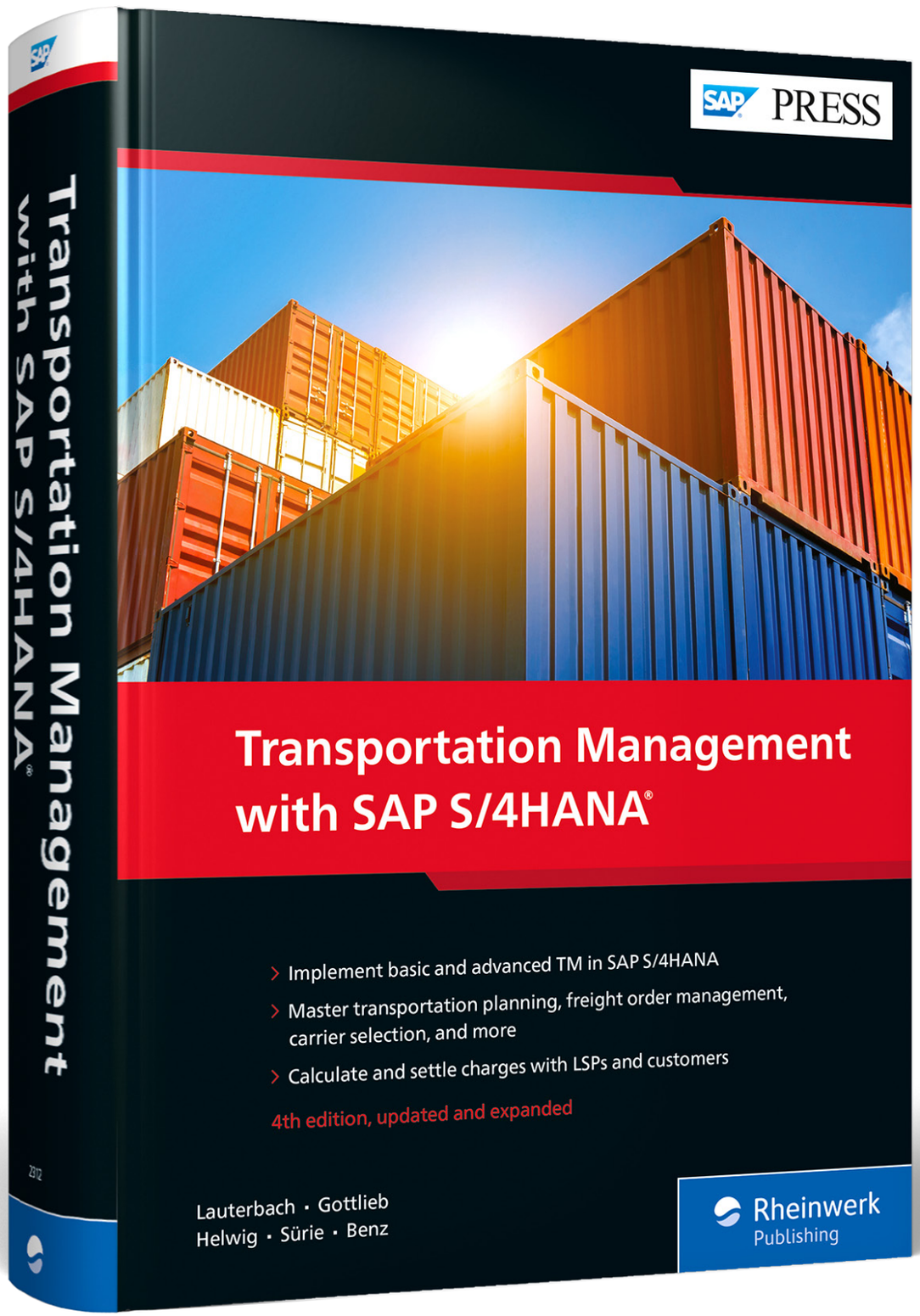

Reading Sample

In this chapter, you'll learn about transportation execution and tracking in your SAP S/4HANA landscape. You'll walk through the steps with three solutions: freight order management, SAP Event Management, and SAP Business Network Global Track and Trace.

"Transportation Execution and Monitoring"

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The Authors

Lauterbach, Gottlieb, Helwig, Sürie, Benz

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Chapter 7

Transportation Execution and Monitoring

Managing and controlling transportation processes is the focus of transportation execution, which includes the use of transportation management (TM) in SAP S/4HANA, SAP Event Management, and SAP Business Network Global Track and Trace with required support for end-to-end cargo movements.

Transportation execution and monitoring allows you to manage all required process steps around organization and documentation of activities focused on preparation, physical movement, handling, and monitoring of cargo along the supply chain. The SAP system supports employees working in documentation and freight-handling departments of logistics service providers (LSPs) and shippers' logistics departments to fulfill their responsibilities in a compliant manner and create an audit trail for the actual cargo movement.

Freight movement processes are executed and monitored using one or more of the following components:

- **Freight order management**
  The freight order management component of TM allows you to manage all steps in terms of preparation, organization, handling, loading, movement, and unloading of cargo. This includes creation of documents related to the cargo movement as well as initiating checks for compliance, such as documentation of actual quantities and details of the cargo. You can record discrepancies that occur between order capture and planning on the one hand and physical checking and handling on the other. Moving cargo also results in updates of order and cargo status, such as documenting a loading status either manually out of the TM system or automatically in conjunction with, for example, SAP Event Management. The organizational aspect of the cargo movement is supported by export/import handling, which provides you with the handover capability between multiple organizational units along the path of a cargo move.
- **SAP Event Management**
  SAP Event Management is an extremely flexible, efficient, and generic software tool for management and visualization of track and trace processes, status management processes, and key performance indicators (KPIs) based on these process types. You

can use SAP Event Management in logistics and beyond to automatically record activity information related to cargo movements, order processes, resource lifecycles, and financial management aspects related to shipments (e.g., cargo prepayment). SAP Event Management is provided as a private track and trace tool; that is, it needs to be operated by a customer and isn't a public cloud service or general networking tool.

Based on high customer demand, SAP went a logical step forward in 2021 and made SAP Event Management available as add-on on for SAP S/4HANA (SAP Event Management on SAP S/4HANA). Function-wise, the SAP S/4HANA-based version is equal to the SAP NetWeaver version from SAP TM 9.2. However, the main benefit is that no additional SAP installation is required anymore when running transportation management and event management together.

- **SAP Business Network Global Track and Trace**
  Fueled by the innovation of the SAP logistics technology, SAP Global Track and Trace was first released in 2018 as a new tool for collaborative process tracking. From technology and use cases, this tool was designed for parties engaging in a joint logistics process in the public cloud. SAP Business Network Global Track and Trace started as an independent cloud tool and has now become part of SAP Business Network for Logistics. However, as SAP Business Network Global Track and Trace is very close to SAP Event Management, we'll give a detailed overview in this chapter. For other SAP Business Network for Logistics topics, refer to Chapter 12, Section 12.6.

  Global track and trace functionality can be licensed in two different versions:

  – As part of SAP Business Network Freight Collaboration, SAP Business Network Global Track and Trace provides tracking support for a fixed set of events such as loading, departure, arrival, or unloading in relation to transportation processes driven from TM.
  – When licensing SAP Business Network Global Track and Trace as part of SAP Business Network for Logistics, you may use its functionality more flexibly, as you can define required events, event-driven activities, and backend integration in a more versatile way, which gives you a scope and behavior comparable to SAP Event Management.

In this chapter, we'll explain the features and background of transportation execution and tracking through each of these three solutions: freight order management in TM (Section 7.1), SAP Event Management (Section 7.2), and SAP Business Network Global Track and Trace (Section 7.3).

7.1 Transportation Execution

Transportation execution comprises all activities involved with handling and documenting shipments in transit. It's more than just tracking a vehicle on the road: it

includes recording any changes to the planned transport and handovers to other business partners or entities.

In previous chapters, we mainly talked about how to use the TM functionality to record, plan, and subcontract transportation requirements. Actual pallets, containers, and wagons hadn't yet been loaded, let alone put into motion. The freight order management component within the TM functionality not only supports transportation management during the planning phase but is also used after the vehicle has left the loading location.

Before the vehicle actually leaves for the transit, the loading process gathers new information that might be relevant for the shipper or carrier. So far, we've been dealing with planned quantities, but now the carrier has to deal with actual quantities, which could differ from the freight quantities ordered. These discrepancies between ordered and actual quantities can be recorded and, depending on the agreement between the ordering party and the carrier, taken into consideration for charge calculation.

In international, multimodal transports, more than one LSP unit is often involved in the overall transportation. Sometimes importing in the destination country can be very specialized, and a local LSP unit or organization can support the import leg much better than a foreign LSP unit. Therefore, we can observe a handover between the exporting LSP unit (which is also the single point of contact for the customer) and the local importing LSP unit.

In addition, transportation isn't only about moving goods from point A to point B. Sometimes it seems like it's more about moving paper or information from point A to point B. Waybills, customs declarations, bills of lading, and other documents need to be generated, printed, and transported with the goods or transmitted in advance. Often legal requirements also need to be respected.

More than moving goods from one place to another, transportation execution involves significant administrative effort, legal requirements, transparency, and organizational interactions. The freight order management component supports all these areas, so we now delve deeper into each of them to show you how you can leverage these requirements with the TM functionality.

7.1.1 Document Creation

Regardless of which transportation mode is involved, creating, printing, and carrying documents is very important in the transportation process. Depending on the perspective from which we look at the transportation process, several documents are involved. In this section, we concentrate on the creation of bills of lading and waybills.

The difference between these two documents is their legal and practical purposes. The *bill of lading* (B/L) serves as proof that a contract or order has been issued between a shipper and a carrier stating that certain goods need to be transported. A *waybill* is the more logistical document, listing the goods that need to be transported.

However, in a process involving a freight forwarder as an agent between an actual carrier and shipper, the B/L and waybill can mean the same thing. The LSP now issues its own B/L, called the *house bill of lading* (HBL), which is at the same time also called a house waybill. Because waybills are usually seen in the context of the transportation mode, the terminology for waybills is usually used together with the mode of transport (e.g., sea waybill for ocean transports or air waybill for air transports).

If we look at it from a shipper's perspective, for some modes of transport (e.g., ocean), we're obliged to hand over a B/L to the consignee that lists all goods to be transported. The B/L is a legal and negotiable document enabling the receiver—who is usually the consignee—to claim the goods at the port of discharge. On the other hand, the consignee may also sell the goods during ocean transit and hand over the B/L to the buyer.

The LSP or carrier who manages the order for the shipper issues the B/L. For consolidated transportation for different shippers, the LSP issues itself a B/L or receives one from the carrier for the consolidation and issues multiple HBLs, which the LSP provides to the involved shippers.

Making It Simple

Recall that the terminology of waybills is often used in combination with its mode of transport. To make this chapter easier, we use air transportation as an ongoing example from now on; therefore, we refer to *house air waybills* (HAWBs) and *master air waybills* (MAWBs).

HAWBs can be created from the forwarding order as well as from the freight units, freight orders, or freight bookings. By customizing the forwarding order, you can define how the number of the HBL or HAWB should be put together. We talked about this already in Chapter 4, Section 4.2.1. Nevertheless, you can also define in Customizing how the HBL should be composed by defining a process controller strategy that takes over the job of creating HBLs.

Several possibilities are offered with the standard strategies. In general, the HBL is built out of the *items* of a document, not the header data:

- **By shipper and ship-to party**
  All items containing the same shipper and ship-to party combination are consolidated into one HBL. There are also additional, more specific strategies available that group the items on a HBL by container or transportation group of the material in addition to the shipper and ship-to party information.
- **By destination location**
  In some cases, the goods are transported to the same location, but different consignees will later receive the goods. This is the case if an importing business unit will take over the goods at the port of discharge.

- **By forwarding order**
  If the HBL or HAWB is created by an LSP, all items belonging to the same forwarding order can be put together in one document.
- **By freight documents**
  Again, this scenario is built for LSPs. All items planned on the same document on the main carriage are consolidated into one HBL.

Which strategy you use and from which document you would like to create the HBL depends on your business case and industry.

The waybill, on the other hand, is the logistical document passed between two parties cooperating in a transportation business. The waybill document comprises the information about the cargo, transportation route, and terms.

The consumer of a transportation service and the provider of that transportation service share a common number range from which the consumer can draw a number to give to the provider. This number is then a unique referral for both parties of the transportation business. In the TM functionality, the number ranges are stored in *waybill stock IDs* that define agreed-upon number ranges.

Waybills in TM can be separated into house waybills and master waybills. The house waybills represent the transportation documents between the sales side of the company using TM and a sold-to party. The master waybills represent the purchasing document between the company using TM and a carrier. You can compare this differentiation with freight settlement documents and forwarding settlement documents—they are similar-looking documents but are built for different parts of the transportation process.

Waybills Aren't Separate Entities

Other than with freight settlement documents and forwarding settlement documents, waybills aren't represented with their own separate entities in the TM system. Waybills serve as print documents only on the forwarding orders and freight orders, freight bookings, and freight units. These documents provide the functionality of drawing the right number. However, there is no separate business object designed for the waybills.

To create waybill stock IDs, you need to carry out some Customizing activities. Remember that the number ranges in TM are stored as waybill stock IDs. To create these waybill stock IDs, you need to define *waybill stock types*, which you can do in Customizing via IMG menu path **Transportation Management • Master Data • Waybill Stock • Define Waybill Number Stock Types**.

As shown in Figure 7.1, you can customize several details about the waybill number stock before you define the waybill number stock itself. Waybill number stocks are always dependent on the transportation mode, so the assignment of a transportation

mode is mandatory in this Customizing activity. With the stock category, you specify whether the number stock is used as a waybill number or as a tracking number.

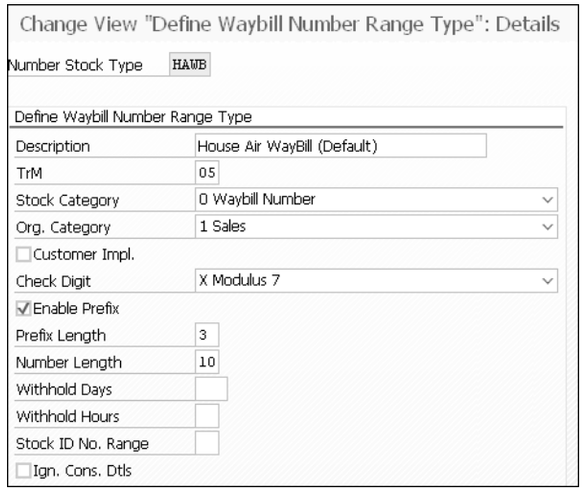


Figure 7.1 Number Stock Customizing

Waybill Numbers and Tracking Numbers

Technically, there is no difference between a waybill number and a *tracking number*. Both numbers are used to identify a transport uniquely in communication between the transportation service consumer and the provider.

However, the different terms are used in different transportation scenarios. Air, sea, road, and rail transportation use the waybill number; we refer to tracking numbers in parcel scenarios.

Later in this section, you'll see that tracking numbers are maintained the same way waybill numbers are.

The organization category defines whether the waybill number stock we're creating is supposed to be used for master waybills or house waybills. Recall that house waybills are used between the sales side and a sold-to party, while master waybills are used between the purchasing side and a carrier. Therefore, the house waybill usually represents the entire transportation ordered, and the master waybill represents only a certain transportation leg.

The lower part of the Customizing activity illustrated in Figure 7.1 addresses how the number should be composed. First, you can define that a carrier-specific prefix should be added by selecting the **Enable Prefix** checkbox.

Carrier Prefix

The prefix for the carriers is also defined in Customizing. In the Customizing activity found via IMG menu path **Transportation Management • Master Data • Business Partner • Define IATA Airline Codes**, you can assign a waybill prefix to the carriers.

In addition, waybill numbers may have a check digit. TM offers two possibilities for automatically adding a check digit to the waybill number. The waybill number is calculated with either Modulus 7 or Modulus 10. If none of the provided calculation rules fit the specific waybill number stock requirements, you can implement custom implementation using a business add-in (BAdI).

Calculation with Modulus

Calculation with modulus is often used in IT. When you use the calculation operation MOD, the base number is first divided by the divisor. But it's the remainder after the division that's important, not the result of the division.

For example: 11 MOD 3 = 2.

As you would expect, the waybill number stock type also defines the general length of the waybill number. The waybill number is always extended with leading zeros to match the waybill number length defined in the waybill stock type.

In certain processes, master waybill numbers can be returned, such as the cancellation of a freight booking for which a waybill number was already assigned. Although the returned number can't be directly reused by other documents, it needs to be withheld for a certain time because the cancellation might be replicated into other systems, as well. Therefore, a withholding time in days and hours can be maintained in the waybill stock type.

After defining a waybill stock type, we can create the actual waybill number ranges. In the SAP Fiori launchpad, you can find the corresponding Waybill Number Stocks app in the **Master Data** tab. Here you can see a personal object worklist (POWL) that differentiates among house waybills, master waybills, and tracking numbers.

When creating a new waybill stock with the **New** button on the top of the POWL list, you'll see that you need to select a waybill stock type first. After you've chosen a waybill stock type, the definitions from Customizing are automatically propagated into the waybill stock.

Terminology

In this chapter, we use the terms *waybill stock*, *waybill stock IDs*, *and waybill number ranges*. All these terms describe the same entity in TM: the waybill stock.

With the waybill stock, you now define the actual number range for the waybill document in the **From Number** and **To Number** fields. For air waybills, the waybill stock needs to be assigned a specific airline's prefix, as you can see in the top-right corner of Figure 7.2.

However, as you can see in the lower part of Figure 7.2, the waybill stock can be defined among several organizational units (sales organizations for a house waybill and purchasing organizations for a master waybill) and several external parties (sold-to parties in house waybills and carriers in master waybills).

Waybill numbers can automatically be drawn on all TM documents that are related to waybills. In air freight bookings, you can do this with a follow-up activity called **Draw MAWB Number** (in ocean freight bookings, the action is called **Build House Bill of Lading**); in forwarding orders, you have a separate button in the global toolbar called HBL, where you find the **Draw HBL Number** action.

Numbers are drawn for waybills based on the waybill stocks that we defined earlier. For house waybills, the system looks for waybill stocks that have the sales organization and sold-to party of the corresponding forwarding order assigned. If several waybill stocks are found, a popup appears, where you can choose between the different relevant waybill stocks. During searches for waybills stocks, the validity dates of the waybill stock are also considered; only waybills stocks that are currently valid are taken into consideration.

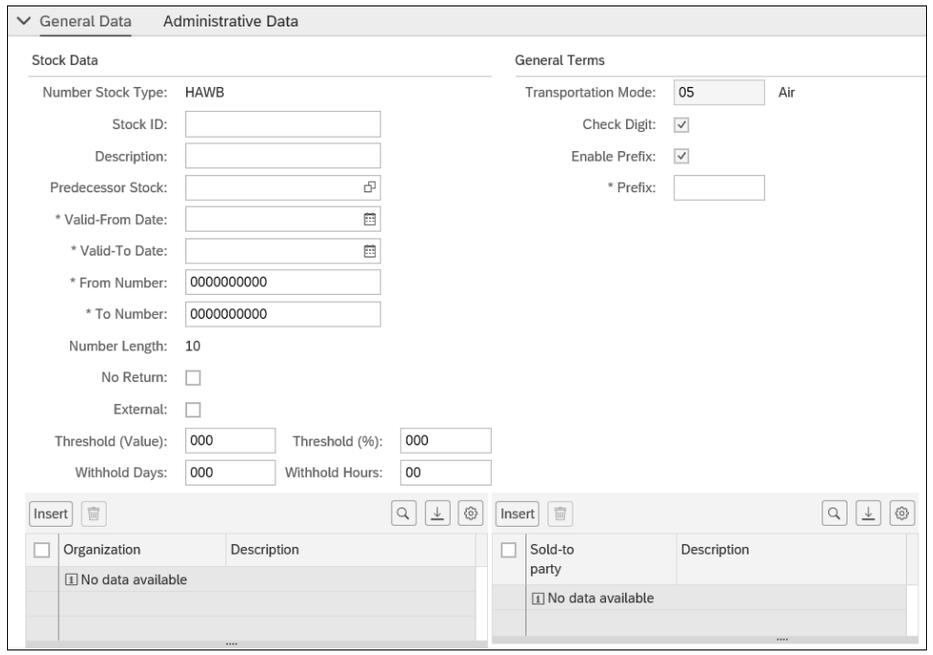


Figure 7.2 Defining Waybill Stock

Predecessor Stocks

If several valid waybill stocks represent the required organizational unit/ordering party combination, you need to choose the waybill stock manually from a popup.

However, you can use the predecessor stock functionality to define a priority among waybill stocks that are valid at the same time. You can see in Figure 7.2 that you can insert an ID of another waybill stock as the predecessor stock. If a predecessor stock is maintained, numbers from this predecessor stock are drawn first.

Only when the predecessor stock is exhausted will the next waybill stock be considered.

If there is no valid house waybill stock that represents the combination of sales organization and sold-to party, the system next looks at waybill stocks that have only a sold-to party assigned. If no waybill stocks are found in this case, either, waybill stocks that have only sales organizations assigned are then considered.

This logic doesn't exist for master waybills because these should always represent a certain combination of carriers and purchasing organizations.

If the waybill stock is running out of numbers, you can define a threshold value (either an absolute value or a relative value) for your waybill stock. When the use of the waybill stock exceeds the threshold value, the user sees a warning message when drawing another number from the almost-exhausted waybill stock.

When a waybill stock that represents a number range agreed upon between an organizational unit and an external party is eventually exhausted, the organizational unit has to approach the external party to agree on a new number stock. However, if the organizational unit foresees that only one more number is needed, this number can be drawn from another waybill stock that wasn't designed for the relationship between this organizational unit and the external party. This process is called *delegation* of a waybill number. When you access your waybill stock in the lower part of the SAP Fiori screen, you can see which waybill numbers have already been used and on which documents they were used.

You could access the freight document directly from this list. If a number was returned, but the withholding time hasn't yet expired, the number is still displayed together with the freight document it was previously used on, but the status of the number is **Returned**.

If you want to delegate a number to another organizational unit as just explained, you can also do this in the waybill stock. If you click the **Delegate** button, the next available number from the waybill stock is drawn and added to the list of numbers in the **Details** area of the waybill stock. The status is set to **Delegated**, and you can now enter the organizational unit to which you would like to delegate the number.

Restrictions on Delegation

Note that delegating waybill numbers is possible only for master waybills, not for house waybills. Furthermore, the number will only be delegated to another purchasing organization; the carrier has to remain the same.

After the delegation is entered in the waybill stock, the next automatic drawing of a waybill number takes the delegated number into consideration.

As you know from Chapter 3, organizational units can be created hierarchically, representing the responsibilities of some organizational units to other units. The organizational hierarchy is considered in the number drawing of waybill numbers as well. In waybill stocks, you can enter not only purchasing organizations as organizational units but also other functional roles such as forwarding houses and companies.

If different waybill stocks are defined for purchasing organizations and forwarding houses, the automatic number drawing only considers the more specific organizational unit; in this example, this is the purchasing organization. Only if the waybill stock of the most specific organizational unit is exhausted is the next higher level considered as a fallback solution. With this functionality, you can make sure you have some fallback numbers maintained if a waybill stock unexpectedly runs out of numbers.

Now that we've discussed the process of drawing waybill numbers, let's look at the waybill itself. In Customizing of the freight order or freight booking type, you define which documents can be printed out of the corresponding document. Via IMG menu path **Transportation Management** • **Freight Order Management** • **Freight Booking** • **Define Freight Booking Types** (or the definition of freight order types), you can assign two output profiles to the document type, as shown in Figure 7.3.

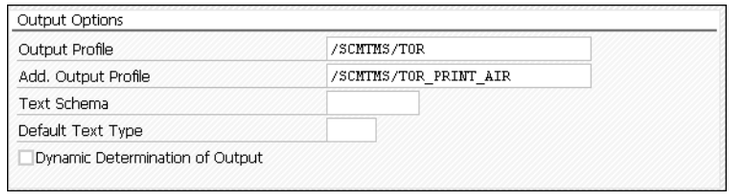


Figure 7.3 Assignment of Output Profiles to a Document Type

The output profile defines which documents may be printed for the document. Therefore, you can find output profiles for each supported transportation mode in Customizing. If you want to define your own output profiles, you can do this in the Post Processing Framework (PPF) that was discussed in Chapter 2, Section 2.3.3.

TM provides a standard format for MAWBs. You can change the layout of this document in Transaction SFP with Adobe Document Server, as we described in Chapter 2, Section 2.3.4.

When you want to print a waybill from a freight document, such as a freight order or freight booking, define the printing options in the configuration of the corresponding action of the PPF. In the freight booking or freight order itself, you can navigate to the **Output Management** tab, where you'll be able to preview the waybill documents when selecting a corresponding action.

House waybills on forwarding orders can be printed and viewed on the **Output Management** tab. If the output profile was assigned to the forwarding order type, the document automatically appears on this tab.

7.1.2 Discrepancies

So far, we've discussed only transportation process steps that deal with requested and planned quantities. However, in some cases, the actual quantity can't be estimated precisely beforehand, for example, when transporting bulk freight. When the transportation execution starts, the actual quantity needs to be recorded as well. This process in the TM functionality is called *discrepancy handling*.

Discrepancies are a hassle for transportation execution because they might affect the choice of vehicle resource being used for the transportation or lead to a different charge calculation. Therefore, discrepancies need to be discussed with the shipper before transportation can continue.

The transportation process starts as usual, requested quantities are entered into a forwarding order, and freight units are created out of this document. After the freight units are planned, the execution of the transportation may begin. The carrier now physically receives the cargo and checks the actual quantities against the requested quantities. This checking and reporting are performed by the carrier and communicated to us as the freight forwarder. We'll then enter the actual quantities in the freight order's items, as shown in Figure 7.4.

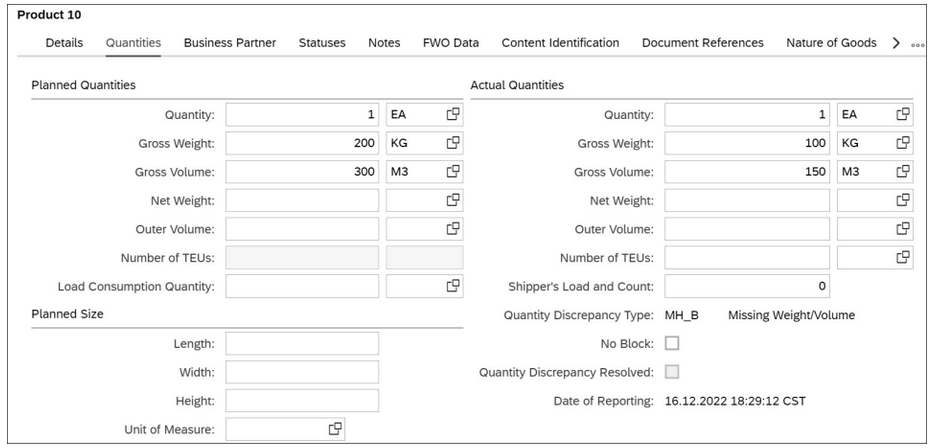


Figure 7.4 Actual Quantities on the Item Level

If the carrier doesn't receive the cargo as planned, you need to report the discrepancy. In general, you can differentiate between two types of discrepancies:

- **Quantity discrepancies**
  The actual quantities are different from the requested quantities because of a change in the quantity, gross weight, or volume.
- **Other discrepancies**
  These are the discrepancies that are *not* caused by a change in quantities. If the cargo is damaged or documents are missing for the cargo, these events can be recorded as other discrepancies.

When the carrier discovers a quantity discrepancy, the carrier can report it using TM. The system automatically checks the actual quantities against the requested quantities. If a discrepancy exists, it's automatically reported.

You can define different types of discrepancies in Customizing by following IMG menu path **Transportation Management • Freight Order Management • Define Discrepancy Profile**.

For the discrepancy type, you can define a tolerance range, meaning that if the actual quantities are within the defined tolerance range, no discrepancy is recorded. The tolerance range is defined as a percentage.

Discrepancy types are clustered in a *discrepancy profile* in the same Customizing activity. The discrepancy profile is assigned to a freight order or freight booking type so that different freight documents can react to discrepancies differently.

After a discrepancy is recorded, the actual quantities of the subsequent transportation stages and the actual quantity of the freight units are updated. The carrier now has to discuss the discrepancy with the customer before the execution of the transport may continue. Therefore, after a discrepancy is reported, all transportation stages carrying a freight unit with unresolved discrepancies get a planning and execution block. In discrepancy type Customizing, however, you can specify that the reported discrepancy of a special discrepancy type doesn't lead to a planning and execution block. If you remove the freight unit with unresolved discrepancies from the freight document, the planning and execution block is also removed.

In the freight order on the **Items** tab, you can select the item for which you've entered discrepant quantities. In the **Details** area below the table of items, the reporting of discrepancies is first drafted on the **Discrepancies** tab, and a corresponding event (assigned to the discrepancy type in Customizing) is triggered.

If the carrier discusses the discrepancy directly with the shipper, you can report the resolution of the discrepancy directly on the **Items** tab. From the toolbar above the list of discrepancies, select **Resolve • Resolve Discrepancy**, as shown in Figure 7.5.

After the discrepancy is set to **Resolved**, the planning and execution block is removed.

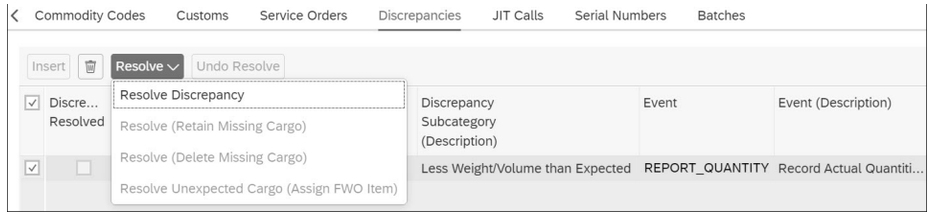


Figure 7.5 Resolving Discrepancies in the Freight Order

In other cases, the carrier notifies only the freight forwarder of the discrepancy, and that freight forwarder has to discuss the discrepancy with the shipper. Therefore, the discrepancy is also propagated to the forwarding order. If you select the item of the forwarding order, you'll see the **Discrepancies** tab in the **Details** area of the forwarding order items.

As you can see in Figure 7.6, the freight forwarder can now also set the discrepancy to **Resolved** by selecting **Resolve • Resolve Discrepancy**, which leads to the removal of the planning and execution block of the stages in the assigned freight documents.

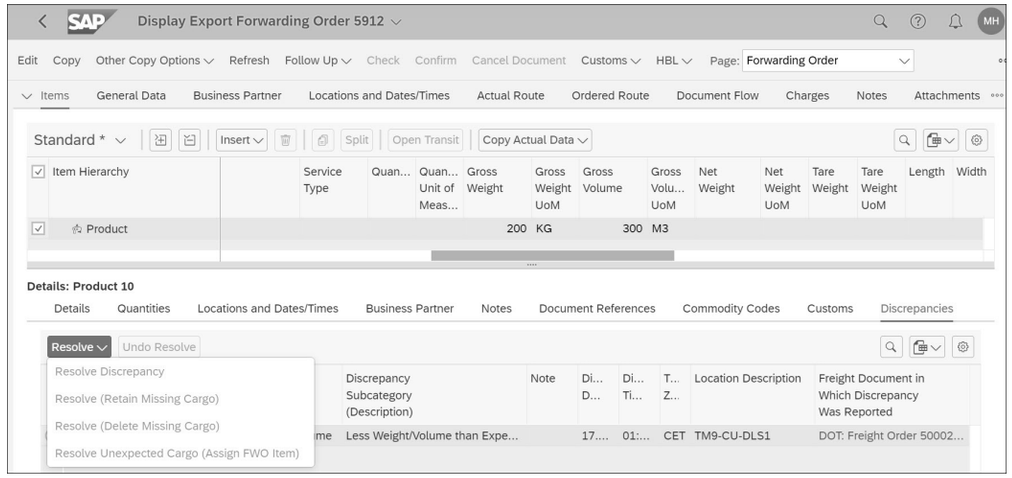


Figure 7.6 Resolving Discrepancies in the Forwarding Order

If the cargo was already damaged when handed over to the carrier, the carrier can report discrepancies, as well. In Figure 7.5 shown earlier, you can also insert discrepancies on the **Discrepancies** tab without entering actual quantities in the cargo information of the freight order or freight booking. The processing of other discrepancies is exactly the same as the processing of quantity discrepancies.

If you've reported a wrong discrepancy, or the discrepancy was resolved by changing the quantity, you can click the **Delete** button to reset the discrepancies so that the actual quantities no longer differ from the requested quantities.

7.1.3 Export/Import Processing

In international, multimodal transports, several organizational units or even business partners are often involved in the planning and execution of the transport. It's not uncommon for an export organization to organize the pre-carriage and main leg of the transportation while an import organization deals with the on-carriage of the same transport. Due to customs regulations and special circumstances in the importing country, this makes sense because organizations with local knowledge can participate in the transportation planning, making the transport more efficient and, in most cases, cheaper.

Let's take a deeper look at how the interaction between export and import organizations is established in TM. As an example of the process, we concentrate on an ocean transport ordered at the export organization. The export organization deals with the pre-carriage and main carriage, while the import organization is responsible for the organization and execution of the import transportation leg. Figure 7.7 illustrates this division of labor.

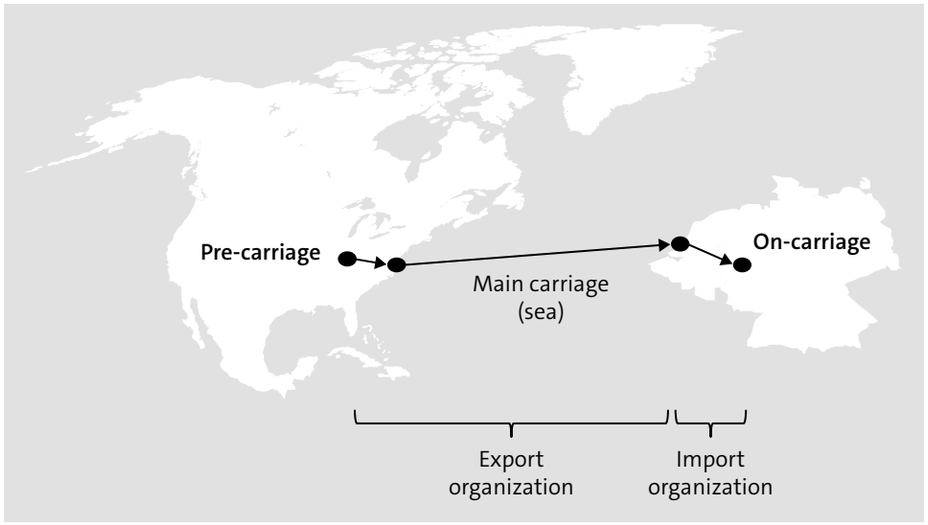


Figure 7.7 Responsibilities in an Export/Import Process

In general, we can differentiate among different scenarios in the export/import process:

- **Full container load (FCL)**
  Because a full container is shipped completely from the shipper to the carrier, there is exactly one transportation request (TRQ) on the export side and one TRQ on the import side. The number of freight documents is also exactly one on each side.
- **Less than container load (LCL)**
  The number of TRQs on either side still matches. However, because several TRQs are now consolidated into one container, more than one TRQ is created on each side, but there is still only one freight document on each side.

- **Buyer's consolidation**
  In this scenario, the export side needs to deal with several pickup transports from many shippers and consolidate them at the port. The import side, however, receives only one container that can be delivered as a whole to the ship-to party. Therefore, the export side creates several TRQs and one freight document (for the main leg); for the import side, however, it's sufficient to create only one TRQ.
- **Shipper's consolidation**
  As in the buyer's consolidation scenario, consolidation effects should be exploited. In this scenario, the shipper creates only one TRQ (because the pre-carriage and on-carriage are transported in one container) and one freight document, but the import side now needs to create one TRQ and one freight document per ship-to party (also because one waybill needs to be created per consignee).

As you've seen while browsing through the different scenarios, two documents in the TM functionality are crucial to using the export and import process: the TRQ (in our case, a forwarding order) and the freight document (in our case, freight booking).

If you know the forwarding order quite well, you'll be wondering how the information about the export and import organizations is stored on the forwarding order. In the forwarding order, you can define whether the forwarding order should be for export or import purposes with the **Traffic Direction** field. If it's an export forwarding order, the sales organization of this TRQ is the export organization of the entire transport. If you're viewing an import forwarding order, the sales organization of this forwarding order acts as the import organization for the transport.

> **Forwarding Houses**
>
> Recall from Chapter 3 that an organizational unit can be a sales unit, purchasing unit, or forwarding house. In the export/import process, the organizational units used as sales organizations of the forwarding order and purchasing organization of the freight documents should be created as forwarding houses so that the same organizational units can be used for purchasing and selling.

On an export forwarding order, the import organization is assigned on the **Business Partner** tab shown in Figure 7.8.

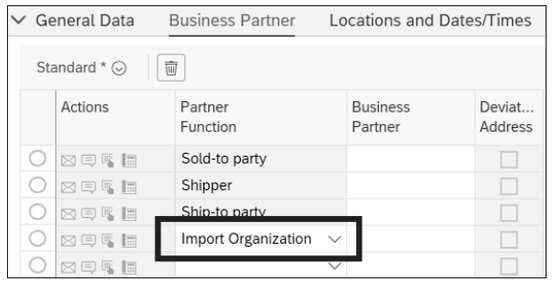


Figure 7.8 Import Organization on an Export Forwarding Order

With the partner function **Import Organization**, you can assign the business partner created for the organizational unit to the export forwarding order as the import organization. This also applies to import forwarding orders, where you can assign an export organization in the same way.

Business Partners for Organizational Units

To assign the import organization to the export forwarding order as shown in the preceding figure, the import and export organizational units have to be created as business partners as well. They also need to be assigned to the organizational units.

There are several ways to create organizational units and business partners and to link these two entities. The easiest way is to ensure that a business partner is automatically created upon creation of the organizational unit. Maintain the following entry in database table T77S0:

```
GRPID = HRALX
SEMID = HRAC
GSVAL = X
```

If you've already created organizational units and business partners separately, you can also assign the business partner to the organizational unit in Transaction PPOME. Manually assign the business partner in the **Org. Data** tab.

Report /SCMB/ORG_CREATE_BP_ASSIGNMENT automatically links organizational units to business partners if both entities have already been created. To establish the link between organizational unit and business partner, the business partner's **Search Term 1** needs to be the name of the organizational unit, and **Search Term 2** needs to be the description of the organizational unit.

Let's look at how the export and import organizations interact and which documents need to be created in TM. In general, we can differentiate between an internal communication of two organizational units and an external communication. In the internal communication, both organizational units use an TM system and even access the same client; this means that no web service–based information flow needs to be established. In the external communication, the two parties use different transportation management systems (TMSs), but at least one of them uses TM (otherwise, we wouldn't describe this case in this book!).

Let's first look at the ideal case of both organizational units working in the same TM system: The general transportation process starts as usual with the creation of a forwarding order. In our case, we create an export forwarding order. The traffic direction (which defines whether we're dealing with an export or import forwarding order) can be entered manually in the document or predefined in the forwarding order document type via Customizing in IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Order • Define Forwarding Order Type**. It makes sense to define one dedicated forwarding order type for export forwarding orders and another for import forwarding orders.

As we've already discussed, the export organization acts as the forwarding order's sales organization, while the import organization is an additional partner function on the **Business Partner** tab. For the shipper's consolidation scenario, you might not want to define one import organization for the entire forwarding order but, instead, define several import organizations for each item of the forwarding order in the **Details** area of the forwarding order items (discussed in Chapter 4, Section 4.2.1).

After the forwarding order is defined, the export organization can start planning the pre-carriage and main carriage. The method of planning the two stages is completely up to the planner. We've taken a look at the different planning methods in Chapter 5.

Because the export and import processes usually take place in ocean or air scenarios, TM supports these processes only when you're using freight bookings for the main carriage, which can be either an ocean booking or an air booking. For you to realize the interaction between the export and import organizations, the main leg has to be planned on a freight booking.

The traffic direction of the freight booking must now also be **Export** because it was created by the export organization. In addition, we again enter the import organization on the **Business Partner** tab of the freight booking. Alternatively, this is done automatically due to the setting in the freight booking's document type Customizing that business partners should be taken over from the predecessor document, which, in our case, is the forwarding order. The export organization now has to deal with all the necessary process steps regarding the customs declaration for exporting the goods. The freight booking in this case is therefore used as the supporting document for the export declarations but also in general for the capacity reservation at the carrier.

After the freight booking is **Set to Shipped on Board** (in air freight booking, the status is **Uplift Confirmed**), as shown on Figure 7.9, the TM system automatically starts generating the import documents.

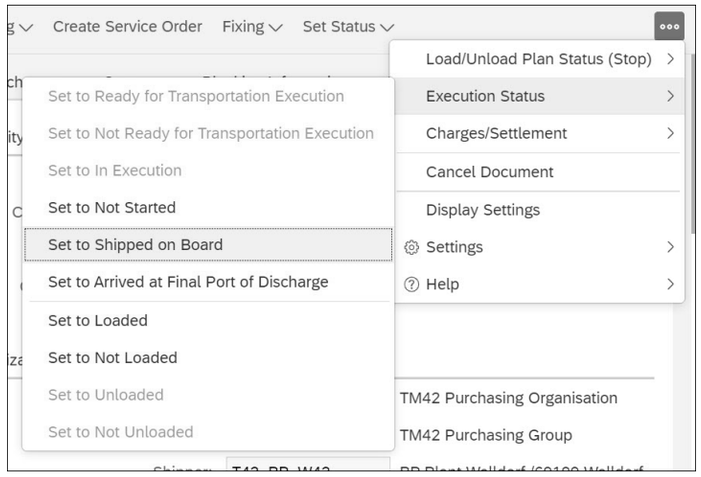


Figure 7.9 Setting the Ocean Freight Booking to Shipped on Board Status

From a process perspective, this means the import organization is notified by the upcoming TRQ only after the cargo is loaded onto the vessel or aircraft.

After the **Execution Status** of the freight booking is **Set to Shipped on Board**, the automatic generation of import documents is triggered by the PPF.

To enable the internal communication—that is, create the import documents within TM—the corresponding output profile has to be activated and assigned to the document type of the export freight booking in Customizing, as shown in Figure 7.10.

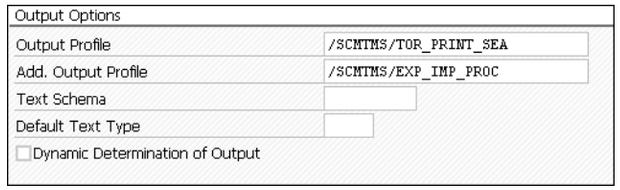


Figure 7.10 Assigning the Output Profile for Export/Import Processing to the Freight Booking Type

The import documents are created by a PPF action. For this to occur, import document types for the import freight booking, import forwarding order, and import freight units need to be defined up front. The correct document types can be determined during the automatic creation of import documents in two ways:

- **Assignment of import document type based on export document type**
  In Customizing of the forwarding order type and of the freight booking type, you can directly assign a corresponding document type for the import document. During the creation of the import document from the export document, the corresponding document type is taken into consideration.
- **Condition-based document type determination**
  TM offers two condition types for the condition-based determination of the import forwarding order type and the import freight booking type:
  - Condition type `/SCMTMS/FWO_TYPE` can be used to determine the forwarding order type for the import document.
  - Condition type `/SCMTMS/FRB_TYPE_IMP` can be used to determine the import freight booking type.

Both condition types are singleton conditions, meaning they can't be assigned anywhere in Customizing, and you need to define one global condition for all use cases.

The TM functionality first creates an import freight booking out of the export freight booking. The import organization can use this import document to carry out the import declarations for customs, and it's also the basis on which to plan the on-carriage.

After the import freight booking is created, the import forwarding order and freight units are also created from the booking. The freight units are now created by the freight unit building rule assigned to the import forwarding order type, so the automatic

import document creation actually has nothing to do with the creation of import freight units. This is done independently by the forwarding order functionality.

> **Relation of Forwarding Orders and Freight Bookings**
>
> Remember the beginning of this chapter when we discussed buyer's and shipper's consolidation? For a shipper's consolidation, one import booking is created, but because the items will eventually be delivered to different ship-to parties, several import forwarding orders are created—one for each ship-to party.

With the import documents created, the import organization can now start with the import declarations and plan the on-carriage based on the freight units created out of the import forwarding order.

On the import freight booking, the purchasing organization is now automatically the import organization, and the export organization is entered as the additional partner function in the **Business Partner** tab. The same applies to the import forwarding order that was automatically created. The import organization now acts as the sales organization of the forwarding order, and the export organization is shown on the **Business Partner** tab in the corresponding partner function.

The import forwarding order and import freight booking were created in the **Draft** status. In a document with this status, data can't be changed, except for the purchasing organization in the freight booking or the sales organization in the forwarding order. The import organization now has to check the forwarding order and the freight booking for completeness; then it can set the status manually to **In Process** when starting the on-carriage planning.

> **Import Documents and Service Items**
>
> In TM, the standard process is to copy only cargo items from the export documents to the import document. Service items aren't transferred. However, you can influence the system's copy logic by implementing a BAdI via IMG menu path **Transportation Management • Business Add-Ins (BAdIs) for Transportation Management • Basic Functions • Export/Import Processing • BAdI: Service Item Processing for Import Forwarding Orders**. With this BAdI, you can make changes to the copy logic so that service items are copied to the import document.

The external communication scenario isn't especially different from the internal communication scenario because the physical and legal process doesn't differ from the internal communication. Only the use of TMSs is different here.

With the external communication, we need to differentiate between two cases:

- **Only the export organization uses TM**
  In this case, we can start the process just like in the internal communication scenario because we're going to create an export forwarding order and export freight booking.

After that, the information concerning the import is sent out to the import organization's TMS.

- **Only the import organization uses TM**
  If the import organization uses TM, the TRQ communicated by the customer is recorded in an external TMS. Only after the cargo is loaded into the vehicle executing the main transportation leg is a message sent to TM to create import documents.

We'll now look at both cases, starting with the export organization using TM.

As already mentioned, the export organization—just like in the internal communication scenario—starts creating an export forwarding order and plans the freight units created out of this forwarding order on an export freight booking. Now when **Execution Status** is **Set to Shipped on Board**, as shown earlier in Figure 7.9, the system needs to react differently.

For external communication, a web service is called that sends out all the necessary information to the import organization's connected external TMS. Service interface `TransportationOrderBookingWaybillNotification_Out` is sent to SAP Process Integration, where the routing of the message is processed.

System Landscape Setup

To use external communication between the export and import organizations, the external TMS needs to be connected to the system landscape on which the SAP S/4HANA system is located that is running the TM functionality. We recommend that you connect the external TMS with the SAP S/4HANA system using SAP Process Integration or any other middleware.

When the import organization uses the TM system, another service interface can be used. Service interface `TransportationOrderBookingWaybillNotification_In` integrates the information from an external TMS into SAP S/4HANA and triggers the creation of an import freight booking, as well as the creation of an import forwarding order, based on the information provided by the service interface.

Let's compare internal and external communication. First, the TM functionality within SAP S/4HANA—as well as the standalone deployment of TM—supports both scenarios. However, internal communication offers some advantages because export document updates are received seamlessly on the importing side. In addition, internal communication provides more transparency because the import organization, using the same system, can be notified by upcoming imports earlier. They can proactively look for export documents with shipments to the region the import organization is responsible for. Furthermore, internal charging between export and import organizations can be performed, which we'll look at in Chapter 11.

In rare cases, manual creation of freight bookings is necessary. Import freight bookings can therefore be created manually in the system. As always with the manual creation of

freight bookings, you need to ensure that the necessary information from the export freight booking is correctly copied into the import freight booking. For manually created import freight bookings, you can't use all the functionalities that you usually use on an export freight booking, such as the following:

- **Subcontracting the freight booking**
  Because the export organization handles the planning and execution, the import organization doesn't have to do anything about subcontracting the freight booking.
- **Assignment of schedules**
  As with subcontracting of the freight booking, planning (and therefore also schedule assignment) is done by the export organization.
- **Automatic drawing of master waybill number**
  The waybill number has been negotiated by the export organization and the carrier. Therefore, the import organization isn't aware of the number ranges available for the freight booking. However, if the waybill number is already known from the export document, the user can manually enter the waybill number in the import freight booking.

After the import freight booking is manually created, the user can also manually create the import forwarding order as a follow-up action, as shown in Figure 7.11.

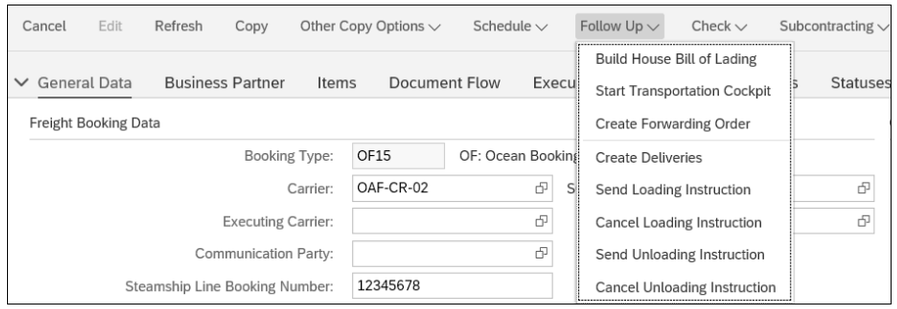


Figure 7.11 Creating a Forwarding Order from the Import Freight Booking

7.1.4 Statuses of Execution Documents

On execution documents, such as the freight order or freight booking, a **Statuses** tab shows the statuses of the document (see Figure 7.12). This tab shows not only statuses of the execution of the freight booking but also process steps that are handled before the actual execution. They include **Subcontracting**, as well as statuses that are of a more technical nature, such as the **Fixing Status**. However, this section is only concerned with statuses of the execution of the transport.

Among the execution statuses, we can differentiate among three types: the **Handling Execution Status**, the **Cargo Execution Status**, and the **Unload/Load Plan Status**.

To understand the difference between these three statuses, let's look at an example. We have a freight booking that is supposed to consolidate different freight units into one

container to transport these freight units together on the main leg. The **Cargo Execution Status** tracks the progress of loading these freight units (meaning package items) into the container. The **Handling Execution Status**, on the other hand, tracks the progress of the container being loaded onto the vessel. The **Unload/Load Plan Status** identifies whether the execution data collected in the document is fit to be transmitted to the next stop, advising what freight will arrive and how it's loaded.

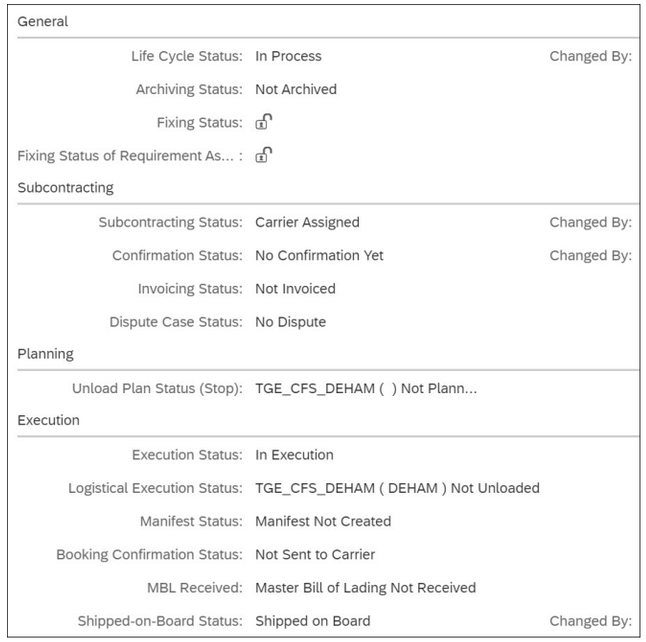
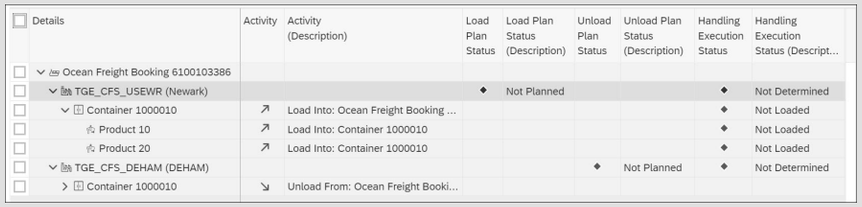


Figure 7.12 Freight Booking Statuses

Load Plan Status and Unload Plan Status

As you'll see in Figure 7.13, both **Load Plan Status** and **Unload Plan Status** are shown. Both statuses relate to the fact that a plan on what needs to be loaded or unloaded is finalized and can be communicated to the location where loading or unloading will take place. To simplify the flow of this chapter, we'll only mention the **Load Plan Status** in the course of this section. Keep in mind, however, that the functionality described for the **Load Plan Status** also holds true for the **Unload Plan Status.**



Details	Activity	Activity (Description)	Load Plan Status	Load Plan Status (Description)	Unload Plan Status	Unload Plan Status (Description)	Handling Execution Status	Handling Execution Status (Descript...
Ocean Freight Booking 6100103386								
TGE_CFS_USEWR (Newark)			◆	Not Planned			◆	Not Determined
Container 1000010	↗	Load Into: Ocean Freight Booking ...					◆	Not Loaded
Product 10	↗	Load Into: Container 1000010					◆	Not Loaded
Product 20	↗	Load Into: Container 1000010					◆	Not Loaded
TGE_CFS_DEHAM (DEHAM)					◆	Not Planned	◆	Not Determined
Container 1000010	↘	Unload From: Ocean Freight Booki...						

Figure 7.13 Execution Statuses for the Items of the Freight Booking

Because freight bookings can have multiple stops (e.g., in the case of connecting schedules), the **Handling Execution Status** needs to be tracked on every stop and for every item of the freight booking. If the **Handling Execution Status** is updated for an item, the same status is propagated to the subordinate items. The **Cargo Execution Status**, on the other hand, is defined only on the container item level because it's assumed that the container will only be loaded and unloaded once during the transportation part covered by the freight booking.

Both the **Handling Execution Status** and the **Load Plan Status** can be seen on the **Items** tab in the freight booking or freight order. (In air freight bookings, this tab is called **Operations**.)

Keep It Simple

In this chapter, we refer only to a very simple example to show the course of the execution statuses. In addition, we refer to the freight document as a freight booking, meaning an ocean freight booking.

Bear in mind that the execution statuses for the freight documents also apply to more complex scenarios and are used (and work in the same way) on freight orders or freight bookings for other modes of transport.

For the **Handling Execution Status** on the item level, TM provides the following statuses:

- **Not Determined**
  This is the initial status after the freight document is created. After the freight document is ready for execution (covered later in this chapter), the initial status changes to the first status in the process.
- **Not Loaded**
  After the freight document is ready for execution, the **Handling Execution Status** for the items changes to this status because the system now awaits the loading of the container onto the vehicle or vessel.
- **Loaded**
  The packed container is confirmed to be loaded to the transporting vehicle.
- **Not Unloaded**
  At its destination, the container is still sitting on the transport vehicle waiting for unloading.
- **Unloaded**
  The container was unloaded from the vehicle.

Because the last three statuses are probably self-explanatory, we need to add here that the **Handling Execution Status** on the item level always adapts to the current location. This means that in a multistop freight booking, the item status changes from **Not Loaded** to **Loaded**, and at the destination location of the first transportation stage, it

changes to **Not Unloaded** and **Unloaded**. However, if the first transportation stage is finished, the status of the item changes to **Not Loaded** again.

The **Handling Execution Status** on the stop level represents the statuses on the item level and offers the additional events **Departed** and **Arrived** (i.e., **Checked-In** and **Checked-Out** for road transport). Usually, these two events are reported by SAP Event Management, as we explain in Section 7.2. In addition, the **Handling Execution Status** on the stop level also represents all the statuses in the **Cargo Execution Status**. If the current stop is the first stop of the freight booking, meaning this is where the cargo is loaded into a container, then the **Handling Execution Status** on the stop level also shows the current progress of the loading of the cargo into the container. If the current stop is an intermediate stop, these statuses aren't shown.

Now let's look at what statuses in **Cargo Execution Status** the system offers. As already mentioned, the **Cargo Execution Status** is only *defined* on the item level but is also *shown* on the stop level using the **Handling Execution Status** if the current stop is a stop where cargo is loaded or unloaded.

TM offers the following statuses in **Cargo Execution Status**:

- **Not Determined**
  As with the **Handling Execution Status**, the **Cargo Execution Status** is first set to this initial status before the execution process is started.
- **Cargo Ready for Loading**
  Before the cargo can actually be loaded, it needs to arrive at the loading location. In an ocean scenario, we can imagine that the cargo is brought to the port with trucks, and the container waits for the cargo at the port. Therefore, the container and subordinate items are ready for loading only when the cargo items have arrived, meaning that the prerequisite freight order has arrived at its destination location.
- **Cargo Not Loaded**
  None of the cargo items have been loaded yet. Because the previous status **Cargo Ready for Loading** is optional, this status can also show that cargo loading hasn't started yet.
- **Cargo Partially Loaded**
  In the example shown earlier in Figure 7.13, each subordinate item needs to be loaded into the container separately. If some package items have already been loaded into the container and others haven't yet, the container's **Cargo Execution Status** would be **Cargo Partially Loaded.**
- **Cargo Loaded**
  After all the cargo items have been loaded, the **Cargo Execution Status** of the freight booking or freight order is changed to this status.
- **Cargo Ready for Unloading**
  As already mentioned, when the freight booking has arrived at its final destination, the cargo needs to be unloaded from the container again. Note that this applies only

to the last location of the container item; the **Cargo Execution Status** isn't changed on intermediate stops. All statuses regarding the unloading process correspond to the loading statuses, so we'll only list the unloading statuses without going into detail.

- **Cargo Not Unloaded**
  Similar to the **Cargo Not Loaded** status, this status indicates that the system expects unloading to happen next. This can mean that the truck is still traveling to the loading location, or it's already there but waiting for an available door. The difference from **Cargo Ready for Unloading** is that the status **Cargo Not Loaded** can also mean the truck hasn't yet arrived.
- **Cargo Partially Unloaded**
  This status indicates that unloading has started, and some of the cargo items that are supposed to be unloaded at this location have already been unloaded. However, more cargo items are still due to be unloaded.
- **Cargo Unloaded**
  When the **Cargo Execution Status** shows this status, it means that all cargo was unloaded at this location. If this was the final location of the freight order, this would also mean that the overall **Execution Status** of the freight order is changed to **Executed**. If there are more unloading stops after the current one, the overall **Execution Status** remains in the **In Execution** status.

The **Load Plan Status** is used to define when information on the cargo can be passed to the next locations where loading and/or unloading takes place. This is connected to the transit warehousing scenario, which we'll describe in further detail in Chapter 12, Section 12.2. After the **Load Plan Status** is set to **Finalized**, the application will send a message to the extended warehouse management (EWM) functionality to create the corresponding documents to prepare unloading and loading. The **Load Plan Status** can be set to the following statuses:

- **Not Planned**
  There isn't yet a load plan defined for this stop.
- **Planned**
  The load plan is created, but it may be preliminary. No message is sent to the EWM functionality in this status.
- **Finalized**
  The plan is finalized. After this status is set, a message with the information about the cargo to be unloaded/loaded at the next stop is sent to the EWM functionality.
- **Invalidated**
  The plan is invalidated. A message is sent to the EWM functionality to cancel any documents that were already created on the EWM side. The plan therefore needs to be put back to **Finalized** to create new documents in the EWM functionality.

The **Items** tab on the freight booking is used not only to monitor the current statuses of the cargo items but also to manually set these statuses. Recall that the **Handling Execution Status** and **Cargo Execution Status** can be linked to SAP Event Management events. Because we cover this in Section 7.2, for now, we'll just focus on setting these statuses manually. This is applicable in many use cases because the loading and cargo loading is often done not by the shipper or LSPs (which created the freight booking in the TM functionality), but by the carrier, who doesn't have access to the SAP S/4HANA system and therefore can't set the **Execution Status**. Because of this, the carrier calls the LSP to report the current status of the cargo and container.

If the freight booking is ready for execution, you can start setting the execution statuses in the freight booking.

Readiness for Execution

A freight booking's readiness for execution depends on various factors and information in the freight booking. For example, if a freight booking type is defined in Customizing as relevant for subcontracting, then the freight booking needs to have a carrier assigned to it before the freight booking is ready for execution.

You can check the readiness for execution by selecting **Check • Ready for Transportation Execution** in the global toolbar of the freight booking.

If you want to set the **Cargo Execution Status** or **Load Plan Status** manually in the freight booking, click the **Execution Status • Set to Loaded** button above the item hierarchy displayed in the **Items** tab, which should be set to the **Status Management** hierarchy.

As you can see in Figure 7.14, the choice of statuses combines the different statuses of the **Cargo Execution Status** and the **Handling Execution Status**. Note also that not all the statuses are selectable. Which statuses are selectable depends on the current status of the items. For example, if the freight booking has already left the port of loading, you can no longer select any statuses that are concerned with loading cargo into the container.

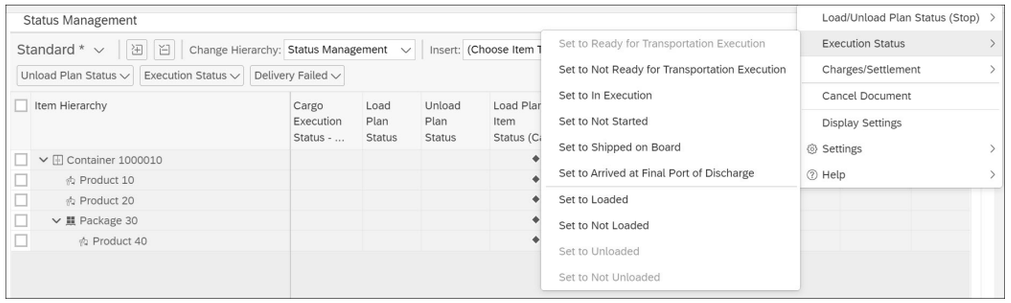


Figure 7.14 Setting Execution Statuses Manually

In addition, you can set the **Handling Execution Status**, **Cargo Execution Status**, and **Load Plan Status** by clicking the corresponding buttons shown in Figure 7.14.

The Statuses Need to Be in Order

The statuses have a defined sequential order in which they can appear. Therefore, the cargo must be loaded into the container before the container can be loaded onto the vessel. The same applies at the port of discharge: the container needs to be unloaded from the vessel before the cargo can be unloaded from the container. This reflects the common use case at ports and airports, where the containers are usually unloaded outside the vessel or aircraft.

You can see in Figure 7.15 that the execution statuses of the items change depending on the overall execution progress of the freight booking, including the first product loaded into the container ❶, the second product loaded into the container/container loaded into the vessel ❷, the finalized load plan ❸, and the departed vessel/finalized unload plan ❹.

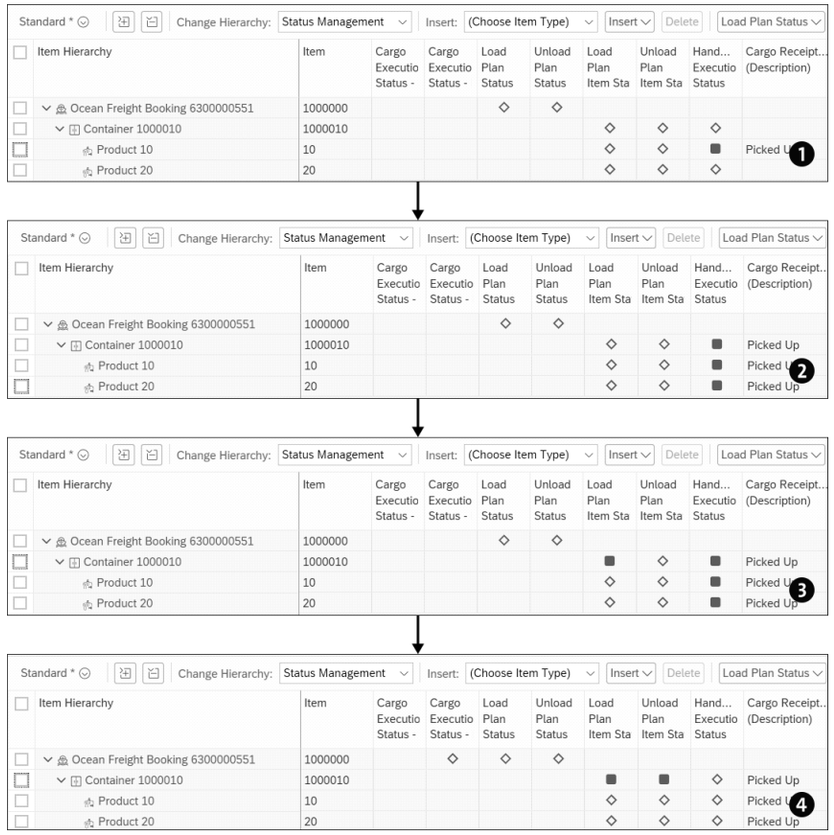


Figure 7.15 Progress of Execution Statuses

The vessel leaves the port after the cargo is loaded into the container and the container is loaded onto the vessel. After the vessel has left the port, the **Handling Execution Status** is reset to a status awaiting the next execution at the next port.

Recall from Figure 7.12 the overall status, called the **Execution Status**, which we haven't yet discussed. The following are some of the most important execution statuses:

- **Not Started**
  This is the initial status of a newly created freight booking.
- **Ready for Transportation Execution**
  All preparations for the shipment have been successfully finalized, and the shipment is ready to go.
- **In Execution**
  The resource used in the freight booking has left the source location but hasn't yet reached the destination where the container and cargo can be unloaded. Think of this as en route.
- **Executed**
  The resource has reached its final destination, and the cargo has been unloaded from the container. In Customizing of the freight order type, as described in Chapter 6, Section 6.1, you can specify which event from SAP Event Management is supposed to set the overall **Execution Status** to this status. There is also the possibility to change the last stop or event via BAdI `/SCMTMS/TOR_LAST_EXP_EVENT`.
- **Not Relevant**
  If you've defined in the Customizing of the freight booking type that the freight booking isn't relevant for execution tracking, the execution status will always be **Not Relevant**.

The overall **Execution Status** is influenced by the handling execution level on the stop level. If the **Handling Execution Status** on the first stop changes to **Loaded** or **Partially Loaded**, the overall **Execution Status** changes to **Loading in Process**.

The same applies to the actual transportation of the goods. If the **Handling Execution Status** has been set to **Departed** (which, as we said, is usually done by an event in SAP Event Management), the overall **Execution Status** changes to **In Execution.**

Now that we've discussed some execution statuses, it's time to delve deeper into the area of execution tracking. Recall from this section that many of the statuses described are tied to SAP Event Management, which will automatically set these statuses.

7.2 SAP Event Management

SAP Event Management is a versatile and adaptable tool that manages processes for object and status tracking and tracing, as well as performing collection, and analysis of

KPI data. SAP Event Management can be integrated into an SAP and legacy system landscape that communicates with partner systems in a worldwide network.

AMR Research (*https://amr-research.com/*) breaks SAP Event Management's functions into five core areas:

- **Monitoring**
  Monitoring of processes and objects is based on their statuses and events that are expected to happen within the process or with the object. Usually, monitoring has certain real-time requirements; there sometimes need to be immediate reactions to occurring or missing events. An example of monitoring is the tracking and tracing of a shipment.
- **Notification**
  Decision makers need to be notified if a process deviates from a planned progression. First, the deviation needs to be detected (which is an outcome of the monitoring function). Then a notification via an appropriate channel is raised, giving information about and access to the critical situation (e.g., sending an email that alerts the recipient of a delay in the delivery of a shipment).
- **Simulation**
  In the case of process deviations or delays, it can be sensible to simulate different options for recovery or alternative progression. Simulation is a tool for decision-making that allows evaluation of the impact of actions in terms of complying with definitions at the customer or internal service level.
- **Control**
  Any situation within a process that is monitored through events or status values can lead to reactions that allow you to control the process itself or dependent activities within a business system. The decision on the type of control required for a situation is based on a rule set. An example of control is posting a goods receipt in a distribution system if a customer reports the complete arrival of the goods at the customer's premises.
- **Measure and analyze**
  The planned and actual process data, status, and event information can be used in a variety of ways to identify weak points in processes or determine KPIs of the capabilities of an organization. This data can be collected by SAP Event Management and evaluated in a business warehouse. An example is the average delay time of deliveries made by a certain carrier.

SAP Product Roadmap for SAP Event Management

As an extremely versatile tool, SAP Event Management has a very widespread and flexible use and footprint in many customer implementations. However, it's not a public cloud tool and reaches a maturity of 20 successful years. Based on the SAP strategy, which moves toward providing track and trace functionality as a software service in the public cloud, SAP Event Management still has many use cases and a large fan base.

Despite initially being indicated to be at the end of its maintenance lifetime, SAP decided due to requests from large customers to provide the component as a new add-on to SAP S/4HANA (SAP Event Management on SAP S/4HANA) to enable its further utilization. Therefore, SAP Event Management will still be available and used by customers.

SAP Event Management is now available in two versions:

- SAP Event Management 9.2 is a software version that is provided on and can be installed as a standalone component on an SAP NetWeaver 7.50–based system (or higher release). It can be deployed standalone or together with, for example, SAP ERP or SAP TM, as long as the SAP NetWeaver release prerequisite is met.
- SAP Event Management on SAP S/4HANA 1.0 is a new SAP Event Management component that is functionally equivalent to SAP Event Management 9.2. However, it isn't a successor of this version, so there is no upgrade path available and it requires a new installation. As a prerequisite, installation needs to be done on SAP S/4HANA release 1809 or higher. The deployment of SAP Event Management on SAP S/4HANA can either be done standalone or as an add-on to an SAP S/4HANA or SAP TM system. The component can work with TM either on the same system or side-by-side. In addition, on-premise or private cloud deployment is supported.

SAP Event Management 9.2 has no installation as part of SAP S/4HANA. Therefore, an implementation on the same instance together with TM in SAP S/4HANA isn't possible. If SAP Event Management 9.2 needs to run together with TM in SAP S/4HANA, the SAP Event Management should reside on its own instance. Figure 7.16 shows the deployment options for SAP Event Management together with TM in SAP S/4HANA.

License-wise, TM allows users to utilize SAP Event Management in the context of the scenarios predefined for TM. Going beyond the defined scope would require a separate licensing.

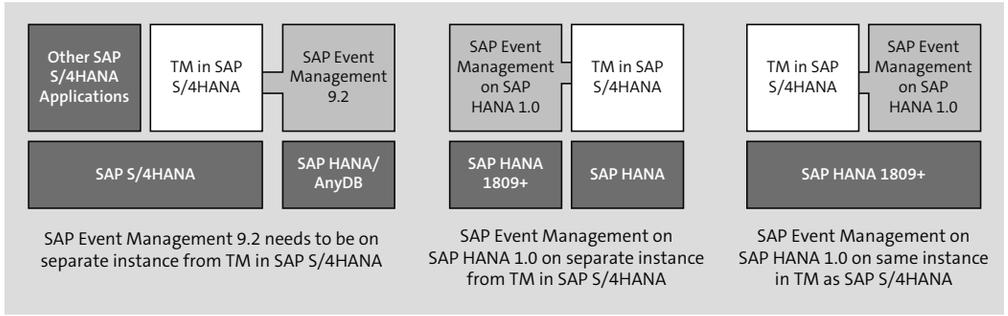


Figure 7.16 Installation Options for SAP Event Management Running Integrated with TM in SAP S/4HANA

An upgrade of SAP Event Management from 9.2 to the version on SAP S/4HANA would require a crossover of SAP Event Management onto a separate instance and

isn't provided. Therefore, you always need to do a fresh installation. However, as SAP Event Management 9.2 works with SAP NetWeaver and SAP S/4HANA–based versions of TM, there is a good chance to have SAP Event Management reside in its current place and connect it to the new SAP TM instance remotely. In a properly decoupled implementation, this would not cause much overhead except running a second instance.

Real-world business processes usually entail a variety of process requirements that need to be reflected in an implementation of an event management process. Because SAP Event Management isn't bound to any predefined designated business objects (e.g., a sales order), you have flexibility in deciding which object type, process steps, and reactions you want to model and implement in a tailor-made event management process. Yet, because SAP Event Management is the standard tracking and tracing system within SAP logistics applications, many of the processes it covers are connected to a corresponding preconfigured scenario (in SAP TM, enabling plug-and-play integration to process visibility).

Event Management Purpose

The purpose of event management is an implementation of a real-world process in an event management system (EMS), where major milestones and characteristics of the process are reflected in the system. The event management process can have different flavors depending on the main emphasis:

- Control processes keep control over a business process.
- Track and trace processes show the current status of a process.
- Visibility processes provide an end-to-end overview of a process.

Let's dive into SAP Event Management, including event handling, the event management process, configuration, processing, and integration.

7.2.1 Event Handlers and Event Messages

The key business object of SAP Event Management is the event handler. All event management processes are based on at least one event handler, which allows you to define main characteristics, statuses, and steps that need to be tracked and controlled. Event handlers can represent a material object, process, or virtual operation. The following are examples of material objects that need to be tracked:

- A pallet that is used as the package for a shipment that needs to be tracked (you're interested in the shipment, but the pallet carrying it is the object that is identifiable from outside)
- A container asset that needs to be tracked during its complete ownership lifecycle
- A production device whose correct operation needs to be monitored and logged
- A shipment such as an express parcel that needs to be tracked from pickup to delivery

Examples of more process-specific visibility scenarios include the following:

- A customer order handled in various steps of order processing
- A payment process that should result in the balance of an invoice
- A purchase order that needs to be tracked from ordering time to delivery and quality inspection of goods

Event Handlers for an Example with Multiple Views (Car)

Let's consider an example of a process with multiple views, which can be set up in SAP Event Management.

In the automotive industry, a car can be tracked from at least two different viewpoints:

- As a to-be-produced material object that will be sold in the future
- As an order from a customer who wants a made-to-order car

In such a process, either form may occur first (i.e., an order for a specific car that isn't produced yet or the production of a specific car that hasn't yet been ordered by a customer). Because the sequence isn't known up front, all the related objects (customer order or car production order) need to be modeled in SAP Event Management and be instantiated independently of each other. For this purpose, you can create two linked event handlers:

- One event handler will represent the order for the car.
- A second event handler will represent the production order for the car.

Both can be created independently from the other and be linked as required.

Each event handler has a lifecycle that corresponds to the lifecycle of the object or process it represents. An event handler is instantiated by an incident in a business process, which could be related to a certain status (e.g., order accepted) or to the creation of a business object (master data object for a container created). During its lifetime, the event handler processes a variety of events and reacts to them according to a defined rule set. It can be put to sleep and woken up again before being deactivated and finally archived. Table 7.1 lists some examples of typical event handler lifecycles and event counts.

Characteristics	Event Handler Type (Business Usage)		
	Tendering Process	Shipment Tracking	Container Resource Tracking
Lifecycle	2 hours	4 weeks	5 years
Number of processed events	3–5	approx. 20	>10,000

Table 7.1 Examples of Event Handler Lifecycles

To underline the flexibility and comprehensive applicability of SAP Event Management, let's consider a few examples of how it's used throughout various SAP industry segments:

- Order management, including production monitoring, delivery, and invoice settlement (mill industry)
- Tendering and visibility for logistics execution (high-tech industry)
- Distribution processes in a complex environment (industrial machines and components)
- International ocean freight, including customs management (retail industry)
- Purchase order management process for LSPs managing the supply chain of their customers (fashion industry)
- Returns management (automotive industry)
- Tracking of handling units in logistics outbound processes (LSPs)
- Spare parts and equipment management (aerospace and defense industry)
- Tracking of parcels, including hierarchical loading (postal services)
- Railcar management (chemical and mill industry)
- Integration with vehicle management systems (automotive industry)
- Integration with the Trader's and Scheduler's Workbench (oil and gas industry)

High-Performance Tool

SAP Event Management is designed to process scenarios with large amounts of data. Many large postal companies use SAP Event Management for parcel tracking, where several billion events need to be processed every year. Big data isn't new to SAP Event Management.

SAP Event Management runs on an SAP HANA database, which enables in-memory use of event handler and event message data. Data access has been adapted to SAP HANA, resulting in the capability of processing more than 1,000 events per second.

Event messages are notifications related to real-world processes or objects represented in an event management context. These messages are communicated in a standardized form to SAP Event Management; they carry information to identify the related process or object, the incident, time and location, and further contextual details. Event messages can be created and communicated in various ways:

- Interactive creation by humans (e.g., with a mobile device, scanner, internet application, or business system)
- Automatic creation by machines (e.g., a technical system, production system, or RFID scanner)
- Forwarded by external business systems (e.g., Electronic Data Interchange [EDI] or XML messages with business content)

We can define events by some essential characteristics:

- **Identification (tracking ID)**
  What is the identification of the process or object this message refers to, for example, number of a pallet that arrived or number of an order that has been dispatched. Usage of multiple IDs per process or object is possible; for example, a shipment can be referred to by the shipment number or by the waybill number.
- **Event type**
  The event type is a definition of the incident that is reported by the event message (e.g., acceptance of an order, departure of a shipment at a location, or proof of delivery of a shipment).
- **Repeatability**
  The repeatability defines whether the event type occurs only once in the context of the current process, or the same event type can reoccur at the same or another location (e.g., an *arrival event* may happen multiple times during a truck tour as several customers are visited).
- **Expected event date/time**
  Expected dates/times define a point in time or a time frame when an event should happen; an earliest and latest point in time may be assigned to the expected event.
- **Expected message date/time**
  Even if an event is expected to happen within a certain time frame, it may be reported via an event message at a different time. The expected message date/time or time frame is a characteristic that can be defined as a benchmark for reporting compliance.
- **Actual event date/time**
  If an event is reported, the actual date and time of event occurrence are defined. At this point, they can be measured against the expected date and time.

An event management process usually has initialization and termination events. The various other events happening during the process can be assigned to four event categories. Event categories are determined as part of the monitoring function of SAP Event Management and lead to different behavior in terms of notification, simulation, control, and analysis. Figure 7.17 shows an overview of the event categories in the context of an event handler lifecycle, which moves from left to right. We can divide the example events in Figure 7.17 into four event categories:

- **Regular events**
  A *regular event* is defined by a milestone in a business process that is reflected in the definition of the expected event and its expected time frame. The actual event occurs within the expected time frame and is reported within the expected message time frame.

  Say, for example, a container should arrive at a terminal between 9:00 a.m. and 10:00 a.m. The confirmation is expected until 1:00 p.m. The container arrives at 9:43 a.m., and the confirmation (event message) is sent at 10:35 a.m.

In some cases, a regular event can occur without a defined expected time frame (e.g., it can happen anytime, but it needs to happen at least once).

- **Early or late events**
  Like a regular event, the *early or late event* is a milestone that is expected to happen within a defined time frame. The actual event occurs either earlier or later than the expected time frame, or it's reported earlier or later than the expected messaging time frame.

  Say, for example, a container should arrive at a terminal between 9:00 a.m. and 10:00 a.m.; the confirmation is expected until 1:00 p.m. Instead, the container arrives at 10:33 a.m., and the confirmation (event message) is sent at 3:27 p.m.

  A specific real-time reaction to the early or late event isn't planned. Instead, the fact that the process isn't executed according to the expected milestones is registered and used for analytical and process improvement steps (perhaps to evaluate the quality of service of a business partner).

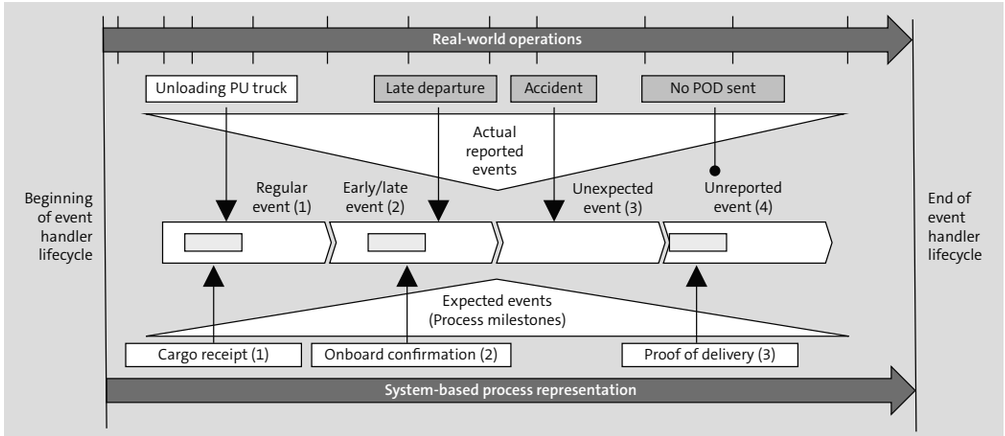


Figure 7.17 Event Types and Event Handler Lifecycle

- **Unexpected events**
  Unexpected events don't have a corresponding milestone in the business process, and there is no expectation that the event is reported. We need to differentiate between two situations:
  - The event simply happens and is registered (e.g., location is reported by a GPS device in a truck).
  - The event indicates a more or less serious problem, and some corrective measures must be taken (e.g., accident report of a delivery truck).

  In some cases, the situation needs to be evaluated based on further event characteristics (e.g., if a railcar is reported to be in a switchyard in Chicago when it should be routed from Denver to Los Angeles).

- **Unreported events**
  Unreported events are also based on an expected and time-defined milestone, but either the actual event doesn't happen, or an event message isn't received within the required time frame. The missing information on the event is rated as noncompliance and immediately leads to exception handling. This allows at least a notification to be raised to someone (or a system) who can assess the situation and take further actions. For a well-defined escalation process, an automatic control process can be initiated as the reaction.

7.2.2 Event Management Process

An event management process is usually triggered by one of the following sources:

- A transactional object in a business system is created or set to a status, which triggers the process to start (e.g., an order that reaches the status **Accepted**).
- A master data object is created in a business system (e.g., a company's own container resource).
- A process in a business system reaches a state (e.g., a delivery process reaches the state of goods issued).
- A message from external sources indicates that an event management–relevant process has been kicked off, and event messages are expected in the future (e.g., a shipment is sent of a sender and future tracking information will arrive).
- A process implemented in SAP Event Management starts with manual creation of an event handler for pure event management-based handling. This kind of process is special because SAP Event Management may be creatively used to run a business process on the implemented event handlers without a backend business system (e.g., starting a standalone returns management process on SAP Event Management).

Business Objects and Application Objects

In a business system, manifold business objects represent substantial entities of the business processes (e.g., sales order, freight unit, or invoice), which are configured by Customizing to represent the real entities (e.g., a domestic truck shipment or the ocean leg of an international shipment). In the context of event management, *application objects* define an even more granular and semantic classification of objects, which depends on the individual characteristics of a business object. This is necessary because an event management process may differ considerably depending on what a business object represents. In the context of event management, the business systems are generally also referred to as *application systems*.

According to the previously mentioned example, a freight order business object can, for example, represent a domestic less than truckload (LTL) truck tour or a bulk railcar shipment. You can determine the nature of the business object only by looking up

characteristics or indicators (e.g., freight order type, mode of transport, main resource, stage type, or type of cargo).

Depending on these characteristics, SAP Event Management needs to initiate a different event management process and use an individual type of event handler. Therefore, based on the business object characteristics, the *application object type* and the related data are determined to control the event management process.

Figure 7.18 illustrates the elements of SAP Event Management that are involved in an event management process. Usually, the process starts in a business system such as TM, where the originating object or process is created. While running the event management process, the following stages or steps are executed:

1. A business process is started in the backend business system (e.g., TM). At a certain step, the process reaches a status when an event management process needs to be triggered (e.g., freight order is ready for execution). When the business object is saved, the business object data is handed over to the PPF or a BAdI layer (SAP TM) for post-save action handling. In both cases, the business object data is handed over to the SAP Event Management application interface, which is a configurable integration component that manages the communication with SAP Event Management.

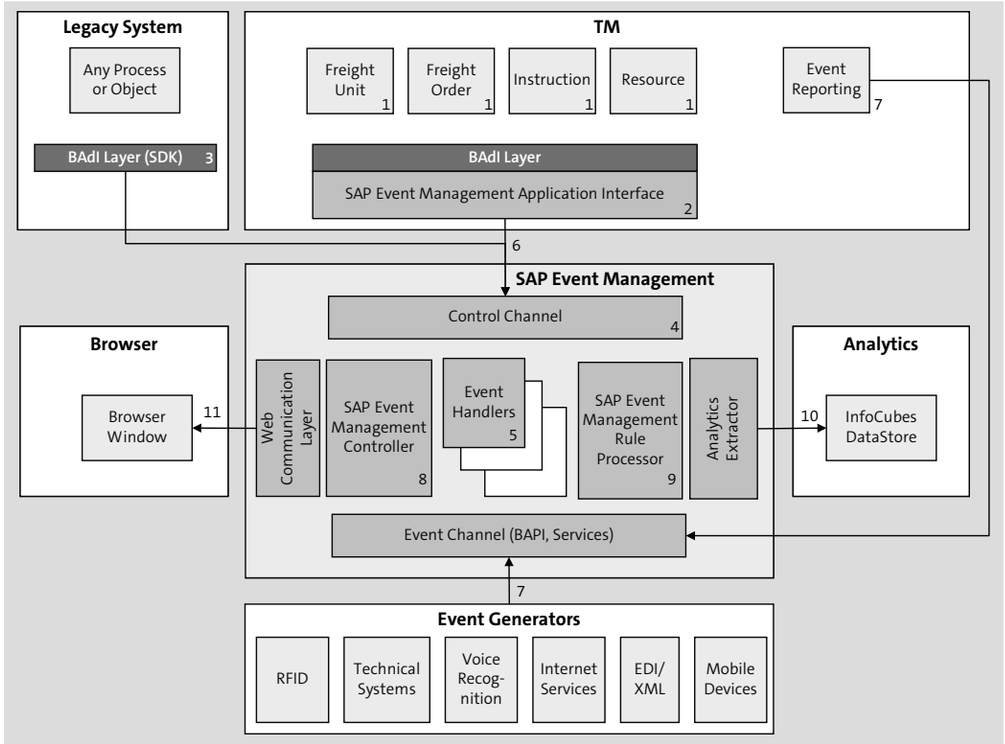


Figure 7.18 Elements of SAP Event Management

2. The application interface determines the tracking relevance of the business object by checking configured rules of the application object type and analyzing the related business object data (e.g., freight order of type **XYZ1** and status is switched from **Not Planned** to **Planned**). If an application object type is relevant for tracking, and the object status requires communication with SAP Event Management, the relevant context data is extracted from the business object, and several data packages containing object data in a standardized form are created (e.g., expected events, tracking IDs, and general parameters). In addition, the SAP Event Management instance to be used is determined (it's possible to use multiple SAP Event Management instances for different purposes). Finally, the data packages are sent asynchronously to the SAP Event Management instance. The same procedure applies in the case of updates or deletions of business objects, where change or delete requests are sent to SAP Event Management.
3. Legacy systems don't have an application interface (unless they are built on an SAP NetWeaver ABAP stack). Therefore, a legacy system needs to determine the tracking relevance on its own, build the application data packages, and send them over to SAP Event Management using a Business Application Programming Interface (BAPI) or web service call. This integration isn't uncommon; one of the largest customer installations of SAP Event Management used this integration technique with a legacy mainframe.
4. The control channel in SAP Event Management receives the request from the application interface of the business systems or from the legacy systems. The received data is forwarded to the event controller, which determines if an event handler exists or, if not, which type of event handler needs to be created.
5. If an event handler is created, SAP Event Management checks to see if messages have already been received (sometimes external parties send event messages before the event handler is created). If so, the buffered messages are processed in sequential order. If an event handler already exists, it's first changed according to the new data (e.g., it may contain changed or new expected events). Then the already-received messages can be reprocessed to check whether the altered event handler is still compliant with the previously received event messages.
6. SAP Event Management finally sends back a status protocol of applied change steps to the application systems, where this information is logged in the application log (Transaction SLG1, object **SAPTRX**, subobject **APPSYS**).
7. Event messages can be received from various sources as single messages or a batch of messages. The messages are sorted by tracking ID and sequenced by event date/time before being forwarded to event processing by an event controller and rule processor.
8. The event controller retrieves the event handlers for the event messages to be processed and hands over the individual batches of messages to each event handler.

9. Each event handler processes its batch of event messages sequentially using the rule processor. The rule processor analyzes the received event message and applies the rule set defined for the event handler type to the event and event handler context. Based on current and previous data of the event handler, a decision on reactions to reported events can be made.
10. Extraction of event management data for analytics is one sort of reaction. The extracted data on process performance is sent to the analytics system.
11. The web communication layer allows data to be retrieved from one or multiple event handlers and to be presented in a role-based web interface. Due to its configurability, the web communication layer can be used to present visibility data to customers and provide access for partners or internal employees.

7.2.3 Setup and Configuration

SAP Event Management configuration requires settings on the SAP application side (e.g., in SAP S/4HANA, SAP ERP, or SAP TM), as well as the SAP Event Management side, which need to match in some regards. In this section, we describe how to set up SAP Event Management system instances, data extraction, and communication in the application interface, and how the directly related Customizing is done in SAP Event Management. Visibility process configuration components are also explained.

Configuration in SAP Application Systems

SAP Event Management–related configuration capabilities of an SAP application systems are provided by the application interface and are part of application basis in SAP NetWeaver or SAP_BW software component of SAP S/4HANA. Therefore, you can use it in all systems of SAP Business Suite or SAP S/4HANA.

The technical integration between the business processes and the application interface is delivered out of the box for various business objects. Table 7.2 provides an overview of the logistics-related SAP Event Management integration objects in TM.

Object	Object	Event Management Usage (Examples)
Freight unit	TMS_TOR	Cargo item/container tracking
Freight order/freight booking	TMS_TOR	Shipment tracking, master bill tracking
Resource	TMS_RES	Equipment tracking
Standard operating procedures (SOP) instruction	TMS_INS	Tracking of SOP
TRQ	TMS_TRQ	Forwarding order

Table 7.2 Logistics-Related TM Objects with SAP Event Management Integration

The application interface provides a standardized way of configuring the integration between business processes and the corresponding event handling. Depending on the semantic context of a business object, configuration can control which process in SAP Event Management is fed with data and expected milestones. The configuration is controlled mainly by definition of business object type and application object type.

The business process type is directly related to the business objects as they are defined in the business object repository of the application system (e.g., a transportation order object). It relates to a technical integration of the business object with the application interface and a list of data tables with object content that can be used for extracting data and events to be sent to SAP Event Management.

You can customize the business process type by following IMG menu path **Integration with Other SAP Components • Event Management Interface • Define Application Interface • Define Business Process Types**. For each business process type, settings for technical data posting (dialog task, V1 update task) and queuing are defined. In addition, a list of data structures is provided that allows you to characterize the Data Dictionary (DDIC) structure used and gives an indication of how to evaluate business object changes. The indicator allows you to define, for example, which value in a structure field indicates a newly created object that needs to be communicated to SAP Event Management.

Figure 7.19 shows the business process types of a TM system and some details of the application table definition of the business process type **TMS_TOR** of the transportation order object.

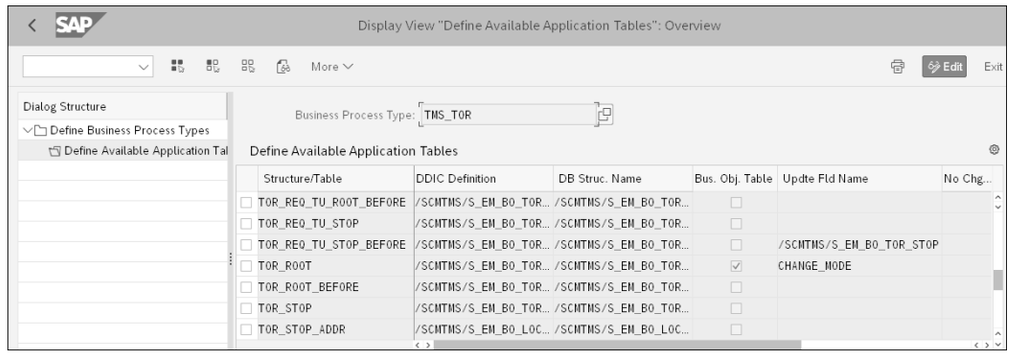


Figure 7.19 Business Process Types of TM and Application Tables of the TOR Object

Definition of Application Object and Event Types

You can define the settings for application object types via IMG menu path **Integration with Other SAP Components • Event Management Interface • Define Application Interface • Define Used Bus. Proc. Types, Appl. Obj. Types, and Evt Types**. Each application object type is directly related to a business process type.

Using Multiple Event Management Systems for Your Visibility Processes

If you integrate your application systems, you have the option to connect multiple SAP Event Management clients or systems for different tracking purposes. In application object configuration, you can choose which EMS should handle the processes for an application object type (e.g., shipment tracking on EMS A and resource tracking on EMS B for load distribution).

In the **General Data** settings of the application object type, you must define the EMS where the visibility process is started. In addition, you can set the behavior of the application object creation (e.g., whether the application object is relevant to trigger an SAP Event Management communication; you can use this to deactivate an application object type).

The **Control Tables** settings define which of the business object data tables represent the main object. An application object may, for example, be created for a whole shipment (header level) or for each shipment item (item level). In the first case, the main table would be the object's header table; in the second case, the main table would be the item table, and the header table should be assigned as a master table. For some objects, deleted records are kept in separate tables. In this case, the table for deleted objects could deviate from the main object table.

On the **Object Identification** tab, you can configure how the application object ID is compiled. The application object ID identifies the object or part of it, which is directly related to the event handler. You can extract it from one or two fields of the business object data tables or use a function module for extraction. If you want to track item 0020 of freight order 001234, for example, the application object ID may be set to 0012340020.

The **Event Mgmt. Relevance** settings determine when an application object is communicated to the EMS. The determination can be done by either a condition or an ABAP function module. Alternatively, the application object can be set to be always relevant, which triggers a communication to SAP Event Management as soon as a business object is created or changed.

Using ABAP Function Modules in SAP Event Management

In application system and EM configuration, there are many settings where ABAP function modules are used to either extract data or perform processing (e.g., rules engine). Many function modules are delivered with the standard software. You also have the option to create your own function modules from templates that are available or as copies of existing modules. If you assign such a function module in Customizing, you first need to create an entry for it in Customizing because the function module name isn't directly entered, but a logical name is assigned to it. You can find the assignment via IMG menu path **Integration with Other SAP Components • Event Management Interface • Define Application Interface • Define SAP EM Extraction Functions**.

In the **Parameter Setup** tab, you can define which data of the business object is handed over to SAP Event Management to create or update an event handler. There are multiple categories of data to be extracted, as follows (Figure 7.20 shows the Customizing screen):

- **Tracking ID Setup**
  Tracking identifications (IDs) and code sets are used to identify the event handler when event messages are received. Tracking IDs are usually numbers such as shipment numbers, B/L numbers, pallet numbers, or order numbers. The code set associated with the number classifies the ID and helps you find the correct event handler (there might be a shipment with number 12345 identified by SHP 12345, and an order with number ORD 12345, where SHP and ORD represent the tracking code set, and 12345 represents the tracking ID). Tracking IDs can be extracted via a table field reference or an ABAP function module. You would have to use the ABAP function if you want to assign multiple tracking IDs to one event handler, which may all be used for event reporting (e.g., shipment SHP 12345 and B/L number BLN 9876543).
- **Cntl Data Extract./Info Data Extract.**
  Control and information data extraction provides containers to hand over any kind of data in the format name-index-value to SAP Event Management. This data is related to the object or process and gives additional information. The control data container holds information that can directly influence the SAP Event Management logic and which can be accessed by rules processing (e.g., an indicator that a shipment contains dangerous goods, that the cargo type is bulk, or that the used truck is of medium size). The information data container holds additional object characteristics (e.g., the name of the truck driver), which usually aren't used to control the process. The index is used to relate several entries belonging to the same group (PRODUCT[1] = "Television", QUANTITY[1] = "200", TYPE[1] = "Yamamoto DXTV-230", PRODUCT[2] = "Dishwasher", etc.).
- **Query ID Extract.**
  Query IDs provide the option to assign additional code set/ID pairs to an event handler that can be used for data retrieval from SAP Event Management but not for message processing.
- **Exp Event Extract.**
  Expected event extraction allows the retrieval of milestones from the application object that are later used to create the expected events in the event handler. Because the extraction is done in an ABAP function module, you have the option to enhance the expected event list by calculating or enriching the milestones given in the business object context. If, for example, a shipment object contains only a departure date, you can additionally create a gate check-out date 30 minutes later, which allows you to track your internal operation schedule compliance.

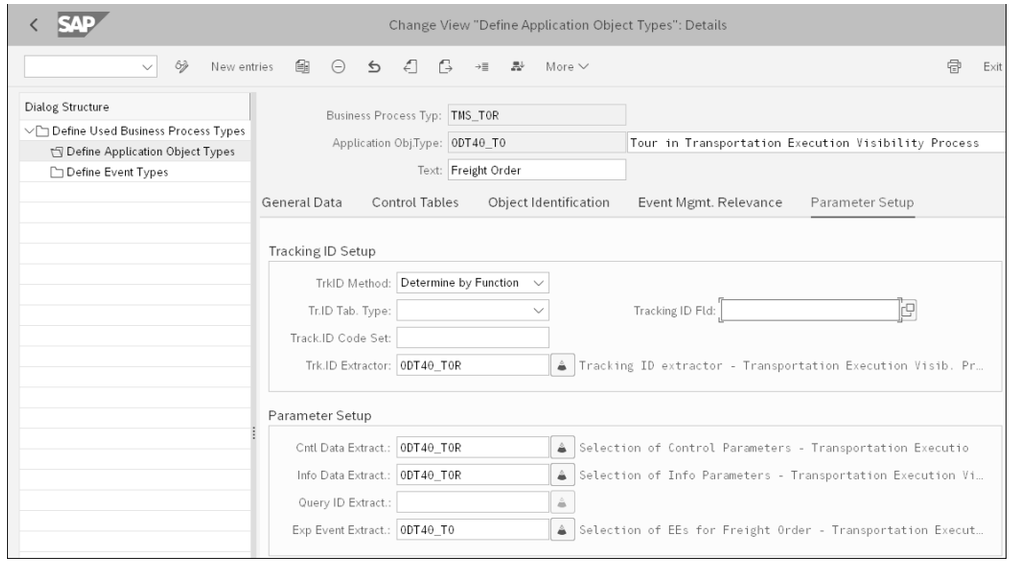


Figure 7.20 Parameter Setup of an Application Object Type

For each business object type, you can configure one or multiple event types in the application system. Event types allow you to set up event messages to be sent from the application to a connected EMS in the context of the backend process. An example is the confirmation of goods issue in an SAP S/4HANA delivery, which needs to be registered in the shipping process tracking in SAP Event Management or via a load status on a freight order in TM.

Data extraction from the application is done in an assigned ABAP function module that allows you to build the event message context in a very flexible way. Figure 7.21 shows the event types defined for the TM transportation order objects (freight order and freight booking).

The standard application log, which you can start via Transaction SLG1, provides detailed information on the success or failure reasons for the activities happening within the application interface. You can access details about the event management relevance of application objects, data extraction and application data, or event transmission to the EMS. The response of SAP Event Management to the application system requests is transmitted back to the application system and stored in the log (e.g., no suitable event handler type could be determined in SAP Event Management). You can see the complete process by accessing the log via Transaction SLG1 for object **SAPTRX** and subobject **APPSYS**.

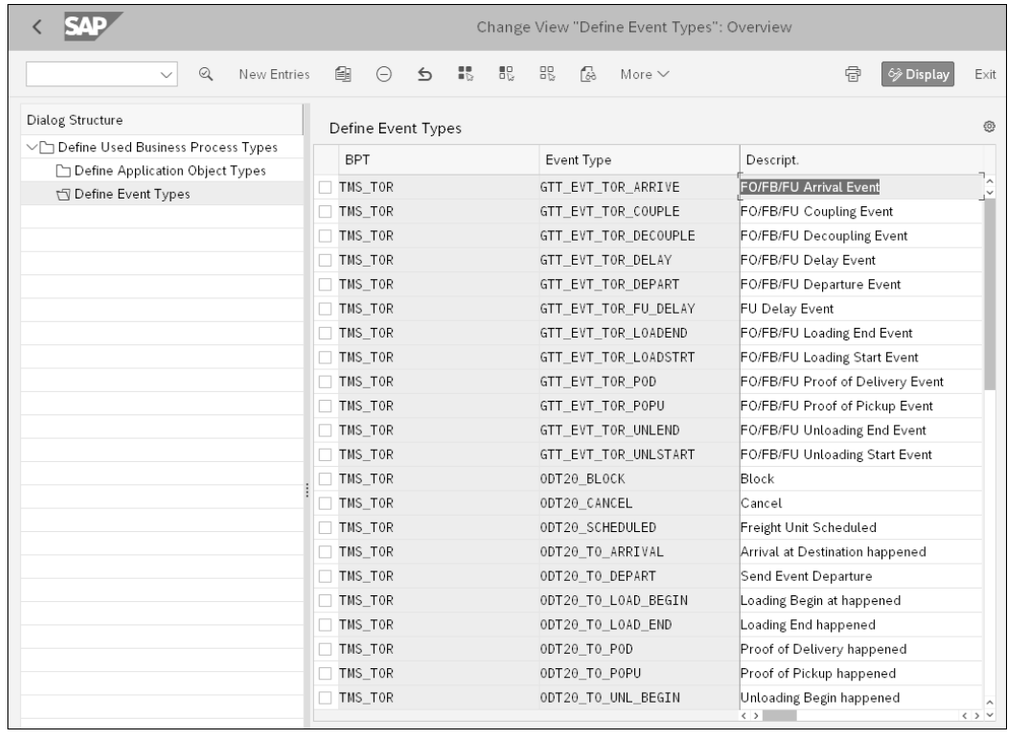


Figure 7.21 Definition of Event Types for the Transportation Order Object of TM

Configuration of SAP Event Management

The configuration of SAP Event Management allows you to define the behavior and characteristics of the visibility processes. Other than the Customizing of the application system, the settings of the EMS are only available if the SAP Event Management on SAP HANA 1.0 add-on is installed or the system is set up with SAP Event Management 9.2; that is, you don't find it on a normal SAP S/4HANA instance. The Customizing entries are identical on both versions. The main activities in SAP Event Management configuration are to define the following:

- Event handler types, expected event messages, and status settings
- Event handler type determination and data mapping from the application system data
- Event messages and event codes to be processed
- Rules about how to react to received or missing event messages
- Setup of personalized web transactions for accessing event management data

To allow process synchronization between application systems and SAP Event Management, you need to make a few essential settings to connect application system processes with SAP Event Management configuration. You can find these settings in the SAP Event Management IMG by selecting **Event Management • General Settings in SAP Event Management**:

- Define remote function call (RFC) connections to enable technical communication.
- Define logical systems to identify application systems and EMSs.
- Define application systems to give a name to the systems for which you set up processes in SAP Event Management.
- Define business process types because you need them to synchronize the application system extraction process to the event handler creation process.

Definition of different event handler types allows you to control the creation, composition, and behavior of individual visibility processes on the event management side. Event handler types are always related to a business process type, which you need to define in the event handler type settings, however, many event handler types can refer to the same business process type. Figure 7.22 shows the setup of an event handler type that you can find in SAP Event Management Customizing by selecting **Event Management • Event Handlers and Event Handler Data • Event Handlers • Define Event Handler Types**.

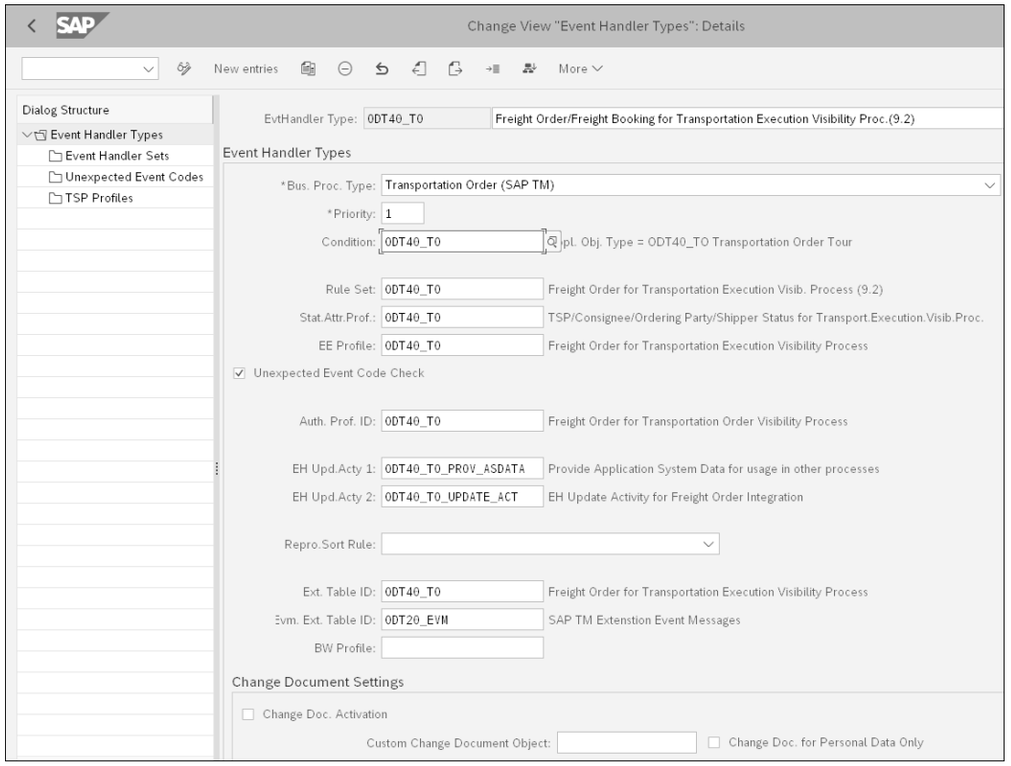


Figure 7.22 Configuration of an Event Handler Type

The main fields of the event handler type are as follows:

- **Bus. Proc. Type**
  You must assign the event handler type to a *business process type.*
- **Priority** and **Condition**
  You can set a *priority* to allow a ranking within the event handler type determination. You define a *condition* that specifies the applicability of the event handler type (e.g., only to be used for a specific application object type).
- **Rule Set**
  The rule set defines how the created event handler reacts to incoming or overdue event messages.
- **Stat.Attr.Prof**
  Using the status attribute profile, you can detail the creation of status fields and set an initial value to it during event handler creation.
- **EE Profile**
  The expected event profile summarizes the expected events that are created with the event handler based on application system milestones or other expected events.
- **Auth. Prof. ID**
  Using the authorization profile, you can define who has access to which part of the event handler data if data is accessed or displayed on the web.
- **EH Upd.Acty 1** and **EH Upd.Acty 2**
  The event handler update activities allow you to specify ABAP function modules to update data of the application system before creating the event handler or update the event handler after running through the standard event handler creation process. They can be used like traditional BAdIs.
- **Ext. Table ID**
  The extension table IDs for event handlers and event messages allow you to add fields on the header level of event handlers and messages.
- **BW Profile**
  The **BW Profile** defines which data is extracted from the event handler to be sent to a connected data warehouse system (SAP Business Warehouse [SAP BW] or SAP HANA).
- **Change Doc. Activation**
  Changing document activation and logs allows you to capture additional data for auditing purposes and may range from no log to a very detailed one (verbose mode), which may also influence performance.

Event Handler Header Extension Tables and Use of Logs

As the header fields of each event handler (type) are the same, and there are mainly only technical or admin fields, you can use an extension table to extend the event handler header for various purposes and make it more case specific. Most important is the ability to create fields specifically to a particular event handler type that are part of a database index and allow a fast search (e.g., a field for location of last sighting) without modifying the header table for all event handler types. Each event handler type can have its own extension table and therefore may have specific indexing and access characteristics.

Event handler logs—especially in the verbose mode—should be used very carefully or mainly for testing when running SAP Event Management in high-performance scenarios or with high data volumes. They may create multiples of the data load of the pure tracking process and slow down the process.

Figure 7.23 gives example data of an event handler. The event handler header keeps the references between the application system and SAP Event Management and provides identification and control characteristics for the process. Milestones, tracking IDs, and other attributes are stored in related tables. The header extension table contains important context data for the process. Control and information parameters store more detailed information that can be used in rules or presented upon request.

An event handler that needs to work with milestones must be assigned an expected event profile. You can define expected event profiles in IMG by selecting **Event Management • Event Handlers and Event Handler Data • Expected Events • Define Profiles for Expected Events**.

Event handler header

GUID	*Appl. object type*	*Appl object ID*	*Business process type*	*Event handler type*
34eG62fs6DF	SHIPMENT	9926007	TMS_SHPMT	TMS_CONT

Tracking IDs

Codeset	*ID*
CONTNR	EASU7777779
SHPMNR	9926007
HAWBNR	EASC -2777098-2
MAWBNR	EASC -8755545

Query IDs

Codeset	*ID*
ORD_NR	35500726
PO_NR	978925007-08

Extension table (System parameters) Z_CONT_EH_TAB

Origin	*Destination*	*Container type*	*Last sighting*	*Container line*
HAMBURG	SINGAPORE	22GP	ROTTERDAM	EASC

Control parameter

Name	*Idx*	*Value*
COMMODITY	1	Toys
COMMODITY	2	Furniture
HTS	1	34526700
HTS	2	34584100
WEIGHT	1	3360 KG
WEIGHT	2	7840 KG

Info parameter

Name	*Idx*	*Value*
VESSEL	1	Northstar
SHIPPING LINE	1	EASC
CUSTOMS AGENT	1	MÜLLER&CO
CONSIGNEE	1	Jun Chen Ltd., Singapore, Main St.1

Expected events

Event	*Actual time*	*Location*	*Partner*	*Reporting time*
LOADING	03.02.13, 14h00	HAMBURG	HHLA	04.02.13, 12h00
DEPARTURE	03.02.13, 22h00	HAMBURG	EASC	05.02.13, 12h00
SIGHTING	05.02.13, 04h00	ROTTERDAM	EASC	06.02.13, 0h00
ARRIVAL	23.02.13, 17h00	SINGAPUR	EASC	25.02.13, 12h00
UNLOADING	23.02.13, 23h00	SINGAPUR	SGP_PORT	25.02.13, 12h00

Measurements

Measurement	*Expected*	*Actual*	*Status*
OVERALL WEIGHT	11200 KG	11350 KG	OK

Figure 7.23 Example Data of an Event Handler (Not a Complete Data Set)

When an event handler is created, SAP Event Management uses the information in the expected events profile to generate a list of expected events to serve as milestones for processing actual received event messages and as a basis for detecting overdue events. The right side of Figure 7.24 shows an example of an expected event list for a truck shipment with a trailer and customs clearance.

The expected events of a profile can be bundled into groups to allow alternative processing of events. One example is a group of events where either an approval or rejection event is expected. Either of these two events fulfills the requirement to receive an answer for a request and therefore satisfies the necessity to receive an answer within a defined time frame.

The detailed setting for expected event generation (see the left side of Figure 7.24) allows you to define how an expected event is created. You can relate the event to an expected event communicated from the application system. Dates and times can be directly moved or manipulated as required. You can also create an expected event by referencing a previously generated expected event (e.g., loading end is always 30 minutes after loading begin). If the event scheduling follows a more complex rule or needs to reference other data, you can use an ABAP function module to determine the correct date and time.

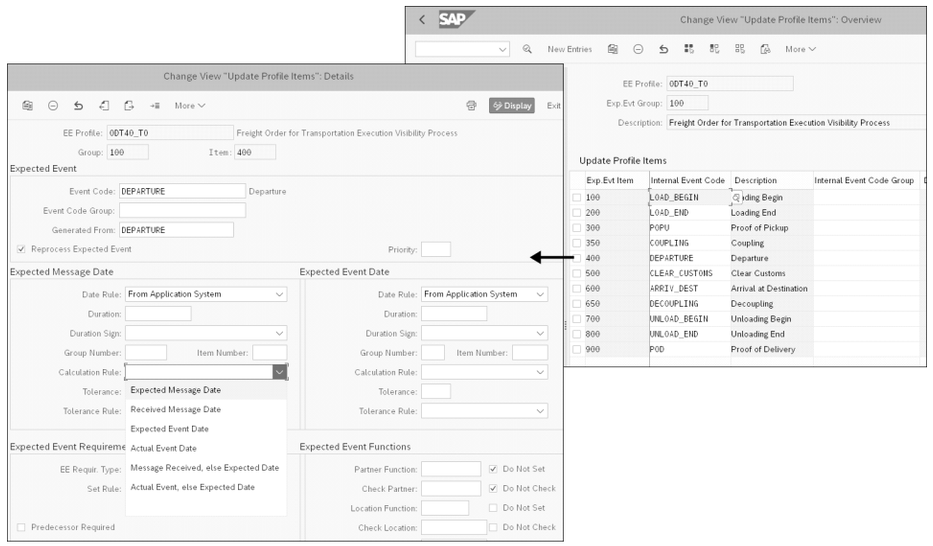


Figure 7.24 Event List in an Expected Event Profile and Detail Settings for Expected Event Generation

Each expected event can have event and message dates with a defined earliest/latest time frame. If an event code occurs multiple times in a process, the individual event instances can be enriched by event locations or sending partners (e.g., if a departure event occurs multiple times on a distribution tour).

Keeping Track of Original Plans

Within the expected event structure, an event handler keeps track of the expected and actual event date and time. In addition, an original expected event date and time is kept. Even if a plan changes multiple times, the first (original) plan is retained in the expected event structure. In-between changes are usually overwritten in the structure, but may be looked up in the log data in verbose mode, which is the most talkative level of logging event handler activities and event processing.

Because business processes often require quite specific status settings, SAP Event Management provides a tool to define the status of each event handler type individually. You can configure the Customizing for status attribute profiles by selecting **Event Management • Event Handlers and Event Handler Data • Statuses • Define Status Attribute Profiles**. The profiles, which are assigned to one or multiple event handler types, consolidate a list of status attributes, each offering a status definition, possible status values, and an initial value that is set when the event handler is instantiated. Transition of the status values from one setting to another is accomplished by rules processing with specific status modification activities. Figure 7.25 shows an example of a status attribute profile (TM transportation order event handler) with status attributes for block, delivery, and transportation status.

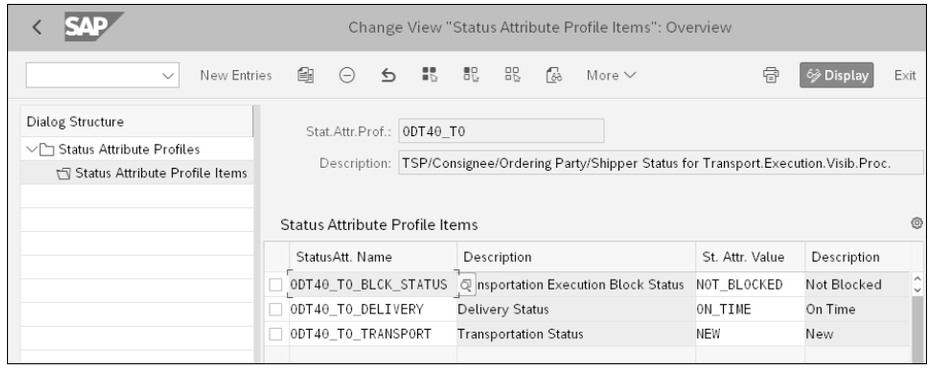


Figure 7.25 Status Attributes of an Event Handler for Transport Order Tracking

When an event handler is created by request from an application system, the extracted and transmitted data is used to determine the appropriate type of the event handler. The first step is to compare the business process type assigned to the application object against the business process type assigned to event handler types. The two should match. Optionally, the alternative business process type assigned to the application object is compared. Event handler types matching the business process type are now ranked by their priority. Subsequently, the conditions of the event handler types are checked until the first applicable one is found. This event handler type is then used to instantiate the event handler.

Because not all application systems are structured the same way, you can harmonize individually created parameters in a common process using the parameter mapping functionality. Even in the SAP world, orders of different kinds exist (e.g., SAP purchase orders [materials management] or sales and distribution orders). To avoid a cross-system harmonization of transmitted parameters, SAP Event Management offers a parameter mapping tool to assign parameter entities to a joint EMS-specific naming definition. For example, a `PO_NUM` parameter from material management and an `ORDERNUM` parameter from an SAP S/4HANA sales order can be mapped to an `ORDERNUMBER` parameter in the event handler. The assignment of a corresponding mapping profile in the IMG under **Event Management • Event Handlers and Event Handler Data • Parameters • Define Parameter Mapping** is mandatory; otherwise, the event handler can't be created, and you'll find a mapping error in the application log. In a simple case, the mapping profile just defines that all parameters are routed through event handler creation the same way they are received from the application system (i.e., the mapping profile defines that nothing is mapped).

7.2.4 Event Messages and Event Processing

An event message is a structured set of data that conveys information to SAP Event Management about what, when, where, by who, and why did something happen in a real-world incident. SAP Event Management uses this information to identify potential event handlers as receivers by comparing the tracking ID of the message with the tracking IDs of the event handlers. All active event handlers with matching tracking IDs and code sets get a feed of the event message.

Technical Processing of Event Messages

Event message processing is mass enabled for support of high volumes of event messages to be passed to SAP Event Management with a single transmission. All received raw event messages are first saved in the database before being forwarded to message processing, which can be done either synchronously or asynchronously, depending on how quickly the receiver needs to be listening again.

Message processing then picks the messages up from the queue, packages received messages by tracking ID, sorts the packages by actual event time stamp, and pushes each package into the event handler update process. In the end, the processing status and logs are saved with the messages. The event handler update process assigns the internal event code, checks the feasibility of message processing, and finally executes the rule processing for each message.

Synchronous processing of event messages should be used when you expect an immediate response on the success or outcome of an event message (e.g., if a truck departure is posted on a mobile device, and the status update is immediately shown on the mobile UI after refresh).

An event code characterizes the purpose of an event message. Event codes are divided into an external and internal view. Because there are many standards that define how to report a specific incident (e.g., by standards such as Electronic Data Interchange for Administration, Commerce, and Transport [EDIFACT], American National Standards Institute [ANSI] X.12, and RosettaNet), the external view needs to be flexible. Therefore, you can define external event codes and a mapping rule to harmonize and transform them into an internal view defined by internal event codes.

You configure the event codes in Customizing under **Event Management • Event Handlers and Event Handler Data • Codes**. There are multiple settings to define external and internal views and the possibility to group them. Figure 7.26 shows the definition and grouping of internal event codes.

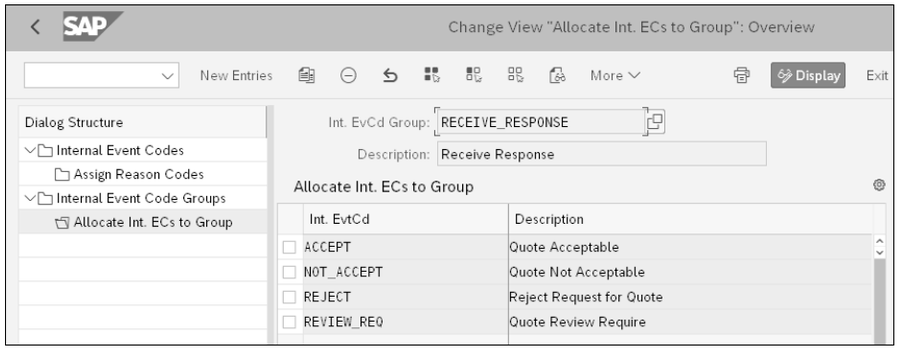


Figure 7.26 Internal Event Code Definition and Grouping

Event message processing is organized through the definition and use of rule sets. A rule set is a sequence of activities conditionally applied upon receipt of an event message or, alternatively, if an expected event is overdue with respect to either an expected event or message data.

A rule set is directly associated with an event handler. It can be a comprehensive list of rules, where each rule contains a condition under which it's executed, and a definition of which activity should happen if the condition is true or false. The activity may be an ABAP function module or method, or an SAP Event Management procedure containing multiple other activities (see Figure 7.27).

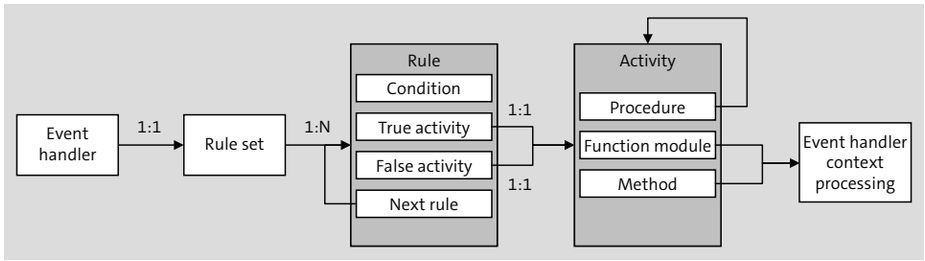


Figure 7.27 Associations among Event Handler, Rule Sets, Rules, and Activities

You can also define a next rule that should be executed based on the result of a called activity, which could be true, false, or an error.

Using Rules to Build an Event Handler Hierarchy

If you need hierarchical relations of event handlers (e.g., a tracked box in a tracked container), inheritance of tracking IDs allows you to easily indicate this reference. As soon as the box is packed into the container, the container event handler passes its tracking ID to the box event handler so that each message for the container event handler is now also processed by the box event handler (same tracking ID). This can be easily managed by rules and activities in the SAP Event Management activity repository (see the IMG under **Event Management • General Settings in SAP Event Management • Functions, Conditions, and Activities in SAP Event Management**). After the box is decontainerized, the box event handler deactivates its relation to the container event handler, and it can then be tracked on its own.

You define rule sets in Customizing under **Event Management • Reaction to Event Messages • Define Rule Sets**. Here, you can manage rule sets and define their single activities and logic. You also have access to activity definitions, multitasking activities (procedures), and rule conditions. To use this function, you can click the **Display Rule Set** button on the **Rule Sets** level of the Customizing transaction.

To provide a better overview of complex rule sets, you can also display rule set details, which takes you to a screen where the complete rule set with all its rules, conditions, and activities are displayed. Figure 7.28 shows the rule set maintenance and the rule set details display. In the details display, you can identify the procedural structure of the rule set, for example, in the **LOADING_BEGIN** section.

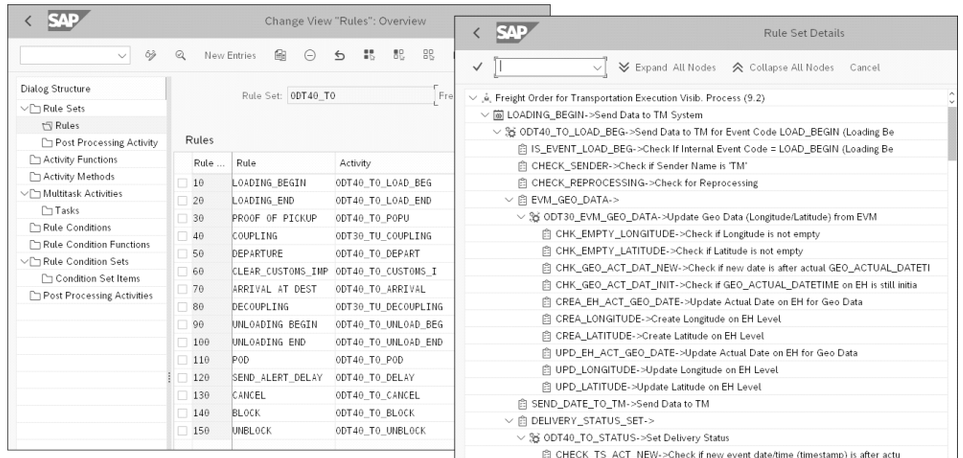


Figure 7.28 Rule Set Maintenance and Details Display

To ease and support the development and distribution of SAP Event Management settings, you can use solutions and scenario definitions to package all settings done for a scenario implementation on the SAP Event Management or application system side. In the IMG, the setup can be found under **Event Management • Solutions and Scenarios**. Here, you can assign event handler types, rule sets, extension tables, parameters and conditions, functions, activities, web interface transactions, users, and document flows to a scenario. Each scenario can then be exported from SAP Event Management as a business configuration (BC) set, which allows you to import it into another EMS.

7.2.5 End User Interaction, Lists, and Background Processing

SAP Event Management offers different methods of end user interaction:

- Role-based web end-user interaction to retrieve data from SAP Event Management and display it and interaction based on sending event messages
- List processing for power users to execute maintenance, retrieval, and inspection tasks
- Transactions for simple event message input

The role-based web interface allows you to define web transactions for event handler data retrieval and posting of event messages. It can be used to provide tracking information to end users and customers or partners and offers them the possibility to take part in the event reporting. An example is a transaction for parcel tracking, where you as receiver can follow the status of your parcel, and, after receipt, you can send a proof of delivery event if the package is in the correct condition.

Because the web transactions are role based, you can assign different authorizations to each role and define the kind of event handlers and event messages, as well as the details a particular user can see. In addition, the event reporting feature can be authorized or restricted. You can find the setup of the web interface in the IMG under **Event Management • Event Messages, Status Queries, and Web Interface • Web Interface**, where you can define the web interface transactions, configure the visibility of data and authorization, and assign users or roles to the web interface transactions. Figure 7.29 shows an example of a web interface transaction where drilldown capabilities have been configured to do complex intermodal container tracking for an LSP.

With the lists in SAP Event Management, you can either retrieve information as a professional user or control the processing of data. Control processing can be done interactively, when a user starts the corresponding transaction, or as a background process started by a batch job to regularly do data processing. The following list processes are provided in SAP Event Management:

- **Event handler list (interactive)**
  Using the event handler list, you can find and retrieve event handlers from SAP Event Management. You can drill down into the event handler overview and the detail display, which offers an in-depth overview of all event handler data. From the

event handler details, you can also update event handler data, which is a functionality that should be used only for maintenance purposes because it may corrupt data consistency.

- **Unprocessed message list (background or interactive)**
  The unprocessed message list allows you to process received messages that could not be processed (e.g., due to a locking situation). If an event handler receives two independent messages within a millisecond time frame, the second message may find the event handler locked while processing the first message. In this case, the unprocessed message processor can be scheduled and run regularly to resolve this situation.
- **Expected event overdue processing (preferably background)**
  The expected event overdue processing should be done regularly, best triggered by a batch job in less than an hour time frame (usually 5–10 minutes, depending on the on-time criticality). The processing checks whether any expected event was overdue and raises an exception processing of the corresponding event handlers that can be handled in the rule set.
- **Event message reprocessing (interactive)**
  In situations where event handler rules need to be tested, reprocessing can support the process so that not every test requires new event messages.

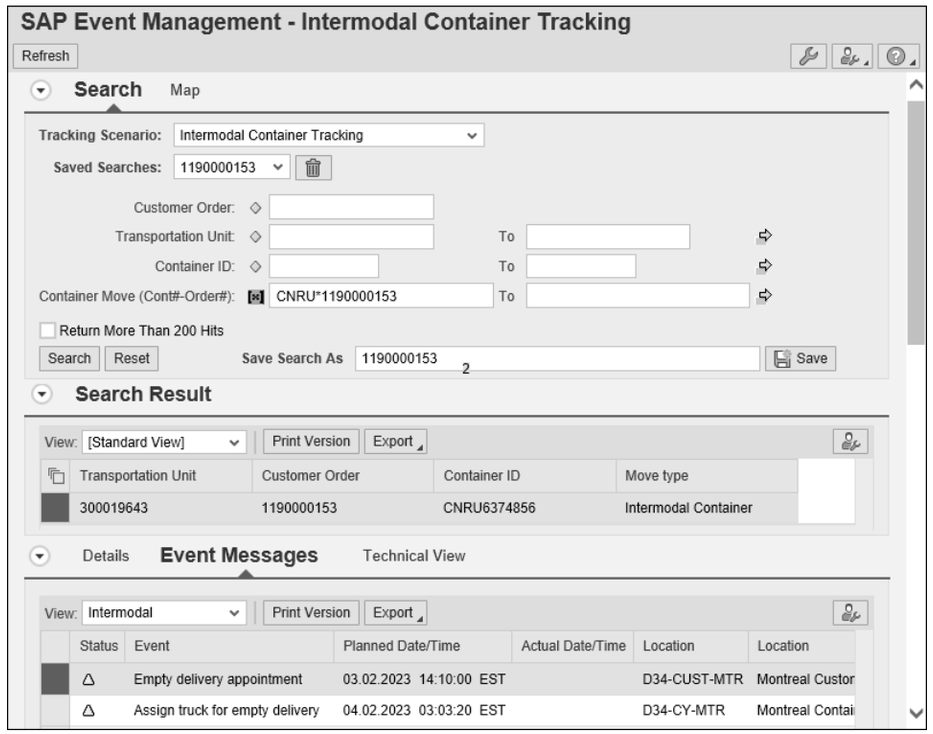


Figure 7.29 Web Interface of SAP Event Management

- **Status list for event message processing**
  This status list shows the processing status of the event messages that have been received for the selected event handlers.

7.2.6 Integrating SAP Event Management with Other Components

In Section 7.2.2, we described the integration of application systems (which includes TM) with SAP Event Management for creating event handlers or posting event messages. On top of this very fundamental integration, SAP Event Management offers a variety of predefined content and additional integration points with TM and other components and legacy systems, which we'll discuss in this section.

Predefined Transportation Management Content

For TM application objects, there is a corresponding preconfigured process, which you can use out of the box just by enabling it in Customizing, as follows:

1. Activate the SAP Event Management integration in the corresponding settings of the TM object type (e.g., in the freight order type).
2. Enable and set up the application interface for the corresponding process (Section 7.2.3).
3. Enable and set up the SAP Event Management process (Section 7.2.3).

The visibility processes shown in Table 7.3 are ready to use.

Visibility Process	Application Object	Event Handler Type
SOP instruction tracking	ODT30_INS	ODT30_INS
Freight unit tracking	ODT30_FU	ODT30_FU
Freight order/freight booking tracking	ODT30_TO	ODT30_TO
Resource tracking	RES30_RESOURCE	RES30_RESOURCE

Table 7.3 Visibility Processes and Their Implementations

Integration between Transportation Management and SAP Event Management

There are two additional integration points between TM and SAP Event Management:

- The first is the posting and update of TM-relevant data from SAP Event Management to TM as a result of rule processing. In many scenarios, receipt of an event needs to update corresponding data in TM. If, for example, an event handler has an expected event for arrival at a destination that is derived from a TM transportation order arrival date, then the rule processing can call an activity, which updates the TM transportation order actual date upon receipt of the arrival event message (see Figure 7.30).

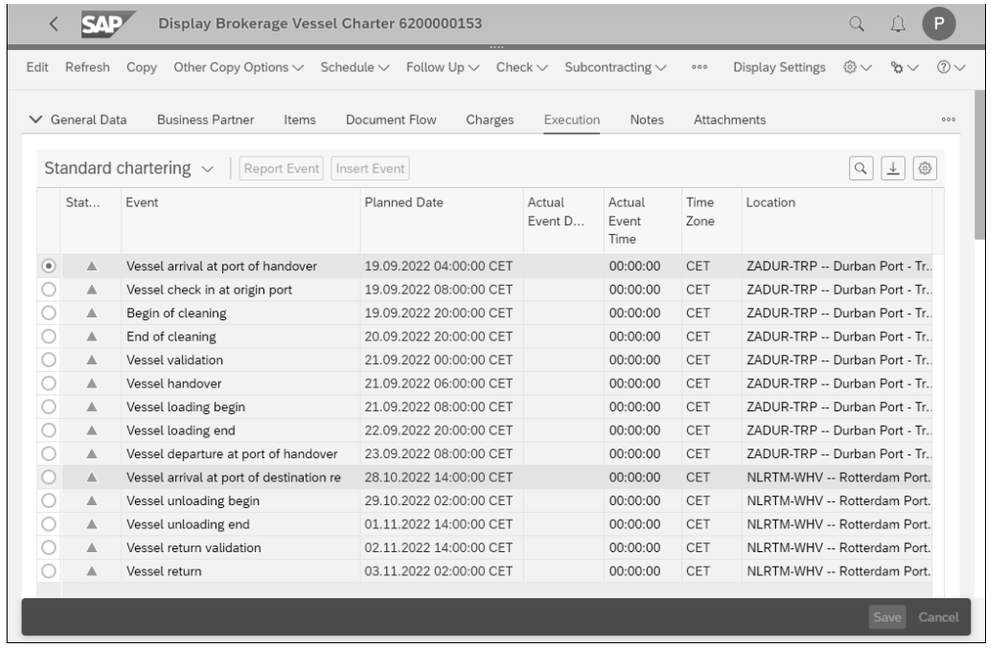


Figure 7.30 Event Message Data Displayed in TM Freight Booking Context

- TM and other systems can retrieve event handler data for displaying inside the application context. With this integration, a user can see the event handler status without calling a web transaction. The data is displayed as part of the current transaction (e.g., in the TM **Execution** tabs). TM also offers the sending of event messages to SAP Event Management upon manual setting of the actual dates, for example, in the freight booking maintenance. Figure 7.30 shows an example of displayed event message data in an TM freight booking context.

Integrating SAP Event Management with Other Systems

SAP Event Management offers three important interfaces for communication, which can be used as BAPIs, enterprise web services, or IDocs. The interfaces can also be used to integrate with non-SAP systems such as legacy systems running in a customer's landscape.

Due to its flexibility and universality, SAP Event Management can also be connected and integrated with many other SAP components. The following integration cases have, for example, been done within SAP environments as prototypes, as part of standard products, or as custom development projects:

- Integration of SAP Event Management with SAP Global Trade Services (SAP GTS) for tracking customs approval status
- Integration of SAP Event Management with SAP EWM to track the detailed movements of items in a warehouse or yard

7.3 SAP Business Network Global Track and Trace

SAP Business Network Global Track and Trace is a public cloud–based service that allows joint access and scenario usage. The event processing, visualization, and process handling capabilities are provided for all related and registered parties.

> **Renaming**
>
> SAP Logistics Business Network has been renamed to SAP Business Network for Logistics. See Chapter 12, Section 12.6, for more information.

Implemented scenarios don't represent the view of one company as usually provided in SAP Event Management (i.e., the process owner), but a common view on a scenario where all relevant companies can visualize and contribute. Typical use cases for SAP Business Network Global Track and Trace are as follows, for example:

- You want to track order fulfillment and associated goods in transit with milestone and geolocation tracking with predictive estimated time of arrival (ETA) and enable customers to track the progress of their order.
- You want to track order fulfillment and associated goods in transit from suppliers with milestone and geolocation tracking with predictive ETA.
- You like to track inbound advanced shipping notifications (ASNs) via milestones and associated tracking to update inbound shipments.
- You want to track truck, ocean, air, and small volume parcel shipments via milestones and with geolocation tracking with predictive ETA (shipment and delivery only or in combination with sales or purchase order processing).
- You like to extend or customize tracking scenarios with additional process integration and additional milestones.

We'll see what's available for SAP Business Network Global Track and Trace, as well as integration scenarios, in the following sections.

7.3.1 Architecture and Features

SAP Business Network Global Track and Trace has gone through some architectural changes since the previous edition of this book. Instead of being an independently built tool, it has become an integral part of SAP Business Network for Logistics from a business and technical perspective. Figure 7.31 depicts this change of technology setup for the components, where SAP Global Track and Trace is now an option in (i.e., a part of) SAP Business Network for Logistics 2.0. You can use SAP Business Network Global Track and Trace as a standalone component for a variety of purposes, comparable to SAP Event Management. On the other hand, SAP Business Network Global Track and Trace also provides a part of its functionality to support SAP Business Network Freight Collaboration with standardized tracking support. You can use SAP Business Network Global Track and Trace here to track your shipments with a fixed set of events, derived

from TM. For more information on SAP Business Network for Logistics and SAP Business Network Freight Collaboration, refer to Chapter 12, Section 12.6.

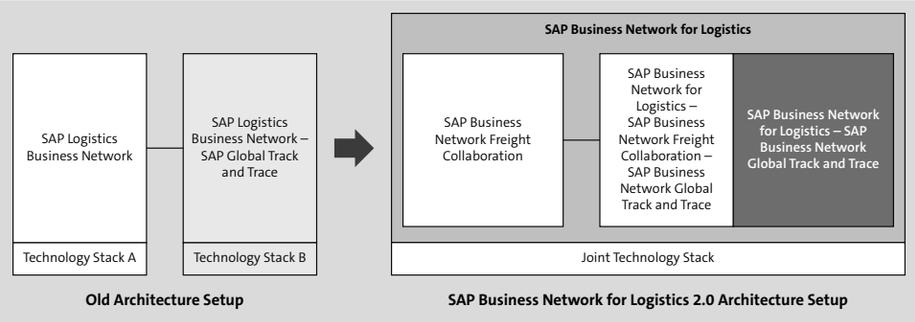


Figure 7.31 Change of Component Relations in SAP Business Network for Logistics

As SAP Business Network for Logistics is a public cloud tool, it also has a release schedule, which is quite independent of that of TM. SAP Business Network for Logistics and SAP Business Network Global Track and Trace as an intrinsic part, will get monthly updates. SAP Business Network for Logistics version 2304 should be available by the time you're reading this book.

On a high level, the components of SAP Business Network Global Track and Trace are comparable with those of SAP Event Management. From an application side, a variety of logistics systems can be connected as originating systems for objects or processes to be tracked. This could be SAP S/4HANA, TM on SAP S/4HANA or SAP TM, or SAP ERP. You also have the option to connect to legacy systems. From the SAP Business Network Global Track and Trace side, IDocs, RESTful, and OData services are provided. On the tracking system connection side, SAP Business Network Global Track and Trace provides a list of published APIs. These are already adopted by a list of tracking providers such as project44 or Shippeo, which can connect to SAP Business Network Global Track and Trace processes directly. Figure 7.32 gives you an overview of the high-level architecture and integration of SAP Business Network Global Track and Trace in its environment.

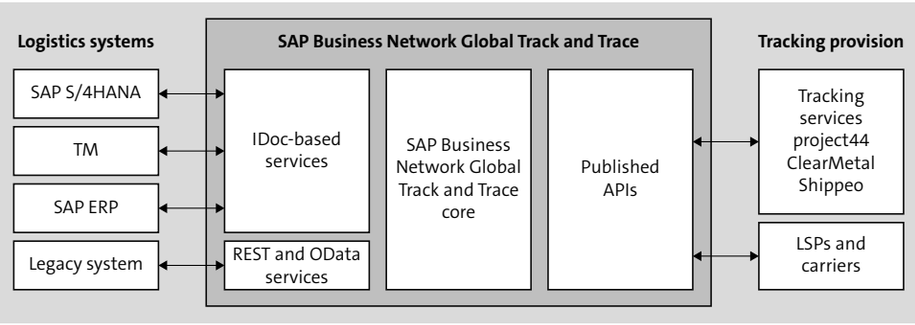


Figure 7.32 Integration of SAP Business Network Global Track and Trace into Logistics Systems and Tracking Provider Systems

SAP Business Network Global Track and Trace offers quite a range of new features and technologies when it comes to collaborative tracking and data evaluations. This allows for a certain strength compared to SAP Event Management, which is based on the innovative architecture and foundation. Table 7.4 shows you a comparison of the features of SAP Business Network Global Track and Trace and SAP Event Management.

Feature	SAP Business Network Global Track and Trace	SAP Event Management on SAP S/4HANA
Onboarding support	X	
Master data consolidation	X	
Integration to SAP S/4HANA	X	X
Integration to SAP TM	X	X
Role-based access	X	X
Role-specific view and filtering		X
Standard tracking	X	X
Tracking of parts/items	X	
Internet of Things (IoT) sensor tracking integration	X	Needs interface
Alerting, rules engine, process control	X	X
Attachments to events	X	X
High configurability/Customizing in model setup	X	X
Event handler sets		X
Serialization support, Electronic Product Code Information Services (EPCIS)	X	X
Analytics	X	X
On-premise installation		X
Cloud service	X	X (only private)
Cloud scalability on demand (performance)	X	X (only private)
Multitier visibility	X	

Table 7.4 Comparison of SAP Business Network Global Track and Trace and SAP Event Management Features

Feature	SAP Business Network Global Track and Trace	SAP Event Management on SAP S/4HANA
Archiving		X
Strong business network support with predefined connections to track and trace suppliers	X	
Machine learning and blockchain integration	X	
Shipper processes	X	X
LSP processes	Can be configured	X

Table 7.4 Comparison of SAP Business Network Global Track and Trace and SAP Event Management Features (Cont.)

As tracking processes in SAP Business Network Global Track and Trace can be jointly used due to the cloud access capability, implementation of complex product provenance proofs can be implemented more easily. A trust chain from raw material to point of consumption with a complete electronic record and forward as well as backward traceability of the material can be expected to be implemented in the future. The availability of new IoT and sensor integration technologies coming with SAP Business Technology Platform (SAP BTP) opens a large field of integration possibilities to enrich the data and event reporting in logistic chains. The SAP platforms also allow embedding of the relevant tracking information into workspaces and platforms.

Industry-Related Utilization of SAP Business Network Global Track and Trace

SAP Business Network Global Track and Trace is quite an established tool, which is reflected in its capabilities and ongoing development progress as well as in its industry-related utilization. Due to the necessary efforts, usage in all industries still isn't in focus. Therefore, typical use cases that match capabilities and integration paths are provided for the shipper industries. An integration with TM, as is required for LSPs, for example, is available, but not yet prepared to match LSP industry requirements.

Because SAP Business Network Global Track and Trace is a public cloud–based solution, the deployment cycles for new functionalities and features are much shorter compared with an on-premise version. Therefore, existing, updated, and new features that users need to be made aware of are directly accessible through the UI of the SAP Business Network Global Track and Trace launchpad start page. In Figure 7.33, you can see the help function for new release updates of SAP Business Network Global Track and Trace.

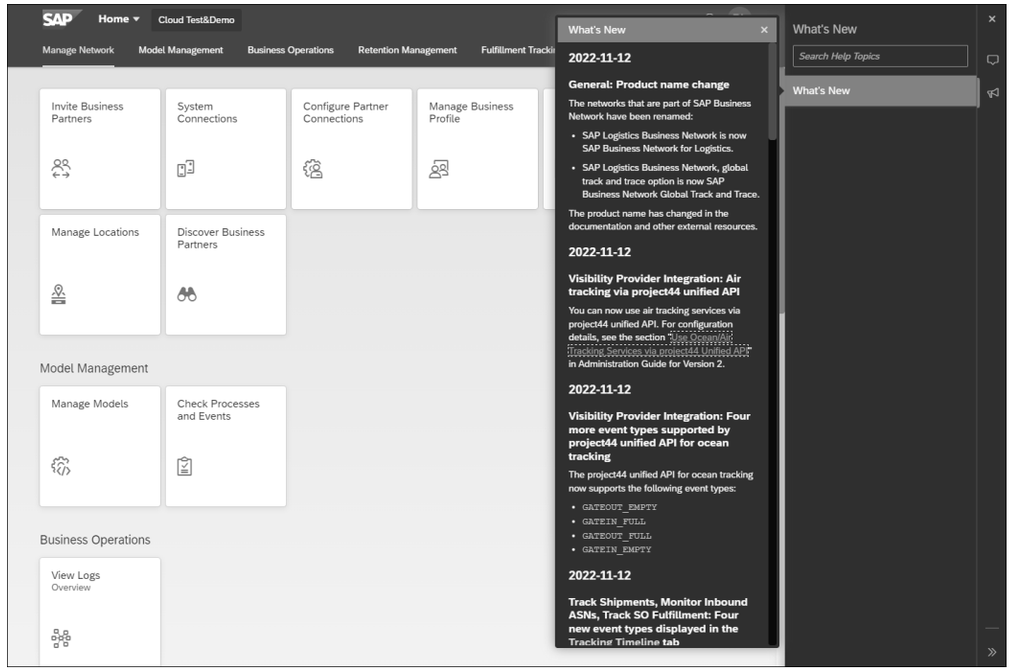


Figure 7.33 SAP Business Network Global Track and Trace Launchpad Start Page with Menu Content and Feature Updates

SAP Business Network Global Track and Trace works for air, ocean, and truck modes of transport and provides the following functionalities:

- Standard apps and template apps for out-of-the box consumption and extension
- Geolocation tracking with predictive ETA
- Scripted actions as exception management for stakeholder notification in case of predefined event occurrences (delays, exceptions, etc.)
- Document flow–based overview of transportation execution to show the correlation between orders, deliveries, and shipments
- Integration of third-party tracking providers
- Qualtrics integration for structured and free-text feedback on deliveries
- Capture of transportation-related CO2 emissions

7.3.2 Integration Scenarios

Within SAP Business Network Global Track and Trace, real-time and event visibility is established at a granular level that is determined by the company employing it and therewith providing transparency on the most crucial steps of transportation execution. Based on predefined scenarios, follow-up actions can be scripted, such as the

automatic sending of emails in case of disruptions, to further strengthen the operative control of the moving parts of a business. Furthermore, the network participants may share expected data on when a disruption will be resolved to further strengthen the planning capability of companies and their customers.

As an example for operative use, with this tool, a sales employee can directly access the tracking data of a specific sales order, receive notifications if something is amiss, and directly act upon the disruption without searching for the right shipment numbers or contacting further personnel. This ultimately supports the increase of customer service levels while simultaneously decreasing cost. Similarly, delays in incoming shipments can be made visible directly to the procurement specialist and immediately integrated to the respective deliveries to allow for timely alternate sourcing or adaption of production plans.

As of the time of writing, SAP Business Network Global Track and Trace has some major scenarios and standard apps embedded, which are directly integrated with the logistics functionality of SAP S/4HANA as pure public cloud solutions:

- **Track sales order fulfillment (including outbound delivery) and track purchase order fulfillment (including inbound delivery)**
  Tracking of inbound or outbound deliveries created in an SAP S/4HANA ERP system (sales and distribution/materials management) with real-time feedback of event data. There doesn't need to be a TM system in place. The following features are included:
  - Ensures on-time, in-full delivery to customers by surveying all relevant milestones to increase customer satisfaction
  - Provides granular, real-time purchase order status information from your business partner ecosystem to avoid costly firefighting
  - Includes a list overview with indication of fulfillment rate and status:
    - Detailed page per order for in-depth analysis
    - End-to-end document flow visual tracking (exceptions displayed in red) and an aggregated execution status across business documents (e.g., outbound delivery and sales order)
  - Works with TM freight documents and LE-TRA shipments
  - Displays estimates by data providers and provides and on-time, in-full (OTIF) status calculation
- **Tracking of shipments**
  Tracking of inbound and outbound shipments coming from a source system (TM or LE-TRA) with real-time feedback of event data. Attachments can be done for specific events such as proof of delivery. The following features are included:
  - List overview with indication on status
  - Detailed page per shipment for in-depth analysis
  - Support for buyer and supplier managed transportation

  - Freight documents can be fed either from SAP S/4HANA or an external source system
  - Real-time and map-based transportation visibility with updated ETA
  - Manual maintenance of events
  - Ability to sync back events to TM
  - Display of impacted documents of delayed shipments
  - Display of estimated status provided by service providers
- **Monitoring of inbound ASNs**
  Track goods that are in transit and keep track of assets/returnables as they move along the entire supply chain to reduce operational costs. The following features are included:
  - List overview with indication on fulfillment rate and status
  - Detailed page per ASN for in-depth analysis
  - Ability to feed inbound deliveries or ASNs from SAP S/4HANA or external source system
  - Create Inbound ASN app to allow manual creation via SAP Business Network for Logistics
  - Display of related shipments and delivery items
  - Updates ETA of related inbound deliveries
  - Status and tracking timeline with current and estimated statuses and times

Figure 7.34 shows the availability of the predefined and integrated apps and scenarios on the launchpad of SAP Business Network Global Track and Trace. In Figure 7.35, you can see the tracking of a shipment in SAP Business Network Global Track and Trace with a list as an entry step, an overview, and a map view.

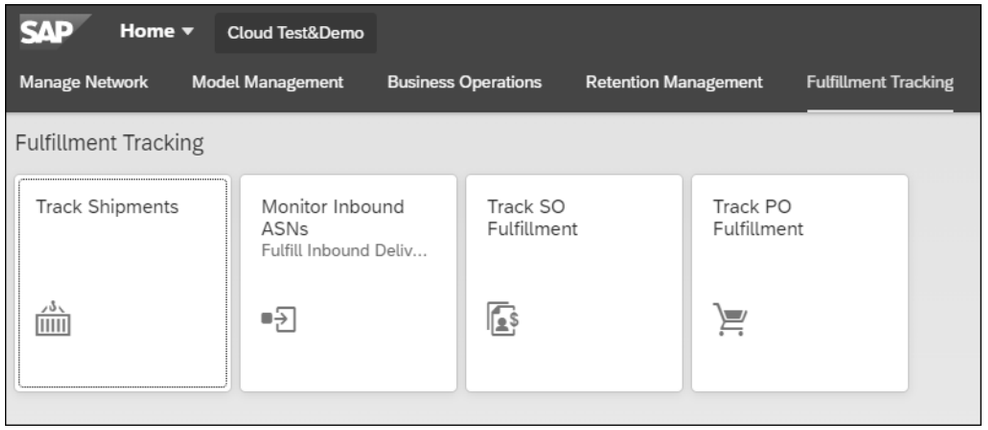


Figure 7.34 Launchpad with Predefined Tracking Apps and Scenarios

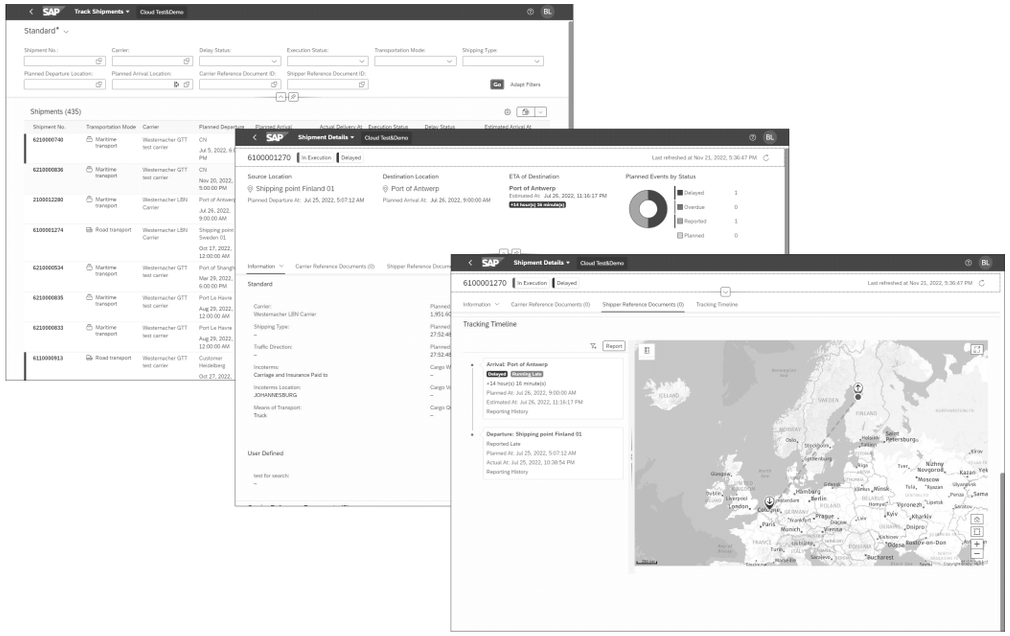


Figure 7.35 Tracking of Shipment in SAP Business Network Global Track and Trace: List, Overview, and Map

As an example for a tracking app (Track PO Fulfillment), Figure 7.36 shows the tracking of fulfillment as a full document flow (based on the corresponding purchase order positions), including deliveries and shipments, which is made visible by the status indicated by color and values.

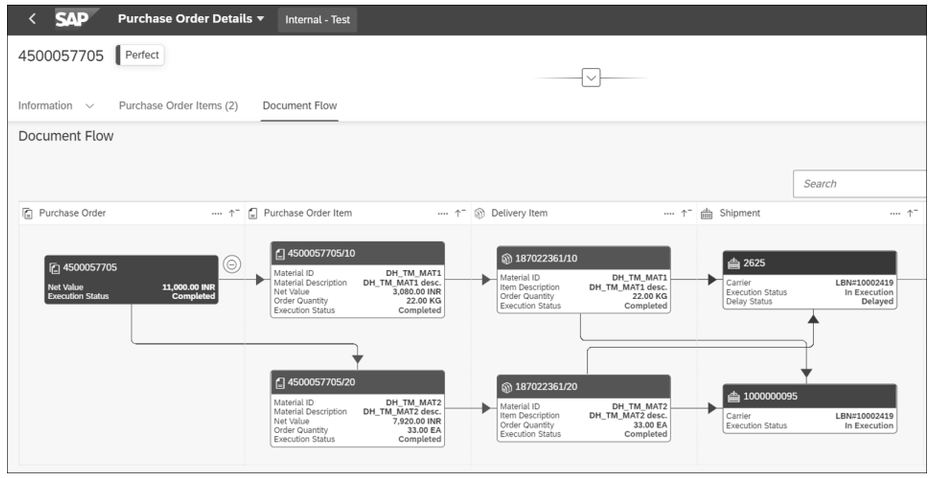


Figure 7.36 SAP Business Network Global Track and Trace Document Flow and Status of a Tracked Purchase Order Fulfillment

Concerning flexibility of models, there is still a higher configurability and Customizing capability in SAP Event Management, as it's on-premise as an individual instance and not provided in the public cloud. In SAP Business Network Global Track and Trace, models are also pretty flexible, but they must be created using a metadata modeling app with a language called CDS definition language (CDL), which runs as a part of the SAP Business Network Global Track and Trace plug-in for SAP Web IDE full-stack. There, you can define, design, and deploy SAP Business Network Global Track and Trace projects, which allow you to activate it in the cloud. For maintenance purposes, the Manage Models app is available. In Figure 7.37, you can see the metamodels and their status, which are deployed into SAP Business Network Global Track and Trace.

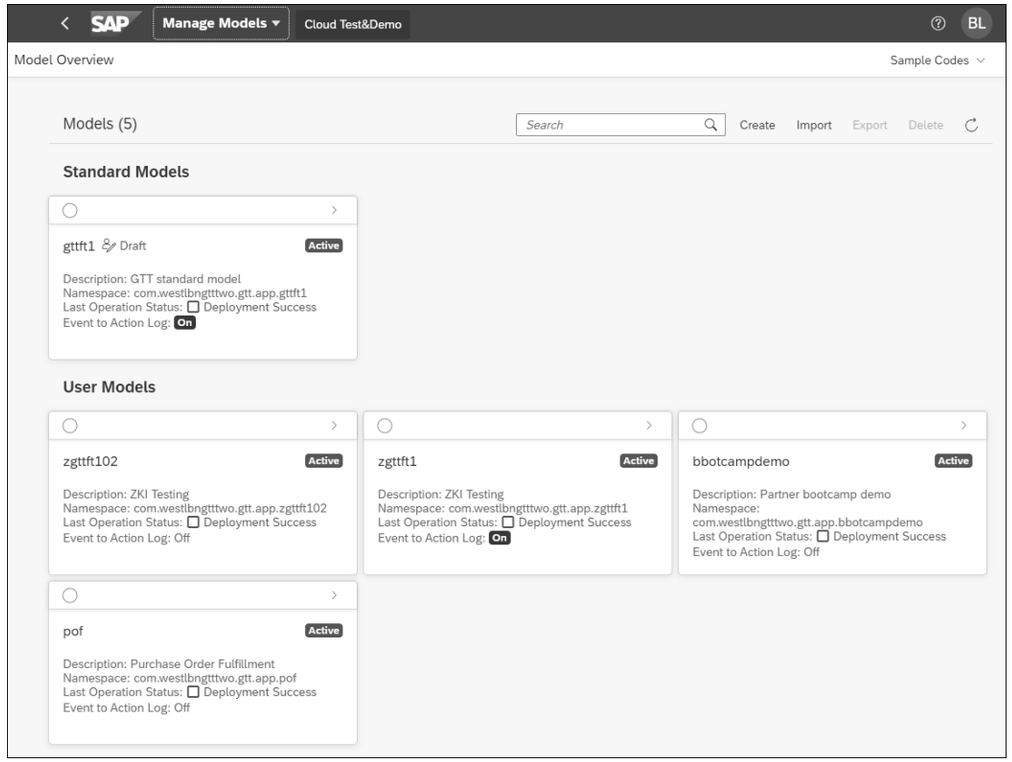


Figure 7.37 SAP Business Network Global Track and Trace Models Overview

If you drill down into the models, you can, for example, see or access the model definition or data used within the models, as shown in Figure 7.38.

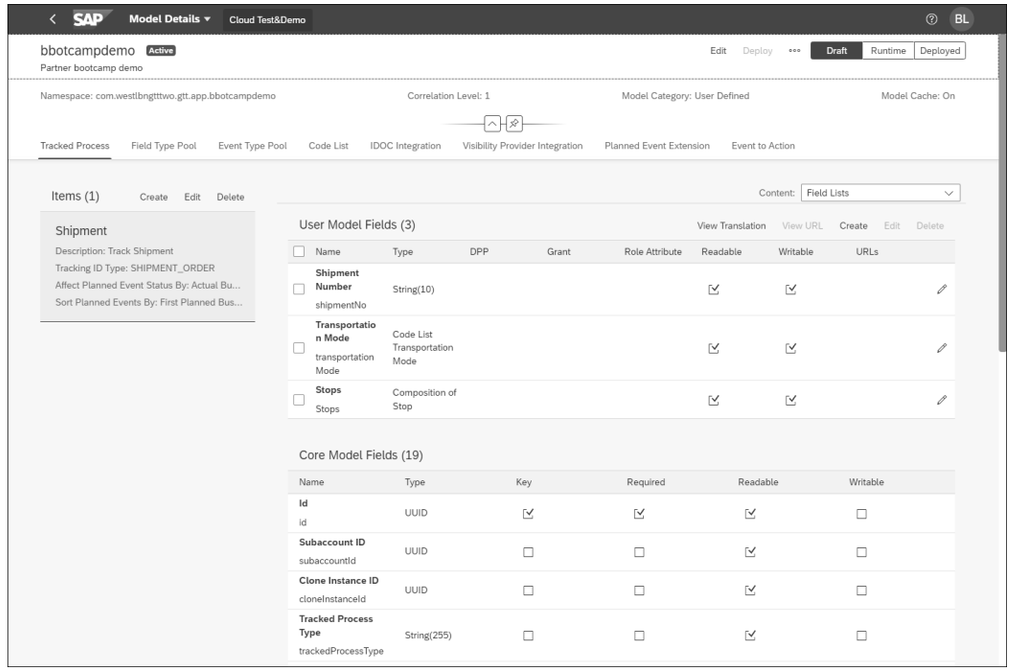


Figure 7.38 Data Usage in SAP Business Network Global Track and Trace Models

Users can build their own models or applications on SAP Business Network Global Track and Trace. The system provides template apps for this purpose, which allow you to easily reuse certain features given by the standard apps of SAP Business Network Global Track and Trace. The templates include the following:

- Model template (can be imported into your Manage Models app)
- ABAP coding – ERP extractor and BAdI implementations
- SAPUI5 frontend coding
- OData read service to be consumed
- Instructions (including basic system setup)

SAP Business Network Global Track and Trace will see further developments and features in the future and is already prepared to support the processes coming with the new digital age of logistics.

7.4 Summary

This chapter gave an overview of how to execute and monitor transportation processes. Regarding transportation execution, we explained how you can work with the result of planning and execute freight orders and freight bookings, introducing the

concept of print documents and discrepancies. We also introduced the concept of interaction between an export and import organization and how this can be handled with different sets of documents on either side.

In the SAP Event Management and SAP Business Network Global Track and Trace sections, you learned which visibility options you have with the traditional SAP Event Management or what the new SAP Business Network Global Track and Trace will bring.

In the next chapter, we offer insight into transportation compliance handling in terms of legal and trade compliance and dangerous goods regulations. In addition, we'll look to processes of TM that are supported by connecting to third-party providers in terms of compliance and security.

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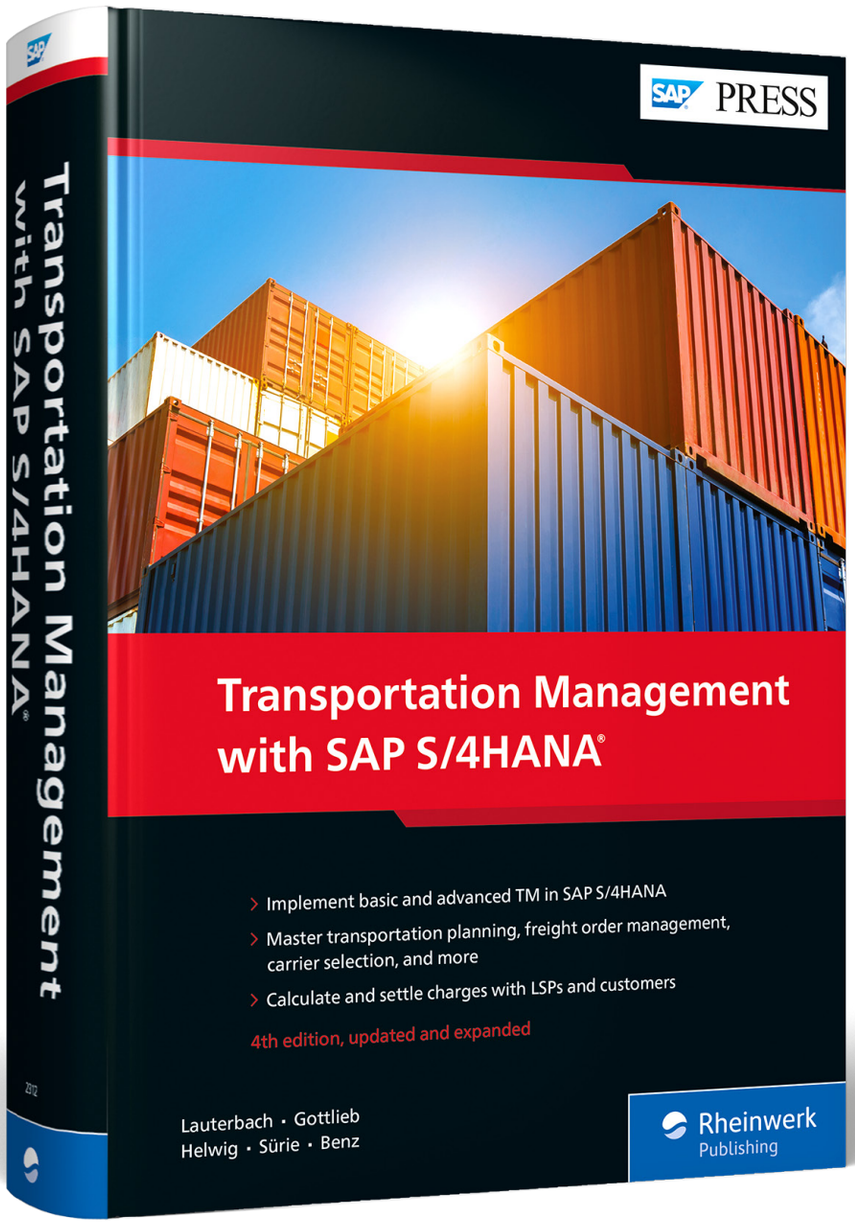

Dr. Bernd Lauterbach is chief solution architect for transportation management at Westernacher Consulting in Heidelberg. Until 2019, Bernd worked for SAP SE for 25 years. He gained 13 years of experience, both as a development manager for SAP TM and as a development architect for SAP Event Management, the Auto-ID infrastructure, and SAP ERP Logistics Execution (LE-TRA). Subsequently, Bernd was responsible worldwide as chief solution architect for the logistics industry at SAP IBU Travel & Transportation – Cargo & Logistics.

Dr. Jens Gottlieb has worked in supply chain software development at SAP SE in Walldorf, Germany, since 2000. He is chief product expert in the TM standard development unit. As the product owner responsible for transportation planning and the transportation network, Jens leads a development team. He has worked as a developer, development architect, and development manager, and led internal development projects as well as a standard-related custom development project for a TM customer in the beverage industry.

Meike Helwig leads the Center of Expertise for transportation management (TM) at SAP SE in St. Leon-Rot. She is responsible for managing and delivering services for the premium customers of SAP SE in the EMEA region. Together with her team, she proactively supports customers during the whole lifecycle of a TM system with technical and advisory services. Furthermore, her team is responsible for solving critical situations and escalations in customer projects in the area of TM.

Dr. Christopher Sürie has worked for more than 18 years as a chief consultant in supply chain optimization and transportation management at SAP Deutschland SE & Co KG in Walldorf, Germany. In this position, he has been involved in numerous international customer projects, implementing both SAP APO and SAP TM and focusing on their planning capabilities and optimization engines in production and transportation. He worked as a solution architect in several SAP TM projects and taught numerous SAP TM customer trainings.

Ulrich Benz is an SAP supply chain management specialist with a focus on transportation management. As a consultant, he has managed and supported multinational IT transformation projects covering different industries over the past 11 years. In his current role, Ulrich advises customers on a holistic IT architecture and roadmap for SAP S/4HANA logistics projects to achieve their vision of an intelligent enterprise.

Lauterbach, Gottlieb, Helwig, Sürie, Benz

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