



Infor LN Enterprise Planning User Guide for Order Planning

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About this Guide

This document describes the process used to manage planning data in the form of planned orders. The options, steps and conditions for the use of order planning are detailed.

Document summary

Enterprise Planning supports two types of planning processes: order planning and master planning. This document focuses on setting up and basic concepts that apply to this type of planning.

How to read this document

This document was assembled from online Help topics. As a result, references to other sections in the manual are presented as shown in the following example:

For details, refer to Scenarios. To locate the referred section, please refer to the Table of Contents or use the Index at the end of the document.

Underlined terms indicate a link to a glossary definition. If you view this document online, you can click the underlined term to go to the glossary definition at the end of the document.

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Chapter 1: Planning Concepts

Enterprise Planning

Enterprise Planning performs and controls the planning process in multicompany and singlecompany environments. The planning run supports master planning and detailed order planning for production, purchase and distribution. The planner can use extensive analysis tools, such as scenarios, planning signals, and performance indicators to evaluate the plan.

You can use Enterprise Planning to plan supply based on:

- Demand forecasts
- Actual customer orders
- Dependent demand for components of manufactured items

Enterprise Planning supports logistic planning at various levels of detail in terms of:

- Time (from plan periods to seconds)
- Product level (from product families to individual products)
- Degree of explosion of requirements (from a wide range of components and/or work centers to a limited number of critical components and/or work centers).
- Sourcing

Enterprise Planning supports three sources of supply:

- Production
- Purchase
- Distribution (within your company, or between your company and an *affiliated company*)

If you wish, you can divide the required supply for an item over several sources and several suppliers.

- Planning Methods

Enterprise Planning offers two basic planning concepts:

- In *master planning*, supply is planned in the form of a *supply plan*.
- In *order planning*, supply is planned in the form of *planned orders*.

You can also combine these methods for one item. For production planning, Enterprise Planning supports:

- Infinite master planning.
- Order planning.
- *Workload control (WLC)*: a constraint-based master-planning method

You can use *scenarios* to compare planning alternatives. When you are satisfied with the planning solution in the *actual scenario*, you can transfer the planned supply to the *execution level* of LN.

- Modules

This package contains the following modules:

- Common Data (COM)
- Workload Control (WLC)
- Resource Master Planning (RMP)
- Rough Requirement Planning run, an overview
- Workload Control (WLC)
- Resource Analysis and Optimization (RAO)
- Plan Aggregation and Transfer (PAT)

Enterprise Planning, an Overview

You can use Enterprise Planning to carry out logistic planning for items, production facilities, and distribution networks.

This overview topic contains links to a number of Help topics where basic notions and procedures in Enterprise Planning are explained.

Basic data

- To configure Enterprise Planning
- Plan items in Enterprise Planning
- Resources in Enterprise Planning
- Plan levels and product families

Planning framework

- Channels in Enterprise Planning
- Planning Clusters in Enterprise Planning
- Plan units in Enterprise Planning
- Scenarios in Enterprise Planning
- Calendars in Enterprise Planning

Planning process

- Master planning versus order planning
- Demand and Inventory Planning
- Supply planning

Planning analysis

- Exception Messages in Enterprise Planning
- Performance indicators in Enterprise Planning

Aggregation and disaggregation of planning data

- Aggregated planning

Transferring planned supply to the execution level

- Order grouping in Enterprise Planning
- Transferring orders to execution level

To configure Enterprise Planning

Before you can use Enterprise Planning, an administrator must carry out the following actions:

- 1 Define the *item segmentation*.
- 2 Set initial default values for the parameters in Enterprise Planning, using the **Initialize Parameters (tcmcs0295m000)** session .
- 3 Set the parameters for Enterprise Planning, in the **Planning Parameters (cprpd0100m000)** session and the **Performance Parameters (cpcom0100m000)** session.
- 4 Optionally, customize the application toolbar of Enterprise Planning.

Master planning versus order planning

Enterprise Planning offers two basic planning concepts:

- *Master planning*
- *Order planning*

Master planning

- Roughly comparable to traditional MPS planning
- Planning data is recorded in terms of time buckets (plan periods)
- Supply is planned in the form of a supply plan, containing supply quantities by plan period
- If you use master planning for production planning, only critical materials and critical resource capacity are taken into account

Order planning

- Roughly comparable to traditional MRP planning
- Planning data is recorded on a second-by-second basis
- Supply is planned in the form of planned orders
- If you use order planning for production planning, all necessary materials and all necessary resource capacity are taken into account

For each *plan item*, you can either choose one of these methods for supply planning, or combine them.

Item master plan

An *item master plan* contains item-specific planning information by plan period.

Master planning requires an item master plan. However, master-plan functionality is not confined to master planning:

- Some types of master-plan data (demand forecasts, inventory plans) can also be used as input for order planning.
- An item master plan supports functionality that is not available otherwise.

If you plan all supply for an item by order planning, an item master plan is optional.

On the one hand, an item master plan gives access to functionality that is not available otherwise. On the other hand, item master plans have an adverse effect on system performance. Therefore, you should only maintain an item master plan if you need specific master-plan functionality.

Note: You determine whether an item master plan is maintained for an item by means of the **Master Plan** check box in the **Items - Planning (cprpd1100m000)** session. Master-plan functionality is only available for an item if this check box is selected.

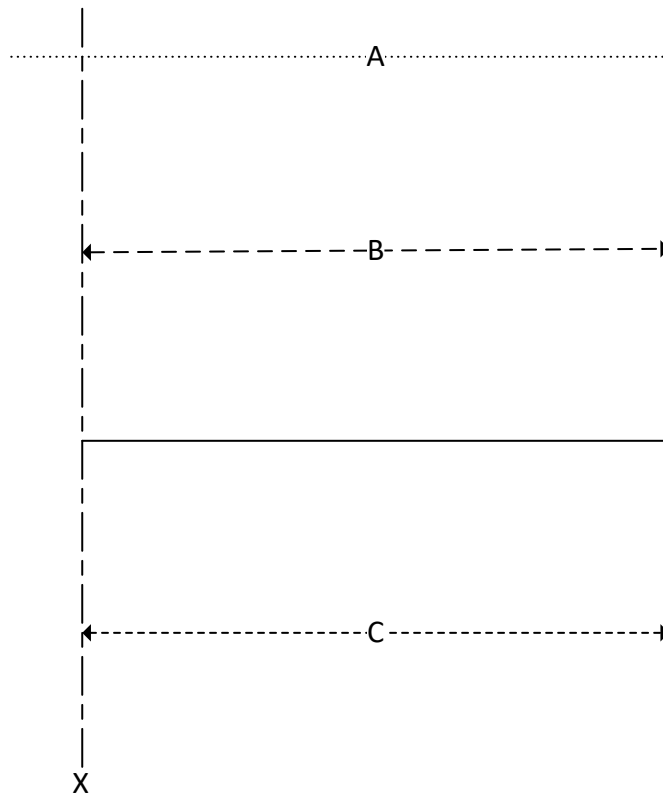
Combinations

For each plan item, you can choose between the following combinations:

- Supply planned by order planning; no item master plan
- Supply planned by order planning; item master plan
- Short-term supply planned by order planning, and long-term supply planned by master planning; item master plan
- Supply planned by master planning; item master plan

The following sections contain a diagram that explains each of the previously mentioned combinations.

Supply planned by order planning; no item master plan



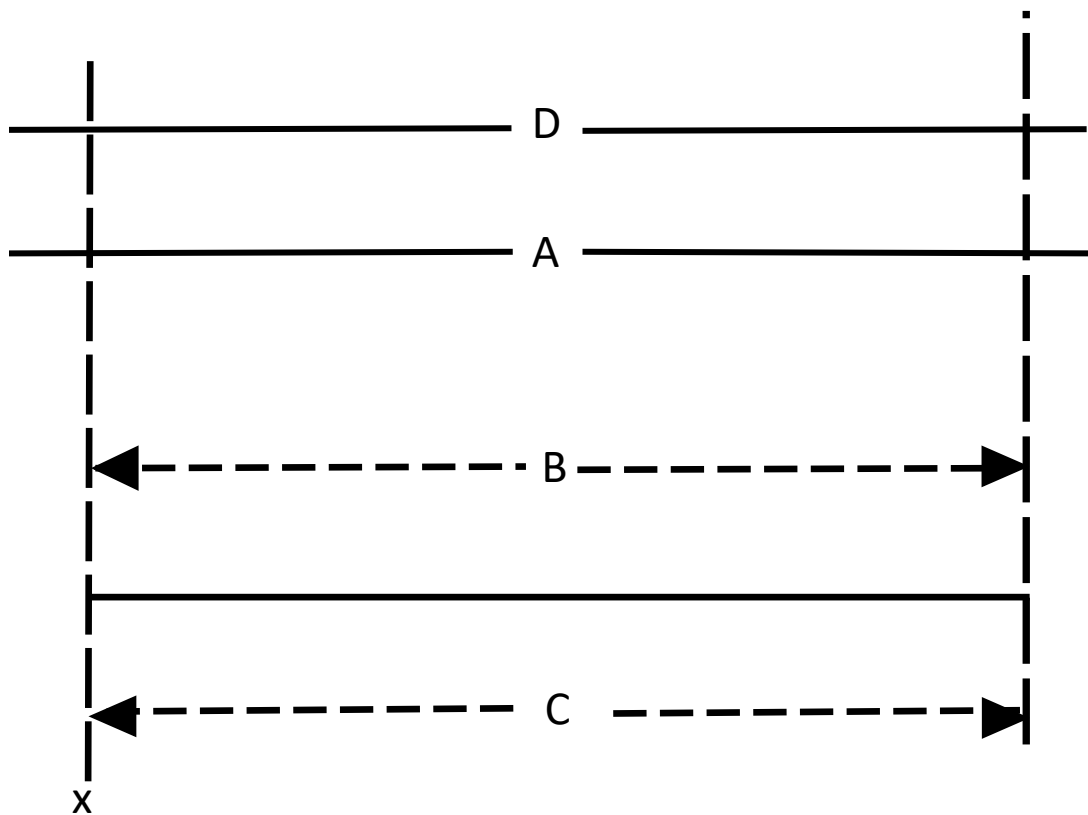
A	Item order plan
B	Order horizon
C	Planning horizon
x	Current date

In this situation, basic functionality is available for:

- Demand forecasting
- ATP
- Component CTP
- Inventory planning

Supply is planned in the form of planned orders.

Supply planned by order planning; item master plan



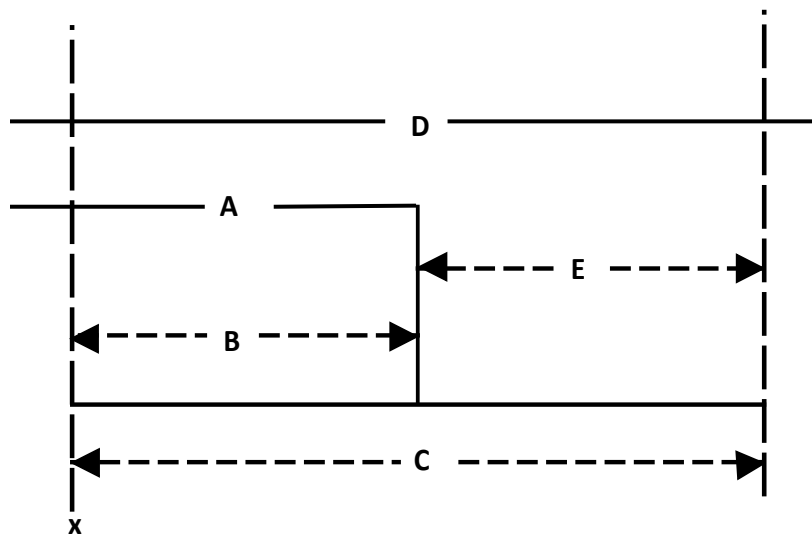
D	Item master plan
A	Item order plan
B	Order horizon
C	Planning horizon
x	Current date

In this situation, advanced functionality is available for:

- Demand forecasting and forecast generation
- ATP and CTP
- Inventory planning and inventory-plan generation

Supply is planned in the form of planned orders.

Supply planned by order planning and master planning; item master plan



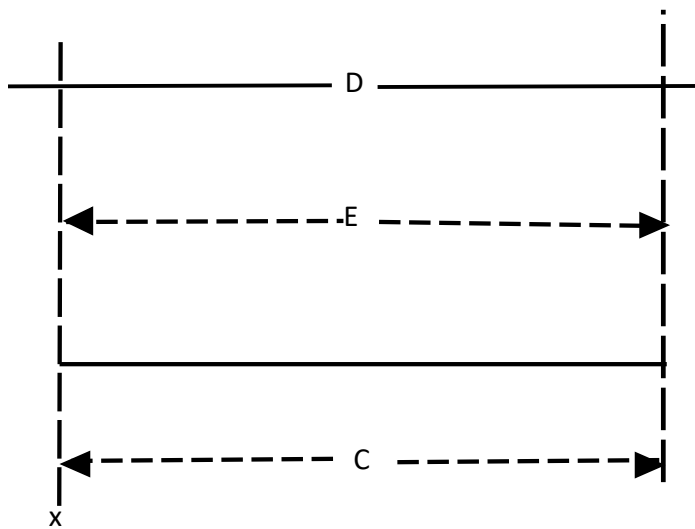
D	Item master plan
A	Item order plan
E	Master planning horizon
B	Order horizon
C	Planning horizon
x	Current date

In this situation, advanced functionality is available for:

- Demand forecasting and forecast generation
- ATP and CTP
- Inventory planning and inventory-plan generation

Within the order horizon, supply is planned in the form of planned orders. Within the master-planning horizon, supply is planned in the form of a supply plan.

Supply planned by master planning; item master plan



D	Item master plan
E	Master planning horizon
C	Planning horizon
x	Current date

In this situation, advanced functionality is available for:

- Demand forecasting and forecast generation
- ATP and CTP
- Inventory planning and inventory-plan generation

Supply is planned in the form of a supply plan.

Horizons and time fences

You can influence the planning procedure in Enterprise Planning by means of horizons and time fences.

Horizons

Generally, a horizon is a time period during which a particular function or planning concept is available. A horizon can either start at the current date, or start at a future date. A horizon in Enterprise Planning is defined by a figure that indicates a number of *workdays*. This figure represents either the start or the end of the horizon.

Time fences

Generally, a *time fence* is a point in time before which a certain restriction applies. A time fence in Enterprise Planning is defined by a figure that indicates a number of workdays.

Major horizons and time fences

The most general horizon in Enterprise Planning is the *planning horizon*. The planning horizon represents the period during which requirements are generated and supply is planned.

The planning horizon consists of an *order horizon* and/or a *master-planning horizon*. This yields three possible planning situations:

- Order horizon only
- Order horizon (for shorter-term planning) and master-planning horizon (for longer-term planning)
- Master-planning horizon only

For the first part of the planning horizon, you can set a time fence to prevent Enterprise Planning from making changes in your near-future supply planning.

Order horizons and planning horizons must comply with a number of rules. LN can check these horizons according to the following types of rules:

- Length rules that are based on cumulative order lead times
- A synchronization rule between order horizons at various BOM levels

Other horizons and time fences

The following horizons and time fences are available for all plan items:

- The *ATP/CTP horizon*, which determines for which period ATP or CTP must be checked.
- The *fixed lead-time horizon*, which is used in *order planning* to determine whether Enterprise Planning must use a fixed order lead time or detailed routing data to plan production orders.

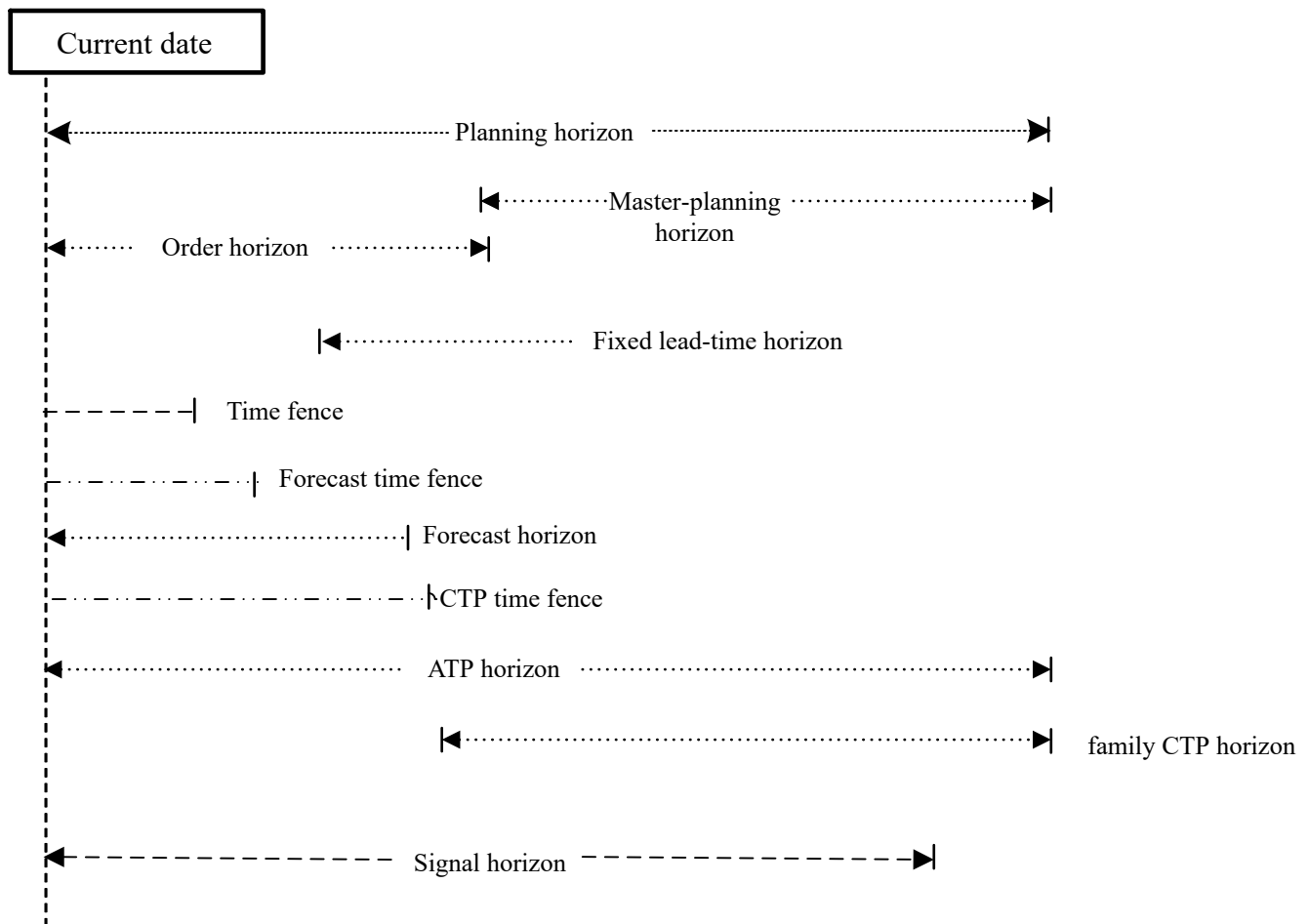
When you maintain an *item master plan* for an item, you can use the following additional horizons and time fences:

- *Forecast time fence* (ignore the forecast in near-future planning)
- *Forecast horizon* (used for forecast-based inventory planning)
- *Family CTP horizon* (optionally redirect ATP/CTP checks to a higher product-family level)

You can use the *signal horizon* to indicate for which period you want Enterprise Planning to generate a particular exception message.

Note: You can define most horizons and time fences in the **Items - Planning (cprpd1100m000)** session. *Exception message* horizons are defined in the **Exception Message Types by Planner (cprao1110m000)** session.

Diagram of horizons and time fences



Note: Most of these horizons and time fences can be set independently from each other. However, the following rules apply:

- The planning horizon must be greater than zero.
- The order horizon, time fence, forecast time fence, and CTP horizon must fall within the planning horizon.
- The end of the fixed lead-time horizon coincides with the end of the order horizon.
- The end of the family CTP horizon coincides with the ATP/CTP horizon.

Lot sizing

In Enterprise Planning, a number of constraints can be imposed on the ordered quantity of a production order, purchase order, or distribution order.

Example

You can specify that the ordered quantity must be a multiple of 100 units. If you have a requirement for 530 units, LN generates an order for 600 units.

You can also specify a fixed order quantity of 50 units. If you have a requirement for 530 units, LN generates 11 orders of 50 units each.

Define an item's *order method* in the **Items - Ordering (tcibd2100m000)** session.

Define the order quantity settings in the following sessions:

- **Items - Ordering (tcibd2100m000)** session
- **Item Data by Warehouse (whwmd2510m000)** session
- **Items - Purchase Business Partner (tdipu0110m000)** session
- **Supplying Relationships (cprpd7130m000)** session

Use of lot size settings

If you defined warehousing data for the item, and you cleared the **Use Item Ordering Data** check box in the **Item Data by Warehouse (whwmd2510m000)** session, LN uses the warehousing data for lot sizing. If you selected the **Use Item Ordering Data** check box, LN carries out lot sizing according to the value that you specified in the **Method** field in the **Items - Ordering (tcibd2100m000)** session. Next, LN sorts out which supply source to use, and takes into account the order quantity details of the **Items - Purchase Business Partner (tdipu0110m000)** session for purchase orders, or the constraints that you set for lot sizing in the **Supplying Relationships (cprpd7130m000)** session for distribution orders.

Note: A *project item* always has a **Lot for Lot** order method.

Lot sizing of purchase schedule items

For purchase schedule items, LN divides the purchase part of the supply over the available suppliers. Instead of lot sizing the divided quantities according to the lot-size settings that you defined for the supplier in the **Items - Purchase Business Partner (tdipu0110m000)** session, which LN does for normal purchase items, LN groups the purchase requirements for purchase schedule items according to the delivery moments of the supplier. Next, LN groups the purchase requirements for each supplier to the delivery moments and lot sizes the quantities of separate schedule lines according to the lot-size settings in the **Items - Purchase Business Partner (tdipu0110m000)** session.

Chapter 2: Basic Data

Item definition in Enterprise Planning

Enterprise Planning allows a very flexible definition of item codes using *segmentation*.

An administrator must define the item segmentation, before you can use Enterprise Planning.

Currently Enterprise Planning supports the following logical segments:

- *Planning cluster* segment
- *Project* segment
- *Item code* segment

Note: If *multisite* functionality is active, a *planning cluster* is mandatory. If multisite is not implemented, leaving the planning cluster segment blank will link all warehouses to a blank cluster to accommodate distribution planning functionality.

With the optional project segment you can define *project items*.

You can define anything between 1 and 3 segments. Item code segments have the following order:

- Planning Cluster
- Project
- Item code

1 Defining the segment

You define the segments in the **Segmented Domains (ttgfd4122m000)** session and the **Item Code Segmentation (tcibd0500m000)** session.

2 Defining domain(s)

The segments must correspond to the domain definition of related domains. This is extremely important. This means that the conversion (upper, lower case), alignment and length of the segment and its related domain must be the same.

- The item code segment must correspond to the definition of the cpitem domain.
- The planning cluster segment must correspond to the definition of the tcepm.clus domain.
- The project segment must correspond to the definition of the tccprj domain.

Note:

- The item code segment is mandatory.
- The segment definition cannot be easily changed at a later date. Be careful when you specify the segments.
- The item code segment in Enterprise Planning must have the same length as the item code segment in the other packages.

Plan items in Enterprise Planning

Each item that is planned using Enterprise Planning must not only be defined as an item in Common, but also as a *plan item* in Enterprise Planning.

When you define an item in Common, in the **Items (tcibd0501m000)** session, you can specify its *order system* in the Items - Ordering (tcibd2100m000) session. If the order system is **Planned**, LN automatically starts the Items - Planning (1100m000) session, where you can define or manage the corresponding *plan items*.

You can define default data for plan items in the Item Planning Defaults (cprpd1110m000) session.

Plan-item settings

The plan item's settings in the Items - Planning (cprpd1100m000) session determine, among other things:

- Whether an *item master plan* is maintained for a plan item.
- Which supply-planning method is used (*master planning*, *order planning*, or both.)
- Which types of ATP and CTP checks are applied.

Enterprise Planning uses the following data, some of which is stored in Manufacturing, and some of which in Enterprise Planning:

- *Bills of critical materials* (BCM)
- *Bills of critical capacities* (BCC)
- *Bills of material* (Job Shop BOM)
- *Routings*
- *Aggregation relationships*
- *Supplying relationship*
- *Production model*
- *Subcontracting Models*

You can maintain the data related to the BOM and the *routings* in the Bill of Material and Routing modules of Manufacturing.

The production models and subcontracting models are maintained in the Repetitive Manufacturing and Subcontracting modules of Manufacturing.

The *bill of critical materials*, *bill of critical capacities*, *aggregation relationships* and supplying relationships are maintained in Enterprise Planning.

Product families in Enterprise Planning

In the short term, LN normally plans in a detailed way, on the level of individual items.

For the longer term, however, details are often less relevant, and a more general type of planning can be more appropriate.

In Enterprise Planning, you can perform this type of planning by grouping plan items into *families*. To a large extent, you can carry out planning for a product family in the same way as you do for individual items.

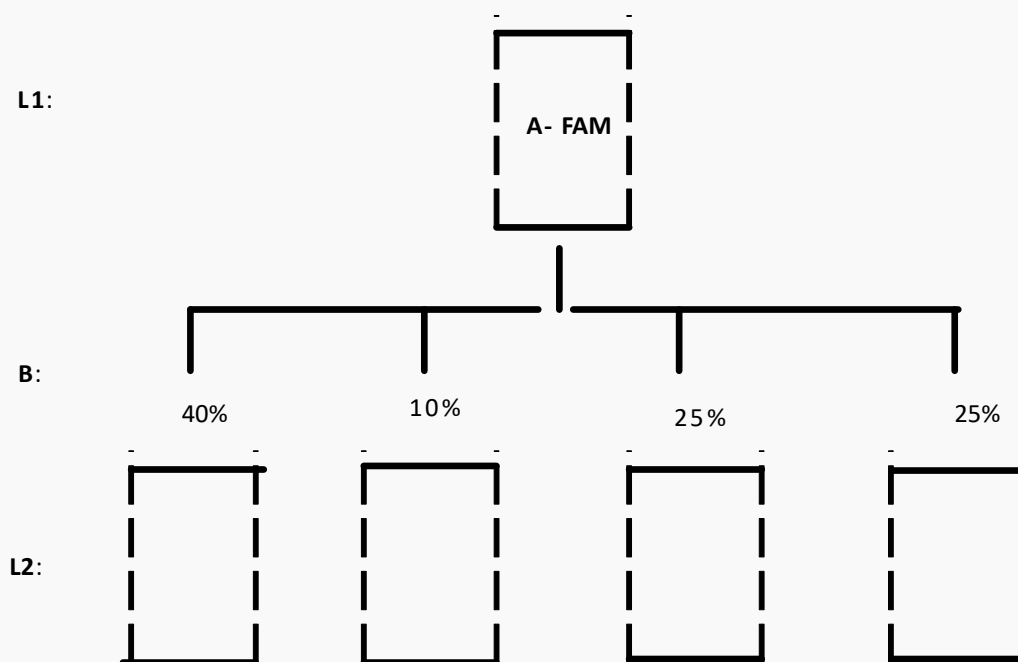
You can use *plan levels* to represent the various levels of aggregation in a product-family structure.

The following examples demonstrate how you use families and plan levels:

- Similar items
- Multiple containers

Similar items

The A-1, A-2, A-3, and A-4 items are products that are almost identical, and that can be planned together as a group. A family A-FAM is defined, which consists of these four items.



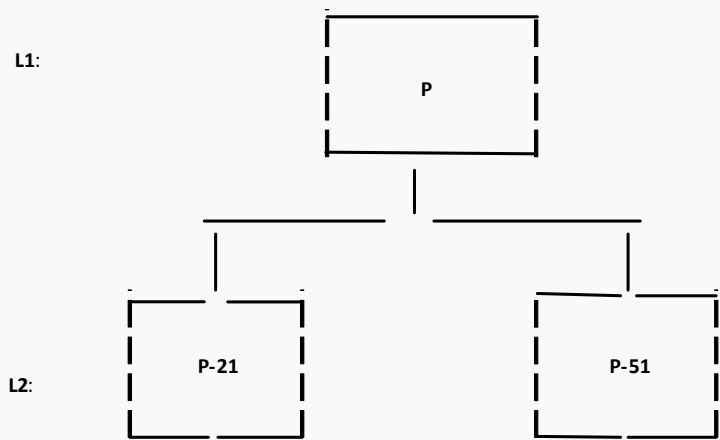
L1	Plan level 1
B	Planning percentage
L2	Plan level 2

Plan item A-FAM is planned at level 1 of the logistic plan (demand forecast, production plan, and so on). In a certain period, a production volume of 500 pieces is planned.

The master plan for each item (plan level 2) can be determined by disaggregation of the plan at level 1 in accordance with the planning percentages.

Multiple containers Example

Paint is packaged in two-liter and five-liter cans. The following family structure is defined:



L1	Plan level 1
L2	Plan level 2
P	Paint
P-2l	Paint (two-liter cans)
P-5l	Paint (five-liter cans)

The *family CTP horizon* of plan items PAINT-2L and PAINT-5L starts after twenty workdays.

If a customer order is received for 1000 cans of PAINT in five-liter cans, to be delivered in two months, LN checks the quantity of PAINT that is capable-to-promise on that date. It will not check the CTP at container level.

If an order is received for 600 cans of PAINT in five-liter cans, to be delivered in fifteen workdays, LN checks the available quantity of PAINT in five-liter cans.

How to define a product family

- 1 Define a plan item in the **Items - Planning (cprpd1100m000)** session.
 - 2 Set the **Plan Item Type** field to **Family**.
 - 3 Define the *aggregation relationships* between the family and its constituents (subitems) by using the **Aggregation Relationships (cprpd3110m000)** session.
- You can define various relationships for *aggregation* or *disaggregation* of various plans, such as the production plan and the demand plan.
- Note:** Typically, the aggregation relationships for families are defined between different plan levels, but you can also define a product family and its child items on the same plan level.

Functionality of families

A family is defined as a normal item in the **Items (tcibd0501m000)** session. A family has practically the same functionality as other plan items. You can generate planned orders for families just as you would do for other items. However, normally you do not define *BOMs* and *routings* for families.

By generating planned production orders for families, you can carry out the planning and reserve resources. At the very last moment, you can decide which of the subitems you will actually produce.

You can apply a *family CTP check* to see how much of an item you can promise to a customer. See: Family CTP.

The only major difference between a plan item and a family concerns the way in which *goods flow* data is retrieved from the *execution level*. For a family, the goods-flow data is obtained by aggregating the goods-flow data of the subitems involved, according to the aggregation relationships. (This type of goods-flow aggregation only takes place if you run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.)

Project items in Enterprise Planning

This topic describes how Enterprise Planning handles the planning of *project items*.

Planning of derived versus nonderived project items

If an item's project segment is filled (that is, the item is a *customized item* or a *standard-to-order item*, the way in which this item is treated in Enterprise Planning depends on whether or not the item is derived from a *standard item*. (For a derived project-specific item, the **Derived-from Item** field in the **Items (tcibd0501m000)** session is filled; for a non-derived item, it is empty).

In *master planning*, the planning of a standard item includes all project-specific items that are derived from this item as indicated in the **Items (tcibd0501m000)** session. This holds good for all master-planning data (demand, supply, inventory, ATP). You cannot maintain a separate item master plan for a derived project-specific item. For a non-derived item, you can maintain a master plan.

Project structure of derived project items

You can directly enter orders for to-order items in the Sales Orders (tdsls4100m000) session. When you save the sales order line for the order, you can start the **Generate (Project PCS) Structure for Sales Orders (tdsls4244m000)** session where you can customize the to-order item structure of a project. In addition to the *bill of material (BOM)* and the *routing*, LN also automatically customizes the *supplying relationships*, *sourcing strategies*, and *supplying strategies*. In other words, the structure for the derived-from item is used as a template for the *customized item*. As soon as the item is customized, all the relations to this item in Enterprise Planning are also customized.

However, the customization method is different, if you generate a *project structure* for a project item with one of the following sessions:

- **Copy Standard Product Structure to Customized Structure (tipcs2230m000)**
- **Copy Customized Product Structure to Customized Structure (tipcs2231m000)**

- **Copy Customized Product Structure to Standard Structure (tipcs2232m000)**

If you go through the previously mentioned sessions, LN searches for the *warehouse* linked to the derived from item in the **Items - Ordering (tcibd2100m000)** session and for the related plan item in the **Items - Planning (cprpd1100m000)** session. Next, LN customizes the corresponding general item and the *plan item* in the *planning cluster* to which the warehouse belongs, as you defined in the **Items - Ordering (tcibd2100m000)** session. This means that you must still customize the underlying *supplying relationships*, so that LN can plan for the project item. You can use the **Copy Multilevel Supplying Structure (cprpd7200m000)** session to do so.

In *order planning*, a derived project-specific item is not included in the planning of the standard item from which it is derived: both are planned separately.

Module planning

You can define *modules* for *projects* in the Project Control module in Manufacturing.

If you select the **Fixed Plan Quantity** check box in the **Module Planning (tipcs4120m000)** session, you can enter the required quantity directly in the **Plan Quantity** field. If you clear the **Fixed Plan Quantity** check box, LN determines the required quantity based on the BOM.

LN determines the date of the requirement on the basis of the *network planning* in the Project Control module.

If you plan a customized item with *order-based planning*, the plan quantity of the module is the basis for the generation of planned orders.

If you want to generate orders on the basis of the module planning, the item must have an item master plan. You must not use this master plan for master-plan simulations; the master plan is only used to temporarily store the requirements.

If you transfer planned orders from Enterprise Planning to the *execution level*, LN automatically reduces the plan quantity in the **Module Planning (tipcs4120m000)** session by the order quantity, so that you can plan the remaining plan quantity during a following RRP calculation.

ATP and CTP for customized items

LN supports ATP and CTP checks for project items. To do so, LN takes into account the *generic BOM* and the generic routing of the *generic item* if the project item is a derived-from item. If the project item is not derived from a generic item, LN uses the normal *bill of material (BOM)* and the normal *routing* of the item to perform CTP checks.

Note: To perform ATP and CTP checks on generic items configured in the *CPQ Configurator* you must generate a generic BOM and routing in the Generic Planning Bill of Material (cprpd3145m000) and Generic Planning Routing (cprpd3150m000) sessions for use in Enterprise Planning.

Item Order Data in Enterprise Planning

Lot sizing

A planned order's order quantity is the quantity that is manufactured, bought, or otherwise supplied by that planned order.

The value of the **Method** field determines which rules Enterprise Planning applies in the order quantity calculation.

General lot-sizing parameters:

- **Order Increment**
- **Minimum**
- **Maximum**

Parameters for specific order methods:

- **Fixed Order**
- **Economic Order Quantity**
- **Maximum Inventory**

To avoid orders for unusual quantities (for example, 32,142 iron bolts), set the **Order Increment** field to round numbers, such as 10, 50, or 100. Enterprise Planning plans the order quantity to a multiple of the **Order Increment** field.

To avoid orders for extremely small quantities (for example, 20 inch of metal wire), set the **Minimum** field to a reasonable value.

Very large orders reduce the planning flexibility for your production and handling facilities. For example, a production order that keeps a work center occupied for three weeks, prevents the system from scheduling small rush orders in between. To prevent these situations, use the **Maximum** field.

The **Method** field can have these values:

- **Lot-for-Lot**
- **Fixed Order Quantity**
- **Economic Order Quantity**
- **Replenish to Maximum Inventory**

Lot-for-Lot

The most simple order method is **Lot-for-Lot**. If the order method is **Lot-for-Lot**, Enterprise Planning calculates the order quantity as follows:

- First, sets the order quantity to the required quantity.
- Rounds the order quantity up to the next multiple of the **Order Increment** field.
- If the order quantity is less than the minimum order quantity, adjusts the order quantity accordingly.
- If the order quantity is greater than the maximum order quantity, generates multiple orders.

Note:

- If the maximum order quantity constraints the order quantity, the system optimizes the generated orders.

- LN takes safety stock into account when calculating maximum order quantity.

Fixed order quantity

If the order method is **Fixed Order Quantity**, Enterprise Planning always makes the order quantity equal to the fixed order quantity, as follows:

- If the demand is less than or equal to the fixed order quantity, Enterprise Planning generates an order and sets the order quantity equal to the fixed order quantity.
- If the demand is greater than the fixed order quantity, Enterprise Planning generates multiple orders.

Economic order quantity

The *economic order quantity* is the lot size that will give you the lowest total cost, considering order costs and inventory handling costs.

To calculate the economic order quantity, click **Calculate EOQ**.

If the order method is **Economic Order Quantity** (EOQ), Enterprise Planning sets the order quantities to at least the economic order quantity.

Replenish to maximum inventory

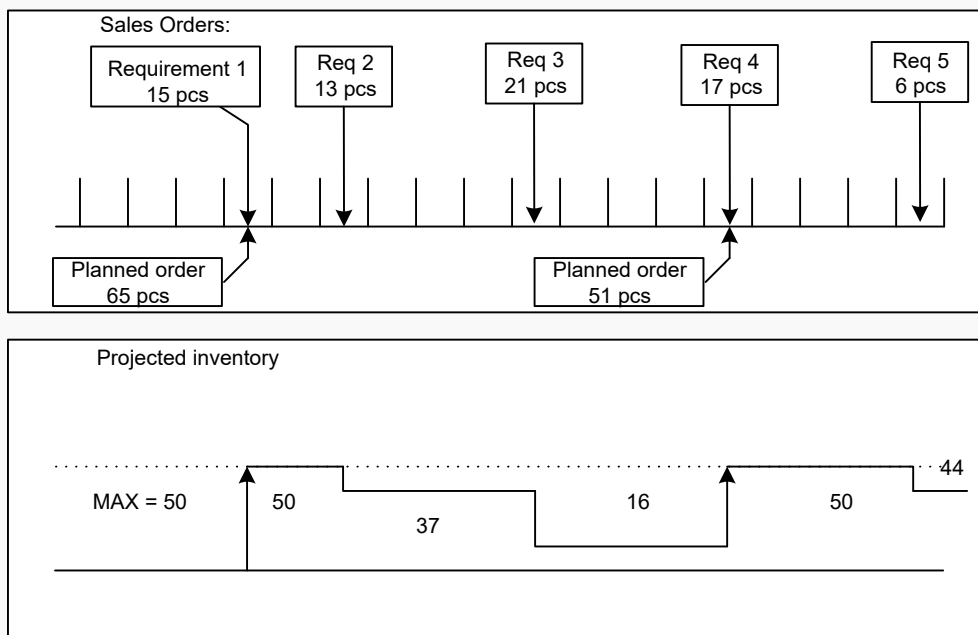
If the order method is **Replenish to Maximum Inventory**, Enterprise Planning generates orders if the projected inventory drops below the inventory plan or the safety stock. If this happens, the order quantity is made large enough to bring the inventory back to the maximum inventory level. You can set the maximum inventory level in the **Maximum Inventory** field.

The **Replenish to Maximum Inventory** order method is particularly suitable if:

- The item has a relatively low standard cost and low storage cost; in other words, you can keep a reserve quantity in storage without much cost.
- Demand for the item is difficult to predict or lead times are long.

Example

- Order Method = Replenish to Maximum Inventory
- Maximum Inventory = 50 pieces
- Safety Stock = 0



- Stock at starting point is 0
- At Requirement 1, you receive the first sales order (15 pcs). The projected inventory drops to a negative value (-15)
- Enterprise Planning generates an order for 65 pcs to bring the inventory back to 50
- At Req. 4, the time-phased inventory value drops below the safety stock or below 0, to -1.
- Enterprise Planning raises the next order for 51 pcs, and brings the projected inventory back to 50

In previous LN versions, this order method was implemented for SIC (Statistical Inventory Control) items). The functionality is available for planned items as well. You can apply the SIC logic during the order generation run.

Unit effectivity in Enterprise Planning

In LN, you can use *unit effectivity* to adapt the standard business procedure for items, and model exceptions that originate from specific customer requirements. The unit effectivity concept supports situations in which customers have specific wishes concerning the features of the products they order. For each specific wish, you can define an *exception*, and link it to the business aspect that is impacted by the exception. In this way, you can model small deviations from the standard product configuration. LN takes into account the exceptions that you define in the process of *order planning*.

Before you can define exceptions, you must first set up a unit effectivity structure for the item involved in the Unit Effectivity (UEF) module of Common. For more information about the use of unit effectivity, refer to

online manual topic To set up unit effectivity. Next you can define exceptions for the following business aspects:

- *BOM lines*: Click **Exceptions** in the **Bill of Material (tibom1110m000)** session to define the corresponding exceptions.
- *Routings*: Click **Exceptions** on the *appropriate* menu in the **Item - Routings (tirou1101m000)** session to define exceptions for the routing.
- *Operations*: Click **Exceptions** on the *appropriate* menu of the **Routing Operations (tirou1102m000)** session to define unit effective operations.
- *Sourcing strategies*: Click **Exceptions** in the **Sourcing Strategy (cprpd7110m000)** session to define exceptions for the sourcing strategies.
- *Item purchase business partners*: Click **Exceptions** in the **Items - Purchase Business Partner (tdipu0110m000)** session to define unit effective purchase business partners.

On the other hand, the way in which unit effectivity impacts on the order-planning process depends on the following criteria:

- Whether the *effectivity units* involved are interchangeable or not, which means that LN can use the inventory of an effectivity unit to meet demand for another effectivity unit.
- Whether the units involved have the same configuration or not, which means that various effectivity units share the same set of exceptions. LN can combine demand for different effectivity units that share the same configuration into one planned order.

Inventory and firm-planned receipts

For each requirement, LN checks the projected inventory level for the unit involved. If the inventory is insufficient, LN checks the inventory of interchangeable units, and uses this inventory when necessary.

If no sufficient inventory can be found, LN looks for the first unused firm-planned receipt of the unit or any interchangeable unit.

Refer to online manual topic Example: inventory usage for units (unit effectivity) for more information about interchangeable units.

Generating planned orders

If inventory and firm-planned receipts are not sufficient to meet a requirement, Enterprise Planning generates a *planned order*. As a rule, this order takes into account all demand, within the *order interval*, of the following units:

- The unit itself
- All interchangeable units
- All units with the same configuration

If the order quantity is higher than the required quantity (because of lot-size rules), LN checks if part of the order can be used for a unit with the same configuration (either within or beyond the order interval). If this is the case, the planned order contains a separate order line for this unit.

Refer to online manual topic Example: planned orders for units (unit effectivity) for more information about planned orders for interchangeable units.

Scenarios in Enterprise Planning

Scenarios are used to simulate planning runs for various business situations. Only one scenario can be the *actual scenario*, representing the actual plan that is transferred to production, purchase and warehousing.

The scenario-planning horizon can be divided in to plan periods of various lengths. This allows forecasting and planning in small periods on the short-term and in longer periods in the longer-term. The scenario can be defined as rolling, which will periodically redivide the scenario-planning horizon in plan periods starting as the current date. This offers a consistent period division for the planner as time passes.

Static data such as supplying and sourcing strategies and dynamic data such as planned orders can be copied between scenarios.

Relationships between a central scenario and local scenarios in a multicompany environment can be defined, this allows a central planning run that triggers the local planning runs. Data such as forecast and orders can be aggregated and disaggregated between the local scenarios and central scenario.

A *scenario* represents one out of several (possible) overall planning situations.

In Enterprise Planning, planning is carried out within the context of a particular scenario, and depending on the settings in that scenario. You can set up several scenarios to compare possible planning solutions.

One scenario is designated the *actual scenario*. The other scenarios serve for what-if analyses. The planned orders (and production plans) of the actual scenario can be confirmed and transferred to the *execution level*, where they become actual orders.

Use the Scenarios (cprpd4100m000) session to define a new scenario:

- If you want to keep using the scenario for a prolonged period of time, you can choose to define the scenario as a *rolling scenario*.
- If you want to use the scenario for central *multicompany* planning, you must designate the scenario as a central multicompany scenario.

A scenario is subdivided into *plan periods*. Plan periods are used as time buckets for *master planning*. Horizons and time fences are always rounded to the end of a plan period.

Scenario-dependent data

Many basic entities in Enterprise Planning are not dependent upon a particular scenario, but can be used in all scenarios.

- Plan items
- Resources
- Channels
- Planning clusters
- Plan units

Several types of planning data, however, are defined within the context of a scenario, and therefore can differ between scenarios.

- Master plans
- Planned orders
- Sourcing strategies
- Supply strategies

You can copy the data from one scenario to another scenario. In the Copy Scenario (cprpd4201m000) session several options are available to copy all, or only specific scenario data from the source scenario to the target scenario. The **Overwrite** check box determines whether Enterprise Planning must add the data of the source scenario to those of the target scenario, or whether Enterprise Planning must overwrite the data of the target scenario. You can even select a range of plan items for which you want to copy specific data from one scenario to another.

Initializing, Rolling and Updating Scenario

In addition, you can use this session to:

- Aggregate *goods-flow* data by means of *aggregation relationships*.
- Recompute the inventory levels and the *ATP* based on data from the *execution level*.

If the **Master Plan** check box in the **Items - Planning (cprpd1100m000)** session is selected, you can also update a *multicompany* scenario.

LN also updates channel master plans. LN only updates the channel master plans that you specified in the **Plan Item - Channels (cpdsp5100m000)** session.

This session carries out the following steps:

- Roll the scenario If the scenario is a *rolling plan*, and a certain number of days passed since the reference date, the plan is shifted forward in time. See *Using a rolling scenario*.
- Update the master plan LN updates the master plan of each selected plan item. See *To update master-plan data*.

Note:

- If a scenario is rolled forward, LN updates all plan items, regardless of what range of plan items is specified.
- If you specify a **Scenario Finish Date** for your scenario that does not match the end of the last *plan period*, the length of this last plan period is not equal to the plan period length you defined in the Scenario - Periods (cprpd4120m000) session. This leads to disproportionate planning values if you roll the scenario with the Initialize, Roll, and Update Scenario (cprpd4200m000) session.

Using a rolling scenario

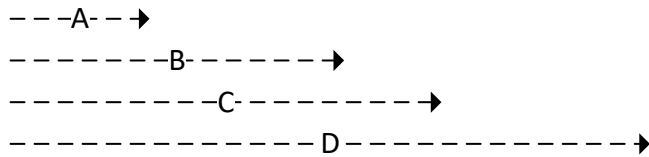
If a scenario is defined as a *rolling scenario* in the Scenarios (cprpd4100m000) session, LN regularly shifts the entire scenario a particular interval forward in time.

Diagram

The following diagram illustrates the rolling procedure. In this example, the rolling frequency is 7 days.

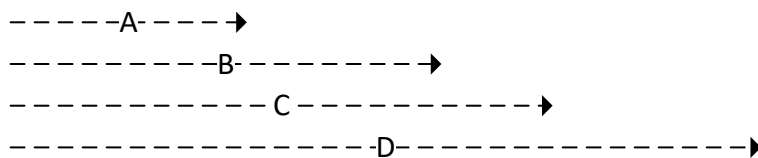
Week:	9	10	11	12	13	14	15
-------	---	----	----	----	----	----	----

Before Rolling:						
--------------------	--	--	--	--	--	--



Week:	9	10	11	12	13	14	15
-------	---	----	----	----	----	----	----

After Rolling:	→					
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A	Start date
B	Reference date
C	Current date
D	Finish date

How to roll a scenario

Use the Initialize, Roll, and Update Scenario (cprpd4200m000) session to roll a scenario. If you select a scenario that needs to be rolled, LN automatically performs a full update for that scenario:

- Shifting the scenario forward.
- Updating all item master and channel master plans, including the goods-flow data, and critical material and capacity requirements.
- Rebuilding all resource master plans.

If a multicompany scenario is rolled, LN also rolls all local scenarios that belong to the multicompany scenario.

To determine if the specified scenario must be rolled, the difference between the current date and the Reference Date field date is taken and rounded down to an integer. A scenario needs to be rolled if the current date is greater than the *reference date* plus the *rolling frequency*.

Example

The difference is 5.8 days and the *rolling frequency* is 6 days.

If the difference between the current date and the reference date is 5.8 days, LN will round down to 5 days and the scenario will not be rolled.

Once the scenario is rolled, the date in the Reference Date field in the **Scenarios (cprpd4100m000)** session is adjusted by adding the number of the days specified by the rolling frequency to the old reference date, the time specified is preserved.

Example

If the reference date is 04-11-2010 08:29 and the rolling frequency is 5 days, the new reference date will be 09-11-2010 8:29.

The Scenario Start Date fields are updated as well. This update affects the plan-period dates. These are updated in all *item master plans* and *channel master plans* present in the scenario.

Because plan periods can be of unequal length, a special procedure is needed to redistribute the master-plan data over the new plan periods

- LN disaggregates the master-plan quantities of the rolling scenario (for example, the production-plan quantities) over the calendar days of the relevant plan period. This disaggregation is based on the company calendar: for a detailed description, see To distribute master-plan quantities over calendar days.
- LN aggregates the quantities of each day to the new plan periods.

Note: When a scenario is rolled, the time is not adjusted when the new reference date is saved. The default time of 00:00:00 is maintained.

To delete a scenario

This topic describes how you can delete a *scenario*.

Prerequisites

- Before you can delete a scenario, you must first delete the scenario's *item master plans*, *channel master plans*, and *resource master plans* for all plan items and resources.
- To delete these master plans, use the **Delete Master Plan (cprmp2210m000)** session.

1 Start session

Start the **Scenarios (cprpd4100m000)** session.

2 Select the scenario you want to delete

3 Use the **Delete Master Plan** command

Note:

- If you delete a scenario, LN also deletes all associated planning data and parameters.
- You cannot delete the scenario that you designated as the *actual scenario*.
- This procedure also deletes any *planned order*, *sourcing strategy*, and *supply strategy* associated with the deleted scenario.
- All records from the **Assembly Part Demand (cprrp0116m000)** and **Line Station Variant - Assembly Parts (tiase2121m000)** sessions.

Scenario Performance

Carry out the following steps to compare the performance of two scenarios:

- 1 Click the Find Record icon on the toolbar to go to the **Find Performance Indicators (cpao2202s000)** session, in which you can enter the two scenarios that you want to compare.
- 2 Enter the *plan level* of the scenarios.
Note: You can only compare *plan items* that have the same plan level in the two scenarios.
- 3 Select the range of resources and plan items for which you want to view the performance indicators.
- 4 If you want to view the performance indicators for a specific resource only or for a specific plan item, enter the same resource or plan item in both the From field and the To field.
- 5 Click the OK button to start the computation and go back to the **Compare Scenario Performance (cpao2203s000)** session.

LN computes the values of all performance indicators and stores them separately for each individual plan item and resource. In the next step these values can be *aggregated* for ranges of resources and plan items.

In the **Compare Scenario Performance (cpao2203s000)** session LN displays the results of the previous step and displays the total or the average of these indicators for the selected resources and plan items.

Note: When there is a change in the data on which the computation is based (for example, the *demand forecast*), the performance indicators are not automatically updated. If you want to make sure that the indicators reflect the current planning situation, recompute them by repeating steps 4 and 5.

For an explanation of each performance indicator, see the help information of the performance indicator fields.

Note: All indicator computations which are carried out for a range of *plan periods* start with the plan period in which the current date falls. For instance, when the field help information states that an indicator is computed for all plan periods, you must keep in mind that plan periods which lie completely in the past are ignored.

Calendars in Enterprise Planning

In other words, Enterprise Planning uses *calendars* to:

- Determine the hours and *resources* available per day.
- Determine start date, end date, and requirement date for *planned orders*.
- Carry out capacity planning.
- Determine the actual length of horizons and *time fences* that are expressed in workdays.

Calendar selection for production planning

If LN cannot find a calendar, it uses the following priority path to select a calendar for production planning:

- The resource calendar, which is linked to the resource.
- The department calendar, which is linked to the *work center*.
- The *enterprise unit* calendar, which is linked to either the work center, the warehouse, or the plan item, dependent on the lead time which is being planned.
- The company calendar.

If the required delivery date of a *planned production order* is after the latest date on the calendar that is used for production planning, LN falls back on the workweek.

For planning aspects that take place at a resource, Enterprise Planning uses the calendar that you linked to the specific resource. If no resource calendar is available, Enterprise Planning looks at the department calendar for planning.

For planning aspects that take place at a work center that is not a resource, Enterprise Planning uses the calendar that you defined for the department in the Departments (tcmcs0565m000) session.

For planning aspects that are not related to a work center, for example, fixed lead times, Enterprise Planning uses the calendar you defined for the enterprise unit to which the item in question belongs.

Calendar selection for purchase planning

For purchase planning, LN first determines the business partner safety time, for which a calendar is selected according to the following priority path:

- The shipping calendar linked to the *buy-from business partner*.
- The calendar linked to the buy-from business partner.
- The company calendar.

Next, LN distinguishes between situations in which you specified a supplier in the **Buy-from Business Partner** field in the **Item - Purchase** session or in the **Items - Purchase Business Partner (tdipu0110m000)** session, and situations in which you did not define a supplier.

Purchase planning with supplier

If you specified a supplier, LN further distinguishes between items it can plan in the lead-time horizon and items that it cannot.

For items that can be planned in the lead-time horizon, the next step LN performs is to offset the transport time. To do so, LN selects a calendar according to the following priority path:

- The shipping calendar linked to the buy-from business partner.
- The calendar linked to the buy-from business partner.
- The company calendar.

Finally, LN must offset the processing time of the purchase order. The calendar to calculate this lead-time type is selected according to the following priority path:

- The calendar linked to the purchase office.
- The company calendar.

For items that Enterprise Planning cannot plan in the lead-time horizon, LN must offset the calculated lead-time, for which LN uses the company calendar.

Purchase planning without supplier

If you did not specify a supplier for the item, after the offset of the outbound time, the inbound time, the extra lead time, and the safety time, LN only must offset the item supply time. To do so, LN uses the company calendar.

Calendar selection for distribution planning

For distribution planning, Enterprise Planning uses various distribution-related calendars. To offset the inbound time and the outbound time, LN uses the following priority path to select a calendar:

- The calendar linked to the warehouse.
- The company calendar.

Next, LN offsets the *extra lead time* and the item safety time, for which the following priority path is used:

- The calendar linked to the buy-from business partner.
- The company calendar

For the next step, LN checks whether you specified a carrier in which case LN offsets the transport time. To do so, LN uses the following priority path to select a calendar:

- The calendar linked to the buy-from business partner.
- The company calendar.

If you did not specify a carrier, LN checks whether you specified a resource in the **Supplying Relationships (cprpd7130m000)** session, in which case LN calculates the distribution supply time. To do so, LN uses the following priority path to select a calendar:

- The resource calendar, which is linked to the resource.
- The department calendar, which is linked to the work center.
- The enterprise-unit calendar, which is linked to the plan item.
- The company calendar.

If you did not specify either a *carrier* or a resource, LN also calculates the distribution supply time. However, if you did not specify a resource, LN uses the following priority path to select a calendar:

- The calendar linked to the enterprise unit.
- The company calendar.

Planning clusters in Enterprise Planning

Planning clusters are used to support business procedures such as forecasting, sales, inventory planning, order acceptance, and inventory replenishment per site linked to a company.

The planning cluster concept provides LN with a method to perform planning for entities such as warehouses, distribution centers, and manufacturing locations in one specific geographical location, taking into account the flow of goods within a company.

Note:

- If the *multisite* concepts are activated, planning clusters and *sites* are mandatory.
- Every site must have a planning cluster.
- A site can be linked to one planning cluster. Planning is performed for the *entities* within the site.
- If no *planning cluster* is found for a selected site, an error message is displayed.

A planning cluster represents one or more business locations for which planning processes are performed. Warehouses and sites are grouped together for planning purposes.

Each item defined in a company can be linked to multiple sites, and one or more planning clusters. In each planning cluster a separate plan item is created with specifications unique to the site where it is manufactured, bought or received from another planning cluster..

You can set up supplying relationships between planning clusters. These relationships enable you to build the network that is used in Enterprise Planning when you perform distribution requirements planning (DRP).

To perform forecasting, LN supports master planning for planned items, which means that you can use forecasting techniques, inventory planning, *available-to-promise (ATP)*, and (dis)aggregation functionality.

The use of a master plan for plan items enables you, for example, to (dis)aggregate forecasts, plans, and orders between a central distribution center and a regional distribution center or a sales office.

Setting up a planning cluster

- 1** Define a planning cluster in the Planning Clusters (tcomm1135m000) session.
- 2** In the Warehouses (tcomm1112m000) session, link warehouses to a specific planning cluster.

If the multisite concepts are activated, planning clusters are added to the sites of the warehouses. In the **Planning Cluster** field of the Sites (tcomm0150m000) session, select an existing planning cluster for the selected site. Clicking on the field opens the Planning Clusters (tcomm1135m000) session.

See Defining enterprise units and entities.

Enterprise Planning always aggregates the planning to a specified default warehouse if there is more than one warehouse.

ATP for planned items

LN fully supports the following types of *available-to-promise (ATP)* for planned items:

- Standard CTP
- *Channel ATP*
- Family CTP

The use of *component CTP checks* and *capacity CTP checks* for clustered items is restricted. For more information, refer to the Component CTP and capacity CTP for planning clusters online manual topic.

Note: On the *appropriate* menu in the Items - Planning (cprpd1100m000) session, you can generate a range of items based on a particular plan item (for a range of planning clusters), or based on a particular planning cluster (for a range of plan items). If you do this, Enterprise Planning also copies the relevant plan item data.

Multisite planning clusters

If the *multisite* concepts are activated, planning clusters and sites are mandatory. A planning cluster can include multiple sites, but a site can be linked to only one planning cluster.

This means that Enterprise Planning performs order-based planning for the warehouses of the sites linked to the cluster.

When Enterprise Planning is performed for a cluster, the aggregated supply and demand for all warehouses of the sites linked to the cluster are added to the default warehouse of the cluster. If you want to plan the replenishment of a specific warehouse within the cluster, you can use *kanban*, *TPOP*, or *generate order advice (SIC)*.

If Enterprise Planning is to be performed separately for one or more warehouses at a business location, separate sites and planning clusters need to be set up for the warehouse or warehouses for which planning is to be performed.

Example

Customer X has location XYZ at which production and service activities are performed.

Production is performed in production hall ABC that includes various work centers, a purchased materials receipt warehouse, a shop floor warehouse, and a finished goods warehouse. The purchased materials receipt warehouse supplies the shop floor warehouse that in turn supplies the work centers.

To support the service activities, spare parts and other service-related items are stored in service warehouse SW1.

Service office SO1 is responsible for service warehouse SW1. The inventory of warehouse SW1 is used exclusively for service purposes. It is not allowed to use this inventory for production.

Therefore, order planning and purchase order creation for service warehouse SW1 is done by service office SO1 and is performed separately from the planning performed for the warehouses of production hall ABC.

For this purpose, separate planning clusters and separate sites are set up for service warehouse SW1 and production hall ABC. This is because a site cannot include more than one planning cluster.

Consequently, location XYZ has these sites and planning clusters:

- Planning cluster PL1 and site PRD1 for production hall ABC.
- Planning cluster PL2 and site SRV1 for warehouse SW1 and service office SO1.

For both planning clusters order planning is used but planning is performed separately for each cluster. Inside site PRD1, the purchased materials receipt warehouse supplies the shop floor warehouse through kanban.

For each site all data, such as item data, needs to be set up separately.

In general, performing planning for all warehouses within one site and one cluster results in lower inventory levels and lower prices. If customer X would choose for this option, they could set up a single site and cluster that would include the service warehouse in addition to the warehouses of the production hall. The service warehouse could then be replenished through warehouse planning such as TPOP.

In this example, the need for customer X to perform separate planning for the service warehouse outweighs the advantage of cost effectiveness and leaner setup that can be achieved through central planning.

Resources in Enterprise Planning

In Enterprise Planning, the means used in production processes to produce items are referred to as *resources*. Resources are used to provide information about available capacity, capacity utilization, the resulting free capacity, and capacity capable to promise.

The activation status of the **Resources by Site** concept determines which resource functionality is available.

Resources by Site inactive

A resource plan in Enterprise Planning corresponds to a *work center* in Manufacturing. These plans are only available for Job Shop work centers. The **Work Centers - Planning (cprpd2100m000)** session, which is used to maintain plan settings, is renamed to **Work Centers - Planning (cprpd2100m000)**.

Resources by Site active

The Resources functionality that was used when the **Resources by Site** was inactive is still available.

The new Resources functionality uses various types of resources and resource capacities. The **Planner Workbench (cprprp8351m000)** session provides overviews of the available resources and resource capacities.

A resource in Enterprise Planning corresponds to an operational *entity* in Manufacturing or Purchase Control.

The table shows the available types of resources and the operational entities to which the resources correspond:

Operational entity	Resource type
Work center	Work center
Work cell	Work Cell
Work cell machine	Work Cell Machine
Machine capacity group	Machine Capacity Group
Operation subcontractor	Operation Capacity
Product subcontractor	Production Capacity
Supplying cluster	Supplying Cluster
Supplier	Supplier

When you create an operational entity such as a work center in Manufacturing or a supplying relationship in Enterprise Planning, a resource of type **Work center** or **Supplying Cluster** is automatically created in Enterprise Planning. If an operational entity is deleted, the corresponding resource is also deleted.

The table shows the available types of resources, the data from which the resource types are created, and the data from which the resource capacities are created:

Resource type	Resource created from	Resource capacity created from
Work center	Work Centers (tirou0101m000)	
Work Cell	Work Cells (tirpt0140m000)	
Work Cell Machine	Work Cells (tirpt0140m000)	
Machine Capacity Group	Machine Capacity Groups (tirou4161m000)	
Operation Capacity	Subcontractors by Site (tisub0130m000)	Operation Subcontractors List (tisub2100m000)
Production Capacity	Subcontractors by Site (tisub0130m000)	Product Subcontractors List (tisub1100m000)
Supplying Cluster	Supplying Relationships (cprpd7131m000)	
Supplier	Items - Purchase Business Partner by Site (tdipu0190m000)	

Calendars

If you link a *calendar* to a planning resource, Enterprise Planning uses this calendar for capacity planning. If no calendar is linked to the planning resource, LN uses a more general calendar.

Calendars are defined in Common, and consist of combinations of *time-interval types* and *availability types*. In the **Scenario - Override Calendar (cprpd4160m000)** session, you can specify per scenario which availability type is used for a specific calendar.

This means that you can change the availability type of a calendar in a certain scenario, and let Enterprise Planning calculate the consequences of a changed availability type of the calendar linked to the planning resource. If you did not specify an availability type for the calendar linked to the planning resource in the **Scenario - Override Calendar (cprpd4160m000)** session, Enterprise Planning uses the availability type of the **Job Shop Master Data Parameters (tirou0100m000)** session in Manufacturing to plan routing operations.

Sales schedules in Enterprise Planning

In Sales you can use *sales schedules* for customers who regularly place orders for a relatively long period. Sales schedules support long-term sales with frequent deliveries. In a sales schedule you can store all the requirements for a specific item that are sold to a certain *business partner*.

A sales schedule consists of the following two parts:

- A *sequence shipping schedule*: the confirmed part of the requirements. The shipping schedule contains detailed information about shipping times or delivery times and quantities of the ordered goods, and is defined on exact dates in a period, and for a relatively short period of time.
- A *material release*: the forecasted part for a total plan period.

Sequence shipping schedule

Enterprise Planning handles *sales orders* that result from a sales schedule as normal sales orders and stores requirements that originate from the shipping schedule part as sales schedule orders of the – (**Planned Issue**) transaction type in the **Planned Inventory Transactions (whinp1500m000)** session.

In Enterprise Planning, the shipping schedule part of the sales schedule is stored as *customer order* in the **Item Master Plan (cprmp2101m000)** session, and it is consumed from the forecast. In the **Item Order Plan (cprrp0520m000)** session, you can see the shipping schedule part as *planned orders* of type sales schedule.

Material Release

Enterprise Planning stores the requirements that originate from the material release part of the sales schedule in the **Unconfirmed Customer Orders** field of the **Item Master Plan (cprmp2101m000)** session. These requirements do not affect the planning process of Enterprise Planning, and are only displayed to show which part of the customer orders is not yet confirmed. In the **Item Order Plan (cprrp0520m000)** session, Enterprise Planning shows the sales requirements of the material release part of the sales schedule as sales schedule forecast.

Master planning and order planning

When you update or simulate the *item master plan* or the *item order plan*, Enterprise Planning reads goods flow data from the **Planned Inventory Transactions (whinp1500m000)** session to take into account sales quantities of the shipping schedule. To take into account sales quantities related to the material release of the sales schedule, Enterprise Planning reads the schedules with schedule type material release in the **Sales Schedules (tdsls3111m000)** session.

ATP updates

If order quantities or (delivery) dates in the shipping schedule or in the material release change, and you selected the **Online ATP Update in EP** check box in the **Planning Parameters (cprpd0100m000)** session, LN performs an ATP update for the item. This update is similar to the ATP update that Enterprise Planning carries out if anything changes in planned receipts or planned issues in the **Planned Inventory Transactions (whinp1500m000)** session. Enterprise Planning checks the acceptance of sales orders against the actual ATP value.

In case of changes, Enterprise Planning also sets two new *net change dates*, so that changes are taken into account during a planning run:

- The net change date in the **Items - Ordering (tcibd2100m000)** session. This is the date from which on Enterprise Planning must take into account changes in the shipping schedule.
- The net change date in the **Items - Planning (cprpd1100m000)** session. This is the date from which on Enterprise Planning must consider all other changes.

To perform an ATP update and to set new net change dates, Enterprise Planning reads goods flow data of the item. Enterprise Planning receives the dates and quantities that relate to the shipping schedule from the Inventory Planning module in Warehousing.

To perform an ATP update for changes in the material release part of the shipping schedule, Enterprise Planning receives data about the quantity and date for which sales requirements are needed from Sales.

Overlapping material release schedules: Extrapolation

Enterprise Planning receives the sales requirements related to the shipping schedule for a specific date from the Inventory Planning module, whereas it receives the sales requirements related to the material release as one quantity from the Sales Control module. Shipping schedules usually end in the middle of a *plan period* and, as a result, an overlap exists between the shipping schedule and the material release in a specific plan period. For this reason, LN distinguishes between material release schedules that overlap a shipping schedule, and material release schedules that do not overlap.

For material releases that overlap a shipping schedule, Sales uses the extrapolation method to determine sales quantities for the days that are not filled with sales requirements that originate from the shipping schedule.

The way in which LN extrapolates these quantities depends on whether or not you selected the **Linear Estimate** check box in the **Items - Sales Business Partner (tdisa0510m000)** session:

- If you clear the **Linear Estimate** check box, LN subtracts the sales quantities of the shipping schedule from those of the material release for a certain plan period. Next, LN divides the resulting quantity over the days in the plan period that are not covered by shipping schedule quantities.
- If you select the **Linear Estimate** check box, LN divides the material release quantity by the number of days in the plan period. Next, LN fills the days in the plan period that do not have shipping schedule quantities with the resulting value.

In the plan periods where the material release does not overlap the shipping schedule, Sales sends the total quantity of the material release to Enterprise Planning when it carries out an ATP check.

Another check box that plays an important role in the extrapolation process, is the **Accumulate Demand on Start Date of Period** check box in the **Items - Sales Business Partner (tdisa0510m000)** session:

- If you select the **Accumulate Demand on Start Date of Period**, LN fills the first day of the plan period with the total quantity of the material release part of the sales schedule.
- If you clear the **Accumulate Demand on Start Date of Period** check box, LN spreads the total quantity of the material release over the number of days of the plan period.

Example 1

Check box

Linear Estimate selected

Accumulate Demand on Start Date of the Period selected

Week	1	2	3
Day	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5

Material Release	50	50	50
Shipping Schedule	10 9 8 12 10	12 9	
Planning	10 9 8 12 10	12 9 10 10 10	50

In week 1, a material release takes place, but the entire period is filled by the shipping schedule, and Enterprise Planning only takes into account the shipping schedule.

In week 2, an overlap occurs: the week is not completely filled by the shipping schedule, so the remaining days are filled by the material release. Because the **Linear Estimate** check box is selected, LN extrapolates the quantity of the material release to the number of days in the period ($50 : 5 = 10$). The days that are not filled by the shipping schedule, receive the extrapolated quantity (10).

Week 3 only contains material release, and LN takes into account the related quantity. The first day of week 3 is filled with the total quantity of the material release, because the **Accumulate Demand on Start Date of Period** check box is selected.

Example 2

Check box

Linear Estimate cleared

Accumulate Demand on Start Date of the Period cleared

Week	1	2	3
Day	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Material Release	50	50	50
Shipping Schedule	10 9 8 12 10	12 9	
Planning	10 9 8 12 10	12 9 10 10 9	10 10 10 10 10

LN now distributes the material release in week 2 without linear estimate, because the **Linear Estimate** check box is not selected. As a result, Sales subtracts the shipping schedule quantity from the total material release quantity for the period, and divides the resulting quantity over the number of days that are not filled by shipping schedule quantities.

In week 3, LN equally spreads the total quantity of the material release over the number of days in the period, because you did not select the **Accumulate Demand on Start Date of Period** check box.

Example 3

Check box

Linear Estimate cleared

Accumulate Demand on Start Date of the Period cleared

The following example shows what happens if the quantity of the material release changes from 50 to 60 in week 2.

Week	1	2	3
Day	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Material Release	50	50 → 60	50
Shipping Schedule	10 9 8 12 10	12 9	
Update		+3 +3 +4	
Planning	10 9 8 12 10	12 9 13 13 13	10 10 10 10 10

In week 2, the remaining quantity for each day that is not covered by the shipping schedule is now 13 ($60 - 12 - 9 = 13$). Sales informs Enterprise Planning that three material release quantities increase, and Enterprise Planning subsequently reduces the ATP values.

Example 4

The following example shows what happens if the quantity of the shipping schedule changes on a specific day.

Check box

Linear Estimate cleared

Accumulate Demand on Start Date of the Period cleared

Week	1	2	3
Day	1 2 3 4 5	1 2 3 4 5	1 2 3 4 5
Material Release	50	60	50
Shipping Schedule	10 9 8 12 10	12 15	
Update		-2 -2 -2	
Planning	10 9 8 12 10	12 9 11 11 11	10 10 10 10 10

The quantity of the shipping schedule on day 2 of week 2 changes from nine to 15. This change results in a change of the **Planned Inventory Transactions (whinp1500m000)** session, which is sent to Enterprise Planning for the ATP update.

Obviously, changes in the shipping schedule quantities also affect the material release for week 2. The new quantity for the remaining material release in week 2 in the example is 33 ($60 - 12 - 15 = 33$). The quantity for each of the remaining three days is then 11. Sales communicates this change to Enterprise Planning, which consequently increases the ATP figures.

Lead times and horizons

For a variety of reasons, it is often important to know how long it takes to supply a particular item. Especially in manufacturing environments, where end items are built from materials that can be either purchased or manufactured from other materials, computing the total order lead time can be a complicated issue.

In addition, in complex manufacturing environments it is important to use the right horizons for the planning of your items. On the one hand, if these horizons are too long, this can lead to unnecessary performance problems. On the other hand, if they are too short, this can lead to problems in the explosion of material requirements.

To deal with these issues, Enterprise Planning offers functionality for:

- Calculation of a plan item's cumulative order lead time
- Checking and synchronization of order horizons for items throughout a BOM structure.

You can use the **Check Horizons (cprpd1200m000)** session to access this functionality. You can find this session on the *appropriate* menu in the **Items - Planning (cprpd1100m000)** session.

You can use this functionality in the following ways:

- Check the various order horizons and planning horizons, and send the results to a report.
- Update (correct) order horizons and planning horizons, but only if they are too small.
- Update each order horizon and planning horizon, changing each horizon to its minimal size (according to the rules that are applied).

The minimum values for the order horizon and the planning horizon are displayed in the **Items - Planning (cprpd1100m000)** session. The underlying data on which these values are based are updated when you check or update the horizons by using the **Check Horizons (cprpd1200m000)** session.

Rules

The horizons are checked or updated based on a number of rules. Two types of rules can be distinguished:

- Length rules that are based on cumulative order lead times
- A matching rule between horizons at various BOM levels

Horizons and time fences

You can influence the planning procedure in Enterprise Planning by means of horizons and time fences.

Horizons

Generally, a horizon is a time period during which a particular function or planning concept is available. A horizon can either start at the current date, or start at a future date. A horizon in Enterprise Planning is defined by a figure that indicates a number of *workdays*. This figure represents either the start or the end of the horizon.

Time fences

Generally, a *time fence* is a point in time before which a certain restriction applies. A time fence in Enterprise Planning is defined by a figure that indicates a number of workdays.

Major horizons and time fences

The most general horizon in Enterprise Planning is the *planning horizon*. The planning horizon represents the period during which requirements are generated and supply is planned.

The planning horizon consists of an *order horizon* and/or a *master-planning horizon*. This yields three possible planning situations:

- Order horizon only
- Order horizon (for shorter-term planning) and master-planning horizon (for longer-term planning)
- Master-planning horizon only

For the first part of the planning horizon, you can set a time fence to prevent Enterprise Planning from making changes in your near-future supply planning.

Order horizons and planning horizons must comply with a number of rules. LN can check these horizons according to the following types of rules:

- Length rules that are based on cumulative order lead times
- A synchronization rule between order horizons at various BOM levels

Other horizons and time fences

The following horizons and time fences are available for all plan items:

- The *ATP/CTP horizon*, which determines for which period ATP or CTP must be checked.
- The *fixed lead-time horizon*, which is used in *order planning* to determine whether Enterprise Planning must use a fixed order lead time or detailed routing data to plan production orders.

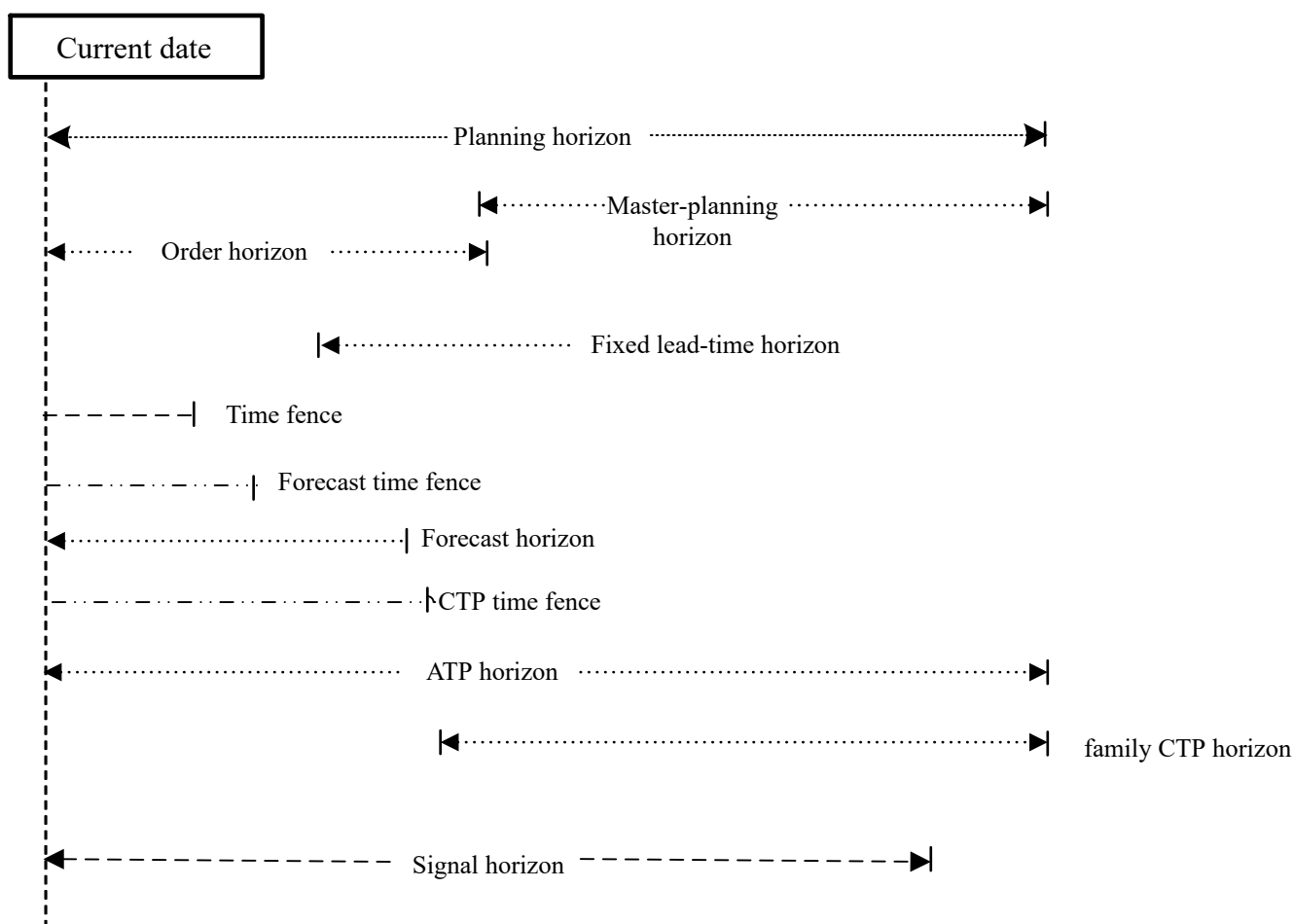
When you maintain an *item master plan* for an item, you can use the following additional horizons and time fences:

- *Forecast time fence* (ignore the forecast in near-future planning)
- *Forecast horizon* (used for forecast-based inventory planning)
- *Family CTP horizon* (optionally redirect ATP/CTP checks to a higher product-family level)

You can use the *signal horizon* to indicate for which period you want Enterprise Planning to generate a particular exception message.

Note: You can define most horizons and time fences in the **Items - Planning (cprpd1100m000)** session. *Exception message* horizons are defined in the **Exception Message Types by Planner (cprao1110m000)** session.

Diagram of horizons and time fences



Note: Most of these horizons and time fences can be set independently from each other. However, the following rules apply:

- The planning horizon must be greater than zero.
- The order horizon, time fence, forecast time fence, and CTP horizon must fall within the planning horizon.
- The end of the fixed lead-time horizon coincides with the end of the order horizon.
- The end of the family CTP horizon coincides with the ATP/CTP horizon.

Cumulative order lead times and horizons

For every plan item you must define an *order horizon* and a *planning horizon*. The order horizon is the time span in which Enterprise Planning generates *planned orders* and explodes the *dependent demand* to all components included in the *bill of material (BOM)*.

The planning horizon is the time span in which Enterprise Planning creates, plans, and explodes the dependent demand to all the components of the parent item that you defined in the *bill of critical materials*.

If the horizons are too long, this can lead to unnecessary performance problems. If horizons are too short, this can lead to problems in the explosion of material requirements. As a consequence, it is critical that the settings of the order horizon and the planning horizon are correct, because they directly affect the explosion of the dependent demand. This is why Enterprise Planning uses the concept of cumulative order lead times.

The COLT concept applies two different values:

- The *cumulative order lead time (COLT)*.
- The *noncritical cumulative order lead time (COLT)*.

The total cumulative order lead time (COLT) of an item is equal to the longest of the following lead times:

- The item's purchase lead time.
- The item's cumulative production lead time.

Refer to online manual topic Example: cumulative order lead time (COLT) for a detailed explanation about the COLT concept.

The noncritical cumulative order lead time (noncritical COLT) of an item is equal to the longest of the following lead times:

- The item's purchase lead time.
- The item's noncritical cumulative production lead time.

LN uses these COLT values to calculate the minimum length of the order horizon and the planning horizon:

- The total cumulative order lead time (COLT) is used to update the planning horizon of an item.
- The noncritical cumulative order lead time (noncritical COLT) is used to update an order horizon.

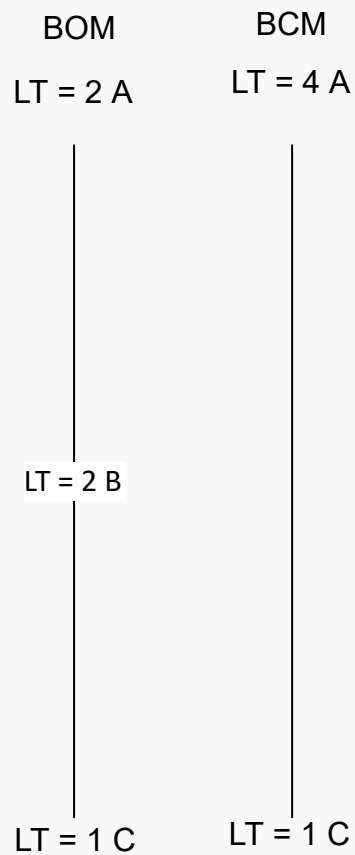
For each specific plan item you can see both the COLT and the noncritical COLT in the **Items - Planning (cprpd1100m000)** session. In this session, you also find the **Automate Update Horizons** check box. If you select this check box, and select **Check Horizons** on the *appropriate* menu, you can zoom to the **Check Horizons (cprpd1200m000)** session. When you click the **Update** button in this session, Enterprise Planning computes each COLT value.

Note: If you use the Enterprise Modeler Content Pack with LN, consider using the MPL0370 (Cumulative Order Lead Time Calculations) *wizard* to calculate the cumulative order lead time. You can execute this predefined wizard from the **Wizards by Project Model (tgwzr4502m000)** session after you specified the *business function model* for your company.

The following example explains why it can be necessary to compute a COLT and a noncritical COLT.

Example

End item A is composed of item B (lead time = two weeks). Item B is composed of item C (lead time = two weeks). Item C is purchased externally (lead time = one week). Only item C is a critical component for item A (lead time = four weeks).



Suppose Item A, B, and C have the following horizon settings:

	Item A	Item B	Item C
Order horizon	7 weeks	4 weeks	4 weeks
Planning horizon	10 weeks	4 weeks	4 weeks

Three *sales orders*, X, Y, and Z exist for item A:

Week	1	2	3	4	5	6	7	8	9	10
Item A					X	Y	Z			
Item B				X						
Item C		X		Z						

As you can see, the dependent demand for sales order X in week six is exploded to component B in week four and to component C in week two. The dependent demand for sales order Y in week seven is not exploded at all, because the order horizon for component B stops at the end of week four. The dependent demand for sales order Z in week eight is exploded directly to component C in week four.

If you roll the *scenario* one week with the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, the dependent demand for component C, caused by sales order Z, which now occurs in week seven, disappears completely.

If you roll the scenario for another week, sales order Z occurs in week six, and the dependent demand reappears for components B and C. To avoid these unusual planning situations, LN uses the COLT concept. Based on this concept, LN can automatically update and correct the minimum values for the order horizon and the planning horizon, which is crucial for consistent order planning and master planning.

Enterprise Planning applies a set of basic rules when it uses the COLT values to set the minimum order horizon and the minimum planning horizon. These rules vary in accordance with the plan item details.

For items that are critical in master planning (see the **Items - Ordering (tcibd2100m000)** session) and that have an *item master plan*, the following rules apply:

- The item's planning horizon must at least be equal to the item's total COLT.
- The item's order horizon must at least be equal to the item's noncritical COLT.

For items that are critical in master planning, and that do not have an item master plan, Enterprise Planning applies the following rules:

- The item's planning horizon must at least be equal to the item's total COLT.
- The item's order horizon must at least be equal to the item's total COLT.

For items that are not critical in master planning, the following rules apply:

- The item's order horizon must at least be equal to the item's total COLT.
- The item's planning horizon must at least be equal to the item's order horizon.
- The item's order horizon must at least be equal to the order horizon of the nearest critical parent item in the (multilevel) BOM structure.

In the **Check Horizons (cprpd1200m000)** session, you can select one of the three update options in the **Update Method** field to determine how Enterprise Planning must update the COLT values and the horizons. These update options are:

- **COLT:** Enterprise Planning calculates the COLT, the noncritical COLT, and updates the values in the **Minimum Order Horizon** field and the **Minimum Planning** field in the **Items - Planning (cprpd1100m000)** session.
- **COLT + Horizons When Too Small** Enterprise Planning calculates the COLT, the noncritical COLT, updates the values in the **Minimum Order Horizon** field and the **Minimum Planning** field, and the values in the **Days** field and the **Days** field in the **Items - Planning (cprpd1100m000)** session, if they are too small to correctly generate planned orders.
- **COLT + All Horizons:** Enterprise Planning calculates the COLT, the noncritical COLT, updates the values in the **Minimum Order Horizon** field and the **Minimum Planning** field, and the values in the **Days** field and the **Days** field in the **Items - Planning (cprpd1100m000)** session.

Confirm planned orders based on lead time

This topic describes how you can confirm *planned orders* in such a way, that only those orders which are about to start will be confirmed, taking the order lead times into account.

A confirmed planned order is ready to be transferred to the *execution level*.

Introduction

You must carefully select which planned orders you confirm:

- If you confirm planned orders whose start date lies far in the future, you lose flexibility; if the demand situation changes after the planned orders were confirmed, you may need to perform additional actions to adjust the plan.
- If you confirm planned orders too late, execution starts too late for the planned orders to complete in time. This risk is more pronounced for planned orders with long order lead times, that is, the planned orders that take a long time to complete.

Within Order Lead Time Only

In the **Confirm Order Planning (cprrp1200m000)** session, you can select planned orders based on their lead time.

You can adjust this process by entering a multiplier in the **Order Lead-Time Multiplier** field. If you use this option, a planned order is confirmed only if the planned start date lies before the following moment:

$$\text{current date} + (\text{order lead time} * \text{order lead-time multiplier})$$

Production orders and purchase orders

For *planned production orders* and *planned purchase orders*, the lead time is specified in the following fields:

Type of order	Session	Field
Planned production order	Item - Production (tiipd0101m000)	Order Lead Time
Planned purchase order	Item - Purchase	Supply Time

Planned distribution orders

For *planned distribution orders*, you can choose the following methods to determine the order lead time:

- **Supplying Item**
The order lead time is defined as the time to manufacture or purchase the supplying item. This order lead time is defined in the **Item - Production (tiipd0101m000)** or **Item - Purchase** sessions respectively. The supplying item can be defined in another company – the *supplying company*.
- **Supply Lead Time**
The order lead time is defined as the distribution lead time. The calculation of the distribution lead time depends on whether you specified a *carrier* for the *supplying relationship* in the **Supplying Relationships (cprpd7130m000)** session. For more information, refer to Distribution Lead-time Calculation.

Production lead-time calculation in Enterprise Planning

Enterprise Planning can determine lead times for planned production orders in two ways:

- Using detailed *routing* data
- Using a *fixed order lead time*
- Using detailed routing data for the short-term future, combined with a fixed order lead time for the longer-term future.

Which method LN uses, depends on the value that you specified in the **Operations Horizon** field in the **Items - Planning (cprpd1100m000)** session.

Usually, LN plans *production order* based on a routing, on a second-by-second basis. A *fixed lead time* is less detailed: it is expressed in working days, and is quantity-independent. On the other hand, using fixed lead times leads to faster calculations.

For longer-term planning, the level of detail offered by routing-based planning is not always necessary. Especially in the following cases, a fixed lead time can be a useful approximation:

- There is little or no variation in the order quantity of your orders.
- The production process involved is largely quantity-independent.

Fixed lead-time horizon

In Enterprise Planning you can set a *fixed lead-time horizon*. In the **Operations Horizon** field in the **Items - Planning (cprpd1100m000)** session, you can specify the number of workdays after which the fixed lead-time horizon starts. The value of this field is used in the following way:

- If it is zero, Enterprise Planning uses a fixed lead time for all planned production orders.
- If it is larger than the order horizon, Enterprise Planning always uses a routing for all planned production orders.
- If it is between zero and the order horizon, Enterprise Planning uses a routing for orders before the fixed lead-time horizon, and uses a fixed lead time for orders within the fixed lead-time horizon.

Important: If the **Operations Horizon** field is zero, you cannot transfer the generated planned orders to the *execution level*, because Enterprise Planning links no routing operations to the planned order. You can use this setting only for simulations.

Note: If the **Operations Horizon** is greater than zero, Enterprise Planning rounds the start of the fixed lead-time horizon to the end of a plan period. As a result, the fixed lead-time horizon effectively starts at the next plan period.

The start date of a planned order determines whether the order falls before or within the fixed lead-time horizon. If you apply backward planning, Enterprise Planning first carries out preliminary backward planning by using the fixed lead time. The resulting preliminary start date is checked against the fixed lead-time horizon. If this start date is before the fixed lead-time horizon, Enterprise Planning repeats the calculation with detailed routing data.

Before Enterprise Planning actually plans the order lead time, it offsets the order finish date with the following lead-time components:

- Safety time (**Items - Ordering (tcibd2100m000)**).
- Extra lead-time (**Items - Planning (cprpd1100m000)**).
- Outbound time (**Item Data by Warehouse (whwmd2510m000)**).

Lead-time planning with a fixed lead time

If the order start date falls after the fixed lead-time horizon, the production order lead-time is always equal to the order lead-time in the **Item - Production (tiipd0101m000)** session.

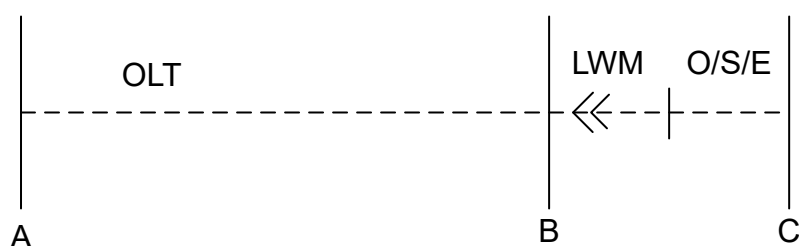
You can either enter a value in the **Order Lead Time** field of the **Item - Production (tiipd0101m000)** session, or let LN automatically fill in this field. In the latter case, you must run the **Update Order Lead Times (tirou1202m000)** session to let Enterprise Planning calculate the value.

Enterprise Planning plans the fixed lead time based on the calendar of the item's *enterprise unit*.

This planning process consists of the following steps:

- 1 The order's finish date is set backward to the latest working moment according to the enterprise-unit calendar.
- 2 The order's start date is determined by planning backward the fixed lead time, using the enterprise-unit calendar.

Figure 1: Lead-time planning with a fixed lead time



OLT	Order lead time (from the Item - Production (tiipd0101m000) session)
LWM	Finish date set to the latest working moment (according to the item/enterprise-unit calendar)
O/S/E	Outbound time / Safety time / Extra lead time
A	Start date
B	Finish date
C	Requirement date

Lead-time planning with detailed routing data

If the order start date falls before the fixed lead-time horizon, Enterprise Planning uses detailed routing data to calculate the order lead-time, and, subsequently, use this order lead-time to compute the order start date.

Enterprise Planning retrieves these routing data from the Routing module in Manufacturing. For each item, you can define a series of routings, and for each item/routing combination, you must define operations. Which routing LN selects depends, among other things, on:

- Selection of the **Standard** check box in the **Item - Routings (tirou1101m000)** session.

- The order quantity, if you selected the **Quantity-dependent Routing** check box in the **Item - Production (tiipd0101m000)** session.
- The setting of the **Reference** field in the **Production Order (tisfc0101s000)** session, which determines which operation lines Enterprise Planning selects in the **Routing Operations (tirou1102m000)** session.

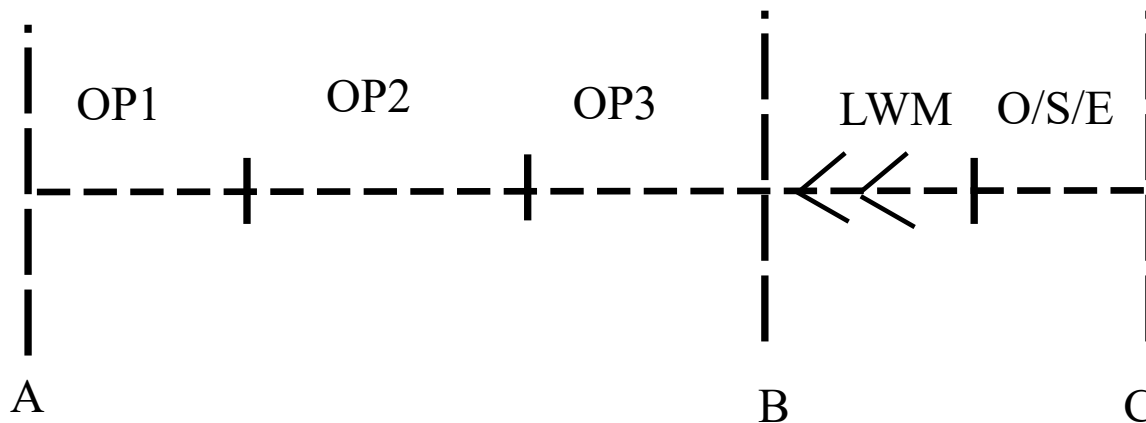
After Enterprise Planning selects a routing, it can calculate the order lead-time, which consists of a series of separate operations lead-times. To calculate these operation lead-times, Enterprise Planning retrieves the following operation data from the Routing Operations (tirou1102m000) session:

- Queue Time
- Setup Time (min)
- Cycle Time
- Wait Time
- Move Time

Enterprise Planning calculates operation lead-times with the following formula:

$$\text{Operation lead time} = \text{Queue time} + \text{Cycle time} * \text{quantity} + \text{Wait time} + \text{Move time}$$

Figure 2: Lead-time planning with detailed routing data



OP1/OP2/OP3	Routing operations (see the Item - Routings (tirou1101m000) session)
LWM	Finish date set to latest working moment (according to the resource calendar of the latest operation)
O/S/E	Outbound time / Safety time / Extra lead time
A	Start date
B	Finish date
C	Requirement date

Purchase lead time calculation

An important task of Enterprise Planning is to calculate and plan order start dates and order finish dates. One of the dates Enterprise Planning calculates is the lead time for purchased items.

Dependent on the situation, Enterprise Planning uses one of the following three methods to calculate lead times for *planned purchase orders*:

- Based on order-specific purchase data.
- Based on the calculated lead time.
- Based on the *supply time*.

The method that LN uses is determined by the supplier that LN selects to deliver the ordered goods. LN selects the supplier according to the *priority rule* that you defined in the **Supply Strategy (cprpd7120m000)** session, and is also based on the *priorities* that you specified for the eligible supplier in the **Items - Purchase Business Partner (tdipu0110m000)** session.

The **Lead Time Horizon (Days)** field in the **Items - Purchase Business Partner (tdipu0110m000)** session determines the method that LN chooses to compute lead time for planned purchase orders. The function of the lead time horizon is comparable to that of the *fixed lead-time horizon* that you can set for *planned production orders*.

Purchase lead-time calculation based on order-specific purchase data

If the finish date is within the lead-time horizon, and LN finds a valid supplier, LN first calculates the interim finish date, which is included in the purchase order sent to the selected supplier. The lead-time components that LN uses to calculate this date, and the sessions from which it retrieves these data are:

- **Items - Planning (cprpd1100m000).**
- **Items - Ordering (tcibd2100m000).**
- **Item Data by Warehouse (whwmd2510m000).**

Next, LN calculates the final finish date, for which it uses the following data:

- **Item Data by Warehouse (whwmd2510m000).**
- **Items - Purchase Business Partner (tdipu0110m000).**

Finally, LN computes the exact order start date based on supplier-specific data. The specific lead-time components that LN uses and the sessions in which they are defined are:

- Transport time: LN calculates the transport time based on the distance between the *ship-from business partner* address, and the address of the receiving warehouse business partners, distance tables, and *carrier*.
- Business partner supply time: **Items - Purchase Business Partner (tdipu0110m000).**
- *Internal processing time*: **Items - Purchase Business Partner (tdipu0110m000).**

Purchase lead-time calculation based on calculated lead time

If the finish date of the *planned purchase order* is outside the supplier's lead time horizon, LN computes the order start date based on the calculated lead time, which is the rough purchase item lead time. LN offsets the calculated lead time from the finish date to find the start date. The calculated lead time is the sum of the following lead-time components:

- Internal processing time (**Items - Purchase Business Partner (tdipu0110m000).**

- Business partner supply time (**Items - Purchase Business Partner (tdipu0110m000)**).
- Transport time (based on the distance between the *ship-from business partner* address, and the address of the receiving warehouse business partners, distance table and *carrier*).
- Business partner safety time (**Items - Purchase Business Partner (tdipu0110m000)**).
- *Inbound lead time* (**Item Data by Warehouse (whwmd2510m000)**).

Next, LN computes the finish date by offsetting the business partner safety time and the inbound lead time from the requirement date. This is necessary because these two lead-time components must be excluded from the supplier's *planned receipt date*.

Purchase lead-time calculation based on supply time

If LN cannot find a valid supplier for the purchase order, or if the supplier that LN selects has no capacity left, it plans the order without a supplier. In this situation, the only purchase-related lead time component LN uses is the *supply time* that you defined in the **Item - Purchase** session. This is a substitute for the more specific lead-time components such as *internal processing time*, business partner supply time, transport time, and business partner safety time which LN uses if it cannot find a valid supplier for the purchase order.

Cumulative production lead time

Enterprise Planning uses the cumulative order lead time (COLT) to correctly set the minimum value of the items planning horizon.

For *manufactured items*, the COLT consists of:

- The lead time of the item itself.
- The longest COLT among all the item's components in the BOM, which includes the plan items that you defined as critical in master planning.

The lead time of the item itself consists of:

- The *order lead time* defined in the **Item - Production (tiipd0101m000)** session.
- The *outbound lead time* defined in the **Item Data by Warehouse (whwmd2110s000)** session.
- The *safety time* defined in the **Items - Ordering (tcibd2100m000)** session.
- The *extra lead time* defined in the **Items - Ordering (tcibd2100m000)** session.

In the **Check Horizons (cprpd1200m000)** session, you can fill in the following fields to influence the way in which Enterprise Planning calculates/updates the COLT:

- **Additional Lead Time:** extra lead time that Enterprise Planning adds to the item's COLT and noncritical COLT.
- **Order Lead-Time Multiplier:** a factor that Enterprise Planning applies to increase the total lead time of the involved item.

Noncritical cumulative production lead time

Enterprise Planning uses an items noncritical cumulative order lead time (noncritical COLT) to correctly calculate the minimum value of the order horizon.

For manufactured items, the noncritical COLT consists of:

- The lead time of the item itself.
- The longest noncritical COLT among the item's noncritical components in the BOM.

The lead time of the item itself consists of:

- The *order lead time* defined in the **Item - Production (tiipd0101m000)** session.
- The *outbound lead time* defined in the **Item Data by Warehouse (whwmd2110s000)** session.
- The *safety time* defined in the **Items - Ordering (tcibd2100m000)** session.
- The *extra lead time* defined in the **Items - Ordering (tcibd2100m000)** session.

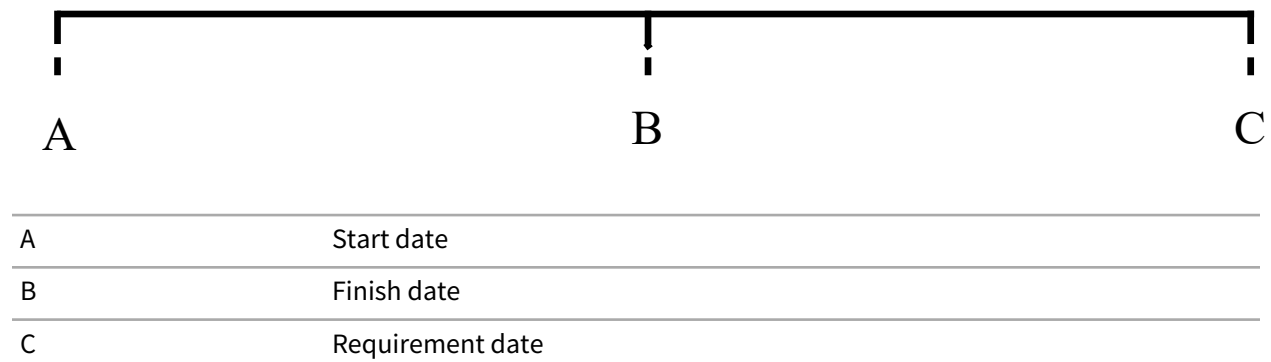
In the **Check Horizons (cprpd1200m000)** session, you can fill in the following fields to influence the COLT calculation:

- **Additional Lead Time:** extra lead time that Enterprise Planning adds to the item's COLT and noncritical COLT.
- **Order Lead-Time Multiplier:** a factor that Enterprise Planning applies to increase the total lead time of the involved item.

Lead-time offsetting

Enterprise Planning offsets lead times to find order start date and the order finish date. If, during *order planning*, demand is generated, planned order receipts exist in a certain *plan period*. This planned reception of goods requires the release of that order in an earlier period, so that the manufacturing location can start the production process, the sales department can dispatch the *ordered quantity*, or the supplier knows when to ship the goods for transport.

The following diagram shows the crucial points in time in the lead-time offsetting process:



Based on the lead-time components of which the total lead time of a planned order is built up, and which vary according to the order source type (purchase, production, or distribution), Enterprise Planning computes the date on which a *planned order* must be released. This process is called lead-time offsetting.

The basic data that Enterprise Planning needs to perform lead-time offsetting are:

- Lead-time data: lead-time components are partly common, partly source-specific.
- Calendars: *calendars* determine when the resources required to produce or buy the required goods are available, and what their capacity is.

Before Enterprise Planning can offset lead times, the lead-time components must be converted from days to hours. Only then, Enterprise Planning can compare the resulting hours with the available plan hours in the appropriate calendar.

During the lead-time offsetting process, Enterprise Planning takes the requirement date as point of departure, and from there, takes into account the separate lead-time components in a fixed inverse chronological order to take backward steps in time. How big the steps are that Enterprise Planning, depends on the type of lead-time component, and the available space (plan time) in the calendar used to offset the lead-time component.

This process finally brings Enterprise Planning to the point in time where the involved supplier must start the activities to be able to deliver the required goods in time: the order start date.

To offset the individual lead-time components, Enterprise Planning uses different calendars. A calendar in LN not only represents the dates in a chronological order, but for each date it also includes a daily schedule that indicates:

- whether a *resource* is available on a particular day, or not.
- the exact hours on which the resource is available.
- what the capacity/efficiency rate of the resource is on specific hours.

Which calendar Enterprise Planning selects to offset a specific lead-time component depends on the resource where the logistic activity to which the lead-time component relates, is carried out. For more detailed information about calendars, see help topic Calendars in Enterprise Planning.

When Enterprise Planning finished the offset of a specific lead-time component, the offset mechanism stops at a certain time on a particular date. From that point in time, the process continues to offset the next lead-time component of the total order lead time, for which Enterprise Planning switches to the calendar linked to the *resource* that carries out the activity to which that lead-time component relates.

Depending on the *fixed lead-time horizon*, Enterprise Planning can offset in a detailed way, or in a more aggregated way. When Enterprise Planning offsets lead time in a detailed way, it individually offsets all the lead-time components of which the total order lead time for each order type is built up. In the more aggregated way, Enterprise Planning only offsets one lead-time component between the order start date and finish date.

Note: You can define lead-time components in days or in hours. If there is only one hour/one second available on a day, Enterprise Planning considers this as an available day in lead-time planning.

To synchronize order horizons between BOM levels

In situations where multilevel *BOM* and *BCM* structures are used, it is important that the order horizons and planning horizons at the various levels are properly synchronized.

Without such synchronization, strange planning situations can occur. This is illustrated in the following example.

Example

Item A is manufactured using subassembly B. B is manufactured using component C. C is purchased from a business partner. A and C are critical items; B is not critical. This results in the following BOM and BCM structures.

	A	B	C
Planning horizon	10 weeks	4 weeks	4 weeks
Order horizon	7 weeks	4 weeks	4 weeks

The effective lead times are as follows:

- The production of 100 piece of item A takes 2 weeks (according to the routing of A).
- The production of 100 piece of item B takes 2 weeks (according to the routing of B).
- According to the Bill of Critical Materials of the lead time for the critical component C is 4 weeks.

Consider the following planning situation, in which there are three requirements for item A, labeled X, Y, and Z. In principle, each requirement is passed on to the next BOM or BCM level, shifted in time on the basis of either routing data or BCM data.

- Requirement X, falling within item A's order horizon, is passed on from A to B, and from B to C.
- Requirement Z, falling within item A's master-planning horizon, is passed on directly from A to C.
- Requirement Y falls within item A's order horizon. However, when it is passed on to item B, it falls outside B's order horizon. Consequently, this requirement is not considered in the planning of B, and is not passed on to C.

This results in a strange planning situation for item C when the *scenario* is rolled forward (at weekly intervals). If a requirement for 100 piece of A is present in week 18, the following will occur:

- When you generate the item plan in week 10, the requirement for A (in week 18) results in a dependent demand for C in week 14 (4 weeks from present week).
- A week later, in week 11, you update the item plan. Now, this requirement for C disappears: it does not show up in week 14 (three weeks from now).
- Another week later, week 12, this same requirement for C reappears in week 14 (two weeks from now).

In other words, a gap occurs in the planning of item C. This is due to the fact that requirements that fall just inside A's order horizon fall outside B's order horizon (and planning horizon). In this situation, B's order horizon should be at least one week longer.

Rule

To avoid situations like the one described here, LN applies the following rule to noncritical items when checking horizons (in the **Check Horizons (cprpd1200m000)** session):

- The item's order horizon must at least be equal to the order horizon of the nearest critical parent item in the (multilevel) BOM structure.

In the above example, LN will indicate that the order horizon of item B must be extended to 7 weeks (the same as item A).

Defining lead time components

Lead time components are mostly defined outside Enterprise Planning, such as in Job Shop Control or Purchase Control. The lead time components must represent the execution level as much as possible so that during planning, the lead times on execution level are reflected.

In the following sections, the relevant lead time components are listed that you can specify in LN for production, purchase, distribution, and general purposes.

Production lead time (Job Shop)

Lead time component	Package	Unit	Defined in
Average setup time	Manufacturing	min	Routing Operations (tirou1102m000)
Cycle time	Manufacturing	min	Routing Operations (tirou1102m000)
Queue time	Manufacturing	days/hours	Routing Operations (tirou1102m000)
Wait time	Manufacturing	days/hours	Routing Operations (tirou1102m000)
Move time	Manufacturing	days/hours	Routing Operations (tirou1102m000)
Order lead time (JSC)	Manufacturing	days/hours	Item - Production (tiipd0101m000)
Planned production time	Manufacturing	hours	Generic Planning Routing (cprpd3150m000), Configurable Item - Structure (tipcf3100m100)
Lead time offset	Manufacturing	days	Generic Planning Routing (cprpd3150m000), Configurable Item - Structure (tipcf3100m100)

Production lead time (Repetitive)

Lead time component	Package	Unit	Defined in
Order Plan Lead Time	Manufacturing	Days/hours per Order Plan Quantity	Production Models (tirpt2100m000)

Purchase lead time

Lead time components	Package	Unit	Defined in
Safety time (per supplier)	Procurement	days/hours	Items - Purchase Business Partner (tdipu0110m000) , Approved Supplier List (tdipu0110m200)
Internal processing time	Procurement	days/hours	Items - Purchase Business Partner (tdipu0110m000)
Supply time (per supplier)	Procurement	days/hours	Items - Purchase Business Partner (tdipu0110m000)
Calculated lead time	Procurement	days	Items - Purchase Business Partner (tdipu0110m000)
Supply time	Procurement	days/hours	Item - Purchase
Transportation time	Common/ Freight	user de- fined	Addresses (tccom4530m000) Distance Table by City (tccom4537m000) Distance Table by ZIP Code/Postal Code (tccom4538m000) Route Plan Legs (fmfoc1151m000)

Distribution lead time

Lead time components	Package	Unit	Defined in
Supply time (Distribution)	Enterprise Planning	days/ouhrs	Items - Planning (cprpd1100m000)
Transportation time	Common/ Freight	user de- fined	Addresses (tccom4530m000) Distance Table by ZIP Code/Postal Code (tccom4538m000) Route Plan Legs (fmfoc1151m000)

General lead time

Lead time component	Package	Unit	Defined in
Extra lead time	Enterprise Planning	days/hours	Items - Planning (cprpd1100m000)
Safety time (item)	Common	days/hours	Items - Ordering (tcibd2100m000)
Inbound lead time	Warehousing	days/hours	Item Data by Warehouse (whwmd2510m000)
Outbound lead time	Warehousing	days/hours	Item Data by Warehouse (whwmd2510m000)

Time units

Several lead times can be defined in days.

Because calendars are defined in hours/minutes, you must specify how the lead time days are calculated in the calendar.

The rule is that lead times in days are planned as working days, which means that the available time on a day is one day of lead time.

Example

Planning backwardsThe calendar runs from 8:00 to 17:00:

- Planning one day backwards from 11:55 sets the start date on 8:00 (start of the day)
- Planning one day backwards from Tuesday 7:55 sets the start date on Monday 8:00
- You work from Monday to Friday, planning two days backwards from Monday 13:15 sets the start on Friday 8:00

Example

Planning forwardThe calendar runs from 8:00 to 17:00:

- Planning one day forward from 11:55 sets the start date on 17:00 (end of the day)
- Planning one day forward from Monday 17:05 sets the end date on Tuesday 17:00
- You work from Monday to Friday, planning two days forward from Friday 13:15 sets the end on Monday 17:00

Example

Planning 0 daysTherefore, if you plan:

- Zero (0) days backward/forward from 13:00 Monday, nothing happens because this time is already the working moment
- Zero (0) days backward from Monday 18:00, the date is set to Monday 17:00
- Zero (0) days forward from Monday 18:00, the date is set to Tuesday 8:00

Note: You can also plan zero (0) days. This sets the dates to the nearest working moment.

- Using days and hours

The list of available time units usually includes hours and days.

The granularities week and month are not supported to avoid problems with converting them into days.

The only exception is the definition of distances. In the distance tables by city and ZIP code, the time distance's unit is user definable. Unit conversion factors are used to calculate the length in seconds.

The lead time is then planned in seconds on the calendar, similar to the planning of hours.

- Conversion of hours to days

In general, the lead times defined in days are planned as days, and lead times defined in hours are planned as hours. Still, you must convert hours into days in a number of situations. The situations related to Enterprise Planning are:

- The calculation of the calculated lead time in the **Items - Purchase Business Partner (tdipu0110m000)** session
- The calculation of the order lead time to determine the economic order quantity in the **Optimize Lot Sizing (cpao3200m000)** session
- The cumulative lead time calculation in the **Check Horizons (cprpd1200m000)** session

To carry out the conversion, you can also use the average basic day capacity of the availability type involved. Because each lead time is linked to an availability type, an availability type is always involved. The basic day capacity is derived from the working times defined in the Workweeks (tcccp0105m000) session:

The total number of working hours defined / number of weekdays with working times

Chapter 3: Planning Framework

Time fences in order planning and in master planning

In LN, you can use a *time fence* to prevent LN from making changes in the near-future supply planning.

As a rule, LN does not overwrite the existing planned orders in the time fence. As a result, LN only generates planned orders beyond the time fence when you carry out the **Generate Order Planning (cprp1210m000)** or beyond the *forecast time fence* when you carry out the **Generate Master Planning (cprmp1202m000)** session.

To ignore the time fence for order planning, you can select the **Generate within** check box in the **Generate Order Planning (cprp1210m000)** session. Enterprise Planning then simulates the order planning for the selected range of plan items within the time fence and overwrites the existing planned orders.

In addition to the **Generate within** check box in the **Generate Order Planning (cprp1210m000)** session, the settings of the **Use Time Fence** check box in the **Items - Planning (cprpd1100m000)** session also impacts whether LN plans within or outside the time fence.

Dependent on the settings of both the **Generate within** check box and the **Use Time Fence** check box, three situations exist:

- If you clear the **Use Time Fence** check box, LN plans within the time fence, and does not take into account the settings of the **Generate within** check box in the **Generate Order Planning (cprp1210m000)** session.
- If you select the **Use Time Fence** check box, and you clear the **Generate within** check box, LN plans outside the time fence.
- If you select the **Use Time Fence** check box, as well as the **Generate within** check box, LN plans within the time fence.

Bshells for Parallel Processing

You may divide the planning run over multiple bshells in LN, this allows parallel processing of plan items.

Each bshell has its own processing capacity, so when multiple bshells are in use, the total processing capacity for planning run increases. The bshells are assigned plan items starting from the top planning level, until the complete level has been assigned and calculated. On each pass an average of 500 plan items is assigned to a bshell. Lower level plan items are only assigned to a bshell after the above level has been fully assigned.

The number of plan items that is allocated to each bshell is set in the Workload per Server field of the **Performance Parameters (cpcom0100m000)** session.

Setup

To setup multiple bshells for parallel processing:

- 1** Select the Parallel Processing check box in the **Generate Order Planning (cprp1210m000)** session.
- 2** Select the relevant session from the Session field in the **Performance Boosters (tcmcs0597m000)** session.
- 3** In the Performance Booster field give the number of bshells that are running.
- 4** To optimize performance the parameters in the Performance Parameters (cpcom0100m000) need to be set.
 - **Display Time Interval**
Enter the refresh interval for the progress bar when running the **Generate Order Planning (cprp1210m000)** session.
 - **Workload per Server**
Enter the maximum number of plan items that is included in each batch distributed over the parallel bshells.

If multiple bshells are used, LN uses a dynamic calculation to determine the optimal workload per server. The workload is used as the upper limit for each of the bshells. A workload of 500 plan items per bshell on average is recommended.
 - **Workload Based on Operations**
If this check box is selected, the routing composition of each item is used as a parameter for workload distribution over the available bshells.

Note The more operations a routing of an item is composed of, the more weight it has.

If this check box is selected, performance increases in case of large differences in the number of operations between the different items. If this situation doesn't apply, this parameter should be disabled.
 - **Dynamic Workload Calculation**
If this check box is selected, the total workload is equally distributed over the available bshells.

Note: The planning process can use multiple bshells, but the transfer process can only be implemented in one at a time.

Job shop production planning in Enterprise Planning

You can use Enterprise Planning for the logistic planning of items that you manufacture at one or more production sites.

In Enterprise Planning, production volumes are planned in the following way:

- Within the *master-planning horizon*, production is planned in the form of a *production plan*.
- Within the *order horizon*, production is planned in the form of *planned production orders*.

Note:

If *multisite* is activated, planning takes place per *planning cluster*. A planning cluster contains one or more *sites* where production can take place.

In master planning, only critical requirements (according to the *bill of critical materials* and the *bill of critical capacities*) are passed on to the component items and resources involved.

When a production volume is planned, the resulting requirements for components are passed on to the component items involved, so that LN can take this dependent demand into account when these items are planned. The capacity requirements resulting from planned production are passed on to the *resources* involved.

You can convert a production plan to planned production orders in the Convert Master Plan to Planned Orders (cprmp2240m000) session.

You can use the Transfer Order Planning (cppat1210m000) session to transfer a batch of planned production orders and/or production plans to the *execution level* of LN. In addition, you can use the **Transfer Planned Production Orders (cppat1211m000)** session to transfer one specific planned production order from the **Planned Orders (cprrp1100m000)** session to the execution level.

Purchase planning in Enterprise Planning

You can use Enterprise Planning for the logistic planning of items that you purchase from business partners.

In Enterprise Planning, purchase volumes are planned in the following way:

- Within the *master-planning horizon*, purchase is planned in the form of a *purchase plan*.
- Within the *order horizon*, purchase is planned in the form of *planned purchase orders*.

Note:

If you wish, you can convert a purchase plan to planned purchase orders in the **Convert Master Plan to Planned Orders (cprmp2240m000)** session.

You can use the **Transfer Order Planning (cppat1210m000)** session to transfer a batch of planned purchase orders and/or purchase plans to the *execution level* of LN. Here the planned orders become actual *purchase orders*. In addition, you can use the **Transfer Planned Production Orders (cppat1211m000)** session to transfer one specific planned purchase order from the **Planned Orders (cprrp1100m000)** session to the execution level.

Purchase schedules and Enterprise Planning

In LN, the purchase of *JIT items* is handled through *purchase schedules*. This topic describes how Enterprise Planning handles the purchase planning of these items.

During an order simulation in Enterprise Planning, purchase volumes are planned as *planned purchase orders*.

However, LN can also transfer purchase orders to a purchase schedule in the Purchase Control module of Procurement.

LN does so, if:

- The order simulation is run for the *actual scenario*.
- You selected the Purchase Schedule in use check box in the **Item - Purchase** session for the item involved.

If you run the Generate Order Planning (cprp1210m000) session, LN determines whether a shortage exists for a particular item for the simulated time period, and takes into account the demand, the firm supply, and for what exact moments possible shortages exist. If a shortage occurs, LN generates supply.

If LN uses a *purchase schedule* to plan supply for an item, LN does not generate *planned purchase orders*, but stores a purchase volume in an internal memory. When LN generated all the required purchase volumes for the item, LN groups the ordered purchase volumes in between two delivery moments in one purchase-schedule line, and lot sizes the purchase volumes according to the lot-size rules.

General constraints

During an order-based planning run, LN checks if shortages exist for the purchase schedule items. If so, LN records the supply of these items in *schedule lines* that it set on the delivery moments that you generated in the **Generate Planned Delivery Moments (tdipu0225m000)** session for the supplier involved in the purchase schedule. If the purchase schedule is shipment-based, LN lists these planned delivery moments in the **Planned Delivery Moments (Shipment Based) (tdipu0125m000)** session; if the purchase schedule is receipt based, LN lists the planned delivery moments in the **Planned Delivery Moments (Receipt Based) (tdipu0126m000)** session.

In the order-based planning process, LN carries out a rescheduling step to match supply with demand. The way in which this rescheduling mechanism works for purchase scheduled items differs slightly from the way LN applies this mechanism for items that are not planned through purchase schedules.

The following constraints apply for purchase schedule items:

- LN always disables the **Only Reschedule Total Order Quantity** check box in the **Planning Parameters (cprpd0100m000)** session for purchase schedule items.
- Purchase schedule lines always behave as if the **Planned Order before Firm/Actual** check box in the **Planning Parameters (cprpd0100m000)** session were selected.
- LN can only reschedule schedule line quantities to delivery moments.

Horizons and Frozen Zones

LN uses a specific horizon and a frozen zone to plan purchase schedule items. The horizon end date of a purchase schedule is the date until which LN displays delivery moments in the **Planned Delivery Moments (Shipment Based) (tdipu0125m000)** session or the **Planned Delivery Moments (Receipt Based) (tdipu0126m000)** session.

LN groups all the requirements between two delivery moments into one purchase schedule. LN groups purchase volumes that fall between the last defined delivery moment and the horizon end date to a *schedule line* for the last delivery moment.

Beyond the horizon end date, where no predefined delivery moments exist, LN inserts required purchase volumes into the purchase schedule, but does not lotsize, nor group the purchase volumes to a delivery moment.

After the contract related to the purchase schedule expires, LN translates the required purchase volumes to *planned purchase orders* for an empty supplier and generates a *message* to inform the planner.

Beyond the horizon end date, where no predefined delivery moments exist, LN translates required purchase volumes into planned purchase orders for an empty supplier and generates an *exception message* to warn the planner.

For plan items, LN uses a time fence as a period during which LN cannot modify the supply plan and the planned orders. However, for the firm part of purchase schedule items, LN uses a:

- Frozen period: the time period during which Enterprise Planning cannot generate or update purchase schedule lines.
- Frozen zone-: the time period calculated from the current date and during which LN takes into account a lower bound, which means that the schedule line quantities can increase, but not decrease. Enterprise Planning can create new schedule lines for new demand, but cannot delete existing schedule lines in this period.
- Frozen zone+: the time period calculated from the current date and during which LN takes into account an upper bound, which means that the schedule line quantities can decrease, but not increase. Enterprise Planning cannot generate new schedule lines in this period, but the quantities of the existing lines can be lowered.

Note: Do not specify a period of lower bound if you want Enterprise Planning to automatically delete undelivered and redundant schedule lines with a date in the past. Therefore, you can select the Delete Past Schedule Lines check box only if the Frozen Period for Decreasing Quantity field is zero in the **Items - Purchase Business Partner (tdipu0110m000)**, **Purchase Contract Line Logistic Data (tdpur3102m000)**, or **Purchase Contract Line Logistic Detail Line (tdpur3102m100)** sessions.

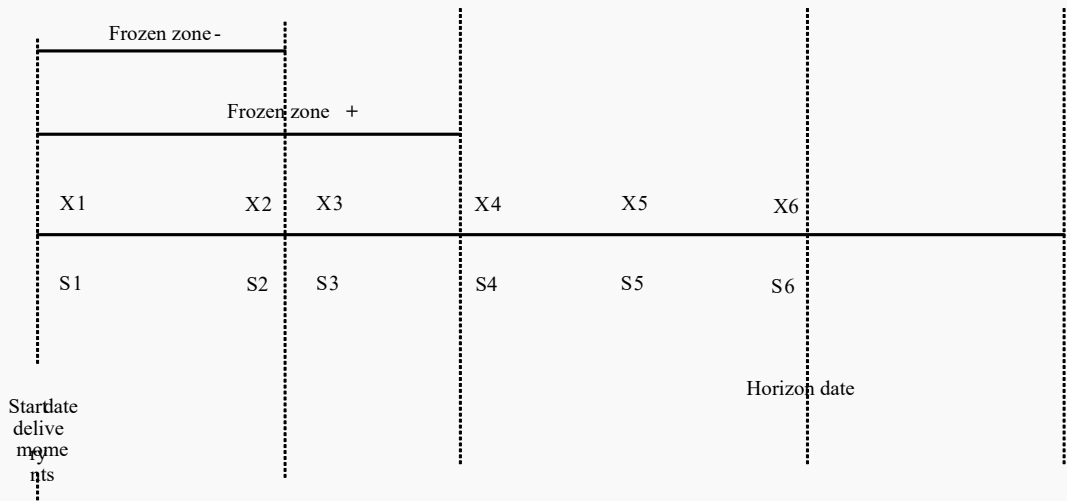
Purchase schedule items and time fences

In addition to the *frozen zone-*, the *frozen zone+*, and the *frozen period*, you can set a *time fence* in the **Items - Planning (cprpd1100m000)** session for items for which the **Purchase Schedule in use** check box in the **Item - Purchase** session is selected.

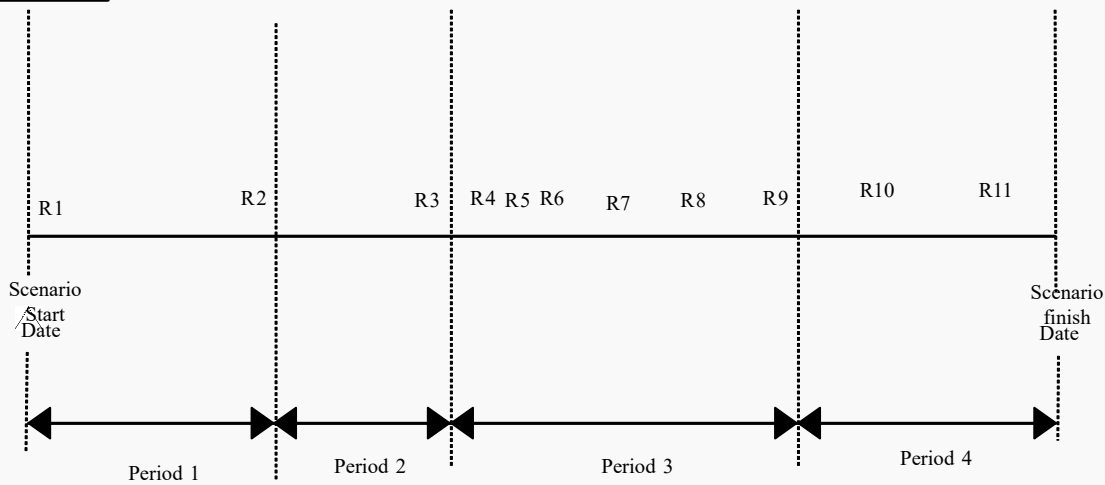
Although the use of a time fence for purchase schedule items leads to complex and unclear results, the reason for this functionality is that you can have multiple sources for a plan item. You can have several planning clusters for an item. Possibly, only one of these items has a purchase schedule, while the other items are distributed or manufactured items. Therefore, you can enter a time fence for plan items with a purchase schedule. However, if you do enter a time fence, LN displays a warning.

Example frozen zone and horizon

Purchase



Enterprise planning



X	delivery moment
S	schedule line
R	Requirement

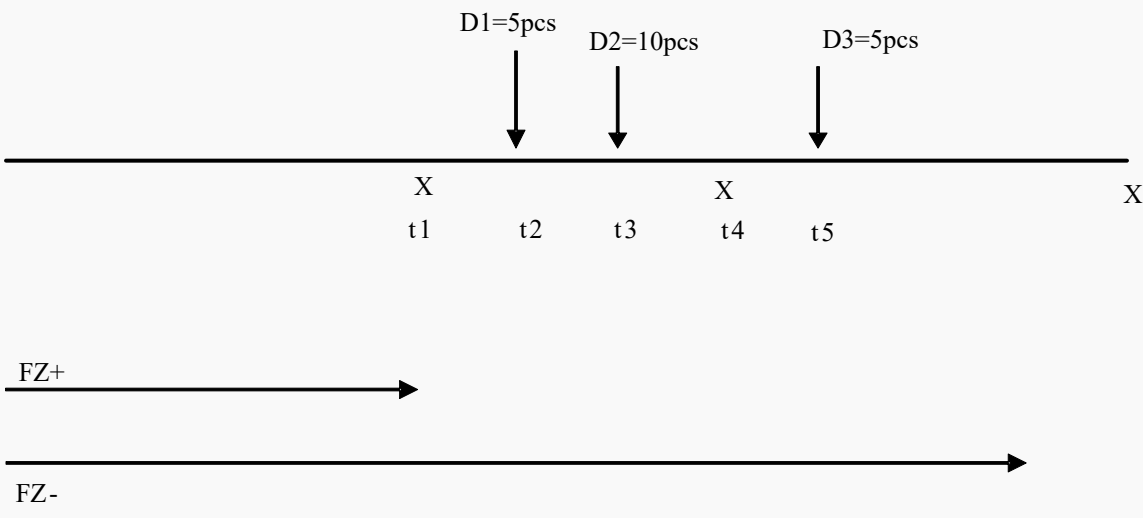
In Figure 1-1, the time span of the purchase schedule is divided in four periods. The figures show how both Procurement, and Enterprise Planning model the existing situation, and how LN handles requirements that occur in Enterprise Planning:

- Period 1 is the *frozen period*. LN cannot touch the volumes recorded in the schedule lines in this period. Enterprise Planning cannot plan supply in this period. To avoid supply from being originated by requirements that result from an order-planning or master-planning run end up in this period, Enterprise Planning generates a *rescheduling message* which advises you to plan the supply to another delivery moment on a date outside period 1.
- In period 2, the *frozen zone+*, LN cannot add new schedule lines, but only decrease the quantities of the schedule lines in this period. To avoid that requirements resulting from an order-planning or a master-planning run end up in this part of the purchase schedule, Enterprise Planning can generate rescheduling messages.
- In period 3, the purchase schedule can be regenerated, and subsequently the schedule lines (delivery moments) are not yet defined. Enterprise Planning groups all the requirements that it generated during a planning run to the delivery moments, and then sends these requirements to the Purchase Control module of Procurement where the requirements are used to update the corresponding schedule line.
- In period 4, Figure 1-1 shows that no more delivery moment are available. As a result, Enterprise Planning considers every date as a potential delivery moment, and does not group the requirements anymore, but sends them directly to Purchase Control.

Example planning and rescheduling

Figure 1-2 shows the existing demand for a purchase schedule item. All the time moments are in the *frozen zone-*, and t1 falls after the *frozen zone+*. In addition the following is true:

Min. Lot Size	8
Demand on t2	5 pcs
Demand on t3	10 pcs
Demand on t5	5 pcs
Pattern moment 1	on t1
Pattern moment 2	on t4



X	planned delivery moment
FZ+	frozen zone +
FZ-	frozen zone -

LN must fill the demand placed on t2 and t3 in time, which is why LN generates supply of 15 pieces on t1, that is, the closest planned delivery moment available.

LN must fill the second demand of 5 pieces, placed on t5, with a supply of 8 pcs (minimum lot size) on planned delivery moment t4 (see Figure 1-3).

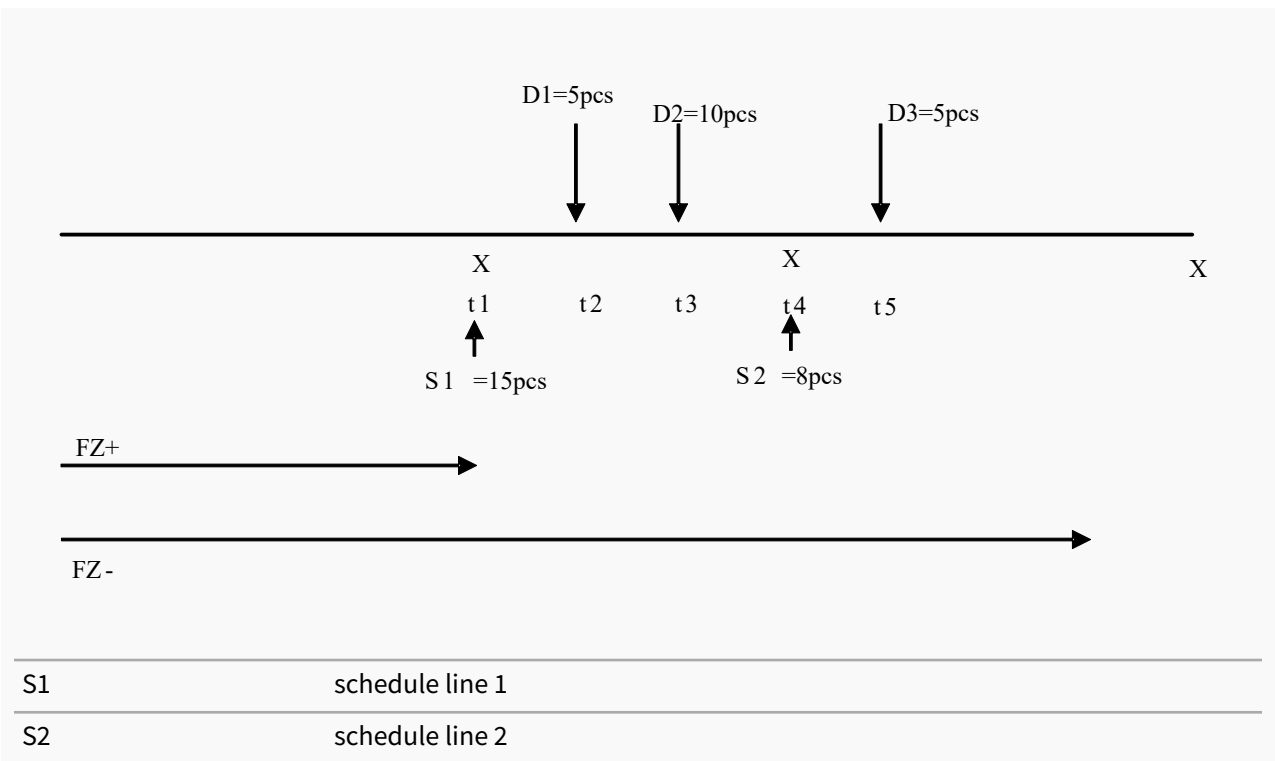
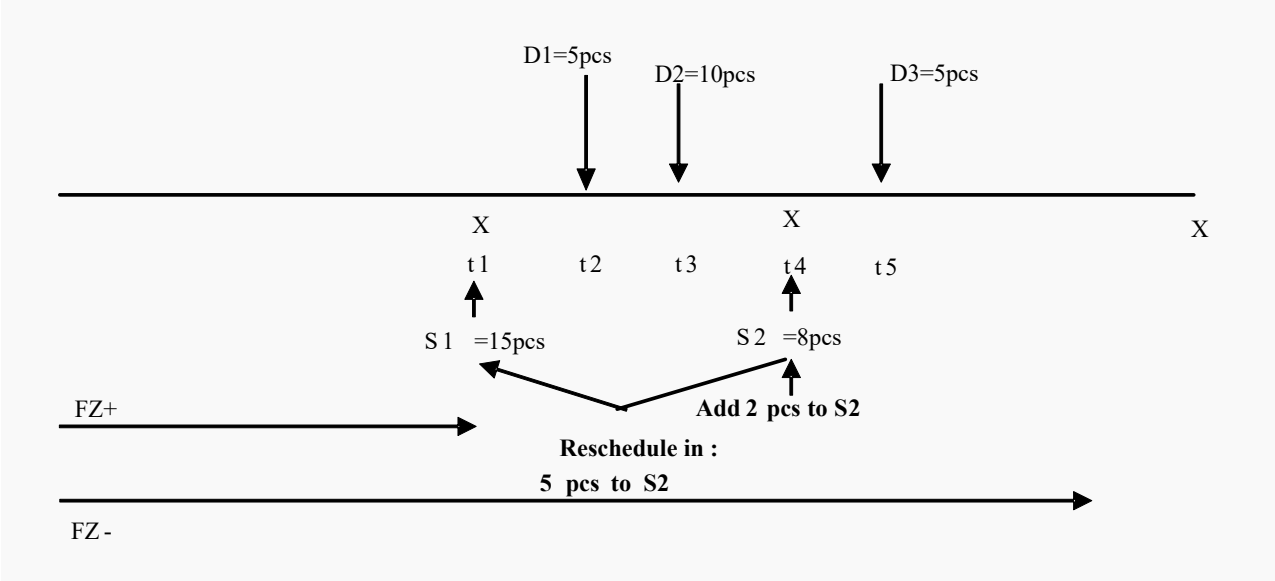


Figure 1-4 shows how LN reacts if the demand placed on t3 increases with 5 pieces.

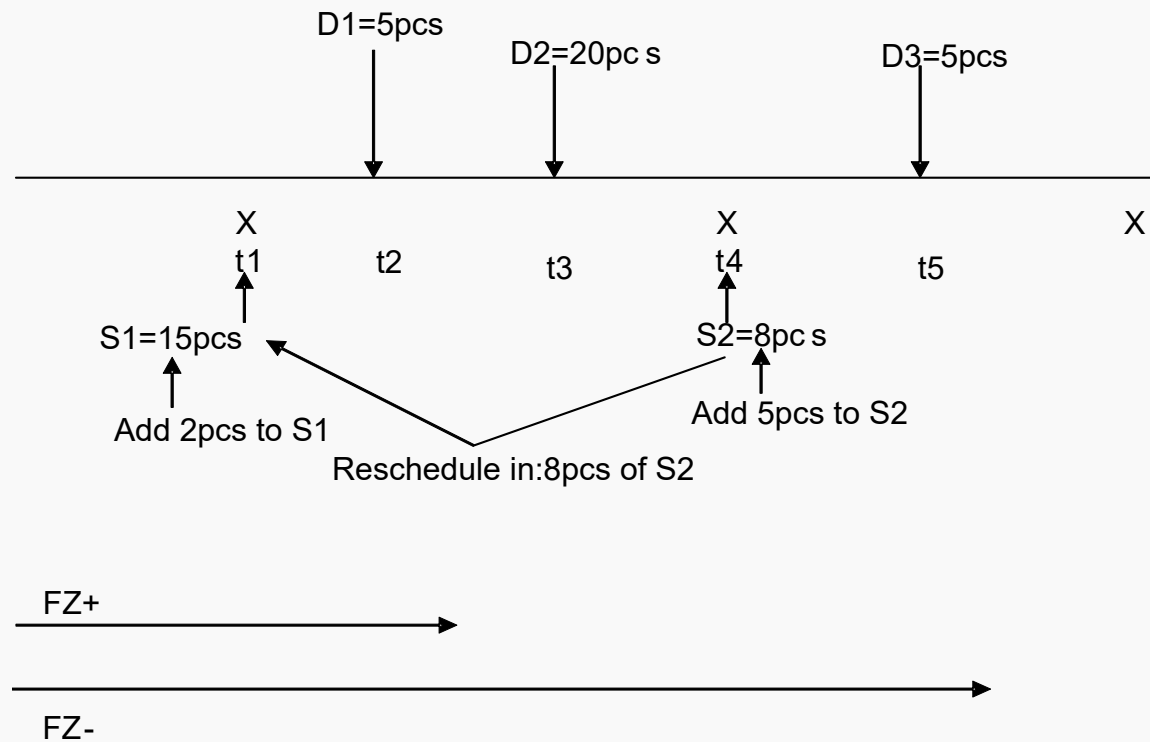


LN carries out the following steps during an order-based planning run, if the demand placed on t3 increases by five pieces (see Figure 1-3):

- 1 The schedule lines S1 and S2 are recognized as firm planned because these lines are in the *frozen zone*-. However, the lines are firm planned in the sense that LN can still increase the ordered quantity, not decrease it.

- 2 Generate a rescheduling message **Reschedule into %1\$u001 %2\$U001..** In other words, LN advises you to reschedule five pieces of schedule line 2 into schedule line 1.
- 3 LN adds 2 pieces to schedule line 2 to be able to fill the demand placed on t5.

Figure 1-5 shows the way in which LN reacts if the demand placed on t3 increases by ten pieces.



LN carries out the following steps during an order-based planning run, if the demand placed on t3 increases with 10 pieces (see Figure 1-5):

- 1 The schedule line are recognized as firm planned in the sense that LN can still increase the ordered quantity, but not decrease it.
- 2 Generate a rescheduling message **Reschedule into %1\$u001 %2\$U001..** In other words, LN advises you to reschedule eight pieces of schedule line 2 into schedule line 1.
- 3 LN adds 5 pieces to schedule line 2 to be able to fill the demand placed on t5.

Example: to calculate the optimized order parameters

Calculating the optimized order parameters is one of the steps that LN performs in the optimization algorithm for logistic parameters in the Resource Analysis and Optimization module in Enterprise Planning. The optimized order parameters consist of the optimized *order interval* (in days) and the optimized lot size.

Optimized order interval

The formula that LN uses to calculate the optimized order interval is the following:

$$OI = L/F$$

Where:

O	Order interval (days)
L	Optimized time period (days)
F	Number of times an item is produced in the optimized time period

Example

Suppose that we have the following data:

L:	60 days
F:	20

The calculation of the optimized order interval is then:

$$OI = L/F = 60/20 = 3$$

This means that the optimized order interval is 3 days.

Optimized lot size

The formula that LN uses to calculate the optimized lot size is the following:

$$LS = D/F$$

Where:

LS	Lot size
D	Total demand in the optimized period
F	Number of times an item is produced in the optimized period

Example

Suppose that we have the following data:

D:	600 pieces
F:	20

The calculation of the optimized lot size is then:

$$LS = D/F = 600/20 = 30$$

This means that the optimized lot size is 30 pieces

Generating Aggregation Relationships

You can use this session if the family structure of the item for which you want to define the aggregation relationships is rather extensive. Rather than define the aggregation relationships manually and one-by-one in the **Aggregation Relationships (cprpd3110m000)** session, LN can generate these relationships in one action.

By default, the aggregation relationship that LN generates, apply the following planning data:

- Production plans, production orders, and planned production receipts.
- Purchase plans, purchase orders, and planned purchase receipts.
- Inventory plan.
- Distribution orders and receipts.
- Demand forecast.
- Extra demand.

If you open the **Aggregation Relationships (cprpd3110m000)** details session for an aggregation relationship that LN generated, the check boxes in the **Aggregation Data** group are all selected, but you can still fine-tune the default settings.

LN can generate aggregation relationships between the following item types:

FROM	TO
normal plan item	family item
channel item	normal plan item
family item	family item
channel item	family item
channel item	channel family item
channel family item	channel family item

Maintaining Aggregation Relationships

Before you can define aggregation relationships, you must define plan items and sub-plan items in the **Items - Planning (cprpd1100m000)** session.

Possible aggregation relationships are:

normal plan item	family item
channel item	normal plan item
family item	family item
channel item	family item
channel item	channel family item
channel family item	channel family item

Note: If the main item is not of type **Family**, the sub-item is the same as the main item, and only the channel must be filled.

To define aggregation relationships:

- 1 Click the **New** button on the *appropriate* menu to insert a plan item for which you want to define aggregation relationships. You can also insert a *planning cluster* and/or a *channel*.
- 2 Click the add a **New** button to open the detail session where you can add a sub-item.
- 3 Determine the planning percentages for the sub-plan items. You can either enter a planning percentage manually in the Aggregation Relationships (cprpd3110m000) details session, or calculate a planning percentage automatically with the Calculate (Dis)Aggregation Percentages (cprpd3210m000) session. You can start this session from the *appropriate* menu, or select Update Aggregation Relationship check box when performing the calculation.

You can use the Aggregation Type field in the **Aggregation Relationships (cprpd3110m000)** details session to determine whether Enterprise Planning must aggregate, disaggregate, or both. The setting of this field is determinant for the way in which Enterprise Planning applies the data percentages that you define for the various types of aggregation data.

Click the **Sub-Plan-Item - Where-Used in Aggregation Relationships** button to zoom to the **Sub-Plan-Item - Where-Used in Aggregation Relationships (cprpd3515m000)** session, where you see in which aggregation relationships a specific sub plan item is used.

Click the **Calculate (Dis)Aggregation Percentages** button to zoom to the **Calculate (Dis)Aggregation Percentages (cprpd3210m000)** session, where you can let LN calculate the planning percentages for *aggregation relationships*.

LN uses aggregation relationships in the **Aggregate Channel, Plans & Orders (cprmp2250m000)** session and the **Disaggregate Channel, Plans & Orders (cprmp2260m000)** session.

Chapter 4: Order Based Planning

Order planning, an overview

Order planning is a planning concept that has the following aspects:

- A method for maintaining planning data (in various degrees of detail)
- A method for supply planning (by generating planned orders)

Order planning works with the following types of order plans:

- *Item order plan*
- *Resource order plan*

The item order plan is based on detailed planning data from various sources. The item order plan is not stored as such, but is composed online when you run the Item Order Plan (cprp0520m000) session. You can choose between various levels of detail for the item order plan, ranging from 28-day periods to the level of individual orders.

If *multisite* is activated, planning is done by *planning cluster*.

Order-based supply planning

During an order simulation (RRP run), supply is planned in the form of planned orders. You can carry out an order simulation in the following sessions:

- **Generate Order Planning (cprp1210m000)**
- **Generate Order Planning (Item) (cprp1220m000)**

Enterprise Planning can generate three types of planned orders:

- *Planned production orders*
- *Planned purchase orders*
- *Planned distribution orders*
- *Planned Production Schedules*
- *Production Schedules*

For planned production orders, Enterprise Planning uses:

- *BOMs* linked to the item and *site* combination to explode material requirements
- *Routings* linked to the item and *site* to calculate lead times and determine the necessary resource capacity

Instead of using routings, Enterprise Planning can also use fixed lead times for planned production orders.

Note:

Most horizons and time fences in Enterprise Planning are rounded to the end of a *plan period*. Therefore, you need to define plan periods for the scenario involved, even if you only use order-based supply planning.

The horizon of the **Item Order Plan (cprp0520m000)** session is the *planning horizon*, so that you can check all the item's transactions time-phased. If an item does not have an *item master plan*, the planning horizon is equal to the *order horizon*. If you use the **Convert Master Plan to Planned Orders (cprmp2240m000)** session in combination with *workload control*, you must extend the *item order plan* view with the planning horizon.

LN shows the *production plan* and the *purchase plan* as *planned production orders* and *planned purchase orders*, with a blank **Order Number** field.

- Planned supply orders

In the **Planned Orders (cprp1100m000)** session you can:

- Review existing planned orders
- Modify existing planned orders
- Manually create planned orders
- Transfer to execution level

You can transfer planned orders to the *execution level* in the **Transfer Order Planning (cppat1210m000)** session, or transfer an order manually in the **Transfer Planned Production Orders (cppat1211m000)**, which you can access via the *appropriate* menu of the **Planned Orders (cprp1100m000)** session.

Order statuses in Enterprise Planning

You can view planned supply orders in the **Planned Orders (cprp1100m000)** session.

In general, a *planned order* proceeds through the following *order statuses* during its life cycle:

- **Planned**
- **Firm Planned** (optional)
- **Confirmed**

Planned

When a planned order is generated, it normally gets the **Planned** order status. During the order-planning process, existing planned orders with this order status are discarded.

These planned orders are not yet final. You can change parameters and modify individual planned orders. To make a planned order permanent during order planning runs, change its status to **Firm Planned**.

Firm Planned

You can manually set a planned order's status to **Firm Planned**. During an order simulation, existing orders with **Firm Planned** or **Confirmed** status are retained, unless you select the **Remove Firm Planned Orders** check box. Enterprise Planning does no longer change the planned order's date and quantity.

As a rule, Enterprise Planning does not plan any new planned orders before the last order with **Firm Planned** status or higher. In other words, such a planned order effectively serves as an additional *time fence*.

Confirmed

To indicate that the planner has approved a planned order, set its status to **Confirmed**. A confirmed planned order is ready to be transferred to the *execution level*.

You can confirm a planned order manually, or do this for a range of planned orders by running the **Confirm Order Planning (cprp1200m000)** session.

You can determine which planned orders must be confirmed based on the order lead time. For more information, refer to Confirm planned orders based on lead time.

Transfer to execution level

You can transfer planned orders to the *execution level* in the **Transfer Order Planning (cppat1210m000)** session, which you can access via the *appropriate* menu of the **Planned Orders (cprp1100m000)** session.

As a rule, only confirmed orders are transferred. However, in the **Transfer Order Planning (cppat1210m000)** session you can expand the transfer to firm-planned orders, and even to orders with **Planned** status.

Order groups

To handle the order status of groups of *planned production orders* in a convenient way, use *order groups*. For more information, refer to Order grouping in Enterprise Planning.

Planned orders in Enterprise Planning

Planned orders in Enterprise Planning are generated during an order simulation in one of the following sessions:

- Generate Order Planning (cprp1210m000)
- Generate Order Planning (Item) (cprp1220m000)

Note: If *multisite* is activated, planning is done by *planning cluster*.

You can review existing planned orders in the **Planned Orders (cprp1100m000)** session. For example, you can review the *order status* of each order by site, and manually change it in the Planned Orders (cprp1100m000) details session.

In the Planned Order (cprp1600m000) session you can view details of a planned order line, such as pegging information, which indicates the source of the demand for which the order line was generated.

In the **Planned Orders (cprp1100m000)** session, you can also manually create a new order, or modify an existing one. For example, you can change the finish date of an order line, and then replan the order line based on this new date.

Order grouping in Enterprise Planning

Order groups are used to limit the handling of individual orders. Packages are created that contain multiple orders that can be handled as one large order. Planned orders can be grouped when they share a particular characteristic.

An *order group* in Enterprise Planning is a collection of *planned production orders*. You can collectively confirm the planned orders in an order group or transfer the planned orders to Job Shop Control.

If you transfer the planned orders of an order group, you can indicate that Manufacturing must create *order groups* for Job Shop Control based on the order groups in Enterprise Planning. Then, you can use those order groups to collectively perform actions, such as release production orders or generate outbound advice for materials.

Only planned production orders that belong to the *actual scenario* can be part of an order group.

A planned order can belong only to a single order group.

Definition of order groups

You can create order groups, based on different criteria, such as:

- *Order status*
- *Start date or finish date*
- *Routing group*
- *Warehouse*
- *Work center, task, or machine*
- *Required tools*
- *Main item* or range of item codes or item characteristics
- *Used materials*

You can manually add or remove planned orders to or from an order group.

Automatic-update order groups

An order group without the automatic-update feature can be modified only by manually adding or removing planned orders.

An *automatic-update order group* stores a set of planned orders and a set of criteria. If you run the order planning process with the automatic-update feature activated, LN rebuilds the order group and includes the planned orders that currently match the criteria and are not yet part of another order group.

Example

If you create an order group without the automatic-update feature for planned production orders using machine TGGU2, and a later order-planning run generates more planned orders for the same machine, the new planned orders are not part of the order group.

If you create an automatic-update order group for planned production orders using machine TGGU2, and a later order-planning run generates more planned orders for the same machine, these new orders are added to the order group when you update the order group.

Overlapping criteria

If you define two automatic-update order groups with overlapping criteria, and a planned order belongs to both order groups, the planned order is included only in the first matching order group.

Example

First, you created order group G10034. G10034 contains planned orders for item A.

Then, you created order group G20001. G20001 contains planned orders linked to planner J.

If a planned order for item A is linked to planner J, the planned order is included in the G10034, which was created first, but the planned order is not included in G20001.

Maximum size

To avoid order groups with an impractically high number of planned orders, you can define a maximum size.

Removing planned orders and deleting order groups

If an order group without the automatic-update feature does no longer contain any planned orders, LN deletes the order group. This can occur when all planned orders have been transferred, or when the planned orders were deleted, or when you removed the planned orders from the order group manually.

LN does not automatically delete *automatic-update order groups*.

Rough Requirement Planning run, an overview

If you simulate orders with the **Generate Order Planning (cprp1210m000)** session, LN carries out the following steps for the specified *scenario* and *plan level*.

- Determine the set of items to simulate
- Determine the planning sequence of the items
- Simulate the items one by one

1. Determine the set of items to simulate

You can specify a range of items in the **Generate Order Planning (cprp1210m000)** session. If you use the **Generate Order Planning (Item) (cprp1220m000)** session you can specify a single item.

You can make the item selection smaller by selecting the **Run a Net Change Planning** check box. For more information, refer to Net-change simulations.

You can extend the item selection by selecting one or both of the following check boxes:

- **Include Parent Items**
- **Include Child Items**

For more information about these check boxes, refer to RRP run, item selection.

2. Determine the planning sequence of the items

LN sorts the items by *order phase-number*. This sequence ensures that the end products are planned before the components. For more information, refer to Planning sequence and phase numbers.

LN divides each group of items that have the same phase number in two sub-groups:

- The first sub-group contains all items that are used as a *use-up material* or an *alternative material*.
- The second sub-group contains the remaining items.

Items that are defined as alternative materials must be planned first, to determine the *ATP* (available-to-promise) of these items.

If the RRP run later decides to use a use-up material instead of a standard material, or if the RRP run uses an alternative material to cover for a shortage of the standard material, the first planning results for the alternative materials are no longer correct. In that case, LN replans the alternative materials automatically.

3. Simulate the items one by one

LN plans each item in the order of phase number. See

- RRP run, basic calculation for one item

RRP run, item selection

This section describes how LN selects the items to plan in the **Generate Order Planning (cprp1210m000)** session and the **Generate Order Planning (Item) (cprp1220m000)** session.

- Net-change planning

For each plan item, LN records if a change has occurred since the last simulation, for example, a change in the bill of material or changed demand figures. LN also records the earliest date on which a change has occurred (*net change date*).

You can have the order-planning sessions to plan only the items for which planning data changed since the last planning run.
- Bottom-up item selection

To investigate the effects of a change in availability of some critical component that is used in many end products, you can use the bottom-up item-selection feature.

In a bottom-up planning run, the LN plans every item that somehow relies on the availability of the originally selected plan item.
- Top-down item selection

To perform a complete planning run for some high-priority sales order, for example, for a sophisticated customized (engineer-to-order) end item, you can use the top-down item-selection feature.

In a top-down planning run, LN plans every purchased item and subassembly of which the timely availability can influence the production of the originally selected plan item.
- Restrictions

LN applies the following restrictions to the selection of plan items, for which LN generates the order planning:

- LN only includes plan items that you defined on the specified *plan level*.
- Bottom-up item selection does not work for items with a *standard-to-order (STO)* structure.
- Both top-down and bottom-up select the related items on one *company*. The selection algorithm stops as soon as it encounters a company change.
- Selection procedure

LN determines the set of plan items to plan in the following way:

1 Selection range

LN selects the plan item you specified in the **Generate Order Planning (Item) (cprp1220m000)** session or the range of plan items you specified in the **Generate Order Planning (cprp1210m000)** session.

2 Bottom-up selection

If you select the **Include Parent Items** check box, for the selected plan items, LN also includes the following items:

- Parent items on the *bill of material (BOM)*.
- Receiving items specified in the **Supplying Relationships (cprpd7130m000)** session.
- Parent items on the *generic bill of material (BOM)* for the generic items included in the item range.
- Derived items: The project items for which you created a project in the Project Control module in Manufacturing.
- Alternatives
 - The *use-up materials* and *alternative materials* of the selected items.
 - All items for which a selected item is a use-up material or alternative material.

The bottom-up selection works in a multilevel way. For example, LN also selects the parent item of the parent item, up to the end items that can be sold to customers.

3 Top-down selection

If you select the **Include Child Items** check box, for the selected plan items, LN also includes the following items:

- Components on the bill of material.
- Supplying items that you specified in the **Supplying Relationships (cprpd7130m000)** session.
- Components on the generic bill of material (BOM), for the generic items included in the item range.
- Derived-from items: The generic or normal items that you use to create project items in the Project Control (PCS) module of Manufacturing, and from which the project items included in the specified item range are derived.

If, during the order-based planning, the project structure of a project item must be built up, this also works together with the top-down item selection algorithm. For example, if during order-based planning, LN finds out that supply must be generated for project item PX, LN copies the structure of item X. In that case, LN must also create new project items. These newly created project items are also taken into account during the planning.

- Alternatives
 - The *use-up materials* and *alternative materials* of the selected items.
 - All items for which a selected item is a use-up material or alternative material.

The top-down selection works in a multilevel way. For example, LN also selects the components of the components, up to the purchased parts.

4 Restrictions

LN applies the restrictions listed previously under "Restrictions" to the plan item selection.

5 If you selected the **Run a Net Change Planning** check box, LN restricts the planning run to plan items of which the planning parameters, or item structure has changed since the previous order-planning run. For details, refer to Net-change simulations.

6 Phantom items

If the **Inherit Warehouse if Parent Item is a Phantom** check box in the **Bill of Material (tibom1110m000)** session is selected for any of the selected plan items, Enterprise Planning selects plan items for all clusters for the material. For more information, refer to Direct material supply (DMS)

For examples of this procedure, refer to Item selection in order planning, examples.

To generate planned orders

During an order simulation (RRP run), Enterprise Planning generates planned orders to cover inventory shortages.

Enterprise Planning uses the following procedure:

1 Determine the finish date

2 Determine the quantity

3 Select a source of supply

4 Select one or more suppliers, and determine the order quantity

5 Correct the finish date

6 Determine the start date

1 Determine the finish date

For more information, see To compute supply lead-times.

2 Determine the quantity

LN determines the quantity to be ordered, including all demand within the *order interval*, and taking the lot-size rules into account.

3 Select a source of supply

Enterprise Planning can generate three types of planned orders:

- *Planned production order*
- *Planned purchase order*
- *Planned distribution order*

LN chooses between these types of orders according to a *sourcing strategy*. If no sourcing strategy exists, Enterprise Planning uses the default source defined in the **Items - Planning (cprpd1100m000)** session.

4 Select one or more suppliers, and determine the order quantity

This step only applies to planned purchase orders and planned distribution orders.

If the selected source is purchase, Enterprise Planning searches for one or more external suppliers.

If the selected source is distribution, Enterprise Planning searches for one or more internal suppliers.

The way the required volume is distributed over various suppliers is determined by the supply strategy defined in the **Supply Strategy (cprpd7120m000)** session. If no supply strategy is found, Enterprise Planning uses a default strategy.

If necessary, LN adjusts the order quantity for planned orders to account for the lot sizing rules. See Lot sizing.

5 Correct finish date

For more information, see To compute supply lead-times.

6 Determine start date

For more information, see To compute supply lead-times.

Exploded requirements

If LN generates a planned production order, it also generates the requirements for the components of the manufactured item. LN takes these exploded requirements into account when it simulates items with higher *phase numbers*. In case of a multicompany simulation, LN also carries out this explosion process for planned distribution orders.

For information on reviewing and modifying planned orders, see Planned orders in Enterprise Planning.

RRP run, basic calculation for one item

The planning engine matches the planned requirements against the planned receipts and identifies potential shortages.

If the expected inventory level deviates from the inventory plan, LN generates *rescheduling messages* for existing orders, or generates new *planned orders* if necessary.

In the following section, the steps of an RRP run are described. These steps are:

- 1** Determine the simulated time period.
- 2** Consume demand forecast.
- 3** Determine the starting inventory.
- 4** Place receipts and requirements on a time axis.
- 5** Select next requirement.
- 6** Check the inventory.
- 7** Generate rescheduling messages.
- 8** Transfer anonymous inventory to project inventory.
- 9** Generate planned orders.
- 10** Generate cancel messages.
- 11** Update database.

Alternative materials

If the **Alternative Materials** check box in the **Implemented Software Components (tccom0100s000)** session is selected, LN follows a modified algorithm. For more information, refer to Use-up materials and alternative materials in Enterprise Planning.

1. Determine the simulated time period

LN carries out the simulation over a certain time period. The simulated time period is determined by the following factors:

- Start date and end date of the scenario.
- *Time fence* and *order horizon*.
- *Net-change date*.

For information about these factors, see Simulated time period (RRP run).

2. Consume demand forecast

If no item master plan exists for a plan item, demand forecasts are recorded in the **Special Demand by Item (cpdsp2100m000)** session. Enterprise Planning performs forecast consumption to determine how much of the forecast has not yet been filled in by actual demand. This non-consumed forecast is taken into account during the planning process.

3. Determine the starting inventory

LN determines the inventory at the start of the simulation by retrieving the current on-hand inventory, and adjusting this inventory for all *planned inventory transactions* until the start date of the simulation.

4. Place receipts and requirements on a time axis

LN places all existing requirements and scheduled receipts on a time axis for subsequent analysis.

The following types of demand data are taken into account:

- Non-consumed demand forecast
- Actual sales orders
- Critical material requirements originating from *master planning*
- Dependent demand originating from planned orders
- Dependent demand originating from actual orders

The following types of supply data are taken into account:

- Planned orders with **Firm Planned** order status
- Planned orders with **Confirmed** order status
- Actual supply orders

Note

Before LN carries out a planning run, all previously created planned orders with **PLanned** order status are removed.

If you select the **Remove Firm Planned Orders** field in the **Generate Order Planning (cprrp1210m000)** session, LN also removes the previously created planned-orders with **Firm Planned** order status.

The receipts and requirements are retrieved from:

- The non-consumed demand forecast in the item master plan, or in the **Special Demand by Item (cpdsp2100m000)** session (if no item master plan exists).
- The critical material requirements in the Master Planning module.
- The planned inventory movements in the Order Planning module.
- The *planned inventory transactions* in the Inventory Planning module in Warehousing.
- The *inventory transactions* in the Inventory Reporting module in Warehousing.

5. Select next requirement

Search for the next requirement. If a requirement can be found, subtract the required quantity from the inventory, and proceed with the next step.

If there are no more requirements, go to step 10 (generate cancel messages).

6. Check the inventory

If the inventory drops below the required inventory level, proceed with the next step (reschedule receipts), or else, return to step 5 (select next requirement).

If an item has no item master plan, Enterprise Planning uses the *safety stock* to determine the required inventory level. You can define the safety stock in the **Items - Ordering (tcibd2100m000)** session. Here you can also specify a *seasonal pattern* for seasonal variations in the safety stock.

If an item has an item master plan, the *inventory plan* in the **Item Master Plan (cprmp2101m000)** session is used. However, the inventory level in the first simulated period must be at least equal to the safety stock.

7. Generate rescheduling messages

Search for the next receipt. If a receipt can be found:

- 1 Add the received quantity to the inventory.
- 2 If necessary, generate a rescheduling message for this receipt.
- 3 Return to step 6 (check the inventory).

LN generates two types of rescheduling messages:

- **Reschedule Out** (move order to later date)
- **Reschedule In** (move order to earlier date)

For more information, see Exception Messages in Enterprise Planning.

If the **Only Reschedule Total Order Quantity** check box in the **Planning Parameters (cprpd0100m000)** session is cleared, LN can also reschedule part of an order.

You can let LN automatically process the rescheduling messages in the **Process Exception Messages (cprao1220m000)** session. For more information, see Order and order planning exception messages.

Example

Scheduled receipt for day 1:	20 pcs
Scheduled receipt for day 4:	10 pcs

Requirements:

Day	1	2	3	4
Scheduled receipt	15			10
Required quantity	0	5	14	6

In this example there will be 3 rescheduling messages:

- Reschedule out from day 1 to day 2: 5 pcs
- Reschedule out from day 1 to day 3: 10 pcs
- Reschedule in from day 4 to day 3: 4 pcs

Note

In the **Exception Message Types by Planner (cpao1110m000)** session, you can set a tolerance in days for rescheduling messages. For example, if you set a tolerance of one day for reschedule-out messages, the first rescheduling message in this example will not be generated.

If there are no more receipts, proceed with the next step (transfer anonymous inventory).

8. Transfer anonymous inventory to project inventory

If the item is a *project item* that is derived from a standard item, LN can transfer inventory of the standard item to the inventory of the project item. See Project items in Enterprise Planning .

9. Generate planned order

Generate a planned order and add the order quantity to the inventory. For more information, see To generate planned orders.

Note

A *firm-planned* order serves as a sort of additional *time fence*: LN does not generate planned orders before the last firm-planned order. If necessary, LN generates reschedule-in messages.

However, you can override this rule by selecting the **Planned Order before Firm/Actual** check box in the **Planning Parameters (cprpd0100m000)** session.

Return to step 5 (select next requirement).

10. Generate cancel messages

Generate cancel messages for all scheduled receipts that are not yet selected. These receipts are unnecessary.

11. Update database

LN stores the results of the simulation in the database. LN updates the data in the following sessions:

- **Planned Orders (cprrp1100m000)**
- **Planned Order - Inventory Movements (cprrp0511m000)**
- **Capacity Use by Planned Order (cprrp2100m000)**
- **Items - Planning (cprpd1100m000)**

RRP run, required inventory level

When LN determines the required inventory level for order-based planning, it takes the following data into account:

- Safety stock
- Inventory plan

You can define the *safety stock* in the **Items - Ordering (tcibd2100m000)** session. In the same session, you can define a *seasonal pattern* for safety stock.

You can define the *inventory plan* in the **Item Master Plan (cprmp2101m000)** session. You can also generate the inventory plan (see Inventory planning in Enterprise Planning).

If the item has a master plan, the inventory plan determines the required inventory level. However, the inventory level in the first simulated period must be at least equal to the safety stock.

If the item has no master plan, the required inventory level in each plan period is equal to the safety stock.

Bshells for Parallel Processing

You may divide the planning run over multiple bshells in LN, this allows parallel processing of plan items.

Each bshell has its own processing capacity, so when multiple bshells are in use, the total processing capacity for planning run increases. The bshells are assigned plan items starting from the top planning level, until the complete level has been assigned and calculated. On each pass an average of 500 plan items is assigned to a bshell. Lower level plan items are only assigned to a bshell after the above level has been fully assigned.

The number of plan items that is allocated to each bshell is set in the Workload per Server field of the **Performance Parameters (cpcom0100m000)** session.

Setup

To setup multiple bshells for parallel processing:

- 1 Select the Parallel Processing check box in the **Generate Order Planning (cprrp1210m000)** session.
- 2 Select the relevant session from the Session field in the **Performance Boosters (tcmcs0597m000)** session.

- 3** In the Performance Booster field give the number of bshells that are running.
- 4** To optimize performance the parameters in the Performance Parameters (cpcom0100m000) need to be set.
- **Display Time Interval**
Enter the refresh interval for the progress bar when running the **Generate Order Planning (cprrp1210m000)** session.
 - **Workload per Server**
Enter the maximum number of plan items that is included in each batch distributed over the parallel bshells.

If multiple bshells are used, LN uses a dynamic calculation to determine the optimal workload per server. The workload is used as the upper limit for each of the bshells. A workload of 500 plan items per bshell on average is recommended.
 - **Workload Based on Operations**
If this check box is selected, the routing composition of each item is used as a parameter for workload distribution over the available bshells.

Note The more operations a routing of an item is composed of, the more weight it has.
If this check box is selected, performance increases in case of large differences in the number of operations between the different items. If this situation doesn't apply, this parameter should be disabled.
 - **Dynamic Workload Calculation**
If this check box is selected, the total workload is equally distributed over the available bshells.
- Note:** The planning process can use multiple bshells, but the transfer process can only be implemented in one at a time.

Simulated time period (RRP run)

An order simulation (RRP run) is always carried out for a particular time period. The simulated time period is limited by a number of factors:

- The start date and end date of the scenario, defined in the **Scenarios (cprpd4100m000)** session.
- The *time fence* and the *order horizon* of the item, defined in the **Items - Planning (cprpd1100m000)** session.
- **Firm-planned orders**
A *firm-planned* order serves as a sort of additional time fence: LN does not generate planned orders before the last firm-planned order. If necessary, LN generates reschedule-in messages. However, you can override this rule by selecting the **Planned Order before Firm/Actual** check box in the **Planning Parameters (cprpd0100m000)** session.
- **Simulate in time fence**
If you select the **Generate within** check box, the time fence is ignored and the simulation can start at the current date.
- **Net-change simulation**

If you select the **Run a Net Change Planning** check box, the simulation does not start before the *net-change date* (see Net-change simulations).

Note:

LN determines the end date and time for the simulated time period with the following formula:

```
End point = current date + order horizon - 1 second
```

See also Workdays and calendar days in Enterprise Planning

Net-change date before time fence

If LN detects changes that influence planned orders, for example, a changed BOM, LN sets the net-change date to the date of these changes. A zero net-change date indicates that nothing has changed since the last simulation. After simulating an item, LN resets the net-change date to zero.

If the net-change date lies before the time-fence date, two problems arise:

- If you do not simulate within the time fence, your planning might not be up-to-date.
- You cannot see whether or not the net-change date must be reset.

Resetting the net-change date

If you run an order simulation by means of the **Generate Order Planning (cprp1210m000)** session or the **Generate Order Planning (Item) (cprp1220m000)** session, the **Reset Net Change in Time Fence** check box determines if LN resets a net-change date that falls within the time fence.

Note:

If the **Generate within** check box is selected, LN always resets the net-change date. In this case, the **Reset Net Change in Time Fence** check box is unavailable.

If you clear the **Reset Net Change in Time Fence** check box, LN does not reset a net-change date that falls within the time fence.

This setting has the following consequences:

- The advantage is that if you ignore the time fence during a next simulation, the correct net-change information is still available.
- The disadvantage is that as long as this net-change date exists, any net-change simulation usually starts at the time fence. As a result, you effectively lose the advantage of the net-change method.

If you select the **Reset Net Change in Time Fence** check box, LN always resets the net-change date.

This setting has the following consequences:

- The advantage is that the net-change method will still work after the simulation.
- The disadvantage is that after the simulation, the reset net-change status suggests that the planning is up-to-date, which is possibly not the case. Even if you ignore the time fence in a next simulation, the correct net-change information is no longer available.

In *master planning*, a net-change date that falls before the time fence is always reset during a simulation.

Planning sequence and phase numbers

Planned supply for a plan item can result in requirements for other plan items. Because of such logistic dependencies, plan items must be planned in a specific order.

Enterprise Planning uses *phase numbers* to determine the order in which items are planned.

Order planning

In *order planning*, each item has its own order phase number.

The order phase numbers determine in which order plan items are planned:

- All plan items with phase number 0
- All plan items with phase number 1
- And so on

Master planning

In *master planning*, each item has its own master-planning phase number. Moreover, each plan unit has its own phase number.

In master planning, supply planning is carried out by plan unit. A plan item that does not belong to a plan unit is treated as a plan unit of its own.

The items are planned in the following order:

- All plan units with phase number 0, and all plan items that do not belong to a plan unit and which have phase number 0
- All plan units with phase number 1, and all plan items that do not belong to a plan unit and which have phase number 1
- And so on

Note: The planning order within a plan unit is only relevant for *workload control*. Here the planning order within the plan unit is determined by the priority level computed for each item. For more information, see *Workload control*, to compute planning priorities.

Reviewing and computing phase numbers

You can find a plan item's master-planning phase number and order phase number in the **Items - Planning (cprpd1100m000)** session. A plan unit's phase number is displayed in the **Plan Unit (cprpd6100m000)** session.

You can use the **Compute Phase Numbers (cprpd6200m000)** session to recompute phase numbers. Alternatively, you can let LN recompute phase numbers online.

To compute phase numbers for order-based planning

LN computes a phase number for each plan item.

LN bases the *phase number* for order-based planning on the following data:

- *Bill of material (BOM)*
- *Supplying relationships*

Criteria for phase numbers

The phase numbers of the plan units must conform to the following criteria:

- If a plan item is defined as a component of another plan item in a BOM, the phase number of the component must be greater than the phase number of the parent.
- A plan item must have the same phase number as any of the *use-up materials* and *alternative materials* of that plan item.
- If a supplying relationship exists between two plan items that belong to the same company, the phase number of the supplying item must be greater than the phase number of the receiving item.
- If a supplying relationship exists between two plan items, and both items are controlled by central multicompany planning, the phase number of the supplying item must be greater than the phase number of the receiving item.

Note: An item is controlled by central multicompany planning if the **Central Multicompany Planning** check box in the **Items - Planning (cprpd1100m000)** session is selected. Moreover, there must be a central multicompany scenario that includes the companies involved. If you use the **Compute Phase Numbers (cprpd6200m000)** session to recompute phase numbers for central multicompany planning, you need to specify the multicompany scenario involved.

Computation procedure

The computation of the phase numbers is an iterative process. You can choose between two methods:

- Regenerative computation
- Net-change computation

In a regenerative computation, every plan item initially gets phase number 0. LN then checks the plan items one by one and adjusts their phase numbers until the criteria for phase numbers are fully met. For information on the net-change computation see Net-change phase number computation.

You can see the result of the computation in the **Order Phase Number** field in the **Items - Planning (cprpd1100m000)** session.

Note: The phase number computation also checks for cycles in the bills of materials.

Forecast Consumption without an Item Master Plan

If an item has no *item master plan*, the only available type of demand forecast is *special demand*.

You can enter special demand for an item or item/channel combination in the **Special Demand by Item (cpdsp2100m000)** session.

LN automatically applies forecast consumption during an order simulation. In the **Item Order Plan (cprrp0520m000)** session and the **Special Demand by Item (cpdsp2100m000)** session, you can also manually perform forecast consumption.

Forecast-consumption procedure

The dates of the forecast demand and the actual demand that consumes it do not have to match exactly. A particular instance of actual demand can also consume forecast demand from an earlier moment, or forecast demand from a later moment. This depends on the values of the following fields in the Scenarios (cprpd4100m000) session:

- **Backward Forecast Consumption**
- **Forward Forecast Consumption**

Example

Suppose that there is an instance of actual demand on date (and time) P. The starting moment for consumption (B) is P minus the value of the **Backward Forecast Consumption** field. The end moment for consumption (Y) is P plus the value of the **Forward Forecast Consumption** field.

The starting moment (B) is rounded to the start of the day (time 00:00:00). The end moment (Y) is rounded to the end of the day. If the **Backward Forecast Consumption** and the **Forward Forecast Consumption** field are zero days, LN consumes the special demand of a single day.

The consumption proceeds as follows:

- The actual demand at moment P is used to consume the earliest occurrence of (nonconsumed) forecast on or after moment B.
- If there is still actual demand left, this is used to consume the next forecast occurrence, and so on.
- If necessary, the consumption process continues until moment Y is reached, and all forecast between B and Y has been fully consumed.

This consumption procedure takes place in two phases:

- Phase 1
In this step, only customer demand that falls in a *channel* is considered. This demand is used to consume the special demand defined for a particular item/channel combination.
- Phase 2
In this step, all remaining actual demand is considered:
 - Remaining channel-specific demand after all channel-specific forecast has been consumed.
 - Actual customer demand that does not fall in a channel.
 - Dependent demand (only if the **Dependent Demand Forecast** check box in the **Items - Planning (cprpd1100m000)** session is selected).

Material-routing relationship

A *work center* consists of a number of machines, executing more than one *production order* at the same time. Depending on the configuration multiple machines can be dedicated to a specific *task*, or multiple tasks performed on one machine.

To accommodate these requirements flexibility is needed in the use of the available machinery through deviation from standard *routings*, and the defining of situation dependant *operations*.

If the Quantity-dependent Routing check box in the **Item - Production (tiipd0101m000)** session is selected, LN uses one of the quantity dependent routings you defined for the item in the **Item - Routings (tirou1101m000)** session once the specified quantity is reached. Which routing LN selects is determined by the value you specified in the Quantity Ordered field in the **Production Orders (tisfc0501m000)** session. In this situation, LN does not take into account material-routing relationships.

If you do not select the Quantity-dependent Routing check box in the **Item - Production (tiipd0101m000)** session, LN takes into account the routing that you defined in the Default Routing field in the **Job Shop Master Data Parameters (tirou0100m000)** session.

Enterprise Planning can take into account specific material-routing relationships during the order planning run, and creates planned orders based on the *routing operations* linked to a specific *bill of material (BOM)* line of the *main item* in the **BOM Line - Material-Routing Relationships (tibom0140m000)** session. In other words, the material-operation link in the *bill of material (BOM)* becomes routing dependent. You can link multiple routings to a main item, and for each separate routing you can link a specific operation to the corresponding components in the BOM lines in the BOM Line - Material-Routing Relationships (tibom0140m000) session.

Enterprise Planning takes routing specific material/operation links into account when:

- You linked more than one routing to a main item in the **Item - Routings (tirou1101m000)** session.
- You set the **Operation** field of a specific BOM line in the **Bill of Material (tibom1110m000)** session to 0, which means that the field is empty.

If these conditions are met, and the **Material-Routing Relations** check box in the **Bill of Material (tibom1110m000)** session is selected, LN creates planned orders based on the routing operation that corresponds with a specific BOM line in the **BOM Line - Material-Routing Relationships (tibom0140m000)** session.

If you did not select the **Material-Routing Relations** check box in the **Bill of Material (tibom1110m000)** session, LN plans orders for all the items listed on the corresponding BOM at the start date of the first operation of the routing.

Example

For manufactured item MAN001 the default routing STD and alternative routing ALT exist. Operations 10 and 20 are defined and linked to both routings.

The bill of material for MAN001 consists of line 10 for MAT001, line 20 for item MAT002 and line 30 for item MAT003.

In the BOM Line - Material-Routing Relationships (tibom0140m000) session, the following relations are defined:

- Line 10 for routing STD is linked to operation 10
- Line 10 for routing ALT is linked to operation 10
- Line 20 for routing STD is linked to operation 20
- Line 20 for routing ALT is linked to operation 10
- Line 30 for routing STD is linked to operation 20
- Line 30 for routing ALT has no operations linked

Two production orders are generated:

- SFC000001 with routing STD
- SFC000002 with routing ALT

All three material components defined in the BOM appear on both production orders.

The estimated material lines are:

- SFC000001 (STD)
 - Line 10 linked to operation 10
 - Line 20 linked to operation 20
 - Line 30 linked to operation 20
- SFC000002 (ALT)
 - Line 10 linked to operation 10
 - Line 20 linked to operation 10
 - Line 30 linked to operation 10

Note: MAT003 (line 30) is not linked to any operation of the ALT routing, the item cannot be found in the estimated material lines of the production order using the ALT routing.

Phantoms of generic items

In regular order-based planning, phantoms are treated in the following way:

- The phantom is replaced by the components in its BOM
- The phantom's routing is treated as part of the existing routing

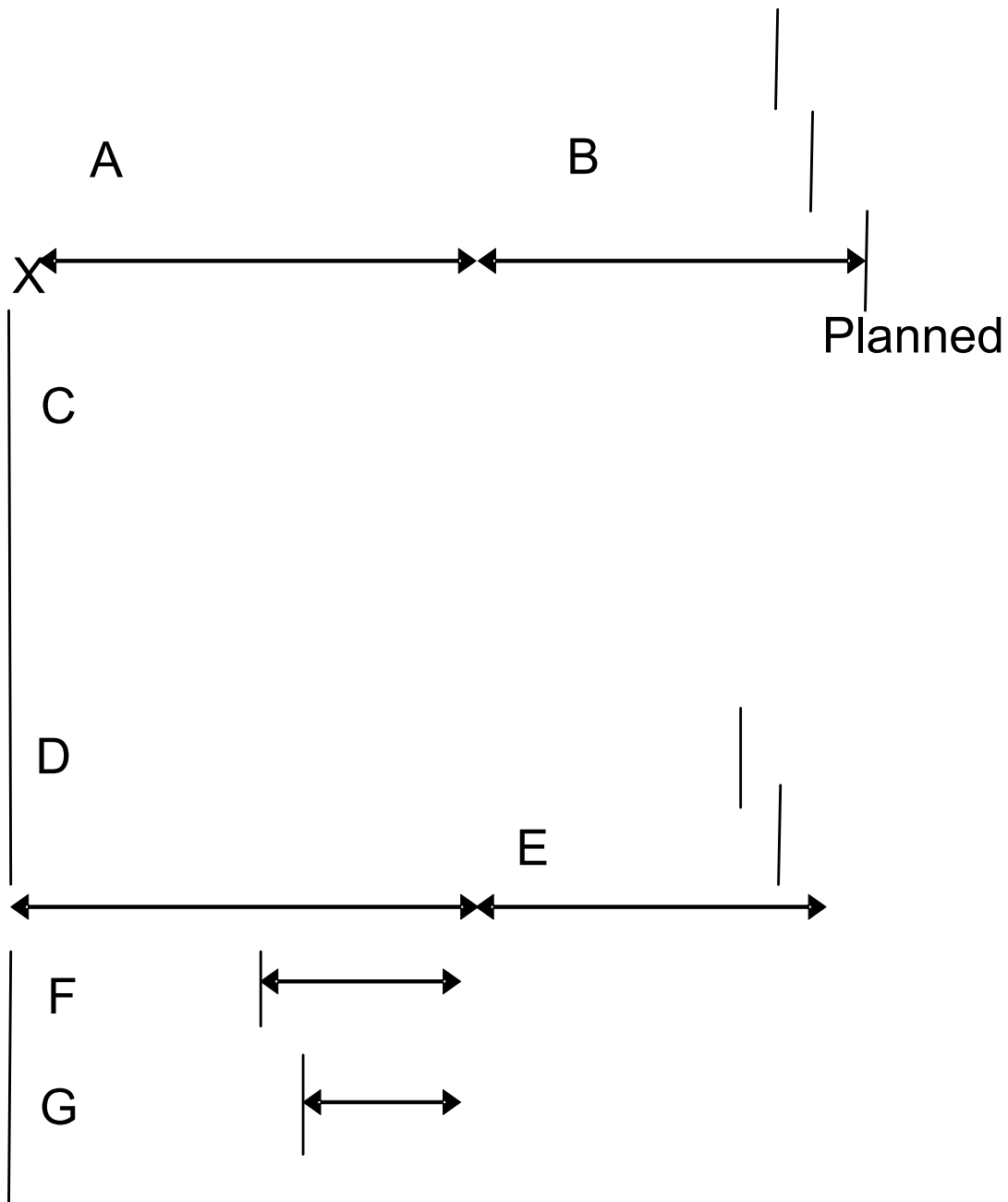
If a generic item G has a phantom, the phantom's components and operations are offset relative to the planned order finish date of G. The way in which this is done depends on whether the phantom itself is a generic item or a normal item. Below you will find an example of both situations.

Example: generic phantoms of generic items

Consider the following situation:

- A generic item G1 has a generic phantom G2
- G2's generic BOM contains a (normal) component N3
- G2's generic routing contains one operation OP

In this situation, the planning proceeds according to the following diagram:



A	Offset of N3 in G-BOM of G2
B	Offset of G2 in G-BOM of G1
C	N3 finish date of G1 order
D	Offset of OP in G-ROU of G2
E	Offset of G2 in G-BOM of G1
F	OP1

G

OP2

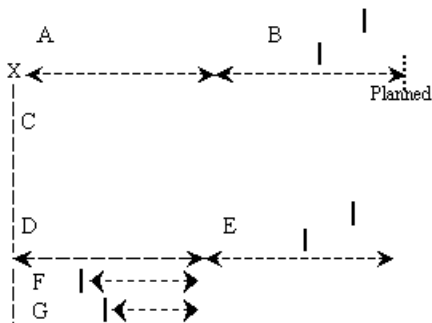
Example: normal phantoms of generic items

Consider the following situation:

- A generic item G1 has a normal phantom N2
- N2's BOM contains a (normal) component N3
- N2's routing contains operations OP1 and OP2

In this situation, the planning proceeds according to the following diagram:

- (1) Offset of N3 in BOM of N2,
- Or:



A	Order lead-time of N2
B	Offset of N2 in G-BOM of G1
C	N3 finish date of G1 order
D	Order lead-time of N2
E	Offset of N2 in G-BOM of G1
F	OP1
G	OP2

Remarks:

- If an offset is specified in N2's BOM, this offset is used to offset N3; otherwise, N2's order lead-time is used.
- In a normal routing, no offset is available; instead, N2's order lead-time is used to offset N2's operations.

Note: You can specify an item's order lead-time in the **Item - Production (tiipd0101m000)** session.

Planning customized items

This topic describes a method to plan the items that have the Customized check box selected in the **Items (tcibd0501m000)** session.

Usual procedure

If the Customizable check box is selected in the **Items (tcibd0501m000)** session, the item is a *customized item*.

For customized items, the usual procedure is as follows:

- 1** You create a *project* for the customer that ordered the item.
- 2** You use the customized item to create a *project item* for the project.
- 3** In Enterprise Planning, you plan the supply of the project item.
- 4** You transfer the planned orders to the *execution level*.

To plan a customized item without a project

You can enter a *demand forecast* for a customized item with an empty project *segment*. This is recommended if you want to reserve resources for production of the item before sales orders for it are present. Any sales orders for a project item that is based on this customized item *consume* this demand forecast.

Then, you can generate an *item master plan* or *planned orders* for the customized item with an empty project segment.

Note: If you use the Transfer Order Planning (cppat1210m000) session to transfer a range of planned orders, and the **Include Items to be Customized** check box is cleared, Enterprise Planning does not transfer the orders for customized items with an empty project segment.

To generate actual orders for a customized item

If you want to transfer planned orders and plans for customized items with empty project segments to the *execution level*, you must use the following method:

- Transfer the planned orders batchwise, by using the following procedure:
 - 1** Start the Transfer Order Planning (cppat1210m000) session.
 - 2** Select the **Interactive** check box.
 - 3** Select the **Include Items to be Customized** check box.
 - 4** Click **Transfer**. (The Select Order Planning for Transfer (cppat0210m000) session appears.)
 - 5** Select the **Transfer** check box for the relevant planned orders.
 - 6** On the *appropriate* menu, click **Transfer**.

That action is useful if you want to stock a quantity of the item before a sales order for the item exists.

Potential errors caused by inconsistent selection of order system

If the order systems of manufactured items are set up inconsistently, the following problems can occur:

- If a *BOM component* is a planned item, and its *main item* is not a planned item, Enterprise Planning does not plan the requirements for the main item. Therefore, the *dependent demand* for the component is not correctly calculated.
- If a *manufactured item* is a planned item, and has a BOM component that is a *phantom item* with *routing operations*, the component must be a planned item. If the component is not a planned item, the transfer of *planned production orders* to the *execution level* fails, because the phantom item's operations were not planned. Therefore, LN displays an error message.

LN does not automatically check the BOMs and routings for these incorrect item structures.

To check and correct the order systems of a range of items, use the Check Order System for Planning (tibom1220m000) session.

Example: source allocation in order planning

In LN, you must define a *sourcing strategy* if you want to use more than one source of supply.

In a sourcing strategy, per supply source, you can define the minimum and a maximum volume that LN can use to cover requirements. LN then distributes the requirements over the specified supply sources.

If you define a sourcing strategy in the **Sourcing Strategy (cprpd7110m000)** session, you must choose between two *source allocation rules*:

- **Percentage**
- **Priority**

According to these rules, LN distributes the required demand over the selected sources.

Source allocation rule: Percentage

Suppose you set the **Source Allocation Rule** field in the **Sourcing Strategy (cprpd7110m000)** session to **Percentage**, and specify the following source values:

- **Job Shop:** 30%.
- **Purchase:** 20%.
- **Distribution:** 50%.

You record an item's demand forecast in the *item master plan* and subsequently generate *planned orders* based on this forecast.

The following table shows the demand forecast:

Plan period	1	2	3	4	5	6
Forecast	100	100	100	100	100	100

If you clear the **Allow Multiple Sources per Demand** check box in the **Generate Order Planning (cprp1210m000)** session or the **Generate Order Planning (Item) (cprp1220m000)** session, LN generates a single *planned order* for each requirement. In other words, LN generates one planned order per plan period. The following table shows a possible distribution of the planned orders over the available types:

Plan period	1	2	3	4	5	6
Planned production orders	-	100	-	-	100	-
Planned purchase orders	-	-	100	-	-	-
Planned distribution orders	100	-	-	100	-	100

The resulting distribution is:

Order type	Target percentage	Total volume	Actual percentage
Production	30%	200	33%
Purchase	20%	100	17%
Distribution	50%	300	50%

Source allocation rule: Priority

If you set the **Source Allocation Rule** field in the **Sourcing Strategy (cprpd7110m000)** session to **Priority**, you can define the priority for each source. The priority source-allocation rule only applies to order planning. In master planning, a priority source-allocation rule is interpreted as a **Percentage** source-allocation rule.

Suppose you define the following priorities:

- **Job Shop:** 0.
- **Purchase:** 30.
- **Distribution:** 70.

First, LN tries to cover the demand with planned distribution orders. If the quantity that internal suppliers can deliver is insufficient, LN generates purchase orders to supply the remaining quantity.

Example: cumulative order lead time (COLT)

LN uses COLT values to calculate the minimum length of the *order horizon* and the *planning horizon*:

- The noncritical cumulative order lead time (noncritical COLT) is used to update an order horizon of an item.
- The total cumulative order lead time (COLT) is used to update the planning horizon.

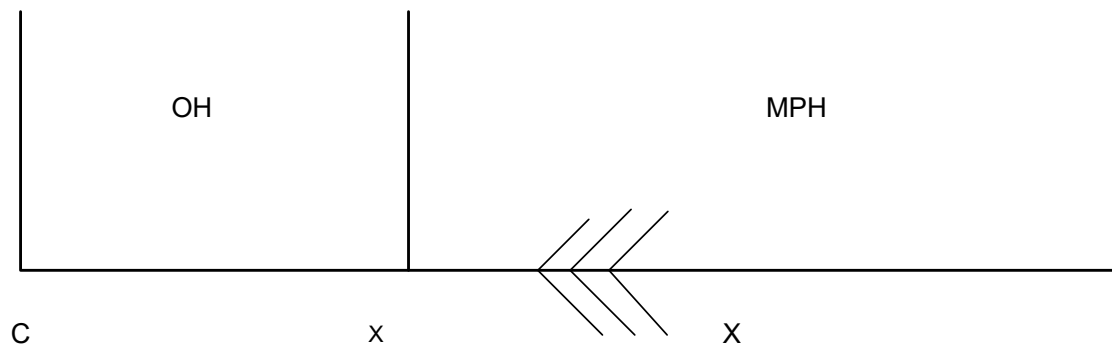
This topic explains both the cumulative order lead time (COLT) and the noncritical COLT.

Noncritical cumulative order lead time

The noncritical cumulative order lead time (noncritical COLT) of an item is equal to the longest of the following lead times:

- The item's purchase lead time. For more information, refer to Purchase lead time calculation.
- The item's noncritical cumulative production lead time. For more information, refer to Noncritical cumulative production lead time.

The reason why it can be necessary to compute a noncritical COLT is as follows. Suppose that a particular item has the following planning horizon:



OH	Order horizon
MPH	Master planning horizon
C	Current date
x	Requirement

In this case, order planning is used to cover short-term requirements, while master planning covers long-term requirements. As long as requirement X falls within the master-planning horizon, this requirement is exploded to the item's critical components only. Explosion to noncritical components only takes place after the requirement has shifted into the item's order horizon. When that takes place, the total lead time for the item and its noncritical components must still fit within the order horizon: otherwise, the order will be delivered late.

Rules

For items that are critical in master planning (see the **Items - Planning (cprpd1100m000)** session) and that have an item master plan, the following rules apply:

- The item's planning horizon must at least be equal to the item's total COLT.
- The item's order horizon must at least be equal to the item's noncritical COLT.

For items that are critical in master planning (see the **Items - Planning (cprpd1100m000)** session) and that have no item master plan, the following rules apply:

- The item's planning horizon must at least be equal to the item's total COLT.
- The item's order horizon must at least be equal to the item's total COLT.

For items that are not critical in master planning (see the **Items - Planning (cprpd1100m000)** session), the following rules apply:

- The item's order horizon must at least be equal to the item's total COLT.
- The item's planning horizon must at least be equal to the item's order horizon.

Moreover, the following rule also applies to noncritical items:

- The item's order horizon must at least be equal to the order horizon of the nearest critical parent item in the (multilevel) BOM structure.

For more information on this rule, see To synchronize order horizons between BOM levels.

Cumulative order lead time

Item A is manufactured from components X, Y, and Z. Components X and Y are purchased from a business partner. Component Z is manufactured from subcomponents Z-1 and Z-2. Subcomponents Z-1 and Z-2 are purchased from a business partner.

Item	Lead time (days)
A	2
X	5
Y	2
Z	1
Z-1	7
Z-2	9

The lead times include safety time, extra lead time, and outbound time.

The COLT of item Z is 10 days (1 + 9). The COLT of item A is 12 days (2 + 10).

Now, suppose that the item can also be purchased, and that the supply time in the **Item - Purchase** session is 21 days. This is converted to 15 working days. In this case, item A's COLT will be 15 days instead of 12.

Item selection in order planning, examples

This section presents several examples of the selection of plan items to plan in the **Generate Order Planning (cprp1210m000)** session and the **Generate Order Planning (Item) (cprp1220m000)** session.

For the general description, refer to RRP run, item selection.

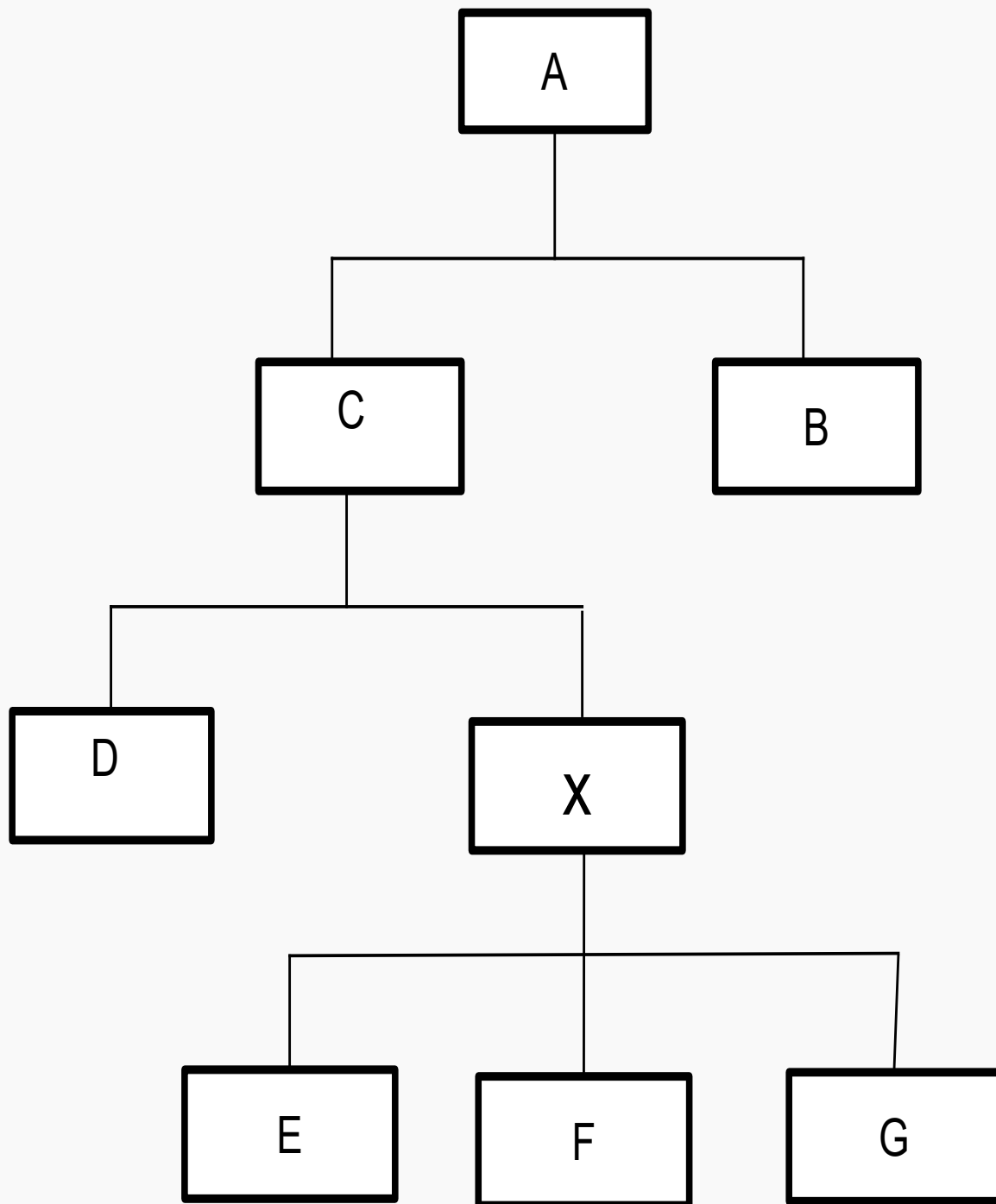
This topic contains the following examples:

- [Example 1: Item selection and anonymous items](#) on page 105

- [Example 2: Item selection and project items](#) on page 106
- [Example 3: Item selection and supplying relationships](#) on page 107
- [Example 4: Item selection and alternatives](#) on page 108

Example 1: item selection and anonymous items

You plan a plan item, called X. The X item is part of the following multilevel BOM:



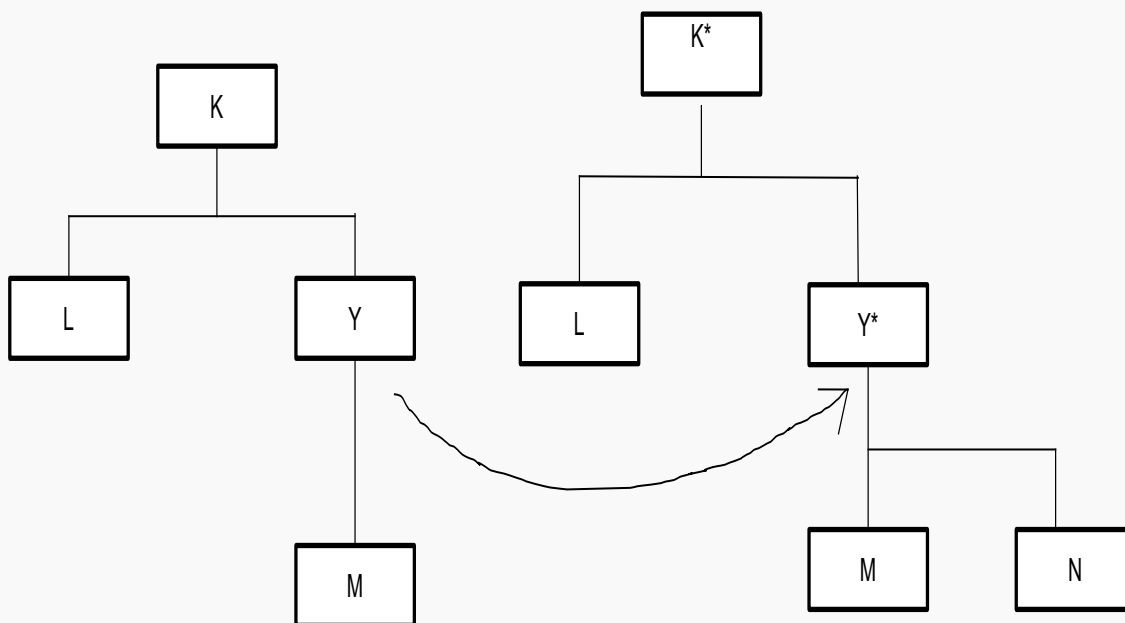
The A item is a *project item*. All the other items are anonymous items.

If you select the **Include Parent Items** check box, LN plans the following items: A, B, and X.

If you select the **Include Child Items** check box, LN plans the following items: X, E, F, and G.

Example 2: item selection and project items

You plan a plan item called Y. Item Y* is derived from Y. The Y item is part of the following multilevel BOM:



The M item is an anonymous item. The other items are project items.

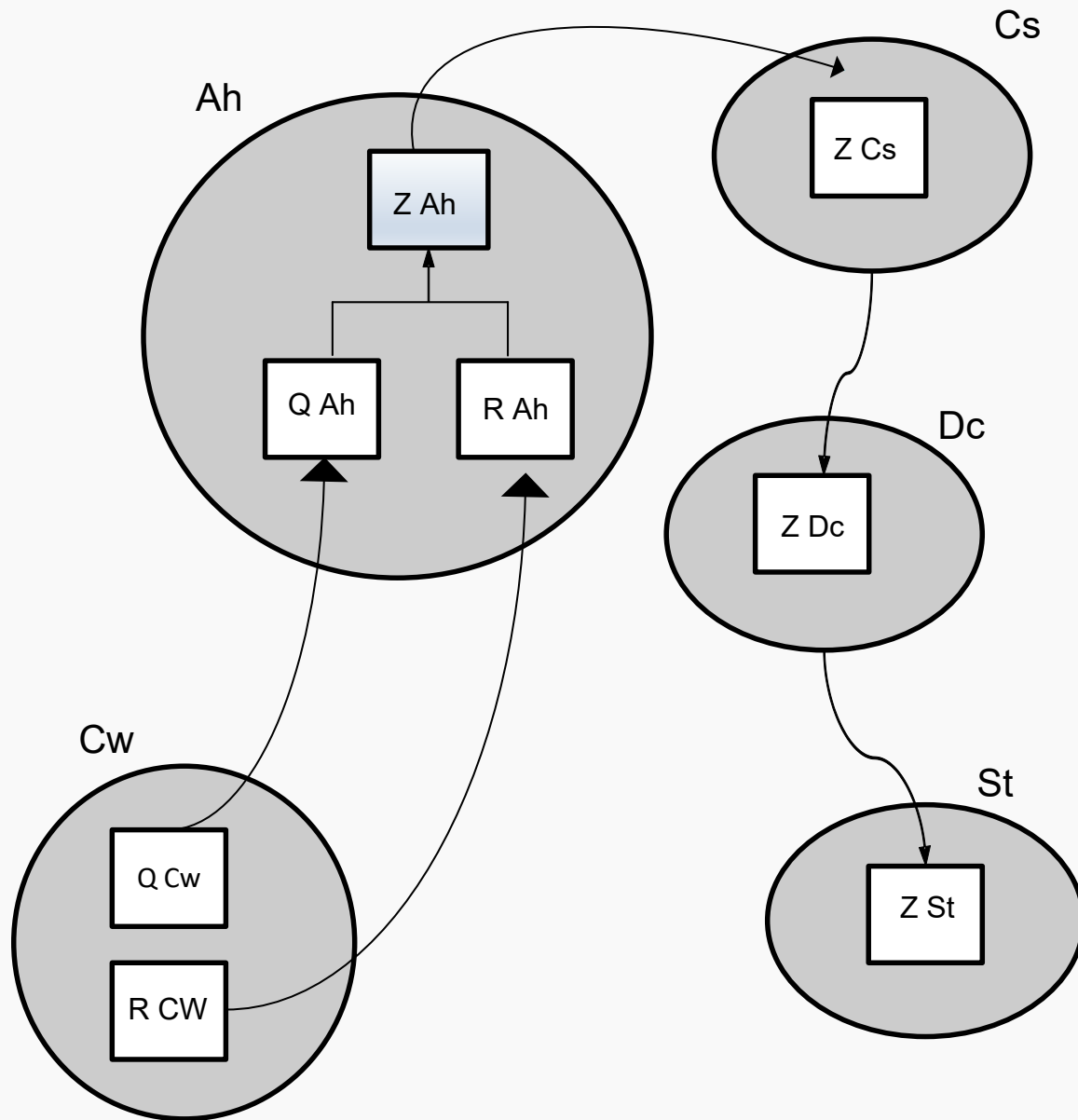
If you select the **Include Parent Items** check box, LN plans the following items: Y, K, Y*, and K*.

If you select the **Include Child Items** check box, LN plans the following items: Y and M.

If you select the project item Y*, and select the **Include Child Items** check box, LN plans the following items: Y*, M, N, and Y.

Example 3: item selection and supplying relationships

You plan a plan item called Z(Ah). Item Z(Ah) is part of the following multilevel BOM, and of the following distribution network:



Z Ah	Item Z in the assembly hall
Z Cs	Item Z in the central storage
Z Dc	Item Z in the distribution center
Z St	Item Z in the store
Q Cw	Component Q in the central warehouse

Q Ah	Component Q in the assembly hall
R Cw	Component R in the central warehouse
R Ah	Component R in the assembly hall

Item Z, Q, and R are normal items. The dashed arrows in the figure indicate the *supplying relationships* between the plan items.

If you select the **Include Parent Items** check box, LN generates the order planning for the following items:

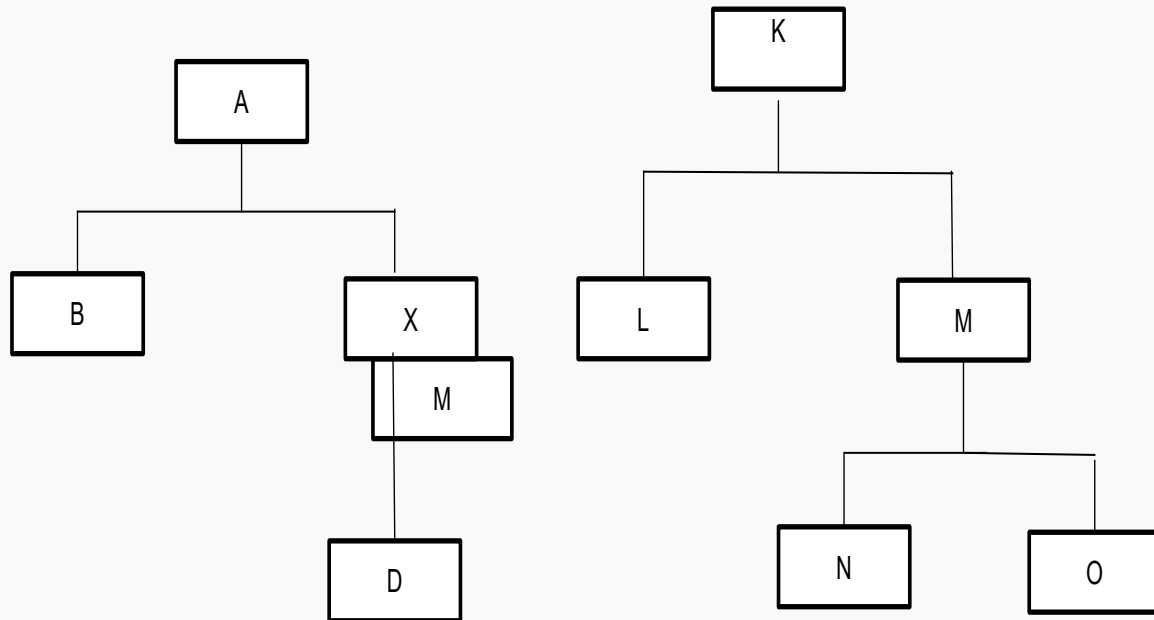
Planned Item	Reason
Z Ah	The item that you selected yourself
Z Cs	Receiving item of Z Ah
Z Dc	Receiving item of Z Cs
Z St	Receiving item of Z Dc

If you select the **Include Child Items** check box, LN generates orders for the following items:

Planned Item	Reason
Z Ah	The item that you selected yourself
Q Ah	Component of Z Ah
Q Cw	Supplying item of Q Ah
R Ah	Component of Z Ah
R Cw	Supplying item of R Ah

Example 4: Item selection and alternatives

In the BOM for item A, you have defined item M as an alternative for component X. The same item M is used as a standard component in the BOM for item K.



If you plan item X and you select the **Include Parent Items** check box and the **Include Child Items** check box, LN generates orders for the following items:

Planned Item	Reason
X	The item that you selected yourself
M	The alternative for X
A	The main item of X
D	Component of X

If you plan item M and you select the **Include Parent Items** check box and the **Include Child Items** check box, LN generates orders for the following items:

Planned Item	Reason
M	The item that you selected yourself
K	The main item of M
N, O	Components of M
X	An item for which M is an alternative
A	The main item of X

Chapter 5: Master Planning

To use master plans

Enterprise Planning uses master plans to maintain planning data in a bucketed fashion.

There are three types of master plans:

- *Item master plan*
- *Channel master plan*
- *Resource master plan*

In each master plan, planning data is recorded by plan period.

Item master plan

With a few exceptions, you can maintain an *item master plan* for any plan item. If you want to use a *master-planning horizon* and generate a *supply plan* for a plan item, you must maintain an item master plan. If you only use order-based supply planning, the item master plan is optional.

The advantage of an item master plan is that it provides access to several types of master-planning functionality. The disadvantage is that it has an adverse effect on system performance.

As a rule, you need an item master plan in the following situations:

- You want to use a long *planning horizon* for an item (longer than one year), but you do not want to work with *planned orders* over the complete horizon.
- You want to generate forecasts based on demand history, or based on sales budgets.
- You want to maintain an *inventory plan* for the item.
- You want to *aggregate* or *disaggregate* forecasts, supply plans, or inventory plans.
- You want to use *channel ATP* for the item.
- The item is a *product family*.
- You want to aggregate the item's *goods-flow* data to a product family.

Note: You determine whether an item master plan is maintained for an item by means of the **Master Plan** check box in the **Items - Planning (cprpd1100m000)** session. Master-plan functionality is only available for an item if this check box is selected.

Channel master plan

For a particular item/channel combination, you can maintain a *channel master plan*. A channel master plan is comparable to an item master plan, but only contains demand-related data, such as forecast and actual demand, and *channel ATP*.

You need a channel master plan in the following situations:

- You want to maintain demand forecasts by channel
- You want to use Channel ATP

Resource master plan

For a particular resource (work center), you can maintain a *resource master plan*. A resource master plan contains information on:

- Total available capacity
- Capacity required by various types of activities that are planned and/or carried out in Enterprise Planning, Manufacturing, and Service.
- Free capacity and *capacity CTP*

As a rule, you need a resource master plan for each resource that LN must take into account during a capacity CTP check.

Infinite master planning

In *infinite* master planning, LN generates a supply plan without taking into account any capacity or material constraints. Therefore, this planning method is comparable to the traditional MRP II planning paradigm.

Infinite planning is especially suitable in situations where the amount of available capacity and the availability of materials for production can easily be expanded when necessary.

Infinite planning is the default planning method in master planning. It is used for:

- Plan items which have not been linked to a specific plan unit.
- Plan items which have been linked to a plan unit in which **Infinite Planning** is the master-planning engine used.

Note:

- The choice of *master-planning engine* only makes a difference for production planning. Purchase planning and distribution planning are always carried out in the same way, regardless of whether infinite planning or workload control is used as the master-planning engine.
- Below you can find an overview of the planning procedure used for infinite planning (and playing a role in workload control as well - see Workload control. For a step-by-step description of the way item master plans are updated, see also To update master-plan data.
- Production and purchase are only used as supply sources if the **Automatic Update of Production Plan** or **Automatic Update of Purchase Plan** field in the **Items - Planning (cprpd1100m000)** session is set to either **Generate** or **Always Update**.
- ATP data is only maintained within the *CTP Horizon*.

Planning procedure

During a master-plan simulation in the **Generate Master Planning (cprmp1202m000)** session or the **Generate Master Planning (Item) (cprmp1203m000)** session, LN generates a supply plan to meet the demand in a plan period and to reach the inventory target expressed in the *inventory plan*.

The procedure is roughly similar to the procedure for updating an item master plan (see To update master-plan data). There is one major difference. In the update procedure the projected inventory is simply recomputed. A simulation, on the other hand, involves detecting shortages in the projected inventory, and generating a supply plan to cover these shortages.

A supply plan is only generated within the item's *master-planning* horizon.

Determining the required supply

For each plan period for which supply has to be planned, the required quantity has to be computed. First, the expected inventory level at the end of the period is computed. For the basic procedure, see To compute the projected inventory. Keep in mind, however, that in this stage of the computation, the supply plan quantities that have to be recomputed are ignored (in other words, set to zero). This means that:

- The *planned distribution orders* are ignored (these are always regenerated during a master-plan simulation).
- The *production plan* is ignored if the **Automatic Update of Production Plan** field in the **Items - Planning (cprpd1100m000)** session is set to **Generate** or to **Always Update**.
- The *purchase plan* is ignored if the **Automatic Update of Purchase Plan** field in the **Items - Planning (cprpd1100m000)** session is set to **Generate** or to **Always Update**.

If the expected inventory level thus computed is equal to or higher than the *inventory plan* for the plan period in question, no more supply needs to be planned for this plan period. In this case, the planning algorithm proceeds to the next period.

If the expected inventory level is lower than the inventory plan, the difference between the two is the quantity for which a supply plan must be generated.

Selecting sources of supply

For the supply that is to be planned, the planning system has to determine which sources to use (production, purchase, distribution, or a combination of these), and how to divide the supply over these sources. This is done according to the sourcing settings that have been recorded for the item involved. For more information, see Sources of supply.

Depending on these sourcing settings, the supply plan quantity is allocated in one of the following ways:

- Only one source is used for supply (either production, purchase, or distribution).
- The supply is divided percentage-wise over two or three different sources.

Recomputing projected inventory and ATP

After the supply plan has been updated, the *projected inventory* is recomputed (see To compute the projected inventory).

Moreover, the *ATP* and the *cumulative ATP* are recomputed (see Computing item ATP).

To update master-plan data

You can run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session (with the **Generate Item/Channel Master Plan** check box selected) to update *item master plans* and, if applicable, *channel master plans* for a range of plan items. This topic describes the various steps of the procedure involved.

In this procedure, no *supply plan* is generated. If you want to generate or update supply plans, run the **Generate Master Planning (cprmp1202m000)** session or the **Generate Master Planning (Item) (cprmp1203m000)** session.

If necessary, LN first rolls the scenario. See *Using a rolling scenario*. Next, LN (re)generates the master plans of the selected plan items. The plan items are processed in order of *phase number*.

The update procedure consists of the following steps:

1 Retrieve goods flow data from **Warehousing**

If you select the **Update Goods Flow Data** check box in the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, LN retrieves the goods flow data from the execution level. For channel master plans, only customer order data is retrieved. See *To update goods-flow data*.

When you choose **Update** in the **Item Master Plan (cprmp2101m000)** session, this step is always carried out.

If the plan item is a *product family*, Enterprise Planning does not retrieve the goods flow data from the execution level. Instead, Enterprise Planning aggregates this data from the item master plan of the child items to the item master plan of the family, based on the *aggregation relationships*.

Note

- This aggregation is only carried out for item master plans (not for channel master plans).
- This aggregation is only carried out in the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session (not when you choose **Update** in the **Item Master Plan (cprmp2101m000)** session).

2 Update receipts and requirements from **Enterprise Planning**

LN updates the following fields in the **Item Master Plan (cprmp2101m000)** session:

- **Special Demand**
- **Dependent Material Demand**
- **Dependent Distribution Demand**
- **Planned Production Orders**
- **Planned Purchase Orders**
- **Planned Distribution Orders**

Note

- For channel master plans, only the special demand is updated.
- If you run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, LN removes the special demand that occurs before the start date of the scenario.

3 Consume demand forecast

LN uses the actual demand to consume the demand forecast, the extra demand, and the special demand in the same or nearby plan periods.

4 Generate critical requirements

If you select the **Generate Requirements** check box in the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, LN generates the material and capacity requirements based on the following:

- The *production plan*
- The *bill of critical materials*
- The *bill of critical capacities*

Note

- This step is not carried out for channel master plans.
- When you choose **Update** in the **Item Master Plan (cprmp2101m000)** session, this step is always carried out.

5 Recompute projected inventory and ATP

LN updates the following fields in the **Item Master Plan (cprmp2101m000)** session:

- **Projected Inventory**
- **ATP**
- **Cumulative ATP**

For channel master plans, the *channel ATP* is recomputed.

Note:

A similar procedure is carried out when you choose Update in the **Item Master Plan (cprmp2101m000)** session.

When a scenario is rolled forward, LN updates the planning data for all plan items.

If you select the **Multicompany Updating** check box in the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, LN carries out the steps listed above for each logistic plan within the multicompany structure. See Multicompany planning.

After the update, LN updates all resource master plans that need to be updated.

You can view the results of the update in the following sessions:

- **Item Master Plan (cprmp2101m000)**
- **Channel Master Plan (cpdsp5130m000)**
- **Resource Master Plan (cprmp3501m000)**

To update goods-flow data

You can update the *goods-flow* data in an item's master plan in one of the following ways:

- Choose the **Generate** command in the **Item Master Plan (cprmp2101m000)** session.
- Run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, with the **Update Goods Flow Data** check box selected.
- Run the **Generate Master Planning (cprmp1202m000)** session or the **Generate Master Planning (Item) (cprmp1203m000)** session, with the **Update Goods Flow** check box selected.

Retrieving goods-flow data for items

If the **Plan Item Type** field has the value **Item**, LN retrieves the goods-flow data from the *inventory transactions* and the *planned inventory transactions* in Warehousing.

The *on-hand inventory* of the current period is also retrieved.

LN sometimes adds the *sales quotations* to the *customer orders*. See To add quotations to customer orders.

Retrieving goods-flow data for product families

If the **Plan Item Type** field has the value **Family**, LN aggregates the goods-flow data from the item master plan of the child items to the item master plan of the family, based on the *aggregation relationships*.

Updated data

For items and families, the following fields in the **Item Master Plan (cprmp2101m000)** session are updated:

- **Customer Orders**
- **Dependent Scheduled Demand**
- **Dependent Distribution Demand**
- **Customer Deliveries**
- **Internal Deliveries**
- **Distribution Deliveries**
- **Scheduled Production Receipts**
- **Scheduled Purchase Receipts**
- **Scheduled Distribution Receipts**
- **Actual Receipts**

Note:

In the case of a family, planned orders are also taken into account:

- *Planned production orders* are added to the **Scheduled Production Receipts** field.
- *Planned purchase orders* are added to the **Scheduled Purchase Receipts** field.
- *Planned distribution orders* are added to the **Scheduled Distribution Receipts** field.

Plan units in Enterprise Planning

Plan units are used to manage interdependencies that exist in constraint-based production planning. A plan unit groups plan items that must be planned together because of capacity or material constraints.

Plan units are only necessary for *workload control*.

How to define plan units

- 1 Identify the main planning entities in a manufacturing facility. A planning entity usually consists of items that share a particular (bottleneck) resource, or items that share a particular (critical) material.

- 2 Define each planning entity as a plan unit in the **Plan Unit (cprpd6100m000)** session. Select the appropriate master-planning engine for the plan unit.
- 3 Assign each item involved to a particular plan unit (in the **Items - Planning (cprpd1100m000)** session).

Rules for defining plan units

The following rules apply to plan unit definitions:

- Plan items in a plan unit must not be related through the *bill of critical materials* (BCM). Relationships through the *bill of materials* (BOM) are allowed.
- You must not have loops in the goods flow through plan units.

If these rules are not observed, LN cannot determine a correct planning order for the plan units.

You can detect incorrect situations with the **Compute Phase Numbers (cprpd6200m000)** session.

Each of these situations is illustrated with an example:

Example 1: Plan items related through BCM

Item B is a critical component in the production of item A. This means that the two items A and B are related in a bill of critical material:



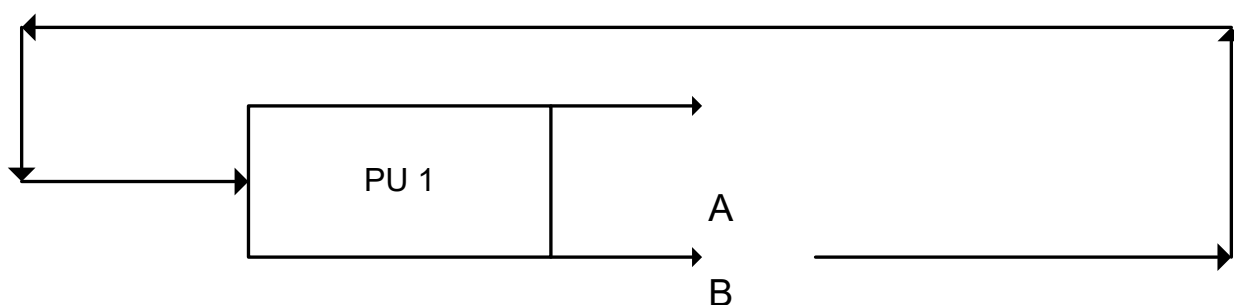
A	Main item
B	Component

Items A and B both belong to plan unit PU1. This means that they are both manufactured in plan unit PU1. This results in a loop in the goods flow through PU1.

Items A and B must be planned simultaneously, because they use the same resources, which implies that they belong to the same plan unit. However, this is not possible as B can only be planned after A has been planned because B is a component of A.

Example 2: Loop in goods flow through plan units

Assume the two items A and B are not related through the bill of material. Item A belongs to plan unit PU1, item B belongs to plan unit PU2. Item A is a component in the production of an item of plan unit PU2. Item B is a component in the production of an item of plan unit PU1. This results in the following goods flow:



In this case it is not possible to determine the order in which PU1 or PU2 must be planned. PU1 cannot be planned before PU2 because PU1 uses an item of PU2. For PU2 the same argument holds.

Plan periods in Enterprise Planning

A scenario consists of *plan periods*. Plan periods can be of varying length, and are defined in calendar days, weeks, or months.

You can define the plan periods for a scenario in the **Scenario - Periods (cprpd4120m000)** session. After this, you need to run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session for the changes to take effect.

Note: If the plan-period definition does not cover the whole scenario, LN extends the last plan period to cover the remainder of the scenario.

Plan periods are used as time buckets for *master planning*.

Note: In Enterprise Planning, horizons and time fences are rounded to the end of a plan period, except for the *signal horizon*. For that reason, you must always define plan periods for a scenario, even if you only use *order planning*.

To maintain an item master plan

This topic explains how you can generate, review, update, or delete *item master plans*.

How to generate an item master plan

- 1 Make sure that the item is defined as a plan item in the **Items - Planning (cprpd1100m000)** session.
- 2 In the **Items - Planning (cprpd1100m000)** session, select the **Master Plan** check box.
- 3 In the **Items - Planning (cprpd1100m000)** session, set the *planning horizon* (see Horizons and time fences).
- 4 Start the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.
- 5 Specify the scenario in which you want the item master plan to be created. This scenario must have the plan status **Open**.
- 6 Specify the plan item involved.
- 7 Select the **Generate Item/Channel Master Plan** check box.
- 8 Set the remaining options as appropriate, and choose **Initialize**.

How to view and manually edit an item master plan

In the **Item Master Plan (cprmp2101m000)** session, you can view an item's master plan. Moreover, you can manually edit various fields on the Edit tab:

- **Demand Forecast**
- **Extra Demand**
- **Inventory Plan**
- **Production Plan**
- **Purchase Plan**

How to update item master plan data

To update the demand and inventory data displayed in the item master plan (but not generate a supply plan), you have the following options:

- Choose the Update command in the **Item Master Plan (cprmp2101m000)** session.
- Run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.

If you use the Update command in the **Item Master Plan (cprmp2101m000)** session, the master plan data of the current item is updated, including the *goods-flow* data from the *execution level*.

If you want to update the item master plan data for a range of plan items, and/or need more options, you can use the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session. Here you can enable or disable the update of the goods-flow data, as well as the generation of requirements (for an existing production plan). You can also use this session to update goods-flow data for product families (by aggregation from the item master plans of the child items).

If you do not only want to update the demand and inventory data, but to (re)generate a supply plan as well, you need to run a master plan simulation.

How to simulate an item master plan

Simulating a master plan involves updating the demand and inventory data, and (re)generating a supply plan.

To simulate an item master plan, run one of the following sessions:

- **Generate Master Planning (Item) (cprmp1203m000)**
- **Generate Master Planning (cprmp1202m000)**

The **Generate Master Planning (Item) (cprmp1203m000)** session, which you can find in the *appropriate* menu of a number of sessions in Enterprise Planning, runs a simulation for only one item. A number of options are available for the simulation run. For example, you can:

- Constrain the range of plan periods for which the simulation is performed.
- Disable the goods-flow update.
- Simulate within the *time fence*.

The **Generate Master Planning (cprmp1202m000)** session is the most configurable way to run a master plan simulation. This session can handle a range of plan items, and has a number of extra options. For example, you can:

- Perform a *net-change calculation*.
- Set the number of iterations used in the *workload control (WLC)* planning engine.

How to delete an item master plan

You can delete an item master plan (or a range of item master plans) in the **Delete Master Plan (cprmp2210m000)** session.

Note: If you want to delete all item master plans for a plan item (in all scenarios), you can do so by clearing the **Master Plan** check box in the **Items - Planning (cprpd1100m000)** session.

Planning sequence and phase numbers

Planned supply for a plan item can result in requirements for other plan items. Because of such logistic dependencies, plan items must be planned in a specific order.

Enterprise Planning uses *phase numbers* to determine the order in which items are planned.

Order planning

In *order planning*, each item has its own order phase number.

The order phase numbers determine in which order plan items are planned:

- All plan items with phase number 0
- All plan items with phase number 1
- And so on

Master planning

In *master planning*, each item has its own master-planning phase number. Moreover, each plan unit has its own phase number.

In master planning, supply planning is carried out by plan unit. A plan item that does not belong to a plan unit is treated as a plan unit of its own.

The items are planned in the following order:

- All plan units with phase number 0, and all plan items that do not belong to a plan unit and which have phase number 0
- All plan units with phase number 1, and all plan items that do not belong to a plan unit and which have phase number 1
- And so on

Note: The planning order within a plan unit is only relevant for *workload control*. Here the planning order within the plan unit is determined by the priority level computed for each item. For more information, see *Workload control*, to compute planning priorities.

Reviewing and computing phase numbers

You can find a plan item's master-planning phase number and order phase number in the **Items - Planning (cprpd1100m000)** session. A plan unit's phase number is displayed in the **Plan Unit (cprpd6100m000)** session.

You can use the **Compute Phase Numbers (cprpd6200m000)** session to recompute phase numbers. Alternatively, you can let LN recompute phase numbers online.

To maintain a resource master plan

This topic explains how you can generate, review, update, or delete *resource master plans*.

How to generate a resource master plan

- 1 Start the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.
- 2 Specify the appropriate *scenario*.
- 3 Select the **Generate Resource Master Plan** check box.
- 4 Specify the *resource*, or range of resources, for which you want to maintain a resource master plan.
- 5 Click **Initialize**.

How to view and update a resource master plan

In the **Resource Master Plan (cprmp3501m000)** session, you can review the resource master plan. The resource master plan contains capacity use from various sources.

For capacity planning, Enterprise Planning uses the value that you specified in the **Available Number of Machines** field in the **Work Centers - Planning (cprpd2100m000)** session. If you did not specify a value in

this field, for capacity planning, Enterprise Planning then uses the value that you specified in the **Available Labor Resources** field of the **Work Centers - Planning (cprpd2100m000)** session.

Note:

Enterprise Planning only records the capacity use of JSC orders if the **Update Method Day Utilization** field in the **Production Order Parameters (tisfc0100s000)** session is set to **Automatic** or **Manual**.

If a resource's calendar is changed, you can use the **Rebuild Resource Planning (cprmp3200m000)** session to regenerate the resource planning.

How to delete a resource master plan

You can delete a resource master plan, or a range of resource master plans, in the **Delete Master Plan (cprmp2210m000)** session.

To compute phase numbers for master-based planning

LN bases the *phase number for master planning* on the following data:

- *Bill of critical materials (BCM)*
- *Supplying relationships*

LN computes phase numbers for

- Plan units (and the plan items that belong to it)
- Plan items that are not part of any plan unit

In the master-planning process, an item that is not part of any plan unit is treated as a plan unit of its own.

Criteria for phase numbers

The phase numbers of the plan units must conform to the following criteria:

- If two plan items are in different plan units, and one of these plan items is defined as a component of the other in a BCM, the phase number of the component's plan unit must be greater than the phase number of the parent's plan unit.
- If a supplying relationship exists between two plan items that belong to the same company, the phase number of the supplying item's plan unit must be greater than the phase number of the receiving item's plan unit.
- If a supplying relationship exists between two plan items that belong to different companies, and both items are controlled by central multicompany planning, the phase number of the supplying item's plan unit must be greater than the phase number of the receiving item's plan unit.

Note: An item is controlled by central multicompany planning if the **Central Multicompany Planning** check box in the **Items - Planning (cprpd1100m000)** session has been selected. Moreover, there must be a central multicompany scenario that includes the companies involved. If you use the **Compute Phase Numbers (cprpd6200m000)** session to recompute phase numbers for central multicompany planning, you need to specify the multicompany scenario involved.

Similar criteria apply to plan items without plan units except LN uses the phase number of the plan item instead of the phase number of the plan item's plan unit.

Computation procedure

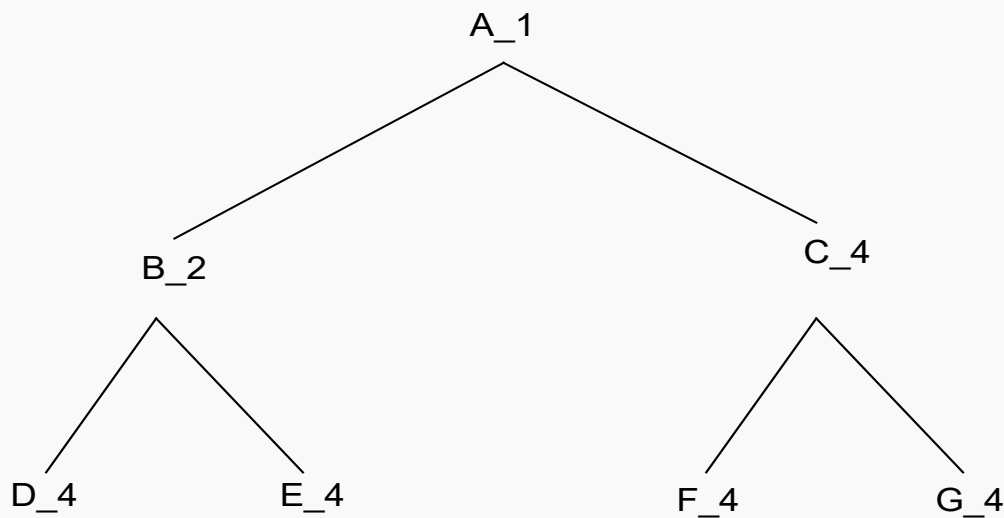
The computation of the phase numbers is an iterative process. You can choose between two methods:

- Regenerative computation
- Net-change computation

In a regenerative computation, every plan unit and every plan item without a plan unit initially gets phase number 0. LN then checks the plan units and plan items without a plan unit one by one and adjusts their phase numbers until the criteria for phase numbers are fully met. For information on the net-change computation, see Net-change phase number computation.

Example

Consider the following bill of critical materials with seven items:



Items A_1 belongs to plan unit 1, B_2 belongs to plan unit 2, and so on.

The computation yields the following result:

Plan item	Plan unit	Phase number
A_1	1	0
B_2	2	1
C_4	4	2
D_4	4	2
E_4	4	2
F_3	3	3
G_3	3	3

You can see the result of the computation in the **Master Phase Number** field in the **Plan Unit (cprpd6100m000)** session for plan units and in the **Master Phase Number** field in the **Items - Planning (cprpd1100m000)** session for plan items without plan unit.

Note: The phase number computation also checks for cycles in the bills of critical materials.

To recompute phase numbers

The phase numbers can be recalculated manually or automatically.

You can recalculate the phase numbers manually with the **Compute Phase Numbers (cprpd6200m000)** session.

If the **Online Phase Number Update** check box in the **Planning Parameters (cprpd0100m000)** session is selected, LN updates the phase numbers online whenever there is a change in either:

- The *bill of material (BOM)*
- The *bill of critical materials (BCM)*
- The *supplying relationships*

Note: Online updating of phase numbers reduces the system performance, especially when you enter or generate a large number of BOM lines or BCM lines at once.

The difference between the phase numbers for *master planning* and the phase numbers for *order planning* is:

- Master-planning phase numbers are based on the BCMS, whereas order-planning phase numbers are based on the BOMs.
- Master-planning phase numbers take the plan units into account.

To distribute master-plan quantities over calendar days

In principle, the quantities in an *item master plan* or *channel master plan* are stored by plan period.

However, there are cases in which these quantities must be disaggregated to quantities by day, for example, when the plan is rolled forward. The basis for the distribution is the company calendar specified in the **Companies (tceemm1170m000)** session.

Distribution of quantities

LN uses the following basic rules to distribute the plan period quantities over the calendar days:

- The quantity per day is proportional to the capacity on that day divided by the total capacity in the plan period (see example)
- If there is no capacity in the plan period, the total quantity is allocated to the first day.

Example: distribution of quantities

Assume a plan period of seven days with a (production) volume of 100 pieces.

The capacity by day and the distribution of the quantity over the days would be the following:

Day	Capacity [hours]	Distributed quantity
Sunday	0	0
Monday	8	20
Tuesday	8	20
Wednesday	8	20
Thursday	16	40
Friday	0	0
Saturday	0	0

Distribution of the inventory plan

The *inventory plan* is distributed differently over the calendar days of the plan period than it is for the quantities. The inventory plan is not a quantity but a target inventory. LN determines the inventory plan by day by first setting the inventory plan at the end dates of each plan period. The inventory plan at the end date of a plan period equals the inventory plan for the plan period. The inventory plan on intermediate days (between consecutive end dates) is determined in a linear fashion while taking into account the available capacity. On days with no capacity, the inventory plan will be the same as on the previous day.

Example: Distribution of inventory plan

Assume a plan period of seven days with a (production) volume of 100 pieces.

Inventory plan at the end of the previous plan period : 100. Inventory plan at the end of the current plan period : 200

This results in the following inventory plan by day:

Day	Capacity	Inventory plan
Saturday		100
Sunday	0	100 (*)
Monday	8	120
Tuesday	8	140
Wednesday	8	160
Thursday	16	200
Friday	0	200
Saturday	0	200

(*) No capacity

When aggregating the day quantities back to period quantities, LN makes the inventory plan of a plan period equal to the inventory plan of the last day of the plan period. As a result of this procedure, information is lost if the inventory plan in the middle of the plan period is higher than at the end because that higher inventory plan level will not be retained.

To generate critical capacity requirements

When a *production plan* is generated, the critical resource capacity needed to carry out this production plan is recorded in the form of *critical capacity requirements*. In the **Resource Master Plan (cprmp3501m000)** session, these requirements are displayed in the **Capacity Used for Critical Capacity Requirements** field.

Resource capacity is considered as critical capacity for the production of an item if the following conditions are met:

- The resource appears as a critical *work center* in the item's *bill of critical capacities (BCC)* (see the **Bill of Critical Capacities (cprpd3130m000)** session).
- The first date with capacity of the plan period in which the planned supply falls (or, if there is no such date, the first day of the plan period) has to fall between the effective date and the expiry date recorded for the critical capacity in the item's BCC.

As a rule, critical capacity requirements are generated when you update an item master plan (see To maintain an item master plan). When you use the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, however, you can disable the generation of requirements.

When a critical capacity requirement is planned, the duration of the production process is an important factor. Starting from the assumption that the supply of the end item is evenly distributed over a plan period, the capacity requirement is shifted back in the past using the *lead-time offset* and the lead time recorded in the BCC of the end item.

The start date for the critical capacity requirement is computed as the start date of the plan period minus the lead-time offset (in working days). The end date of the requirement is computed as follows:

$$\text{Plan period end date} - \text{lead-time offset} + \text{lead time}$$

The lead-time offset and the lead time are expressed in working days. The period comprised by the start date and the end date of the capacity requirement can overlap with more than one plan period. In that case, the required capacity is distributed over these plan periods in proportion to the available capacity (according to the resource calendar) in each plan period. For each combination of originating plan period and required plan period, a separate critical capacity requirement is recorded.

You can view the critical capacity requirements and their origin in the **Critical Capacity Requirements (cprmp3560m000)** session.

Generating critical material requirements

When a *production plan* is generated, the critical components needed to carry out this production plan are recorded as *critical material requirements*. In the Item Master Plan (cprmp2101m000) session, these requirements are visible as *dependent material demand*.

A component is considered a critical material for the production of an item if the following conditions are met:

- The component appears in the item's *bill of critical materials (BCM)* (see the Planning Bill of Critical Material (cprpd3120m000) session).
- The first date with capacity of the plan period in which the planned supply falls (or, no such date exists, the first day of the plan period), must fall between the effective date and the expiry date recorded for the critical component in the item's BCM.

As a rule, critical material requirements are generated when you update an item master plan (refer to the topic To maintain an item master plan. (When you use the Initialize, Roll, and Update Scenario (cprpd4200m000) session, you can disable the generation of requirements.)

Because the production process takes time, the planning of a critical material requirement must fall before the planned supply of the end item. Assuming that the supply of end item is evenly distributed over the plan period, the material requirement is shifted back in the past with the *lead-time offset* recorded in the bill of critical materials of the end item.

Offsetting logic BCM

LN takes into account the parent / component relation when it calculates *dependent demand* for critical items. As a result, LN plans a multiple of the *bill of critical materials (BCM)* quantity in each *plan period*. The advantage is that you do not have to wait until the *production plan* of all the periods over which the dependent demand is spread, is executed.

The offsetting process to plan critical components is as follows:

- Create a production plan for the parent item.
- Offset the lead time of the parent item to the plan periods, and divide the amount of the forecasted demand over the available plan periods.
- Round the forecasted demand to the parent unit set according to the unit set that you defined for the parent item in the **Items (tcibd0501m000)** session.
- Multiply each BCM quantity of critical components of the parent item.
- Round the (critical) dependent demand according to the component unit set.
- The start date for the critical material requirement is computed as the start date of the plan period minus the lead-time offset (in working days).
- Likewise, the end date of the requirement is computed as the end date of the plan period minus the lead-time offset (in working days).
- The period comprised by the start date and the end date of the material requirement can overlap with more than one plan period. In that case, the required quantity is distributed over these plan periods in proportion to the available capacity (according to the company calendar) in each plan period.
- For each combination of originating plan period and required plan period, a separate critical material requirement is recorded.

You can view the critical material requirements in the **Critical Material Requirements (cprmp2505m000)** session. The origin of critical material requirements is displayed in the **Critical Material Requirements (cprmp2505m000)** session.

Note: To guarantee that dependent demand explosions of critical items are allocated to the correct warehouse, a warehouse must be specified on the BCM line. LN automatically enters the warehouse specified for the item on the BOM line in the **Bill of Material (tibom1110m000)** session, or the warehouse specified for the item in the **Items - Ordering (tcibd2100m000)** session if no warehouse is specified on the BOM line. The ATP and the dependent demand of a main item are exploded to plan items that have the same planning cluster as the warehouse you specified on the bill of critical materials of the main item.

Generating an inventory plan

If you maintain an item master plan for an item, you can let LN generate an *inventory plan*.

You can choose between two methods for generating the inventory plan:

Method: Safety stock and seasonal pattern

If the Forecast Based Generation Method check box in the Items - Planning (cprpd1100m000) session is cleared, the inventory plan is based on the safety stock and a seasonal pattern.

You can define the following relevant parameters for this calculation in the **Items - Ordering (tcibd2100m000)** session:

- **Seasonal Pattern**
- **Safety Stock**

Note: You can differentiate these parameters by warehouse in the **Item Data by Warehouse (whwmd2510m000)** session.

Calculation procedure

If a seasonal pattern for safety stock is specified, LN first loads the relevant seasonal factors.

For each plan period the planned inventory level is determined as follows:

$$PI(t) = SS * SF(t)$$

PI(t)	planned inventory level for period t
SS	safety stock
SF(t)	seasonal factor for period t

If no seasonal pattern for safety stock is specified, the planned inventory level is determined for each plan period:

$$PI(t) = SS$$

PI(t)	planned inventory level for period t
SS	safety stock

Example

Plan Period	Start Date	End Date	Expected Demand
1	29 April	2 May	200
2	3 May	6 May	50
3	7 May	10 May	60
4	11 May	14 May	400
5	15 May	18 May	1000
6	19 May	22 May	700

Forecast Horizon = 10 days

Method: Forecast-based generation method

If the Forecast Based Generation Method check box in the Items - Planning (cprpd1100m000) session is selected, the inventory plan is based on a forecast of the demand.

Example

Plan Period	Start Date	End Date	Expected Demand
1	29 April	2 May	200
2	3 May	6 May	50
3	7 May	10 May	60
4	11 May	14 May	400
5	15 May	18 May	1000
6	19 May	22 May	700

Forecast Horizon = 10 days

Plan period one: End date + 10 days = 12 May (= 10 days after 2 May) Inventory plan = 510 (= 50 + 60 + 400)

Plan period two: End date + 10 days = 16 May (= 10 days after 6 May) Inventory plan = 1460 (= 60 + 400 + 1000)

Deleting Master Plan

To delete master plans:

- 1 Specify a scenario and a plan level.
- 2 Select a range of plan items, channels, and/or resources.
- 3 Click Delete.

When an item master plan is deleted, LN also deletes all data that is directly linked to the item's *production plan*:

- The *critical material requirements*
- The *component CTP reservations*
- The *critical capacity requirements*
- The *capacity CTP reservations*
- The capacity use that is recorded for the production plan

Moreover, if you select the **Delete Planned Orders** check box, LN deletes all planned orders for the item and the data that is directly linked to these orders:

- The planned receipts and requirements recorded for each planned order in the **Planned Order - Inventory Movements (cprp0511m000)** session.
- The capacity use that is recorded for each *planned production order*.

Aggregated Planning

Aggregated planning

In Enterprise Planning, you can use carry out planning at various levels of aggregation: from general product groups to individual products. Moreover, you can exchange data between these levels through *aggregation relationships*:

- Aggregate data to a more general product level.
- Disaggregate data to a more specific product level (families).

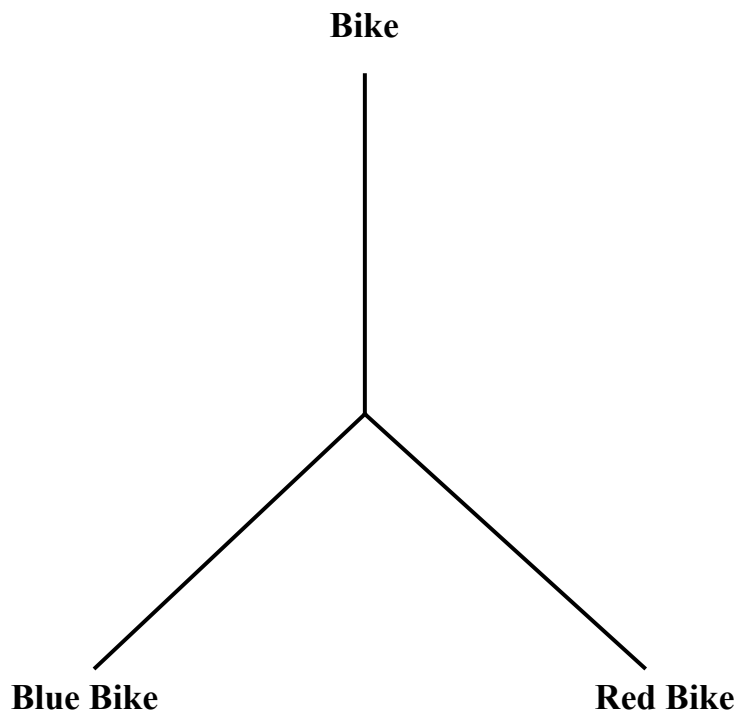
This aggregation concept has several applications:

- You can group items into *product families*, which can be planned collectively.
- You can combine items that belong to different *channels*, or companies.

The following examples demonstrate the use of aggregation relationships:

Example: standard product-family structure

A family of bikes has two child items: red bikes and blue bikes. The forecast is made by color, and then aggregated to the family level to get an overview of the total forecast.

**Example: aggregation through a distribution structure**

You have a manufacturing location M1 with two distribution centers (DC1 and DC2) that each make a forecast:



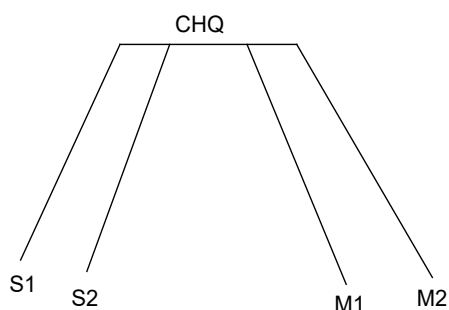
M1 can then aggregate the forecast from DC1 and DC2 to get an overall forecast.

Example: Multicompany aggregation

You have:

- Two sales offices, S1 and S2

- Two manufacturing locations, M1 and M2
- A central headquarters (CHQ) that performs coordinated planning.



The forecast can be aggregated from S1 and S2 to CHQ. A production plan is established centrally. This production plan can then be disaggregated to the production locations.

Types of (dis)aggregated data

As a rule, you can aggregate and/or disaggregate the following types of data:

- Production plans
- Production orders
- Purchase plans
- Purchase orders
- Production receipts
- Purchase receipts
- Distribution orders
- Distribution receipts
- Demand forecasts
- Inventory plans
- Extra demand

LN automatically aggregates *goods-flow data* for a family item to plan items with **Family** item type. LN cannot disaggregate these data.

How to set up aggregation relationships

You can manually define aggregation relationships in the **Aggregation Relationships (cprpd3110m000)** session, or let LN create aggregation relationships between a specific family item and an entire range of sub-items in the **Generate Aggregation Relationships (cprpd3211m000)** session.

You can define aggregation relationships between items (or families) on any *plan level*. This provides a lot of flexibility:

- You can use aggregation relationships to explode the forecast demand of a product family directly to the components of the family, which can also be families.

Aggregation from channel master plans to item master plan

If you want to aggregate data from one or more channel master plans to the corresponding item master plan, you need not define aggregation relationships for this. You can use the **Aggregate Channel to Item Master Plan (cpdsp5210m000)** session to carry out this type of aggregation directly.

Plan levels and product families

In Enterprise Planning you can use *plan levels* to represent different levels of aggregation.

Example

- On plan level 1, you define a general *product family* named BIKE.
- On plan level 2, you define various subfamilies, such as RACING BIKE and MOUNTAIN BIKE.
- On plan level 3, you define individual products, such as RACING BIKE C1 and RACING BIKE C2.

You maintain planning data at each plan level. You can exchange data between the various levels by defining *aggregation relationships*.

Example

- You can create separate forecasts for RACING BIKE and MOUNTAIN BIKE, and use the sum of these forecasts as an overall forecast for BIKE. This is an example of *aggregation*.
- You can make a production plan for RACING BIKE, and distribute this plan over the various types of racing bike. This is an example of *disaggregation*.

You can specify an item's plan level in the **Items - Planning (cprpd1100m000)** session.

Plan levels play an important role in the planning process:

- A planning run in Enterprise Planning always involves one particular plan level.
- Capacity overviews in Enterprise Planning always concern one particular plan level. In this way, you can maintain distinct capacity overviews at various levels of aggregation.

Note: Use of plan levels is not strictly necessary. For example, you can define aggregation relationships between items that are at the same plan level. As a general rule, however, it is recommended that you use plan levels to represent the various levels of aggregation in a product-family structure.

Aggregation of channels

In Enterprise Planning, you can carry out aggregation and disaggregation of planning data, based on *aggregation relationships* defined in the **Aggregation Relationships (cprpd3110m000)** session.

You can define aggregation relationships between:

- A *plan item* and a family item
- A channel item and a plan item

- Two family items
- A channel item and a family item
- A channel item and a channel family item
- Two channel family items

Aggregation from channel master plans to item master plan

If you want to aggregate data from one or more *channel master plans* to the corresponding *item master plan*, you do not need to define aggregation relationships for this. You can use the **Aggregate Channel to Item Master Plan (cpdsp5210m000)** session to carry out this type of aggregation directly.

Multicompany aggregation

Aggregation and *disaggregation* can take place within a company as well as between several companies.

Starting from the parent company (that is, the company that contains the parent item for the aggregation or disaggregation), you can define a multicompany *aggregation relationship* by specifying another company in the **Company** field in the **Aggregation Relationships (cprpd3110m000)** session.

Multicompany aggregation works in essentially the same way as aggregation within a company.

Note: When Enterprise Planning passes on planning data between companies, it always does so in the context of a particular *scenario* (in each company involved).

Aggregation of planning data

Use the **Aggregate Channel, Plans & Orders (cprmp2250m000)** session to aggregate planning data according to the *aggregation relationships* defined in the **Aggregation Relationships (cprpd3110m000)** session.

For aggregation, the parent item needs to have an *item master plan*.

In the **Aggregate Channel, Plans & Orders (cprmp2250m000)** session, you can aggregate the following types of planning data:

- *Demand forecast*
- *Extra demand*
- *Inventory plan*
- *Production plan*
- *Purchase plan*

Aggregation from channel master plans to item master plan

If you want to aggregate data from one or more channel master plans to the corresponding item master plan, you need not define aggregation relationships for this. You can use the **Aggregate Channel to Item Master Plan (cpdsp5210m000)** session to carry out this type of aggregation directly.

Aggregation of goods-flow data

For a plan item with **Family** item type, LN automatically aggregates the *goods-flow* data of the child items. To do so, you must first define an appropriate aggregation relationship, and run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, with the **Update Goods Flow Data** check box selected. LN updates the goods flow in the following three situations:

- Before LN generates the master planning of a family item.
- Before LN runs the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.
- If you click **Update** in the item master plan of a family item.

Disaggregation of planning data

Use the **Disaggregate Channel, Plans & Orders (cprmp2260m000)** session to disaggregate master-plan data according to the *aggregation relationships* defined in the **Aggregation Relationships (cprpd3110m000)** session.

For disaggregation, the parent item and the child items each need an *item master plan*.

In the **Disaggregate Channel, Plans & Orders (cprmp2260m000)** session, you can disaggregate the following types of planning data:

- *Demand forecast*
- *Extra demand*
- *Inventory plan*
- *Production plan*
- *Planned production orders*
- *Scheduled production receipts*
- *Purchase plan*
- *Scheduled distribution receipts*
- *Planned purchase orders*
- *scheduled purchase receipts*
- *Planned distribution orders*

Disaggregation rules

The way in which Enterprise Planning disaggregates the selected master-plan data to master plans of lower level plan items depends, among other things, on the disaggregation rule you specify in the **Disaggregate Channel, Plans & Orders (cprmp2260m000)** session.

Enterprise Planning supports the following types of disaggregation rules:

- **Disaggregate Percentage**
- **Inventory Level**
- **Capable to Promise**
- **Pro Rate**

Disaggregation rule: Disaggregate Percentage

The volume by period of the parent item is distributed over the child items based on the planning percentages defined in the aggregation relationships. This can result in more than 100% in total.

Example

Demand forecast of item A = 100 This demand forecast is disaggregated from A to A1, A2, and A3.

-	A1	A2	A3
Planning percentage	75	45	30
Disaggregated volume	75	45	30

Disaggregation rule: Inventory Level

The volume by period of the parent item is distributed over the child items in a proportionate fashion, based on the difference between the *inventory plan* and the *projected inventory*.

This rule is typically used for disaggregating planned supply. The largest part of the planned supply is moved to the place where the inventory is relatively low. This optimizes the inventory levels.

Example

Production plan of item A = 100 This production plan is disaggregated from A to A1, A2, and A3.

-	A1	A2	A3
Inventory plan	100	100	100
Projected inventory	25	55	70
Difference	75	45	30
Disaggregated volume	50	30	20

Note: If the value of the difference for A1 is negative or equal to zero, LN does not disaggregate planned supply to A1

Disaggregation rule: Capable-To-Promise

The volume by period of the parent item is distributed over the child items on the basis of the *capable-to-promise (CTP)* of the child items. Note that all types of CTP are supported and taken into account here. Also see the Related topics for more information about the capable-to-promise functionality.

Example

Production plan of item A = 100 This production plan is disaggregated from A to A1, A2, and A3.

Item	A1	A2	A3
------	----	----	----

Capable-to-promise	75	45	30
Disaggregated volume	50	30	20

Note: If the value of Capable-to-promise for A1 is negative or equal to zero, LN does not disaggregate CTP to A1.

Disaggregation rule: Pro Rate The volume by period of the parent item is distributed over the child items on the basis of the existing values for the child items.

Example Inventory plan of item A = 100 This inventory plan is disaggregated from A to A1, A2, and A3.

Item	A1	A2	A3
Existing inv. plan	75	45	30
Disaggregated volume	50	30	20

Disaggregation Rule: Pro rate

LN disaggregates the planning quantities in a proportional way, based on the current values in the *item master plan*. If sub-item 1 has the most in the current situation he will have the most after disaggregation.

The Pro rate disaggregation rule allows you to split planning data of a family plan item based on the original quantities of the underlying (individual) plan items. In this way the forecast data at item level can follow different trends for different items, such as steady for item A, increasing for item B, decreasing for item C in the example below. If the forecast quantity of the family item is modified, you can disaggregate the modified aggregated forecast data at family level back to item level based on the original forecast quantities at item level, as demonstrated in the chart in the following table.

Note: When LN disaggregates planning quantities from a normal item to the corresponding channeled items, all plans (production, and purchase), orders (production, purchase and distribution) and receipts (production, purchase and distribution) are disaggregated to the **Allowed Demand** field in the **Channel Master Plan (cpdsp5130m000)** session.

Example

The following table shows the forecast quantities of a family item and the sub-plan items A, B, and C in plan periods 1 to 5.

Plan period	1	2	3	4	5
Item A	10	10	10	10	10
Item B	5	7	9	11	13
Item C	14	13	12	11	10
Family item (aggregated)	29	30	31	32	33

The following table shows how LN disaggregates the forecast quantities according to the pro rate disaggregation rule if the forecast values of the family item change in plan period 3 and 4.

Plan period	1	2	3	4	5
Family item (modified)	29	30	36	38	33
Item A (pro rate)			11.61	11.87	
Item A (rounded)			12	12	
Item B (pro rate)			10.45	13.06	
Item B (rounded)			10	13	
Item C (pro rate)			13.94	13.06	
Item C (rounded)			14	13	

To set up an aggregation structure

To carry out aggregation and/or disaggregation, you must first set up *aggregation relationships*.

You can manually define aggregation relationships in the **Aggregation Relationships (cprpd3110m000)** session. Here you can specify, among other things:

- If you want to use the aggregation relationship for aggregation, for disaggregation, or for both.
- If you want to use the aggregation relationship to aggregate/disaggregate a particular type of planning data.

In addition, you can let LN generate aggregation relationships between a specific family item and an entire range of sub-items in the **Generate Aggregation Relationships (cprpd3211m000)** session. This is a straightforward way to create aggregation relationships, because you can only define general settings that apply to all the relationships that LN generates for the specified range of sub-items. Afterwards, you can fine-tune each of the aggregation relationships that LN generated individually in the **Aggregation Relationships (cprpd3110m000)** session.

Note:

The way in which LN uses the various aggregation percentages that you define in the **Aggregation Relationships (cprpd3110m000)** session depends on the value that you specify in the **Aggregation Type** field:

- If you specify **Aggregate from Sub-Item**, Common aggregates the planning data according to the percentage you define for each type of data.
- If you specify **Disaggregate to Sub-Item**, Common disaggregates the planning data according to the percentage you define for each type of data.
- If you specify **Both**, Common aggregates 100% of the underlying planning data and disaggregates them according to the percentages that you specified for each specific data on the aggregation relationship.

Note: If you want to use planning percentages for disaggregation as well, it is recommended that you define separate aggregation relationships for aggregation and disaggregation.

Automatic updating

For aggregation and/or disaggregation, you need to set the following fields in the **Items - Planning (cprpd1100m000)** session to **(Dis)aggregate OR Always Update** (as required):

- **Automatic Update of Production Plan**
- **Automatic Update of Purchase Plan**
- **Automatic Update of Inventory Plan**
- **Automatic Update of Demand Forecast**

Special cases of aggregation

You can use the **Aggregate Channel, Plans & Orders (cprmp2250m000)** session and the **Disaggregate Channel, Plans & Orders (cprmp2260m000)** session to aggregate or disaggregate planning data.

However, note the following special cases of aggregation:

- Use the **Aggregate Channel to Item Master Plan (cpdsp5210m000)** to aggregate data from *channel master plans* to the corresponding item master plan. For this type of aggregation, you do not need to define aggregation relationships.
- Use the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session to aggregate *goods-flow* data to a product family. Select the **Update Goods Flow Data** check box. (For this type of aggregation, aggregation relationships are required.)

Channels

Channels in Enterprise Planning

Enterprise Planning supports the use of *channels* to serve particular customers (sold-to business partners) or to distribute specific items. For example, a channel can represent a particular geographical area, or a particular group of customers. Forecasts can be maintained and compared with actual sales in the channel master plan.

Based on the allowed demand, the channel available to promise is automatically calculated to support order promising. Forecast and allowed demand can also be automatically calculated using disaggregation from the central item master plan.

- Without an item master plan
If an item has no item master plan, you can maintain forecasts by channel in the **Special Demand by Item (cpdsp2100m000)** session. The channel division is also taken into account for forecast consumption. For more information, see To compute the projected inventory.
- With an item master plan
If you maintain an item master plan for an item, you can also maintain a *channel master plan* for each item/channel combination. Channel master plans offer the following types of functionality:
 - Channel-specific demand forecasting and forecast consumption

- Aggregation of channel master plans to the corresponding item master plan
- *Channel ATP*, used to control the maximum sales volume for each channel
- How to set up a channel

To set up a channel for use in Enterprise Planning, you must define the channel, and specify which customers and which items belong to this channel.

 - Define the *channel* in the **Channels (tcmcs0166m000)** session.
 - Enter this channel as the default channel for one or more customers (sold-to business partners) in the **Channel** field in the **Sold-to Business Partners (tccom4510m000)** session.
 - You can modify the customer's channel for a particular item in the **Channels** field of the **Items - Sales Business Partner (tdisa0510m000)** session. If there is a channel linked to the business partner and a channel master plan present, the channel is defaulted in the sales order line. Updating of a channel master plan is based on channel data in the sales order lines: The channel master plan is only updated if channel data is present on the sales order line.
 - Define specific item/channel combinations in the Plan Item - Channels (cpdsp5100m000) session.
- Multicompany planning

Channel functionality can also be used for other *companies* in a multicompany situation. Define the company in the Business Partners (tccom4500m000) session, designating it as an *affiliated company*.

To maintain a channel master plan

If you maintain an *item master plan* for a plan item, you can also maintain a *channel master plan* for each item/channel combination.

How to set up a channel master plan

Once you have set up items, business partners, and channels (see Channels in Enterprise Planning, you can prepare a channel master plan by using the following procedure:

- Define specific item/channel combinations in the **Plan Item - Channels (cpdsp5100m000)** session.
- Run the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session, select the item and channel, and select the **Generate Item/Channel Master Plan** check box.
- If you want to use *channel ATP*, enter the *allowed demand* in the **Channel Master Plan (cpdsp5130m000)** session.

Note: If you primarily use channels for channel ATP, you need not necessarily group all your customers into channels. Only those customers for which you want to limit the maximum sales volume need be in a channel.

Views

For a channel master plan, two different views are available:

- The **Channel Master Plan (cpdsp5130m000)** session displays the channel master plan of one particular item/channel combination, in a way comparable to the item master plan.
- The **Channel Master Plan (cpdsp5130m000)** session displays all channel master plans available for a particular item for one plan period. The corresponding data in the item master plan is also displayed.

How to delete a channel master plan

You can use the **Delete Master Plan (cprmp2210m000)** session to delete channel master plans.

Demand forecast by channel

You can enter a *demand forecast* for a channel in the **Channel Master Plan (cpdsp5130m000)** session. You can also generate a demand forecast by using the **Generate Demand and Inventory Plan (cpdsp1210m000)** session. For more information, see Demand forecasting in Enterprise Planning.

You can store the generated demand forecast in one of the following fields in the **Channel Master Plan (cpdsp5130m000)** session:

- **Demand Forecast**
- **Extra Demand**

Aggregation of demand forecast

You can aggregate the demand forecast of individual channels to the demand forecast of the item master plan. Alternatively, you can copy the sum of the demand forecasts of all channels to the item's *production plan*. This procedure is a simplified method for production planning. For more information, see Aggregation of channels.

Channel ATP periods

You can enter the *allowed demand per plan period* for an item in the **Channel Master Plan (cpdsp5130m000)** session, but LN checks the *channel ATP* per channel ATP period.

You can define the channel ATP periods in the **Plan Item - Channels (cpdsp5100m000)** session.

Channel ATP period length

Enter the channel-ATP-period length in the **ATP Period Length** field of the **Plan Item - Channels (cpdsp5100m000)** session. A channel ATP period is defined in calendar days. The channel ATP periods have a fixed length over the total planning horizon.

As a rule, a channel ATP period comprises several plan periods.

Reference date

You can specify a reference date in the **Reference Date** field of the **Plan Item - Channels (cpdsp5100m000)** session. This reference date indicates when the first channel ATP period must start.

If the reference date lies before the scenario start date, LN adds a multiple of the value of the **ATP Period Length** field to the reference date. The first channel ATP period starts at the first possible date after the start date of the scenario.

Note: The reference date is a fixed date. Rolling the scenario does not change the reference date.

Example

You use the following settings:

- Reference date: Jan. 1
- Channel ATP period length: 28 days. As a result, the first ATP period is: Jan. 1 - Jan. 28.

Channel ATP

LN accumulates the allowed demand of all plan periods with a start date in the same channel ATP period. Customer orders can be accepted for a channel, until all of the channel ATP in a channel ATP period has been used up.

Workload Control

Workload control

Workload control is a *master-planning* method for production planning that considers the constrained availability of capacity and materials. The main purpose of the planning method is to control the workload level for all *work centers* that are considered a constraint.

The basic procedure of the planning method is:

- As a starting point for the planning process, an ideal plan is generated, assuming infinite availability of production resources and materials. (Or, alternatively, the current master plan is taken as a starting point.)
- LN checks the available capacity and components. The planned production is moved to earlier or later periods where necessary, to create a feasible plan.

If a part of a planned production volume is moved to an earlier period, the inventory level will increase, because the item is produced in advance of the demand. If a part of the planned production volume is moved to a later date, the projected inventory can become negative. This implies, that it is impossible to produce everything in time to meet the demand. In general, the objective of the planning method is to generate a plan in which the projected inventory follows the desired inventory levels as closely as possible.

Application areas

This planning method is generic as it can be used in many different situations. However, sequence dependent setup times are not taken into account.

The application areas for workload control are:

- Job shop

- Discrete multi-model flow
- Process flow and batch processing

Job shop

The workload-control planning method is based on the relationship between workload and production lead time. It is particularly important in job shop environments to control the workload and the lead times.

Discrete multi-model flow

The workload-control planning method plans with fixed lead times. In multi-model flow the production lead times are often fixed. This planning method is therefore also suited for multi-model flow production systems without sequence-dependent setup times.

Workload control, planning algorithm

The workload-control planning method is basically a leveling algorithm that levels the production plans of several items simultaneously. If the production plan in a particular plan period creates an overload of the available production capacity, LN moves a part of the production plan to an earlier or later period. If the available materials are insufficient, LN also responds by moving part of the production plan.

This algorithm is applied to plan units for which the **Master Planning Method** field in the **Plan Unit (cprpd6100m000)** session is **Workload Control**.

The planning procedure is started by running a master-plan simulation in one of the following sessions:

- Generate Master Planning (cprmp1202m000)
- Generate Master Planning (Item) (cprmp1203m000)

The complete algorithm consists of three steps:

- 1 Generate the non-constraint plan
- 2 Backward planning
- 3 Forward planning

You can skip the backward or the forward planning step by setting the **Backward Planning** and **Forward Planning** parameters in the **Work Load Control Parameters (cpwlc2101m000)** session. For details, see Workload control, backward and forward planning.

The effect of these planning steps is demonstrated graphically in the Workload control, a graphic example topic.

A description of the steps of the planning algorithm:

- 1 Generate the non-constraint plan

LN generates a production plan in which capacity and material constraints are ignored. In this plan each item is produced exactly when it is needed. This plan is generated in the same way as described for the infinite planning method. For details, see Infinite master planning. **Note** This step is skipped if the **Starting Point WLC** field in the **Work Load Control Parameters (cpwlc2101m000)** session has the **Current Master Plan** value.

2 Backward planning

Backward planning starts from the non-constraint production plan and replans this production plan by considering any material and capacity constraints. All plan periods are planned one by one, starting from the last period, and working backward up to the first plan period. If the production volume cannot be planned completely due to material or capacity constraints, part of it is moved to the preceding period.

3 Relative priority of plan items

The order in which the items are planned in each period has a great influence on the resulting plan. This order can be defined by specifying a priority rule in the planning parameters on the basis of factors such as:

- Moved production volume
- Material and production costs
- Priority of the plan item

For details, see Workload control, to compute planning priorities. If the algorithm arrives at the first plan period, and the production volume in that period exceeds the capacity or material constraints, the method fails to generate a feasible plan in which all desired delivery dates are met.

4 Forward planning

The forward planning always results in a feasible plan. However, it is possible that a production volume is delivered late. The forward planning step starts at the first period and plans the periods one by one. Production volumes that cannot be planned completely due to material or capacity constraints, are moved to the next period.

Capacity constraints

The capacity requirements of the plan items are recorded in the **Bill of Critical Capacities (cprpd3130m000)** session. Only the resources for which the **Constraint** check box in the **Work Centers - Planning (cprpd2100m000)** session is selected are considered a constraint in the planning. LN assumes an infinite capacity for the other resources.

The division of capacity requirements over the plan periods is determined by the value of the **Capacity Consumption Based On** field in the **Work Load Control Parameters (cpwlc2101m000)** session.

Capacity constraints are only considered in the planning if the **Consider Capacity Constraints** check box is selected during a master-plan simulation.

Material Constraints

The material requirements of the plan items are recorded in the **Planning Bill of Critical Material (cprpd3120m000)** session. Only the materials for which the **Constraint** check box in the **Items - Planning (cprpd1100m000)** session is selected are considered a constraint in the planning.

Material constraints are only considered if the **Consider Material Constraints** check box is selected during a master-plan simulation.

Note: If the **Number of Iterations** field in the **Generate Master Planning (cprmp1202m000)** session is greater than zero, LN always starts by creating a non-constraint plan. The material constraints can be considered during subsequent iterations.

Workload control, a graphic example

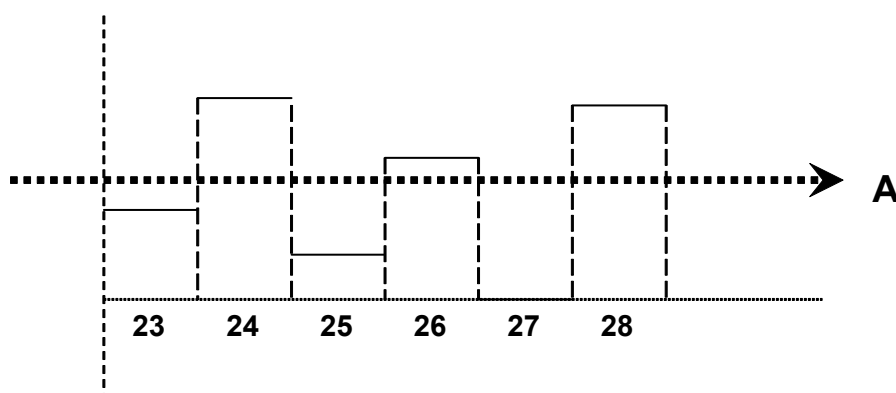
The planning algorithm of the Work Load Control planning method can be illustrated by means of the graphics below. The planning method is described in detail in the Workload control, planning algorithm topic.

In these graphics the total production volume of a number of plan items is displayed.

Note: This example shows the effect of capacity constraints. Material constraints are handled in exactly the same way.

Step 1: Generate the non-constraint plan

When no constraints are considered, LN plans the production of each item exactly when it is needed. Generally, this non-constraint plan is not feasible, because of capacity or material constraints.

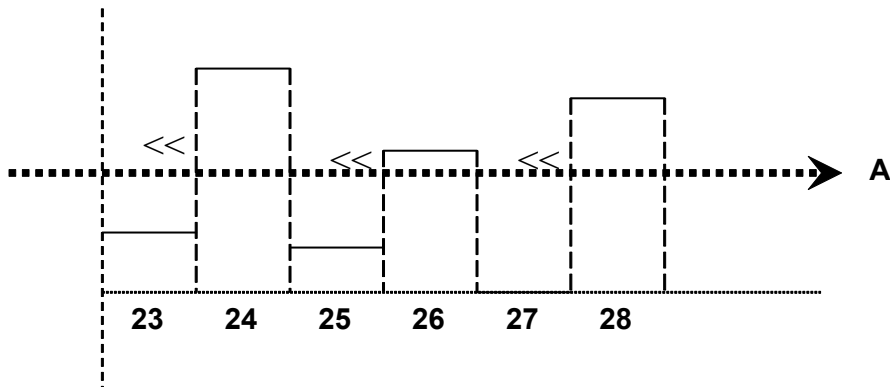


A

Capacity Constraints

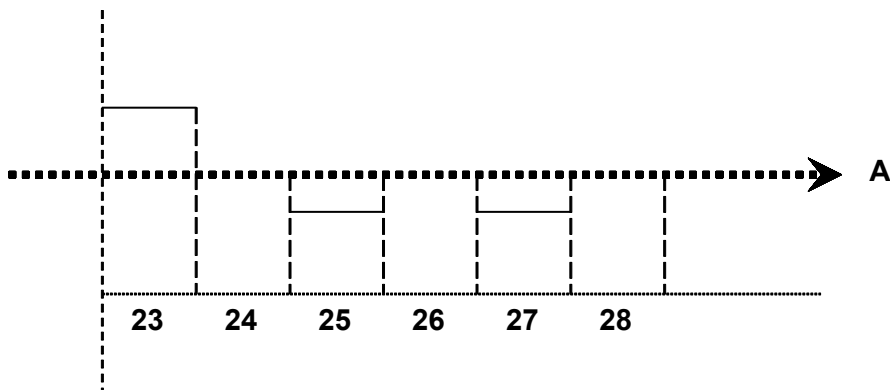
Step 2: Backward planning

In week 24, 26 and 28 the required production capacity exceeds the available capacity. In a backward-planning step, part of the planned production is moved to earlier periods.



A

Capacity constraints



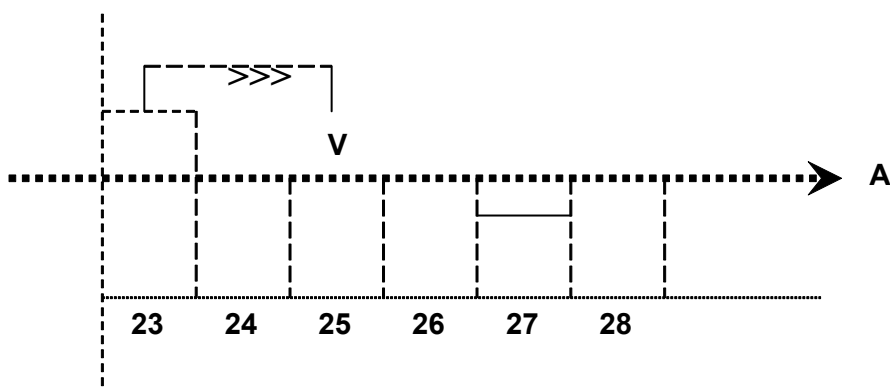
A

Capacity constraints

Step 3: Forward planning

The excess capacity requirements in the first period of the plan cannot be moved backward any further.

As a result, the desired delivery dates cannot be met. The excess production volume is moved forward, to get a plan that resembles the non-constraint plan as much as possible.



A

Capacity constraints

Workload control, to compute planning priorities

If the desired production volume for a plan period exceeds the capacity or material constraints, LN must make a selection. Some plan items can be planned immediately. The rest must be moved to the next or the preceding plan period.

This selection is based upon the following planning data and item data:

Planning data:

- Production volume
- Volume moved
- Numbers of periods moved

Item data:

- Total material costs
- Production costs
- Item priority

Item data can be defined in the **Items - Planning (cprpd1100m000)** session.

You can change the planning priority calculation in the **Work Load Control Parameters (cpwlc2101m000)** session. The effects of the fields in that session are demonstrated in the Workload control, a detailed example topic.

- Priority Level

A priority level is calculated for each plan item. Three different approaches are available. The priority level can be based on:

- Planning data, such as the production volume
- Predefined item priorities (such as high, medium, low)
- A combination of planning data and item priorities

Determine this by setting the **Consider Item Priority** field.

- Planning data

If the **Consider Item Priority** field is **no**, the priority level is based on planning data such as the production volume.

The priority level is calculated according to the following method:

- Backward/forward planning rules

First, the priority level is set to one of the following:

- **Production Volume** The production volume is the quantity to be produced in a plan period.
- **Volume Moved** The volume moved is the production volume that has been moved to another plan period.
- **Number of Periods Moved** The number of periods that a certain production volume has been moved backward or forward.
- **Volume and Periods Moved** The Volume and periods moved is defined as:

Volume moved * Number of periods moved

Separate rules for the backward and forward planning steps can be defined in the **Backward Plan. Rule** and **Forward Plan Rule** fields.

- Material and Production Costs

The priority level that was determined in the previous step, can be adjusted by multiplying it by the material or production costs of the plan item. This is determined by the **Consider Material Costs** or **Consider Production Costs** in the **Work Load Control Parameters (cpwlc2101m000)** session.

- Predefined item priorities

If the **Consider Item Priority** field is set to **only**, the priority level is based on predefined item priorities. Item priorities can be low, medium, high, and so on. The priority of each plan item is recorded in the **Priority** field in the **Items - Planning (cprpd1100m000)** session.

- Combination of planning data and item priorities

If the **Consider Item Priority** field is **yes**, the priority level is based on a combination of planning data and predefined item priorities.

The priority level is subsequently multiplied by a priority factor which reflects the relative importance of a plan item. The priority factor is based on the following table:

Priority	Priority Factor
Highest	1.8
Very high	1.6
Higher	1.4
High	1.2
Medium	1
Low	0.8
Lower	0.6
Very Low	0.4

Priority	Priority Factor
Lowest	0.2

The priority of an item is recorded in the **Priority** field in the **Items - Planning (cprpd1100m000)** session.

Note:

The unit of measure is not considered in the criterion of production volume. If the plan items are measured in a number of different units, such as piece, kg, or liter, the production volume is not a suitable criterion. In that case, it is better to use the financial value of the production volume. Do this by selecting the **Consider Material Costs** or **Priority** check boxes.

If the planning rules result in the same priority level for two items, the item with the highest production volume is planned first.

Workload control, a detailed example

Six *plan items* are produced in the same *work center*. If the workload exceeds the capacity constraints, it is divided over the *plan periods* by means of a backward planning pass.

The parameter setting in the **Work Load Control Performance Indicators (cpwlc2520m000)** session determines which item's production volume is the first to be allocated to a particular plan period and which production volume must be moved to an earlier period.

This topic contains examples of the following parameter settings:

- **Example 1 : Plan item priority**
The production of the plan item with the highest priority is allocated first. If a plan period's production capacity is exceeded, production volumes are moved to the preceding period. For details, refer to [Example 1 : Plan item priority](#) on page 148.
- **Example 2 : Volume x times cost**
The plan item of which the highest value of production volume has been shifted in the previous planning step is allocated first. If a plan period's production capacity is exceeded, production volumes are moved to the preceding period. For details, refer to [Example 2 : Volume moved x cost](#) on page 151.

Example 1 : Plan item priority

The production of the plan item with the highest priority is allocated first. If a plan period's production capacity is exceeded, other plan items' production volumes are moved.

Settings

The following parameter settings are used:

Backward Plan. Rule	= Volume Moved
Consider Material Costs	= No
Consider Production Costs	= No

Consider Item Priority**= Only**

Note: The backward planning rule **Volume Moved** is overruled by the setting of the **Consider Item Priority** parameter.

Relevant item data:

Item	Priority
A	Very Low
B	Medium
C	High
D	Low
E	Medium
F	Medium

The plan items are always planned in the following order: C - (B, E, or F) - D - A.

You can specify a plan item's priority in the **Items - Planning (cprpd1100m000)** session, in the **Priority** field.

Ideal plan

In the first planning step, the capacity constraints are ignored. This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	70	30	-
C	-	-	50	-
D	-	-	10	110
E	-	-	-	15
F	-	-	-	35
Total	70	70	90	160

The available capacity allows for a total production volume of 100 in each plan period.

To adjust the plan in period 4

The capacity in period 4 is exceeded by 60.

In period 4, only the plan items D, E, and F have a production volume. These plan items are planned in the order: (E or F) - D.

This means:

- First, the production volume of items E and F are planned in period 4. That leaves a production capacity open for a production volume of 50 ($= 100 - 15 - 35$).
- Now, the production volume of item D is planned, but only a volume of 50 can be planned in period 4. The remaining 60 are moved backward to period 3.
- In period 3, a volume of 10 was already planned for item D. Together with the moved volume coming from period 4, this makes 70.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	70	30	-
C	-	-	50	-
D	-	-	70	50
E	-	-	-	15
F	-	-	-	35
Total	70	70	150	100

To adjust the plan in period 3

The capacity in period 3 is exceeded by 50.

The plan items B, C, and D have a production volume in period 3. These plan items are planned in the order: C-B-D.

This means:

- First, the production volume of item C is planned in period 3. That leaves a production capacity open for a production volume of 50 ($= 100 - 50$).
- Then, the production volume of item B is planned, which leaves a production capacity open for a production volume of 20 ($= 100 - 50 - 30$).
- Next, the production volume of item D is planned, but only a volume of 20 can be planned in period 3. The remaining 50 are moved backward to period 2.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	70	30	-
C	-	-	50	-
D	-	50	20	50
E	-	-	-	15
F	-	-	-	35

Item	Period 1	Period 2	Period 3	Period 4
Total	70	120	100	100

To adjust the plan in period 2

The capacity in period 2 is exceeded by 20.

The plan items B and D have a production volume in period 2. These plan items are planned in the order: B-D.

Part of the production volume of item D is moved to period 1.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	70	30	-
C	-	-	50	-
D	20	30	20	50
E	-	-	-	15
F	-	-	-	35
Total	90	100	100	100

Example 2 : Volume moved x cost

The plan item of which the highest value of production volume has been shifted in the previous planning step is allocated first. If a plan period's production capacity is exceeded, other plan items' production volumes are moved. Value of production volume is defined as (unit cost x moved production volume).

Settings

The following parameter settings are used:

Backward Plan. Rule	= Volume Moved
Consider Material Costs	= Yes
Consider Production Costs	= No
Consider Item Priority	= No

Ideal plan

In the first planning step, the capacity constraints are ignored. This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-

Item	Period 1	Period 2	Period 3	Period 4
B	30	70	30	-
C	-	-	50	-
D	-	-	10	110
E	-	-	-	15
F	-	-	-	35
Total	70	70	90	160

The available capacity allows for a total production volume of 100 in each plan period.

To adjust the plan in period 4

The capacity in period 4 is exceeded by 60.

Relevant item data for plan period 4:

Item	A	B	C	D	E	F
Volume Moved	0	0	0	0	0	0
Material Costs (\$)	60	30	80	4	10	1
Volume Moved x Costs	0	0	0	0	0	0
Production Volume of Period 4	0	0	0	110	15	35

At the start of the backward planning step, the Volume Moved equals zero for all plan items. In that case LN uses the production volume to determine which items will be planned first.

The plan items are planned in the order: D-F-E. This means:

- First, the production volume of item D is planned in period 4.
- A volume of 100 can be planned in period 4; the remainder is moved backward to period 3.
- The production volumes of the items E and F are also moved to period 3.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	70	30	-
C	-	-	50	-
D	-	-	20	100
E	-	-	15	-
F	-	-	35	-
Total	70	70	150	100

To adjust the plan in period 3

The capacity in period 3 is exceeded by 50.

Relevant item data for period 3:

Item	A	B	C	D	E	F
Volume Moved	0	0	0	10	15	35
Material Costs (\$)	60	30	80	4	10	1
Volume Moved x Costs	0	0	0	40	150	35
Production Volume of Period 3	0	30	50	20	15	35

The plan items that have already been moved are planned in the order of (volume moved x costs): E-D-F. The other plan items are planned in the order of production volume: C-B-A.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	30	100	-	-
C	-	20	30	-
D	-	-	20	100
E	-	-	15	-
F	-	-	35	-
Total	70	120	100	100

To adjust the plan in period 2

The capacity in period 2 is exceeded by 20.

Relevant item data for period 2:

Item	A	B	C	D	E	F
Volume Moved	0	30	20	0	0	0
Material Costs (\$)	60	30	80	4	10	1
Volume Moved x Costs	0	900	1600	0	0	0
Production Volume of Period 2	0	100	20	0	0	0

The plan items that have already been moved are planned in the order of (volume moved x costs) : C-B.

Part of the production volume of item B is moved to period 1.

This results in the following plan:

Item	Period 1	Period 2	Period 3	Period 4
A	40	-	-	-
B	50	80	-	-
C	-	20	40	-
D	-	-	20	100
E	-	-	15	-
F	-	-	35	-
Total	90	100	100	100

Workload control, backward and forward planning

- Backward planning
 - Backward planning minimizes inventory levels by minimizing early delivery, but it does not always result in a feasible production plan. Any unplanned production volumes are reported.
 - The backward planning step is especially useful in case of seasonal demand patterns.
 - The backward planning step ignores coproducts completely. You should use only the forward planning step if coproducts must be considered.
- Forward planning
 - The forward planning step computes feasible delivery dates.
 - Forward planning automatically uses safety stock.
- Combination

Use the combination of backward and forward planning to level out seasonal peaks and compute feasible delivery dates in one run. The combination may result in longer computation times.

Note: If backward planning and forward planning are combined, LN executes a backward planning pass first, and then a forward planning pass.

Workload control, production volumes vs. values

The workload control planning method can operate in two ways:

- Based on production volumes (quantities)
- Based on the value of production volumes

The way the planning process operates is determined by the values of the **Consider Material Costs** and **Consider Production Costs** check boxes in the **Work Load Control Parameters (cpwlc2101m000)** session. The performance indicators in the **Work Load Control Performance Indicators (cpwlc2520m000)** session are displayed accordingly.

Production volumes

If the **Consider Material Costs** and **Consider Production Costs** check boxes are both cleared, LN plans in terms of volumes. Whenever the production plan must be changed because of constraints, LN minimizes the changes in terms of the total quantity produced ahead or behind schedule.

Production value

If at least one of the **Consider Material Costs** or **Consider Production Costs** check boxes is selected, LN will plan in terms of value. If the production plan must be changed because of constraints, LN minimizes the changes in terms of the total value of the items that are produced later or earlier. The production value is defined as:

$$\text{Production volume} \times (\text{Material and/or Production Costs})$$

Workload control, to plan against constraints

If *workload control (WLC)* is used for the master planning of an item, material constraints and/or capacity constraints are taken into account.

Material constraints

Planning against material constraints means that the production plan of a plan item is constrained by the availability of critical components.

Example

If you produce a table with four legs, and 1003 legs are available in week 27, you can produce no more than 250 tables in that week.

A component is only considered as a planning constraint if the following conditions apply:

- The component is included in the *bill of critical materials (BCM)* of the end item.
- The component is defined as a constraint in master planning (see the **Constraint** check box in the **Items - Planning (cprpd1100m000)** session).

Capacity constraints

Planning against capacity constraints means that the production plan of a plan item is constrained by the availability of critical resource capacity.

Example

If the final stage of the production process of a chair takes 2 hours at a certain resource, and 101 hours of capacity are available in week 29 for that resource, you can produce no more than 50 chairs in that week.

Capacity at a specific resource is only considered as a planning constraint if the following conditions apply:

- The resource is included in the *bill of critical capacities (BCC)* of the item.

- The resource is defined as a constraint in master planning (see the **Constraint** check box in the **Work Centers - Planning (cprpd2100m000)** session).

Planning options

For a planning run using workload control, you have the following options:

- Do not consider any constraints at all. This is equivalent to using *infinite planning*.
- Only consider material constraints.
- Only consider capacity constraints.
- Consider material as well as capacity constraints.

You can make your choice by selecting or clearing the appropriate check boxes in the **Generate Master Planning (cprmp1202m000)** session or the **Generate Master Planning (Item) (cprmp1203m000)** session.

Planning and replanning

As a rule, the order in which plan items are planned depends on the phase number of the plan unit that each item belongs to. (If a plan item is not linked to a plan unit, the phase number of the item itself is used. For more information, see Planning sequence and phase numbers.

The normal planning order starts with the lowest phase number, and ends with the highest phase number. LN assigns phase numbers in such a way that a manufactured item is planned before its components are planned. In this way, dependent demand originating from the end item is taken into account when its components are planned.

However, this poses a problem if material constraints are to be considered. When the supply of the end item is planned, and the availability of a critical component has to be checked, the projected inventory of this component has not yet been updated.

There are two solutions to this problem:

- Use the previously computed projected inventory stored in the component's item master plan.
- Use one or more iterations.

The first solution assumes that the item master plan is updated on a regular basis, so that usually the existing projected inventory values are approximately correct. For an example, see Planning without iterations, an example.

Note:

You can update an item master plan's inventory data by choosing the **Generate** command in the **Item Master Plan (cprmp2101m000)** session. You can update the inventory data for a range of items in the **Initialize, Roll, and Update Scenario (cprpd4200m000)** session.

The second solution involves the use of iterations. When the projected inventory computed for a component item drops below the inventory plan, the consequences of this constraint are determined by replanning all items for which this is relevant. For a more detailed description, see Planning with iterations; for an example, see Planning with iterations, an example.

Planning without iterations, an example

This example explains how *item master plans* are simulated when material and/or capacity constraints are considered and no iterations are used.

Overview

A chair is manufactured from a metal frame and a leather seat. The frame is manufactured from two metal pipes.

In the planning, items with the following item codes are used:

- CHAIR
- FRAME
- METAL PIPE

The frame and the metal pipe are defined as constraints.

Initial situation

In this example, a single plan period is considered.

The following assumptions apply:

- The *projected inventory* of the previous plan period is zero for each item.
- The *lead-time offsets* involved are zero.
- The *inventory plan* for each item is zero.
- The **Starting Point WLC** field in the **Work Load Control Parameters (cpwlc2101m000)** session has been set to **Current Master Plan**.

A previous simulation resulted in the following master plan data:

CHAIR	
Demand (forecast)	50
Production plan	50
Projected inventory	0
FRAME	
Dependent demand	50
Production plan	50
Projected inventory	0
METAL PIPE	
Dependent demand	100
Production plan	100
Projected inventory	0

Simulating the master plan

Suppose that the actual demand for CHAIR turns out to be 60, thus surpassing the demand forecast. Moreover, the resource where METAL PIPE is produced is overloaded, so that actually only 80 pipes can be produced.

Suppose further that the master plan is simulated while considering material and capacity constraints, but without using iterations.

The simulation consists of a normal planning pass, in order of increasing phase number (this means: first the end item, then the component).

The following table shows the results of the simulation run. The left column contains the existing master plan values; the right column shows the result of the simulation.

CHAIR	Old	New
Demand (forecast)	50	50
Demand (actual)	0	60
Production plan	50	50
Projected inventory	0	-10
FRAME	Old	New
Dependent demand	50	50
Production plan	50	50
Projected inventory	0	0
METAL PIPE	Old	New
Dependent demand	100	100
Production plan	100	80
Projected inventory	0	-20

Explanation:

- In the new simulation, the actual demand for CHAIR is used instead of the demand forecast (because the actual demand is higher).
- According to this higher demand, the production plan of CHAIR should be increased from 50 to 60. However, FRAME is a constraint in the planning of CHAIR, and because the projected inventory for FRAME is 0, the production plan for CHAIR is not increased.
- Because the production plan of CHAIR remains the same, the dependent demand for FRAME is not raised either.
- METAL PIPE is a constraint in the planning of FRAME. However, because the existing projected inventory for METAL PIPE is zero, the production plan for FRAME is not reduced.
- The limited production capacity for METAL PIPE only plays a role in the production plan for METAL PIPE. At the higher levels (which are planned earlier), the planning algorithm is not aware of the constraint posed on metal pipe production.

The main advantage of not using iterations is that it makes the planning process relatively fast. However, as this example shows, constraint-based planning without iterations clearly has its limits. In some situations it can work well, especially if the following conditions apply:

- The structure of the *bills of critical materials (BCMs)* involved is fairly simple (not many levels, and usually only one critical component per item).
- The current master plan is used as the starting point for the workload-control algorithm.
- The master-plan data is updated regularly.

Especially when the planning situation becomes more complicated (complex BCM structures, a high number of interdependencies between plan items), full optimization of the planning requires the use of iterations.

For an explanation of the use of iterations, see *Planning with iterations*; for an example, see *Planning with iterations, an example*.

Planning with iterations

As a rule, the order in which plan items are planned in *master planning* depends on the phase number of the plan unit that each item belongs to. (If a plan item is not linked to a plan unit, the phase number of the item itself is used). For more information, see *Planning sequence and phase numbers*.

The normal planning order starts with the lowest phase number, and ends with the highest phase number. LN assigns phase numbers in such a way that a manufactured item is planned before its components are planned. In this way, dependent demand originating from the end item is taken into account when its component is planned.

However, this planning order poses a problem if material constraints are to be considered. Actually, a planning pass in the opposite direction (starting with the highest phase number: first component, then end item) would be the most efficient way to pass on the constraints to higher levels in the *bill of critical materials (BCM)*. After that, a planning pass in the normal direction is needed again, to recompute the consequences of the constraint for all parts of the BCM structure.

For this purpose, the workload-control planning algorithm uses iterations. An iteration is a two-way planning pass, consisting of:

- A reverse planning pass (in order of decreasing phase number: first component, then end item).
- A normal planning pass (in order of increasing phase number: first end item, then component).

For an example, see *Planning with iterations, an example*.

In principle, one iteration can be sufficient if all items to be planned belong to only one BCM structure. Usually, however, the planning situation is more complex, with different production processes competing for a common resource or for a common component item. In such cases, full optimization of the entire planning requires the use of multiple iterations. In the **Generate Master Planning (cprmp1202m000)** session, you can specify the maximum number of iterations used for the simulation run.

Planning with iterations, an example

This example explains how *item master plans* are simulated when iterations are used to determine the consequences of material and/or capacity constraints for the total planning.

Overview

A certain chair is manufactured from a leather seat and a frame (both are critical components). The frame is manufactured from two metal pipes (which are critical components).

The leather seat is also used (as a critical component) for the production of a certain stool.

In the planning, items with the following item codes are used:

- CHAIR
- FRAME
- METAL PIPE
- LEATHER SEAT
- STOOL

The frame, the metal pipe, and the leather seat are defined as constraints.

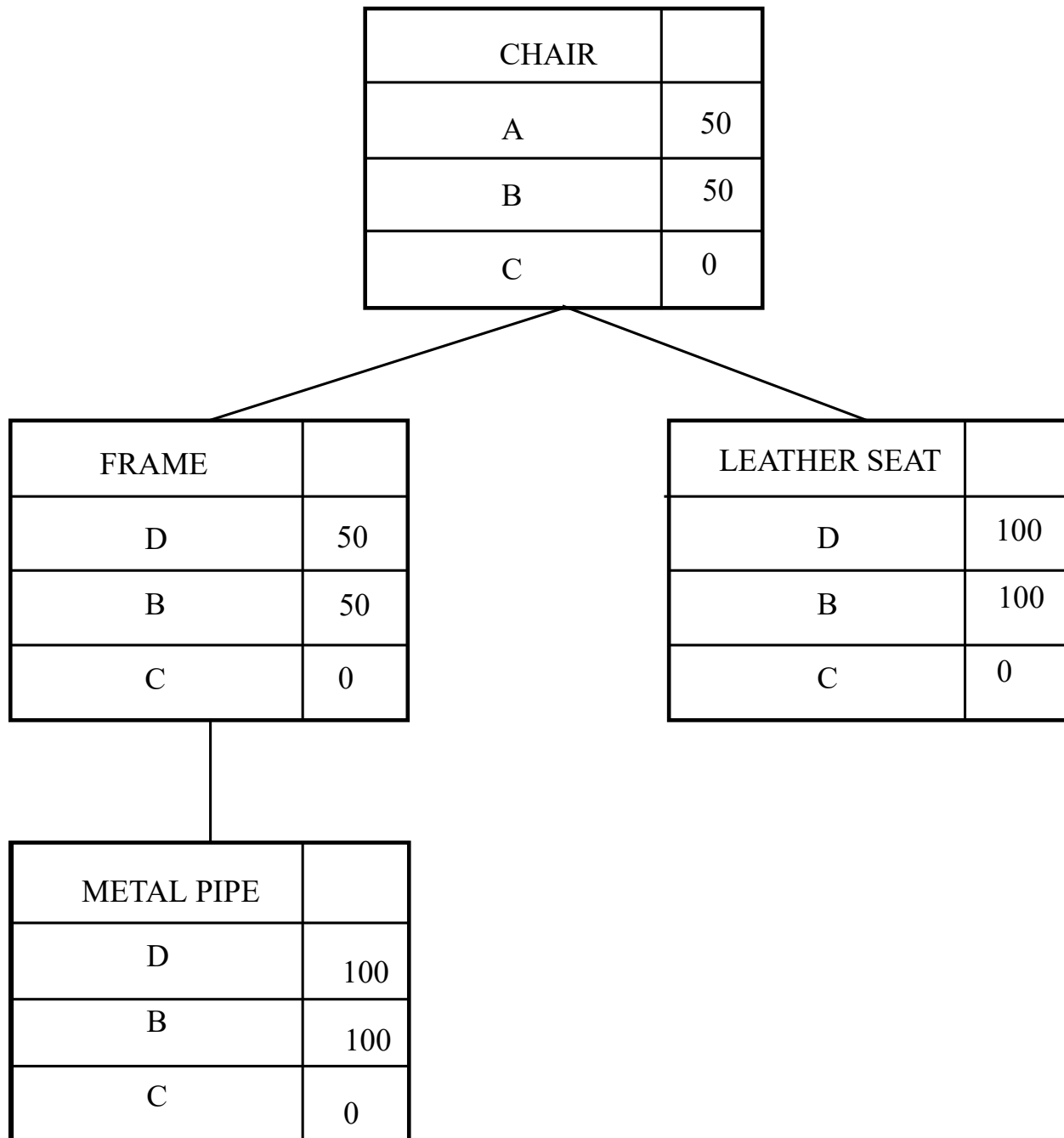
Initial situation

In this example, a single plan period is considered.

The following assumptions apply:

- The *projected inventory* of the previous plan period is zero for each item.
- The *lead-time offsets* involved are zero.
- The *inventory plan* for each item is zero.
- The planning of CHAIR has priority over the planning of STOOL (see also Workload control, to compute planning priorities).

A previous simulation (or an initial infinite planning run) resulted in the following master plan data for CHAIR, FRAME, METAL PIPE, and LEATHER SEAT:



A	Demand (forecast)
B	Production plan
C	Projected inventory
D	Dependent demand

Note The dependent demand for LEATHER SEAT also includes the demand originating from the production plan of STOOL (50).

Simulating the master plans

Suppose that the actual demand for CHAIR turns out to be 60, thus surpassing the demand forecast. Moreover, the resource where METAL PIPE is produced is overloaded, so that actually only 80 pipes can be produced.

Suppose further that the item master plans in question are simulated while considering material and capacity constraints, and using one iteration.

First, a normal planning pass (in order of increasing phase number: first the end item, then the component) is performed.

Next, an iteration is carried out, consisting of:

- A reverse planning pass (in order of decreasing phase number: first the component, then the end item).
- A normal planning pass (in order of increasing phase number: first the end item, then the component).

The following table shows the results of the simulation for CHAIR, FRAME, and METAL PIPE. The first column contains the old master plan values. The second column contains the result of the first (normal) planning pass, that is, before the iteration; the third column shows the result of the (first) iteration.

	Old	New	
		Before iteration	After iteration
CHAIR			
Demand (forecast)	50	50	50
Demand (actual)	0	60	60
Production plan	50	60	40
Projected inventory	0	0	-20
FRAME			
Dependent demand	50	60	40
Production plan	50	60	40
Projected inventory	0	0	0
METAL PIPE			
Dependent demand	100	120	80
Production plan	100	80	80
Projected inventory	0	-40	0

Remarks:

- If the number of iterations used is greater than zero, material constraints are ignored during the first planning pass (before the first iteration), and are only considered during the iteration(s).
- In the new simulation, the actual demand for CHAIR is used instead of the demand forecast (because the actual demand is higher).
- During the first part of the iteration (the reverse pass: from component to end item), the constraint on the availability of METAL PIPE is passed on to FRAME and to CHAIR.

- During the second part of the iteration (the normal pass: from end item to component), the reduction of the production plan for CHAIR is passed on as a reduced dependent demand for its components (including LEATHER SEAT).

The reduction of the demand for LEATHER SEAT could imply that the production plan for STOOL (another item using LEATHER SEAT as a component) can be increased. Moreover, the resource capacity no longer needed for the production of CHAIR can now be used for the production of another item. In both cases, another iteration will be necessary to reallocate the components and/or capacity involved.

Especially when there are a lot of interdependencies between items (competing for common components and/or a common resource), the use of multiple iterations can be necessary to fully optimize the planning. In the **Generate Master Planning (cprmp1202m000)** session, you can specify the maximum number of iterations used for the simulation run.

Chapter 6: Resource Planning

Sourcing strategies overview

Enterprise Planning works with five sources of supply:

- **Job Shop** — manufacture goods at a production facility
- **Purchase** — acquire goods from a *business partner*
- **Distribution** — acquire goods from elsewhere in your company or from an *affiliated company*
- **Repetitive** — manufacture goods based on a limited number of predefined configurations
- **Subcontract** — outsourcing parts, or the whole manufacture to another company

Note:

- If *multisite* functionality is active, sourcing strategies are defined per *planning cluster*.
- Sourcing strategies have priority over the default supply source.
If an applicable sourcing strategy exists, Enterprise Planning uses the sourcing strategy, and ignores the default source.
- Sourcing strategy
If you want to use more than one source of supply, or deviate from the default source in one particular scenario, you must define a *sourcing strategy* for the item involved.
You can define sourcing strategies in the **Sourcing Strategy (cprpd7110m000)** session.
- Scenario and validity period
A sourcing strategy is valid for a particular *scenario*.
A sourcing strategy is valid for a particular time period. You can enter an effective date and an expiry date for a source strategy to determine for which time period the sourcing strategy is valid.
- Sourcing strategies for planning clusters and item groups
You can link a sourcing strategy directly to a *plan item* or link the sourcing strategy indirectly, via a *planning cluster* or *item group*.
For more information, refer to *To search sourcing strategies*
- Unit effectivity
In addition, you can define a unit effective *sourcing strategy*, which means that you link an *exception* the sourcing strategy. In this way, you can model (small) deviations from a standard sourcing strategy for a specific period.
For more information about unit effectivity, see *Unit effectivity in Enterprise Planning*.
- Source allocation rule
When you define a sourcing strategy, you must choose between the following:

- **Percentage**
- **Priority**

- Source allocation rule: Percentage

If the source allocation rule is **Percentage**, you define the percentage for each source in the **Sourcing Strategy (cprpd7110m000)** session.

In *master-based planning*, LN distributes the *supply plan* according to these percentages for each plan period.

In *order-based planning*, the percentages can be used in two ways:

- If you select the **Allow Multiple Sources per Demand** check box in the **Generate Order Planning (cprrp1210m000)** session or the **Generate Order Planning (Item) (cprrp1220m000)** session, LN uses the percentages to divide a single requirement over the various sources.
- If you clear the **Allow Multiple Sources per Demand** check box, LN tries to approximate the percentages as closely as possible, but assigns each requirement to one source. In other words, LN does not split planned orders.

For more information about source allocation in order planning, refer to Example: source allocation in order planning.

- Source allocation rule: Priority

If the source allocation rule is **Priority**, you define the priority for each source. The priority source-allocation rule only applies to order planning. In master planning, a priority source-allocation rule is interpreted as a **Percentage** source-allocation rule.

For more information about sourcing allocation rule **Priority**, refer to online manual topic Example: source allocation in order planning.

Note: If LN has first attempted to cover a requirement by selecting the source **Purchase**, and this source cannot fulfill the requirement, the next step depends on the question whether the plan item's supplier is a single-source supplier.

The behavior depends on the **Preferred** field in the **Items - Purchase Business Partner (tdipu0110m000)** session:

- **Preferred** is set to **Single Source**
If the supplier cannot fulfill the required demand, LN uses the lower-priority supply sources (**Job Shop** or **Distribution**) from the sourcing strategy.
- **Preferred** is set to **Preferred**
If the supplier cannot fulfill the required demand, LN generates a *planned production order* with an empty supplier field.

- Minimum and maximum volume

Per supply source you can define minimum and maximum volumes, and specify the time period for which these limits apply.

If the order volume for a specific source exceeds the maximum volume (within the specified time period), LN can move part of the volume to another source.

If the order volume for a specific source drops below the minimum volume, LN can use a larger part from the required quantity to generate planned orders for that source. As a result, the total ordered quantity for other sources will be reduced.

Note: Do not confuse the minimum volume fields with the *minimum order quantity* defined in the item data. LN does not create orders for more than the required quantity, even if the order volume falls below the minimum volume.

Defining Sourcing Strategy

You can specify sourcing strategies on the following levels of aggregation:

- Planning cluster level
- Item group level
- Item level (See To search sourcing strategies).

Use the following procedure to enter a sourcing strategy on cluster level:

- 1 Enter the planning cluster in the Planning Cluster field.
- 2 Leave the Item Group field empty.
- 3 Leave the Item field empty.

Use the following procedure to enter a sourcing strategy on item group level:

- 1 Optionally, enter a planning cluster in the Planning Cluster field.
- 2 Enter the item group in the Item Group field.
- 3 Leave the Item field empty.

Note:

If a plan item has no valid supply strategy, LN uses the following values by default:

- *Priority rule:* **Priority**
- *Allocation rule:* **Percentage**

You can specify different rules for external and internal suppliers.

Sources of supply

Sourcing is the method to determine the source of supply for a plan item to satisfy demand. Sourcing can be defined on two levels:

- The *sourcing strategy*

Determines if the item sourcing strategy is:

- **Job Shop**
- **Purchase**
- **Repetitive**
- **Subcontract**
- **Distribution**

Defining a sourcing strategy is not required, if a sourcing strategy is not defined the default source from the Items - Ordering (tcibd2100m000) data is taken.

- The *supply strategy*

This determines the rules that specify which suppliers and warehouses must be selected for purchasing and distribution. For production, no second level applies in the sourcing of the Business Object.

The supplying relationships between *planning clusters* can be defined to represent the links between warehouses linked to different sites.

Five sources of supply

Enterprise Planning works with five sources of supply:

- **Job Shop**
Manufacture of goods at a production facility
- **Repetitive**
Mass manufacture of product with few, or no variations.
- **Purchase**
Acquisition of goods from a business partner
- **Subcontract**
Delegation of part or the whole manufacture process: delivering components to a subcontractor who returns a completed product
- **Distribution**
Acquisition goods from elsewhere in your company or from an *affiliated company*

The *sourcing strategy* of the plan item is based on the data specified in the Items - Ordering by Site (tcibd2150m000) session.

Sourcing strategies allow you to use a combination of multiple supply sources at the same time, or one after another.

Note: Items with the supply source **Assembly** are planned in the Assembly Planning module.

The use of sourcing strategies

If you generate a master plan or planned orders, LN first searches for a valid *sourcing strategy* in the Sourcing Strategy (cprpd7110m000) session.

You can link a sourcing strategy directly to a *plan item*, or link the sourcing strategy indirectly, via a *planning cluster* or *item group*.

If LN finds no effective sourcing strategy, LN uses the default supply source.

For more information, refer to Sourcing strategies overview.

Note: LN generates a signal if you define a sourcing strategy for a plan item for which a date effectivity definition exists.

Supply planning

Enterprise Planning can plan supply for a plan item within this item's *planning horizon*. Enterprise Planning plans supply on the basis of the forecast and actual demand.

For supply planning, there is a division of labor between *order planning* and *master planning*.

- Planning supply with order planning
Within the *order horizon*, supply is planned by means of order planning, in the form of *planned orders*.

Planned orders are generated during an order simulation. You can start an order simulation by running one of the following sessions:

- **Generate Order Planning (cprrp1210m000)**
- **Generate Order Planning (Item) (cprrp1220m000)**

- Planning supply with master planning

Within the *master-planning horizon*, supply is planned by means of master planning, in the form of a *supply plan*.

Supply plans are generated during a master-plan simulation. You can start a master-plan simulation by running one of the following sessions:

- **Generate Master Planning (cprmp1202m000)**
- **Generate Master Planning (Item) (cprmp1203m000)**

- Order planning and master planning

When you run an order simulation, you can indicate that a master-plan simulation must be performed as well.

In both master planning and order planning, the various plan items involved are planned in a particular order, to take logistic dependencies between plan items into account.

- Five sources of supply

Enterprise Planning works with five sources of supply:

- **Job Shop**
The manufacture goods at a production facility
- **Purchase**
The acquisition of goods from a business partner
- **Distribution**
The acquisition of goods from elsewhere in your company or from an *affiliated company*
- **Repetitive**
The manufacture of goods based on a limited number of predefined configurations
- **Subcontract**
The outsourcing of parts, or the whole manufacture to another company.

For more information, refer to Sources of supply.

Supplier selection

If LN selects the source **Distribution**, LN must then select the internal suppliers (*clusters*).

If LN selects the source **Purchase**, LN must then select the external suppliers (*buy-from business partners*).

For more information, refer to:

- Selecting External Suppliers
- Selecting internal suppliers

To select suppliers

When Enterprise Planning plans supply, it first determines the source of supply: production, purchase, distribution, or a combination of these. For more information, refer to Sources of supply.

In case of purchase or distribution, Enterprise Planning must determine which supplier(s) to use. *Supply strategies* determine how this selection takes place.

You can define supply strategies in the Supply Strategy (cprpd7120m000) session.

Planned purchase orders

For purchase, LN selects the suppliers on the basis of:

- Supply strategies for external suppliers.
- Item-supplier data defined in the Item Purchase Data module.

For more information, refer to Selecting External Suppliers

Planned distribution orders

For distribution, LN selects the suppliers on the basis of:

- Supply strategies for internal suppliers.
- *Supplying relationships*.

For more information, refer to Selecting External Suppliers

Selecting internal suppliers

Distribution planning in Enterprise Planning handles the generation and planning of distribution orders. You can use distribution orders to:

- Transfer goods between *planning clusters*.
- Transfer one item into another item.

Distribution planning is very similar to purchase planning. The main differences are:

- Distribution planning is based on the *supplying relationships*, while purchase planning is based on item-supplier information.
- Distribution planning always works with planned orders (also in *master planning*).

Distribution planning chooses between alternative suppliers and distributes volumes over these suppliers on the basis of the parameters defined in the following sessions:

- **Supply Strategy (cprpd7120m000)**
- **Supplying Relationships (cprpd7130m000)**

Distribution planning uses *supply strategies* with supply type **Distribution**.

The supply planning carries out the following steps for each required plan item:

- 1 Determine the requirements.
- 2 Determine the source of supply (production, purchase, or distribution).
- 3 Put the supplying relationships in order of preference.
- 4 Determine delivery date by supplying relationship.
- 5 Determine the volume by supplying relationship.

- 1 Determine the requirements.

The master planning engine or the order planning engine determines the required volume and the requirements date.

- 2 Determine the source of supply (production, purchase, or distribution).

LN determines how much of the requirements is covered by distribution orders on the basis of the *sourcing strategy*. See Sourcing strategies overview.

- 3 Put the supplying relationships in order of preference.

LN orders the supplying relationships in accordance with the priority rule that is effective on the requirements date. Define the priority rule in the **Supply Strategy (cprpd7120m000)** session.

- 4 Determine delivery date by supplying relationship.

LN uses various calendars to determine the finish date (delivery date) and the start date (order date). See To compute supply lead-times.

- 5 Determine the volume by supplying relationship.

LN distributes the required volume over the supplying relationships in the order calculated in step 3. LN generates distribution orders for each planned volume.

This step is carried out in multiple phases. If, after a phase, not all requirements are covered LN proceeds with the next phase.

For an overview of these phases, refer to online manual topic Internal-supplier selection (procedure).

Note:

If a plan item has no valid supply strategy, LN uses the following values by default:

- *Priority rule:* **Priority**
- *Allocation rule:* **Percentage**

If LN cannot find a valid supplying relationship to fulfill a requirement at a certain moment, LN tries to fulfill the required demand with the other supply sources following the *sourcing rules* that you defined for the *plan item* in the **Sourcing Strategy (cprpd7110m000)** session. If LN still cannot fulfill the required demand, LN generates a signal.

Selecting External Suppliers

Order-based purchase planning in Enterprise Planning handles the generation and planning of purchase orders.

Purchase planning chooses between alternative suppliers and distributes volumes over these suppliers on the basis of constraints and rules.

You can specify these constraints and rules in the following sessions:

- **Items - Purchase Business Partner (tdipu0110m000)** (in Common).
- **Supply Strategy (cprpd7120m000)** (in Enterprise Planning).

Purchase planning uses *supply strategies* with supply type **Purchase**.

During order-based supply planning, the following steps are carried out for each required plan item:

- 1 Determine the requirements.
 - 2 Determine the source of supply (production, purchase, or distribution).
 - 3 Arrange the suppliers in order of preference (LN takes into account the value set in the **Priority** field).
 - 4 Determine the volume by supplier by the value set in the **Allocation Rule** field in the **Supply Strategy (cprpd7120m000)** session, and determine the lot size restrictions, and capacity restrictions.
 - 5 Determine the delivery date and order date by supplier.
- 1 Determine the requirements
The master planning engine or the order planning engine determines the required volume and the requirements date.
 - 2 Determine the source of supply
LN determines how much of a requirement is covered by purchase on the basis of either a valid sourcing strategy or the plan item's default source. See Sources of supply.
 - 3 Put the suppliers in order of preference
LN orders the suppliers in accordance with the *priority rule* that is effective on the requirement date. You define the priority rule in the **Supply Strategy (cprpd7120m000)** session.
 - 4 Determine the delivery date and order date by supplier
LN uses various calendars to determine the finish date (delivery date) and the start date (order date). See To compute supply lead-times.
 - 5 Determine the volume by supplier
LN distributes the required volume over the suppliers in the order calculated in step 3.
For more details, see To compute purchase order quantities.

Note:

If a plan item has no valid supply strategy, LN uses the following values by default:

- *Priority rule:* **Priority**.
- *Allocation rule:* **Percentage**.

This process is carried out in multiple phases. If, after a phase, all the requirements have not been covered, LN proceeds with the next phase. In each phase, LN plans the volume based on the *allocation rule*.

- Unit effectivity
When LN searches for suppliers, LN takes into account the *exceptions* that you link to buy-from business partners and sourcing strategies. With these exceptions, you can influence the way in which LN selects supply sources in two ways:
 - Link an *exception* to a *buy-from business partner* in the **Items - Purchase Business Partner (tdipu0110m000)** session.
 - Link an *exception* to a *sourcing strategy* in the **Sourcing Strategy (cprpd7110m000)** session.
 For more information about unit effectivity, refer to Unit effectivity in Enterprise Planning.

- If supplier cannot deliver

If LN cannot find a valid supplier for a requirement at a certain moment, it creates a purchase order for an empty supplier and generates a signal. If you specified a supplier as single source supplier, and this supplier cannot deliver the demand at a certain moment, LN does not generate a purchase order, but tries to fulfill the demand with the supply source distribution or purchase following the *sourcing strategy* that you defined. If you did not specify a sourcing strategy for the item, LN does not create orders, but generates a signal.

Supply chain strategies

The supply chain strategies consist of two layers:

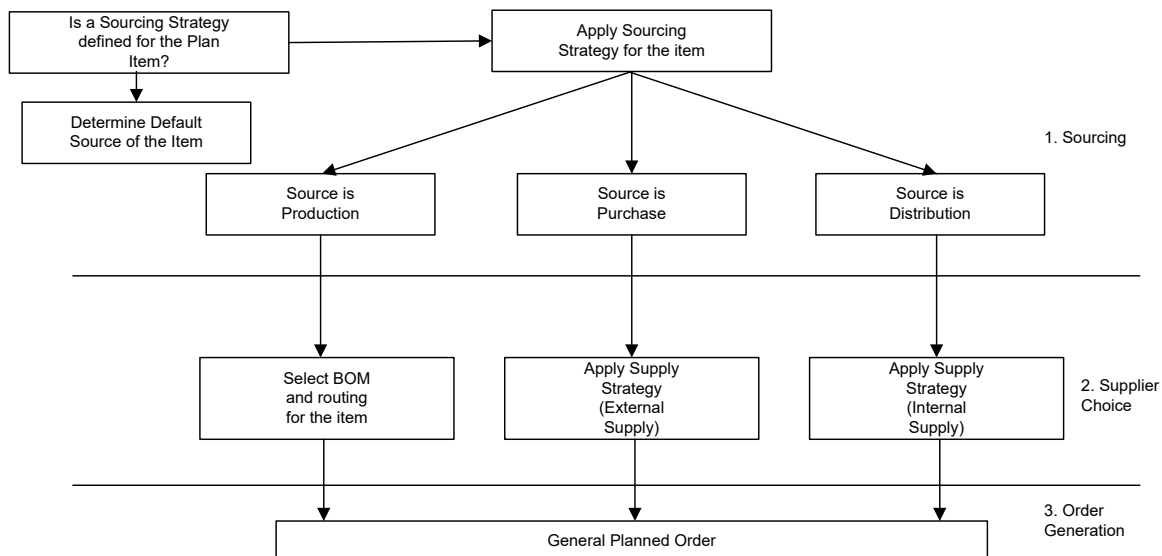
- Sourcing Strategies

The sourcing strategy defines how Enterprise Planning must choose between the sources of supply, which are manufacture, purchase or distribution. The sourcing strategy determines how demand is fulfilled by what kind of supply.

- Supply Strategies

The supply strategy defines per source the supplier choice within that source. For example: when Enterprise Planning decides on the basis of the sourcing strategy that a planned purchase order should be generated, the supply strategy determines which supplier will be selected.

Therefore, the process of sourcing and supplier choice is a two-step approach.



To plan supply with master planning

When you use *master planning* to plan supply, LN generates a *supply plan* for the item's master-planning horizon. This is done in a master-plan simulation, by using the **Generate Master Planning (cprmp1202m000)** session or the **Generate Master Planning (Item) (cprmp1203m000)** session.

A supply plan consists of:

- *Production plan*
- *Purchase plan*
- *Planned distribution orders* (serving as a *distribution plan*)

In master planning, two methods for production planning are available:

- *Infinite planning*
- *Workload control*

Infinite planning assumes that there are no capacity or material constraints. In workload control, capacity constraints and/or material constraints are taken into account.

If you want to use workload control, you need to define *plan* units. A plan unit groups items that use capacity at the same critical resource, or use the same critical material.

Related topics

- Master planning, an overview
- Supply planning
- Infinite master planning
- Workload control

Time fences in order planning and in master planning

In LN, you can use a *time fence* to prevent LN from making changes in the near-future supply planning.

As a rule, LN does not overwrite the existing planned orders in the time fence. As a result, LN only generates planned orders beyond the time fence when you carry out the **Generate Order Planning (cprrp1210m000)** or beyond the *forecast time fence* when you carry out the **Generate Master Planning (cprmp1202m000)** session.

To ignore the time fence for order planning, you can select the **Generate within** check box in the **Generate Order Planning (cprrp1210m000)** session. Enterprise Planning then simulates the order planning for the selected range of paln items within the time fence and overwrites the existing planned orders.

In addition to the **Generate within** check box in the **Generate Order Planning (cprrp1210m000)** session, the settings of the **Use Time Fence** check box in the **Items - Planning (cprpd1100m000)** session also impacts whether LN plans within or outside the time fence.

Dependent on the settings of both the **Generate within** check box and the **Use Time Fence** check box, three situation exist:

- If you clear the **Use Time Fence** check box, LN plans within the time fence, and does not take into account the settings of the **Generate within** check box in the **Generate Order Planning (cprp1210m000)** session.
- If you select the **Use Time Fence** check box, and you clear the **Generate within** check box, LN plans outside the time fence.
- If you select the **Use Time Fence** check box, as well as the **Generate within** check box, LN plans within the time fence.

To search sourcing strategies

You can define *sourcing strategies* and *supply strategies* on three levels of detail:

- *Plan item*
- *Item group*
- *planning cluster*

Note: By default, LN uses the most detailed sourcing and supply strategy defined for the item.

Example

Suppose a requirement for item A has been identified. Item A belongs to item group B and planning cluster C.

LN searches the applicable sourcing strategy as follows:

- If a sourcing strategy has been defined for item A, LN will use that sourcing strategy.
- If no sourcing has been defined for item A, LN uses the sourcing strategy for item group B.
- If no sourcing strategy has been defined for item A or item group B, LN uses the sourcing strategy for planning cluster C.

The same process applies to supply strategies.

To compute supply lead-times

The order dates (start dates) and delivery dates (finish dates) for *planned orders* in Enterprise Planning can be determined in a number of ways.

The following factors play an important role in determining the order start and finish date:

- Lead times defined for various parts of the supply process.
- Calendars (which define workdays and working hours).
- Distance between the supplying and receiving address.

For information about the way in which LN determines order start and finish date, refer to online manual topic Determining order start and finish date (basic procedure).

In general, the following applies to the start dates and finish dates of planned orders:

- The start date and finish date are never before the scenario start date.
- The start date can be in the past.
- If you simulate within the time fence, the finish date can be in the past.
- If you do not simulate within the time fence, the finish date is never before the time fence (and never in the past).
- If you use fixed deliveries and simulate within the time fence, the finish date is always on a fixed delivery moment.
- If you use fixed deliveries and do not simulate within the time fence, the finish date is always on a fixed delivery moment after the time fence.

Supply lead time

The effective supply lead time depends on the type of order, and the planning method used.

Production lead time

Planned production orders can be planned in two ways:

- Based on detailed *routing* data, using the appropriate calendars
- Based on a *fixed lead time*, using the enterprise-unit calendar

Purchase lead time

Planned purchase orders are planned using various types of lead-time data:

- Item/supplier data (or item purchase data, if no supplier can be found)
- Item/warehouse data
- Distance tables

Planned purchase orders can be planned in two ways:

- Based on various types of lead times, using the appropriate calendars.
- Based on a calculated lead time, interpreted as calendar days.

Distribution lead time

Planned distribution orders are planned by using *supplying relationships*.

Planned distribution orders can be planned in two ways:

- Based on distance tables, using an appropriate calendar.
- Based on the fixed supply lead time defined in the **Supplying Relationships (cprpd7130m000)** session, using an appropriate calendar.

In general, there are two ways in which Enterprise Planning calculates order start dates and order finish dates of planned orders:

- Based on a fixed value that the user defines, or that LN calculates.
- Based on item-specific data about each lead-time component in the *order lead time*.

Which of these two methods Enterprise Planning uses, depends on the order type, and on whether the finish date that Enterprise Planning finds, is before or after the *fixed lead-time horizon*.

For detailed information about lead-time calculation according to order type, you can refer to the corresponding related topic.

To compute purchase order quantities

When Enterprise Planning carries out purchase-order planning, the volume that is planned for a supplier depends on the value of the **Allocation Rule** field in the **Supply Strategy (cprpd7120m000)** session.

The resulting volume is checked against the lot sizing rules. The ordered quantity can be divided over multiple purchase orders as a result of the lot sizing. See Lot sizing.

Percentage

If the **Allocation Rule** field is **Percentage**, the calculation proceeds as follows:

$$OQ = RQ \times PE / 100$$

Where:

OQ	ordered quantity
REQ	quantity that remains to be planned
RQ	originally required quantity
PE	percentage

If the ordered quantity (OQ) is greater than the quantity that remains to be planned (REQ), OQ is set to REQ.

The percentage is defined in the **Sourcing Percentage** field in the **Items - Purchase Business Partner (tdipu0110m000)** session.

Percentage/Capable

If the **Allocation Rule** field is **Percentage/Capable** and the just calculated value of the ordered quantity is greater than the maximum quantity that the supplier can deliver, the ordered quantity is reduced accordingly.

See the **Supplier Capacity** field in the **Items - Purchase Business Partner (tdipu0110m000)** session.

To compute distribution order quantities

When Enterprise Planning carries out distribution planning, the volume that is planned for a supplying relationship depends on the value of the **Allocation Rule** field in the **Supply Strategy (cprpd7120m000)** session.

The resulting volume is checked against the lot sizing rules. The ordered quantity can be divided over multiple distribution orders as a result of the lot sizing. See Lot sizing.

Percentage

If the **Allocation Rule** field is **Percentage**, the calculation proceeds as follows:

$$OQ = \min(REQ, RQ \times PE / 100.0)$$

Where:

OQ	ordered quantity
REQ	remaining quantity
RQ	originally required quantity
PE	percentage

The percentage is defined in the **Percentage** field in the **Supplying Relationships (cprpd7130m000)** session.

If a supplying relationship consists of two or more lines of which the validity period (partially) overlaps, LN must rescale the percentages of the corresponding lines if that total is not equal to 100%.

Example

A supplying relationship consisting of three lines exists for Item X in warehouse D:

Receiving item	Supplying item	In warehouse	Percentage	Period
Item X		D	-	-
	Item X	B	80%	1/1/2003 to 7/1/2003
	Item X	C	70%	7/1/2003 to 12/31/2003
	Item X	A	30%	1/1/2003 to 12/31/2003

A demand of 100 pieces placed on item X in warehouse D in the period from 1/1/2003 to 7/1/2003 results in:

- Delivery of 73 pieces from warehouse B to warehouse D: $(0.8 * 100) / (0.8 + 0.3)$
- Delivery of 27 pieces from warehouse A to warehouse D: $(0.3 * 100) / (0.8 + 0.3)$

The same demand in the period from 7/1/2003 to 12/31/2003, results in:

- Delivery of 70 pieces from warehouse C, that is, 70% of 100 pieces.
- Delivery of 30 pieces from warehouse A, that is, 30% of 100 pieces.

For the demand of 100 pieces placed on item X in warehouse D in the period from 7/1/2003 to 12/31/2003, LN does not have to rescale the percentages of the lines of the supplying relationship, because they total exactly 100%.

Percentage/Capable

If the **Allocation Rule** field is **Percentage/Capable**, the calculation proceeds as follows:

The same formula as above with the following addition:

$$OQ = \min(OQ, MQ)$$

Where:

MQ	maximum quantity that can be ordered
----	--------------------------------------

Capability

If the **Allocation Rule** field is **Capability**, the calculation proceeds as follows:

$$OQ = \min(MQ, REQ)$$

Note: LN determines the maximum quantity that you can order from a supplying planning cluster by using *capable-to-promise* techniques.

Demand and Inventory Planning

Enterprise Planning contains several types of functionality for demand forecasting and inventory planning.

- Demand and inventory planning without an item master plan

If you do not maintain an *item master plan* for a particular plan item, you must use *order planning* to plan supply for that item using the following sessions for demand and inventory planning:

- **Special Demand by Item (cpdsp2100m000)**

To enter demand forecasts

- Standard ATP and component CTP to support the actual sales process
- **Items - Ordering (tcibd2100m000)**

To apply basic inventory planning by specifying a *safety stock* and, optionally, a *seasonal pattern*

- Demand and inventory planning with an item master plan

If a item master plan is maintained for a particular plan item, more advanced functionality for demand and inventory planning is available.

With an item master plan, you can use the following types of demand-planning functionality:

- Maintain three types of forecast:
 - *Demand forecast*
 - *Extra demand*
 - *Special demand*
- Automatic generation of forecasts, based on historical demand, or based on *sales budgets*
- Manual editing of forecasts
- Automatic consumption of forecast by actual demand

To support the actual sales process, an item master plan gives access to a variety of *capable-to-promise* (CTP) techniques. See also Capable-to-promise, an overview.

With an item master plan, you can use the following types of inventory-planning functionality:

- Automatic generation of inventory plans, based on the safety stock, or based on demand forecasts
- Manual editing of inventory plans

Example of a weighted average of a negative inventory level

The average negative projected inventory level is one of the performance indicators of the Resource Analysis and Optimization (RAO) module of Enterprise Planning .

The computation of the average negative projected inventory level is based on principles similar to those of the average projected inventory computation. An important difference, however, is that for the computation of average negative inventory, LN only considers those stretches of time during which the projected inventory is negative.

Once the exact periods of negative inventory level have been determined, LN computes the average negative projected inventory. In other words, a weighted average is computed that takes the length of the various periods with negative inventory into account.

The calculation example below uses the following figures:

- Inventory on hand = 10
-

Plan period	1	2	3	4
Length of plan period (days)	2	2	5	5
Projected (end) inventory	30	-10	-20	60
Days with negative inventory	0	0.5	5	1.25
Average negative inventory		5	15	10

- 1 For plan periods in which there is a shift from positive to negative or from negative to positive, the number of days with negative inventory is computed as follows:

For plan periods in which there is a shift from positive to negative or from negative to positive, the number of days with negative inventory is computed as follows:

$$\frac{|N|}{|N|+P} * \text{Days}$$

N	The negative inventory level (expressed as a positive figure)
P	The positive inventory level

Days	The number of days of the plan period
------	---------------------------------------

In the case of a shift from positive to negative inventory, NegLevel is the end level of the plan period, while PosLevel is the starting level (equal to the end level of the previous plan period). When the shift is from negative to positive inventory, these roles are reversed.

- 2** The average negative inventory for a plan period is computed as follows:

The average negative inventory for a plan period is computed as follows:

$$\frac{|N|}{2}$$

N	The negative inventory level (expressed as a positive figure)
---	---

- 3** Now, LN can compute a weighted average negative inventory for all plan periods according to the following formula:

Now, LN can compute a weighted average negative inventory for all plan periods according to the following formula:

$$(ANI(pp1) * NegDays (pp1)) + (ANI(pp2) * NegDays (pp2)) \dots$$

$$\text{Sum}(NegDays)$$

ANI(pp1)	The average negative inventory for plan period 1
NegDays(pp1)	The number of negative inventory days in plan period 1
Sum(NegDays)	The total (round) number of days with negative inventory

The NegDays figures for the various plan periods (see Step 1) are decimal values. These values are added up and the outcome is rounded upwards, yielding the value for Sum(NegDays).

In this example, the weighted average negative inventory level is computed as follows:

$$\frac{(5 * 0.5) + (15 * 5) + (10 * 1.25)}{0.5 + 5 + 1.25} = \frac{90}{6.75} = 13.33$$

Demand Planning

Demand forecasting in Enterprise Planning

Enterprise Planning offers demand-forecasting functionality for items and item/channel combinations.

The demand-forecasting functionality in Enterprise Planning includes forecast-consumption logic: forecasts are gradually filled in (consumed) by actual demand. During supply planning, actual demand and *nonconsumed demand-forecast* quantities are taken into account.

Demand forecasting and forecast consumption are available for *master planning* as well as for *order planning*.

Demand-forecasting techniques

Enterprise Planning works with three categories of forecasts:

- *Demand forecast*
- *Extra demand*
- *Special demand*

If a plan item does not have an item master plan, only special demand is available. In this case, you can manually enter forecasts in the **Special Demand by Item (cpdsp2100m000)** session.

If you maintain an item master plan for an item, all types of forecasts are available. Together, they form the item's *demand plan*. In this case, you can obtain a demand forecast in the following ways:

- Enter the data manually
- Calculate from demand history
- Copy from sales budgets
- Download forecasts from an external application

Forecasting methods

Enterprise Planning offers the following methods to compute a demand forecast based on historical data:

- **Moving Average**
- **Exponential Smoothing**
- **Polynomial Regression**
- **Time Series Analysis**

You can specify the forecast method in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

Forecast method: moving average

If the **Forecast Method** field is **Moving Average**, LN determines the demand forecast as follows:

The relevant parameters for this forecast method are the following fields in the **Plan Items - Forecast Settings (cpdsp1110m000)** session:

- **Forecast Method**
- **Moving Average Period**

LN determines the mean deviation of the actual demand from the estimated demand for each forecast period. The mean deviation of the actual demand from the estimated demand is determined by past demand figures, the **Forecast Method** field, and the **Moving Average Period** field. If desired, the average demand is adjusted for the trend influence and seasonal influence, which were determined earlier.

This is computed as follows:

$$TD(t) = AV$$

(without trend influence)

$$TD(t) = CS + TF \times t \text{ (linear trend influence)}$$

$$TD(t) = BS \times TF^{(t-1)} \text{ (progressive trend influence)}$$

$$ED(t) = TD(t) + SF(t) \text{ (constant seasonal influence)}$$

$$ED(t) = TD(t) \times SF(t) \text{ (progressive seasonal influence)}$$

$$MA = \text{SUM}((AD(t) - ED(t)) / PR)$$

Where:

$TD(t)$	the trend-based demand for period t
$ED(t)$	the estimated demand for period t
$AD(t)$	the actual demand for period t
$SF(t)$	the seasonal factor for period t
AV	average demand (*)
CS	constant demand
BS	base demand (the estimated demand for period 1)
TF	trend factor
MA	trend-adjusted and season-adjusted mean deviation from the demand for the period for which the moving average must be calculated
PR	number of periods for which the moving average must be computed

(*) The average demand is the sum of the historical demand figures by period, divided by the number of periods with demand history.

The forecast demand is computed as follows:

$$FD(t) = ED(t) + MA$$

Where:

$FD(t)$	the demand forecast for period t
$ED(t)$	the estimated demand for period t
MA	trend-adjusted and season-adjusted mean deviation from the demand for the period for which the moving average must be calculated

Forecast method: exponential smoothing

LN calculates the demand forecast according to the **Exponential Smoothing** forecast method as follows:

The relevant parameters for this forecast method are:

- **Automatic Update of Forecast Parameters**
- **Smoothing Factor for Demand**
- **Smoothing Factor for Trend**
- **Smoothing Factor for Season**
- **Smoothing Factor for Forecast Error**
- **Tracking Signal for Demand Forecast**
- **Critical Tracking Signal**

You can maintain these parameters in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

If the **Automatic Update of Forecast Parameters** check box is selected, LN first recomputes the smoothing factors for the exponential smoothing method. Using an iterative process, with step sizes of 0.2 and subsequently 0.05, LN produces an optimum combination of smoothing factors for the demand, the season, and the trend. This combination gives the smallest mean absolute deviation (MAD).

Next, LN calculates a demand forecast starting from the first period with demand history to the last forecast period via the exponential smoothing method.

The various variables for the demand forecast are computed as follows:

Average demand

Without seasonal influence:

$$AV(t) = FD(t) + a (AD(t) - FD(t))$$

With a constant seasonal influence:

$$AV(t) = (FD(t) + a (AD(t) - FD(t))) - SF(t)$$

With a progressive seasonal influence:

$$AV(t) = (FD(t) + a (AD(t) - FD(t))) / SF(t)$$

Where:

AV(t)	season-adjusted average demand for period t
FD(t)	demand forecast for period t
AD(t)	actual demand for period t (*)
SF(t)	seasonal factor for period t
a	Smoothing Factor for Demand field

(*) For the current period and later periods, the forecast demand is taken as the actual demand.

Trend factor

With a linear trend influence:

$$TF(t) = TF(t-1) + b ((AV(t)-AV(t-1)) - TF(t-1))$$

With a progressive trend influence:

$$TF(t) = TF(t-1) + b (1.0 + ((AV(t)-AV(t-1))/AV(t)) - TF(t-1))$$

Where:

TF(t)	trend factor for period t
AV(t)	season-adjusted average demand for period t
b	Smoothing Factor for Trend field

Seasonal factor

With a constant seasonal influence:

$$SF(t+L) = SF(t) + g ((AD(t) - AV(t)) - SF(t))$$

With a progressive seasonal influence:

$$SF(t+L) = SF(t) + g ((AD(t) / AV(t)) - SF(t))$$

Where:

SF(t)	seasonal factor for period t
AD(t)	actual demand for period t (*)

AV(t)	season-adjusted average demand for period t
L	season length in periods
g	Smoothing Factor for Season field

(*) For the current period and later periods, the forecast demand is taken as the actual demand.

Demand forecast

Without trend influence:

$$FD(t+1) = AV(t)$$

With a linear trend influence:

$$FD(t+1) = FD(t+1) + TF(t)$$

With a progressive trend influence:

$$FD(t+1) = FD(t+1) * TF(t)$$

With a constant seasonal influence:

$$FD(t+1) = FD(t+1) + SF(t+1)$$

With a progressive seasonal influence:

$$FD(t+1) = FD(t+1) * SF(t+1)$$

Where:

AV(t)	season-adjusted average demand for period t
TF(t)	trend factor for period t
SF(t+1)	seasonal factor for period t+1
FD(t+1)	demand forecast for period t+1

Mean forecast error

$$AE(t) = AE(t-1) + e * (abs(FD(t) - AD(t)) - AE(t-1)) \quad SE(t) = SE(t-1) + e * ((FD(t) - AD(t)) - SE(t-1))$$

Where:

AD(t)	actual demand for period t
-------	----------------------------

FD(t)	demand forecast for period t
AE(t)	mean absolute deviation (MAD) for period t
SE(t)	mean forecast error (SER) for period t
abs(FD(t)-AD(t))	absolute value of (FD(t)-AD(t))
e	Smoothing Factor for Forecast Error field

The tracking signal is calculated as follows:

$$TS(t) = \text{abs}(SE(t)/AE(t))$$

Where:

TS(t)	tracking signal
SE(t)	mean forecast error (SER) for period t
AE(t)	mean absolute deviation (MAD) for period t
abs(SE(t)/AE(t))	absolute value of (SE(t)/AE(t))

Note:

If the forecast demand (FD) is always greater than the actual demand (AD), the value of (SE(t)/AE(t)) is 1. If the forecast demand (FD) is always less than the actual demand, the value of (SE(t)/AE(t)) is -1. The tracking signal is a number between 0 and 1. The tracking signal indicates whether the forecast demand is systematically above or below the actual demand.

If the **Tracking Signal for Demand Forecast** check box is selected, the smoothing factor for the demand is dependent on the forecast error.

If the tracking signal is greater than the value of the **Critical Tracking Signal** field, LN makes the smoothing factor for the demand equal to the tracking signal.

Forecast method: polynomial regression

LN calculates the demand forecast according to the **Polynomial Regression** forecast method on the basis of an n'th degree polynom, which matches the historic demand data.

The relevant parameters for this forecast method are:

- **Degree for Polynomial Regression**
- **Type of Seasonal Influence**
- **Seasonal Cycle Time**
- **Automatic Update of Forecast Parameters**

You can maintain these parameters in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

The polynom's degree is indicated by the **Degree for Polynomial Regression** field. If the **Automatic Update of Forecast Parameters** check box is selected, LN determines the polynom's optimum degree.

Trend-adjusted average demand

First, the historical demand figures are adjusted with the trend-adjusted average demand for the relevant period.

Without seasonal influence:

$$TD(t) = AV$$

With a linear trend influence:

$$TD(t) = CS + TF * t$$

With a progressive trend influence:

$$TD(t) = BS * TF^{(t-1)} \quad DM(t) = AD(t) - TD(t)$$

Where:

DM(t)	trend-adjusted average demand for period t
TD(t)	trend-based demand for period t
AD(t)	actual demand for period t
AV	average demand (*)
CS	constant demand
BS	estimated demand for period 1
TF	trend factor

(*) The average demand is the sum of the historical demand figures by period, divided by the number of periods with demand history.

Coefficients of the polynom

LN calculates the coefficients of the polynom with the polynomial regression method. See the Related topics for more information about polynomial regression.

Demand forecast

LN calculates the demand for each forecast period based on the trend-adjusted average demand for the period in question, increased with the average noise in the past.

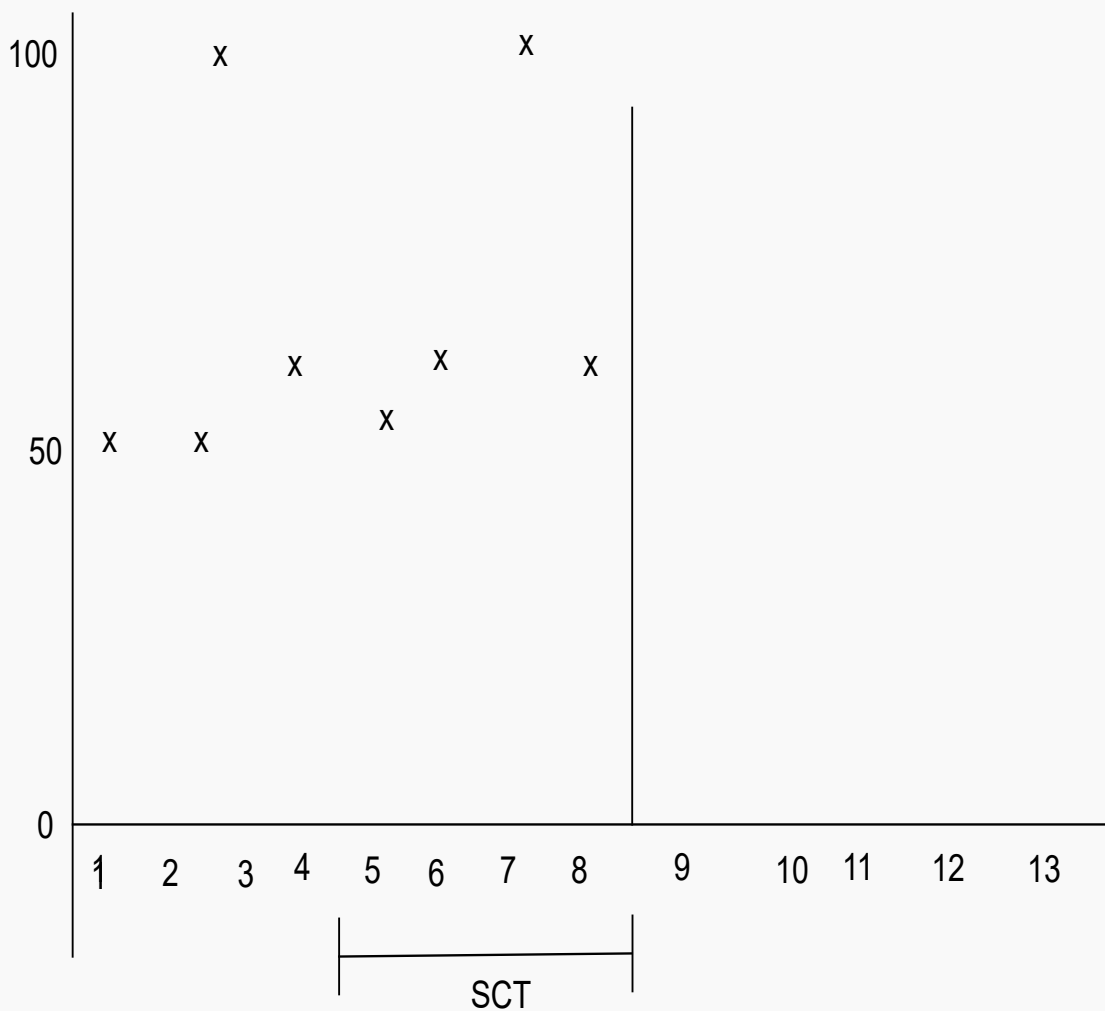
Noise

The noise is the fluctuation of the demand data compared to the trend that has been determined. The average noise is determined for each forecast period based on the history periods which are a whole number of seasonal cycles ago.

Note: If the **Type of Seasonal Influence** field is **Not Applicable**, LN assumes a fictitious seasonal cycle with a season length of up to a quarter of the number of periods with historical demand.

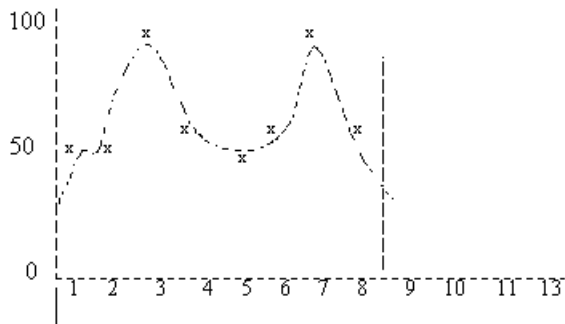
Example

This diagram shows the history demand data of two seasonal cycles, which consist of 8 forecast periods. Period 9 is the current period.



SCT = seasonal cycle time

This diagram shows the polynomial that is determined with polynomial regression.



For each history period, the demand based on the polynomial is compared to the trend of the demand. A linear trend is assumed to be present, characterized by the following formula:

$$TD(t) = CS + TF * t$$

TD (t)	trend based demand for period t
--------	---------------------------------

CS	constant demand (= 54)
----	------------------------

TF	trend factor (= 2)
----	--------------------

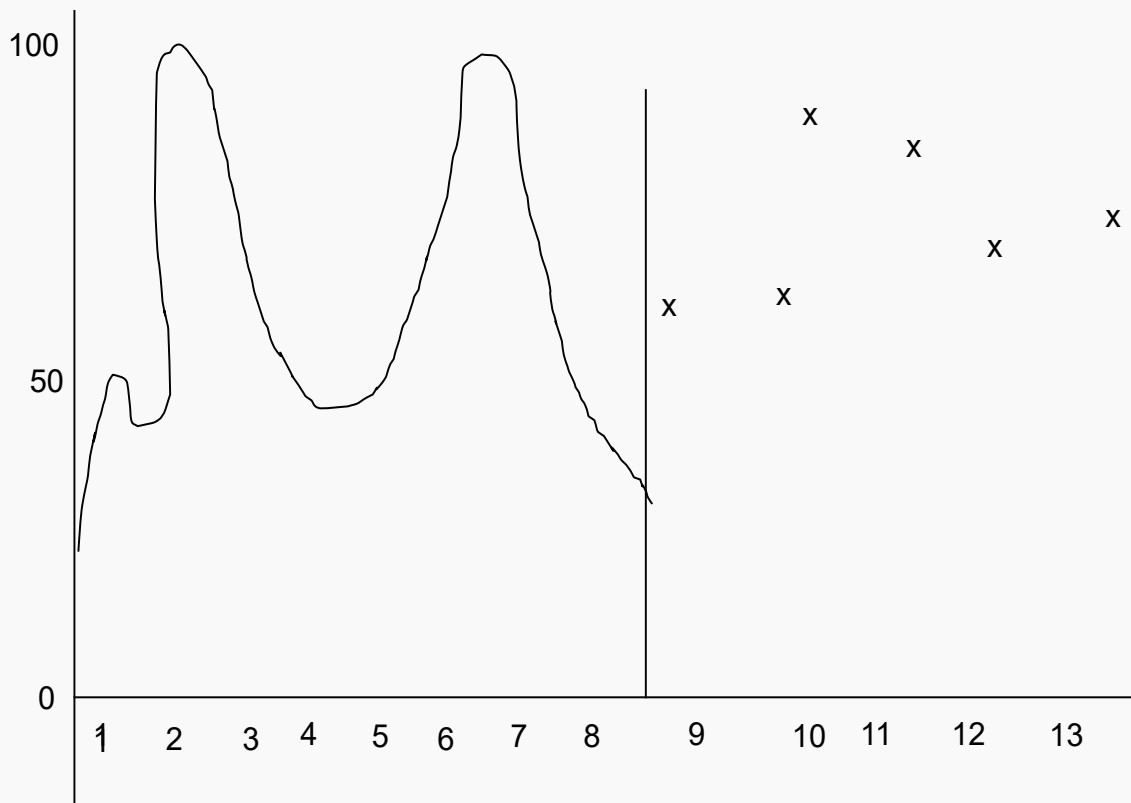
Period	Polynom	Trend	Noise
1	45	56	-11
2	53	58	-5
3	76	60	+16
4	70	62	+8
5	49	64	-15
6	55	66	-11
7	78	68	+10
8	70	70	+0

The average noise based on these differences is added to the trend-adjusted demand. For example, the average noise for forecast period 9 is the average of the noise of periods 1 and 5.

Forecast period	Trend	Average noise	Based on periods	Forecast demand
9	72	-13	1,5	59
10	74	-8	2,6	66
11	76	+13	3,7	89

Forecast period	Trend	Average noise	Based on periods	Forecast demand
12	78	+4	4,8	82
13	80	-13	1,4	67
14	82	-7	2,6	75

This diagram shows the result:



Forecast method: time-series analysis

LN calculates the demand forecast according to the **Time Series Analysis** forecast method based on the average demand and any earlier defined trend influence and seasonal influence.

The demand forecast is computed as follows:

Without trend influence:

$$TD(t) = AV$$

With a linear trend influence:

$$TD(t) = CS + TF * t$$

With a progressive trend influence:

$$TD(t) = BS * TF ^ (t-1)$$

With a constant seasonal influence:

$$FD(t) = TD(t) + SF(t)$$

With a progressive seasonal influence:

$$FD(t) = TD(t) * SF(t)$$

Where:

AV	average demand (*)
CS	constant demand
BS	base demand (the estimated demand for period 1)
TF	trend factor
SF(t)	seasonal factor for period t
TD(t)	trend based demand for period t
FD(t)	demand forecast for period t

(*) The average demand is the sum of the historical demand figures by period, divided by the number of periods with demand history.

Forecast errors and seasonal correlation

After LN calculates the demand forecast for a plan item, LN determines the forecast errors and any seasonal correlation.

LN calculates the following fields in the **Plan Items - Forecast Settings (cpdsp1110m000)** session:

- **Average Forecast Error** (AFCE)
- **Mean Absolute Deviation** (MAD)
- **Mean Relative Deviation** (MRD)
- **Standard Deviation** (SDEV)
- **Seasonal Correlation Factor** (COR)

The calculations are based on the following formulas:

Average forecast error

$$AFCE = \text{sum}(FD(t) - AD(t)) / n$$

AFCE	the Average Forecast Error field
sum()	the sum of all historical periods
FD(t)	the forecast demand for period t
AD(t)	the actual demand for period t
n	the number of historical periods

Mean absolute forecast error

$$MAD = \text{sum}(\text{abs}(FD(t) - AD(t))) / n$$

MAD	the Mean Absolute Deviation field
sum()	the sum of all historical periods
abs(FD(t)-AD(t))	the absolute value of (FD(t)-AD(t))
FD(t)	the forecast demand for period t
AD(t)	the actual demand for period t
n	the number of historical periods

Mean relative forecast error

$$MRD = \text{sum}(100 * \text{abs}((FD(t) - AD(t))) / AD(t)) / n$$

MRD	Mean Relative Deviation
sum	the sum of all historical periods
FD(t)	the forecast demand for period t
AD(t)	the actual demand for period t
n	the number of historical periods

Standard deviation of the forecast error

$$SDEV = \text{sqr}(\text{sum}(((FD(t) - AD(t)) - AFCE)^2) / (n - 1))$$

SDEV	the Standard Deviation field
sqr()	the square root

sum()	the sum of all historical periods
FD(t)	the forecast demand for period t
AD(t)	the actual demand for period t
AFCE	the mean forecast error
n	the number of historical periods

Seasonal correlation

LN determines the standard deviation from the actual demand for two sets of data. Data set one consists of the periods from the first period to the last period minus the season length in periods. Data set two consists of the periods from the first period after the season length in periods up to the last period. In other words, data set two is shifted by a season length compared to data set one.

The following diagram illustrates this for a season length of one month.



A	Data set 1
B	Data set 2
1	January
2	February
3	March
4	April
5	May

Standard deviations:

$$SDV1 = \sqrt{\frac{\sum((DM(t) - DM1)^2)}{(m - 1)}} \quad SDV2 = \sqrt{\frac{\sum((DM(t+L) - DM2)^2)}{(m - 1)}}$$

SD1	the standard deviation for data set one
SD2	the standard deviation for data set two
sqr()	the square root

sum	the sum for all historical periods
DM(t)	the trend-adjusted actual demand for period t (*)
DM1	the trend-adjusted average demand for data set one (*)
DM2	the trend-adjusted average demand for data set two (*)
L	the season length in periods
m	the number of historical periods minus the season length in periods

LN determines the covariance factor for the two sets of data.

(*) For the calculation of the trend-adjusted average demand, see Forecast method: polynomial regression.

$$COV = \text{sum}((DM(t) - DM1) \times (DM(t+L) - DM2) / (m - 1))$$

COV	covariance factor
sum	the sum of all periods minus the season length in periods
DM(t)	the trend-adjusted actual demand for period t
DM1	the trend-adjusted average demand for data set one
DM2	the trend-adjusted average demand for data set two
L	the season length in periods
m	the number of historical periods minus the season length in periods

Finally, the seasonal correlation factor is computed as follows:

$$COR = COV / (SDV1 \times SDV2)$$

COR	the Seasonal Correlation Factor field
COV	covariance factor
SDV1	standard deviation for data set one
SDV2	standard deviation for data set two

Forecast Distribution Example

The forecast demand can be distributed across the days of the specified period by different methods for planning purposes.

Example

The demand forecast for the item master plan:

	Week 11	Week 12
Demand Forecast	100	100

The corresponding day capacities are:

Week 11	Capacity	Week 12	Capacity
March 14	0	March 21	0
March 15	8h	March 22	0
March 16	16h	March 23	24h
March 17	8h	March 24	24h
March 18	16h	March 25	24h
March 19	8h	March 26	0
March 20	0	March 27	0

Based on the option you specified in the **Forecast Distribution** field of the **Scenarios (cprpd4100m000)** session, one of these distributions is generated:

Distributed over days of the period

Date	Demand
March 15	14
March 16	29
March 17	14
March 18	29
March 19	17
March 23	67
March 24	66
March 25	67

Note: The rounding differences are spread within the specified period.

Distributed over the last day of a period

Date	Demand
March 20	100
March 27	200

Demand Forecasting without an Item Master Plan

If an item has no item master plan, the only available type of demand forecast is *special demand*.

You can enter special demand for an item or item/channel combination in the **Special Demand by Item (cpdsp2100m000)** session.

Enterprise Planning supports forecast consumption: forecasts are gradually filled in (consumed) by actual demand. During supply planning, actual demand and *nonconsumed demand forecast* are taken into account.

LN automatically applies forecast consumption during an order simulation. In the **Item Order Plan (cprp0520m000)** session and the **Special Demand by Item (cpdsp2100m000)** session, you can also manually perform forecast consumption.

Demand Forecasting with an Item Master Plan

If you maintain an item master plan for an item, you can obtain a demand forecast in the following ways:

- Enter the data manually
- Calculate from demand history
- Copy from sales budgets
- Download forecasts from an external application

Enter the demand forecast manually

You can enter the demand forecast by plan period directly into an *item master plan* or a *channel master plan*.

You can also modify automatically generated forecast data.

Calculate the demand forecast

If the following conditions are met, you use the **Generate Demand and Inventory Plan (cpdsp1210m000)** session to calculate a demand forecast for an item or item/channel combination:

- The master plan contains sufficient information about the actual demand in the past.
- Future demand is expected to follow the same trends and patterns as the demand in the past.

If the demand patterns are very irregular, you must not use LN to calculate the demand forecast. The calculation only works, if the start date of the scenario is sufficiently far in the past. The calculation takes trends and seasonal patterns into account. For details about this method, see *To compute the demand forecast*.

Copy sales budget to demand forecast

You can define *sales budgets* in the Statistics module of Sales. You can use the Copy Sales Budget to Demand Forecast (cpdsp1280m000) session to copy these sales budgets to the demand forecast of an item or item/channel combination.

Download forecasts from an external application

Use an OLE interface to download data from external sales forecast applications (such as a spreadsheet) into Enterprise Planning.

Extra demand and special demand

Instead of entering or generating a regular demand forecast, you can also enter or generate a forecast as *extra demand*.

You can use the extra demand to simulate an increased demand level. After the simulation run, you can decide to delete the extra demand or to add it to the normal demand forecast with the Copy Demand, Supply or Inventory Plan session.

If you expect a one-time demand for a specific reason (such as a special sales action), you can enter this demand in the Special Demand by Item (cpdsp2100m000) session. Here you can enter *special demand* for an item or a particular item/channel combination. Moreover, you can record a reason for each occurrence of special demand. Special demand is also taken into account in item master plans and channel master plans.

Note: You can view the special demand in the Special Demand field of the **Item Master Plan (cprmp2101m000)** session.

Aggregation from channel master plans to item master plan

You can use the Aggregate Channel to Item Master Plan (cpdsp5210m000) session to aggregate demand plans for channels to the corresponding item master plan.

Forecast Consumption

In the logistic planning process, demand forecasts are used as an estimate of future demand. In the course of time, this estimate is gradually filled in by actual orders. This process is known as forecast consumption: the forecast is consumed by actual demand.

The goal of forecast consumption is to determine which part of the demand forecast is already matched by actual orders, and which part is not. During the planning process, the following demand is taken into account:

- The actual demand
- The *nonconsumed demand forecast*

In addition to direct customer demand, there can also be *dependent demand* for an item, resulting from the explosion of requirements for another item. If you wish, you can include dependent demand in your forecasts, by selecting the **Dependent Demand Forecast** check box in the **Items - Planning (cprpd1100m000)** session. In this case, dependent demand is also used to consume forecast demand.

The way in which LN applies forecast consumption depends on the value of the **Master Plan** check box in the **Items - Planning (cprpd1100m000)** session for the plan item involved:

- If the plan item has an *item master plan*, forecast consumption is applied to the *demand plan* in the item master plan, and in the corresponding *channel master plans*.

- If the plan item has no item master plan, forecast consumption is applied to the *special demand* in the **Special Demand by Item (cpdsp2100m000)** session.

Algorithm for demand forecasting

LN calculates the *demand forecast* on the basis of the historical demand with the following algorithm.

The main steps of the calculation are:

- 1 Retrieve the demand history.
- 2 Check the demand history.
- 3 Determine the trend factor.
- 4 Determine the seasonal pattern.
- 5 Forecast the demand.
- 6 Compute forecast errors and the seasonal correlation.
- 7 Convert the demand forecast to plan periods.

In the following sections, each calculation step will be explained.

1. Retrieve the demand history

The demand forecast is based on the historical demand data in the time period between the start date of the scenario and the current plan period.

Historical demand data consists of the following fields in the **Item Master Plan (cprmp2101m000)** session or the **Channel Master Plan (cpdsp5130m000)** session:

- **Scheduled Production Receipts**
- **Internal Deliveries (*)**

(*) Only taken into account if the **Dependent Demand Forecast** check box in the **Items - Planning (cprpd1100m000)** session is selected.

LN converts the demand history in the current master plan from *plan periods* to fixed-length forecast periods, based on the **Forecast Period Length** field in the **Scenarios (cprpd4100m000)** session. See To distribute master-plan quantities over calendar days.

Adjusting for non-working days

LN increases the actual demand with a fictitious demand for non-working days, such as holidays, to prevent demand fluctuations. The fictitious demand is equal to the average demand in the forecast period.

The calendar of the item's enterprise unit (see the **Items - Planning (cprpd1100m000)** session) defines which days are *workdays*. LN reverses the adjustment in the final step of the calculation, when the demand forecast is converted back to plan periods.

2. Check demand history

After LN retrieves the available demand history for a plan item, it checks whether the demand history is sufficient to perform a demand forecast. LN counts the forecast periods from the first period with actual demand up to the current period.

The criteria for the minimum number of forecast periods depend on the applied forecast method and the seasonal cycle time. If the history data does not suffice, LN aborts the demand forecast calculation, and reports the reason.

3. Determine trend factor

Determination of the trend factor depends on:

- **Type of Trend Influence**
- **Type of Seasonal Influence**

These parameters are located in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

Note: In the following part of this text, it is assumed that the **Automatic Update of Forecast Parameters** check box is cleared. The effect of the automatic update of forecast parameters is described later.

Linear

If the **Type of Trend Influence** field is **Linear**, the trend influence can be described by means of the following formula:

$$FD(t) = CS + TF * t$$

Where CS = constant demand TF = trend factor FD(t) = the demand forecast for period t

LN calculates the trend factor (TF) and the constant demand (CS), based on a first degree polynomial by means of polynomial regression. See Principle of polynomial regression. If there is a seasonal cycle, LN determines the first degree polynomial on the basis of a whole number of seasonal cycles.

Progressive

If the **Type of Trend Influence** field is **Progressive**, the trend influence can be described by means of the following formula:

$$FD(t) = BS * (TF ^ (t-1))$$

Where BS = base demand (the estimated demand for period 1) TF = trend factor FD(t) = the demand forecast for period t

LN determines the trend factor (TF) and the base demand (BS) with the following calculation:

- The calculation is based on the first and the last period with demand history. If a seasonal influence exists, two periods, which lie a whole number of seasonal cycles apart, are selected.
- The estimated demand of the selected periods is determined by using a second degree polynomial. LN determines this polynomial with polynomial regression. If a second degree polynomial cannot be determined,

the actual demand in the first and last period with demand history is used instead of the estimated demand.

- The trend factor and base demand are calculated as follows:

$$BS = ED(t2)$$

$$TF = \sqrt[n]{\frac{ED(t2)}{ED(t1)}}$$

BS	base demand
TF	trend factor
ED(t1)	the estimated demand in the first period with demand history
ED(t2)	the estimated demand in the last period with demand history
n	number of demand history periods minus 1

Not Applicable

If the **Type of Trend Influence** field is **Not Applicable**, the trend factor is not used.

Note:

LN checks whether a trend is present. LN reports the following situations without actually changing the type of trend influence:

- The **Type of Trend Influence** field is **Linear** or **Progressive**, but no trend can be detected.
- The **Type of Trend Influence** field is **Not Applicable**, but a trend is detected anyway.

Automatic Update of Forecast Parameters

If the **Automatic Update of Forecast Parameters** check box in the **Plan Items - Forecast Settings (cpdsp1110m000)** session is selected, LN performs an automatic trend detection.

If the **Type of Trend Influence** field is **Linear** or **Not Applicable**, LN calculates a trend factor according to the method for linear trends. If the trend factor is found to be zero, LN sets the **Type of Trend Influence** field to **Not Applicable**.

LN reports any automatic change of the **Type of Trend Influence** field.

4. Determine seasonal pattern

A seasonal pattern is defined by a series of seasonal factors: one seasonal factor for each forecast period in a seasonal cycle.

If you specified a fixed seasonal pattern in the **Seasonal Pattern for Forecast** field in the **Items - Ordering (tcibd2100m000)** session, LN determines the seasonal factor for each period based on the seasonal factors defined at the *execution level*. If the **Seasonal Pattern for Forecast** field is empty, LN determines the seasonal pattern on the basis of the trend-adjusted demand history.

The determination of the seasonal pattern based on the demand history depends on the following fields in the **Plan Items - Forecast Settings (cpdsp1110m000)** session:

- **Type of Seasonal Influence**
- **Seasonal Cycle Time**
- **Automatic Update of Forecast Parameters**

If the **Automatic Update of Forecast Parameters** check box is selected, LN can update the following fields automatically:

- **Type of Seasonal Influence**
- **Seasonal Cycle Time**

The seasonal factors are calculated as follows:

$$(1) \text{TD}(t) = AV$$

$$(2) \text{TD}(t) = CS + TF * t$$

$$(3) \text{TD}(t) = BS * TF ^ (t-1)$$

1 without seasonal influence

2 with linear trend influence

3 with a progressive trend influence

4 The average demand is determined as the sum of the historical demand figures per period divided by the number of periods with demand history.

Where:

TD(t)	the trend based demand
AV	average demand
CS	constant demand
BS	the estimated demand for period 1
TF	trend factor

Constant

If the **Type of Seasonal Influence** field is **constant**, the seasonal factor is equal to the actual demand reduced by the trend-adjusted average demand for the relevant period. This is calculated as follows:

$$SF(t) = AD(t) - TD(t)$$

Where:

SF(t)	the seasonal factor for period t
AD(t)	the actual demand for period t
TD(t)	the trend based demand for period t

Progressive

If the **Type of Seasonal Influence** field is **Progressive**, the seasonal factor is equal to the actual demand divided by the trend-adjusted average demand for the period concerned. This is calculated as follows:

$$SF(t) = AD(t) / TD(t)$$

Where:

SF(t)	the seasonal factor for period t
AD(t)	the actual demand for period t
TD(t)	the trend based demand for period t

The above seasonal factor is computed as an average seasonal factor for each period.

Note:

LN checks whether a seasonal pattern is present. LN reports the following situations:

- The **Type of Seasonal Influence** field is **Constant** or **Progressive**, but no seasonal pattern can be detected.
- The **Type of Seasonal Influence** field is **Not Applicable**, but a seasonal pattern is detected anyway.

A seasonal pattern is assumed to be present, if the value of the **Seasonal Correlation Factor** field is at least 0.8.

If the **Automatic Update of Forecast Parameters** check box is selected and one of the above-mentioned situations presents itself, LN changes the **Type of Seasonal Influence** field accordingly.

Automatic Update of Forecast Parameters

If the **Automatic Update of Forecast Parameters** check box in the **Plan Items - Forecast Settings (cpdsp1110m000)** session is selected, LN performs an automatic seasonal pattern detection.

If the **Type of Seasonal Influence** field is **Constant** or **Not Applicable**, LN calculates a seasonal pattern according to the method for Constant patterns. If no seasonal pattern is detected, LN sets the **Type of Seasonal Influence** field to **Not Applicable**.

If the **Type of Seasonal Influence** field is **Progressive**, LN calculates a seasonal pattern according to the method for Progressive patterns. If no pattern is detected, LN sets the **Type of Seasonal Influence** field to **Not Applicable**.

LN reports any automatic change of the **Type of Seasonal Influence**.

5. Forecast the demand

LN applies the forecast method that you specified in the **Forecast Method** field in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

6. Compute forecast errors and seasonal correlation

After LN forecasts the demand for a plan item, it determines the following error and correlation information:

- **Average Forecast Error**
- **Mean Absolute Deviation**
- **Mean Relative Deviation**
- **Standard Deviation**
- **Seasonal Correlation Factor**

This information is displayed in the **Plan Items - Forecast Settings (cpdsp1110m000)** session.

7. Convert demand forecast to plan periods

LN converts the computed demand forecast for the forecast periods from a fixed period length to plan periods with a variable period length. This process is the reverse of the first step Retrieve demand history).

Adjusting for non-working days

LN treats workdays and non-working days differently. The calendar of the company calendar provider defines which days are *workdays*. Concretely, this means that a demand forecast for a day with zero available capacity is ignored, so that no demand forecast is generated for public holidays and other days off.

To compute the demand forecast

Use the **Generate Demand and Inventory Plan (cpdsp1210m000)** session to generate the *demand forecast* based on historical demand data. The parameters of the **Plan Items - Forecast Settings (cpdsp1110m000)** session control the calculation method.

Historical demand data

LN forecasts the future demand on the basis of historical demand data from the *item master plan* or the *channel master plan*. This historical demand data consists of the *customer deliveries* between the start date of the scenario and the current plan period.

If the **Dependent Demand Forecast** check box in the **Items - Planning (cprpd1100m000)** session is selected, LN bases the demand forecast on the sum of:

- Customer deliveries
- *Internal deliveries*
- *distribution deliveries*

Structure of the demand forecast

The demand forecast has three parts:

- Trend influence
Describes how fast the demand increases or decreases.
- Seasonal influence
Describes any recurring pattern in the demand. For example, the demand for umbrellas is higher in rainy seasons.
- General demand level or average demand
The demand without trend or seasonal influence.

Demand forecasting procedure

First, the trend and seasonal influences are determined. Then, the future demand is forecast by means of one of the following methods:

- Moving average
- *Exponential smoothing*
- Forecast method: polynomial regression
- Forecast method: time-series analysis

The details of the calculation are described in the Algorithm for demand forecasting topic.

To add quotations to customer orders

During a goods-flow update in Enterprise Planning, information on actual customer orders is retrieved from the execution level. You can see the volume of these orders in the **Customer Orders** field in the item master plan.

If the **Include Quotes** check box in the **Scenarios (cprpd4100m000)** session has been selected, LN also adds *sales quotations* to the customer orders.

LN only includes sales quotations for which the *success percentage* is equal or higher to the value of the **Minimum Probability % for Time Phased Inventory** field in the **Sales Quotation Parameters (tdsls0100s100)** session. Quotations with a lower success percentage are not recorded in the *planned inventory transactions*.

Example

The following quotations have been entered in the Sales Control module:

Customer	Ordered quantity	Success percentage
A	200	10 %
B	50	50 %
C	300	90 %

The **Minimum Probability % for Time Phased Inventory** field is set at 50 %.

In this case, the calculation of the master plan will take the sales quotations for customers B and C into account. The quotation for customer A will not be taken into account because the chance that an order will be closed is less than 50 %.

Principle of polynomial regression

The historical demand data can be represented by an nth degree polynomial. This mathematical technique is applied to determine the trend influence and to make a demand forecast.

An nth degree polynomial is determined as follows:

The polynomial's degree varies from 0 to 9, in which a 0-degree polynomial matches a constant equal to the average demand in the past. An nth degree polynomial can be rendered as follows:

$$f(t) = a + b t + c t^2 + \dots + k t^n$$

To determine the coefficients

The coefficients of the polynomial are determined by the method of the least square described in literature. You can minimize the sum of the quadratic deviations of the computed values from the actual values via mathematical differential equations. These equations lead to a system of linear equations, which you can solve with the Gauss-Seidel method.

Accuracy of the polynomial

To determine the accuracy of the polynomial, LN computes the variance of the forecast error for each polynomial:

$$VE = \sqrt{\text{SUM}((FD(t) - AD(t))^2) / m}$$

Where:

VE	the variance of the forecast error
FD(t)	the forecast demand for period t
AD(t)	the actual demand for period t
SQR	the root
SUM	the sum for all historical periods
m	the number of historical periods reduced by the polynomial's degree minus 1

The polynomial with the smallest variance of the forecast error is the optimum.

Chapter 7: Planning Analysis

Displaying data in Item/Channel Planning Chart

The following chart types are available:

- Demand chart
- Supply chart
- Inventory chart
- Demand, supply, and inventory chart
- Cost chart
- Cash flow chart
- Cost and cash flow chart

To display data:

- 1 Specify a plan company, a scenario, and a plan level.
- 2 Select a range of plan items.
- 3 Specify a channel (optional). If you specify a channel, LN displays a channel chart; otherwise, an item chart is shown.
- 4 Specify whether the values shown on the chart must be aggregated for the selected items or channels, and whether the values shown must be cumulative.
- 5 Specify the start date, the period length, and the maximum number of periods for the chart.
- 6 Choose a chart type
- 7 Click **Show Chart**

Note: To draw the chart, LN redivides the scenario into time periods, starting from the scenario's start date, and according to the value of the **Number of Periods in View** field. Therefore, the actual start date used for the chart can be earlier than the requested start date entered.

Determining chart periods: example

Scenario start date: March 1 Scenario finish date: April 30 Chart start date: March 20 Period length: 14 days

The scenario is divided into the following chart periods:

Period	From	To
1	March 1	March 14
2	March 15	March 28
3	March 29	April 12

4	April 13	April 27
5	April 28	April 30

The requested start date for the chart is in period 2. Therefore, LN creates a chart that starts at the beginning of period 2, that is, on March 15.

This example shows that the last period can actually be shorter than the normal period length.

If you cannot get the chart to work

The Help below is written for WindowsNT users. If your computer uses another operating system, the same principles apply, but the directory or folder names must be altered accordingly.

You must have the ERP Graphics program correctly installed on your computer before you can use this session:

- The GRAPHS32.OCX file must be in the C:\WINNT\Baan\bin folder (directory)
- That folder must be in PATH of your user variable settings (on the Environment tab of the System folder of the Control Panel).
- The GRAPHS32.OCX file must not also be in another folder on your computer. If you have previously used an older version of Baan Windows it might be in the C:\WINNT\System32 folder. In that case you must rename it (to GRAPHS32.OCX.bak, for instance), and you must also rename all the DLL files in that folder which have the same date as the GRAPHS32.OCX file.

Example of a weighted average of the inventory level

The average projected inventory of a *plan item* is one of the performance indicators in the Resource Analysis and Optimization module of Enterprise Planning. LN computes it as a weighted average of the average inventory levels found for the various plan periods. The average is a weighted average in that it takes the length of each plan period into account.

Example

Inventory on hand = 10

Plan period	1	2	3
Length of plan period (days)	2	2	5
Projected (end) inventory	20	30	99
Average inventory level	15	25	64.5

In this example, the weighted average inventory level for all plan periods is computed as follows:

$$\frac{(15 \times 2) + (25 \times 2) + (64.5 \times 5)}{2 + 2 + 5} = \frac{402.5}{9} = 44.72$$

Chapter 8: Transfer of Orders to Manufacturing

Transferring Planned Orders

LN can transfer the following types of orders and plans:

- *An order group*
- *Planned production orders*
- *A production plan*
- *Planned purchase orders*
- *A purchase plan*
- *Planned distribution orders*

For all these types of planned orders and plans, you can define selection criteria for transfer to the execution level.

On the Options tab, you can use several check boxes to determine the *order status* of the planned order that LN must transfer. By default, LN only transfers planned orders with the Confirmed order status.

Use the **Transfer** button to start the transfer of the selected planned orders and/or plans.

If you select the **Interactive** check box, LN does not directly transfer the selected orders, but lists them in the **Select Order Planning for Transfer (cppat0210m000)** session, where you can make a final selection before the orders are actually transferred.

Include Items to be Customized

If the **Include Items to be Customized** check box is cleared, Enterprise Planning does not transfer the orders for *customized items* with an empty project *segment*.

Job Shop

If you selected the **Planned Order Group** check box or the **Job Shop** check box, you can use the Production tab to:

- Further fine-tune the order selection.
- Assign order series to the orders.
- Specify *workload* constraints.

Note: LN only transfers planned production orders that belong to an order group if you selected the corresponding order group. If you selected the **Job Shop** check box, and select a planned production order that belongs to an order group, LN does not transfer the order.

Purchase

If you selected the **Purchase** check box and/or the **Distribution** check box, you can use the Purchase/Distribution tab to:

- Further fine-tune the order selection.
- Assign order series to the orders.
- Specify multicompany data for distribution orders.

Multiple planned purchase orders are combined into one purchase order if the following purchase order header fields are the same:

- **Buy-from Business Partner**
- **Purchase Office**
- **Purchase Order Type**
- **Currency**
- **Buyer**
- **Planner**
- **Reference A**
- **Reference B**

Important:

The **Order Date** must also be the same if both the following are applicable:

- The **Log Financial Economic Transactions** field is not set to **Standard Cost** in the **Procurement Parameters (tdpur0100m000)** sessions.
- The **Use Creation Date as Order Date when generating Purchase Order** is cleared in the **Purchase Order Parameters (tdpur0100m400)** session.

Order release

For some planned orders, the **Order Release** field in the **Planned Orders (cprp1100m000)** session is **not to be released**. You cannot transfer these planned orders to the *execution level*, until the **Order Release** field is set to **To be released**. These planned orders are used in a *vendor managed inventory (VMI)* setup.

For more information, refer to Supply planning by supplier.

Transferring orders to execution level

You use the Plan Transfer module to transfer planned orders from Enterprise Planning to the *execution level* of LN. In addition, it allows you to transfer *production plans* and *purchase plans*.

General procedure

- Origin of transferred orders
You can transfer orders from the *actual scenario* only.
The following types of planned supply can be transferred:
 - *Planned production orders*

- *Production plan*
- *Purchase plan*
- *Planned purchase orders*
- *Planned distribution orders*
- Planned Cost Peg Transfers (cprrp0130m000)
- Destination of transferred orders
 - Planned production orders and production plans are translated to production orders in the Job Shop Control module in Manufacturing.
 - Planned purchase orders and purchase plans are translated to purchase orders in Procurement.
 - Planned distribution orders for single-company distribution are translated to warehouse orders in the Warehouse Orders module in Warehousing. **Note:** If *multisite* functionality is implemented, the planned production orders must be for warehouses linked to sites which are part of the *planning cluster* used for planning.
 - Planned distribution orders for multi company distribution are translated to purchase orders in Procurement.
 - Project Cost Peg Transfers (whinh1140m000)
- Planned materials

When you transfer planned production orders to the Job Shop Control module, LN will respect the material selections and quantities as planned by the Enterprise Planning package.

Order status LN only transfers planned orders with **Confirmed order status**. However, on the **Options** tab in the **Transfer Order Planning (cppat1210m000)** session, you can change the session's behavior:

- To transfer planned orders with **Firm Planned** order status as well, select the **Transfer Status Firm Planned as Well** check box.
- To transfer planned orders with **Planned** order status as well, select the **Transfer Status Planned as Well** check box.

Workload-based transfer

When you transfer production orders, you can set a maximum to the total *workload* that will be transferred to a resource. See: Workload-based order transfer.

Order grouping

You can use the order-grouping functionality in the Plan Transfer module to group planned production orders according to various criteria. You can use this functionality to transfer a whole order group at once, and (optionally) translate it to an SFC order group.

Order release

For some planned orders, the **Order Release** field in the **Planned Orders (cprrp1100m000)** session is **not to be released**. You cannot transfer these planned orders to the *execution level*, until the **Order Release** field is set to **To be released**. These planned orders are used in a *vendor managed inventory (VMI)* setup.

For more information, refer to Supply planning by supplier.

Workload-based order transfer

It is often undesirable to have a large number of production orders waiting for execution. LN allows you to avoid that situation by transferring no more production orders to a *resource* when the *workload* of this resource reaches a certain workload norm.

You can also increase the workload for a specific resource that has too little work to do.

Define the *workload norm* and the *workload tolerance* in the **Work Centers - Planning (cprpd2100m000)** session.

You can now use the workload of the resource as a criterion for the transfer process in the **Transfer Order Planning (cppat1210m000)** session.

If the total workload exceeds the workload norm, LN selects the production orders to be transferred on the basis of the **Priority Rule** field.

Note: If you select the planned orders interactively, you can immediately see the change in workload when you add a production order to the selection.

Chapter 9: Item Data

Item data structure

You can further differentiate between items at various suppliers:

- Locations (warehouses)
- Purpose (planning, purchase)
- Origin (supplier, warehouse)

Example

An item is supplied by two different suppliers.

Supplier A ships in lots of 100 pieces because the packing of the item determines so.

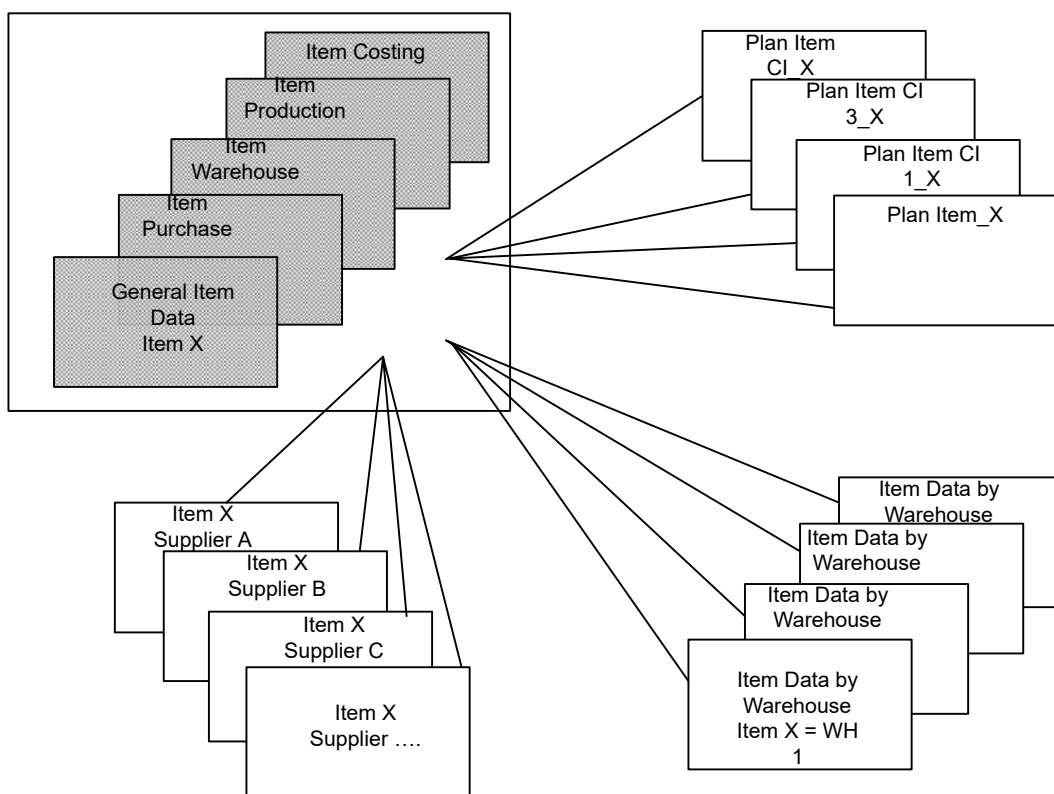
Supplier B ships the goods in units of 60 pieces.

You can define specific parameters for each supplier.

You can use the following sessions to define these characteristics:

- **Items - Planning (cprpd1100m000)**
- **Check Item Data by Warehouse (whwmd2210m000)**
- **Item Supplier Plan (cpvmi0530m000)**

These sessions define entities that have an n-to-1 relationship with the general item data.



Planning clusters and Planned items

The *planning cluster* concept allows you to perform integrated planning over one or multiple sites. A planning cluster represents one or more warehouses located near each other, typically at a particular location or the same country.

You can define a plan item for each combination of planning cluster and item code, once the item is defined on company level.

The plan item code includes these segments:

- The planning cluster segment
- The project segment
- The item code segment

Therefore, the plan item represents the combination of item definition and site.

When you use multiple clusters for one company, assigning all warehouses in a specific location to the same cluster is mandatory.

When multiple planning clusters are used, all warehouses in a single location must be linked to a separate cluster for easier planning. The item groups, all inventory, and planned inventory transactions of all warehouses must be assigned to the same cluster for planning to be possible.

To view the planned inventory transactions, use the Planned Inventory Transactions (whinp1500m000) session.

Note:

- If *multisite* functionality is active, a *planning cluster* is mandatory.
- You can define a plan item with an empty cluster segment. If your company has only one location that is involved in planning, and just one planning cluster is used, you do not have to define a cluster code. All warehouses will be linked to the 'empty' planning cluster. The item being planned must still be defined on company level, for planning to be possible.
- If multiple planning clusters are present, warehouses not linked to a specific cluster are treated as one group, related to the empty segment cluster.
- The planning system ignores inventory and planned inventory transactions of warehouses that are explicitly excluded from the planning process, such as a warehouse for rejected items or spare parts.
- To exclude a warehouse from the planning process, clear the **Include in Enterprise Planning** check box in the Warehouses (whwmd2500m000) session.

Item purchase data

In Item Base Data, you can specify items and item data on a global level. Before you can complete purchase procedures, you must also specify purchase-related item data in Item Purchase Data.

Specifying item purchase data and default item purchase data for an item group

Before order transactions can be used in Procurement, purchase-specific item data must be specified in the Item - Purchase (tdipu0601m000) session. To enter a purchased item, you must specify a large amount of information. If you set up defaults, you can reduce the amount of data that you must specify when you add

a purchased item. The *item group* is used in combination with the *item type* to set up item defaults. You can specify defaults for purchased items that belong to an item group in the **Item - Purchase Defaults** session.

To specify item purchase defaults and purchased items:

- 1 Specify an item group in the **Item Groups (tcmcs0123m000)** session.
- 2 Specify default global item data in the **Item Defaults (tcibd0102m000)** session, in which you must enter the **Item Group** that you previously defined in the **Item Groups (tcmcs0123m000)** session.
- 3 Click **Purchase** in the **Item Defaults (tcibd0102m000)** session. The **Item - Purchase Defaults** session starts in which you can specify item-purchase defaults for the combination of **Item Type** and **Item Group**.
- 4 Specify an item in the **Items (tcibd0501m000)** session for the combination of **Item Type** and **Item Group** that you previously defined in the **Item Defaults (tcibd0102m000)** session. As a result, the default values from the **Item Defaults (tcibd0102m000)** session are inserted in the **Items (tcibd0501m000)** session.
- 5 Click **Purchase** in the **Items (tcibd0501m000)** session. The **Item - Purchase** session starts in which you can enter the purchase data for the item that you created in the **Items (tcibd0501m000)** session. The default values from the **Item - Purchase Defaults** session are inserted in the **Item - Purchase** session.

Note:

- If you use *multisite*, you can specify item purchase data by purchase office or site. Specify the *sites* and *purchase offices* on the appropriate tabs of the **Item Purchase Defaults (tdipu0602m000)** and **Item - Purchase (tdipu0601m000)** sessions.
- To generate transactions for the purchased item, ordering-related item data must be specified in the **Items - Ordering (tcibd2100m000)** session and costing-related item data must be calculated in the **Item - Costing (ticpr0107m000)** session.

Purchased Item 360

If the **Buyer** field is filled in the **Item - Purchase** session, you can use the Purchased Item 360 (tdipu0103m000) session to display all items that are relevant for the specific *buyer*. The **Purchased Item 360 (tdipu0103m000)** session gives a quick overview of item data and easy access to item- and purchase-related data.

You can use the **Purchased Item 360 (tdipu0103m000)** session to:

- View, maintain, and create item-related data.
- View, maintain, and create purchase data for an item, such as purchase orders, purchase contracts, requests for quotation, purchase schedules, etc.
- Easily perform multiple item-related tasks.
- View several item-related graphs. See Purchased item graphs.

Specifying item - purchase business partner data

Use the **Items - Purchase Business Partner (tdipu0110m000)** session to specify purchase business partner-specific information by item. This information is used to determine how the order is purchased and received from a purchase business partner. The **Items - Purchase Business Partner (tdipu0110m000)** session contains the default logistic data of a purchase business partner that is required for a purchase order. If the purchase business partner is an internal business partner, the **Items - Purchase Business Partner (tdipu0110m000)** session also contains the default logistic data for purchase schedules and purchase releases. If the purchase business partner is an external business partner, the logistic data for the purchase schedule or the purchase release is retrieved from the **Purchase Contract Line Logistic Data (tdpur3102m000)** session.

Supplier 360

You can use the **Supplier 360 (tdsmi1501m000)** session to view, maintain, and create buy-from business partner-related data and display all business partners that are relevant for a specific *buyer*. The **Supplier 360 (tdsmi1501m000)** session provides an overview of buy-from business partner information and easy access to buy-from business partner-related data.

Sourcing

If the same item is delivered by various business partners, you can assign a *priority* and a *sourcing percentage* to business partners in the **Items - Purchase Business Partner (tdipu0110m000)** session. For more information, refer to Sourcing.

Approved supplier list

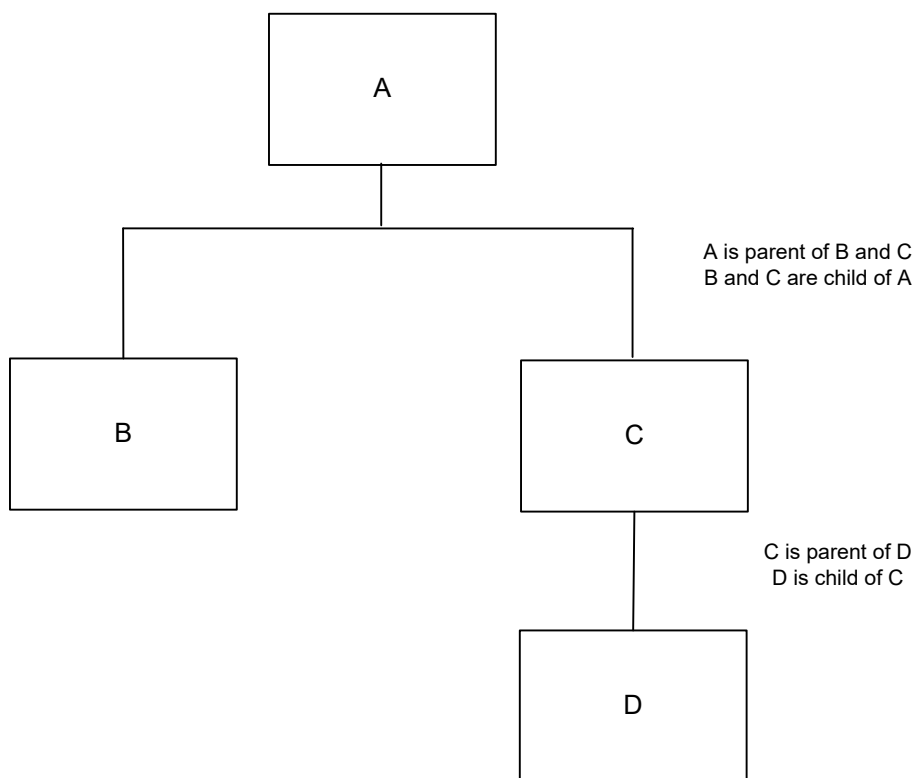
You can use the Approved Supplier List (tdipu0110m200) session to view the *approved supplier list*.

The Only Source from Approved Suppliers check box in the **Item - Purchase (tdipu0601m000)** session determines which suppliers are approved to deliver the item.

Item structures

Bill of Material (tibom1110m000)

For production planning, Enterprise Planning and Job Shop Control make use of the item structure and the routing for these items. The item structure, also called the Bill of Materials (BOM), describes the relationships between items in a production environment. Items that are related to each other have a parent-child relation:



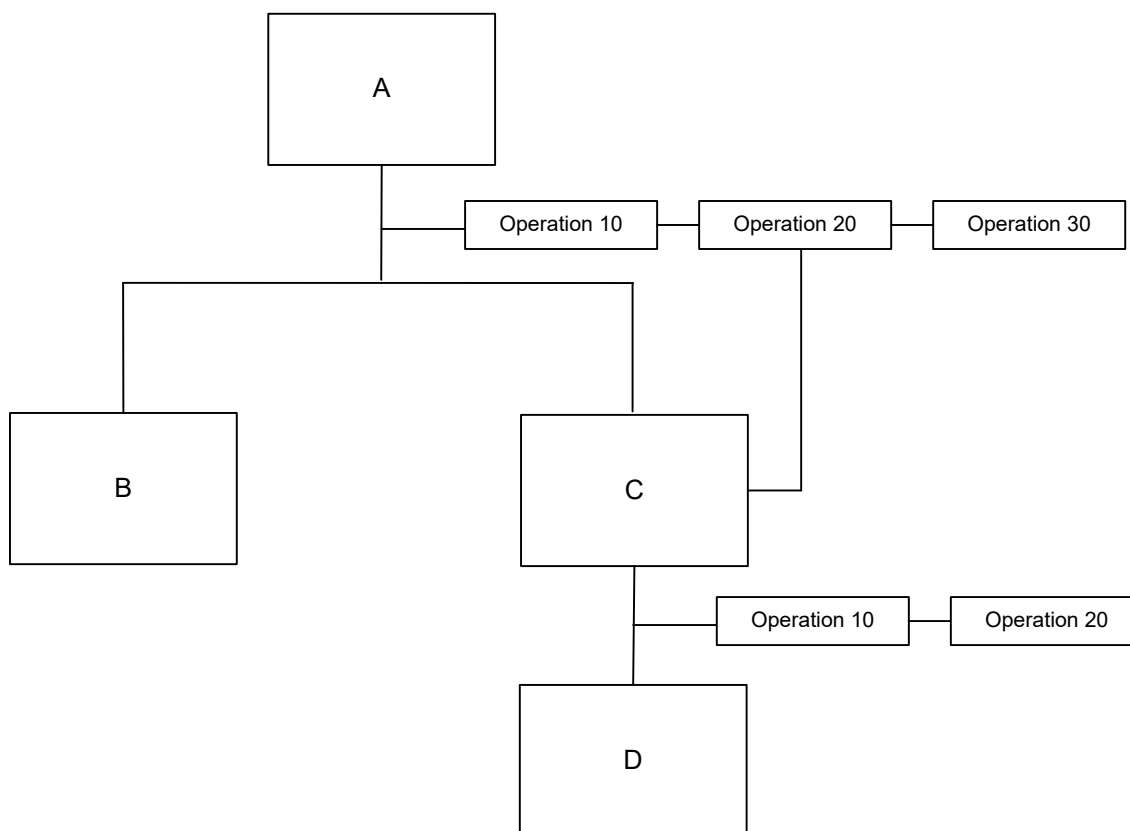
Each parent-child relation has specific characteristics that are defined on the BOM line, such as scrap percentage, scrap quantity, and net quantity.

Enterprise Planning uses the bill of material for several purposes:

- Material explosion for order planning
- BOM generation for customized items (customized item derived from a standard item) (Make to Order (MTO)).
- The BOM is the basis for the Bill of Critical Materials (BCM) generation. Enterprise Planning uses the BCM for material explosion for master planning and for available to promise (ATP) checks across the whole planning horizon.

Item - Routings (tirou1101m000)

An item can have a routing and a routing can have one or more routing operations. Each operation describes a process step on a specific work center.



The operation defines the processing and waiting times and things such as scrap and yield. Enterprise Planning uses the routing to perform the following:

- Generate the operations of the planned production orders. All operations together determine the planned start and finish date of the order.
- Generate the project routing.
- As the basis for the Bill of Critical Capacities (BCC). The BCC is used for master planning and Capable to Promise (CTP) checks of the resources. BCC is also used for CTP checking in the order planning horizon.

In the example above item A has a routing with 3 operations.

Operation 10 is the first operation and 30 the last operation.

Item C has two operations.

Note:

The materials are always planned at the beginning of the routing except when on the BOM line it is defined that the material should be available at a specific routing operation (like C) that is linked to operation 20.

This link is defined on the **Operation** field of the BOM line.

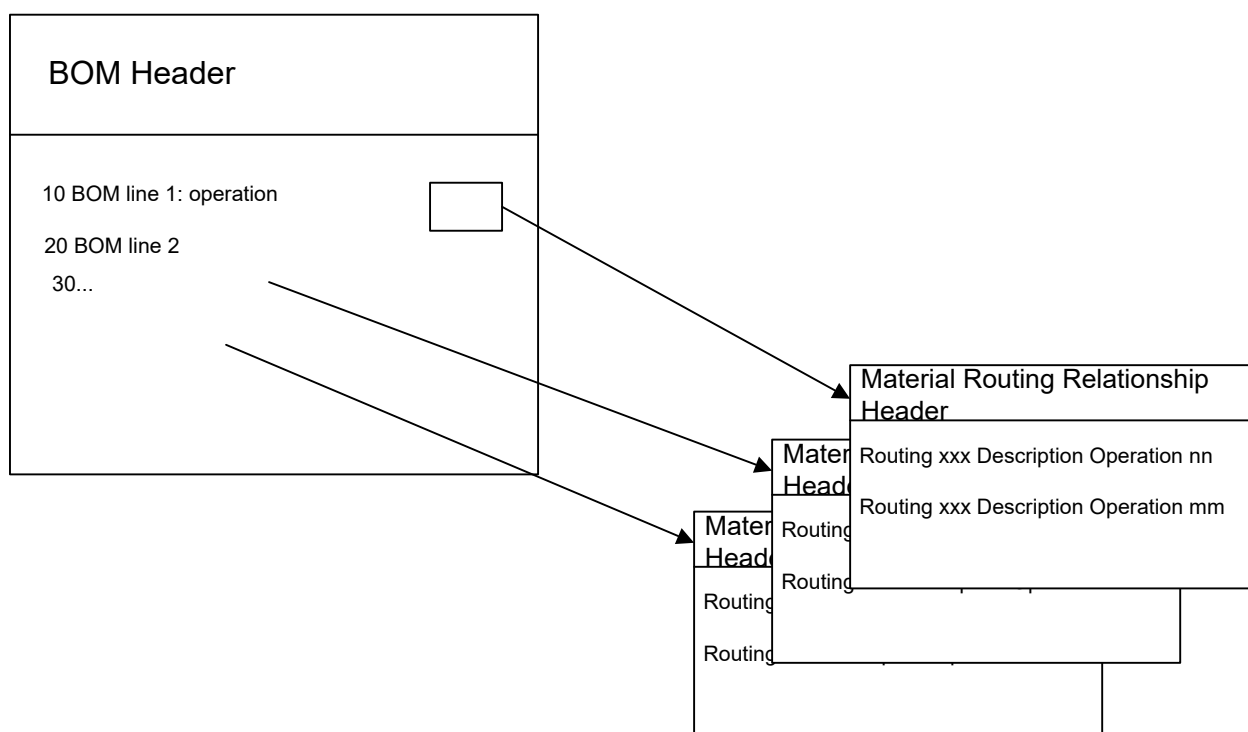
When the **Operation** field is empty, the material is planned at the start of the routing which is at the start of operation 10.

BOM Line - Material-Routing Relationships (tibom0140m000)

The material-routing relationship is an extension of the Operation-on-BOM-line concept. The link between material and operation is dependent on the selection of the (quantity dependent) routing.

The screen dump below shows the material-routing relationship for a BOM line. The header defines the item and position of the BOM line in the BOM. Each line (record) defines a relation of this BOM-line item (component) to an operation for each specific routing.

With this relationship, you can link BOM lines to an operation of a specified routing.



Inventory planning in Enterprise Planning

Enterprise Planning offers functionality for inventory planning. You can use this functionality to determine time-phased target inventory levels for the planning process in Enterprise Planning.

Without an item master plan

If an item has no *item master plan*, you can carry out inventory planning by means of the *safety stock* defined in the **Items - Ordering (tcibd2100m000)** session. In this same session you can specify a *seasonal pattern* for the safety stock, to account for seasonal fluctuations. During an order simulation for an item without a

master plan, the safety stock and the seasonal pattern determine the target inventory level used by the planning engine.

With an item master plan

If you maintain an item master plan for an item, this master plan includes an inventory plan. During a master-plan simulation or order simulation for an item with a master plan, LN uses the inventory plan as the target inventory level.

Note:

The inventory plan states the desired inventory level at the end of each plan period.

You can manually specify inventory-plan values for each plan period. However, you can also use the **Generate Demand and Inventory Plan (cpdsp1210m000)** session to automatically generate an inventory plan.

Vendor-managed inventory

In a *vendor managed inventory (VMI)* setup, where a supplier plans the supply on behalf of the customer, you can use a *terms and conditions agreement* to define minimum inventory levels and maximum inventory levels that must be maintained at the customer's warehouse.

For more information, refer to *To work with minimum and maximum inventory*

Note: For an item that is planned by the supplier, you cannot maintain an *item master plan*.

Fields Affected By The Long Item Description Parameter

The item description fields in some sessions can be extended by selecting the **Long Item Description** check box in the **Item Base Data Parameters (tcibd9199m000)** session. Descriptions will be extended to up to 80 characters when the parameter is activated.

If you have an extension on any of the affected fields, the extension must be updated with the new domain before this parameter can be selected.

New Domain	Length	Package/Module	Table	Table Field Code	Table Field
tscerl.desc	80	Service	Serialized Items	tscfg200.desc	Description
tcitm.dscr	60	Central Invoicing	Invoice Lines	cisli310.ldsc	Line Description
			Billable Lines	cisli810.ldsc	Detail Description
		Enterprise Planning	Planning – Generic Bill of Material	cprpd345.dsca	Description

New Domain	Length	Package/Module	Table	Table Field Code	Table Field
		Localization Angola	Interim Table for SAFT-AO	lpago219.dsca	Description
		Localization Israel	Interim D110 Header for Integration Transactions	lpisr106.desc	Goods Description
		Localization Russia	Customer Account Lines	lprus209.dsca	Description
		Items	Items	tcibd001.dsca	Description
			Item Code by Item Code Systems	tcibd004.aitd	Business Partner Item Description
			Business Partner Item – Revisions	tcibd014.dsca	Description
		Finance - Accounts Payable	Received Invoice Lines	tfacp111.itds	Item Description
			Purchase Invoice Lines	tfacp510.itds	Item Description
			Purchase Invoice Lines History	tfacp560.itds	Item Description
		Manufacturing	Engineering Item	tiedm010.dsca	Description
			Settings for Generic Item-Data Generation	tipcf300.desc	Description
			Generic Bill of Material	tipcf310.dsca	Description
		Project	Customer Furnished Materials	tpctm050.dsca	Item Description
			Estimate Lines	tpest200.desc	Description
			Bid Lines	tpest310.desc	Description
			Equipment	tppdm025.desc	Description
			Subcontracting	tppdm035.desc	Description

New Domain	Length	Package/Module	Table	Table Field Code	Table Field
			Project Equipment	tppdm625.desc	Description
			Project Subcontracting	tppdm635.desc	Description
			Buy-from BP Items	tppdm750.desc	Description
			Holdback	tppin040.desc	Description
			Commitments (Material)	tpppc211.desc	Description
			Equipment Costs	tpppc251.desc	Description
			Subcontracting Costs	tpppc271.desc	Description
			Revenues	tpppc301.desc	Description
			Cost Control by Project	tpptc400.desc	Description
		Warehousing	Clustered Shipment Lines for Bill of Lading	whinh432.dsca	Description
tcmcs.str80m	80	Sales	Sales Quote Lines	tdsls101.nids	Item Description
			Sales Quote Line History	tdsls151.nids	Item Description
tcmpn.dscr	80	Purchase	Manufacturer Part Numbers	tdipu045.dsca	Description
tcreq.nids	80	Purchase	Purchase Requisition Lines	tdpur201.nids	Item Description
tsmdm.dscd	60	Service	Service User Cost Defaults	tsmdm162.desc	Description

Chapter 10: Vendor Managed Inventory

Supplier Forecast setup

Supply planning by supplier

A company can outsource the supply planning for some purchased items. In this case, the company does not send the supplier orders to delivery-specific quantities on specific dates and times. Instead, the supply planning is delegated to the supplier who decides when to deliver what quantity. The customer and supplier have a *terms and conditions agreement* that specifies all relevant planning parameters. This terms and conditions agreement is linked to a valid *sales contract* or *purchase contract*.

Vendor managed inventory

Supply planning by the supplier is an aspect of *vendor managed inventory (VMI)*. To give the supplier control over the inventory, the supplier defines the warehouse at the customer's location as warehouse in the supplier's LN system.

The supply planning by supplier can be applied in three scenarios as shown in the following table:

Scenario	Owner of the supplied goods at the customer's site	Responsible for managing the warehouse at the customer's site	Responsible for the supply planning
Full VMI	Supplier	Supplier	Supplier
Planning by supplier	Customer	Customer	Supplier
Warehouse management by customer	Supplier	Customer	Supplier

For more information, refer to the Vendor managed inventory.

Order-based planning and VMI

The main difference between regular *order-based planning* and supply planning by supplier is the following:

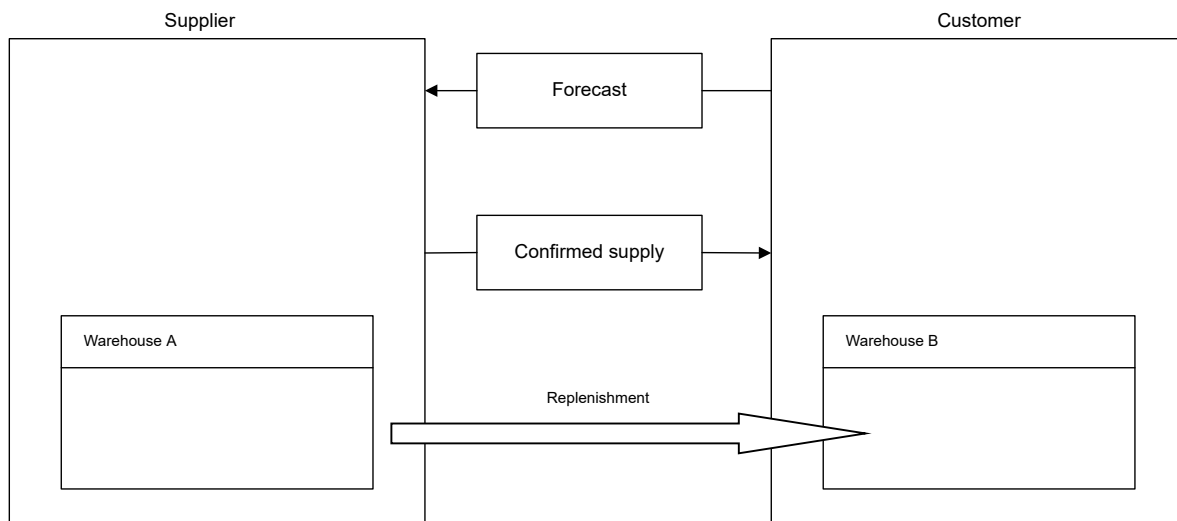
- Regular order-based planning
In general, if regular order-based planning is applied, Enterprise Planning generates *planned purchase orders* for the items that must be delivered by a supplier.

- Supply planning by supplier

If the supplier of an item is a valid *VMI supplier*, Enterprise Planning does not generate purchase orders for the item. Instead, Enterprise Planning can generate a *forecast* that is sent to the supplier. The supplier performs the supply planning based on the forecast or the actual inventory levels at the customer. In general, the replenishment is accomplished by using *warehouse transfers*.

Overview

The following diagram shows the general information flow and the goods flow for the setup where the supplier takes care of the planning.



Forecast

In the general case, the customer sends the supplier a *forecast* of the demand for an item. The supplier can use that forecast as input for its order-based planning process.

If the customer does not send a forecast for an item, the supplier can base the supply planning on the actual inventory levels.

The customer aggregates the forecast to *forecast periods*. For example, the forecast can be defined by week.

Enterprise Planning can generate the forecast, but the customer can manually modify the forecast before sending it to the supplier.

For more information, refer to Forecast (VMI)

Confirmed supply

Depending on the setup, the supplier sends the customer a *confirmed-supply message*.

Enterprise Planning can generate the confirmed supply, but the supplier can also use other methods to determine the confirmed supply. If Enterprise Planning generates the confirmed supply, the supplier can manually modify the confirmed supply before sending it to the customer.

For more information, refer to Confirmed supply (VMI)

Revisions

Each forecast the customer sends to the supplier gets a *revision* number. The corresponding *confirmed supply* is identified with the same revision number.

You can store past revisions for future reference. You can define the number of revisions LN retains in the **Planning Parameters (cprpd0100m000)** session. For example, you can set up LN to store the 10 most recent revisions.

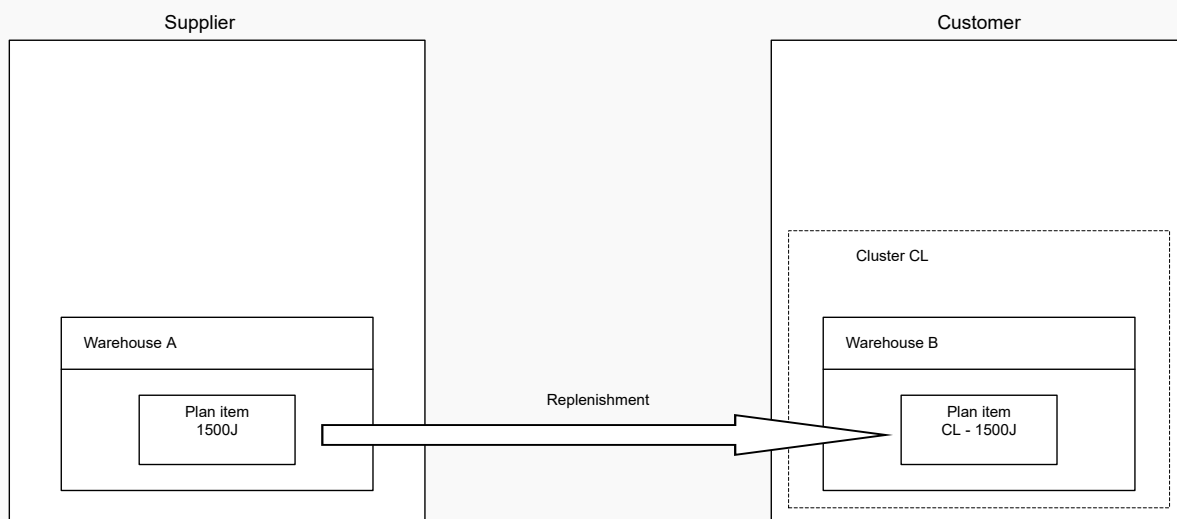
Restrictions

The forecast and confirmed supply do not include *effectivity units*. If an item is setup for *unit effective supply*, the item cannot be supplied by a *VMI supplier*.

For VMI planned items, an *item master plan* is not available.

Example

The following diagram shows how the situation is represented in the supplier's system.



In this example, the supplier defined the following entities:

- *Planning cluster CL*, that represents the customer's location.
- *Warehouse A*; this warehouse is at the supplier's own location.
- *Warehouse B*, an external warehouse linked to planning cluster CL.
- *Item 1500J*, an item manufactured by the supplier and sold to the customer.
- *Plan item 1500J*, with default warehouse A. Note: the planning cluster *segment* of the *item code* is empty, or else it differs from CL.
- *Plan item CL - 1500J*, with default warehouse B. Note: the planning cluster *segment* of the *item code* is CL.

The customer in this example regularly sends a forecast to the supplier. Based on this forecast, the supplier generates *planned distribution orders* to deliver plan item CL - 1500J to warehouse B (at the customer) and planned production orders for 1500J and its components.

The planned orders for plan item CL - 1500J can be translated to confirmed supply. The confirmed supply is the delivery quantity that the supplier commits to. Optionally, the supplier can change the confirmed supply, before sending the confirmed-supply data to the customer.

Finally, the supplier replans the supply, based on the confirmed supply sent to the customer. Because the confirmed supply can deviate from the received forecast, this planning run creates *planned orders* which can differ from the planned orders that were based on the forecast.

Procedures

For instructions on how to set the system up and how to run the planning and replenishment, refer to the following topics:

- Supplier's side
 - Performing the supply planning for your customer - Setup
 - Performing supply planning for your customer - Procedure
 - Supply planning by supplier sending the forecast
- Customer's side
 - To let your supplier perform the supply planning - Setup
 - Supply planning by supplier, sending the forecast

VMI business partner selection

This topic describes how LN selects a supplier in a *vendor managed inventory (VMI)* situation.

Some restrictions for the use of VMI functionality are also described.

Only a single *VMI supplier* can carry out your planning for an item at any single time. However, you can switch from one VMI supplier to another. LN searches for suppliers with terms and conditions agreements effective between the current date ('now') and the scenario finish date.

To select the effective VMI suppliers, the following rules apply:

- If LN finds multiple valid VMI suppliers, LN sorts the suppliers according to the *effective dates* and *expiry dates* of their respective *terms and conditions agreements*.
- If the *effectivity period* of one VMI supplier completely encloses the effectivity period of another VMI supplier, that other VMI supplier is ignored.
- As soon as a valid supplier becomes effective, LN selects that supplier as the VMI supplier.
- If, at a particular date, no supplier is effective as VMI supplier, no more VMI suppliers can be selected for later dates. For example, you cannot have a supplier carry out the planning in March, then use regular planning methods in April, and have the supplier carry out the planning again in May. If you try this, Enterprise Planning generates a *signal* and handles the second period (May in the example) by using the regular supply method.

However, of the total period between the current date and the scenario finish date, you can use regular planning in the first part of the period, later, a VMI supplier can carry out the supply planning for a particular time, and in the last part of the period you can use regular planning again.

Multiple sourcing

Multiple sourcing is permitted, as long as no more than one of the suppliers is a VMI supplier.

If you use multiple sourcing, the order planning procedure generates requirements and distributes the requirements over the available sources in the usual way. The demand that is allocated to the VMI supplier results in *forecast* that is sent to the VMI supplier. The other demand results in *planned purchase orders* or *planned distribution orders*.

You can assign a priority to the various suppliers, but the VMI supplier always has priority 0, which is the highest priority.

To view all active VMI suppliers and regular suppliers for a plan item, take the following steps:

- 1 Start the **Items - Planning (cprpd1100m000)** session.
- 2 Select the plan item.
- 3 Click *appropriate* menu > **Product Structure** > **Active Suppliers by Plan Item**.

Determining the VMI Relation

This topic describes how LN determines the value of the **VMI Relation** field in the Items - Planning (cprpd1100m000) session.

Whenever you run *order-based planning*, LN reevaluates the **VMI Relation** field. LN takes the entire period between current date and the *planning horizon* into account.

If at any time in that period an applicable *terms and conditions agreement* is found, the **VMI Relation** field is set to **Create Supplier Forecast** or **Receive Customer Forecast**, even if this terms and conditions agreement is not effective at the current date.

With this, LN ensures the *order-based planning* run carries out the *vendor managed inventory (VMI)* functionality if it is needed and makes the VMI related sessions and features available.

Overall procedure

- The Master Plan check box in the **Items - Planning (cprpd1100m000)** session must be cleared.
- Order Planning checks if **Receive Customer Forecast** is set up, if this is not the case Order Planning checks if **Create Supplier Forecast** is set up.
- If neither applies, LN sets the **VMI Relation** field to **Not Applicable**.

Checking if VMI purchase contract is set up

To determine if the VMI relation is set to **Create Supplier Forecast**, LN performs the following actions:

- 1 LN searches for suppliers (*buy-from business partners*) with *terms and conditions agreements* effective between the current date ('now') and the planning horizon.

LN also retrieves the plan item's default warehouse.

This terms and conditions agreement must be valid for the combination of item, *buy-from business partners*, and warehouse.

A terms and conditions agreement defined for a group of items, such as an *item group* or *product type*, is valid for every item within that group of items. Similarly, a terms and conditions agreement in which no warehouse is specified is valid for all items.

A terms-and-conditions agreement without an active *purchase contract* is not a valid terms-and-conditions agreement.

- 2 LN finds the effective *terms and conditions lines* between the current date and the planning horizon, based on the *terms and conditions search attributes*.
- 3 From the applicable record in the **Planning Terms and Conditions (tctrm1135m000)** session, LN retrieves the values of the Supply Planning by Supplier check box.
- 4 If the Responsible for Supply Planning check box is selected, LN sets the **VMI Relation** field to **Create Supplier Forecast**.

To check if VMI sales contract is set up

To determine if the VMI relation is set to **Receive Customer Forecast**, LN performs the following actions:

- 1 LN retrieves the plan item's *planning cluster*, based on the first *segment* of the plan item code, and checks whether this planning cluster has a *sold-to business partner*.
A planning cluster's sold-to business partner is defined in the Sold-to Business Partner field in the **Planning Clusters (tcepm1135m000)** session, optionally you can define a planning cluster's *ship-to business partner* there as well.
- 2 LN searches for a valid *terms and conditions agreement* for the combination of item, *sold-to business partner*, and optionally *ship-to business partner*.
A terms and conditions agreement defined for a group of items, such as an *item group* or *product type*, is valid for every item within that group of items.
A terms-and-conditions agreement without an active *sales contract* is not a valid terms-and-conditions agreement.
- 3 LN finds the effective *terms and conditions lines* between the current date and the planning horizon, based on the *terms and conditions search attributes*.
- 4 From the applicable record in the Planning Terms and Conditions (tctrm1135m000) session, LN retrieves the value of the Responsible for Supply Planning check box.
- 5 If the Supply Planning by Supplier check box is selected, LN sets the **VMI Relation** field to **Receive Customer Forecast**.

Supply planning by supplier sending the forecast

For the customer, the following procedures are relevant:

- Procedure 1: Sending the forecast
- Procedure 2: Receiving the confirmed supply

After you send the forecast and before you receive the confirmed supply, the supplier performs the planning. For a description of the supplier actions, refer to Performing supply planning for your customer - Procedure.

To review previous *revisions* of the *forecast* and the corresponding *confirmed supply*, use the **Forecast by Revision to Supplier (cpvmi0503m100)** session.

For an overview of the plan during all steps of the procedure, use the Item Supplier Plan (cpvmi0530m000) session.

This procedure is applicable only if your supplier sends *confirmed-supply messages*. This is the case if the Use Confirmed Supply check box is selected in the **Terms and Conditions Line (tctrm1620m000)** session in the relevant *terms and conditions agreement*.

If the supplier does not send confirmed-supply messages, the *item order plan* displays the sent forecast as Expected Supply.

1 Forecast by Revision to Supplier (cpvmi0503m100)

When you receive a confirmed-supply message, you can use the **Forecast by Revision to Supplier (cpvmi0503m100)** session to inspect this revision of the confirmed supply.

To enter confirmed supply received by fax or mail, use the **Confirmed Supply from Supplier (cpvmi0105m000)** session. (Usually, however, the confirmed supply is received automatically in LN by electronic messaging.)

To display an overview of all stored revisions, use the **Forecast Revisions to Supplier (cpvmi0503m000)** session.

2 Accept Confirmed Supply from Supplier (cpvmi0205m000)

Until you accept a confirmed-supply revision, the planning process does not take that revision into account.

To accept the confirmed supply, use one of the following methods:

- To accept all received confirmed supply automatically without checking, in the **Planning Parameters (cprpd0100m000)** session, select the **Automatic Accept Confirmed Supply** check box.
- To accept the confirmed supply for a range of items, use the **Accept Confirmed Supply from Supplier (cpvmi0205m000)** session. Specify which checks the session must apply before accepting the confirmed supply.
- To accept the confirmed supply for one particular item, start the **Forecast by Revision to Supplier (cpvmi0503m100)** session, and click **Accept Confirmed Supply**. If any *planned receipt date* is before the current date, or the delivery dates do not match the agreed *pattern*, LN asks you whether you accept the deviations.

3 Item Supplier Plan (cpvmi0530m000)

To view the result of the planning that the supplier performed, use the **Item Supplier Plan (cpvmi0530m000)** session.

The *item supplier plan* is similar to the *item order plan*, with the following differences:

- The item supplier plan only shows the demand and supply for one *VMI supplier*.
- You can choose what the item supplier plan displays as demand:
 - The calculated forecast
 - The sent forecast
 - The actual and planned forecast (same as item order plan)
- Additional columns display the *confirmed forecast* and *unconfirmed forecast*.

To review historic data

To display an overview of all stored revisions of forecast and confirmed supply, use the **Forecast Revisions to Supplier (cpvmi0503m000)** session and double-click a revision to display the details.

Confirmed supply (VMI)

A *VMI supplier* can send confirmed-supply messages to the customer. The confirmed supply is the quantity of the item the supplier has confirmed will be delivered to the customer on the planned delivery date. The confirmed supply can be less than the quantity requested by the customer.

Use of confirmed-supply data

LN uses the confirmed-supply data in two ways:

- If the **Confirm Supply** check box in the **Planning Terms and Conditions (tctrm1135m000)** session is selected, you communicate the confirmed supply to the customer.
- If the **Planning Based On** field is **Confirmed Supply**, LN uses the confirmed supply to generate *planned orders* to supply the customer.

Life cycle of confirmed-supply data

In the most extended form, the life-cycle of confirmed supply consists of the following stages:

- 1 The supplier generates planned supply orders for an item based on the received *forecast*.
- 2 The *VMI supplier* converts the planned supply orders and actual supply orders to confirmed supply.
- 3 Optionally, the supplier adjusts the confirmed supply, for example if a limited production capacity or shortage of components makes it impossible to execute all planned orders.
Alternatively, the supplier enters the confirmed supply manually.
- 4 The supplier approves the confirmed supply and sends the confirmed supply to the customer.

Alternatively, the confirmed supply can be used as follows:

- 1 The supplier receives the *forecast* from the customer.
- 2 The supplier manually enters the confirmed supply.
- 3 The supplier approves the confirmed supply and sends the confirmed supply to the customer.

When the confirmed supply is marked as approved, you cannot change the confirmed supply for that *revision number*. You can undo the approval, until the confirmed supply is sent to the customer.

The procedure is controlled in detail by the *terms and conditions agreement* defined by the supplier and the customer. For more information, refer to Overview of terms and conditions.

Aggregation period

The dates of the supply are independent from the *forecast periods*.

The dates of the supply can be based on the delivery moments specified in the terms and conditions agreement. You can specify these delivery moments in the **Delivery Moments** field in the **Planning Terms and Conditions (tctrm1135m000)** session.

Confirm Supply Horizon

The supplier must send confirmed-supply information for the number of days specified in the Confirm Supply Horizon field in the **Planning Terms and Conditions (tctrm1135m000)** session.

Customer actions

The customer can view the confirmed supply in the *item supplier plan*. This data can also be used to calculate the *available-to-promise* (ATP) quantity and to perform *component CTP checks*.

Confirmed supply type

This topic contains the following information:

- How must the confirmed supply type of a *confirmed-supply* record be interpreted?
- How does LN determine the confirmed supply type?

If you are the supplier in a *vendor-managed-inventory* (VMI) setup, LN can use the *confirmed supply* to plan the supply for a customer.

You can view and modify the a confirmed-supply record's type in the **Confirmed Supply Type** field in the **Confirmed Supply to Customer (cpvmi0108m000)** session.

Allowed values

A confirmed-supply record's type determines how that confirmed supply is handled:

- **Stock**
Supply of type **stock** is already present at the customer; so, you do not need to generate *planned distribution orders* to deliver the supply.
- **Immediate**
Supply of type **Immediate** is used to increase the inventory level to at least the agreed minimum inventory level.
Planned distribution orders that result from this confirmed supply can be immediately transferred to the *execution level*.
- **To Release**
If planned distribution orders are based on confirmed supply of type **To Release**, these orders get the **Order Release** field set to **To be released**. These planned orders can be immediately transferred to the execution level.
- **Planned**
If planned distribution orders are based on confirmed supply of type **Planned**, these orders get the **Order Release** field set to **Not to be released**. These planned orders cannot be transferred to the execution level until the **Order Release** field is changed to **To be released** in a later planning run or manually.

- **Released**

If a confirmed-supply record has confirmed supply type **Released**, the confirmed supply has already been covered by an actual order. This actual order corresponds with a scheduled receipt for the customer's warehouse.

Note: If you transfer a *planned distribution order* to the execution level, the planned order results in a *warehousing order* with *inventory transaction type* **Transfer**. Theoretically, a planned distribution order can also be transferred to a *sales order*, but that is not useful in a vendor-managed-inventory (VMI) setup.

How the confirmed supply type is determined

The confirmed supply type depends on the **Replenishment Based On** field in the **Planning Terms and Conditions (tctrm1135m000)** and the Order Release field in the **Planned Orders (cprrp1100m000)** session.

Supplier's side

Performing the supply planning for your customer - Setup

This topic describes how to set the system up to perform the supply planning for your customer in a *vendor managed inventory (VMI)* situation.

1 Implemented software components

In the **Implemented Software Components (tccom0500m000)** details session, set the following fields:

- **Terms and Conditions**
Under **Modules**, select the **Terms and Conditions** check box.
- **Ownership External**
Under **Concepts (Logistics)**, select the **Ownership External** check box.
- **VMI (supplier side)**
Under **Concepts (Logistics)**, select the **VMI (supplier side)** check box. This will make the supplier side of the *vendor managed inventory (VMI)* functionality available.

2 Planning Cluster

In the Planning Clusters (tcemm1135m000) session, define a *cluster* that represents your customer's site. Set the following fields to the appropriate values:

- **External**
To associate this cluster with a *sold-to business partner*, select the **External** check box.
- **Sold-to Business Partner**
Enter the customer for which you perform the supply planning in the **Sold-to Business Partner** field.
- **Ship-to Business Partner**
If you deliver goods to multiple sites for the same customer, specify the *ship-to business partner* that represents the customer site where the items must be delivered.

3 Warehouse

In the Warehouses (whwmd2500m000) session, define the warehouse at the customer's site.

Set the following fields to the appropriate values:

- **Include in Enterprise Planning**

To have the planning process take the inventory in this warehouse into account, under **General**, select the **Include in Enterprise Planning** check box.

- **External Site**

Under **Relationships > Site**, in the **External Site** field, select **yes**.

- **Planning Cluster**

Under **Relationships > Site**, in the **Planning Cluster** field, enter the cluster you defined in the previous step.

Note: If you will be managing the inbound and outbound operations in this warehouse, you must also select the Inventory Management check box.

4 Terms and conditions agreement (Planning)

In the **Terms and Conditions (tctrm1100m000)** session, define a *terms and conditions agreement* of type **Sales**. For further instructions, refer to Setting up terms and conditions.

To make the planning-related parameters in the *terms and conditions group* available, in the **Terms and Conditions Search Level (tctrm1610m000)** session, select the Planning check box.

After you set up a basic *terms and conditions line*, start the **Terms and Conditions Line (tctrm1620m000)** session, click the **Planning** tab, and enter a record. Set the fields to the appropriate values

- **Responsible for Supply Planning**

To specify that you perform the supply planning for your customer, select the Responsible for Supply Planning check box.

- **Forecast**

For instructions on the fields under **Forecast**, refer to Forecast (VMI).

- **Inventory Levels**

For instructions on the fields under **Inventory Levels**, refer to To work with minimum and maximum inventory.

- **Confirmed Forecast**

For instructions on the fields under **Confirmed Forecast**, refer to Confirmed forecast and unconfirmed forecast and How to set up confirmed forecast (supplier side).

- **Confirmed Supply**

For instructions on the fields under **Confirmed Supply**, refer to Confirmed supply (VMI).

- **Planning**

For instructions on the fields under **Planning**, refer to Replenishment methods (VMI) and Planning methods (VMI).

5 Terms and conditions agreement (Order)

In the **Terms and Conditions (tctrm1100m000)** session, select the terms and conditions agreement you defined in the previous step.

To make the order-related parameters in the *terms and conditions group* available, in the **Terms and Conditions Search Level (tctrm1610m000)** session, select the Order check box.

Start the **Terms and Conditions Line (tctrm1620m000)** session, click the **order** tab, and enter a record. Set the fields to the appropriate values.

The value of the Transfer Type field determines if LN will use *warehouse transfers* or sales transfers to deliver the items to the customer's warehouse. In general, warehouse transfers are the most simple solution, but sales transfers offer some additional features.

If the Payment field has the value **Pay on Receipt**, the **Transfer Type** field cannot be set to **Warehouse Transfer**.

6 Sales contract

In the **Sales Contracts (tdsls3500m000)** session, define a *sales contract* between you and your customer. Set the following fields to the appropriate values:

- **Terms and Conditions ID**
Enter the *terms and conditions agreement* defined in the previous step in the **Terms and Conditions ID** field.

7 EP Parameters

In the **Planning Parameters (cprpd0100m000)** details session, set the following fields:

- **Number of Revisions**
To specify the number of *revisions* of the *forecast* and *confirmed supply* that LN stores, use the **Number of Revisions** field.
- **Automatic Accept Forecast**
To specify whether you accept all forecast messages without checking, use the **Automatic Accept Forecast** check box.

8 Plan items

In the **Items - Planning (cprpd1100m000)** session, define a *plan item* that represents the item inventory at your customer's site, for the item you deliver to your customer. In the plan item's cluster segment, enter the *planning cluster* you defined in step 2.

Set the following fields to the appropriate values:

- **Supply Source**
To supply the item by using *planned distribution orders*, set the Supply Source field to **Distribution**.
To supply the item by using *direct delivery* from your suppliers to your customer, set the Supply Source field to **Item Source**.
- **Ordering Warehouse**
Enter the warehouse you defined in step 3 in the **Ordering Warehouse** field.
- **VMI Relation**
If you run the planning process, LN automatically sets the VMI Relation field to **Create Supplier Forecast**.

To build up inventory at your own site, define a corresponding *plan item* that has a planning cluster that is associated with the site from where you deliver the item.

9 Supplying relationships

In the **Supplying Relationships (cprpd7130m000)** session, define the *supplying relationship* from your site to your customer's site.

Note: If you use *direct delivery* or manual replenishment, you do not require supplying relationships.

For more information on the use of *multicompany distribution orders* to supply your customer, refer to Transferring multicompany distribution orders.

10 configure LN for BOD publishing

If you use *Business Object Documents (BOD)* to exchange data between supplier and customer, you must set up the BODs. For more information, refer to Configuring LN for BOD publishing.

Performing supply planning for your customer - Procedure

This topic describes the supplier's side of the procedure for planning an item for a customer, starting with the receipt of a *forecast*, and up to the replenishment of the inventory at the customer's site.

For an overview of the plan during all steps of the procedure, use the Item Customer Plan (cpvmi0520m000) session.

This is a description of the most comprehensive variant of the procedure. Depending on the parameter settings, you can skip certain steps.

1 Forecast by Revision from Customer (cpvmi0506m100)

If in the **Terms and Conditions Line (tctrm1620m000)** session, on the **Planning** tab, the Forecast received from Customer check box is selected in the relevant *terms and conditions agreement*, your customer sends you messages that contain the *forecast* by using the Planning Schedule BOD.

If your customer sends you another *revision* of the forecast, you can use the **Forecast by Revision from Customer (cpvmi0506m100)** session to inspect this revision.

To enter forecast data received by fax or mail, use the **Forecast from Customer (cpvmi0107m000)** session. (Usually, however, the forecast is received automatically in LN by electronic messaging).

2 Accept Forecast from Customer (cpvmi0206m000)

Until you accept a forecast revision, the planning process does not take the revision into account.

To accept the forecasts, use one of the following methods:

- To accept all received forecast automatically without checking, in the **Planning Parameters (cprpd0100m000)** session, select the **Automatic Accept Forecast** check box.
- To accept the forecast for a range of items, use the **Accept Forecast from Customer (cpvmi0206m000)** session. To exclude revisions that do not comply with the agreed *frozen zone-* or *frozen zone+*, clear the **Accept Forecast changes in Frozen Zone** check box.
- To accept a forecast for one particular item, start the **Forecast by Revision from Customer (cpvmi0506m100)** session, find the item and the revision, and click **Accept Forecast**. If the revision does not comply with the agreed *frozen zone-* or *frozen zone+*, LN asks you whether you accept the deviations.

If in the **Terms and Conditions Line (tctrm1620m000)** session, on the **Planning** tab, the Confirm Supply check box is cleared in the relevant *terms and conditions agreement*, skip the following steps and proceed with step 7, **Generate Order Planning (cprpr1210m000)**.

3 Generate Planned Supply based on Forecast (cpvmi1211m000)

If in the **Terms and Conditions Line (tctrm1620m000)** session, the Confirm Supply check box is selected, generate *planned orders for plan items* for your customer by using the **Generate Planned Supply based on Forecast (cpvmi1211m000)** session.

Note: The planning cluster *segment* of the item code must be the *planning cluster* associated with the warehouse located at your customer's location. The VMI Relation field in the **Items - Planning (cprpd1100m000)** session must be **Create Supplier Forecast**.

4 **Generate Confirmed Supply (cpvmi1210m000)**

If in the **Terms and Conditions Line (tctrm1620m000)** session, on the **Planning** tab, the Confirm Supply check box is selected in the relevant *terms and conditions agreement*, you must send the customer messages that contain the *confirmed supply*.

To generate the confirmed supply, use the **Generate Confirmed Supply (cpvmi1210m000)** session. LN bases the confirmed supply on the *planned orders* generated in the previous step.

5 **Confirmed Supply to Customer (cpvmi0108m000)**

To check and adjust the confirmed supply manually, use the **Confirmed Supply to Customer (cpvmi0108m000)** session.

The Confirm Supply Horizon field in the **Planning Terms and Conditions (tctrm1135m000)** session determines for how many days you must guarantee the deliveries specified in the confirmed-supply message.

6 **Approve Confirmed Supply to Customer (cpvmi0208m000)**

Before the LN sends the confirmed-supply message to the customer, you must approve it.

To approve the confirmed supply, use one of the following methods:

- To approve the confirmed supply for a range of items, use the Approve Confirmed Supply to Customer (cpvmi0208m000) session. Specify which checks the session must apply before approving the confirmed supply.
- To approve the confirmed supply for one particular item, start the **Confirmed Supply to Customer (cpvmi0108m000)** session, find the item and the revision, and click **Approve**.

7 **Send Confirmed Supply to Customer (cpvmi0208m100)**

To send the confirmed supply, use the **Send Confirmed Supply to Customer (cpvmi0208m100)** session.

To send the confirmed supply to the customer, use one of the following methods:

- Using *Business Object Documents (BOD)*
Under **Send Method**, select **Publish or Print and Publish**.
- Not controlled by LN
Under **Send Method**, select **Print**. LN does not send the information. You must take care of that by other means, for example fax.

8 **Generate Order Planning (cprrp1210m000)**

After you generated and approved the confirmed supply, you must plan the item supply. To plan the item supply, use the **Generate Order Planning (cprrp1210m000)** session. The planning process takes the relevant *terms and conditions agreement* into account. The Planning Based On field in the **Planning Terms and Conditions (tctrm1135m000)** session determines the method to plan the item.

9 **Item Customer Plan (cpvmi0520m000)**

To view the result of the planning, use the Item Customer Plan (cpvmi0520m000) session. The item customer plan displays demand and supply for a specific customer, whereas the item order plan displays demand and supply from all suppliers or customers.

10 **Transfer Order Planning (cppat1210m000)**

To turn planned orders into actual *production orders*, *purchase orders*, and *warehouse transfers*, use the **Transfer Order Planning (cppat1210m000)** session. Depending on the value of the Replenishment Based On field in the **Planning Terms and Conditions (tctrm1135m000)** session, some planned orders are marked as **Not to be released** and are blocked from transfer to the execution level.

LN turns *planned distribution orders* for shipments to the customer warehouse into either *warehouse transfers* or sales transfers. The Transfer Type field in the **Order Terms and Conditions (tctrm1130m000)** session in the applicable *terms and conditions agreement* determines the type of transfer used.

Reviewing historic data

To display an overview of all stored revisions of forecast and confirmed supply, use the **Forecast Revisions from Customer (cpvmi0506m000)** session and double-click a revision to display the details.

Customer's side

To let your supplier perform the supply planning - Setup

This topic describes how to set the system up if your supplier performs the supply planning for you in a *vendor managed inventory (VMI)* situation.

1 Implemented software components

In the **Implemented Software Components (tccom0500m000)** details session, set the following field:

- **VMI (customer side)**

To make the customer side of the *vendor managed inventory (VMI)* functionality available, select the **VMI (customer side)** check box.

2 Warehouse

In the **Warehouses (whwmd2500m000)** session, define the warehouse where you receive the item.

Set the following field to the appropriate value:

- **Include in Enterprise Planning**

To have the planning process take the inventory in this warehouse into account, select the **Include in Enterprise Planning** check box.

Note: If your supplier also manages the inbound and outbound operations in this warehouse, you must clear the Inventory Management check box.

3 Business partner

In the **Business Partners (tccom4500m000)** session, define the supplier.

To specify the relevant data for *buy-from business partners*, click **Buy-from Business Partner** to start the **Buy-from Business Partner (tccom4120s000)** session.

4 Terms and conditions agreement

In the **Terms and Conditions (tctrm1100m000)** session, define a the *terms and conditions agreement* of type **Purchase**. For further instructions, refer to Setting up terms and conditions.

To make the planning-related parameters in the *terms and conditions group* available, in the **Terms and Conditions Search Level (tctrm1610m000)** session, select the Planning check box.

After you set up a basic *terms and conditions line*, start the **Terms and Conditions Line (tctrm1620m000)** session, click the **Planning** tab, and enter a record. Set the fields to the appropriate values

- **Forecast**
For instructions on the fields under **Forecast**, refer to Forecast (VMI).
- **Inventory Levels**
For instructions on the fields under **Inventory Levels**, refer to To work with minimum and maximum inventory.
- **Confirmed Forecast**
For instructions on the fields under **Confirmed Forecast**, refer to Confirmed forecast and unconfirmed forecast and How to set up confirmed forecast (customer side).
- **Confirmed Supply**
For instructions on the fields under **Confirmed Supply**, refer to Confirmed supply (VMI).
- **Planning**
For instructions on the fields under **Planning**, refer to Replenishment methods (VMI) and Planning methods (VMI).

5 Purchase contract

In the **Purchase Contracts (tdpur3100m000)** session, define a *purchase contract* between you and your supplier.

Set the following fields to the appropriate values:

- **Terms and Conditions ID**
Enter the *terms and conditions agreement* defined in the previous step in the **Terms and Conditions ID** field.

6 EP Parameters

In the **Planning Parameters (cprpd0100m000)** details session, set the following fields:

- **Number of Revisions**
To specify the number of *revisions* of the *forecast* and *confirmed supply* that LN stores, use the **Number of Revisions** field.
- **Automatic Accept Confirmed Supply**
To specify whether you accept all confirmed-supply messages without checking, use the **Automatic Accept Confirmed Supply** check box.

7 Plan items

In the **Items - Planning (cprpd1100m000)** session, define the *plan item*.

Set the following fields to the appropriate values:

- **Ordering Warehouse**
Enter the warehouse you defined in step 2 in the **Ordering Warehouse** field.
- **VMI Relation**
If you run the planning process, LN automatically sets the VMI Relation field to **Receive Customer Forecast**.

Supply planning by supplier, sending the forecast

For the customer, the following procedures are relevant:

- Procedure 1: Sending the forecast
- Procedure 2: Receiving the confirmed supply

After you send the forecast and before you receive the confirmed supply, the supplier performs the planning. For a description of the supplier actions, refer to Performing supply planning for your customer - Procedure.

To review previous *revisions* of the *forecast* and the corresponding *confirmed supply*, use the **Forecast by Revision to Supplier (cpvmi0503m100)** session.

For an overview of the plan during all steps of the procedure, use the Item Supplier Plan (cpvmi0530m000) session.

1 Generate Order Planning (cprrp1210m000)

Run the **Generate Order Planning (cprrp1210m000)** session. The planning process determines the value of the VMI Relation field in the **Items - Planning (cprpd1100m000)** session, based on the available *VMI suppliers*, valid *purchase contracts*, and *terms and conditions agreements*. If a plan item's VMI role is **Receive Customer Forecast**, the planning process does not generate *planned orders* for that item, because the supplier takes care of the supply planning.

If in the **Terms and Conditions Line (tctrm1620m000)** session, on the **Planning** tab, the Send Forecast to Supplier check box is selected in the relevant *terms and conditions agreement*, the planning process generates a *forecast* for the item.

2 Forecast to Supplier (cpvmi0102m000)

To check and adjust the forecast manually, use the **Forecast to Supplier (cpvmi0102m000)** session.

Make sure the forecast complies with the *frozen zone-* and *frozen zone+* specified in the relevant terms and conditions agreement.

3 Approve Forecast to Supplier (cpvmi0202m000)

You must approve the forecast, before you can send the forecast message to the supplier.

To approve the forecast, use one of the following methods:

- To approve the forecast for a range of items, use the **Approve Forecast to Supplier (cpvmi0202m000)** session. Specify which checks the session must apply before approving the forecast.
- To approve the forecast for one particular item, start the **Forecast to Supplier (cpvmi0102m000)** session, and click **Set Approved for Sending**.

4 Send Forecast to Supplier (cpvmi0202m100)

To send the forecast, use the **Send Forecast to Supplier (cpvmi0202m100)** session.

To send the forecast, use one of the following methods:

- Using *Business Object Documents (BOD)*
Under **Send Method**, select **Publish** or **Print and Publish**.
- Not controlled by LN
Under **Send Method**, select **Print**. LN does not send the information. You must take care of that by other means, for example fax.

You can send the forecast for a single item also by using the **Send** command in the **Forecast to Supplier (cpvmi0102m000)** session.

Reviewing historic data

To display an overview of all stored revisions of forecast and confirmed supply, use the **Forecast Revisions to Supplier (cpvmi0503m000)** session and double-click a revision to display the details.

Forecast

Forecast (VMI)

A forecast in a *vendor managed inventory (VMI)* setup is the demand for parts, calculated by the customer that purchases that item, and aggregated to forecast periods according to the agreed terms and conditions. The customer sends the forecast to the supplier that plans the item supply.

Life-cycle of forecast data

During an *order-based planning* run, Enterprise Planning generates *planned production orders*, *planned purchase orders*, and *planned distribution orders* to fill the demand. However, if a plan item is purchased from a *VMI supplier*, Enterprise Planning does not generate *planned orders* for that item. Enterprise Planning generates a *forecast* instead of planned orders.

The customer sends the forecast to the supplier.

The supplier uses the forecast to plan the supply and optionally to calculate the *confirmed supply*.

Terms and conditions

To use *vendor managed inventory (VMI)*, the supplier and the customer must define a *terms and conditions agreement*, which is stored in the Terms and Conditions module in the Common package. A terms and conditions agreement is linked to a contract. The supplier stores this contract as a *sales contract* and the customer stores the contract as a *purchase contract*.

For more information, refer to Overview of terms and conditions.

Aggregation period

Generally, the customer aggregates the forecast to *forecast periods*, such as, one day, one week, or five weeks. The terms and conditions agreement defines the forecast periods' length. The customer can also send detailed demand data without aggregating over periods.

Example

If the forecast period is a week, the forecast message for item X can specify the following data:

Period	Forecast
Week 20	350 piece
Week 21	410 piece
Week 22	360 piece

Approval

After LN calculated the forecast, the customer can optionally change the forecast manually. Before LN sends the forecast to the supplier, the customer must approve the data.

If a forecast revision has been approved, you cannot change that forecast revision, unless you undo the approval. After a forecast revision was sent to the supplier, you can no longer undo the approval.

Revisions

The customer can send as many forecast messages as desired. Every revised forecast message gets a *revision number* that is incremented by one. You can specify whether and how many previous revisions must be stored for future reference.

If the supplier sends a *confirmed-supply* message to the customer, the relationship with the forecast revision on which the confirmed supply was based is retained.

Forecast frozen zone

Supplier and customer can agree that the forecast for the immediate future cannot be increased or decreased. This restriction ensures that the supplier has sufficient time to adapt the supply plan if required.

For more information, refer to Forecast frozen zones.

Total forecast and confirmed part of the forecast

Optionally, you can split the *forecast* in *confirmed forecast* and *unconfirmed forecast*. The supplier can use this information in several ways. For example, the supplier can base its internal production plans on the total forecast, and replenish the customer based on the confirmed forecast.

When more sales information becomes available and the customer sends new forecast revisions, the unconfirmed forecast can be gradually replaced by confirmed forecast.

For more information, refer to Confirmed forecast and unconfirmed forecast.

Supplier actions

Before the supplier uses the received forecast in the planning process, the supplier must accept the forecast. Optionally, you set the system up to automatically accept all forecasts.

The supplier uses the forecast for the following purposes:

- To calculate the *confirmed supply*, which is subsequently sent to the customer.

- To generate the *planned distribution orders* to replenish the customer's warehouse.

For more information, refer to Planning methods (VMI).

Confirmed forecast and unconfirmed forecast

This topic discusses the concept of confirmed and unconfirmed forecast, and presents an overview of the functionality.

For instructions on setting up the various options, refer to the following topics:

- How to set up confirmed forecast (customer side)
- How to set up confirmed forecast (supplier side)

For a description of the algorithm to determine which part of the total forecast is confirmed forecast, refer to How to determine the confirmed forecast

Reliability of the forecast to supplier

If you use *vendor managed inventory (VMI)* and the supplier plans the supply on behalf of the customer, the supplier can plan based on *forecast* received from the customer.

The customer can differentiate between confirmed and unconfirmed forecast:

- confirmed forecast
The part of the total forecast for which the customer confirms that this part will be consumed.
Typically, confirmed forecast is derived from actual sales orders, sales schedules, and so on.
- unconfirmed forecast
The part of the total forecast for which the customer is unsure whether this quantity will be needed.

The sum of the confirmed forecast and the unconfirmed forecast is called total forecast. Usually, the total forecast includes the demand based on actual sales orders for the customer's end products and forecast demand based on estimated future sales.

To use unconfirmed forecast

If you differentiate between confirmed forecast and unconfirmed forecast, you can choose whether the supply planning is based on the confirmed forecast or on the total forecast.

With confirmed supply

If the *VMI supplier* sends the customer messages with the *confirmed supply* that the customer can expect to receive, the supplier can calculate the confirmed supply based on **Total Forecast** or **Confirmed Forecast**.

In both cases, the supplier bases the supply planning on the confirmed supply.

Without confirmed supply

If the supplier does not send the customer messages with the *confirmed supply* that the customer can expect to receive, the supplier can base the supply planning on **Total Forecast** or **Confirmed Forecast**.

If the planning is based on **Total Forecast**, the supplier can base the replenishment on **Total Forecast**, **Confirmed Forecast**. If the planning is based on **Confirmed Forecast**, the replenishment can be based on **Confirmed Forecast**. In both cases, you can handle the replenishment also completely manually.

Item supplier plan and item customer plan

In the *item supplier plan* and the *item customer plan*, LN displays the **Total Demand** field and the **Confirmed Demand** field in adjacent columns. LN also displays the **Planned Avail. (Total)** and the **Planned Available (Confirmed)** fields, which show whether the supplier can prevent inventory shortages. A negative planned available quantity indicates a projected inventory shortage.

If the *VMI supplier* cannot fill the total forecast, the item plans shows whether the supplier can at least cover the confirmed forecast.

How to determine the confirmed forecast

This topic describes how to set up the algorithm to determine which part of the total *forecast* is *confirmed forecast* and which part is *unconfirmed forecast*.

The general concept is explained in the Confirmed forecast and unconfirmed forecast topic.

Two available methods

If you are the customer that sends forecasts to a *VMI supplier*, you can choose between two approaches to distinguish confirmed forecast from unconfirmed forecast:

- Based on **Order Type**
You can define a collection of sources of demand, such as, **Sales Order**, **Maintenance Sales Order**, and so on, you consider to be confirmed demand. All other sources of demand are automatically considered unconfirmed demand. The part of the component forecast pegged to confirmed end-item demand is confirmed forecast.
- Based on **First Periods**
You can define the first few *forecast periods* as confirmed forecast. For example, you can define that all demand forecast for the first 4 weeks is considered confirmed forecast, and all demand forecast for the longer-term future is considered unconfirmed forecast.

These approaches are further explained in the following sections.

Confirmed forecast based on order type

If the distinction between confirmed and unconfirmed forecast is based on order type, the customer must determine which part of the *forecast* is considered confirmed forecast. The customer can specify which types of orders are confirmed forecast in the **Propagate as Confirmed Demand (cpvmi0101m000)** session. The *independent demand* and *dependent demand* originating from these order types are considered confirmed forecast. For an example calculation, refer to the Help of the Base Confirmed Forecast on field.

Then, the customer can pass this information on to the supplier as additional information in the messages that communicate the forecast from customer to supplier.

Note:

- The customer can ignore the order types and proceed as if all of the forecast is confirmed forecast, or proceed as if none of the forecast is confirmed forecast.
- The customer can manually modify the values of the confirmed forecast and the unconfirmed forecast before the customer sends the forecast to the supplier.

Confirmed forecast based on first periods

If you base the definition of confirmed forecast on the distinction between the demand for the near future and demand for the far future, use one of the following methods:

- In the forecast message the customer sends to the supplier, the customer indicates which forecast is confirmed forecast and which forecast is unconfirmed forecast.
- The number of periods in which the forecast quantities are considered to be confirmed forecast is defined in the *terms and conditions agreement*. The customer does not send any additional information to the supplier.

Note: The *terms and conditions agreement* can also specify that all forecast is considered confirmed forecast.

How to set up confirmed forecast (customer side)

This topic contains instructions to set up functionality for *confirmed forecast* and *unconfirmed forecast* for the customer in a *vendor managed inventory (VMI)* situation.

For an overview of the various options, refer to *Confirmed forecast and unconfirmed forecast*.

Basic setup

To enable the use of confirmed and unconfirmed forecast, first set up the relevant *terms and conditions agreement*; for instructions on how to do this, refer to *Setting up terms and conditions*.

All the fields and check boxes mentioned in this topic are located in the **Planning Terms and Conditions (tctrm1135m000)** session, unless otherwise specified.

To specify that your supplier plans the supply, select the **Supply Planning by Supplier** check box.

To make a distinction between confirmed forecast and unconfirmed forecast, select the **Use Confirmed Forecast** check box.

You can use two methods to set up confirmed forecast:

- Based on **Order Type**.
- Based on **First Periods**.

To set up confirmed forecast based on order type

To set up confirmed forecast based on order type, use the following settings:

Field	Value
Use Confirmed Forecast	Yes (check box selected)

Field	Value
Specify Confirmed Forecast by	Message
Base Confirmed Forecast on	Confirmed End Item Demand

In the **Propagate as Confirmed Demand (cpvmi0101m000)** session, specify which types of orders are considered to result in confirmed forecast.

Note: To ignore the order types and proceed as if all of the forecast is confirmed forecast, set the **Base Confirmed Forecast on** field to **All Forecast**. To proceed as if none of the forecast is confirmed forecast, set the **Base Confirmed Forecast on** field to **None**.

To set up confirmed forecast based on first periods

You can communicate for each period whether the forecast in that period is confirmed forecast within the message. In this situation, the supplier does not need to know the terms and conditions agreement. To achieve this, use the following settings:

Field	Value
Use Confirmed Forecast	Yes (check box selected)
Specify Confirmed Forecast by	Message
Base Confirmed Forecast on	First Periods
Number of Periods	The number of periods in a demand forecast message that must be marked as confirmed forecast.

To define the number of periods in which the forecast quantities are considered to be confirmed demand in the *terms and conditions agreement*, which has been negotiated with the supplier, use the following settings:

Field	Value
Use Confirmed Forecast	Yes (check box selected)
Specify Confirmed Forecast by	Terms and Conditions
Interpret Confirmed Forecast	First Periods
Number of Periods	The number of periods in a demand forecast message interpreted as confirmed forecast.

Note: To specify that all forecast is considered confirmed forecast, set the **Interpret Confirmed Forecast** field to **All Forecast**.

How to set up confirmed forecast (supplier side)

This topic contains instructions to set up functionality for *confirmed forecast* and *unconfirmed forecast* for the supplier in a *vendor managed inventory (VMI)* situation.

For an overview of the various options, refer to *Confirmed forecast and unconfirmed forecast*.

Basic setup

To enable the use of confirmed and unconfirmed forecast, first set up the relevant *terms and conditions agreement*. For instructions on how to do this, refer to *Setting up terms and conditions*.

All the fields and check boxes mentioned in this topic are located in the **Planning Terms and Conditions (tctrm1135m000)** session, unless otherwise specified.

To specify that you plan the supply for your customer, select the **Responsible for Supply Planning** check box.

If the customer makes a distinction between confirmed forecast and unconfirmed forecast, select the **Use Confirmed Forecast** check box.

Your customer can use two methods to communicate the confirmed forecast:

- In the forecast messages, by using an indicator for confirmed forecast or specifying a quantity of confirmed forecast.
- In the terms and conditions agreement, by specifying a fixed number of periods in which the forecast is interpreted as confirmed forecast.

Confirmed forecast sent in forecast message

If your customer sends the confirmed forecast in the forecast message, use the following settings:

Field	Value
Use Confirmed Forecast	Yes (check box selected)
Specify Confirmed Forecast by	Message

Confirmed forecast based on terms and conditions

To define the number of periods in which the forecast quantities are considered to be confirmed demand in the *terms and conditions agreement*, use the following settings:

Field	Value
Use Confirmed Forecast	Yes (check box selected)
Specify Confirmed Forecast by	Terms and Conditions
Interpret Confirmed Forecast	First Periods
Number of Periods	The number of periods in a demand forecast message interpreted as confirmed forecast.

Note: To specify that all forecast is considered confirmed forecast, set the **Interpret Confirmed Forecast** field to **All Forecast**.

The use of the confirmed forecast

The confirmed forecast messages can serve two purposes:

- Purely informational
- As basis for the planning performed by the supplier.

You can use the confirmed forecast to calculate the *confirmed supply* that you communicate with your customer. If you do not calculate a confirmed supply, you can use the confirmed forecast to plan the supply and to optionally determine the *replenishment plan* as well.

To base the confirmed supply on confirmed forecast

To base the confirmed supply on confirmed forecast, use the following settings:

- Select the **Confirm Supply** check box.
- Set the **Confirmed Supply Based On** field to **Confirmed Forecast**.

To plan or replenish based on confirmed forecast

The following fields determine how you plan and replenish the supply:

- The **Planning Based On** field.
- The **Replenishment Based On** field.

The allowed values of these fields depend on the settings of many other fields. For more information on these fields, refer to the Help of the Planning Based On field and the Replenishment Based On field.

To plan the supply based on confirmed forecast, set the **Planning Based On** field to **Confirmed Forecast**.

To replenish the item based on confirmed forecast, set the **Planning Based On** field and **Replenishment Based On** field to **Confirmed Forecast**.

Forecast frozen zones

This topic describes how to prevent undesirable changes in the forecast for the short-term future.

Prevention of short-term changes in the forecast

In a *vendor managed inventory (VMI)* situation, if a supplier plans the supply for the customer, the supplier relies on the forecast received from the customer. If the customer changes the forecast for the near future, the supplier can become unable to adjust the plan in time.

The following types of problem can occur:

- If the customer sends a new *revision* of the forecast, in which the forecast is suddenly increased, it is possible that the supplier cannot adapt the production level in time, because the supplier's lead times are too long.
- If the customer suddenly decreases the forecast, it is possible that the supplier is left with a high inventory of unused components and subassemblies.

To prevent these problems, customer and supplier can agree on a time period in which the customer is not permitted to increase or decrease the forecast; you define this time period in a *terms and conditions agreement*.

Note: LN does not strictly enforce these limits. You can manually override the restrictions.

To set up frozen zones

The frozen zone is defined in the **Frozen Zone -** field and the **Frozen Zone +** field in the **Planning Terms and Conditions (tctrm1135m000)** session. The supplier and customer must both define these fields.

The **Frozen Zone -** field restricts the customer's freedom to decrease a forecast.

The **Frozen Zone +** field restricts the customer's freedom to increase a forecast.

Both parameters are defined as a number of calendar days from the current date.

Example

The supplier wants to be informed about decreasing demand at least 14 days in advance. The supplier wants to be informed about increasing demand at least 21 calendar days in advance.

To achieve this restriction, the supplier and the customer must set the **Frozen Zone -** field to 14, and the **Frozen Zone +** field to 21.

For detailed calculation examples, refer to Forecast frozen zone calculation.

To use the frozen zone restrictions

Customer side

When you approve the forecast, LN checks the frozen zone by comparing the forecast to the previously sent *revision*. If the forecast has been increased in the *frozen zone+*, or decreased in the *frozen zone-*, the system asks whether you want to approve the revision.

To determine what LN must do if a forecast was changed in the frozen zone, use the **Approve Forecast changes in Frozen Zone** check box in the **Approve Forecast to Supplier (cpvmi0202m000)** session.

If you approve a forecast that violates the frozen-zone restrictions, the supplier might refuse to approve your forecast.

Supplier side

When you accept the forecast received from your customer, LN checks the frozen zone by comparing the received forecast to the previously received *revision*. If the forecast has been increased in the *frozen zone+*, or decreased in the *frozen zone-*, the system asks whether you want to approve the revision.

Note: To determine the last day of the frozen zone, LN uses the date on which you received the forecast as a reference.

To determine what LN must do if a forecast was changed in the frozen zone, use the **Accept Forecast changes in Frozen Zone** check box in the **Accept Forecast from Customer (cpvmi0206m000)** session.

Forecast frozen zone calculation

This topic describes how LN checks whether changes to the *forecast* occur inside the *frozen zone-* or the *frozen zone+*, compared to the previously sent *revision*.

For a general overview of the frozen-zones functionality, refer to Forecast frozen zones.

Calculation details

The details of the calculation of the frozen zones are as follows:

- LN retrieves the frozen zones from the **Frozen Zone +** field and the **Frozen Zone -** field in the **Planning Terms and Conditions (tctrm1135m000)** session.

To select the relevant version of the *terms and conditions agreement*, LN takes the start date of the first period after the current date as the effective date.

- On the customer side, to obtain the end of the frozen zone plus, LN adds the number of days from the **Frozen Zone +** field to the current date. In the same way, LN calculates the frozen zone minus by using the value of the **Frozen Zone -** field. On the supplier side, LN performs a similar calculation, but LN uses the receipt date of the forecast instead of the current date.

LN does not calculate this date against any specific calendar; all calendar days are counted.

- LN checks the forecast against the forecast in the previously sent revision. If no earlier revision is present, LN presumes the previous forecast zero (0).
- LN adds the forecast before the current date to the first period after the current date.
Similarly, for the previously sent revision, LN adds the forecast before the date that revision was sent to the first period after the date sent.
- If the current forecast and preceding revision of the forecast have the same number of periods, and the start dates of these periods are the same, LN performs the frozen-zone check separately for each period. Otherwise, LN uses the sum of the forecasts of all periods within the horizon and only checks the totals.
- If the forecast increases in the *frozen zone+*, compared to the previous revision, or if these values decrease in the *frozen zone-*, the system concludes that the frozen-zone restrictions have been violated.

These checks are always initiated from the sessions where you approve or accept a forecast. LN can respond in various ways to a failed frozen-zone check. For more information, refer to [To use the frozen zone restrictions](#) on page 249.

Example

In the following example, the *frozen zone+* and the *frozen zone-* are 20 days.

Period	Period Start Date	Forecast Revision 1	Current Forecast
1	April 2	15	15
2	April 9	20	20
3	April 16	20	25
4	April 23	20	15
5	April 30	20	20
6	May 7	25	25
7	May 14	25	50
8	May 21	25	20

Forecast revision 1 sent	April 10	Period 2
Current date	April 13	Period 2
Horizon	May 3	Period 5

The current date falls in period 2 and the horizon falls in period 5; therefore, LN checks periods 3, 4, and 5.

LN adds the forecast of periods 1 and 2 to period 3, because the date sent of revision 1 and the current date are in period 2.

For forecast revision 1, the forecast for period 3 becomes 55 (15+20+20). For the current forecast, the forecast for period 3 becomes 60. That increase is not permitted in the frozen zone plus.

Suppose the customer adjusts the current forecast of period 3 from 60 to 55, and tries again. Now, period 3 passes the test, but period 4 shows a decrease from 20 to 15, and the frozen-zone-minus check fails.

Period 5 is accepted.

Period 6 is not checked, because that period is beyond the frozen-zone horizon.

Example

In following example, the *frozen zone+* and the *frozen zone-* are 20 days.

Period	Period Start Date	Forecast Revision 1	Current Forecast
1	April 2	15	
2	April 9	20	
3	April 16	20	5
4	April 23	20	15

Period	Period Start Date	Forecast Revision 1	Current Forecast
5	April 30	20	20
6	May 7	25	25
7	May 14	25	60
8	May 21	25	30

Forecast revision 1 sent	April 10	Period 2
Current date	April 19	Period 3
Horizon	May 9	Period 6

The current date falls in period 3; therefore, LN checks periods 4, 5, and 6.

For forecast revision 1, LN adds the forecast of periods 1 and 2 to period 3, because the date sent of revision 1 is in period 2. However, period 3 does not need to be checked.

For the current forecast, LN adds the forecast of period 3 to period 4, because the current date is in period 3.

For the current forecast, the forecast for period 4 becomes 20 (5+15). This value equals the forecast of period 4 in forecast revision 1. Therefore, period 3 does not need to be checked.

Period 5 and 6 are also accepted.

Planning methods

Planning methods (VMI)

This topic describes the options for a *VMI supplier* to plan the supply for a customer.

This topic is especially useful for the supplier in a *vendor managed inventory (VMI)* situation; some of the information also applies to the customer.

Available methods

To specify the planning method, use the Planning Based On field on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

The following table describes the available settings.

Planning Based On	Description	Further information
Total Forecast	The Order Planning module plans the supply based on the total <i>forecast</i> , received in messages from the customer.	VMI planning based on forecast
Confirmed Forecast	Similar to Total Forecast , but the Order Planning module only takes the <i>confirmed part of the forecast</i> into account.	VMI planning based on forecast
Confirmed Supply	You determine a <i>confirmed supply</i> that you communicate to your customer. You can base the confirmed supply on the total forecast or the confirmed forecast, and optionally adjust the confirmed supply manually. LN plans the supply based on the confirmed-supply data.	VMI planning based on confirmed supply
Inventory Level	LN plans the supply based on the agreed <i>minimum inventory levels</i> .	VMI planning based on inventory levels
Manual	No planning takes place.	

Note: The value of the Replenishment Based On field determines which values of the **Planning Based On** field are available. For details on the possible combinations of the **Planning Based On** field and **Replenishment Based On** field, refer to Replenishment methods (VMI).

VMI planning based on confirmed supply

This topic describes how a *VMI supplier* can plan the supply for a customer based on confirmed supply.

For an introduction to the various planning methods, refer to Planning methods (VMI).

General planning procedure

If the VMI planning is based on confirmed supply, the general planning procedure is as follows:

- 1 The customer sends the supplier a *forecast* for the items for which the supplier handles the supply planning.
- 2 Based on the forecast, the supplier generates the planned supply for these items in the form of *planned orders*.
These planned orders are based on either the total forecast or on the *confirmed part of the forecast*.
- 3 If necessary, the supplier can move or adjust the planned orders to create a feasible plan.
- 4 The supplier converts this planned supply and any existing supply orders to *confirmed supply*.
- 5 After optional modification, the supplier communicates the confirmed supply to the customer.
- 6 The supplier uses the values of the confirmed supply to generate *planned orders*.

Note:

You can skip the steps 1 through 4 and manually define the confirmed supply.

In step 3 and step 5, the planner can adjust the planned supply.

Parameter setting

To specify this planning method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Responsible for Supply Planning	= Yes
Forecast received from Customer	= Yes
Confirm Supply	= Yes
Confirmed Supply Based On	= Total Forecast Or Confirmed Forecast
Replenishment Based On	= Confirmed Supply, Inventory Level, Or Manual
Planning Based On	= Confirmed Supply

Note: If you select the **Confirm Supply** check box, the Planning Based On field is set to the value **Confirmed Supply** and cannot be modified.

VMI planning based on forecast

This topic describes how a *VMI supplier* can plan the supply for a customer based on the *forecast* received from the customer.

For an introduction to the various planning methods, refer to Planning methods (VMI).

General planning procedure

If the VMI planning is based on forecast, the general planning procedure is as follows:

- Your customer sends you a *forecast*.
- LN uses the values of the forecast to generate *planned orders* to fill the customer warehouse. Most of these planned orders are *planned distribution orders*. In case of *direct delivery*, LN generates *planned purchase orders*.

The planned orders are based on either the total forecast or on the *confirmed part of the forecast*.

Note:

In this procedure, you do not determine a *confirmed supply*.

For more information, refer to Confirmed forecast and unconfirmed forecast.

Parameter setting

To specify this planning method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Forecast received from Customer	= Yes
Confirm Supply	= No
Replenishment Based On	= Total Forecast, Confirmed Forecast, Inventory Level, Or Manual
Planning Based On	= Total Forecast Or Confirmed Forecast

Note: The replenishment quantity can never exceed the planned quantity; therefore, if the **Replenishment Based On** field is **Total Forecast**, you cannot set the **Planning Based On** field to **Confirmed Forecast**.

For more information, refer to Replenishment methods (VMI)

VMI planning based on inventory levels

This topic describes how a *VMI supplier* can plan the supply for a customer based on the agreed *minimum inventory level*.

For an introduction to the various planning methods, refer to Planning methods (VMI).

General planning procedure

If the VMI planning is based on the agreed *minimum inventory level*, you do not send your customer *confirmed-supply messages*. The planning and the replenishment process are entirely based on the *inventory levels* at the customer's warehouse. If the inventory level drops below the effective minimum inventory level, the supplier supplies the customer. Optionally, you can also take a maximum inventory level into account.

Specification of the inventory level

You can use the following methods to determine the inventory level:

- A fixed level specified in the item data.
- A fixed level agreed between the supplier and customer.
- A time-phased level, agreed between the supplier and customer.
- A time-phased level, based on a forecast that the customer sends to the supplier.

For further details, refer to To specify the minimum and maximum inventory.

Parameter setting

To specify this planning method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Responsible for Supply Planning	= Yes
---------------------------------	-------

Forecast received from Customer	= Yes Or No
Use Min-Max Inventory Levels	= Minimum Levels, Maximum Levels, Or Minimum and Maximum Levels
Confirm Supply	= No
Replenishment Based On	= Inventory Level
Planning Based On	= Inventory Level

Note: If you set the **Replenishment Based On** field to **Inventory Level**, LN also sets the **Planning Based On** field to the fixed value of **Inventory Level**.

Replenishment Methods

Replenishment methods (VMI)

This topic describes how a *VMI supplier* can replenish inventory at a customer. The replenishment plan is usually agreed between the supplier and the customer.

Planning methods and replenishment methods

For the purpose of this description, the terms planning and replenishment are defined as follows:

- **Planning**
Planning is the process of generating *planned orders* based on the requirements of the customer, intended to replenish the warehouse at the customer. This process drives the generation of *planned production orders*, *planned purchase orders*, and *planned distribution orders* used to build up inventory in the supplying warehouse from which the supplier supplies the customer.
- **Replenishment**
Replenishment is the process of transferring *planned distribution orders* to the *execution level* to start the actual delivery of items to the warehouse at the customer's. In case of *direct delivery*, you do not use a planned distribution order but a *planned purchase order*.

If you select the same method for the planning and the replenishment, the replenishment closely follows the planning; all planned orders are transferred to the *execution level* and executed without further delay.

Important: If you use different methods for the planning and the replenishment, some *planned orders* are not immediately transferred and executed. You can use that setting to build stock at your location as determined by the planning method, but ship the items later, as determined by the replenishment method.

Available methods

To specify the replenishment method, use the Replenishment Based On field on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

The following table describes the available settings.

Replenishment Based On	Description	Further information
Total Forecast	LN bases the replenishment on the total <i>forecast</i> , received in messages from the customer.	
Confirmed Forecast	Similar to Total Forecast , but LN only takes the <i>confirmed part of the forecast</i> into account.	
Confirmed Supply	You determine a <i>confirmed supply</i> that you communicate to your customer. You can base the confirmed supply on the total forecast or the confirmed forecast, and optionally adjust the confirmed supply manually. LN bases replenishment on the confirmed-supply data.	VMI planning based on confirmed supply
Inventory Level	LN bases the replenishment on the agreed <i>minimum inventory levels</i> .	Replenishment based on minimum inventory
Manual	LN does not transfer any planned order. You make deliveries manually, independently from any planned order. When a subsequent planning run takes the actual deliveries into account, the existing planned orders are not generated again.	To specify the minimum and maximum inventory

Possible combinations of planning method and replenishment method

To specify this planning method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Note: You must enter the **Replenishment Based On** field before you enter the **Planning Based On** field.

The following table displays all permitted combinations of planning method and replenishment method:

		Replenishment Based On				
		Total Fore- cast	Confirmed Fore- cast	Confirmed Sup- ply	Inventory Lev- el	Manu- al
Plan- ning Based On	Total Forecast	A	B	-	D	E
	Confirmed Fore- cast	-	A	-	D	E
	Confirmed Supply	-	-	A / C	D	E
	Inventory Level	-	-	-	A / D	-
	Manual	-	-	-	-	F

Legend:

A	= The Planning Based On field has the same value as the Replenishment Based On field. The replenishment closely follows the planning. All planned orders are transferred to the <i>execution level</i> and executed without further delay.
B	= Planning on total forecast, replenishment on confirmed forecast
C	= VMI planning and replenishment based on confirmed supply. For more information, refer to VMI planning based on confirmed supply.
D	= The execution of the planned orders is delayed until the last moment. For more information, refer to Replenishment based on minimum inventory.
E	= Manual replenishment
F	= No planning at all
-	= Combination not permitted

Replenishment method different from planning method

If you use different methods for the planning and the replenishment, the *planned orders* are divided in two groups:

- Order Release = **To be released**
LN permits you to immediately transfer these planned orders to the *execution level*.
- Order Release = **Not to be released**
Planned orders not immediately required for replenishment. LN prevents you from transferring these planned orders to the execution level. If the situation changes, a later planning run can replace these planned orders by planned orders set to **To be released**.

In urgent cases, you can manually change the **Order Release** field from **Not to be released** to **To be released**.

To view the value of the **Order Release** field for a planned item, use the **Planned Orders (cprp1100m000)** session.

Planning on total forecast, replenishment on confirmed forecast

This topic describes how a *VMI supplier* can plan the supply for a customer based on the total forecast received from the customer, and replenish the customer based on *confirmed forecast*.

To build up sufficient inventory for an uninterrupted service and at the same time supply no more than necessary, the supplier can base its planning process on the total *forecast* and base the replenishment on *confirmed forecast*

If the supplier uses this strategy, the *planned orders* that fill the *unconfirmed* part of the forecast are not immediately transferred and executed.

For a detailed description of the difference between total forecast and confirmed forecast, refer to Confirmed forecast and unconfirmed forecast.

Parameter setting

To specify this planning method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Responsible for Supply Planning	=	Yes
Forecast received from Customer	=	Yes
Confirm Supply	=	No
Replenishment Based On	=	Confirmed Forecast
Planning Based On	=	Total Forecast

The *planned orders* that fill the *unconfirmed* part of the forecast are not immediately transferred and executed. For more information, refer to [Replenishment method different from planning method](#) on page 258.

Replenishment based on minimum inventory

To make sure the inventory level at the customer is sufficient at any time, a *VMI supplier* can replenish the customer based on the *minimum inventory level* at the customer's location. You can use this replenishment method in combination with various planning methods.

Parameter setting

To specify this replenishment method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Responsible for Supply Planning	=	Yes
Forecast received from Customer	=	Yes Or No
Use Min-Max Inventory Levels	=	Minimum Levels Or Minimum and Maximum Levels
Replenishment Based On	=	Inventory Level
Planning Based On	=	Total Forecast, Confirmed Forecast, Confirmed Supply, Or Inventory Level

For further details, refer to To specify the minimum and maximum inventory.

If the **Planning Based On** field and the **Replenishment Based On** field both have the value **Inventory Level**, the replenishment closely follows the planning. All planned orders are transferred to the *execution level* and executed without further delay. For more information, refer to VMI planning based on inventory levels.

If the **Planning Based On** field and the **Replenishment Based On** field have different values, some of the planned orders are not transferred to the *execution level*. For more information, refer to [Replenishment method different from planning method](#) on page 258.

Manual replenishment

If you handle the replenishment manually, you enter the supply orders when the inventory at the customer location is physically replenished. LN does not need to generate these orders. This topic describes how to set up LN for this situation.

If the supplier's representative determines which items will be replenished when and in which quantity, you must select the manual replenishment method.

Parameter setting

To specify this replenishment method, define an appropriate *terms and conditions agreement* on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab.

Use the following settings:

Responsible for Supply Planning	=	Yes
Replenishment Based On	=	Manual
Planning Based On	=	(Any value is permitted)

If the **Replenishment Based On** field is **Manual**, LN can still generate *planned orders*, but these planned orders are not transferred to the *execution level*. These planned orders only serve to generate the *dependent demand* and create inventory of the item at the supplier's location. For more information, refer to [Replenishment method different from planning method](#) on page 258.

To turn off all planning functionality for an item during the effective period of a *terms and conditions line*, set the **Planning Based On** field and the **Replenishment Based On** field both to **Manual**.

Minimum and Maximum Inventory

To work with minimum and maximum inventory

This topic describes how a supplier in a *vendor managed inventory (VMI)* setup can perform supply planning and replenishment based on the minimum and maximum inventory level that the customer should have in inventory.

Relevant parameters

The following fields on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab, determine how this method is applied.

- Use Min-Max Inventory Levels
- Min-Max Specification
- Time-phased Inventory Levels
- Inventory Unit
- Minimum Inventory Level
- Maximum Inventory Level

Minimum levels, maximum levels, or both

To use this method to plan the supply to the customer, set the **Use Min-Max Inventory Levels** field to **Minimum Levels, Maximum Levels, Or Minimum and Maximum Levels**.

If you set the **Use Min-Max Inventory Levels** field to **Maximum Levels**, you must use another method to plan the supply.

If the *terms and conditions agreement* specify a maximum level, the customer limits the *forecast* for each *forecast period* to this maximum level. If the inventory at the customer exceeds the maximum inventory level, LN generates a *signal* for the customer and the *VMI supplier*.

Methods to specify inventory levels

You can define the required inventory levels in the following ways:

- Fixed inventory levels
- Time-phased inventory levels
- Inventory levels based on the number of days of supply

For more information, refer to *To specify the minimum and maximum inventory*.

Planning based on number of days supply

This topic describes how a supplier in a *vendor managed inventory (VMI)* setup can perform supply planning based on the number of days of supply that the customer should have in inventory.

Goal of the planning method

This planning method is a variant of the *To work with minimum and maximum inventory* planning method.

The goal of this planning method is to keep the customer's inventory at a sufficient level to safeguard the customer's continuing operation in case of temporary supply problems. The inventory level must be such, that, if all supply would suddenly stop, the customer would have sufficient inventory to continue operations for a particular number of days before the customer runs out of stock.

Meanwhile, this method reduces the risk that inventory becomes obsolete, because the delivered quantity will no more than needed.

Relevant parameters

The following fields on the **Terms and Conditions Line (tctrm1620m000)** session's **Planning** tab determine how this method is applied.

- Use Min-Max Inventory Levels
- Min-Max Specification
- Min-Max Number of Days
- Minimum Factor
- Maximum Factor

To use the planning method described in this topic, set the **Min-Max Specification** field to **Number of Days**.

Note: If you set the **Min-Max Specification** field to **Number of Days**, you cannot select the Confirm Supply check box or the Use Confirmed Supply check box anymore and the Replenishment Based On field is automatically set to the fixed value of **Inventory Level**.

Minimum levels, maximum levels, or both

To use this method to plan the supply to the customer, set the **Use Min-Max Inventory Levels** field to **Minimum Levels, Maximum Levels, or Minimum and Maximum Levels**.

Minimum factor and maximum factor

In this planning method, you can determine the lower and upper bounds between which the inventory can fluctuate.

Example

Suppose, you have set the following parameters:

- **Min-Max Number of Days** = 10 days
- **Use Min-Max Inventory Levels** = **Minimum and Maximum Levels**
- **Minimum Factor** = 0.9
- **Maximum Factor** = 1.5

Then, this planning method aims to keep the customer's inventory sufficient for at least 9 days ($0.9 * 10$) and at most 15 days ($1.5 * 10$)

Calculation

When the customer approves a forecast *revision*, the maximum and minimum levels are frozen for that revision.

For each *forecast period*, LN performs the following steps:

- 1 LN adds the value of the **Min-Max Number of Days** field to the start of the concerned forecast period. This addition produces the horizon date.

- 2 LN calculates the sum of the *forecast* for every forecast period between the start of the designated forecast period and the horizon date.

If the horizon date falls in the middle of a forecast period, LN uses a proportional part of the forecast of that forecast period.

Only the forecast periods' start dates are recorded. A forecast period's finish date is derived from the next forecast period's start date. Therefore, the length of the ultimate forecast period is unspecified. For the purpose of this calculation, LN assumes that the length of the ultimate forecast period equals the preceding forecast period.

- 3 The effective minimum inventory for the relevant forecast period is the calculated sum of the forecast values multiplied by the value of the **Minimum Factor**.
- 4 The effective maximum inventory for the relevant forecast period is the sum of the forecast values multiplied by the value of the **Maximum Factor**.

Note: The number of days is expressed in calendar days, not in working days. The calculation does not take a working calendar into account. Therefore, the procedure also calculates minimum and maximum inventory levels for not workable days.

Example

In this example, the following values apply.

Parameter	Value
Min-Max Number of Days	10 days
Use Min-Max Inventory Levels	Minimum and Maximum Levels
Minimum Factor	0.9
Maximum Factor	1.5

The following table shows the *forecast* in each forecast period.

Forecast period	Period start date	Forecast demand
22	April 2	150
23	April 9	49
24	April 16	84
25	April 23	35

The following table shows how the calculation of the minimum and maximum inventory proceeds.

Period	10-day period		Sum of forecast	Inventory levels	
	First day	Last day		Minimum Inventory	Maximum Inventory
22	April 2	April 11	$150 + (3/7) * 49 = 171$	153.9 (=171 * 0.9)	256.5 (=171 * 1.5)
23	April 9	April 18	$49 + (3/7) * 84 = 85$	76.5	127.5

Period	10-day period		Sum of forecast	Inventory levels	
	First day	Last day		Minimum Inventory	Maximum Inventory
24	April 16	April 25	$84 + (3/7) * 35 = 99$	89.1	148.5

To specify the minimum and maximum inventory

This topic describes how a supplier in a *vendor managed inventory (VMI)* setup can perform supply planning based on the minimum and maximum inventory level that the customer should have in inventory.

Safety stock and maximum inventory level of an item

If a valid *terms and conditions agreement* prescribes a minimum inventory, LN ignores the item's *safety stock* set up for the customer's warehouse.

If a valid terms and conditions agreement prescribes a maximum inventory, LN ignores the item's *maximum inventory level* set up for the customer's warehouse.

If the terms and definitions do not prescribe a minimum inventory on a particular date, LN applies the item's safety stock. Similarly, if the terms and definitions do not prescribe a maximum inventory on a particular date, LN applies the item's maximum inventory level.

You can define an item's safety stock and maximum inventory level in the **Items - Ordering (tcibd2100m000)** session or the **Item Data by Warehouse (whwmd2510m000)** session.

Methods to specify inventory levels

You can define the required inventory levels in the following ways:

- Fixed inventory levels
- Time-phased inventory levels
- Inventory levels based on the number of days of supply

You can find the fields mentioned in the following sections in the **Terms and Conditions Line (tctrm1620m000)** session, on the **Planning** tab.

To define fixed inventory levels

To define fixed levels for the minimum inventory or the maximum inventory, complete the following steps:

- 1 Set the **Min-Max Specification** field to **By Quantity**.
- 2 Enter the required inventory levels in the **Minimum Inventory Level** field and the **Maximum Inventory Level** field.

To define time-phased inventory levels

To define time-phased levels for the minimum inventory or the maximum inventory, complete the following steps:

- 1 Set the **Min-Max Specification** field to **By Quantity**.
- 2 Enter the required inventory levels in the **Planning Inventory Levels (tctrm1136m000)** session.

To start the **Planning Inventory Levels (tctrm1136m000)** session, in the **Terms and Conditions Line (tctrm1620m000)** session, open the **Planning** tab, and then, on the *appropriate* menu, click **Inventory Levels**.

To define number of days supply

For instructions how to specify the minimum and maximum inventory levels by defining the number of days supply, refer to Planning based on number of days supply.

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