

# S4601

## **Business Processes in SAP S/4HANA Supply Chain Execution**

### **PARTICIPANT HANDBOOK INSTRUCTOR-LED TRAINING**

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# Typographic Conventions

American English is the standard used in this handbook.

The following typographic conventions are also used.

This information is displayed in the instructor's presentation



Demonstration



Procedure



Warning or Caution



Hint



Related or Additional Information



Facilitated Discussion



User interface control

*Example text*

Window title

*Example text*



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# Course Overview

## TARGET AUDIENCE

This course is intended for the following audiences:

- Project Manager
- Project Stakeholder
- Application Consultant
- Support Consultant
- Super / Key / Power User
- Business Process Owner/Team Lead/Power User
- Enterprise Architect



# UNIT 1

# Supply Chain Execution in SAP S/4HANA

## Lesson 1

Positioning SAP S/4HANA

3

## Lesson 2

Positioning Warehouse Management

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## Lesson 3

Positioning Transportation Management

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## UNIT OBJECTIVES

- Position SAP S/4HANA
- Understand Supply Chain Management with SAP S/4HANA
- Differentiate between available warehouse management solutions
- Identify SAP Transportation Management solutions



# Unit 1

## Lesson 1

# Positioning SAP S/4HANA



## LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Position SAP S/4HANA
- Understand Supply Chain Management with SAP S/4HANA

## SAP S/4HANA

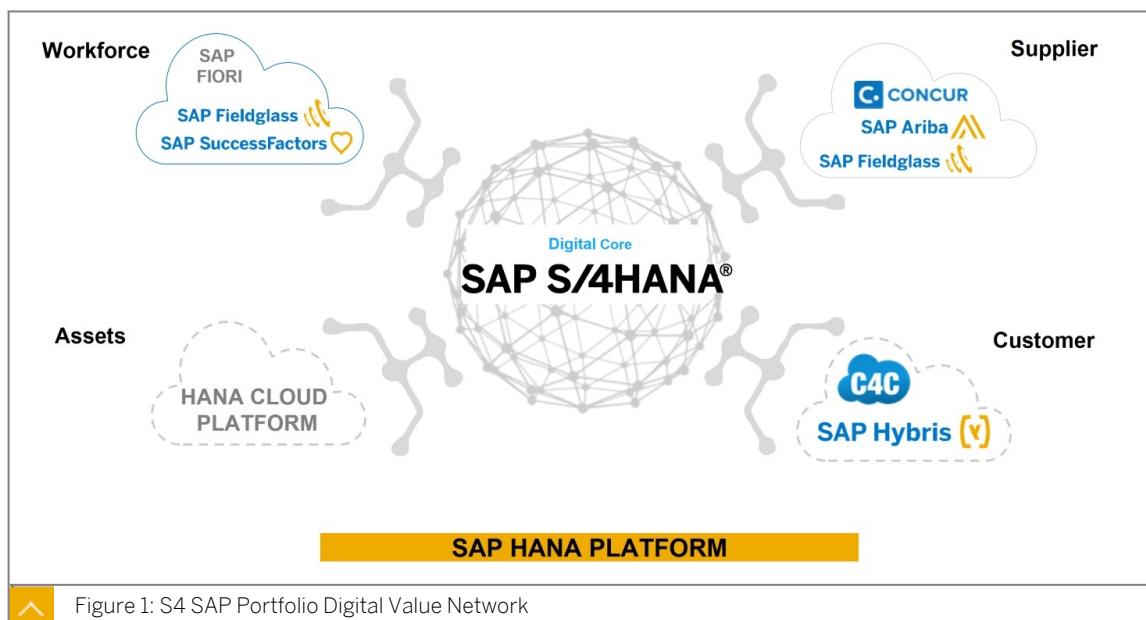


Figure 1: S4 SAP Portfolio Digital Value Network

With SAP S/4HANA, SAP is providing a new product that represents the next generation of business applications: simple enterprise software that is designed to help you run simple in the digital economy and supports you in dealing with challenges like integrating business data with big data outside of your company.

The SAP S/4HANA family is completely built on the in-memory platform SAP HANA. Using the (advanced) potential of the SAP HANA platform, SAP S/4HANA is designed for your digital business and it provides an instant insight into where your business currently stands by combining a single source of truth with dynamic planning and analysis capabilities and real-time process support. With the SAP Fiori user experience and a less complex data model, it is designed to run simple. In parallel, it reduces the data footprint of your company. SAP S/4HANA is also already connected to business networks and company-internal collaboration networks (for example, SAP Jam Collaboration) and it prepares you for the Internet of Things (IoT). All of these aspects protect your investment into SAP software by facilitating the next generation of business applications.

## SAP S/4HANA Suite

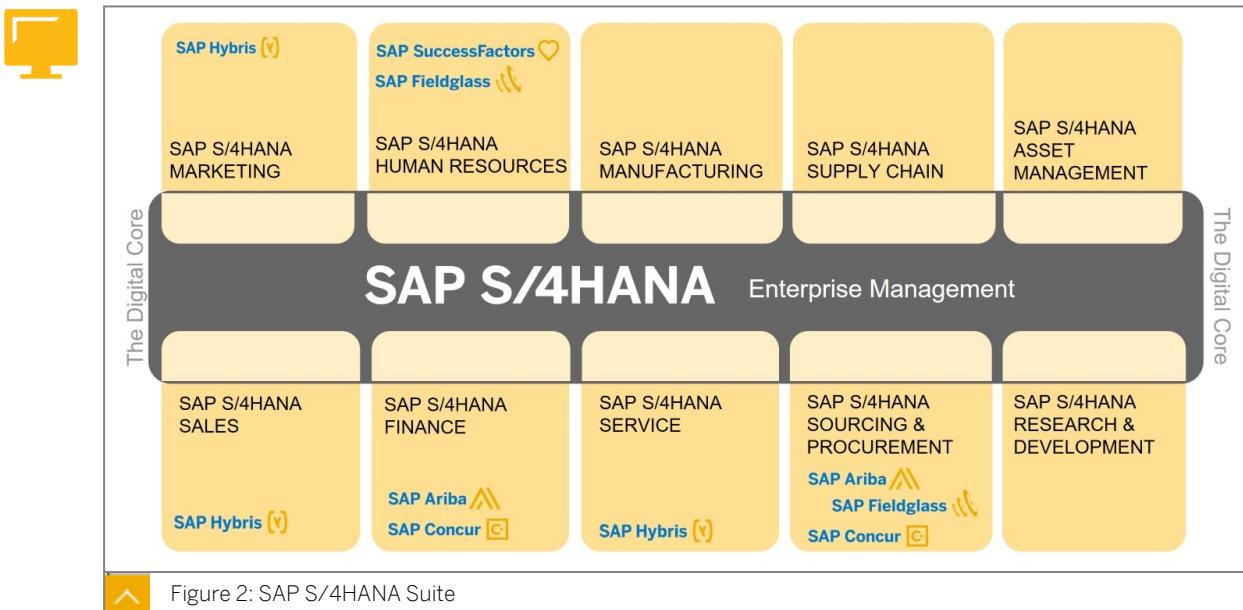


Figure 2: SAP S/4HANA Suite

SAP S/4HANA contains the following elements:

- SAP S/4HANA Enterprise Management:

SAP S/4HANA Enterprise Management is designed for enterprises across industries that need a deep and broad level of functionality combined with a high degree of flexibility in customization of the system. It has been built by simplifying the (data model of the) SAP ERP solution and re-integrating (and simplifying) parts of some SAP Business Suite products such as SAP SRM, SAP CRM and SAP SCM into this core. An example of this is embedded SAP Extended Warehouse Management (embedded SAP EWM). SAP S/4HANA Enterprise Management is available as an on-premise solution, but also as a cloud solution. Licensing and subscription models are different for the different solutions. An example of this is the SAP S/4HANA 1909 on-premise version versus the SAP S/4HANA Cloud 2002 version of the system.

- SAP S/4HANA Line-of-Business (LoB) Products:

SAP S/4HANA Line-of-Business (LoB) Products enhance core functions of SAP S/4HANA Enterprise Management to provide additional business benefit for a specific line of business (LoB).

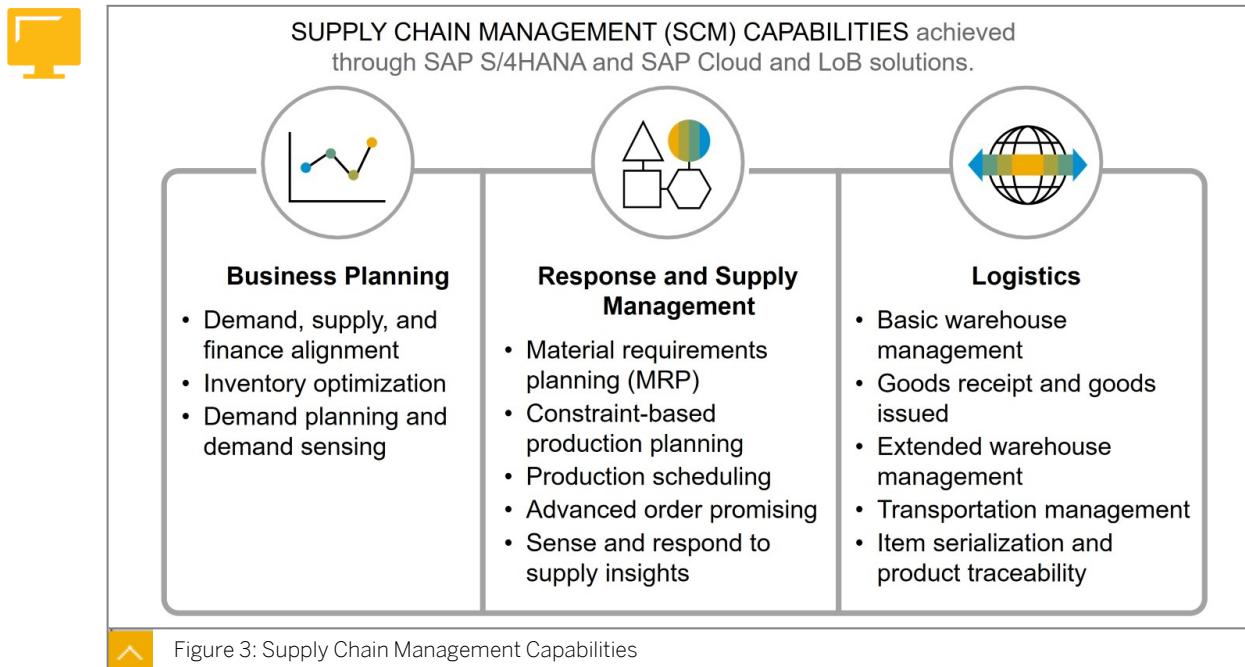
- SAP S/4HANA Line-of-Business (LoB) Products for specific industries:

SAP S/4HANA Line-of-Business (LoB) Products for specific industries enhance core functions of SAP S/4HANA Enterprise Management to provide industry specific business benefit for a line of business (LoB).

- SAP S/4HANA Compatibility Packs:

Through so called Compatibility Packages (CPs), SAP provides customers a limited use right to run certain classic SAP ERP solutions on SAP S/4HANA installations. These customers need to have licensed the applicable solutions as set forth in their License Agreements. Please note that the specific usage rights for SAP S/4HANA Compatibility Packs are set forth in the Software Use Rights Document.

## Supply Chain Management



SAP S/4HANA enables companies to integrate and visualize all supply chain processes from supplier to customer. Intelligence can also be embedded in these processes. Digital supply chain and mission-critical business processes are supported across the enterprise with one single source of live information. Some examples:

- Reduced Days of Inventory:

Live inventory management (using a redesigned data model in SAP S/4HANA) enables unlimited simultaneous material movements and allows for true transparency concerning inventory and material flows. It also provides improved materials planning with faster, more frequent material requirements planning (MRP) runs, multiple times a day if needed, with planning and rapid re-planning in minutes instead of hours to minimize inventory.

- Reduction in Revenue Loss Due to Fulfillment Issues:

SAP S/4HANA enables intelligent, real-time product availability checks for sales, planned, and production orders. It includes scalable ATP checks for managing large production and transaction volumes and flexible allocation management capabilities. It provides back-order processing with intuitive priority classification and interactive exception handling.

- Reduced Overall Supply Chain Planning Costs:

SAP S/4HANA is suited for collaborative sales and operations planning (S&OP) in conjunction with SAP Integrated Business Planning (IBP), including “what if” and scenario planning to maximize the potential of market demand. It does this by providing the best service at the lowest costs. Manufacturing costs are reduced with detailed constrained planning and scheduling, enabling agility and efficient use of capacity.

- Improved Supply Chain Planning, increasing Productivity:

Supply chain planning productivity is enhanced through easy-to-use Microsoft Excel and analytics-based planning interfaces in conjunction with SAP Integrated Business Planning

(IBP). This helps production and material planners to execute critical daily tasks with embedded decision support analytics and SAP Fiori (role-based) user interface applications.

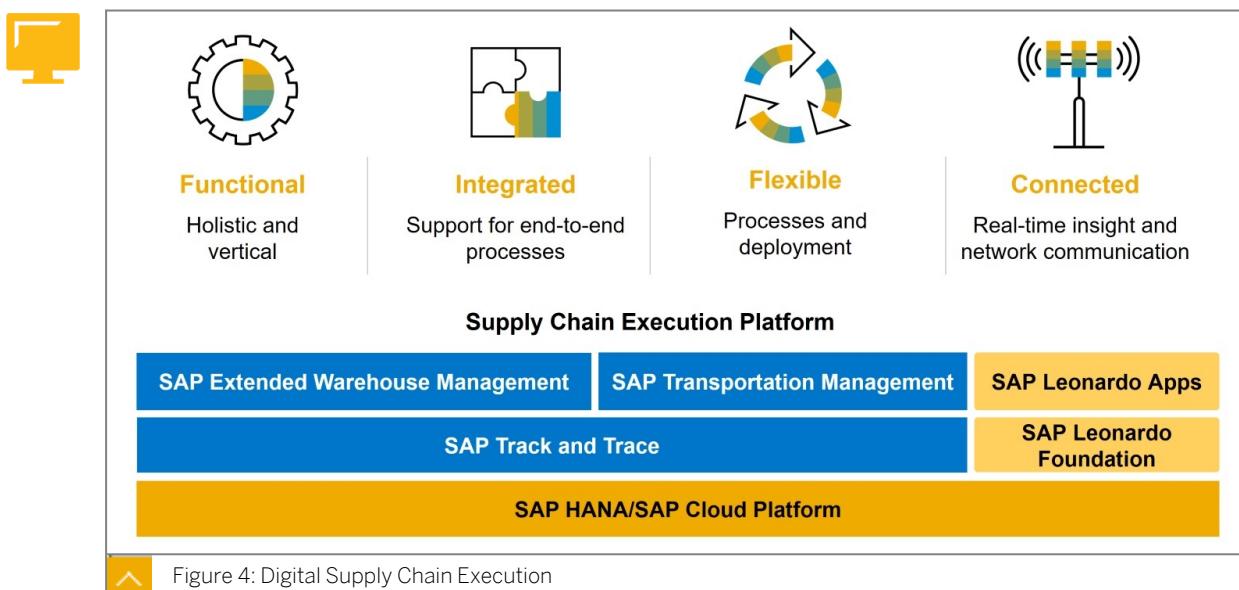
- Reduced TCO Through Landscape Simplification:

SAP S/4HANA aims to simplify a customer's system landscape. Better business outcomes are achieved with reduced operational cost when simplifying the system landscape.

Redesigned data structures and embedded solutions in SAP S/4HANA result in fewer systems and interfaces. Examples: embedded SAP Extended Warehouse Management (embedded SAP EWM), embedded Production Planning and Detailed Scheduling (PP/DS).

### Digital Supply Chain Execution

The core functionality provided by SAP S/4HANA can be extended with other (sometimes cloud based) SAP products, to support the complete logistics network of a company.



Examples of additional SAP products that support the complete supply chain are:

- SAP Global Batch Traceability:

SAP Global Batch Traceability (SAP GBT) supports a company to trace the complete production network and the product distribution of a batch. From the origin of the raw materials throughout various stages of the production process and the internal and external distribution. Tracked objects (i.e. a batch of a product) can be traced completely across both SAP systems and non-SAP systems.

- SAP Global Track and Trace:

The aim of SAP Global Track and Trace is to capture, process and store tracking information about tracked business processes. This allows business users to get real-time transparency of the execution of those processes. The users can query any tracked process and display its retrieved data from end to end.

- SAP Leonardo:

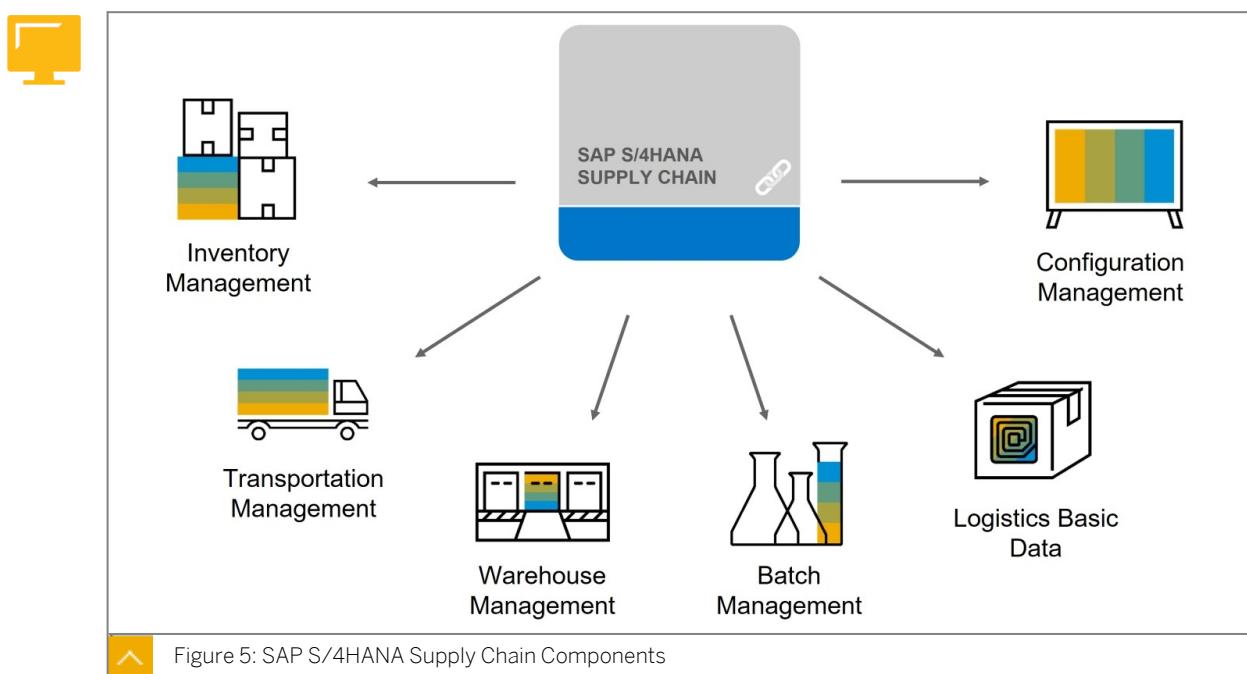
SAP Leonardo IoT Bridge is an adaptable cloud solution offering a central digital operations work environment, which correlates business processes with data from IoT (Internet of Things) applications and SAP enterprise applications.

- SAP Yard Logistics:

The SAP Yard Logistics solution provides check-in to check-out support for transportation units, focusing on planning, execution, yard operations, yard monitoring and billing processes within a yard.

### Supply Chain Management in SAP S/4HANA

Supply Chain Management in SAP S/4HANA consists of several individual components and functions. These functions are also used in other areas in SAP S/4HANA besides Supply Chain Management. Basic Data for logistics, for example, includes Material/Product Master Data, Business Partner Master Data and data to uniquely identify an item. Batch Management and Variant Configuration are also part of the area Logistics - General in SAP Supply Chain Management. Other topics that are part of Supply Chain Management are Inventory Management, Warehouse Management and Transportation Management.



When talking about Supply Chain Execution, the focus is on three specific topics: Warehouse Management, Transportation Management, and working with deliveries in general.

### SAP User Experience Strategy

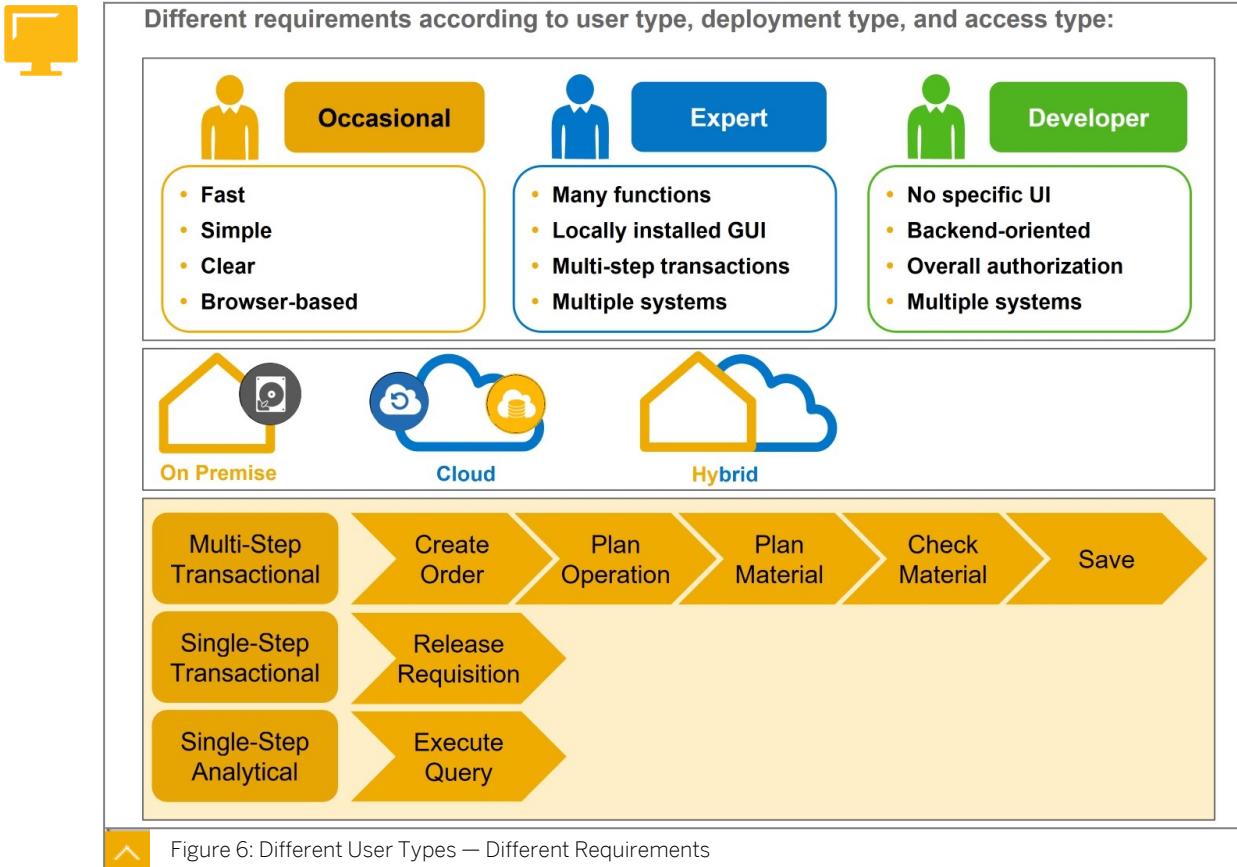
The use of mobile devices (smart-phones and tablets) to perform certain work tasks, is no longer reserved to a special group of experts. Ease of use is a very important characteristic for the end user of such a device. The focus of the user interface (UI) of the device is no longer maximum functionality, but rather a comfortable user experience and thus a focus on the consumer of the device.

With this in mind, the business software running behind the device must be adapted and transformed so that it supports the user interface (used within the business roles of an enterprise) to a maximum. In practice this means that SAP S/4HANA and SAP Fiori as its user interface go hand-in-hand, and should be developed hand-in-hand.

### Different User Types — Different Requirements

Depending on the industry in which a company operates and also depending on the company itself, various types of users can be identified. The types of users that can be found in a company are also influenced by other characteristics. Examples: the structure of the

company (how many and what areas of specialization are defined in the company), how is the IT department set-up and what choices do they make, the degree of digitization of the company, etc.



However, in almost every company, three basic types of users can be identified:

- The Occasional User

The Occasional User makes use of the system occasionally and therefore needs simple and easy-to-use applications. In many cases, single-step transactions are executed.

- The Expert (or Key User)

The Expert (or Key User) is a fully trained SAP user who knows the processes and the available applications in detail. This user often uses multiple systems and different user interfaces (UIs).

- The Developer or Programmer

The Developer or Programmer has detailed know-how in the area of system adaptations. They deal with the adaptation and extension of the existing applications. They look after several applications with often different UIs and develops extensions for these applications.

### SAP Fiori

SAP Fiori is a collection of apps, which is created based on a specific set of guidelines and rules and that can be started using the SAP Fiori Launchpad.

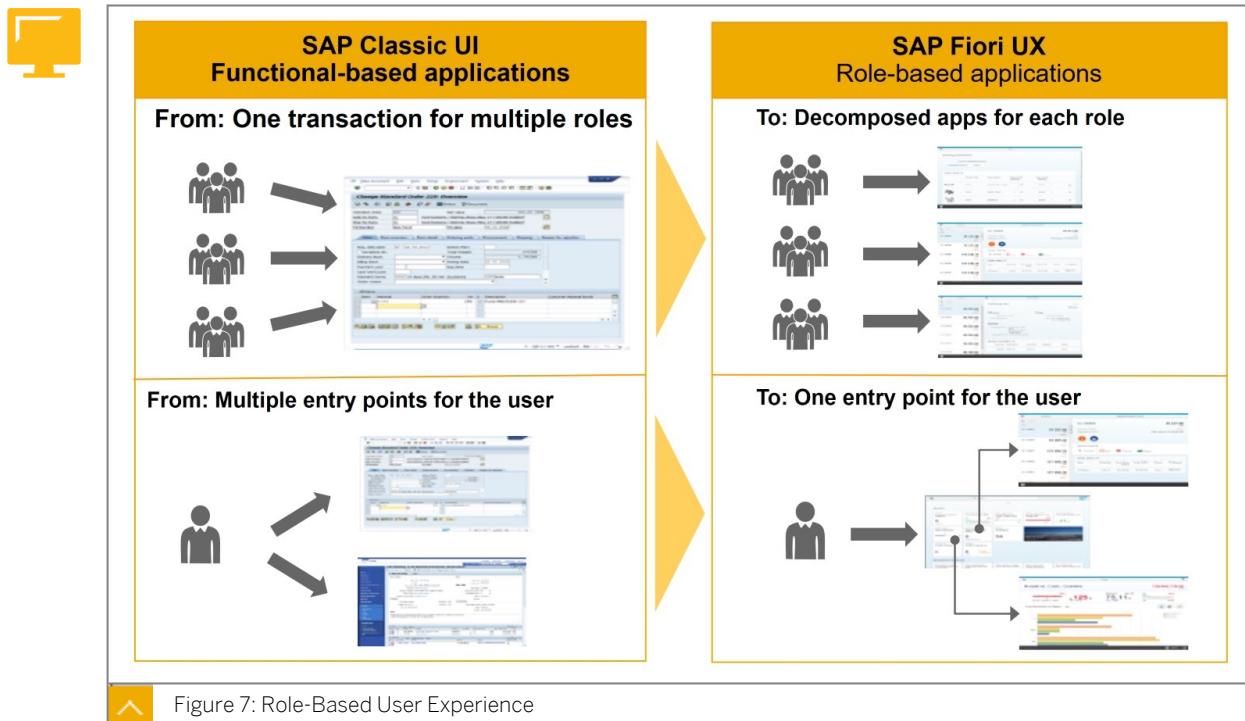


Figure 7: Role-Based User Experience

SAP Fiori is role-based. This means that an end user gets all the information and functions that they need for their daily work. No unnecessary information is presented to the user. The classic SAP User Interface (UI) works the other way around: often a single complex transaction is available, that is useful for many users in different business roles.



## LESSON SUMMARY

You should now be able to:

- Position SAP S/4HANA
- Understand Supply Chain Management with SAP S/4HANA



## Positioning Warehouse Management



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Differentiate between available warehouse management solutions

### Warehouse Management

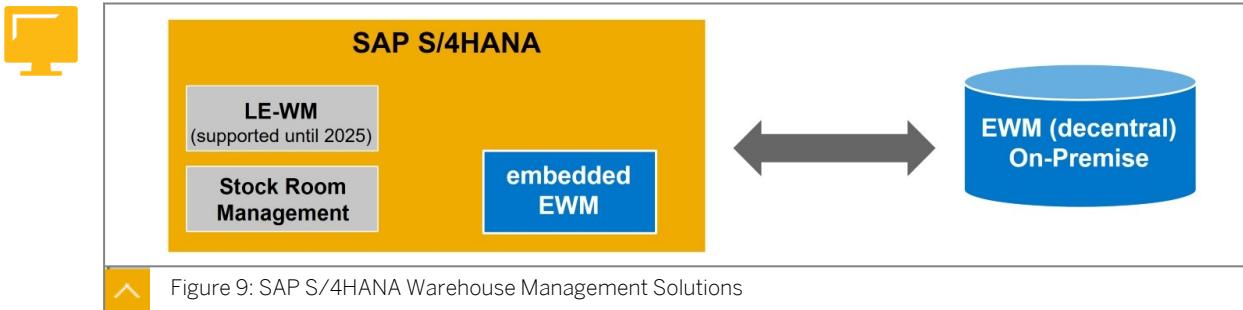


Figure 8: Warehouse Management

Managing stock happens on different levels in an enterprise. **Inventory Management** deals with the management of material stocks on a quantity and value basis. **Warehouse Management** allows you to map a warehouse complex with more details up to storage bin level. Not only do you gain an overview of the entire quantity of a material in the warehouse, you can also always determine exactly where a certain material currently is stored in your warehouse. With a warehouse management system you can optimize the use of all of your storage bins and resources and optimally plan warehouse movements.

### SAP S/4HANA Warehouse Solutions

SAP S/4HANA offers different solutions for warehouse management.



SAP S/4HANA offers different solutions for warehouse management: the classic Logistics Execution Warehouse Management (LE-WM) solution (from SAP ERP) can still be used and will be supported up until 2025. SAP Extended Warehouse Management (SAP EWM) can be used either as an embedded solution or decentrally. Starting from SAP S/4HANA release 1909, there is also a basic warehouse management solution available called Stock Room Management which is very similar to the SAP ERP Warehouse Management solution (LE-WM) but much more streamlined. For example: Task and Resource Management (TRM) is not supported in Stock Room Management.

### **Warehouse Management LE-WM**

The classic SAP ERP solution for warehouse management LE-WM is part of SAP S/4HANA through a Compatibility Package (CP). This provides customers with a limited use right which expires on December 31, 2025. The inclusion of LE-WM in SAP S/4HANA helps customers migrating from SAP ERP to SAP S/4HANA to start using some of the advanced features of SAP S/4HANA without having to also immediately migrate their warehouse management solution at the same time. For existing customers that do not require complex warehouse processing in their SAP S/4HANA system, with release 1909 of SAP S/4HANA a basic warehouse management solution has been introduced in SAP S/4HANA called Stock Room Management.

The solution LE-WM is not the target architecture in SAP S/4HANA for Warehouse Management. The target architecture is either Stock Room Management or SAP Extended Warehouse Management (SAP EWM) depending on customer needs. For details of Compatibility Packages see SAP Note 2269324 - Compatibility Scope Matrix for SAP S/4HANA on-premise.

### **Stock Room Management**

Stock Room Management is a specific offering within SAP S/4HANA for installed base customers to continue running a basic warehouse management implementation in the context of SAP S/4HANA beyond 2025. The license for Stock Room Management is included in the SAP S/4HANA Enterprise Management component.

The main reason for adding Stock Room Management to SAP S/4HANA is to give existing customers of LE-WM an opportunity to keep their existing LE-WM warehouses after 2025 that do not benefit immediately from moving to (embedded) SAP Extended Warehouse Management (SAP EWM).

Stock Room Management is relevant for small warehouses with manual operations that manage stocks on storage bin level. LE-WM features that are not supported in Stock Room Management include:

- Task and Resource Management (WM-TRM)
- Warehouse Control Unit interface (WM-LSR)
- Value Added Service (WM-VAS)

- Yard Management (WM-YM)
- Cross-Docking (WM-CD)
- Wave Management (WM-TFM-CP)
- Decentral WM (WM-DWM)

### SAP Extended Warehouse Management (SAP EWM)

SAP EWM offers flexible, automated support for processing various goods movements and for managing stocks in a warehouse complex. The system supports planned and efficient processing of all logistics processes in a warehouse.

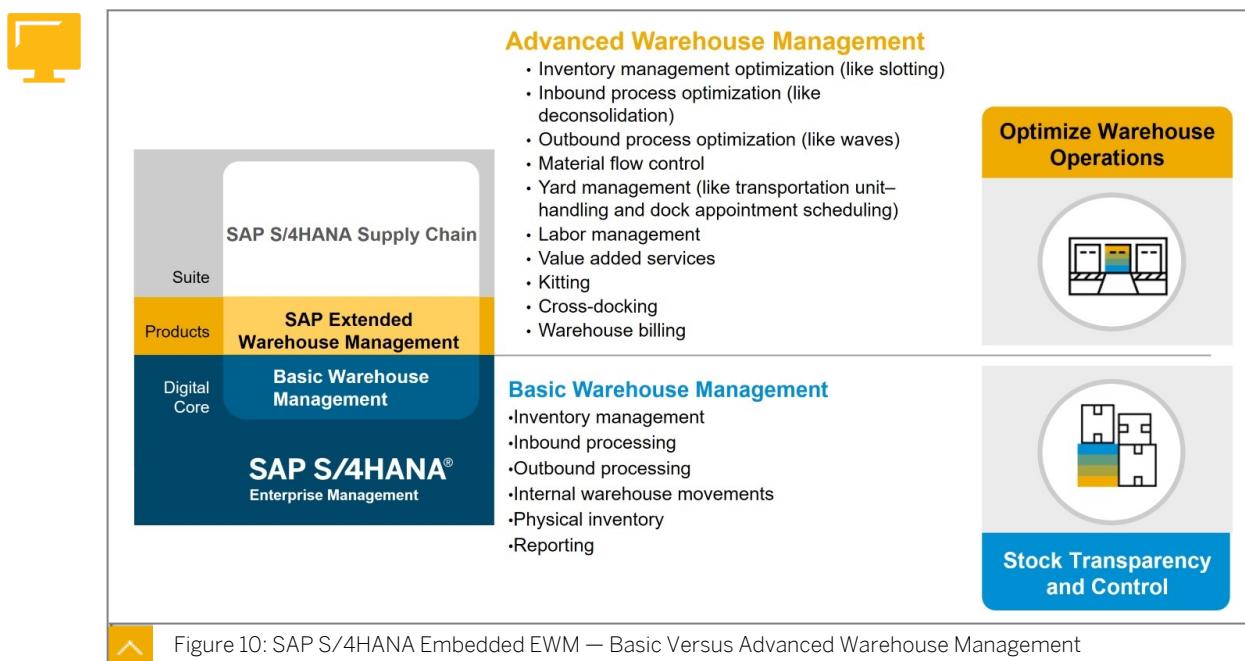


Figure 10: SAP S/4HANA Embedded EWM — Basic Versus Advanced Warehouse Management

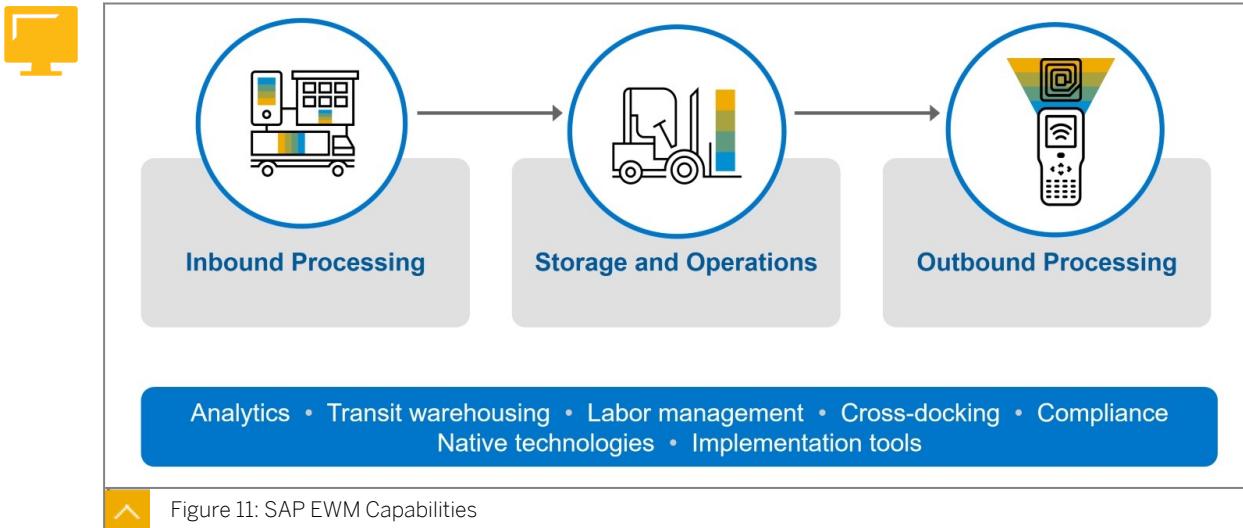
SAP EWM can be installed standalone and be connected to an SAP S/4HANA system. Since SAP S/4HANA 1610, embedded SAP EWM is also available. Embedded means that no separate system is required and therefore SAP EWM can be used as a direct replacement for LE-WM. EWM is in such a set-up completely embedded within the SAP S/4HANA system.

When using embedded SAP EWM in SAP S/4HANA, customers can choose to implement the solution in a basic way or more extensive for each individual warehouse, depending on the local needs.

For details about the differentiation between Basic and Advanced Warehouse Management as well as for the difference between embedded and decentralized SAP EWM, see for example SAP Note 2806070 - SAP S/4HANA 1909: Release information and restrictions for SAP EWM in SAP S/4HANA.

### SAP Extended Warehouse Management (EWM) Capabilities

SAP EWM is a comprehensive solution which offers flexible, automated support for processing various goods movements and for managing stocks in a warehouse complex. The system supports planned and efficient processing of all logistics processes in a warehouse.



Inbound processing functionality includes transportation unit processing, goods receipt management and optimization, inbound quality management, and internal routing. This enables a company to:

- Optimize the use of manpower (labor)
- Facilitate cross-docking
- Streamline receiving and dock management
- Optimize inventory placement in the warehouse through flexible put-away strategies
- Improve inbound inventory visibility

Storage and operations functionality includes physical inventory, slotting, replenishment and rearrangement, kit-to-stock management, value-added services, transit warehousing, and warehouse billing. This enables a company to:

- Track every unit down to the lowest level of detail
- Continuously manage inventory balances
- Reduce the effort required for annual physical counts
- Eliminate inefficient movement and redundant effort
- Improve facility utilization

Outbound processing functionality includes outbound planning (including route, wave, and bin planning), picking optimization, packing, staging, and load management. This enables a company to:

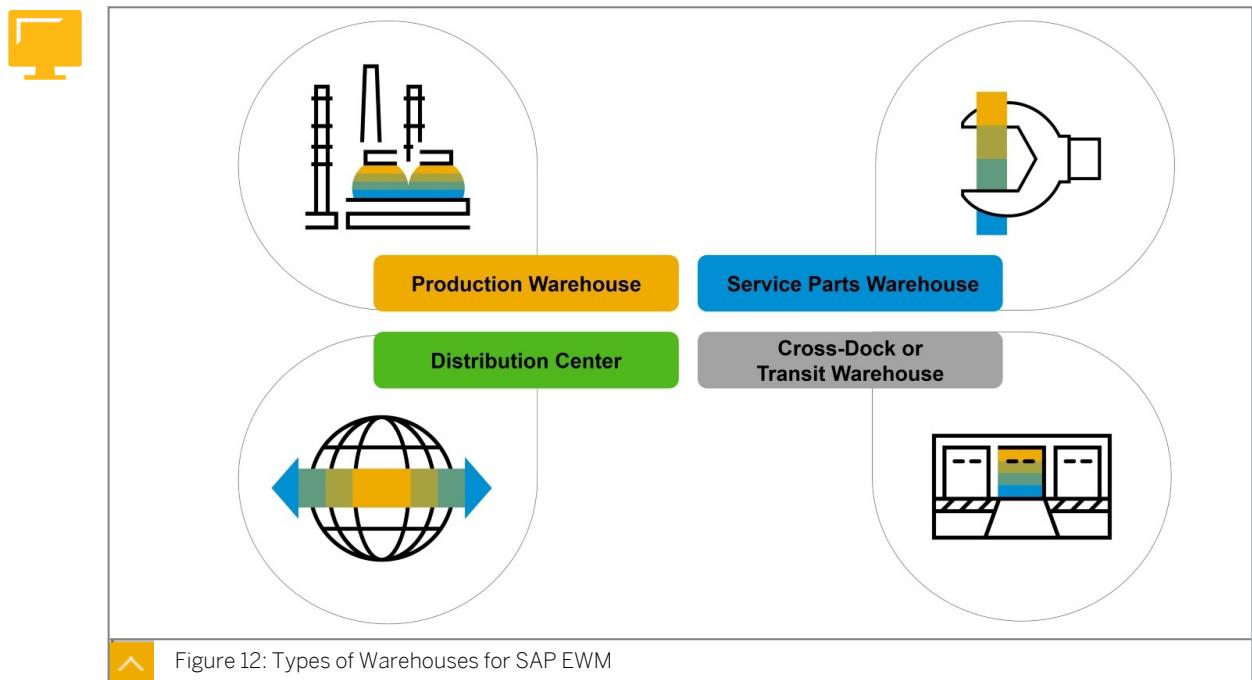
- Improve inventory accuracy and availability
- Reduce picking, shipping and billing errors
- Increase customer service levels due to high efficiency and accuracy
- Shorten order turn-around times
- Provide value-added services quickly
- Take advantage of cross-dock opportunities

SAP EWM offers integration to mobile devices and RFID scanners as well as to automated warehouse technologies like conveyors, picking systems and automated storage and retrieval systems.

### Types of SAP EWM Warehouses

#### Types of Warehouses for SAP EWM

SAP EWM can be used for different types of warehouses which have different requirements.



Types of warehouses and their main tasks could be:

- Production Warehouse:
  - Raw-materials handling
  - Integration of quality management
  - Production supply
  - Receipts from production
  - Materials staging and consumption
- Distribution Center:
  - Complex process and high volume
  - High degree of automation
  - Wave management
  - Slotting and rearrangement
  - Replenishment
- Service Parts Warehouse:

- Low to very high complexity
- Kitting and value-added services
- High volatility
- Serial numbering
- Heterogeneous product ranges
- Cross-Dock or Transit Warehouse:
  - Regional hubs, gateways, and container freight stations
  - Air and ocean freight handling
  - Unit-load devices and containers handling
  - Receive from and sent to airport or seaport (drayage)



### LESSON SUMMARY

You should now be able to:

- Differentiate between available warehouse management solutions

# Unit 1

## Lesson 3

# Positioning Transportation Management



## LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Identify SAP Transportation Management solutions

## Transportation Management

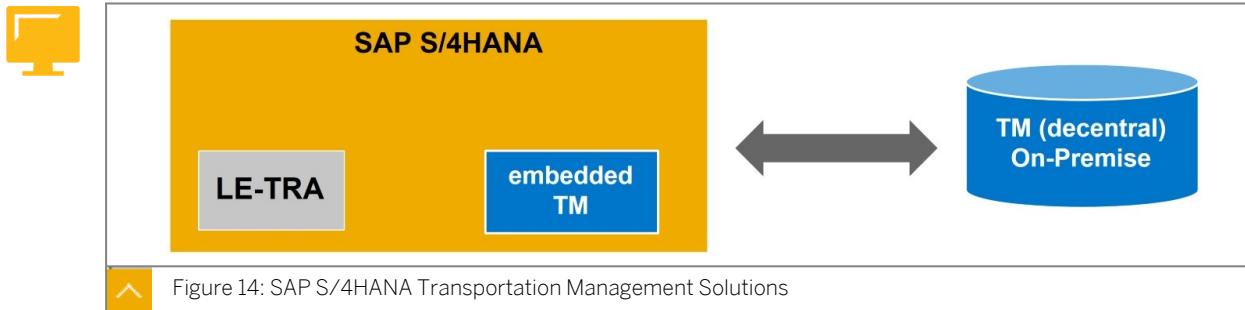


Figure 13: Transportation Management

Transportation is an essential element in a supply chain. It affects both incoming and outgoing goods. Effective transportation planning and processing ensures that shipments are dispatched without delays and arrive on schedule. Transportation costs play an essential role in the calculation of the price of a product. It is important to keep these transportation costs to a minimum so that the price of a product remains competitive. Efficient transportation planning and processing helps to keep these costs down.

### SAP S/4HANA Transportation Management Solutions

Similar to Warehouse Management, SAP S/4HANA offers several solutions for managing transportation in a company (transportation planning and execution). These solution are LTRA and (embedded) SAP Transportation Management (SAP TM).



LE-TRA (with the same functionality as in the SAP ERP system) is part of SAP S/4HANA through a Compatibility Package (CP). It provides customers with a limited use right which expires on December 31, 2025.

The solution LE-TRA is not the target architecture for managing transportation in SAP S/4HANA as the alternative functionality SAP Transportation Management (SAP TM) is also available. For details of Compatibility Packages see SAP Note 2269324 - Compatibility Scope Matrix for SAP S/4HANA on-premise.

### SAP Transportation Management (SAP TM)

SAP TM supports a company in all activities related to the physical transportation of goods from one location to another. SAP TM can be used to create and monitor an efficient transportation plan that fulfills the relevant constraints (for example, service level, costs and resource availability). SAP TM can determine options to save costs and to optimize the use of available resources. SAP TM can react to transportation events and find solutions to possible deviations from the original transportation plan.

SAP S/4HANA can be connected to an existing SAP TM solution (as a decentral solution). Since SAP S/4HANA 1709 TM is also available as an embedded version.

For the embedded SAP Transportation Management solution, customers can select between the SAP S/4HANA Basic Shipping or Supply Chain for Transportation Management solutions.

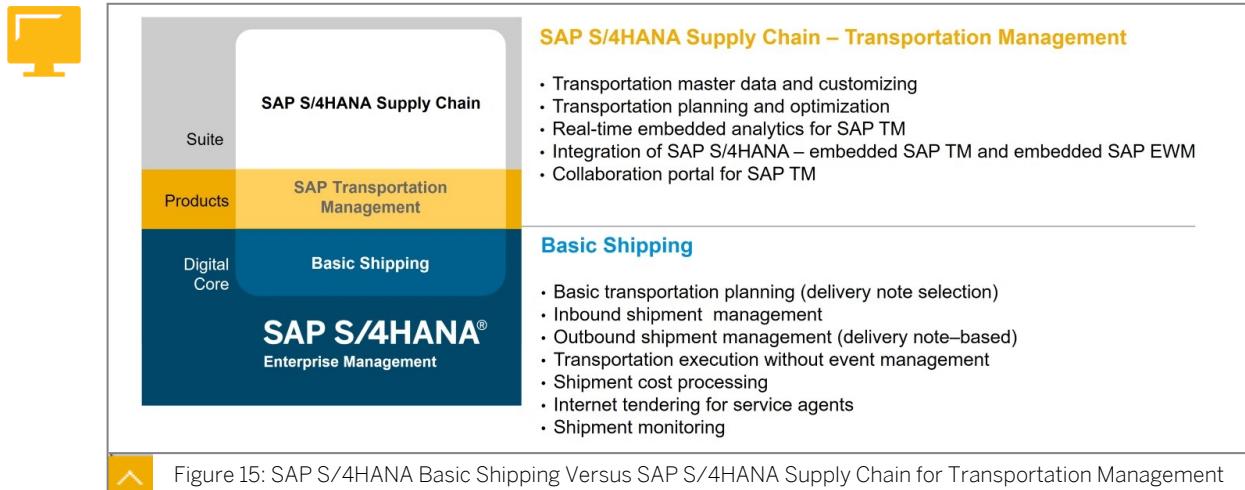
- SAP S/4HANA Basic Shipping:

Basic Shipping in SAP S/4HANA supports the entire transportation chain. Transportation demands can be managed by planning, tendering, and settling freight processes. Also, carriers can be booked in accordance with the requirements of hazardous goods. From a functional view Basic Shipping corresponds to the scope of LE-TRA.

- SAP S/4HANA Supply Chain for Transportation Management:

Embedded Transportation Management (TM) in SAP S/4HANA also supports the entire transportation chain, but now with a full suite of features way beyond the scope of Basic Shipping.

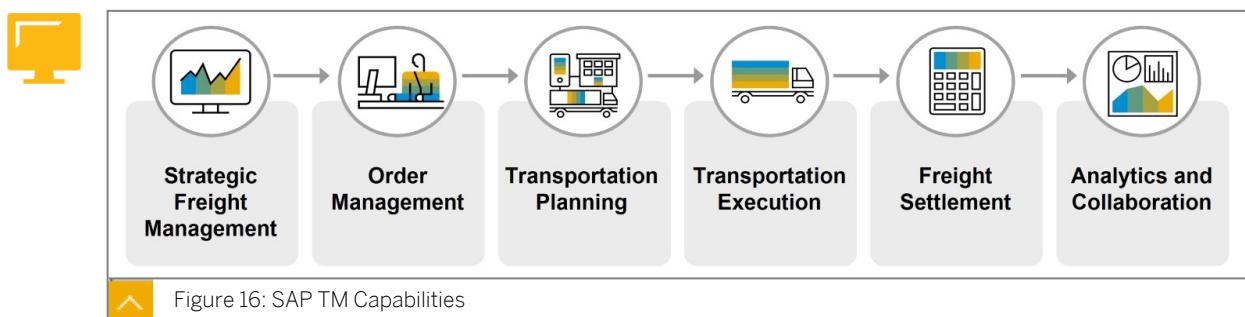
## SAP S/4HANA Basic Shipping Versus SAP S/4HANA Supply Chain for Transportation Management



For details about the difference between Basic Shipping and Supply Chain for Transportation Management and the differences between SAP S/4HANA Transportation Management 1909 and SAP TM 9.6, see SAP Note 2813859 - SAP S/4HANA 1909 Supply Chain for Transportation Management - Release information.

### SAP Transportation Management Capabilities

SAP Transportation Management (SAP TM) is a solution with a comprehensive process and multimodal coverage. It enables customers to plan domestic and international transportation for inbound and outbound freight.



### The Functions of SAP TM Capabilities

Strategic freight management is built to support shippers to procure long-term transportation services at logistic services providers (LSPs) or carriers. This enables a customer to:

- Keep transportation costs down
- Improve cost planning
- Efficiently manage contracts

Order management functionality includes integration with order and delivery data in the SAP S/4HANA application, order and booking management, personal worklists and schedule management. This enables a customer to:

- Improve the efficiency of order and process management
- Create dynamically-generated, optimized routing proposals based on business rules
- Minimize freight costs
- Enhance customer service

Transportation planning functionality includes manual and automated planning and dispatching, routing, resource and carrier selection, order tendering, dangerous goods management, and planning of parcels. This enables a customer to:

- Improve resource utilization and carrier selection to reduce transportation costs
- Handle huge volumes of data thanks to automated planning processes
- Combine decentralized, local business views to identify synergies
- Achieve on-time delivery

Transportation execution functionality includes extended warehouse integration for execution, logistics execution, execution monitoring and event tracking, capacity monitoring, transportation documents printing and trade regulation compliance using SAP Global Trade Services. This enables a customer to:

- Improve cargo handling
- Achieve faster, more dynamic and responsive logistics execution
- Reduce shipping costs due to a streamlined process and maximized efficiency

Freight settlement functionality includes freight agreement management, charge and tariff management and transportation charge calculation. This enables a customer to:

- Achieve accurate transportation costing
- Integrate transportation management and billing
- Increase invoice inaccuracy

Analytics and collaboration functionality includes dashboards for SAP S/4HANA, landed cost analysis, flexible reporting on business warehouse costs, and support for collaborative business processes between shippers, carriers and logistics service providers. This enables a customer to:

- Support real-time, data-driven decision making
- Gain in-depth business insights
- Reduce data complexity
- Enable efficient collaboration between logistics business partners



## LESSON SUMMARY

You should now be able to:

- Identify SAP Transportation Management solutions

## Learning Assessment

1. SAP S/4HANA requires a separate database besides SAP HANA.

*Determine whether this statement is true or false.*

- True
- False

2. Warehouse Management and Transportation Management are part of which one of the following application areas?

*Choose the correct answer.*

- A Manufacturing
- B Supply Chain
- C Sales

3. What solutions for warehouse management can be used with S/4HANA?

*Choose the correct answers.*

- A LE-WM
- B Embedded EWM
- C Stock Room Management

4. To use SAP Transportation Management, you need your own trucks.

*Determine whether this statement is true or false.*

- True
- False

5. What solutions for managing transportation are available within SAP S/4HANA?

*Choose the correct answers.*

- A LE-TRA
- B Embedded TM
- C Decentral TM
- D Production Execution

## Learning Assessment - Answers

1. SAP S/4HANA requires a separate database besides SAP HANA.

*Determine whether this statement is true or false.*

True

False

Correct. SAP S/4HANA runs on SAP HANA and doesn't require a separate database besides SAP HANA.

2. Warehouse Management and Transportation Management are part of which one of the following application areas?

*Choose the correct answer.*

A Manufacturing

B Supply Chain

C Sales

Correct. Warehouse Management and Transportation Management are part of application area Supply Chain.

3. What solutions for warehouse management can be used with S/4HANA?

*Choose the correct answers.*

A LE-WM

B Embedded EWM

C Stock Room Management

Correct. LE-WM, Embedded EWM, and also Stock Room Management are all solutions for warehouse management which can be used with S/4HANA. Support for LE-WM will stop at some point in time in the (near) future however.

4. To use SAP Transportation Management, you need your own trucks.

*Determine whether this statement is true or false.*

True

False

Correct. To use SAP Transportation Management, you do not need your own trucks. SAP Transportation Management is a solution with a comprehensive process and multimodal coverage. It enables customers to plan domestic and international transportation for inbound and outbound freight.

5. What solutions for managing transportation are available within SAP S/4HANA?

*Choose the correct answers.*

A LE-TRA

B Embedded TM

C Decentral TM

D Production Execution

Correct. LE-TRA, embedded TM, and decentral TM are all solutions for managing transportation, which are available within SAP S/4HANA.

## Lesson 1

Identifying Organizational Units for Supply Chain Execution

27

## Lesson 2

Creating Storage Bins and Displaying Quants

31

## Lesson 3

Maintaining Materials and Business Partners

37

## UNIT OBJECTIVES

- Describe the organizational units for supply chain execution
- Create storage bins
- Display quants
- Create a warehouse product
- Maintain shipping-relevant data in a business partner master record



## Unit 2

### Lesson 1

# Identifying Organizational Units for Supply Chain Execution



#### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe the organizational units for supply chain execution

#### Integrating the Organizational Units

In Customizing in the SAP S/4HANA system, the organizational units that are specific to Supply Chain Execution need to be connected to the rest of the organizational structure. This way, complete logistical processes (integrating with SAP S/4HANA Financials) can be set-up.

#### Shipping Point

**Plants** are organizational units serving to subdivide an enterprise according to production, procurement, maintenance, and materials planning aspects. A plant represents a location where either materials are produced or goods and services are provided. More generally, plants are used to map company subsidiaries.

Shipping points are assigned to plants (n:n).

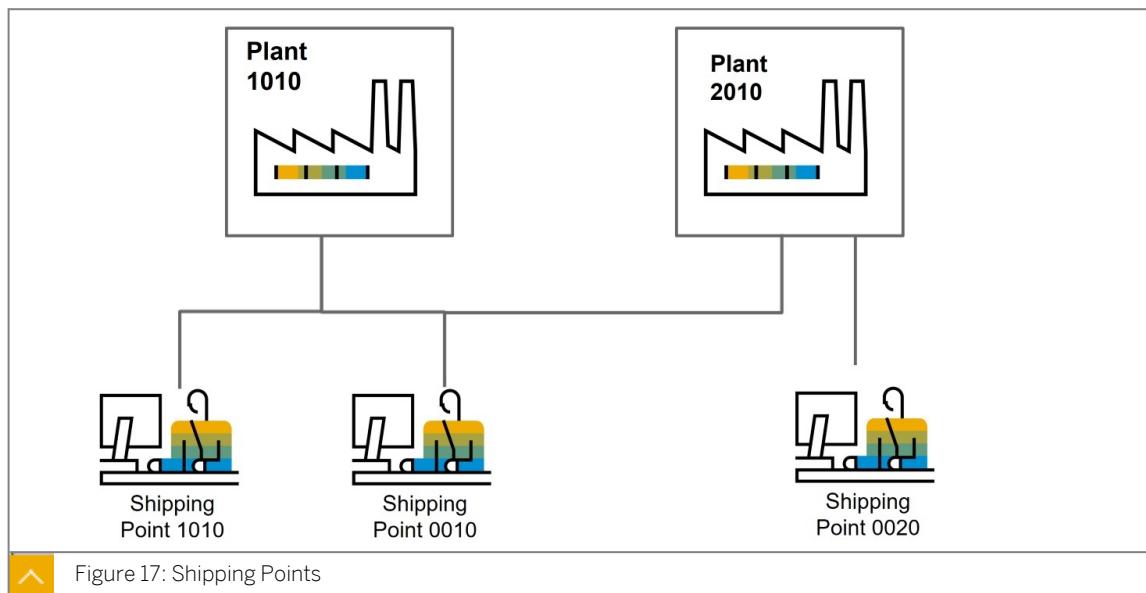


Figure 17: Shipping Points

If a shipping point represents a physical location within your company, it can be assigned to several plants (that are then probably in proximity to each other). Also: one plant can have more than one shipping point assigned to it.

## Warehouse Number

A **Storage Location** is an organizational unit allowing the differentiation of material stocks on a level below the plant. One example could be stocks of raw materials versus stocks of finished goods. Another example could be stocks of spare parts in a separate spare parts storage location.

A warehouse number is always linked to at least one combination of plant and storage location. This means that Warehouse Management is connected to Inventory Management via a link between a warehouse number and a plant-storage location combination. Storage locations are used for quantity-based inventory management. Warehouse numbers are used to represent the physical storage of materials within a company.



### Note:

This assignment refers to the three character ERP warehouse number which defines which type of warehouse management is used. For example: in case of embedded EWM, this ERP warehouse number is then connected to an EWM warehouse number.

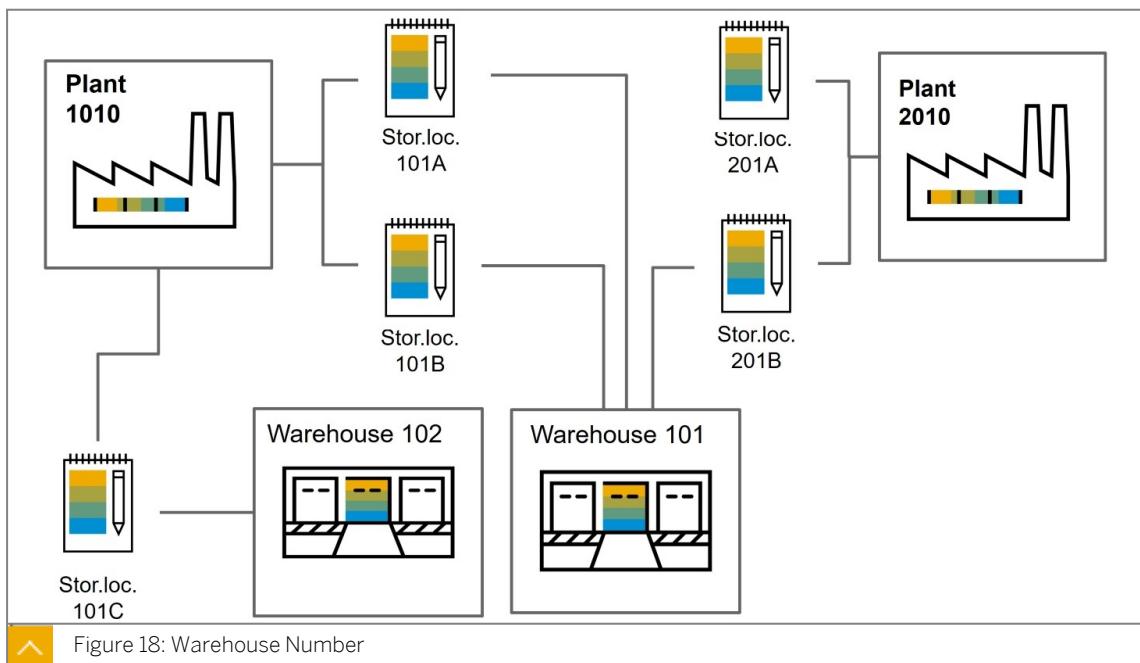


Figure 18: Warehouse Number

The features of Warehouse Management can only be used if a warehouse number has been assigned to a plant-storage location combination. However, not every plant-storage location combinations needs to be connected to a warehouse number. Certain stocks, such as packaging materials or consumable materials that are stored in fixed bins, might not require management on storage bin level and therefore no warehouse number is needed.

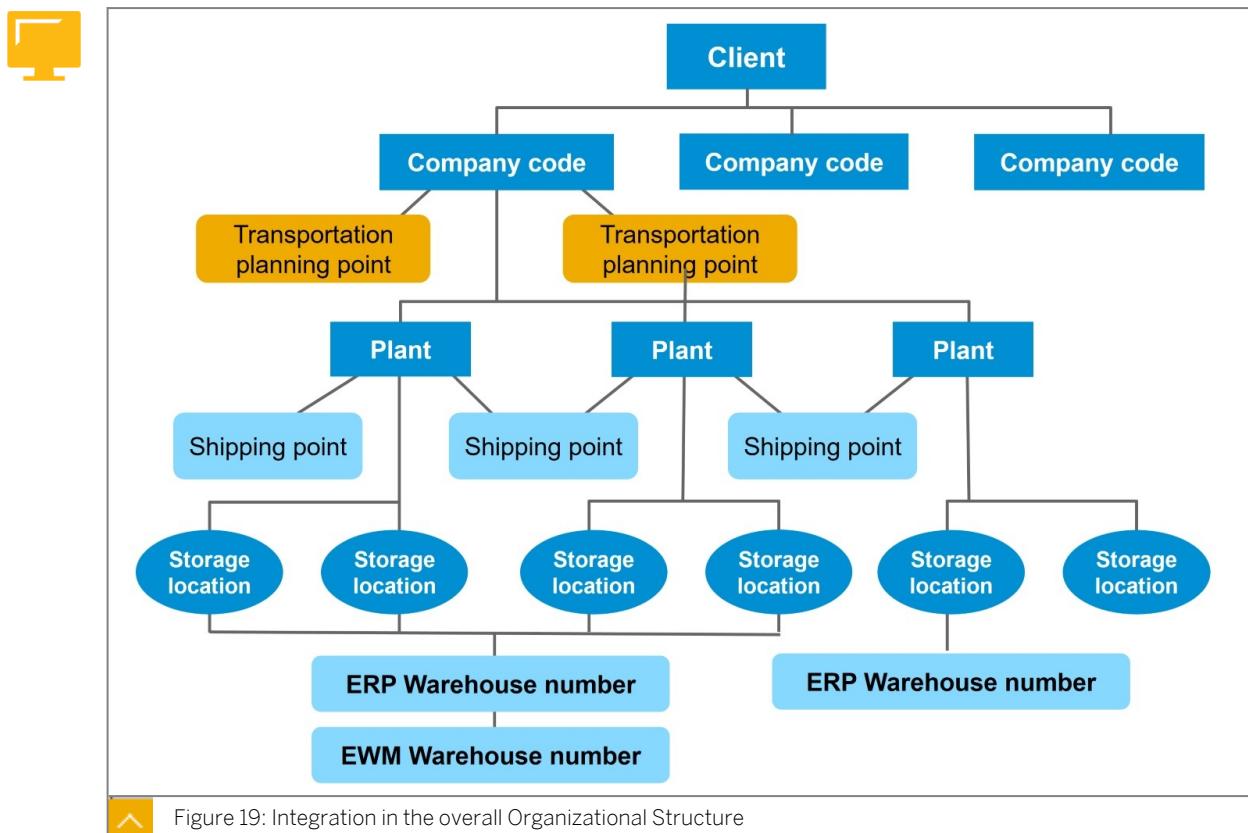
Several plant-storage location combinations can also be linked to one warehouse number. Again, the geographical situation could be the influencing factor here. However, it is not possible to simultaneously assign one plant-storage location combination to two or more warehouse numbers.

## Transportation Planning Point

A transportation planning point is usually assigned to a company code. This specific connection is required for calculating and settling freight costs when using LE-TRA. You can connect a transportation planning point to only one company code.

### Integration in the overall Organizational Structure

This is what the complete organizational structure of a company from the point of logistical processing could look like:



### LESSON SUMMARY

You should now be able to:

- Describe the organizational units for supply chain execution



## Unit 2

### Lesson 2

# Creating Storage Bins and Displaying Quants



#### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create storage bins
- Display quants

#### Substructure of the Warehouse Number

Each warehouse number includes a number of subordinate organizational units (the number depends on your Customizing settings); storage types, storage sections, and storage bins. All these elements are used to map the spatial characteristics of the warehouse and how they relate to each other.

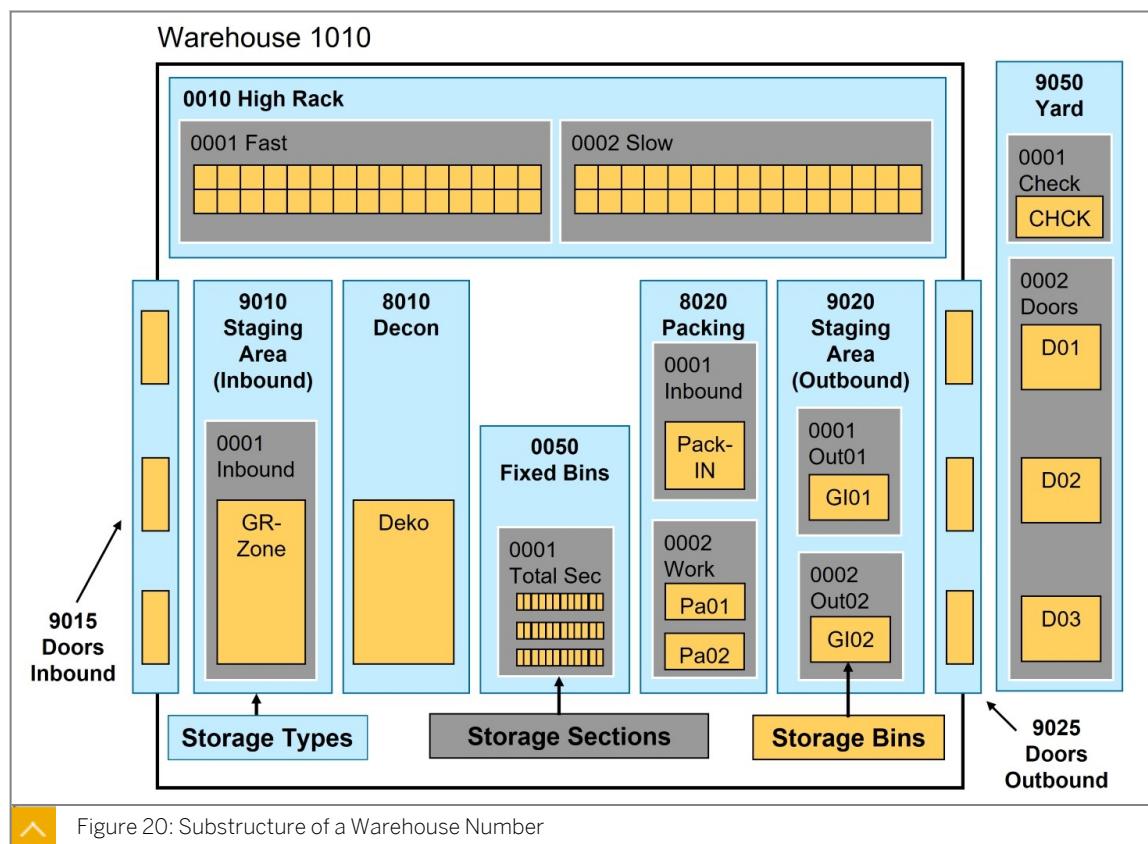


Figure 20: Substructure of a Warehouse Number

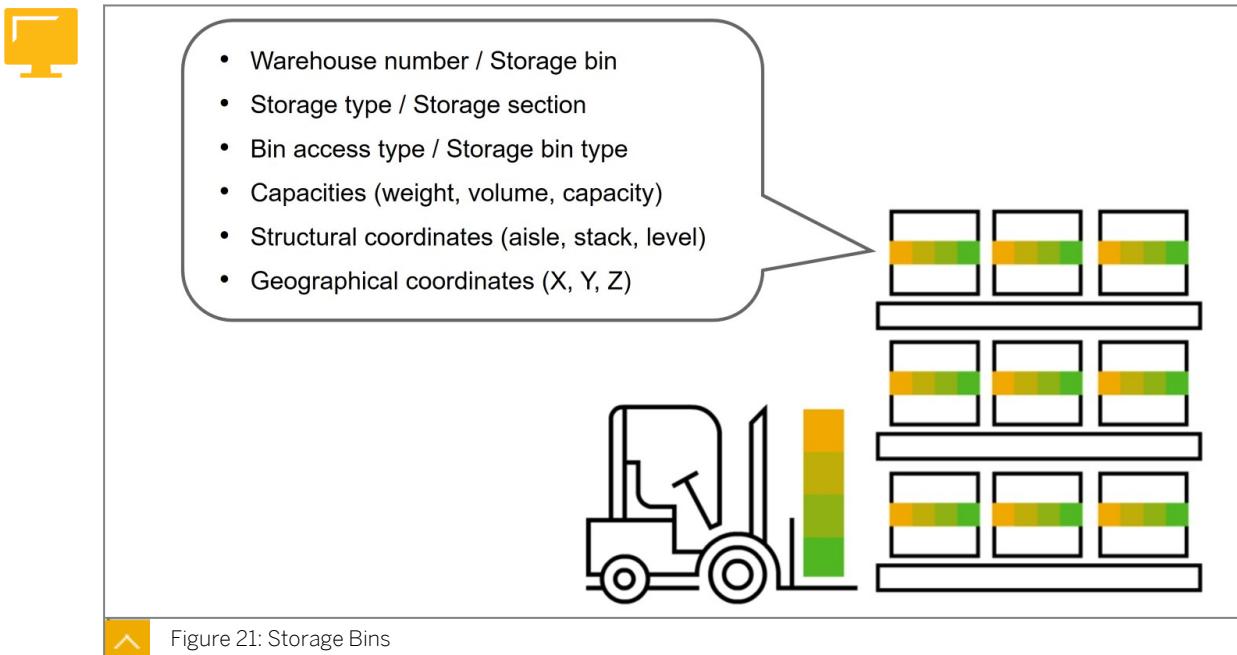
The **Storage Type** is used to represent an individual storage space (groups of bins) that needs to be dealt with as a separate entity because of either spatial or organizational requirements. Strategies and storage behavior are defined for each storage type. SAP delivers predefined storage types, which you either adapt or use as a template when creating your own storage types. Besides normal storage types like a high rack storage area or a fixed bin storage area,

storage types can also be used to describe a door and its surroundings or a goods receipt areas, or even a work center.

**Storage Sections** can be used to further divide a storage type into smaller units for example strategy reasons. One example of this is separating fast and slow moving items.

A **Storage Bin** is the smallest structure unit within a warehouse number. Storage bins are however master data records and are not defined in customizing like storage types or storage sections.

### The Storage Bin Master Record



Storage bins are created as master data records within a warehouse number. The only other assignment which is always necessary is the storage type to which the bin belongs. This storage type controls for example the putaway and picking strategy that is relevant within that storage type.

Storage sections are used to control the putaway of goods in a storage type, for example to distinguish between fast and slow moving items, or to separate hazardous materials in a specific section.

You can assign a **Storage Bin Type** when creating a storage bin. This is optional. But it is particularly useful if the storage bins in a certain storage section have different dimensions. Bin types are categories that you define for each warehouse number in Customizing for *Warehouse Management* to specify the rough dimensions of storage bins (for example, bin width 1 m). Depending on the settings at storage type level, the system can take storage bin types into account during putaway. This means that you can for example avoid trying to put away pallets in storage bins where they don't fit. You can also assign a collection of bins you are creating to a specific picking area. This picking area can be used to, for example, group bins when picking from a specific storage type.

A storage bin can contain values for the maximum allowed weight or volume for that bin. Also, a neutral key figure number can be assigned to a bin that then represents an abstract representation of the total capacity of that storage bin.

Storage bins can also include structural information like aisle, stack and level of the bin, as well as geographical coordinates (inside the warehouse). This information can be used to

calculate the distance a resource has to travel inside the warehouse and the time required for it.

## The Quant

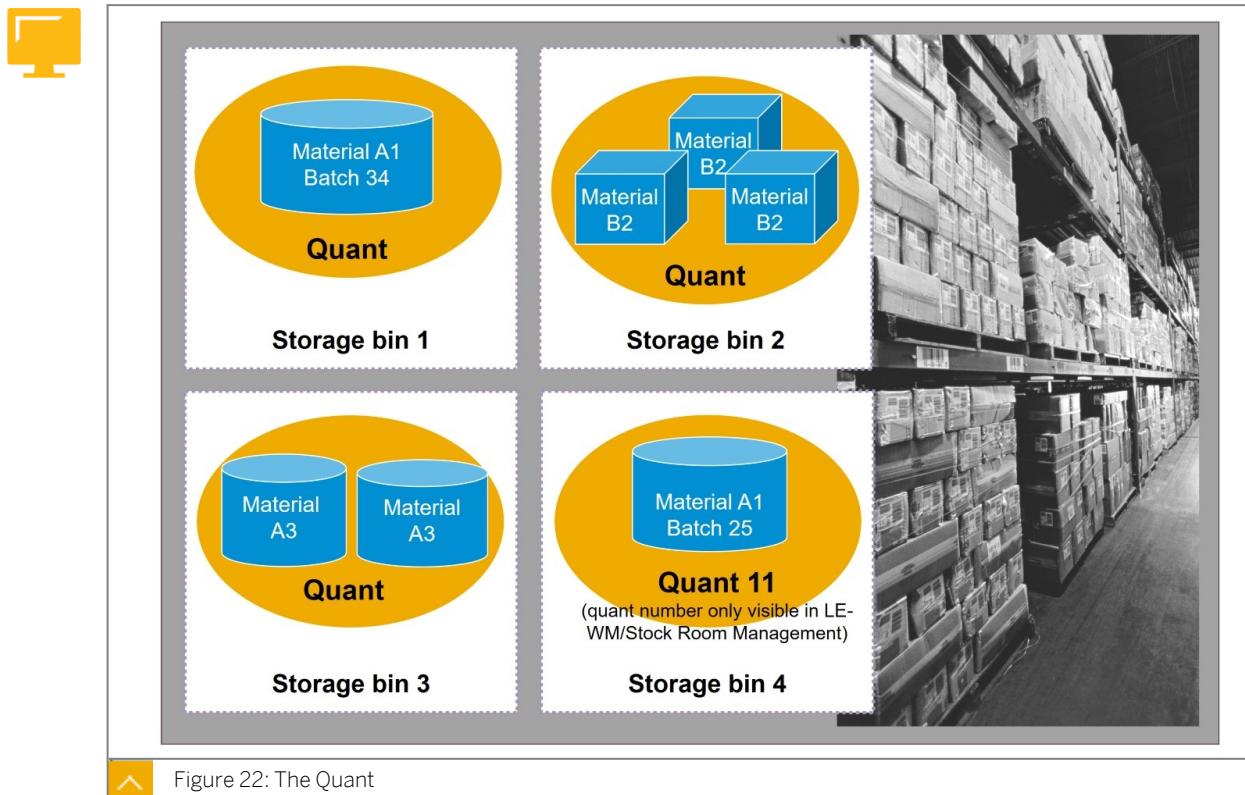


Figure 22: The Quant

In a warehouse (both in LE-WM/Stock Room Management and also in (embedded) EWM), a quant refers to the contents of a specific storage bin. There are default criteria that the SAP S/4HANA system uses during a putaway and also during a stock removal process to determine the material quantity that forms a quant in a storage bin.

**The default quant criteria are the following:**

- Material number
- Stock type
- Special stock type
- Plant and storage location to which the material belongs
- Batch number (if necessary)
- Handling Unit number (if existing)

The stock type, special stock type and plant and storage location to which a material belongs (called the Owner in (embedded) EWM) are all Inventory Management characteristics of the material that is stored in a bin. When an inbound delivery is received, Inventory Management indicates the stock type in which the material quantity is received. Quality Management (QM) processes can change the stock type before or after inspections. Concerning special stock types: quantities of a material can for example be flagged as special project stock or as customer consignment stock. If the inventory quantity of a material is managed in several storage locations (for example, to differentiate normal stock from spare parts stock), the

plant and storage location combination to which a specific material quantity belongs, is also important. All of these characteristics are important when forming a quant in a storage bin in the selected Warehouse Management solution.

Example: if you want to put away a material partially in unrestricted-use stock and partially in quality inspection stock, at least two quants are generated in the Warehouse Management system.

If you use batch management as a cross-component functionality in your SAP S/4HANA system, the batch number of a material quantity that you receive, is also a quant characteristic. If you have activated batch management in a material master record, you need to enter the relevant batch for each goods movement. In the Warehouse Management system, you must be able to determine at any point which material quantity belongs to which batch, so batch is then also a quant characteristic.

Configuration settings in the system on storage type level determine whether **addition to existing stock** and/or **mixed storage** is allowed in a storage bin. Addition to existing stock means that an already existing quant in a bin can be extended when an additional quantity of the same material is received that matches all other quant characteristics of the existing quant. Be careful: at that moment, some important information like for example the goods receipt date might not be clear anymore for the complete quant. Mixed storage means that different materials or different batches of a material are stored in one bin. Beside the issue of capacity checks, which is then necessary, this might also create practical issues in handling and finding the correct quants during a picking process.

### Stock in Inventory Management and Warehouse Management

To understand the concept of a quant it is also helpful to understand the different way in which stock is displayed in Inventory Management compared to Warehouse Management.



Inventory Management View						
Material xyz						
			Unrestricted	Quality Insp.	Blocked	
Company Code 1010			2350	80	100	
	Plant 1010		1850	50		
		Stor. loc. 101A	1000			
		Stor. loc. 101B	850	50		
	Plant 2010		500	30	100	
		Stor. loc. 2010	500	30	100	

Warehouse Management View						
Stor. type	Stor. bin	HU	Product	Quantity	Owner	Stock type
0010	0010-01-01-01	123	XYZ	500	1010	F1
0010	0010-03-01-02	124	XYZ	500	1010	F1
0020	0020-01-A		XYZ	500	1010	F2
0020	0020-02-D		XYZ	50	1010	Q2
0030	0030-0001	234	XYZ	350	1010	F2



Figure 23: Inventory Management versus Warehouse Management

In Inventory Management (IM), you can see the different types of stock (like unrestricted-use stock, quality inspection stock, blocked stock) on various levels within your company (company code, plant, and storage location). You only see quantities. You do not see where the stock is physically located. In Warehouse Management, physical information is added to this: the actual storage bin(s) where material is stored, are visible.



### LESSON SUMMARY

You should now be able to:

- Create storage bins
- Display quants



## Unit 2

### Lesson 3

# Maintaining Materials and Business Partners



#### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create a warehouse product
- Maintain shipping-relevant data in a business partner master record

#### The Warehouse Product

The master data record for a material is divided into views. In most cases, these views correspond to specific departments or activities in a company, such as sales and distribution, purchasing, and accounting. Each view contains a collection of fields that are either indicators for accessing Customizing tables or values for specific applications. These values are often default values. Default values means that these values can be overwritten/overruled through more specific definitions (for example coming from a customer-material info record) or manually by the user.

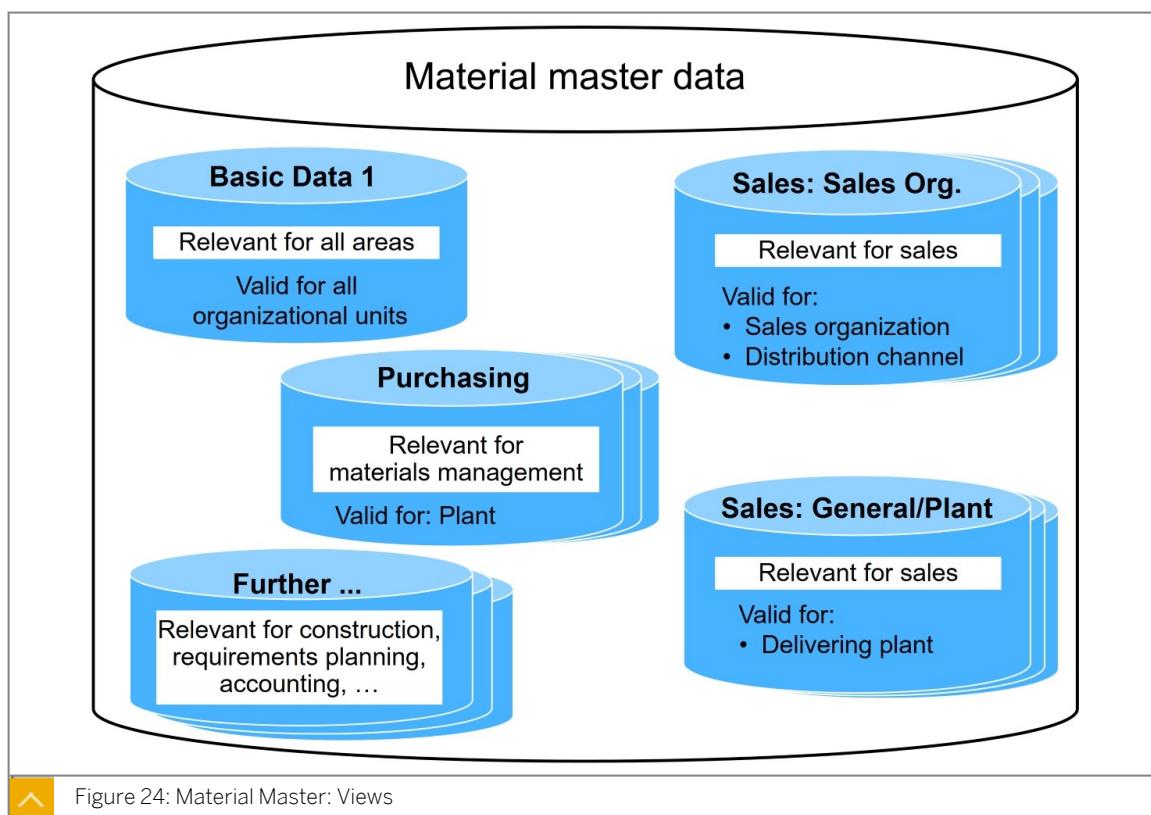
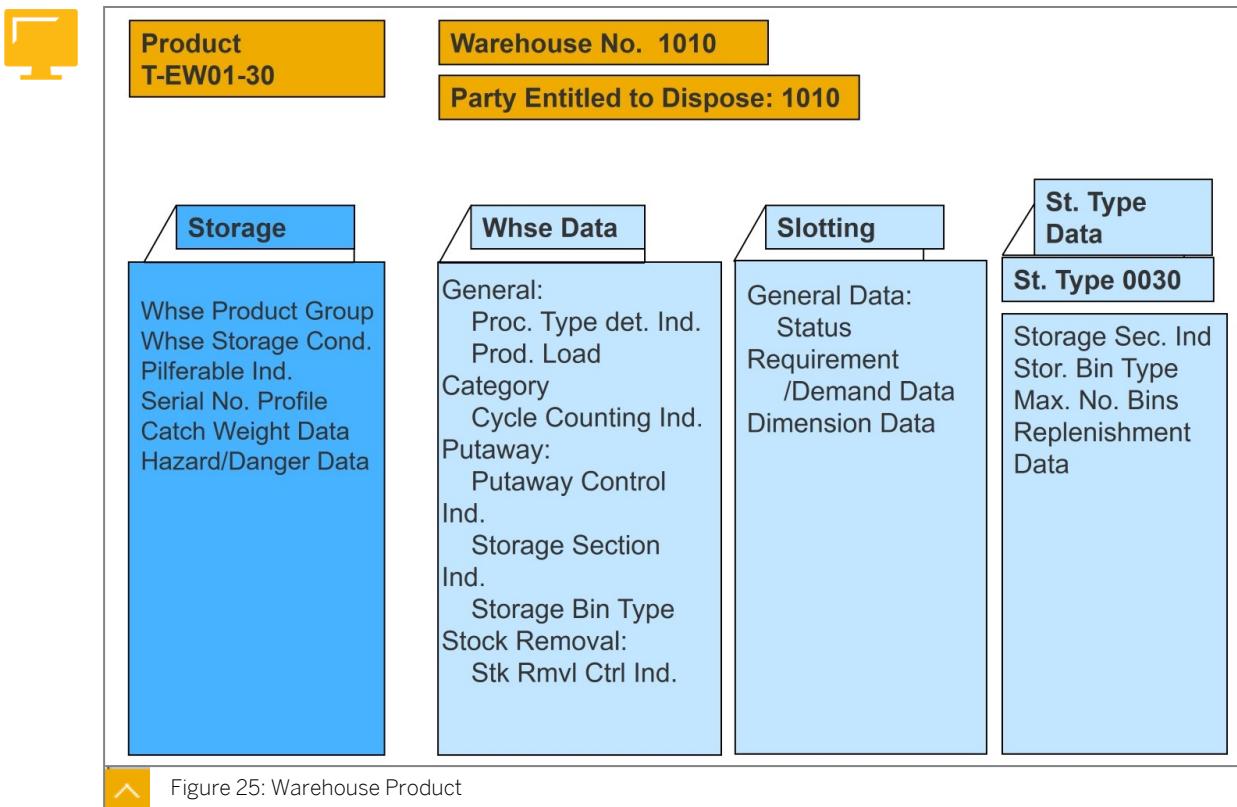


Figure 24: Material Master: Views

### Warehouse Product

For (embedded) Extended Warehouse Management (EWM), the material master can be extended with a **Warehouse Product** master record. The warehouse product contains information that is relevant for a specific warehouse number or storage type. The warehouse product is not required, but it can for example be used to control the behavior of a product during a putaway or a picking process.



The tab *Warehouse Data* of the Warehouse Product master record contains control parameters for various processes on Warehouse Number level. Examples are a required minimum shelf life, a preferred unit of measure, or the putaway control indicator that influences the determination of the bins during a putaway process.

For some customers maintaining these fields can be cumbersome and time consuming. For this reason, EWM also includes “slotting”. This is a process which uses other information already available in for a product, to determine the correct entries for some of these fields in the Warehouse Product master record. Several fields of the material master record can be used for this determination (for example fields from the tab *Storage*).

The tab *Slotting* displays if the slotting process has been done for a product and additional data which can be determined during a slotting run.

The *Storage Type Data* tab contains control data like the maximum number of bins for a material or quantities for the replenishment process for the specified storage type.

### Business Partner Master Records

The master data records for customers and vendors are managed in SAP S/4HANA by using Business Partner master records. Using this approach, it is possible to centrally maintain all master data related to customers and vendors (and even other business partners in the customer realm).

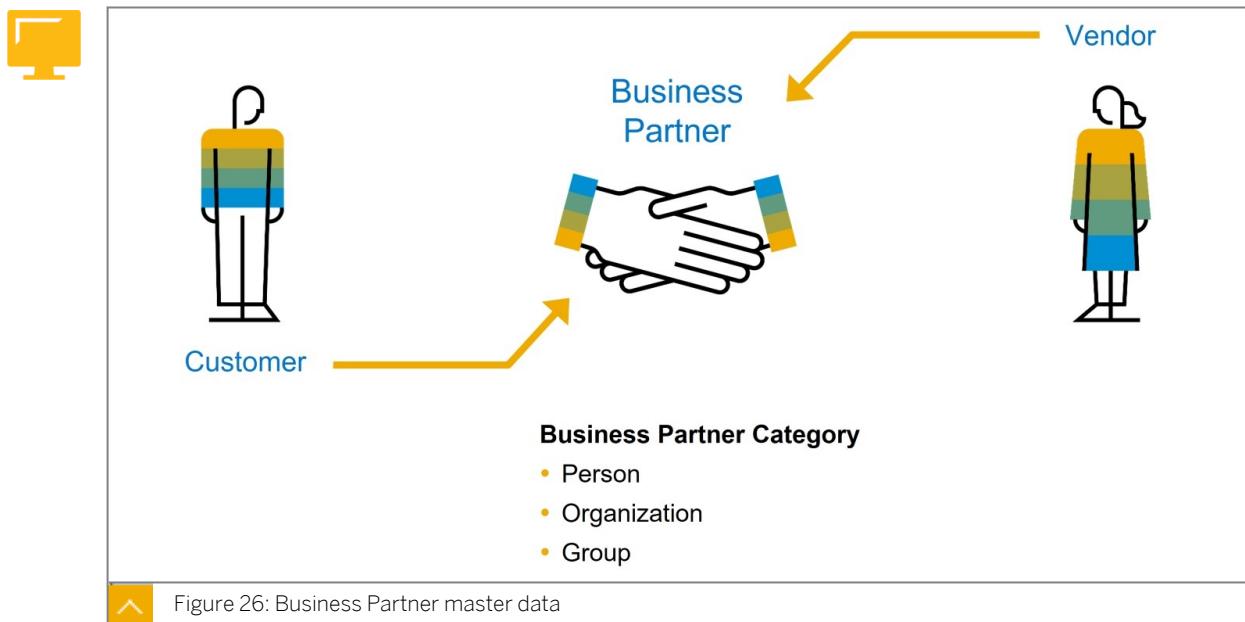


Figure 26: Business Partner master data

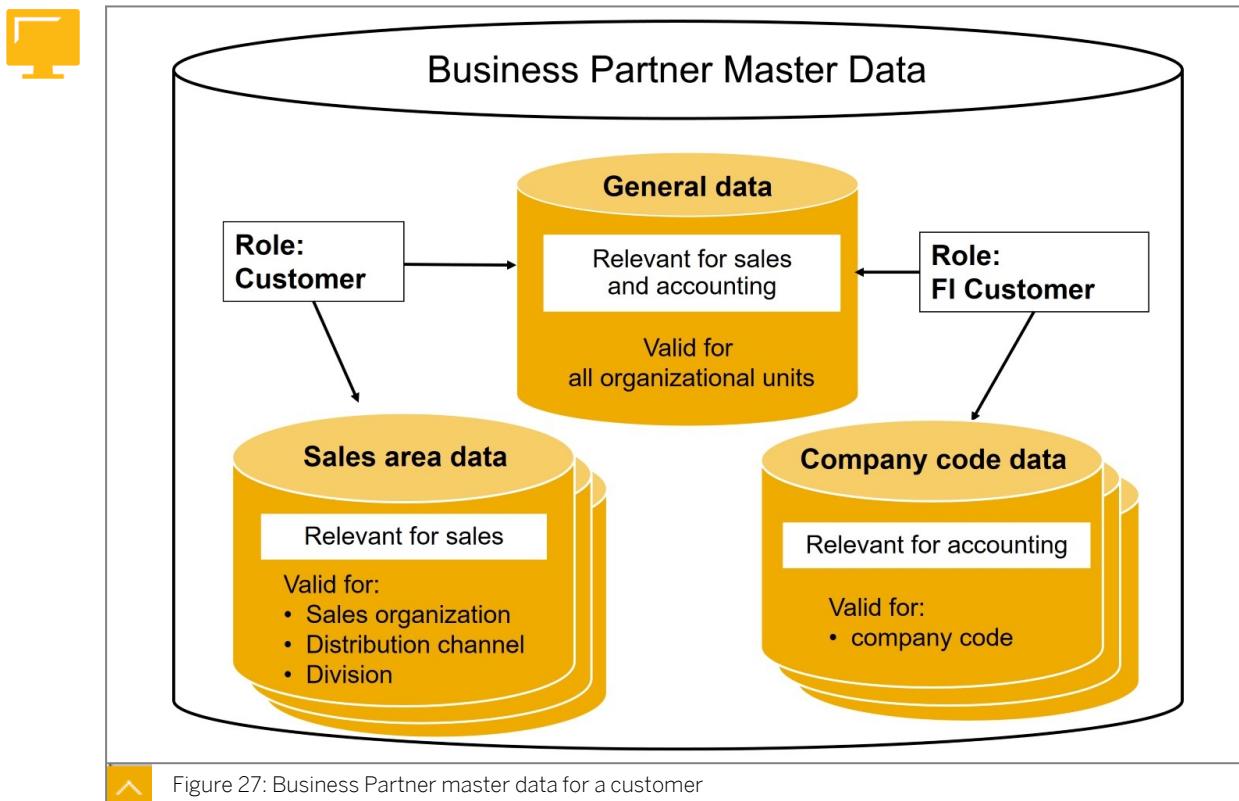
Business Partner master data can be maintained using transaction code `BP` in the SAP GUI or by using a corresponding Fiori app (started from the SAP Fiori Launchpad).

When a business partner is created, the Business Partner Category must be selected. Business partners can be categorized as a person, group, or organization. A group represents some sort of shared arrangement (like a married couple or an executive board). An organization represents a unit such as a company, a department of a company, or an association.

The link between a Business Partner master record and the applications where it is used, is set-up via a role concept. A business partner role corresponds to a business context in which a business partner is used. Possible roles are, for example, customer (relevant for sales processes), FI customer (Accounts Receivable processes), or vendor. The role concept ensures that the relevant master data for the various processes is recorded and that the business partner can be used in those processes.

The business partner data that is needed for the order-to-cash process (business partner roles Customer and FI Customer) is grouped into the following levels of data that needs to be maintained: General data, Sales Area data, and Company Code data. It includes all the data necessary for processing sales orders, outbound deliveries, billing documents and customer payments.

### Business Partner master data for a customer



The general data is relevant for sales processes and also for accounting processes. It is valid for all organizational units within a client in the SAP S/4HANA system.

Sales Area data is relevant for Sales and Distribution (the order-to-cash process). It is valid for the respective Sales Area (which is a combination of a Sales organization, a Distribution Channel and a Division).

Company Code data is relevant for accounting (Accounts Receivable processes).

To facilitate maintenance of all the data fields, the relevant fields are grouped into different tab pages. The most important ones for Sales are:

- Orders
- Shipping
- Billing
- Partner Functions

The **Shipping** tab contains fields like the **delivering plant** and the **shipping conditions**. The values in these fields are used in sales processes. For example: the shipping conditions are used to determine the shipping point and the route for a sales order item.



#### Note:

The delivering plant can also be maintained in the material master record. The shipping condition can also be assigned to the document type of the sales order.

The shipping point to be used when creating an outbound delivery, is determined for each sales order item. During delivery creation, the system can use the shipping point that is automatically determined or a shipping point that you assign manually. The shipping point is also a source of information for scheduling in the shipping process (i.e. calculation of the confirmed delivery date(s) for a sales order item).

### Business Partner Roles for SAP Transportation Management

Besides the usual business partner roles for sales order and purchase order processing, SAP Transportation Management uses some special business partner roles. Especially relevant are the business partner roles **CRM010 Carrier** and **TM0001 Driver**.

The role CRM010 (Carrier) contains the data of role FLVN01 (Vendor) plus additional SAP TM specific data such as:

- Regulated Agent Code:

A regulated agent is a freight forwarder that conducts business with an air carrier and provides security controls that are accepted or required by the appropriate authority for cargo or mail (as defined by the International Civil Aviation Organization (ICAO)).

- IATA Agent Code:

IATA is the International Air Transport Association.

- CASS Account:

The Cargo Account Settlement Systems (CASS) is designed to simplify billing and settling of accounts between airlines and freight forwarders.

- SCAC Codes:

The Standard Carrier Alpha Code (SCAC®) is a US code used to identify road transport companies.

- Airline Codes

- Service Level Codes

- Carrier Service Codes

For the driver role (TM0001 Driver) information like planned absences, qualifications and location can be maintained.



### LESSON SUMMARY

You should now be able to:

- Create a warehouse product
- Maintain shipping-relevant data in a business partner master record



# Learning Assessment

1. The \_\_\_\_\_ is the highest level organizational unit used within a warehouse management system.

*Choose the correct answer.*

- A Shipping point
- B Warehouse number
- C Transportation planning point (TPP)
- D Storage bin

2. One shipping point can be assigned to one or to several plants.

*Determine whether this statement is true or false.*

- True
- False

3. Storage bins represent actual physical locations in a warehouse where goods can be stored.

*Determine whether this statement is true or false.*

- True
- False

4. When can you assign a storage bin type?

*Choose the correct answer.*

- A Before creating a storage bin
- B You cannot assign a storage bin type yourself
- C When creating a storage bin
- D After creating a mixed storage section

5. The batch number is a quant characteristic.

*Determine whether this statement is true or false.*

- True  
 False

6. The shelf life expiration date (SLED) is a quant characteristic.

*Determine whether this statement is true or false.*

- True  
 False

7. Which fields are available on the Shipping tab of a business partner master record?

*Choose the correct answers.*

- A Delivering plant  
 B Shipping conditions  
 C Billing conditions

8. What do you have to select when a warehouse product master record is created, changed, or displayed?

*Choose the correct answer.*

- A The cost quantity  
 B The warehouse number  
 C Values that are specific to a storage type  
 D The maximum bin quantity

# Learning Assessment - Answers

1. The \_\_\_\_\_ is the highest level organizational unit used within a warehouse management system.

*Choose the correct answer.*

- A Shipping point
- B Warehouse number
- C Transportation planning point (TPP)
- D Storage bin

Correct. The warehouse number is the highest level organizational unit used in a warehouse management system.

2. One shipping point can be assigned to one or to several plants.

*Determine whether this statement is true or false.*

- True
- False

Correct. One shipping point can indeed be assigned to one or to several plants.

3. Storage bins represent actual physical locations in a warehouse where goods can be stored.

*Determine whether this statement is true or false.*

- True
- False

Correct. Storage bins indeed represent actual physical locations in a warehouse where goods can be stored.

4. When can you assign a storage bin type?

*Choose the correct answer.*

- A Before creating a storage bin
- B You cannot assign a storage bin type yourself
- C When creating a storage bin
- D After creating a mixed storage section

Correct. You can assign a storage bin type when you create a storage bin.

5. The batch number is a quant characteristic.

*Determine whether this statement is true or false.*

- True
- False

Correct. The batch number is indeed a quant characteristic.

6. The shelf life expiration date (SLED) is a quant characteristic.

*Determine whether this statement is true or false.*

- True
- False

Correct. The shelf life expiration date (SLED) is not a quant characteristic.

7. Which fields are available on the Shipping tab of a business partner master record?

*Choose the correct answers.*

- A Delivering plant
- B Shipping conditions
- C Billing conditions

Correct. The delivering plant and the shipping conditions fields are available on the Shipping tab of a business partner master record.

8. What do you have to select when a warehouse product master record is created, changed, or displayed?

*Choose the correct answer.*

- A The cost quantity
- B The warehouse number
- C Values that are specific to a storage type
- D The maximum bin quantity

Correct. You have to select the warehouse number when a warehouse product master record is created, changed, or displayed.



## UNIT 3

# Goods Receipt Processes

### Lesson 1

Posting Goods Receipts for Purchase Orders

51

### Lesson 2

Packing during Goods Receipt

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### Lesson 3

Creating Warehouse Tasks for Putaway

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### Lesson 4

Processing Warehouse Orders

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### Lesson 5

Creating Inbound Deliveries in EWM directly

73

### UNIT OBJECTIVES

- Create a purchase order
- Create an inbound delivery
- Pack materials during goods receipt
- Create warehouse tasks for inbound deliveries
- Process warehouse orders with resources
- Work with mobile devices
- Execute quality management processes
- Create inbound deliveries in SAP EWM



# Unit 3

## Lesson 1

# Posting Goods Receipts for Purchase Orders



## LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create a purchase order
- Create an inbound delivery

## Procurement

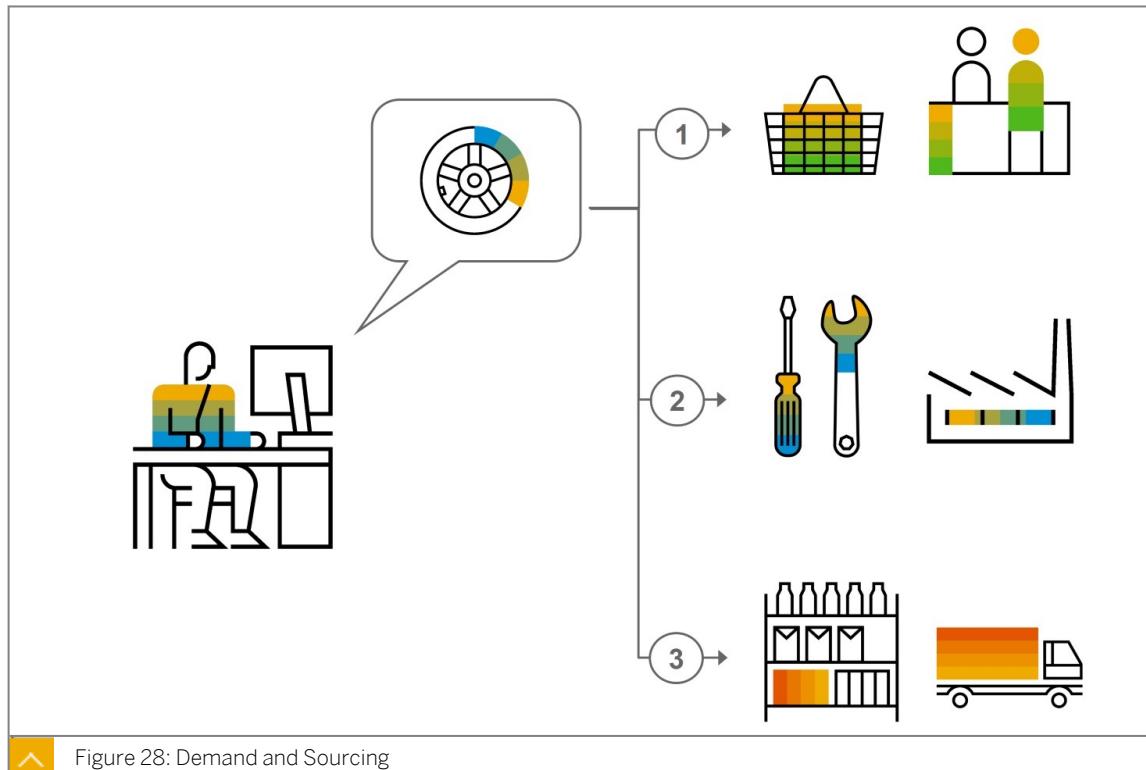


Figure 28: Demand and Sourcing

When there is a demand for certain products, there are three possible ways in which this demand can be fulfilled. They can all lead to an inbound process with a goods receipt that needs to be posted in the SAP S/4HANA system. Products are either purchased from an external supplier, produced in their own plant, or procured internally from another plant within the company structure. So procurement can either be internally or externally. Often, certain products are always produced in-house or purchased externally. This can be specified in the material master of these products via a field called the procurement type.

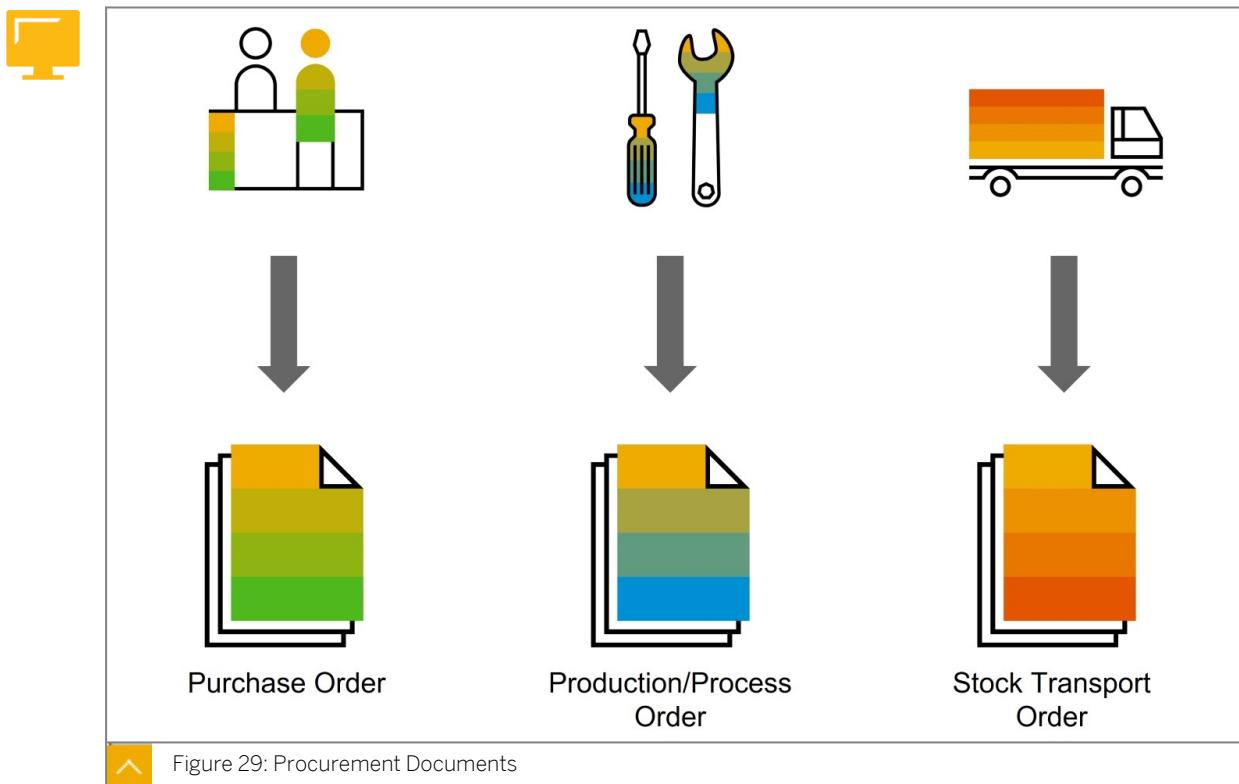


Figure 29: Procurement Documents

Depending on the way of procurement that is selected in a certain situation, a purchase order, a production order or a stock transport order is created in the SAP S/4HANA system.

### Purchasing Process

The process of purchasing materials from suppliers and from other plants within your own company is handled in SAP S/4HANA using purchasing documents such as purchase requisitions and purchase orders. Employees can create requirements for externally procured materials by creating purchase requisitions directly in the system or by using SAP Fiori apps for self-service requisitioning.

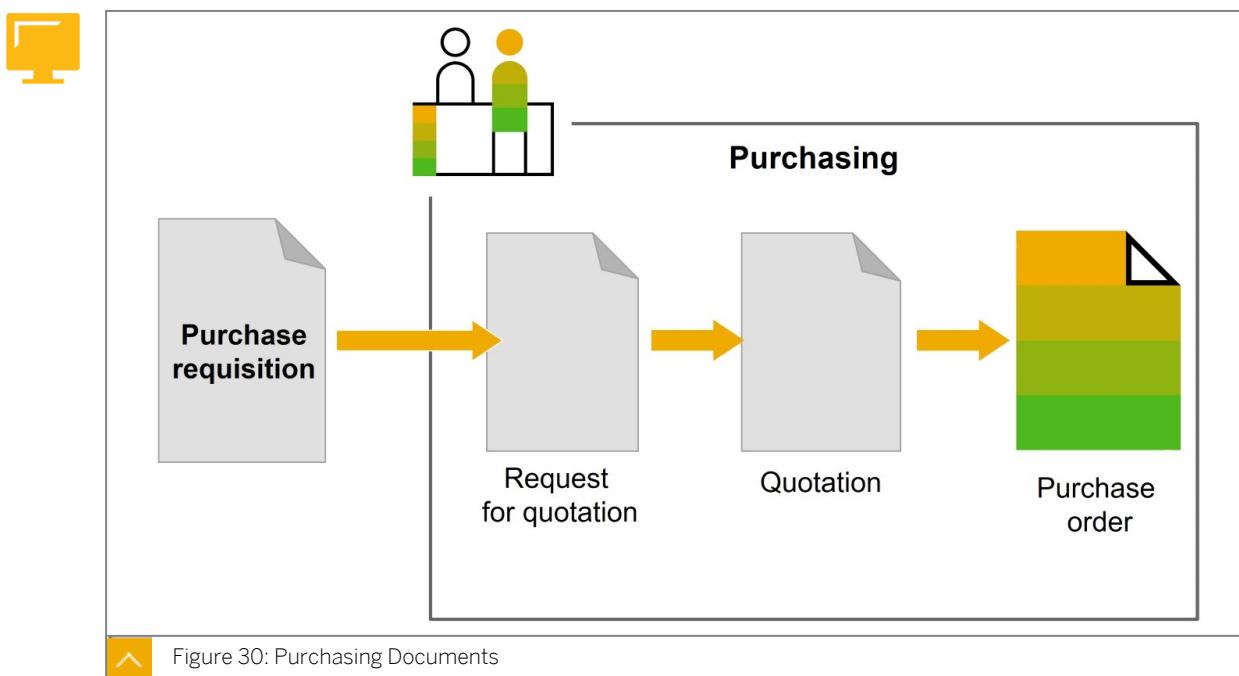


Figure 30: Purchasing Documents

For one-time transactions or for new contacts, purchasing can create a request for a quotation and then enter a corresponding quotation later. The system supports the buyer in comparing quotations from various suppliers.

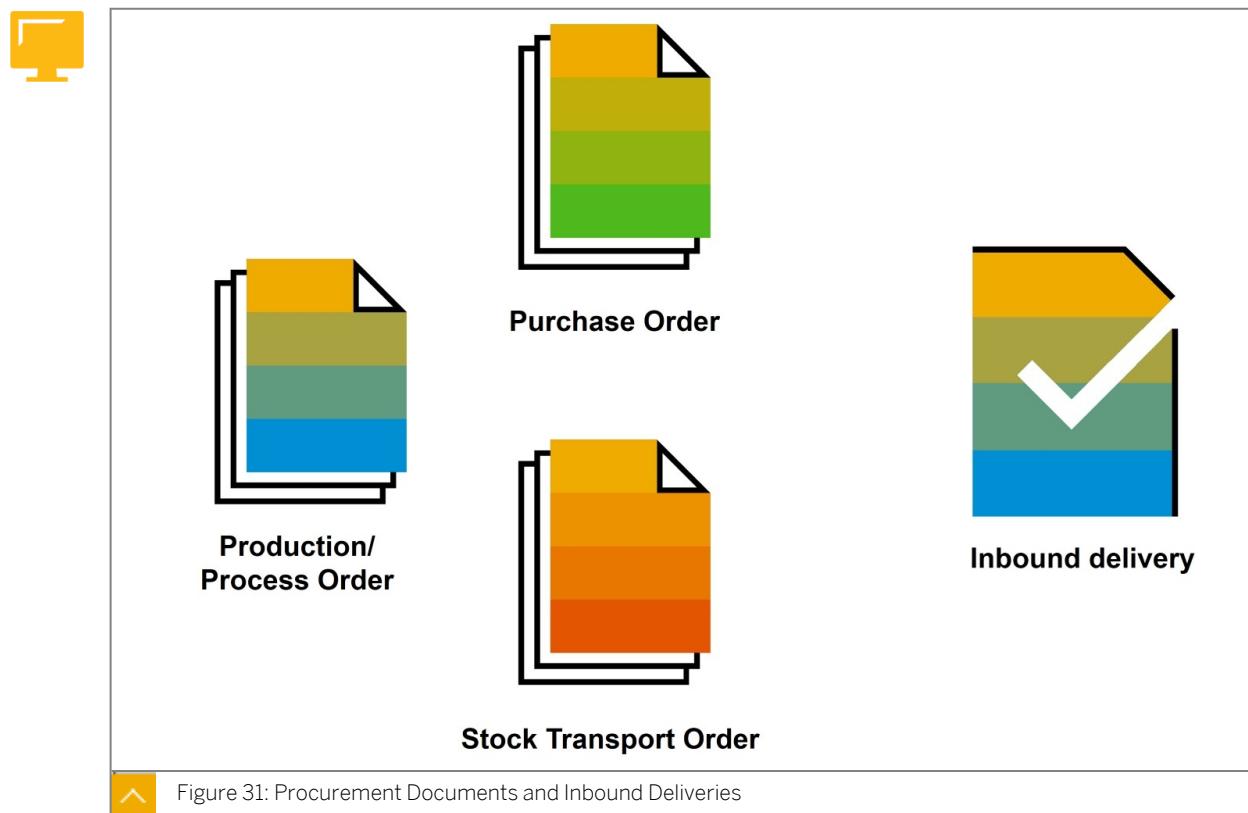
A purchase order can refer to a purchase requisition or a quotation, but a reference is not required.

Materials procured from external suppliers have a separate *Purchasing* view in their master data. Suppliers are represented by a business partner master record that contains address data, accounting data, and default values for purchase order processing (for example a setting whether confirmation of a purchase order receipt is required from this supplier).

If the same material is procured regularly from a specific supplier with fixed conditions, such as price, purchase quantities and delivery times, it is possible to create a purchasing information record for the relevant combination of material and supplier. The system accesses this master data record when purchasing documents are created and copies the data out of the purchasing info record into the relevant fields in the purchase order.

### Goods Receipt with SAP EWM

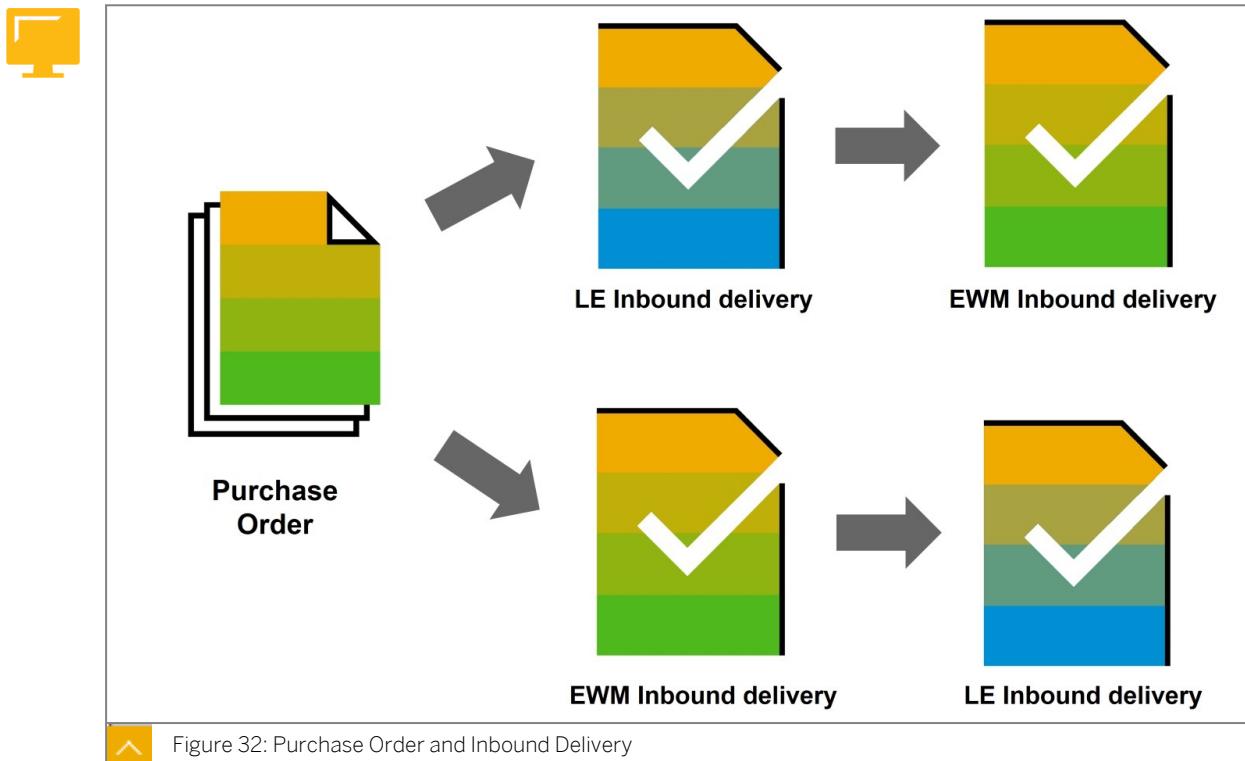
When posting a goods receipt in an SAP EWM-managed warehouse, it is necessary to work with an inbound delivery for the purchase order or the production/process order that is used. There are several ways to create this inbound delivery, depending on the physical process or the information flow between the supplier and the receiving company.



The inbound delivery is the document based on which the physical putaway of a material in the warehouse (Warehouse Management) and the posting of the goods receipt (Inventory Management) is executed.

### Purchase Order and Inbound Delivery

The process of procuring externally from suppliers and also from other plants within your own company is handled in SAP S/4HANA using purchase orders. When you procure from another plant in your own company, this purchase order has a specific document type and is called a stock transport order.



For items relevant for putaway in an SAP EWM warehouse number, it is necessary to create an inbound delivery document in SAP EWM as well. This document is the basis for posting the goods receipt and creating the warehouse tasks for putaway in EWM. The Logistics Execution (LE) inbound delivery can be created automatically when you receive a shipping notification from a supplier. It can also be created manually with reference to a purchase order. In both cases the inbound delivery is replicated to SAP EWM. Alternatively the inbound delivery can be created directly in SAP EWM at the time of the physical receipt of the products. In that case a LE inbound delivery is created as well.

#### Confirmation Control Key

In order to be able to create an inbound delivery for a purchase order, it is necessary to enter a confirmation control key in the purchase order item.

A vendor confirmation is a notification/message from a supplier regarding the delivery status of a specific purchase order. Vendor confirmations enable a company to plan better. This is because in the period between the PO date and the planned delivery date, more reliable and up-to-date information from a supplier (i.e. a confirmation/delivery notification) can then immediately be used to re-plan quantities if needed. The confirmation control key defines what types of confirmations are expected from a supplier and also defines the requirement for and the possibility to create an inbound delivery in the SAP S/4HANA system.



## LESSON SUMMARY

You should now be able to:

- Create a purchase order
- Create an inbound delivery



## Packing during Goods Receipt



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Pack materials during goods receipt

### Packing in the Goods Receipt Process

#### Handling Units

A handling unit (HU) is a physical unit consisting of packaging products (load carriers/ packing products like boxes) and the goods contained on or in them. A handling unit is always a combination of products and packaging products. All the information contained in the product items (for example batch information) is retained in the handling units and is always available.

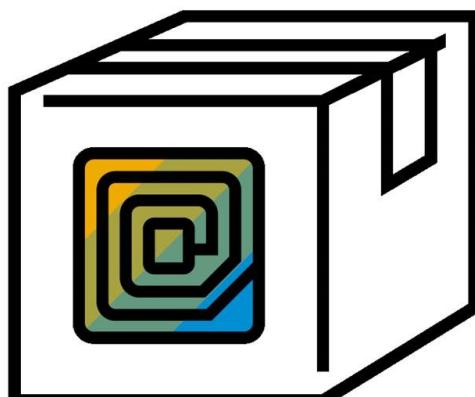


Figure 33: Handling Unit

Handling units can be nested (for example a box within a box), and you can create a new handling unit from several other handling units.

A HU has a unique, scannable identification number that you can construct according to industry standards such as GS1-128 to create a Serial Shipping Container Code (SSCC).

Handling units play a very important role in warehouse management, as they can help to simplify movements. Certain processes in SAP EWM require the use of handling units (HUs). Some specific putaway/removal strategies also need them.

#### Packing Process

When products are received in the warehouse they are probably packed or they will be packed before or during the putaway process.

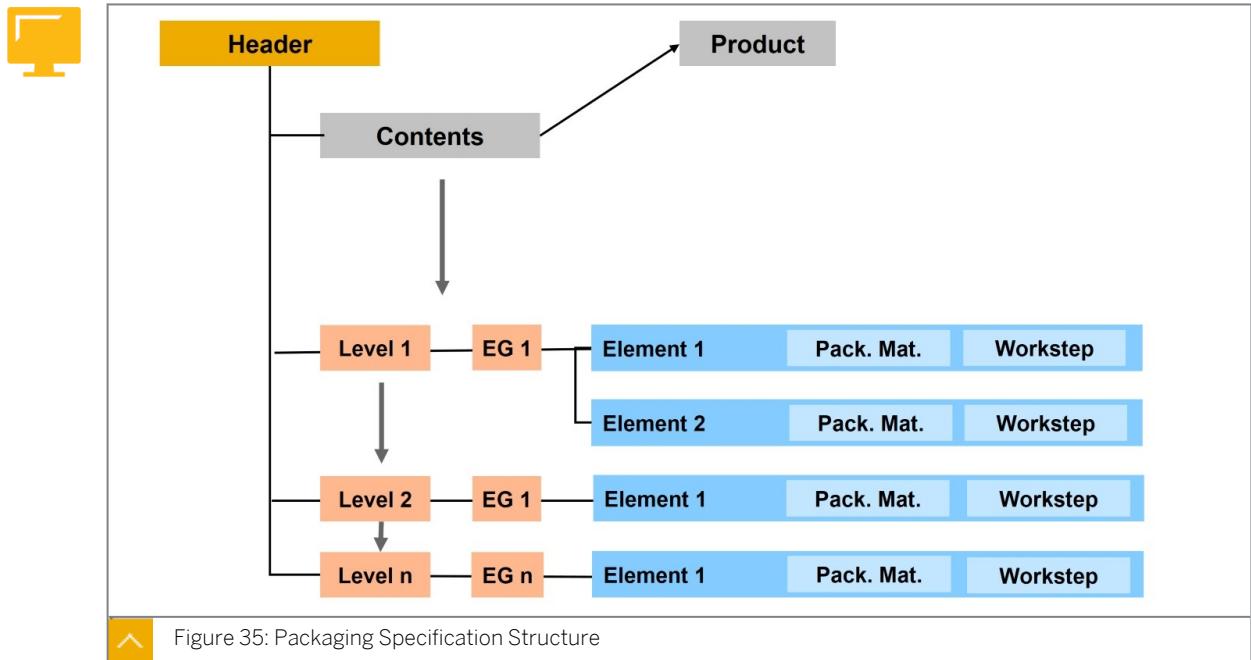


Packing information can be received from the supplier together with the shipping notification. This packaging information can create a handling unit (HU) in the LE inbound delivery. The HU information is copied into the SAP EWM inbound delivery and can be used directly in SAP EWM.

If no packing information is received, the actual packing information can be entered manually during the physical goods receipt process. You can also use a master record in SAP S/4HANA called Packaging Specifications to inform the user how the products should be packed.

With packaging specifications it is also possible to trigger an automatic packing process in the background. Automatic packing means that the system creates HUs in SAP EWM. This of course does not trigger the physical packing itself. Automatic packing is helpful if you have agreed with a supplier about standard packing of a material, but no specific information is sent from supplier to you with every delivery.

## Packaging Specifications



With packaging specifications you can define packaging for different processes in the warehouse, including the following:

- Palletization
- Packing in the work center
- Packing during warehouse task confirmation (pick HU)

A packaging specification can be simple and contain only one step, but it can also contain several levels or packing steps.

Packaging specifications are determined using the condition technique. Using this technique, it is possible that for different packaging steps different packaging specifications are found. This is not required however: you can use the same specifications for all steps.



### LESSON SUMMARY

You should now be able to:

- Pack materials during goods receipt



## Creating Warehouse Tasks for Putaway



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create warehouse tasks for inbound deliveries

### Warehouse Tasks for Inbound Deliveries

When moving products from one location in the warehouse to another, SAP (embedded) EWM uses **Warehouse Tasks** and **Warehouse Orders**. A warehouse task contains all necessary information needed for a warehouse movement to be executed:

- **What should be moved?**  
Warehouse tasks can be for products (product warehouse tasks) or for handling units (handling unit warehouse tasks)
- **Which quantity should be moved?**
- From where (source storage bin) and to where (destination storage bin) should the product or HU be moved?
- A warehouse task can also contain a process step to be executed (like packing) or it can be used to trigger a stock type change (for example from quality inspection to unrestricted use stock).

Warehouse tasks are created with reference to a document like an inbound delivery, but they can also be created without any reference for internal movements.

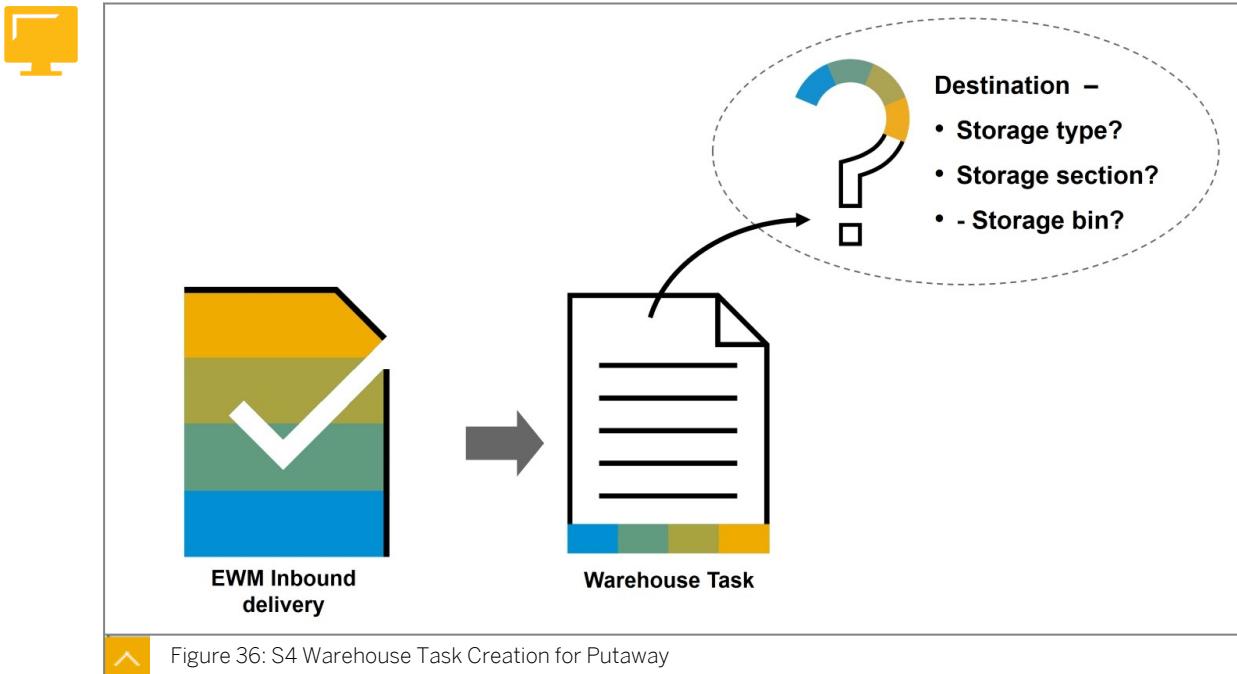


Figure 36: S4 Warehouse Task Creation for Putaway

When a warehouse task for putaway of a material is created with reference to an inbound delivery, the system goes through several steps to find the right bin or bins for the material. During warehouse task creation the system checks whether there exists:

- A storage type sequence:

This sequence contains the storage types in which the system should look for available bins for putaway. The system will check the first storage type, if no bin can be found (or one of the other steps in the search triggers this), the system checks the next storage type for an available bin for putaway, etc.

- A storage section sequence:

Storage sections can be used to (for example) distinguish fast and slow moving items. A certain priority sequence of groups of bins (i.e. sections) can be setup (for example first search in the section Fast Moving and then search in the section Slow Moving). Storage sections can however also be setup as a constraint: for example slow movers only in section 0002. Using the storage section search is optional in the system.

- A storage bin type sequence:

Bin types are used to ensure that packaging materials like pallets or boxes are stored in bins which have the correct size, so that they actually fit. An example: there are high and low pallets, and also high and low bins. For low pallets the system should try to find a low bin, but if none is available a high bin is also OK. For high pallets, only high bins are useable. Again, a sequence can be setup and also a constraint. This is similar to what was discussed for storage sections. "High" and "Low" are defined by assigning certain HU types to certain bin types. This check using HU types and bin types is also called the "HU type check".

- The putaway strategy:

The putaway rule or strategy is defined in the configuration of the storage type. Examples for possible rules are **empty bin**, **addition to stock**, or **bulk storage**.

- A capacity check:

A capacity check can be setup for bins as well; if a bin cannot carry the weight of the materials that need to be putaway, the search should skip the bin and continue.

## Warehouse Orders

Warehouse tasks are grouped into warehouse orders based on **warehouse order creation rules**. A warehouse order represents an executable work package that a warehouse employee should perform at a specific time.

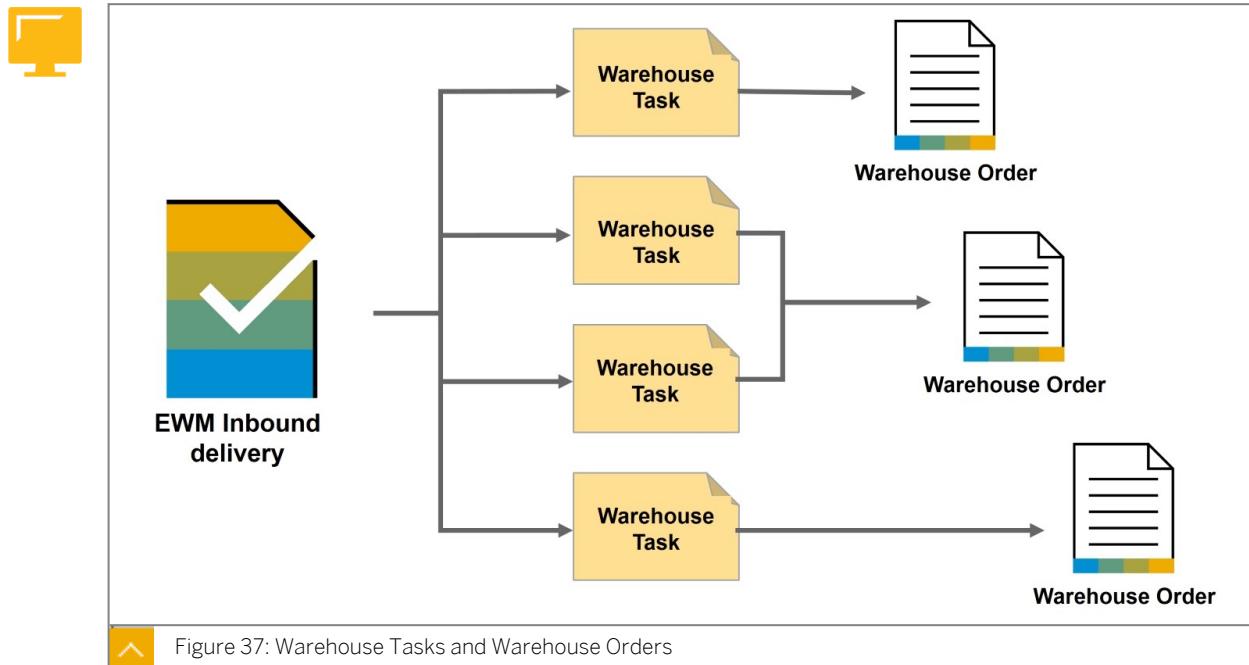


Figure 37: Warehouse Tasks and Warehouse Orders

With warehouse order creation rules (WOCRs) you can define:

- Which warehouse tasks should be grouped together, based for example on the source or the destination bin used in these tasks.
- How much workload a warehouse order can contain: this can be done by limiting for example the number of warehouse tasks that can be assigned to one order, or by specifying the maximum weight one order can contain, or the maximum time required for the tasks assigned to the warehouse order.

## Warehouse Tasks and Warehouse Orders

The number of warehouse tasks in a warehouse depends on the number of individual movements from one bin to another bin for a product or a handling unit. If there are for example three items in an inbound delivery and they have to be moved to three different destination bins, then this will result in three warehouse tasks. If one of the three items is packed in two separate handling units, this will create four warehouse tasks altogether, even if both handling units need to be moved to the same destination bin.

A warehouse order must contain at least one warehouse task, but there can be as many as needed, based on the settings in the warehouse order creation rule.



## LESSON SUMMARY

You should now be able to:

- Create warehouse tasks for inbound deliveries



## Processing Warehouse Orders



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Process warehouse orders with resources
- Work with mobile devices
- Execute quality management processes

### Putaway Process for Inbound Deliveries

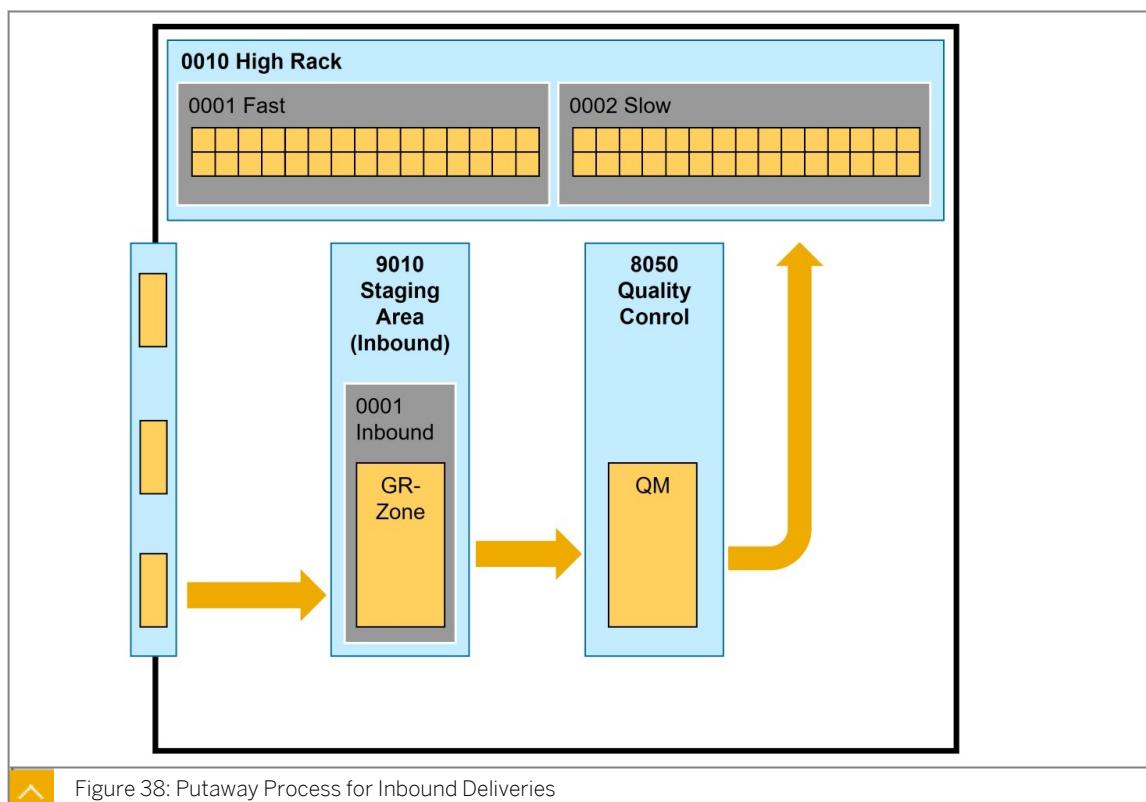
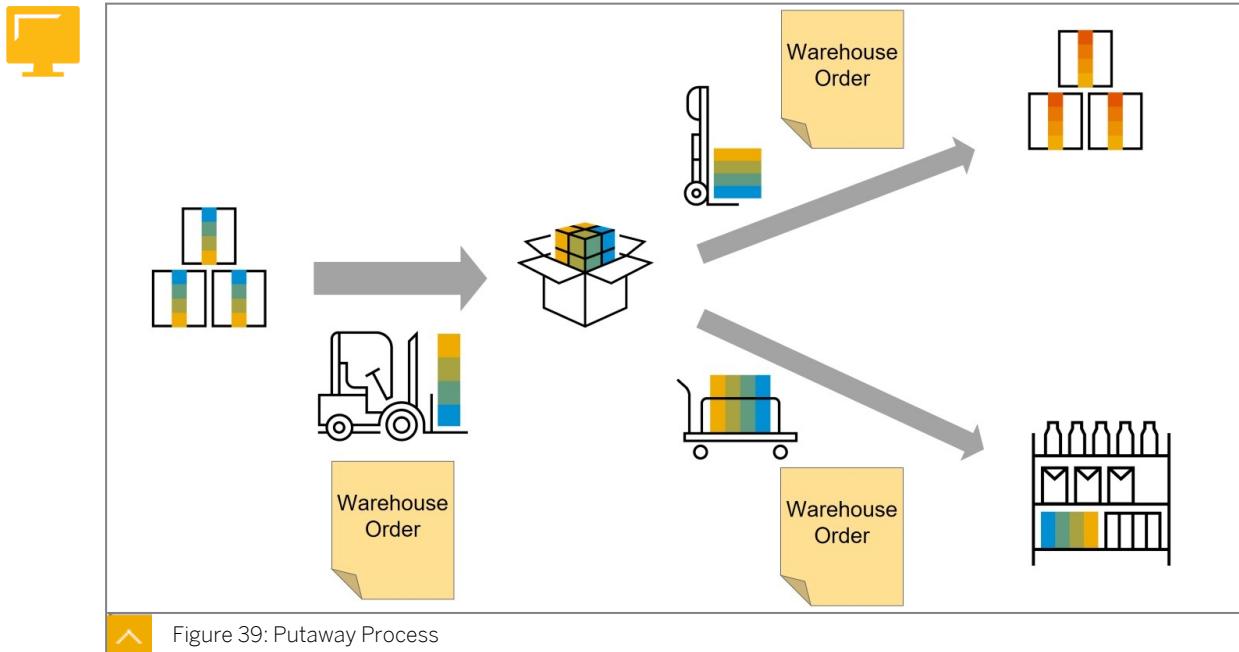


Figure 38: Putaway Process for Inbound Deliveries

Depending on your requirements and settings, the materials received are either moved into the selected destination storage bins directly, or they are moved into an interim storage bins or work centers first. This is done for example when a quality inspection is needed first. When materials are delivered by truck, a first step could be the unloading of the materials and then the posting of these materials into the goods receipt area. After that, the materials could be moved to a quality inspection work center or a work center for re-packing. After this, they could be moved further towards their final destination bins. All these movements are controlled with separate warehouse tasks and warehouse orders, and various resources can be involved in the whole process.

### Putaway Process

To control such a process with multiple movements inside of the warehouse, a functionality can be used in EWM called **Process-Oriented Storage Control**. There is a more warehouse layout oriented version of this available that is called **Layout-Oriented Storage Control**. Process-oriented storage control is used to define process steps like unloading, quality inspection, or packing. Layout-oriented storage control is used for example to set-up a material flow system.



During the movement of goods through a warehouse, several workers can handle the same handling unit one worker after the other, based on the tasks that need to be executed. All the warehouse tasks and warehouse orders in such a process are related to each other, but each individual movement (i.e. warehouse order) can be executed by a separate resource.

### Resources in the Warehouse



When working with mobile devices, warehouse orders are always processed by **resources**. A resource can be a person which moves goods on a cart, a forklift, or an element of an automated part of the warehouse. The user who logs onto a mobile device then also enters the (SAP) resource that logs on. This determines then the following:

- What warehouse orders are assigned to this resource (when in the set-up of the warehouse, warehouse order are assigned automatically to resources)
- Where this resource can go to
- What types of handling units this resource can process



**Note:**

Resources can also be used when working paper-based, but several features are only supported when mobile devices are used.

Warehouse orders are assigned to a resource either automatically by using a queue, manually by a person responsible, or manually by a selection of the end user (i.e. the resource itself). A **queue** is a logical file to which warehouse orders for processing are assigned. Queues represent different movements in the warehouse for which the total amount of work is managed and assigned to the individual persons/users in the warehouse. An example: both an inbound queue and an outbound queue could be defined for a specific warehouse.

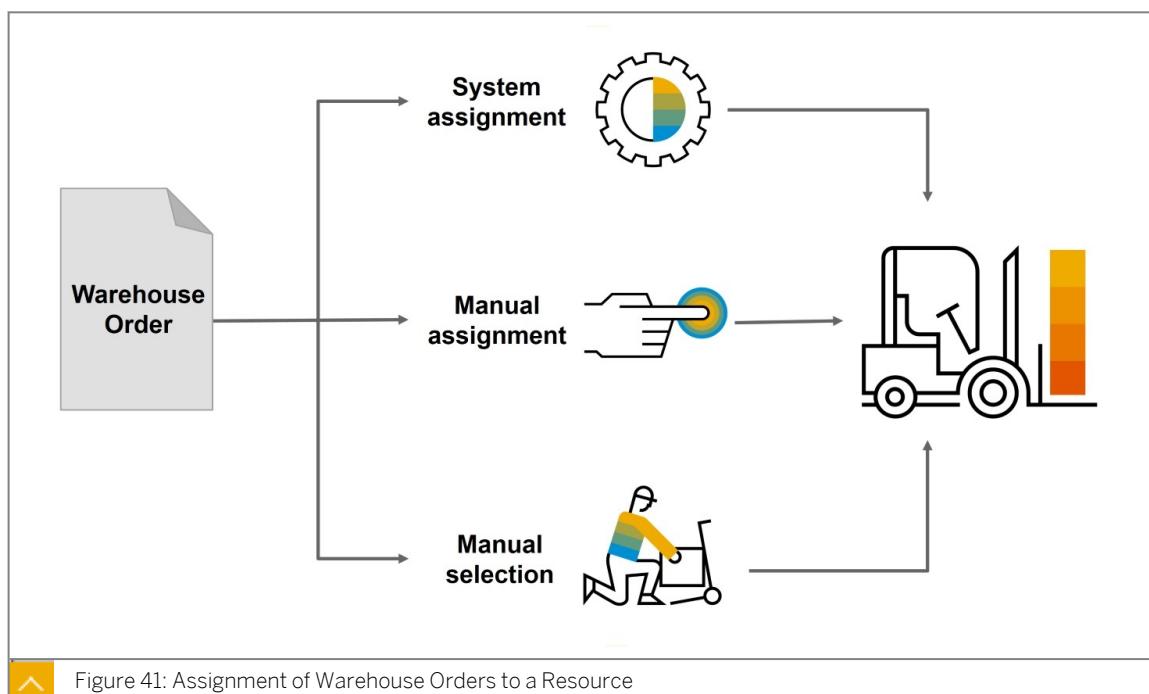
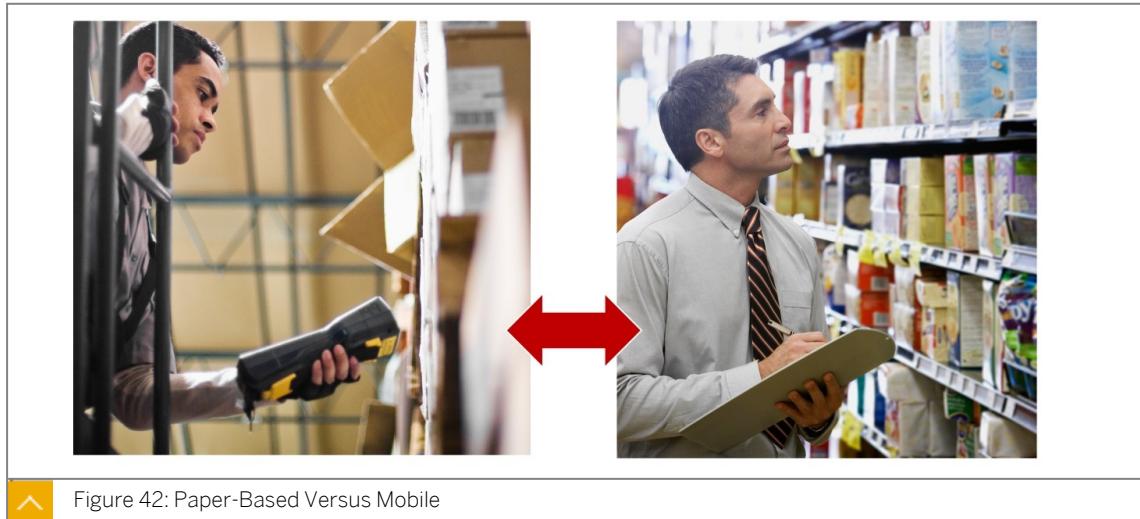


Figure 41: Assignment of Warehouse Orders to a Resource

## Mobile Devices

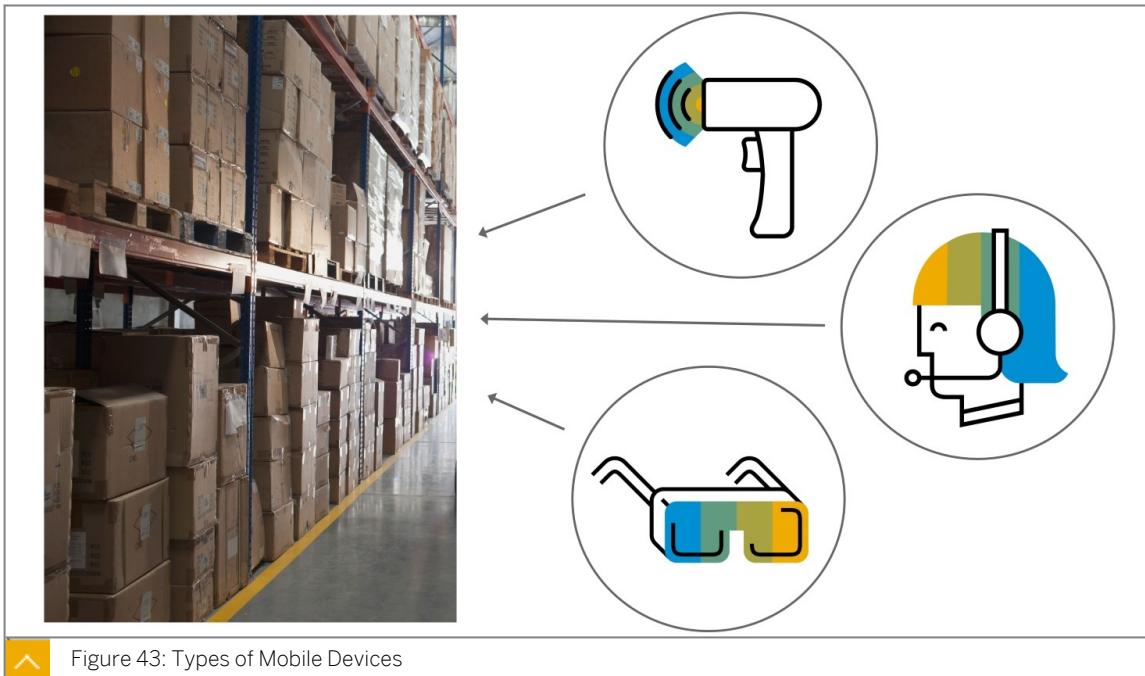


Warehouse tasks can be executed in a warehouse either via **paper-based working** or via **working with a mobile device**. Paper-based means that the instruction is printed (like a pick list): the warehouse worker marks on the piece of paper what he or so she has done and also any deviations if needed. Someone later enters this information in the SAP S/4HANA system. This way of working has certain limitations and disadvantages. For example: the delay between the actual processing of the materials and the entering of the information in the system might make it impossible to react timely to issues. If a worker manually selects another bin than instructed (for whatever reason) and notes this information on the piece of paper, then this is not known to others until the information is entered in the system. Other people executing other processes could thus be triggered to start their processing based on wrong information.

When working with a mobile device, the system can react directly to information entered by the user, so, for example, when the originally assigned bin cannot be used, the system can determine the next available bin. It is also a way to avoid errors which can happen when transferring the information from paper into the system. There are also special processes in SAP EWM that are only available when the users work with mobile devices.

### Types of Mobile Devices

There are different types of mobile devices which can be used in combination with SAP EWM. In general a mobile device is a device that can be carried by the user and connects the user directly to the system. It can also represent a (bigger) device that is installed on a forklift or a cart, but would use specialized transactions and different screens than a desktop application would use to process the same tasks.



Traditionally, mobile devices have a small screen and mobile devices often support scanning capabilities. The user sees the relevant information on the screen and uses the scanner to confirm the different steps like the source or target bin, the material, and so on. Other information like quantities, can be entered using a keyboard which is usually part of the device.

SAP S/4HANA uses the RF (Radio Frequency) Framework when connecting mobile devices to the system. This framework supports also the usage of **pick-by-voice**. Pick-by-voice means that the user wears a headset (instead of looking on a display) and the task-related information is then audible and confirmations are done via speech input.

Another technology available for SAP EWM is the use of Smart Glasses in combination with the **SAP Augmented Reality Warehouse Picker** app. This combines the advantages of a display and a scanner with the pick-by-voice functionality.

### Quality Management During Goods Receipt

During a goods receipt process in a warehouse, there might be a need to check the quality of the delivered materials. For this, Quality Management process steps can be integrated with the standard putaway process. The goods receipt posting will then initially be done in stock type Quality Inspection, and therefore the received quantities will not be available for (for example) sales.



Figure 44: Quality Inspection

To perform a quality check, a so called Inspection Lot is created in the system. This inspection lot is then processed by the person responsible for the quality inspection. Depending on the usage decision (UD) for the inspection lot, the material is either posted to unrestricted use stock (and then it will be put away in the normal way), or it is posted to blocked stock (and then sent back to the vendor for example). For internally produced products, the decision might be taken to scrap the materials or to send them back to production for rework.

To be able to execute a return process, additional system documents are required.

You can use *Acceptance Sampling* to inspect externally procured goods before a goods receipt posting. Depending on the result of the acceptance sampling, you can then allow goods receipt with or without restrictions. Without restrictions means that the material will be posted to unrestricted use stock and can be putaway normally. With restriction could lead to a more thorough inspection with the final usage decision after this more extensive inspection.

### **Processing Quality Management in the Warehouse**

The actual quality inspection of the materials will usually not happen immediately when unloading the materials from the truck or in the goods receipt area. Usually, a sample of the materials which need inspection are brought to a lab and the inspection there might take some time. The rest of the delivered quantity could for example be putaway already; there might be not enough space to keep the product in the goods receipt area. It is also possible that the complete quantity of the delivery will be brought to a special work center, where the products gets unpacked and inspected.

Several variants of these quality inspection processes can be set-up in the SAP S/4HANA system. Extended Warehouse Management can use *Process-Oriented Storage Control* to support these processes. It is for example possible to model not just one movement related to quality inspection for materials during a putaway process, but to model that materials are moved through various points in the warehouse during an inspection and that different actions need to take place.

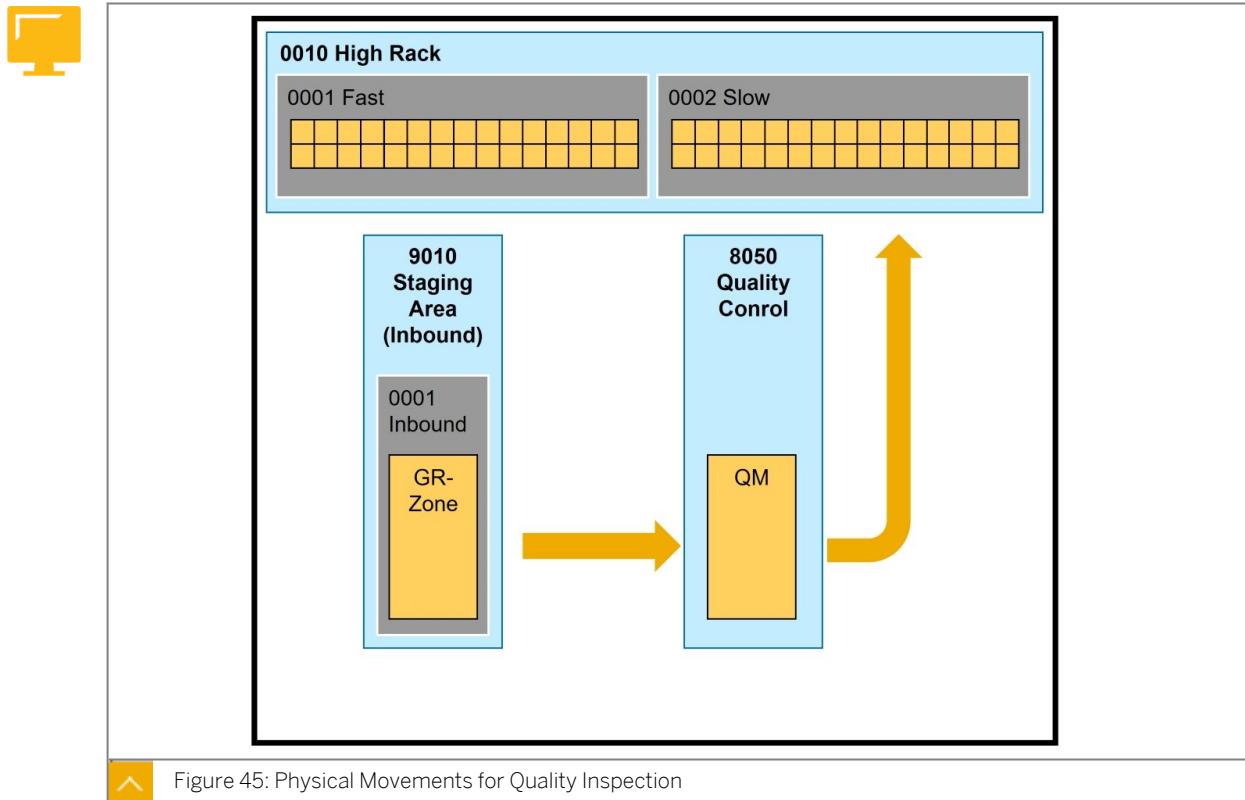


Figure 45: Physical Movements for Quality Inspection

Integration with Quality Management processes is just one example for the use of Process-Oriented Storage Control. A process can also include steps like unloading and have steps which are processes on a work center (like Value-Added Services (VAS)).

Process-Oriented Storage Control always requires a handling unit (HU). For an inbound process this means that packing (manually or automatically) is required before the warehouse tasks are created.



## LESSON SUMMARY

You should now be able to:

- Process warehouse orders with resources
- Work with mobile devices
- Execute quality management processes



## Creating Inbound Deliveries in EWM directly



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create inbound deliveries in SAP EWM

### Creation of Inbound Deliveries in SAP EWM directly

The possibility to create inbound deliveries directly in SAP EWM is not only an option to set-up a more simplified process in the system. This possibility is also very useful when a supplier does not send any information prior to goods receipt (like an EDI message) based on which inbound deliveries could be created automatically in the SAP S/4HANA system. When goods arrive physically at the warehouse and no LE Delivery document exists, the standard process can be sped up by creating the EWM inbound delivery directly in SAP EWM without an LE (Inbound) Delivery number.

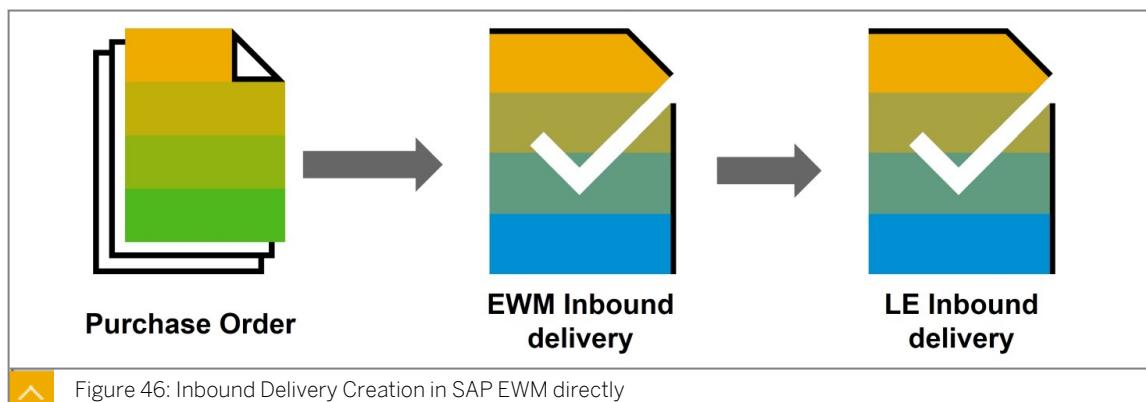


Figure 46: Inbound Delivery Creation in SAP EWM directly

There are different possibilities available to create the inbound delivery in SAP EWM directly. There is a SAP GUI transaction available (this is the same as it was in the decentral SAP EWM system), but there is also a Fiori app available which offers a simple user interface to create the delivery, post the goods receipt, and create the needed warehouse task for putaway.



#### Note:

The standard Fiori app does not allow for the confirmation of the warehouse task in the same step. In a simple warehouse, a solution for this might be to have the automatic confirmation of warehouse tasks set up. If not, the confirmation of the warehouse task is done with a SAP GUI transaction or with the Radio Frequency (RF) framework.



## LESSON SUMMARY

You should now be able to:

- Create inbound deliveries in SAP EWM

## Learning Assessment

1. A \_\_\_\_\_ can be created with reference to a purchase requisition and/or to a quotation.

*Choose the correct answer.*

- A purchase order
- B inbound delivery
- C goods receipt

2. When working with SAP Extended Warehouse Management (SAP EWM), you always need an inbound delivery for posting the goods receipt for a purchase order.

*Determine whether this statement is true or false.*

- True
- False

3. If you want to work with handling units in SAP EWM, the packaging information must be received from the supplier. You cannot enter this manually during goods receipt processing.

*Determine whether this statement is true or false.*

- True
- False

4. A handling unit is always a combination of a product and a \_\_\_\_\_?

*Choose the correct answer.*

- A storage bin
- B packaging material
- C transportation unit

5. During the warehouse task creation, the system uses:

*Arrange these steps into the correct sequence.*

- The storage type sequence
- The storage section sequence
- The storage bin type sequence
- The putaway rule

6. A warehouse order cannot contain more than one warehouse task.

*Determine whether this statement is true or false.*

- True
- False

7. To control the specific movements needed during a putaway process in an EWM warehouse, you can use:

*Choose the correct answers.*

- A Process-Oriented Storage Control
- B Layout-Oriented Storage Control
- C Storage sections
- D Handling units (HUs)

8. In SAP EWM, a resource always represents a person on foot.

*Determine whether this statement is true or false.*

- True
- False

9. For the system to be able to automatically assign a warehouse order to a resource, the warehouse order must:

*Choose the correct answer.*

- A Be assigned to a queue
- B Contain a Handling Unit (HU)
- C Have more than one warehouse task
- D Be printed

10. On a mobile device, in general the user utilizes the same transaction as on a desktop PC.

*Determine whether this statement is true or false.*

- True
- False

11. In what stock type are materials usually stored until the quality inspection process is done?

*Choose the correct answer.*

- A Unrestricted stock
- B Quality inspection stock
- C Blocked stock

12. When no information is received from a supplier prior to goods receipt, it is possible to create the inbound delivery directly in SAP EWM.

*Determine whether this statement is true or false.*

- True
- False

## Learning Assessment - Answers

1. A \_\_\_\_\_ can be created with reference to a purchase requisition and/or to a quotation.

*Choose the correct answer.*

- A purchase order  
 B inbound delivery  
 C goods receipt

Correct. A purchase order can be created with reference to a purchase requisition and/or to a quotation.

2. When working with SAP Extended Warehouse Management (SAP EWM), you always need an inbound delivery for posting the goods receipt for a purchase order.

*Determine whether this statement is true or false.*

- True  
 False

Correct. When working with SAP Extended Warehouse Management (SAP EWM), you indeed always need an inbound delivery for posting the goods receipt for a purchase order.

3. If you want to work with handling units in SAP EWM, the packaging information must be received from the supplier. You cannot enter this manually during goods receipt processing.

*Determine whether this statement is true or false.*

- True  
 False

Correct. If you want to work with handling units in SAP EWM, the packaging information can be received from the supplier together with the shipping notification, but this is not mandatory. It can be entered manually in SAP S/4HANA.

4. A handling unit is always a combination of a product and a \_\_\_\_\_?

*Choose the correct answer.*

- A storage bin
- B packaging material
- C transportation unit

Correct. A handling unit is always a combination of products and a packaging material.

5. During the warehouse task creation, the system uses:

*Arrange these steps into the correct sequence.*

- 1** The storage type sequence
- 2** The storage section sequence
- 3** The storage bin type sequence
- 4** The putaway rule

Correct. During warehouse task creation, the system first uses the storage type sequence, then the storage section sequence, then the storage bin type sequence, and after that the putaway rule assigned to the selected storage type.

6. A warehouse order cannot contain more than one warehouse task.

*Determine whether this statement is true or false.*

- True
- False

Correct. A warehouse order must contain at least one warehouse task, but there can be as many as needed based on what the warehouse order creation rule specifies.

7. To control the specific movements needed during a putaway process in an EWM warehouse, you can use:

*Choose the correct answers.*

- A Process-Oriented Storage Control
- B Layout-Oriented Storage Control
- C Storage sections
- D Handling units (HUs)

Correct. You can use process-oriented storage control and layout-oriented storage control to control the various movements needed within a warehouse during a putaway process.

8. In SAP EWM, a resource always represents a person on foot.

*Determine whether this statement is true or false.*

True

False

Correct. A resource can be a person that moves goods on a cart, but also a forklift, or an element of an automated part of the warehouse.

9. For the system to be able to automatically assign a warehouse order to a resource, the warehouse order must:

*Choose the correct answer.*

A Be assigned to a queue

B Contain a Handling Unit (HU)

C Have more than one warehouse task

D Be printed

Correct. For the automatic assignment of a warehouse order to a resource, the warehouse order must be assigned to a queue.

10. On a mobile device, in general the user utilizes the same transaction as on a desktop PC.

*Determine whether this statement is true or false.*

True

False

Correct. When using a desktop PC, different transactions and screens are usually used.

11. In what stock type are materials usually stored until the quality inspection process is done?

*Choose the correct answer.*

A Unrestricted stock

B Quality inspection stock

C Blocked stock

Correct. The stock type in which products are usually stored until the quality inspection is done, is called Quality inspection stock.

12. When no information is received from a supplier prior to goods receipt, it is possible to create the inbound delivery directly in SAP EWM.

*Determine whether this statement is true or false.*

True

False

Correct. When no information is received from a supplier prior to goods receipt, it is indeed possible to create the inbound delivery directly in SAP EWM.



**Lesson 1**

Posting the Goods Issue for Sales Orders

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**Lesson 2**

Picking Materials for Outbound Deliveries

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**Lesson 3**

Performing Value-Added Services (VAS)

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**Lesson 4**

Monitoring the Warehouse

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**Lesson 5**

Posting Goods Issue

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**Lesson 6**

Processing using SAP Fiori apps

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**UNIT OBJECTIVES**

- Describe shipping-relevant functions during sales order creation
- Create outbound deliveries
- Work with waves
- Create pick handling units
- Work with exceptions
- Perform a value-added service
- Work with the warehouse management monitor
- Post a goods issue
- Process an outbound process using SAP Fiori apps



## Posting the Goods Issue for Sales Orders



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe shipping-relevant functions during sales order creation
- Create outbound deliveries

### Goods Issue process step

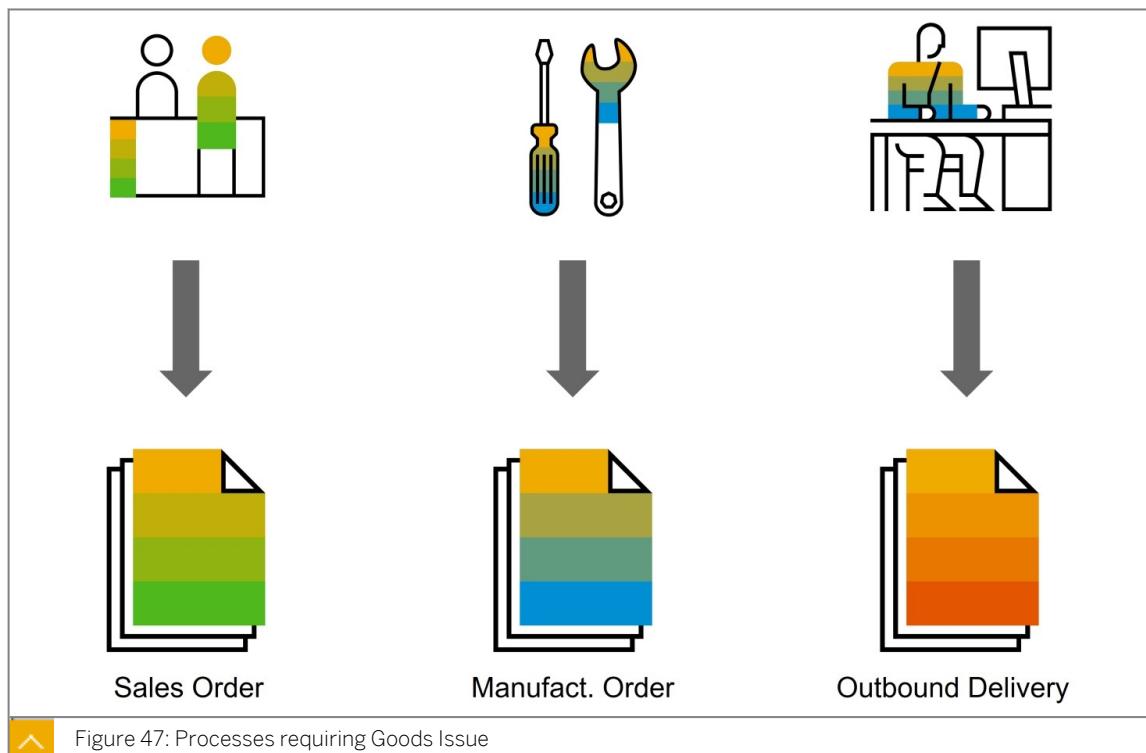
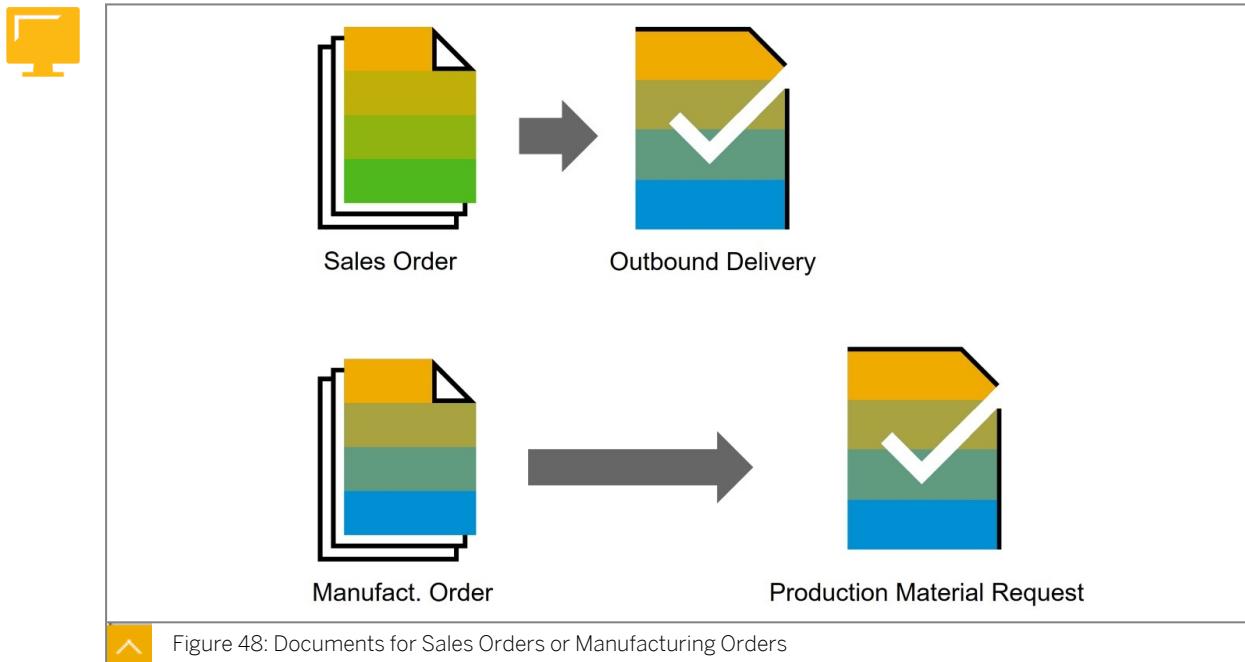


Figure 47: Processes requiring Goods Issue

When fulfilling customer orders, picking and posting a goods issue are necessary process steps. Other examples are supplying materials to production, or issuing goods internally for a cost center or an internal order.

When selling to an external customer, a sales order is created. A manufacturing order (production or process order) is the source document in production that could require materials to be able to execute the production process. For internal usage of materials, an outbound delivery might be the only document needed. This document could be created manually from the Inventory Management solution in the system, but it could also be created directly in SAP EWM. This is easier in many cases.

## Goods Issue with SAP EWM



When using an SAP EWM-managed warehouse, the documents needed differ depending on the business process and the system settings. For a sales order, an outbound delivery is used; similar to the inbound process discussed earlier. There is a Logistics Execution (LE) outbound delivery and a corresponding document in SAP EWM. For the supply of materials for manufacturing orders, you can create outbound deliveries in SAP ERP, but it is also possible to create a Production Material Request (PMR) directly in SAP EWM. This reduces the number of documents needed in certain processes significantly.

### Sales Order and Outbound Delivery

For sales order items which are picked from an SAP EWM warehouse, an LE outbound delivery is created with reference to the sales order. The delivery is replicated to SAP EWM as an outbound delivery order. This outbound delivery order is used for the creation of warehouse tasks to pick the goods.

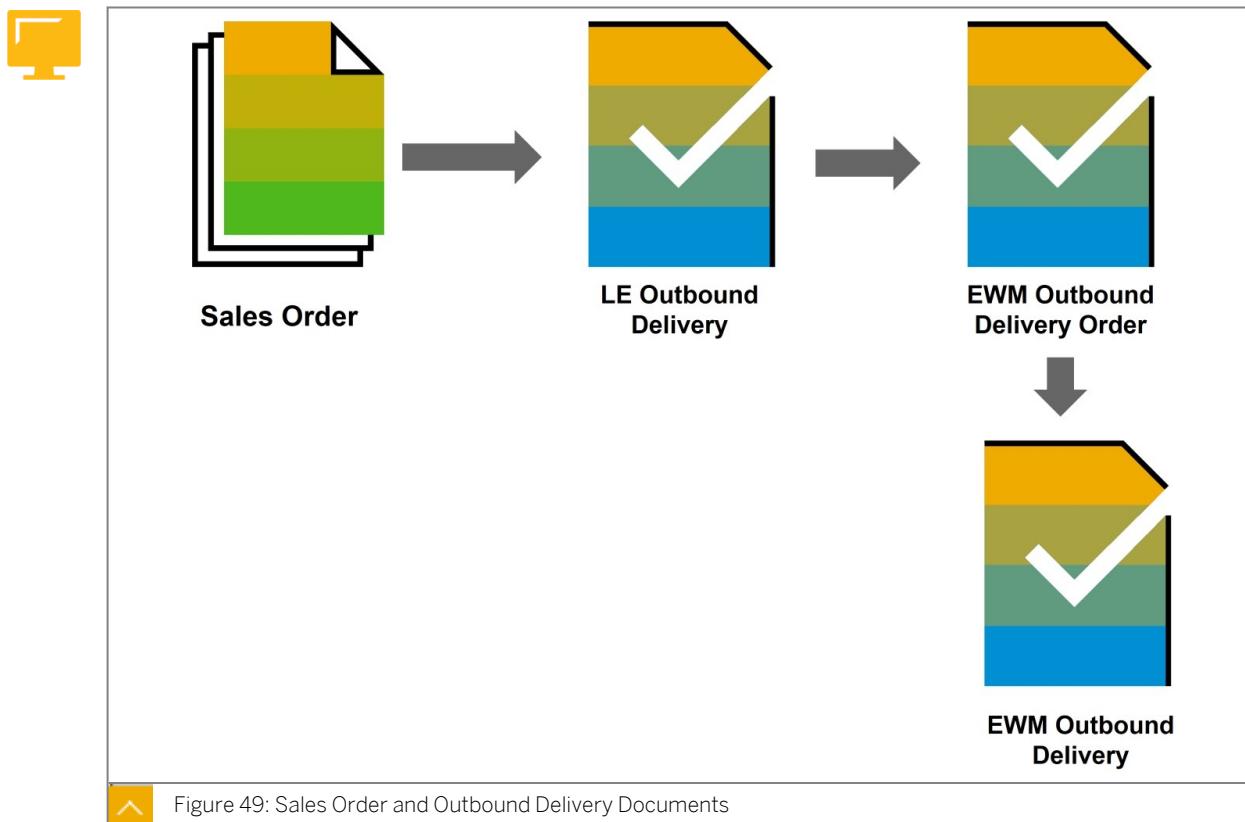


Figure 49: Sales Order and Outbound Delivery Documents

At the end of the process in SAP EWM, an additional document (another outbound delivery) is created. This is necessary for a potential split of the LE outbound delivery in case of partial deliveries.

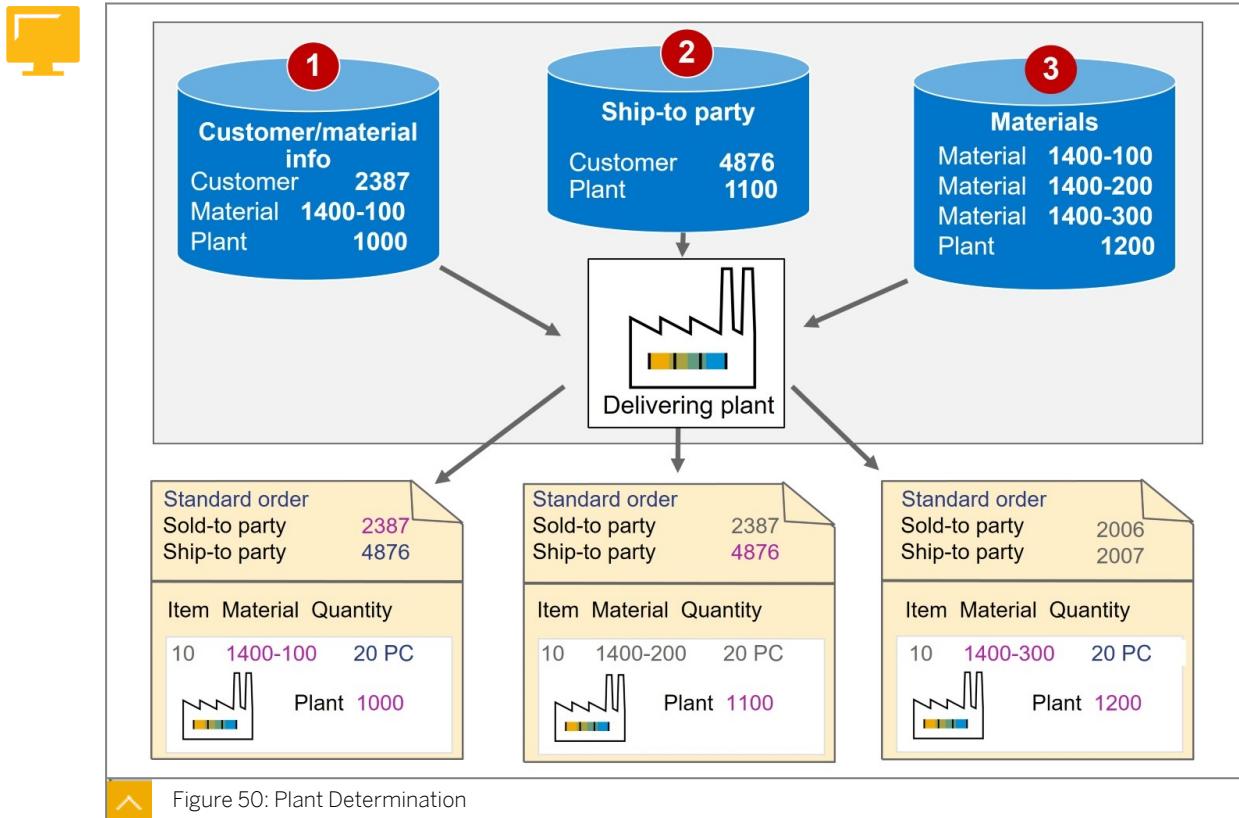
### Determination of Shipping Data in Sales Orders

When you create a sales order in SAP S/4HANA, the sales order is scheduled according to some Customizing settings and the set-up of the master data records used in the process. Scheduling means that times are calculated for certain steps in the process. Examples are: the goods loading time and the date/time on which the material needs to be available for the system to be able to confirm the sales order on the requested delivery date. This calculation (which is executed for each document item) is dependent on for example the sales document type that you select when creating the sales order (normal order versus rush order).

For the scheduling of the sales order, some other information needs to be determined first per sales order item. First of all, the **(Delivering) Plant** for a sales order item. The (delivering) plant plays a central role in sales and distribution processes and is therefore already relevant during the creation of a sales order. Among other things, the plant is relevant for the determination of the **Shipping Point**. The shipping point again is required for the calculation of the **Route**. All these elements are used when scheduling the sales order and when calculating the **Material Availability Date**. This is the date on which the material needs to be available in order to be able to confirm the sales order on the requested delivery date. If the actual **Material Availability Date** is later than this requested date, the sales order will be confirmed late.

### Plant Determination

Because the delivering plant is of vital importance to the whole process, the system automatically attempts to determine the delivering plant (per item in the sales order) when sales orders are created.



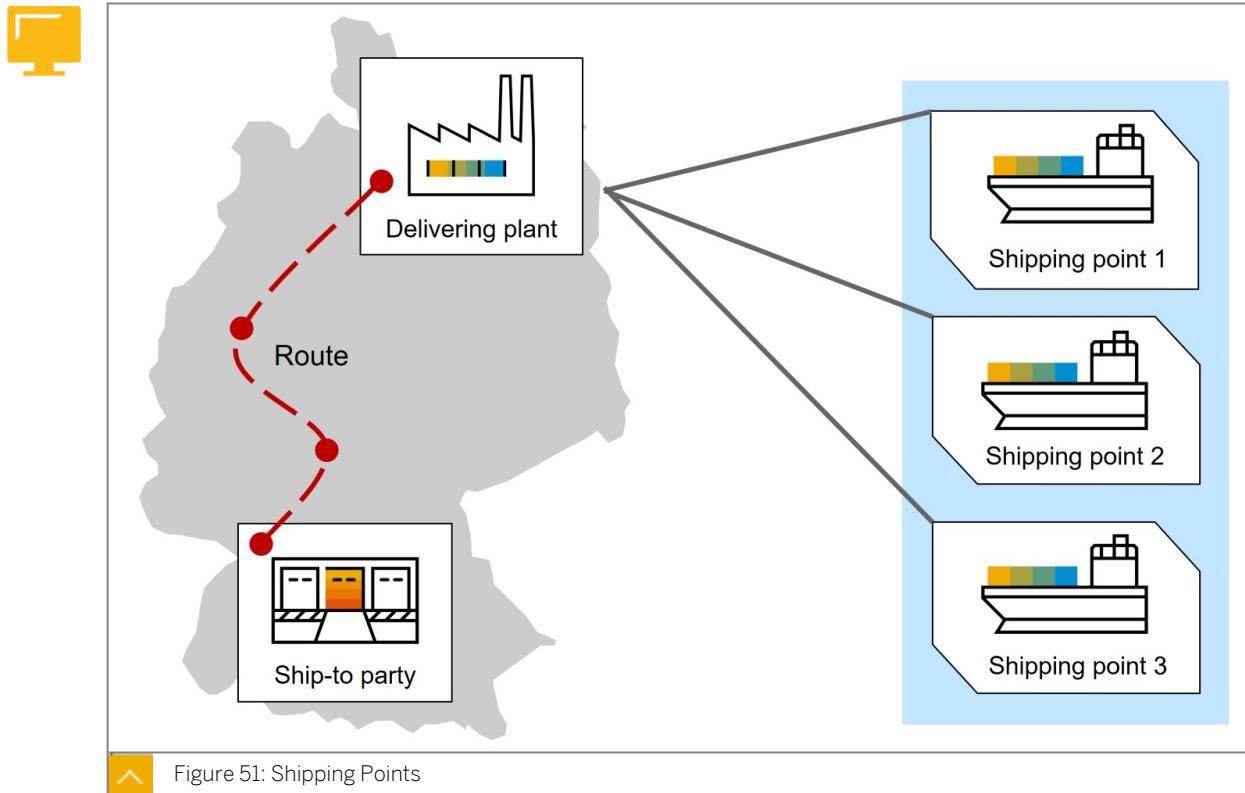
For the determination of the (delivering) plant, the system uses a priority sequence. This sequence is as follows:

- Customer-material information record
- Ship-to party master record
- Material master record

If no valid plant can be found in these master data records (for example, because the field (delivering) plant is not maintained in any of these records), no delivering plant is automatically set in the sales document item. This means that the document will be incomplete. The user can then manually enter the (delivering) plant per sales order item.

### Shipping Point

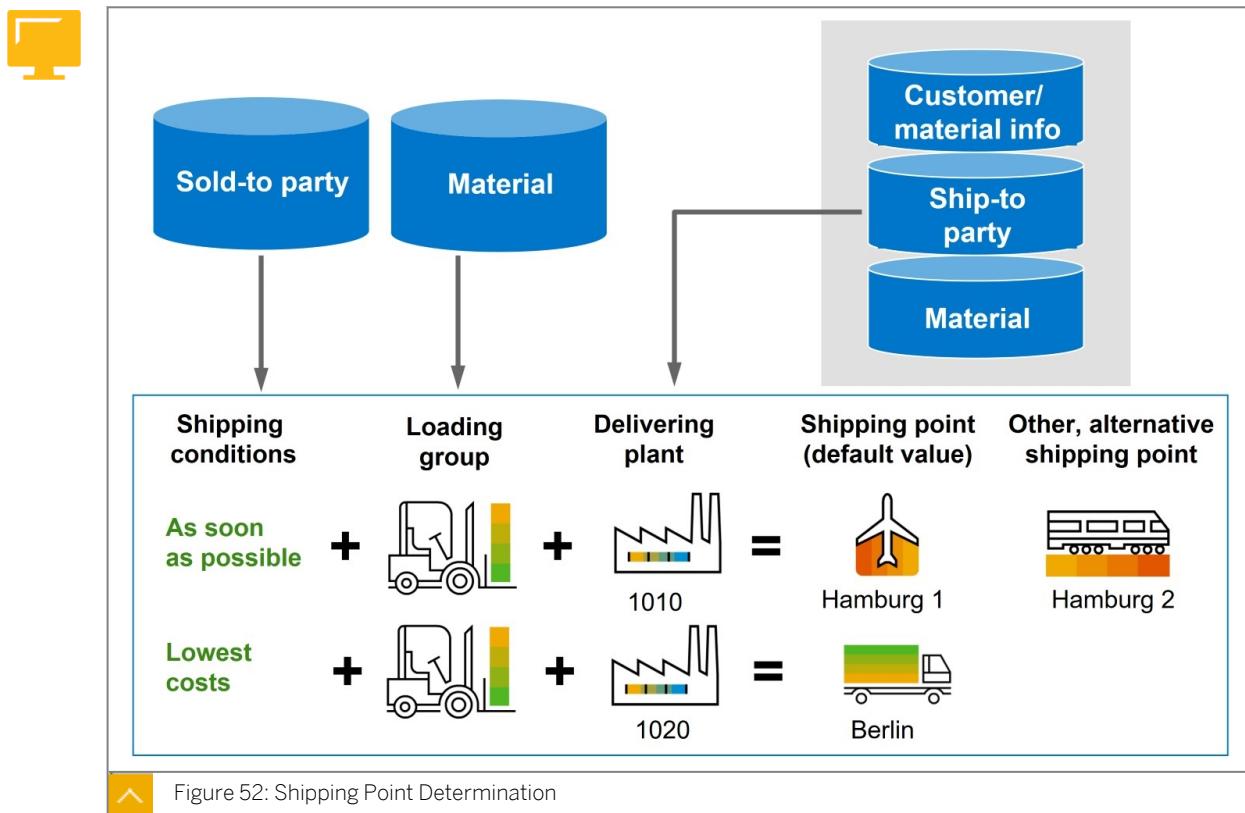
A Shipping Point is the organizational unit that is responsible for shipping /outbound processing. If you sell physical products that have to be delivered to a customer, the appropriate shipping point is, like the (delivering) plant, already determined for the corresponding sales order items when the sales order is created.



From an organizational point of view, shipping points are assigned to (delivering) plants.

### Shipping Point Determination

Because shipping points are of vital importance to the process, the system tries to determine the right shipping point for every delivery-relevant item within a sales order automatically.



The shipping conditions are copied from the business partner master record of the Sold-to Party (*Shipping* tab page). They are copied into the sales document header. If certain shipping conditions are assigned to the sales order type (in the configuration of the system) that is used, then these overrule the shipping conditions from the Sold-to Party. This way you can use special sales order types for special processes which need a different shipping point (and a different sales order scheduling). Examples could be Rush Orders (standard order/document type RO) or Cash-Sales Orders (standard order/document type CS).

The loading group can be found on the *Sales: General/Plant Data* tab page within the material master record.

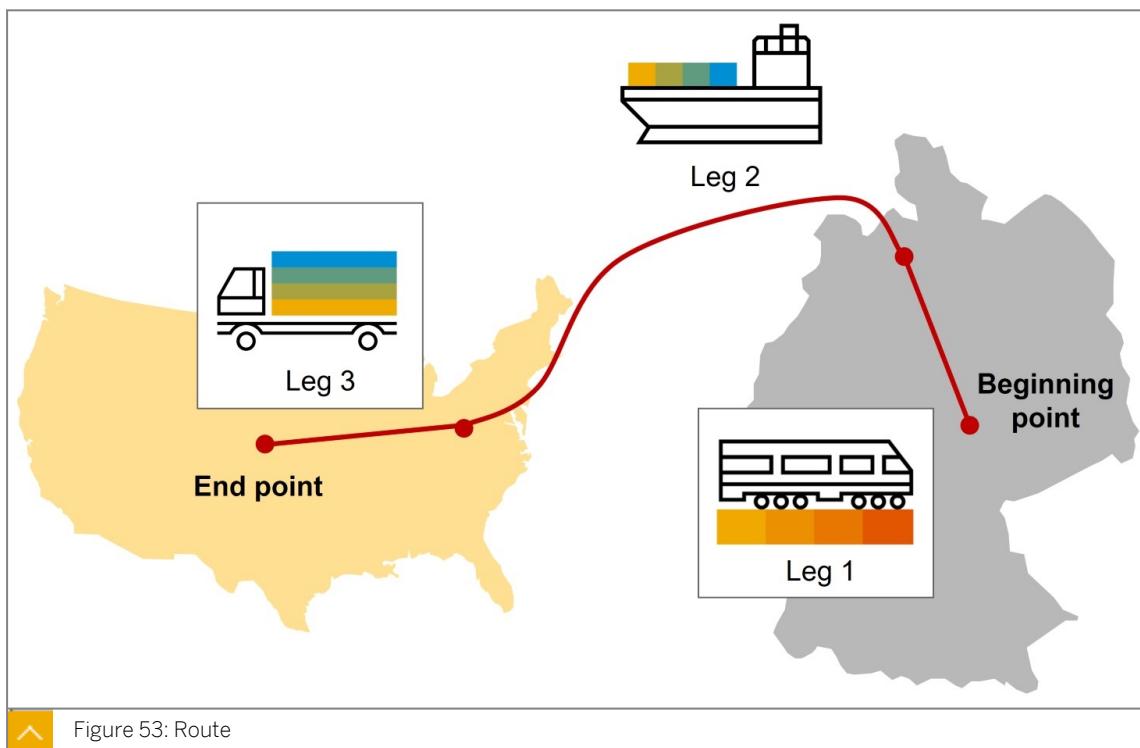
You can change the value of the automatically determined shipping point manually, but only to some other allowed shipping points as per the customizing tables where this is controlled.

### Route

The route describes the way the materials belonging to an outbound delivery need to be transported when moving from a shipping point to their destination. This destination depends on the Ship-to Party selected for the sales order item. This Ship-to Party could represent a specific address in the region where the customer is located. The route can consist of one or more **sections** and **legs**. It can also contain information on the service provider, the means of transportation and the actual transit time needed.

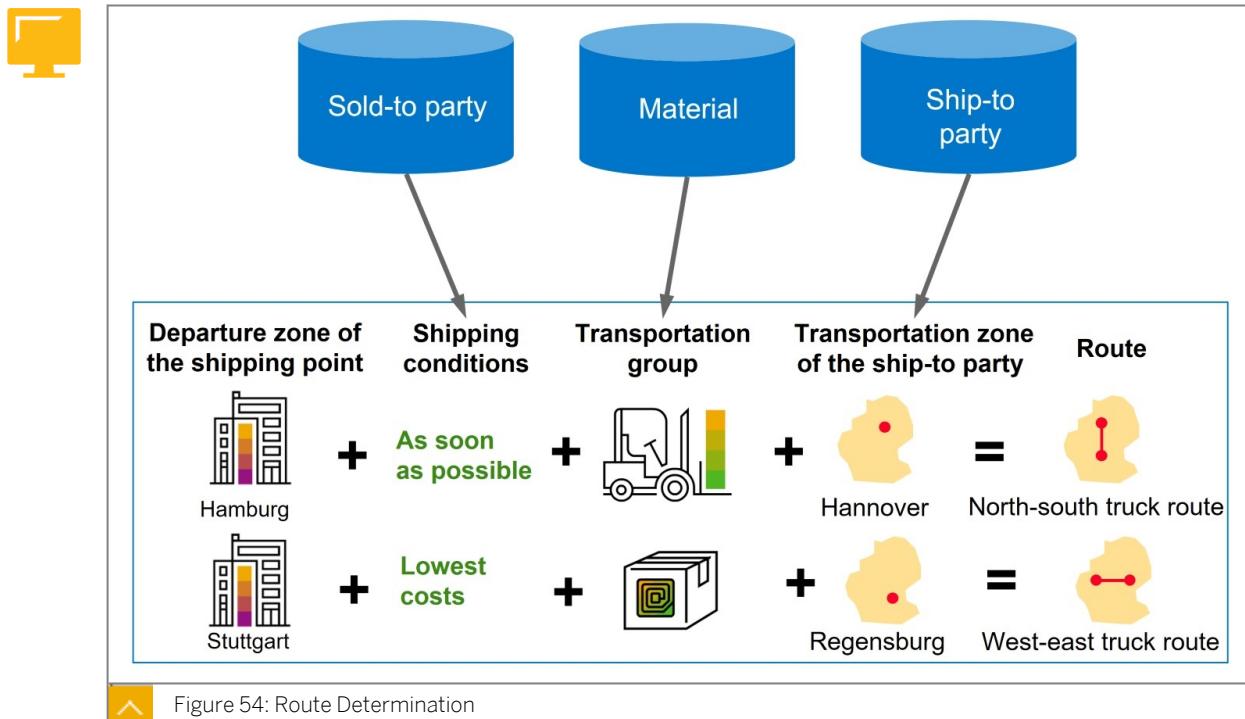


Note:  
A route does not necessarily use or include geographical information.



### Route Determination

Route determination is performed automatically for each delivery-relevant item in the sales document, using specific data from the customer master, material master, and from the shipping point and if needed the document type of the sales order (e.g. Rush Order).



Route determination depends on a successful shipping point determination. The system copies the value for the field *departure zone* out of the shipping point (maintained in the configuration of the system).

As in shipping point determination, the shipping conditions are determined from the customer master of the Sold-to Party. Again, the field value can be overruled by shipping conditions maintained in the sales order/document type (like Rush Order (RO)).



#### Note:

You can change the shipping conditions manually in a sales order. If you do change the shipping conditions in an order, the system re-executes the shipping point determination and the route determination.

The transportation group can be found in the material master record (Sales: General/Plant Data tab page). The transportation zone is taken from the business partner master record of the Ship-to Party (General data).

### Backward Scheduling

Based on time elements maintained in the shipping point and also in the route in a sales order item, the system is able to propose dates for the following shipping activities:

- Material Availability Date

The date on which a sufficient quantity of the material must be available for picking and packing to be able to confirm the sales order item on the requested delivery date.

- Transportation Planning Date

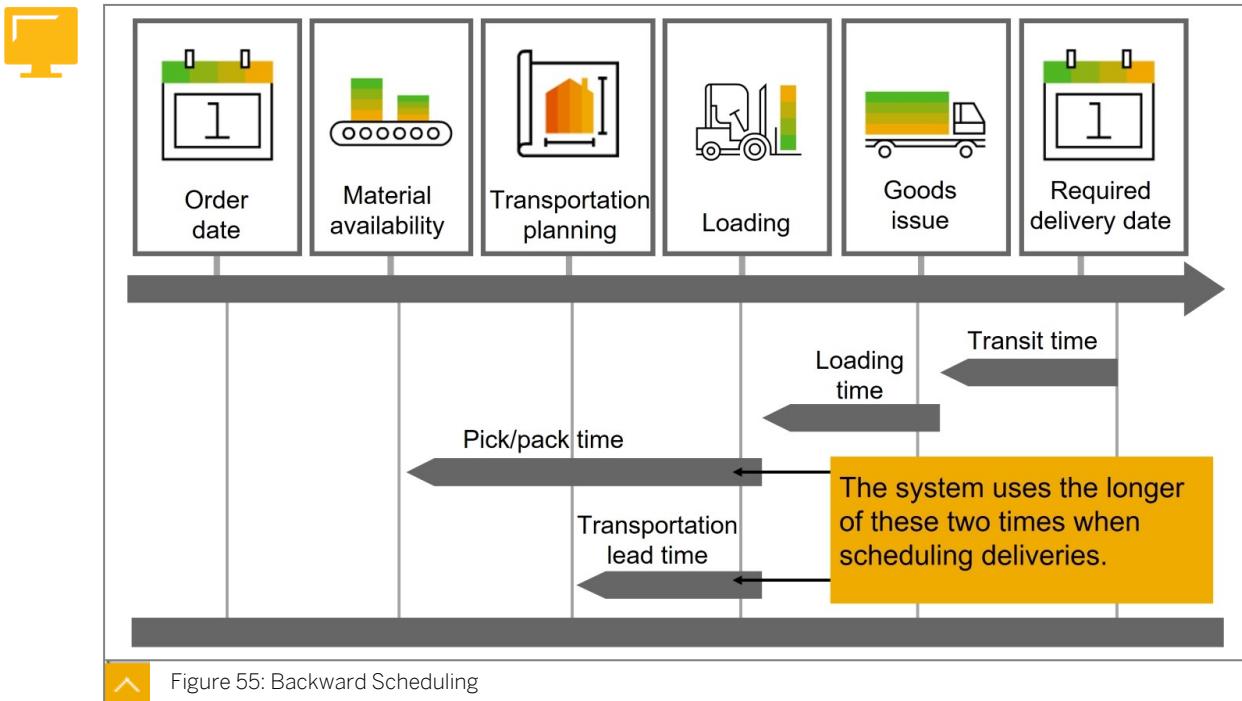
The date on which transportation planning should begin.

- Loading Date

The date on which the loading of the means of transportation should begin.

- Goods Issue Date

The date on which the goods must leave the delivering plant/shipping point/warehouse so that they reach the customer in time.



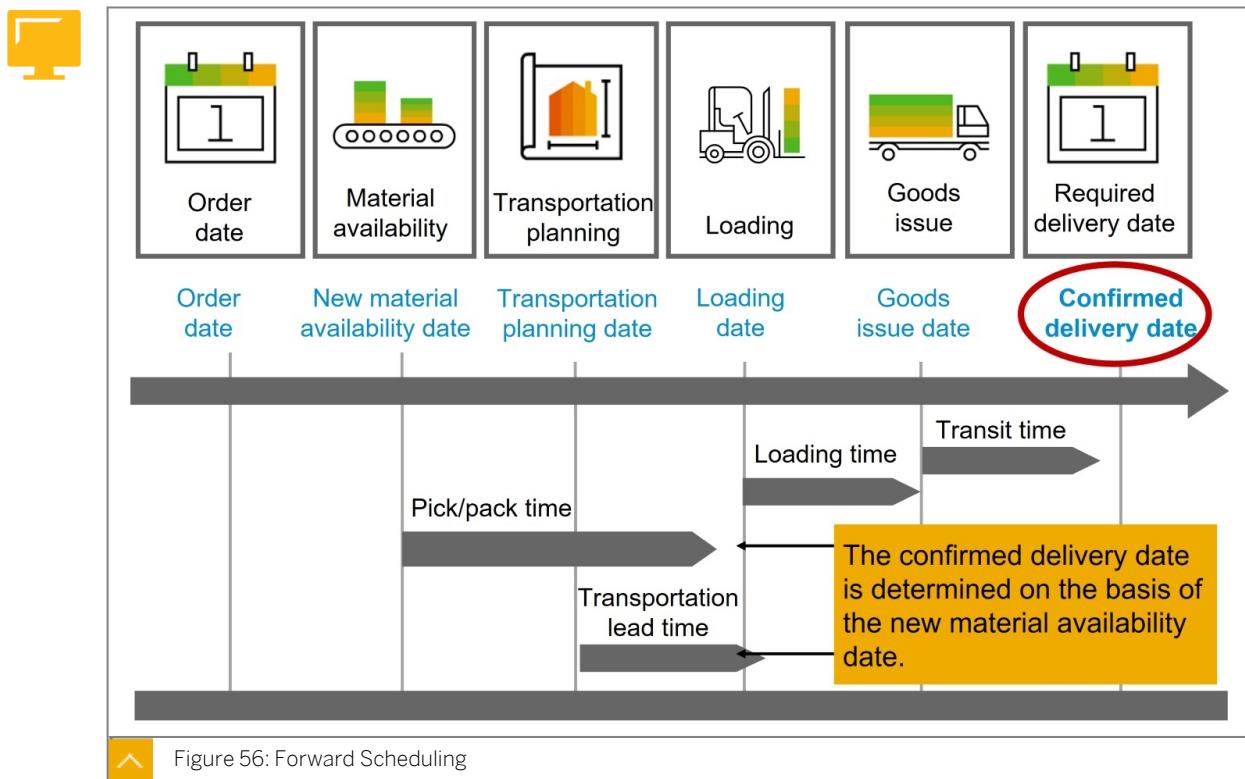
When a sales order item is scheduled first, the system uses a technique called Backward Scheduling. The system first checks if the requested delivery date of the customer can be met. The requested delivery date is the starting point for backward scheduling. The system calculated backwards to determine the (required) Material Availability Date.

The planned dates are calculated by subtracting from the requested delivery date the number of days maintained for each of the following four time elements (as indicated on the slide):

- The **Transit time** (coming from the route) is subtracted from the requested delivery date to determine the Goods Issue Date.
- The **Loading time** (coming from the shipping point) is subtracted from the Goods Issue date to determine the Loading Date.
- The **Pick/pack time** (coming from the shipping point) and the **Transportation lead time** (coming fom the route) are subtracted from the Loading Date to determine the (required) Material Availability Date and the Transportation Planning Date. The earliest creation date for the Outbound Delivery document is either the Material Availability Date or the Transportation Planning date, depending on which date is earlier. As can be seen: picking/ packing and planning of the transportation are activities that are scheduled in parallel.

### Forward Scheduling

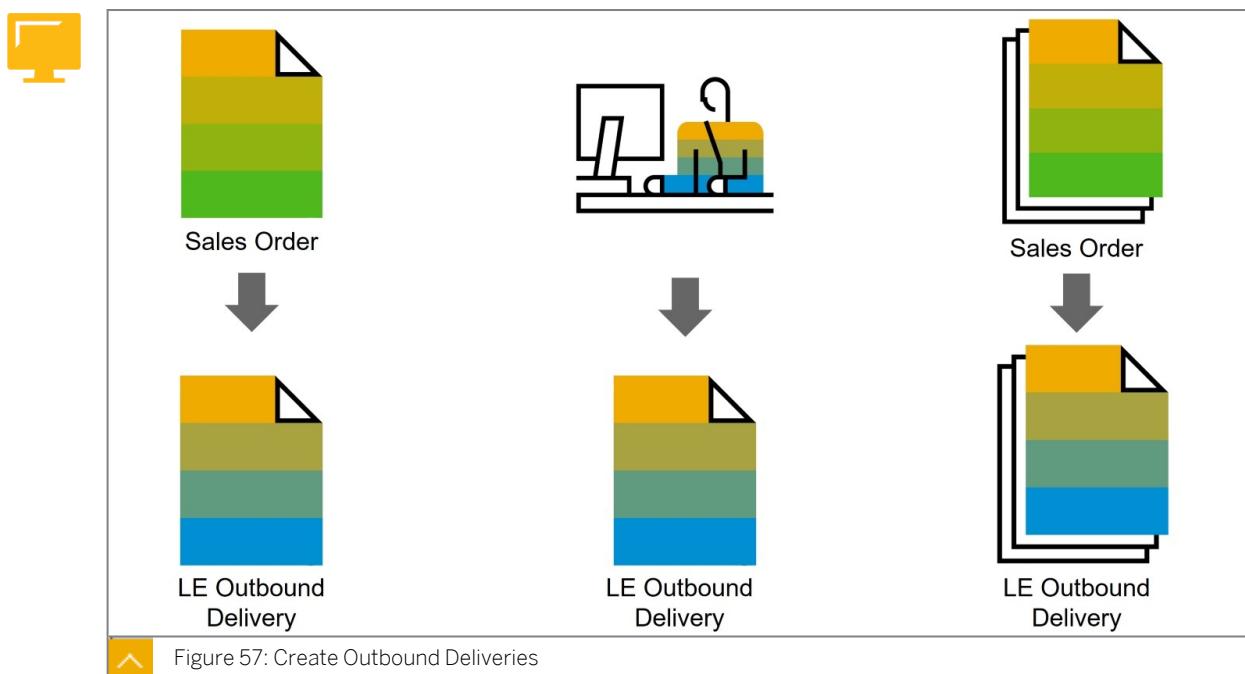
If the system encounters a problem when performing backward scheduling from the requested delivery date of the customer (for example: no stock is available for a material on the required Material Availability Date), the system tries to propose a realistic material availability date. The system will calculate a confirmed delivery date, starting to schedule from a date as soon as the material is available. The system then adds the four time elements to this newly calculated Material Availability Date to reach a new confirmed delivery date for the customer. This process is called Forward Scheduling.



In Customizing in SAP S/4HANA, you can specify for a sales document type (if needed) that the system is only allowed to perform backward scheduling. This means that unconfirmed or partially confirmed sales order items are more easily visible in the system.

### Creation of Outbound Deliveries

There are different ways to create outbound deliveries for sales orders.



An order type can be set up in such a way that the outbound delivery is created automatically when a sales order is saved. This is a useful feature for special sales orders, like Rush Orders (RO) or a Cash Sales Orders (CS).

You can create outbound deliveries manually with or without a reference to a sales order. When creating an outbound delivery without reference to a sales order, certain fields which are normally determined in a sales order must now be entered manually in the outbound delivery.

Usually, outbound deliveries are created using collective processing transactions. This can be done manually, which enables the user to control what deliveries should be created, or it can be done with a batch job at a scheduled time.

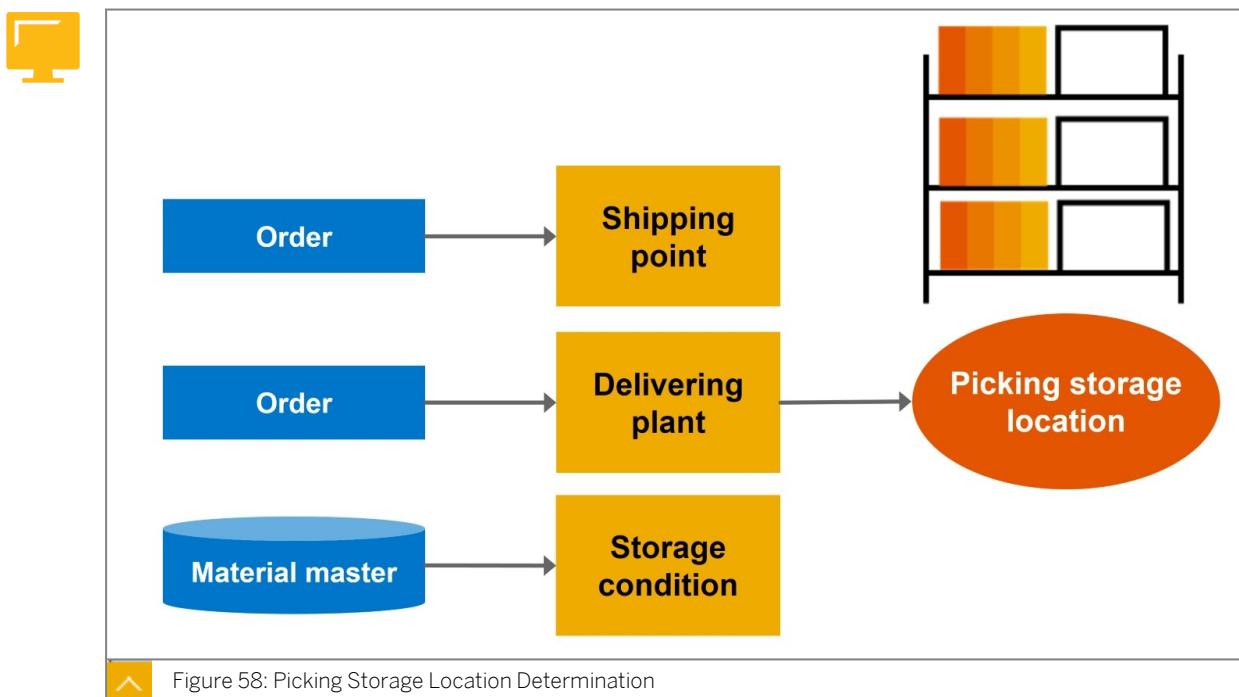
During the creation of an outbound delivery, the calculated dates, the shipping point, and the route are copied from the sales order item into the outbound delivery. While these details are on item level in the sales order, they are copied into the delivery header in the outbound delivery. The shipping point and the route then work as **split criteria**. Split criteria means that if there are different shipping points or routes in the items of a sales order, this causes the system to create multiple outbound deliveries.

The route can also be re-determined in an outbound delivery; the weight of the materials in the outbound delivery can then also influence the determination of the route.

The previously calculated times can also be re-scheduled when creating an outbound delivery. That is important if, for example, the planned creation date of the delivery is actually already in the past.

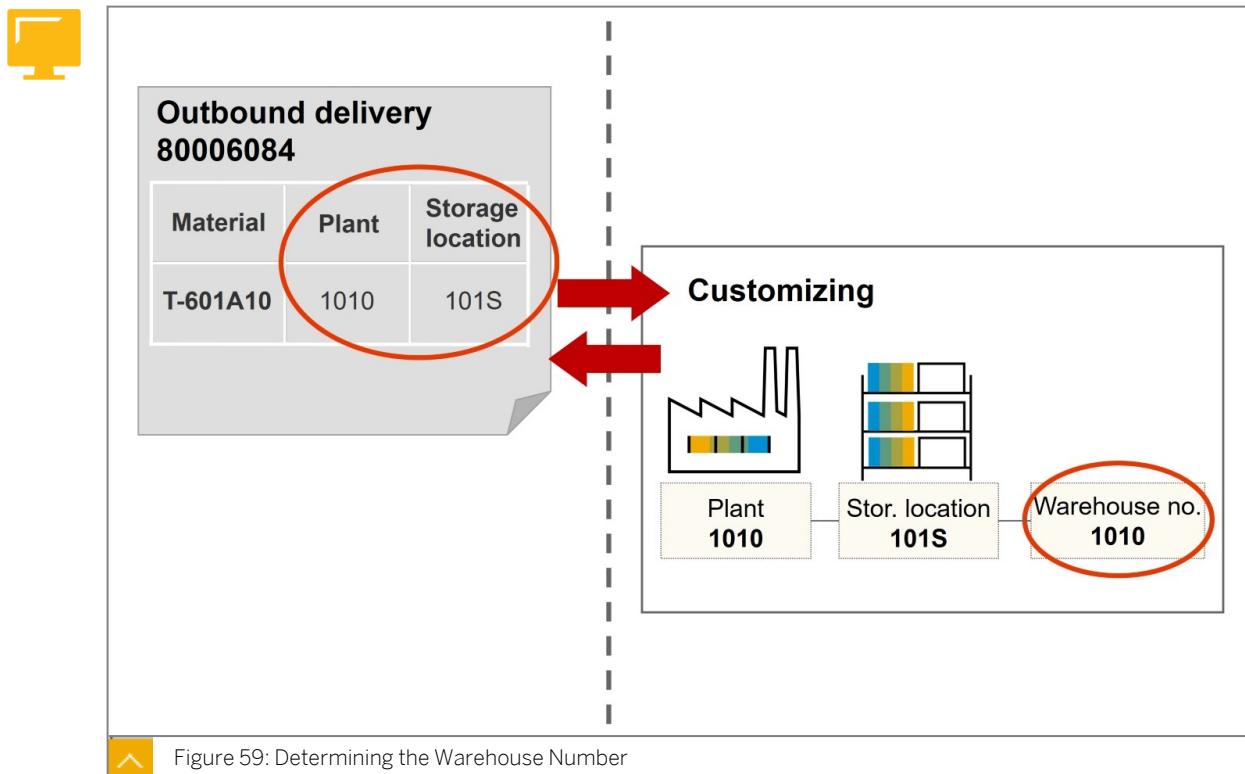
### Determining the Pick Storage Location

For a sales order, the delivering plant is determined. During the creation of the outbound delivery, the system determines the storage location (in Inventory Management) to be used for picking.



### Determining the Warehouse Number

You can assign a warehouse number to the combination of a plant and the determined storage location. If a warehouse number has been assigned, it is in this warehouse number that picking now needs to be executed (see next figure).



### LESSON SUMMARY

You should now be able to:

- Describe shipping-relevant functions during sales order creation
- Create outbound deliveries



## Picking Materials for Outbound Deliveries



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Work with waves
- Create pick handling units
- Work with exceptions

### Waves



Figure 60: Wave Management

Waves are groupings of **warehouse request items** to control warehouse activities such as picking or posting changes.



#### Note:

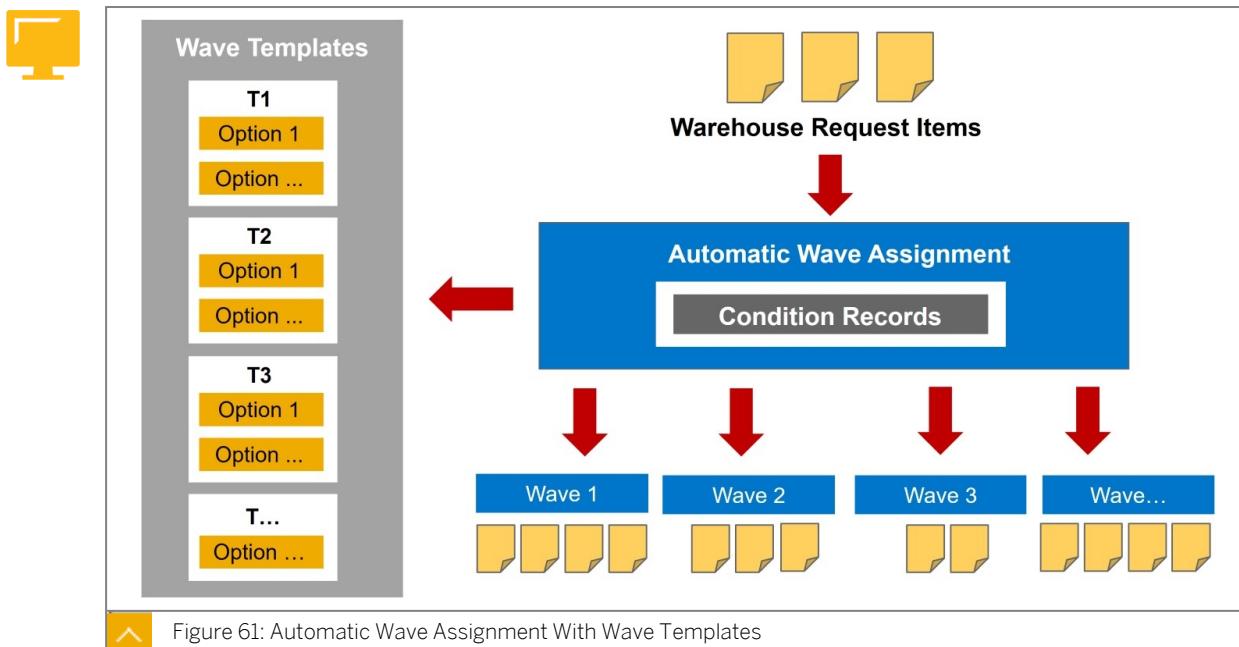
An outbound delivery order is a warehouse request. An internal SAP EWM document such as a stock transfer delivery or a posting change, is also a warehouse request. The items of these types of documents can also be used to create waves. An inbound delivery is also a warehouse request, but the items of this type of document cannot be used in waves.

The first and foremost function of a wave is to optimize the creation of warehouse tasks and warehouse orders. This can be done manually or by the system at a defined point in time (called the **release time** of the wave).

Usually a warehouse request item has a point in time when it is supposed to leave the warehouse (the **goods issue** time). In wave management, this time is considered as the time the wave has to be finished. The system plans the release time so that the processes in the warehouse are finished before that end time.

### Assignment of Items to Waves

As stated, one way of creating waves, is to manually select warehouse request items and assign them to a wave.



Another way to create waves is the automatic creation of the waves using **wave templates** and condition records for the determination of these wave templates. In this determination process, information can be used from within the warehouse requests and the items to determine the proper wave template and to combine the items in the desired way.

### Processing Waves

Processing steps for waves can be several things. For example; a wave can be blocked. It can also be split into several individual waves. It is possible to add items to a wave or remove items from a wave. A wave can also be released manually, even if an automatic release is planned for the wave.

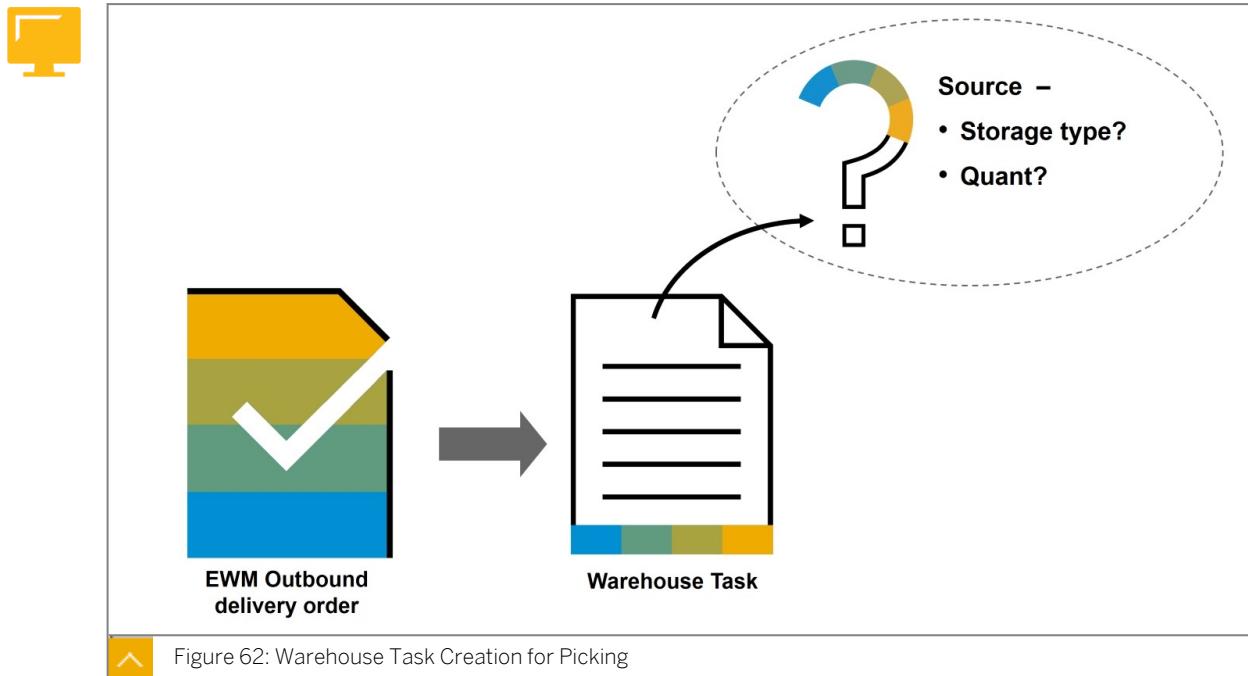
### Creating Waves after Transportation Planning

Besides the creation of waves as explained before, waves can also be created after transportation planning has been executed. In this case, the **transportation unit** is the object which is used to trigger wave creation. Again, this process can be triggered manually or automatically.

### Warehouse Tasks for Outbound Delivery Orders

Similar to the process for an inbound delivery, the physical movement of a material in an outbound process is also controlled with a warehouse task. The details concerning the creation of a warehouse task for picking though, are very different from the details concerning the creation of a warehouse task for putaway. While during putaway, the system tries to find

the **best bin** for the material to be stored, during picking the system tries to find the **best quant** based on what is requested in the outbound delivery order.



When you create a warehouse task with reference to an outbound delivery order, the system considers two things when trying to find the right stock to pick:

- The storage type sequence:

This sequence contains the sequence of storage types that the system should follow when trying to find a bin. The system checks the first storage type of the sequence, and if no stock can be found that fits all requirements, the system checks the next storage type, etc.

For picking, the storage type search sequence can also contain a **storage type group**. A group is used to consider quants from different storage types simultaneously and to use criteria from the so-called stock removal rule for the quant determination (see below: stringent FIFO).

- The stock removal rule:

The stock removal rule (or picking strategy) can be assigned to a storage type, but can also be determined in general in combination with the storage type search sequence. This is especially fitting if you have rules like **FIFO** (first in, first out), which looks for the oldest quant in your storage types in a defined sequence; or **stringent FIFO**, which uses a storage type group to do the same but then across several storage types.

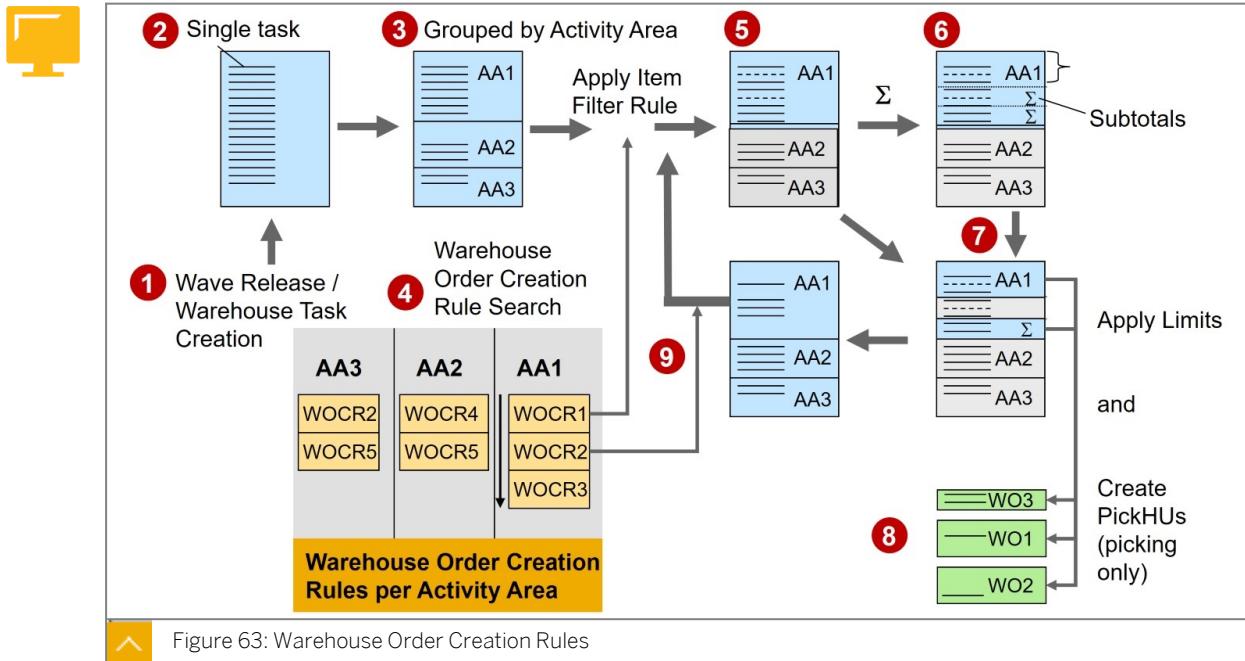
## Warehouse Order Creation Rules

### Warehouse Orders

Warehouse tasks for outbound delivery orders are grouped into warehouse orders similar to what was discussed for inbound deliveries and their warehouse tasks. While the process is generally the same, the process is often more complex when dealing with outbound processing. Maybe complete pallets with one material on it, are usually putaway. During picking however, small quantities of various materials often need to be picked together. This of course depends on the warehouse and the materials that are bought and sold (among other things).

## Warehouse Order Creation Rules

During the grouping of warehouse tasks into warehouse orders, SAP EWM can use one directly assigned warehouse order creation rule, or it uses a search sequence for several warehouse order creation rules (for example rule A, then rule B, then rule C). The sequence is defined and assigned to the so-called **activity area** to which the selected storage bin for picking belongs. Customizing controls which storage bins (and thus which activity areas) are being considered during picking.



- Filter and Limit Values:

These control which warehouse tasks, and how many warehouse tasks, SAP EWM groups into a warehouse order.

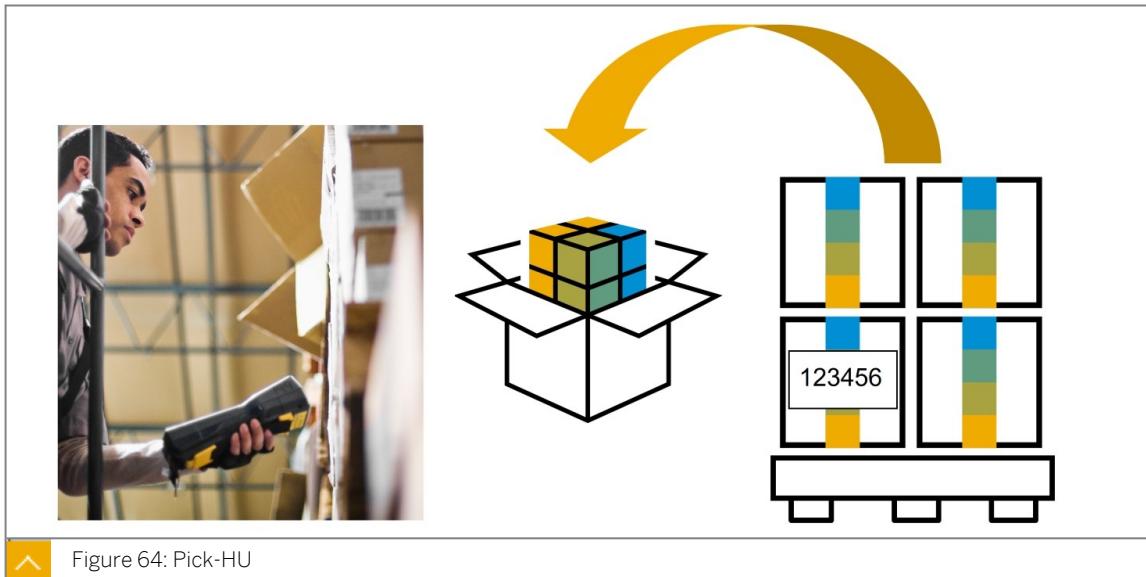
- Sort Rules:

When SAP EWM applies a warehouse order creation rule, it sorts the warehouse tasks according to the sort rule. Individual warehouse order creation rules can contain their own sort rules.

In addition to the sort rules and filter and limit values, warehouse order creation rules can also contain parameters for packing and **consolidation groups**. The consolidation group determines the warehouse tasks that are permitted to be packed together.

## Pick Handling Units

In SAP S/4HANA it is possible to generate pick Handling Units (pick-HUs) into which materials are packed during picking. A pick-HU is assigned to a warehouse order. You can then use the pick-HU for shipping or repack the material at a work center. You can either further pack the HU into another packaging material (and thus creating a nested Handling Unit structure), or you can move the material from one HU into another HU.



A user can create a pick-HU manually using the dialog screen on the mobile device that the user uses: the user chooses the packaging material and creates the HU. Using packaging specifications, it is possible to propose the required packaging material(s) based on selected fields during the set-up for the determination of the packaging specifications. With the correct set-up of the system, pick-HUs can also be created fully automatically. That is of course something that then only happens in the system: the physical packing activities must still be executed by a user, but this user can simply trigger the printing of the needed label(s) with a push of a button on their mobile device based on the automatically generated packing structure.

### Exceptions

During the everyday operation of a warehouse, things can go wrong. An example: a picker cannot find all of the materials they need to pick in a specific bin. Or: a scanner (which is part of the Material Flow System (MFS) of the warehouse) cannot read a HU label. Or: a bin that is supposed to be empty is actually not empty. Or: when putting away a pallet, the material quantity on the pallet is smaller than the quantity that should be on the pallet.



Figure 65: Exceptions

Whenever an exceptional situation arises in the warehouse, an **exception code** is needed to describe in the system what the reason or cause for the exception is. A follow-up action can then also be triggered. Such an action can be highly automated; a delivery can be changed or a physical inventory document can be created automatically. The follow-up action can also be very basic; someone is informed that the exceptional situation occurred for example.

Exceptions can be entered by a user using his/her mobile device. They can also be entered using desktop transactions. Another way of creating exceptions is by triggering them through communication with automated devices in the warehouse or by SAP EWM itself.

### Examples of Exception Codes

SAP delivers several exception codes for all kinds of warehouse situations. The following are examples of exception codes:

- BIDP, Partial Pick Denial:

The user cannot find the required quantity in the bin they are supposed to pick a material from. When entering the exception using his/her mobile device, the system shows a screen where the user has to confirm the quantity picked. The system then tries to trigger a new warehouse task to pick the missing quantity from another bin. Additionally, it is possible to set-up the system to trigger a workflow to inform someone about the situation. It is possible to create a physical inventory document and the bin can be blocked for putaway and picking.

- BIDF, Full Pick Denial:

A user cannot access the bin from which a material needs to be picked. This exception (BIDF) can be entered using a mobile device. The system is able to create a new warehouse task to pick from a different bin. Additionally it is possible to set-up the system to trigger a workflow to inform someone about the situation. And then after that, to create a physical inventory document and to block the bin for further putaway and picking tasks.

- DIFD, Difference as Charges for Inbound Delivery:

During putaway, the material that is putaway in the final bin is counted and a difference is found. The full quantity was not delivered by the vendor. The exception is raised and the quantity in the inbound delivery is adjusted and the goods receipt is corrected.

- DIFW, Difference as Charges for Warehouse:

During putaway, a piece of a material falls from a pallet and is broken. The correct quantity was delivered, but in the final bin there is now a difference quantity. This difference is then posted to the Difference Account.



## LESSON SUMMARY

You should now be able to:

- Work with waves
- Create pick handling units
- Work with exceptions



## Performing Value-Added Services (VAS)



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Perform a value-added service

### Value-Added Services

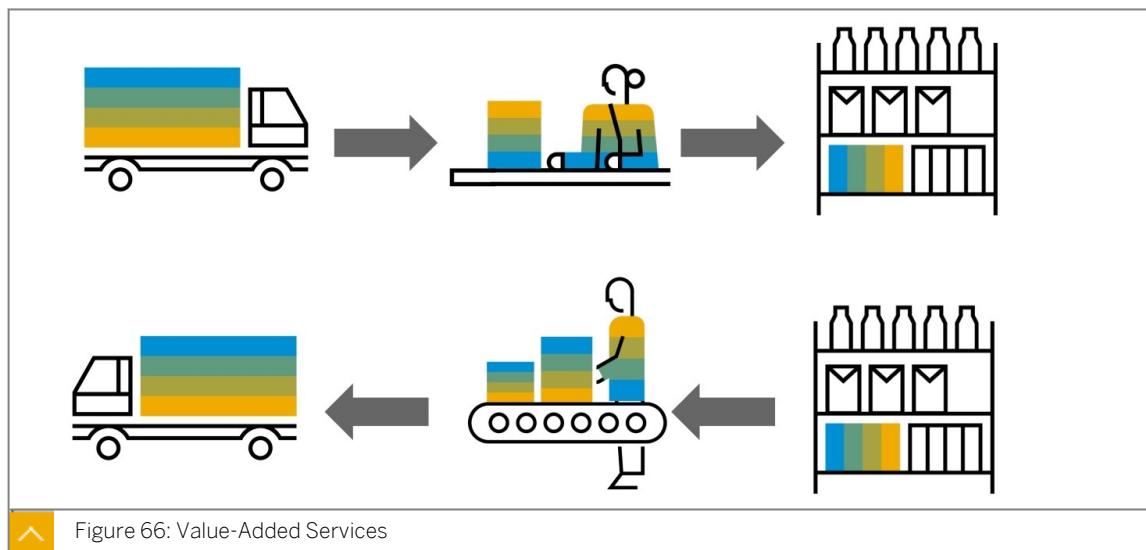


Figure 66: Value-Added Services

You can use a value-added service order (VAS-order) to perform value-added services (VAS) in the warehouse through VAS activities. Typical VAS activities are packing products, labeling, or assembling products (kitting). Value-added services are possible during goods receipt and during goods issue processes.

Value-added services are usually processed at a work center. You can use process-oriented storage control (POSC) to control the movement of the materials to this VAS work center.

### Value-Added Service Order

The VAS-order is the central SAP EWM document that controls the VAS process.

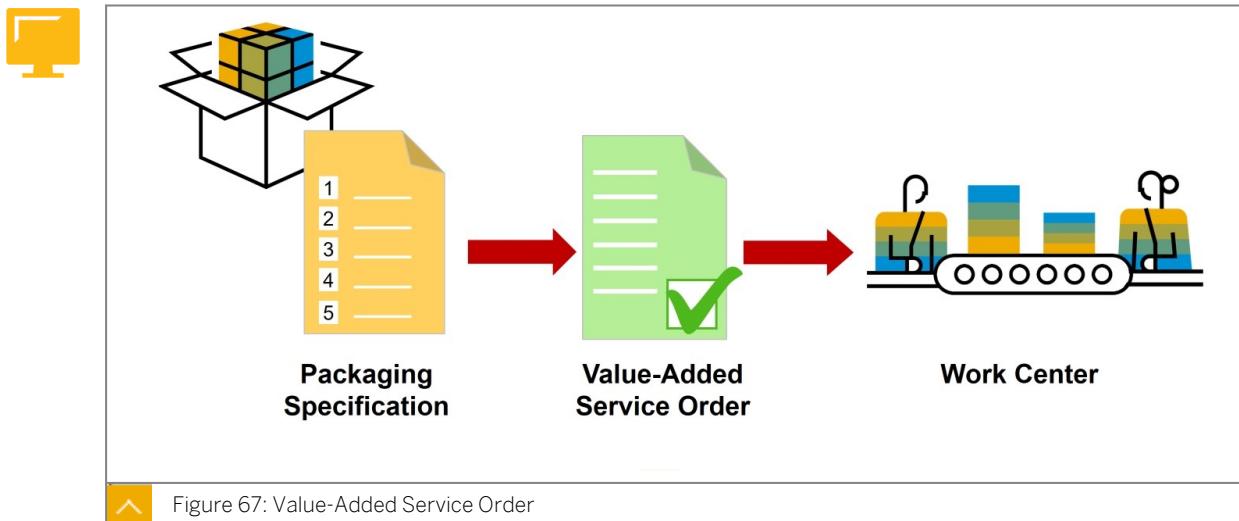


Figure 67: Value-Added Service Order

The VAS-order is the instruction to perform a value-added service for one or more materials with reference to a delivery item. A VAS-order is always based on a packaging specification and it contains details from both the delivery item and from the packaging specification. You can use a VAS-order to:

- Inform warehouse employees about the tasks they must carry out for certain materials
- Track work that is being or has been carried out

### Kitting

A kit describes a piece list that is always delivered in a complete and assembled form. The individual components of the kit are picked and before posting the goods issue, a new product is assembled in the warehouse.

Kitting can be done in different ways:

- A **kit-to-order** process means that the reason for kitting is a sales order for the kit header product. The components are picked, the kit header product is created, and goods issue is posted for the header product and the kit components.

This process can be modeled with or without a VAS-order; the header product can be “created” at a work center or automatically in the background.

- **Kit-to-stock** means that the components are picked and brought to a special work center in the warehouse from where the goods issue for the components is posted. Then, the kit header product is created and a goods receipt is posted for this header product. Finally, the header product is putaway in the warehouse again.

This process always requires a VAS-order and a work center. The process can be started directly in SAP EWM by the creation of this VAS-order. It can also be triggered through the creation of a production order in the SAP S/4HANA system.



### LESSON SUMMARY

You should now be able to:

- Perform a value-added service

## Monitoring the Warehouse



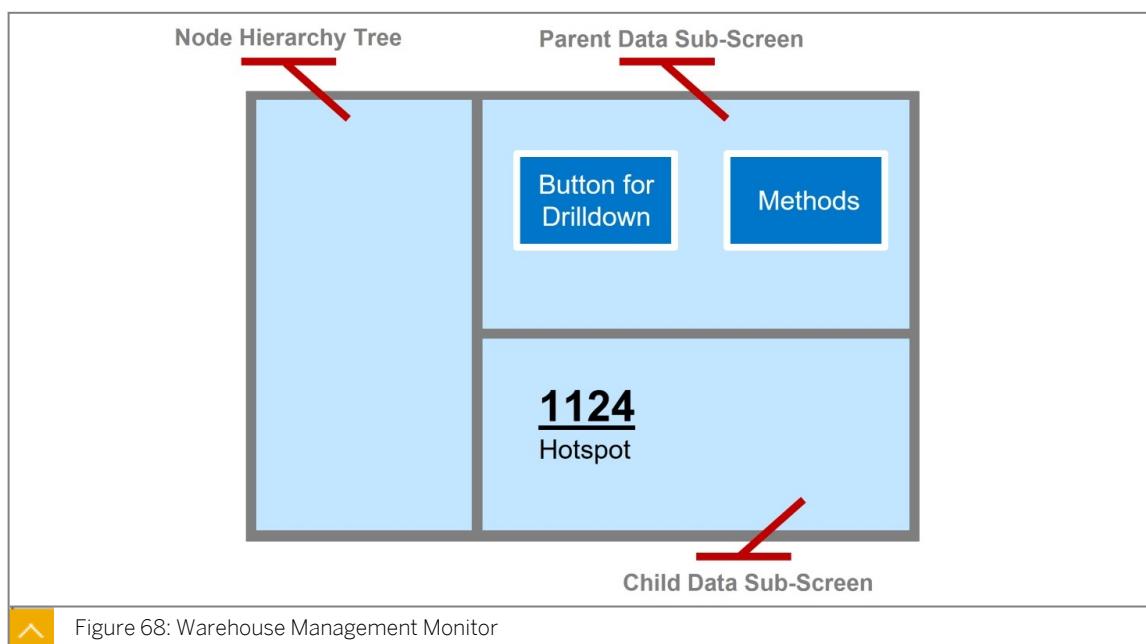
### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Work with the warehouse management monitor

### The Warehouse Management Monitor

The SAP EWM Warehouse Management Monitor is a central tool to keep warehouse managers informed about the current situation in the warehouse. The monitor enables them to take appropriate actions depending on the current warehouse situation.



The warehouse management monitor also has alert-monitoring capabilities. Any actual and/or potential problems in the warehouse are signaled using alerts. Exception-handling tools are available to help correct any problem situations.

It is also possible to execute functions directly from within the monitor (based on authorizations of course). Examples:

- Create or confirm warehouse tasks and warehouse orders
- Change or block bins
- Trigger wave processing

The warehouse management monitor is highly customizable and the information displayed can also be extended. For example, you can create custom nodes and custom monitors within the warehouse management monitor.

Customers can use the standard SAP Warehouse Management Monitor or they can create their own monitor when customizing the system. When the standard SAP monitor is used, it can be tailored to the needs of the user(s) by hiding nodes or creating new variant nodes based on the standard nodes. Creating variant nodes enables the creation of own nodes, which are based on standard nodes but with specific selection criteria or a specific layout.

By default, object information is displayed as a list view. The list view is using a SAP List Viewer (ALV) grid, and it offers all standard ALV functionality like sorting, filtering, and printing. Form View can be toggled for a selected object. The form view provides a focused view of the object, and more-detailed information than the list view provides. The form view is displayed in an HTML viewer.



### LESSON SUMMARY

You should now be able to:

- Work with the warehouse management monitor

## Posting Goods Issue



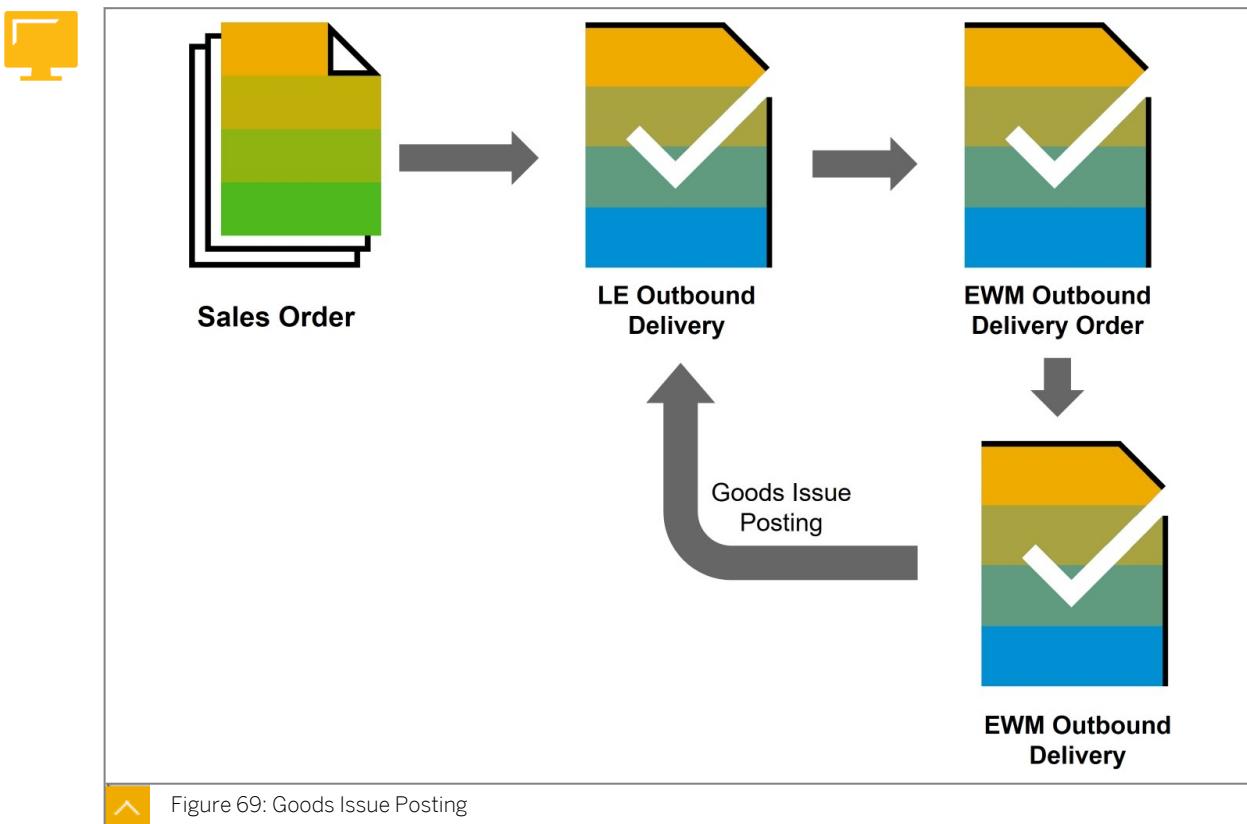
### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Post a goods issue

### Goods Issue

Once the products are picked and are located in the goods issue zone of the warehouse, the goods issue can be posted, indicating that the materials have left your warehouse and your stock value decreases. The goods issue posting can be triggered manually from the outbound delivery order, but it can also be triggered automatically when the products arrive at the staging area or when the truck with the products leaves the warehouse.



For the goods issue, another SAP EWM document is created. This document is called the EWM outbound delivery. The EWM outbound delivery sends information about the goods issue posting back to the LE outbound delivery in SAP S/4HANA. From this, the inventory management document and the financial documents are then created.

Why do we need an additional document in the system? When you post the goods issue, it must always be for the complete quantity in the LE outbound delivery. It is not possible to

post a partial goods issue. But a partial goods issue could be required because maybe it is not possible to deliver the complete requested quantity at a certain point in time. This could be because there is less physical stock in reality in your warehouse than what you see as available in your system, or there is maybe not enough capacity for transportation. When a partial goods issue is necessary, a **delivery split** of the LE outbound delivery is required. This is triggered through the EWM outbound delivery document.



### LESSON SUMMARY

You should now be able to:

- Post a goods issue

## Processing using SAP Fiori apps



### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Process an outbound process using SAP Fiori apps

### Simple Warehouse Requirements

Some of your locations might have very simple requirements for a warehouse. The number of different items and the total quantity that needs to be processed is low; all products are stored in fixed bins or just one bin each; there are not many movements.



Figure 70: Simple Storage

For cases like this, you might not want to work with mobile devices, but only print out a simple pick list. Maybe no waves are required and the small number of outbound deliveries per day is processed manually.

SAP S/4HANA offers a Fiori app especially for this type of outbound process. It enables the user to execute the complete process from within this one app.



#### Note:

Of course, a small warehouse can also require complex processes and the use of mobile devices. And the Fiori app can also be used in more complex scenarios. Having a simple warehouse is not an exclusive criteria for using this Fiori app.



## LESSON SUMMARY

You should now be able to:

- Process an outbound process using SAP Fiori apps

## Learning Assessment

1. Which elements are used in the system during plant determination in a sales order item?

*Choose the correct answers.*

- A Purchasing info record
- B Ship-to party
- C Material
- D Shipping point

2. If no shipping point is determined in a sales order item, any shipping point can be selected manually.

*Determine whether this statement is true or false.*

- True
- False

3. The sources of information (for the elements mentioned on the left) used during the route determination in a sales order item are as follows:

*Match the item in the first column to the corresponding item in the second column.*

Departure zone
Shipping conditions
Transportation group
Transportation zone

Ship-to party
Sold-to party or ship-to party
Shipping point
Material master

4. If different items in a sales order have different shipping points, what happens during delivery creation?

*Choose the correct answer.*

- A The main shipping point is copied into the outbound delivery.
- B The most frequently determined shipping point is copied into the outbound delivery.
- C A delivery split is triggered and each shipping point is copied into the respective outbound delivery.
- D The system triggers a new shipping point determination for the outbound delivery.

5. Where and how can you create pick-HUs?

*Choose the correct answers.*

- A Manually using a mobile device
- B Automatically in the background during warehouse order creation
- C Manually during re-packing in the work center
- D Automatically during putaway

6. An exception can only be triggered by the user when using a mobile device.

*Determine whether this statement is true or false.*

- True
- False

7. Which of the following processes can be executed using a value-added service order?

*Choose the correct answers.*

- A Packing
- B Quality inspection
- C Labeling
- D Kitting

8. For the creation of variant nodes, you also need to create a new warehouse management monitor.

*Determine whether this statement is true or false.*

- True  
 False

9. The \_\_\_\_\_ sends information about the goods issue back to the LE outbound delivery.

*Choose the correct answer.*

- A Warehouse order  
 B Outbound delivery order  
 C (EWM) outbound delivery  
 D Resource

10. SAP Fiori apps can be used in all types of SAP EWM warehouses.

*Determine whether this statement is true or false.*

- True  
 False

## Learning Assessment - Answers

1. Which elements are used in the system during plant determination in a sales order item?

*Choose the correct answers.*

- A Purchasing info record
- B Ship-to party
- C Material
- D Shipping point

Correct. The ship-to party and the material are used in the system during plant determination in a sales order item.

2. If no shipping point is determined in a sales order item, any shipping point can be selected manually.

*Determine whether this statement is true or false.*

- True
- False

Correct. If no shipping point is determined in a sales order item, you cannot just select any shipping point manually.

3. The sources of information (for the elements mentioned on the left) used during the route determination in a sales order item are as follows:

*Match the item in the first column to the corresponding item in the second column.*

Departure zone
Shipping conditions
Transportation group
Transportation zone

Shipping point
Sold-to party or ship-to party
Material master
Ship-to party

4. If different items in a sales order have different shipping points, what happens during delivery creation?

*Choose the correct answer.*

- A The main shipping point is copied into the outbound delivery.
- B The most frequently determined shipping point is copied into the outbound delivery.
- C A delivery split is triggered and each shipping point is copied into the respective outbound delivery.
- D The system triggers a new shipping point determination for the outbound delivery.

Correct. If different items in a sales order have different shipping points, these will become split criteria. Different outbound deliveries are created based on the different shipping points.

5. Where and how can you create pick-HUs?

*Choose the correct answers.*

- A Manually using a mobile device
- B Automatically in the background during warehouse order creation
- C Manually during re-packing in the work center
- D Automatically during putaway

Correct. You can create pick-HUs automatically in the background during warehouse order creation and manually when using a mobile device.

6. An exception can only be triggered by the user when using a mobile device.

*Determine whether this statement is true or false.*

- True
- False

Correct. Exceptions can be entered by a user using a mobile device or using desktop transactions. They can also be triggered through communication with automated devices in the warehouse or by SAP EWM itself.

7. Which of the following processes can be executed using a value-added service order?

*Choose the correct answers.*

- A Packing
- B Quality inspection
- C Labeling
- D Kitting

Correct. Packing, labeling, and kitting are processes that can be executed using a value-added service order.

8. For the creation of variant nodes, you also need to create a new warehouse management monitor.

*Determine whether this statement is true or false.*

- True
- False

Correct. If you use the standard SAP monitor, you can tailor it to your needs by hiding nodes or creating new variant nodes based on the standard nodes.

9. The \_\_\_\_\_ sends information about the goods issue back to the LE outbound delivery.

*Choose the correct answer.*

- A Warehouse order
- B Outbound delivery order
- C (EWM) outbound delivery
- D Resource

Correct. The EWM outbound delivery sends information about the goods issue back to the LE outbound delivery.

10. SAP Fiori apps can be used in all types of SAP EWM warehouses.

*Determine whether this statement is true or false.*

- True
- False

Correct. SAP Fiori can indeed be used in all types of SAP EWM warehouses.

## Lesson 1

Planning Transportation

121

## Lesson 2

Executing Transportation

129

## UNIT OBJECTIVES

- Understand the transportation planning process
- Create transportation requirements
- Plan transportation
- Perform carrier selection
- Describe the integration of SAP Transportation Management and SAP Extended Warehouse Management
- Using the yard



# Planning Transportation

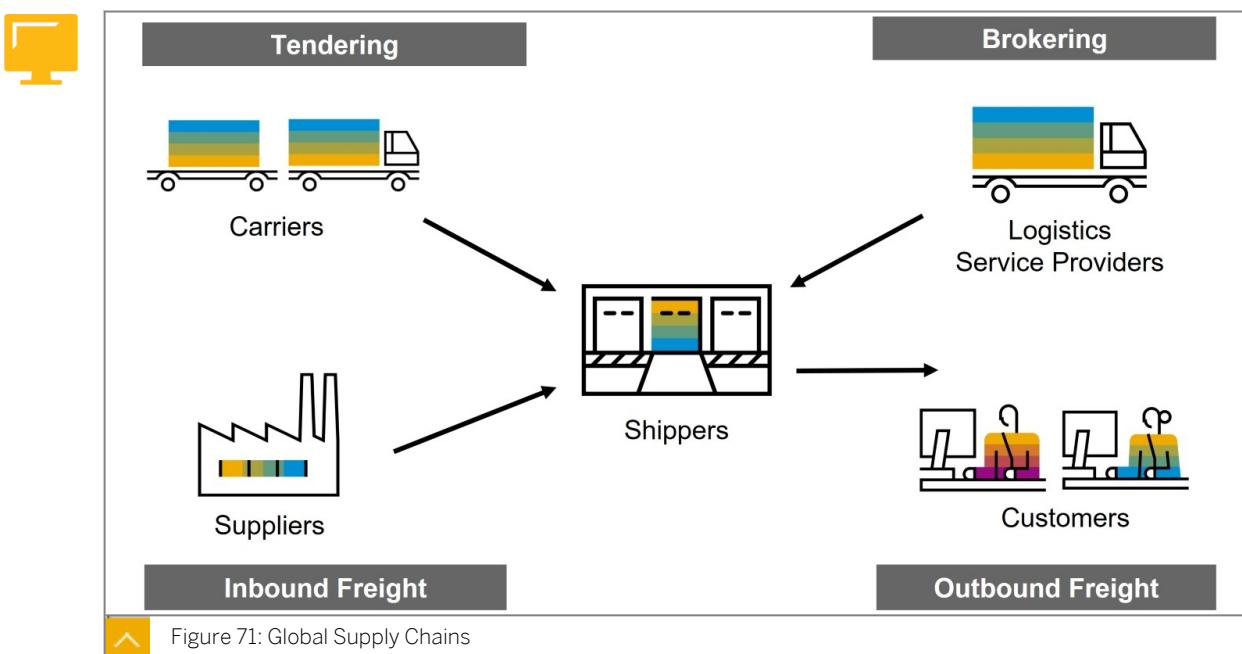


## LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Understand the transportation planning process
- Create transportation requirements
- Plan transportation
- Perform carrier selection

## Reasons for Transportation Planning



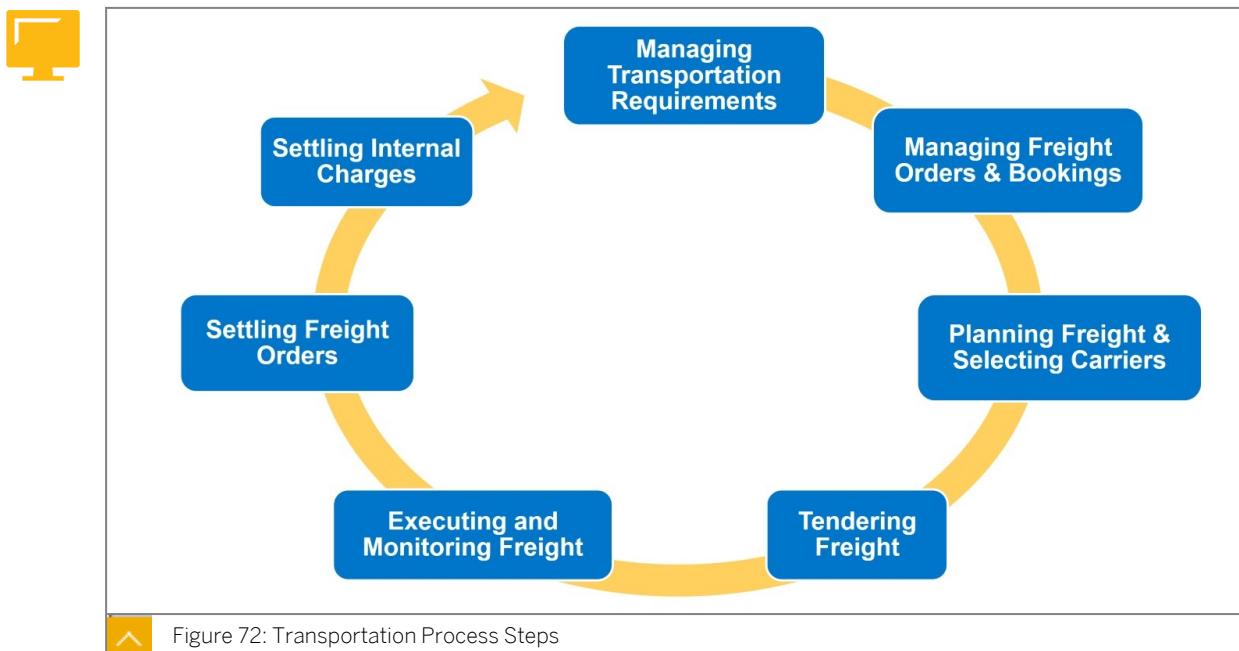
Transportation Management (TM) supports a company in all activities connected with the physical transportation of goods from one location to another.

SAP S/4HANA 1709 introduced an additional deployment option for SAP Transportation Management (TM) where TM functionality runs on the same S/4HANA instance as the SAP ERP functionality: this is known as embedded TM. SAP S/4HANA 1809 and 1909 have made the embedded TM option even more appealing, by closing most of the functional gaps that previously existed when compared with a decentral SAP TM system.

The goal of SAP TM is to provide customers with the ability to either manually or automatically plan and optimize their transportation requests. This includes the ability to perform order consolidation. This means that a company can group orders with the same ship-from and/or ship-to locations for planning and managing transportation quantities more

efficiently. If multiple sales orders for example are being shipped to a predefined transportation zone, your company can try to efficiently schedule, route and combine these multiple orders, and choose an appropriate carrier. Planning and carrier selection can be done to try and find the most cost effective and timely route from source to destination while considering real-world constraints, costs, and penalties. The TM optimizer is capable of making multi-modal decisions regarding transportation via sea, air, truck, train, and/or any combination thereof. The SAP TM planning function can also deal with multi-pickup and stop options.

## The Transportation Process



### The Transportation Process: Process Steps in Detail

A transportation process includes different steps, from planning transportation requirements, to the execution and cost settlement for the process. The details depend on the different scenarios that are being used in a certain company. These steps include:



#### Note:

The detailed process steps and scenarios vary depending on whether you are a shipper or a logistic service provider (LSP). This course concentrates on the processes important for a shipper. For a logistic service provider (LSP) some other specific steps are available in the system or the step details look somewhat differently.

- Managing transportation requirements:  
Transportation requirements can come from different sources. As a shipper: for example purchase orders, sales orders, or deliveries.
- Freight orders and bookings:  
Freight orders are used primarily for land transportation and rail transportation. You use a freight booking to reserve freight space on a ship or in an airplane.

- Freight planning and carrier selection:

Freight orders can be further optimized with features like load planning and a carrier selection can be started.

- Tendering:

In a bidding process, the possible carriers quote their prices.

- Monitoring transportation events:

Through the integration with **SAP Event Management** it is possible to track and monitor events in the transportation chain. With the SAP TM Notifier app, a truck driver can display freight order details and report the status of deliveries using predefined events on his mobile device.

- Freight settlement:

Invoice from carrier need to be entered and checked against the freight settlement document.

- Internal charges:

In case of an internal department organizing and taking care of the transportation (embedded LSP), the shipping costs are distributed to the organizational units for which transportation is planned and executed.

### **Business Scenarios in SAP Transportation Management**

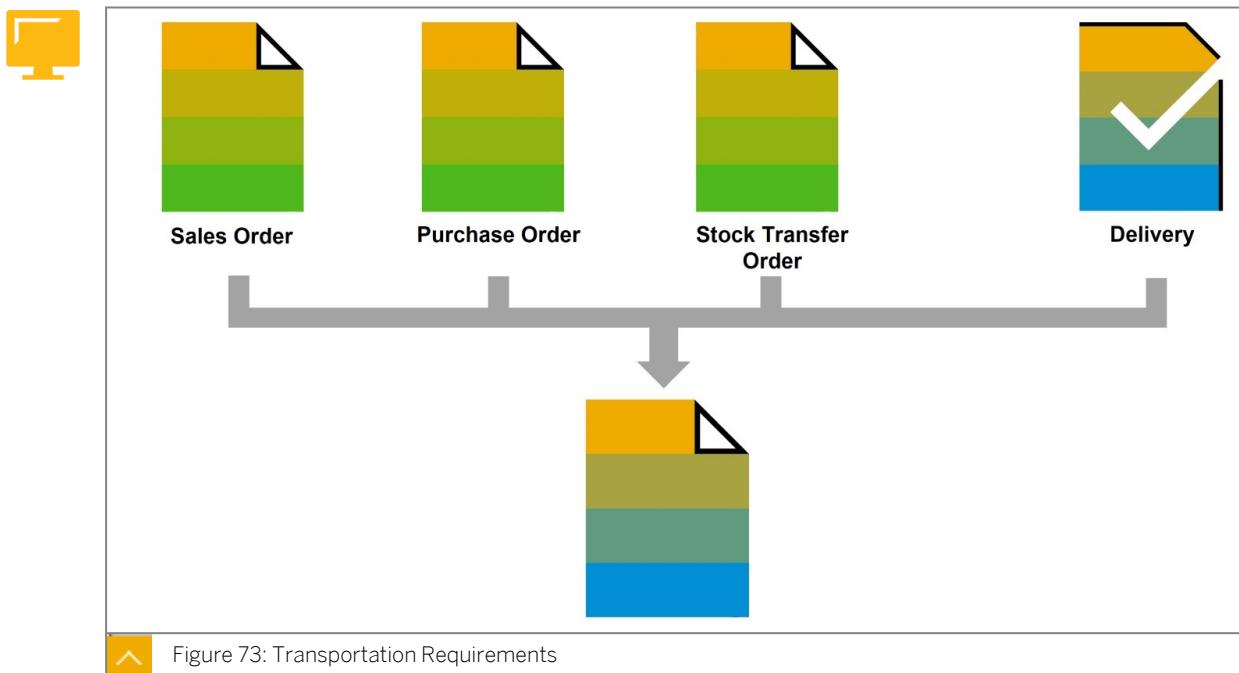
SAP Transportation Management supports the following scenarios for shippers and logistic service providers (LSPs):

- Domestic inbound transportation
- Domestic outbound transportation
- International inbound logistics
- International outbound logistics
- Ocean freight
- Air freight
- Intermodal rail freight
- Courier express parcel

### **Transportation Requirements**

The initial event that triggers a transportation management process is a transportation requirement. This document may be created from a sales order, a purchase order, a stock transport order (STO), or a scheduling agreement. It might also be an outbound or an inbound delivery. All of these transportation requirements request the movement of a material from one location to another. This movement may be to a customer (external) or to another facility within the same company.

Each of these transportation requirements creates one or more freight units.



## Freight Units

A sales order in the SAP S/4HANA system usually contains a number of different items with different schedule lines. This may be because the customer requires the materials at different dates or times, or because of some other specific issues of compatibility or timing. For example: a retailer orders ice-cream and milk in bulk quantities from its supplying dairy company. Because of different temperature requirements the materials cannot be shipped together in the same truck. Furthermore, if the required quantities exceed a truck capacity, the schedule lines may need to be split because of capacity reasons.

### What is a Freight Unit?



- A set of goods that can be transported together
- Used to merge items that can be transported together
- The smallest unit of freight
- Used in the planning of freight

A freight unit is an object in (embedded) SAP TM that groups items that are transported together. Freight units can be created per item and schedule line, but freight units can also group (consolidate) different items if these have similar characteristics with respect to their transportation requirements and options.

The most convenient way of creating freight units is to have the system create them automatically, based on their predecessor document. Freight units can also be created using a report that can be scheduled to run in the background. The creation of freight units can also be triggered manually using work lists. If it so happens during planning that a freight unit has to be adapted (split or merged, for example), this can be done manually using the Transportation Cockpit.

## Transportation Proposals

A transportation proposal defines how a freight unit can be transported through a transportation network (which is defined by locations, transshipment locations,

transportation zones, transportation lanes, vehicle resources, schedules and bookings). For a given transportation demand (freight unit), the system determines a set of alternative transportation proposals.

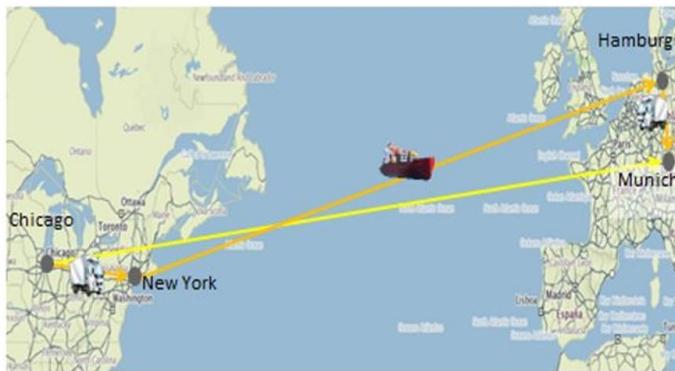


Figure 74: Visualization of Transportation Proposals

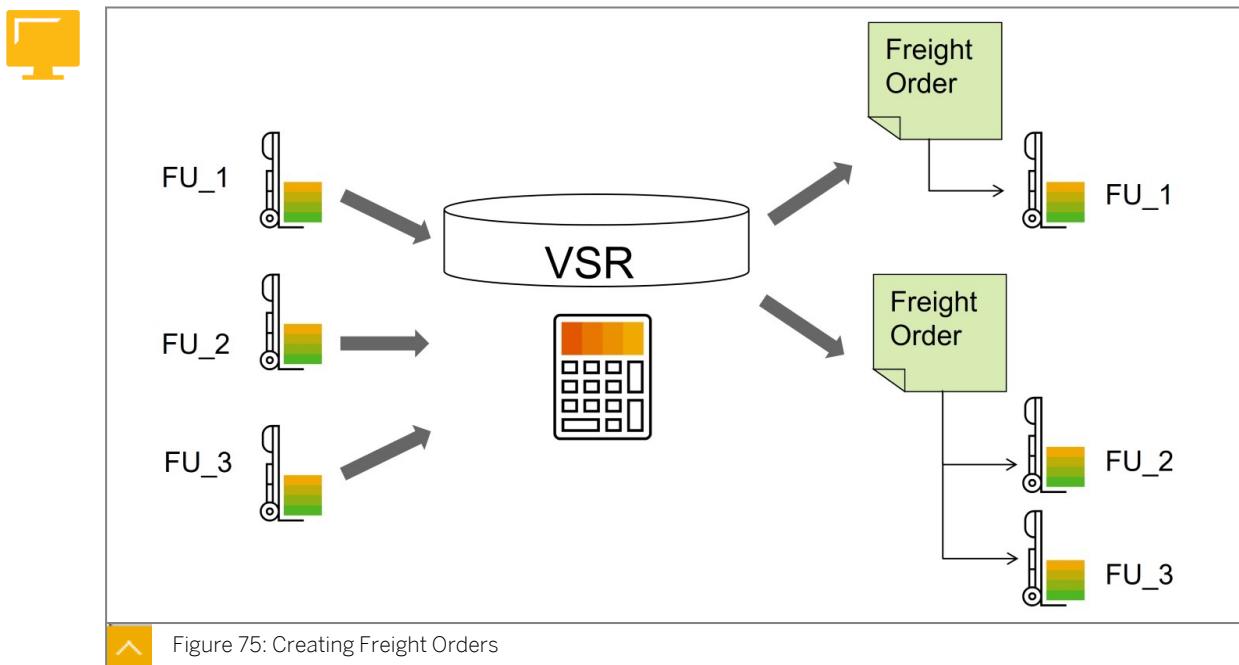
The first purpose of a transportation proposal is to help the user identify the different transportation options for a freight unit. In a complex network, in which end-to-end transportation requires several stages, transportation proposals are an easy way to make the different options transparent. Transportation proposals can differ from one another with respect to the chosen routing, the selected means of transportation, and/or the time required. Each of these variables can increase or reduce costs, and the proposals thus provide the planner responsible with the necessary information to make an appropriate choice.

Transportation proposals can be displayed in a tabular format or they can be visualized on a map.

### The Freight Order

Freight orders represent a single shipment or load departing from one of your facilities (outbound scenario) or arriving in one of your facilities (inbound scenario). A freight order can be created manually or automatically (for example by using the **Vehicle Scheduling and Route (VSR) optimizer**). Freight orders are the basis for carrier selection, tendering, and freight settlement processes.

A freight booking can also be created as one of the results of transportation planning, similar to a freight order. You use freight orders mostly for land transportation and you use freight bookings mostly for sea and air transportation.



In a freight order, freight units from different transportation requests can be consolidated. The VSR optimizer aims at finding the lowest cost solution based on the freight units to be planned, the transportation network (as defined in master data) and, for example, the costs defined in the relevant planning profile for the VSR optimizer.

### Carrier Selection

Carrier selection is used to assign a suitable carrier to your freight orders, either manually or automatically. The aim is to find a carrier that can provide transportation against the lowest possible costs while considering all of the defined constraints.



During manual carrier selection, you manually assign the required carrier to your business documents. If you have configured a check against transportation allocations, the system takes this into account and checks transportation capacities (transportation allocations) that

you have defined for the individual carriers. If, during the allocation, the system finds relevant transportation allocations without capacity or that certain rules are violated by the current allocation, warning messages appear.

A separate optimization run is available for automatic carrier selection. It takes selected optimization options into account when determining the most cost-effective carrier for all business documents that you have selected. If none of the carriers are available, the system does not assign any carrier to the relevant business documents.

### Order Tendering Process

Once carrier selection has taken place, communication with the selected carrier needs to be initiated. This process is referred to as order tendering. Different tendering processes can be deployed depending upon the technology used by the carrier. You use this process to tender (offer) a freight order to one or more potential carriers. Tendering is a bidding process, in which you request one or multiple carriers to submit a quote for a transportation service that is defined in a freight order. You can select the carrier that you want to execute the transportation service by evaluating the quotes. The main characteristics of the tendering process are flexible configuration and the reduction of required manual interaction to support ease of use and lower total cost of ownership (TCO).



### LESSON SUMMARY

You should now be able to:

- Understand the transportation planning process
- Create transportation requirements
- Plan transportation
- Perform carrier selection



## Unit 5

### Lesson 2

# Executing Transportation



#### LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe the integration of SAP Transportation Management and SAP Extended Warehouse Management
- Using the yard

#### Integrating SAP TM and SAP EWM

A shipper that doesn't own a fleet of means of transportation (trucks, boats, etc.) usually has nothing to do with the physical execution of the transportation itself. A freight order for the chosen logistic service provider (LSP) or freight forwarder is created. This party then either performs the transportation or also uses a transportation service provider for it. Depending on the size of the transportation requirements and the possibilities of transportation, most of the planning process itself might be in the hands of an external party.

Integration with transportation usually only happens for a shipper when a truck arrives at the warehouse, either picking up or delivering goods. This of course assumes that the warehouse operations themselves are not outsourced as well. It is important to know from a warehouse management perspective what transportation activities are expected, so that warehouse processes can be aligned with these activities.



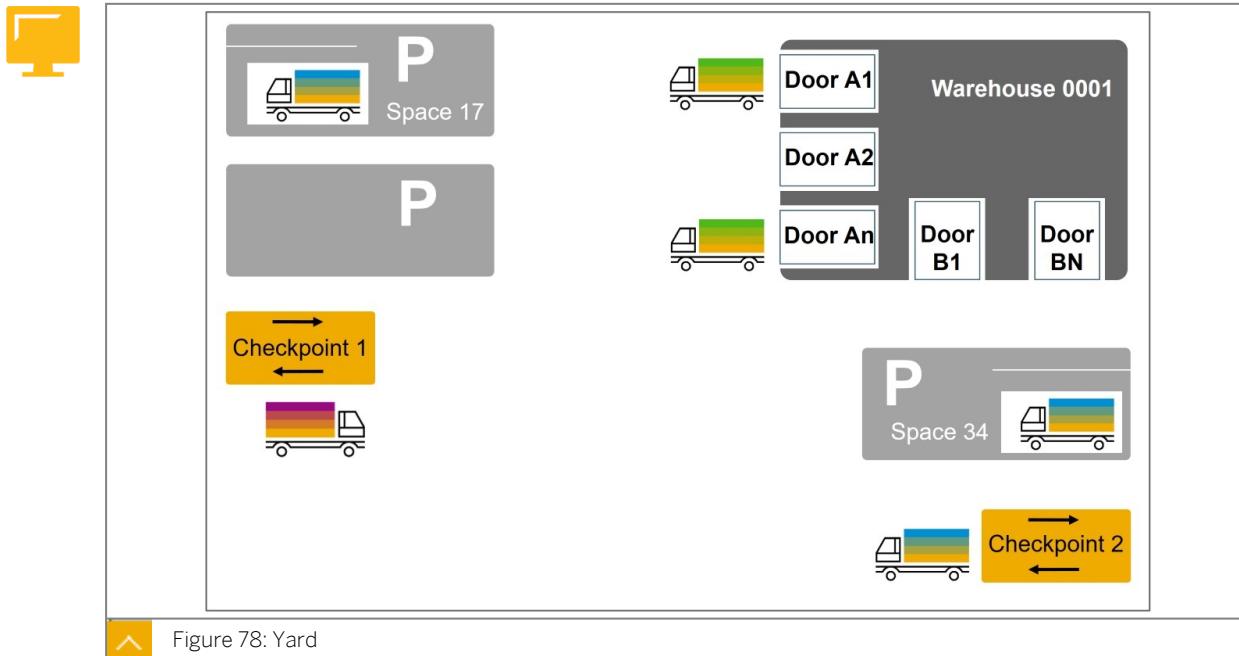
Figure 77: Integration of SAP TM and SAP EWM

When integrating SAP Transportation Management (SAP TM) with SAP Extended Warehouse Management (SAP EWM), a **Yard** is used in the system to represent the physical location where the means of transportation arrive when they reach the warehouse and from which they depart again. **Transportation Units** correspond to the actual freight orders.

#### Managing a Yard

A yard is an enclosed area just outside a warehouse where vehicles and transportation units arrive and where they are managed. Examples of activities at a yard: managing arrivals,

managing vehicles waiting to be able to park, warehouse door assignment, managing units waiting to be collected by an external carrier, etc. You can use a yard with basic functions to control the arrival, loading or unloading, and also the departure of trucks. More advanced functions can be used to control the individual movements of a specific means of transport. This is called **Yard Management**. With Yard Management, movements of a means of transport within the yard are controlled via warehouse tasks.



A yard is represented via a separate storage type in a warehouse. Corresponding storage bins as yard bins are defined, which can be grouped into yard sections. This is done in the same way as for the warehouse itself. The following elements can be defined in a yard:

- Checkpoints:

A checkpoint is a location where means of transportation enter or exit the yard. A checkpoint can represent a physical gate at the yard entrance, or a virtual gate from which data is transmitted electronically. You first define a checkpoint and then you assign this checkpoint to a yard bin.

- Doors:

A door is a location in the warehouse where the goods arrive at or leave the warehouse. Doors connect the yard to the warehouse. Means of transportation drive up to a door of a warehouse to load or unload goods.

- Parking spaces:

A parking space is a location in the yard where a means of transportation can be parked.



**Note:**

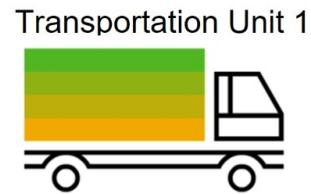
Parking spaces are only usable with Yard Management active in the system.

## Transportation Units

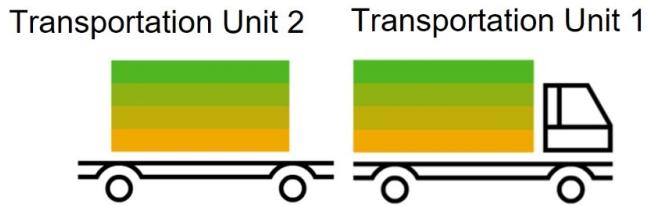
In a yard, vehicles and/or transportation units are moved from one location to another location.



### Vehicle 1



### Vehicle 2



### Vehicle 3

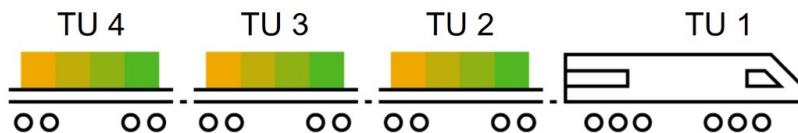


Figure 79: Vehicles and Transportation Units

A vehicle is an instance of a particular means of transportation. A vehicle can comprise one or more transportation units and represents the physical entity that performs the transportation service.

A transportation unit is the smallest unit that can be loaded into or onto a means of transportation from the viewpoint of transporting materials. A Transportation Unit (TU) can be a fixed part of a vehicle. The figure shows different possibilities for defining TUs.

- Vehicle 1: Semitrailer truck, which equals one TU
- Vehicle 2: Truck with cargo area and trailer, which equals two TUs
- Vehicle 3: Train with four wagons, which equals four TUs

It is not mandatory to use vehicles in the system. If the features available at transportation unit (TU) level are sufficient for your yard processes, you can simply skip the process step to define vehicles.



### LESSON SUMMARY

You should now be able to:

- Describe the integration of SAP Transportation Management and SAP Extended Warehouse Management
- Using the yard



## Learning Assessment

1. Which of the following are benefits of SAP Transportation Management?

*Choose the correct answers.*

- A It allows companies to consolidate orders.
- B It allows companies to efficiently schedule, route and combine multiple orders.
- C It allows companies to choose an appropriate carrier.
- D It allows companies to decentralize warehouses.

2. Since SAP S/4HANA release 1709, SAP Transportation Management (SAP TM) is available as an embedded solution running on the same HANA server as where the SAP S/4HANA functionality is running.

*Determine whether this statement is true or false.*

- True
- False

3. What is the name of the document that can be used to support freight planning and carrier selection?

*Choose the correct answer.*

- A Stock transport order
- B Transportation Order
- C Freight order
- D Freight unit

4. In SAP S/4HANA, freight units can only be created manually by the freight forwarder.

*Determine whether this statement is true or false.*

- True
- False

5. Select the correct statements concerning the integration of SAP TM and SAP EWM.

*Choose the correct answers.*

- A Integrating SAP TM and SAP EWM means at least one of them has to be set up as a decentralized solution.
- B When integrating SAP TM with SAP EWM, a yard is used to represent the physical location where transportation and warehouse 'meet'.
- C When integrating SAP TM and SAP EWM, the use of vehicles is required.
- D Once load planning is finished in SAP TM, the information about the transportation unit can be send to SAP EWM.

## Learning Assessment - Answers

1. Which of the following are benefits of SAP Transportation Management?

*Choose the correct answers.*

- A It allows companies to consolidate orders.
- B It allows companies to efficiently schedule, route and combine multiple orders.
- C It allows companies to choose an appropriate carrier.
- D It allows companies to decentralize warehouses.

Correct. The goal of SAP TM is to provide customers with the ability perform order consolidation. This means that a company can group orders with the same ship-from and/or ship-to locations for planning and managing transportation quantities more efficiently. If multiple sales orders are being shipped to a predefined transportation zone, companies can efficiently schedule, route and combine the multiple orders, and choose an appropriate carrier.

2. Since SAP S/4HANA release 1709, SAP Transportation Management (SAP TM) is available as an embedded solution running on the same HANA server as where the SAP S/4HANA functionality is running.

*Determine whether this statement is true or false.*

- True
- False

Correct. Since SAP S/4HANA release 1709, SAP Transportation Management (SAP TM) is available as an embedded solution running on the same HANA server as where the SAP S/4HANA functionality is running.

3. What is the name of the document that can be used to support freight planning and carrier selection?

*Choose the correct answer.*

- A Stock transport order
- B Transportation Order
- C Freight order
- D Freight unit

Correct. Freight order is the name of the document that can be used to support freight planning and carrier selection.

4. In SAP S/4HANA, freight units can only be created manually by the freight forwarder.

*Determine whether this statement is true or false.*

- True
- False

Correct. In SAP S/4HANA, freight units can only be created manually by the freight forwarder.

5. Select the correct statements concerning the integration of SAP TM and SAP EWM.

*Choose the correct answers.*

- A Integrating SAP TM and SAP EWM means at least one of them has to be set up as a decentralized solution.
- B When integrating SAP TM with SAP EWM, a yard is used to represent the physical location where transportation and warehouse 'meet'.
- C When integrating SAP TM and SAP EWM, the use of vehicles is required.
- D Once load planning is finished in SAP TM, the information about the transportation unit can be send to SAP EWM.

Correct. The correct statements concerning the integration of SAP TM and SAP EWM are

— When integrating SAP TM with SAP EWM, a yard is used to represent the physical location where transportation and warehouse 'meet' and Once load planning is finished in SAP TM, the information about the transportation unit can be send to SAP EWM.