Sterling Commerce

An IBM Company

Warehouse Management System Concepts

Release 7.5 SP1

May 2006

Copyright Notice

Contents

Preface

1   Introduction

2   Inventory Control

3   Inbound Planning

8 Value-Added Services

9 Outbound Planning

10   Outbound Execution

Preface

This manual provides general concepts and explanations about different features within the Yantra 7x suite of applications.

Intended Audience

This manual is intended to provide a high-level overview to all users of the Yantra 7x suite of applications.

Structure

This manual contains the following sections:

Chapter 1, "Introduction"

This chapter introduces the Yantra 7x WMS and describes how it can be used to resolve different business challenges.

Chapter 2, "Inventory Control"

This chapter describes how Yantra 7x WMS provides comprehensive functionality to track, monitor, and maintain inventory in a warehouse.

Chapter 3, "Inbound Planning"

This chapter explains how Yantra 7x WMS provides warehouses the visibility to inbound inventory upon creation of purchase order or transfer order.

Chapter 4, "Inbound Execution"

This chapter explains how Yantra 7x WMS provides warehouses the ability to complete their inbound execution process, which comprises of the receipt and putaway of inventory.

Chapter 5, "Quality Control"

This chapter describes how Yantra 7x WMS helps address the quality control (QC) procedures that may be achieved at the receiving warehouse.

Chapter 6, "Task Management"

This chapter describes how Yantra 7x WMS allows task requests to be placed for all processes that occur in a warehouse. Yantra 7x WMS also provides interleaving and avoidance of deadheading.

Chapter 7, "Reverse Logistics"

This chapter explains how Yantra 7x WMS provides comprehensive capabilities to manage the "end-to-end" process of reverse logistics for all types of companies including retailers, manufacturers and third party reverse logistics providers.

Chapter 8, "Value-Added Services"

This chapter describes how Yantra 7x WMS provides the functionality to perform value-added services (VAS) at a warehouse to meet customer demands in Yantra 7x.

Chapter 9, "Outbound Planning"

This chapter describes how Yantra 7x WMS provides a complete solution to all outbound planning activities for the productivity of a warehouse which is measured in terms of its efficiency, inventory accuracy and order turnaround time.

Chapter 10, "Outbound Execution"

This chapter describes how Yantra 7x WMS provides complete control over the shipment execution process at a granular level. A shipment can be monitored, managed and processed through consoles.

Yantra 7x Documentation

For more information about the Yantra® 7x components, see the following manuals in the Yantra® 7x documentation set:

- *Yantra® 7x Release Notes*
- *Yantra® 7x Installation Guide*
- *Yantra® 7x Upgrade Guide*
- *Yantra® 7x Performance Management Guide*
- *Yantra® 7x High Availability Guide*
- *Yantra® 7x System Management Guide*
- *Yantra® 7x Localization Guide*
- *Yantra® 7x Customization Guide*
- *Yantra® 7x Integration Guide*
- *Yantra® 7x Product Concepts*
- *Yantra® 7x Warehouse Management System Concepts Guide*
- *Yantra® 7x Platform Configuration Guide*
- *Yantra® 7x Distributed Order Management Configuration Guide*
- *Yantra® 7x Supply Collaboration Configuration Guide*
- *Yantra® 7x Inventory Synchronization Configuration Guide*
- *Yantra® 7x Product Management Configuration Guide*
- *Yantra® 7x Logistics Management Configuration Guide*
- *Yantra® 7x Reverse Logistics Configuration Guide*
- *Yantra® 7x Warehouse Management System Configuration Guide*
- *Yantra® 7x Platform User Guide*
- *Yantra® 7x Distributed Order Management User Guide*
- *Yantra® 7x Supply Collaboration User Guide*
- *Yantra® 7x Inventory Synchronization User Guide*
- *Yantra® 7x Logistics Management User Guide*
- *Yantra® 7x Reverse Logistics User Guide*

- *Yantra® 7x Warehouse Management System User Guide*

- *Yantra® 7x Mobile Application User Guide*

- *Yantra® 7x Analytics Guide*

- *Yantra® 7x Javadocs*

- *Yantra® 7x Glossary*

- *Yantra® 7x Carrier Server Guide*

- *Yantra® 7x Application Server Installation Guide* (for optional component)

Conventions

The following conventions may be used in this manual:

Convention	Meaning
`...`	An ellipsis represents information that has been omitted.
< >	Angle brackets indicate user-supplied input.
`mono-spaced text`	Mono-spaced text indicates a file name, an API name, or a code example.
/ or \	Slashes and backslashes are file separators for Windows, UNIX and LINUX operating systems. The file separator for the Windows operating system is "\" and the file separator for Unix and Linux systems is "/". The Unix convention is used unless otherwise mentioned.

1

Introduction

1.1 Business Challenges

Increasing customer demands and an ever-changing environment drives businesses today. Some factors that influence business processes are:

- mergers and acquisitions

- introduction of new products or product lines

- servicing new customers

- addition of new business channels

- consolidation of facilities

- business outsourcing

As businesses strive to keep pace with the changing environment, it is also imperative to keep operating costs low.

Businesses must manage inventory in a variety of facilities that may include Plant Warehouses, Regional Business Centers, Stock Rooms, Stores, andFlow-through Distribution Centers.

Due to the disparate nature of these facilities, each facility employs different operational processes. This leads to complexity in operations and lack of centralized visibility, increased infrastructure costs, and quality issues.

Due to the variety of facilities in a complex warehousing environment, disparate systems are used throughout the network. This results in higher infrastructure and ownership cost at each facility. Integrating systems across disparate facilities becomes complex, and implementing business process changes is a challenge. Figure 1–1 illustrates a typical network built on disparate warehousing systems.

Figure 1–1   Network of Disparate Warehousing Systems
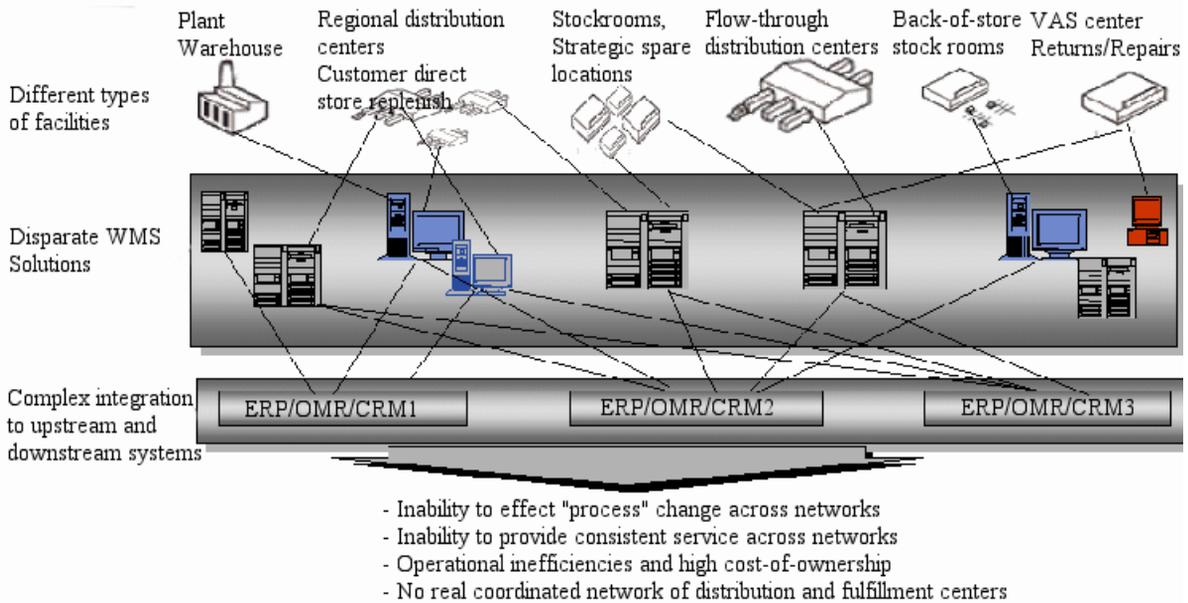
Offering complete visibility and automating operations in a complex warehouse environment requires thorough knowledge of business processes combined with state-of-the-art technology. An efficient warehouse management system helps businesses:

- Achieve increased productivity levels.

- Improve inventory accuracy.

- Adhere to varying compliance requirements.

- Manage logistics effectively.

1.2 Yantra 7x Warehouse Management System

Yantra 7x Warehouse Management System is a web-based application that provides a comprehensive end-to-end solution helping businesses manage inventory and processes throughout their network, through a synchronized warehouse management system.

Yantra 7x Warehouse Management System is built using a robust architectural framework that provides enough flexibility to adapt to changing business needs. Figure 1–2 illustrates various modules of Yantra 7x WMS.

Figure 1–2   Yantra 7x WMS Advanced Functionality
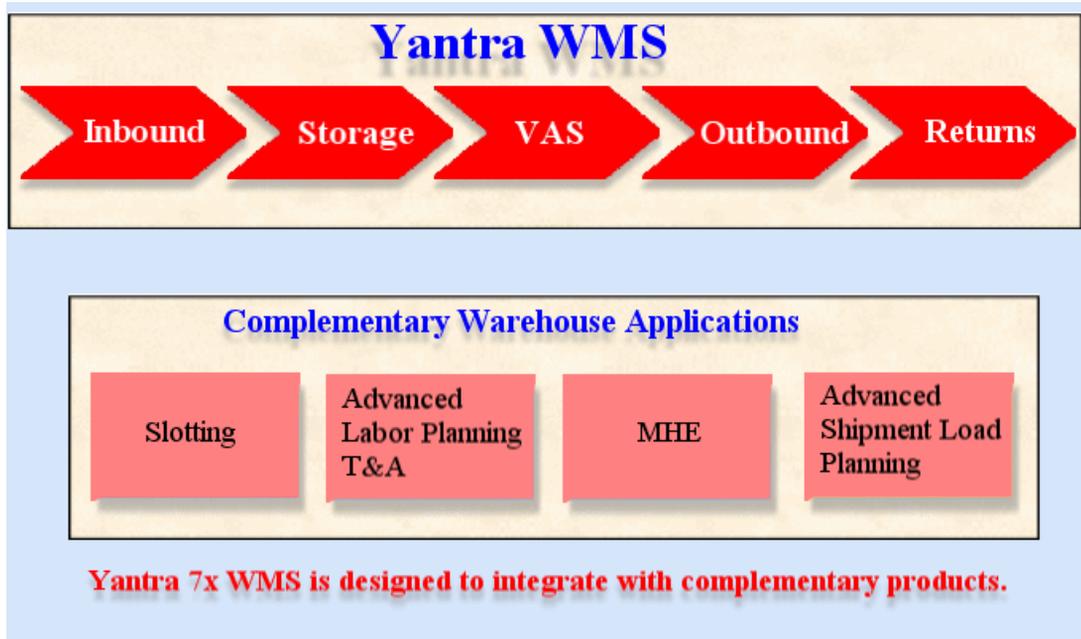
The functionality performed by each of these modules are as follows:

- **Inventory Control**
  - Granular tracking of Inventory at a location, case or pallet based on item attributes including Lot#, Serial#
  - Putaway of inventory
  - Retrieval of inventory
  - Replenishment of locations
  - Count

- Management, visibility and monitoring of inventory in a warehouse
- **Inbound**
  - Comprehensive visibility to inbound shipments
  - Pre-receiving
  - Shipment, PO, Blind receiving
  - Putaway of receipts
- Quality Control
  - Quality profiling
  - Quality Inspection
  - Comprehensive visibility to quality process
- Task Management
  - Task generation
  - Task assignment
  - Task interleaving
  - Management, visibility, monitoring of tasks in a warehouse
- Reverse Logistics
  - Returns pre-receiving
  - Returns receiving
  - Serial number capture
  - Disposition of inventory
  - Putaway of return receipts
- Value-Added Services
  - Kitting and Dekitting for static or dynamic BOM
  - Customer compliance such as special ticketing, security tagging
  - Support for Build to Stock, Build to Customer or Build to Order
  - Retrieval of component inventory
  - Putaway of kit inventory

- Management, visibility, monitoring of all VAS activities
- Cross Dock
  - Opportunistic as well as planned cross dock
  - Product diversion to Cross dock staging or directly to outbound shipping lanes
  - Cross dock based on Items and for units, cases or pallets
- Outbound
  - Order release consolidation
  - Shipment routing
  - Grouping of shipments and wave planning
  - Constraint based real time optimization to suggest the best picking strategy
  - Containerization for optimizing packing and freight cost
  - Replenishment for demand
  - Picking
  - Packing
  - Outbound VAS
  - LTL/TL Shipments, BOL
  - Manifesting for Parcel Shipments
  - Trailer loading
  - Management, visibility, monitoring of all outbound activities

1.3 Key Capabilities

Yantra 7x WMS is designed, as a comprehensive solution to take care of all functionality needs in a warehouse environment. It also provides the flexibility to model and implement customized needs. Rich in features and functionality, the modules of Yantra 7x WMS provide the following key capabilities:

- Networked Solution
- Multi-Enterprise Management

- Process Centric

- Comprehensive Product Management

- Visibility

- Vendor Performance

- Customer Compliance

- Radio Frequency Identification Enabled

- Optimized Operation

1.3.1 Networked Solution

Yantra 7x WMS is unique in its architecture - it is the only warehouse management system that is designed as a networked solution. It is built on a service oriented, component-based architecture. Figure 1–3 depicts network solution design of Yantra 7x Warehouse Management System.

Figure 1–3   Yantra 7x WMS Component-Based Architecture
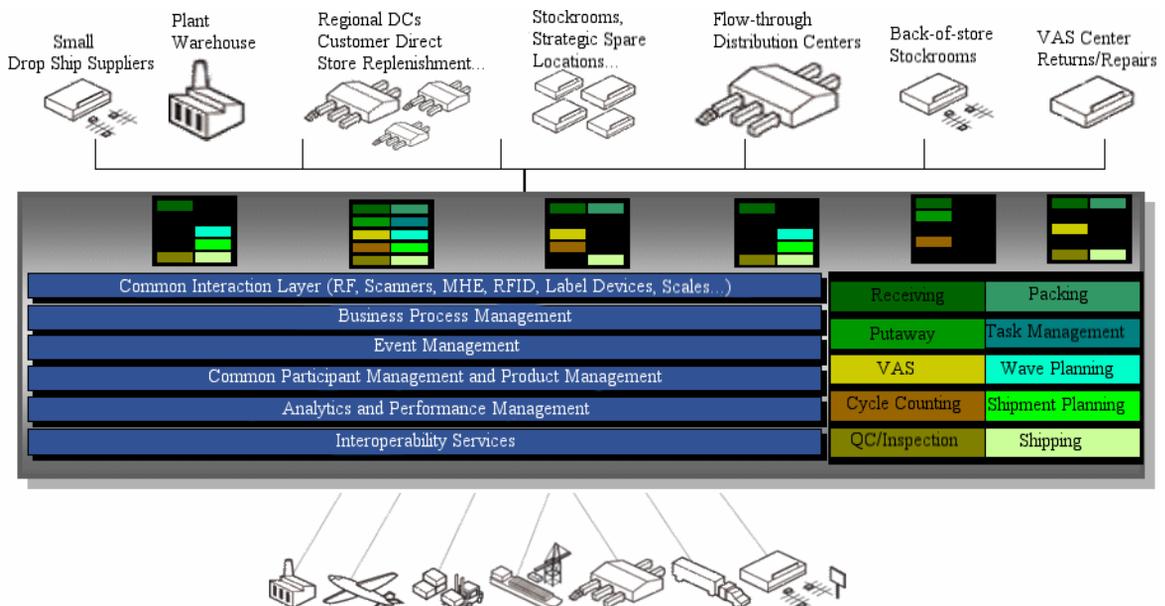
Yantra 7x WMS provides low-cost of ownership, higher flexibility, and consistent customer service.

1.3.2 Multi-Enterprise Management

A business or business channel can be modeled as an enterprise in Yantra 7x WMS allowing warehouses handle inventory and processes uniquely for diverse enterprises. Yantra 7x WMS can be easily configured to suit business needs and processes for each enterprise.

Yantra 7x WMS provides for network-wide control through a common catalog of services for multiple enterprises within a warehouse ensuring optimal use of labor and assets despite process diversity.

1.3.3 Process Centric

Yantra 7x WMS is process centric, making it highly configurable. Traditional warehouse solutions are services intensive, and provide data-centric configurations.

The process management model in Yantra 7x WMS is optimized for supply chain operations, and integrates monitoring with event and task management. The process flow definition in Yantra 7x WMS is highly extensible, which allows each implementation to incorporate custom logic necessary for keeping your competitive advantage.

Yantra 7x WMS is adaptive to changes in facility and operations. It provides the ability to configure business processes for disparate facilities, such as Plant Warehouses, Regional Distribution Centers, Stock Rooms, and VAS Centers. Yantra 7x WMS facilitates incorporating changes in the network through virtual deployment of ship-nodes, inheritance of rules, and configuration deployment tools.

The net-native framework makes Yantra 7x WMS highly interoperable, and provides for internationalization and localization. This networked solution is highly scalable, and provides a central control point to introduce new business processes, and technologies.

Yantra 7x WMS thus provides flexibility for business demands, reduced implementation time, and rapid response to customer demands.

1.3.4 Comprehensive Product Management

Yantra 7x WMS is built to track and control inventory of products/items across an organizational network. Various parameters and granular definitions bundled into Yantra 7x WMS ensure consistent handling and measurement of inventory, and accurate handling of variable goods.

Yantra 7x WMS provides the capability to improve inventory accuracy by tracking user-defined product attributes such as Lot Number, Serial Number.

1.3.5 Visibility

Yantra 7x WMS enables effective management of warehouse operations by providing wall-to-wall visibility of all critical information about inventory, orders, shipments, or containers. A warehouse operation will benefit from visibility into this process information. By leveraging Yantra 7x WMS's Alert Framework, the process is proactively monitored for potential problems thereby enhancing productivity levels.

Yantra 7x WMS provides web-based consoles to monitor, control, and direct day-to-day operations. Consoles like Task Management, Wave Planning, Pick Planning, Event Management enable automation of daily operations.

Yantra 7x WMS raises proactive and reactive events, and raises appropriate exceptions through the Event Management layer.

1.3.6 Vendor Performance

Yantra 7x WMS provides features that include ASN matching, inventory disposition, and product classifications that allows for vendor rating and performance. Other features support tracking a carrier's capabilities for delivery compliance. Similarly, other partner's performance to agreement can be captured and reported.

1.3.7 Customer Compliance

Yantra 7x WMS offers features to support unique customer compliance requirements, such as labeling, value-added services, performance management, and business process design.

1.3.8 Radio Frequency Identification Enabled

Yantra 7x WMS is designed to allow for adoption of Radio Frequency Identification (RFID) technology, allowing definition of new RFID driven business processes in your warehouse operations.

1.3.9 Optimized Operation

Yantra 7x WMS offers real-time, constraint based optimization of processes in warehouse reducing labor cost and improving productivity.

1.4 Yantra 7x Warehouse Management System Ecosystem

Yantra 7x WMS is a fully integrated warehouse management system offering advanced functionality to efficiently manage the most complex warehouse ecosystems. Yantra 7x WMS offers completely adaptable solutions that can be tailored to fit most environments. Figure 1–4 illustrates the Yantra 7x WMS Ecosystem.

Figure 1–4   Yantra 7x WMS Ecosystem

2
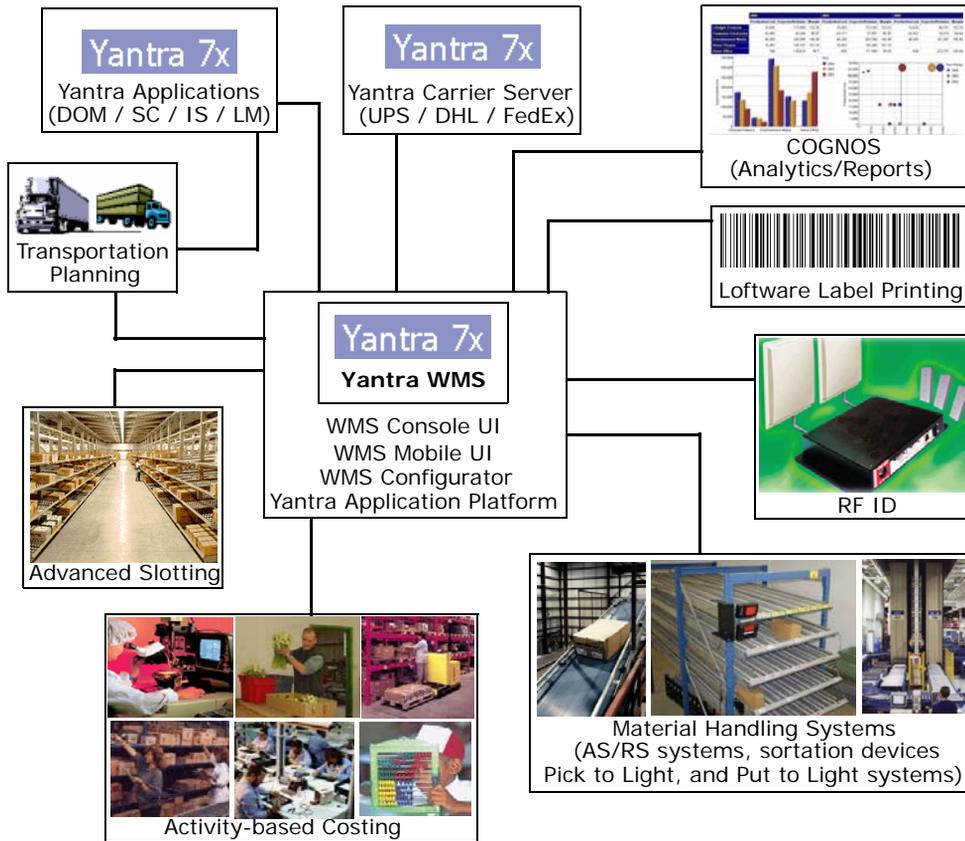
Inventory Control

Yantra 7x WMS provides comprehensive functionality to track, monitor, and maintain inventory in a warehouse. Inventory visibility is provided through consoles that provide granular information, as necessary.

The features provided by Yantra 7x WMS for Inventory Control are:

* Real time and accurate inventory information

* Inventory tracking at a granular level

* Comprehensive inventory audit trail

* Comprehensive control of movements within the warehouse to synchronize the movement of products and real time information

* Complete management of transfer between warehouses

* Industry standard count procedures

2.1 Inventory Tracking

Yantra 7x WMS enables inventory tracking based on item attributes at a warehouse and location level. Yantra 7x WMS provides various inventory tracking attributes, such as:

* Enterprise in a warehouse

* Product Class

* Inventory Status

* Unit of Measure

* Container

* First In First Out

- Receipt
- Country Of Origin
- Tag Number
- Serial Number
- Segment
- Expiration Date

2.1.1 Enterprise in a warehouse

Yantra 7x WMS is designed to support either single or multiple businesses or business channels in a warehouse. If any of those businesses require segregation of inventory, they are referred to as enterprises in Yantra 7x WMS. Figure 2–1 illustrates multiple business channels in a warehouse.

Yantra 7x WMS also tracks inventory of every SKU at a location level within the warehouse. A single location in Yantra 7x WMS can hold multiple SKUs. Each location number is a combination of the zone, aisle, level, bay, and position parameters. Various location types at which inventory is tracked include:

- Pallet storage (Singe deep, Double deep)
- Case storage
- Loose or Active Storage
- Floor level
- Carousels
- Flow racks
- Bins

Figure 2–1   Multiple Enterprises in a Warehouse

Warehouse	Enterprise	SKU	SKU Description	Quantity
MA03	ABCCORP	SKU1	Batteries	20
	ABCCORP	SKU2	Phones	30
	EYZCORP	SKU1	Hard Disk	15
	EYZCORP	SKU3	13" ... sions	22

Location	License Plate	Quantity
01010101		10
01010102		8
50010201		4

Location	License Plate	Quantity
75010201	3873872	8
75020101	3775878	4
75030102	5676376	3

Industry examples include:

- A manufacturer sets up a separate business channel for "Direct to Consumer." Same warehouse can be used to manage fulfillment for "Direct to Consumer" or "To Retail" channel.

- A 3PL logistics provider can service multiple clients from the same facility, which enables utilization of all resources in a warehouse across multiple enterprises.

Yantra 7x WMS has the ability to track inventory for an enterprise down to a location level. This eliminates the need to have a zone configured for an enterprise. Similarly, an organization may have multiple business channels in the same warehouse.

The resulting advantages are better asset utilization, resource utilization and complete support for multi-tenancy.

Also, transfer of inventory between business channels in a warehouse does not require any physical movement of product.

2.1.2 Product Class

In a traditional warehouse environment, inventory of finished goods is represented as a good quality product. Inventory that fails quality control requires representation as bad inventory. For example, shoes with a different shade than what is specified. In best practice situations, these must be maintained and transacted with the understanding that it is bad inventory.

Yantra 7x WMS maintains bad inventory under a different product class. This maintains item integrity and simplifies handling from a global inventory perspective. This also provides immediate visibility of SKUs at their product class level. An example of product class attribute is described in Table 2–1.

Table 2–1   Product Class Attribute

Location	Node	Item ID	Product Class	On Hand Quantity
13C01	Memphis Distribution Center	ITEM1	FQ	100
		ITEM1	FD	20

Industry examples include:

- Finished goods marked as First Quality
- Finished goods marked as Factory Defects
- Finished goods marked as Irregulars

The advantages provided include a single item ID across multiple product classes.

2.1.3 Inventory Status

Yantra 7x WMS is capable of tracking the inventory status of an item. The inventory status of an item influences the inventory as being allocatable or non-allocatable. An example of inventory status attribute is described in Table 2–2.

Yantra 7x WMS allows specification of inventory status at a zone level.

For example, consider a warehouse that prefers only products to storage as eligible for order reservation. After receipt, the product is expected to be in 'Awaiting Putaway' status, and after move into storage the product is expected to be in 'Good Inventory' status.

In Yantra 7x WMS, the receiving dock location or zone would be configured as 'Awaiting Putaway' inventory status and the storage zone(s) would be configured as "Good Inventory" inventory status. At the inventory status level, you would indicate that 'Awaiting Putaway' is non-allocatable and 'Good Inventory' as allocatable.

Table 2–2   Inventory Status Attribute

Location	SKU	Inventory Status	Quantity
13C01	SKU1	Quality Control	100
13C02	SKU1	Good Inventory	20

Industry examples include:

- Good inventory

- Awaiting putaway

- Held under quality control

- Awaiting inspection

- Pending rework

- Scrapped

2.1.4 Unit of Measure

Yantra 7x WMS tracks inventory at the UOM level. A UOM translates to the type of packaging of a SKU.

A SKU has its own basic UOM, called as Inventory UOM in Yantra 7x WMS. For example, the basic UOM for a shoe is EACH. Similarly that of metal sheets is a ROLL, a metal block is in cubic metres, milk in ounces or gallons or liters dependent on the region in the world. These UOMs are unique at a SKU level and define the lowest such measure that an item has. Figure 2–2 depicts UOM for various items.

Figure 2–2   Unit Of Measure (UOM)

Let us expand this concept a further. If you have an item, say milk, then a carton is either a half-gallon or a gallon or 2 gallons. Each of these is sold in supermarkets as individual measures. Yantra 7x WMS Supports this by having multiple Inventory UOMs for a single item. Another well-known example is a battery pack, sold as 4-pack, 6-pack, 12-pack. Needless to say, the beverage industry has made a 6-pack and a case (12-pack) very popular.

From the above discussion, it is apparent that each item has its own unique Inventory UOM, as well as, additional Inventory UOMs. Figure 2–3 depicts UOM for a 6-Pack and 16-Pack batteries.

Figure 2–3   6 Pack and 16 Pack Batteries

Now let us consider inventory being received, procured and ordered. Typically, inventory is also received in multiples of inventory UOMs, for example, case of 4-pack batteries or a pallet of milk cartons. These measures further define alternative methods of addressing an Inventory UOM. They have a direct relationship to the inventory UOM. In Yantra 7x

WMS, these UOMs are called as alternate UOMs. Alternate UOMs are case pack of 20 6-pack batteries, half-pallet of 1 gallon cartons of milk, pallet of air-conditioners. Figure 2–4 depicts case pack UOM.

Figure 2–4   Case Pack

Yantra 7x WMS therefore allows you to transact (receive, purchase, sell, move) inventory at UOM levels that are appropriate for the transaction, further removing the constraint of the way the inventory is stored.

The advantages of tracking inventory and alternate UOMs in inventory are:

- Ideally, in applications that cannot track multiple Inventory UOMs for the same item, a unique SKU is defined for each UOM. If you define separate SKU for each inventory UOM, warehouse would lose visibility for the product. Hence, tracking inventory with the same SKU and different inventory UOM provide correct visibility to the inventory on WMS and it represents the physical inventory.

- Ability to place and source orders at a higher UOM level and have the WMS translate those quantities to appropriate lower Inventory UOMs.

2.1.5 Container

Yantra 7x WMS provides visibility to inventory at a container level. A container in Yantra 7x WMS is a case or a pallet that is tracked by a License Plate Number (LPN) and may contain other cases or inner packs.

The different types of containers are:

Single or Multiple SKU Case with LPN

Yantra 7x WMS tracks a case license plate for multiple quantities of a single stock-keeping unit (SKU). Inventory tracking is maintained at the case with LPN level based on location attributes. This tracking could be disabled in the loose or active pick areas where individual items handled.

Yantra 7x WMS also supports the breaking of a case at any location for partial retrieval or pick. Table 2–3 provides an example of single or multiple SKU case with LPN attribute.

Table 2–3   Single or Multiple SKU Case with LPN Attribute

Location	Case ID	SKU	Quantity
13C01	000091299	SKU1	10
13C02	00092146	SKU1	8
13C02	00092146	SKU2	5

Industry examples include:

- Case of 12 boots with an LPN
- Musical runs for footwear in cases

The advantages include tracking of unique UOM quantities by a case with LPN.

Single SKU case with inner packs

Yantra 7x WMS is also capable of identifying the number of inner packs available in a case. An example of single SKU case attribute is described in Table 2–4. An example of single SKU case with inner pack quantity is described in Table 2–5.

Table 2–4   Single SKU Case

Location	License Plate Number	SKU	Quantity
13C01	0913999	SKU1	100
13C02	0913997	SKU2	100

Table 2–5   Single SKU Case with Inner Pack Quantity

License Plate Number	Inner Pack Quantity
0913999	25
0913997	25

Industry examples include:

- Pens come in packs of 20, which in turn is placed in a larger carton

The advantages include ability to define and understand inner pack quantities.

Single or Multiple SKU Pallet with LPN

Yantra 7x WMS in addition to supporting a single item at case and pallet levels also supports multiple SKUs on a case and pallet with LPN as shown in Figure 2–5. Inventory visibility is provided at the individual SKU in their respective quantities.

Figure 2–5   Single or Multiple SKU Pallet with LPN

Pallet#9848848 in
Location 13-C-02

Containing

SKU1   80 units

SKU2   80 units

SKU3   80 units

Industry examples include:

- Pallet of calculators with an LPN

- Outbound or shipment pallets with LPN

The advantages include the ability to receive, putaway, retrieve and allocate product individually on a pallet with LPN.

Multi-level LPN

Yantra 7x WMS tracks a case level license plate attached to a pallet for multiple SKUs as shown in Figure 2–6.

Figure 2–6   Pallet with Multi-level LPN

Pallet#9848848 in Location 13-C-02

Containing 12 cases of SKU1 with 20 units each. All 12 cases are uniquely identified by a case license plate#

Carton# 1848848 on Pallet 9848848

Containing 12 cases of SKU1
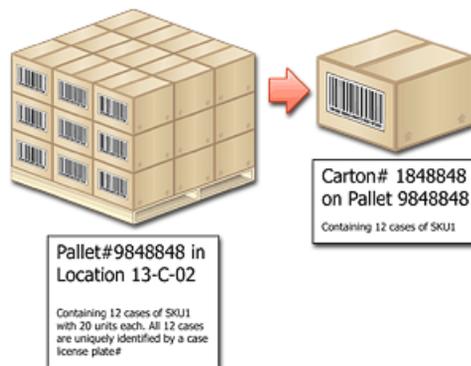
Industry examples include:

Complete outbound shipment with ASN compliance

The advantage include complete inventory tracking and ability to move inventory at both the pallet and case with LPN levels.

Case and Pallet with Unknown Contents

Yantra 7x WMS tracks inventory for a case or pallet with unknown contents by using an LPN as shown in Figure 2–7.

Figure 2–7   Case and Pallet with unknown contents
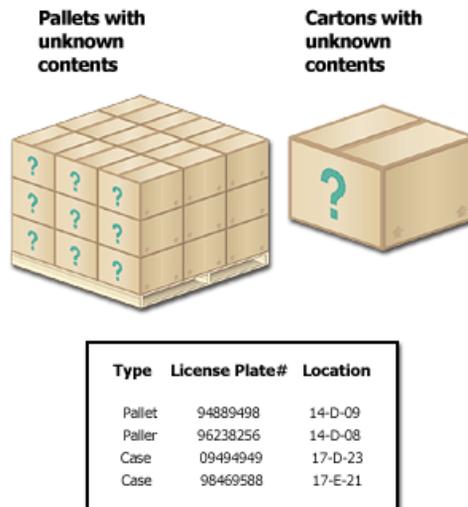
Industry examples include:

- Pre-receipt during returns

- Customers who do not require granular level details for outbound shipments

- Distro operations

- Flow through warehouses (parcel companies)

- Public warehousing

The advantages include:

- A case or pallet with LPN once assigned is re-usable across all processes and uniquely identifies the SKU(s) and quantity associated

- Usage of case or pallet with LPN allows warehouses to store and track inventory that has multiple COO, receipt number, serial number at a location

- A case or pallet with LPN may be reserved partially or completely for a movement or order

- A case or pallet with LPN simplifies the movement to that of scanning of a bar code. For example, a pallet with LPN containing 20 cases, when moved from one location to another, requires only the LPN to be scanned

2.1.6 First In First Out

A warehouse that calculates turnover of inventory requires ensuring that inventory is tracked using the First In First Out (FIFO) methodology. The requirement could be limited to a few items as well. Yantra 7x WMS generates a unique FIFO number upon receipt of such items. Yantra 7x WMS ensures that the oldest inventory is first allocated to orders.

All receipts received within a specified date period are assigned the same FIFO number. An example of FIFO attribute is described in Table 2–6. The example considers the FIFO period as a month.

Table 2–6   FIFO Attribute

Location	SKU	FIFO Number	Receipt Date	Quantity
13C01	SKU1	2003011	11/15/2003	100
13C01	SKU1	2003011	11/18/2003	10
13C01	SKU1	2003011	11/28/2003	50
13C02	SKU1	2003012	12/10/2003	10

Industry examples include:

- Leather based products like wallets that loose color after a period of time

- Electronics like PDA and cameras have newer versions very often

The advantages include:

- Reduced obsolescence

- Ability to distinguish aged product

- Ability to identify velocity or inventory turnaround

2.1.7 Receipt

Yantra 7x WMS identifies each receipt with a unique receipt number. This number is used to track inventory back to the shipment number. An example of receipt number attribute is described in Table 2–7.

Table 2–7   Receipt Number Attribute

Location	SKU	Receipt Number	Quantity
13C01	SKU1	200010101	100
13C02	SKU1	200010101	20

Industry examples include:

- Recall of specific shipments

- Post receipt quality inspections

The advantages include:

- Ability to track inventory by their shipment and/or receipt numbers in storage

- Ability to retrieve from a specific receipt for inspection

- Modify inventory status at a receipt level

Yantra 7x WMS supports multiple receipt numbers at a location only when an inventory is maintained at a case or pallet with LPN level.

2.1.8 Country Of Origin

Yantra 7x WMS tracks the COO of an item being received. COO is determined based on shipment details or purchase order details during receipt or manually entered in inventory adjustments. The values captured may be used for customer compliance. An example of COO attribute is described in Table 2–8.

Table 2–8   COO Attribute

Location	SKU	COO	Quantity
13C01	SKU1	US	100
13C02	SKU1	CH	20

The advantages include:

- Segregate inventory by COO.

- Reduce manual determination of COO information for preparing international shipping documents such as Commercial Invoice.

Yantra 7x WMS supports multiple COO at a location only if inventory is maintained at a case or pallet with LPN level.

2.1.9 Tag Number

Yantra 7x WMS allows for tracking of inventory back to the exact batch it was manufactured through the usage of a tag number.

Examples of tag numbers tracked in inventory are:

Lot Number

Lot number is a unique number allocated to one or more product during manufacture or assembly to enable traceability.

Industry examples include:

- Set of picture tubes received in a warehouse

- Pallet of keyboards on hold

Cut Lot Number

In addition to tracking the lot number, further granularity is achieved to a cut lot level.

Industry example include:

- Wood industry.

Dye Lot Number

In the clothing industry, most yarns require a dye lot number to ensure that all the pieces are the same color.

Industry examples include:

• Wallpaper

• Knitting wool

Coffee Grind Level

To ensure the best flavor in a cup of coffee, coffee needs to be ground well so that the proper amount of soluble material is extracted from the bean.

Industry examples include:

• Expresso machines require extra fine grind

• Coffee press requires coarse grind

Wood Grading

In the timber industry, wood is treated with chemicals that provide color, texture, strength, resistance.

Industry examples include:

• Air dried

• Kiln dried

• Chemically treated

Revision Number

Items that frequently undergo an engineering change are assigned with different revision numbers. Yantra 7x WMS has the ability to record the revision numbers of such item.

Industry examples include:

• Spare parts industry

• Electronics

Yantra 7x WMS allows to define a set of additional identifiers for specific items that needs to be tracked in inventory using the Tag attribute. This enables a warehouse to decide what attributes of an item needs to be tracked in inventory and allows a warehouse to track inventory at a

granular level. An example of user defined attributes applied to an item is described in Table 2–9.

Table 2–9   User Defined Attributes Applied to an Item

		Additional Inventory Tracking Identifiers				
Item ID	Description	Lot Number	Batch Number	Wood Grading	Grind Level	Cut Lot Number
M-23983 8	Men's Shoe					
P-29838	Picture Tube for 27" TV	4345688				
S018488	Motherboard for a Desktop PC	098675				
H-23984 8	Teak Wood			Kiln Dried		2314579
9238-39	Hazelnut Coffee Powder				Coarse	

Yantra 7x WMS allows a warehouse to track additional attributes against these identifiers. For example, a warehouse may track inventory by lot number for certain items. Additional attributes such as manufacturing date, manufacturing plant number can also be tracked against the lot number.

The advantages include:

- Visibility to location level inventory at most granular level.

- Ability to hold inventory based on additional inventory attributes. For example, warehouse may receive request from the manufacturing plant to put a specific lot number on hold.

- Ability to ship inventory of specific inventory attributes. For example, warehouse may receive order to ship an item of specific revision or lot number.

- Ability to specify on an order the requirement of a specific tag. Yantra 7x WMS allocates all tag numbers to an order that does not have a specific tag.

2.1.10 Serial Number

Yantra 7x WMS is capable of tracking serial numbers in inventory at a SKU and its components level as shown in Figure 2–8. Serial number is recorded at the point of receipt, inventory adjustments or during outbound shipments. SKUs that require serial number tracking are uniquely identified in Yantra 7x WMS. Serial number tracking in Yantra 7x WMS is provided at the global supply chain network level.

Figure 2–8   Component Serial Number

Industry examples include:

- Mobile phones
- Telephones
- Automobile parts
- Demagnetized computer tool kit, which includes:

- Nine allen wrenches

- Six piece mini screw driver set

- Five SAE sockets, five metric sockets

The advantage include:

- Track at a serial number level for returns and recalls

- Ability to put specific serial number on hold

- Ability to ship specific serial numbers

2.1.11 Segment

A warehouse often performs specific value-added services before shipping inventory to specific customers.

Some examples of value-added services are:

- applying customer price tickets

- applying security tags

- printing company logo and name on the product

Performing value-added service is labor-intensive. If value-added services are performed subsequent to receiving sales order, then it may result in increased cycle time for fulfilling the order. In order to reduce order fulfillment cycle time, warehouse often perform customer specific value-added services for specific products ahead of receiving the actual outbound order.

Yantra 7x WMS provides the ability to designate inventory that is reserved for a customer through the use of segments. An example of MTC segment attribute is described in Table 2–10.

Table 2—10   Segment Attribute-MTC

Location	SKU	Segment Type	Segment	Quantity
13C01	SKU1 - Black Lather Wallet	MTC - Made to Customer	Cust-Name	100
13C02	SKU1 - Black Leather Wallet			200

In this example, 100 units of inventory in location 13C01 contains inventory that has Cust-Name special tickets. This inventory is allocated only to orders shipped to Cust-Name. Whereas, inventory in location 13C02 does not have any value-added services, and therefore can be allocated to other customers who do not require any value-added services.

A segment may also be used for in the "Made to Order" situation. Some examples of "Made to Order" situation are:

- Customer placing an order for a Desktop PC with certain configurations.

- Ordering shoes with certain parameters or specifications.

Warehouse may receive such "Made to Order" inventory through service providers built outside, or use VAS module to build order specific inventory. Inventory built for specific order may not be picked, packed and shipped on the same day. Therefore, a warehouse may need to stock such inventory subsequent to manufacturing or receiving inventory. Yantra 7x WMS is capable of associating location level inventory to specific order to ensure that inventory is allocated only to that order. An example of MTO segment attribute is described in Table 2—11, which explains that location 13C01 is built for a specific order and will not be allocated to any other orders.

Table 2–11   Segment Attribute-MTO

Location	SKU	Segment Type	Segment	Quantity
13C01	SKU1 - Desktop PC	MTO - Made to Order	Order Number 9012887	100
13C02	SKU1 - Desktop PC			200

2.1.12 Expiration Date

Yantra 7x WMS tracks inventory of items designated as time sensitive items by expiration date, and ensures that expired items are not allocated to any order. An example of expiration date attribute is described in Table 2–12.

Table 2–12   Expiration Date Attribute

Location	SKU	Expiration Date	Quantity
13C01	SKU1	20 Dec 2004	100
	SKU1	25 Dec 2005	30

Industry examples include:

- Canned foods
- Processed foods (Milk, Meat)
- Pharmaceutical

2.2 Inventory Visibility in the Yantra 7x Application Consoles

Yantra 7x WMS enables inventory visibility in the Application Consoles at a very granular level. The level of visibility is based on the level at which inventory is tracked in a warehouse.

Visibility to inventory levels and respective attributes are provided through a console. The combinations of attributes are better illustrated through use cases or examples, which include:

- View inventory across all SKUs at the warehouse level for an enterprise

  The criteria used include Enterprise, Ship Node.

- View defective inventory for a SKU for an enterprise at a warehouse that are in a specific type of LPN

  The criteria used include Enterprise, Ship node, Item ID, Pallet ID, Case ID. In addition to this, if you want to view all items that are on Quality Hold, then use Inventory status as criteria.

- View all inventory built for a specific order, order type

  The criteria used include Enterprise, Ship Node, Segment, and Segment Type

- View all inventory available in a specific zone

  The criteria used include Enterprise, Ship node, and Zone.

- View all inventory for inbound shipment number or PO number

  Criteria used include Enterprise, Ship Node and receipt number corresponding to shipment or purchase order number.

- View all location level inventories that have been frozen for pick

  The criteria used include Enterprise, Ship node, check flag for frozen locations only.

- View all location level inventories that have been frozen due to count variance

  The criteria used include Ship node and check flag for frozen locations only.

- View all inventory that has aged, say 30 days and older, in a warehouse

  The criteria used include Enterprise, Ship node, Inventory age 'greater than or equal to' 30 days.

- View all inventory for a serial number range

The criteria used include Enterprise, Ship Node, Item ID, Serial number 'starts with' option.

- View all inventory for wood that has been kiln dried and has at least 10 pieces in a lot

  The criteria used include Enterprise, Ship node, Tag Attribute - Kiln Dried 'equals' Y and Tag Attribute - Number of pieces 'greater than' 10.

In addition to inventory level attributes, the warehouse manager manages and views location level attributes to list the following:

- Locations that are empty and available across all zones or limited to certain zones.

- Locations that are frozen for picking or putaway.

- Locations that are empty and of high velocity.

- Locations those are empty in a specific area for frozen items or hazardous items.

- Locations that are sharing a staging location.

In addition to the features provided at the console or screen level, the viewing of data is limited to that of users permissions. In a multi-client or multi-enterprise scenario, a user assigned to a specific client can view only that client's inventory. This also holds true for out sourced providers having only access to inventory that they own (Vendor Managed Inventory [VMI]).

2.2.1 Inventory Audit

Yantra 7x WMS audits all inventory transactions that occur in a warehouse. Audits are written in Yantra 7x WMS for each transaction along with appropriate reference values and SKU attributes for tracking purposes. The combination of attributes are better illustrated through the following use cases or examples:

- View all transactions for a SKU for the last 2 days

  Criteria used include ship node, SKU, date and time

- View all transactions for a shipment or order

  Criteria used include ship node, shipment

- View all positive inventory adjustment done due to count errors

  Criteria used include ship node, and task type

- View all transactions performed by a user today

  Criteria used include ship node, user, date and time

- View all transactions for a tag number or serial number

  Criteria used include ship node, enterprise, tag number, serial number

- View all transactions for a LPN

  Criteria used include ship node, case or pallet with LPN

2.3 Inventory Visibility in the Yantra 7x Mobile Application

Yantra 7x WMS provides inventory visibility in the Yantra 7x Mobile Application. Using the mobile application you can inquire into:

- Inventory that exists in a location.

- Items packaged into an inventory container.

- Locating the specific serial number of a serialized item.

- Inventory availability for an item.

- Shipment information for an outbound container.

The attributes are better illustrated through use cases or examples, which include:

- View the entire inventory available in a location.

  The criteria used is Location ID.

- View the contents of an inventory container (Pallet LPN or Case LPN).

  The criteria used is Container Number.

- Determine the location of a misplaced container or serialized item.

  The criteria used is Container Number or Serial Number.

- View the inventory availability for an item in the warehouse.

  The criteria used is Item ID.

- View the shipment information for an outbound container.

  The criteria used is Container SCM.

2.3.1 Inventory Modifications

Yantra 7x WMS allows modification of inventory through console. Inventory modifications in a warehouse are either initiated manually, or as part of cycle count or physical count process. Examples of inventory modifications are as follows:

- Adjusting on hand quantity of a SKU at location level, or on a license plate
- Changing the inventory attribute without changing on hand quantity:
  - Tag number
  - Expiration date, FIFO date
  - COO
  - Product Class
  - Inventory Status

2.4 Sorting Before Putaway

This feature provides the ability to sort inventory based on the location, zone or set of zones where it is to be putaway. The user can then build pallets or cases for the sorted inventory, based on target. This functionality can be used to sort inventory in the warehouse.

2.5 Putaway

Yantra 7x WMS categorizes putaway request as a move from a particular location without necessarily specifying the target location. In situations, where the target location is not specified, Yantra 7x WMS utilizes its putaway algorithms to determine the optimal target location(s).

A putaway request is either created automatically due to a related event that is executed, or manually initiated by a user.

Some examples for automated requests include:

- **Putaway from Dock**—the receiving department requests the inventory department to putaway stock at the dock location, specifying only the receipt and dock-location. For example, the receipt of an item or closure of a receipt for a shipment initiates a putaway request.

- **Putaway from Value-Added Services**—the VAS department requests the inventory department to move stock out of a VAS location. For example, a work order completion creates inventory that requires move to storage locations.

An example for manual move requests include:

- **Putaway after Quality Inspection**—the inspection department requests the inventory department to move inventory that has completed inspection after receipt to the storage locations.

Putaway requests are placed to Yantra 7x WMS task management, which utilizes constraints and preferences configured at the warehouse level to determine the optimal target location(s).

2.5.1 Putaway Algorithm

Yantra 7x WMS putaway algorithm utilizes criteria that include SKU, packaging type, capacity constraints and sorting/sequencing strategy. The algorithm goes through all locations in a warehouse and applies or verifies constraints to arrive at the optimal location. Figure 2–9 illustrates the putaway algorithm. For more information about putaway algorithm, see Figure 2–11, Figure 2–12, Figure 2–13, and Figure 2–14.

Figure 2–9   Putaway Algorithm

- ◆ Locations in Warehouse
  - All locations in the warehouse

- ◆ Allowed Locations
  - Locations in particular zones

- ◆ Storage Constraints
  - Constraints such as do not mix Enterprise/SKU/FIFO

- ◆ Sorting
  - Nearest to Dedicated Locations
  - Best Fit / Least Put away
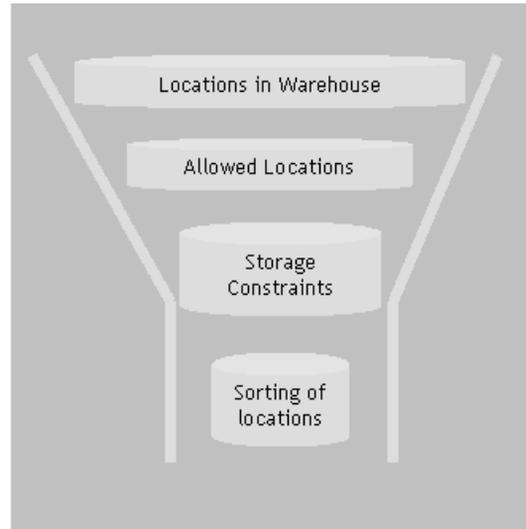
The putaway algorithm is initiated based on events that occur in a warehouse.

The business process configuration and algorithm answers the following questions:

1. When to putaway?

Putaway inventory upon receipt or after inspection or VAS is complete. Another example is, initiation of a putaway request after completing VAS.

2. What to putaway?

Putaway can be initiated for a SKU, case or pallet with LPN. It can also be initiated for Pallets or Cases that do not have contents. Each of these attributes influence the resultant locations.

3. Where and how to putaway?

Constraints for storage, capacity and storage preferences are considered.

Storage Constraints

Storage constraints are specified in a warehouse to match an item or inventory attributes to a location. Yantra 7x WMS ensures that constraints defined are not violated while suggesting putaway locations. Different constraints defined are:

Zone Dedication

A zone in Yantra 7x WMS is a group of locations that have similar attributes. A zone in a warehouse is used to distinguish storage types or types of item stored.

- Ability to designate a zone to an enterprise.

  An example is a 3PL warehouse that has multiple clients. When a zone is dedicated to a specific or set of enterprises, only products belonging to those enterprises is putaway into the zone.

- Ability to restrict a zone for a particular type of SKU or storage types

  An example is a zone for hazardous or high-value items. When a zone is dedicated to a specific type of item, other types of products cannot be putaway into such zones.

Location level Dedications

A specific location can be dedicated to an item. This automatically restricts other items into the same location.

Zone level product mixing or segregation constraints

A warehouse can define additional constraints for each zone so that products with different inventory attributes are not putaway in the same location. These attributes include enterprise, SKU, and receipt number. An example of storage types and constraints are described in Table 2–13.

Table 2–13   Storage Type and Constraints

Type of Storage	Constraints
Bulk Zone—Pallet Racks	Do not mix SKU and do not store products with different FIFO in the same location.

Table 2−13   Storage Type and Constraints

Type of Storage	Constraints
Active/Forward Pick locations	Do not mix Items. However, products with different FIFO/Receipt can be stored in the same location.
Bulk—Case Storage	Match item velocity to location velocity. It is acceptable to mix products in a location, but do not mix products belonging to different enterprises in the same location.

A warehouse that tracks inventory at a case or pallet with LPN could combine enterprises in the same location. This would result in better asset and resource utilization.

Capacity Constraints

A warehouse can define capacity constraint in terms of maximum weight and/or volume that can be putaway to a location. In addition to weight or volume, Yantra 7x WMS allows defining capacity constraints in terms of number of units of a specific UOM. For example, a location may hold four pallets for all items except for some items that are large and can hold only one pallet.

Storage Preferences

In addition to defining constraints at zone or location level, Yantra 7x WMS sets additional preferences specific to inventory type. An example of storage preferences is described in Table 2−14.

Table 2−14   Storage Preferences

What to Putaway	Where to Putaway
All Pallets of Hazardous Materials	Putaway to zone 1. If there are no locations in zone 1, putaway to zone 2.
Camcorders	Putaway to zone 3, which is a lock and key storage zone. If there are no locations in zone 3, then putaway in zone 4.
All damaged products	Putaway to zone 5, which is designated for damaged products.
Refrigerated products	Putaway to Zone 6, which has freezer locations.

A warehouse configuration in Yantra 7x WMS is illustrated in
Figure 2–10.

Figure 2–10   Warehouse Configuration in Yantra 7x WMS
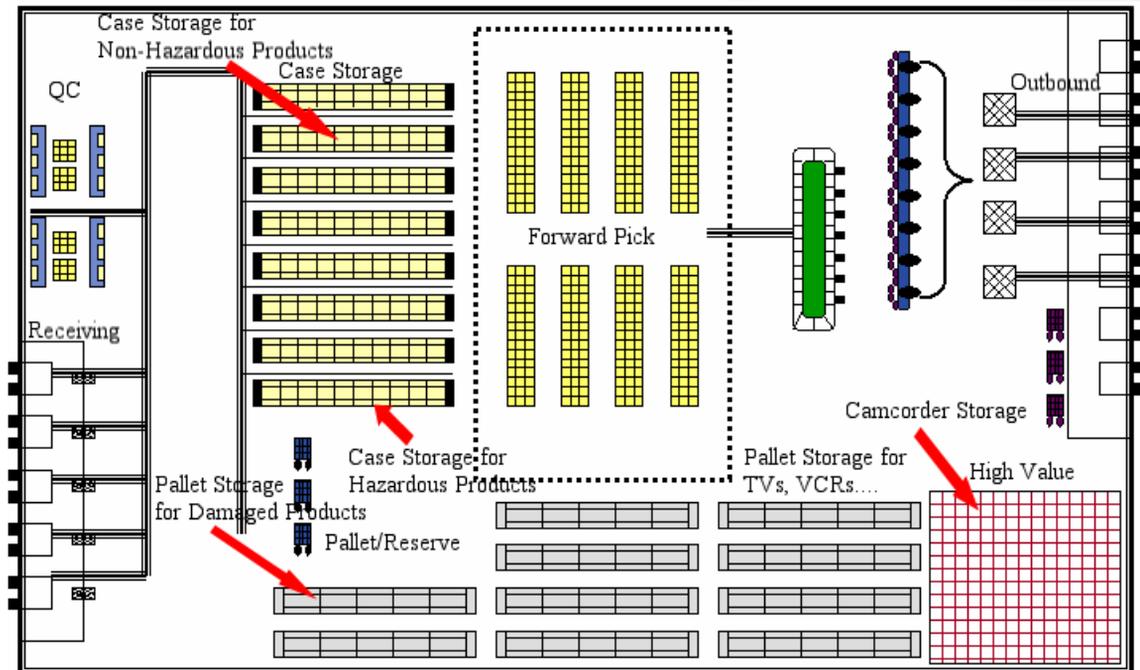
Figure 2—11   Putaway Algorithm
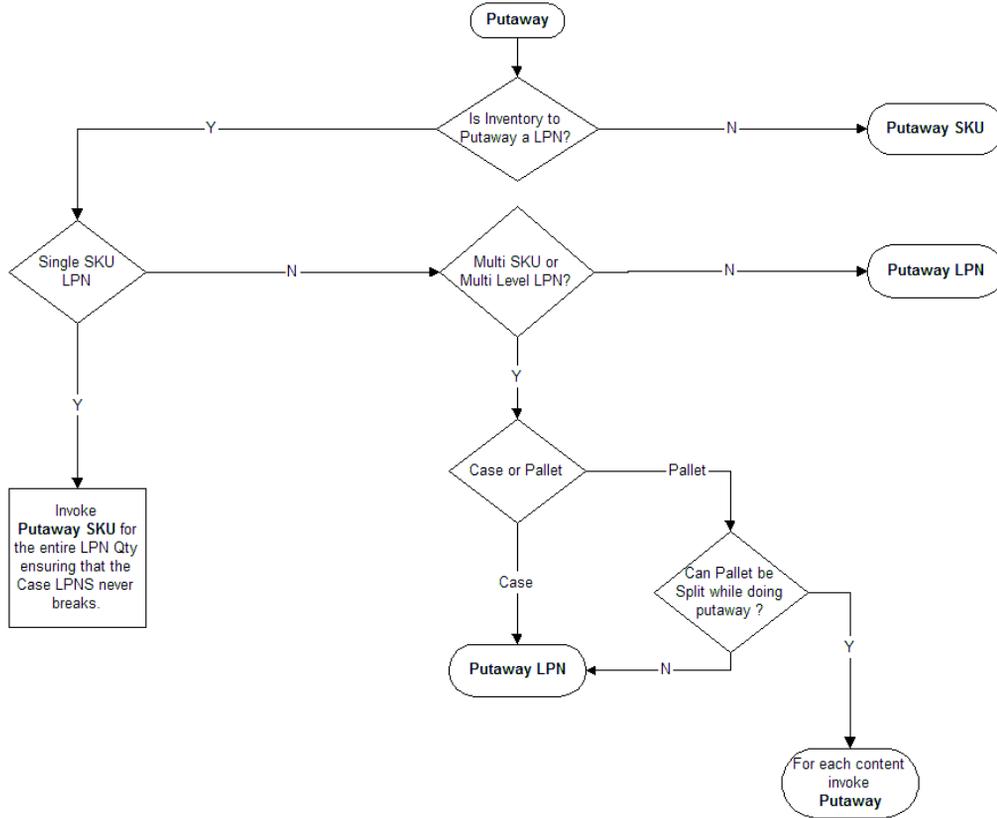
Figure 2–12   Putaway SKU

Figure 2–13   Putaway LPN
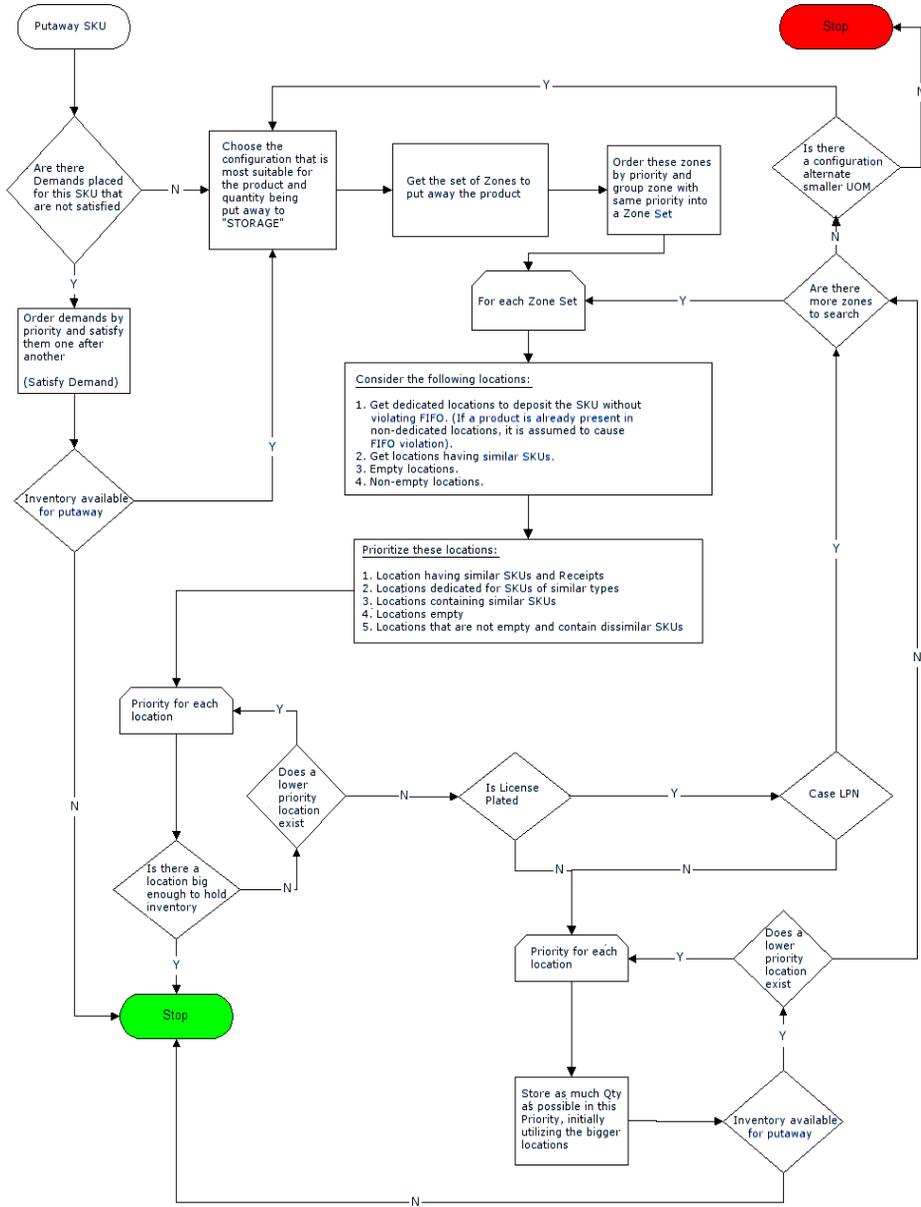
Figure 2–13   Putaway LPN
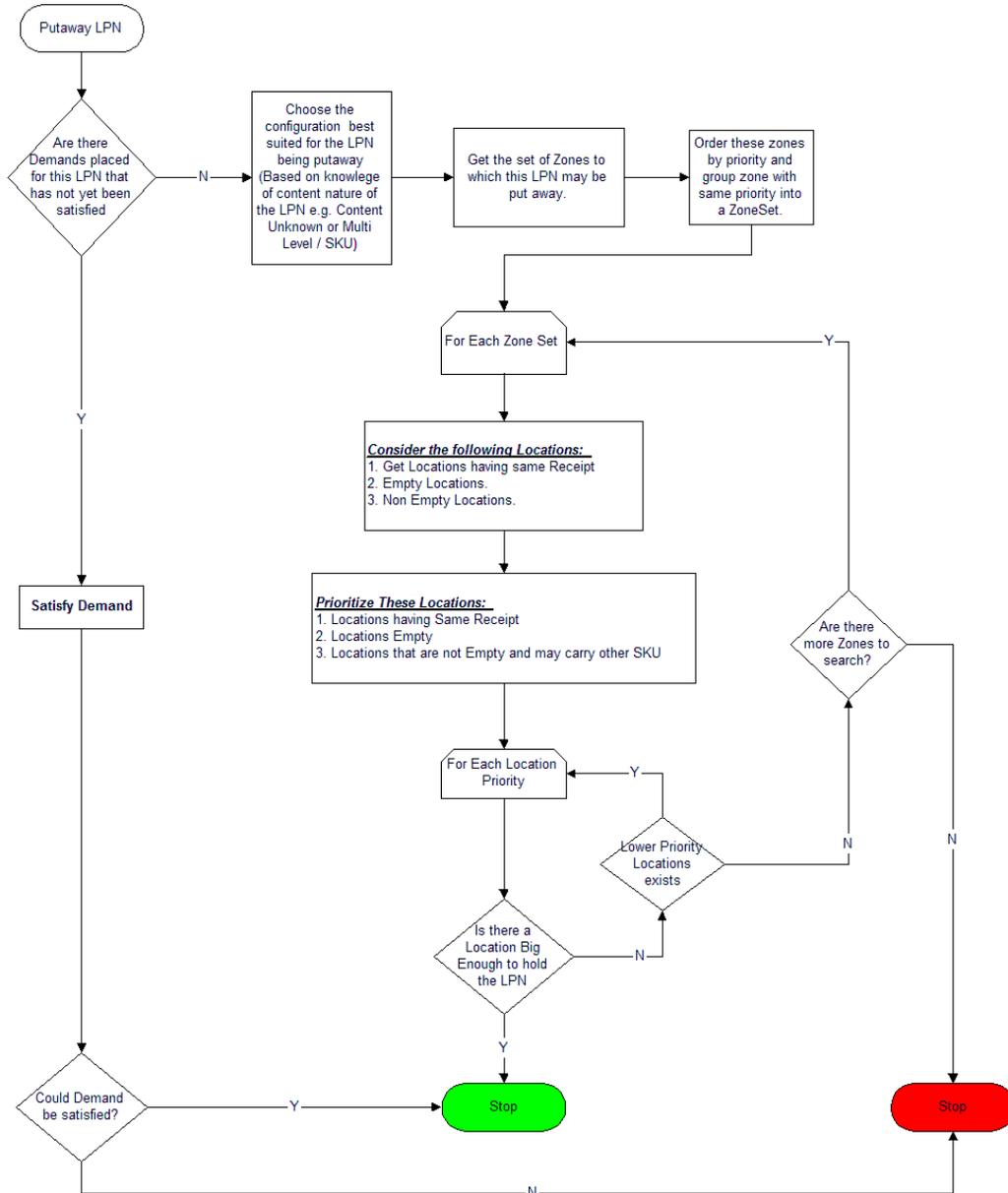
Figure 2–14   Satisfy Demand
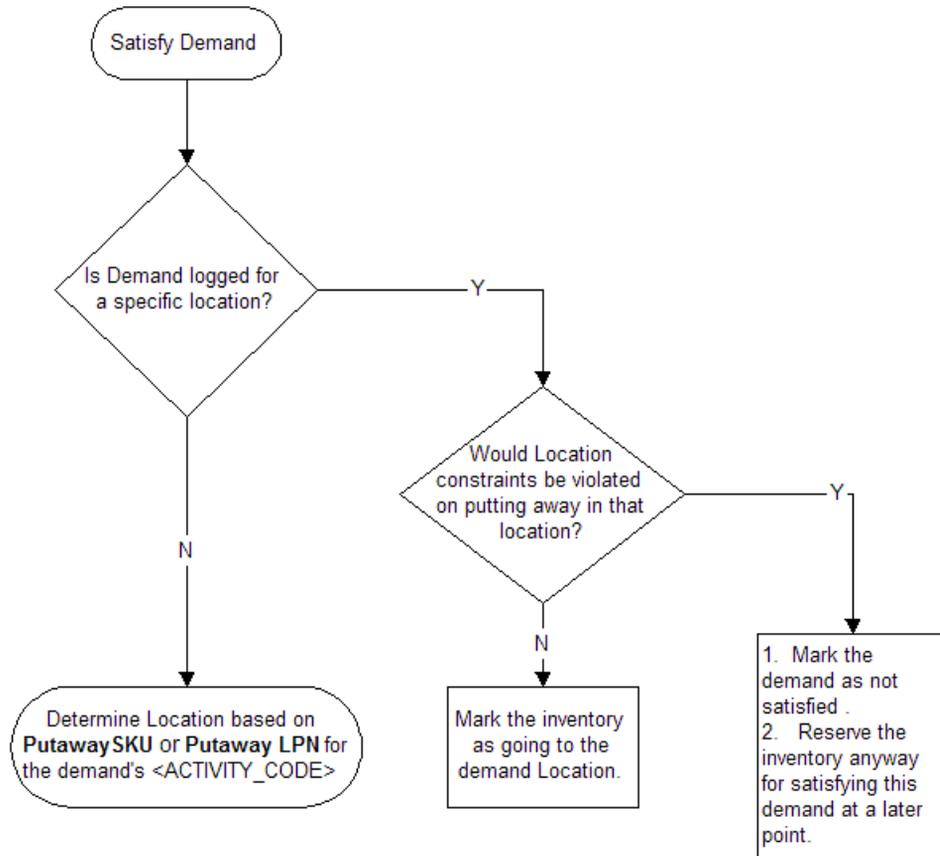
2.5.2 Putaway Execution

Yantra 7x WMS generates appropriate tasks for each putaway request. Yantra 7x WMS Task Management is used to execute these tasks using printed move tickets, Mobile Terminal, or by integrating with Material Handling Equipment (MHE).

Execution of these tasks uses strategies that include:

• **One request at a time**—a user completes the request in one trip or multiple trips.

- **Multiple requests at a time**—a user completes tasks across requests in a single trip for more efficiency purposes. (This is very similar to a batch pick scenario.)

    A putaway request may result in multiple steps being executed. For example, usage of a drop-off location during inbound creates a two-step putaway task. (Dock to drop-off and drop-off to storage.)

    Yantra 7x WMS may be used to control putaway task suggestion by placing constraints based on a user or attributes, such as shipment number or work order number. For more information, see Chapter 6, "Task Management".

2.5.3 Putaway Visibility

Yantra 7x WMS provides complete visibility to the status of putaway requests. The visibility is at a granular level indicating the request and attributes used to initiate the request.

The visibility to putaway requests is provided through console. Users view move requests by status or item, and source and target locations. Yantra 7x WMS also provides an audit trail views. The combination of attributes are illustrated through the following use cases or examples:

- View putaway requests that have exceptions for a receipt number

    The criteria used include department, receipt number

- View open putaway or retrieval requests for a source or target location

    The criteria used include department, status, and source or target location

- View audit trail for putaway requests of an inbound shipment

    The criteria used include department and shipment number. The details page at the request level displays the complete audit trail

Yantra 7x WMS also allows cancellation of entire move request or removal of part of a move request.

2.6 Retrieval

Yantra 7x WMS categorizes a retrieval request as a move request to a particular location without necessarily specifying the source. In situations, where the source location is not specified, Yantra 7x WMS utilizes its retrieval algorithms to determine the optimal source locations.

A request can be specified at an item level with no attributes, even though inventory is tracked at a more granular level.

Some examples for automated requests include:

• **Retrieval for Value-Added Services**—the VAS department requests the inventory department to move stock to a VAS-station. For example, a work order initiates a retrieval request for move of inventory to VAS department.

• **Retrieval for Replenishment**—the picking department requests retrieval of items needed for a picking wave to their respective locations specifying the location and item to be retrieved. For example, a wave released initiates a retrieval request for inventory from bulk locations to pick locations.

• **Retrieval for Shipment**—the release of a shipment without using wave planning creates retrieval tasks that are directed to the appropriate packing zones. For example, customer pick-up scenario or for urgent orders.

Some examples for manual move requests include:

• **Retrieval for Quality Inspection**—the inspection department requests the inventory department to retrieve stock for a specific receipt and inventory status for inspection. For example, a defective inventory found results in a retrieval request for either remaining inventory in the location or for the receipt number of the inventory.

• **Retrieval for Manufacturing**—the manufacturing department requests for raw material depending on the consumption of raw material on the manufacturing lines.

• **Retrieval for Manual Move Request and Execution**—ad hoc request to move additional inventory from one location to another. This is mainly to allocate space for new receipts received in a warehouse. For example, relocation of the last remaining pallet from a multi-deep pallet location to a single pallet deep location.

2.6.1 Retrieval Algorithm

Yantra WMS retrieval algorithm utilizes criteria that include SKU classification, UOM and zones and sequencing strategies. The algorithm retrieves products from eligible locations in a warehouse and employs either the 'pick to clean' or 'least pick' methods. Figure 2–15 illustrates the retrieval algorithm.

Figure 2–15   Retrieval Algorithm

* Warehouse Locations
    - All locations in the warehouse

* Filter locations by item classification and UOM
    - Locations in particular zones

* Sequencing locations
    - Pick to Clean
    - Least Pick
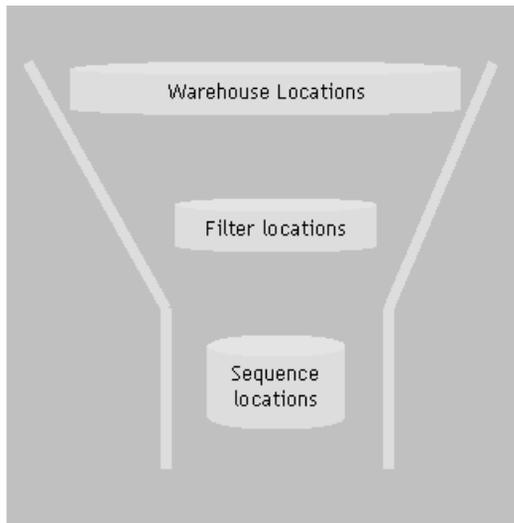
The business process configuration and algorithm answers the following questions:

1. What location do I retrieve to?

Retrieve to location corresponding to department that places request automatically or manually through move request. For example, VAS requesting for component inventory.

2. What locations do I retrieve from?

Retrieval strategy values to determine the optimal zones to search for based on item classification and UOM.

3. Which method do I use to retrieve from these locations?

'Pick to clean' method indicates that the system optimizes on a location becoming empty after quantity is retrieved, while also considering the least amount of locations to pick from.

'Least Pick' method indicates the system optimizes on the least number of locations that will satisfy the retrieval quantity.

2.6.2 Retrieval Execution

Yantra 7x WMS generates appropriate tasks for each retrieval request. Yantra 7x WMS Task Management is used to execute these tasks using printed move tickets, Mobile Terminal, or by integrating with Material Handling Equipment (MHE).

Execution of these tasks uses strategies that include:

- **One request at a time**—a user completes the request in one trip or multiple trips.

- **Multiple requests at a time**—a user completes tasks across requests in a single trip for more efficiency purposes. (This is very similar to a batch pick scenario.)

Yantra 7x WMS can be used to control retrieval task suggestion by placing constraints based on a user or based on attributes such as shipment number or work order number. These are further described in Task Management.

2.6.3 Retrieval Visibility

Yantra 7x WMS provides complete visibility to the status of retrieval requests. The visibility is at a granular level indicating retrieval request and attributes used to initiate the request.

The visibility to retrieval requests is provided through console. Yantra 7x WMS also provides an audit trail views for the move request. The combination of attributes are illustrated through the following use cases or examples:

- View open retrieval requests for a work order

  The criteria used include department, status, work order number

- View retrieval requests by outbound shipment number on a wave

  The criteria used include department, shipment and wave number

- View open retrieval requests for pallets or cases

  The criteria used include unit of measure and status

- View open retrieval requests created by the user that was expected to finish in next 30 minutes

  The criteria used include department, status, and finish no later than

Yantra 7x WMS also allows cancellation of entire move request or removal of part of a move request.

2.7 Replenishment

In a warehouse as product is removed from a location, the inventory in that location requires re-stocking. This process is called as 'replenishment.'

A warehouse consists of zones that are classified for multiple UOMs. For example, a zone that holds units with UOM as EACH or a zone that holds cases with UOM as CASE or a zone that holds pallets with UOM as pallet. The replenishment strategy would involve a multi-step strategy covering moves from pallet storage to case storage or loose storage and from case storage to loose storage. This is called "multi-step replenishments" as shown in Figure 2–16. In a scenario, where offsite storage is used, the first step of replenishment is to the pallet storage, thereby increasing one more step in the process.

Figure 2–16   Multi-step Replenishments

Multi Step Replenishment

Step 1:
Move pallet from bulk storage to drop off location, which is at the end of aisle in bulk storage area.

Step 2:
Move pallet from drop off location in the bulk storage to drop off location in the active area.

Step 3 (Final Step):
Move pallet from drop off location in active area to pick locations.
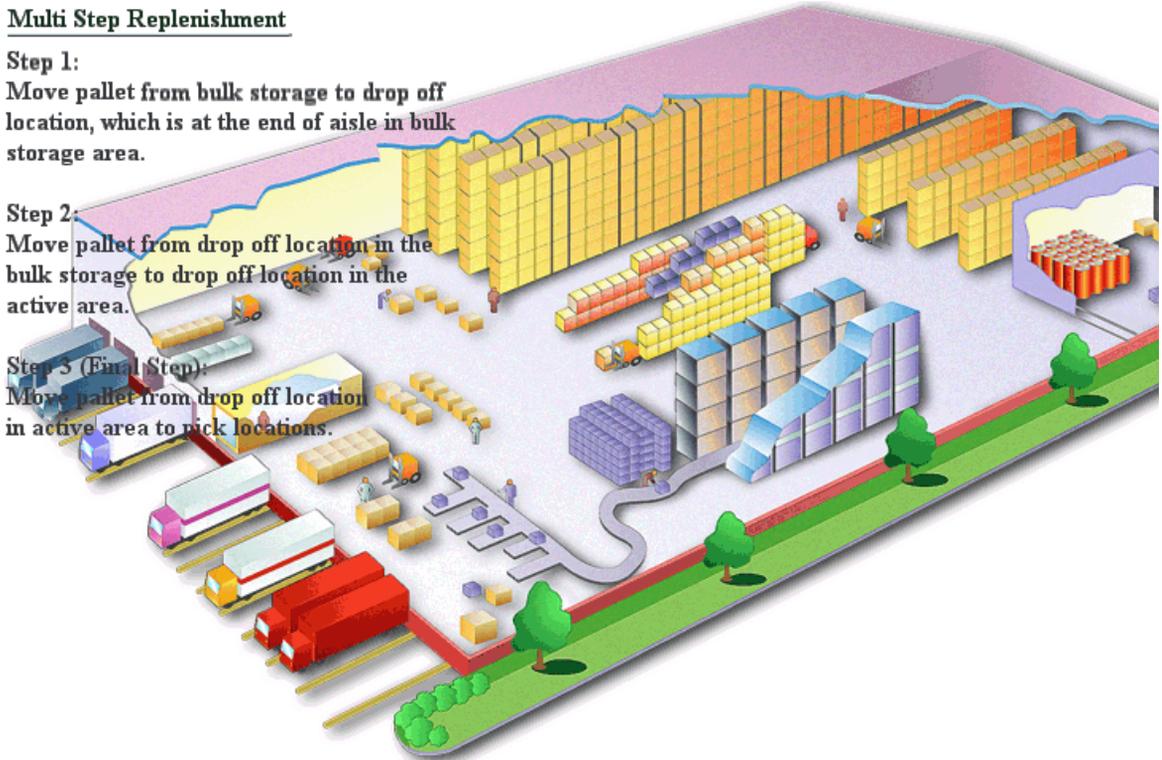
Yantra 7x WMS supports replenishments that are based on demand or inventory levels. Yantra 7x WMS also allows placing ad-hoc requests for replenishment of locations.

In outbound planning, a replenishment request is created due to demand and the demand causing the inventory of a SKU at a location to fall below its 'minimum' level. Demand is created from work orders in VAS, shipments and wave. Demand is also created by a manual move request.

Inventory level based replenishments are created based on inventory 'minimum' and 'maximum' levels defined at a location for a SKU and UOM. In a 3PL environment these levels may be specified at the company (enterprise) level. For more information about demand based replenishment, see Section 9.4.4, "Replenishment" on page 104.

2.7.1 Inventory level based replenishment

Inventory levels are periodically checked through inventory monitor. The strategies used for inventory level based replenishment include Minimum/Maximum level triggers and top-off.

Inventory monitor raises an event when the net inventory at a location falls below the minimum level, or when there is no inventory. A request is placed for retrieval based on the event to replenish the location.

In addition, if the request is for a top-off, all locations that are below the 'maximum' level for the criteria specified are considered for replenishment.

In both the strategies location is replenished to the 'maximum level'. (Replenishment Quantity = Max Capacity - Net Inventory).

Typically, top-off replenishments are chosen as end-of-day shifts or during 'graveyard' shifts.

2.8 Count

Accuracy of inventory level is critical to a supply chain. Inventory levels are the key to having better customer satisfaction, demand planning and lower labor costs. It is possible to reduce the human error factor while receiving and putaway of inventory to a location in a warehouse, by introducing packaging restrictions that include labeling, consistent marking and bar coding. Also, each move request in the system requiring location and the package being scanned reduces human error further.

However, it is common that a customer or consumer may order in quantities that is different from the package unit of measure. For example, shoes are usually packed in case packs. But, a consumer may order a single pair, which introduces the requirement to break open the package and introduce some human handling of product.

A count system allows you to execute counts in a planned or ad hoc manner. A common type of count employed is year-end inventories. While this is exhaustive, it is also time consuming, and does not ensure accuracy throughout the year. The other method is to only count items based on velocity or price every quarter. However, the best method is to ensure count performed periodically in the system. The count tasks may be either generated for a cycle count program, requested by the

inventory control department ad hoc, or be initiated through system events that occur at a location level.

Yantra 7x WMS allows count requests to be initiated through console on an ad hoc basis. Count requests can be generated automatically for a cycle count program that is employed at a node, or a set of nodes for an enterprise. System events like exception being recorded during an activity performed like putaway, retrieval or pick, or a location quantity dropping below minimum levels or at zero can also be used to initiate a count request.

Some examples of different count requests include:

- Request to count a location

- Request to count for an item, product class, and UOM combination

- Request to count all received products based on purchase order or shipment using the receipt number

- Request to count entire zone

- Request to count a case or pallet

- Request to count a product line or any other item classification

- Request to count at a region level

- Request to count at a node level or across nodes

Yantra 7x WMS allows priority to be placed on a count request and allows to place date and time based conditions for start and/or finish times. For example, user may request a count for a zone that has slow moving items and requests for count to start the next day assigning a low priority. The start and end time allows for planning and tracking.

Yantra 7x WMS allows a user to count inventory at a location using mobile terminal for which a count task does not exist. If a count task already exists for the scanned location, the system suggests it.

Yantra 7x WMS provides inventory monitors that raise events based on the location level activity for either minimum levels or a location that is at zero quantity.

Yantra 7x WMS also requests users for confirmation whenever it detects that a location is empty after picking. If the user specifies that the location is not empty, an event is triggered that creates a count request. This ensures that a variance is detected at the earliest, even before the

next cycle count is due. The confirmation is done during retrieval, replenishment, and picking. The user is not inconvenienced in any way; they can carry on with their allotted tasks after confirmation.

Tasks for a count request could be at a location, item, category of items, or container level, or in any combination of those based the on level at which the request was placed.

2.8.1 Count Execution

Yantra 7x WMS enables to count inventory using any of the following methods:

1. **Count inventory using pape**r—this methodology shows the user the current inventory in a location, which can be altered while recording count.

2. **Count inventory real-time using mobile terminal**—initially, this methodology is used for counting a blind count, which does not show the user the current system quantity. This methodology is the most accurate and exhaustive method to ensure that all users perform counts accurately. This also allows for real-time inventory updates and the ability to interleave count tasks during the process of a regular workday.

In some warehouses, inventory is tracked at a tag number or serial number level. The count at these granular levels is cumbersome and requires opening of packages. In such situations, Yantra 7x WMS allows for counting without specifying these granular attributes. However, variance resolution of these tasks has to be done at the granular level.

The following example explains count execution process:

For locations that are double deep or even quadruple deep in a case or pallet with LPN scenario, it is not physically possible to scan each license plate. In such case, Yantra 7x WMS allows count to be recorded at the SKU level without scanning individual case or pallet with LPN.

The count business process configuration allows for either another count task or a variance task to be generated. This is possible only if the quantity entered does not match the system quantity. Generation of another count task verifies the count executed by the first user. During this count system quantity is displayed.

Variance

Yantra 7x WMS allows the following as a result of a count that has variance:

- Generate re-count task at a later time
- Accept count and generate variance task for resolution
- Accept count and adjust level of inventory only if acceptance criteria are met.

Yantra 7x WMS provides acceptance criteria for variance at an item classification and value level. For example, a variance with value greater than 1000 USD for an item classified as high-value item is not accepted. But, a variance of less than 100 USD for low-value items are accepted automatically.

Yantra 7x WMS can be configured such that all variances require manual acceptance. For example, 3PL where inventory ownership is at a customer level, variance acceptance is executed through a console. For more information about variance acceptance, see Section 2.8.2, "Count Visibility" on page 53.

A new count request can be made, if variances viewed are not acceptable.

2.8.2 Count Visibility

Yantra 7x WMS provides complete visibility into both count request status as well as count results at the appropriate granular level.

2.8.2.1 Count Request Visibility

The count request visibility is provided through console. Count requests are searched for their status utilizing criteria. These combinations of attributes are better illustrated through use cases or examples, which include:

- View count request status made by a client user scheduled to end today

  Criteria used includes Enterprise, Requesting user, Finish no later than

- View all open high priority tasks for across all clients

Criteria used include Priority and status range

- View all open tasks due to complete in the next two hours

  Criteria used include Enterprise, finish no later than and status range

- View all open count requests for an Item, UOM

  Criteria used includes Enterprise, Item ID, UOM and Status Range

- View status of all recounts issued for a receipt

  Criteria used includes Enterprise, Receipt Number and Status Range

- View all requests made for a zone

  Criteria used includes enterprise, zone and maximum records

- View all requests made for a region

  Criteria used is enterprises across nodes

2.8.2.2 Count Result Visibility

The count results visibility is provided through a console. Count results are searched for their status utilizing criteria. These combinations of attributes are better illustrated through use cases or examples, which include:

- View latest count results for a particular enterprise

  Criteria used includes ship node, enterprise, item ID, variance value as 'Any' and latest summary task flag selected

- View all variances at the node that have exceeded a specified currency value

  Criteria used include enterprise and variance value with 'greater than'

- View all positive variances for a particular item, UOM

  Criteria used include enterprise, item, UOM and check 'Positive' variance value

- View all variances for a particular enterprise

  Criteria used include enterprise and check 'Any' variance value

3

Inbound Planning

Many companies track their inbound planning and procurement costs in an attempt to reduce the cost of goods sold. The opportunity to reduce costs are enhanced by better visibility to both inventory holding and goods in transit, optimized transportation and lower labor costs.

A warehouse has visibility to inbound inventory upon creation of purchase order or transfer order. A merchandising or purchasing system owns the purchase order. A transfer order is initiated as an inter-warehouse transfer or a transfer after manufacturing process is complete.

The interaction between various participants in the supply chain may be achieved through collaboration or by manual methods. Yantra Supply Synchronization achieves this by tracking the purchase order from the individual participant to the destination.

Yantra 7x WMS provides web-based, real-time visibility of the incoming inventory to a warehouse. This is achieved by downloading the inbound order from the appropriate host, either external merchandising or purchasing systems or from Yantra Supply Synchronization.

3.1 Shipment

Yantra 7x WMS maintains and tracks shipment (ASN - Advanced Ship Notice) details from various sources. This provides a warehouse visibility to the Expected Time of Arrival (ETA). Yantra 7x WMS has the ability to track shipment at all points in the supply chain. This enhanced visibility to shipment in Yantra 7x WMS is used to prepare dock doors for receiving.

A shipment or inbound order contains item information and the expected quantity. There are situations when a shipment or inbound order contains additional details, such as case or pallet with LPN, lot numbers and serial numbers.

A carton can have SKU labels or a case with LPN label associated. These labels are generated at the origin warehouse or through the web through collaboration software. The pre-printed labels are industry practices employed to standardize inventory. It improves inventory accuracy and reduces labor costs. However, Yantra 7x WMS allows for manual creation of shipment when the information is not available electronically.

3.1.1 Dock Scheduling

The Dock Scheduling functionality of Yantra 7x WMS enables you to manage all dock locations in a warehouse for receiving inbound shipments and shipping outbound shipments. The dock scheduling rules enables the user to specify number of days in advance to take a dock appointment.

Yantra 7x WMS enables you to associate a dock schedule with a shipment or load. If scheduling is done for a shipment, then Yantra 7x WMS provides complete visibility into the shipment volume, weight, number of cartons available, and pallet information. Based on the Productivity Metrics (SAM definition), the duration of the appointment is also suggested.

Dock scheduling is based on the warehouse calendar associated with a dock and considers all working days and holidays, and shifts that are valid for receiving or shipping operations. Each dock can have its own calendar and shifts specified when they are available. You may also exclude certain docks from the scheduling process. For example, a warehouse may allocate one dock for UPS fluid loading, which may require one full day. In this case, dock appointment is not required for UPS fluid loading.

Each appointment is assigned a unique reference number. The time slot assigned for each appointment may vary based on the shipment size. For example, the duration for one appointment could be for 30 minutes and another appointment could vary between 45 minutes to 1 hour. Appointments can be changed to a future date in case the delivery fails. Yantra 7x WMS creates alerts for such missed deliveries or pickups to

ensure that new appointments are created. Yantra 7x WMS also enables the cancellation of appointments that are already taken.

Due to additional resource constraints, a warehouse may not want to take more than a certain number of appointments at a given time. For example, if 20 docks are available for taking appointments, a warehouse may not want to schedule all 20 docks from 10:00 AM to 11:00 AM, as it may not be possible for a warehouse to unload all 20 trucks at the same time.

Appointments can be taken only for the number of days specified in advance.

3.2 Shipment and Inbound Order Visibility

Yantra 7x WMS provides visibility to shipment and purchase orders expected into a warehouse. Visibility is provided at a shipment number level, purchase order number level inclusive of the status. Yantra 7x WMS business process configuration allows to track all incoming shipments at each step in the supply chain. The combination of attributes is detailed through the following use cases or examples:

- View all shipments that are in-transit after clearing local customs

  Criteria used includes status

- View all purchase orders for a particular item expected shortly

  Criteria used include document type, item and status

- View all transfer orders that have been shipped from the regional warehouse

  Criteria used includes document type, status range and origin node

- View status of a particular shipment

  Criteria used include shipment number or a combination of tracking attributes such as Pro number, BOL number or trailer number

- View status of all purchase orders from a vendor

  Criteria used include document type and the seller

4

Inbound Execution

Inbound execution is the completion of inbound planning process, which is receipt and putaway of inventory. Inbound execution is one of the most critical factors that directly influence the throughput of a warehouse. The impact of where and how inventory is stored in a warehouse directly influences the time taken to putaway, replenish and pick inventory. There is a significant amount of time that is spent in warehouse layout and configuration based on the type of inventory received, how the inventory is received, and the equipment used to receive and putaway inventory.

The receiving process in a warehouse involves acceptance of goods from the carrier and then the physical process of checking and receipt of inventory. The process of acceptance is to verify number of packages (cases or pallets) against the bill of lading or packing slip that the carrier provides. If an ASN is available for the shipment received, a preprinted sheet is used to verify the contents. The process used to receive inventory into a warehouse is executed through Mobile Terminal, console or MHE like a receiving sorter.

For some inventory that is received in a warehouse the pre-packaging steps has to be performed before putaway. For example, in the parts industry, screws are received in large boxes or bags and are packaged into appropriate inventory UOM packs before putaway. These pre-packaging activities requires a different location to be allocated in a warehouse. The ability to automate these procedures based on the SKU being received significantly reduces labor requirement.

Yantra 7x WMS provides comprehensive functionality to effectively manage inventory execution process. Yantra 7x WMS provides complete visibility to specific shipment available in the supply chain. Yantra 7x WMS also enhances this visibility by tracking the acceptance of inventory from a carrier. This feature of Yantra 7x WMS enables warehouses to

pre-receive product based on the number of packages (cases or pallets) received and routes these packages to the appropriate business area. Yantra 7x WMS business process configuration allows modeling of the physical process in a warehouse.

Yantra 7x WMS also permits diversion of inventory received into the appropriate area based on quality profiles, cross-dock requirements or putaway preferences. Yantra 7x WMS allows to model a warehouse individually or distinctly from the other warehouses based on its layout and MHE deployments.

The information captured during the receiving process is visible through consoles for audit as well as tracking purposes. The ability to track individual activities in a warehouse allow for productivity tracking and reporting.

4.1 Pre-Receipt

Yantra 7x WMS pre-receipt process enables a shipment to be marked as received at the package level. This process is followed in warehouses that have large receiving yard or area where shipments are offloaded before the receiving department starts the shipment work.

Yantra 7x WMS allows recording of shipment level attributes during pre-receiving process that include trailer details and driver details. In addition, the actual date and time of pre-receipt is recorded to track carrier performance.

4.2 Receiving

Yantra 7x WMS allows to control receipt process with the information that is available in a warehouse. Yantra 7x WMS supports the least automated warehouse through paper-based process and all warehouses up to the most automated, involving MHE for receipts. These warehouses however disparate, are modeled individually in the Yantra 7x WMS network.

A warehouse can identify its own receiving preferences to characterize the flow of inventory from the receiving dock to other departments and zones of a warehouse.

A receipt in Yantra 7x WMS is made for a purchase order level or shipment level. Yantra 7x WMS holds case or pallet with LPN details at a shipment level, if available. Yantra 7x WMS also supports blind receipts.

Blind receipts are inventory that arrives in a warehouse without any information. A warehouse may use any or all of these methods to receive its inventory. Yantra 7x WMS places constraints for each of these methods.

Quality profiles and SKU attributes influence the diversion of inventory to various areas of a warehouse. In addition, if there is a demand for certain product or quantity, Yantra 7x WMS creates cross-dock diversions during receipt. In addition, if there is a demand for certain product or quantity, Yantra 7x WMS creates move requests for diversion to the appropriate department during receipt. The diversions are displayed at the time of receipt of the container or SKU to place inventory received into appropriate pallets for putaway.

Yantra 7x WMS supports planning for QC or cross-dock diversions for an item. These planned diversions could be for a specific inbound order or shipment, or across inbound orders or shipments.

Yantra 7x WMS provides inventory receipt in a warehouse at most granular level. Yantra 7x WMS supports inventory receiving at a SKU and UOM level, case or pallet with LPN level. Yantra 7x WMS has the ability to create new case or pallet with LPN, if necessary.

The receipt completion creates inventory at both location and warehouse levels. Yantra 7x WMS uniquely identifies inventory by the attributes captured during the receiving process. For more information about inventory attributes, see Section 2.1, "Inventory Tracking" on page 11. Yantra 7x WMS provides visibility and tracking through consoles for receipt and inventory audits.

4.3 Receiving Exceptions

Yantra 7x WMS tracks inventory receipt at a purchase order level or shipment level, and also maintains case or pallet with LPN level details.

The exception types that occur in a warehouse include receipt after the expected date, receipt of items that do not exist in the shipment, overages, shortages or damaged inventory. Yantra 7x WMS tracks visibility of quantity received against a shipment that allows for overages or shortages to be tracked. This allows to track performance against a vendor.

Yantra 7x WMS also records receipts against shipments and enables to correct manual receipt data entry errors. These modifications are reflected against a shipment or a purchase order.

4.4 Receipt Putaway

The receipt of a product initiates requests for diversion of product for putaway. Receiving preferences controls the timing of when a putaway request is generated. The request is generated when a receipt is complete or when the complete shipment has been received.

During putaway, Yantra 7x WMS considers the preferences that are set up at an item and location level. This is executed on Mobile Terminal, or batch sheets, or integrated with MHE. Yantra 7x WMS task management controls task execution.

A warehouse configuration may require inventory availability to be tied to when putaway is complete. Yantra 7x WMS achieves this by using inventory status at the zone level as inventory availability is tied to inventory status. The task management of Yantra 7x WMS utilizes this to move inventory to the appropriate inventory status.

4.5 Close Receipt

The closure of a receipt indicates completion of receipt against the ASN or shipment, and uploading of information to the host systems. Yantra 7x WMS enables both manual and automatic closure of receipt. Manual closure of a receipt is initiated through a console. Automatic closure is based on business process configuration that checks for conditions, such as full receipt of quantity, excess quantity has been received, or putaway completion. Yantra 7x WMS initiates closure of a receipt typically as an end of day process based on the warehouse requirements.

4.6 Receipt Visibility

Yantra 7x WMS provides visibility to all receipts at most granular level. The visibility is provided at a level at which inventory has been received into a warehouse.

The visibility is provided through a console at shipment, receipt or purchase order level. Visibility into the audit trail is provided through

inventory audit console. The following use cases or examples explain the combination of attributes in Yantra 7x WMS:

- View all inventory for a specific shipment or purchase order number

  Criteria used include Enterprise, Reference number as inbound shipment number or PO number

- View all receipts that are in progress at a warehouse

  Criteria used include enterprise, ship node and status

- View particular shipment or purchase order serial number

  Criteria used include enterprise, serial number

5

Quality Control

In the supply chain today, products are being sourced from external vendors. These vendors vary from the highly sophisticated to the highly skilled but with low access to technology. A few manufacturers have chosen to send their representatives to each facility to oversee the quality and accuracy of the operation. Others have chosen to instill a high degree of checks when the product is received into their own facilities. Retailers also perform inspection to ensure accuracy and quality of the product they receive from the manufacturers.

Yantra 7x WMS Quality Control (QC) helps address the quality control procedures that may be achieved at the receiving warehouse. Yantra 7x WMS also ensures quality and accuracy of the product shipped out.

5.1 Quality Profiling

Yantra 7x WMS Quality Control module allows profiles to be created for a specific vendor or item level. It also allows profiles at a vendor or item classification level. For example, all items that are high-value or vendors who are classified as yellow (to indicate vendors who have failed QC before). These pre-created profiles in any combination of the mentioned criteria eliminate manual intervention for normal operations.

Inventory upon receipt is marked for diversion using profiles that are created. Yantra 7x WMS directs putaway of product to QC automatically based on the QC profile.

5.2 Quality Inspection

Yantra 7x WMS provides the ability for a warehouse to inspect products in inventory.

Yantra 7x WMS enables a warehouse to apply a disposition to the product. This results in inventory being classified into a specific inventory status, such as Awaiting Inspection, QC Hold, Good Inventory, Scrap. Inventory status may be applied to either at a location level or for a complete item in a warehouse. Further, inventory status may be restricted to a specific lot and even a specific serial number. Warehouse may define different reason codes and specify reason code and additional inspection comments while changing the inventory status.

Inventory status as described in inventory control has a direct relationship to the availability of the product. Any inventory status is categorized as 'not available' or 'available'.

A quality problem if spotted during inspection process or regular pick and pack process or during count may require additional inventory to be retrieved from storage. Yantra 7x WMS allows for a retrieval request to be placed at the location, item level or at the receipt number, lot number levels. For example, safety recalls. Upon completion of ad hoc retrieval tasks, a putaway request can be placed for the putaway of SKUs in the QC location.

5.3 Inventory Visibility

Yantra 7x WMS allows inventory tracking at its most granular levels, which include SKU, location and inventory status. The combinations of these attributes are better illustrated through the following use cases and examples:

- View all inventory that have been placed on quality hold due to vendor packing errors

  Criteria used in location inventory console include enterprise, ship node and inventory status

- View all scrapped inventory in a warehouse

  Criteria used in location inventory console include enterprise, node, inventory status

- View all inventory that was put on hold for a receipt number

  Criteria used in location inventory audit console include enterprise, ship node, receipt number and inventory status.

6

Task Management

Task management enables you to manage all warehouse processes in order to optimize node throughput and maximizing worker efficiency.

Yantra 7x enables you define the type of task, schedule tasks, assign people to complete those tasks, and raise exceptions when they occur to alert appropriate personnel.

A task in the warehouse requires definition as to the type of resources (for example, worker or equipment) authorized to perform the task.

The application generates tasks to be performed within the warehouse based on certain events. For example, receiving triggers a putaway task, wave release generates picking tasks and inventory in a location reaching below defined minimum triggers replenishment tasks.

The application enables you to place resource constraints on a task in order to control when and who executes the task. The dynamic assignment of tasks enables supervisors to reprioritize orders, resulting in automatic reprioritization of a worker's tasks. A process in a warehouse also has equipment constraints. For example, put away to a high-bay location requires the use of a man-up truck or a pallet-up truck operated only by authorized users.

A task is executed through a paper-based operation, a mobile device, or material handling equipment. This enables task management to improve throughput of the least automated warehouse through paper-based operations to the most automated warehouse through mobile device and integration with material handling equipment. In the case of a paper-based operation, a batch is printed on request rather than printing up ahead. This enables reprioritization of orders, cancellation and modification of orders to be reflected immediately.

The application provides real-time visibility to task status. Task aggregation is also provided for each process and its unique parameters. For example, task visibility at a wave or shipment level.

6.1 Task Type

Each activity in the warehouse has unique characteristics and requires specific operating procedures. For example, picking requires moving inventory from one place to another while counting does not require moving inventory. Each type of activity is assigned a task type. Typical task types include the following:

- Counting
- Batch picking
- Order picking
- Retrieving cases for replenishment
- Retrieving pallets to the VAS department
- Packing all picked items into a pallet or carton
- Preparing carts with empty shipping cartons for picking
- Putting away pallets from the receiving dock

The application enables you to control task generation and execution at a task type level. The controls include the following:

- Should the task be batched?
- Does the task go through a drop-off location?
- Which pick strategy is to be used?
- Will the task assignment be controlled by the system or will a worker request the task?

6.2 Task Dependencies

Task Management enables you to manage warehouse operations such as picking, packing, and receiving. These operations are accomplished by completing a series of tasks. A *task* is a unit of work that accomplishes a goal. For example, completing an inbound putaway task accomplishes

the goal of moving product from the receiving dock to a storage location. Tasks are composed of one or more consecutive steps.

A *step* is the most granular unit of work as defined in Yantra 7x. For example, in order to move product from a receiving dock to a bulk storage location, an inbound putaway task can be composed of a two-step process: First, a pallet jack operator moves the product from a receiving dock to a staging location. Next, a fork lift operator moves the product to the bulk storage location.

Task Management enables you to create dependencies between groups of tasks, so that one group of tasks can be executed only **after** completion of another group of tasks. For example, a warehouse may want to complete **all** of the picking tasks associated with a 10:00 a.m. shipment before beginning the picking tasks associated with a 4:00 p.m. shipment.

6.3 Task Assignment

Each type of process in a warehouse typically requires workers who possess a specific set of characteristics that correspond with the task to be performed. For example, computer kit assembly requires workers that understand how the electronic components are assembled; and picking expensive inventory, such as jewelry, requires security clearances. Each worker is assigned to execute tasks that match their own set of skills or authorization.

Skill Sets

Each worker may have skills that correspond with multiple task types. In addition, each worker's tasks are prioritized. For example, one worker must complete all putaway tasks before proceeding to replenishment, while another worker must complete replenishment tasks before proceeding to counts.

Zones and Locations

You can define within which specific zones a worker is authorized to perform tasks.

These constraints control what tasks are displayed to a user and in what sequence. A user on a mobile device is expected to login to a console that automatically directs them to perform a specific task. Figure 6–1 illustrates the task assignment process.

Figure 6−1   Task Assignment
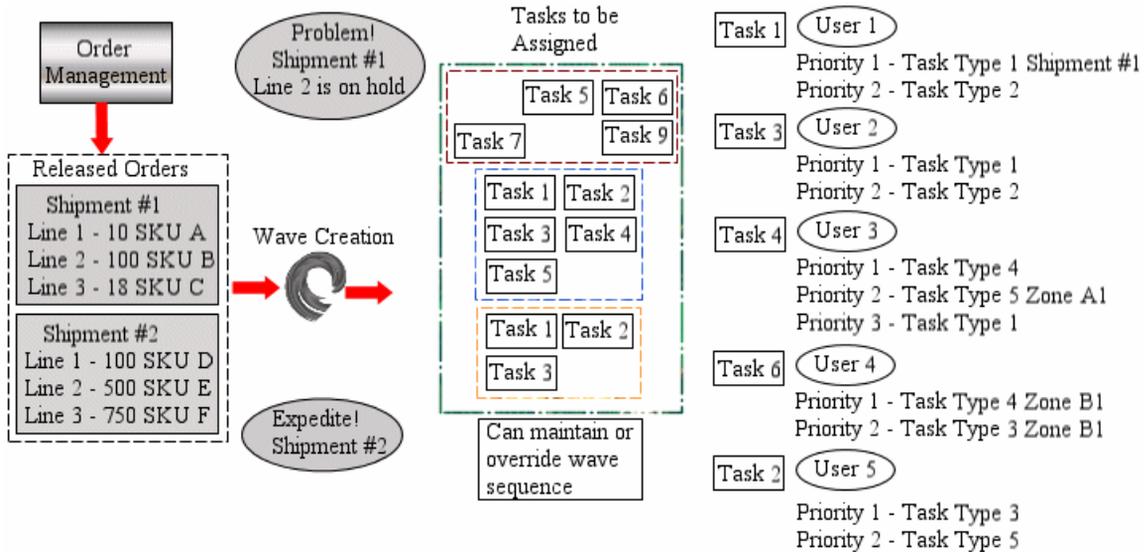
You can define the maximum number of workers who can be assigned to perform specific types of task. For example, if a warehouse chooses order pick, only one worker executes the given order. Or for trailer loading, a warehouse allows a maximum of three people to load a trailer.

The application automatically suggests the best possible match of task to worker, based on where the user is working and the type of equipment that the user has. The application optimizes task suggestion based on best sequence in which to traverse the location. Additionally, time constraints placed on a task are also adhered to.

The application has the ability to assign specific tasks and equipment to specific operators in a warehouse depending on their skill sets. For instance, the warehouse supervisor may assign putaway, picking, replenishment, and packing tasks to an operator. The forklift or grab truck may be assigned to perform the tasks. Another operator may be assigned to perform the final step of replenishment using only grab truck.

The application controls when a task is available for assignment. This availability is computed from associated date and time constraints for

start of the task. For example, a putaway request from the quality control department is scheduled to start only during off-peak time. The task is suggested to all eligible users after the date and time specified. The expected finish time for a task can also be specified. For example, a move request to top-off high moving dedicated locations in the warehouse is expected to be completed during the lunch break while picking team is on the lunch break, then the application suggests tasks that are closer to their finish time.

6.4 Task Execution

Regardless of the use of technology employed in your warehouse, a task can be executed by using any of the following techniques:

- Batch sheets
- Handheld mobile devices
- Material handling equipments

As tasks are executed, their status is tracked and may be audited. Task statuses including the following:

- Open
- Suggested
- In Progress
- Held
- Complete
- Cancelled

When assigning tasks to the users, the application suggests tasks to the users based on the skills set and constraints assigned to the users. For example, after a user picks up the first task of a truck load shipment, he is restricted to executing all tasks for that particular shipment before continuing to the next shipment in the truck load.

Yantra 7x WMS also allows the user to choose the type of task to perform using the Yantra 7x Mobile Application. When performing tasks, Yantra 7x WMS allows the user to:

- Select the specific type of task to perform or the system suggests the next task to be performed by the user.

- Pick less than the task quantity when inventory is not available at the location for the task performed.

- Deposit quantity less than the system suggested quantity when the space in the location cannot be utilized for the task performed.

After the user executes all tasks, the system suggests the next task to the user, when available. During task execution, the system captures exception reasons, if any.

Task execution is better explained utilizing a process as a reference. Therefore, further constraints are better explained under each department. For example, putaway execution is detailed under inventory control section and receiving is detailed under the inbound execution section.

6.5 Task Management Visibility

The application provides granular visibility to the task. Tasks are viewed by task type and status. The following examples or use cases explain the combinations of attributes:

- View all pick tasks due to start in the next hour

  Criteria used includes warehouse, task type, start task after date and time

- View all pick tasks associated with a particular SKU

  Criteria used includes warehouse, task type, item and status

- View all pick tasks that are on hold

  Criteria used includes warehouse, task type, reason code and status

- View all replenishment tasks associated with a wave

  Criteria used includes warehouse, task type and wave number

- View all replenishment tasks associated with a location or zone

  Criteria used includes warehouse, task type, target location, target zone and status

6.6 Batching

A batch represents a list of tasks that can be performed together. Only specific task types can be combined into a batch and each batch consists of only one type of task. The type of task is determined based on the pick strategy.

If a container and shipment has multiple types of pick tasks, the container and shipment is split into multiple batches and consolidation is required for packing and shipping. Batching is used in many scenarios, including the following:

- Outbound Shipments (with or without containers)
- Replenishments
- Work Order Pick
- Put away (Inbound, Work Order, Replenishment final step)

6.6.1 Batch Size

Batch size depends on the type of task. Batch size can be defined by various parameters such as the following:

- Maximum number of transactions (task reference such as wave number, containers, shipments or work orders)
- Maximum volume
- Maximum number of tasks

Batch size is also determined by the following factors:

- The capacity of the picking equipment used, since different types of tasks may require different sizes of carts
- The potential volume and dimensions of the shipping carton, when containerization is being performed
- The real volume and dimensions of the items, when being packaged into a shipment

The application assumes that picking carts are available for any number of batches created but does not consider the inventory availability of picking carts.

When a batch is created, it is not automatically assigned a specific cart number; however, during the picking process, a specific cart can be associated with that batch.

Equipment used for batching must have at least one location. Each cart can have multiple locations. When cart locations are defined, in addition to the maximum limits specified for the batch, the size of the batch is also restricted based on the cart location definition.

6.6.2 Batch Creation

Batches can be created manually or triggered automatically, and the algorithm for batch triggering is extensible.

Manual Batch Creation

During the manual creation of a batch, a user can scan a set of containers and shipments and request the application to create a batch based on those items. Or in a pick and pass environment, each picker in a zone may create a batch for efficient picking of multiple containers and shipments in a zone. Lists of containers and shipments for a batch can change from one zone to another.

Automatic Batch Creation

Automatic batch creation can be triggered by any of the following means:

- Created and printed online—when the user is waiting for the batch to print before executing the next receipt. For example, if receipts are recorded on a pallet, when a user closes pallet, all put away tasks for the pallet need to be batched together and printed immediately.

- Event triggered—such as Wave Release and ASN Closure.

- Time triggered—when batching is time triggered, batching may be triggered to run for a specific type of task. The maximum number of batches to be created can also be specified.

- Users may request creation of next batch for a specific task type. On request, the application creates one batch and print batch created. In this scenario, creation of batch is postponed until the last minute to gain maximum picking efficiency.

6.6.3 Cost Based Optimization

Yantra 7x WMS optimizes the batch created by associating costs with criteria, which includes locations, aisles, zones and locations. The cost is determined by using the Standard Allowed Minutes (SAM) against the task type. The list of tasks to create a batch are run through multiple iterations in the cost based optimizer. At each iteration the previous iteration's result is further optimized. During each iteration the cost is compared and the least cost option chosen as the best batch.

During the process of optimizing the batch constraints standard constraints including a container not being split across batches or when creating a batch for order pick a shipment is not split across batches. Equipment capacity defined is considered to determine the maximum number of units or containers that can be on a batch. Additionally, task type configuration based on the maximum number of primary references is also considered to limit the batch size. For example, during outbound pick, shipment number or container number is referenced or during work order pick, work order number is a primary reference.

6.6.4 Batch Picking Execution

Picking for a batch can be through any of the following methods.

- **Printing Batch Sheets**—the application can print a batch sheet during any of the following events:
  - During wave release process
  - As and when batches are created
  - Users requesting next batch to print (dispatching a batch to printer)
- Users can execute the picking process using printed batch sheet and report picking process to the application. The printed batch sheet can be formatted according to the type of batch as follows:
  - Batch of Containers, sort while picking
  - Batch of Shipments, sort while picking
  - Batch of containers, no sorting while picking
  - Batch of Shipments, no sorting while picking

When a batch sheet is printed, in addition to batch number, the application can print check digit and code mapping. In a paper-based picking environment, the user may be required to enter this check digit or code during batch confirmation. This is to ensure that batches are confirmed on system only subsequent to printing of the batch sheets.

Batch sheet printout also includes any special instructions (for example, put away, picking, packing) based on the following criteria:

- SKU being picked

- Customer

- Order

While confirming batch sheets, all exceptions such as short picks, over picks, and damages can be recorded and corresponding event or actions can be taken to address these exceptions.

6.6.4.1 Executing Pick Using Handheld Devices

Users can initiate pick for a batch by scanning a batch sheet or the application can suggest a batch to a user for picking. Picking can be executed using handheld devices by scanning location, item bar code, a shipment, and container.

Products picked may or may not be sorted during pick.

Executing pick using integration with external material handling equipment.

Pick batches created can be sent to external systems such as pick to light or other material handling equipment. Warehouse has the visibility to whether batch is sent to material handling equipment or not. Warehouse can re-send the data to the material handling equipment, if required.

6.6.4.2 Multiple-Step Execution

Picking a batch can include multiple steps. The application can track all steps for executing a batch. Different steps include:

1. Preparation of picking cart (placing empty containers or totes in a cart)

2. Picking of items to a cart

3. Packing containers in a cart

4. Closing containers

6.7 Productivity Manager

The productivity manager enables you to model warehouse activities and measure worker productivity.

All variables in the activity are defined in standard allowable minutes (SAM). A warehouse analyzes the time involved with each activity to define the SAM for each warehouse activity. For example, these activities include the number of locations visited, size of items, distance traveled, and the number of trips required.

The variables are a characteristic of a task type. Some task types require only a few of the variables. For example, the variable "number of locations visited" is applicable only to picking or replenishment tasks and not applicable to packing or manifesting process.

The application enables you to configure a list of variables that are applicable to a specific activity and define SAM to each variable in an activity. SAM is defined against a task type for determining the efficiency of a user. For example, a warehouse allows defined minutes to be at a location, time to pick a case and the time taken if aisles are being traversed.

The application issues time credits to users based on the actual tasks performed and SAM defined for each activity. This information enables you to perform the following worker-based activities:

- Identify labor efficiency of each user

- Compare labor efficiency between users

- Measure productivity associated with an activity and use this information to refine SAM

- Support activity based compensation

- Get daily feedback on performance relative to goals

7

Reverse Logistics

Reverse Logistics is the process of handling return of products from a consumer or a retailer to a manufacturer through the use of the supply chain. Reverse Logistics also encompasses recycling of packaging and containers, reconditioning or refurbishing of products and disposition of obsolete goods.

Reverse logistics is one of the least focused areas for many companies. However, the ability to recuperate assets and revenue in the supply chain is causing a refocus in this area. There is a lack of understanding of what is being returned and why. The strategies followed in reverse logistics are disparate due to the type of SKUs being handled. For example, an online consumable retailer and an electronics retailer.

Yantra 7x WMS Reverse Logistics provides comprehensive capabilities to manage "end-to-end" process of reverse logistics for all types of companies including retailers, manufacturers and third party reverse logistics providers. The reverse logistics process covers all aspects like creating a return authorization, disposition of the product and the inventory returned is restocked, returned to vendor or scrapped.

Yantra 7x WMS breaks up a return into individual SKUs along with their disposition. Visibility provided to the disposition in the returns department allows for aggregation and routing of inventory to the respective areas. Routing in Yantra 7x WMS is a multi-step process that incorporates requirements like refurbishment and repackaging before an inventory is restocked. The additional fields inventory attributes recorded include reason code, lot number, revision numbers and serial number.

The granular visibility provided through recording of the information allows tracking of inventory from the time of receipt and through the multi-step disposition process before an item is putaway to the appropriate area. Audit trail is also provided to track activities performed

at a granular level, which includes return number, item, reason codes, disposition, inventory attributes and user.

Many companies are unaware of the amount of inventory tied up in the return and repair process. High-value products and parts may sit in technicians' vans or inspection centers for weeks before they are sent for repair or returned to stock. Often these parts require no repair and could immediately be resold to another customer. Yantra 7x WMS Reverse Logistics enables companies to effectively track items throughout the return and repair process and automates the procedures that return items to stock. Real-time status updates from service and repair organizations enable your company to truly leverage the reverse logistics cycle as a source of supply.

7.1 Receipt

A Return Authorization (RA) can be either created on Yantra Reverse Logistics or downloaded from external host systems. There are situations when inventory is returned due to a customer refusal or without using the proper channels. Yantra 7x WMS allows to create blind returns.

7.1.1 Pre-Receipt

The common practice is to temporarily stage packages that are returned for later processing. These packages may be putaway to specified areas to be retrieved later for inspection.

Yantra 7x WMS allows for receipt at the number of packages level. A package, if necessary, is assigned an individual case or pallet with LPN label to facilitate retrieval and visibility. Business process configuration allows for a putaway request to be automatically initiated.

7.1.2 Return Receipt

A return in Yantra 7x WMS is received based on the information that is available on the package or an item. SKU level attributes also influence the method of receipt.

Receipt on Yantra 7x WMS is executed through consoles. A RA worksheet can be printed for paper-based warehouses. A user scanning or entering either the return number, serial number, or container id initiates a receipt of the return. Capturing serial numbers are mandatory for seralized items

and verification can be performed using extensibility against their original shipments. Yantra 7x WMS also allows for integration with external systems to validated serial number. A case or pallet with LPN associated during the receipt process allows for tracking and movement of inventory. Inventory is tracked at the returns receipt location. In addition, other inventory attributes such as lot number, revision number are recorded, if necessary.

Business process configuration in Yantra 7x WMS allows definition of the steps to be followed in a warehouse. The status of RA indicates the activity being performed or completed on the RA.

7.2 Disposition

Yantra 7x WMS provides visibility to RAs that are pending disposition. A user issues a move request to retrieve RAs to continue with the inspection process. All tasks are created and monitored by Task Management.

Yantra 7x WMS executes product disposition by associating a reason code and disposition code to the inventory. Yantra 7x WMS supports multi-step disposition for a SKU. For example, an item may require repairing, packaging and labeling before restocking. Yantra 7x WMS business process configuration allows for status tracking at each of these steps.

Yantra 7x WMS VAS process is used to generate work orders for tracking the repair process. A work order can span across multiple RAs.

Yantra 7x WMS outbound process allows for transfer or repair orders to an external vendor. Transfer orders are used when products are returned to a vendor.

7.3 Return Receipt Putaway

The completion of the disposition process initiates the putaway of product. The putaway process can be automated through a move request or manually requested.

During putaway, Yantra 7x WMS considers the preferences setup at an item and location level. For more information about constraints and preferences, see Section 2.5, "Putaway" on page 34. This is executed through Mobile Terminal, batch sheet or by interfacing with MHE. The task management of Yantra 7x WMS controls the task execution.

7.4 Close Return Receipt

The closure of a return receipt is based on business rules that are specified for a warehouse. Receipts may be closed either automatically on expected quantity being received, as an end-of-day process, or when putaway process is complete. Closure can also be initiated manually from the console.

The closure of a return receipt may be communicated to external systems. The closure of an return is initiated by external systems.

7.5 Receipt Visibility

Visibility to returns is provided through a console. The console is divided into search through the return as they are created, released and then received in a warehouse. This section refers to visibility provided to the receipt of a return in a warehouse. For more information about visibility provided for returns and its releases before receipt, see the *Yantra 7x Reverse Logistics User Guide*.

The combinations of attributes used to search for a return receipt are better illustrated through use cases or examples, which include:

- View all returns received from a buyer in the last 30 days

  Criteria used includes buyer, status and receipt date range

- View all returns where inspection is complete and for a particular disposition

  Criteria used include disposition code and check 'Inspection Completed'

- View if a particular serial number was returned

  Criteria used include serial number

- View the return associated with a particular LPN

  Criteria used include Case ID or Pallet ID

8

Value-Added Services

Value-Added Services (VAS) are performed to meet customer demands. They can be activities performed on a product before the product is delivered to the customer, or a provided service that is performed at the customer site.

Activities can be performed at all types of facilities including manufacturing facilities and flow-through or distribution centers. Some examples of VAS done at the vendor site are:

- A vendor applies a LPN label on a carton based on the manufacturer's specification.

- A manufacturer applies price ticket or SKU labels based on the requirements of a retailer.

- A warehouse builds a pallet using customer requirements.

- A warehouse applies security tags on a class of items before shipping to certain retailers.

- A warehouse assembles components and builds a kit before shipping.

Provided services are usually purchased by the customer for an additional fee. Some examples of activities that are offered as a provided service are:

- Installing a customer's home theater system.

- Providing maintenance to a furnace as part of a service contract.

- Installing software on a new computer, and configuring the computer to work on a home network.

8.1 Using Value-Added Services

Some examples of how value added services are used within the manufacturing, vendor, or shipping facilities are:

- **VAS for stocking** — a facility performs the VAS operations for stocking periodically on the basis of expected demand for a product. For example, a warehouse ships pens, pencils and erasers separately. In addition, that warehouse may also ship a student package, which consists of 2 pens, 2 pencils and an eraser.

- **VAS for a customer** — this type of VAS operation is performed to meet specific customer requirements, such as special ticketing or security tagging. Yantra 7x allows customizing of inventory for the buyer at a node and ensures allocation to that customer. This scenario is referred to as **made-to-customer**, or **buyer compliance**. The customer usually makes repeated purchases of these specialized items. This type of VAS is performed in a warehouse based on the demand forecast to reduce order cycle time.

- **VAS for an order** — this is applicable when:

  - A customer selects a customization when ordering an item, like monogam on a shirt. Yantra 7x creates a work order to perform these services in a warehouse and ensures that inventory is allocated only to that order. This is also referred to as **made-to-order**.

  - A customer orders a dynamic physical kit and selects the required components for that item. Yantra 7x creates a work order to assemble the kit and ensures that inventory of the assembled unit is allocated only to that order. This is also referred to as **Built to Order**, or **made-to-order**.

  - Inbound shipments that require packaging. Parts received that require packaging to a specified unit of measure.

- **Breaking kits or Dekitting** — this is performed on kits in inventory that are not required anymore. For example, inventory leftover from a seasonal promotion may be dekitted and the components can be used in other kits or sold individually.

- **Unit of Measure (UOM) Conversions** — a warehouse may create a work order to convert inventory from one UOM to another. For example, a warehouse may track inventory of screws individually as

well as in packs of 50. A work order is created to convert single inventory units to packs of 50.

8.2 Postponing Item Creation

One approach to providing Value-Added Services at the warehouse or other facility is to delay customization processes until an order is received. This is referred to as 'postponement'. An example of a postponement process is shown in the figure Figure 8–1, "Postponement Process". The warehouse stores generic product awaiting the customer demand to customize the product. After receiving an order, additional services are performed on the generic inventory to convert the generic inventory into customer requested specific inventory. This increases the order cycle time while reducing the risk of unusable inventory.

Figure 8–1   Postponement Process
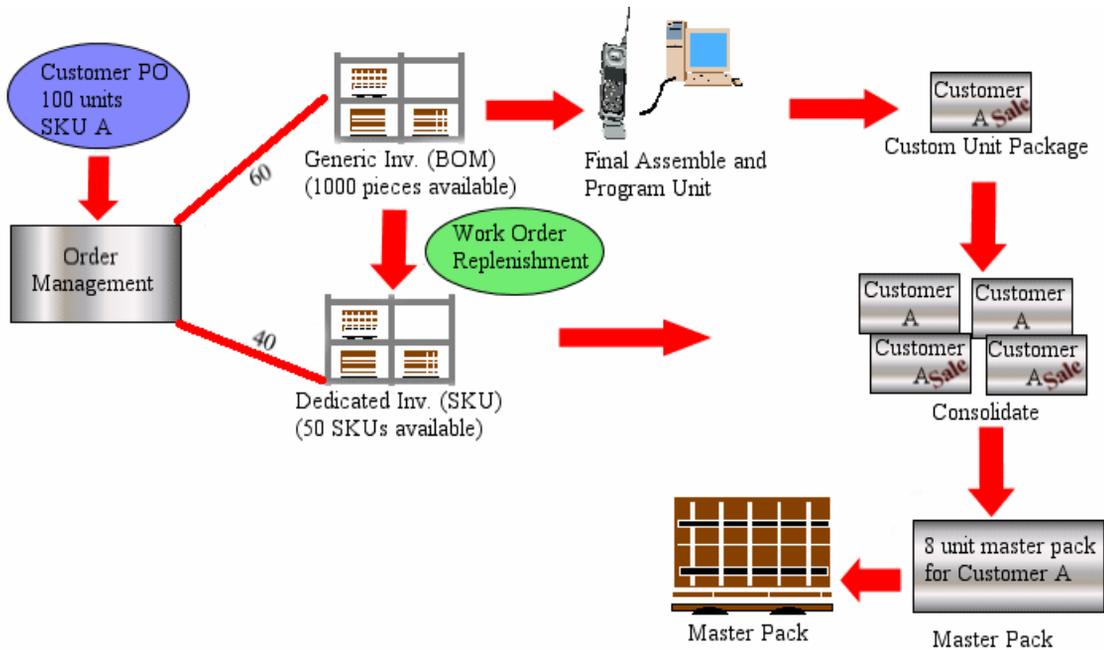
In Yantra 7x, Value-added services are executed by creating a work order. A work order is initiated automatically based on a demand, or

manually by a user. Yantra 7x manages the execution of a work order through retrieval of inventory to the VAS department, recording of completion towards the final inventory, and putaway of the product to appropriate departments.

8.3 Work Order Creation

A work order in Yantra 7x captures the activity required to perform a service. A work order is created in Yantra 7x by one of the following methods:

- Manual creation - a user initiates a request using the Work Order Console for repackaging, UOM conversions, labeling, or dekitting.

- Automatic creation based on Inventory levels - a request is issued by the inventory monitor in Yantra 7x upon minimum or maximum levels being reached for a SKU.

- Automatic creation based on an order - a request issued by a sales order for an item on the order. This typically occurs for **made-to-order** or **made-to-customer** items.

When a work order is created, it consists of one or more of the following types of services:

- Kitting Service - assembling components for a kit item

- Dekitting Service - disassembling a kit item. This may be done to acquire an individual component to complete another order.

- Compliance Service - Value-added services that should be performed to supply an item to a specific buyer for **made-to-customer** orders.

- Inventory Change - converting inventory from one UOM to another.

- Provided Service - service executed at a customer site.

- Delivery Service - service executed for product delivery to the customer site.

One or more services can be included in a work order, and have a sequence number assigned which indicates the order in which they should be performed. Each service can contain one or more service activities, which specifies the category of activity, such as Assemble Components, Apply Logos, or Pack Components. Provided Services are not combined with other services.

8.4 Work Order Hold Type

Yantra 7x WMS provides the ability to put work orders on multiple types of hold and manage them. An extensive search capability into work orders that are put on hold is provided. Visibility into a detailed history of all holds that were ever put on a work order is provided.

8.5 Work Order Execution

Yantra 7x WMS allows a warehouse to select a group of work orders based on the work order attributes and release them for execution.

A work order may have one or more activities representing each step of physical work to be executed in a warehouse. For example, a work order for cell phone assembly involves placing of components into a unit box, actually assembly of components, frequency programming and testing.

Yantra 7x WMS assigns specific VAS stations to each activity in the work order where VAS is performed based on the product. A cell phone assembly process differs from that of a radio assembly.

Yantra 7x WMS retrieval algorithms are used to release the work order. Partial allocation of a work order is also permitted awaiting complete release at a later date or time. The algorithm used determines the optimal retrieval locations based on the quantities requested and the closeness to the VAS station. Inventory is retrieved to the VAS station. Components are retrieved using Mobile Terminal, batch sheets or by integrating with MHE.

Yantra 7x WMS triggers replenishment tasks for the forward pick locations, considering the demand placed during the VAS retrieval process and the minimum levels for a SKU at the location.

Yantra 7x WMS Task Management creates and manages all tasks related to VAS component retrieval. Yantra 7x WMS uniquely tracks inventory that has been allocated to a work order. This allows complete visibility and control over the execution or cancellation of a work order or its tasks.

8.6 Work Order Activity Confirmation

A user confirms activities on a work order as per the BOM. The confirmation is a multiple step or a single step process. Yantra 7x WMS

allows service items to be associated with a work order. Each service item represents activities to be performed for the service. The work order confirmation is done either at an activity level or at the complete work order level. For example, first retrieve the boxes and the individual phones to place them in boxes. Frequency programming is done as a second step by a different group of users.

Yantra 7x WMS displays all instructions (text and graphics) for the activity to be performed on the work order.

A case or a pallet LPN can be associated with the confirmation of an activity. This allows movement of product from one VAS station to another for subsequent activity. New serial numbers can be associated to the product during confirmation. Labels can be generated and applied to the product as required during the VAS operation.

Inventory is created for the parent SKU in the activity location. If a work order has components, the component inventory will be consumed.

The work order status indicates the pending activity. Yantra 7x WMS productivity tracks information related to work order at the activity completion level.

8.7 Putaway

Yantra 7x WMS putaway algorithms are initiated either automatically upon work order completion or manually by the VAS department.

For work orders that are related to a sales order, putaway is performed to the appropriate packing or shipping area. For SKUs that are for future orders in a "Made to Order," are putaway to storage area for later retrieval.

For a build-to-stock work order, putaway is suggested to the appropriate storage areas.

For more information about putaway algorithm, see Section 2.5.1, "Putaway Algorithm" on page 35.

8.8 Visibility

Yantra 7x WMS provides work order visibility at a granular level. A work order consists of parent SKU, component SKUs and other attributes. The

combinations of these attributes are illustrated through the following use cases and examples:

- View the status of all dekitting work orders for a particular shipment

  Criteria used include node, enterprise, and service item group.

- View the status of the special ticketing work order for a case or pallet

  Criteria used include node, enterprise, case or pallet LPN and service item group.

- View all work orders awaiting release and due to start later today

  Criteria used include node, enterprise, status range and start no earlier than date and/or time

- View all open work orders that have 'cut paper' activity pending at VAS station one

  Criteria used include node, enterprise, activity code and location

9

Outbound Planning

The productivity of a warehouse is measured in terms of its efficiency, inventory accuracy and order turnaround time. Order turnaround time is a critical factor in measuring customer satisfaction. It is critical for a system to mirror a warehouse process through each individual process at an order line level. The diverse nature of the operation ensures the need to simplify each process and automate the activities as desired.

Outbound planning decisions include:

- What orders do I consolidate?

- What is the most efficient shipping route that meets my customer's compliance and shipment specific requirements?

- What is the pick strategy that I would use to pick SKUs based on demand and my warehouse layout?

- What is the optimal set of locations that I would like to pick from to fulfill the demand?

- What are the constraints for containerization of outbound packages?

- How should I group by shipments for maximum efficiency?

- How do I restrict the number of parallel activities that are created on the system?

- How can I achieve this in a cost-effective and automated manner, with minimal intervention?

- How can I keep track of what is happening at a warehouse level? Simultaneously, how can I view at a granular level across all the activities above?

- Each warehouse in my network has physical constraints, how can I plan my outbound shipments accordingly?
- How can I view, manage and monitor activities across all my warehouses?

Yantra 7x WMS provides a complete solution to all outbound planning activities. The abilities are configurable at a warehouse level allowing for unique process definitions for a warehouse. Yantra 7x WMS is a networked WMS solution that provides visibility across all warehouses in the supply chain. Figure 9–1, "Outbound Planning Process" on page 92 represents the outbound planning process provided in Yantra 7x WMS.

Figure 9–1   Outbound Planning Process
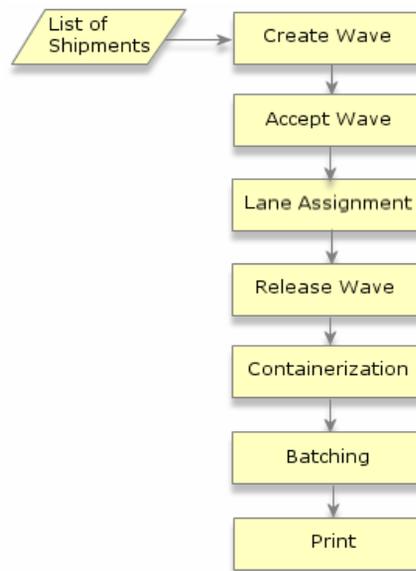
Yantra WMS allows optimization of pick, pack and ship processes for shipments utilizing the attributes and constraints at a warehouse, shipment and item level.

The ability to specify each of the constraints at a warehouse level allows each warehouse to plan its optimization individually.

The following should be taken into consideration during the outbound planning phase:

- Grouping and Prioritization

- Accepting Waves

- Lane Assignments

- Releasing Waves

- Containerization

- Batching

- Printing Documents for a Wave

9.1 Grouping and Prioritization

Yantra 7x WMS provides shipment selectors that groups shipments of similar attributes. A shipment selector consists of shipment item attributes used to distinguish and group shipments. A shipment group defined can have multiple shipment selectors assigned to it. For example, an emergency shipment group has shipments with Priority Code as 'E' or shipments expected to ship in four hours from now.

Shipment selector criteria includes:

- Shipment attributes including document type, Enterprise, priority, order type, shipment value, Buyer, and receiving node.

- Delivery attributes including mode and type of shipment, SCAC, and service.

- Ship to attributes including country and zip code (postal code).

- Turnaround time attributes including request ship date and cancel dates.

- Item classifications. For example, a heavy item in Electronics or a hazardous item in Chemicals.

A shipment selector is a combination of all defined attributes. For example, the 'Urgent Orders' shipment selector includes attributes such as order type, priority code, and requested ship date.

A shipment selector's ability to filter appropriate shipments for a customer or for an item classification is utilized to optimize the processes

in a warehouse. For example, a warehouse may have a special group for its largest customer or for the most stringent customer or carrier.

Order releases are combined into shipments by either Yantra Logistics Management or by an external system.

A shipment group also considers physical constraints specified at a warehouse level or at the group level for a shipment. For example:

- A warehouse that uses an outbound conveyor with chutes has a limitation on the total number of chutes used

- The number of locations in the 'put to light' system

These constraints applied to each shipment are rolled up to a shipment group level in order to limit the number of shipments released together. A wave is created based on the defined constraints.

9.1.1 Waves

A wave is an aggregation of picks across zones and orders that are consolidated to optimize pick and prioritize shipment. Wave planning is very effective in high volume pick or pack environments as it optimizes the labor costs. For low volume pick and pack warehouses (stores, stockrooms or low volume of orders), support customer pick-up or for one-off shipments (urgent orders), it may be more effective to release shipments individually rather than group into waves.

The demand at a wave level for a shipment is grouped and is further broken into the method of pick to be employed using Pick Strategy, and where to pick the inventory using Pick Location Assignment. Containerization process is also applied, if necessary, considering customer and SKU specific constraints.

It is important in a warehouse to manage the total work issued on the system at any given time. Yantra 7x WMS allows control over the number of waves picked in parallel at a shipment group level. For example, a warehouse having 5 pre-defined shipment groups can ensure that each shipment group releases and picks only one wave by setting the values to 1 at a shipment group level.

9.2 Accepting Waves

Waves that are created can be released automatically or manually. Some warehouses may choose to monitor the waves that are created, and decide their manual release. This manual decision is called "accepting the wave". Shipments belonging to waves that are not accepted would be considered for inclusion into new waves.

The acceptance of a wave in Yantra 7x WMS can be automatically or conditionally accepted based on constraints such as volume, weight constraints or configured to be always accepted non-conditionally depending on shipment group configuration. Also, you can accept a wave manually.

9.3 Lane Assignments

Lane assignment is typically used in warehouses that have either large number of shipments or carriers being used every day. Sorters may be employed to improve the flow-through of containers for these shipments after they are picked and packed.

Shipments are sorted either by carrier or shipments. However, shipments are first sorted by carrier to ensure that all shipments being shipped by a particular carrier are kept together to aid loading of a carrier's truck when it arrives. Then, shipments are sorted by shipments to ensure that shipments being picked from multiple zones in a warehouse are consolidated before shipping the shipment. In the case of LTL or TL shipments, shipments are sorted into pallets by scanning the containers. To aid this sorting process, Yantra 7x WMS assigns lanes to each shipment. depicts a typical lane assignment in Yantra 7x WMS.

Figure 9–2   Lane or Route Assignment
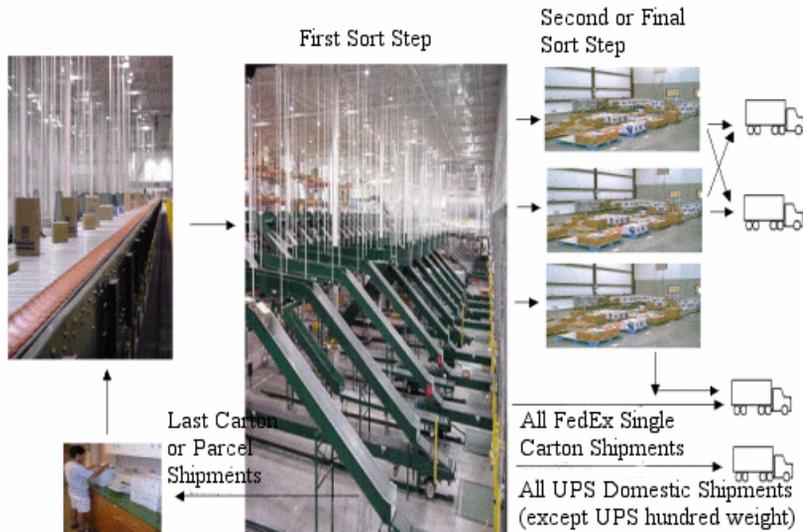
9.4 Releasing Waves

A warehouse also specifies the release time for waves. For example, a shipment group specified for a customer specifying a particular 'day of the week', because the delivery date requires waves to be released on a specific day. The release schedule considers waves that have been accepted for release.

Shipments that do not have sufficient inventory will be removed from a wave. For shipments that require segmented inventory, Yantra 7x WMS automatically checks released work orders for excess inventory that may be available, and creates a work order for the remaining quantity, if necessary, to create segmented inventory to fulfill the shipment.

Based on the demand, Yantra 7x WMS Release Wave searches for inventory at a wave level in specific zones, and creates pick tasks for available inventory.

9.4.1 Buyer Compliance

A buyer organization may choose to use units of measure defined in the buyer's catalog. In such a situation, at the time of picking it is ensured that products are picked in UOMs supported by the buyer organization. To achieve this, UOMs from the buyer's catalog is compared with the enterprise's catalog. Yantra 7x WMS ensures that the UOMs defined in both the catalogs and with same quantities are considered for picking.

9.4.2 Over-Packing

Yantra 7x WMS considers over-pack when UOMs defined in the buyer's catalog are not used. In such case, multiple smaller containers needs to be placed into a bigger container. However, this operation is optional and can be defined in the Pack Planning configuration at the node-enterprise level.

Yantra 7x WMS allows to perform over-pack on specific constraints like containerization, category, and volume. If UOM is not applicable for shipment line's containerization category (item classification for Containerization Category), Yantra 7x WMS considers only those UOMs defined in the enterprise's catalog for picking. However, if over-pack is applicable, UOMs whose volume is less than over-pack volume are not eliminated during the picking process. By doing this, Yantra 7x WMS ensures that the products are not picked in UOMs that require over-pack. The demand in these UOMs are picked as loose inventory, and therefore assists containerization in over-packing.

9.4.3 Pick Strategy Activities

Pick strategy is applied to each wave to determine the best process and locations to use for inventory picking.

Pick strategies consist of:

- Pick Processes
- Pick Location Assignment

9.4.3.1 Pick Processes

The common pick processes in the industry are as follows:

- **Order Picking**—in order-picking method, an order or shipment picker picks one order or shipment at a time in the assigned zones.

The picking tasks are sorted in the same sequence as the picking flow. The order picking method works well in operations with a small total number of orders and a high number of picks per order. Operations with low picks per order find the travel time excessive in order picking. Operations with large number of orders find that the congestion from many pickers working in the same area slows down the process.

- **Batch Picking**—in batch picking, multiple orders or shipments are grouped into batches. Constraints are defined at batch level for the zones, locations and the number of units. In operations with low picks per order, batch picking greatly reduces travel time by allowing the picker to make additional picks while in the same area. Since multiple orders are picked at the same time, systems and procedures will be required to prevent mixing of orders. In situations where same day shipping operations are critical, a balance between optimal batch picks and shipping requirements need to be achieved.

- **Item Picking**—a variation on zone picking and batch picking where rather than picking single order, items across orders or shipments are picked from different zones at the same time and brought to the sorting or staging location. These items are later sorted and consolidated into individual orders or shipments at the sorting or staging location. From the sorting or staging location, orders or shipments are moved to the respective pack locations for packing. Operations with low total number of items and moderate to high picks for each order and item may benefit from item picking.

Yantra 7x WMS allows pick processes to be determined based on item and shipment attributes. This allows constraints and controls to be specified at a warehouse level to handle seasonal or occasional peaks. The enhanced handling at a wave, shipment and item level allows usage of:

- 'Item Pick' process when demand at an item attribute level in a wave exceeds defined limits.

- 'Item Pick' process for items with certain attributes or shipment level attributes such as single-unit shipments.

- 'Order Pick' process for items with certain attributes or shipment level attributes, such as single unit or line shipments.

- 'Batch Pick' process for all regular and small orders. The ability to specify 'zone based pick' is part of the batching strategy in Yantra WMS.

The determination of pick process is based on demand, which removes the manual procedure required to handle end-of-month and end-of-quarter procedures.

9.4.3.2 Pick Location Assignment

Pick Location Assignment (PLA) assigns the warehouse location(s) to the demand placed. PLA is defined at a shipment group level and can be shared across multiple shipment groups.

PLA rules are defined at an item classification and UOM level. List of zones are specified for a combination of item level attributes, such as classifications and UOM. Multiple PLA rules may be specified to ensure that the zone level constraints are unique to the item classification and/or UOM combination. For example, for SKUs stocked in pallets, cases and loose units, it is advisable to have 3 distinct rules to cover zones that are applicable for each UOM.

The PLA algorithm checks for inventory in the zones that are configured for picking. Figure 9–3, "Pick Location Assignment for Item Pick PLA Rule" on page 101 illustrates the pick location assignment process for a zone configured for item picking. Figure 9–4, "Pick Location Assignment for Batch Pick and Order Pick PLA Rule" on page 102 illustrates the pick location assignment process for a zone configured for batch picking and order picking.

9.4.3.2.1 Locations with Inventory

Yantra 7x WMS while determining the optimal locations, also considers the order line attributes including a specific tag attributes that have been requested.

Yantra 7x WMS allows specifying zones where inventory exists, and utilization of dedicated and dynamic slots in these zones, if applicable. All zones are considered in equal priority, thereby honoring FIFO and ship by date.

Yantra 7x WMS assigns pick locations for a zone based on "Least Number of Trips" or "Pick-to-Clean" configuration. Yantra 7x WMS also ensures picking efficiency for a "Pick-to-Clean" configuration. The following example further explains this strategy:

Assume that there are 35 units to be picked for an item, and there are 4 locations with inventory in the zones configured. The zone does not have any constraint, such as 'inventory is stored in multiples of', then the inventory available at a location is as follows:

- Location-1: 40
- Location-2: 30
- Location-3: 20
- Location-4: 10
- Location-5: 5

In this scenario, Yantra 7x WMS chooses Location-1 for 'Least number of trips', and Location-2 and Location-5 for 'Pick-to-Clean'.

Assuming that Location-6 also exists having 35 units, then Yantra 7x WMS chooses Location-6 to pick inventory irrespective of 'Pick-to-Clean' or 'Least Number of Trips' configuration.

Figure 9–3   Pick Location Assignment for Item Pick PLA Rule
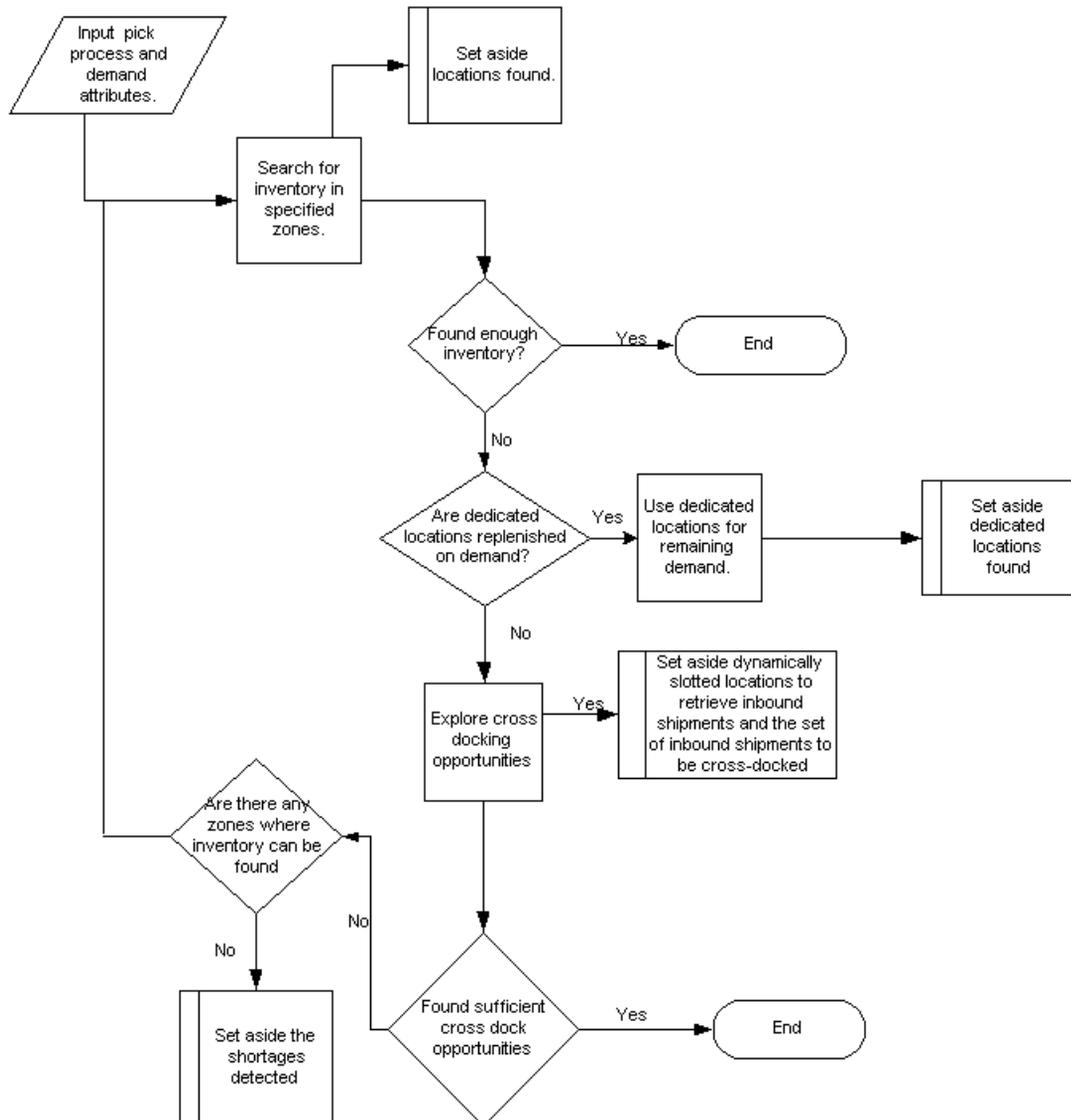
Figure 9–4   Pick Location Assignment for Batch Pick and Order Pick PLA Rule
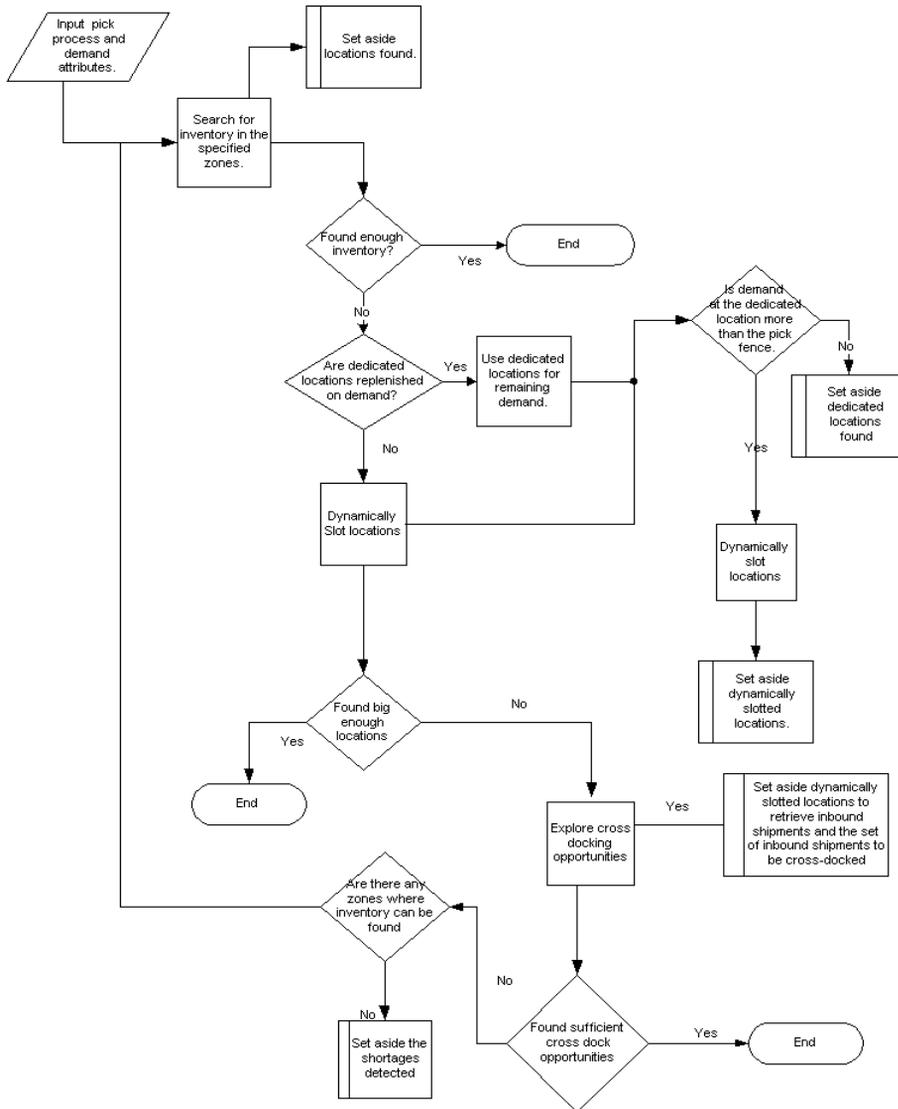
Yantra 7x WMS allows specifying the UOM for products stored at a given zone. If UOM is specified, Yantra 7x WMS ensures to pick the specified products in multiples of the specified UOM. This also holds good for LPNs that are non-standard. For example, if there is a demand for 25 units (1 case), and the item's pallet quantity is 100 and case quantity is 25, Yantra 7x WMS allows to pick cases from the pallet zone.

However, in a location, if 2 pallets are stored in the pallet zone, and the zone has a constraint of storing products in multiple cases, Yantra 7x WMS allows picking cases from the location. If the zone is configured to store products in multiples of pallet, Yantra 7x WMS does not allow picking either cases or pallets from the location.

NOTE: If a zone has specified split UOM constraint, the UOM should be defined for all items that are picked from the zone. If, for any item the UOM is not defined, locations having inventory more than the demand will not be suggested. A warning message "It is an invalid setup" appears and the location will be rejected.

9.4.3.2.2   Dedicated Locations

Yantra 7x WMS allows utilization of dedicated and dynamic slots in the zones specified, if applicable. If dedicated locations does not exist for the demand, locations are determined dynamically in the zones specified. However, if dedicated locations exist, they can be allocated for the remaining demand. Yantra 7x WMS ensures that sufficient inventory exist in bulk zones to replenish the dedicated/dynamic slot locations. Yantra 7x WMS allows creating a retrieval request for allocated demand to the dedicated locations. Dedicated locations that cannot be replenished for the entire demand results in PLA exception. Yantra 7x WMS allows applying zone constraints only when locations are determined dynamically. Yantra 7x WMS does not allow mixing of SKUs in dynamic slotted locations unless it is an infinite location.

9.4.3.2.3   Pick Fence Locations

During peak times for a SKU the dedicated and dynamic slot locations are too small to occupy the demand even at a wave level. In such situations, Yantra 7x WMS allows defining pick fence and its corresponding zone. The SKU quantity is deposited to the pick fence location (typically a floor location), where picking tasks are executed. Pick locations that are found results in PLA exception, and Yantra 7x WMS ensures that a retrieval request is created for the entire demand to

the pick locations. However, pick locations that cannot be replenished for the entire demand also results in PLA exception.

9.4.3.2.4 Cross Dock Locations

Yantra 7x WMS allows for inbound shipments at the warehouse to be considered as available inventory, after searching for inventory in other locations as explained in the pervious sections.

The task types that are assigned to each location are specified at a PLA rule level. This allows a warehouse to have a different task type for a pallet pick, case pick and loose pick, by utilizing the combination of UOM and zones. For more information about task types, see Chapter 6, "Task Management".

Yantra 7x WMS triggers demand based replenishment tasks for the forward pick locations, considering the demand placed during the PLA process and the inventory availability for a SKU at the location.

9.4.4 Replenishment

In a warehouse as product is removed from a location, the inventory in that location requires re-stocking. This process is called as replenishment. Demand based replenishment is initiated after PLA has specified the total demand placed for an item. A retrieval request is created by PLA for the demand.

The replenishment strategy is specified for a zone that requires replenishment. The zones to replenish from can be specified by the unit of measure that is required. For example, an active (loose) pick zone is replenished from case storage zone for UOM being EACH, while the case storage zone is replenished from the pallet zone when the unit of measure is CASE. Additional zones can be specified as secondary preferences in both these cases. During the process of replenishment, zone attributes such round-off level controls the optimal quantity suggested for replenishment. For example, in case storage zone the quantity to replenish can be rounded up to a case quantity for the item, while in a pallet zone, quantity to replenish can be rounded up to a pallet quantity for the item.

Yantra 7x WMS groups demand-based tasks based on the department requesting replenishment. For example, PLA for a wave creates both a

replenishment task and pick task. Typically, replenishment tasks are expected to precede pick tasks for a wave.

9.5 Containerization

Containerization is the process of using standardized containers for the storage and transport of loose units from a warehouse. The containers used for containerization are defined in Product Management.

If you pack during picking, the results of containerization are used during picking. If you pack after picking, the results of containerization are used during packing. When packing is performed it is specified as part of the task type configuration in pick planning. This decision affects the way in which containerization logic works. However, the parameters that govern the logic remain the same regardless of when packing is performed.

The following constraints are evaluated during containerization:

- Buyer specific constraints include:
    - Whether the container requires shipment container marking
    - The level at which shipment container markings are applied
    - Whether items can be mixed in a case based on different parameters, such as item ID, mark for address, unit of measure
    - Whether items can be mixed in a pallet based on different parameters, such as item ID, mark for address, unit of measure
- Warehouse/Enterprise specific constraints include:
    - Whether items can be mixed in a case based on different parameters, such as item ID, mark for address, unit of measure
    - Whether items can be mixed in a pallet based on different parameters, such as item ID, mark for address, unit of measure
    - Which containers can be used
    - Whether the container requires shipment container marking based on parcel and less-than truckload/truckload shipments
    - The level at which shipment container markings are applied based on parcel and less-than truckload/truckload shipments
- Container specific constraints include:

- The Buyer on the shipment line

- The shipment line item's containerization category

- The volume of the container that can be used

- The maximum weight the container can hold

- The quantity of a particular item the container can hold, based on item classification

In addition to the standard industry constraints, Yantra 7x WMS ensures that a container does not contain multiple shipments, task types, items requiring different value-added services, and container categories.

Yantra 7x WMS provides the initial containerization estimate to determine the pick strategy, which is recalculated during wave release in accordance with PLA.

A warehouse can also choose manual post-pick containerization. In this case a packer provides details about the shipment container chosen, and the items in the container. For example, warehouses that handle soft items defy regular area, volume calculations, like clothes that have a 'squish' ratio or warehouses that do not have standard packs defined or are in the process of establishing the same.

For more information about containerization, refer to the *Yantra 7x Warehouse Management System Configuration Guide*.

9.6 Batching

Activities or processes in a warehouse are executed on equipment that has their own size or quantity restrictions. The different activities in a warehouse include picking, retrieval for replenishment. The tasks are grouped into 'batches' of activities based on the equipment used to execute these tasks.

Batch pick is defined as picking of multiple tasks across shipments in one trip. A batch is picked either using equipment like carts or flatbeds or totes. Equipment constraints limit the number of units that is picked in one trip due to slots being defined in carts or physical limitations.

The different methods of batch pick include:

- Pick—This process involves picking of multiple shipments into a single tote. The picked quantity is deposited at a pack station where packing

slips or Mobile Terminal scanners are used to pack the individual shipments.

- Sort while pick—This process involves picking of quantity into specific totes determined by the system. Each tote represents either a shipment or carton in a shipment. The picked quantity can now be dropped off at a pack station at a tote level.

- Sort and pack while pick—This process involves picking of quantity into specific cartons placed in specific slots in a cart or flat bed. Each carton indicates the item and quantity that needs to be packed in it as well as the size of carton. The picked cartons can now be individually dropped at packing station where packing slip is applied and carton is closed.

The locations assigned for pick are also considered when building the optimal batch. The optimal batch is determined by calculating cost of picking using criteria including number of trips, number of locations visited and the number of aisles to be visited, to determine the batch that takes the least time. For more information about batch optimization, see Chapter 6, "Task Management".

Shipping Specific Serials

When a customer requests for shipments with serial numbers, Yantra 7x WMS creates Move Requests for such shipments and releases to the pack station.

9.7 Inducting a Tote

Yantra 7x WMS provides the ability to manually associate a tote to an outbound pick task reference, such as batch number, shipment number, and container SCM. All the inducted totes are put on a conveyer. A MHE diverts these totes to respective pick zones.

9.8 Printing Documents for a Wave

The operation of a warehouse requires numerous documents, be it labels or reports, to be printed daily. The printing of the documents is either initiated by the occurrence of specific events or requested ad-hoc by a user. Yantra 7x WMS provides necessary documentation to complete the outbound processes. Documents are printed either individually or in a set or group. A document set consists of multiple documents that relate to

individual activity that is performed. Yantra 7x WMS supports printing of standard documents for waves.

9.9 Visibility

Yantra 7x WMS provides comprehensive visibility to shipments and waves through consoles. The combinations of the attributes are better illustrated through the following use cases or examples:

- View waves status for priority UPS Shipments

  Criteria used include ship node, enterprise, status range and shipment group id representing priority UPS shipments

- View waves that are scheduled to release for tomorrow

  Criteria used include ship node, enterprise, status range and release no earlier than date and time

- View all shipments for a buyer that are included in wave expected to ship by tomorrow

  Criteria used include ship node, enterprise, buyer, select 'Shipment In Wave', select 'Enter Shipment Dates' to enter requested ship dates

- View all shipments that are on a specific trailer

  Criteria used include ship node, enterprise and trailer number.

- View all shipments that are picked or packed for a specific item that requires additional inspection

  Criteria used include ship node, enterprise, item and status.

- View all picklists that have been created today for a specific carrier

  Criteria used include ship node, carrier and picklist date range

- View all loose cases that belong to a specific shipment that are awaiting pick

  Criteria used include ship node, container type, select 'Loose Quantity', shipment number and status range

10

Outbound Execution

Outbound Execution covers the process from the point when pick tasks are released for an outbound shipment up to the point when the packages are loaded into trailers.

The seamless and flawless execution is an integral part of how reduced order turnaround time and inventory accuracy is achieved. The ability of a system to mirror the routing of inventory in order to comply with the customer and item requirements are the key to reduced turnaround time. Figure 10–1 illustrates the relationship between Order Pipeline, Shipment Pipeline, and Container Pipeline.

Figure 10–1   Order Shipment Container
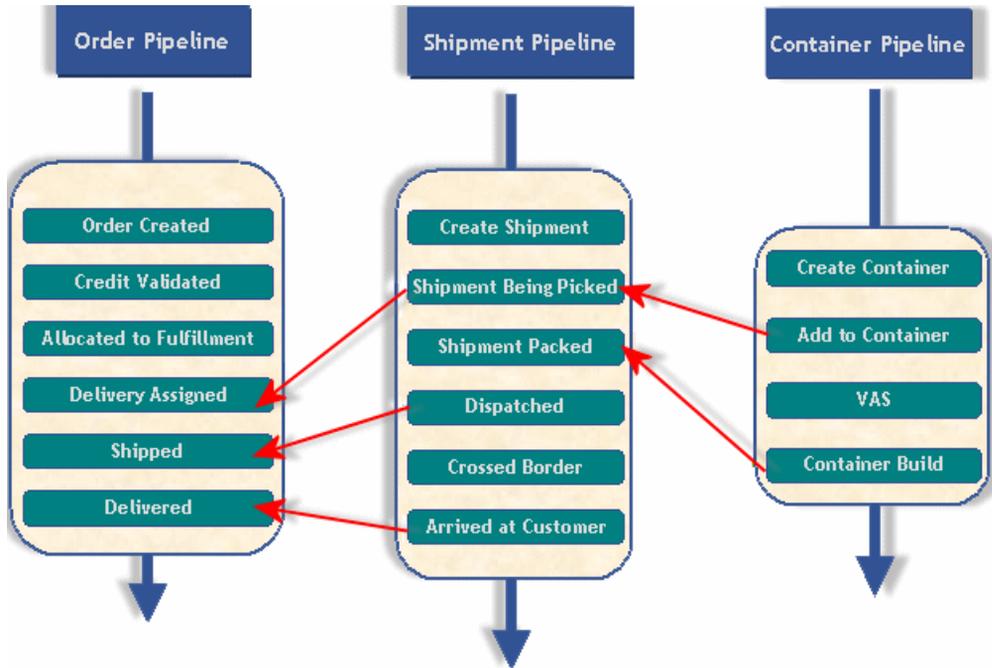
Shipment specific attributes further define the process to be followed during picking and packing. For example, shipments are loaded in stop-off fashion demanding that the picking and packing process be done in a certain sequence. LTL and TL require pallets to be built from individual containers. Parcel shipments are shipped at an individual carton or container level.

Shipments requiring additional VAS activity are routed through the appropriate departments. Items that require assembly referred to as 'physical kits' are also routed through the VAS department. VAS activities, such as customer specific labeling, monogramming, price ticketing and gift-wrapping deferred till the last minute are part of "postponement" strategies employed. The diverse nature of the VAS requirements enforces the need to track each individual process.

The complex and shipment specific nature of the processes enforces the need to have visibility to a shipment at a granular level.

Outbound execution in Yantra 7x WMS is a result of the strategies employed during the release of shipments. The flow of activity in a warehouse is modeled through business process configuration at a shipment attribute level in a warehouse.

An activity in a warehouse is modeled through a task type. Additional constraints are defined at a task type level to control the execution. Task Management manages and monitors all tasks. Shipment selectors that are defined allow a warehouse to group shipments by attributes including 'Pack & Hold' or 'VAS.'

A task is executed through Mobile Terminal, batch sheet or interfacing with appropriate MHE. Yantra 7x WMS allows the deployment of different pick strategies including "sort while pick," "pick and sort," "pick and pass" in a warehouse. Also, a warehouse can choose to have batch picking in the shelves, Mobile Terminal picking in bulk and put to light systems in active zones.

Picking, packing and shipping procedures also adhere to the compliance requirements at a customer, carrier level. Customs compliance is also enforced for international shipments. The requirements include appropriate labeling and documentation. The generation and printing of these documents is modeled through events in the business process configuration against a transaction. Yantra Event Management then dispatches these prints through Yantra Print Infrastructure.

Yantra 7x WMS business process configuration at both a shipment and container level allows quality control processes to be enforced. This improves the inventory accuracy of shipments, thereby improving customer satisfaction.

Parcel shipments are processed through a manifesting console. Yantra 7x Carrier Server (YCS) provides integration to carrier specific services including FedEx Ship Manager, Airborne Ship API, and other external carrier servers.

LTL and TL shipments require creation of BOL. Yantra 7x WMS provides the VICS standard BOL. Trailer manifests or Master BOL is also provided to carriers, if necessary.

Yantra 7x WMS provides complete control over the execution process at a granular level. A shipment can be monitored, managed and processed through consoles. Yantra 7x WMS provides complete control over modifications done at a shipment line level.

10.1 Picking

Picking tasks are executed by Mobile Terminal, batch sheet or by interfacing with a MHE.

During the pick process, appropriate instructions for pick and pack are provided to the user. Additional attributes such as serial numbers can be captured during the picking process. Pick strategy determines the method of pick for a SKU on the shipment. Pick strategies including "pick and sort", "sort while pick", "order pick", "pick and pass" and "zone based pick" are supported. For small products that are not received in standard cases, Yantra 7x WMS allows over-picking if the excess quantity picked does not exceed preset over-ship limits.

Users are assigned to specific task types and equipment associated with their skill set. The controls provided to a supervisor allow a shipment to be restricted to specific users and to the number of users who can work on the task. This allows a warehouse to leverage assets appropriately. For example, a warehouse where TL shipments are restricted to one or two users provides batch pick to a larger group of users.

Yantra 7x WMS always attempts to consolidate outbound pick tasks before suggesting to the user.

Ability is provided to a picker to record exceptions such as short picks at a location.

Yantra 7x WMS lets you pick, pack and ship more than the shipment line quantity, as long as the quantity picked is within the set tolerance limit.

Thus you can pick and pack more than the shipment line quantity. Over picking is allowed as long as the quantity picked (sum of the shipment line quantity and the over ship quantity) is within the set tolerance limit.

At the end of the picking process, the inventory is moved through drop-off locations to the next point in the route. After all pick tasks are completed for a wave, the wave status is appropriately updated.

Task management automatically assigns the next task to the picker based on business process configuration and priorities at a task type level. In the event, that a specific shipment requires to be moved to a higher priority, a supervisor uses the console to modify the priority manually. A user is assigned the task based on the priority. This reduces the need for a supervisor to call out or walk up to a user to indicate which shipment or task they need to work on.

10.2 Building a Cart

In earlier releases, you could build a cart only through printed batch sheets. Now, the Build Cart feature enables users to build carts using the Yantra 7x Mobile Application. Users can build cart by associating cart locations to a set of totes, cartons, or shipments. Each cart location can be associated to one or more totes, cartons, or shipments.

10.3 Inducting a Cart

Yantra 7x WMS allows inducting a cart by associating an existing batch with a cart. Based on the Cart ID you scanned, the system can also search for an open batch and associate the batch with the cart. After inducting a cart, users may pick inventory for the batch or induct a new cart.

10.4 Picking Inventory for a Cart

Yantra 7x WMS enables a warehouse to perform picking using the Yantra 7x Mobile Application. This feature allows a user to perform cart manifest picking using a cart that is built manually by the user or automatically inducting a cart to a batch created by the system using the batching algorithm of Yantra.

10.5 Outbound Value-Added Services

Yantra 7x WMS enables a warehouse to configure different VAS operations as part of outbound shipment. For more information about Yantra 7x WMS VAS operations, see Chapter 8, "Value-Added Services".

Inventory picked for shipments that require VAS processing is putaway to the VAS department. VAS processes are diverse based on the type of item being processed. For example:

- Gift-wrapping each individual package with a personalized card.
- Monogramming on garments.
- Grinding coffee seeds to the required grind level.
- Assembly of a mobile phone with the appropriate front panel.
- Frequency programming

VAS operations may also apply only to a single carton in the shipment. This type of VAS operation is customer based and not based on the item picked in the shipment. Examples include, inserting marketing materials, return labels or packets, or inserting packing list.

All VAS processes are recorded through a VAS Station. A station is associated with activities that can be performed. A work order is associated with multiple activities that may be confirmed individually.

The completion of the VAS activities automatically initiates the next step in the route. Visibility is provided at a shipment level for the VAS work order.

10.6 Packing Cartons and/or Pallets

Packing operations or confirmation is performed on completion of the picking and/or VAS operations at a SKU level.

Certain pick strategies including "sort while pick" and "pick and pass" combine packing activity along with the pick. The pack process in this scenario is closing of the carton after insertion of appropriate material.

The pack process in other pick strategies including "pick and sort" is performed at the completion of pick of the entire wave or shipment.

The packing process captures additional information like serial numbers, ship by date and weight. Serial number is captured during the pack process only if the warehouse does not capture serial number as an inventory attribute. Yantra 7x WMS automatically determines the weight of a container using the attributes at an item level and the corrugation weight. However, it is necessary for some warehouses to capture actual weight at a carton level.

The packing process ensures customer compliance. Packing is done into a container. Yantra 7x WMS supports the ability to assign a unique license plate number or a SCM label to a container. In addition, a container may go through further VAS operations to meet additional customer requirements. Instructions to the customer or carrier compliance requirements like pallet height restrictions and stacking restrictions are provided.

Documentation is provided during the packing step based on the customer compliance or as per business process configuration. For

example, customer compliance requirements to have packing list for each carton or only for the last carton.

The packing process for a Yantra 7x WMS containerized carton directs the user to pack contents of the cartons. Visibility is provided to a user to the expected contents of a carton. A warehouse that choose to manually pack cartons after the pick operation is referred to as 'post-pick containerization', which records the license plate number and contents being packed at stations. A packer is informed of completion of the container packing or of an exception immediately. In the manual packing process, a packer informs the system of completion.

Yantra 7x WMS also supports the feature of packing at a shipment level. A shipment is sorted into multiple pallets or cartons and unique license plate numbers or SCM labels are applied. The shipment is considered as packed upon user confirmation of the labels associated with it. However, the contents of each individual carton are not known.

A single item broken into multiple physical containers is also supported in this manner. For example, a table where the legs and individual table are physical shipped as two or more containers. Yantra 7x WMS ensures that the number of containers associated with the item is packed.

Freight charges for parcel shipments are placed at an individual container level. LTL and TL shipments are typically charged for their weight. Individual standard cases are placed along with other items into a larger carton or multiple cartons are shrink-wrapped together to optimize on the total charge for parcel shipments. This is referred to as "over-pack".

Quality processes to ensure picking and packing accuracy and customer compliance are enforced through business process configuration or through ad-hoc processes. The QC operator marks a container if the check fails.

Yantra 7x WMS provides procedures for directed building of pallets by associating an outbound pallet to the shipment. A packer indicates when a pallet is complete and associates a new pallet with the shipment. A packer is instructed to place a container for a shipment into the appropriate pallet.

The license plate or the SCM label associated to the pallet allows subsequent movements on the scan of the label, into the trailer or to the appropriate shipping lane.

A shipment container or pallet is passed through a manifesting station in the case of pallet shipments or to a shipping lane awaiting trailer loading.

Documentation required in the inside of a container or on the outside of a pallet or container is automated through the raising of appropriate events to the Print Infrastructure.

10.7 Pack and Hold

Yantra 7x WMS allows a warehouse to pick and pack shipments that are marked as 'Pack and Hold.' These pallets or cartons are putaway to appropriate locations for later retrieval.

Tasks are automatically created for a container based on the ship date attribute of a shipment.

Yantra 7x WMS also supports last minute modifications to indicate that a shipment must be put on 'Pack and Hold.' Yantra 7x WMS provides complete location level visibility to all containers of a shipment.

10.8 Shipping

A shipping in Yantra 7x WMS can be either LTL, TL, or Parcel shipments.

10.8.1 Dock Scheduling

The Dock Scheduling functionality of Yantra 7x WMS enables you to manage all dock locations in a warehouse for receiving inbound shipments and shipping outbound shipments. The dock scheduling rules enables the user to specify number of days in advance to take a dock appointment.

Yantra 7x WMS enables you to associate a dock schedule with a shipment or load. If scheduling is done for a shipment, then Yantra 7x WMS provides complete visibility into the shipment volume, weight, number of cartons available, and pallet information. Based on the Productivity Metrics (SAM definition), the duration of the appointment is also suggested.

Dock scheduling is based on the warehouse calendar associated with a dock and considers all working days and holidays, and shifts that are valid for receiving or shipping operations. Each dock can have its own calendar and shifts specified when they are available. You may also

exclude certain docks from the scheduling process. For example, a warehouse may allocate one dock for UPS fluid loading, which may require one full day. In this case, dock appointment is not required for UPS fluid loading.

Each appointment is assigned a unique reference number. The time slot assigned for each appointment may vary based on the shipment size. For example, the duration for one appointment could be for 30 minutes and another appointment could vary between 45 minutes to 1 hour. Appointments can be changed to a future date in case the delivery fails. Yantra 7x WMS creates alerts for such missed deliveries or pickups to ensure that new appointments are created. Yantra 7x WMS also enables the cancellation of appointments that are already taken.

Due to additional resource constraints, a warehouse may not want to take more than a certain number of appointments at a given time. For example, if 20 docks are available for taking appointments, a warehouse may not want to schedule all 20 docks from 10:00 AM to 11:00 AM, as it may not be possible for a warehouse to unload all 20 trucks at the same time.

Appointments can be taken only for the number of days specified in advance.

10.8.2 Less-Than-Truckload or Truckload Shipments

Typically, LTL and TL shipments are physically sorted into pallets at a carrier level.

For LTL carriers, Yantra 7x WMS can automatically generate PRO numbers.

Yantra 7x WMS provides a VICS compliant BOL for each shipment. Additional documentation for customs including commercial invoices and NAFTA ship by date documents can also be printed.

A shipment is marked as 'Shipped' upon confirmation at a BOL level or at a trailer level.

10.8.2.1 Trailer Loading

A load consists of a single shipment or multiple shipments. In TL and LTL shipments, it is critical to ensure that all pallets and containers are loaded into the correct trailer to ensure shipment accuracy and customer satisfaction.

A trailer manifest or Master BOL is printed for the load, if necessary.

Visibility is provided at a load, shipment and container level for a trailer indicating which containers have been loaded.

10.9 Manifesting

Yantra 7x WMS supports both LTL and Parcel Manifests. The following sections provides a brief description about both manifests.

10.9.1 Parcel Manifest

Parcel shipment containers are processed through the manifest station. Each container is associated with the appropriate carrier's manifest at the station. For parcel shipments, Yantra 7x WMS is capable of creating loads and load containers that can be manifested.

Yantra 7x WMS supports parcel manifest procedures for parcel carriers including UPS, FedEx and Airborne. Carrier specific requirements are automatically provided at the station. For example, FedEx requires that each container being added to the manifest to obtain a tracking number from its Ship Manager ® Server.

Yantra 7x WMS supports multiple billing options such as prepaid, collect and third party billing that are provided by the parcel carriers. International and domestic shipments are also supported. Special services for a carrier are also provided, which can be added or removed as needed.

Yantra 7x WMS is configured appropriately at a carrier or SCAC level, to pre-generate tracking numbers and labels.

A manifest station processes containers belonging to multiple carriers. However, physical requirements or printer type compliance forces a warehouse to have a dedicated station for specific carriers. Yantra 7x WMS also supports building of pallets for shipments to allow movements of containers at the pallet license plate level to the manifest station.

Integration is provided for in-line weighing scales, such as Mettler Toledo. Yantra 7x WMS allows a warehouse to integrate with weighing scales connected to the MHE devices. In such situations, weight of the package is recorded as and when the container is diverted through MHE. Manual entry of weight is also allowed.

A unique manifest number is assigned by Yantra 7x WMS or provided by the user. Parcel carriers provide tracking at both manifest level and individual container level.

Typically, containers are fluid-loaded into the parcel truck. Confirmation of a manifest as an end-of-day process confirms the individual cartons as 'Shipped.'

Shipments that are added to a manifest gets shipped on closing the manifest. Yantra 7x WMS supports Synchronous and Asynchronous closure of manifests, with the default being Synchronous closure. When manifests are closed synchronously, errors, if any are reported to the user on submitting the closure request. However, when closed Asynchronously, the user would need to check for alerts/errors in the Alert Console. The manifest status "Closure Failed" indicates occurrence of errors while closing the manifest.

10.9.2 LTL Manifest

Similar to parcel manifesting, all parent containers in LTL shipments and loads can be manifested. Yantra 7x WMS provides the ability to include the entire load into a manifest, instead of manifesting individual containers. Upon confirming an LTL manifest, apart from LTL BOLs, a Trailer Manifest for all loads included in the manifest gets printed.

10.10 Exceptions in Outbound Execution

The activities during pick, pack, VAS and ship are dependent on the inventory available at each step. Typically, exceptions that occur in a warehouse include short picks, customer requests for cancellation of entire order or part of order. Modifications of carrier assigned, rebuild of pallets or re-containerization at a shipment level are also allowed.

In the case of a short pick, the picker requests for an alternate location. Yantra 7x WMS automatically records a discrepancy against the location. If inventory is not found, the carton is marked as short pick and the shipment requires resolution after interaction with the customer.

A customer requests to modify an order or place an order on credit hold. The shipment corresponding on the order requires to be stopped. If necessary, the shipment needs to be cancelled. Yantra 7x WMS facilitates this process by allowing moving of this carton into a problem area for resolution. Depending on the activities that have been completed on this

carton, the picking and packing are undone. Inventory is created in the problem resolution that is putaway based on the algorithm.

Yantra 7x WMS allows a problem container or pallet to be removed from the appropriate trailer or manifest before closing the manifest. At a shipment level carrier modification, re-containerization and re-building of pallets are allowed.

Cancellation of a wave automatically cancels the corresponding batches and tasks for all shipments.

Manual move request for putaway or retrieval is provided for ad-hoc moves of inventory into locations that have shortage.

Yantra 7x WMS enables you to move products that are already allocated. After moving the allocated products into the location, the system automatically cancels the corresponding putaway task for these products.

Yantra 7x WMS provides comprehensive visibility to shipment status. Audits are also provided at each step of the process to monitor user productivity and quick resolution.

10.11 Visibility

Yantra WMS provides comprehensive visibility to shipments, containers, waves through consoles. The combinations of the attributes are better illustrated through the following use cases or examples:

- View all shipments packed for a carrier

  Criteria used include ship node, enterprise, carrier and status.

- View all shipments that will not be shipped as expected due to bad weather

  Criteria used include ship node, enterprise, select 'Enter Shipment Dates' to enter today's date and status range.

- View all shipments that are part of a specific load

  Criteria used include ship node, enterprise and load number.

- View shipments for a LTL or TL shipments using attributes

  Criteria used include ship node, enterprise, shipment mode and BOL or PRO#, Trailer#.

- View shipments that are waiting for pickup

Criteria used include ship node, enterprise, delivery method and status range.

- View all containers that are packed and not manifested for a specific carrier

  Criteria used include ship node, select 'Un-manifested Containers Only' and status range

Index

A

advanced ship notice. See ASN
ASN (Advanced Ship Notice), 55

B

Batch
    automatic creation, 74
    creation, 74
    initiate pick, 76
    manual creation, 74
    muti-step execution, 76
    pick shipments, 106
    printing batch sheets, 75
    shipping specific serials, 107
    sort and pack while pick, 107
    Sort while pick, 107
Batch Picking, 98
Batch size, 73
batching
    definition, 73

C

Capacity Constraints, 38
closure of a return receipt, 82
compliance services, 86
Container Type
    case and pallet with unknown contents, 20
    multi-level LPN, 20
    single or multiple SKU pallet with LPN, 19
Container type

single or multiple SKU case with LPN, 17
    Single SKU case with inner packs, 18
Containerization
    definition, 105
Count
    count request visibility, 53
    count result visibility, 54
    definition, 50
    execute counts, 50
    execution, 52
    variance, 53
Count Execution
    count inventory real-time using mobile
        terminal, 52
    count inventory using paper, 52
count request, 52
count request visibility, 53
count results visibility, 54
Count Visibility, 53
Cross Dock Locations, 104

D

Dedicated Locations, 103
dekitting services, 86
delivery services, 86
disparate systems, 1
Disposition, 81
disposition, 81
Diversions
    item diversions, 61