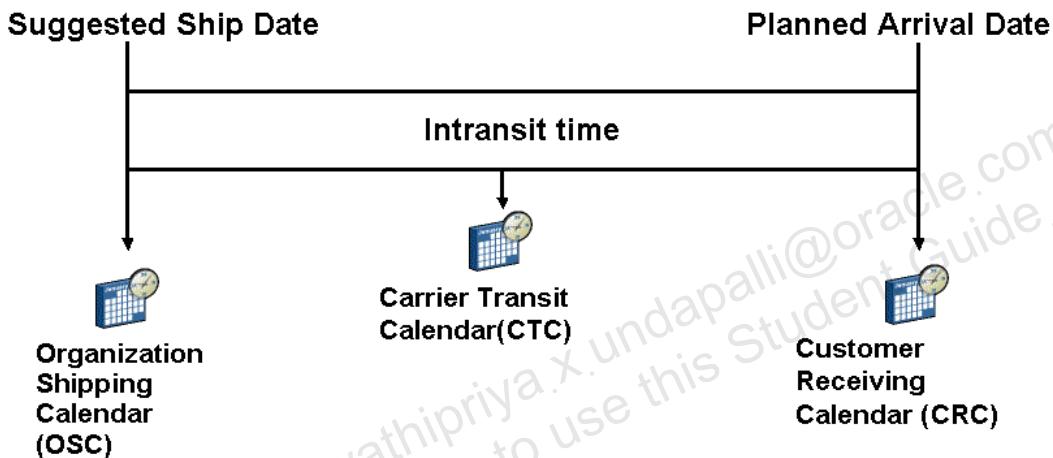
The intransit time between the organizations is specific to the carrier used. The transit calendar of the carrier is used to offset the intransit duration.

In the diagram, the organization manufacturing calendar is in the destination organization and the organization shipping calendar is in the shipping organization. The preprocessing lead time is based on the organization manufacturing calendar in the destination organization.

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Effect of Calendars on Planning Output – Sales Orders and Forecasts

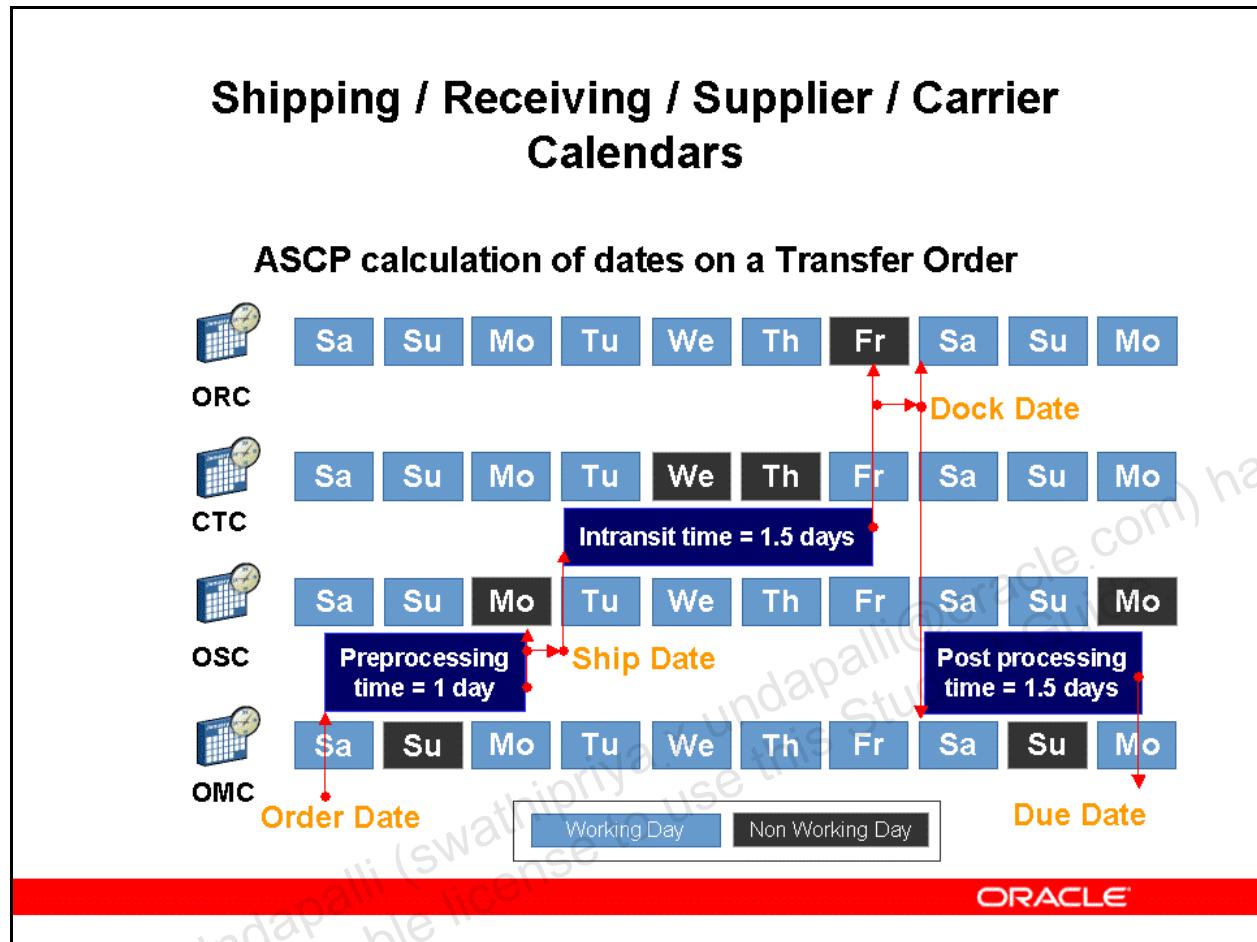


Shipping /Receiving / Supplier / Carrier Calendars (continued)

The transit time is specific to the carrier used and the location of the customer site.

In the diagram, the organization shipping calendar is in the shipping organization.

Shipping / Receiving / Supplier / Carrier Calendars



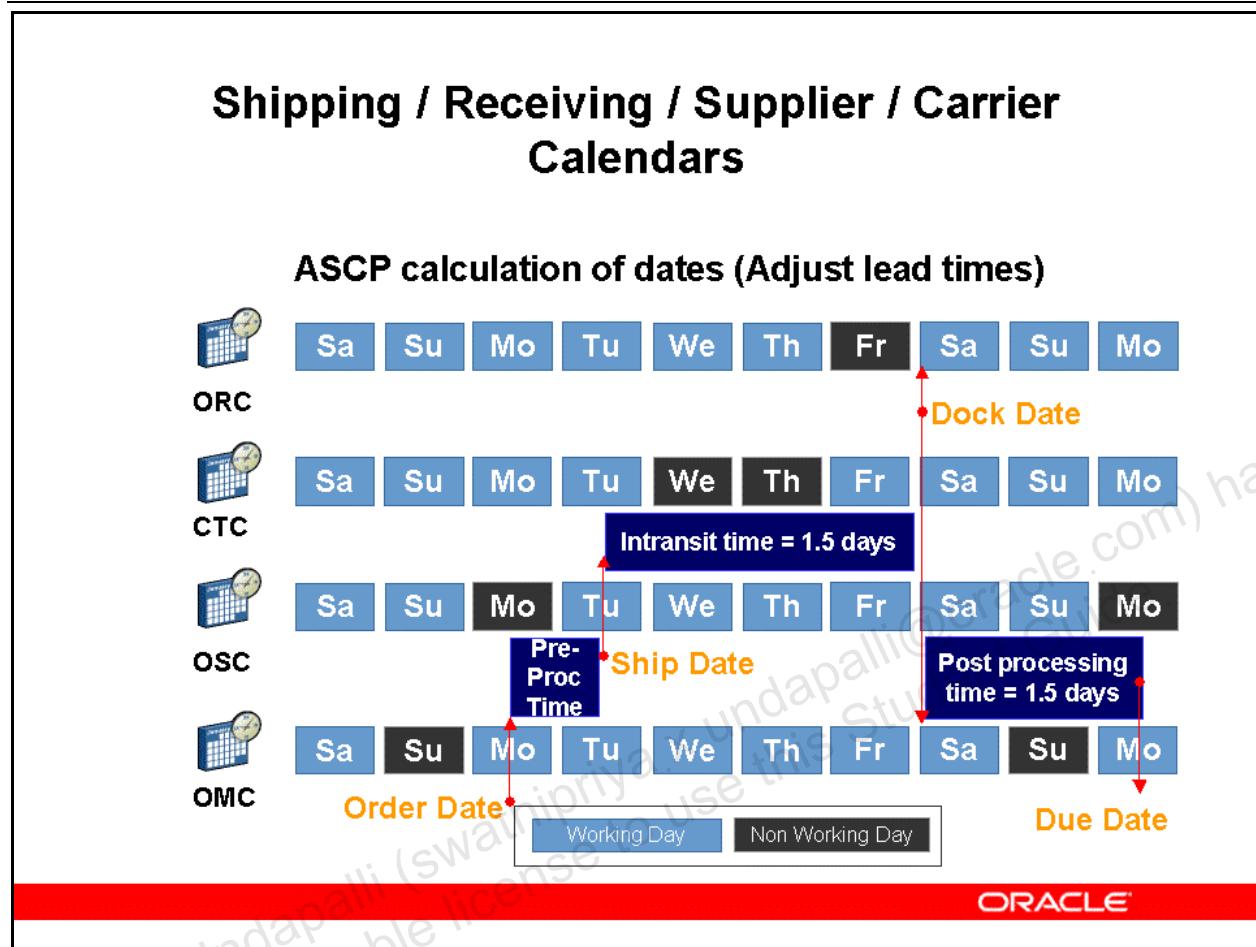
Shipping /Receiving / Supplier / Carrier Calendars (continued)

The example shows the steps that ASCP goes through when forward calculating the dates on a transfer order starting with the order date that falls on a Saturday. A similar process is used to schedule the lead times and dates on the other order types also. A similar process is used when dates are calculated backwards from the due date also.

- Forward offset the preprocessing time of 1 day from Mid Saturday on the OMC to arrive at Mid Monday
- Since Mid-Monday is non working on the OSC push the ship date to Start of Tuesday
- Offset the intransit time of 1.5 days on the CTC to arrive at Mid-Friday
- Since Mid Friday is non working on the ORC, move it to Start of Saturday to arrive at the dock date.
- Offset the post-processing time of 1.5 days on the OMC to arrive at Mid Monday as the Due date.

In the diagram, the organization manufacturing calendar is in the destination organization.

Shipping / Receiving / Supplier / Carrier Calendars



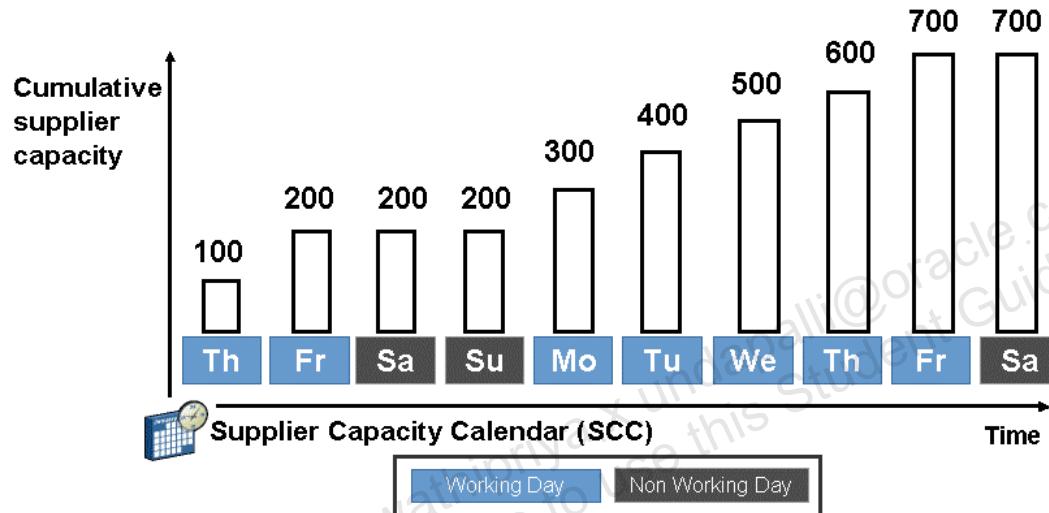
Shipping /Receiving / Supplier / Carrier Calendars (continued)

After the forward calculation is completed, ASCP will re-adjust the lead times so as to be consistent with the results. For example, the intransit lead time is backward offset from the dock date calculated in the previous step to come up with the new ship date and this is in turn used to calculate the new order date.

Shipping / Receiving / Supplier / Carrier Calendars

Shipping / Receiving / Supplier / Carrier Calendars

Supplier capacity is accumulated based on the supplier capacity calendar (SCC) For example,
supplier capacity = 100 units / day



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Shipping /Receiving / Supplier / Carrier Calendars (continued)

Supplier capacity does not accumulate on non working days on the SCC.

Quiz

Quiz

Which of the following calendars is most detailed?

- 1. Supplier/Supplier Site/Carrier**
- 2. Supplier/Supplier Site**
- 3. Supplier/Carrier**
- 4. Supplier**

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Answer: 1. Supplier/Supplier Site/Carrier

Summary

Summary

In this module, you should have learned how to:

- **Describe concepts**
- **Describe constraints**
- **Describe demand priority rules**
- **Describe aggregation levels**
- **Describe constraint planning details**
- **Describe calendars**
- **Describe plan options**

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Querying Supply Chain Plan Information

Chapter 9

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Querying Supply Chain Plan Information

Querying Supply Chain Plan Information

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe personal and public queries**
- **Create personal and public queries**
- **Manage personal and public queries**
- **Describe order queries**
- **Create order queries**
- **Manage order queries**

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Module Overview: Topics

Module Overview: Topics

- Personal and Public Queries
- Order Queries

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Topic Overview: Personal and Public Queries

Topic Overview: Personal and Public Queries

- **Description: Personal and Public Queries**
- **Benefits: Personal And Public Queries**
- **Personal / Public Query Example**
- **Process: Personal and Public Queries**
- **Managing Personal / Public Queries**

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Description: Personal and Public Queries

Description: Personal and Public Queries

Personal and public queries enable you to:

- **Filter items, resources, suppliers, exception messages etc within the area of your responsibility as a planner**
- **Have instant access to the queried information whenever you want, through the Planner Workbench**
- **Switch easily and quickly between multiple views of a large supply chain plan, each focused on a specific area of responsibility**



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Description: Personal and Public Queries

Personal and public queries help you to filter a supply chain plan based on items, resources, suppliers, manufacturing departments, and exception messages. You can create and save a query with a custom name. You can execute the saved query at any point of time to retrieve the latest information stored in the supply chain plan. Note that the Planner Workbench always displays the custom query name, and not the item, resource, department, or exception name.

You can save your query either as a Personal query or a Public query. In case you want to share the query with others planners, save the query as Public query. On the other hand, if you want to have exclusive ownership rights to view, execute, and modify a query, save it as a Personal query. For example, if you want to create a personal query to filter items in a plan, navigate to the Item type in the Personal Queries node, right-click and select Create Query.

To create a Personal query, use the Personal Queries node in the Queries tabbed pane of the Planner Workbench. To create a Public query, use the Public Queries node in the Queries tabbed pane of the Planner Workbench.

Benefits: Personal and Public Queries

Benefits: Personal and Public Queries

- **Improved planner efficiency**
- **A comprehensive search facility that enables you to:**
 - **Arrange data in a tree fashion but in a non-hierarchical way**
 - **Use the retrieved record list as a starting point for drilling down into more detailed level of information**
 - **Store queries for repeated personal or public use**



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Capabilities

Queries help in increasing productivity by alleviating the need to go through large amounts of data. You can simply enter search criteria that help in fetching only the records of interest. That way you would not have to browse through an entire list of records trying to look for the record of his choice.

Queries also help in improved efficiency by allowing you to target specific set of information tailored to your specific needs. For example, if you are looking for a set of related items, you could simply enter the query criteria as “Items starting with AS..” rather than having to look for the related items in the left tree of the Planner Workbench Navigator.

The Planner Workbench presents you with a list of results and is provided with ways to drill down into more details such as Exceptions, Supply/Demand information, and Horizontal Plan, directly from the results list.

Personal / Public Query Example

Personal / Public Query Example

Consider the following example where you search for the following criteria:

Criteria	Condition	From
Query type	Equals	Exceptions
Exception Name	Equals	Late replenishment for sales order
Exception Name	Equals	Late replenishment for forecast
Exception Name	Equals	Items with a shortage
Item	Is Entered	--
Days Late	Greater Than	3

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Personal/Public Query Example

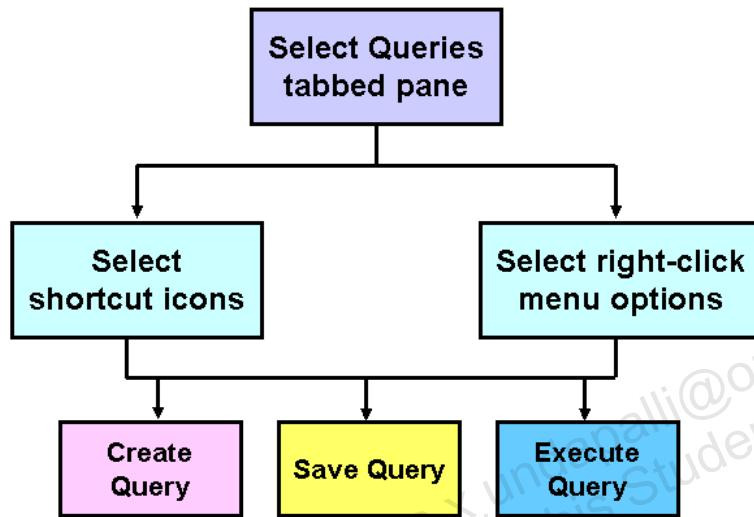
The above example of personal/public query displays the critical exception messages for a planner when an item is overdue for more than 3 days.

Note that any of the individual query criteria can be made inactive by un-checking the ‘Active’ checkbox. This offers flexibility in restructuring the query. For example, if you would like to view the specified exception messages on all items and not only on those items that are overdue, then the query criterion “Days Late” can be made inactive.

If the query is saved and subsequently re-executed, then all the desired exception messages against the overdue items would be displayed.

Process: Personal and Public Queries

Process: Personal and Public Queries



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Process: Personal and Public Queries

Planners can access the Queries tab located next to the Plans tab on the Planner Workbench left tree navigation.

You can select the options for creating, saving, or executing a query by right clicking in the Queries tabbed pane.

There are also shortcut icons on the left tree navigation to create query, save query, and execute query.

You can create any of the following four types of query:

- Item
- Resource
- Exception
- Supplier

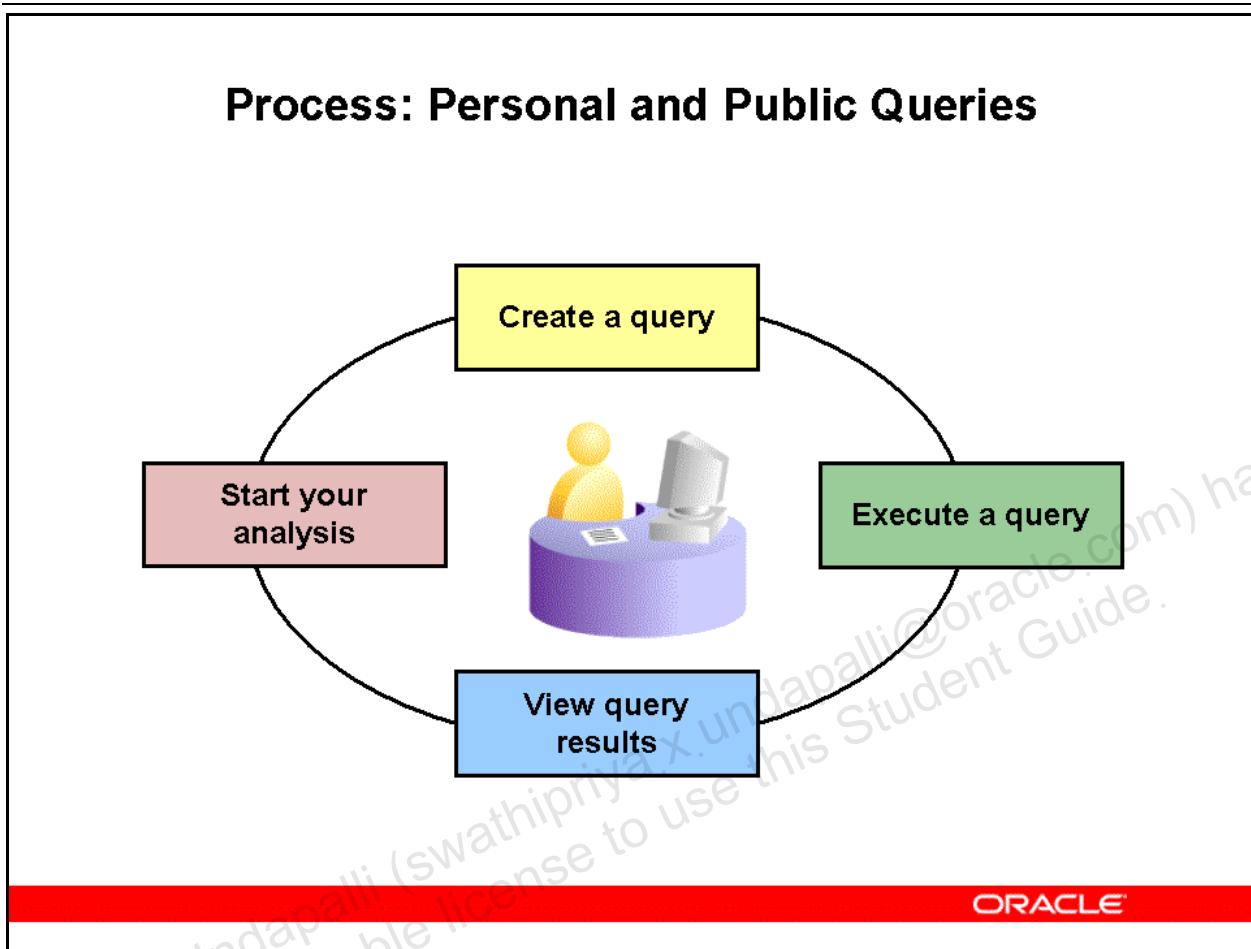
The plan name on the Queries tab indicates the context in which the search was run.

There is a node for executed queries called Query Result, with nodes for each query that has been executed. In addition, there are folders for existing queries. A query designated as a

public query is displayed under the Public Queries folder and a personal query is displayed under the Personal Queries folder.

Personal Queries folder is visible only to the users that defined them, whereas the Public Queries folder is visible to all the users of the ASCP Planner Workbench. Both the Personal Queries and Public Queries folders have the queries bucketed into sub-folders (such as Item, Resource, Exceptions, etc.) based on the context of the queries.

Process: Personal and Public Queries



Process: Personal and Public Queries

Create Query:

- You can create a query and then execute it to view results. For each query type, different criteria for search are available.
- You can enter a search criterion but not use it for execution but instead save it for later use. At any point in future you could make this criterion active for use by selecting the “Active” checkbox.
- Once you select a few query criteria, you can choose to either match all criteria or match any of the several criteria when fetching result records. Two radio buttons are provided for this.

Execute Query:

- Once a query is created, you can select the Execute button to view the results based on the query criteria chosen. If a plan context is not already specified, The system prompts you to choose the plan for which you want to execute the query. If you Execute before saving, you can save the query later on from the Query Results tab. We will only store one unsaved query for later save.

- Note that when you execute a query, the planning engine considers only the active criteria as the basis for the search.

Query Results:

- The query results will be stored for a particular query against a particular plan and be available over multiple Planner Workbench sessions.
- You can save the results of an executed query by selecting the right mouse selection of Save query on Query Result node. This brings up a pop-up window where the user can enter the name of the query, and indicate if it is a Public query or a Personal query.
- You can select multiple records or items in the Query Results window. For example, you may want to view the demand information for two specific records in the Query Results window. Use Ctrl-click to highlight the specific records. Select [right-click] > Supply > Demand to view the demand information for the items you selected.

Managing Personal / Public Queries

Managing Personal / Public Queries

- **Planner Workbench Navigator**
 - Collapsing
 - Shortcuts
- **Accessing saved queries**
- **Default queries**
- **Exception display**
- **Grouping**



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Managing Personal/Public Queries

Planner Workbench Navigator:

The slider bar in the Planner Workbench Navigator helps in collapsing the window so that the left tree can be hidden. This allows you to expand the results window to the permitted full size and focus on the query results.

For the selected record on top, you can either select the options you want from the pop-up menu (the pop-up menu appears if you right click on the selected row), or use the icons at the bottom to go to other windows such as Horizontal Plan, Supply/Demand, Exceptions, and Items.

Accessing Saved Queries:

There is also an easy way to access previous queries. All saved queries show up in their respective query type folders on the left tree. You can easily pick a saved query and view the query, rename it, or view its results, etc.

Default Queries:

On the Tools > Preferences window, there is a field to specify the name of a query to auto-execute once you navigate to the query tab on the left tree. This precludes the need for you to

execute a query manually. You have also to specify the name of a default plan that should be used as the context for the auto-execution of the query.

Exception Display:

As a planner, you may be interested in viewing all the exceptions that are of interest to you in a central place, regardless of the planning engine that has generated them. For example, you may be interested in viewing all exceptions that relate to a specific supplier, some of which originate in a plan, while others may arise out of collaboration between your company and the supplier. You can therefore create queries that retrieve exceptions that have been generated in an ASCP plan, as well as those generated in Collaborative Planning.

There are different query criteria for different exception types depending on their relevance for each exception type.

Grouping:

While creating a query, you can specify several criteria. You can also designate a criterion as the group by criterion, such that the results of the query are displayed based on that criterion. For example, while looking for Late replenishment for forecast, you can designate that the results be grouped by Org.

Quiz

Quiz

Which of the following is NOT a query type?

1. Item
2. Resource
3. Exception
4. Demand
5. Supplier

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Answer: 4. Demand

Quiz

Quiz

Personal and Public queries can both be shared with other planners.

- 1. True**
- 2. False**

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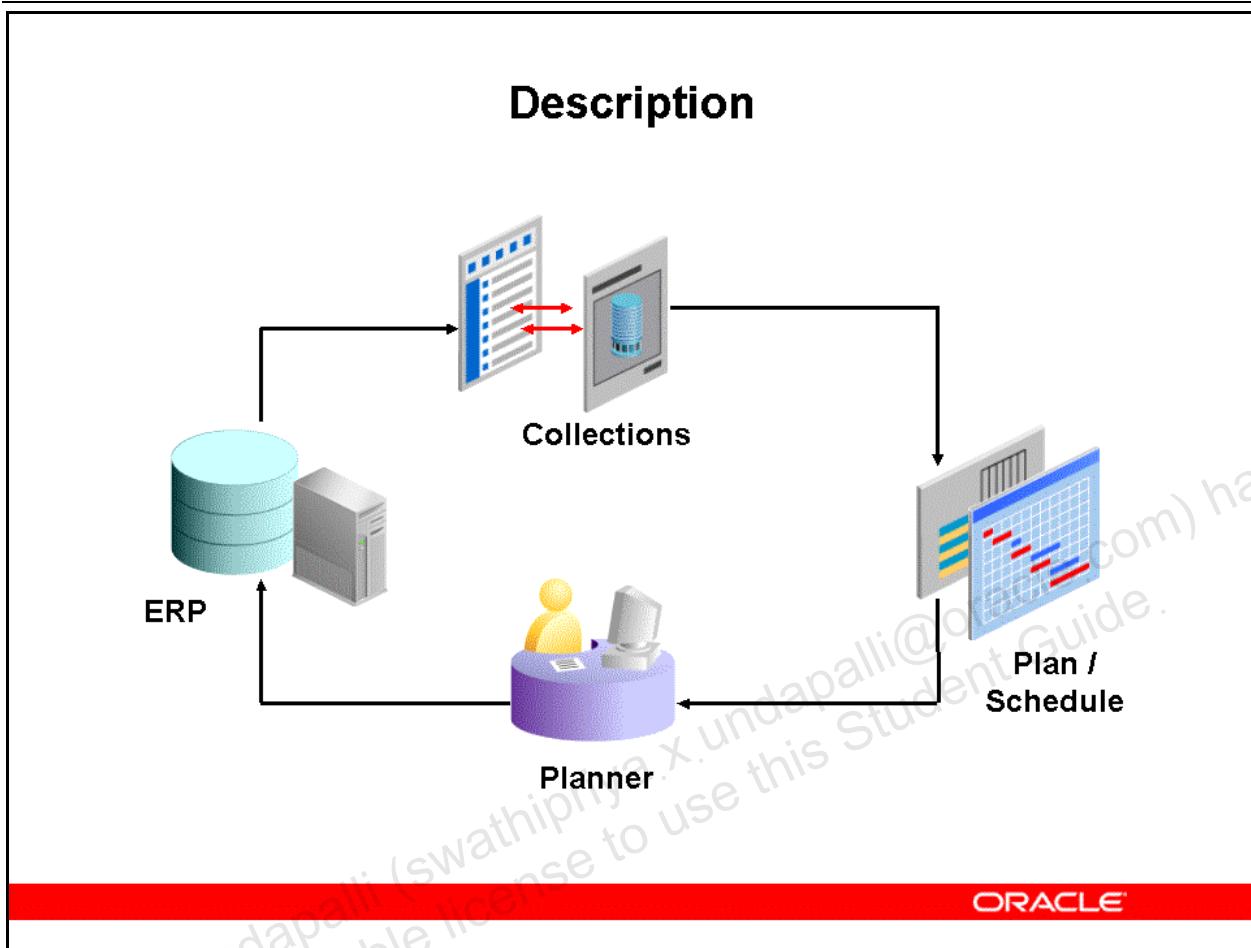
Answer: 2. False – only public queries can be shared with other planners.

Topic Overview: Order Queries

- **Description**
- **Benefits of order queries**
- **Order query example**
- **Setup and process**
- **Setup - creating an order query**
- **Setup - auto execution of order query**
- **Process - manual selection of order query**
- **Process - review and release**

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Description



Description

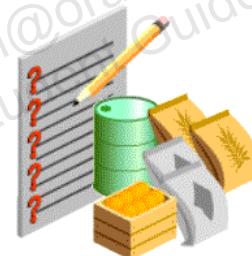
Advanced Supply Chain Planning supports personal queries (order queries) for supplies and demands. This allows you to easily retrieve key supply and demand information. For example, you can find purchasing recommendations for a specific supplier that need to be released within the next 10 days or all top priority sales orders that are satisfied more than 3 days beyond their due date. Order queries supports all types of supply chain plans, including the new Distribution Planning (DRP) plans.

For more information on distribution plans, refer the Distribution Planning (DRP) courseware.

Benefits of Order Queries

Benefits of Order Queries

- Allows the planner to adopt the best course of action based on the query results
- Allows the planner to create order-centric queries (for supply and demand information)
- Increases planner productivity
- Provides powerful find criteria to select required orders
- Provides direct access to Supply-Demand window



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Benefits of Order Queries

Allows the planner to adopt the best course of action based on the query results

Based on the supply and demand information retrieved by the planning engine, you can release the planned orders or reschedule or cancel the existing orders.

Allows the planner to create order-centric queries (for supply and demand information)

The order queries are similar in concept to item, resource, exception, and supplier queries, providing a good framework to specify the criteria for selection of orders for subsequent review. You can also create Public order queries that can be shared across planners and across Advanced Supply Chain Planning, Distribution Planning, and Inventory Optimization Planner Workbenches.

Increases planner productivity

The ability to filter supply and demand information based on key attributes helps you to focus only on the relevant information and reduces time required to retrieve accurate result. It helps in leveraging the Planner Workbench release capabilities for orders present in the query output.

Provides powerful find criteria to select required orders

You can specify many key order attributes in an order query related to supply and demand orders as part of the query criteria, in order to get a more accurate result.

You can also combine multiple sub queries to form a final query. The “Match all” or “Match any” capability provides flexibility while you create your order query.

Provides direct access to Supply-Demand window

The Supply and Demand window provides an easy review and edits of the orders, once you execute the order query. You can release orders retrieved by an order query using the existing standard procedure to release an order.

Order Query Example

Order Query Example

Consider the following example where you search for the following criteria:

Criteria	Condition	From
Order type	Equals	Purchase order
Supplier	Equals	Advanced Network Devices
Suggested Dock Date	Days From Today	10
Exception Name	Equals	Orders to be rescheduled in
Planner	Equals	Bob

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Order Query Example

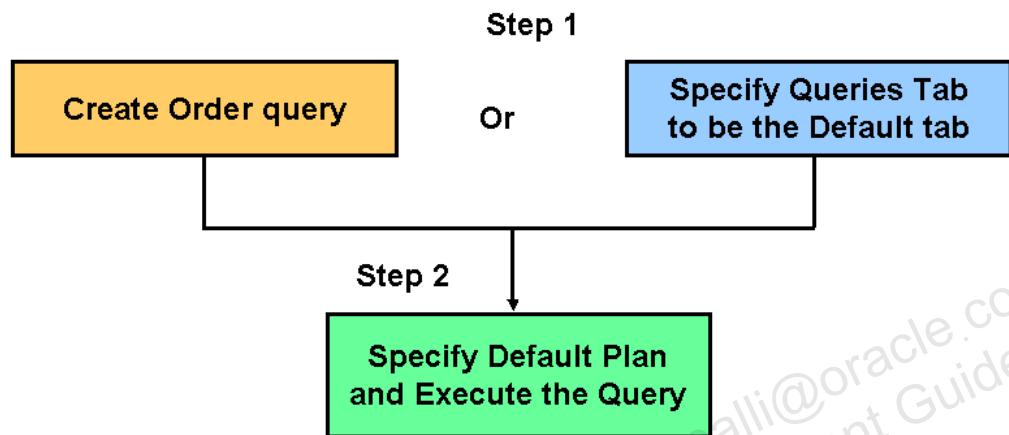
The above example of order query displays planner Bob's purchase orders against supplier Advanced Network Devices within the first 10 days of plan run date that have been rescheduled in.

Note that any of the individual query criteria can be made inactive by un-checking the 'Active' checkbox. This offers flexibility in restructuring the query. For example, if the user would like to view all the Purchase orders (against supplier Advanced Network Devices that have been rescheduled in) and not just the ones within the first 10 days, then query criterion 'Suggested Dock Date 10 Days from Today' can be made inactive.

If the query is saved and subsequently re-executed, then all the desired Purchase orders would be displayed.

Setting Up an Order Query

Setting Up an Order Query



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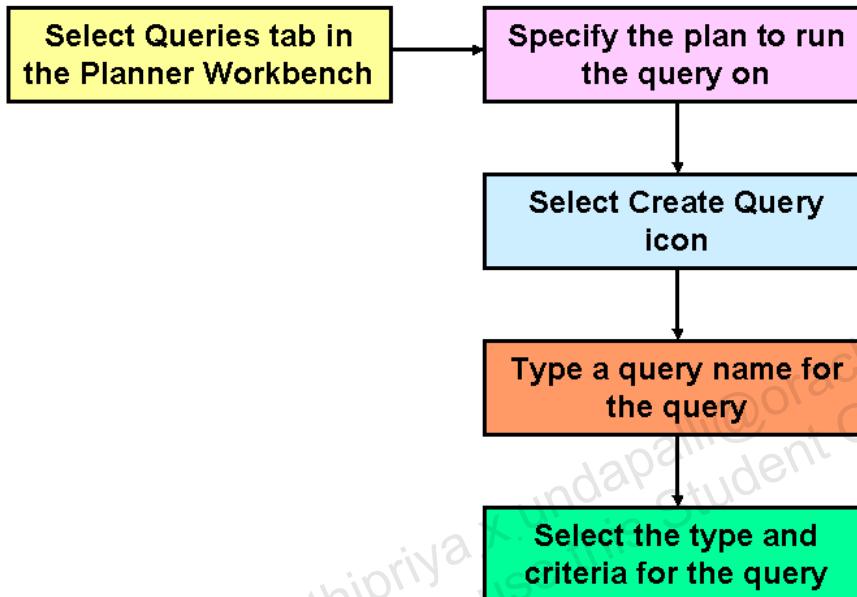
Setting Up an Order Query

To setup an order query, you should either create a new query or specify the Queries tabbed pane as the default tab in your Planner Workbench. Next you set a default plan and execute the default plan. Note that you can choose an automated execution process for the query.

The setup process is discussed further in the next slides.

Setup: Creating an Order Query

Setup: Creating an Order Query



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Setup - Creating an Order Query

Follow the given steps to create a new order query:

1. Open the Planner Workbench
2. Select the Queries tab if it is not the default tab in the Queries tabbed pane.
3. Select the “Create Query” icon on the left bottom of the Queries tabbed pane.
Alternatively, you can right-click in the Queries tabbed pane and select Create Query in the pop-up menu.
4. In the Create Query window,
 - a. Specify a name for the query in the Query Name field.
 - b. Select a type of query (Item, Resources, Exceptions, or Suppliers) from the Query Type drop-down list to specify the information you want to filter.
 - c. Select Yes in the Public drop-down list to share the query to other planners as a public query.
 - d. Specify the criteria in the Criteria box. For example, you may want to filter those orders that need to be released within the next week. In this case, specify Make or Buy, Equals, and Buy in the Criteria, Condition, and From fields, respectively.

- e. To retrieve all the records that meet any one of the criteria that you specify, select Match Any. To retrieve only those records that meet all criteria, select Match All.
- f. Select the check box preceding the criteria specifications for those criteria specifications that you want to include as active. When you execute a query, the planning engine considers only the active criteria as the basis for the search.
- g. Select Save to save the query. Based on your selection, the planning engine saves the query either as a Personal Query or a Public Query.

Note: You can create multiple sub-queries for one main query, each with its own criteria. The planning engine executes all the sub-queries together.

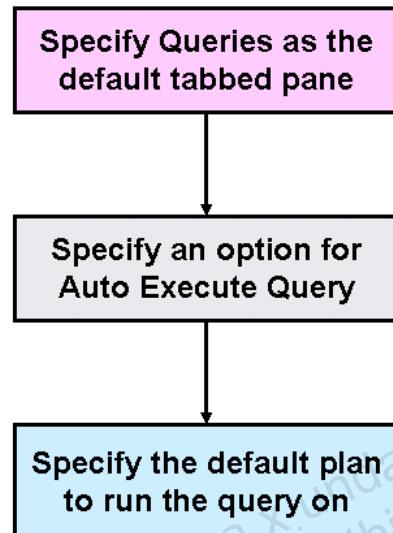
To edit and/or maintain an existing query:

1. Open the Planner Workbench
2. Select to Queries tabbed pane if it is not the default tab in the Planner Workbench.
3. Drill down from the Personal Queries node if the query is specified as a Personal query. Alternatively, drill down from the Public Queries node if the query is specified as a Public query.
4. Drill down to the required Order query from the Order node.
5. Highlight the required query and edit the query name, type and/or criteria as required.
6. Right-click on the query and select View Query in the pop-up menu.

Note: Queries specified as Public can only be edited by the user who created the query. Other users can only view them.

Setup: Auto Execution of Order Query

Setup: Auto Execution of Order Query



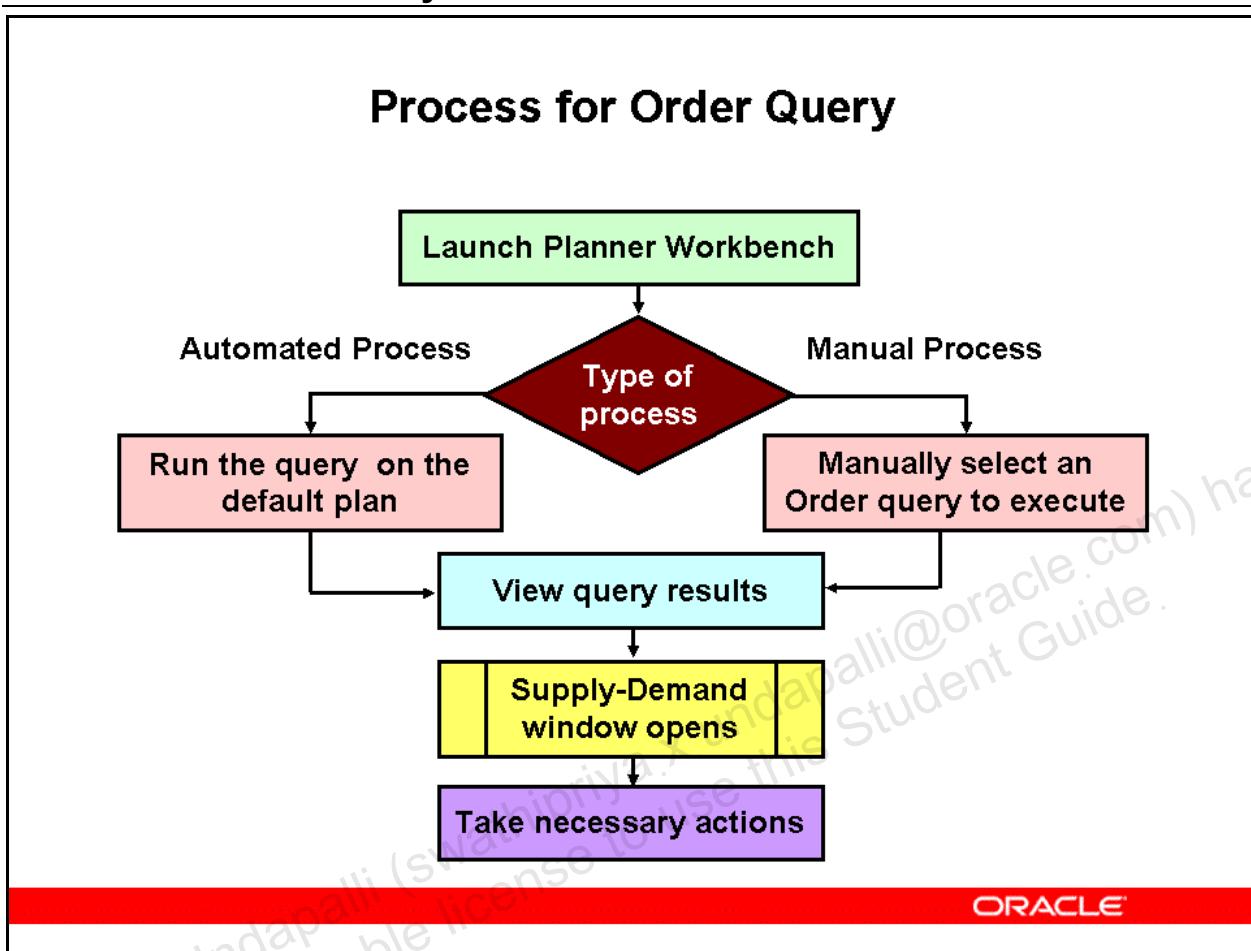
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Setup: Auto Execution of Order Query

To setup the auto-execution option for your order queries,

1. Select Preferences from the Tools menu. The Preferences window opens.
2. Select the Other tab.
3. Select a query in the list of query names available for the Auto Execute Query field. After you select a query to run automatically, the planning engine would run the query when you open the Planner Workbench and display the query results.
4. Specify a default plan that needs to open when you access the Planner Workbench. The Auto Execute Query is executed against the default plan when you open the Planner Workbench.

Process for Order Query



Process for Order Query

You can adopt any of the following two approaches to execute a order query:

Manual Process:

1. Select the Queries tabbed pane in the Planner Workbench.
2. Drill down to the Order Query which needs to be executed, and select the query you want to run.
3. Specify the Plan name against which the query should be executed
4. Select Execute to run the query. The planning engine filters and displays the result based on the criteria you specified in the query. Alternatively, you can right-click on the selected query and select Execute Query in the pop-up menu.

Automated Process:

This process would work only if you have specified a query to be executed automatically using the Auto Execute Query field in the Preferences window. To run a query automatically,

1. Select the Queries tabbed pane in the Planner Workbench.

2. The Auto Execute Query executes the specified query against the default plan when you open the Planner Workbench.
3. After the query is executed, the Supply/Demand window is automatically opened with the query results.
4. You can then review the orders and use standard release options such as “Select all for release” and “Release” to release the reviewed orders.

Quiz

Quiz

Order Queries may be executed either automatically or manually.

- 1. True**
- 2. False**

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Answer: 1. True

Summary

Summary

In this module, you should have learned how to:

- **Describe personal and public queries**
- **Create personal and public queries**
- **Manage personal and public queries**
- **Describe order queries**
- **Create order queries**
- **Manage order queries**

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Constrained Plans - Enforce Capacity Constraints

Chapter 10

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Constrained Plans - Enforce Capacity Constraints

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10

Constrained Plans - Enforce Capacity Constraints

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe constrained plans**
- **Describe exceptions**
- **Describe other information**
- **Describe details**
- **Run enforce capacity constraints plans**
- **Work with enforce capacity constraints plans**
- **Regenerate plans**

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Module Overview: Topics

Module Overview: Topics

- **Constrained plans**
- **Exceptions**
- **Other information**
- **Details**

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Module Topics

This module addressed the following topics:

- Constrained plans
- Exception messages
- Other information, such as:
 - Root causes of late demands
 - Gantt Charts
 - Planning detail report
 - Plan comparison report
 - Workflow notifications
- Details, such as:
 - Bottleneck resources
 - Enforced and non-enforced constraints
 - Flexible shift times: Day bucket
 - Flexible shift times: Hour bucket

- Flexible shift times: Minute bucket
- Firm work orders
- Pegging, and
- Network routings

Topic Overview: Constrained Plans

Topic Overview: Constrained Plans

- **Enforce capacity constraints**
- **Enforce demand due dates**
- **Decision rules**
- **Plan type comparison**

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Constrained Plans

This topic encompasses:

- Plans that enforce capacity constraints
- Plans that enforce demand due dates
- Plans that use decision rules
- Comparing plan types

Enforce Capacity Constraints

Enforce Capacity Constraints



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Capacity Constraints

When capacity constraints are enforced, the planning run generates a plan that does not violate manufacturing, supplier, and transportation capacity, or result in material shortages.

If necessary to respect capacity constraints, the plan may allow supplies to be late, and the plan may violate demand due dates. Late replenishment exception messages indicate where the planning engine violates demand due dates.

Enforce Demand Due Dates

Enforce Demand Due Dates



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Demand Due Dates

When demand due dates are enforced, the planning run may overload resource and supplier capacity, in other words, violate capacity constraints, as needed to respect demand due dates.

For example, the planning engine may schedule a job to use two resource units when there is normally only one resource unit available, or it may schedule a job on a resource when the resource is on break or on its non-work time. Supplier capacity may be overloaded or purchase requisitions may be scheduled with less than the normal lead-time.

Decision Rules

Decision Rules

Balanced supply and demand...

...across the supply chain

Respects constraints...

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Decision Rules

Decision rules are additional instructions to the planning engine for using substitutes and alternates to produce the supply with fewer constraint violations. Decision rules can automatically select alternate routings, resources, bills of material, items, and sources. Decision rules are an additional feature for both enforce capacity constraints and enforce demand due dates types of constrained plans.

The decision rules are:

- **Use alternate sources:** Use primary sources as far as possible and use alternate sources (rank 2 or numerically higher) only if necessary.
- **Use alternate BOM/routings:** Use primary routing as far as possible and use alternate only if necessary.
- **Use alternate resources:** Use primary resource as far as possible and use alternate resource only if necessary.
- **Use end item substitutions:** Use primary item and end item substitute, when enabled, prior to creating new planned orders.
- **Use substitute components:** Use primary components as far as possible and use substitute component only if necessary.

With decision rules you can do the following:

- Select alternatives with the minimum data input prerequisites possible. You can run a supply chain plan that automatically selects alternate routings, BOM, resources, suppliers, internal sources, end-items and components with the minimum amount of input.
- Enforce a specified sequence of decision-making actions, which may mimic a planner's problem resolution thought process. The sequence in which the planning engine looks for supply using standard Oracle Application functions is transparent to the user. For example, you may specify substitutes for a given component but not alternate sources. You can specify a global decision rule when more than one supply source can satisfy the demand. For example, if you have specified both substitutes and alternate sources, you can choose one over the other.
- Make easier APS planning decisions because the decision-making process is more transparent. You can select alternates when the primary source of supply is unable to satisfy demand. In doing so, you can express preferences as business rules, such as: the alternate resource should be used before looking for alternate supply and substitute components.
- Restrict planning to a universe of authorized decision-making actions. For example:
 - Permit exploration of alternate routings and substitute items, but not of sourcing or permit substitute components, and
 - Do not permit end item substitution, even though rules are specified for the given items at the source level.
- You specify the sequence in which the planning engine evaluates substitutes and alternates.

Note: You do not need to use cost-based optimization to select substitute components, alternate bills of material or routings, and alternate sources.

Plan Type Comparison

Plan Type Comparison

Constrained -
Enforce capacity
constraints

- Demands may be late
- Resource capacity, supplier capacity respected
- Lead time, planning time fence respected

Constrained -
Enforce demand
due dates

- Demands on time
- Resource capacity, supplier capacity violated
- Lead time, planning time fence violated

Constrained with
decision rules

- May Enforce capacity constraints (ECC) or
Enforce demand due dates (EDD)
- Substitutes and alternates selected based on
decision rules

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Topic Overview: Exceptions I

Topic Overview: Exceptions I

- **Constrained exceptions**
- **Late replenishment for sales order exception message**
- **Late replenishment for forecast exception message**
- **Sales order/forecast at risk exception message**
- **Analyzing late supplies**
- **Related exceptions**

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Topic Overview: Exceptions II

Topic Overview: Exceptions II

- **Constraint exception messages**
- **Material constraint exception message**
- **Resource constraint exception message**
- **Order lead time constraint exception message**
- **Requirement lead time constraint exception message**

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Constrained Exceptions

Constrained Exceptions

- **Enforce capacity constraints**
 - **Respects resource constraints**
 - Late replenishment for sales order exception message
 - Late replenishment for forecast exception message
- **Enforce demand due dates**
 - **Respects demand due dates**
 - **Plan overloads resources when necessary**
 - Sales order/forecast at risk exception message

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Constrained Exceptions

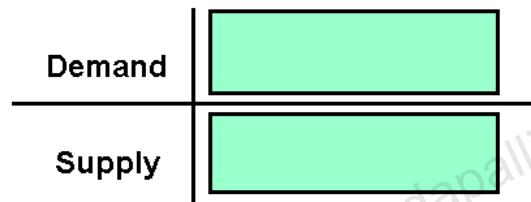
In Constrained - enforce capacity constraints plans, the planning engine respects resource constraints and plans to fulfill sales order and forecasts late. It notifies you of the resource constraint that it hit with the Resource constraint exception message. Since the resource constraint causes a late demand, it notifies you of the late demand with the Late replenishment for sales order and Late replenishment for forecast exception messages.

In Constrained - enforce demand due dates plans, the planning engine respects demand due dates and plans to overload resources. It notifies you of overloaded resources with the Requirement causes resource overload exception message. Since you may not be able to overload the resource in reality, an overloaded resource puts the demand at risk. The planning engine notifies you of this with the Sales order/forecast at risk exception message.

Constraint Exceptions Calculation

Constraint Exceptions Calculation

Use constraint exceptions to find situations in which the planning engine is not able to plan within your constraints.



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Constraint Exceptions

Use the constraint exceptions to find situations in which the planning engine is not able to plan within your constraints.

The overload-related constraint exception messages are:

- Requirement causes resource overload
- Order causes supplier capacity overload
- Order causes transportation weight capacity overload
- Order causes transportation volume capacity overload
- The planning engine issues these exception messages when a specific resource requirement or a supply order causes overload on a production resource (for make items), a supplier capacity (for buy items), or a transportation resource (for transfer items).

The lead time-related constraint exception messages are:

- Requirement with insufficient lead time
- Order with insufficient lead time
- The planning engine issues these exception messages when it schedules a resource requirement or supply order for less than its minimum duration. Minimum duration

depends on order type; for example, a resource requirement minimum duration is the processing time required when using the resource maximum assigned units and usage quantity.

The constrained plan-related constraint exception messages are:

- Resource constraint
- Material constraint
- Transportation weight constraint
- Transportation volume constraint
- Order lead time constraint
- Requirement lead time constraint
- The planning engine issues these exceptions in:
 - Constrained plans
 - Plan option Enforce Capacity Constraint
 - Either or both Material Constraints and Resource Constraints is Yes
 - Profile option MSO: Calculate Constraint Exceptions is Yes
 - It issues them whenever it must satisfy a sales order line or a forecast entry late. They help show the resource overloads, supplier capacity overloads, and lead time violations that need to occur for you to satisfy the order on time.

These exception messages from Constrained plans-Enforce capacity constraints mirror overload and lead time exceptions from Constrained plans-Enforce demand due dates:

- Resource constraint mirrors Requirement causes resource overload
- Material constraint mirrors Order causes supplier capacity overload
- Transportation weight constraint mirrors Order causes transportation weight capacity overload
- Transportation volume constraint mirrors Order causes transportation volume capacity overload
- Order lead time constraint mirrors Order with insufficient lead time
- Requirement lead time constraint mirrors Requirement with insufficient lead time

The firming-related constraint exception messages are:

- Order is firmed early
- Order is firmed late
- Requirement is firmed early
- Requirement is firmed late
- The planning engine issues these exceptions against firmed resource requirements and supply orders when it thinks they are firmed with either of the following effects:
 - Too early: It cannot properly schedule upstream tasks--using minimum duration--to start after the plan start date.
 - Too late: It cannot properly schedule downstream tasks--using minimum duration--to finish before the demand due date.

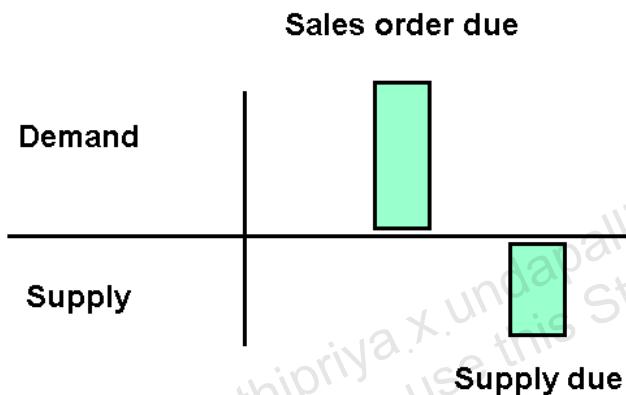
The other constraint exception messages are:

- Shared supply scheduled late: A shared supply is scheduled too late to satisfy one of its end demands. The planning engine issues this exception if profile option MSO: Generate Shared Supply Exceptions is Yes.
- Demand quantity is not satisfied: There is no supply for this demand; the demand is satisfied at the end of the planning horizon.
- Sales order/forecast at risk: The sales order line or forecast entry is likely to be late. The reasons for the lateness are in the exception group Supply Problems for Late Sales Orders/Forecasts.

Late Replenishment for Sales Order Exception Message

Late Replenishment for Sales Order Exception Message

This exception message appears in a constrained plan when the planning engine detects that the supplies for a sales order line are due later than the sales order line.



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Late Replenishment for Sales Order Exception Message

Exception message Late replenishment for sales order is in exception group: Late sales orders and forecasts.

This exception message appears in a constrained plan when the planning engine detects that the supplies for a sales order line are due later than the sales order line.

The demand satisfied date is the latest due date of the supplies pegged directly to an end demand. The planning engine issues this exception message against a sales order line when its demand satisfied date is later than its schedule date.

This exception usually occurs because of a material constraint, resource constraint, or planning time fence. It often occurs in Constrained - Enforce capacity constraint plans when the planning engine needs to move supply order due dates to honor capacity constraints.

The information displayed for this exception message is:

- Org: Sales order line warehouse
- End Item: For the sales order line
- Quantity: For the sales order line
- Order Number: For the sales order line

- Priority: For the sales order line
- Customer
- Customer Site
- Demand Date: Sales order line schedule date
- Demand Satisfied Date
- Days Late: Demand Satisfied Date - Demand Date
- Quantity Satisfied by Due Date: The quantity of on time and early supply orders pegged directly to the sales order line. This appears if you set profile option MSO: Allow Partial Demand Completion to All End Demands or to Sales Orders.

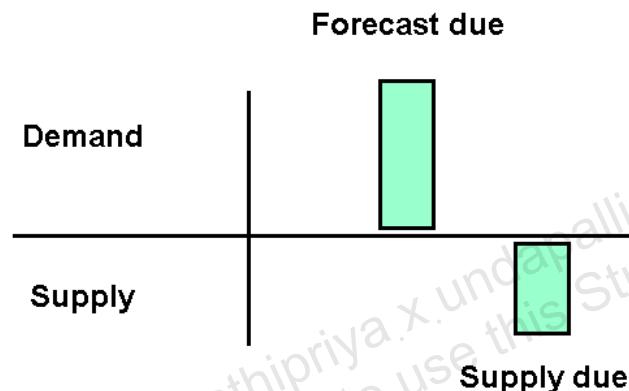
To resolve this exception message:

- In the Planner Workbench, Exception Details window, sort the orders by your priority, for example, days late or demand priority.
- For each exception, right click on it, select Related Exceptions, and view the constraint.
- Consider:
 - Revising demand priority rules
 - Revising the sales order line demand priority
 - Expediting the supply order
 - Revising the sales order line schedule date or forecast entry date

Late Replenishment for Forecast Exception Message

Late Replenishment for Forecast Exception Message

This exception message appears in a constrained plan when the planning engine detects that the supplies for a forecast entry are due later than the forecast entry.



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Late Replenishment for Forecast Exception Message

Exception message Late replenishment for forecast is in exception group: Late sales orders and forecasts.

This exception message appears in a constrained plan when the planning engine detects that the supplies for a forecast entry are due later than the forecast entry.

The demand satisfied date is the latest due date of the supplies pegged directly to an end demand. The planning engine issues this exception message against a forecast entry when its demand satisfied date is later than its schedule date.

This exception usually occurs because of a material constraint, resource constraint, or planning time fence. It often occurs in Constrained - Enforce capacity constraint plans when the planning engine needs to move supply order due dates to honor capacity constraints.

The information displayed for this exception message is:

- **Org:** For the forecast entry
- **End Item:** For the forecast entry
- **Quantity:** Unconsumed quantity for the forecast entry
- **Order Number:** Forecast entry line number

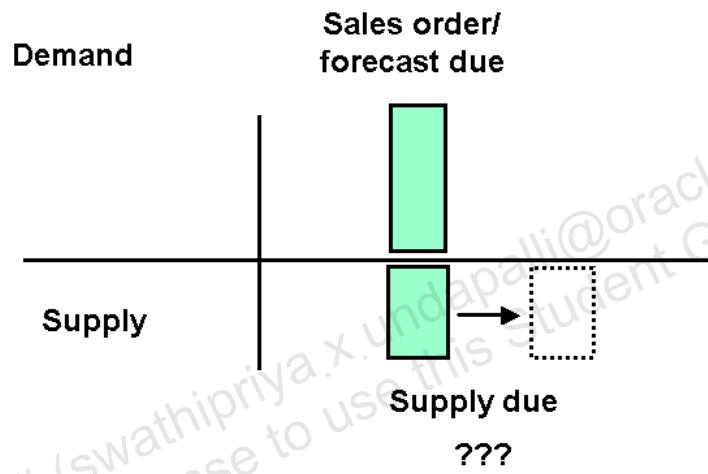
- **Priority:** For the forecast entry
- Customer
- Customer Site
- **Demand Date:** Forecast entry date
- Demand Satisfied Date
- **Days Late:** Demand Satisfied Date - Demand Date
- **Quantity Satisfied by Due Date:** The quantity of on time and early supply orders pegged to the forecast. This appears if you set profile option MSO: Allow Partial Demand Completion to All End Demands or to Sales Orders.

To resolve this exception message, follow the same suggestions as Late replenishment for sales order resolution exception message.

Sales Order/Forecast At Risk Exception Message

Sales Order/Forecast At Risk Exception Message

This exception message appears when demands are at risk; pegged to a supply order against which the planning engine has issued certain exception messages.



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Sales Order/Forecast At Risk Exception Message

Exception message Late replenishment for forecast is in exception group: Late sales orders and forecasts.

This exception message appears when demands are at risk. A demand is at risk when it is pegged to a supply order against which the planning engine has issued certain exception messages. These certain exception messages are in the Supply Problems for Late Sales Orders and Forecasts exception group . You can use them for further information about the sales order or forecast at risk:

- Sales order/forecast at risk due to resource shortage
- Sales order/forecast at risk due to material shortage
- Requirement causes resource overload
- Order causes supplier capacity overload
- Order causes transportation weight capacity overload
- Order causes transportation volume capacity overload
- Order with insufficient lead time
- Requirement with insufficient lead time

- Order lead time constraint
- Requirement lead time constraint
- Demand quantity not satisfied
- Late supply pegged to forecast
- Late supply pegged to sales order

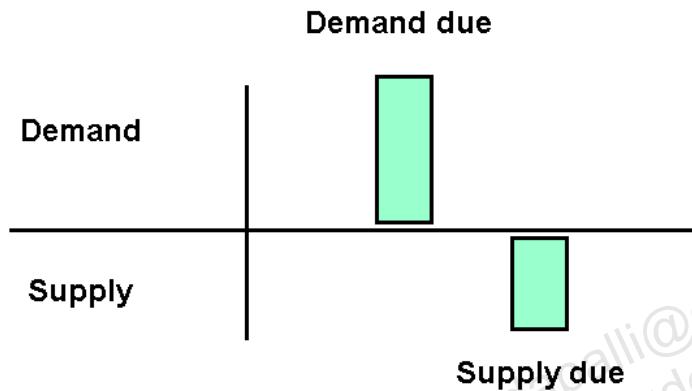
The information displayed for this exception message all refers to the demand line and is:

- Order Number
- End Item
- End Item Org
- End Item Description
- Order Due Date
- Order Quantity
- Customer
- Customer Site
- Demand Class

To resolve this exception message, check for more details from related exceptions in the Supply Problems for Late Sales Orders and Forecasts exception group.

Analyzing Late Supplies

Analyzing Late Supplies



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Analyzing Late Supplies

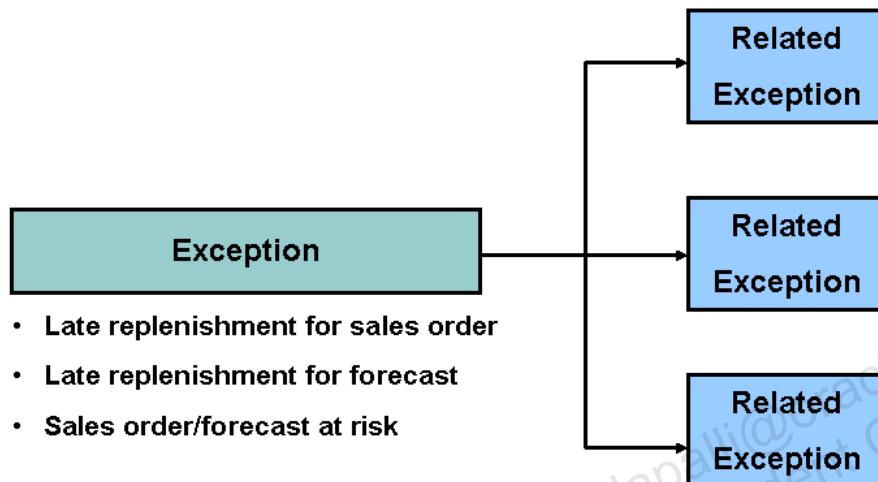
You can analyze late supplies in several ways:

- A basic way is to look over the late replenishment exception details.
- A more detailed way is to analyze exceptions that are related to (related exceptions) the late replenishment exception details.
- The most detailed way is to use the late demand diagnosis capabilities
 - Critical Path Gantt Chart View
 - End Pegged Supplies window
 - Critical Activities window

Not every approach is appropriate for every issue; the issue often suggests the best strategy.

Related Exceptions

Related Exceptions



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Related Exceptions

Related exceptions are exception messages that relate to the same issue as other exception messages and often provide more detail about a situation. You can see related exceptions in both Constrained - Enforce capacity constraints and Constrained - Enforce demand due dates plans.

The exception messages that have related exceptions are:

- Late replenishment for sales order
- Late replenishment for forecast
- Sales order/forecast at risk

The constrained plan-related constraint exception messages are:

- Resource constraint
- Material constraint
- Transportation weight constraint
- Transportation volume constraint
- Order lead time constraint
- Requirement lead time constraint

The planning engine issues these exceptions in:

- Constrained plans
- Plan option Enforce Capacity Constraint
- Either or both Material Constraints and Resource Constraints is Yes
- Profile option MSO: Calculate Constraint Exceptions is Yes

The firming-related constraint exception messages are:

- Order is firmed early
- Order is firmed late
- Requirement is firmed early
- Requirement is firmed late

The planning engine issues these exceptions against firmed resource requirements and supply orders when it thinks they are firmed with either of the following effects:

- **Too early:** It cannot properly schedule upstream tasks--using minimum duration--to start after the plan start date.
- **Too late:** It cannot properly schedule downstream tasks--using minimum duration--to finish before the demand due date.

The other constraint exception messages are:

- **Shared supply scheduled late:** A shared supply is scheduled too late to satisfy one of its end demands. The planning engine issues this exception if profile option MSO: Generate Shared Supply Exceptions is Yes.
- **Demand quantity is not satisfied:** There is no supply for this demand; the demand is satisfied at the end of the planning horizon.
- **Sales order/forecast at risk:** The sales order line or forecast entry is likely to be late. The reasons for the lateness are in the exception group Supply Problems for Late Sales Orders/Forecasts.

It issues them whenever it must satisfy a sales order line or a forecast entry late. They help show the resource overloads, supplier capacity overloads, and lead time violations that need to occur for you to satisfy the order on time.

Constraint Exception Messages

Constraint Exception Messages

- **Material constraint**
- **Resource constraint**
- **Order lead time constraint**
- **Requirement lead time constraint**

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Constraint Exception Messages

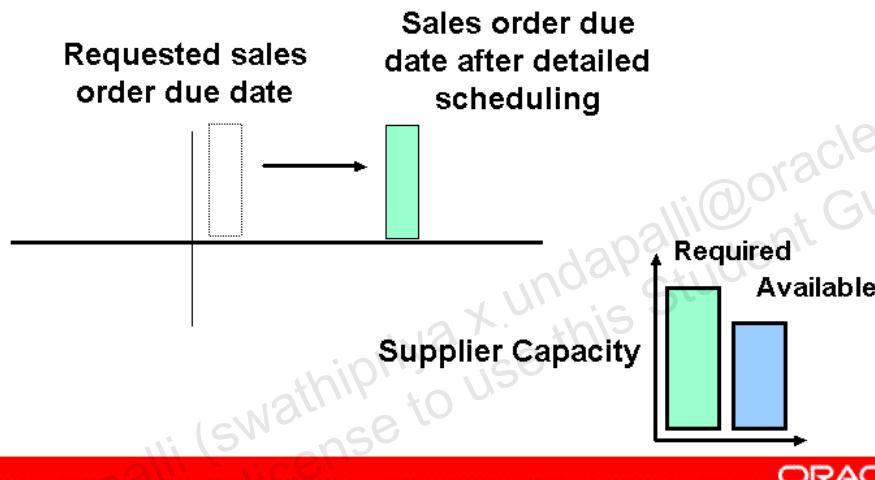
Use these exceptions to identify material and resource trouble spots in the plan and actions to take to remedy the problems.

A recommended strategy is to not start with late replenishment exception messages, but rather to start with the constraint exception messages. Solving the constraint exceptions solves the late replenishment exceptions.

Material Constraint Exception Message

Material Constraint Exception Message

This exception message appears when a demand due date needs to be pushed out due to a supplier capacity constraint.



Material Constraint Exception Message

Exception message Material constraint is in exception group: Material and resource capacity.

This exception message appears when a demand due date needs to be pushed out due to a supplier capacity constraint. If there are also Resource constraint exception messages for this end demand, you may also need to provide adequate resource capacity.

The planning engine issues this exception if profile option MSO: Calculate Constraint Exceptions is Yes.

The information displayed for this exception is:

- Organization
- Item
- Item Description
- Supplier
- Supplier Site
- Supply Order Number
- Order Type
- Quantity

- Due Date
- Dock Date
- Bucket Start Date: The date of the overload. (For this exception, there is no end date.)
- Required Capacity
- Cumulative Available Capacity: At Bucket Start Date before scheduling.
- Overload
- To resolve this exception message:
 - Check to see if these exceptions cause Late replenishment for sales order or Late replenishment for forecast exception messages; right click the exception message and select Related Exceptions.
 - In the Planner Workbench, Exception Details window, sort the Late replenishment for sales order and Late replenishment for forecast exception messages by your priority, for example, days late or demand priority.
 - Check to see if a resource capacity issue caused early processing of the supply order resulted in the material constraint.
- Consider:
 - Adjusting sales order line schedule date
 - Adjusting forecast entry date
 - Adjusting supplier capacity
 - Using an alternate supplier
 - Using a substitute component: In unconstrained plans, make a manual substitution.
 - Arranging and recording new substitute items
 - Increasing supplier flexfences
 - Changing the sales order or forecast quantity
 - Modifying the sourcing rule: For example, change sourcing percentage

Supplier Capacity Constraint Details

It occurs for supplier capacity constraint when there is not enough supplier capacity to purchase the buy item by a certain date. The certain date is the Latest possible completion time (LPCT) - the item post-processing lead time, including breaks and delivery calendars.

You can see the amount of supplier capacity that you need to add at different suppliers during different time periods in order to satisfy a demand on time. If there are Resource constraint exception messages for an end demand, you may also need to provide adequate resource capacity.

Supplier capacity is available at 0000 hours each work day according to the owning organization manufacturing calendar. The planning engine accumulates supplier capacity for a plan:

- From the launch date, if you launch the plan on a work day at 0000 hours
- From the next working day after the launch date, if you launch the plan on a non-work day or on a work day after 0000 hours

While the horizontal plan accumulates the available and required capacities from the beginning, the exception process begins accumulating them again on the day after it issues an exception message.

Since supplier capacity is global, the planning engine issues these exceptions to the owning organization.

The calculation of overload is:

Required Quantity - Cumulative Available Quantity.

The calculation for Cumulative Available Quantity is:

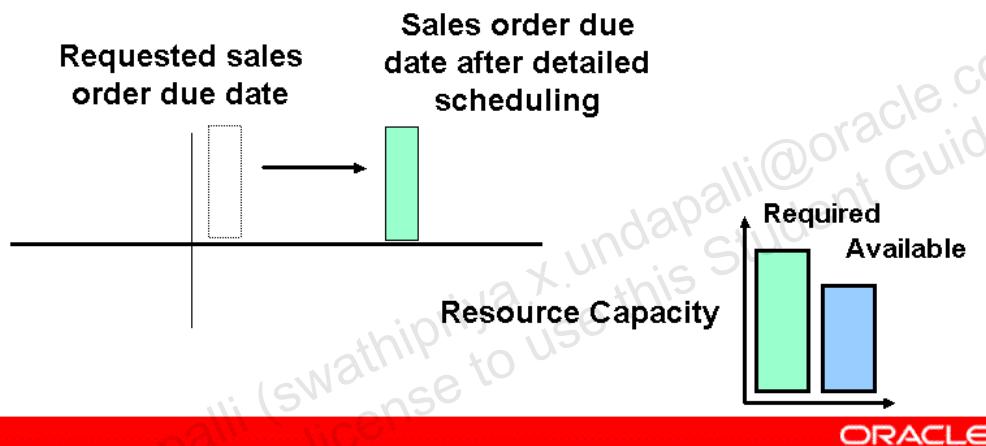
Cumulative supplier capacity - Cumulative quantity already used by other supplies.

The amount already used depends on previously scheduled supplies.

Resource Constraint Exception Message

Resource Constraint Exception Message

This exception appears when the planning engine detects unavailability of resource capacity for a specific time period because of the capacity requirements of an end demand. The overload is the amount of resource capacity needed.



Resource Constraint Exception Message

Exception message Resource constraint is in exception group: Material and resource capacity.

This exception appears when the planning engine detects unavailability of resource capacity for a specific time period because of the capacity requirements of an end demand. The overload is the amount of resource capacity needed.

The planning engine issues this exception if profile option MSO: Calculate Constraint Exceptions is Yes.

When the planning engine performs resource/task allocation for an order, it first tries to schedule demands backward from the demand due dates. If there is not enough resource availability in a planning time bucket for it to schedule an activity to meet the demand due date, it generates this Resource constraint exception for the planning time bucket.

Since the order failed backward scheduling, the planning engine forward schedules the order from the plan start date to realistically allocate the resources/tasks. Therefore, the actual resource requirements may be later than the dates on the exception.

When the planning engine determines the window in which it wants to schedule the operation, it determines if there would be an overload if it schedules the operation. If there would not be any resource overload, the planning engine does not issue the exception. If there would be a

resource overload, the planning engine issues the exception and reports the quantity of the resource constraint as the quantity reported in the exception message.

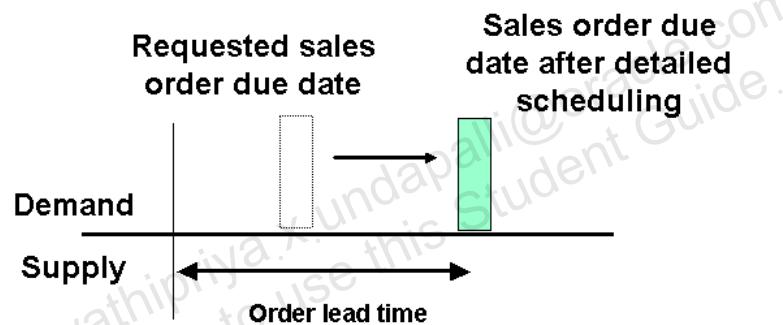
The information displayed for this exception is:

- Resource
- Organization
- Department
- Supply Order Number: Of the operation and resource.
- Order Type
- Item
- Item Description
- Op-seq. number
- Res-Seq number
- From Date: The start date of the planning time bucket in which the resource is overloaded.
- To Date: The end date of the planning time bucket in which the resource is overloaded.
- Resource Requirement
- Resource Capacity: The available capacity of the resource before scheduling the resource.
- Overload: Resource Capacity - Resource Requirement after scheduling the resource.
- To resolve this exception message, consider:
 - Adjusting sales order line schedule date
 - Increasing your resource availability:
 - Increase hours available per unit (overtime)
 - Increase the resource assigned units
 - Increase work days (overtime)
 - Changing shift pattern
 - Using an alternate resource
 - Using an alternate routing
 - Modifying the sourcing rules
 - Subcontracting
 - Using substitute items (with different resources)

Order Lead Time Constraint Exception Message

Order Lead Time Constraint Exception Message

This exception message appears when the planning engine schedules a demand to go late due to an order lead time.



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Order Lead Time Constraint Exception Message

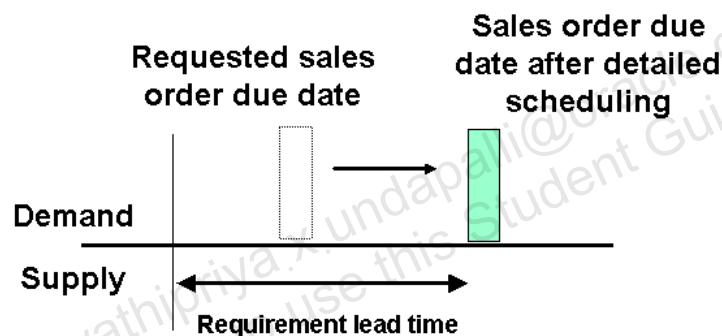
Exception message Order lead time constraint is in exception group: Supply problems for late sales orders and forecasts.

This exception message appears when the planning engine schedules a demand to go late due to an order lead time.

Requirement Lead Time Constraint Exception Message

Requirement Lead Time Constraint Exception Message

This exception message appears when the planning engine schedules a demand to go late due to a resource requirement lead time.



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Requirement Lead Time Constraint Exception Message

Exception message Requirement lead time constraint is in exception group: Supply problems for late sales orders and forecasts.

This exception message appears when the planning engine schedules a demand to go late due to a resource requirement lead time.

Quiz

Quiz

Late Replenishment for Sales Order and Late Replenishment for Forecast exception messages are respected when using Enforce Capacity constraints.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

Which of the following exception messages does not have related exceptions:

- 1. Requirement lead time**
- 2. Late replenishment for sales order**
- 3. Late replenishment for forecast**
- 4. Sales order/forecast at risk**

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Answer: 1. Requirement Lead Time

Topic Overview: Other Information

Topic Overview: Other Information

- Root causes of late demands
- Gantt Charts
- Planning detail report
- Plan comparison report
- Workflow notifications

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Topic Overview: Root Causes of Late Demands

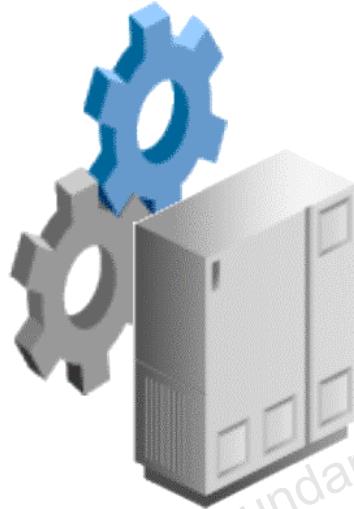
Topic Overview: Root Causes of Late Demands

- **Scheduling process**
- **Dates**
- **Critical activities**
- **Item lead time constraints**
- **Planning time fence constraints**
- **Late demand view**
- **Late demand view: Diagnosis**

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Scheduling Process

Scheduling Process



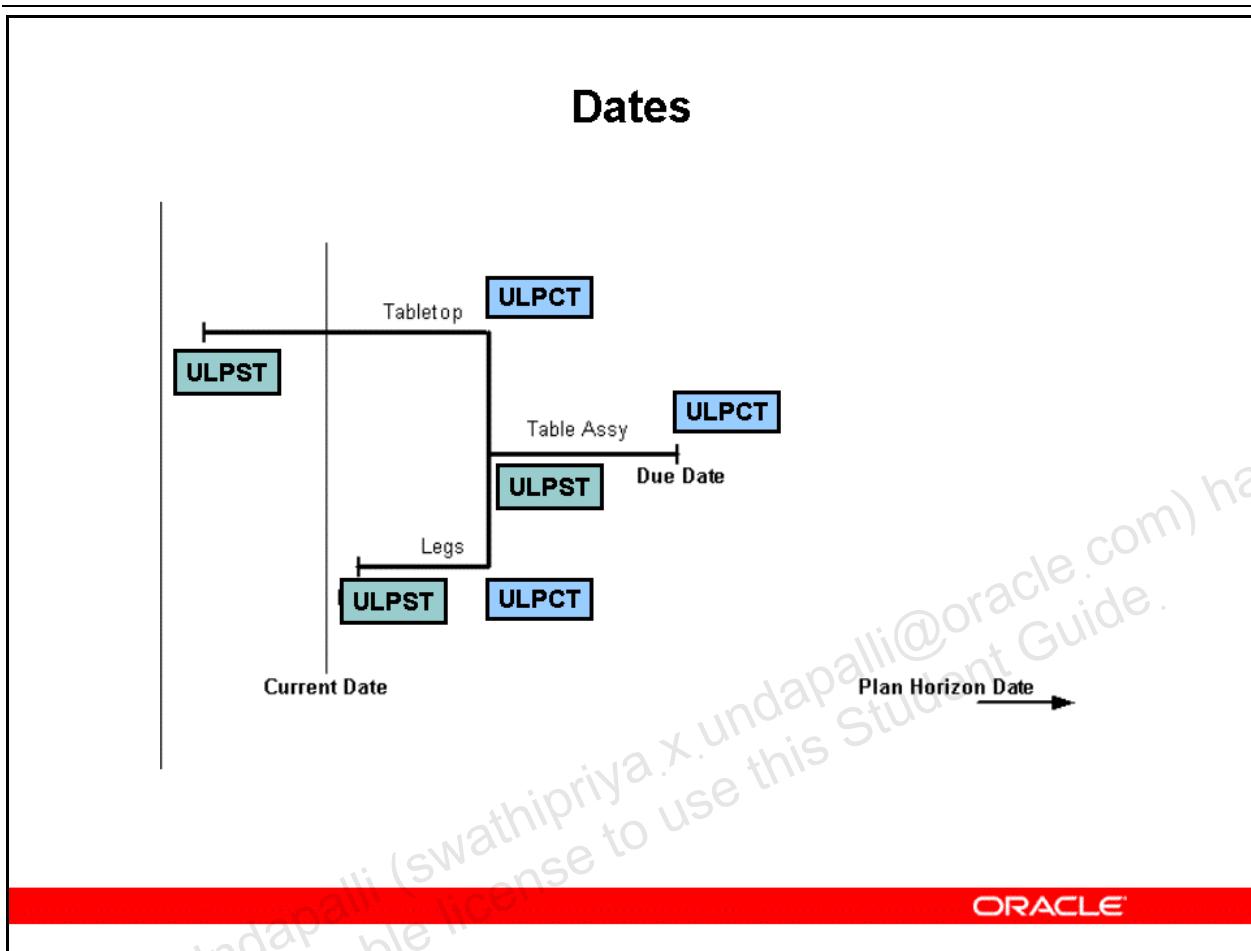
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Scheduling Process

When scheduling, the planning engine:

- Schedules supplies so that, as much as possible, you work on supplies pegged to higher priority demands ahead of supplies pegged to lower priority demands.
- Looks ahead at a certain group of demands and schedules supplies to meet these demands in a single pass.
- Always tries to schedule supplies to be due as late as possible to meet their demands. The scheduling process tends to suggest deliveries and resource work just in time, and only schedules deliveries and resource work to occur early when a constraint forces it to.
- May schedule supplies ahead of their due dates. This can result in higher priority demands completing earlier than their actual due dates and benefiting from additional protection of their delivery dates.

Dates



Dates

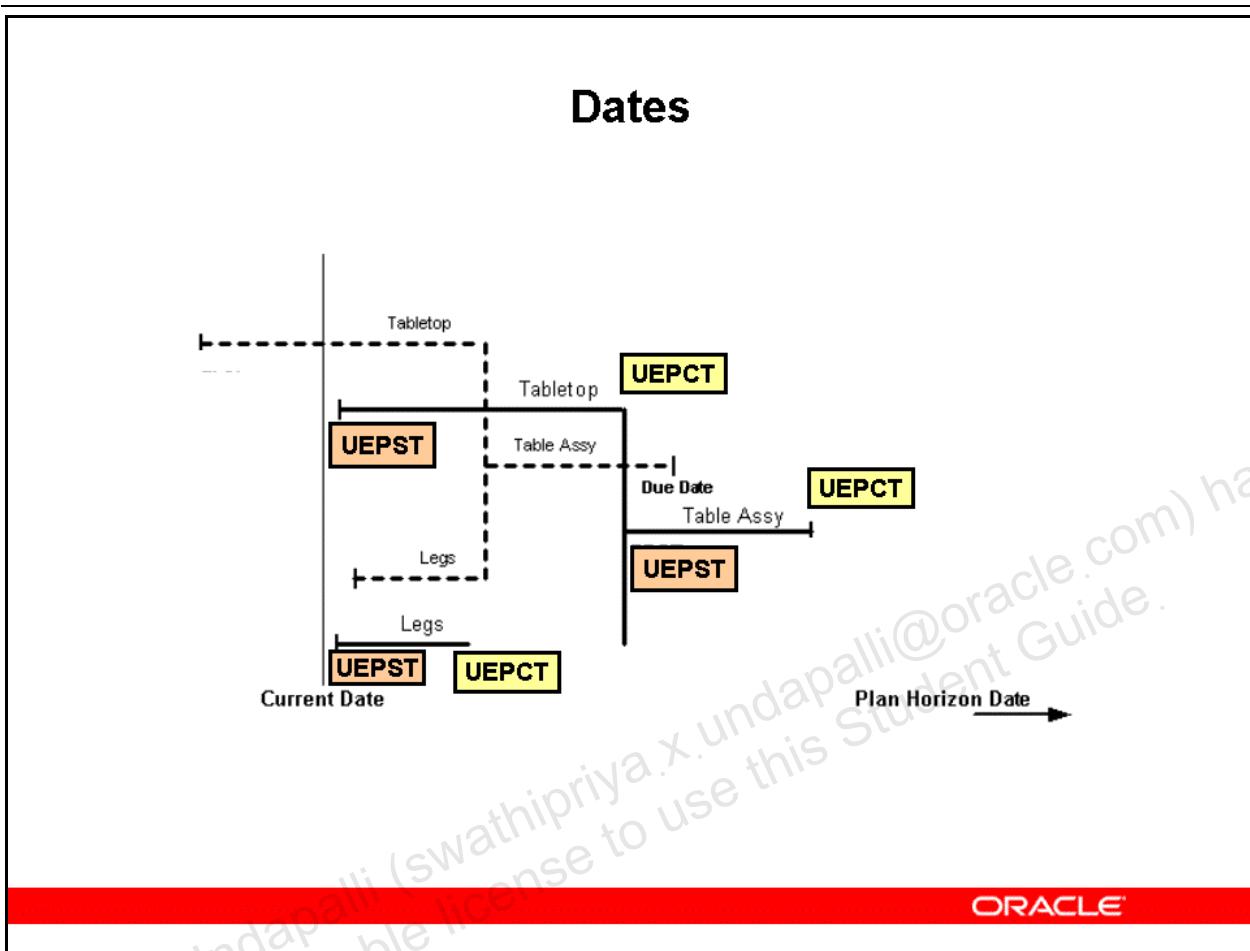
The unconstrained latest possible start time (ULPST) is the time that the activities need to start to meet the demand on time. If the latest possible start time is in the past, the planning engine cannot schedule to meet the demand on time.

The unconstrained latest possible completion time (ULPCT) is the latest date that the operations are complete if they start at the latest possible start time.

These refer to unconstrained scheduling, that is, scheduling without reference to constraints.

This diagram shows the table assembly and its subassemblies backward scheduled from an independent demand due date. The schedule shows each job finishing just in time for its next use; therefore, the beginning of each job is its unconstrained latest possible start time. The unconstrained latest possible start time for the tabletop is in the past.

Dates



Dates

The unconstrained earliest possible start time (UEPST) is the earliest time that the planning engine can schedule the operations to start.

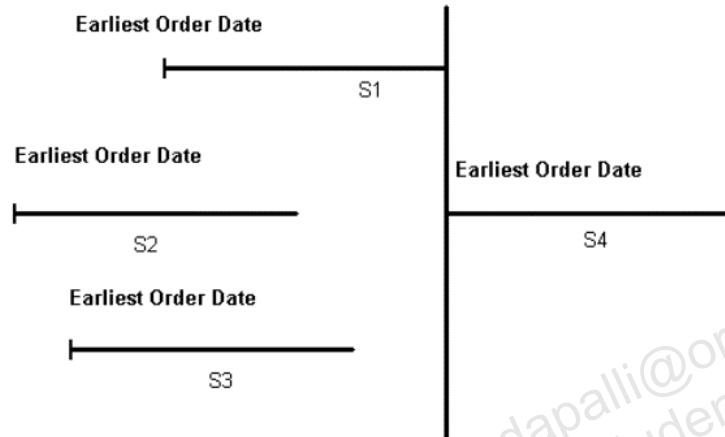
The unconstrained earliest possible completion time (UEPCT) is the earliest date that the operations are complete if they start at the earliest possible start time.

These refer to unconstrained scheduling, that is, scheduling without reference to constraints.

This diagram shows the table assembly and its subassemblies backward scheduled from the demand due date. Since the tabletop latest possible start time is in the past, the planning engine forward schedules each subassembly from the current date (as material and resources are available). The result is the earliest date that the table top demand could be satisfied—only accounting for lead times—which is later than the demand due date. Since the legs subassembly has a shorter lead time than the tabletop assembly, it is finished sooner than the tabletop assembly. The completed legs subassembly remains in work in process or moves to inventory until the table assembly needs it.

Critical Activities

Critical Activities



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Critical Activities

A critical activity is an entity that is:

- Pegged to a late demand.
- One of several activities which are at the same bill of material or pegging level.
- The most constraining at its level. The most constraining activity is the one that most restricts the lower (earliest) bound of the earliest order date of the next highest level supply.

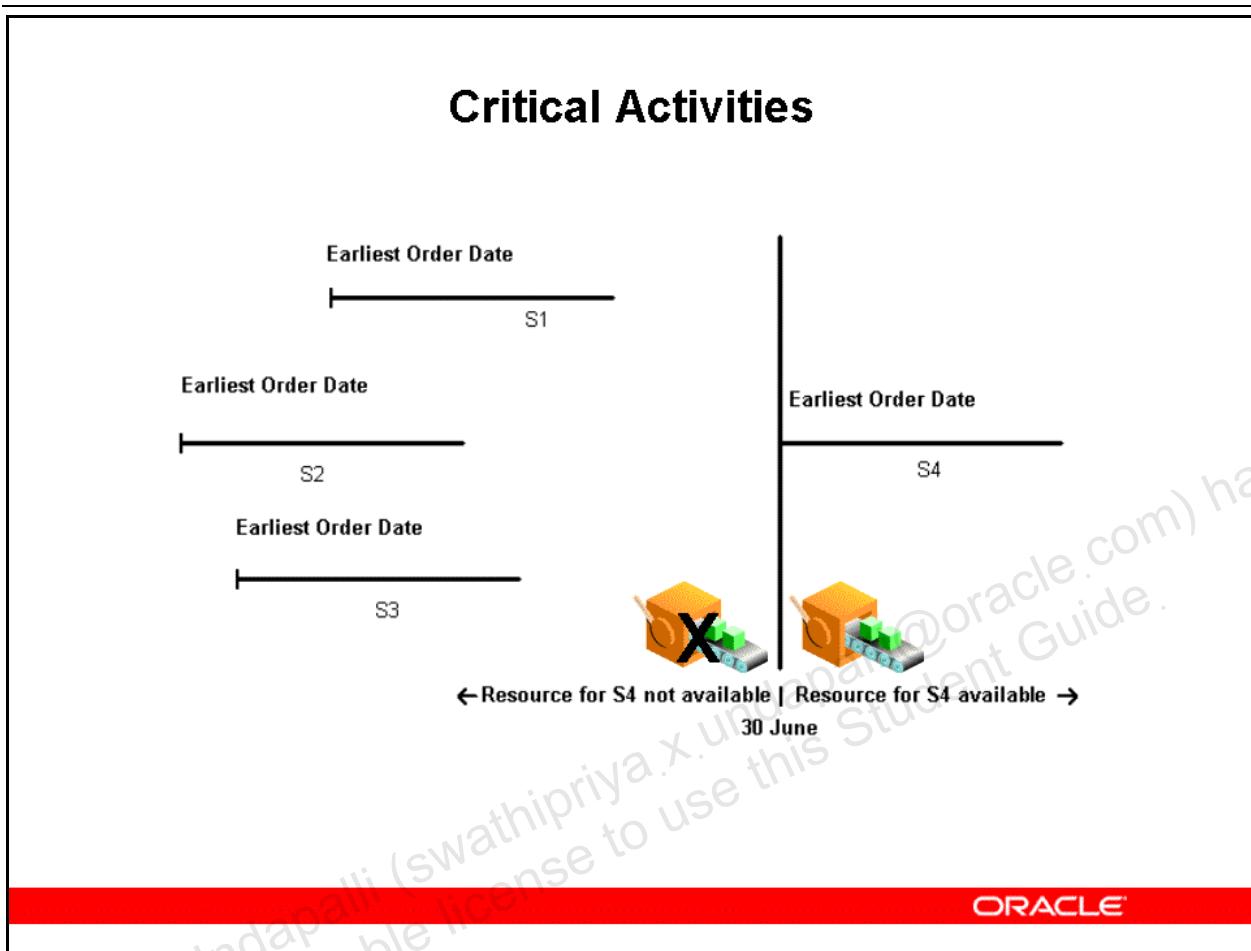
It can be a:

- Specific activity of a resource
- Buy supply
- Transfer supply

This diagram shows three supplies (S1, S2, and S3) pegged to supply S4. The planning engine forward scheduled the supplies. Among the subassemblies, S1 is the critical supply since it determines the earliest order date of supply S4 (the next highest level supply).

In the diagram, the Earliest Order Date refers to the Constrained Earliest Order Date.

Critical Activities



Critical Activities

The critical supply does not always have to have its suggested order date and earliest order date be the same date.

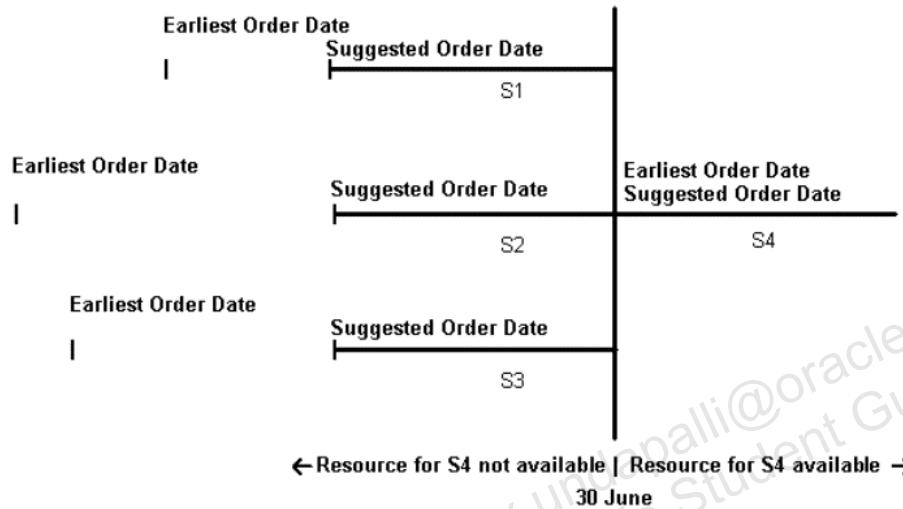
In this diagram, the start date of S4 is determined by a combination of:

- The end date of S1
- The availability of S4's resource

In the diagram, the Earliest Order Date refers to the Constrained Earliest Order Date.

Critical Activities

Critical Activities



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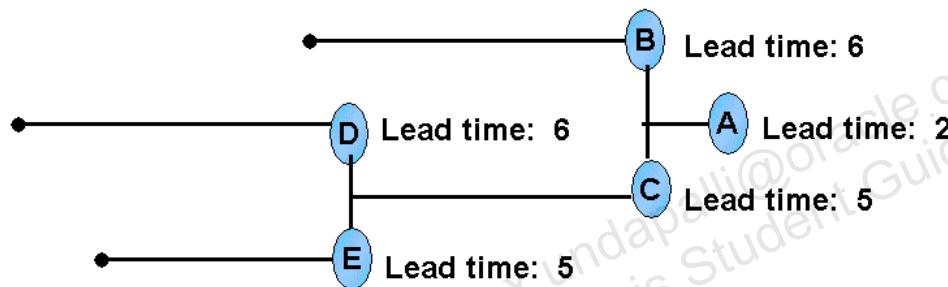
Critical Activities

This diagram shows the final schedule after the planning engine has backward scheduled from the demand satisfied date of supply S4 to minimize work in process and inventory. The planning engine still considers supply S1 as the critical activity.

Item Lead Time Constraints

Item Lead Time Constraints

Item lead times can cause delays in demand satisfaction.



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Item Lead Time Constraints

Item lead times can cause delays in demand satisfaction. For example:

- Tabletops are buy items with the item lead-time of 60 days. For buy items, the order date is offset from the dock date by the pre-processing lead-time plus either the default supplier lead-time or by the default item lead time.
- If there is no supplier assigned with a specific lead time, the forward scheduling process on the late demand supply order schedules the dock date for the tabletop 60 days from the plan start date.

If checking determines that this is the reason for the delay of the order, the planner should correct and firm the scheduled dock date for the planned order and consider adjusting the item and default supplier information for the future.

Types of lead time are:

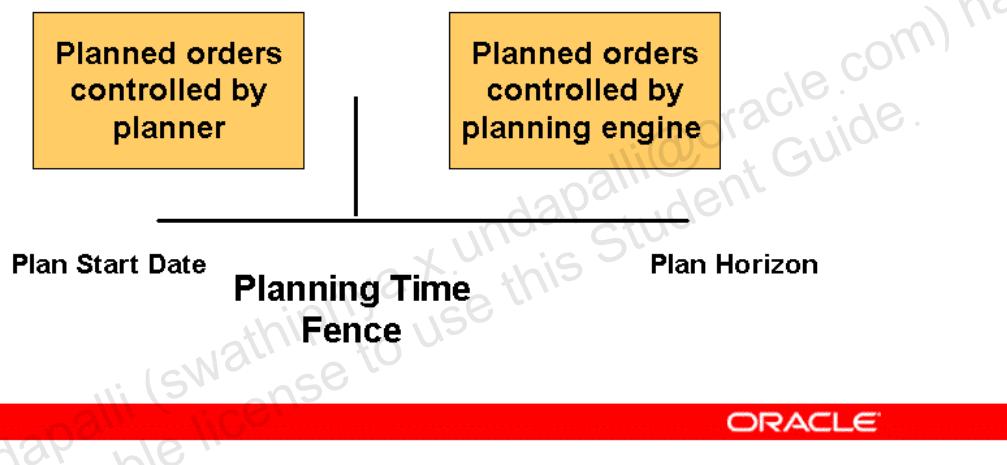
- Preprocessing
- Processing
- Post processing
- Fixed

- Variable
- In-transit
- Total
- Cumulative manufacturing
- Cumulative total

Planning Time Fence Constraints

Planning Time Fence Constraints

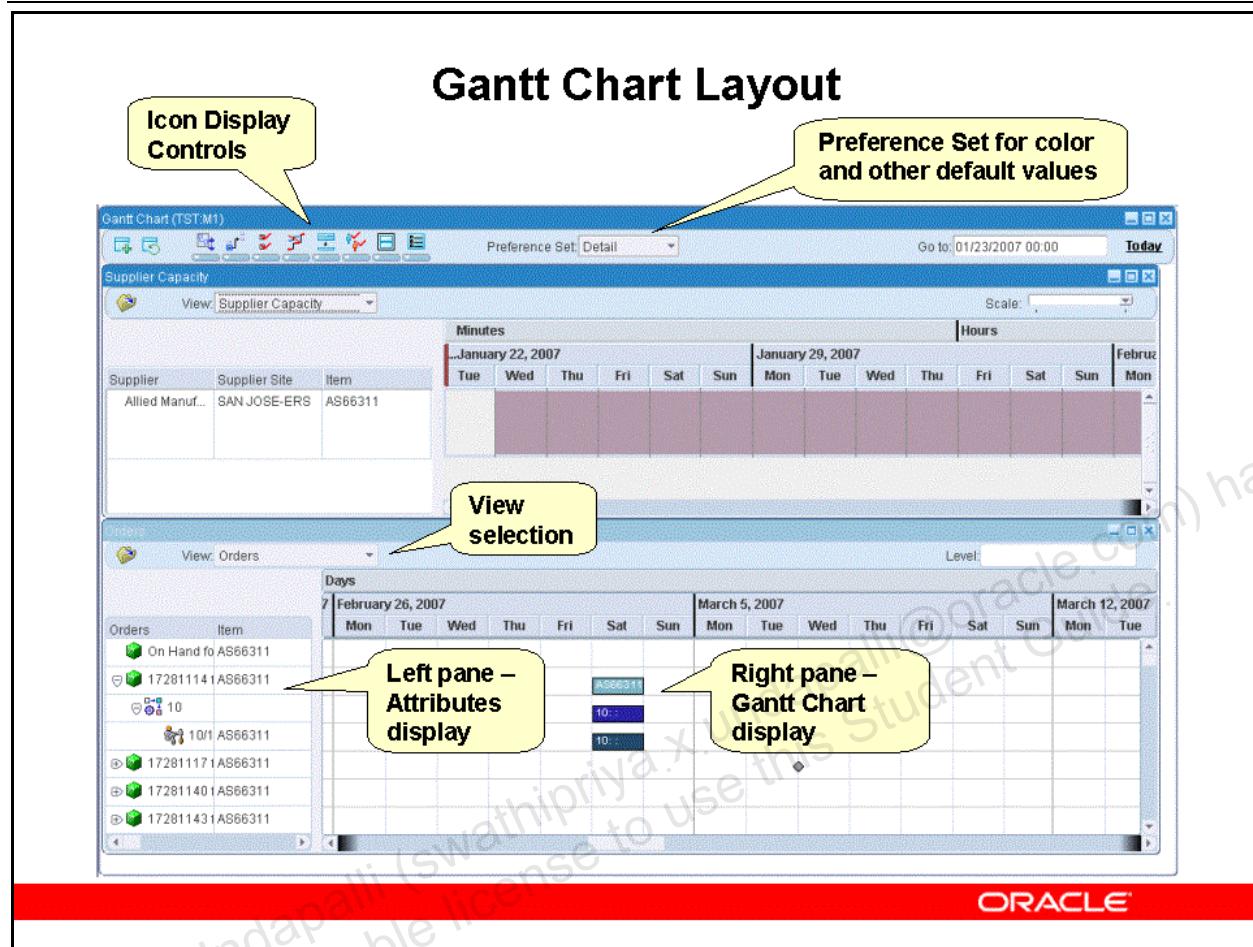
Planned orders outside the planning time fence can be changed by the system planning logic, but changes within the planning time fence must be manually changed by the master scheduler or planner.



Planning Time Fence Constraints

The planning time fence also imposes certain constraints on the scheduling. Planning time fence is the point in time in the scheduling process that marks a boundary inside of which changes to the schedule may adversely affect component schedules, capacity plans, customer deliveries and cost. Therefore, planned orders outside the planning time fence can be changed by the system planning logic, but changes within the planning time fence must be manually changed by the master scheduler or planner. Therefore, if the planning time fence is too large, then the demands cannot be rescheduled within the time fence and may be delayed. The planner should be able to see a 'Reasons for Lateness' report, which details the effect of the planning time fence on the lateness of the order.

Gantt Chart Layout



Gantt Chart Layout

This figure gives an overall perspective of the Gantt chart.

- The row of icons in the top menu bar control the display of information within the Gantt chart.
- The set of colors and other display parameters are stored as part of a preference set that the user can modify
- Two views are currently open. The data content within each view is controlled using Folders. The Gantt chart allows a maximum of two views to be open at the same time
- Folder-controlled display of attributes appear in the left window pane.
- The Gantt chart (task versus time) display appears in the right window pane.

Five Gantt Chart Views

Five Gantt Chart Views

- **Orders**
- **Resource Activities**
- **Resource Hours**
- **Resource Units**
- **Supplier Capacity**

Note: Gantt Views are enabled only for constrained plans.

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Five Views

With Release 12, The Orders view serves the combined purposes of the Orders view and the Late Demand views found in earlier releases. Three Resource views offer unique perspectives on resource loading. The supplier capacity view was added in Release 12.

These enhancements significantly improve usability and power of the Gantt chart with respect to analyzing and modifying the results of an ASCP plan.

Accessing the Gantt Chart Views

Accessing the Gantt Chart Views

- **Navigator**
 - Right click node, **Select Resources > Gantt Chart**
 - Select the Icon
- **Supply**
 - Right click menu, **select Gantt Chart**
- **Resources**
 - **Gantt Chart button**

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Orders View

Orders View

The Orders view displays a list of selected orders, operations, and activities:

- **Supplies and demands**
- **Operations and activities within supplies**
- **Pegging relationships between supplies and the end demand**
- **Critical path and related diagnostic information**

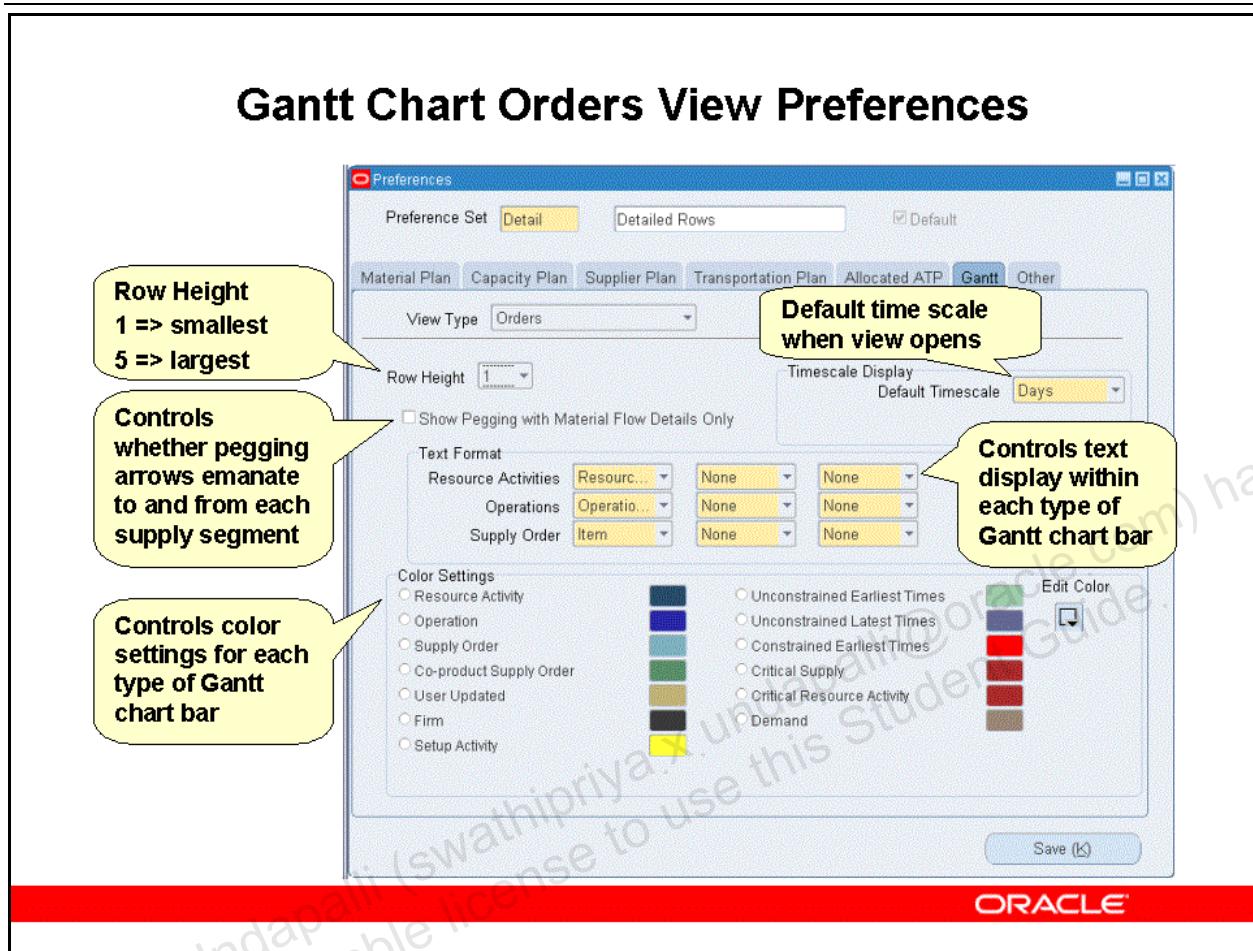
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Orders View

The Orders view shows a list of orders (or supplies), operations within the supplies, and activities within the operations. It shows all supply types, including buy and transfer orders as well as on hand inventory. The Orders view also shows end demands if the user chooses to see how supplies peg to demands, or if the user navigates to this view from a demand.

The user can control display preferences such as the color to be used to display the bars and the text to be displayed within the bars. For more information about preferences, see the module “Planning Information and Planner Workbench” and the practice “Researching Planning Results”.

Gantt Chart Orders View Preferences

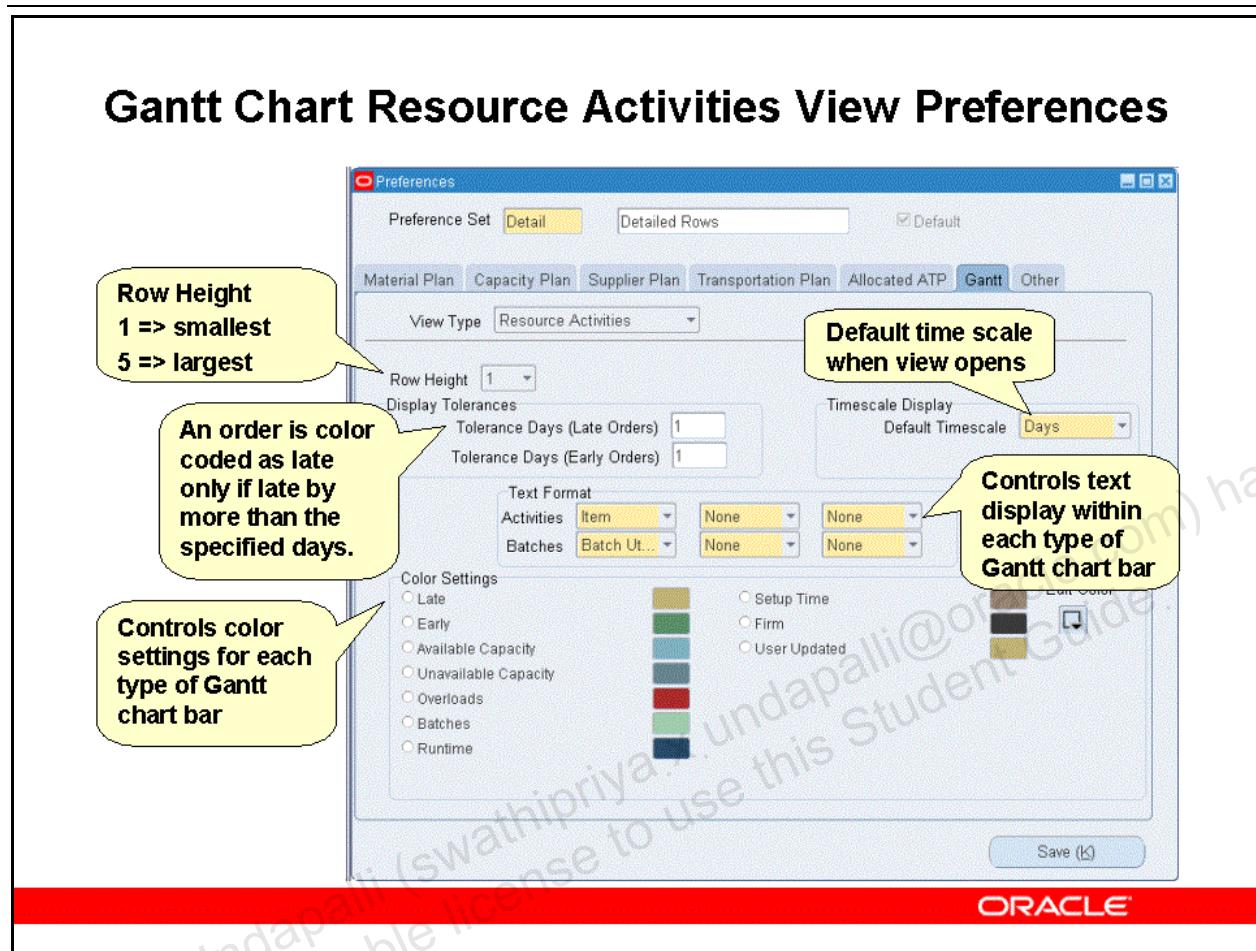


Gantt Chart Preferences

- (N) Supply Chain Plan > Workbench > Tools > Preferences > (T) Gantt Chart > View Type > Orders

In this window you can set the default preferences for display. Select the View Type to be “Orders View” and specify the preferences as explained above.

Gantt Chart Resource Activities View Preferences



Gantt Chart Preferences

- (N) Supply Chain Plan > Workbench > Tools > Preferences > (T) Gantt Chart > View Type > Resource Activities

In this window you can set the default preferences for display. Select the View Type to be “Resource Activities” and specify the preferences as explained above.

Note: These preferences apply only to the Resource Activities View. The List of values for View Type also includes “Resource Hours” and “Resource Units”. Preferences for these other views can be specified separately.

Resource Activities View

Resource Activities View

The Resource Activities view displays activities scheduled on a resource along a horizontal continuous timeline.

- **Activity color coding indicates late, early, or firm status, or an overloaded resource**
- **Display distinguishes:**
 - Changeover activities
 - Batches (a set of resource activities), and
 - Charges (a resource activity broken into segments)
- **Displays resource instances**
 - For Sequence Dependent resources only
- **Displays alternate and simultaneous resources**

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Resource Activities View

The Resource activities view is the typical resource loading Gantt chart that is often seen in finite scheduling applications. It offers a view of all activities scheduled on a resource shown side by side laid out along a horizontal timeline. It is a useful view to analyze resource loads as well as to manually reschedule activities.

Resource Activities View

The Resource Activities View enables the following rescheduling actions:

- Moving an activity along the same resource timeline
- Moving an activity to an alternate resource
- Moving an activity on one instance of sequence-dependent setup resource to another instance

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Resource Activities View Rescheduling Actions

The Resource Activities View displays only the portion of the planning horizon that is scheduled at the Minute level. The schedule level is set in Plan Options.

Resource Hours View

Resource Hours View

The Resource Hours view compares available hours with hours used.

- Access the Resource Hours view from the Resource Activities view
- Rescheduling is not possible within this view
- Bucketed display split between setup time and run time
- Display controls available:
 - Hours:
 - Spent on late orders
 - Spent on early orders
 - Spent on firm orders
 - Overloaded (exceeds available capacity)
 - Height of each row can be interactively resized

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Resource Hours View

To access the Resource Hours view, from the Resource Activities view, open the “View” drop down list, and then select “Resource Hours.”

Resource Hours View

Resource Hours View

- The Gantt Chart display is consistent with plan bucketing.
- The most detailed level of display is “Daily”

Plan Result – Bucket Size	Gantt Chart – Bucket Size
Daily	Daily, Weekly, or Period
Weekly	Weekly or Period
Period	Period

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Resource Hours View

From the Resource activities view, you can access the “View” drop down and select “Resource Hours” to bring up the Resource Hours view

Resource Units View

Resource Units View

The Resource Units view displays the following:

- Capacity profile of the resource
 - A graph of resource units utilized versus continuous time overlays a graph of resource units available
- Height of each row can be resized via drag-and-drop

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Resource Units View

The Resource Units view is useful when analyzing resource loads for resources such as labor that have a large number of available units. For example, your labor pool is comprised of 50 workers, and they can be used in a variety of processes. The Resource Units view of the Gantt chart shows the time-varying picture of consumption of these labor resources.

Notes:

- The Resource Units view displays only the portion of the planning horizon that is scheduled at the Minute level.
- Rescheduling is not possible within the Resource Units view.

Supplier Capacity View

Supplier Capacity View

The Supplier Capacity view displays the following:

- A bucket level view of available capacity and capacity used by supplier
- A line graph showing the accumulation of remaining available capacity
- The view provides the ability to dynamically adjust the scale of display using a slider bar
- Drill downs are possible from each time bucket to detailed information such as Supply and Demand
- If the supplier capacity is infinite (undefined) a dark background color is used

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Supplier Capacity View

The Supplier Capacity view is a useful tool to see the accumulation of supplier capacity that remains after all purchase orders and planned orders have consumed capacity. It also shows how much of capacity in each bucket has been consumed. Drilling down from a bucket shows the supply orders that consume the capacity in that bucket. Note that due to the nature of supplier capacity consumption, it is not necessary that these orders exist in the same bucket on which supplier capacity is consumed by them.

Gantt Chart Interactions Between Two Views

Gantt Chart Interactions Between Two Views

It is possible to pass informational context between 2 open views of the Gantt chart.

- Orders View \leftrightarrow Resource Activities View
- Orders View \leftrightarrow Supplier Capacity View
- Resource Hours View \rightarrow Orders View

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Interactions Between Two Views

Inter-view interactions in the Gantt chart are very valuable in that they allow the user to see the relationships between different functional entities, such as:

- Which orders are processed on this resource;
 - If on a certain day I am using 8 out of 10 hours of capacity on a resource which orders are processed during those 8 hours of resource usage
- Which resources are used in a certain order
- Which orders are present in a certain bucket on which supplier capacity is consumed

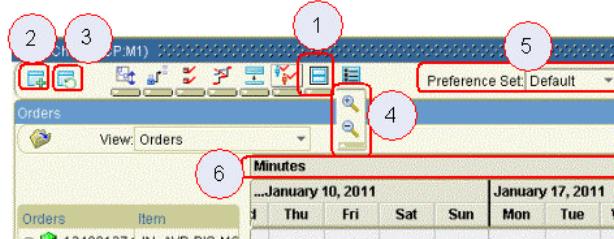
You can:

- Select an order in the Orders View, and select “Show Resources” to see the corresponding resources in the Resource Activities view.
- Select an activity in the Resource activities view, and select “Show Orders” to see the corresponding order (supply) in the orders view.

An activity selected in either view will highlight the same activity in the other view, if present in the visible portion of the display in that other view.

Other Capabilities

Other Capabilities



1. **Tile:** Tile the open windows
2. **New:** open a fresh view in the Gantt chart
3. **Refresh:** refresh the contents after performing a batch replan
4. **Zoom In and Out:** to zoom in or out on the timeline
5. **Preference Sets:** to maintain different sets of user preferences
6. **Display planning granularity different from viewing granularity**

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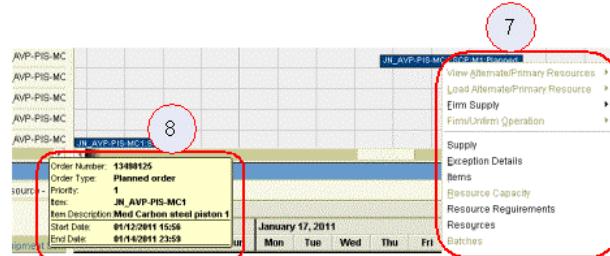
Additional Features

Following are some additional features that improve usability:

1. **Tile:** Tile the open windows – Useful when 2 views are open at the same time
2. **New:** open a fresh view in the Gantt chart
3. **Refresh:** Refresh the contents after performing a batch replan
4. **Zoom In and Out:** To zoom in or out on the timeline. Note that each open view has independent zoom controls. Using the icons will zoom the active view
5. **Preference Sets:** To maintain different sets of user preferences
6. Display of the planning granularity as different from the viewing granularity – For example you might be looking at a portion of the planning horizon that is scheduled to the minute level but you may be viewing the results in daily buckets

Other Capabilities

Other Capabilities



7. Use of right-clicks to access more detailed information
8. Mouse over displays on all bars and arrows

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Additional Features (continued)

7. Use of right-clicks to access more detailed information
8. Mouse over displays on all bars and arrows

Gantt Chart Summary

Gantt Chart Summary

- Ability to show related data side by side
 - Orders and resources
 - Orders and suppliers
- Peg up and down actions
- Folder capability in the left pane
- Three views showing resource related information
 - Display batches and charges in the Resource View
- Orders view
- Supplier Capacity view

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ASCP Gantt Chart Benefits

- Improved user experience
- Increased Planner productivity
- Better diagnosis of ASCP planning results

Planning Detail Report

Planning Detail Report

- **Plan details**
- **Item details**
- **Resource details**
- **Vertical plan**
- **Late order exceptions**
- **Other exceptions**

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Planning Detail Report

The Planning Detail Report provides a simple and consolidated report that shows the output of the advanced supply chain planning process. The report gives detailed information to help you understand and analyze the supply chain planning results by presenting the data selectively and coherently. For a given Supply Chain Plan, the report includes the relevant details about items, resources, gross requirements, scheduled receipts, planned orders, plan constraints, and exceptions in separate worksheets.

The Planning Detail Report contains six worksheets:

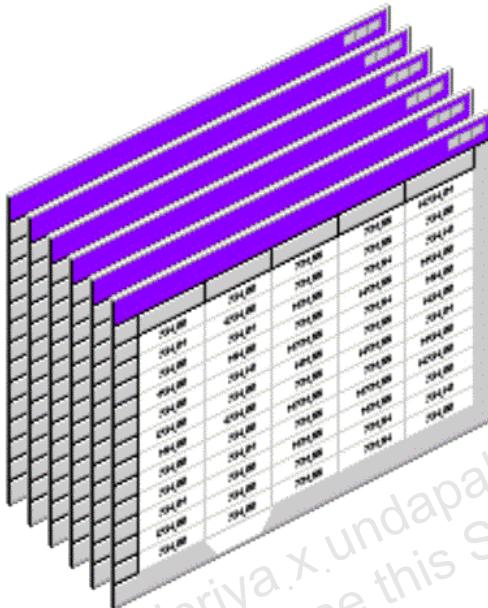
- **Plan Details** - shows the details of the selected plan from the ASCP plan options screen
- **Item Details** - shows the details of the selected items
- **Resource Details** - shows the details of the selected resources
- **Vertical Plan** - shows the cumulative supply/demand picture (No buckets)
- **Late Order Exceptions** - Shows the details of late orders. Only the following exceptions are included in the Late Orders Exception Worksheet:
 - Past Due Sales Order and Forecast
 - Late supply pegged to sales order or forecast

- Late replenishments for sales order or forecast
- Replenishment after need date
- Past Due orders
- **Other Exceptions-** shows the material and resource related exceptions that span the following exception groups:
 - Material and resource capacity constraints
 - Shortages and Excess

You can specify the details you need to see in the report. For example, you can choose not to see a particular worksheet, and you can control the display by selecting the sorting rule. For example, if a report shows material and capacity constraints, you can sort the data on the basis of items or exceptions. A column can be removed from a worksheet, but if the new format (with the deleted column) is saved by any one user, other users would also not be able to view that column.

Plan Comparison Report

Plan Comparison Report



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Plan Comparison Report

If you rerun a plan or run a new plan after making changes or simulated changes, you can compare two plans to find out why the two plans differ. This is useful for determining if:

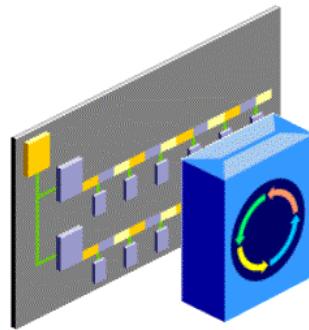
- Actions taken by a planner to solve a specific problem have the desired overall effect
 - For example, a planner may choose to address a late sales order by increasing the priority of the sales order, and then replanning (generating a new plan in the process). By comparing the new plan to the original plan, the planner can see whether the problem sales order is now on time, and whether any other sales orders may have been pushed out as a result of pulling in the problem sales order.
- Plan setup changes led to changes in key indicator performance. You can compare the plan option settings for two plans.

To compare two plans:

- Specify criteria for comparison attributes (preference sets) and the comparison display (filtering criteria)
- Select the plans to compare and view the comparison; you can drill down from exception group comparison to exception type comparison to exception details comparison.

Workflow Notifications

Workflow Notifications



Oracle Workflow

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Workflow Notifications

You can automate the processing of exceptions which lets you take corrective action more quickly and efficiently, driving overhead costs out of your process.

Using Oracle Workflow, you can automatically forward exceptions to your trading partners. They can research and respond to exceptions through self-service web applications including forecast maintenance, supplier capacity update, ATP, and a secured version of the Planner Workbench. Trading partner responses can trigger other workflow activities such as a notification or an automatic reschedule of a purchase order or sales order.

You can define the process that a Workflow Notification should follow which includes the routing for the exception notifications, actions available to the recipient of the notifications, and the approval steps. The messages can be viewed either in Applications or via e-mail. Certain response actions may be required.

Quiz

Quiz

When scheduling, the planning engine may schedule supplies ahead of their due dates.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

Correcting and firming the scheduled dock date for the planned order and adjusting the item and default supplier information is a solution to which type of constraints?

- 1. Planning Time Fence**
- 2. Supply**
- 3. Item Lead Time**
- 4. Demand**

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Answer: 3. Item Lead Time

Quiz

Quiz

Which Gantt chart view would you use to move an activity along the same resource timeline, or move an activity to an alternate resource?

- 1. Orders**
- 2. Resource Activities**
- 3. Resource Hours**
- 4. Resource Units**
- 5. Supplier Capacity**

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Answer: 2. Resource Activities

Quiz

Quiz

Which Gantt chart view would you use to analyze resource loads for resources such as labor that have a large number of available units?

- 1. Orders**
- 2. Resource Activities**
- 3. Resource Hours**
- 4. Resource Units**
- 5. Supplier Capacity**

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Answer: 4. Resource Units

Topic Overview: Details I

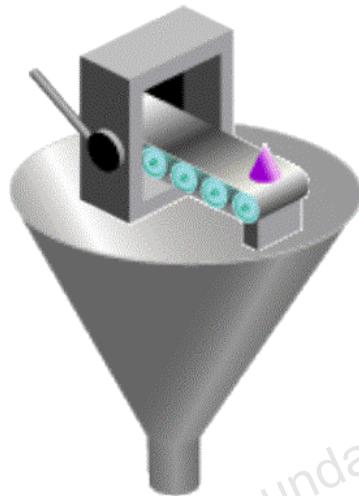
Topic Overview: Details I

- **Bottleneck resources**
- **Enforced and non-enforced constraints**
- **Flexible shift times: Day bucket**
- **Flexible shift times: Hour bucket**
- **Flexible shift times: Minute bucket**
- **Firm work orders**

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Bottleneck Resources

Bottleneck Resources



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Bottleneck Resources

If you plan using a bottleneck resource group, the planning engine schedules all resources but schedules resources in the bottleneck resource group differently than it schedules resources not in the bottleneck resource group.

For resources in the bottleneck resource group, it performs the usual detailed scheduling referring to the constraint planning options that you selected.

For resources not in the bottleneck resource group, it schedules activities and operations:

- When needed
- Based on the required duration (Resource usage and Assigned units)
- Without regard to resource capacity. If its actions overload resource capacity, it issues Resource overloaded exception messages.
- Without regard to the plan option Resource Constraints.

Enforced and Non-enforced Constraints

Enforced and Non-enforced Constraints



Enforced

Non-Enforced

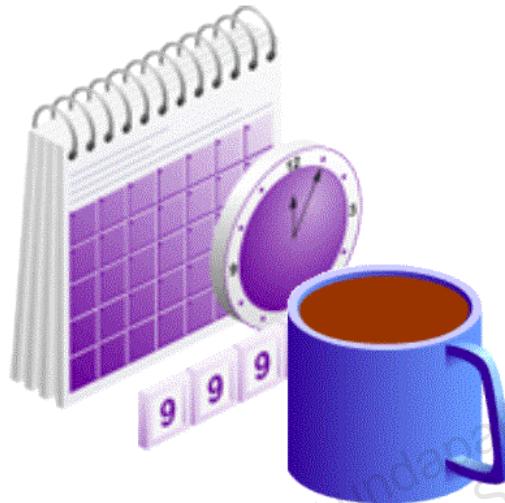
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Enforced and Non-enforced Constraints

If you launch an enforce capacity constraints plan without enforcing resource constraints, the planning engine can overload resources but cannot compress time.

Flexible Shift Times: Day Bucket

Flexible Shift Times: Day Bucket



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Flexible Shift Times: Day Bucket

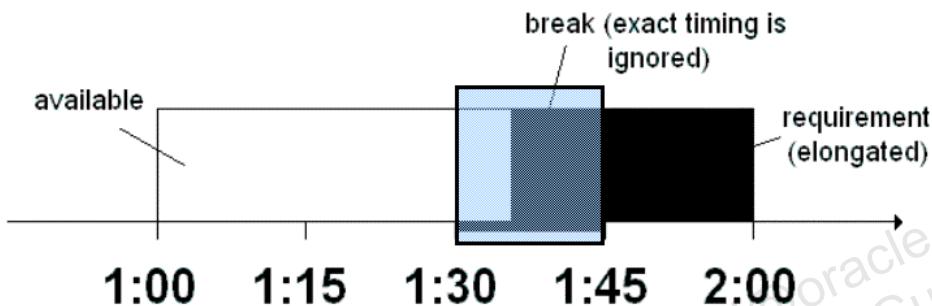
This feature enables planners to plan resource shift start and end times at any minute within the hour. This feature enables ASCP to handle aggregate planning and detailed scheduling concurrently and to accurately schedule resources down to the minute time level.

Flexible shift times means that, in daily or hourly buckets, the scheduling process considers total time in the bucket without regard to the exact minute of activity start and stop times; that is, within the bucket, it schedules time flexibly.

For example, a daily bucket has breaks at 4:00-5:00, 12:00-13:00 and 20:00-21:00. A 2-hour operation in that bucket would be stretched into a $2 / (21/24) = 2.29$ -hour operation. The exact timing of breaks within this day-level planning bucket is ignored. This solution maintains as much scheduling accuracy as possible when more aggregate (time-bucketed) planning is being done. In comparison, in the minute planning bucket, the operation would take exactly 2 hours and would not be scheduled within a break.

Flexible Shift Times: Hour Bucket

Flexible Shift Times: Hour Bucket



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Flexible Shift Times: Hour Bucket

Consider a one-hour portion of the planning horizon (1:00 - 2:00). Within this period there is a resource break of 15 minutes (1:30-1:45). The size of the planning time bucket is 1 hour.

ASCP calculates an elongation factor for this period that is equal to the ratio of working time within the period to the total duration of the period.

- Elongation factor = $(60 - 15) / 60 = 0.75$

If there is a resource requirement of 18 minutes, due at 2:00, by using the elongation factor, the requirement duration is calculated to be:

- Requirement duration = $18 / 0.75 = 24$ minutes

The requirement start time is therefore set to requirement end time (2:00) minus 24 minutes:

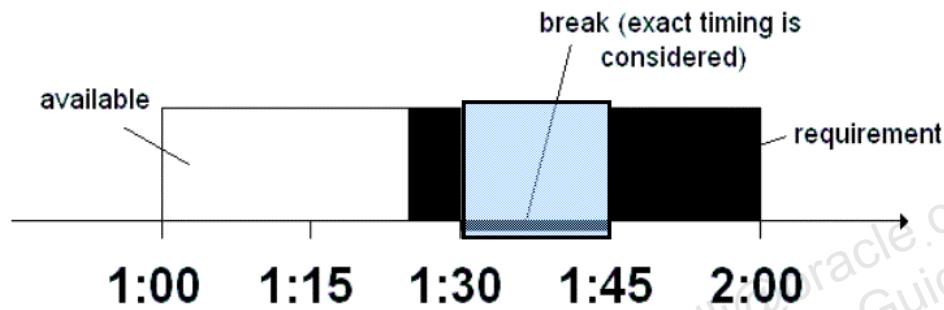
- Requirement start time = 1:36

The figure is an example of how a resource break is scheduled for when the planning time bucket size is one hour.

Note that the requirement is scheduled to start in the middle of the resource break; the exact timing of the resource break is ignored. This is an approximation that ASCP makes in any time bucket of size 1 hour or more. It allows for as much scheduling accuracy as possible while planning at more aggregate time levels.

Flexible Shift Times: Minute Bucket

Flexible Shift Times: Minute Bucket



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Flexible Shift Times: Minute Bucket

Consider the same one-hour portion of the planning horizon (1:00 - 2:00), with the same resource break of 15 minutes (1:30-1:45). In this example, the size of the planning time bucket is 1 minute (the smallest permitted by ASCP).

Once again there is a resource requirement of 18 minutes, due at 2:00.

Since this is the minute-by-minute detailed scheduling portion of the plan horizon, break start and end times are accounted for down to the nearest minute. An elongation factor is not used.

The requirement start time is calculated to be 1:27.

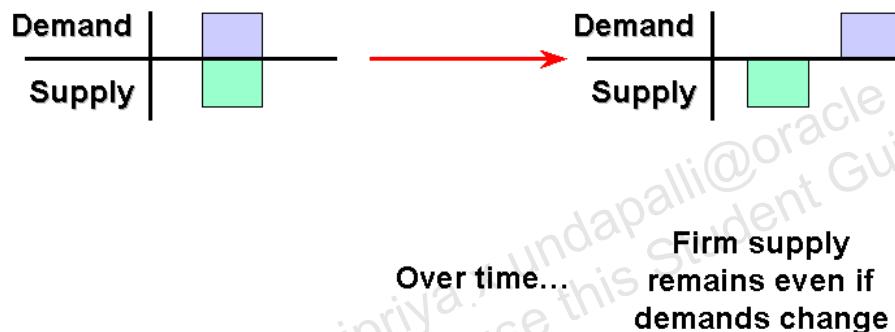
The figure is an example of how a resource break is scheduled for when the planning time bucket size is one minute.

This allows for 3 of the 18 minutes of work to be done before the break (1:27 to 1:30), then the remaining 15 minutes of work to be done after the break (1:45 to 2:00). No work is scheduled during the break.

Firm Work Orders

Firm Work Orders

The planning engine does not change firm work order operation start and end times and resource usages.



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Firm Work Orders

Firm work orders are work orders that are:

- Under the control of a shop floor manufacturing application
- Marked as do not change by shop-floor or planning personnel

The planning engine does not change firm work order operation start and end times and resource usages. However, it calculates firm work order resource requirements and reduces resource availability by these requirements (processes firm work orders).

The planning engine processes firm work orders before it schedules non-firm work orders and planned orders. It does this without regard to the demand priorities. After it processes firm work orders, it schedules non-firm work orders and planned orders in the manner prescribed by the plan options and profile options.

Quiz

Quiz

The planning engine schedules resources in the bottleneck resource group differently than it schedules resources not in the bottleneck resource group.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

The planning engine does not change firm work order operation start and end times and resource usages.

- 1. True**
- 2. False**

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Answer: 1. True

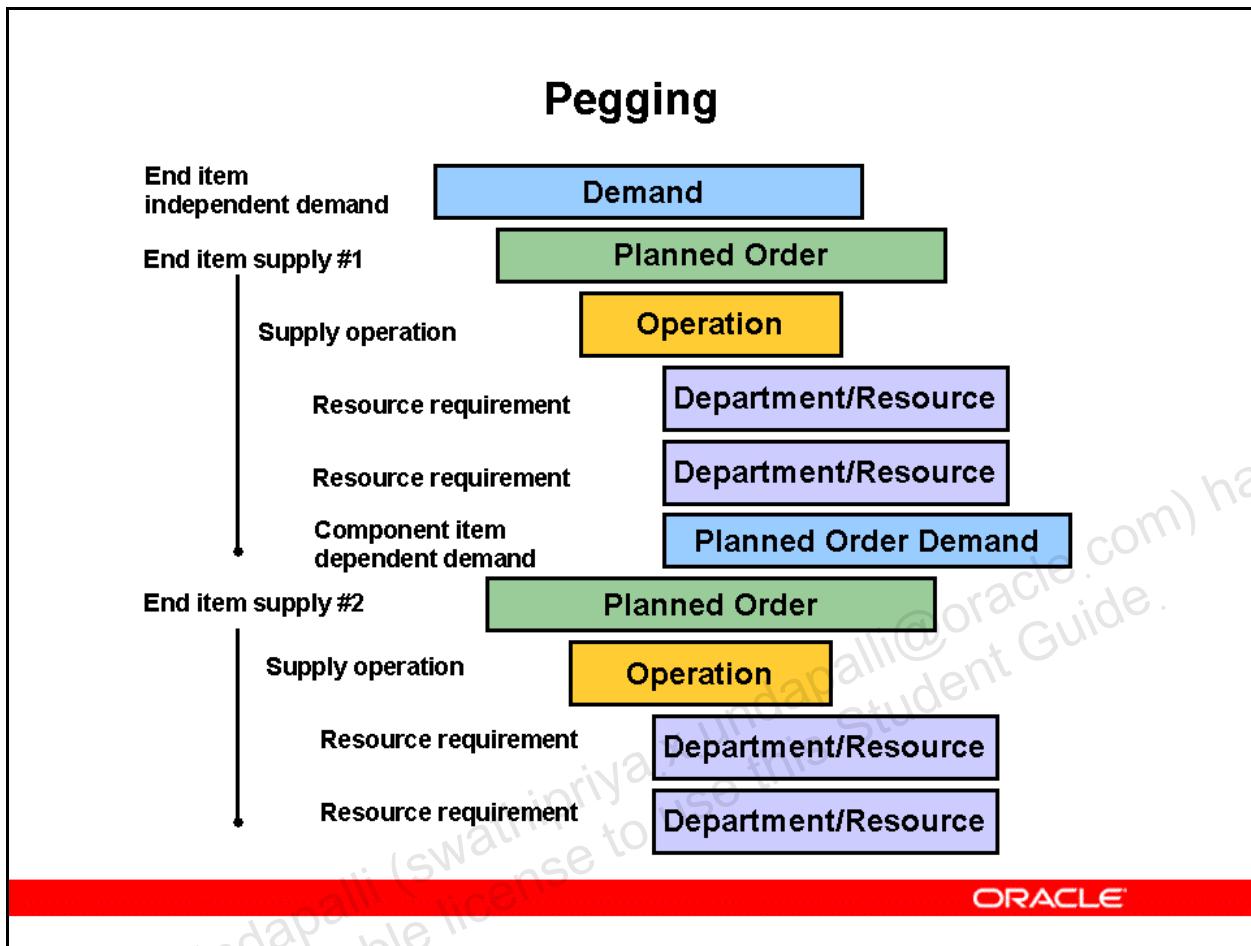
Topic Overview: Details II

Topic Overview: Details II

- **Pegging**
 - Modes
 - Standard
 - Priority
- **Network routings**

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Pegging



Pegging

Pegging is a process that the planning engine uses to link:

- Supplies to demands: All the way up to the top-level independent demand.
- Demands to supplies: All the way down to the bottom-level purchased component supply.

Use pegging to:

- Trace a purchased component or subassembly shortage to the sales orders and forecasts that are affected.
- Prioritize critical material and capacity resources.
- Analyze the impact of changing a supply or demand

Pegging plays a major role in determining the sequence in which demands are satisfied. For some pegging modes, the planning engine:

- Groups supplies and demands into time windows
- Sorts supplies by type
- Pegs by demand priority or randomly within time windows

In performing the pegging process, the planning engine selects demands and locates supplies to peg those demands to. Therefore, we say that the pegging process pegs demands to supplies.

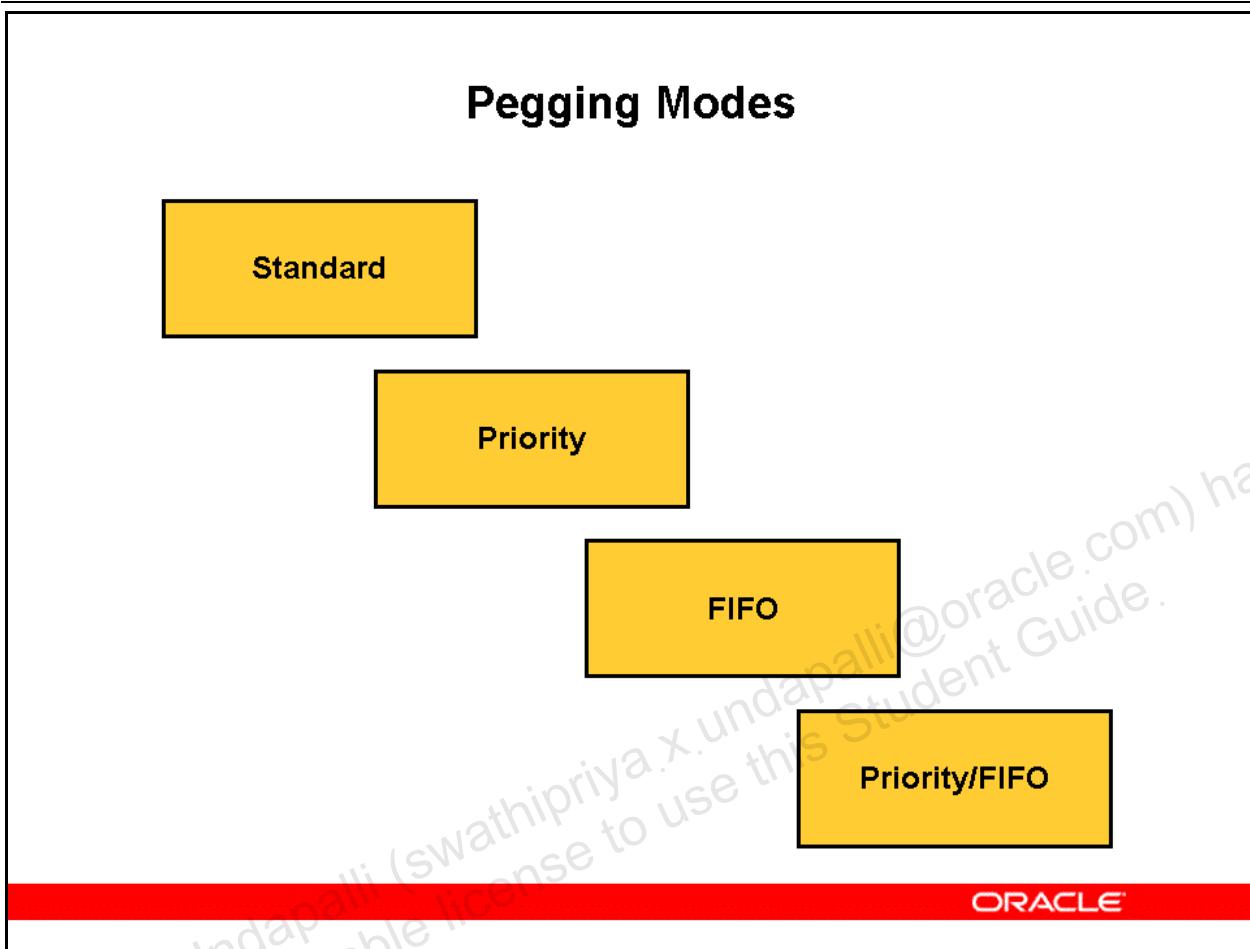
However, when some people think of pegging, they think of supplies pegged to demands. When discussing the results of the pegging process, you can correctly say either that demands peg to supplies or that supplies peg to demands. The diagrams in this course use arrows which indicate the supplies that peg to particular demands.

To use pegging, you must enable it for the items and for the plan. Since pegging is required for constrained planning, it is enabled by default in constrained plans. The planning engine pegs in several ways (pegging modes). For certain modes, you specify information to instruct the planning engine.

The planning engine pegs each item after the netting process. It begins with all of the items in the highest bill of material level and proceeds level by level to the lowest bill of material level.

The planning engine passes independent demand priorities to discrete job and planned order dependent demands to which they peg. Planned order dependent demands have lower priority than discrete job dependent demands at the same bill of material level.

Pegging Modes

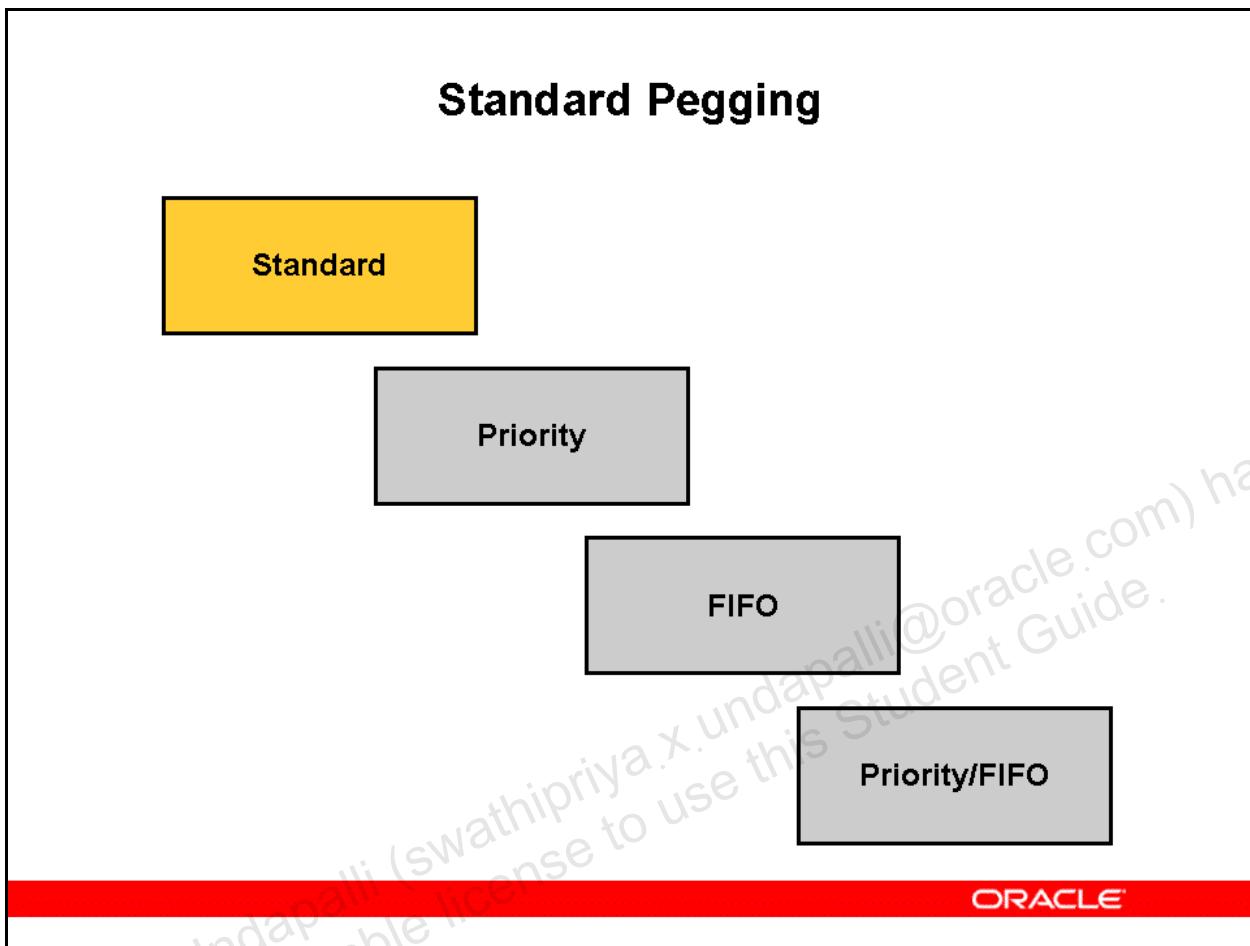


Pegging Modes

You can choose from the following types of pegging:

- **Standard pegging:** Demands and supplies are grouped by day. Within each day, the demands are sorted by priority and the supplies are sorted by type.
- **Priority pegging:** Priority pegging pegs demands first to on-hand and firm supplies then continues with other existing and non-firm supplies. It controls the trade-off between holding inventory or satisfying lower priority demands. Demands and supplies are not necessarily grouped by days; grouping windows may be longer than one day.
- **FIFO pegging:** FIFO pegging pegs demands to supplies on a day-by-day basis. FIFO pegging does group demands and supplies by day like standard pegging, it does not have a pass for firm supplies like priority pegging, and does not sort supplies by type like standard pegging.
- **Priority/FIFO pegging:** The planning engine uses a combination of priority pegging and FIFO pegging methods. It does peg demands first to on-hand like priority pegging but does not prioritize beyond the firm supplies like FIFO pegging.

Standard Pegging



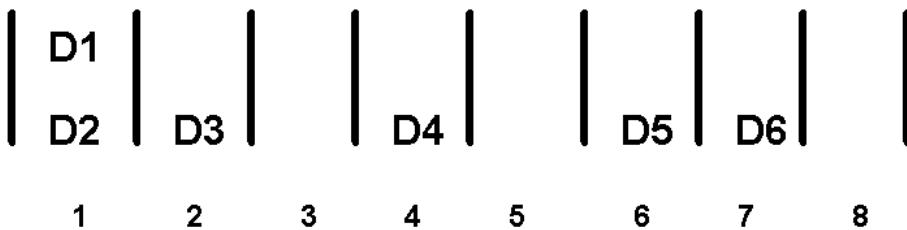
Standard Pegging

Standard pegging groups demands and supplies into days, sorts supplies by type, sorts demands by priority, then pegs within the day.

The standard pegging process makes two passes through the demands and supplies.

Standard Pegging: First Pass

Standard Pegging: First Pass



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Standard Pegging: First Pass

The planning engine groups demands into daily windows. It does not use profile option MSO: Demand Window Size. The first window starts at the first demand date and the last window ends at the end of the planning horizon.

For example, the demand window size is 1 day, the first demand is due on day 5. The first demand window is from day 5 to day 5, the second demand window is from day 6 to day 6, and the third demand window is from day 7 to day 7.

Demands in each window are sorted by demand priority in ascending order.

The planning engine groups supplies into daily windows. It does not use profile option MSO: Supply Window Size. The first window starts at the first supply availability date and the last window ends at the end of the planning horizon.

For example, the supply window size is 1 day, the first supply is available on day 7. The first supply window is from day 7 to day 7, the second supply window is from day 8 to day 8, and the third supply window is from day 9 to day 9.

Supplies in each window are sorted by type using the following order:

1. Firm supplies
 - a. On-hand

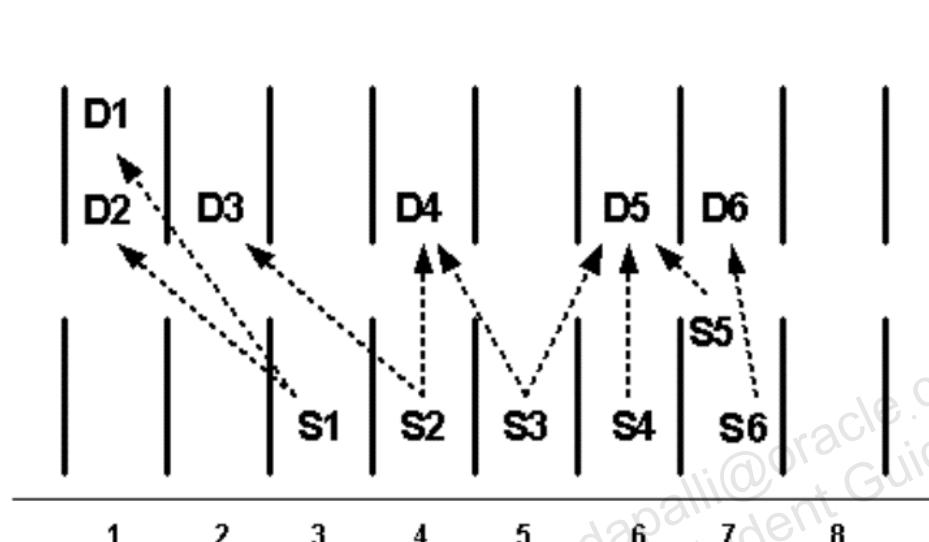
- b. Receipt shipment, intransit shipment, payback supply (Oracle Project Scheduling)
 - c. Work order (firm), job by-product supply (firm), purchase order (firm), non-standard jobs, non-standard job by-product supply (always considered firm)
 - d. Purchase requisition (firm)
2. Existing supplies
 - a. Work order (non-firm), job by-product Supply (non-firm), repetitive schedule, repetitive schedule by-product supply, flow schedule, flow schedule by-product supply, purchase order (non-firm)
 - b. Purchase requisition (non-firm)
 3. Planned supplies
 - a. Planned order (firm), planned order by-product supply (firm). You can raise the pegging priority of firm planned orders by releasing them.
 - b. Planned order (non-firm), planned order by-product supply (non-firm)

The supplies in each type are sorted as follows:

- On-hand: Lot expiration date and then quantity in ascending order to use expiring lots first. A demand pegging to an expiring lot must have its demand date earlier than the lot expiration date; therefore, some expiring lots may not peg.
- Firm: By date in ascending order within each type.
- Non-firm: By quantity in ascending order within each type.

Standard Pegging: Second Pass

Standard Pegging: Second Pass



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Standard Pegging: Second Pass

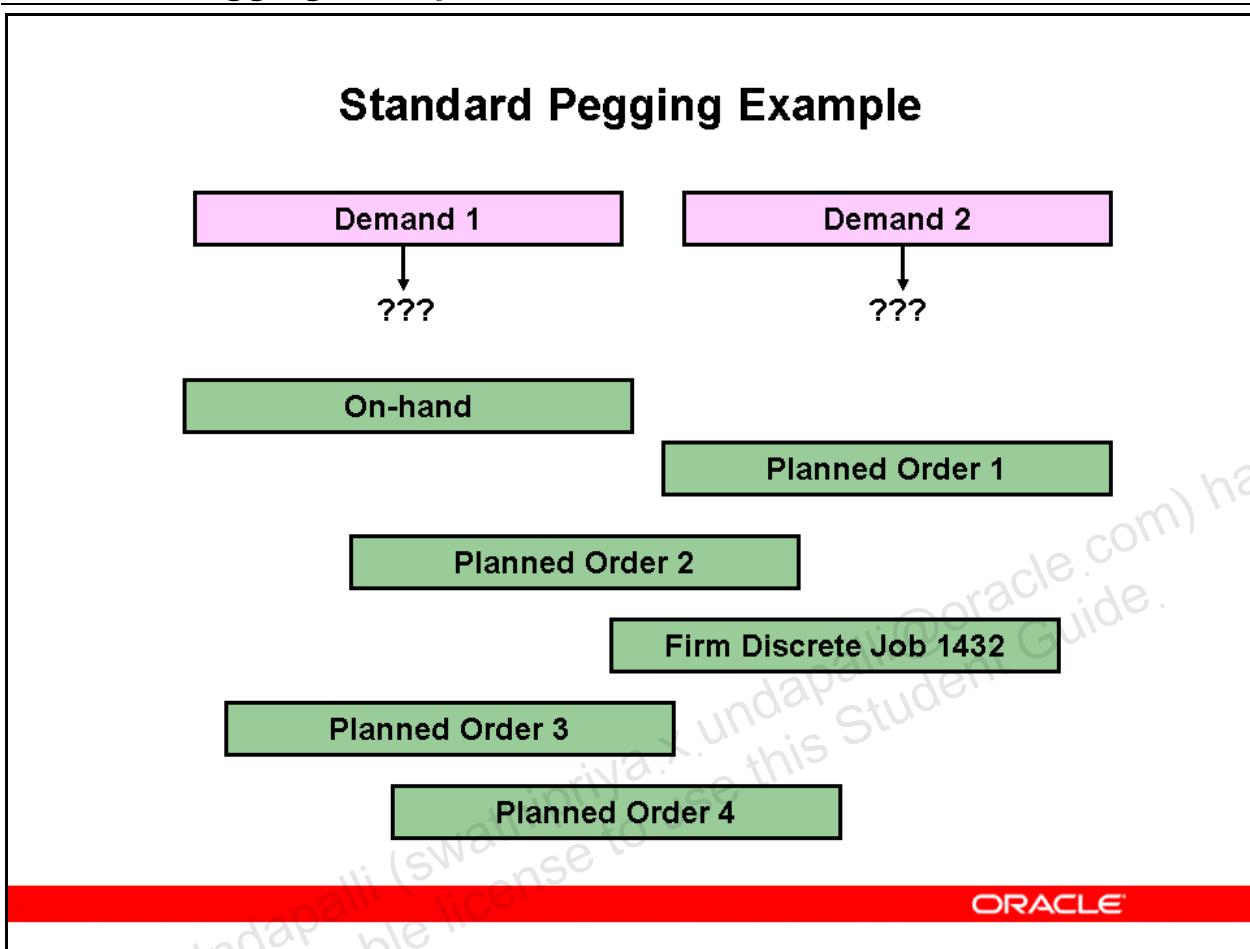
The planning engine begins from the first demand window and pegs demands by demand priority to supplies of the first supply window. If necessary, it continues the pegging process with the next supply window.

As all demands in the each demand window are pegged, it moves to the next demand window and pegs as it did in the first demand window

Unpegged supplies are posted to excess.

In this example, demands D1 and D2 are sorted by priority in ascending order and supplies S5 and S6 are sorted by type. Pegged entities are connected by arrows.

Standard Pegging Example



Standard Pegging Example

This example shows standard pegging for two items. It begins with various settings and then shows the pegging for each item.

Profile option MSC: Use FIFO Pegging is No.

Plan option Peg Supplies by Demand Priority: Cleared.

In standard pegging, the planning engine uses 1 as the value for MSO: Demand Window Size and MSO: Supply Window Size and ignores the entered values.

Standard Pegging Example: Item A101

Standard Pegging Example: Item A101

Entity	1	2	3	4
Sales order 1				100 (1)
Sales order 2			100 (2)	
On-hand	25			
Planned order (firm)	10	5 [10]	[25]	
Planned order (non-firm)	50	35	75	

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Standard Pegging Example: Item A101

This diagram shows the demands, supplies, and pegging information for item A101. Demand priorities are in parentheses, pegged entities are connected by arrows, and split supply quantities are in brackets.

The first demand window starts on day 3 at the first demand date.

Supplies in the first supply window [day 1] are pegged in the following order:

- On-hand of quantity 25 on day 1 and demand quantity of 100 on day 3
- Firm planned order of quantity 10 on day 1 and demand of quantity 100 on day 3
- Non-firm planned order of quantity 50 on day 1 and demand of quantity 100 on day 3

Supplies in the second supply window [day 2] are pegged in the following order:

- Firm planned order of quantity 5 on day 2 and demand of quantity 100 on day 3
- Non-firm planned order of quantity 35 on day 2 (for partial quantity 10) and demand of quantity 100 on day 3
- Non-firm planned order of quantity 35 on day 2 (for partial quantity 25) and demand of quantity 100 on day 4

Supply in the third supply window [day 3] is pegged as non-firm planned order of quantity 75 on day 3 and demand of quantity 100 on day 4.

Standard Pegging Example: Item A102

Standard Pegging Example: Item A102

Entity	1	2	3	4	5	6
Sales order 1						100 (1)
Sales order 2	200 (2)					
On-hand	10					
Work order (firm)		20				
Purchase requisition (firm)			30			
Work order (non-firm)				40		
Planned order (non-firm)	40	100				60

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Standard Pegging Example: Item A102

This table shows the demands, supplies, and pegging information for item A102. Demand priorities are in parentheses and pegged entities are connected by arrows.

Supplies in the first supply window [day 1] are pegged in the following order:

- On-hand of quantity 10 on day 1 and demand of quantity 200 on day 1
- Non-firm planned order of quantity 40 on day 1 and demand of quantity 200 on day 1

Supplies in the second supply window [day 2] are pegged in the following order:

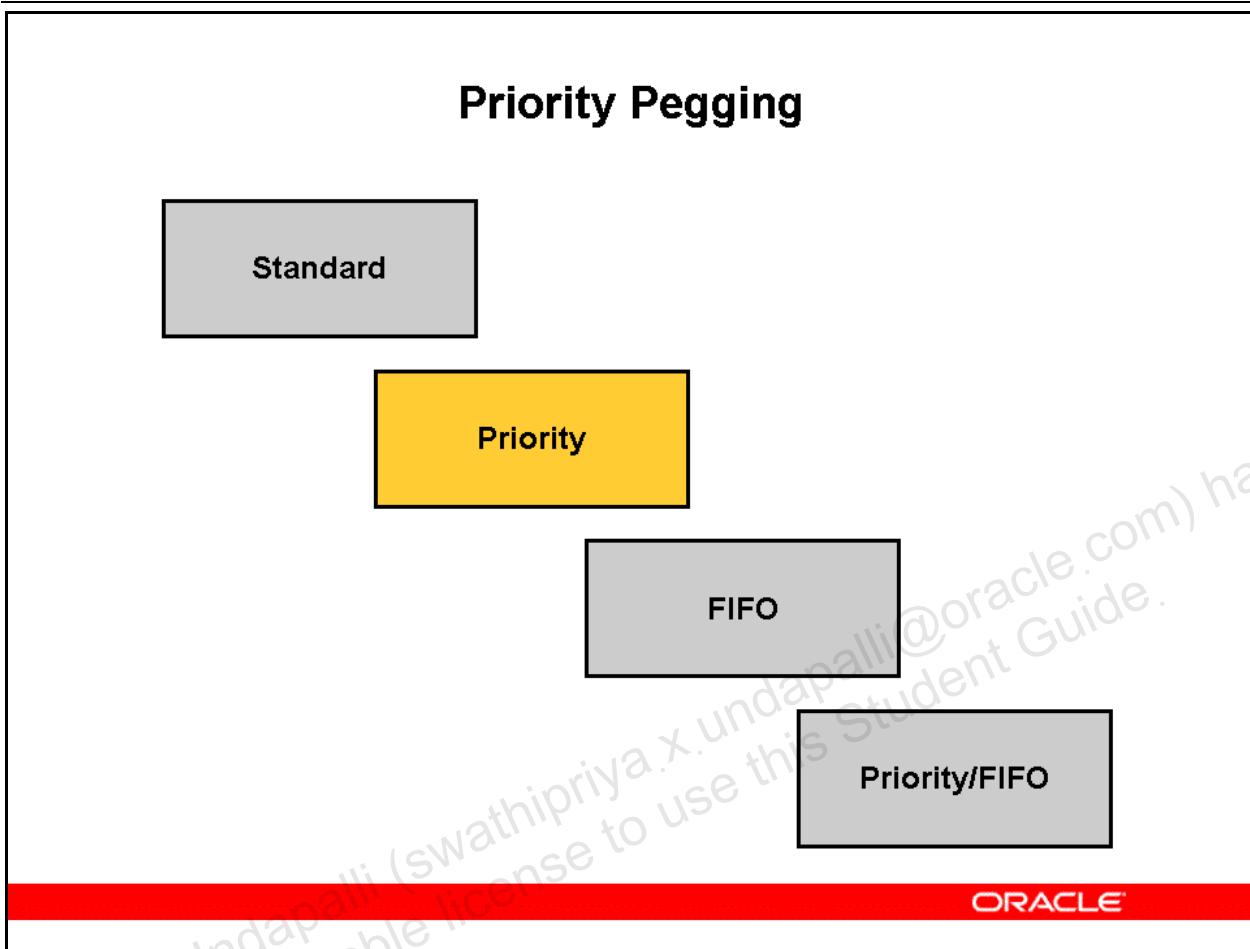
- Firm work order of quantity 20 on day 2 and demand of quantity 200 on day 1
- Non-firm planned order of quantity 100 on day 2 and demand of quantity 200 on day 1

Supply in the third supply window [day 3] is pegged as firm purchase requisition of quantity 30 on day 3 and demand of quantity 200 on day 1

Supply in the forth supply window [day 4] is pegged as non-firm work order of quantity 40 on day 4 and demand of quantity 100 on day 6

Supply in the sixth supply window [day 6] is pegged as non-firm planned order of quantity 60 on day 6 and demand of quantity 100 on day 6.

Priority Pegging



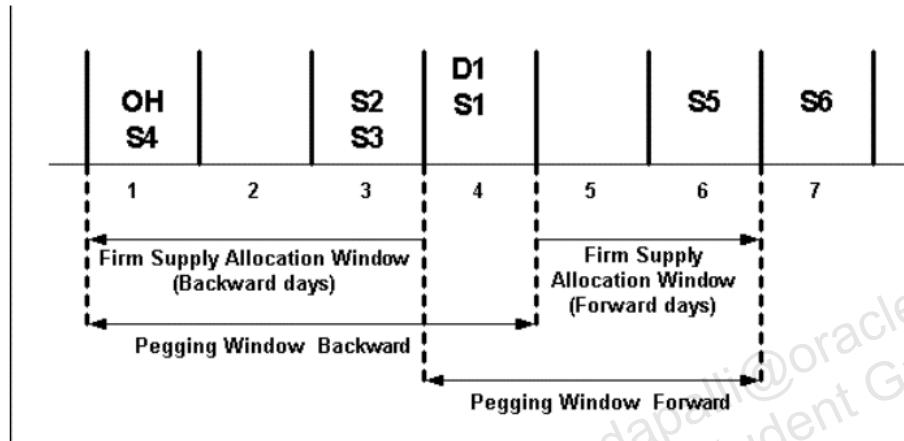
Priority Pegging

Priority pegging pegs high priority demands first to on-hand and firm supplies then continues with other existing and non-firm supplies. It controls the trade-off between holding inventory or satisfying lower priority demands.

The priority pegging process makes three passes through the demands and supplies.

Priority Pegging: First Pass

Priority Pegging: First Pass



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Priority Pegging: First Pass

In this example, assume that all supplies are firm.

The planning engine starts with the demand of highest priority as specified by the plan's demand priority rule. It scans backwards the number of days in the site or item-specific firm supply allocation window (profile option MSO: Firm Supply Allocation Window (Backward days)) and finds the first firm supply quantity to peg the demand to.

The planning engine scans backward and finds supplies. It organizes and pegs them as follows:

- Sorts on-hand by the lot expiration date and then quantity in ascending order. Pegs demand to on-hand before other firm supplies of day 1 when the firm supply allocation window includes day 1.
- Firm supplies are not sorted on any given date.

If it cannot find enough firm supply quantity to satisfy the entire demand quantity, it scans forwards the number of days in the site or item-specific firm supply allocation window (profile option MSO: Firm Supply Allocation Window (Forward days)) to find supplies to peg the demand to.

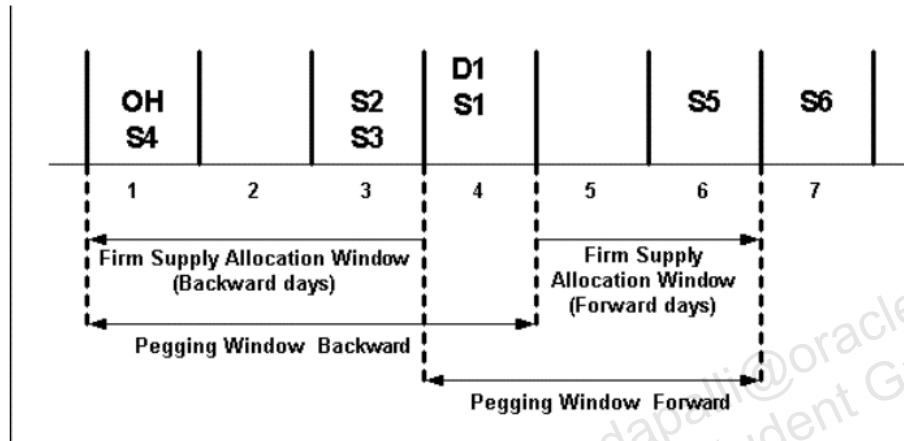
The pass ends when the demand is completely pegged to firm supplies or all firm supplies in the firm supply allocation windows are exhausted.

This diagram shows an example of the first pass:

- Demand D1 on day 4 is the highest priority demand
- MSO: Firm Supply Allocation Window (Backward days) is 3
- MSO: Firm Supply Allocation Window (Forward days) is 2
- Supplies S2 and S3 on day 3 are not sorted
- OH (on-hand) is sorted before supply S4 on day 1
- The order of supplies for pegging to demand D1 is:
 - Backward: S1, S2 and S3 randomly; OH; and S4
 - Forward: S5; D1 cannot peg to S6

Priority Pegging: Second Pass

Priority Pegging: Second Pass



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Priority Pegging: Second Pass

For the remaining demands and supplies, the planning engine groups all demands into windows by using profile option MSO: Demand Window Size. The first window starts at the first demand date and ends after the number of days in the window size. The second window starts at the end of the first window and ends after the number of days in the window size. The last window ends at the end of the planning horizon. For example, the demand window size is 50 days. The first demand date is due on day 1. The first demand window is from day 1 to day 49. The second demand window is from day 50 to day 99.

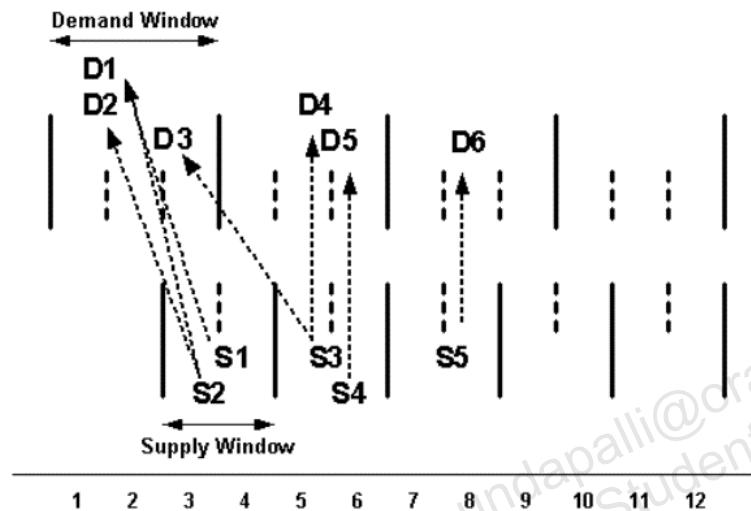
Demands in each window are sorted by demand priority in ascending order.

The planning engine groups all supplies into windows by using profile option MSO: Supply Window Size. The first window starts at the first available supply date and ends after the number of days in the window size. The second window starts at the end of the first window and ends after the number of days in the window size. The last window ends at the end of the planning horizon. For example, the supply window size is 50 days. The first supply is available on day 1. The first supply window is from day 1 to day 49. The second supply window is from day 50 to day 99.

It sorts supplies in each window by type in the same manner as the standard pegging first pass.

Priority Pegging: Third Pass

Priority Pegging: Third Pass



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Priority Pegging: Third Pass

The planning engine uses the standard pegging second pass.

This diagram shows an example of the third pass:

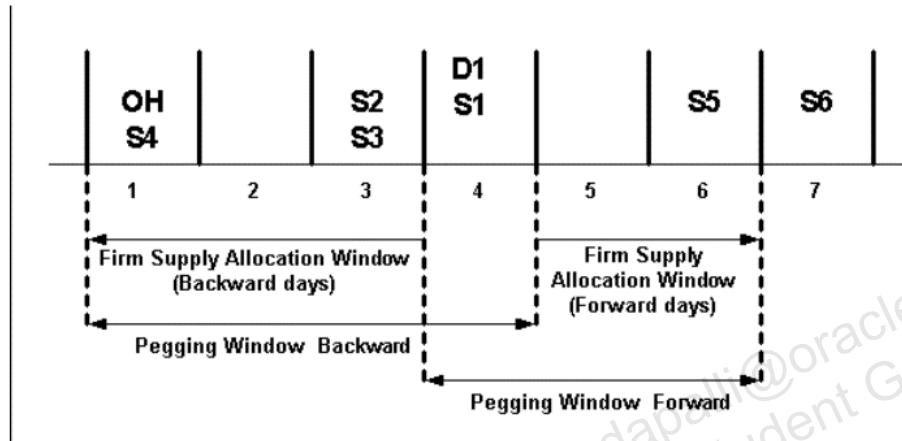
- **MSO:** Demand Window Size = 3
- **MSO:** Supply Window Size = 2
- Demands are sorted by priority in each demand window and supplies are sorted by type and date or quantity in each supply window

Note that:

- Demand D1 is pegged to multiple supplies S1 and S2
- Demands D3 and D4 both peg to supply S3
- Pegged entities are connected by arrows

Priority Pegging: Firm Supply Allocation Window

Priority Pegging: Firm Supply Allocation Window



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Priority Pegging: Firm Supply Allocation Window

Setting

You can set the firm supply allocation window in these ways:

- **Site level:** Use profile options MSO: Firm Supply Allocation Window (Backward days) and MSO: Firm Supply Allocation Window (Forward days) for all items.
- **Item level:** Use Cumulative Manufacturing Lead Time (make items) or Processing Lead Time (buy items) and the profile option MSO: Multiplier to Derive Supply Allocation Window to calculate an item specific value for backward calculations only.

If you specify a positive number for the value of profile option MSO: Multiplier to Derive Supply Allocation Window, then the planning engine ignores the profile option MSO: Firm Supply Allocation Window (Backward days). If you specify a zero, negative, or null number for the value of profile option MSO: Multiplier to Derive Supply Allocation Window, then the planning engine uses profile option MSO: Firm Supply Allocation Window (Backward days).

Calculating

Oracle Advanced Supply Chain Planning derives a firm supply allocation window for each item based on its item attributes as follows:

- **Make:** Cumulative manufacturing lead time. Either automatically calculate it or enter it. To automatically calculate it use either the Oracle Bills of Material Compute Lead Time calculation or the Lead Time Rollup concurrent processes.
- **Buy:** Processing lead time

These are the formulas for the item-specific firm supply allocation window:

- **Make item:** Cumulative manufacturing lead time * MSO: Multiplier to derive supply allocation window
- **Buy item:** Processing lead time * MSO: Multiplier to derive supply allocation window

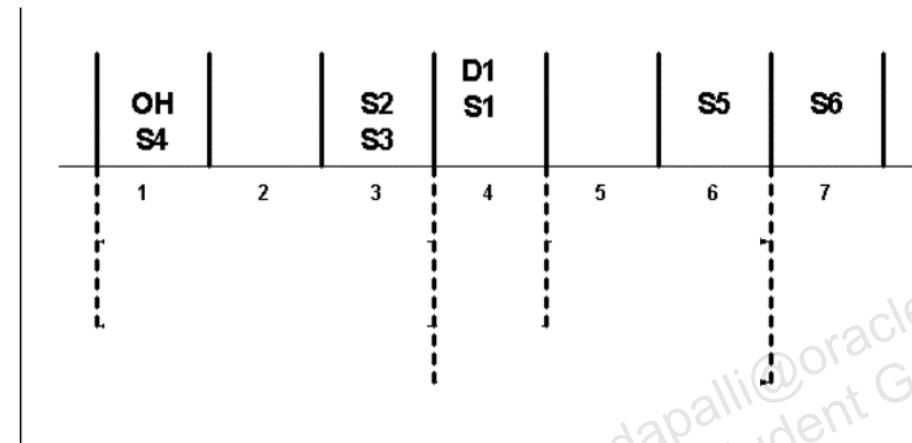
The value is rounded up to the integer. If the cumulative manufacturing lead time or the processing lead time is null or 0 and the multiplier is positive, the planning engine uses the item-specific firm supply allocation window which is 0.

For example:

- MSC: Multiplier to Derive Supply Allocation Window: 1.2
- Cumulative manufacturing lead times for item A101: 12 days
- Cumulative manufacturing lead times for item A102: 20 days
- Firm supply allocation window for item A101: 15 days ($12 * 1.2 = 14.4$)
- Firm supply allocation window for item A102: 24 days ($20 * 1.2$)

Priority Pegging: Sizing Demand and Supply Windows

Priority Pegging: Sizing Demand and Supply Windows



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Priority Pegging: Sizing Demand and Supply Windows

Very small or very large window sizes bring advantages and disadvantages to the results of the pegging process.

Some benefits of small demand window size are:

- Lower inventory and inventory carrying cost: Earlier demands are pegged to on-hand instead of higher priority later demands pegging to on-hand.
- Decrease in total demand lateness: It is more likely that early demands are satisfied before later demands.

A disadvantage of small demand window size is more late higher priority demands. Lower priority demands are satisfied before higher priority demands and low priority demands for safety stock peg to on-hand.

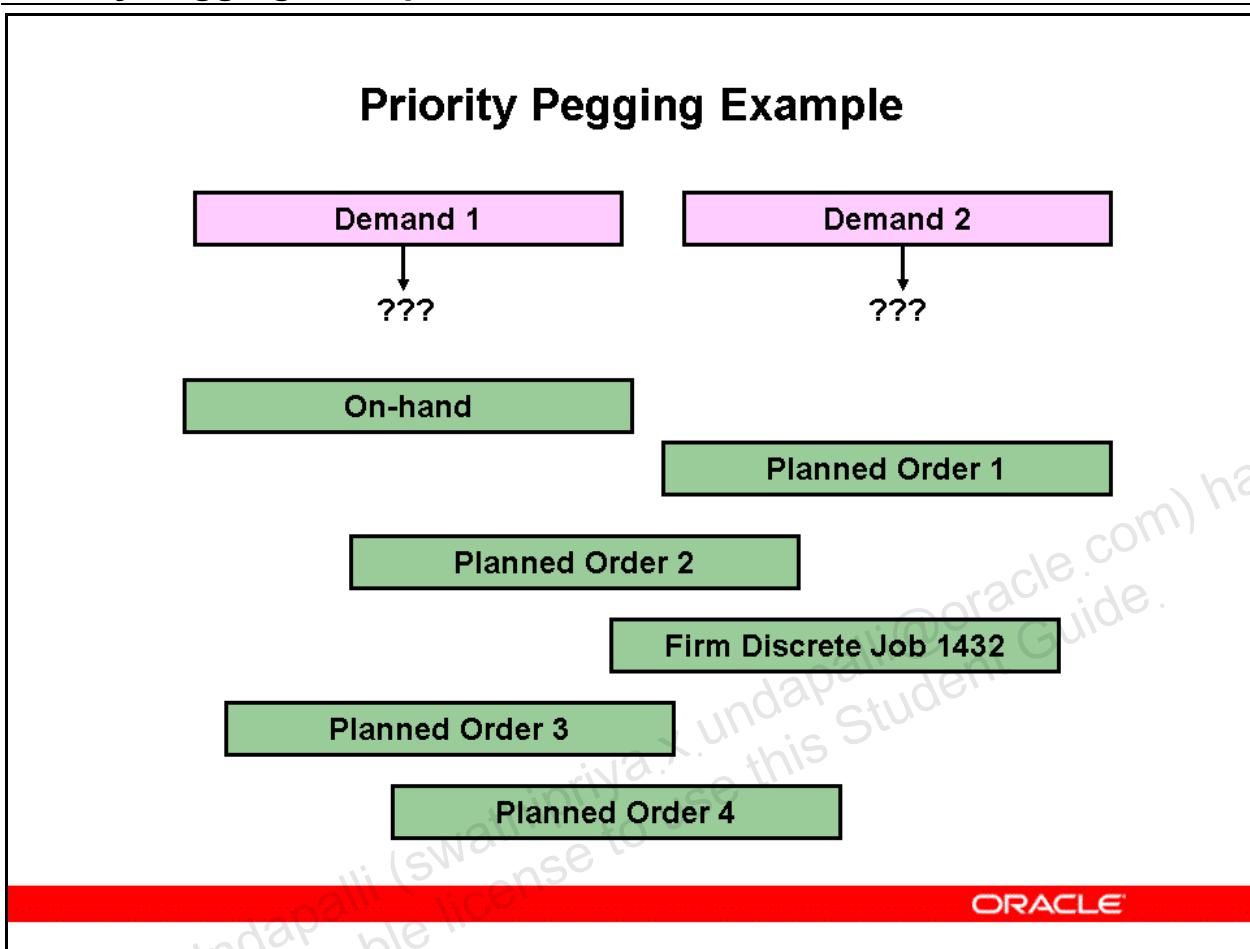
A benefit of large demand window size is higher priority demands having a higher probability of being satisfied earlier.

Some disadvantages of large demand window size are:

- Increased overall demand lateness.
- Increased inventory carrying cost as more inventory is held.

When you are sizing the supply window, note that selecting a large window size can result in the planning engine's pegging early demands to firm supplies or non-firm supplies at the end of the window (firm supplies sort by type and date, non-firm supplies sort by type and quantity). This results in increased lateness for the early demands.

Priority Pegging Example



Priority Pegging Example

This example shows priority pegging for two items. It begins with various settings and then shows the pegging for each item.

Profile option settings:

- MSO: Firm Supply Allocation Window (Backward days): 5
- MSO: Firm Supply Allocation Window (Forward days): 1
- MSO: Multiplier To Derive Supply Allocation Window: 2
- MSO: Demand Window Size: 2
- MSO: Supply Window Size: 2
- MSC: Use FIFO Pegging: No

Plan option Peg Supplies by Demand Priority: Selected.

Item cumulative lead times:

- A101: 2
- A102: 1

Item specific firm supply allocation window:

- A101: 4 (2 * 2)
- A102: 2 (2 * 1)

Priority Pegging Example: Item A101 First Pass

Priority Pegging Example: Item A101 First Pass

Entity	1	2	3	4
Sales order 1				100 (1)
Sales order 2			100 (2)	
On-hand	25			

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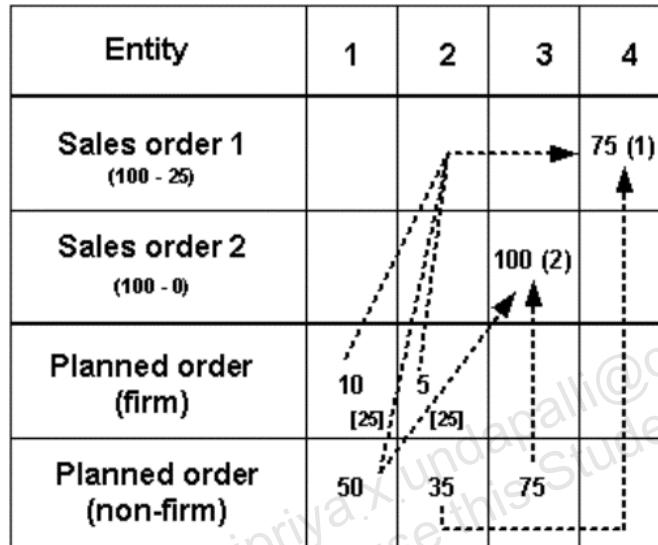
Priority Pegging Example: Item A101 First Pass

This diagram shows the demands, supplies, and pegging information for item A101 on the first pass. Demand priorities are in parentheses and pegged entities are connected by arrows. The order of the schedule entities is:

- Demand
- Pegging to on-hand and firm supplies within the firm supply allocation window. The planning engine starts with the highest priority demand on day 4 going backward and then forward.

Priority Pegging Example: Item A101 Second Pass

Priority Pegging Example: Item A101 Second Pass



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Priority Pegging Example: Item A101 Second Pass

This diagram shows the demands, supplies, and pegging information for item A101 on the second pass. Demand priorities are in parentheses, pegged entities are connected by arrows, and split supply quantities are in brackets. The order of the schedule entities is:

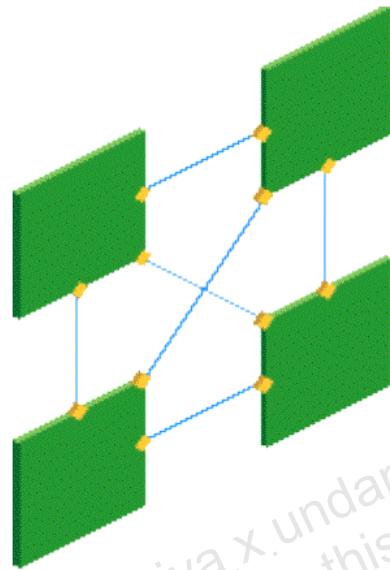
- Demand position after of on-hand and firm supplies within the firm supply allocation window
- Pegging to supply outside the firm supply allocation window, firm supplies first

Note that non-firm planned orders are sorted by quantity in ascending order and firm planned orders are sorted by date in ascending order. Therefore, the planning engine:

- Pegs the non-firm planned order in bucket 2 for quantity 35 and the higher priority demand in bucket 4. Pegs the non-firm planned order for quantity 35 on day 2 and the higher priority demand on day 4. Pegs the non-firm planned order for quantity 50 on day 1 and both the demand on day 4 (for quantity 25) and the demand on day 3 (for quantity 25).
- Pegs the firm planned order for quantity 10 on day 1 and the higher priority demand of day 4.

Network Routings

Network Routings



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Network Routings

Alternate ways of producing an item often demands flexible definition of Routings. Network Routings give you the flexibility of defining multiple manufacturing paths. Network Routings are defined using Oracle Shopfloor Manufacturing (OSFM) at the source. When you set up Network Routings, you can specify the estimated percentage of the orders that need to be processed on a specific path. This is called the planning percent.

You can collect the Network Routings into the planning server using the APS Collection program. You can snapshot the Network Routings and use them to calculate and schedule resource requirements for existing Lot-Based Jobs and planned orders when you run a plan.

You can choose to schedule orders using Network Routings in three ways:

- Primary Path
- Planned Percent
- Optimize

This is an advanced concept in Oracle Advanced Supply Chain Planning.

Quiz

Quiz

Which type of pegging links demands first to on-hand and firm supplies and then continues with other existing and non-firm supplies?

1. Standard pegging
2. Priority pegging
3. Priority pegging
4. Priority/FIFO pegging

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Answer: 2. Priority Pegging

Quiz

Quiz

Planning percent is the estimated percentage of the orders that need to be processed on a specific path.

- 1. True**
- 2. False**

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Answer: 1. True

Summary

Summary

In this module, you should have learned how to:

- **Describe constrained plans**
- **Describe exceptions**
- **Describe other information**
- **Describe details**

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Constrained Plans - Enforce Capacity Constraints with Decision Rules

Chapter 11

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Constrained Plans - Enforce Capacity Constraints with Decision Rules

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Constrained Plans - Enforce Capacity Constraints with Decision Rules

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe constrained plans**
- **Describe plan options**
- **Describe decisions**
- **Work with decision rule plans**

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Module Overview: Topics

Module Overview: Topics

- **Constrained plans**
- **Plan options**
- **Decisions**

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Topic Overview: Constrained Plans

Topic Overview: Constrained Plans

- **Enforce capacity constraints**
- **Enforce demand due dates**
- **Decision rules**
- **Plan type comparison**

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Enforce Capacity Constraints

Enforce Capacity Constraints



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Capacity Constraints

The planning run generates a plan that does not violate manufacturing, supplier, and transportation capacity or result in material shortages.

Supplies may be late and the plan may violate demand due dates if necessary to respect capacity constraints. You review late replenishment exception messages to see where the planning engine violates demand due dates.

Enforce Demand Due Dates

Enforce Demand Due Dates



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Demand Due Dates

The planning run may overload resource and supplier capacity (violate capacity constraints) as needed to respect demand due dates.

For example, the planning engine may schedule a job to use two resource units when there is normally only one resource unit available or it may schedule a job on a resource when the resource is on break or on its non-work time. The supplier capacity may be overloaded or the purchase requisition may be scheduled within lead-time.

Decision Rules

Decision Rules

Balanced supply and demand...
...across the supply chain

Respects constraints...

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Decision Rules

Decision rules are additional instructions to the planning engine on using substitutes and alternates to produce the supply with fewer constraint violations. It can automatically select alternate routings, resources, bills of material, items, and sources. Decision rules are an additional feature on both enforce capacity constraints and enforce demand due dates constrained plans.

The decision rules are:

- **Use alternate sources:** Use primary sources as far as possible and use alternate sources (rank 2 or higher) only if necessary.
- **Use alternate BOM/routings:** Use primary routing as far as possible and use alternate only if necessary.
- **Use alternate resources:** Use primary resource as far as possible and use alternate resource only if necessary.
- **Use end item substitutions:** Use primary item and end item substitute, when enabled, prior to creating new planned orders.
- **Use substitute components:** Use primary components as far as possible and use substitute component only if necessary.

With decision rules you can do the following:

- Intelligently select alternatives with the minimum data input prerequisites possible. You can run a supply chain plan that automatically selects alternate routings, BOM, resources, suppliers, internal sources, end-items and components with the minimum amount of input.
- Enforce a specified sequence of decision-making actions (which may mimic a planner's problem resolution thought process.) The sequence in which the planning engine looks for supply using standard Oracle Application functions is transparent to the user. (For example you may specify substitutes for a given component but not alternate sources.). You can specify a global decision rule when more than one supply source can satisfy the demand. (For example if you have specified both substitutes and alternate sources, you can choose one over the other.)
- Make easier APS planning decisions because the decision-making process is more transparent. You can select alternates when the primary source of supply is unable to satisfy the demand. In doing so, you can express your preference as business rules, such as: the alternate resource should be used before looking for alternate supply and substitute components.
- Restrict planning to a universe of authorized decision-making actions (for example, permit exploration of alternate routings and substitute items but not of sourcing or permit substitute components but do not permit end item substitution, even though rules are specified for the given items at the source level.
- You specify the sequence in which the planning engine evaluates substitutes and alternates. You do not need to use cost-based optimization to select substitute components, alternate bills of material/routings and alternate sources.

Plan Type Comparison

Plan Type Comparison

Constrained - Enforce capacity constraints	<ul style="list-style-type: none">- Demands may be late- Resource capacity, supplier capacity respected- Lead time, planning time fence respected
Constrained - Enforce demand due dates	<ul style="list-style-type: none">- Demands on time- Resource capacity, supplier capacity violated- Lead time, planning time fence violated
Constrained with decision rules	<ul style="list-style-type: none">- May be Enforce capacity constraints (ECC) or Enforce demand due dates (EDD)- Substitutes/alternates selected based on decision rules

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Quiz

Quiz

Additional instructions to the planning engine on using substitutes and alternates to produce the supply with fewer constraint violations are called:

- 1. Capacity Constraints**
- 2. Decision Rules**
- 3. Profile Options**
- 4. Plan Settings**

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Answer: 2. Decision Rules

Quiz

Quiz

With Enforce Capacity Constraints plans, demands may be late.

- 1. True**
- 2. False**

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Answer: 1. True

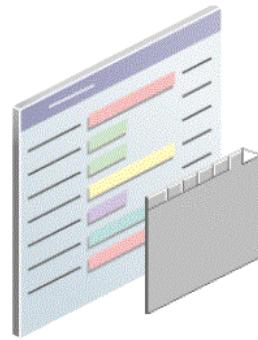
Topic Overview: Plan Options

Decision rules tabbed region

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Decision Rules Tabbed Region

Decision Rules Tabbed Region



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Decision Rules Tabbed Region

To use the Decision Rules tabbed region, you must set profile option MSO: Enable Decision Rules to Yes.

Use End Item Substitution: If selected, use end item substitute prior to creating new planned orders. If cleared, use only the demanded item. Enter the End Item Substitution Set in the Main tabbed region.

Use Alternate Resources: If selected, use primary resource and use alternate resource only if necessary. If cleared, use only primary resources.

Use Substitute Components: If selected, use primary components and use substitute components only if necessary. If cleared, use only primary components only.

Use Alternate BOM/Routing: If selected, use primary routings and use alternate bills of material/routing pairs only if necessary. If cleared, use only primary bills of material and routings.

Use Alternate Sources: If selected, use primary sources and use alternate sources only if necessary. If cleared, use primary sources only. The planning engine does not use alternate sources (rank 2 or higher) as a sources of supply unless the source is a buy from source (supplier). Rank 2 and higher supplies can always be used by the plan if required.

Topic Overview: Decisions

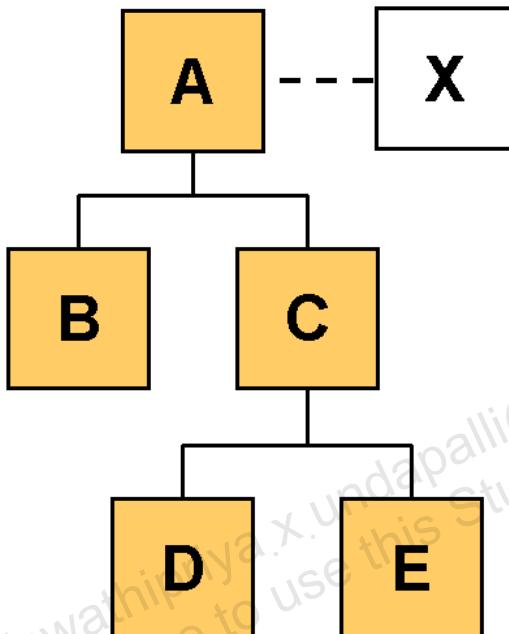
Topic Overview: Decisions

- **End-item substitution**
- **User-defined alternate decision rules**
- **User-defined alternate decision rules: Alternate resources**
- **User-defined alternate decision rules: Substitute components**
- **User-defined alternate decision rules: Alternate bill of material/routing pairs**
- **User-defined alternate decision rules: Alternate sources**
- **Decision rule hierarchy**

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End-Item Substitution

End-Item Substitution



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End-Item Substitution

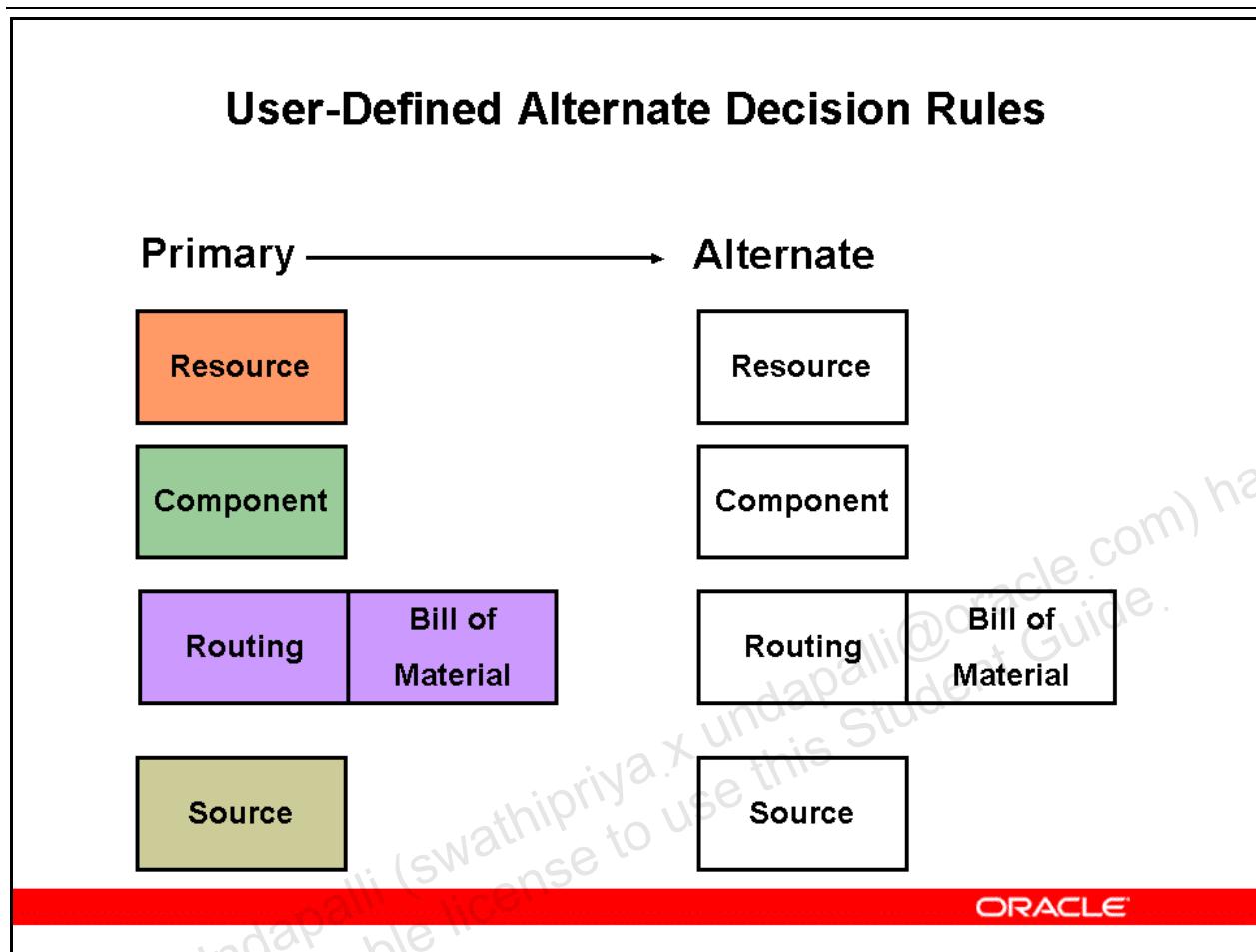
The term end-item refers to the finished good or saleable product. End-item-level substitution is an acceptable business practice in many industries. It is often possible to fulfill customer demand on time when the requested item is not available by substituting a more functionally rich product. Substitution is also done to use up existing inventory of older, functionally equivalent items.

End-item substitution provides the following capabilities:

- Enable substitution based on user-defined rules that can be effective either in one direction or in both directions; defining a chain of substitution relationships is simplified by inferring existing relationships
- Consider substitution rules in the order promising process and suggest substitution similar to planning; this is important because promising orders based on a logic which does not consider substitution may lead to inaccurate promise dates and over promising
- Consider the customer/customer site ordering the item; for example, some customers ordering a specific item might not accept substitutions; on the other hand other customers ordering the same item will accept substitutions
- Consider the effective dates of substitution rules prior to performing substitution

- Evaluate the effects of possible substitution rules by performing plan simulations
- Define whether orders may be fulfilled using a combination of requested and substitute items or only one item

User-Defined Alternate Decision Rules



User-Defined Alternate Decision Rules

This feature allows you specify and the planning engine to automatically select:

- Alternate bill of material/routing pairs
- Resources
- Sources
- Substitute components

It does this by providing decision rules giving you the ability to do the following:

- Intelligently select alternatives with the minimum data input prerequisites possible. You can run a supply chain plan that automatically selects alternate routings, BOM, resources, suppliers, internal sources, and components with the minimum amount of input.
- Enforce a specified sequence of decision-making actions (which may mimic a planner's problem resolution thought process.) Once you have specified the alternates, the sequence in which the planning engine looks for supply using standard Oracle Application functions is transparent to the user. (For example you may specify substitutes for a given component but not alternate sources.).
- Restrict planning to a universe of authorized decision-making actions (for example, permit exploration of alternate routings and substitute items but not of sourcing or permit

substitute components but do not permit end item substitution, even though rules are specified for the given items at the source level.

Non-optimized plans choose alternates without regard to costs. The planner ranks the substitutes during set up. When the planning engine finds the primary unavailable, it checks the highest ranked alternate and uses that. If the highest ranked alternate is also not available, it continues down the ranked list of alternates.

Optimized plans consider substitutes if you select them in the decision rule substitution options. However, they do not use a ranked list, they select the primary or alternate that is the cheapest.

User-Defined Alternate Decision Rules: Alternate Resources

User-Defined Alternate Decision Rules: Alternate Resources

Primary → Alternate



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User-Defined Alternate Decision Rules: Alternate Resources

You can define alternate resources for an operation, but not for a routing. A resource for an operation can have different alternates, each with its own priority. The planning engine uses the primary resource instead of an alternate as long as the primary resource is available. Available resources are those that have available capacity when needed.

By default, the planning engine tries to minimize the use of alternate resources. But if it has to use the alternates, it uses the priority you have assigned to the alternate resource while using the capacity from this resource to build supply. If more than one resource is specified at the same rank, then the planning search is at its discretion for constrained plans.

Specify alternate resources in the Resources form > Alternate Resources form.

The final scheduling phase of the planning engine always considers alternate resources, even if the decision rule option is not selected. However, if User Alternate Resources is not checked, then alternate resources are not considered second in the decision making hierarchy; scheduling will tend to select other alternates and substitutes before using alternate resources.

User-Defined Alternate Decision Rules: Substitute Components

User-Defined Alternate Decision Rules: Substitute Components

Primary —————> Alternate



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User-Defined Alternate Decision Rules: Substitute Components

Each primary bill of material component can have substitutes. The planning engine uses the primary component instead of a substitute as long as the primary component is available. Available components are those that have a projected available supply when needed.

You can define the priority of the substitute component. By default, planning tries to minimize the use of substitutes. Also, the planning engine has an built-in logic that tries to use substitutes at a lower level in your BOM than close to product completion in the BOM. Planning will honor the priority that you have defined while searching for supply from the various substitutes.

Specify substitute components in the Bills of Material form > Substitute Components window.

User-Defined Alternate Decision Rules: Alternate Bill of Material/Routing Pairs

User-Defined Alternate Decision Rules: Alternate Bill of Material/Routing Pairs

Primary —————→ Alternate



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User-Defined Alternate Decision Rules: Alternate Bill of Material/Routing Pairs

You can define alternate bills of material for an item and you can also define alternate routings for an item. The planning engine uses the primary bill of material and routing instead of alternates as long as the primary bill of material's components and routing's resources are available. Available bills of material are those whose components have a projected available balance when needed. Available routings are those whose resources have available capacity when needed.

You must create and name alternate bills of material and routings in pairs. The planning process will only use an alternate bill of material if there is an alternate routing with the same name and vice versa. For example, even if you have several alternate routings and only one alternate bill of material, you must reproduce the alternate bill of material under multiple names to match each of the several alternate routings.

You name the alternate bill of materials in the Bill of Material form and you name the alternate routings in the Routing Details form.

If you want to, you can set the priority of bill of material/routing pairs in the Routings form > Routing Details window. In the Routing Details window, priorities for routings are unique, so you cannot assign the same priority to two different routings for a different item. However, you

can set the priority of the primary bill of material/routing pair lower than that of an alternate bill of material/routing pair.

By default, the planning process tries to minimize the use of lower priority BOM/Routing.

User-Defined Alternate Decision Rules: Alternate Sources

User-Defined Alternate Decision Rules: Alternate Sources

Primary —————> Alternate



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User-Defined Alternate Decision Rules: Alternate Sources

Each primary source can have alternates. The planning engine uses the primary source instead of a substitute as long as the primary source is available. Available sources are those that have available supplier capacity (buy from) or projected available balance (make at, transfer from) when needed.

You can define the priority of the sources in the sourcing rule. By default, the planning engine tries to minimize the use of alternate sources. But if it necessary to use the alternate sources, then the planning engine uses the rank that you have assigned to the source for selecting the alternates. An example of such a situation is if you would like to use and exhaust the supply from the sources with a higher rank before you select one with lower rank. When there is more than one source set at the same rank, planning searches for supply in the following order

- Make
- Transfer
- Buy

If you have specified more than one source of supply of the same type, planning uses the supply at its discretion. (For example you have two make sources and both are at priority 1).

Rank 2 and higher buy from sources are always evaluated without regard to the User Alternate Sources checkbox in the Plan Options form, Decision Rules tabbed region. If you do not want these considered, remove the rank 2 and higher buy from the sourcing rule.

Set sourcing alternates in the Sourcing Rules or Bill of Distribution forms.

Decision Rule Hierarchy

Decision Rule Hierarchy

The planning engine attempts to make decisions in the following order:

- **End-item substitution**
- **Alternate resource decision rules**
- **Substitute component decision rules**
- **Alternate bill of material/routing pair decision rules**
- **Alternate source decision rules**

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Decision Rule Hierarchy

When the planning engine is searching for on-hand balances and scheduled receipts, it looks for both primaries and alternates in the same organization before moving down the supply chain to other organizations. Per the typical supply chain, it would exhaust options at the distribution center before moving to the warehouse, a primary manufacturing plant, and a secondary manufacturing plant.

For example, for make at items within an organization, the planning engine attempts the following before looking for alternate sources:

- Substitute end item
- Primary component using its primary bill of material/routing pair with alternate resources
- Substitute component using its primary bill of material/routing pair with alternate resources
- Primary component using an alternate bill of material/routing pair with alternate resources
- Substitute component using an alternate bill of material/routing pair with alternate resources

Once the planning engine runs, you may find instances where the engine has recommended alternates. When this happens, an exception message is generated. Typical planer actions may consist of:

- Analyzing exceptions generated by the plan
- Using the Supply/Demand window, Vertical Plan window, and Horizontal Plan window to get a detailed understanding of the demands placed on the alternates and supplies received as a result of the user-defined decision rules, and analyzing possibilities of improving the decision rules.
- Oracle does not recommend that you use pegging information to suppose the sequence of selection of alternates. This is because the sequence of selection of alternates is more apparent when looking at total demand and total supply across the time bucket where there is a constraint.

If you simulate a plan, Oracle recommends:

- Do not toggle the site level profile option MSO: Enable Decision Rules. Switching the profile option values and running on-line plans may lead to erroneous results.
- When simulating the changes in demand priorities, keep the priorities contiguous. For example, if the original demand priority for Demand1, Demand2 and Demand3 for a demanded item were 1,2, and 3 respectively, you can change the demand priority for Demand1, Demand2 and Demand3 to 2,1, and 3 but not 2,1, and 18.

Quiz

Quiz

You can define alternate resources for both operations, and routings.

- 1. True
- 2. False

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Answer: 2. False – you can only define alternate resources for operations.

Quiz

Quiz

The planning engine uses the primary component instead of a substitute as long as the primary component is available.

- 1. True
- 2. False

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Answer: 1. True

Summary

Summary

In this you should have learned how to:

- **Describe constrained plans**
- **Describe plan options**
- **Describe decisions**

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Constrained Plans - Enforce Demand Due Dates

Chapter 12

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Constrained Plans - Enforce Demand Due Dates

12

Constrained Plans - Enforce Demand Due Dates

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe constrained plans**
- **Describe exceptions**
- **Run enforce demand due date plans**
- **Work with enforce demand due date plans**

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Module Overview: Topics

Module Overview: Topics

- Constrained plans
- Exceptions

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Topic Overview: Constrained Plans

Topic Overview: Constrained Plans

- **Enforce capacity constraints**
- **Enforce demand due dates**
- **Decision rules**
- **Plan type comparison**

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Enforce Capacity Constraints

Enforce Capacity Constraints



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Capacity Constraints

The planning run generates a plan that does not violate manufacturing, supplier, and transportation capacity or result in material shortages.

Supplies may be late and the plan may violate demand due dates if necessary to respect capacity constraints. You review late replenishment exception messages to see where the planning engine violates demand due dates.

Enforce Demand Due Dates

Enforce Demand Due Dates



Balanced supply
and demand...

...across the
supply chain



Respects
constraints...

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Enforce Demand Due Dates

The planning run may overload resource and supplier capacity (violate capacity constraints) as needed to respect demand due dates.

For example, the planning engine may schedule a job to use two resource units when there is normally only one resource unit available or it may schedule a job on a resource when the resource is on break or on its non-work time. The supplier capacity may be overloaded or the purchase requisition may be scheduled within lead-time.

Decision Rules

Decision Rules

Balanced supply and demand...
...across the supply chain

Respects constraints...

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Decision Rules

Decision rules are additional instructions to the planning engine on using substitutes and alternates to produce the supply with fewer constraint violations. It can automatically select alternate routings, resources, bills of material, items, and sources. Decision rules are an additional feature on both enforce capacity constraints and enforce demand due dates constrained plans.

The decision rules are:

- **Use alternate sources:** Use primary sources as far as possible and use alternate sources (rank 2 or higher) only if necessary.
- **Use alternate BOM/routings:** Use primary routing as far as possible and use alternate only if necessary.
- **Use alternate resources:** Use primary resource as far as possible and use alternate resource only if necessary.
- **Use end item substitutions:** Use primary item and end item substitute, when enabled, prior to creating new planned orders.
- **Use substitute components:** Use primary components as far as possible and use substitute component only if necessary.

With decision rules you can do the following:

- Intelligently select alternatives with the minimum data input prerequisites possible. You can run a supply chain plan that automatically selects alternate routings, BOM, resources, suppliers, internal sources, end-items and components with the minimum amount of input.
- Enforce a specified sequence of decision-making actions (which may mimic a planner's problem resolution thought process.) The sequence in which the planning engine looks for supply using standard Oracle Application functions is transparent to the user. (For example you may specify substitutes for a given component but not alternate sources.). You can specify a global decision rule when more than one supply source can satisfy the demand. (For example if you have specified both substitutes and alternate sources, you can choose one over the other.)
- Make easier APS planning decisions because the decision-making process is more transparent. You can select alternates when the primary source of supply is unable to satisfy the demand. In doing so, you can express your preference as business rules, such as: the alternate resource should be used before looking for alternate supply and substitute components.
- Restrict planning to a universe of authorized decision-making actions (for example, permit exploration of alternate routings and substitute items but not of sourcing or permit substitute components but do not permit end item substitution, even though rules are specified for the given items at the source level.
- You specify the sequence in which the planning engine evaluates substitutes and alternates. You do not need to use cost-based optimization to select substitute components, alternate bills of material/routings and alternate sources.

Plan Type Comparison

Plan Type Comparison

Constrained - Enforce capacity constraints	<ul style="list-style-type: none">- Demands may be late- Resource capacity, supplier capacity respected- Lead time, planning time fence respected
Constrained - Enforce demand due dates	<ul style="list-style-type: none">- Demands on time- Resource capacity, supplier capacity violated- Lead time, planning time fence violated
Constrained with decision rules	<ul style="list-style-type: none">- May be Enforce capacity constraints (ECC) or Enforce demand due dates (EDD)- Substitutes/alternates selected based on decision rules

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Topic Overview: Exceptions

Topic Overview: Exceptions

- **Enforce demand due date scheduling**
- **Sales order/forecast at risk exception message**
- **Related exceptions**
- **Requirement causes resource overload exception message**
- **Order causes supplier capacity overload exception message**
- **Order with insufficient lead time exception message**
- **Late Demand View**

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Enforce Demand Due Date Scheduling

Enforce Demand Due Date Scheduling

In enforce demand due date scheduling, the planning engine can, if needed:

- Overload resources
- Overload supplier capacity
- Shorten lead times

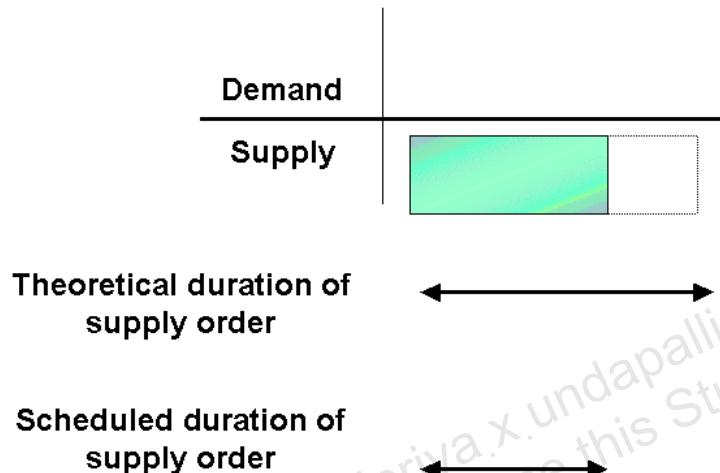
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Enforce Demand Due Date Scheduling

Generally, the enforce demand due date plan can violate lead time constraints. However, there is an option of running and enforce demand due dates plan that respects lead time constraints.

Sales Order/Forecast At Risk Exception Message

Sales Order/Forecast At Risk Exception Message



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Sales Order/Forecast At Risk Exception Message

Exception message Sales order/forecast at risk is in exception group Late sales orders and forecasts.

This exception message appears when demands are at risk. A demand is at risk when it is pegged to a supply order against which the planning engine has issued certain exception messages. These certain exception messages are in the Supply Problems for Late Sales Orders and Forecasts exception group and you can use them for further information about the sales order or forecast at risk:

- Sales order/forecast at risk due to resource shortage
- Sales order/forecast at risk due to material shortage
- Requirement causes resource overload
- Order causes supplier capacity overload
- Order causes transportation weight capacity overload
- Order causes transportation volume capacity overload
- Order with insufficient lead time
- Requirement with insufficient lead time

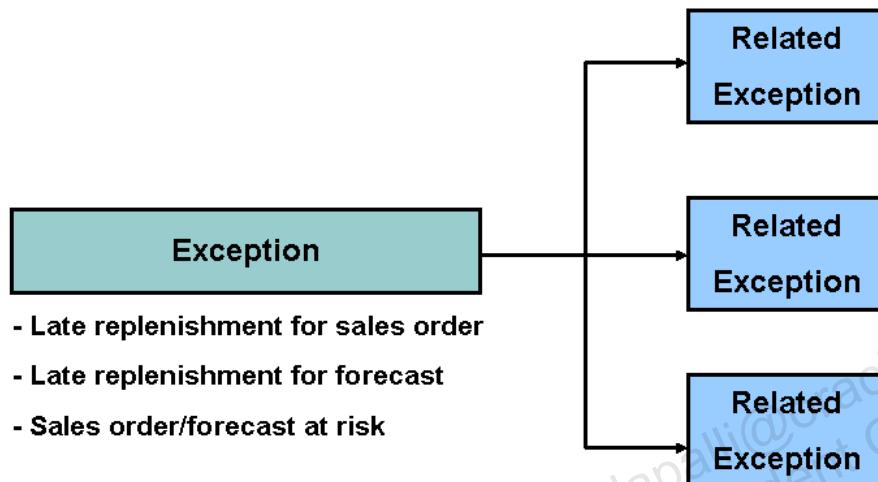
The information displayed for this exception message all refers to the demand line and is:

- Order Number
- End Item
- End Item Org
- End Item Description
- Order Due Date
- Order Quantity
- Customer
- Customer Site
- Demand Class

To resolve this exception message, check for more details from related exceptions in the Supply Problems for Late Sales Orders and Forecasts exception group.

Related Exceptions

Related Exceptions



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Related Exceptions

Related exceptions are exception messages that relate to the same issue as other exception messages and often provide more detail about a situation. You can see related exceptions in both Constrained - Enforce capacity constraints and Constrained - Enforce demand due dates plans.

If you select an occurrence of exception message Sales order/forecast at risk, right-click and select Related Exceptions, you may see one or more of the following related exceptions:

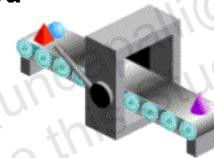
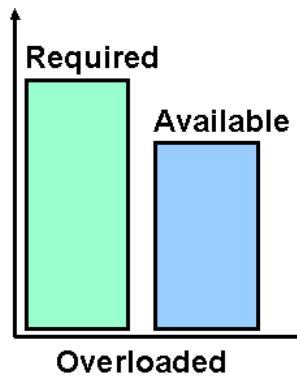
- Requirement causes resource overload
- Requirement with insufficient lead time
- Order causes supplier capacity overload
- Orders with insufficient lead time
- Order causes transportation capacity weight overload
- Order causes transportation capacity volume overload
- Order is firmed late

These exception messages from Constrained plans-Enforce capacity constraints mirror overload and lead time exceptions from Constrained plans-Enforce demand due dates:

- Resource constraint mirrors Requirement causes resource overload
- Material constraint mirrors Order causes supplier capacity overload
- Transportation weight constraint mirrors Order causes transportation weight capacity overload
- Transportation volume constraint mirrors Order causes transportation volume capacity overload
- Order lead time constraint mirrors Order with insufficient lead time
- Requirement lead time constraint mirrors Requirement with insufficient lead time

Requirement Causes Resource Overload Exception Message

Requirement Causes Resource Overload Exception Message



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Requirement Causes Resource Overload Exception Message

Exception message Resource constraint is in exception group Supply problems for late sales orders and forecasts.

This exception message appears when, during scheduling a make order, the planning engine detects a resource requirement that causes a resource capacity overload.

The planning engine does not observe exception set Overutilization % when deciding if there is an overload but does observe it when deciding whether to issue an exception message. If you have an exception set for the resource and have specified an Overutilization %, the planning engine finds the overload but may not issue an exception message if the overloaded quantity falls below the Overutilization %.

The information displayed for this exception message is:

- Supply Order Number: The order number that contains the overloading resource requirement.
- Order Type
- Item
- Item Description
- Start Date: The start date of the time bucket in which the overloading activity falls.

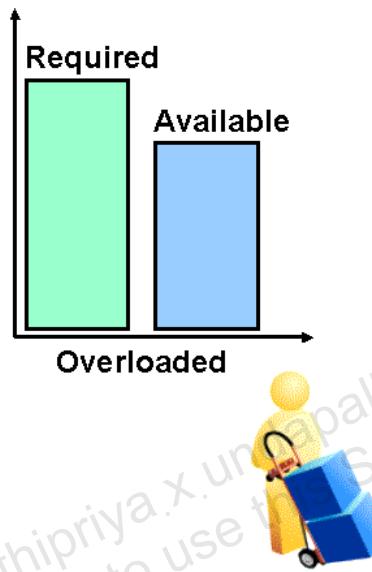
- End Date: The end date of the time bucket in which the overloading activity falls.
- Resource Requirements: The required capacity of the overloading activity within the time bucket.
- Resource Overload: The amount by which the resource capacity in the time bucket is overloaded after scheduling the overloading requirement.
- Resource Name
- Organization
- Department
- Resource Sequence Number: In the routing.
- Operation Sequence Number: In the routing.
- Resource Capacity: The resource available capacity in the bucket before scheduling of the overloading requirement.

To resolve this exception message, consider:

- Checking and evaluating the end demand information
- Collecting and evaluating available options regarding increasing available capacity or decreasing required capacity
- Selecting and implementing options.

Order Causes Supplier Capacity Overload Exception Message

Order Causes Supplier Capacity Overload Exception Message



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Order Causes Supplier Capacity Overload Exception Message

This exception message appears when, during scheduling a buy order, the planning engine detects an order that causes a supplier capacity overload.

View this exception message from Planner Workbench tree Suppliers.

The information displayed for this exception message is:

- Bucket Start Date: The start date of the time bucket in which the overloading order falls.
- Item
- Item Description
- Organization
- Due Date
- Dock Date
- Required Supplier Capacity: The required capacity of the overloading order within the time bucket.
- Supplier Capacity Overload: The amount by which the cumulative available supplier capacity is overloaded after scheduling the overloading order.
- Supplier Name

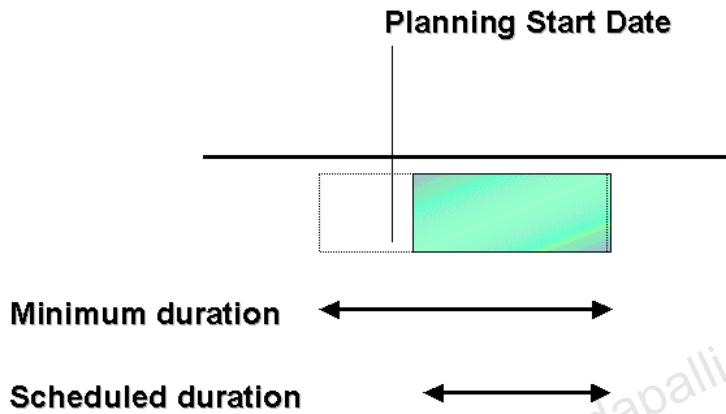
- Supplier Site
- Cumulative Available Capacity: The cumulative available supplier capacity before scheduling the overloading order.

Consider:

- Checking and evaluating the end demand information
- Collecting and evaluating available options regarding increasing available capacity or decreasing required capacity
- Selecting and implementing options.

Order With Insufficient Lead Time Exception Message

Order With Insufficient Lead Time Exception Message



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Order With Insufficient Lead Time Exception Message

This exception message appears when the planning engine schedules a supply order within a window whose size is less than the minimum duration of the supply order.

The planning engine issues this message if either of the following situations exist:

- Constrained Plan - Enforce Due Date and Optimized Plan - Enforce Due Date: Profile option MSO: Lead Time Control is to Violate minimum processing time to meet demand due date and there is not enough lead time to meet the demand.
- Constrained Plan - Enforce Due Date, Optimized Plan - Enforce Due Date, Constrained Plan - Enforce Capacity Constraints, and Optimized Plan - Enforce Capacity Constraints: A supply is firmed early and the upstream orders need to be compressed.

The information displayed for this exception message is:

- Supply Order Number
- Item
- Organization
- Order Type
- Supplier: For buy orders.

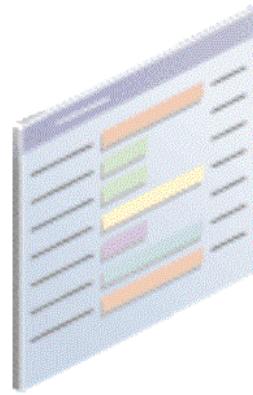
- Supplier Site: For buy orders.
- Source Org: For transfer orders.
- Ship Method: For transfer orders.
- Order Start Time: For make orders, the start time; for buy orders, the dock date; and for transfer orders, the ship date.
- Order Completion Time: For make orders, the completion time and, for buy and transfer orders, the due date.
- Minimum Lead Time: Based on the maximum assigned units in the routing.
- Minimum Start Time

Consider:

- That the supply may be behind schedule
- Checking and evaluating the end demand information
- Either expediting work on the supply or adjusting the demand due date

Late Demand View

Late Demand View



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Late Demand View

You can use the Gantt Chart late demand view in enforce demand due dates plans.

Quiz

Quiz

With enforce demand due date scheduling, which of the following can the planning engine NOT do:

1. Overload resources
2. Reduce demand
3. Overload supplier capacity
4. Shorten lead times

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Answer: 2. Reduce demand

Quiz

Quiz

Resource requirements that causes a resource capacity overload during scheduling a make order is what type of exception?

1. Sales Order/Forecast At Risk
2. Order With Insufficient Lead Time
3. Order Causes Supplier Capacity Overload
4. Requirement Causes Resource Overload

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Answer: 4. Requirement Causes Resource Overload

Quiz

Quiz

The planning engine uses exception set Overutilization % when deciding if there is an overload.

- 1. True
- 2. False

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Answer: 2. False - The planning engine does not observe exception set Overutilization % when deciding if there is an overload but does observe it when deciding whether to issue an exception message.

Summary

Summary

In this module, you should have learned how to:

- **Describe constrained plans**
- **Describe exceptions**

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Cost-Based Optimized Plans

Chapter 13

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Cost-Based Optimized Plans

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe plan options**
- **Describe concepts**
- **Describe objectives**
- **Describe penalties**
- **Describe key indicators**
- **Describe plan differences**
- **Work with optimized plans**

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Module Overview: Topics

Module Overview: Topics

- **Plan options**
- **Concepts**
- **Objectives**
- **Penalties**
- **Key indicators**
- **Plan differences**

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Topic Overview: Plan Options

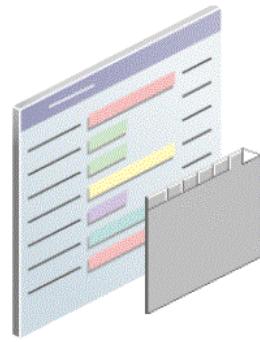
Topic Overview: Plan Options

Optimization tabbed region

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Optimization Tabbed Region

Optimization Tabbed Region



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Optimization Tabbed Region

Optimize: Select if you are running an optimized plan. Before selecting, verify that you selected Constraints tabbed region, Constrained Plan field. If you clear, you cannot enter any other information in this tabbed region.

Enforce Sourcing Constraints: Select if you want to enforce the sourcing splits in the item sourcing rules. For an optimized plan, the planning engine may override these sourcing splits if it results in less cost. For unconstrained and constrained plans, the planning engine respects these sourcing splits without regard to this option.

Maximize inventory turns: Specify a weighting percentage from 0 to 1.

Maximize plan profit: Specify a weighting percentage from 0 to 1.

Maximize on-time delivery: Specify a weighting percentage from 0 to 1.

Exceeding material capacity %: Enter a numerical value to quantify the impact of exceeding material capacity. For example, if you enter 50, the penalty factor is 50%.

Exceeding resource capacity %: Enter a numerical value to quantify the impact of exceeding resource capacity. For example, if you enter 50, the penalty factor is 50%.

Exceeding transportation capacity %: Enter a numerical value to quantify the impact of exceeding transportation capacity. For example, if you enter 50, the penalty factor is 50%.

Demand lateness %: Enter a numerical value to quantify the impact of late demand. For example, if you enter 50, the penalty factor is 50%.

Topic Overview: Concepts

Topic Overview: Concepts

- **What is optimization?**
- **Plan type comparison**
- **Comparing constrained and optimized plans**

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What Is Optimization?

What Is Optimization?

- **The optimal solution to a model is the one that best satisfies the objective criteria**
- **A model represents the essential elements of a system**
- **Constraints specify feasibility boundaries for the solution to the model; for example:**
 - **Resource constraints limit the ability to produce**
 - **Market constraints limit the ability to sell**

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What Is Optimization?

The optimal solution describes a single course of action that is expected to result in the most beneficial outcome. There are several caveats for this definition.

First, the optimal solution is almost always found by manipulating a model of a real system. To the extent that the model does not represent the real system in every detail, the solution to the model will not necessarily be exactly the same as the solution to the real system. There are many kinds of models. Examples include architectural scale models of buildings, electronic circuit models of mechanical systems, graphical models, and mathematical models. A model represents the essence of a real system, but it does not, and should not, duplicate the real system in every detail. As detail is added, the model rapidly becomes more complex and difficult to manipulate.

Constraints bind solutions to reality. Without constraints, optimal solutions have no meaning. For example, say the objective of a grocery business is to maximize profits. If the grocer buys apples for \$0.50 each and sells them for \$0.75 each, the optimal solution is to buy and sell an infinite number of apples and become infinitely wealthy. The optimal solution is meaningless because it does not recognize that the supply of apples and the market for apples are bounded, or constrained, to something less than infinity.

Other examples of constrained resources include:

- Labor, considering skills, certification, contract limits, and so on
- Machines, considering maintenance time and the ability to achieve required tolerances
- Transportation, considering mode, weight and volume capacity, and lead time
- Finance, considering inventory investment, and limited ability to raise capital

What Is Optimization?

What Is Optimization?

- **Objective criteria are used to evaluate alternative feasible solutions**
- **Feasible solutions satisfy all of the constraints**
- **Assumptions state conditions that must be met for the solution to be valid**

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Objectives and Assumptions

An objective criterion is a measure of how well desired goals and outcomes are being achieved.

A solution is not feasible unless it simultaneously satisfies all of the constraints. It is possible to have so many constraints that no feasible solution can be found. When no feasible solution exists within the given constraints, Oracle ASCP will force the solution to be feasible by moving the production date out beyond the promised order due date. In other words, when the choice is between missing a due date or creating no solution at all, the system will miss the due date.

Assumptions form a validity checklist. The concept of validity is different from the concept of feasibility. Sometimes when a solution is implemented, the results are disappointing. The source of the disappointment can usually be traced to a false assumption that was made while creating the model. Based on the assumptions, the solution is correct. But if an assumption is false, we have found the correct solution to a wrongly stated problem. The model is not a valid representation of the real system.

Plan Type Comparison

Plan Type Comparison

Constrained - Enforce capacity constraints	<ul style="list-style-type: none">- Demands may be late- Resource capacity, supplier capacity respected- Lead time, planning time fence respected
Constrained - Enforce demand due dates	<ul style="list-style-type: none">- Demands on time- Resource capacity, supplier capacity violated- Lead time, planning time fence violated
Constrained with decision rules	<ul style="list-style-type: none">- May be ECC or EDD- Substitutes/alternates selected based on decision rules
Optimized	<ul style="list-style-type: none">- May be ECC or EDD- Substitutes/alternates selected based on cost

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Comparing Constrained and Optimized Plans

Comparing Constrained and Optimized Plans

Optimization considers the additional dimension of cost:

- **Requires accurate cost estimates, such as:**
 - Rolled up item costs
 - Resource rates
 - Resource usage time
- **Penalty factors are cost multipliers:**
 - Example: exceeding labor capacity (overtime) = 150%

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Comparing Constrained and Optimized Plans

An important difference between optimized planning and constraint-based planning is that optimization considers costs. ASCP optimization finds the solution that best fits a weighted combination of objectives, as measured by the cost criterion. Therefore it is important that accurate cost estimates are set up in the source instances.

Penalty factors are applied to costs. When costs are missing or very inaccurate, unintended events could result. For example, when no inventory carrying costs are specified, the system might plan to build very large inventories. When there is no cost for a labor resource, that labor could be utilized beyond exhaustion.

Comparing Constrained and Optimized Plans

- Constrained plans are feasible, but not optimal
- Optimized planning requires more implementation effort:
 - Setting objective function weights
 - Specifying penalty factors
 - Verifying costs
- Penalty factor hierarchy permits implementing more detailed penalty factors over time to continuously improve planning model precision

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Contrasting Constrained and Optimized Plans

Contrasting Constrained and Optimized Plans

- **Enforced and non-enforced constraints:**
 - Both constrained and optimized plans respect enforced constraints
- **Demand priorities:**
 - Constrained plans respect demand priorities
 - Optimization overrides demand priorities if that improves the solution
- **Alternates:**
 - Constrained plans pick in sequence
 - Optimized plans pick the cheapest

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Contrasting Constrained and Optimized Plans

Enforced and Non-enforced Constraints

- Both types of planning respect enforced constraints. They will create a sales backorder when it is not possible to fill the demand within production and transportation constraints.
- Optimization satisfies weighted objectives within constraints. For example, it weighs the objective of on-time delivery against penalties for expedited production and delivery. You can affect the solution by entering penalty factors, which are applied as percentages. The optimization process drives penalties out of the solution, tending to drive out the most costly penalty factors first.
- The Objectives region lists several desirable objectives. You enter weights, on a scale of 0 to 1, to state how important those objectives are to you. The absolute value of the numbers you enter are not as important as their relative value. In other words, heavily weighted objectives are satisfied before lightly weighted objectives.
- The Penalty Factors region lists several undesirable outcomes. You enter percentages, on a scale of 1% to 200%, to indicate how important it is to you that those outcomes do not occur in your plan. For example, when the penalty for late demand (factor times line item value) is higher than the penalty for exceeding resource capacity (factor times work order resource cost), the solution will tend to plan overtime work to avoid late delivery.

Demand Priorities

- Constrained plans respect demand priorities, even though plan profit could be increased by filling a lower-priority order.
- With optimization, the priority of the orders may be overridden if optimization sees a way to come closer to meeting the optimization objectives. For example, order priority could be violated because plan profit would be increased by filling a priority 2 order ahead of a priority 1 order.

Optimized plans respect the decision rules on the plan options. For example, if you do not select Use Substitute Components, the planning engine does not consider substitute components even if they are cheaper than the primary components or if they allow demands to be satisfied sooner.

Quiz

Quiz

Constraint-based planning does not consider cost.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

Penalty factors are multipliers applied to costs.

- 1. True**
- 2. False**

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Answer: 1. True

Topic Overview: Objectives

Topic Overview: Objectives

- **Plan objectives**
- **Planning objectives**

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Plan Objectives

Plan Objectives

Objectives are desired outcomes, such as:

- **Maximize inventory turnover**
- **Maximize plan expected profit**
- **Maximize on time delivery**
- **Objectives are translated into currency units**
 - Only one currency per plan

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Available Plan Objectives

Objectives are desired outcomes, such as:

- Maximize inventory turnover
 - Turnover = Sales divided by Average inventory investment
 - Turnover improves by increasing throughput through sales while simultaneously decreasing average inventory investment.
- Maximize plan expected profit
 - Profit = Revenues minus Costs
 - Preference is given to the solution alternative that best fulfills the goal of making more money.
- Maximize on time delivery
 - Days early or late = difference between date requested and date received
 - On time delivery is an indicator of customer service level.

Planning Objectives

Planning Objectives

- **Multiple objectives are allowed**
- **User specified weights indicate the relative importance of objectives**
- **Multiple objectives tend to conflict:**
 - **Late demand versus inventory investment**
 - **Profit versus late demand**



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Multiple Objectives

You can specify objective weights on the Optimization tab of the Plan Options window.

Conflicting Objectives

Customer service level improves when plenty of inventory is available throughout the distribution system. However this requires increased inventory investment, which decreases inventory turnover ratio.

Overtime and expediting costs incurred to increase service can consume the profit from sales. In many situations there is a tradeoff between customer service and profitability.

The cost of late demand is a measure of customer service level.

Enabling the Optimization Calculations

You use the Optimize check box on the Optimization tab of the Plan Options window to enable the optimization algorithms.

Use the Advanced Supply Chain Planner Responsibility to navigate to the Plan Level Defaults region located on the Optimization tab of the Plan Options window.

(N) Inventory Plan > Options (T) Optimization

Topic Overview: Penalties and Constraints

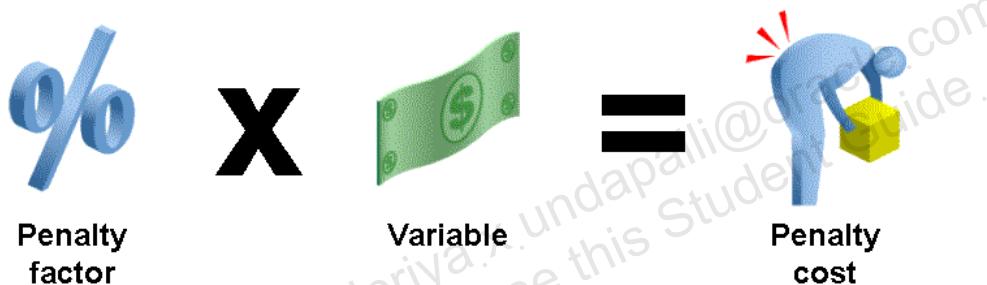
- **Penalty factors and penalty costs**
- **Default penalty factors**
- **Setting penalty factors**
- **Enforced and non-enforced constraints**

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Penalty Factors and Penalty Costs

Penalty Factors and Penalty Costs

- Penalty factors are the percentages that you specify
- Penalty costs are the multiple of the penalty factor and some cost
- Optimization uses penalty costs



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Penalty Factors and Penalty Costs

Penalty costs are different from penalty factors. Penalty factors are the percentages that you specify in the Plan Options window, profile options, item attributes, or flexfields. Penalty costs are the result of multiplying penalty factors times some other cost, such as list price, item cost, resource cost, and so on.

For example, if an older machine with high maintenance costs is specified on the routing, the shop floor manager may only want to use this machine in cases of extreme urgency. The planner can specify a very large penalty cost on the machine, so that optimization will rarely select the older machine.

Default Penalty Factors

Default Penalty Factors

- **Penalty factors can be entered in the Plan Options window**
 - **Act as default values if detailed penalty factors are not specified**
 - **Are overridden if detailed penalty costs are specified**
- **Defaults allow generation of optimized plans without the need to specify detailed penalties**
- **Late Demand (filling demand after promised date)**
- **Exceeding material capacity**
- **Exceeding resource capacity**
- **Exceeding transportation resource capacity**

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Default Penalty Factors

Penalty factors entered in the Plan Options window act as default values if detailed penalty factors are not specified elsewhere. They are overridden when detailed penalty factors are specified. These defaults enable you to quickly prepare to generate optimized plans without going through the effort of modeling penalties at specific levels of detail. As you refine your model with specific penalty factor information, solutions will take the new information into account. As your implementation progresses, the benefits of improved solutions can be traded off against the additional effort required to model penalties at greater levels of detail.

Defining Default Penalty Factors

Penalty factors, along with optimization objectives, determine the trade-offs made during optimization. Default penalty factors within the range of 1% to 200% can be entered in the Plan Options window.

The term factor indicates that the number you enter is multiplied by something else. For example, the late demand penalty factor is a percentage multiplied by the line item value (quantity extended by price). When the system is making decisions to avoid late demand, it will place higher priority on filling large sales orders on time.

Penalty Factors with Defaults Located in the Plan Options Window

Penalty for late demand, factor as a percentage of item sales order line:

- Sales order level using flexfield
- Forecast item level using flexfield
- Organization level using flexfield
- Master item level using flexfield

Penalty for exceeding material capacity, factor as a percentage of item cost:

- Item and supplier level using flexfield
- Master item level using flexfield
- Organization level using flexfield

Penalty for exceeding resource capacity, factor as a percentage of resource cost:

- Resource level using flexfield
- Organization level using flexfield

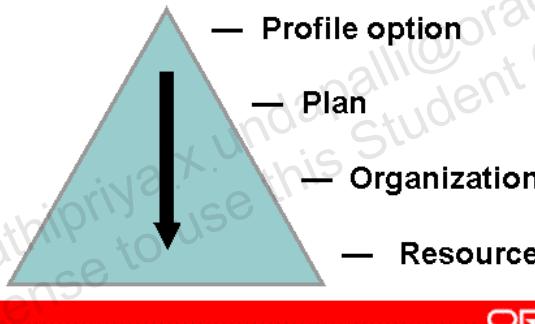
Penalty for exceeding transportation resource capacity, factor as a percentage of transportation cost:

- Ship method level using flexfield
- Organization level using flexfield

Setting Penalty Factors

Setting Penalty Factors

- **Hierarchy of multiple locations provided to enter penalty factor information**
- **Most specific penalty factor overrides**
- **Permits implementing penalty factor information in phases**
- **Example hierarchy: penalty factor for exceeding resource capacity**



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Penalty Factor Hierarchy

You can enter penalty factor information in a multi-level hierarchy. The figure shows the five hierarchy levels where you can set up penalty factors for exceeding resource capacity.

Penalty factors set up at a detailed level of the hierarchy override penalty factors set up at more general levels. Implementations typically begin with penalty factors set up at the general level. In this way the model can be quickly set up to begin return on investment. As time permits, factors can be entered at more detailed levels of the hierarchy to provide a more precise model for the optimization engine.

Generating optimized plans with certain costs set to zero will yield unpredictable results. Optimization minimum requirements are:

- Plan level penalty factors
- Purchased item cost
- Rolled up manufactured item cost
- Resource cost
- MSO: Inventory Carrying Cost

Quiz

Quiz

Penalty costs are the result of multiplying penalty factors times some other cost such as list price, item cost, or resource cost.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

A Plan penalty factor will override a Resource penalty factor.

- 1. True**
- 2. False**

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Answer: 2. False

Topic Overview: Key Indicators

Topic Overview: Key Indicators

- **Key indicators**
- **Making performance improvements based on KPIs**

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Key Indicators

Key Indicators

- **Inventory turns**
- **Planned utilization**
- **Margin percentage**
- **On time delivery**

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Key Indicators

Use Planner Workbench context window Key Indicators to see the key performance indicators related to the plan.

Oracle ASCP is integrated with Oracle's E-Business Intelligence Suite performance management system. The Oracle E-Business Intelligence Suite allows you to set the organizational objectives used to drive continuous improvement in your enterprise. These objectives, known as Performance Measures in BIS, are referred to as Key Performance Indicators (KPIs) in Oracle ASCP.

You can set performance targets and exception tolerances by business units or by period and automatically begin corrective action or notify the appropriate people when exceptions arise. Using the Planner Workbench, you can run multiple simulations, and compare them to your own performance metrics. As you firm a plan, you can directly update performance metrics in the execution system.

The graphical display of the plan performance indicators gives you a quantitative assessment of the quality of a plan, based on its business objectives. You can see instantly how a plan will perform at improving profitability, on time delivery, inventory turnover, and resource utilization. Selecting indicator graphs displays more detailed additional information about the

measure. You can also use Oracle Supply Chain Intelligence for more extensive analysis of selected measures.

KPIs of multiple plans can be compared in the summary chart by selecting two or more plans in the navigator window.

- Setting KPIs Without Oracle Business Intelligence System
- You are not required to purchase licenses for Oracle BIS to set the following four targets. You can set performance management targets for these four key performance indicators (KPIs) from within the Planner Workbench. From the menu bar, select Tools and then the option to set KPI targets.
 - On-Time Delivery = Percent of orders completed by the need date
 - Resource Utilization = (Work load hours/Resource available hours)
 - Inventory Turns = (Annual sales cost/Average inventory level)
 - Margin Percentage = [(Revenue – Costs)/Revenue] expressed as a percentage
- Inventory Turns Graph
- This graph compares the actual inventory turn values to the target values collected from the source. You can view overall inventory turns for a plan or select a node on the tree to see the node's inventory turns. You can view the inventory turns value over time to evaluate the plan throughout the planning period.
- The Inventory Turns graph is displayed at the following nodes:
 - Plans
 - Organizations
 - Product families
 - Categories
 - Individual items
 - Components
 - Planning groups
 - Projects
 - Tasks
- On-time Delivery Graph
- The On-time Delivery Percentage graph is displayed at the following nodes:
 - Plans
 - Organizations
 - Product families
 - Categories
 - Individual items
 - Components
 - Planning groups
 - Projects
 - Tasks

- Planned Utilization Graph
- The Planned Utilization percentage is available at the following nodes:
 - Plans
 - Organizations
 - Departments
 - Resource groups
 - Resources
 - Production lines
 - Transportation resources
 - Approved suppliers
- Margin Percentage Graph
- This graph compares the actual margin to the target values collected from the source. You can evaluate alternate plans based on the net difference between plan revenues and costs. Plan revenues are derived from forecasts and booked sales orders while costs account for planned production schedule expenses.
- Margin percentage is available at the following nodes:
 - Plan
 - Organization
 - Product family

Making Improvements Based on KPIs

Making Improvements Based on KPIs

Increasing Inventory Turns

- Decrease the penalty factor for safety stock violation.
- Increase weight given to the maximize inventory turns objective, decrease weight given to other objectives by choosing Plan Options > Optimization tab.

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Making Improvements Based on KPIs

You can also change sourcing rules used by the plan to reflect material sources (for example, inventory stocks) that are controlled by the planner or the organization being planned. For example, if a plan is run with many inventory sources specified in the sourcing rules, inventory turns will be lower than if only a few inventory sources are used.

Making Improvements Based on KPIs

Making Improvements Based on KPIs

Increasing Planned Utilization

- Decrease penalty factor for exceeding resource capacity.
- Increase weight given to the maximize resource utilization objective, decrease weight given to other objectives.
- Increase the demand that is being planned.
 - Note that increasing demand can have adverse impact to other KPIs (for example, On-time Delivery) if material capacity is not sufficient to support the demand.

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Making Improvements Based on KPIs

Making Improvements Based on KPIs

Increasing Margin Percentage

- Decrease penalty factors considered in the margin percentage calculation.
- Increase weight given to the maximize margin percentage objective, decrease weight given to other objectives.
- If material and/or resource capacity is constrained, demand will not be fulfilled by the request date and sales will either be lost or penalty costs will be incurred for late demand.
 - See actions described in Increasing On-time Delivery.

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Making Improvements Based on KPIs

Making Improvements Based on KPIs

Increasing On-time Delivery

- **On-time Delivery will suffer if material capacity and/or resource capacity are not sufficient to meet requested delivery dates. By looking at the exceptions that occur after a plan is run, you can determine whether material or resource capacity is the gating factor.**

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Making Improvements Based on KPIs

To determine material and resource capacities required to meet all requested delivery dates for demand, run the plan unconstrained by material and capacity to determine total resource and material capacity requirements. (Choose Plan Options > Aggregation tab to specify material and resource constraints.)

Example 1 - If material capacity is insufficient:

- Add capacity at the bottleneck suppliers
- Specify alternate components that can be used if the primary (constrained) component is not available
- Add capacity at feeder plants supplying sub assemblies

Example 2 - If resource capacity is insufficient:

- Add capacity at the bottleneck resource. For example, add shifts, add outsourcing providers, add labor
- Specify alternate resources that can be used

Example 3 - If material and resource capacities are not constrained:

- Increase penalty factor for unmet demand and late demand

- Increase weight given to the maximize on-time delivery objective, decrease weight given to other objectives

Quiz

Quiz

Inventory turns, Planned utilization, Margin percentage, and On time delivery are examples of:

- 1. Penalty factors**
- 2. Plan objectives**
- 3. Key indicators**
- 4. Demand priorities**

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Answer: 3. Key indicators

Quiz

Quiz

Increasing Planned Utilization increases the penalty factor for exceeding resource capacity.

- 1. True**
- 2. False**

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Answer: 2. False: increasing planned utilization decreases the penalty factor for exceeding resource capacity.

Summary

Summary

In this module, you should have learned how to:

- **Describe plan options**
- **Describe concepts**
- **Describe objectives**
- **Describe penalties**
- **Describe key indicators**

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Global Forecasting

Chapter 14

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Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to describe global forecasting.

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Module Overview: Topics

Module Overview: Topics

Global forecasting

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Topic Overview: Global Forecasting

Topic Overview: Global Forecasting

- **Introduction**
- **Receiving forecasts**
- **Forecast spreading**
- **Consumption**
- **Planning process**
- **Sourcing sales orders**
- **Selection of source organization**
- **Selection of ship method**
- **Viewing results**
- **Distribution**
- **Publishing sales order changes**

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Introduction

Introduction



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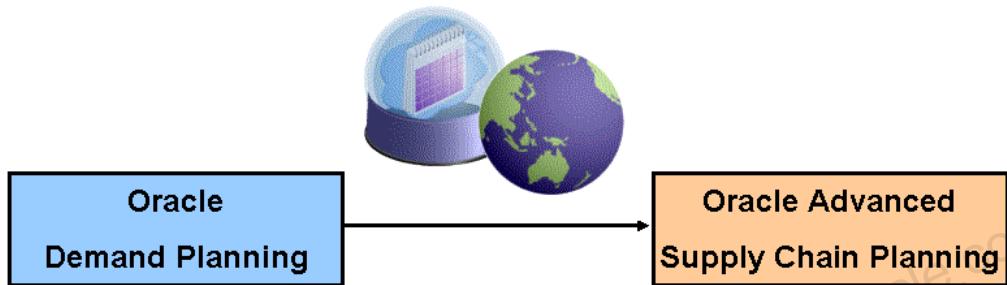
Introduction

Global forecasting is the process of creating and using demand forecasts with no shipment locations.

Enterprises that have multiple shipping facilities, distribution centers, and manufacturing facilities do not usually know the demand fulfilling facility when they prepare and analyze their forecasts.

Receiving Forecasts

Receiving Forecasts



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Receiving Forecasts

Global forecasts are forecasts that you create in Oracle Demand Planning with no ship from information and publish to Oracle Advanced Supply Chain Planning. Their ship to information is in terms of any of:

- Global: Item
- Customer
- Customer site
- Demand class: Any demand segment, for example, internet sales, catalog sales, and retail sales.
- Zone: All customers in a city, postal code, state, and country.
- Customer zone: All customer sites in a city, postal code, state, and country.

If a forecast from Oracle Demand Planning has ship from information, it is a local forecast.

In Oracle Demand Planning:

Set demand plan organization dimension to All Organizations

- Enable Consume in Supply Plan demand plan scenario option

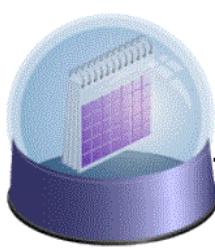
- Select geography hierarchy for dimension Geography (customer, customer site, zone, customer zone)

In Oracle Shipping:

- Enter customer site addresses
- Set up zones that match customer sites
- Set organization-to-zone in transit lead times
- Set zone usage to Forecast analysis

Forecast Spreading

Forecast Spreading



Spread the aggregate forecast demand evenly across the daily buckets

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Forecast Spreading

If you develop and maintain your Oracle Demand Planning forecasts in aggregate (week, month, or quarter), you can:

- Use those forecasts in Oracle Advanced Supply Chain Planning
 - Instruct the planning engine to spread this aggregate forecast demand evenly across the daily buckets based on the workday calendar.

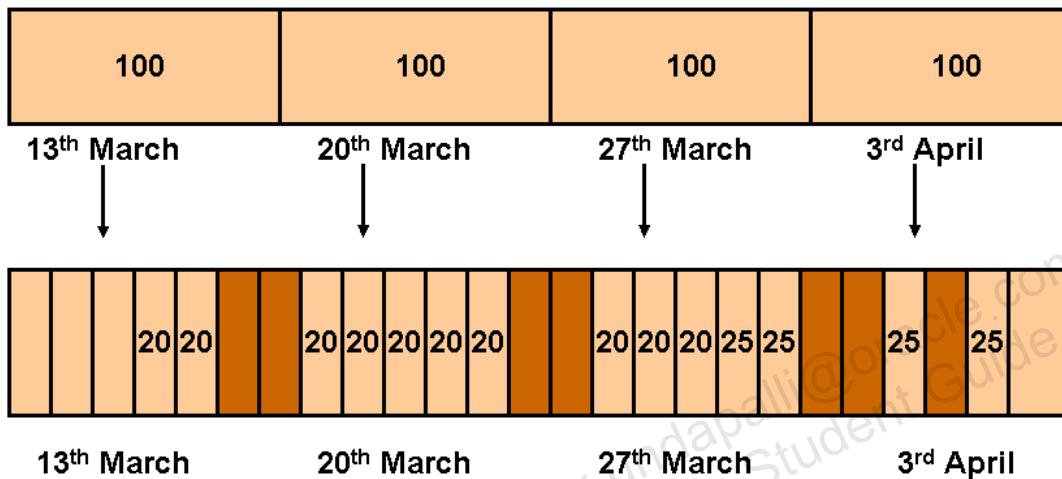
Planning forecast demand in daily buckets may provide a more realistic estimate of the future supply but forecasting in aggregate may lead to more accurate forecasts.

To use this feature, set the following information:

- Use only week or period forecast buckets in Oracle Demand Planning.
 - If you are publishing forecasts from Oracle Demand Planning, set Oracle Advanced Supply Chain Planning planning parameter Include Past Due Forecast. Enter the number of days of past due forecasts to include in plans. No value indicates include all past due forecasts; zero indicates include no past due forecasts.
 - If you are publishing master demand schedules and sales orders from Oracle Demand Planning, set Oracle Advanced Supply Chain Planning profile option Include MDS Days.
 - Navigate to the Plan Options form, Main tabbed region; select Spread Forecast Evenly.

Forecast Spreading for Gregorian Calendars

Forecast Spreading for Gregorian Calendars



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Forecast Spreading for Gregorian Calendars

Oracle Advanced Supply Chain Planning allows you to spread the aggregated forecast received from Oracle Demand Planning to forecast scenarios that use time buckets of Gregorian months. The planning engine applies the following considerations before calculating the forecast entry for each working day:

- If you set outlier percentage for a forecast set, the planning engine applies it to the forecasts after it spreads them.
- If a forecast entry from Oracle Demand Planning falls on a non-workday in Oracle Advanced Supply Chain Planning, the planning engine places the forecast entry on the previous working day.
- For items under rounding control, the planning engine rounds a spread forecast quantity up and applies its cumulative remainder to the next bucket. It uses the item-organization item attribute.

Forecast Spreading Example

The diagram in the slide shows a forecast spreading example. The boxes shaded darker represent the weekends or holidays.

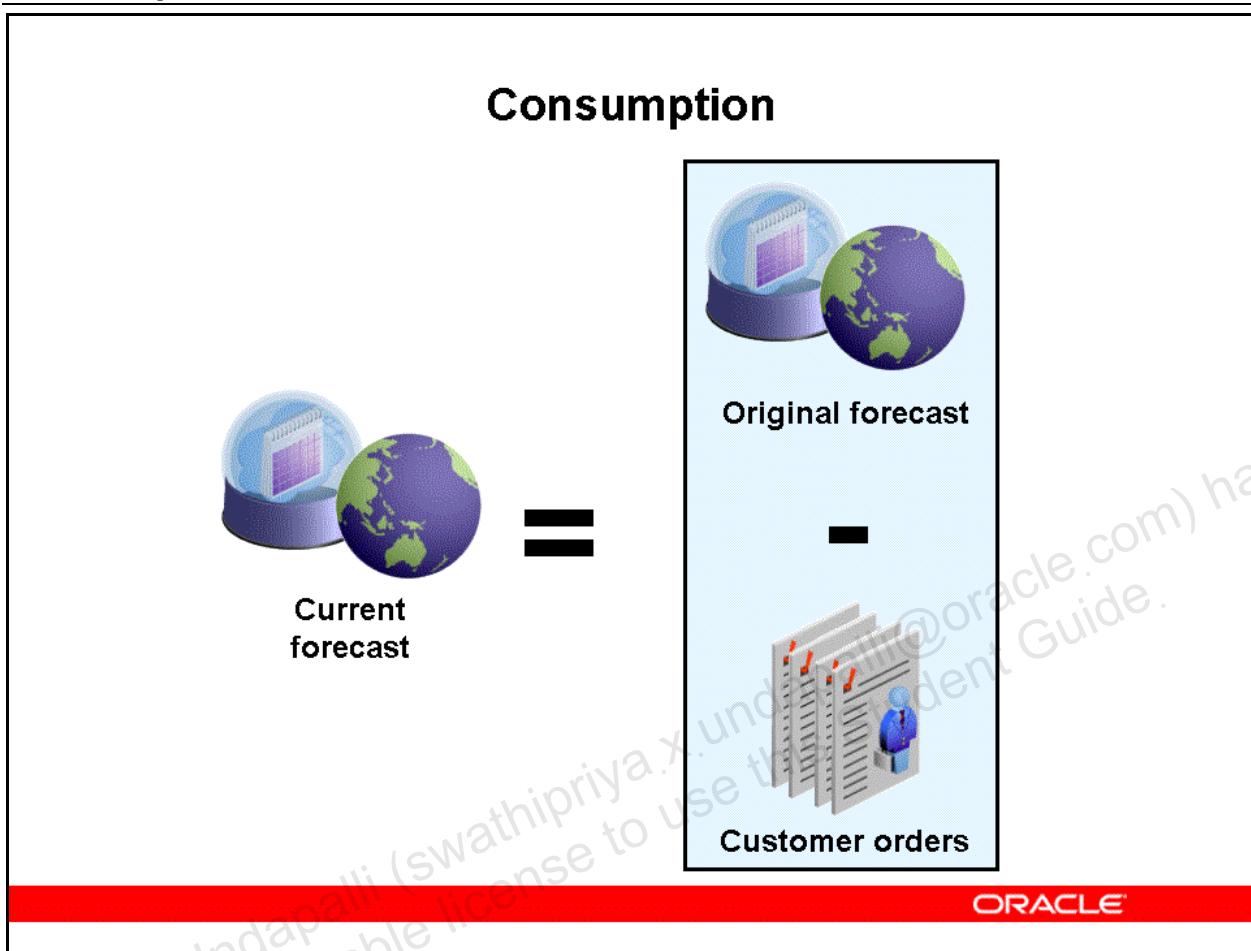
Assumptions:

- You entered forecasts of quantity 100 for the weeks of 13 March, 20 March, 27 March, 3 April, 10 April, and 17 April. Each week begins on Thursday.
- The planning buckets are five days, two weeks, and one period.
- The workdays are Monday through Friday and there is a holiday on Tuesday 1 April.
- You set plan parameter Include Past Due Forecast to 0 and selected plan option Spread Forecast Evenly.

Forecast Spreading:

- The planning engine spreads each weekly forecast of quantity 100 for the weeks beginning 13 March and 20 March to five daily forecasts of quantity 20.
- The planning engine spreads the weekly forecast of quantity 100 for the week beginning 27 March to four daily forecasts of quantity 25.
- The planning engine does not spread forecasts that map to planning horizon periods.
- The planning engine plans to no forecast demand on planning daily buckets 10 March, 11 March, and 12 March. It plans to forecast demand of 20 on daily buckets 13 March and 14 March.
- The planning engine plans for forecast demand of 100 on planning weekly bucket 17 March to 23 March ($20 + 20 + 20 + 20 + 20$).
- The planning engine plans for forecast demand of 110 on planning weekly bucket 24 March to 30 March ($20 + 20 + 20 + 25 + 25$).
- The planning engine plans for forecast demand of 350 on planning monthly bucket 31 March to 4 May ($25 + 25 + 100 + 100 + 100$).

Consumption



Consumption

To delay attaching an organization to a forecast until as late as possible and to re-visit it each time you run a plan, forecast consumption cannot happen at the item-organization level. It must happen at a level higher than the ship-to level, such as:

- Global: Item
- Customer
- Customer site
- Demand class: Any demand segment, for example, internet sales, catalog sales, and retail sales.
- Zone: All customers in a city, postal code, state, and country.
- Customer zone: All customer sites in a city, postal code, state, and country.

If you consume by customer or zone and the customer does not provide a customer-specific or zone-specific forecast, the consumption process assigns that forecast customer Others or zone Others.

The consumption process:

- Aggregates all available sales orders to the level at which you want to consume.

- Consumes the forecasts at the chosen level

For example:

- You choose customer/site level consumption.
- The consumption process groups all sales orders by customer/site values.
- It consumes a forecast with a certain customer/site by sales orders with the same customer/site ship to.
- To set the level for consumption, set plan option Ship To Consumption Level in the Organizations tabbed region. The levels available depend on how the Oracle Demand Planning scenario is published:
- Item dimension is always published, Item is always available.
- If demand class dimension published, Demand Class is available values otherwise demand class will not be a valid option in the LOV

If geography dimension is published:

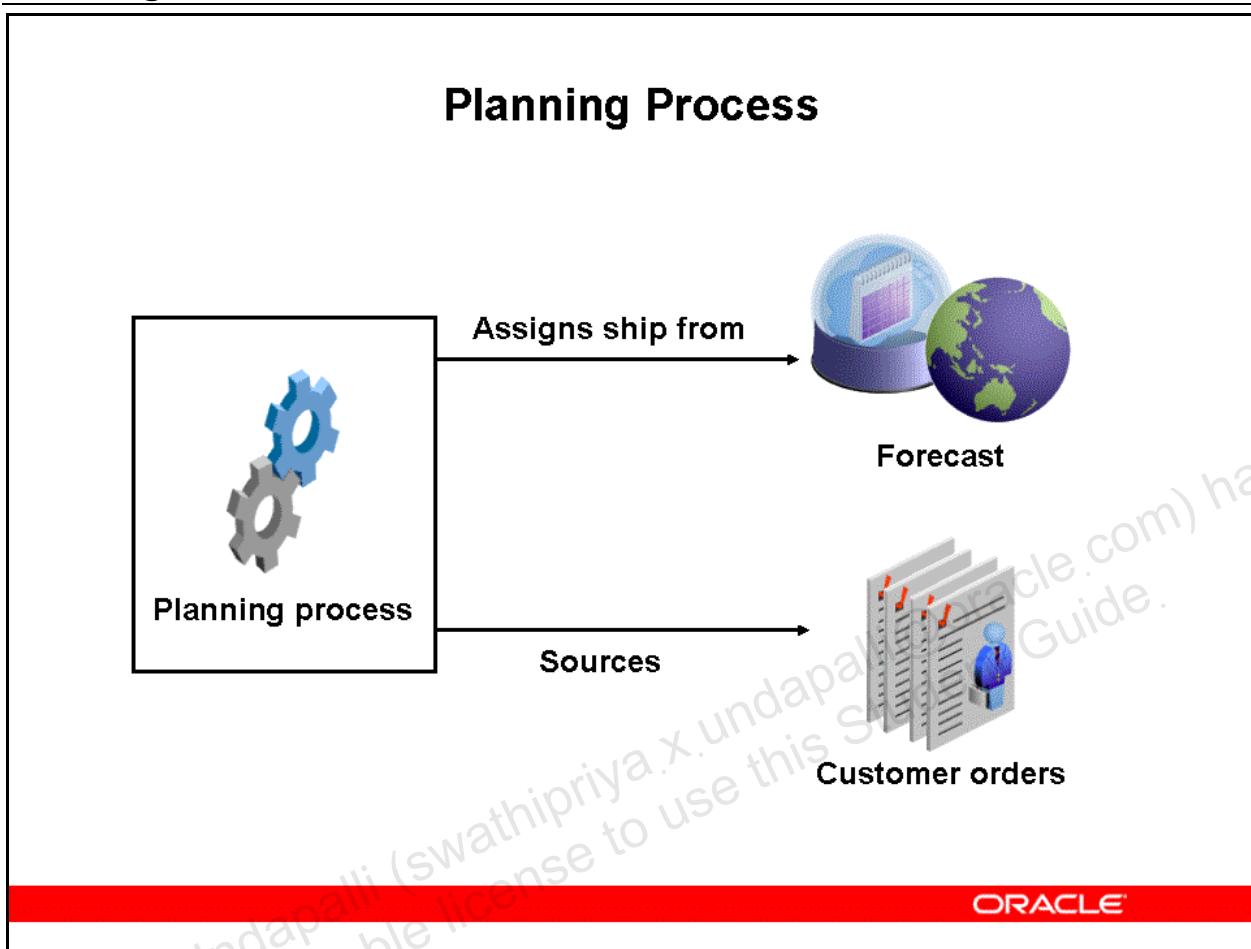
- If the forecast is output at the customer level, Customer is available
- If the forecast is output at the customer site level, Customer and Customer Site are available
- If the forecast is output at the zone level, Zone is available
- If the forecast is output at the customer zone level, Customer, Zone, and Customer Zone are available.

To specify the sales order date that you want to use in consumption, set plan option Schedule By Date in the Main tabbed region to match the meaning of your global forecast dates:

- Schedule ship date
- Schedule arrival date
- Request ship date
- Request arrival date
- Promise ship date
- Promise arrival dates

Sales orders consume local forecasts that match their ship from organizations.

Planning Process

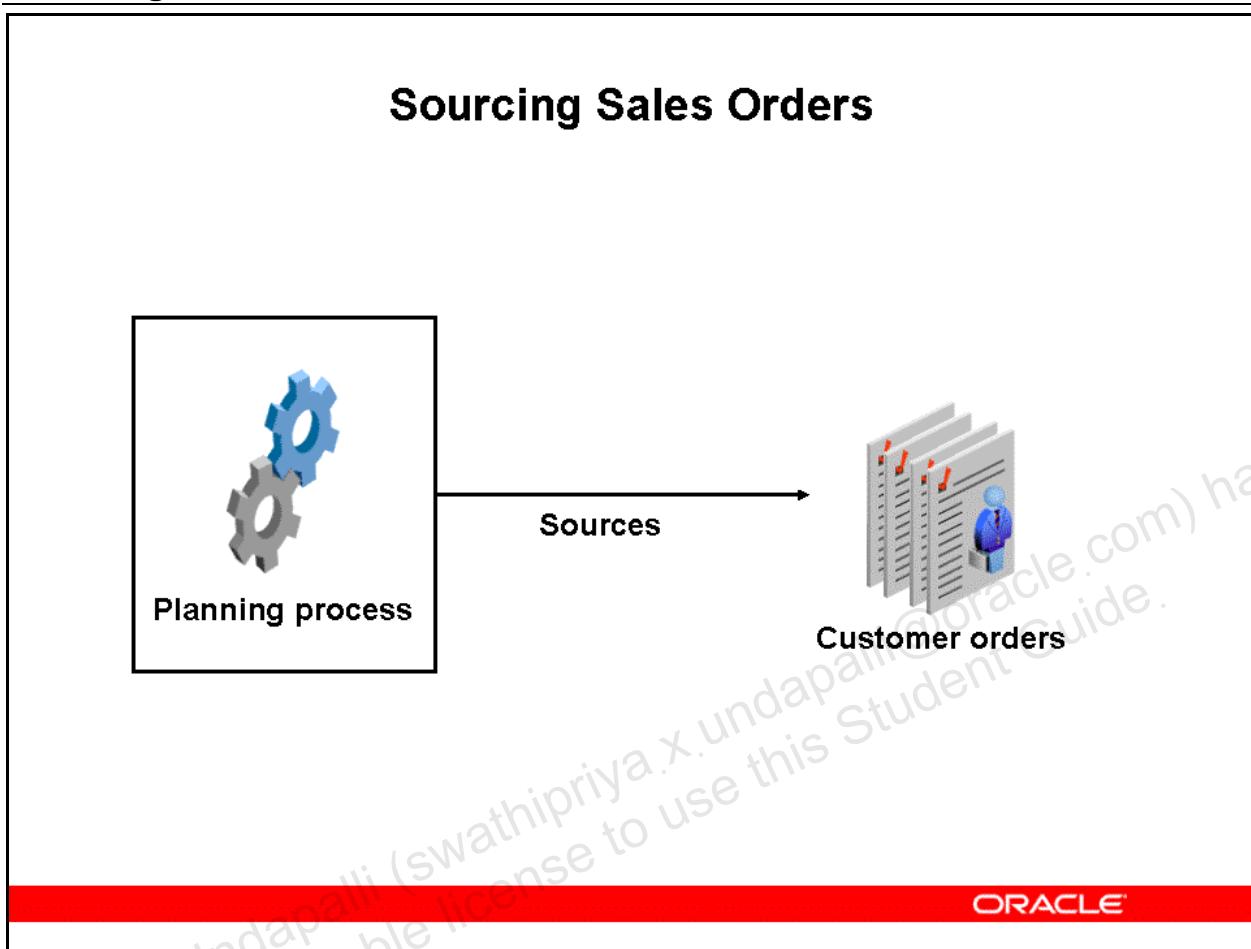


Planning Process

Each time it runs, the planning process:

- Assigns ship from organizations to forecasts after checking inventory availability at inventory organizations.
- Sources sales orders based on information about supply availability and resource constraints.

Sourcing Sales Orders



Sourcing Sales Orders

Sourcing a sales order is recommending changes to the sales order:

- Warehouse (Source organization in planning)
- Scheduled ship date: The later of Request Date and Earliest Ship Date. For example, a sales order line has request date of D10, and schedule ship date of D20. If the planning engine determines that the material availability date is D22, both earliest ship date and the schedule ship date will be changed to D22. If the material availability date from the planning engine is D8, the schedule ship date will be updated to request date which is D10, the earliest ship date will be updated with D8.
- Scheduled arrival date
- Earliest ship date (Material availability date in planning): Date materials available to ship. This is not available for viewing on the sales order.
- Shipping method (Ship method in planning)
- Deliver lead time (In transit lead time in planning)

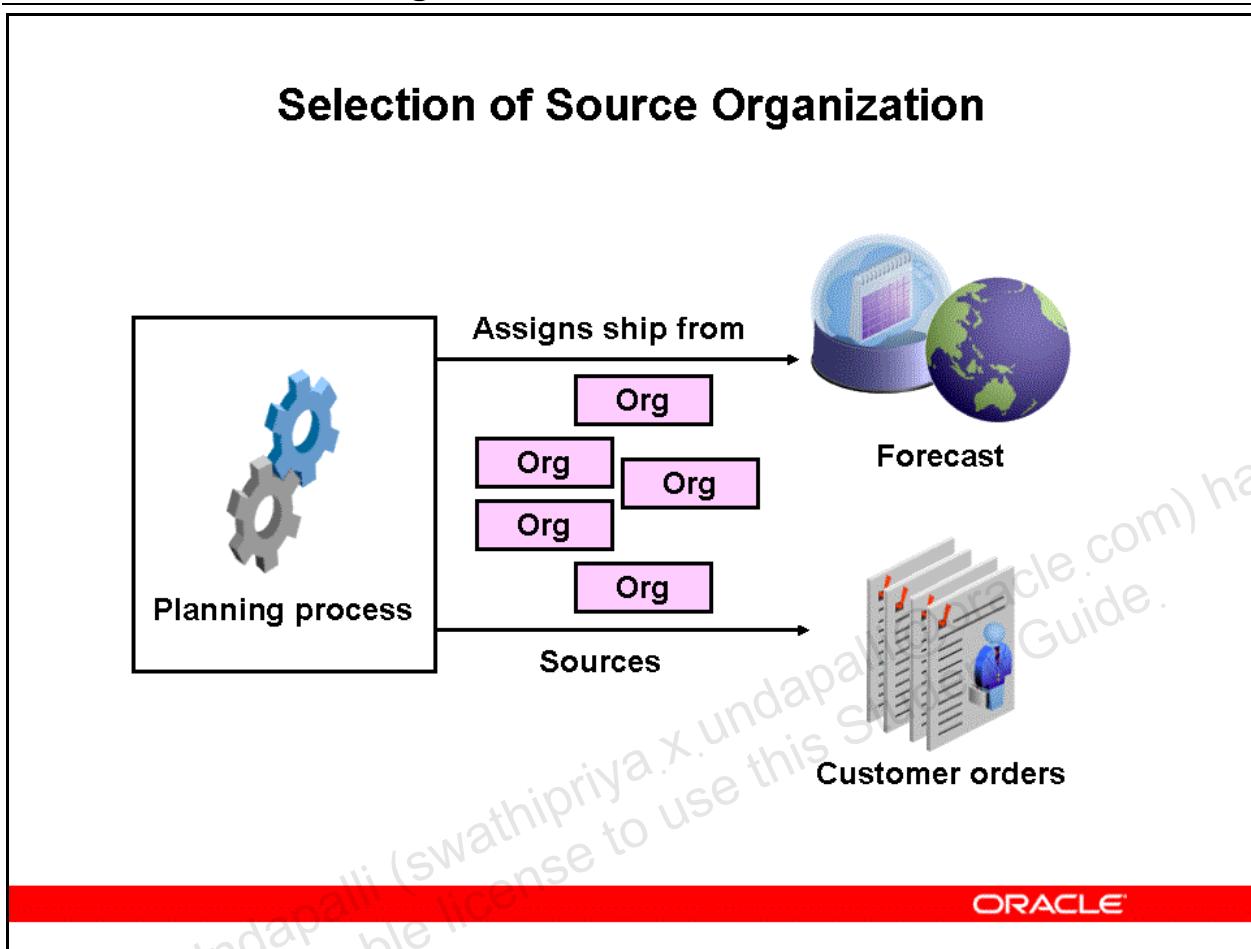
You can firm a sales order line and the planning engine does not issue recommendations against it even if it results in capacity overloads or late supplies for a sales order, depending on the plan options). After firming sales order lines, you typically recollect and rerun the plan.

The planning engine recommends that same date for all lines in a ship or arrival set; it is the latest date of all the lines in the ship set or arrival set.

To enable sales order sourcing, select:

- Notifications in the plan name.
- Plan option Include Sales Orders in the Organizations tabbed region.
- Planner Workbench preference Include Sales Orders in the Other tabbed region

Selection of Source Organization



Selection of Source Organization

For your global forecast distribution scheme, you define sourcing rules/bills of distribution and assign them to sourcing levels in an assignment set:

- Item-Instance
- Instance
- Category-Instance
- Instance-Zones
- Instance-Customer-Zones

Assignment Set is a plan option in the Main tabbed region; the planning engine uses it both to source forecasts and to source sales orders.

If you run:

- Constrained plans with decision rules enabled, the ranks and the material and resource capacity determine the source. Any transportation constraints established between Orgs and customer sites will be considered while distributing sales orders or forecast which are specific to a customer site. When you run constrained plans with Decision rules enabled you may choose to impose a certain pre-determined sourcing split.

- Optimized plans, the cost of producing an item, resource costs, carrying costs, the plan objectives, the resource and material capacities determine the source. If you run optimized plan without Decision Rules set up you, may choose to enforce a predetermined sourcing split. Any transportation constraints established between organizations and customer sites are considered while distributing sales orders or forecast which are specific to a customer site.

Selection of Ship Method

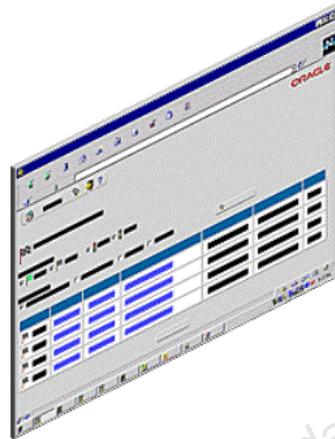
Selection of Ship Method



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Viewing Results

Viewing Results



Viewing Results

To view the global forecast information (the global forecast plan) in Planner Workbench horizontal plan. The global forecast plan appears above the material plan.

The global forecast plan shows rows with:

- Original forecast quantity
- Consumed quantity
- Current quantity
- Cumulative original quantity
- Cumulative consumed quantity
- Expired forecast: The amount of unmet forecasts

The material plan includes the distributed forecasts in its forecast rows.

You can also view:

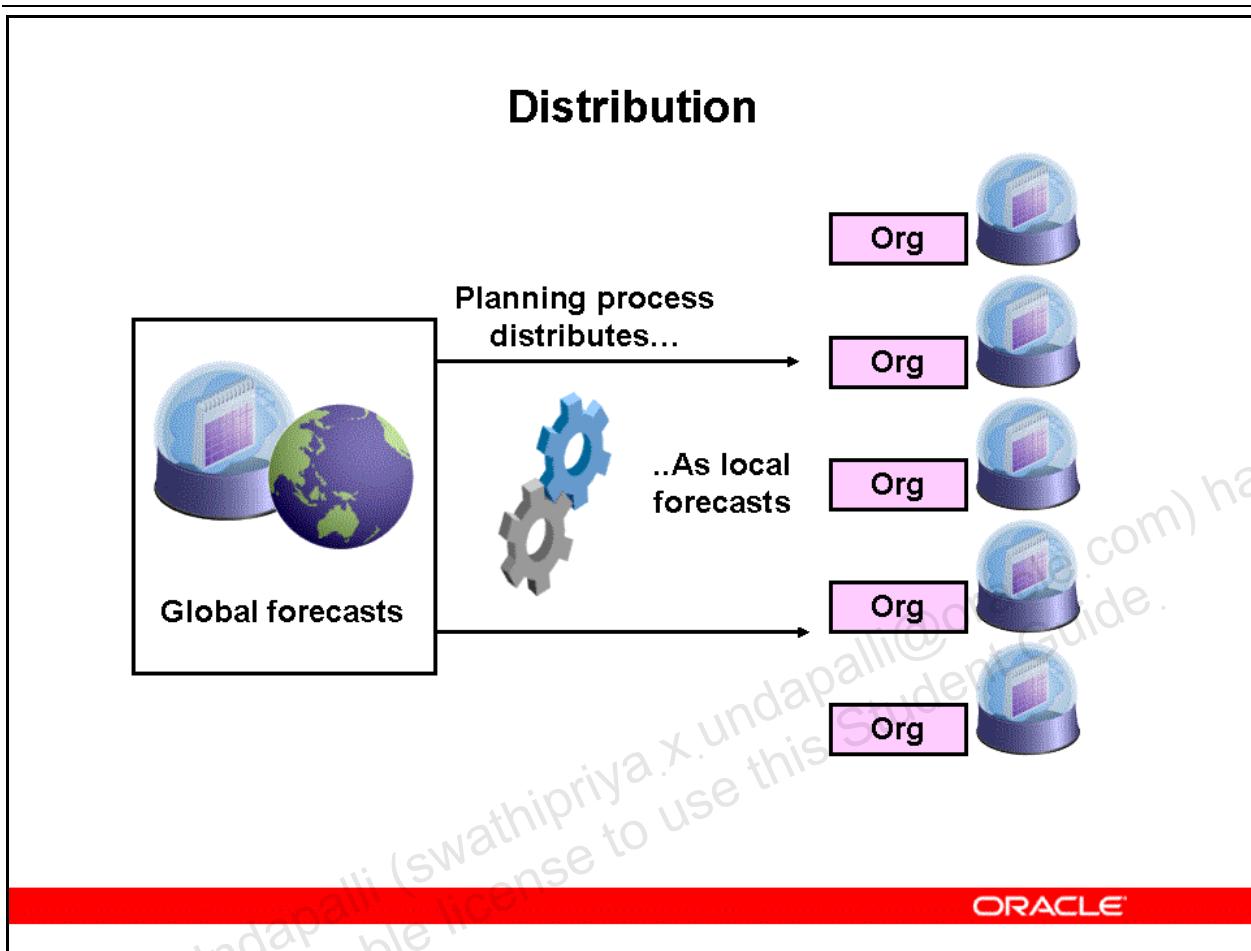
- Forecast and consumption information (consumption plans) specific to the consumption level. For example, if the consumption level is customer site, you can see the consumption plan for each customer site. In the consumption plan row titles area, right-click Global Forecasting and select the specific occurrence.

- If you double-click on the consumed forecasts, you see the Supply/Demand window displaying the distributed forecasts.
- Sales orders that consumed a global forecast entry. In the consumption plan, right click on a quantity in Consumed row.
- Forecast entries distributed to each organization. In the consumption plan, right click on a quantity in Current row.

For each overconsumption, the planning engine issues exception message Items exception group > Item with forecast overconsumptions. You can drill down to context windows:

- Item
- Supply/Demand
- Demand
- Sources
- Destination
- Horizontal plan

Distribution

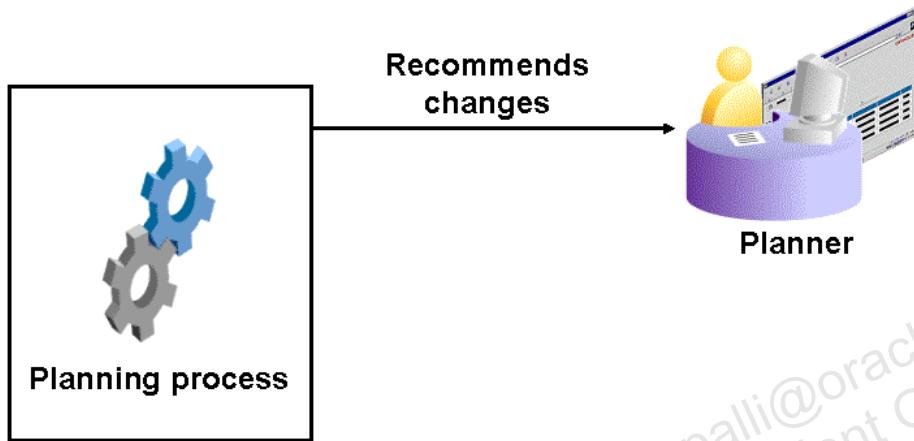


Distribution

The global forecasting process uses sourcing to distribute the consumed forecasts to ship from organizations; the forecasts become demands in the those ship from organizations.

Recommending Sales Order Changes

Recommending Sales Order Changes



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Recommending Sales Order Changes

One of the many decisions Oracle ASCP can make is the selection of a facility to source the materials based on current conditions of supply and demand. Oracle ASCP selects the sources based on global supply availability, constraints that you may have in the supply chain, costs involved in producing and procuring items etc. This information will be made available to Order Management for effective execution.

As sales orders are accepted into the system users may put in a fulfillment facility based on order promising or a preferred facility by default, but the facility chosen by the users may not be the correct facility given the ever evolving supply and demand picture through out the supply chain. The planning process may make recommendations to change schedule date, earliest ship date, arrival date, ship method, or the source warehouse (Organization). If it does, it issues exception message Changes recommended for sales orders in the Reschedules exception group.

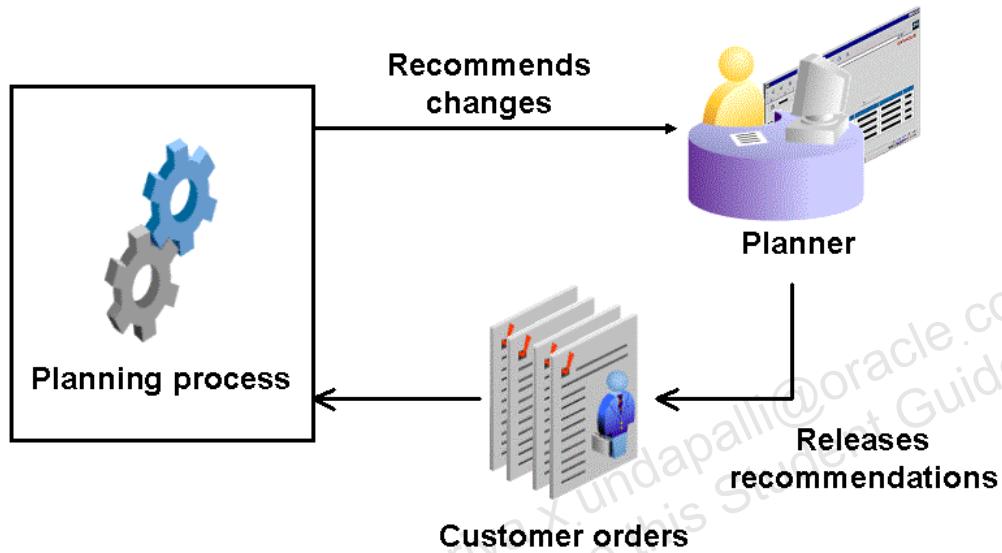
After each planning run, the planner reviews sales order recommendations. Refer to Planner Workbench fields Implement Date, Implement Qty, and Implement Source Org. You can change date cannot change quantity and warehouse. You must enable sales order publishing in Planner Workbench options.

Since changing the execution system constantly can adversely affect operations, you can firm the source for a sales order. Once the source is firmed, the planning system will not suggest changes to execution system and overload resources at that organization or allow late supplies at that organization (depending on the plan options). You can firm in Oracle Order Management using the Orders form, in your workflow processes, or by instructing Oracle Order Management to firm at schedule or shipping interface points.

All sales order lines in ship sets and arrival sets receive the latest date of all of the lines.

Publishing Sales Order Changes

Publishing Sales Order Changes



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Publishing Sales Order Changes

After review, the planner releases (publishes) the changes to Oracle Order Management. The Release Properties window notes any publish failures and the reason and the process sends a notification to the sales representative.

Multiple source for sales orders – Oracle OM cannot accept these changes as it involves line splits.

Sales order line has item substitutions – If the ordered item changes on a sales order line as part of end item substitutions, such sales order lines cannot be pushed over to OM as OM will not be able to accept a change in the item on a sales order line. This may also mean line splits.

Different Sources picked for order lines within a ship set - All sales order lines from a ship set are supposed to ship at the same time from the same Org. Since ASCP does not consider this constraint, ASCP may choose different shipment warehouses for different sales order lines in a ship set. You will be alerted to such a condition via release errors process.

Items under a PTO model selected for release – PTO models are not planned items, but the items under PTO models may be planned. We do not want to release the dates or sources even for components of PTO models as there may be a mismatch between the sources and dates on the sales order lines of models, option classes and options.

One or more items in a ship set/arrival set/ ship model complete is not a planned item - If you have items that are not planned in a ship set, arrival set, ship model complete, the recommendation will not be complete as non planned items will not have any plan generated dates or sources, thus Oracle ASCP will prevent releasing recommendations for such sets.

Quiz

Quiz

Allocating aggregate forecast demand evenly across the daily buckets based on the workday calendar is called:

- 1. Distribution**
- 2. Forecast Spreading**
- 3. Consumption**
- 4. Plan optimization**

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Answer: 2. Forecast Spreading

Quiz

Quiz

The consumption process aggregates all available sales orders to the level at which you want to consume.

- 1. True**
- 2. False**

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Answer: 1. True

Summary

Summary

In this module, you should have learned how to describe global forecasting.

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Integrating Advanced Supply Chain Planning with Other Oracle Applications

Chapter 15

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Integrating Advanced Supply Chain Planning with Other Oracle Applications

15

Integrating Advanced Supply Chain Planning with Other Oracle Applications

Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to:

- List types of manufacturing environments that are integrated with Advanced Supply Chain Planning
- List and describe relevant integration points between the following Oracle applications
 - Demantra Demand Management (DM)
 - Advanced Planning and Scheduling (APS):
 - Advanced Supply Chain Planning (ASCP)
 - Inventory Optimization (IO)
 - Production Scheduling (PS)
 - Strategic Network Optimization (SNO)

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Topic Overview: Mixed Mode Manufacturing Planning

Topic Overview: Mixed Mode Manufacturing Planning

- Plan manufacturing and distribution operations for hybrid manufacturing methods:
 - Discrete Manufacturing:
 - Oracle Shop Floor Management
 - Oracle Engineering Bills of Material
 - Oracle Project Manufacturing
 - Oracle Flow Manufacturing
 - Oracle Process Manufacturing
- Simultaneously plan make-to-stock, make-to-order, assemble-to-order, and configure-to-order products, using a single plan across all methods.

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Overview of Mixed Mode Manufacturing

Oracle ASCP supports mixed mode manufacturing so that you can plan manufacturing and distribution operations for hybrid environments. You can plan for the full range of discrete, repetitive, process, project, and flow manufacturing environments. You can also plan to make-to-stock, make-to-order, assemble-to-order, and configure-to-order products simultaneously, using a single plan across all methods.

Mixed mode manufacturing is supported by the following combination of Oracle applications:

- Oracle BOM and Oracle Shop Floor Management (for discrete manufacturing)
- Oracle Flow Manufacturing,
- Oracle Project Manufacturing
- Oracle Process Manufacturing

These applications together serve primarily to provide process plan (routing) data to the Oracle ASCP engine. They also provide the user interfaces with which users of the different manufacturing modes view the output of the planning process.

Mixed Mode Manufacturing

Mixed Mode Manufacturing

Support for common features in hybrid manufacturing environments:

- **Phantom routings**
- **Utilization efficiency**
- **Routing effectivity**
- **Sequence-dependent setups**
- **Simultaneous, aggregate, and alternate resources**
- **Co-products**
- **Lot-based component usage**

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Common Features in Hybrid Manufacturing Environments

Phantom Routings

Phantoms are non-stocked assemblies that let you group together material needed to produce a subassembly. Oracle ASCP explodes requirements through a phantom subassembly to the components as if the components were directly tied to the parent assembly. No planned orders are generated for phantom assemblies. Routings for phantom items are used to generate resource requirements. However, the planning engine does not support phantom routings for unconstrained plans.

Utilization Efficiency

Routings are used to generate capacity requirements for planned orders and suggested repetitive schedules by the planning engine. In capacity planning you can define utilization and efficiency on a department resource within Bills of Materials.

Routing Effectivity

Routing Effectivity is incorporated into Capacity Planning with Oracle Planning Products. Routings are used to generate capacity requirements for Planned Orders and Suggested Repetitive schedules by the planning engine. The planning engine generates the resource

requirements using routings, which are effective on the start date of the planned order or suggested repetitive schedule. Note that each routing has an effective date and a disable date which indicates the date range for which the routing is effective.

Sequence-Dependent Setups

During the scheduling process, ASCP explicitly considers setup times that must be incurred when a resource transitions between tasks that require different setups of the resource. Out of the possible setup sequences on a resource, ASCP will derive one sequence that minimizes the overall time spent on setting up the resource. Based on user-specified plan option values, ASCP also trades off the benefit of minimizing setup time and maximizing resource throughput against the cost of satisfying demands early and building up inventory.

This capability is available for both discrete and process organizations. ASCP uses the same setup transition matrix inputs as already used by Manufacturing Scheduling.

When scheduling for a resource for which sequence-dependent setups are specified, ASCP schedules down to the resource instance level for that resource. Previously, ASCP scheduled down to the resource level only.

The setup transition matrix associated with a resource can be called up for display from the Resource details screen of the planner workbench. The calculated setup hours for a resource can be seen from the horizontal capacity plan for that resource.

Simultaneous, Aggregate, and Alternate Resources

You can use the flexfield in the Bills of Material form to enter data for planning and scheduling (Cost of using Alternate BOM / Routing).

Co-products

In some production environments, an item may turn into one or more parent items depending on factors such as process control, test results, and raw material quality. The parent items are called co-products.

Both Oracle Shop Floor Management (OSFM) and Oracle Process Manufacturing use co-products.

Lot-based Component Usage

Assembly of some products may consume some components whose usage does not vary with the job quantity, but instead is a fixed quantity. In such cases, the component usage is deemed to be ‘lot-based’ instead of item-based. ASCP considers lot-based component requirements and ensures correct material availability.

Integration with Oracle Project Manufacturing

Integration with Oracle Project Manufacturing

- **Include project, task, or Seiban numbers in planning data.**
- **Manage planning data with project, task, or Seiban numbers.**
- **Recognize, allocate, and combine supply and demand information with common plans.**
- **Perform netting by planning groups, project or Seiban, and tasks.**
- **Generate and execute planned orders with project or Seiban, and task references.**
- **Implement planning suggestions for planned orders.**

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Integration with Oracle Project Manufacturing

Oracle Project Manufacturing is designed to support companies that manufacture products for projects or contracts. It provides robust project tracking, billing, and budgeting. You can plan in a project or contract environment by segmenting all sources of supply and demand by project. This allows the planning process to identify components as shared or project specific, track existing inventories by project, and provide visibility to all supply and demand associated with the project.

Oracle Project Manufacturing supports Seiban production. Seiban is a Japanese management practice that manages a manufacturing plan. All demand and supply for the manufacturing plan is associated with the Seiban number (via its project number).

Oracle Project Manufacturing also supports engineer-to-order (ETO) environment and an assemble-to-order environment. This enables a manufacturer to track supply and demand with a particular product, project, or customer.

Oracle ASCP supports Oracle Project Manufacturing through Project Planning. With Project Planning you can:

- Include project or project-task or Seiban numbers in forecast, MPS, and MDS entries.

- Load, copy or merge forecast, MPS, and MDS entries with project or project-task or Seiban numbers.
- Recognize and allocate supply according to project or project-task or Seiban numbers.
- Combine project or project-task and Seiban related supply and demand with common supply and demand in the same plan or schedule.
- Perform netting by planning groups, project or Seiban, and tasks
- Generate planned orders with project or Seiban, and task references
- Execute a plan in the Planner Workbench by planning group, project or project-task, and Seiban.
- Perform net change simulation in a project environment.
- Generate planned orders with project or project-task or Seiban.
- Implement planning suggestions by planning group, project or project-tasks, or Seiban numbers.

Integration with Oracle Flow Manufacturing

Integration with Oracle Flow Manufacturing

- **Supply chain synchronization**
 - Improve supply-chain throughput and reduce inventories
 - Decrease manufacturing times and increase manufacturing plant throughput
- **Support for flow schedules**
 - Define and manage flow schedules
 - Release flow schedules
- **Support for demand management**
- **Support for Kanban planning and execution**

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Integration with Oracle Flow Manufacturing

Oracle Flow Manufacturing is a demand driven production system with balanced production lines and processes designed to produce a constantly changing mix of products at a steady rate. Flow manufacturing uses schedules for mixed model production instead of work orders to drive production. The mixed model schedules are sequenced based on scheduling rules and material is replenished, or pulled through the sequence, using kanbans.

When there is a hybrid of manufacturing methods, for example if a flow manufacturing system feeds to a discrete manufacturing plant, Oracle ASCP may be used effectively, because Oracle ASCP can consider a flow schedule as a supply.

Oracle ASCP can improve supply-chain throughput and reduce inventories by improving synchronization of operations between facilities. In turn, Oracle Flow Manufacturing increases manufacturing plant throughput by dramatically decreasing manufacturing times and removing in-process and finished goods inventory.

Oracle ASCP can also create plans based on capacity constraints placed by the users. If demand is more than the manufacturing capacity, then Oracle ASCP can create a plan considering the constraints. These planned orders may be converted into flow schedules.

Integration with Oracle Process Manufacturing

- **Support for complex routings**
- **Support for contiguous operations**
- **Support for managing material shelf life**
- **Support for Oracle Process Manufacturing planning convergence**

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Integration with Oracle Process Manufacturing

Support for OPM complex routings:

- A process can start with multiple operations
- Multiple operations can be executing at the same time
- Single operations can feed multiple operations
- Multiple operations can feed a single operation
- Multiple operations can yield multiple co-products
- Products can be harvested from multiple operations (multiple terminal points)

Support for contiguous operations:

In order to support planning according to the common practice of contiguous processing from raw materials to finished product, ASCP allows you to enforce minimum and maximum time offsets between two operations. You can impose the time offset constraint between the finish of the first operation and the start of the second operation. Alternatively, you can impose it between the start of the first operation and the start of the second operation. Planning for contiguous processing is achieved by imposing finish-to-start maximum time offsets of zero between successive operations.

Manage shelf life for materials:

ASCP respects the expiration date of on-hand lots when pegging them to demand. ASCP generates an "insufficient remaining shelf life" exception if the material is planned to arrive at the customer site with a remaining shelf life less than the parameter Minimum Remaining Shelf Life Days as set in the item attribute simulation set for an end demand.

OPM planning convergence:

The existing OPM customers can now upgrade to Oracle ASCP unconstrained planning by replacing the OPM MRP module in a multi-organization environment. However, new OPM customers without an ASCP license can only use single org unconstrained ASCP.

ASCP provides the following advanced features not available in OPM MRP:

- Advanced APS user interface
- Multi-level pegging
- Online planner and simulation capabilities
- Advanced co-product planning

However, ASCP does not support the following OPM MRP features:

- Replenishment method-specific order modifiers
- Multiple transfer types
- Resizing suggestions

Topic Overview: Integration with Demantra Demand Management

- Supported Integration Configurations
- Integration Features
- Summary of Integration Tasks
- Setup and Process
- Demand Management Functional Output

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E-Business Suite (EBS)-Demantra Demand Management (DM) Supported Integration Configurations

E-Business Suite (EBS)-Demantra Demand Management (DM) Supported Integration Configurations

- One or more EBS 11i/10 sources instances, zero or more legacy instances, with separate instance for 11i/10 APS and Demantra destination:
 - Consolidated 11i/10 EBS source / APS / Demantra instance
- One or more EBS 11i/10 source instances, zero or more legacy instances, with a separate 11i/10 Demantra instance (and no other APS products)
 - Consolidated 11i/10 EBS source / Demantra instance
- Supported database versions: Oracle 9i and Oracle 10g
 - Future: support for R12 and for configurations with R12 as the destination and 11i/10 as the source.

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Supported Integration Configurations

Demantra Demand Management can be implemented with or without the full complement of APS applications. See the next slides for a more detailed description of supported instance arrangements.

Note:

JInitiator and Java plugins cannot be used in the same browser session. Navigating to Demantra applications from Forms-based responsibilities will crash Internet Explorer. If users intend to navigate to Demantra applications from forms-based responsibilities, then JInitiator must be upgraded to Sun J2SE 1.5.0 Native Plug-in. Please follow the instructions in MetaLink note 290807.1 “Upgrading Sun J2SE with Oracle Applications 11i to upgrade from JInitiator to Sun J2SE 1.5.0 Native Plug-in”.

EBS-Demantra DM Integration

EBS-Demantra DM Integration

Collections enable bringing in historical data and dimensional data from Legacy systems into Demand Management:

- **Shipment and Booking History**
- **Level Members**

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Demand Management Integration – Legacy

ASCP legacy collections can be used to load items, locations and calendars. Demantra integration interface is used to load fact data, except history loaded through EP Load.

1. Load manufacturing and fiscal calendars using Legacy collections – self-service load.
2. Load items and locations using Legacy collections – self-service load.
3. Load booking and shipment history data into Demantra staging table using Shipment and Booking History – Self Service.
 - This executes the concurrent program to generate items and locations parent levels and populate Demantra items and locations staging table.
 - This executes automatically if the automatic download option is selected. It downloads items, locations, calendars and history data from staging to Demantra internal tables.
4. Use integration profiles to load return history, other fact data, price list, UOM and currency conversions.

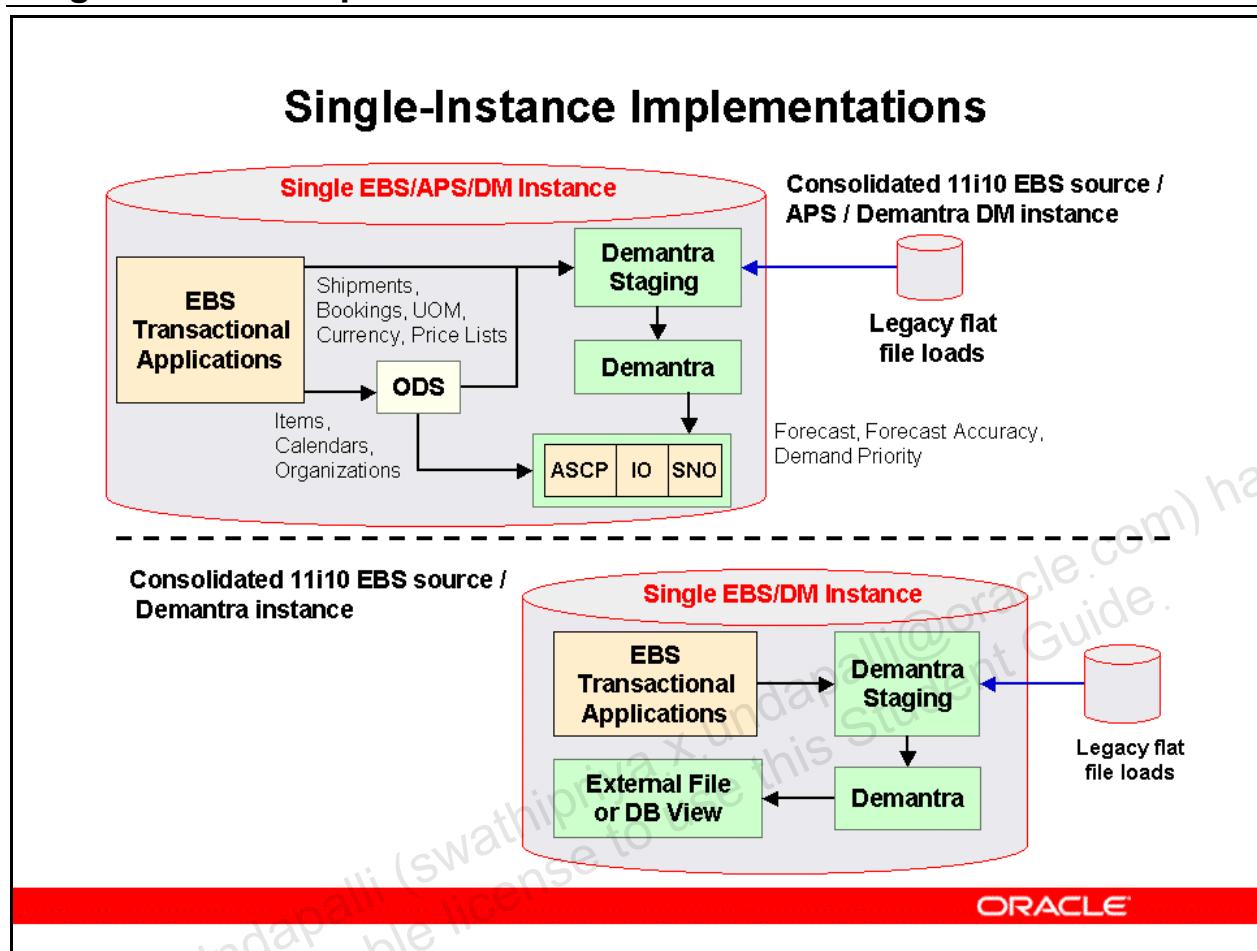
Profile - MSD_DEM: Category Set Name

- Set to the ‘master level’ category set used to find item-to-category rollups in each instance. There is no default value.

Profile - MSD_DEM: Master Org

- This profile is used to find an Item’s product family. There is no default value.

Single-Instance Implementations



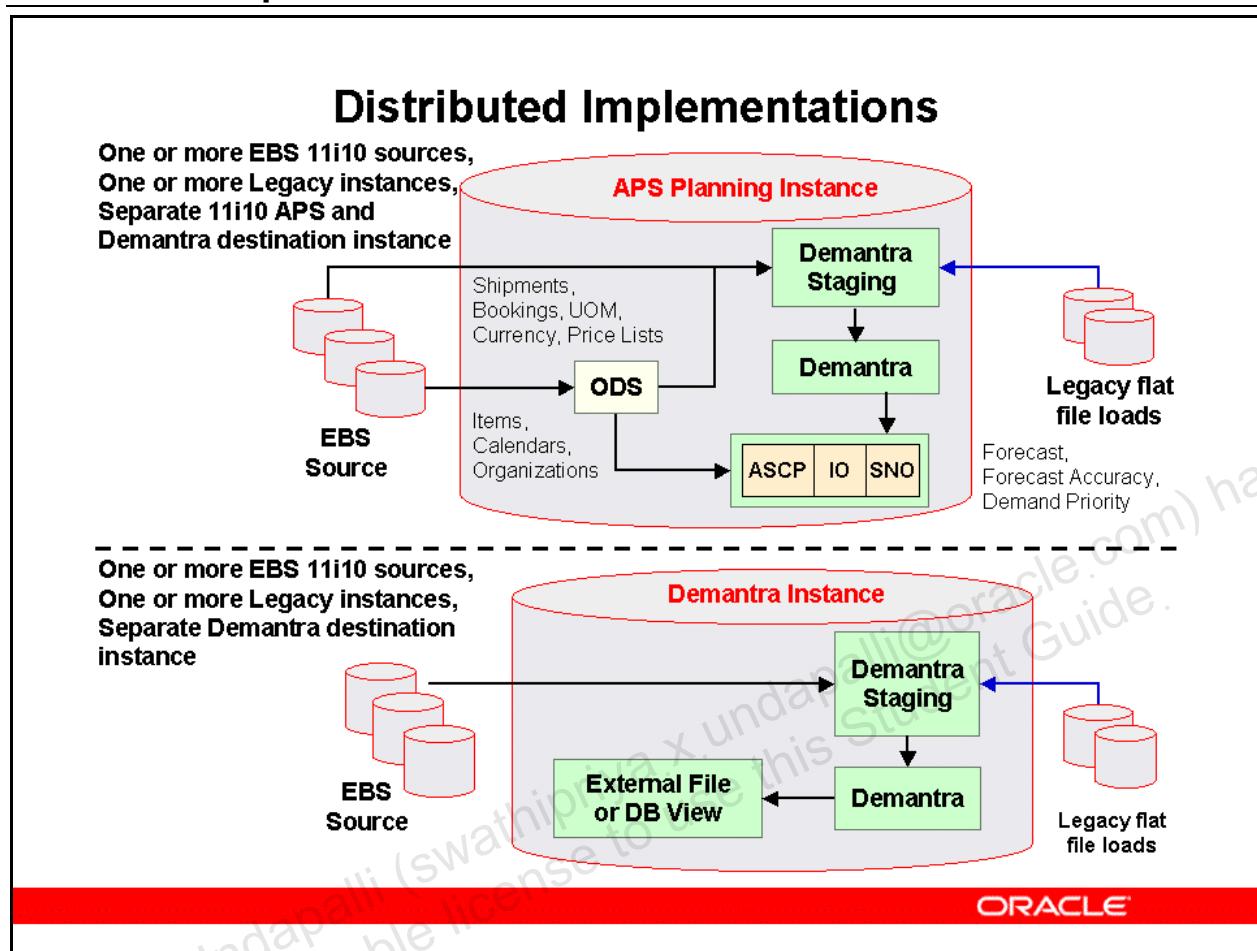
Consolidated Implementations

Integration between Oracle Demantra and the E-Business Suite leverages Oracle Demantra Foundation functionality to the extent possible. Booking history, price list, currency, calendars, users, and items collected from the E-Business Suite applications are loaded into Oracle Demantra. Forecasts and accuracy measures return.

EBS Transactional Applications include Inventory and Order Management. Standard Collections of EBS data, such as items, components, sales bookings, order backlog, inventory, shipments, locations, resources, trading partners, UOM, currency, price lists, item costs, and hierarchies, bring data from the EBS source to the APS planning server operational data store.

Demantra loading processes use Integration Interface Wizard integration profiles to move data between the planning server and the Demantra platform.

Distributed Implementations



Distributed Implementations

Notice in the top diagram that the EBS Source is not in the instance with APS applications and Demantra, which are in the same database instance.

In the lower diagram, EBS Source is separate and Demantra is the only app in the instance. This represents a Demantra standalone install. In other words, there are no APS applications.

The seeded export integration profiles and workflow output forecast data into the table `msd_dp_scn_entries_denorm`. However, if Demantra is installed standalone then these seeded export data profiles should not be used. The user can create custom export data profiles through which s/he can export the forecast data out to a database view or to an external file.

Support for multiple source instances:

- Item A from Instance 1 and Item A from Instance 2 are treated as the same item
- The items & parents collected are determined by profiles:
 - Master Category Set
 - Master Org

Integration Features

Integration Features

- **Demand Management Navigator Menus:**
 - Demand Management System Administrator
 - Demand Analyst
- **User Synchronization**
- **Single Sign-on (SSO)**



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Demand Management Navigator Menus

The Oracle E-Business Suite Navigator provides the following two responsibilities:

- Demand Management System Administrator
- Demand Analyst

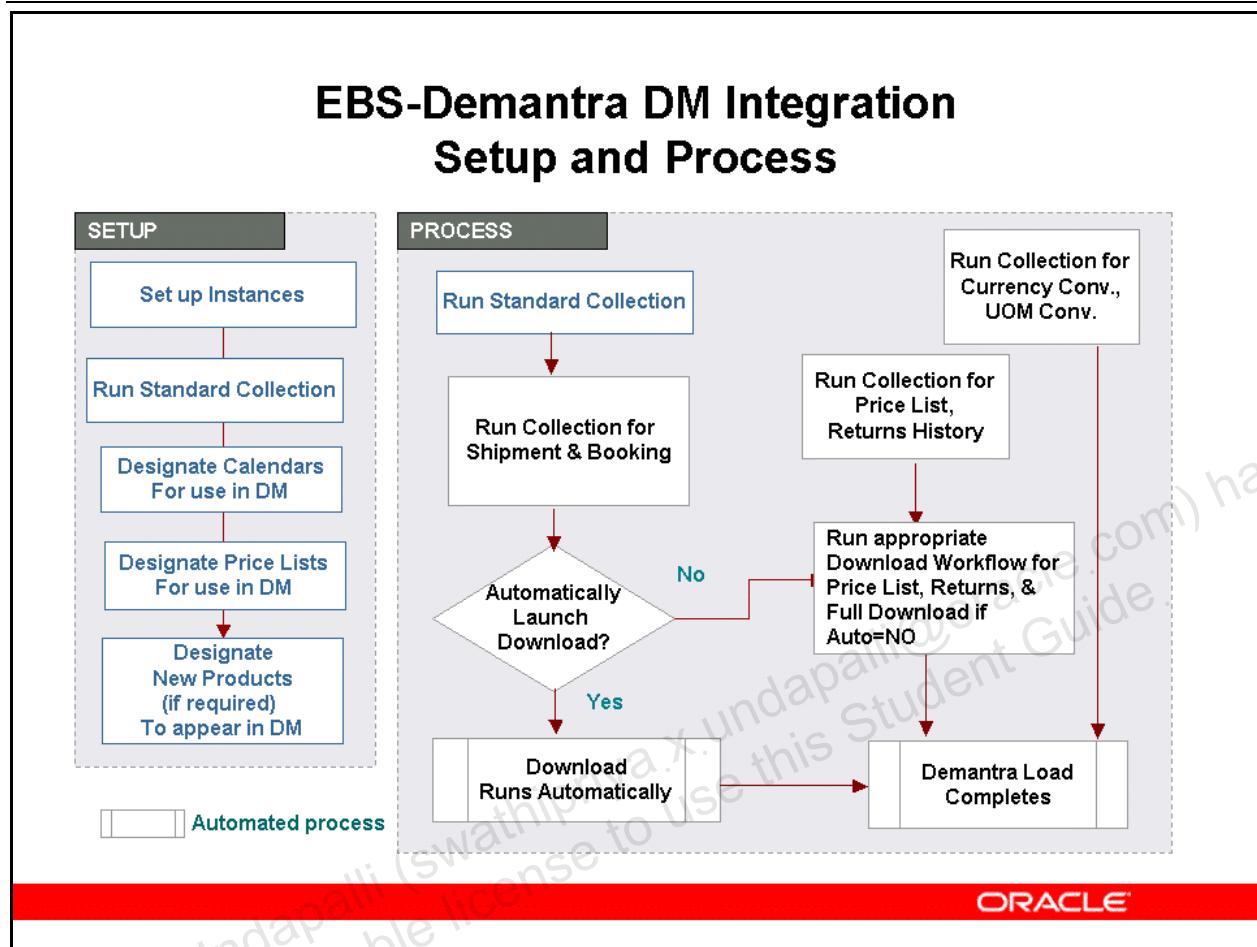
The Oracle E-Business Suite Navigator menu for the Demand Management System Administrator responsibility provides the following links to integrate with the respective Oracle Demantra functionality:

- Collaborator Workbench
- Workflow Manager
- Demantra Administration page
- User Management page
- Collections

User Synchronization. When an E-Business Suite user is granted any responsibility containing the Demand Management Workbench function grant, an Oracle Demantra user of the same username is created in the Oracle Demantra Demand Management component.

Single Sign On. Users who log into the E-Business Suite can access the Oracle Demantra system without requiring an additional login to Oracle Demantra. When users log out from Oracle Demantra they are also logged out from the E-Business Suite.

EBS-Demantra DM Integration Setup and Process



Setup and process flow for EBS-DM

1. Setup > Instance – to specify the instances from which collections for Demantra are done
2. Standard Collections – to collect new or changed reference information from specified Instances
3. Setup for Calendars, New Products, Price Lists for initial setup or as needed
4. Shipment and Booking History Collection – to collect and download historical data and Calendars to DM staging tables
5. Currency Conversions and UOM Conversions – to collect and download currency and UOM conversion information, for initial setup or as needed. These do not require a download into Demantra.
6. Returns History – to collect Returns history
7. Download Calendars – automatically invoked in Shipment & Booking collection if ‘Launch Download’ option = YES
 - **Note:** If the option ‘Launch Download’ = No, then run the seeded workflows EBS FULL DOWNLOAD

The seeded workflows are:

- EBS Return History Download
- EBS Price List Download

Summary of Integration Tasks – Initial Setup

Summary of Integration Tasks – Initial Setup

- **Set up Instances**
- **Run Standard Collections**
- **Set up Calendars**
- **Set up Price Lists**
- **Set up New Products, if required**



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Initial Setup

Set Up Instances

An instance is a database and a set of applications. Run the Setup Instances script before running Standard Collections to specify the Instances from which Standard Collections obtains data.

Run Standard Collections

Standard Collections refers to the Advanced Supply Chain Planning (ASCP) concurrent program for collecting new or changed information from the E-Business Suite to the Oracle Data Store.

Set Up Price Lists, Calendars, and New Products

Setup Calendar, Price Lists and New Products are run initially, and on an as needed basis in ongoing cycles.

Summary of Integration Tasks - Process

Summary of Integration Tasks - Process

- Run Standard Collections
- Download to three staging tables
- Transfer data to Demantra schema
- Generate collaborative forecasts
- Export output (export integration profiles)



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Ongoing Process

After Setup is complete, run Collections for:

- Shipment and Booking History
- Returns History
- Currency Conversion
- UOM Conversion
- Pricing

Download Data for Items, Locations, and Sales into different staging tables for items, locations, and sales.

Workflow transfers data from the staging tables to the Demantra schema.

Workflow controls the collaborative forecasting, adjustment, and approval processes.

Export Integration Profiles upload forecast and other relevant data to Oracle Advanced Planning and Scheduling applications.

EBS-Demantra DM Seeded Collections

- **Shipment History, Booking History, Returns History**
- **Manufacturing and Fiscal calendars**
- **Units of Measure**
- **Price Lists**
- **Currencies, Currency Conversion Rates**
- **Level Values for seeded Hierarchies and Levels**

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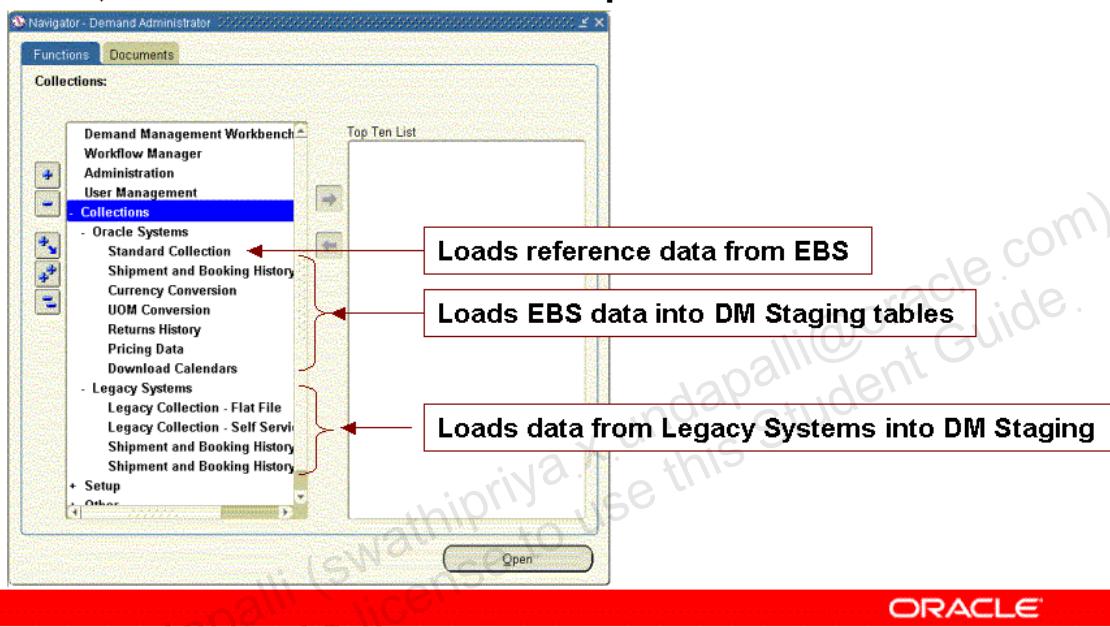
Level Values for seeded Hierarchies and Levels:

- Item Levels
- **Product Category:** Item > Category
- **Product Family:** Item > Product Family
- **Demand Class:** Demand Class
- Location Levels
- **Zone:** Site > Trading Partner Zone > Zone
- **Customer Class:** Site > Account > Customer > Customer Class
- **Business Group:** Organization > Operating Unit > Bus Group
- **Legal Entity:** Organization > Legal Entity
- **Sales Channel:** Sales Channel

EBS-Demantra DM Integration

EBS-Demantra DM Integration

Run the appropriate collections processes after Instances are set up, Standard Collections run, and Calendars, Price Lists, and UOMs have been set up.



Collections

For the initial setup, Currency Conversion, UOM Conversion and Pricing Data should be run. Shipment and Booking History is run every cycle as is Returns History. Download Calendars is only run to update the Calendars without running Shipment and Booking History because Calendars are usually collected and downloaded during the Shipment & Booking History collection and download.

Note: A concurrent request will be available in the future to add additional Price Lists, UOMs and Currencies. Until that time, use the following script, which must be run after Demantra has been installed:

SQL Script

1. Name: 'Create Seed Entities in Demantra'

Script :

```
declare
  retcode number;
begin
  msd_dem_create_dem_seed.create_dem_seed_data(retcode,
  <p_start_no>, <p_num_entities>,<p_entity_type>);
```

```
end;  
/
```

Parameters to be passed to this script:

p_start_no. - starting number of entities to be created

(Units from 100-199 are already created)

p_num_entities - number of entities to be created

p_entity_type - 1 (UOM), 2 (CURRENCY), 3 (PRICE LIST), 0 (ALL)

2. Name: Initial Setup

Script: msddemcrsyn.sql

Parameters: None

EBS-Demantra DM Integration

EBS-Demantra DM Integration

After Setup and Collections are complete, the Administrator launches the *Forecast Calculation & Approval Process* workflow.

Workflow Management							
View according to Schema Groups:				Demand Management			
Schema ID	Schema name	Owner	Creation Date	Last Modified	Instances	Status	Action
566	EBS Forecast Line of Business	dm	11/17/06	03/13/07	0	●	Edit Start Schedule Delete
584	EI Incremental Download	dm	11/08/06	03/08/07	0	●	Edit Start Schedule Delete
585	EI Full Download	dm	11/13/06	03/08/07	0	●	Edit Start Schedule Delete
586	EI Items Download	dm	11/13/06	03/08/07	0	●	Edit Start Schedule Delete
587	EI Locations Download	dm	11/14/06	03/08/07	0	●	Edit Start Schedule Delete
588	EI Load	dm	11/21/06	03/13/07	0	●	Edit Start Schedule Delete
605	Forecast Calculation & Approval Process	dm	11/23/06	03/13/07	0	●	Edit Start Schedule Delete
631	EBS Full Download	dm	12/16/06	02/12/07	0	●	Edit Start Schedule Delete
632	EBS Return History Download	dm	12/16/06	02/12/07	0	●	Edit Start Schedule Delete
633	EBS Price List Download	dm	12/16/06	03/14/07	0	●	Edit Start Schedule Delete
	EBS						

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The Forecast Calculation and Approval Process workflow:

1. Ensures the download completed
2. Resets the Approval series to Null
3. Logs the start of the forecast calculation process
4. Generates the forecast
5. Logs the completion of the calculation process
6. Invokes the Planning Group workflow

EBS-Demantra DM Integration

EBS-Demantra DM Integration

At completion, the *Planning Group* workflow automatically notifies Demand Analysts that the forecast is available.

634	EBS Upload Local Forecast	dm	12/16/06	02/12/07	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Edit	Start	Schedule	Delete
635	EBS Upload Global Zone Forecast	dm	12/16/06	02/12/07	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Edit	Start	Schedule	Delete
636	EBS Upload Local Fst. Demand Class	dm	12/16/06	02/19/07	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Edit	Start	Schedule	Delete
637	EBS Upload Global Zone Fst. Demand Class	dm	12/16/06	02/19/07	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Edit	Start	Schedule	Delete
640	Planning Group	dm	01/25/07	01/26/07	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Edit	Start	Schedule	Delete

[Process Log](#) [New Schema](#) [Refresh](#)

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The Planning Group workflow

1. Notification in MyTasks displays for the manager (or Final Approver) and Analysts that the forecast is available
2. When Analysts complete their modifications, they mark the task as ‘Done’; this sends a notification to the manager.
3. Manager reviews the modifications and checks the Final Approval check box in the worksheet, which locks the forecast.
4. When finished, the manager marks the task as ‘Done’ in the MyTasks pane; this notifies the Administrator that the forecast is ready for upload.

EBS-Demantra DM Integration

EBS-Demantra DM Integration

Once the forecast is approved, the Administrator uploads the forecast, forecast accuracy, and forecast priority to ASCP, IO, SNO and PS.

The Workflow invokes an export integration profile to upload a global or local forecast to EBS

Workflow Management								
View according to Schema Groups:				EBS Workflows				
Schema ID	Schema name	Owner	Creation Date	Last Modified	Instances	Status	Action	
631	EBS Edit Download	dm	12/16/06	02/12/07	0	●	Edit	Start
632	EBS Return History Download	dm	12/16/06	02/12/07	0	●	Edit	Start
633	EBS Price List Download	dm	12/16/06	03/14/07	0	●	Edit	Start
634	EBS Upload Local Forecast	dm	12/16/06	02/12/07	0	●	Edit	Start
635	EBS Upload Global Zonal Forecast	dm	12/16/06	02/12/07	0	●	Edit	Start
636	EBS Upload Local Fcat, Demand Class	dm	12/16/06	02/19/07	0	●	Edit	Start
637	EBS Upload Global Zonal Fcat, Demand Class	dm	12/16/06	02/19/07	0	●	Edit	Start

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Export Integration Profile

The Administrator selects the relevant export integration profile to upload data, and either manually starts it or sets up a schedule.

EBS-Demantra DM Integration

The exported dataset is determined by the export integration profile.

- **Local Forecast**
 - Series: Final Forecast, Forecast Accuracy MAPE, Demand Priority
 - Output Levels: Item, Org, Week
- **Global Zone Forecast**
 - Series: Forecast, Forecast Accuracy MAPE, Demand Priority
 - Output Levels: Item, Zone, Week
- **Local Forecast with Demand Class**
 - Series: Forecast, Forecast Accuracy MAPE, Demand Priority
 - Output Levels: Item, Org, Week, Demand Class
- **Global Zone forecast with Demand Class**
 - Series: Forecast, Forecast Accuracy MAPE, Demand Priority
 - Output Levels: Item, Zone, Week, Demand Class

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Exported Dataset

Horizon range and forecast output levels are defined as part of integration profile.

Import and Export Integration Profiles

Import and Export Integration Profiles

- Administrator can create additional import integration profiles to download custom series
- Administrator can also create additional export integration profiles to upload series; however the following naming convention must be followed for Series' internal names:
 - Forecast: **FCST_**
 - Priority: **PRTY_**
 - Forecast accuracy MAPE: **ACRY_MAPE_**
 - Destination key: **DKEY_**

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Oracle Demantra Demand Management Functional Outputs

Oracle Demantra Demand Management Functional Outputs

- Output from DM to E-Business Suite includes:
 - Forecasts to:
 - Advanced Supply Chain Planning
 - Inventory Optimization
 - Strategic Network Optimization
 - Production Scheduling
 - Forecast accuracy to Inventory Optimization
 - Forecast priority to Advanced Supply Chain Planning
- APS and Demantra must be on the same database instance in order for Demantra to output forecasts to ASCP, IO, SNO, or PS



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Oracle Demantra Demand Management functional outputs

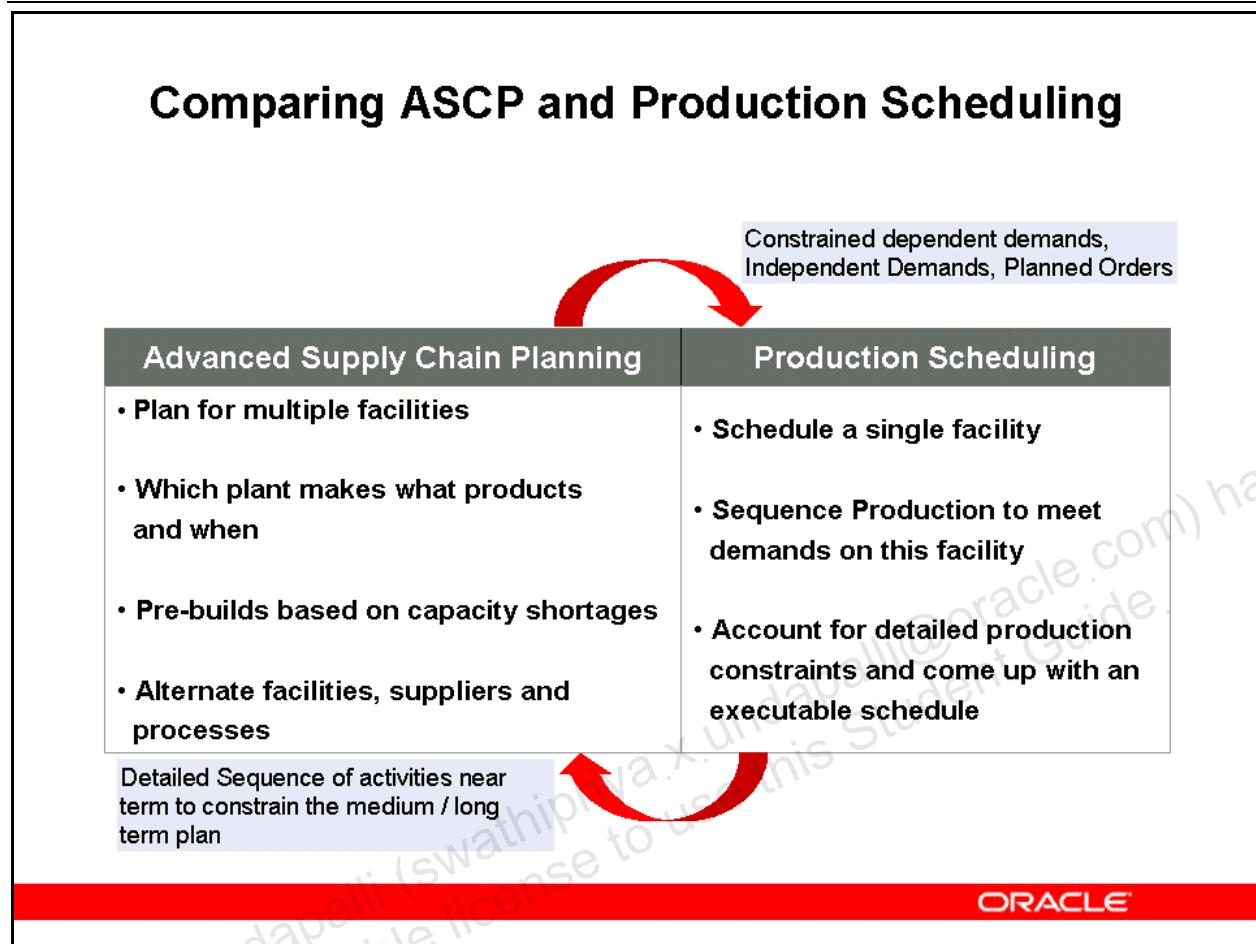
- Forecast and demand priority for Advanced Supply Chain Planning
- Forecast and forecast accuracy for Inventory Optimization
- Forecast for Strategic Network Optimization

Topic Overview: Integration with Production Scheduling

- Overview
- Setup: Setting Profile Options for Production Scheduling
- Process: Running Production Scheduling
 - With ASCP
 - Without ASCP
- Managing Production Schedules with ASCP

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Comparing ASCP and Production Scheduling

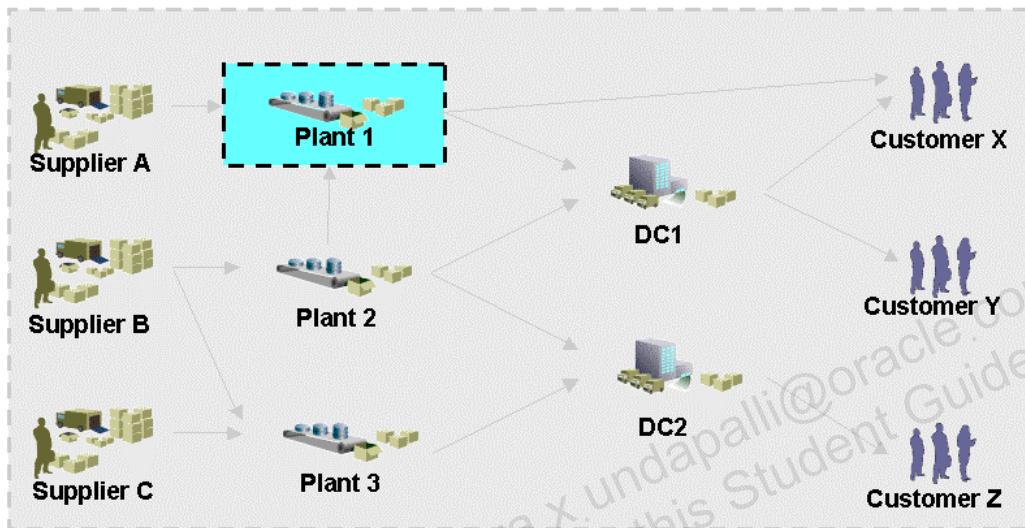


Comparison of key functional areas

This slide explains the key functional areas addressed by Planning and Scheduling. The scope of production scheduling in terms of organizations and time, and the type of decisions being made, are different from that of ASCP. Production Scheduling models the shop floor in more detail and produces an accurate near term schedule.

Scope Comparison

Scope Comparison



Scope of ASCP – Planning the entire supply chain

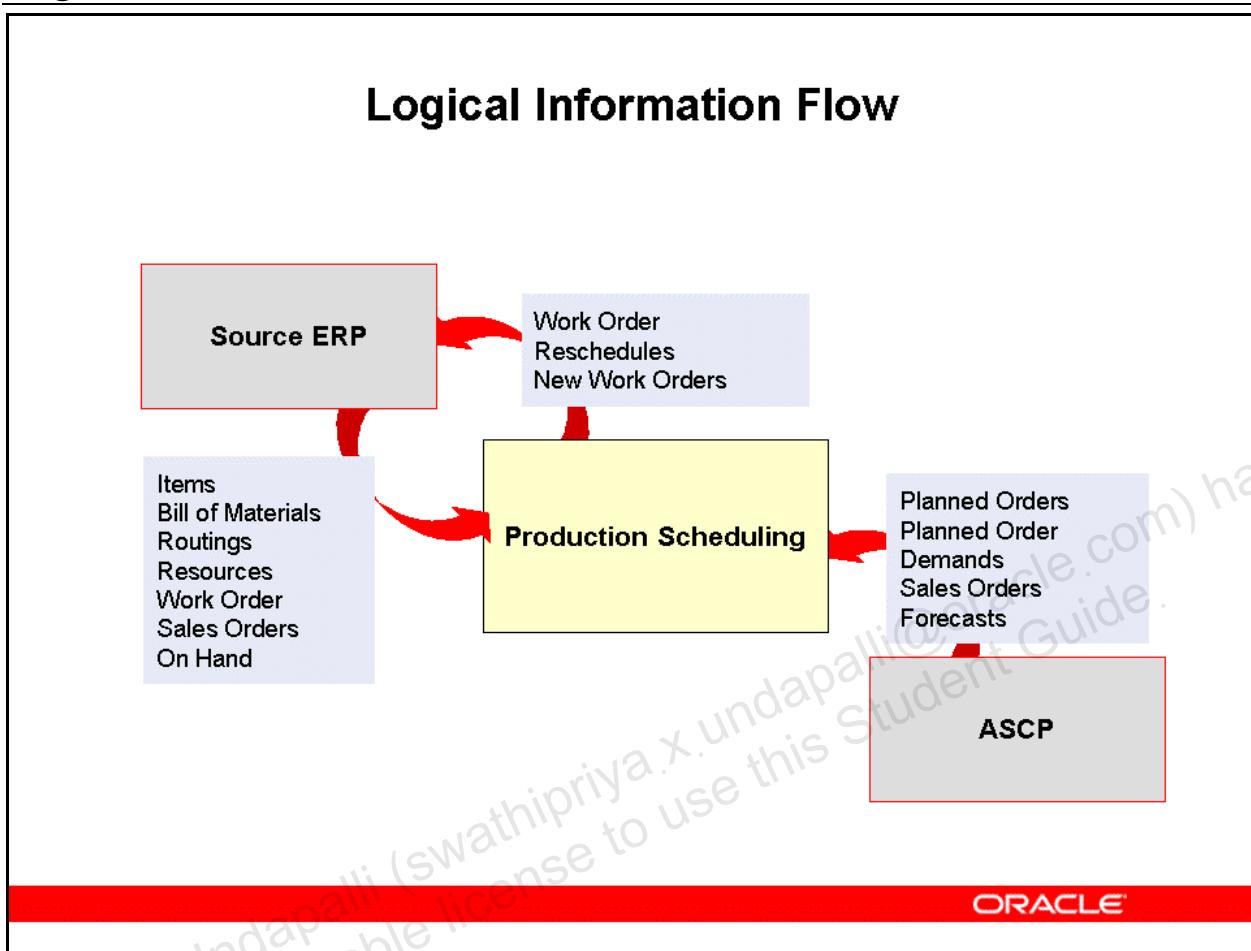
Scope of PS – Scheduling a single plant

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Scope Comparison

Slide graphically contrasts the difference in scope of planning and scheduling in terms of the entities in the supply chain being considered in a single plan or a single schedule

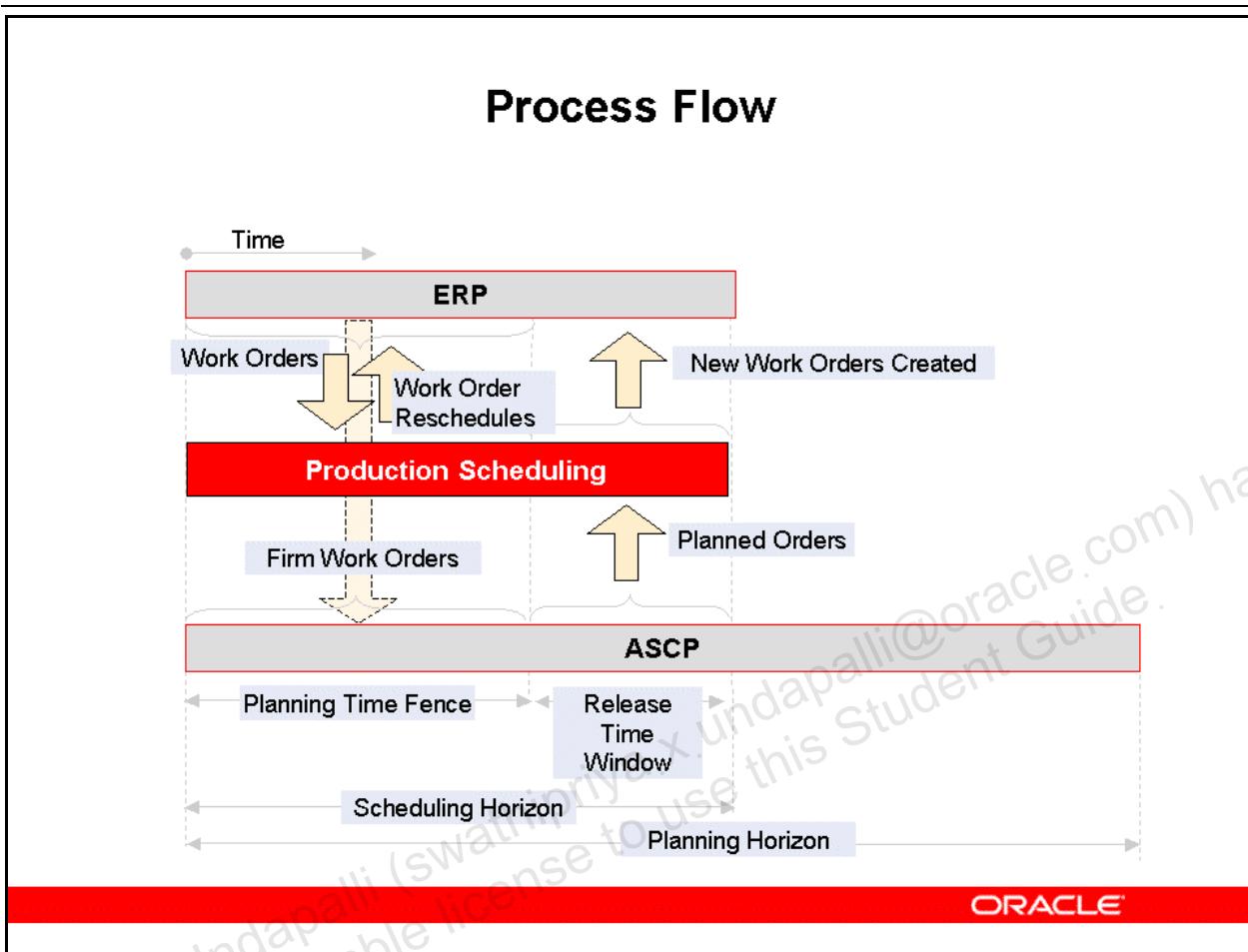
Logical Information Flow



Logical Information Flow

The slide shows the information being passed between ERP, PS and ASCP in terms of the key business entities that are important from a planning and scheduling perspective

Process Flow



Process Steps

The following is a summary of the steps involved in the process.

1. Run the ASCP plan. Within the planning time fence (PTF) ASCP will not create new orders. The existing work orders within the planning time fence can be treated as firm in ASCP.
2. Release new orders from the ASCP plan using either a manual release process or an automated process (in the automated process, all orders within the release time fence are released)
3. Run Production Scheduling with the following supply orders
 - a. The work orders within the planning time fence (unlike in ASCP, these will not be treated as firm in PS unless manually firmed using the Firm flag)
 - b. The new work orders released from ASCP
 - c. Planned orders from ASCP that exist within the scheduling horizon specified for the PS schedule
4. Release any work order reschedules and planned orders scheduled back to the execution system.

PS Run Modes

PS Run Modes

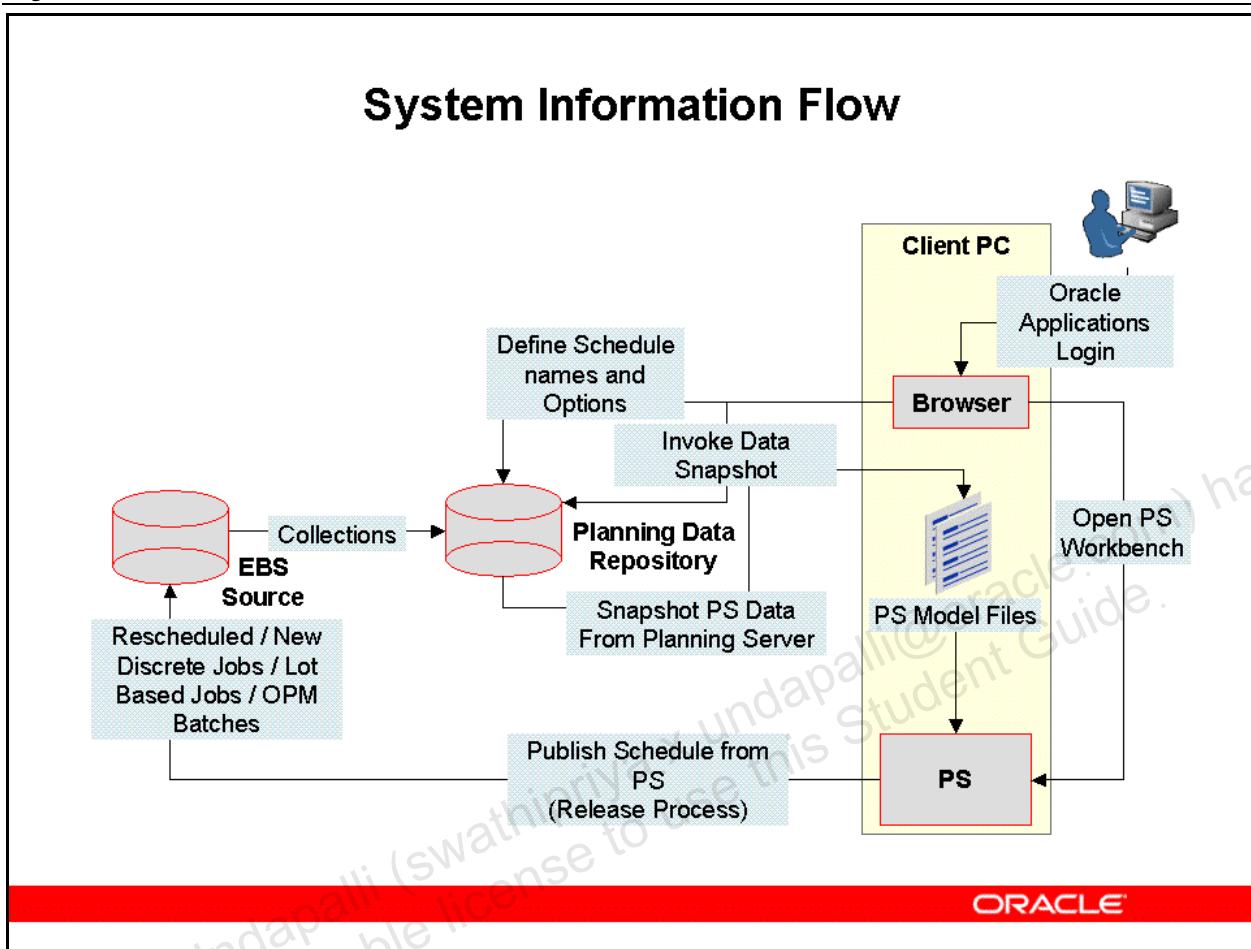
Running PS “Standalone”	Running PS with reference to an ASCP Plan
Schedule work orders only	Schedule work orders and planned orders
Forecast demands specified via Demand schedules	Forecast demands come in via the referenced ASCP plan
Inter-org demands included only via internal sales orders	Inter-org demands also include planned order demands from the ASCP plan
Items to be included in PS specified via specification of category sets / categories	Items to be included in PS derived from the items in the ASCP plan
No Forecast consumption	Forecast consumption performed in ASCP is retained within PS

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Functional Behavior Differences

The slide explains the key differences in functional behavior between running PS in a standalone mode and running PS in a mode where it references an ASCP plan.

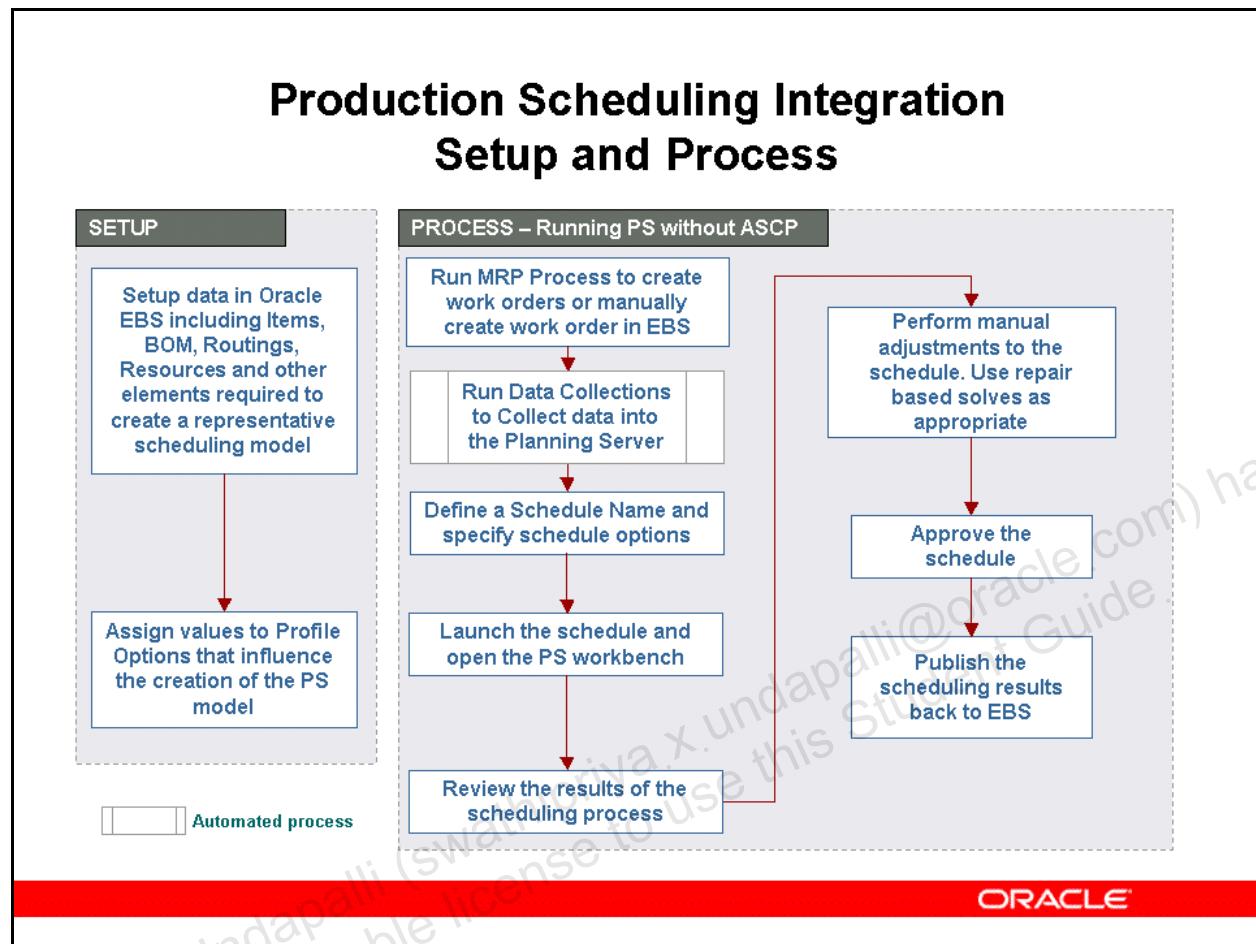
System Information Flow



System Information Flow

This slide shows the flow of data between various systems that are involved in the solution architecture for Production Scheduling.

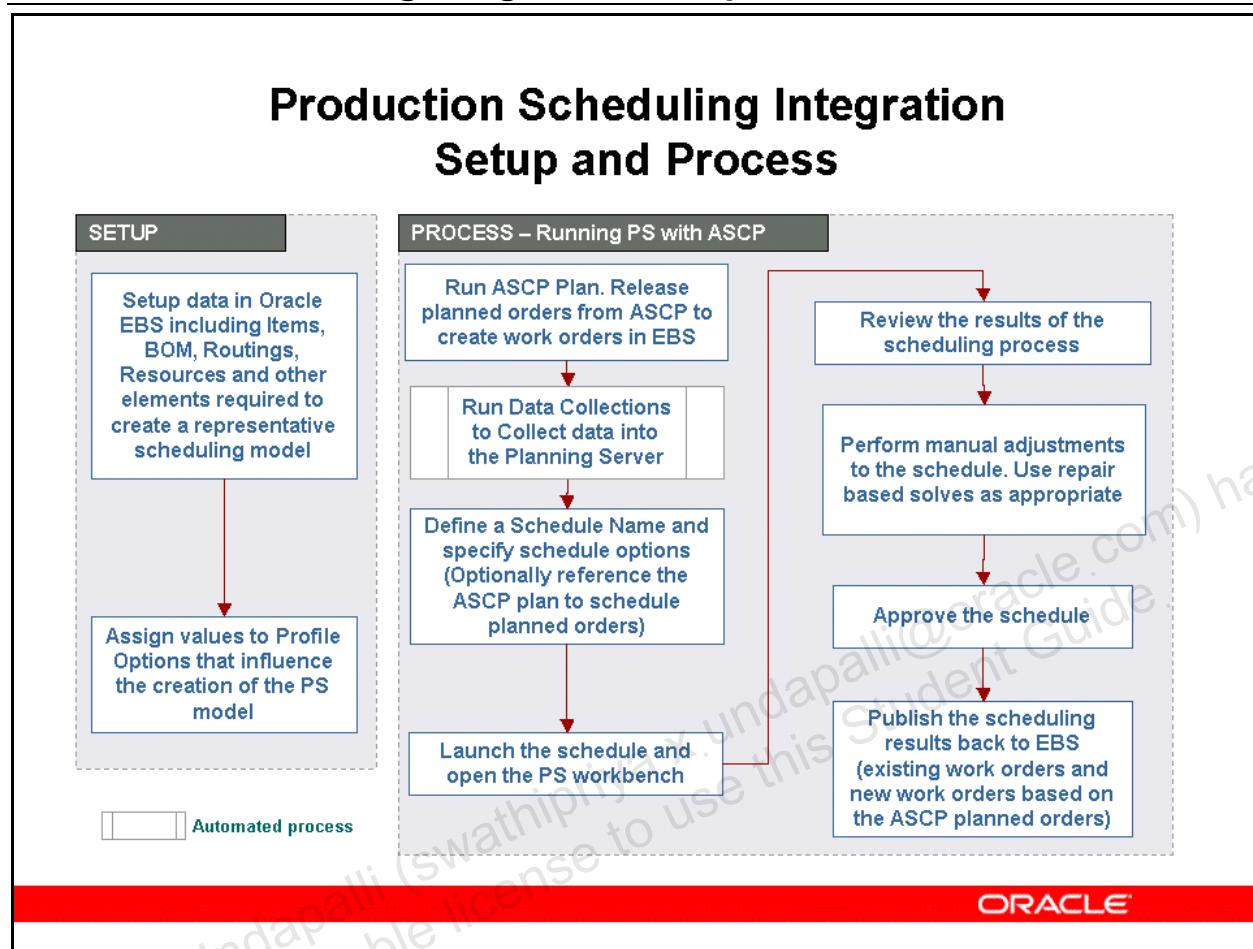
Production Scheduling Integration Setup and Process



Running PS without an ASCP Plan

The slide depicts the process used to run Production Scheduling without using an ASCP plan.

Production Scheduling Integration Setup and Process



Running PS with an ASCP Plan

The slide depicts the process used to run Production Scheduling with using an ASCP plan.

SNO Integration Introduction

SNO Integration Introduction

SNO is now integrated with Advanced Planning 11i.10.

- **Inbound Integration:**
 - Out of the box integration with EBS source data like items, organizations, resources, and so on
 - Consider forecast from Demand Management
 - Consider inventory levels from Inventory Optimization (IO)
- **Outbound Integration:**
 - Generate dynamic sourcing as input to Advanced Supply Chain Planning (ASCP) and Inventory Optimization (IO)

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SNO Integration

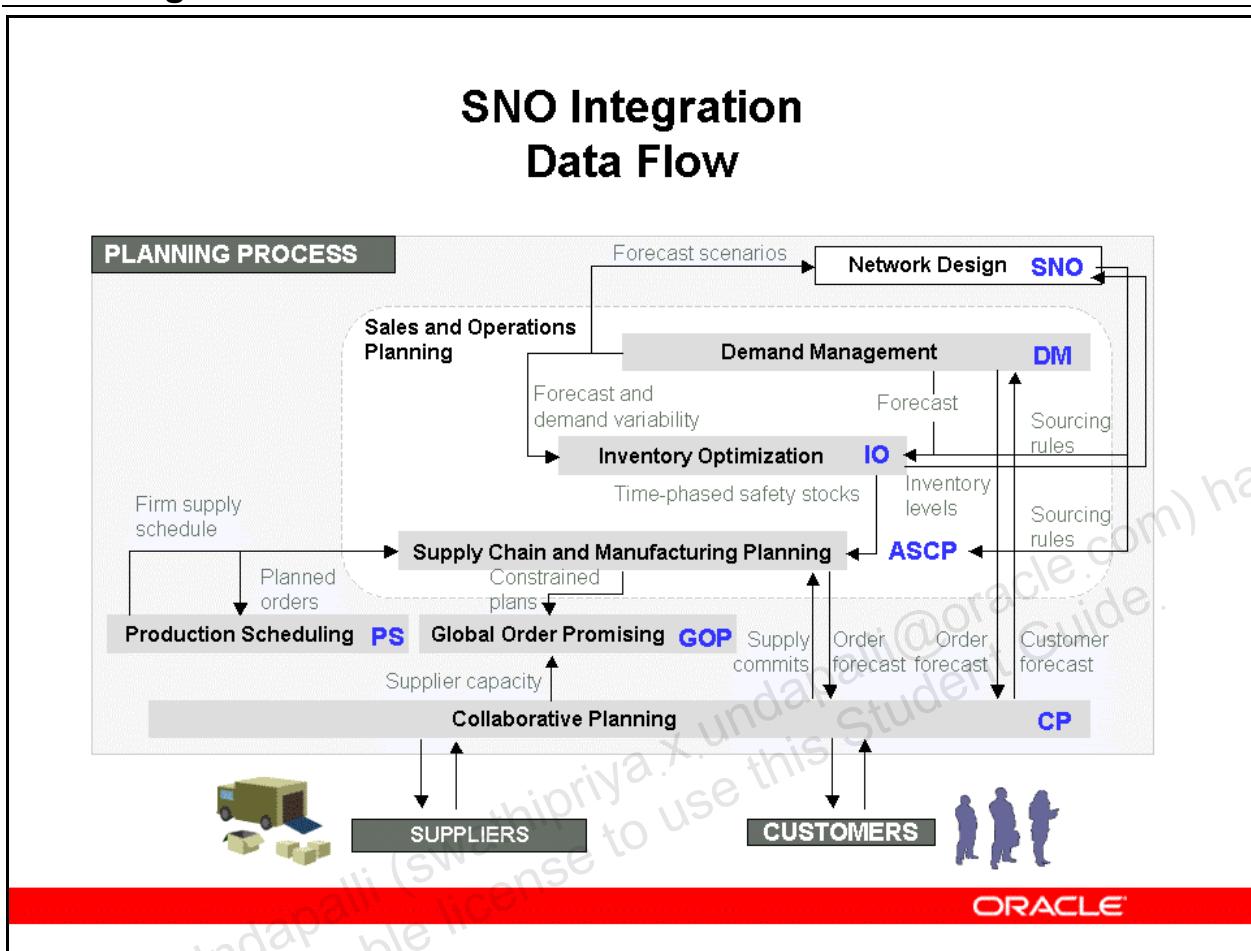
The integration is intended to build a “Strategic” model. SNO is quite often used for tactical purposes, much of this detail necessary for a tactical model is initially not a part of the integration however.

SNO integration with APS provides seamless integration with the EBS metadata on the APS planning server called as ODS or collected data and PDS or planning data. This ensures that all the supply chain planning tools are driven off of the same ERP data. This ensure data accuracy and quality of solution across the planning products.

SNO also considers DP scenario and Inventory plan as an input. This provides an out of the box integrated strategic tool that can be used to perform various use cases as described in the ‘notes’ section of the earlier slide.

The sourcing decisions that SNO makes can be published back to APS. IO and ASCP (and in turn GOP) can use the sourcing rules to make tactical and operational decisions.

SNO Integration Data Flow



SNO Integration Data Flow

This slide indicates the interaction between the various tools within the Oracle APS products. Of particular interest to us is the interaction between Network Design [Product = Strategic Network Optimization (SNO)] and the other products in Advanced Planning. Network Design takes demand from Demand Planning and safety levels from Inventory Optimization.

The output from Network Design that is integrated back into advanced planning is the time phased sourcing decisions. These can be used by ASCP and IO as input assignment sets and indirectly by GOP which uses the same definitions when doing multilevel ATP and CTP.

Data streams into SNO

Data streams into SNO

EBS: Source Data	APS: Planning Data
Items	Forecast From DM
Organizations	<ul style="list-style-type: none"> Demand at leaf level: sku, location, time bucket
Suppliers	<ul style="list-style-type: none"> Bands of forecast for scenario generation
BOM/Routings	
Resources – Machine, Person	
Item Costs	Inventory levels from IO
Supply – On-hand, PO, WIP etc	<ul style="list-style-type: none"> IO scenarios for different service levels could drive alternate sourcing or network topology decisions
Demand	Assignment Set and Sourcing Rule for building base model

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Inbound Data Streams

This section explains how you can setup data and create a strategic plan using Oracle Strategic Network Optimization (SNO). It also explains the functional and technical interaction between SNO and source E-business suite and other components of Advanced Planning namely:

1. Demand Planning,
2. Inventory optimization and
3. Advanced Supply Chain Planning

SNO integration with E-Business suite

The SNO and E-business suite provide out of the box integration whereby you can build standard base models in SNO without requiring creating custom integrations into SNO. The integration passes data both ways:

Inbound Integration:

- SNO receives ERP data like Items, organizations, BOMs, Routings, Resources – Machine and Labor, purchase orders, Forecast, On-hand, and alternates like resources and components.
- SNO can use scenarios generated and published from Demand Planning.

- SNO can use inventory levels generated using an Inventory Optimization plan.
- Important Product substitutes (End Item substitution) are not supported in the Phase-I.

EBS Integration to Strategic Network Optimization

Strategic Network Optimization will be integrated with the E-Business suite, which will provide data necessary to build a base SNO model which can be used to support strategic planning decisions. The inbound integration considers the following entities within EBS:

- Base data including Items, Organizations, Suppliers, Approved Supplier Lists
- Manufacturing related information such as Bills-of-Materials, routings, resources and resource capacities
- Inventory related information including Beginning On-hand and Target Safety Stock Levels
- Distribution representation such as Shipping Networks, Shipping Methods, while respecting Sourcing Rules and Assignment Sets
- Costs including supplier item costs, transportation costs by weight/shipping method, inventory carrying, and resources costs
- Transactional data such as sales orders, standard purchase orders, blanket purchase orders and move orders
- Alternate items and resources will also be considered as a part of the solution and the planner has the option to only consider bottleneck resources. Non-Bottleneck will still be represented within SNO but the capacities for the non-bottleneck resources will be unconstrained. This will allow the planner to visualize the complete manufacturing model and also allow the user to constrain non-bottleneck resources when examining what-if scenarios. The standard collections process is used to populate the ODS (Operational Data Store) and can be initiated by the Strategic Planner.

The diagram provides a high level overview of the EBS integration to SNO. The various components of this are explored in the context of this document.

SNO will provide time phased sourcing decisions on a least cost basis while considering transportation, procurement, material, demand, and inventory constraints. Sourcing Rules will be provided for manufactured products, procured items, and organization transfers. Shipping method will be considered for organization transfers and the sourcing rules will be ranked by volume, which is what is published out of SNO for use in ASCP.

Demand Schedules

If Oracle Demand Planning is a part of the solution planners will have the option to consider forecast scenarios created within ODP, otherwise, forecasts will be sourced from EBS. Currently, only forecasts for the organization-item combination are considered. While Global forecasts will not be used in the initial integration release they can be considered for future releases of the standard integration. Forecasts will be netted as the greater of forecast or sales orders for a given time period.

Time phased Safety Stock Levels can also be included from an Inventory Optimization plan as a demand schedule although it is not necessary. Safety stock can also be included from EBS if ‘Non-MRP-Planned’ is selected from the Organization-Item properties.

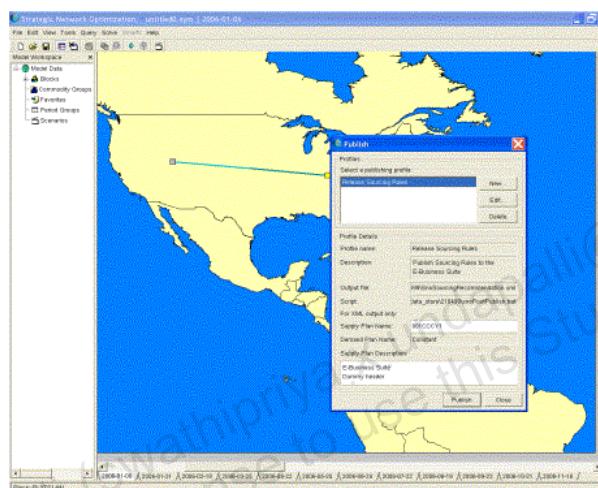
Assignment Sets and sourcing rules

SNO will use assignment set to read network structure and write network structure back into SNO.

Publish Sourcing Rules from SNO

Publish Sourcing Rules from SNO

- Publish to outbound Assignment Set
 - Publish sourcing rules, date effective per the SNO planning buckets
 - Sourcing rule can be used for IO, ASCP, and GOP

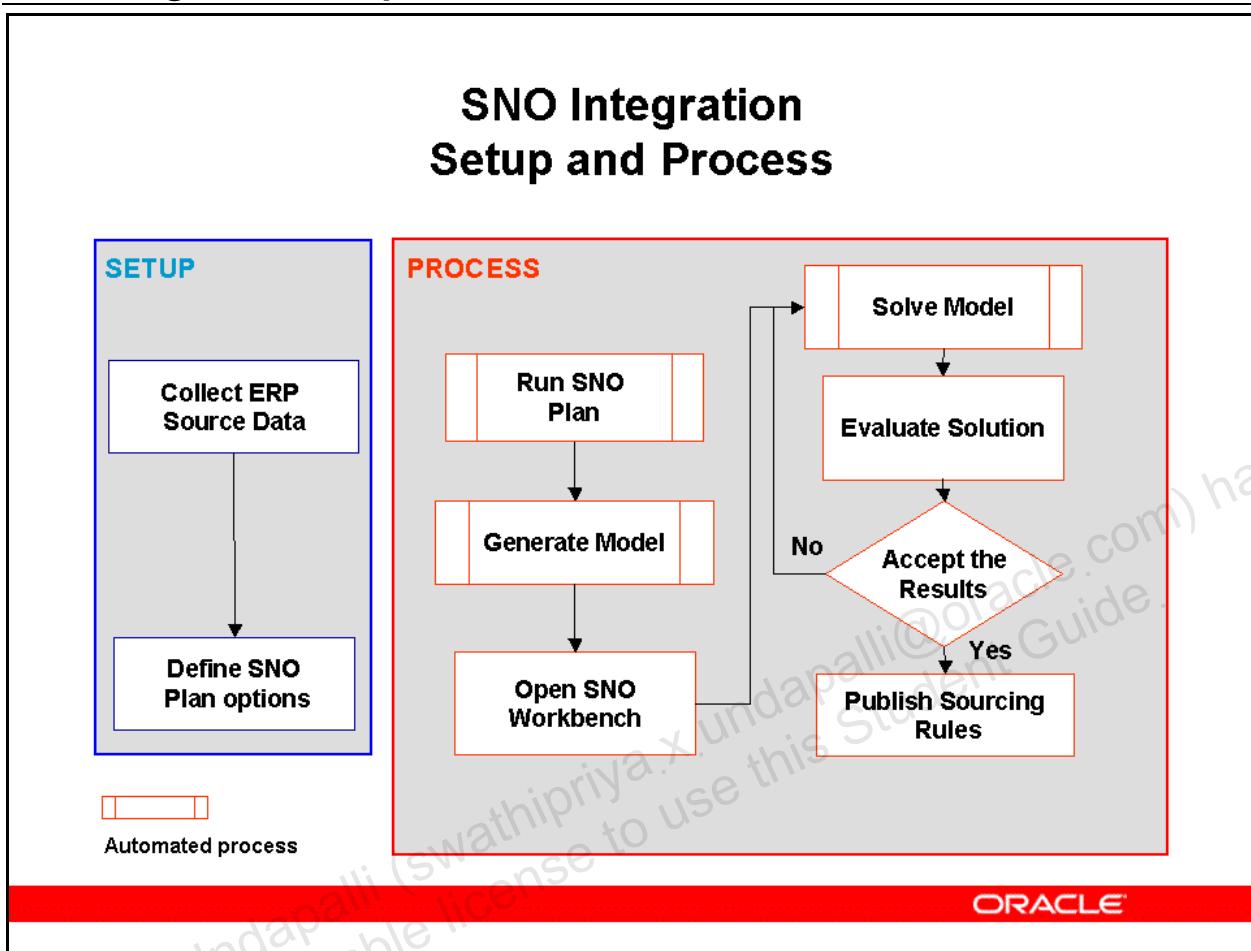


Outbound Integration

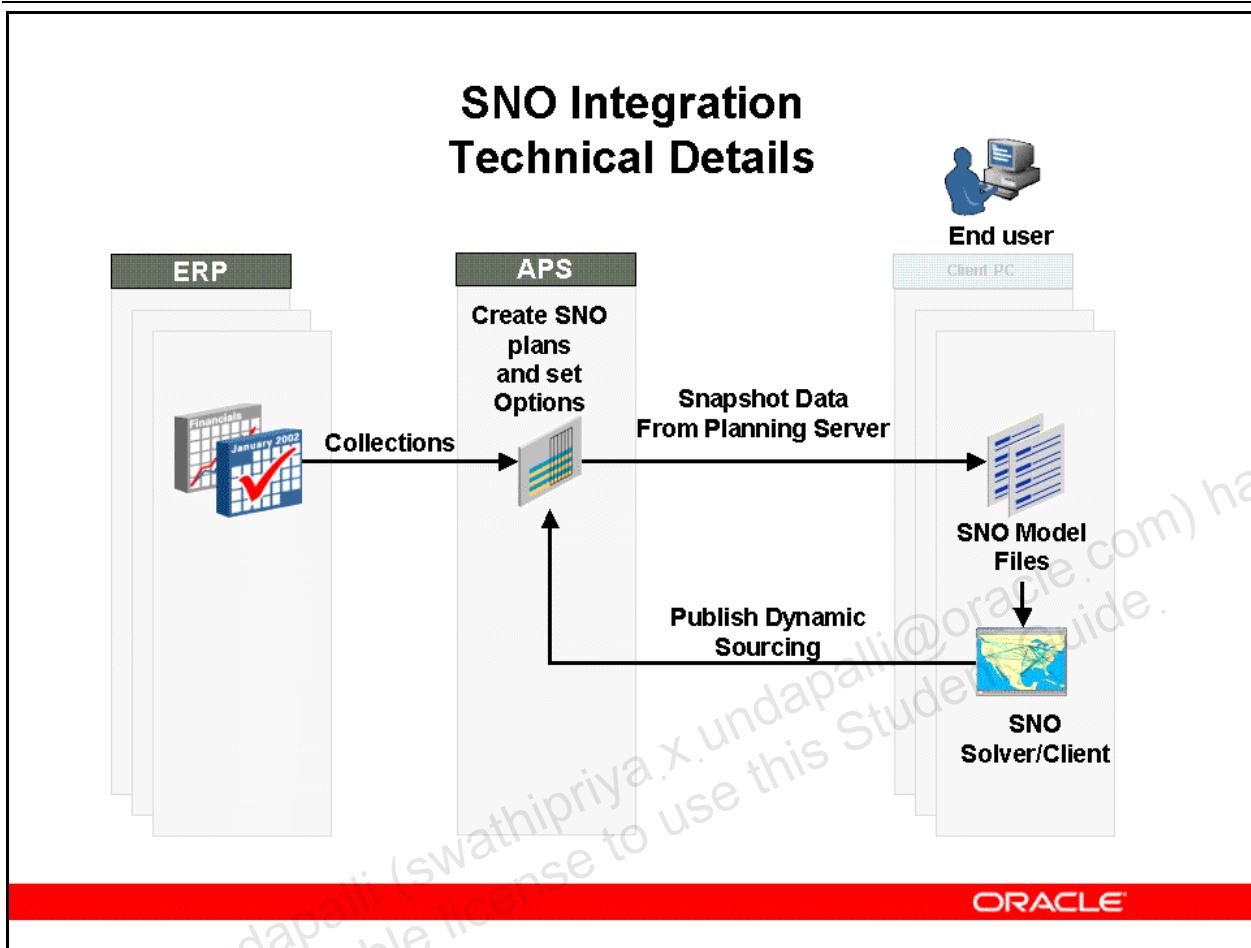
When using SNO to perform sourcing or capital asset decisions that impact the supply chain network definition, sourcing rules used by SNO can be published to APS such that ASCP and IO can use the Assignment Set definition for generating the inventory or tactical plans.

Note: for every SNO planning bucket a sourcing rule with the date effectiveness for that planning bucket is generated (even if the sourcing rule is exactly the same for some months).

SNO Integration Setup and Process



SNO Integration Technical Details



SNO Integration Technical Details

SNO reads data from the collected data streams as well as the input scenarios namely demand and inventory plans.

First time use:

When user invokes the tool for the first time the SNO 8.11.2 product is downloaded into the Client. The download happens into the path as specified by the profile option:

MSC:SCP Client Install Path

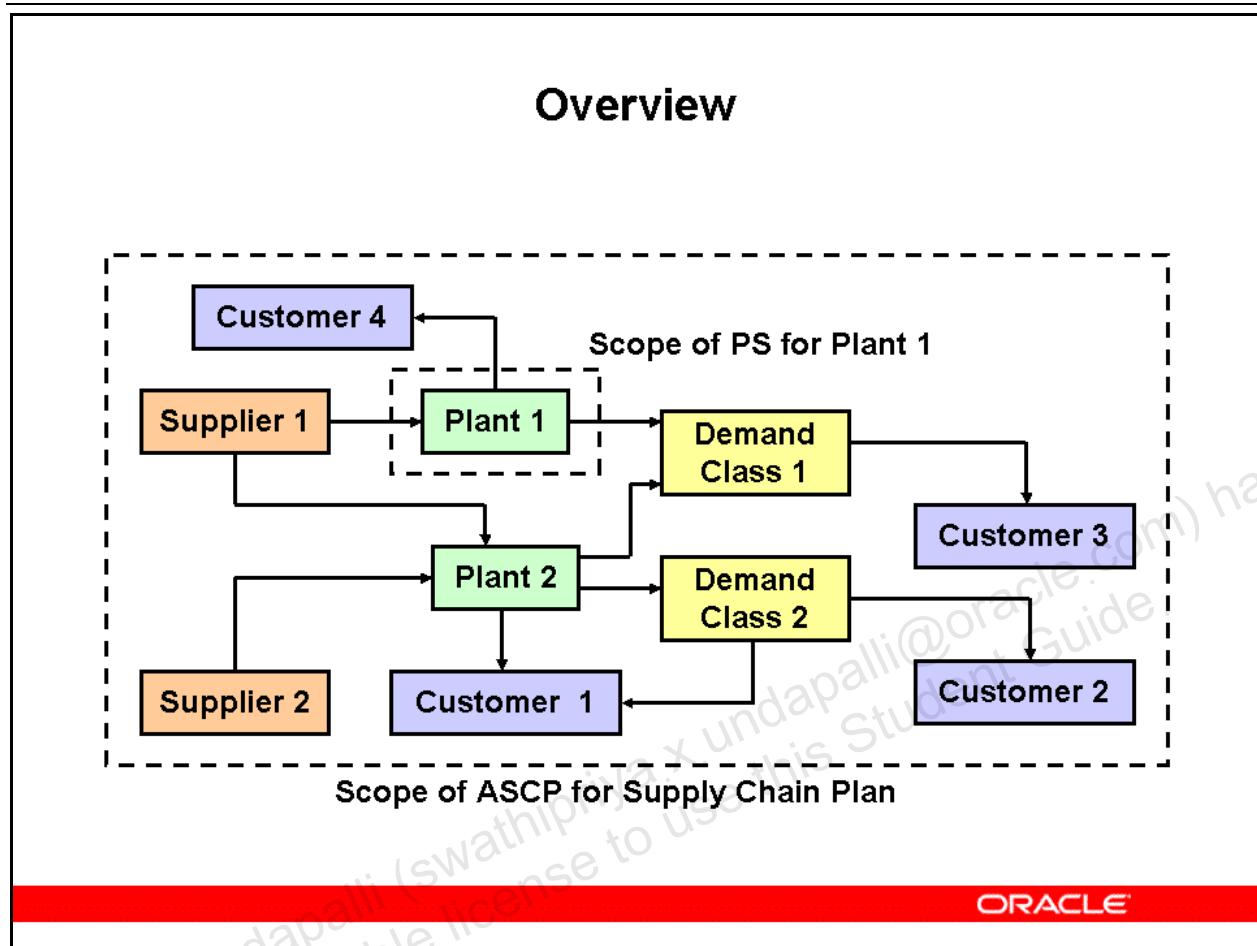
The model data is pulled into the client and resides in the install path.

Topic Overview: Integration with Production Scheduling

- **Overview**
- **Setup: Setting Profile Options for Production Scheduling**
- **Process: Running Production Scheduling**
 - **With ASCP**
 - **Without ASCP**
- **Managing Production Schedules with ASCP**

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Overview



Overview

Oracle Production Scheduling (PS) enables production schedulers to create detailed finite capacity and materially constrained optimized production schedules to drive shop floor execution and material planning. Production Scheduling uses a constraint-based approach to automated scheduling that enables you to assign constraints to every element, including resources, operations, and due dates in a schedule.

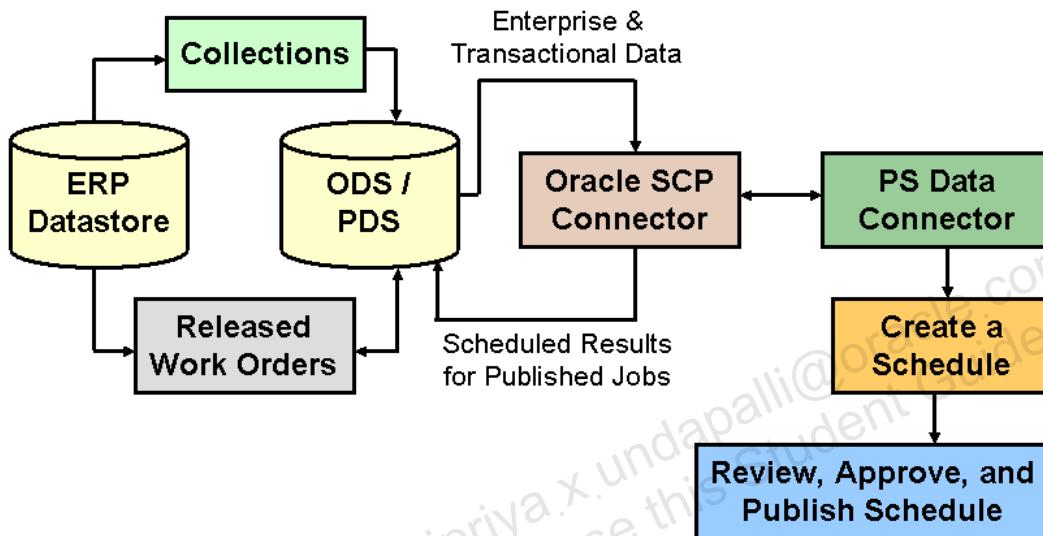
Production Scheduling can either interact only with the E-Business Suite, or additionally receive planned orders from Advanced Supply Chain Planning (ASCP) when generating detailed production schedules. The objectives of ASCP and Production Scheduling are differs as follows:

- ASCP creates New Supply Orders, while Production Scheduling schedules the existing supply orders.
- ASCP creates a supply chain plan for a network of plants, warehouses, suppliers and customers in the supply chain. Production Scheduling, on the other hand, creates a production schedule for a single manufacturing facility.
- ASCP helps you to plan a medium to long term horizon, e.g. 6 months to 1 year, whereas Production Scheduling schedules for the short term plan horizon e.g. 2 to 8 weeks.

- ASCP models aggregate level production constraints, while Production Scheduling models very detailed production constraints.
- ASCP makes decision on procurement by creating new purchase orders. Production Scheduling considers existing purchase orders as a source of supply. The Production Scheduling engine does not take any new purchasing decisions.

Process: Running Production Scheduling without ASCP

Process: Running Production Scheduling without ASCP



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Process: Running Production Scheduling without ASCP

You can run Production Scheduling without ASCP. When configured in standalone mode, Production Scheduling only schedules the work orders that it receives from Oracle ERP. While running in standalone mode, Production Scheduling does not schedule any planned orders because ASCP is not being used.

When running in standalone mode, Production Scheduling uses the following demand sources:

- All external sales orders
- All internal sales orders
- Forecasts from a demand schedule

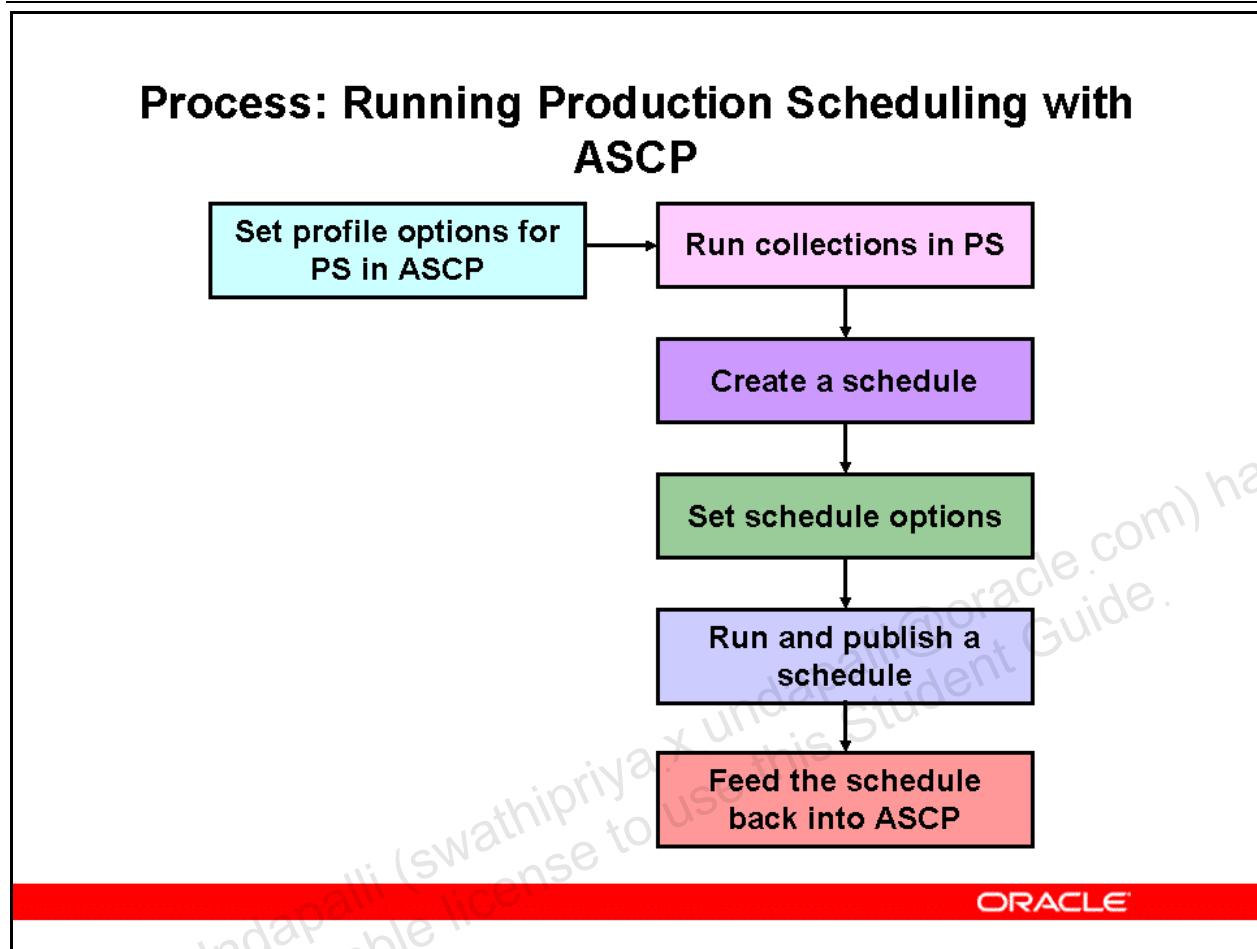
Note that Production Scheduling does not perform any forecast consumption in this case. Forecasts are considered outside the demand time fence while sales orders are considered within the demand time fence.

The process for using Production Scheduling with the EBS in standalone mode is as follows:

1. A Production Scheduling schedule is run from the Oracle Workbench, extracting fresh ERP data from the E-Business Suite.
2. Within Production Scheduling, various scenarios are run until the best schedule is achieved.

3. The preferred schedule is approved and published back to the planning server, and work orders are released automatically to the E-Business Suite.

Process: Running Production Scheduling with ASCP



Process: Running Production Scheduling with ASCP

The following steps describe the steps to run Production Scheduling with ASCP:

Set profile options for Production Scheduling in ASCP:

To produce schedules based on the E-Business Suite data, you must configure the profile options to collect the correct information for the data snapshot. The following profile options must be set in ASCP in order to configure Production Scheduling:

- MSC: PS - Snapshot Base Package
- MSC: PS - Snapshot Beginning Inventory Package
- MSC: PS - Snapshot Calendar Package
- MSC: PS - Snapshot Customer Package
- MSC: PS - Snapshot Distributor Package
- MSC: PS - Snapshot Enterprise Forecast Package
- MSC: PS - Snapshot Inventory Safety Targets Package
- MSC: PS - Snapshot Manufacturing Package
- MSC: PS - Snapshot Purchase Orders Package

- MSC: PS - Snapshot Sales Orders Package
- MSC: PS - Snapshot Supplier Package
- MSC: PS - Snapshot Transfer Orders Package
- MSC: PS - Snapshot Work Orders Package
- MSC: PS Currency Symbol
- MSC: PS Run Application Script
- MSC: PS Run Connector Script
- MSC: PS/SNO Alignment Date
- MSC: PS/SNO API Version
- MSC: PS/SNO Client Install Path
- MSC: PS/SNO Compress XML Package Files
- MSC: PS/SNO Data Store Path

Run collections in PS:

The collections process for Production Scheduler is the same as the collections process for Oracle ASCP. There are no new data setups to be done for Production Scheduling if you have already performed these data setups for ASCP.

Create a schedule:

You can have multiple production schedules. You can either create a new schedule and go through all the steps to define it or you can base your schedule on an existing schedule, making changes where necessary.

Note: You can create copy of a schedule within Production Scheduling for simulation purposes. Production Scheduling maintains a mapping between the original schedule and the copied schedule. The name (and internal id) of the original schedule is used if you publish the simulated results back to the planning server.

Set schedule options:

Once the production schedule has been created, you can configure the model using the following schedule options in the Production Schedule Options window:

In the Horizon tab:

- Scheduling Horizon
- Release Horizon
- Schedule Start Date Offset
- Schedule Start Time
- Schedule Start
- Schedule End

In the Scope tab:

- Include Past Due Sales Orders
- ASCP Plan Reference

- Demand Time Fence
- Demand Schedules
- Category Set
- Category
- Description

In the Schedule Parameters tab:

- Cost Time Unit
- Fixed Time Fence
- Decimal Precision
- Use Work Order Units of Effort
- Adjacent Operations Preferred
- Bottleneck Resource Group
- Simulation Set
- Global Offload Threshold
- Global Offload Threshold Window
- Demand Build Strategy
- JIT Operation Placement To
- Allow Resource Offloading on Work Orders
- Ship Complete for Transfer Orders

In the Display Parameters tab:

- Create Demand Folders Based On
- Create Supply Folders Based On
- Create Work Order Folders Based On

In the Run Optimization tab:

Access and fill out the fields in this tab if you want to run the Repetitive Manufacturing Optimization (RMO) algorithm in Production Scheduling. The RMO algorithm takes into consideration the various costs in the model, including inventory carrying, inventory stockout, changeover, and safety stock violation costs when creating an optimal production schedule.

Run and publish the schedule:

You can manage Production Scheduling directly from ASCP Planner's Workbench with:

- The latest snapshot of ERP data and ASCP planned orders.
- An existing snapshot of ERP data and ASCP planned orders on the planning server.
- An existing snapshot of ERP data and ASCP planned orders saved on the client computer.

You can publish a schedule back to the planning server and to the Oracle Applications Manufacturing modules by using the Publish process. Once the schedule has been solved, you can publish the results back to the E-Business Suite. Of all the scenarios you may have created while fine tuning your schedule, you must first approve your final schedule.

To start Production Scheduling from ASCP, use the following navigation path:

User Responsibility:

Production Scheduler

Navigation Path:

Applications > Workbench > PS Plans

Feed the schedule back into ASCP:

Once the production schedule has been published back to the planning server, it can be used to constrain subsequent runs of ASCP plans. You can specify the name of the production schedule as an input in the ASCP Plan Options window.

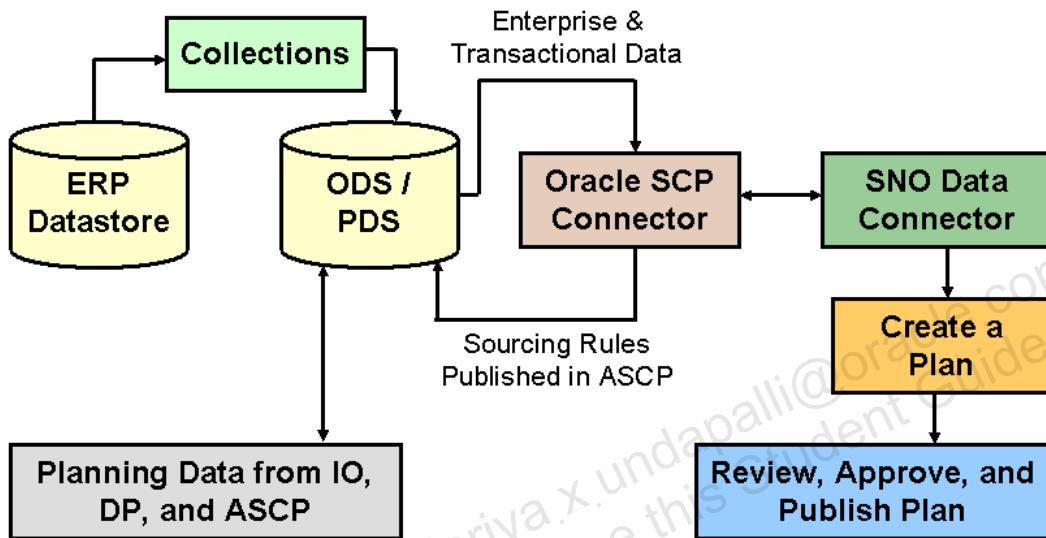
Topic Overview: Integration with Strategic Network Optimization

- **Overview: Integration Architecture and Business Process**
- **Process: Running Strategic Network Optimization with ASCP**

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Overview: Integration Architecture and Business Process

Overview: Integration Architecture and Business Process



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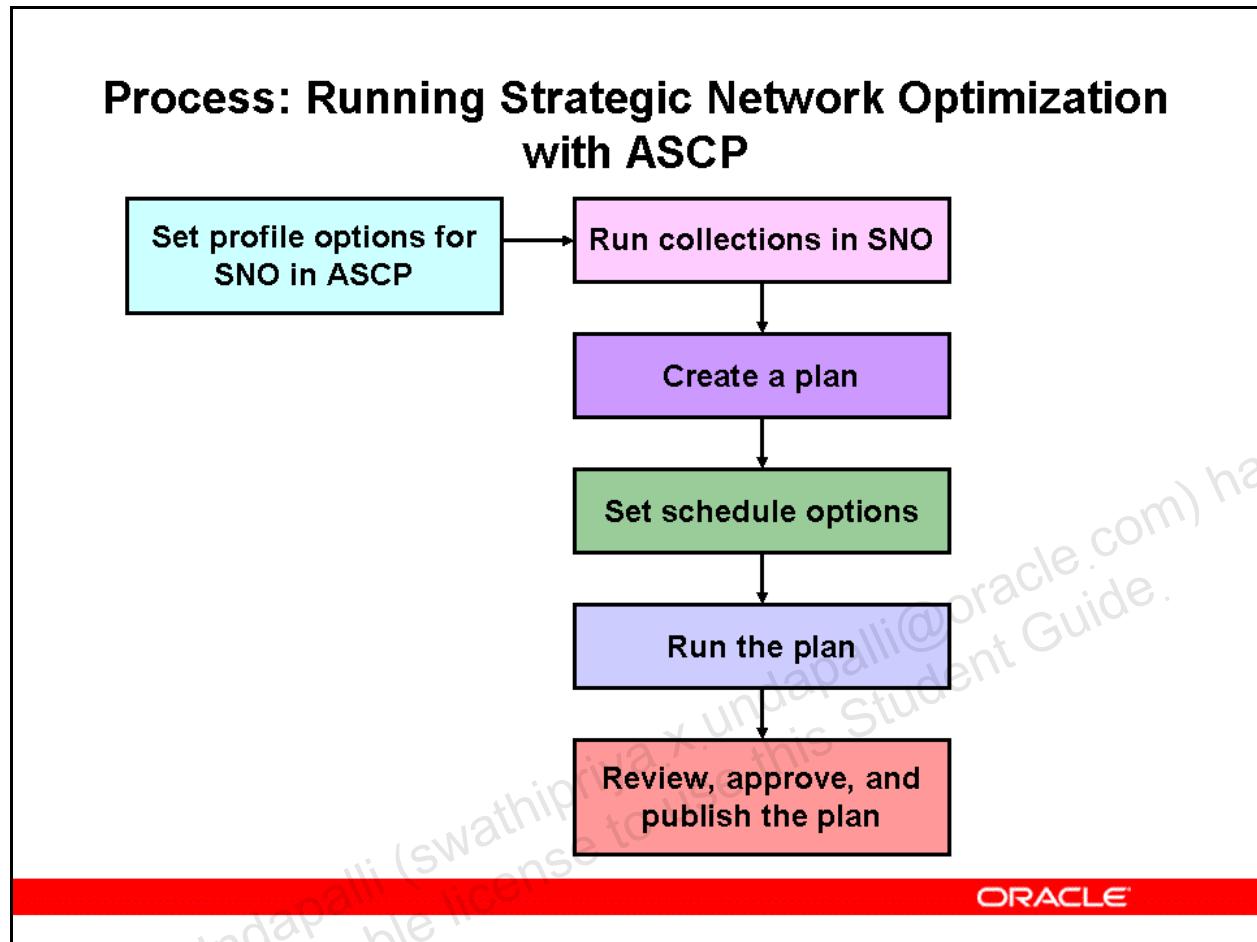
Overview: Integration Architecture and Business Process

Oracle Strategic Network Optimization (SNO) is a tool that enables you to model and optimize your supply chain network, from obtaining raw materials through delivering end products. With strategic network optimization you can determine which material should be sourced from different suppliers and the goods produced in a plant. It also helps you to optimize your distribution plans, including plant locations, warehouses, and your aggregate production plans including machine routings, the flow of materials, and use of critical resources.

Using Strategic Network Optimization, you can:

- Develop and evaluate "what if "scenarios.
- Plan for supply, demand, and capacity changes.
- Optimize plans by performing a variety of detailed analyses including expected profit, new market, marketing promotions, materials and finished goods sourcing, and inventory builds.

Process: Running Strategic Network Optimization with ASCP



Process: Running Strategic Network Optimization with ASCP

Strategic Network Optimization is integrated with the Oracle E-Business Suite and leverages the APS component architecture to pull (or collect) data from the E-Business Suite. The integration helps you build base models in Strategic Network Optimization automatically.

The following steps describe the steps to run Strategic Network Optimization with ASCP:

Set profile options for SNO in ASCP:

To produce Strategic Network Optimization plans based on the E-Business Suite data, you must configure the profile options to collect the correct information for the data snapshot. The following profile options must be set for Strategic Network Optimization:

- MSC: PS/SNO Alignment Date
- MSC: PS/SNO API Version
- MSC: PS/SNO Client Install Path
- MSC: PS/SNO Compress XML Package Files
- MSC: PS/SNO Data Store Path
- MSC: SNO - Snapshot Base Package

- MSC: SNO - Snapshot Beginning Inventory Package
- MSC: SNO - Snapshot Calendar Package
- MSC: SNO - Snapshot Customer Package
- MSC: SNO - Snapshot Demand Package
- MSC: SNO - Snapshot Distribution Package
- MSC: SNO - Snapshot Enterprise Forecast Package
- MSC: SNO - Snapshot Inventory Safety Targets Package
- MSC: SNO - Snapshot Manufacturing Package
- MSC: SNO - Snapshot Purchase Orders Package
- MSC: SNO - Snapshot Supplier Package
- MSC: SNO - Snapshot Transfer Orders Package
- MSC: SNO - Snapshot Work Orders Package
- MSC: SNO Connector Precision
- MSC: SNO Currency Precision
- MSC: SNO Decimal Precision
- MSC: SNO Optimization Type
- MSC: SNO Run Application Script
- MSC: SNO Run Connector Script
- MSC: SNO Transportation Capacity By

Run collections in SNO:

The collections process for Strategic Network Optimization planner is the same as the collections process for Oracle ASCP. There are no new data setups to be done for Strategic Network Optimization if you have already performed these data setups for ASCP.

Create a plan:

In order to create a Strategic Network Optimization plan, the first step is to create a name for the plan and specify the plan options. A Strategic Network Optimization plan name is created in the context of an organization.

Set schedule options:

Once the Strategic Network Optimization plan has been created, you can configure the model using the following schedule options in the SNO Schedule Options window:

In the Main tab:

- Buckets
- Plan Start Date
- Plan End Date
- Planned Resources
- Bottleneck Group

- Assignment Set (Input)
- Assignment Set (Output)
- Category Set
- Category
- Description

In the Organizations tab:

- Add All Authorized Organizations
- Org
- Description
- Simulation Set
- Demand Schedules

Run the plan:

After creating the plan, you can run the plan directly from the E-Business Suite using the Workbench. You can run:

- A plan based on the latest E-Business Suite data.
- A plan based on the latest data available on the Planning Server.
- An existing plan located on the client computer.

Use the following navigation path to run a Strategic Optimization Network plan:

User Responsibility:

Strategic Planner

Navigation path:

Applications > Workbench > The Strategic Plans

Review, approve, and publish the plan:

Once a plan has been solved and reviewed, the sourcing rules can be published back to the planning server and used as input into ASCP. A sourcing rule is created for each item and is time phased over the horizon.

Summary

Summary

In this module, you should have learned about Advanced Supply Chain Planning integration with:

- Mixed-mode manufacturing environments
- Demantra Demand Management
- Production Scheduling
- Strategic Network Optimization

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Planning Strategies

Chapter 16

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Planning Strategies



Advanced Supply Chain Planning Fundamentals

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Objectives

Objectives

After completing this module, you should be able to do the following:

- **Describe simulation**
- **Describe planning strategies**
- **Perform simulation**

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Module Overview: Topics

Module Overview: Topics

- **Simulation**
- **Planning strategies**

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Topic Overview: Simulation I

Topic Overview: Simulation I

- **Simulation**
- **Simulation modes**
- **Plan scenarios**
- **Comparing alternative plans**
- **Implementing plan changes**
- **Net change simulation process**
- **Online net change**
- **Changes for net change simulation**
- **Online demand changes**
- **Online supplier capacity changes**
- **Online resource changes**

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Topic Overview: Simulation II

Topic Overview: Simulation II

- **Running online net change**
- **Batch net change**
- **Undo summary window**
- **Full re-plan simulation process**
- **Changes for full re-plan simulations**

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Simulation

Simulation

Simulation is modeling alternative or what-if scenarios:

- **What if demand dates and quantities change?**
- **What if demand priorities change?**
- **What if material or resource availability changes?**
- **What if optimization objectives change?**

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Simulation

Simulate your plans if you need to:

- Run what-if scenarios to find alternatives that improve supply chain operations.
- Adjust plans to reflect current supplier information and other frequently changing information.
- Graphically compare the results of multiple simulation scenarios to choose the plan that best meets your performance objectives.

You can:

- Simulate changes to material and resource capacity simultaneously
- Copy and version your plan
- Save and compare exceptions
- Visually highlight changes
- Simulate changes to demand priorities, add new demands
- Firm, modify, add supplies
- Run and compare multiple simulation scenarios
- Simulate the effects of changing sources

Constraint/Bottleneck Management

In general, it is more effective to resolve the most constrained resource (bottleneck) before the least constrained resource. Resource refers to manufacturing resources, transportation resources, and suppliers. Similarly, it is more logical to work on the high priority demands before working on low priority ones.

Simulation Modes

Simulation Modes

- **Net change**
 - **Online**
 - **Batch**
- **Full re-plan**

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Simulation Modes

You can run simulations in two modes:

- **Net change:** Generates only those plan outputs that have changed compared to the baseline plan
- **Full re-plan:** Causes a new simulated plan to be completely rerun. Any change that can be simulated in net change mode can also be simulated with a full re-plan.

You can simulate changes to plan output on the planning instance, for example, supply and demand, with net-change mode. For changes to entities and information that you make on the source instance, you must make the changes, run collections, and then use the full re-plan mode.

Net Change Simulation

Net-change simulation refers to the following process:

- Generate a baseline plan.
- Use Planner Workbench to make changes to the plan or a copy of the plan.
- Run either an online re-plan or batch re-plan.

There are two modes of net change simulation:

- **Online:** When minor changes are made in the plan, net-change simulation can revise plans within seconds.
- **Batch:** Batch update has the same effect as an online re-plan but takes the form of a concurrent request and releases the terminal so that the user can continue working.

Online planner is faster if you are the only planner performing the simulations but it does lock out other users from the plan. If more than one planner is performing simulations on the same plan, use batch planner.

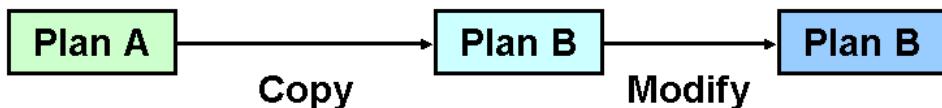
Full Re-plan Simulation

Simulations can be run by changing plan inputs and parameters, collecting, and then completely rerunning the new, simulated plan. The new simulated plan can be saved as a new plan and compared to the original (baseline) plan. You can run and compare multiple simulation scenarios. For example, you could generate an unconstrained plan and a constrained plan and then compare key performance indicator results.

Plan Scenarios

Plan Scenarios

Copy plan and then modify the named copy



Save actions to create a plan version



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Plan Scenarios

You can work with plan scenarios in two ways:

- Copying a Plan to Another Named Scenario
 - The first approach is to make a copy of a baseline plan saved as a new plan name. Then modify the plan in any appropriate way and then run either a full re-plan or a net change re-plan on the modified copy. Both the copy and the original plan are fully preserved for any level of detailed comparison.
 - Note: You must create the new plan name before copying a plan to the new plan name.
- Creating a Series of Plan Versions
 - The second method is to run a series of online versions of the same plan. Before running an online simulation, select Save Actions from the Planner Workbench Plan menu. This saves the exception messages and a count of the number of exceptions under a version number. New exception messages are contained in the version named Current. The messages and counts for the current version can then be compared to the exception messages and exception count saved under previous versions. Using this facility, only the exception messages for each scenario are saved. Other details, such

as KPIs and planned orders, are lost for all versions except for the version named Current.

Comparing Alternative Plans

Comparing Alternative Plans

- **Copy, version, and save your plan**
- **View graphical online comparison of multiple plans and simulation scenarios**
- **Compare key performance indicators**
- **Compare quantified results and exceptions**
- **Visually highlight changes**

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Comparing Alternative Plans

The Planner Workbench provides a graphical online comparison of multiple plans.

The Key Indicators tab displays a side-by-side comparison of key performance indicators of the plans and simulations you select from the tree. You can see:

- Impact on on-time delivery
- Impact on inventory turnover ratio
- Impact on margin percentage
- Impact on resource utilization

The Actions tab provides quantified results with regard to number and type of exception messages.

You can copy plans, version your plans, save and compare exceptions, and visually highlight changes.

Implementing Plan Changes

Implementing Plan Changes

- **Source instance**
- **Destination instance**

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Implementing Plan Changes

Based on the results from simulations, planners can decide what changes to implement in the execution system. Most of the improvement adjustments or changes will need to be made in the source instance except for supplier capacity, supplier flex-fences, and sourcing rules.

For sourcing rules in the destination organization, changes need to be made in the destination instance. For sourcing rules, defined in the source, changes will need to be made in the source instance.

Net Change Simulation Process

Net Change Simulation Process

- **Generate the baseline plan**
- **Save as another plan name**
- **Create alternative what-if scenarios**
- **Run scenarios**
- **Compare results**
- **Simulation set**

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Net Change Simulation Process

You must generate at least one advanced supply chain baseline plan before you begin simulation activity.

You can create a simulation plan name by saving a copy of either the baseline plan or another simulation plan under a different name. Then you manipulate the new plan to model the changes involved in your scenario. Depending on the types of changes you have implemented, you run the simulation using either the net-change or full re-plan simulation mode. When the simulation is completed, you can compare it to other plans by selecting them from the Planner Workbench tree.

Capacity Modifications

A capacity modification is a temporary change to the available capacity of a resource, for example, work on a specific Saturday. You record a capacity modification for a shift of a resource. When you plan a resource that has capacity modifications, the planning process might schedule work on a different day than it would have scheduled the same work if there was no capacity modification.

A simulation set is the label for a group of capacity modifications needed for a specific purpose, for example, a vacation schedule or an end-of-quarter overtime schedule. You may

simulate capacity changes by performing a capacity plan using a certain simulation set. Once you are satisfied with the changes, you make them permanent by such actions as contacting employees to schedule overtime work, schedule less work, and approving or denying requests for time off. If the changes relate to more systemic or long-term modifications, you make them permanent by changing work days and shift times in the workday calendar and increasing or decreasing the number of resources.

The example above shows the four types of capacity modifications:

- Add work day
- Delete work day
- Add capacity (you can add both number of hours and number of resource units)
- Reduce capacity (you can reduce both number of hours and number of resource units)

Simulation Set

Typically, you use simulation sets for a simulation plan, and the planner compares the baseline plan (which does not use the simulation set) with the simulation set plan. Planners specify the simulation set in the plan options organizations tab and the simulation set must be specified for each organization. This cannot be changed for net-change replan.

The Simulation Set field in the Organizations tabbed region of the Plan Options window provides a pull-down list of named simulation sets that have been set up in the instance:organization.

Simulation sets are not required in order to run full re-plan simulations.

Changes for Net Change Simulation

Changes for Net Change Simulation

- Run by changing plan inputs and parameters and rerunning the new, simulated plan.
- The new simulated plan can be saved as a new plan and compared to the original (baseline) plan.
- You can copy and version your plan, save and compare exceptions, and visually highlight changes.

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Changes for Net Change Simulation

During on-line planning, a planner can modify the following information:

- Supplier Capacity
 - Add or remove supplier capacity
 - Modify dates and quantities
- Resource Availability
 - Add new resource availability
 - Modify dates and quantities
 - Add new shifts
- Supplies
 - Add new planned orders
 - Firm planned orders, discrete jobs, and purchase order
 - Modify quantities, dates, sources, and alternates
- Demands
 - Add new Manual MDS

- Modify order priority

Online Demand Changes

Online Demand Changes

- **Demand attributes**
 - Forecasts
 - Sales orders
 - Master demand schedules
- **Demand priorities**

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Online Demand Changes

MDS, sales order, or forecast dates and quantities can be changed on the destination (APS) system, or they can be changed on the source (transaction) system and recollected for a permanent change. You can modify quantities and due dates in:

- Forecasts
- Sales orders
- Master demand schedules

You can alter the demand priority of any demand. Oracle ASCP then modifies the existing schedule to accommodate changes to demand priority. When you assign the highest priority, planning will always try to satisfy the demand on time or within the maximum late days you specified. Demand priority can be changed on the destination side for simulation. Make changes on the source side for a permanent change of priority.

Online Supply Changes

- **New firm planned orders**
- **Firming and changing quantity or date of existing planned orders**

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Online Supply Changes

New firm planned orders

Firming and changing quantity or date of existing planned orders

Online Supplier Capacity Changes

Online Supplier Capacity Changes

- **Change supplier capacity**
- **Change planned orders**
- **Cancel purchase orders or change due date**
- **Cancel work orders or change due date**

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Online Supplier Capacity Changes

You can adjust a supplier's material capacity and processing lead time on the Supplier-Item Attributes window. For example, you can change daily capacity from 100 units to 200 units over a specified time frame. Change this on the source side for a permanent change of supplier capacity.

You can change the planned order status to firm, and change the planned order quantity and due date and then see the result in an online simulation.

You can simulate changed due dates or canceled work orders and purchase orders online, but full re-plan mode is needed to simulate changes in order quantity. You can change the due date and cancel work orders and purchase orders on the destination side and then run an online simulation. Or you can change the due date and cancel and change order quantities on the source side within WIP or Purchasing, respectively, and run a full re-plan simulation.

Online Resource Changes

Online Resource Changes

- **Modify resource availability**
 - Add or remove shifts
 - Change machine or labor resource quantity
 - Employ alternative resources
- **Change material and resources simultaneously**
- **Adjust resource availability over user-specified time frame**

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Online Resource Changes

Resource attributes can be changed on the source or the destination side. You can simulate simultaneous changes to material and resource availability and specify changes in resource availability over a user-specified time frame. You can modify resource availability by:

- Adding or removing shifts
- Changing the number of available machines and workers
- Choosing alternative resources

You can change material and resource availability simultaneously.

You can use resource tolerance fences to change resource availability over a user-specified time frame.

Note: Simulating the addition of a new type of resource requires a full re-plan.

The resource attributes listed in the figure can be changed on the destination side and simulated online. You can also change the resource attributes listed in the figure and add a new resource on the source side and then run a full re-plan simulation.

Running Online Net Change

Running Online Net Change

- 1. Start the online planner.**
- 2. Load the plan into memory.**
- 3. Use the Planner Workbench to adjust data for the scenario desired.**
- 4. Run the online planner.**
- 5. Evaluate and compare scenario results.**
- 6. If desired, go back to step 3.**
- 7. Stop the online planner.**

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Running Online Net Change Re-Plan

The following describes the process for running the online planner.

Make a copy of your baseline or simulation plan and save it under another name. So that you do not lose existing plans, make modifications only to the new copy of the plan.

1. Start the Online Planner and load snapshot into memory (N) Menu > Plan > Start Online Planner
 - Select the copy of the plan in the Planner Workbench.
 - Click OK to acknowledge that starting the online session will prohibit access to this plan by other users.
 - Make a note of the concurrent request ID and click OK.
 - Check the Online Planner status (M) Plan > Status.
 - While the online planner loads the data into memory, you will see the Online Planner Status window. This window displays the progress of the loading and indicates when the session is ready for planning.
 - When the session is ready for planning (the green light is on), close the window to return to the Planner Workbench. Your online planner session is now active.

- Check the Online Planner status (M) Plan > Status.
2. Simulate scenario changes.
 - Navigate to the attribute for which you are modeling a change (N) Workbench (M) Tools > Supply/Demand.
 - Make simulated changes to the plan from within the Planner Workbench.
 - Save actions (M) Plan > Save actions.
 - Note the version number of your saved actions and click OK.
 3. Run the Online Planner (M) Plan > Plan.
 4. Evaluate and compare scenarios.
 5. As desired, return to step 3 and adjust data.
 6. Stop the Online Planner session (M) Plan > Stop. Click OK.

Note: Do not stop the online planner until the simulation is complete.

Batch Net Change

Batch Net Change

- **Same changes**
- **Different launch method**
- **Same output**

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Batch Net Change

- Re-plans the same changes as online net change
- Runs as a concurrent process that locks out everyone from accessing the plan. However, before the concurrent process, multiple planners can access and change the same plan. In comparison, when one starts the online planner, everyone is locked out while that planner is changing and replanning the plan.
- Produces the same output information as online net change

Undo Summary Window

Undo Summary Window

- A complete audit trail of all changes to the plan, by planner, is kept to manage the interaction of multiple users.
- Individual changes, or all changes back to a user-defined bookmark, can be undone to restore the plan to a previous state.

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Undo Summary Window

You can undo the changes that you made in a previous online planner session. While one planner is making changes making changes, everyone else is locked out of access to that plan..

Bookmarks

- Click on the Add Bookmark button and give your bookmark a name in the window that pops up. You will see a new row appear in the Undo Summary window above your other records. It will show the name of your bookmark in the first column.
- Go back to the Planner Workbench, make some changes, and run online planner.
- Bring the Undo Summary window to the foreground. Notice that there are rows to tell you when the online planner was started and run.
- Select your bookmark and click the undo button. A confirmation box will appear, select yes. This will undo all of the changes you have made since you created the bookmark. You also could have selected the online planner row and selected undo and it would have undone all of the changes made since online planner was run.

Undo Detail Window

- Click on the Change Detail button to open the Change Detail window. You will see the specifics about your change such as the field changed (i.e. Quantity/Rate) and the old value and new value.

Full Re-plan Simulation Process

Full Re-plan Simulation Process

- Start with a copy of the baseline plan or define another plan name
- Change any source and destination data and parameters
- Run data collection programs, if source data has changed
- Launch planning
- Compare to baseline plan

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Full Re-plan Simulation Process

There are changes that cannot be simulated by using the online planner. Instead, a full regeneration of the plan is required to make the simulation calculations. These are fundamental changes, such as changing plan objectives and changing the transaction (source) system data that must be collected before the ACSP system can calculate the effect of the changes.

Changes for Full Re-plan Simulation

Changes for Full Re-plan Simulation

- **Work orders**
 - Quantity
 - BOM
 - Routing
- **Purchase orders**
 - Quantity
 - Supplier
 - Cost

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Changes for Full Re-plan Simulation

These changes must be made on the source side and collected, and simulated in full re-plan mode.

Work orders:

- Change a work order quantity.
- Change work order status to firm or not firm.
- Use alternative bills:
 - Create and delete components.
 - Adjust component use quantities.
 - Change BOM and BOM component effectivity dates and enable/disable designators.
- Use alternative routings:
 - Add and remove items.
 - Adjust resource usage in routing operations.
 - Change the production line rate.
 - Enable or disable routings and change routing effectivity dates.

Purchase Orders:

- Change a purchase order quantity.
- Add an alternative supplier.
- Change supplier priorities (ranking).
- Change supplied material costs.

Quiz

Quiz

The Net Change simulation method causes a new simulated plan to be completely rerun.

- 1. True**
- 2. False**

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Answer: 2. False

Quiz

Quiz

A group of capacity modifications needed for a specific purpose is called:

1. Online demand changes
2. Simulation sets
3. Work orders
4. Demand attributes

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Answer: 2. Simulation sets

Quiz

Quiz

During online planning, a planner can modify supplier capacity and resource availability.

- 1. True**
- 2. False**

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Answer: 1. True

Quiz

Quiz

During online planning, a planner can use alternative bills or routings.

- 1. True**
- 2. False**

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Answer: 2. False

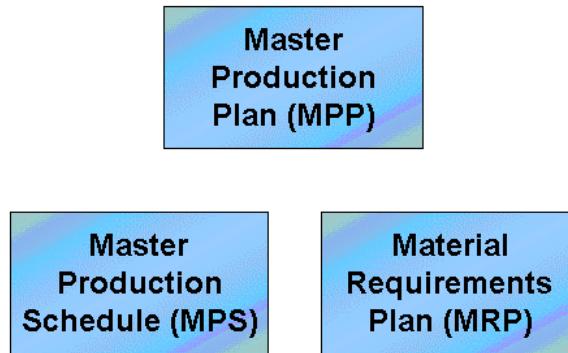
Topic Overview: Planning Strategies

- Plan types
- Planning method
- Multiple organization planning
- Benefits of holistic plans
- Subset planning scenarios
- Pitfalls of subset planning
- Existing plans as demand schedules
- Existing plans as supply schedules

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Plan Types

Plan Types



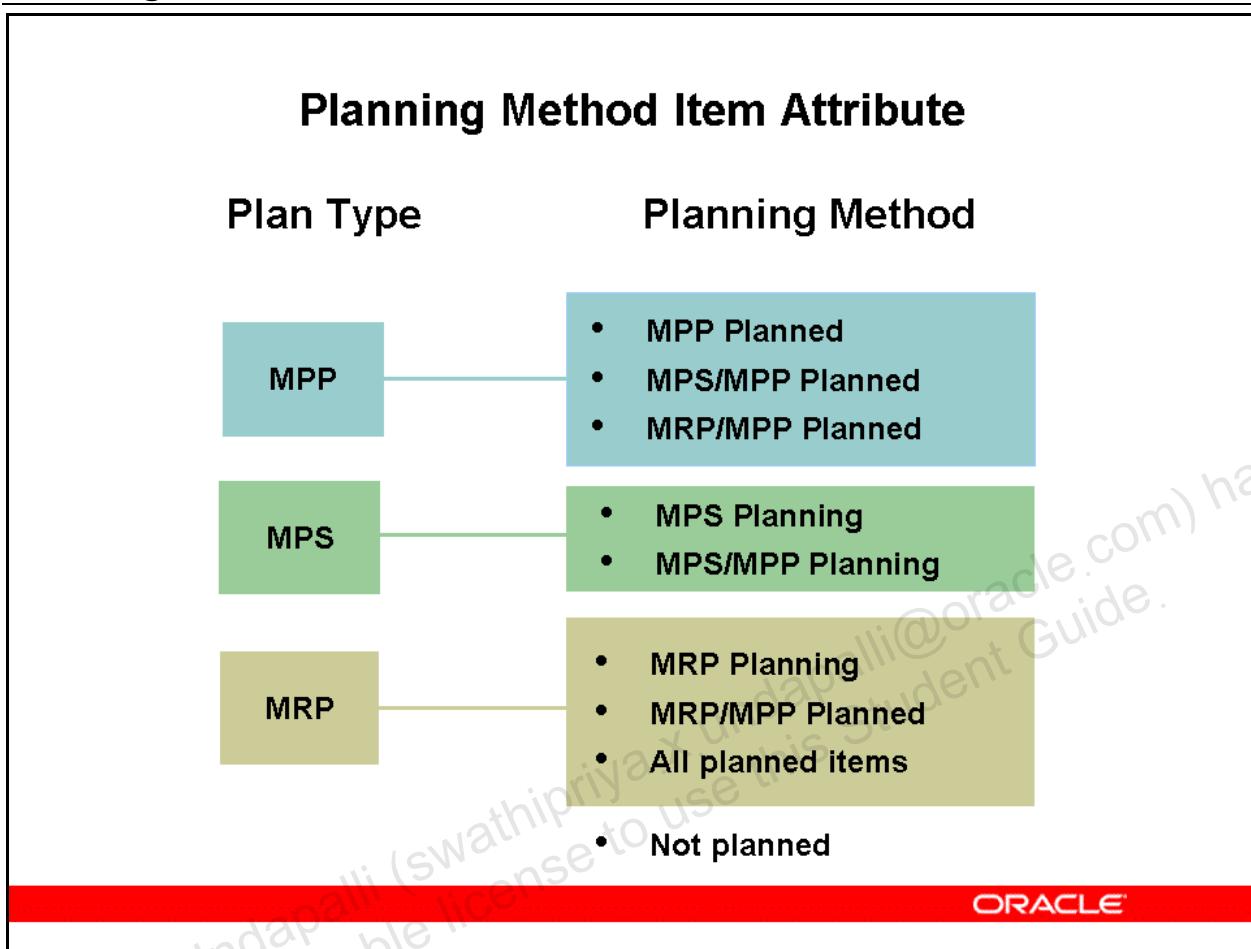
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Plan Types

There are several plan types. Use these singly or in combination for your global, subset, and individual planning schemes. The three plan types perform the same requirements explosion so you can virtually use any plan in any planning scheme. The following is a conventional suggestion:

- If you are doing global supply chain planning, use a material requirements plan.
- If you are planning by subsets, use a master production plan for top-level assembly demand, a master production schedule for top-level assembly supply, and a material requirements plan for subassembly and purchased item demand and supply

Planning Method Item Attribute



Planning Method Item Attribute

Planning Method item attribute specifies the plan type that is used to plan the item. When an item is not planned, it is not included in ASCP calculations.

The choices are:

- Not planned
- MRP planning
- MPS planning
- MRP/MPP planned
- MPS/MPP planned
- MPP planned

Master production plans (MPP) consider the following items:

- MPP planned items
- MPS/MPP planned items
- MRP/MPP planned items

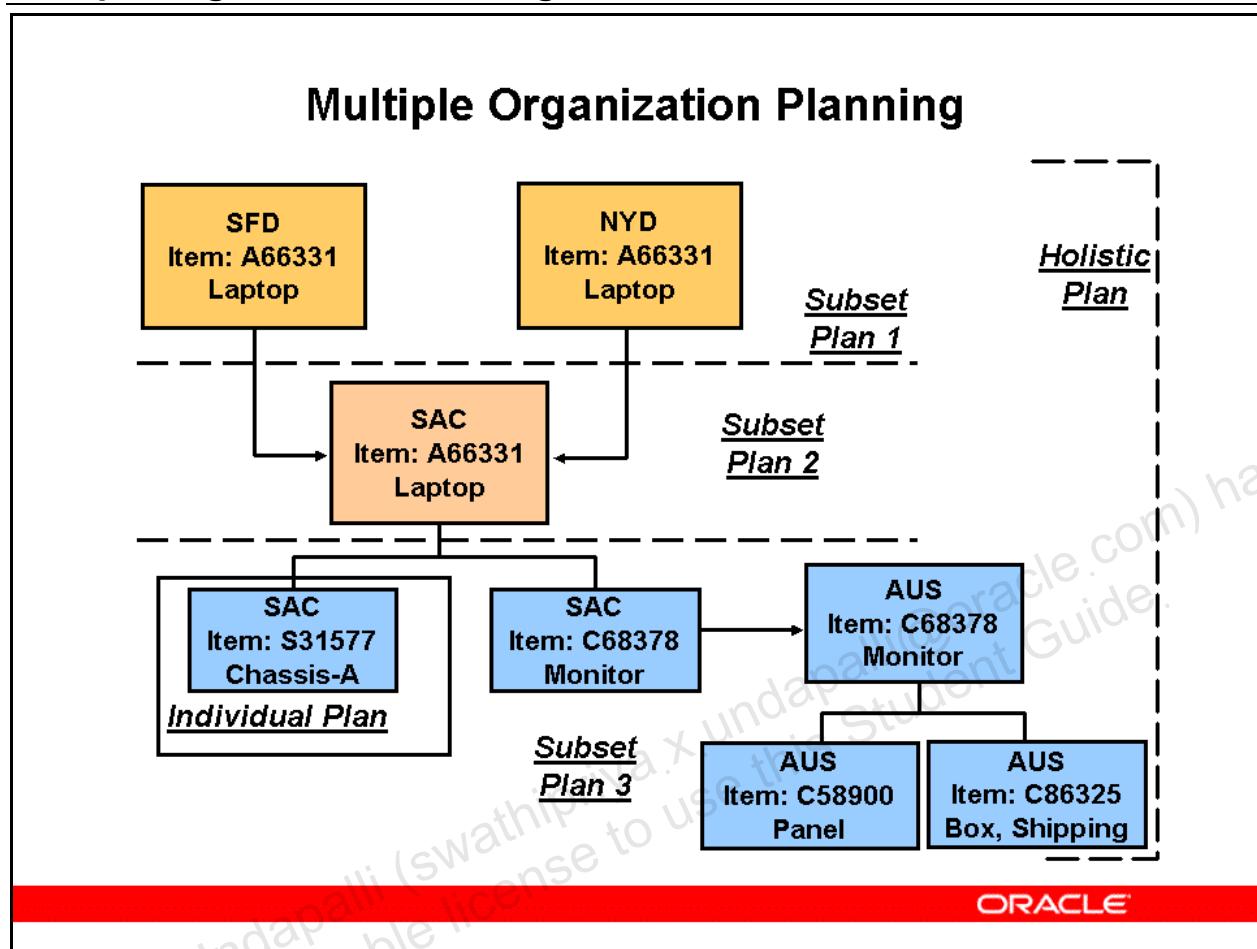
Master production schedules (MPS) considers the following items:

- MPS planning items
- MPS/MPP planning items

Material requirements plans (MRP) consider the following items:

- MRP planning items
- MRP/MPP planned items
- All planned items

Multiple Organization Planning



Multiple Organization Planning

You can plan your enterprise with a production plan using any of these schemes.

Individual planning: Planning each organization separately. In the diagram, the rectangle illustrates a plan for one organization; you plan each organization individually in the same manner.

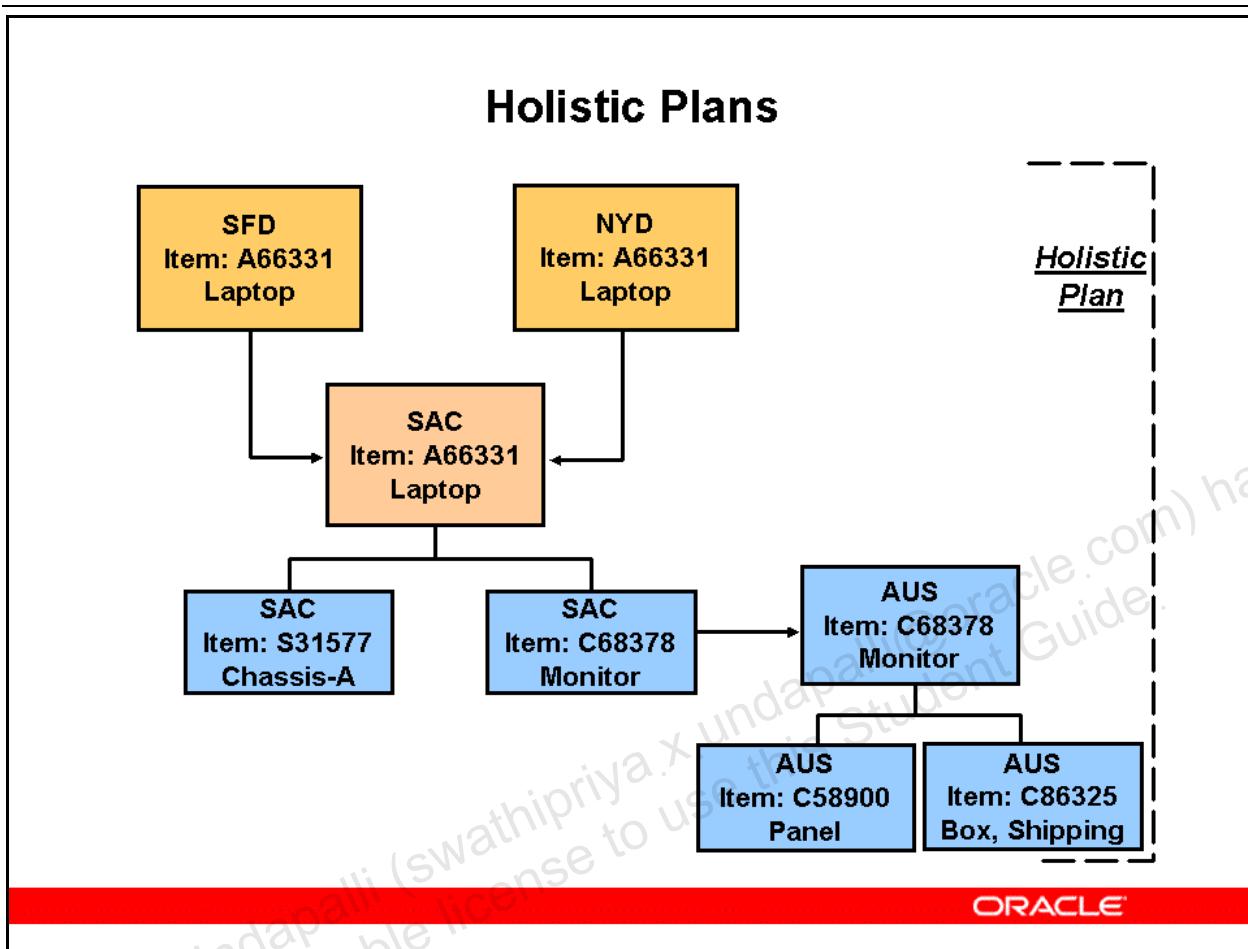
Subset planning: Planning groups of organizations, often by function

For example, all distribution centers, or by the need for human intervention at a certain point in the supply chain, for example, a need for human review of the final assembly plan. In the diagram, you plan this enterprise using three subset plans.

Global supply chain (holistic) planning: Planning your entire supply chain at the same time.

One of the important implementation decisions that you need to make is the scheme that you use to plan your supply chain.

Holistic Plans



Holistic Plans

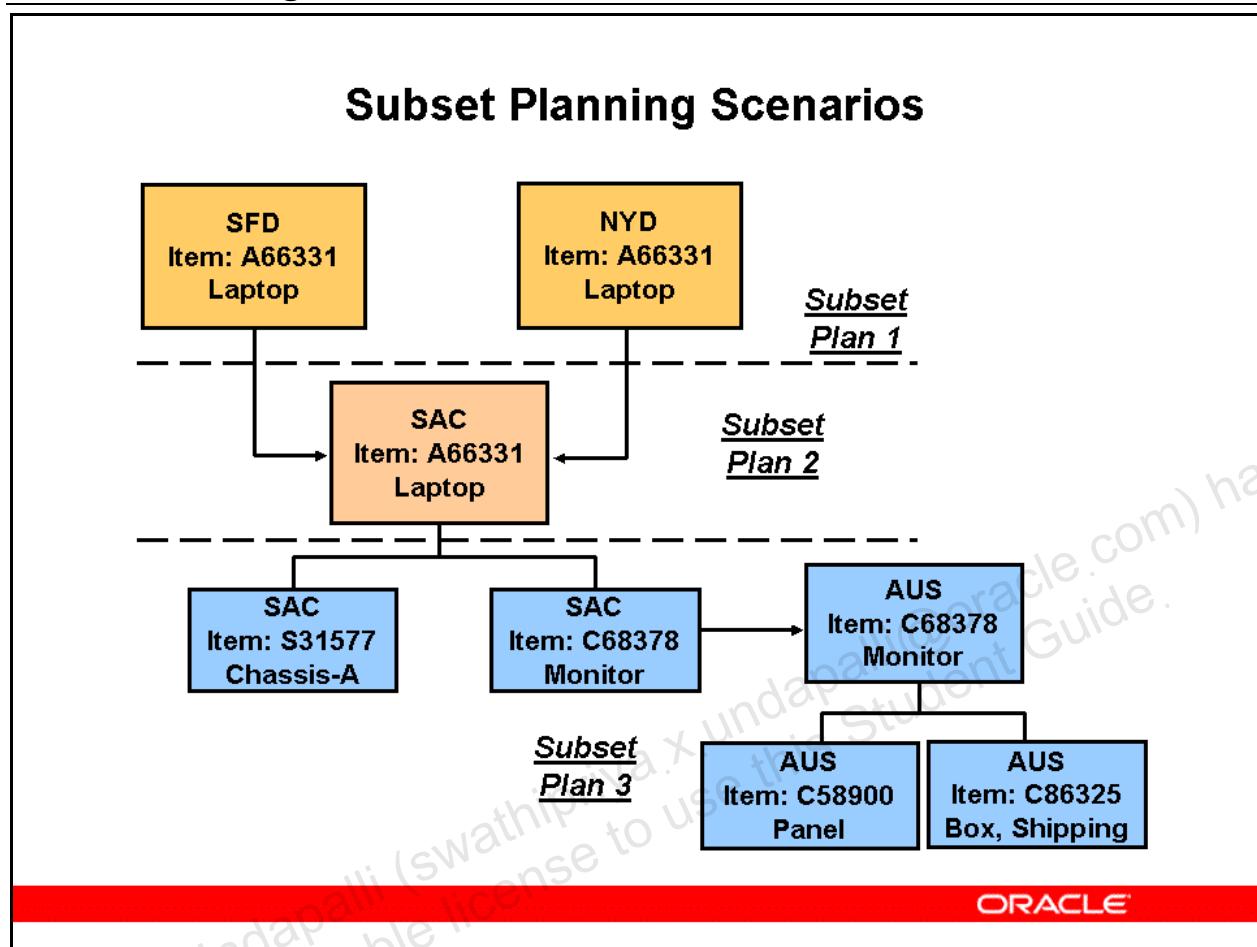
The holistic approach is advantageous for the following reasons:

- Least planning effort. Fewer plans need to be generated.
- Data consistency. Without the single-plan ability, requirements must be repeatedly transferred upstream within the supply chain to each successive supplier facility. Each transfer presents an opportunity for miscommunication or data loss.
- Global optimization. Intelligent tradeoffs between the performance of individual facilities (as measured by, for example, plan profit) can be made because Oracle ASCP optimizes the supply chain planned orders as a whole.
- Minimum communication lag
 - The effects of decisions made at the highest level of the supply chain are immediately visible at the lowest level of the supply chain. If individual facility plans are used, there is at least a one planning-run duration lag between the receipt of requirements at a facility and the passing of the dependent requirements to the facility's suppliers. Moreover, this lag is often much greater due to differences in working hours between upstream and downstream facilities (for example, if the facilities are in different time zones). Also, the planning cycles of upstream and downstream facilities may not be

synchronized (for example, customer facility AF1 runs its plan on Monday, while supplier facility SF1 runs its plan on Sunday). This results in even longer communication lags.

- The overall effect of plan communication lag is to make the supply chain less responsive to meeting changes in customer demand.

Subset Planning Scenarios



Subset Planning Scenarios

There are some situations in which it makes sense to plan a portion of the supply chain separately, outside of the overall supply chain MPP plan.

Scenario 1: Unique Local Objectives Must be Respected Along with Global Objectives

Suppose that subassembly plant SF1 which makes M12, contains very expensive capital equipment. SF1 is the overall supply chain constraint, so every minute that its resources are utilized brings extra profits to the enterprise. Resource utilization is the most important objective for SF1. For the supply chain as a whole, however, due to rapid product life cycles and a fickle market, inventory turns might be the most important objective. In this situation you could run a two-stage planning process.

- An MRP for organization SF1 with resource utilization as the objective to generate planned orders for the portion required at SF1.
- A MPP for the other organizations with the above MRP as a supply schedule with inventory turns as the objective to generate planned orders for the portion required at SF2.

Scenario 2: Local Restrictions Not Captured in Global Planning Inputs

Suppose that a subcomponent item in plant SF1 has volatile pricing. In lieu of implementing the default planned orders one could plan the supply chain as follows:

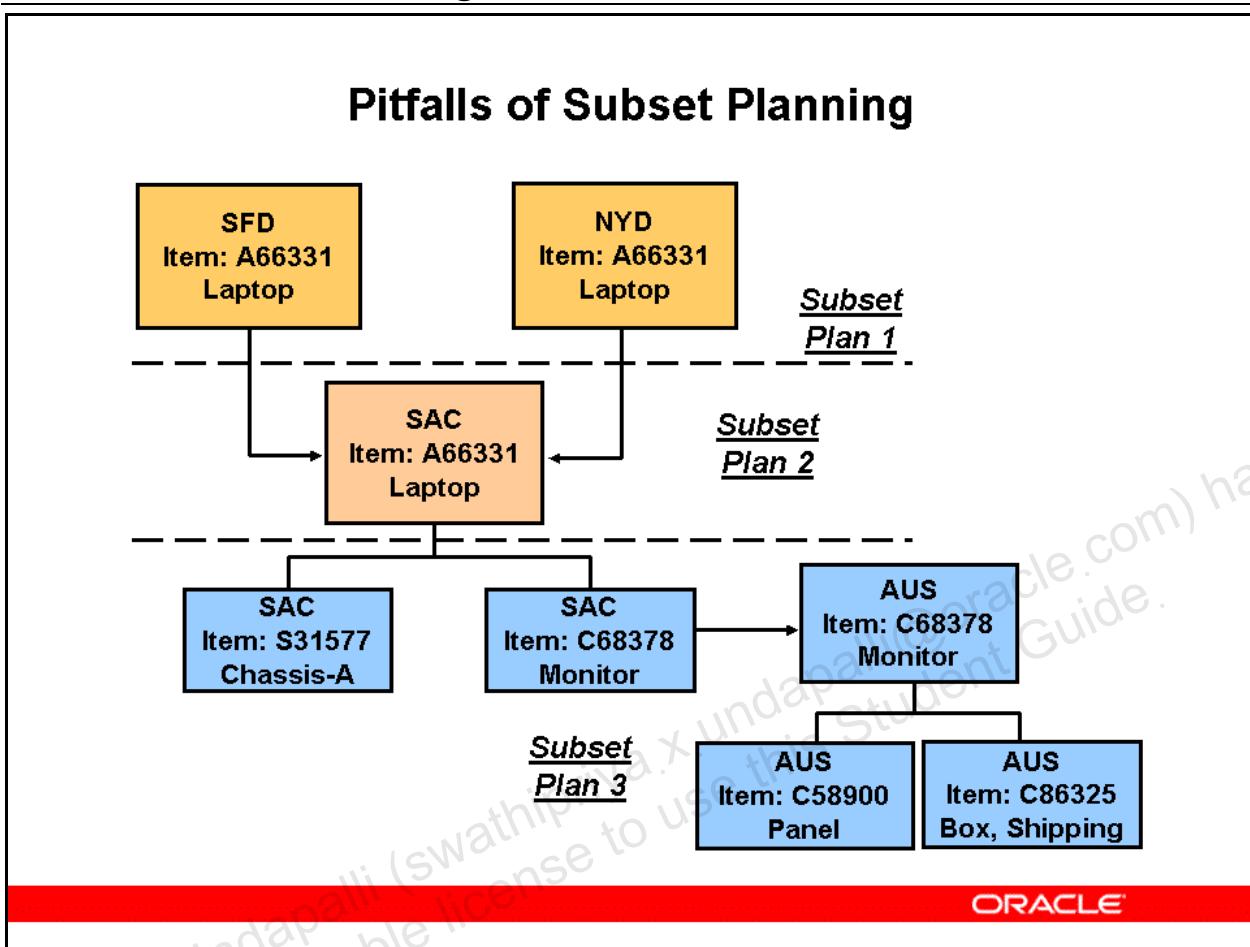
- MPP plan for all other organizations
- Load the MPP as a demand schedule into a Master Production Schedule (MPS).
- Run the MPS.
- Manually adjust the planned orders in the MPS (for example, to pull ahead the orders to take advantage of a time-sensitive special promotion on the volatile subcomponent).
- Run an MRP for organization SF1 with the adjusted MPS as input to create planned orders for components and subcomponents.

Scenario 3: Single Global Data Model Not Available

The one-step supply chain planning capability of Oracle ASCP presumes either the installation of ASCP as part of an enterprise-wide implementation of Oracle Applications, or the existence of collection programs to pull cross-supply chain transaction data from various Oracle Applications instances or from legacy systems. Cross-supply chain data must be accessible to build the net change snapshot used by Oracle ASCP to generate planned orders.

This may not be the case. For example, one or more facilities in the supply chain perform planning and/or transaction processing on legacy systems not yet integrated to Oracle ASCP via some sort of collection program. In this situation, the renegade facilities must be scheduled outside the global MPP plan according to the same steps as used in Scenario 2 above.

Pitfalls of Subset Planning

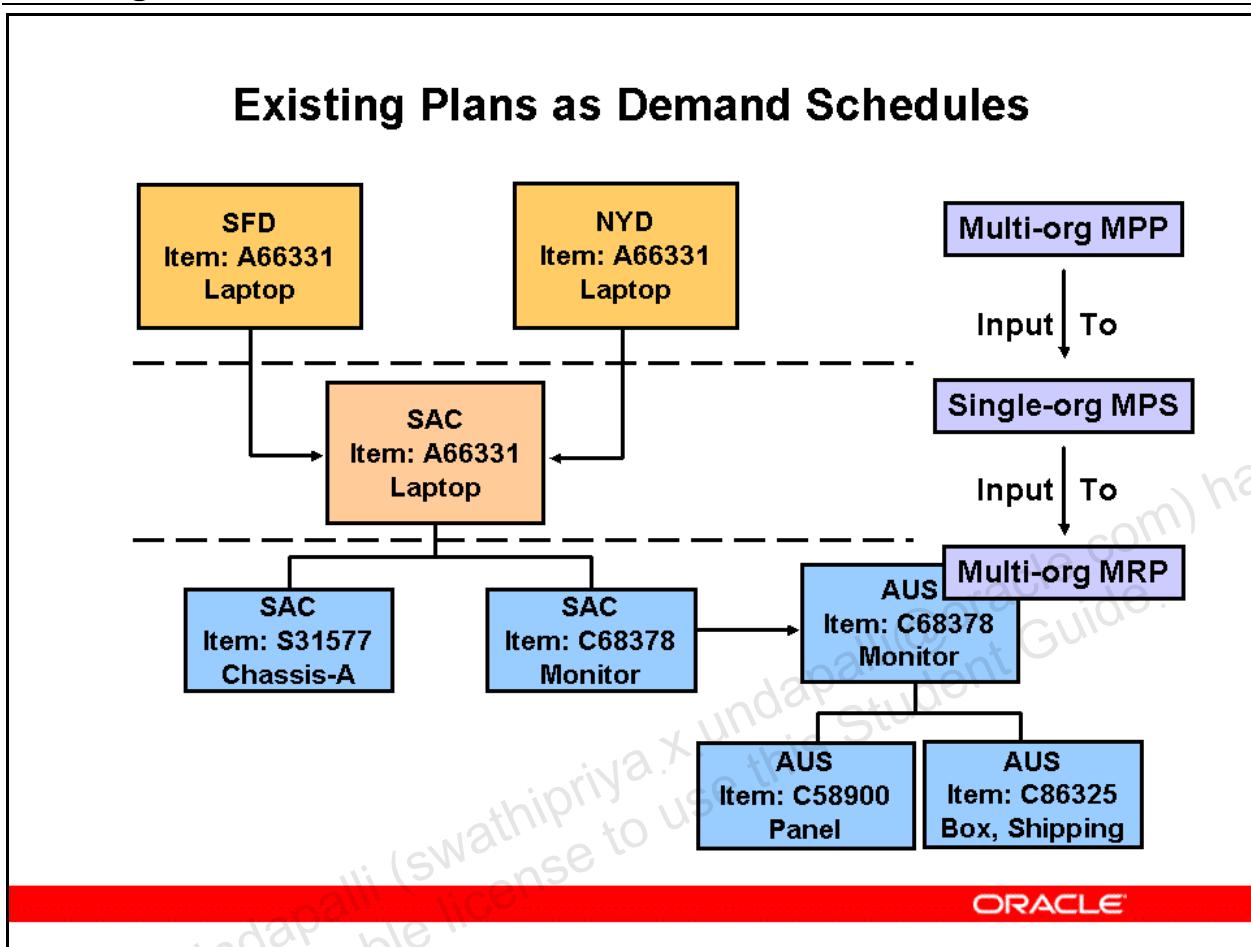


Pitfalls of Subset Planning

The two principal pitfalls of subset planning (as opposed to holistic planning) are:

- Local optimization as opposed to global optimization: The first pitfall is the fact that plans that optimize individual facilities may not be compatible with the optimum global supply chain plan. Take the case of the two distribution centers DC1 and DC2. The way to maximize on time delivery for DC1 is to allocate all production from AF1 to DC1. The same logic holds for DC2. The global optimum solution, which would be missed via subset planning, comes from some allocation of AF1 output to both DC1 and DC2.
 - Plan infeasibility due to supply chain interdependencies A supplier supplies item B21 to both subassembly facilities SF1 and SF2. Individual plans run for SF1 and SF2 could not recognize the shared capacity at supplier S3 and could not evaluate, if the combined SF1 and SF2 demands for B21 are too high, how best to allocate the B21 to SF1 and SF2. In such a situation the SF1 and SF2 individual plans would be infeasible, but would not even generate any exception notices to alert the planners.

Existing Plans as Demand Schedules



Existing Plan as Demand Schedules

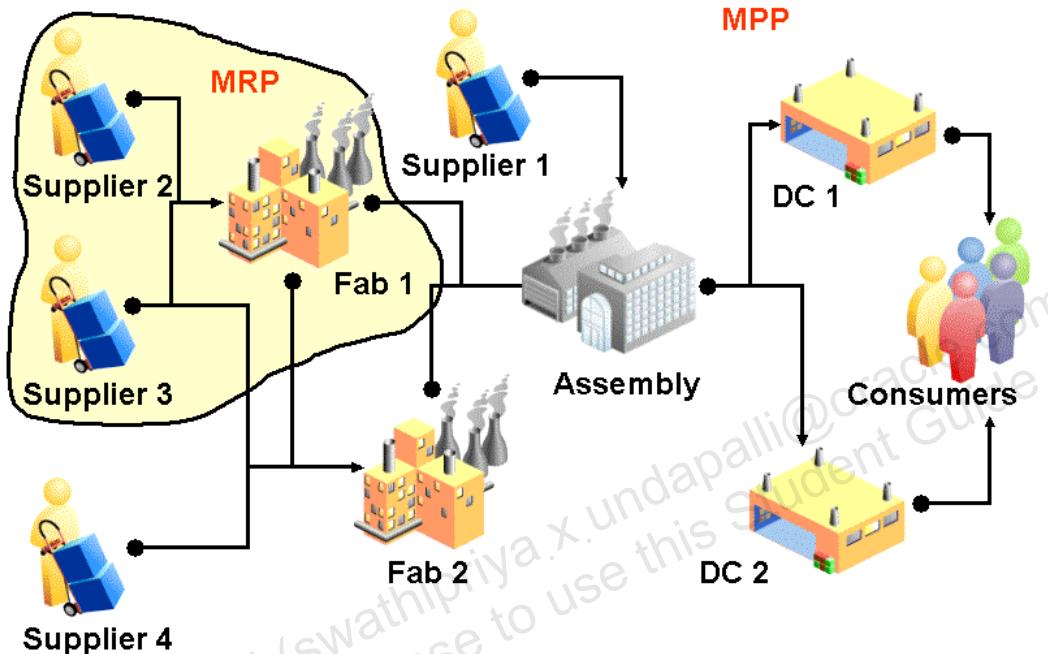
Only if you use subset planning schemes, you may need to pass the dependent demand from a plan higher in the supply chain to a plan lower in the supply chain. To do this, you specify an existing plan as a demand schedule of a plan you are about to run.

For example, you plan to run a single organization master production schedule in final assembly organization SAC to plan the supply for item A23809. The demand that you need to balance against is contained in the planned orders for item A23809 in the multi-organization master production plan that you ran against distribution center organizations SFD and NYD.

Specify the multi-organization master production plan as a demand schedule for the single organization master production schedule.

Existing Plans as Supply Schedules

Existing Plans as Supply Schedules



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Existing Plans as Supply Schedules

If you use individual or subset planning schemes, you can pass the supply from a plan lower in the supply chain to a plan higher in the supply chain. To do this, you specify an existing plan as a supply schedule of a plan you are about to run.

Use this feature only in the rare circumstance where a lower-level facility constrains your entire enterprise.

For example, Fab 1 plant is a constraint in your organization due to supplier availability of a component. You plan Fab 1 and the suppliers that supply it in a multi-organization material requirements plan. When you plan Final Assembly plant in a multi-organization master production plan, you are constrained by the supply that Fab 1 can produce and transfer to it regardless of the demand on Final Assembly.

You specify the multi-organization material requirements plan as a supply plan for the multi-organization master production plan. The multi-organization master production plan works around the available supply from Fab 1 when it plans Final Assembly. Therefore, the planners at Assembly may find demands not met and may need to discuss with planners at Fab 1.

Other alternatives to deal with such a situation include increasing capacity of the fab process or incorporating the constraint at a higher level in the planning process, for example, in the demand planning process.

Quiz

Quiz

The Master Production Plan, Master Production Schedule, and Material Requirements Plan are all:

- 1. Holistic plans**
- 2. Demand schedules**
- 3. Planning scenarios**
- 4. Plan types**

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Answer: 4. Plan types

Quiz

Quiz

Plan a portion of the supply chain separately outside of the overall supply chain MPP plan is called Subset Planning.

- 1. True**
- 2. False**

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Answer: 1. True

Summary

Summary

In this module, you should have learned how to:

- **Describe simulation**
- **Describe planning strategies**

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