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This chapter puts you at the start of the action: the transportation request. You'll walk through integration scenarios for both SAP S/4HANA and SAP TM 9.6, order- and delivery-based transportation requirements, forwarding orders and quotations, and more.



“Transportation Requirements and Order Management”



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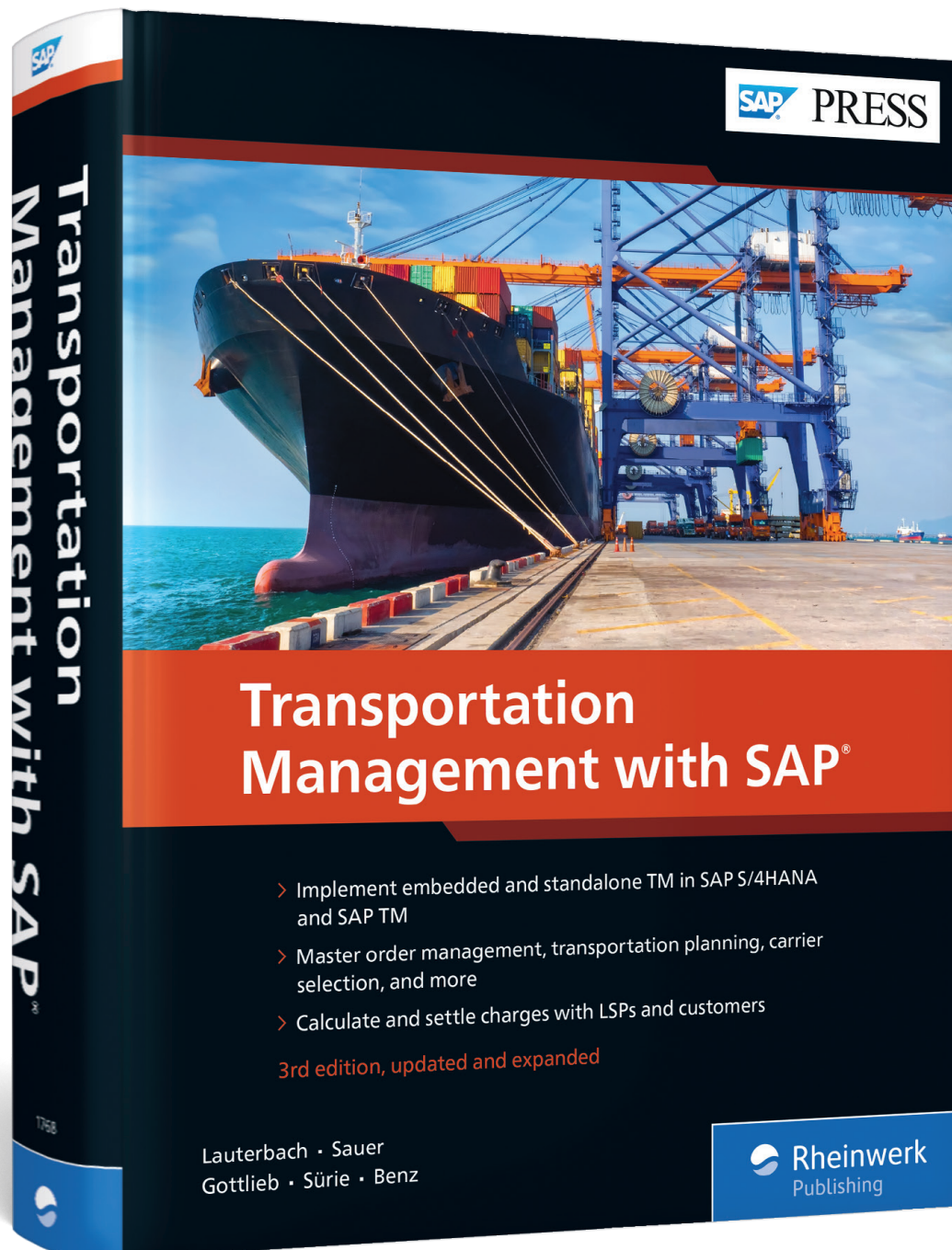
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Chapter 4

Transportation Requirements and Order Management

Regardless of whether you're looking from the perspective of a shipper, a logistics service provider, or a carrier, the transportation process starts with a request for transportation services. This chapter covers the different ways to start the process in SAP Transportation Management and how to record the requests in the system.

When we look at a very simplified, document-driven process flow in SAP Transportation Management (SAP TM), we see that not many documents are used to cover the transportation process. In fact, there are only three process steps (leaving out Transportation Charge Management for the moment) that cover the transportation planning process, as you can see in Figure 4.1. In SAP TM, the starting point of the process is always a *transportation request* (TRQ), followed by freight unit and transportation order.



Figure 4.1 Transportation Planning Process

SAP TM can be used to monitor and execute the transportation processes of many different industries, so transportation process approaches can vary significantly.

These approaches require different ways of starting the transportation process in the system. For example, for a shipper, transportation isn't the core business, so the focus is laid not on the ordering and execution of transportation services, but on manufacturing, materials management, and so on. The shipper will most likely use sales and distribution (SD) or materials management (MM) functionality to cover these processes. Because the transportation process isn't the core business, the leading system in the entire value-generating process should be the core SD or MM functionality

because it handles processes that produce the competitive advantage. The SAP TM functionality therefore *receives* information; it's not allowed to alter any information that is important for the manufacturing process.

To work within this scenario, SAP S/4HANA integrates the SD and/or MM functionality with the SAP TM functionality by sharing information across multiple documents. We cover this integration in Section 4.1.1.

However, if we look at the transportation process from the perspective of a logistics service provider (LSP) or carrier, the transportation process *is* the core process. Therefore, more emphasis needs to be placed on the information generated by the transportation process. Because the SD functionality doesn't provide detailed enough information for the LSP's and carrier's needs, the information needs to be generated in the SAP TM functionality, which is now the leading information (i.e., process-driving) functionality.

Because the SD integration doesn't deliver sufficient information for transportation as a core business, the TRQ needs to be created in the SAP TM functionality itself. So how can these different requirements be covered with only one document, as shown in Figure 4.1? The answer is that they can't. Although the main process flow remains the same, we need to take a closer look at the TRQ process step. When zooming in on this step in Figure 4.2, we can see that several documents are necessary.

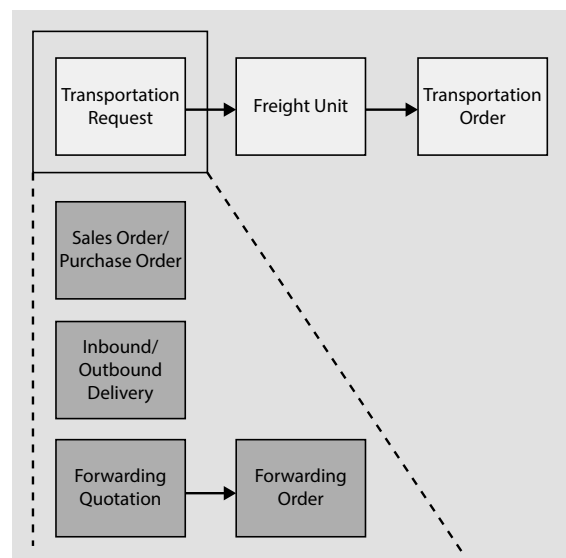


Figure 4.2 Transportation Request Documents

However, it's important to remember that all documents and the respective process variants lead to the common next step: freight unit building (FUB), which will be covered in Chapter 6.

Figure 4.2 shows the different TRQ documents. While the SD sales order (SO), MM purchase order (PO), and inbound and outbound deliveries cater to the shipper's transportation process variant, the forwarding quotation and forwarding order cover the LSP's and carrier's requirements.

Now, let's delve deeper into both process variants and focus on how these documents support the start of the transportation process.

4.1 Triggering the Transportation Management Process

In Chapter 1, we introduced the tight integration across different functionalities as one of the major benefits of SAP S/4HANA. In this section, we take an in-depth look at how that integration can be established. First, it must be said that you don't need to be an SD component expert to establish the integration into the SAP TM functionality, but it *is* advantageous to know a little bit about the standard SD and MM document flow.

Triggering the Process in SAP S/4HANA versus SAP TM 9.6

Section 4.1.1, Section 4.1.2, and Section 4.1.3 will deal with triggering the transportation management process if the SAP TM functionality resides in the same SAP S/4HANA system as the SD and MM functionality.

However, you can also run the SAP TM functionality in a separate SAP S/4HANA system or use SAP TM 9.6 and connect it to an SAP S/4HANA or SAP ERP system. This integration is described in Section 4.1.4. However, in that section, we take for granted you've understood the concepts described in Section 4.1.1 to Section 4.1.3 already.

SAP TM can integrate the following SD and MM documents:

- Sales orders (SOs)
- Purchase orders (POs)
- Stock transfer orders (STOs)
- Inbound deliveries

- Outbound deliveries
- Scheduling agreements (only in SAP TM 9.6 in connection with an SAP ERP system)

As always, you can't immediately begin with integrating orders or deliveries into SAP TM. First, you need to make sure the prerequisites for the integration are fulfilled. In general, there is only one major prerequisite: the master data. With the move of the SAP TM functionality into SAP S/4HANA, this prerequisite is almost met automatically. As described in Chapter 3, the master data defined to create documents in the SD and MM functionality is reused by the SAP TM functionality. However, some basic considerations should be made when defining master data in SAP S/4HANA in case this master data should also be used in the SAP TM functionality:

- **Locations and business partners**

When defining orders in the SD or MM functionality, we usually deal with business partners and shipping points or plants. However, the SAP TM functionality will require entities called *locations*. If you've dealt with SD and MM functionality in the past, you'll notice that the entity of a location isn't used in SD and MM. However, SAP S/4HANA now provides this kind of entity.

For SD and MM documents to trigger the transportation management process, the business partners, shipping points, and plants need to be translated to locations. This is done automatically by the SAP S/4HANA system when saving an order or delivery that is integrated with the SAP TM component. The system checks whether locations already exist for the shipping point and business partner of the order or delivery and, if not, creates them.

Alternatively, this can be done using program /SAPAPO/CREATE_LOCATION in Transaction SE38. The use of this program is a prerequisite to using SAP TM in SAP S/4HANA later on because the SD and MM functionality doesn't use locations but the SAP TM functionality requires them.

- **Organizational data**

In the transportation process, it's optional to assign a sales organization to a TRQ. However, if you want to represent the sales organization from the SO in the SAP TM TRQ, you need to transfer the organizational model to SAP TM as you can create an independent organizational model in SAP TM.

Integration of Master Data with the Same Names

Although shipping points and plants can use the same number in SD and MM, this becomes an issue when creating locations out of them because the locations require

a unique number. Therefore, a business add-in (BAI) can be implemented to avoid potential duplicates when creating locations for shipping points and plants. The most common way to overcome this issue is to employ prefixes to the location ID that identifies locations as shipping points (e.g., using the prefix SP) or plants (when using the prefix PL).

In Customizing, you can get to these BAI implementations by following the IMG menu path **Transportation Management • Business Add-Ins (BAIs) for Transportation Management • Master Data • Transportation Network • Location • BAI: Adaptation of Location Details and Descriptions**.

Customizing Paths in SAP S/4HANA

The IMG paths we depict in this section are for an SAP TM component hosted in an SAP S/4HANA system. The IMG paths for an SAP TM system based on SAP Net-Weaver, such as SAP TM 9.6, can differ but are largely similar. Where there are significant differences, we'll make a note in the text.

Furthermore, some *business functions* need to be activated for the SAP TM integration. The following business functions are required; some of them are specifically designed for the SAP TM integration:

- LOG_TM_ORD_INT
- LOG_TM_ORD_INT_II
- LOG_TM_ORD_INT_III
- LOG_TM_ORD_INT_IV
- LOG_TM_IV_INT
- SD_01
- OPS_ADVRETURNS_1

These business functions are necessary for the integration with the SAP TM functionality within the same SAP S/4HANA system. For integrating with SAP TM functionality outside of the same system or an SAP TM 9.6 system, see Section 4.1.4.

4.1.1 Sales Order Integration

The most commonly used type of integration between SD and SAP TM is the *SO integration*. With SO integration, shippers use the SAP TM functionality to organize the

transport of goods sold to the customer. In this section, we focus on how to trigger the transportation management process from a SO.

We activate the integration of SOs into the SAP TM functionality with the IMG path **Integration with Other SAP Components • Transportation Management • Logistics Integration • Activate Integration of Sales Documents**.

As you can see in Figure 4.3, the activation of a sales document always depends on three things:

- Sales organization plus distribution channel and division
- SO type
- Shipping condition (if not relevant, you can leave **Shp.Cond.** empty)

Change View "Sales Document Integration": Overview									
Sales Document Integration									
Sales org.	Distr. Chl	Division	Sales doc. type	Shp.Cond.	Control Key	TM No.	Log. Int. Profile	Control Key Description	
0001	01	01	LZ		0001			Transfer Sales Order, O. Delivery; Order Scheduling inactive	
0001	01	01	RAOR	01	RACC		RAIP	Logistics Integration Control Key	
0001	01	01	RARE	01	RACC		RAIP	Logistics Integration Control Key	
0001	02	01	ZOR	01	0001			Transfer Sales Order, O. Delivery; Order Scheduling inactive	

Figure 4.3 Integration of Sales Documents

The activation of the sales document is done via a *control key*, which defines which document types should be integrated. Figure 4.4 shows the standard control keys. Note that the control keys also define whether the SOs are integrated with the SAP TM functionality within the SAP S/4HANA system or are sent to an external SAP TM system (inside another SAP S/4HANA instance) or SAP TM 9.6. This is defined with the **Integration Mode** as shown in Figure 4.4. In this section, we'll only discuss the integration with the SAP TM functionality within the same SAP S/4HANA instance.

Control Key Parameters									
Ctrl Key	Integration Mode	SO to TM	PO to TM	Outbd Del.	Inbd Del.	SO Sched.	PO Conf.	Pln. Stat.	Control Key Description
0001	External TM System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Transfer Sales Order, O. Delivery; Order Scheduling inactive
0002	External TM System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transfer Sales Order; Order Scheduling inactive
0003	External TM System	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Transfer Sales Order, O. Delivery; Order Scheduling active
0051	I Internal TM Component	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Sales Order
0052	I Internal TM Component	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Sales Order, Outbound Delivery
0053	I Internal TM Component	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Outbound Delivery
0054	I Internal TM Component	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Purchase Order
0055	I Internal TM Component	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Purchase Order, Inbound Delivery
0056	I Internal TM Component	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Integrate Inbound Delivery

Figure 4.4 Control Keys for Order and Delivery Integration

When looking in detail at Figure 4.3, you'll notice that an SAP *TM number* can be entered in some cases and a *logistics integration profile* was maintained in other cases. The SAP TM number is used when integrating with external SAP TM systems, thus we'll come back to this in Section 4.1.4. The logistics integration profile as depicted in Figure 4.5 is crucial to the entire transportation management process because it consolidates all configuration that is required to trigger the transportation management process, such as the freight unit building rule (FUBR) or the decision regarding whether to plan on requested or confirmed quantities.

Logistics Integration Profile									
Profile	Description	Freight Unit Building Rule	FUB Rule Condition	Autom. FU Building Plan on Requested or Confirmed ...	Actual Qty	Incoterm Loc.	Stage Bldng		
DIL1	DI1 Log. Profile: Split per 100 kg		DI_FUBR_COND	<input checked="" type="checkbox"/>	01 Plan on Requested Quan...		<input type="checkbox"/>	Two Active Stages - T...	
HD50	HP Parcel	HP_PARCEL		<input checked="" type="checkbox"/>	01 Plan on Requested Quan...		<input type="checkbox"/>	Two Active Stages - T...	
HKP	HKP Split per 100 kg	CSI-FUB		<input checked="" type="checkbox"/>	01 Plan on Requested Quan...		<input type="checkbox"/>	Two Active Stages - T...	
LJLI	Johnny's Logistics Integration P...	ZLJ_FUBR		<input checked="" type="checkbox"/>	01 Plan on Requested Quan...		<input type="checkbox"/>	Two Active Stages - T...	
MEU1	MEU Log. Profile: Estimate Pack...	MEU_FUBR_PB		<input checked="" type="checkbox"/>	01 Plan on Requested Quan...		<input type="checkbox"/>	Two Active Stages - T...	

Figure 4.5 Logistics Integration Profile

When integrating an SD SO with the SAP TM functionality, a freight unit is created directly from the SO. The logistics integration profile, which we assigned to a SO document type and—optionally—the sales organization and shipping condition in Figure 4.3 defined how the freight unit was built. We'll discuss freight units in further detail in Chapter 6, Section 6.2.

In Figure 4.5, you can see a setting defining the system behavior when dealing with incoterm locations. Usually, the freight unit created out of the order or delivery would only contain one stage, from the source to destination. Potential intermediate stops would be determined during the planning process. However, the incoterm location defined in the order or delivery can have an impact on the routing of the freight unit.

In Figure 4.5, the **Incoterm Loc. Stage Bldng** field defines how the incoterm location of the order should be interpreted.

Depending on the Customizing entry you've chosen, two stages are created in the freight unit. As shown in Figure 4.6, stage 1, represented by the bold line, leads from the source location to the incoterm location. Stage 2, shown as the dashed line, leads from the incoterm location to the destination location.

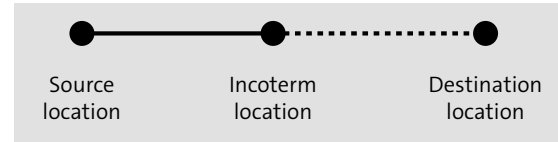


Figure 4.6 Stage Split on Incoterm Location

Depending on the scenario, the stage that is relevant for the shipper's planning can be stage 1 or stage 2. Remember, a freight unit represents an SAP S/4HANA SO as well as an SAP S/4HANA PO and an STO. This means that freight units can be used for both outbound transportation processes and inbound transportation processes.

Therefore, the Customizing entries apply to both outbound and inbound processes. With this Customizing entry, you can define whether the shipper is responsible for stage 1 or stage 2. The Customizing entry also defines whether the stage the shipper isn't responsible for should be created at all. If it should be created, it will be created as a *statistical stage*, meaning it has no influence on the freight unit and therefore on the planning process steps.

If you've integrated an order that represents an internal transfer of goods, such as with an STO, and the shipper is nevertheless responsible for the entire transportation, you can also choose to create two relevant stages. If no incoterm location is entered in the order, no stage splitting is done during FUB.

In orders, you can assign multiple customers and creditors to the order using different partner functions. In the freight unit, you can see on the **Business Partners** tab that the documents in SAP TM also apply to the participation of different business partners in the transportation process.

However, you need to map the defined partner functions of the order to the *business partner roles*. You can define the partner functions in Customizing by following the IMG menu path **Transportation Management • Master Data • Business Partners • Define Partner Functions**. In a standard SAP S/4HANA system, the most common party roles are already predefined. The business partner roles are defined in the master data record of the business partner. This defines what roles the business partner can assume (e.g., vendor, driver, carrier, etc.). To use this information in the SAP TM documents, the business partner role needs to be translated into a partner function. This can be defined in Customizing using the IMG path **Transportation Management • Master Data • Assign BP Roles to Partner Functions**.

If you can't see any freight unit being created or updated in SAP TM in SAP S/4HANA, you can check if an output was triggered. To do so, access the SO you've just saved, and then go to the output overview by following the menu path **Extras • Output • Header**. If you see an output of type TRSO with a green traffic light, the output message was created successfully.

4.1.2 Integration of Materials Management Orders

The integration of MM orders is, in many regards, similar to the integration of SD documents. The most important Customizing activity in SAP S/4HANA for the transfer of MM documents is the specification of the control keys and logistics integration profiles, as just described in the previous section.

The integration of purchasing documents can be activated in Customizing using the IMG path **Integration with Other SAP Components • Transportation Management • Logistics Integration • Activate Integration of Purchasing Documents**. Similar to the activation of sales documents, the logistics integration profile and control key define how the integration with the SAP TM functionality is processed.

4.1.3 Integration Scenarios

If the SAP TM system is the dedicated system leading the transportation process, you would probably set up the integration scenario as shown in Figure 4.7.

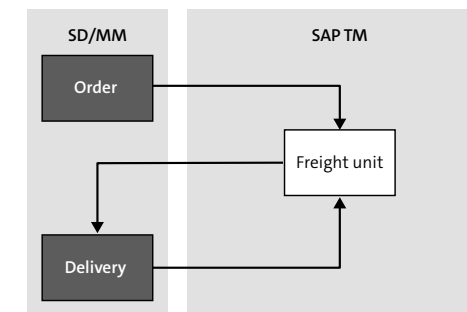


Figure 4.7 Order Integration with Delivery Proposal

The order is created in SD or MM and then integrated into the SAP TM functionality. In SAP TM, the freight units are created automatically. Now the process continues in SAP TM. The freight units are planned on freight orders according to the delivery dates, service levels, incoterms, and so on that were defined on the orders.

After the planning of the freight unit is done, we know a more precise delivery date of the goods that were ordered. This information can then be played back to SD or MM, where delivery documents are created accordingly. This process step is called the *delivery proposal*.

Delivery proposals are used to propagate planning information from SAP TM to SD or MM, where deliveries are then created. The process is called delivery proposal and not delivery creation because, in the end, SD and MM decide how deliveries should be created. The information for the delivery proposal derives from the freight units.

After you've finished planning the freight units, follow the menu path **Logistics Integration • Create Deliveries**. When you enter a selection profile (preferably the same one you've used for planning), your freight units are displayed. Select the freight units you want to create delivery proposals for, and choose **Create Delivery Proposals**. You can review the proposals at the bottom of the screen and then send the proposals to SD or MM by clicking **Create Deliveries**.

The delivery proposals are created using settings and information from the freight units. While the delivery dates are collected from the freight order that is now assigned to the freight units, the quantities are taken from the freight units themselves. SAP TM also tries to consolidate several freight units into one delivery proposal, if possible, for example when they are planned onto the same freight order. However, the consolidation is done only if the order allows order consolidation.

Speaking of quantities, it's also possible to create delivery proposals based on the quantities actually picked up by the carrier. This scenario is especially important for bulk transportation and only applicable if delivery creation can be done only after execution has already started. In this scenario, the freight orders are created based on the freight units and sent to the carrier, and the carrier picks up the goods. As part of the execution process, which we delve deeper into in Chapter 8, Section 8.1, the carrier now reports the actual weight and volume of the goods picked up.

When the **Actual Qty** checkmark is selected in the logistics integration profile (refer to Figure 4.5), the delivery proposal is created based on the actual quantity reported by the carrier and not based on the planned quantity of the freight unit.

After the delivery proposals are released, delivery documents are created. SD and MM might split one SAP TM-based delivery proposal by creating several deliveries, possibly due to additional split criteria maintained in the order and delivery document type Customizing. However, no data (e.g., dates or quantities sent from SAP TM) is changed, and separate delivery proposals created in SAP TM aren't consolidated into one delivery in SD or MM.

The delivery proposal in SAP TM also takes into account that SD and MM consume order schedule lines in chronological order. Therefore, the SAP TM functionality proposes a delivery for a schedule line of an order item only if all schedule lines of the same order item with earlier delivery dates already have an assigned delivery.

In SAP TM, you can also define how delivery proposals should be created. These settings are consolidated in a *delivery profile*. Although the delivery profile is optional, it makes sense to create a profile to reuse the same settings every time you want to create delivery proposals. You can define delivery profiles via the SAP Fiori launchpad menu path **Profiles and Settings • Create Delivery Profile**. The settings you can define here concern how and if freight units can be consolidated into one delivery proposal and which freight units may not be consolidated.

One option of the delivery profile is to “fix” the planning result for freight units and freight orders by selecting the **Fix Planning Results** checkbox, which is shown in Figure 4.8. Fixing the planning means after the planning results are transferred via the delivery proposals, they can no longer be changed in SAP TM. This is a good strategy because you might continue processing the transferred data in the orders and deliveries, as well. You'll learn more about fixing freight orders in Chapter 6. You can define how the delivery proposals should be created (e.g., one proposal per item, one proposal per freight unit, etc.).

Figure 4.8 Delivery Profile

The last feature of delivery profiles that we want to mention is incompatibilities, which we introduced in Chapter 2. Incompatibilities in delivery profiles can be used to prevent certain freight units or items from being consolidated into one delivery proposal.

Delivery profiles are optional and especially unnecessary if you've already planned the freight units; in this case, SAP TM considers the freight units consolidated on

freight orders. Settings such as incompatibilities are already taken into consideration during the planning process. However, if you want to create delivery proposals *before* the freight units are planned, you can do this as well. In this case, the settings in the delivery profile are crucial to help SAP TM decide which freight units should be consolidated.

In a daily business, you probably won't manually create delivery proposals every time you've finished planning some freight units. Therefore, background report /SCMTMS/DLV_BATCH was created for you to run as a batch job. You need to define a selection profile by selecting your freight units or freight orders; the background report does exactly what you can do interactively in the SAP Fiori launchpad (skipping your review, of course).

After the delivery proposals have been sent, deliveries are created. SAP TM receives information about the status of the delivery creation. The delivery type being used for the delivery creation is the one defined in the SD or MM setup. If you've activated the transfer of this delivery type to SAP TM as well, then not only is a short message about the delivery creation transferred to SAP TM, but even more happens—the delivery is integrated, and the freight unit, initially created for the order, is updated with information from the delivery. You might be wondering what we can do with the delivery information now because the planning process has already happened. Recall that SD or MM might create deliveries slightly differently from the delivery proposal; this information is then represented in the updated freight unit.

If you look into the document flow of the freight unit now, you can see not only the SAP TM documents but also the order and delivery documents. What you'll also notice is that the order is now a predecessor document of the delivery, and the delivery is again a predecessor document of the freight unit (even though the freight unit was created before the delivery).

In the integration scenario described previously, SAP TM was leading the planning process; it decided not only how the planning should be done, but also whether and how the items of the order were split or consolidated. In some cases, it makes sense to leave that decision in SD or MM. Because the freight unit can be created from the order and the delivery, you can decide whether to leave out the integration of either one.

Figure 4.9 shows how the integration scenario works if SD or MM is still the leading system for delivery creation and item order consolidation. In this case, the order would not trigger the transportation management process and thus the freight unit creation. Only after the delivery is created for the order should freight units be created.

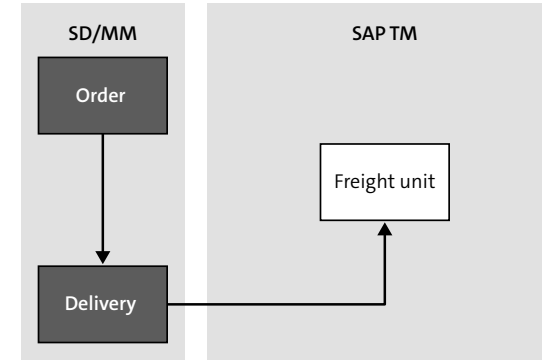


Figure 4.9 Delivery Integration without Delivery Proposals

Those freight units now better represent the splits and consolidations that have been done previously in SD or MM. Planning can now start, although the planning results don't affect the delivery dates of the delivery anymore. Therefore, make sure the dates in the freight unit are considered as hard constraints during planning. (See Chapter 6 for more information about soft and hard constraints in planning.)

So far in this section, we've only delved into the architectural setup of SAP TM as part of the same SAP S/4HANA system instance as the SD and MM functionality. This setup is called *internal SAP TM component integration*. As you can see in Figure 4.10 ❶, the SAP TM component can directly communicate with the SD and MM components without the need of any cross-system messages.

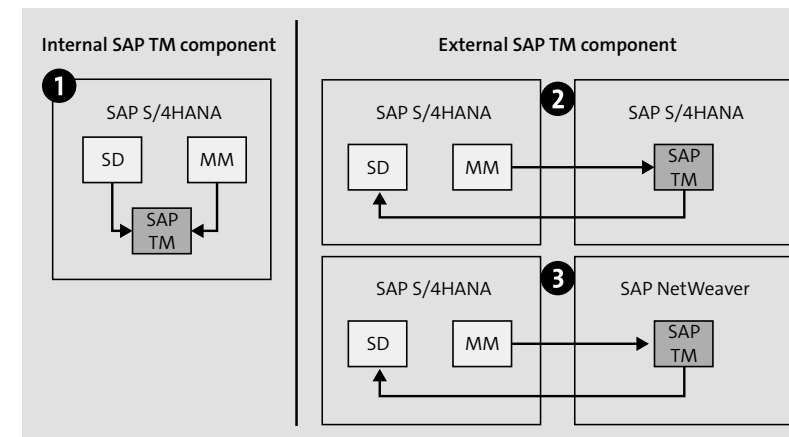


Figure 4.10 Architectural Integration Scenarios

However, there are also cases where SAP TM isn't part of the same system instance as the SD or MM components. This case is called *external SAP TM system integration*. The external SAP TM system integration can be subdivided into two scenarios. Scenario ② in Figure 4.10 describes the case of several SAP S/4HANA systems being run in parallel, of which one hosts the SAP TM component. This makes sense in large-scale companies that require multiple SAP S/4HANA systems but still want to use a centralized transportation management system. The functionality and user experience in this scenario is exactly the same as in scenario ①, only the integration path is different.

In scenario ③, SAP S/4HANA communicates with an SAP TM system that isn't based on the SAP S/4HANA stack (refer to Chapter 2 for more details on the technical foundation of the SAP TM component) but on an SAP NetWeaver stack. This could be an SAP TM 9.6 system that hosts the same functionality as the SAP TM component in SAP S/4HANA or an older release of SAP TM.

When using an external SAP TM system integration, we can no longer create the freight units directly from the orders and deliveries. In this case, we need an intermediary document in SAP TM to reflect the information passed from the order and/or delivery. The document representing the order's information in SAP TM is called *order-based transportation requirement* (OTR) and is a copy of the data maintained in the SO or PO (or scheduling agreement).

The delivery documents is represented in SAP TM by the *delivery-based transportation requirement* (DTR). Both OTR and DTR are read-only documents in SAP TM as they represent the order's and delivery's information in the SAP S/4HANA system that is the information leading system. Any change in order quantity therefore has to be maintained in the order or delivery and propagated to the OTR and DTR document. In the following section, we'll now take a more detailed look at the OTR and DTR document and how the overall process flow differs with these documents in place.

4.1.4 Order-Based and Delivery-Based Transportation Requirements

Let's assume we're using an external SAP TM component, either in a separate (stand-alone) instance of SAP S/4HANA to the SD and MM component or SAP TM 9.6. After an SO is created, a web service will send information from SAP S/4HANA to SAP TM. After the web service is successfully executed, a document is created in the SAP TM

system; this is the OTR, which represents the SO data generated in SAP S/4HANA and carries all information relevant for the transportation process.

Orders and Deliveries Originating in SAP ERP

This section mainly covers the process of how data is sent from SD and MM functionality to SAP TM functionality that isn't part of the same SAP S/4HANA instance as SD and MM. We'll discuss the integration with the example of using the SD and MM functionality in SAP S/4HANA. However, the information described in this section also holds true when using SD and MM functionality in an SAP ERP system (IMG paths might be slightly different in an SAP ERP system than described in this section).

In the following sections, we'll look at the technology and configuration involved to transfer information to standalone SAP TM in SAP S/4HANA or SAP TM 9.6 and how it's processed, starting with the integration of order documents and covering delivery documents later on.

Order Documents

Recall Figure 4.3 in which we activated the integration of sales documents. Remember that we mentioned the SAP TM number that can be maintained in this Customizing activity, which is only relevant when communicating with an external SAP TM component. You'll notice when you fill in this field that no help is available. The purpose of this field is to link one SAP S/4HANA system to several SAP TM systems. If several SAP TM systems are linked to one SAP S/4HANA system, and the SAP TM number is filled, SAP S/4HANA decides to which SAP TM system the order should be sent, based on the entries made in the table shown previously in Figure 4.3. However, you can enter anything you like here. The "navigation" of which logical system the message is routed to is done entirely in SAP Process Integration, where the string sent from SAP S/4HANA is interpreted and translated into a logical system. If you encounter such a situation, consult an SAP Process Integration expert to ensure that the routing is performed correctly.

In contrast to the direct creation of freight units upon saving the SO or PO, a message needs to be created that sends information from SAP S/4HANA to SAP TM. Therefore, the SO needs to create an output.

SD has a feature called *output determination* that is used to control the output—meaning follow-up activities, messages, and documents—for sales, shipping, transportation, and billing. It's used to exchange information with external and internal

systems that represent business partners when looking at it from a process perspective.

Output determination can automatically propose output for an SD document using the condition technique that we already know from SAP ERP (not to be mistaken with Business Rules Framework plus [BRF+] conditions used in the SAP TM functionality).

As you can see in Figure 4.11, the core of the output determination is the output determination procedure, which consists of steps that are supposed to be executed in the given order. Each step represents a condition of a defined condition type; this condition determines whether an output of the defined output type should be triggered.

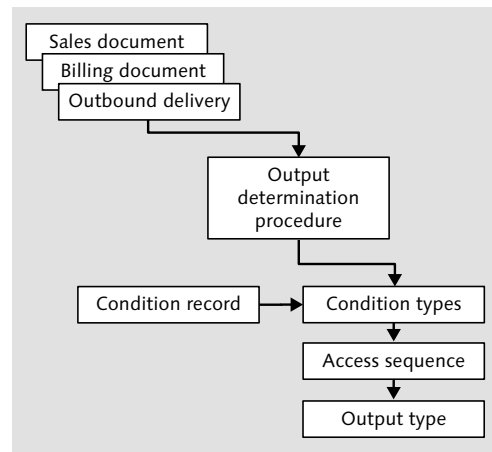


Figure 4.11 Output Determination in SD

The *condition type* is linked to the output type and can contain condition records that define when an output should be triggered. In terms of structure, a *condition record* is a table (like the decision table in conditions used in the SAP TM functionality) that is used to find a value. However, in this condition technique, a condition type can contain several condition records of different structures (e.g., one condition record where the input data is sales organization and customer, and a second condition record where the input data is order type).

With the *access sequence*, you can define in which order the condition records should be processed. Because the condition type is linked to the output type, you don't need to define which output needs to be triggered. This is implicitly done in the output determination procedure, where you define a condition type.

Recall that the output type is linked to the condition type, meaning that after the condition type finds a suitable result, the output of this output type is triggered. In SAP S/4HANA, several output types are available that represent print output, electronic data interchange (EDI) messages, application-to-application (A2A) messages, email, and so on. Some of these are shown in Figure 4.12.

For the integration of the SO, you need to create a new output type (output type TRSO). To do this in your SAP S/4HANA system, follow the IMG menu path **Sales and Distribution • Basic Functions • Output Determination • Output Determination • Output Determination Using the Condition Technique • Maintain Output Determination for Sales Documents • Maintain Output Types**.

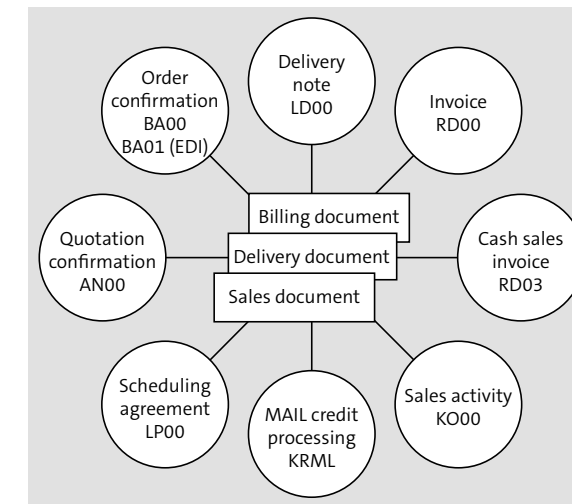


Figure 4.12 Output Types in SAP S/4HANA SD

To maintain the output type TRSO, you need to define general data, processing routines, and partner functions, as shown on Figure 4.13.

After the output type is configured, you can add it to the output determination procedure by following the IMG menu path **Sales and Distribution • Basic Functions • Output Determination • Output Determination • Output Determination Using the Condition Technique • Maintain Output Determination for Sales Documents • Maintain Output Determination Procedure**. Simply add a new step with condition type TRSO and requirement 27 to procedure V10000.

Medium	Program	FORM routine
Special function	OPS_SE_SOC_SEND_MES...	PROCESS

Figure 4.13 Output Type TRSO

Assignment of Output Determination Procedures

This chapter assumes use of the standard output determination procedure and the standard SO type for integration. However, it's clear that this might not always be the case. If you're using a different SO type, you can assign an output determination procedure to the order type by following the IMG menu path **Sales and Distribution • Basic Functions • Output Determination • Output Determination • Output Determination Using the Condition Technique • Maintain Output Determination for Sales Documents • Assign Output Determination Procedures**.

After you've configured these SAP S/4HANA settings (for more details on the configuration steps, consult the guide "Basic Settings and Integration for SAP ERP and SAP S/4HANA" found in the SAP Help Portal for SAP TM), a message according to output type TRSO is always sent when a SO has been created, updated, or deleted.

In contrast to SD documents, MM documents (e.g., POs) use the workflow technology known from previous SAP ERP releases for processing the output. Therefore, error handling as described for the SO isn't possible for POs, STOs, or inbound deliveries.

The OTR is the corresponding SAP TM document that contains all transportation-relevant information from the SAP S/4HANA orders. It can represent four things:

- SOs
- POs
- STOs
- Scheduling agreements

For SAP TM, it doesn't matter whether the predecessor document was an SO, STO, PO, or scheduling agreement. The OTR represents all of these SAP S/4HANA document types.

Remember from Chapter 2, Section 2.3.1, that there is a singleton condition that is used to define the OTR type of integration SAP S/4HANA orders. You can create and define a condition of the condition type /SCMTMS/OTR_TYPE to differentiate OTRs by type. Among other information, you can also use the SO type used in SAP S/4HANA for the condition definition. There is a predefined data access definition that you can use for this. If the condition doesn't find a result, the default type is used. The default type is defined in Customizing for OTR types with a corresponding flag.

Let's take a close look at the OTR document itself. You'll notice that, compared to other SAP TM documents, the amount of information is relatively low. This is because the only information stored on the OTR is transferred from SAP S/4HANA and is crucial for the transportation process.

The most important difference from other documents in SAP TM is that there are no action buttons on the OTR. The document is read only, with no changes allowed because in this scenario, the SAP S/4HANA system is the information leading system, so any updates should come from SAP S/4HANA.

On the **General Data** tab, you'll see the most important information, such as the OTR document type and the total weight and volume of the freight. There is also a field for a sales organization. Recall that you can integrate your sales organization from SAP S/4HANA and put it on the OTR, but it might not serve for the purposes of SAP TM.

Sales Organization in SAP S/4HANA and SAP TM

When first looking at the empty **Sales Organization** field on the OTR document, you might find it strange that the sales organization used in the SAP S/4HANA SO wasn't moved over to the OTR.

However, in most cases, this is correct. Because SAP TM covers the transportation process, the sales organization in this case isn't the organizational unit selling the

products anymore; the sales organization in the OTR is the organizational unit selling the *transportation services*. In most cases, these are different organizational units, if the shipper even sells the transportation of products at all.

On the bottom of the screen displaying the OTR document, you can see the information area for the items. Because one OTR represents one SO, all items of the SO are displayed and listed here. Here you can also find the delivery date that was assigned to the items on the SAP S/4HANA SO. The delivery date in SAP S/4HANA can be defined in many different ways, such as using a connected available-to-promise (ATP) check or simple route determination in SAP S/4HANA. No matter which way you determine the delivery date in SAP S/4HANA, it's a date the SAP TM system will work with.

On the **Locations and Dates/Times** tab, you can see the locations of the entire transportation. The source location is the shipping point or plant for which the SO was created. The destination location is the location that was created from the customer transferred from SAP S/4HANA. Note that the destination location isn't for the sold-to party maintained in the SO, but for the ship-to party.

You'll notice that in many cases the source and/or destination locations are empty. This is because the source and destination location can vary from item to item, depending on the storage location or shipping point assigned to the items of the SAP S/4HANA order. During FUB, several freight units are created for the OTR because the transportation locations of the items differ. If the source location on the header level of the OTR document is empty, you can assume that it's created for an SAP S/4HANA SO; if the destination location is empty, you can assume it's created for an SAP S/4HANA PO.

In Section 4.2.1, we describe how the transportation order clerk can manually pre-define the routing of the transportation requirements by adding stages to the forwarding order. With OTRs, there is no such functionality. The transportation path is simply defined from shipping point to customer for an SO, meaning that the OTR contains only one stage. (We describe one exception concerning incoterm locations later.)

After FUB, the freight unit stage can be split into several stages if the transportation process requires this. This process represents the difference between the *ordered route* and the *actual route*. As its name suggests, the ordered route is the routing that was ordered by the customer (for an integrated SAP S/4HANA order, simply a direct

transportation path). The actual route, on the other hand, is the route that was actually used. If the SAP S/4HANA SO was defined from a shipping point in Germany to a customer in the United States, the ordered route is simply from Germany to the United States. However, the actual route looks different—for example, one stage is from Germany to a port in the Netherlands, one stage is from the Dutch port to an American port, and one stage is from the American port to the customer. Therefore, although the ordered route differs from the actual route, the actual route isn't reflected on the OTR; the OTR represents only the transportation *requirement* and therefore the ordered route.

When looking at the Customizing of OTR types as depicted in Figure 4.14, you'll see that, compared to other document types in SAP TM, there isn't much to customize here. You can access the OTR type Customizing by following the IMG menu path **Transportation Management • Integration • Logistics Integration • External SAP TM System Integration • Order-Based Transportation Requirement • Define Order-Based Transportation Requirement Types**.

Rather than going into every detail of the type Customizing, we mention only the most important topics here. Because you can't do anything with the OTR itself, it's mandatory to create freight units to start planning. While we go into detail of FUB later in this book, it's still worth mentioning that we have some options in this area.

The **Automatic Freight Unit Building** checkbox defines whether a freight unit should be built automatically after the OTR is created. This makes sense in many use cases. If you consider consolidation of SOs, however, you might not want to create freight units directly after creation, but instead only trigger FUB via a batch job so you can consolidate several OTRs to one freight unit.

Regardless of whether you want to create freight units automatically or using a batch job, you need to define how the freight units should be created. To do so, you define a FUBR in Customizing. If the method of creating freight units depends on some values of the OTR, you might even want to use a condition to find the right FUBR.

The default units of measurement can be used to have consistent units of measurement in the SAP TM system. If the integrated material master contains unit of measurement conversions, the default units are used on the OTR's header information. The item information will keep the units of measurement from the original SAP S/4HANA order.

Change View "Order-Based Transportation Requirement Types": Details

OTR Type Order based Transportation Requirement

Default Type

Number Range Settings

Number Range Interval

Process Control / Business Object Mode

BW Relevance Automatic Freight Unit Building

Enable Approval Workflow

Track Changes Actual Quantity

Enable EM Integration Event Manager

Dynamic Determination of Output EM Web Interface Transaction

Output Profile

Add. Output Profile

Dangerous Goods Profile

Text Schema Text Type

Propagate Changes

Incoterm Loc. Stage Bldg

Stage Profile Stage Profile Cond.

Residence Period

Residence Time after Completion

Residence Time after Cancellation

Charge Calculation and Settlement Document Settings

Enable Internal Charge Calculation Automatic Internal Charge Calculation

Enable Internal Settlement Default ISD Type

Default Values

Default Weight UoM Default Volume UoM

Plan on Req/Cnf Qty

Planning Profile

Freight Unit Building Rule

FU Building Rule Condition

Figure 4.14 OTR Type Customizing

Charge Calculation on OTRs

Recall that there are no buttons or actions a user can use on the OTR, which means that no charge calculation can be executed for the OTR. The reason for this lies in the intended process. Because OTRs are used in the shipper's process, the SAP S/4HANA system is the leading system—for potential surcharges for transportation services, too. Charge calculation in SAP TM is used to calculate selling rates for transportation services and is therefore used only on forwarding orders that are used in the LSP's or carrier's processes. Therefore, the surcharges for transportation must already be imposed on the SAP S/4HANA SO.

The **General Data** tab includes a user interface (UI) section about the incoterms and incoterm location. The incoterm and the corresponding location are assigned to the order in SAP S/4HANA, and that information is transferred to the SAP TM system. The same logic about stage splitting based on incoterm locations that was already discussed in Section 4.1.1 also applies to OTRs.

To recognize the incoterms in SAP TM, you need to maintain them in SAP Supply Chain Management (SAP SCM) Basis Customizing via the IMG menu path **Transportation Management • Basic Functions • General Settings • Incoterms • Define Incoterms**. In this Customizing activity, you can also define whether the incoterm requires an incoterm location.

On the OTR, you'll find three important statuses: the planning status, the execution status, and the consumption status. The planning status shows whether freight units have been created (if so, the planning status is **In Planning**; if not, the planning status is **New**). If the freight units are not only created but also already planned on freight orders, then the planning status changes to **Planned**. If the freight unit is planned on freight orders, the execution status of the OTR shows whether the freight order is already executed, in execution, or not yet executed.

The consumption status of the OTR shows whether DTRs were already created and have *consumed* the freight units of the OTR. Figure 4.15 depicts the integration scenario with both order and delivery being sent from SAP S/4HANA to the SAP TM system. In this case, the freight unit is initially created based on the OTR after the order is sent to the SAP TM system.

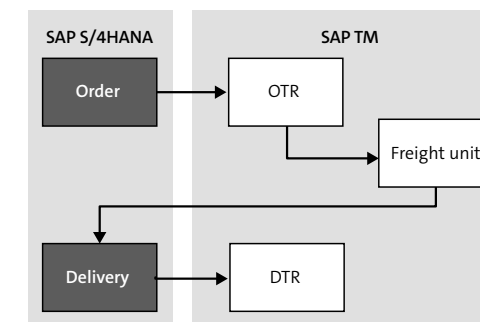


Figure 4.15 Integration Scenario with External SAP TM Component and Freight Unit Consumption

At a later stage, when the delivery is created (either via delivery proposal or internally within the SAP S/4HANA system), the DTR is created for the S/4HANA delivery. The

freight unit is then reassigned to the most current S/4HANA document, which is the DTR representing the delivery. We call this process *freight unit consumption* because the document flow is rearranged, and the freight unit is no longer directly associated with the OTR.

Not only statuses but also blocks are kept in sync between the SAP S/4HANA order and the OTR in SAP TM. The mapping of block reasons is done purely on the ID of the block reason codes, meaning that the reason codes in SAP S/4HANA and SAP TM need to be the same.

The OTR document can define two kinds of blocks: a planning block and an execution block. While the planner is still able to plan a freight unit of an OTR that has an execution block defined, the planning block doesn't even allow the planning of the freight unit. When you use the Customizing path **Transportation Management • Integration • Logistics Integration • External SAP TM System Integration • Define Blocking of Transportation Requirements • Define Blocks Based on Delivery Blocks**, you can define whether a block set on the SAP S/4HANA order should automatically set a planning and/or execution block on the corresponding OTR document.

The block can be defined on the SAP S/4HANA order on the header level or each schedule line. Therefore, the blocks on the OTR document are also set on either the header level (i.e., for all items of the OTR) or only a particular item.

If you want to propagate more information from the SAP S/4HANA order to the OTR in SAP TM, you can do this in the **Notes** tab on the OTR document. Because the OTR can't be edited, the notes of the OTR need to come from the SAP S/4HANA order.

Delivery Documents

Recall that both SAP S/4HANA orders and SAP S/4HANA deliveries can be integrated into SAP TM. The integration setup on the SAP S/4HANA side is very close to the integration setup of SAP S/4HANA orders, so we won't go into details about the deliveries again. Make sure you activate the transfer of the delivery documents in the IMG menu path **Integration with Other SAP Components • Transportation Management • Logistics Integration • Activate Integration of Delivery Documents**. Notice that this IMG activity looks very similar to what we've seen when activating the transfer of SAP S/4HANA orders.

Also on the SAP TM side, the technical integration is almost the same as with SAP S/4HANA orders. Another TRQ document is created, which is the DTR. Technically, there is no difference between the OTR and the DTR; they are both instances of the

business object /SCMTMS/TRQ and are differentiated only by different document names.

You can also see the similarity between the OTR and DTR when you compare the document type Customizing activities of both business objects. The DTR type Customizing contains exactly the same settings as the OTR, including settings concerning FUB, stage splits based on incoterm locations, and so on.

The DTR is the business document representation of the SAP S/4HANA deliveries, as the OTR was for SAP S/4HANA orders. When you're setting up the integration scenario between SAP S/4HANA and SAP TM, you have different options for which documents you want to integrate and how the interaction of SAP S/4HANA and SAP TM documents should work. The main issue to determine is which system should be the leading system for the transportation process. The correct choice depends on what you want to achieve with the SAP S/4HANA integration.

4.1.5 Integration of Scheduling Agreements in SAP TM 9.6

Scheduling agreements describe recurring deliveries to a customer or to a company's own plant. We can therefore also differentiate between SD scheduling agreements, which represent recurring deliveries to customers, and MM scheduling agreements, which describe recurring deliveries to our plants.

Availability in SAP S/4HANA 1809

The creation of freight units out of scheduling agreements isn't available in SAP S/4HANA 1809. When using SAP TM 9.6, however, OTR documents can be created from the scheduling agreements when using an SAP ERP system instead of an SAP S/4HANA system. This section will therefore only describe the integration between SAP ERP and SAP TM 9.6 because it's the only combination available at the time of writing (winter 2018).

The integration of scheduling agreements uses the same configuration on both sides as the integration on SO documents we discussed in Section 4.1.4. The activation of scheduling agreement transfer is done using the activation table for sales documents depicted in Figure 4.3, for both MM scheduling agreements and SD scheduling agreements.

When a scheduling agreement is sent to SAP TM, it creates one OTR document per scheduling agreement with multiple item lines—one per delivery of the scheduling

agreement because the delivery quantity and date differ per item line of the scheduling agreement.

Because the scheduling agreement can be updated or extended in SD or MM or is valid for a very long time, instead of transferring all deliveries of the scheduling agreement to SAP TM, we can consider transferring only the ones in the near future. To do so, you can use IMG path **Integration with Other SAP Components • Transportation Management • Logistics Integration • Define Settings for Sales Scheduling Agreements Integration** (or **Define Settings for MM Scheduling Agreements Integration**). In this Customizing activity, you can define the time horizon that should be transferred to SAP TM. For MM scheduling agreements, you can also define whether just-in-time or forecast delivery schedules should be transferred. (It can only be either just-in-time or forecast, never both.) Because this Customizing activity is optional, just-in-time delivery schedules will be transferred only if nothing was defined.

If you decide to transfer only a certain time horizon, you need to make sure to schedule batch jobs in SAP ERP that transfer the new delivery lines to SAP TM that become relevant in the course of time. There are two batch jobs available:

- TMINT_SAGSD_TRANSFER (for SD scheduling agreements)
- TMINT_SAGMM_TRANSFER (for MM scheduling agreements)

4.2 Forwarding Orders and Forwarding Quotations

In Section 4.1, we talked extensively about the integration of orders and deliveries into the SAP TM functionality. The integration of those documents was introduced to SAP TM with release 8.0 (at that time only in the way described in Section 4.1.4), which was meant to be the release focusing on the shipper's business.

As you've learned so far in this chapter, integrated TRQs only serve the purpose of transferring the transportation-relevant information of orders and deliveries to the SAP TM functionality to execute the transportation process there. SOs and POs in SD and MM aren't sophisticated enough to serve as the TRQ document for LSPs or carriers. In these businesses, more information is required than simply what goods need to be transported from where to where on what date. These businesses often add much more information to the TRQ when transportation service-level codes, Transportation Charge Management, and consolidation come into play. Simply stated, transportation is the core business of LSPs and carriers, which explains why more emphasis is put on the transportation information.

Like SOs, POs, and deliveries, the forwarding orders and quotations generally act as the beginning of the operational process in transportation management. The issuing of a forwarding order creates a business transaction between two companies, or—in more sophisticated scenarios—even among multiple companies.

In this following, we'll discuss the details of the forwarding order document in Section 4.2.1, including what information it can contain and how to process that information. Furthermore, we'll look at quoting processes in Section 4.2.2 and Section 4.2.3 before delving into the functionality that helps users create recurring customer requests more quickly in Section 4.2.4.

4.2.1 Forwarding Order Document

The forwarding order is often called the “typewriter” of SAP TM because most of the data entered into the document is generated at the point of document creation. However, this term undervalues the forwarding order for the transportation process. The forwarding order is the only document in which you can define the data that is used for the entire transportation process of planning, Transportation Charge Management, execution, and so on.

The central business object behind the forwarding order is the TRQ object, which we first discussed in the context of OTRs and DTRs in Section 4.1.4. The forwarding order makes use of the same object used by OTRs and DTRs, which means that comparable data is written into the same database areas.

The forwarding order is the central order business object in SAP TM, and it helps you perform all of the important order-taking processing steps in order management. A forwarding order can be created in different ways:

- **Manual creation**
This is the most common way of creating TRQs in SAP TM. A customer relations manager of the LSP or carrier talks to the customer and enters all data manually in the SAP Fiori UI.
- **Incoming EDI message**
Many big LSPs and carrier companies have been using EDI communication for a long time. Therefore, it's only logical that they also prefer EDI communication for the creation of forwarding orders in their systems. SAP TM makes this functionality possible by providing business-to-business (B2B) web services that automatically create a forwarding order. This web service integration can be compared to the integration of orders into an external SAP TM component, but more information can

be transferred, such as transportation stages, dates concerning the transportation, and so on.

■ Use of a template

In many cases, customers order the same type of transport on a regular basis. To avoid having to type in the same data every time, the order clerks of the LSP or carrier use templates. A new forwarding order can then be created as a copy from the template. We'll talk about templates later in this chapter.

A fundamental feature of the forwarding order is that the document can be saved at practically any time during the order-taking process. If you want to create freight units from the forwarding order automatically, a few prerequisites need to be met. However, the forwarding order can still be saved in any incomplete state. After the forwarding order contains sufficient information for FUB, the freight units are created. This helps customers and LSPs to enter orders even if some information is missing. At LSPs or carriers, multiple employees are also often involved with the order-taking process. For instance, the customer's contact person enters all the customer's information, but the forwarding order is complete only after a transportation clerk has added data that is relevant for planning and execution.

When you browse the SAP TM system in SAP Fiori launchpad, you'll notice that, like master data or planning, forwarding orders have a dedicated work area called **Order Management**. When you access this tab in the SAP Fiori launchpad, you can see that the **Forwarding Orders Worklists** tile provides a personal object worklist (POWL) with all existing forwarding order documents and their related documents.

As you can see in Figure 4.16, the SAP TM functionality provides you with many pre-configured queries categorizing forwarding orders into the different transportation modes.

At the top of each POWL query are some buttons that you can use to perform actions on the forwarding order documents without opening the documents themselves. For process steps such as collective invoicing and consolidated FUB (explained in detail in other chapters), this feature comes in very handy because the actions can be executed on several documents together.

By clicking **Show Quick Criteria Maintenance**, you can set more filters on the predefined queries. A screen area opens where all possible filter values can be defined. The quick criteria are saved so that every time you enter the POWL query again, your last entries are remembered. If you want to avoid this, you can alternatively use the filter of the POWL table itself by clicking a column's header.

Document	T.	Shipper	Ship-to party	Sold-to party	Delivery Date (To)	Source Location	Source UN/LOC	Source Location Address	Dest. Location	Destination UN/LOC
1100000961	OF14	Wabel Electronics Factory...	Ten Media Inc./85737 Tu...	Wabel Electronics Factory...	30.06.2018	OAF-CU-02	2-53-12 Denenchofu / OTA-KU...	OAF-CO-02		
1100001033	OF14	Wabel Electronics Factory...	Ten Media Inc./85737 Tu...	Wabel Electronics Factory...	31.07.2018	OAF-CU-02	2-53-12 Denenchofu / OTA-KU...	OAF-CO-02		
1100001032	OF14	Samurai Fireworks LTD /I...	Soutwire CO./92227 Braw...	Samurai Fireworks LTD /I...	31.07.2018	OAF-CU-04	1-27-6 Shirokane / MINATO-K...	OAF-CO-03		
1100001034	AF14	Wabel Electronics Factory...	Soutwire CO./92227 Braw...	Wabel Electronics Factory...	01.07.2018	OAF-CU-02	2-53-12 Denenchofu / OTA-KU...	OAF-CO-03		

Figure 4.16 POWL for Forwarding Orders

If you have some selections you want to permanently display in the forwarding order POWL, you can use the **Define New Query** link on the top-right corner of the POWL table. In a guided procedure, you can enter your selection criteria, name the POWL query, and assign the query to one of the query categories (the lines on top of the table). Note that this newly created query is available only for your user and can't be used by other users.

Because the forwarding order is a very large and complex business object, this section is the longest section of the chapter. However, you won't find pages explicitly dedicated to the Customizing of the forwarding order type. Instead, we go through the forwarding order document tab by tab and delve deeper into the functionality of the different fields. If Customizing influences the process flow of the fields, we mention this while covering the corresponding section of the forwarding order document. You can find the forwarding order type Customizing via the IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Order • Define Forwarding Order Types**. If other Customizing activities are involved in the forwarding order, they are mentioned when they become relevant.

When starting to create a forwarding order, you'll notice that one piece of information is very crucial to the system: the transportation mode. You can predefine the transportation mode of a forwarding order in the forwarding order type. However, if you want to use one forwarding order type for several transportation modes, you can leave this setting empty. When you access the **Create Forwarding Order** tile in the **Order Management** tab, you'll see that you can enter not only a forwarding order type but also data such as the transportation mode, a template number, or a forwarding

agreement to which the forwarding order is related. You'll learn more about Transportation Charge Management for forwarding orders later in this chapter.

If you haven't defined a transportation mode in the forwarding order document type, then you should decide on a mode here. Note that defining the transportation mode as air, for example, doesn't mean you can't create transportation stages of other transportation modes, such as road or rail. The transportation mode decision is relevant only for the naming of fields in the forwarding order and for which fields are displayed or hidden. In fact, you can also change the transportation mode of the forwarding order while creating it (i.e., after you've already entered some data). When doing so, you'll notice that the screen changes, and the availability of tabs and the naming of fields change.

General Data

After you've defined a document type, you're directed to the forwarding order document. If you haven't defined a template, you'll see that the document is almost empty; only some fields are prepopulated. The **General Data** tab shown in Figure 4.17 displays the most important information that is globally relevant for the transportation contract between a customer and an LSP or carrier.

The **Order Date** near the top of the screen is prepopulated with the current date, but you can alter it as necessary. The order date is important not only for reference but also for Transportation Charge Management. Rate tables that are used in Transportation Charge Management can have different validity dates. Depending on the settings you've made for charge calculation, you can calculate charges based on either the actual transportation date or the order date.

In the top-right corner of the **General Data** tab, you can find the fields for the organizational data—the sales organization, office, and group responsible for the forwarding order. In Chapter 3, we discussed the importance of organizational units in SAP TM, so we don't go into detail here again. However, it's important to note that entering a sales organization is one of the prerequisites of creating a freight unit. If no sales organization is entered, neither automatic FUB nor manual FUB will succeed.

Just as we discussed with the integration of orders and deliveries in Section 4.1.1, the incoterm is a very important piece of information for transportation responsibilities. You can enter the same incoterms here that you already defined in Customizing. The incoterm location here is free text because it's agreed upon with the customer. Because you can define your stages in a forwarding order manually, no mapping or stage splitting is done based on the incoterm location entered.

Figure 4.17 General Data of a Forwarding Order

However, the incoterm is considered in charge calculation and settlement. Depending on the incoterm you use, the stages are charged against different partner functions of the forwarding order. You can assign a payer partner function (i.e., which partner function should pay for which stage types) in Customizing by following the IMG menu path **Transportation Management • Forwarding Order Management • Define Default Agreement Partner Functions for Stages**. We look at stage types later in this section.

The **Controlled** checkbox in the **Forwarding Order Data** section on the **General Data** tab (refer to Figure 4.17) defines whether the ordered transportation is a controlled or uncontrolled transport. With uncontrolled transports, the LSP organizes the entire transportation chain, including the main stage; however, the main stage is charged not from the carrier to the LSP but directly to the sold-to party of the entire transport (known as the ordering party in SAP TM 9.6). You can define an uncontrolled transport by deselecting the checkbox. If you deselect the checkbox, the **External Freight Agreement** field becomes editable. You can then enter the freight agreement that exists between the carrier and the sold-to party.

When doing further planning of the freight units belonging to a forwarding order that have been declared uncontrolled transports, you can find the **Controlled** checkbox and the external freight agreement on the **Terms and Conditions** tab of the freight booking that covers the main stage of the freight units. Note that you can consolidate uncontrolled freight units on one freight booking only if they all have been assigned the same external freight agreement. The pre-carriage and on-carriage of an uncontrolled transport are still charged from the carrier to the sold-to party via the LSP. Figure 4.18 illustrates the difference between controlled and uncontrolled transports, which is a scenario that often takes place in sea and air transportation and affects the main carriage only.

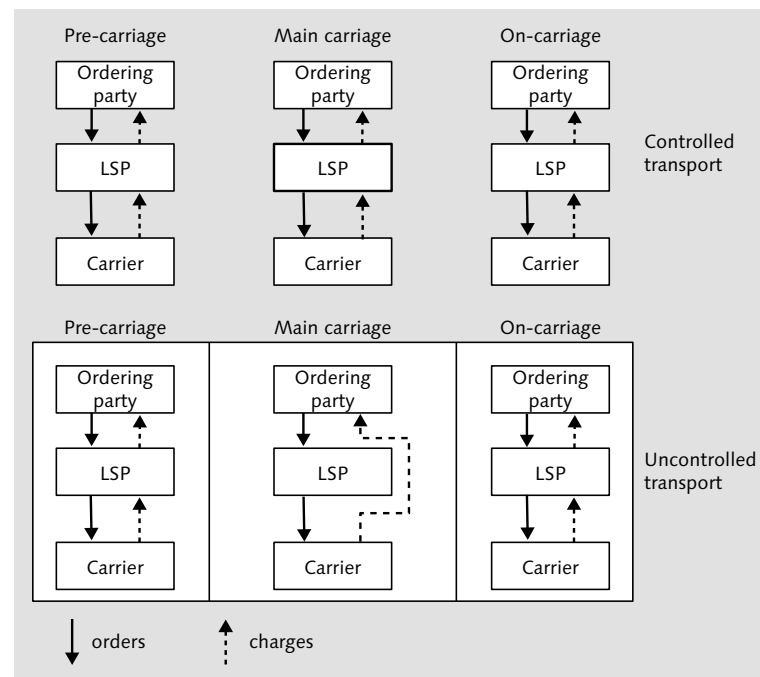


Figure 4.18 Uncontrolled and Controlled Transportation

We cover further details of the different transportation modes and their impact on the forwarding order later in this chapter.

Two more very important pieces of information are the movement type and the shipping type. These settings are crucial for the air and sea transportation processes; they influence the data entry and validation of the forwarding order. Shipping type

and movement type are also prerequisites for the creation of freight units from a forwarding order.

The *shipping type* defines what kind of transportation the customer has ordered. In the transportation business, the differentiation is, roughly speaking, between a full container load (FCL) and a less than container load (LCL). In SAP TM, these processes are shipping types. Considering that the terms FCL and LCL are mainly used in sea transportation, the shipping types may depend also on the transportation mode.

You can define shipping types in Customizing by following the IMG menu path **Transportation Management • Forwarding Order Management • Define Shipping Types**. In this Customizing activity, you define all the shipping types you need. The shipping type entered in the forwarding order document determines what items may be defined on the item area of the forwarding order. In Customizing, you therefore need to define your shipping type, whether all cargo items need to be assigned to an equipment item (e.g., a unit load device (ULD) in air, a container in sea, or a railcar in rail), or whether such equipment items are allowed at all.

Unit Load Device

When talking about packaging units in air transportation processes, we use the term *unit load device* (ULD) to represent special types of pallets or containers used in air transportation.

If you enter the shipping type “ULD,” depicted in Figure 4.19, you get an error message in the forwarding order if not all of your items are assigned to equipment items. We look at the definition of items in the next section.

Shipping Type		
Shpg Type	Description	Item Asgmt
ULD	ULD	
All Cargo Items Must Be Assigned to Equipm. Item or Resource		
Cargo Items Must Not Be Assigned to Equipm. Item or Resource		
Cargo Items Can Be Assigned to Equipm. Item or Resource		

Figure 4.19 Shipping Type Customizing

In this Customizing activity, you can also define for which transportation modes the shipping type is valid. This covers the fact that the terminology is different in different transportation modes.

The shipping type can be entered manually on the forwarding order or be preset in the forwarding order document type Customizing.

The second important feature is the *movement type*. The movement type in the forwarding order determines its routing. It's worth taking a detailed look at the impact of the movement type because you have to deal with it when creating forwarding orders.

In general, movement types can be defined in Customizing in the IMG menu path **Transportation Management • Forwarding Order Management • Define Movement Types**. Here, you can simply define your movement type and whether the location assigned to the shipper should be taken automatically as the source location of the forwarding order. The same setting can be done with the ship-to party and the destination location.

At this point, we've only defined a movement type code. The influence on routing is determined in the Customizing activity that you can find by following the IMG menu path **Transportation Management • Forwarding Order Management • Define Stage Type Sequence for Movement Types**.

Figure 4.20 shows the standard Customizing for the default movement type DD (door-to-door). As you can see, you can define a stage type sequence with sequence numbers. As with all sequence-related Customizing activities, the numbers don't have to be exactly sequential, at least in numerical order. For the movement type, you define the stage types that are being used. We talk about stage types later, in the section about the **Stages** tab. For now, we can state that we bring different stage types into a sequential order. In addition, we define whether the occurrence of a particular stage type is optional or mandatory. For the movement type in our example, only the main carriage (stage type 03) must occur. The **StageProp.** checkbox defines whether some stages on the **Stages** tab should already be created when the corresponding movement type is selected on the **General Data** tab.

Define Stage Type Sequence for Movement Type						
Mov. Type	Seq. No.	Stage Type	StgeTpeOcc	StageProp.	Det. Rule	Set. Rule
DD	1	01	Stage type must occur at le...	<input checked="" type="checkbox"/>	Always Relevant for Planning	In Execution
DD	2	02	Stage type can occur in any...	<input type="checkbox"/>	Always Relevant for Planning	In Execution
DD	3	03	Stage type can occur in any...	<input checked="" type="checkbox"/>	Always Relevant for Planning	Uplift Conf./Shipped on Boa...
DD	4	04	Stage type can occur in any...	<input type="checkbox"/>	Always Relevant for Planning	In Execution
DD	5	05	Stage type must occur at le...	<input checked="" type="checkbox"/>	Always Relevant for Planning	In Execution

Figure 4.20 Assigning Stage Type Sequences to a Movement Type

The next column defines whether the stage is relevant for planning or only statistical. On the **Stages** tab, you can manually assign a planning and execution organization to each stage. The decision about whether the stage is relevant for planning is based on

the setting in this Customizing activity, which again considers the planning and execution organization. Some of the settings you can choose in the **Det. Rule** column compare the planning and execution organization with the sales organization of the forwarding order. If these two organizations belong to different companies or countries, the stage isn't declared as relevant for planning. However, you can also take the easier route here (if that applies to your business process) and simply state whether this stage is always or never relevant for planning.

The last column in Figure 4.20 (**Set. Rule**) specifies from what point in time an internal settlement of the stage can be created. You can choose different execution statuses here to define in what execution status the corresponding stage of the freight unit must be to start an internal settlement.

Another transportation process that is often used in air and sea transportation is the *shipper's consolidation* in export transportation and the *buyer's consolidation* in import transportation. If your forwarding order has a corresponding transportation mode assigned to it, you can set this information on the **General Data** tab of the forwarding order. The transportation for the LSP is considered like an FCL or ULD transportation because the shipper organizes the transportation to the port, but different house bills of lading (HBLs) need to be issued for each item of the forwarding order, even though only one freight unit was created.

In the transportation business, the HBL number—not the forwarding order number—is the relevant number for identifying the entire transportation. You can find the corresponding field on the **General Data** tab of the forwarding order.

You can manually enter a waybill number or HBL number in this field, which is then propagated to the freight units that belong to this forwarding order. However, the assignment of waybill numbers can also be triggered automatically using *waybill stocks*. To do this, activate the use of waybill stocks in the Customizing of the forwarding order document type by selecting the **Enable Waybill Stock** checkbox and assigning an HBL or house air waybill (HAWB) strategy. The strategy defines how the HBL should be created: per forwarding order, per container, per shipper/ship-to party combination, and so on.

To draw HBL numbers, you need to define waybill stock types in Customizing by following the IMG menu path **Transportation Management • Master Data • Waybill Stock • Define Waybill Stock Types**.

The waybill stock type defines how the HBL number is put together. Figure 4.21 shows how a waybill stock type is assigned to a transportation mode.

Number Stock Type	HBL
Define Waybill Number Range Type	
Description	House Bill of Lading (Default)
TrM	04
Stock Category	Waybill Number
Org. Category	Sales
<input type="checkbox"/> Customer Impl.	
Check Digit	No Check Digit
<input type="checkbox"/> Enable Prefix	
Prefix Length	0
Number Length	10
Withhold Days	
Withhold Hours	
Stock ID No. Range	

Figure 4.21 Waybill Stock Type Definition

You can further define whether the number resulting from this stock type should be used as a waybill number or a tracking number. On the bottom of this Customizing screen, you define how the number should be put together, whether a prefix is assigned, the length of the number, and how a potential check digit should look. You can also define how long the number should be withheld after being returned.

After defining a number stock type, we can use it to create a waybill stock. In the SAP Fiori launchpad, go to the **Master Data** tab, and access the **Waybill Number Stocks Worklist** tile to create a new waybill stock based on the number stock type. Here you can define a number range from which a number should be drawn. At the bottom of the screen, you can then define when this waybill stock should be taken into account by defining certain combinations of sales organizations and ordering parties. If the combination of sold-to party and sales organization of the forwarding order matches one of the combinations defined in the waybill stock, a number is drawn from here.

If you choose to assign an HBL number automatically, the **House Bill of Lading** field on the forwarding order isn't editable. Instead, you need to select **HBL • Draw HBL Number** from the action toolbar at the top of the forwarding order screen. This works only after the sales organization, sold-to party, and cargo have been entered.

Waybill Stocks and Numbers

You can find further details about waybill stocks and waybill numbers in Chapter 8, Section 8.1.

On the **General Data** tab of the forwarding order, you can also enter the value of the goods that need to be transported. This information may become relevant for charge calculation or customs. Note that this information is only a manual entry. The values aren't taken from product master data.

We talked about the transportation service-level codes when we discussed order integration. You can manually assign a service level code to the forwarding order. The service level might influence your planning and charge calculation if you've made corresponding entries.

If you want to define your own service-level codes, do this via the IMG menu path **Transportation Management • Forwarding Order Management • Define Transportation Service Level Codes**. If your service-level code applies only to certain transportation modes, then you can define this here, too.

Items

At the bottom of the forwarding order document, you'll find the table of items that are ordered to transport in this forwarding order. You can define several items and create item hierarchies that represent how the packaging was done. Figure 4.22 shows a simple example of an item hierarchy. You can create an item hierarchy like this by choosing **Insert • Container** to insert the first item.

Items									
Standard									
<input type="checkbox"/> Item Hierarchy	Item	Item Type	Resource	Container	Equipment Group	Equipment Type	Empty Provisioning	Empty Return	
<input type="checkbox"/> Container	10				CN	22G0			
<input type="checkbox"/> Package	20								
<input type="checkbox"/> Product	30								

Package...	Packaging Mat. Type	Product	Service Type	Quan...	Quan... Unit of Measure	Gross Weight	Gross Weight UoM	Gross Volume	Gross Volume UoM
				1	PC	2.470	KG		
PAL				1	PC	200	KG		
		CELL PHONES		500	PC	200	KG		

Figure 4.22 Item Area of the Forwarding Order

To create a subordinate item, select the superordinate item (in this case, the container), and again choose **Insert • Package**. The new item is created as a subordinate item that is displayed in a hierarchical way. Alternatively, you can enter the data of the items directly into the table and then create a hierarchy by dragging and dropping a subordinate item onto a superordinate item.

For items, the *item type* is a mandatory piece of information. The item type encompasses several settings relevant for the item.

Figure 4.23 shows the information you can define in the Customizing of the item types, following the IMG path **Transportation Management • Forwarding Order Management • Define Item Types for Forwarding Order Management**. The **Item Category** field defines what kind of item this item type describes. It also impacts the way an item hierarchy can be built.

Figure 4.23 Item Type Definition

Item Hierarchy

SAP TM predefines what an item hierarchy can look like. Whether a subordinate-superordinate item relationship is allowed depends on the item category assigned to the item type. In general, SAP TM allows only the following item hierarchies:

- Resource (trailer or railcar)
- Container (may contain a package or product item)
- Package (may contain a package or product item)
- Product (must be the lowest item in the hierarchy)

If you want to define an item type that is relevant for dangerous goods processing, you can assign a dangerous goods UI profile to this item type. You'll find further information about dangerous goods UI profiles and processing in Chapter 9.

If you've defined an item category as a container or passive vehicle, you can assign equipment groups and equipment types to the item type, and all relevant data from the equipment type is then automatically put on the item data in the forwarding order. You can define equipment types via the IMG menu path **Transportation Management • Master Data • Resources • General Settings • Define Equipment Groups and Equipment Types**. The physical properties of the equipment type are used as the tare weight in the forwarding order item. More information about equipment types can be found in Chapter 3, Section 3.2.

Recall that the shipping type you've defined on the forwarding order's general data determines what item categories you may use. If the shipping type defines that no equipment items are allowed, then you get a corresponding error message if you try to insert an equipment item. However, if you've defined a shipping type that requires equipment items, you can't create freight units before all items have been packed into equipment items.

In addition, you can limit the number of item types you can use on a forwarding order by assigning item types to the forwarding order type. You can do this in Customizing by following the IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Order • Assign Item Types to Forwarding Order Types**. After you've assigned some item types to your forwarding order type, no other item types can be selected in your forwarding order. If you've assigned several item types of an item category, you can define a default item type. When you insert a certain item category in the forwarding order, the default item type is automatically used. The default item type is especially important when you're using the B2B integration for automatically creating forwarding orders. Because the web service doesn't carry the information of the item type, this information has to be taken from Customizing.

If you define containers as equipment items in the forwarding order's items, you're working with anonymous entities, if you wish. Containers can be (but don't have to

be) defined as master data, such as vehicle resources. If you define a forwarding order for rail or road transportation, however, you can assign a passive vehicle from master data (a railcar or truck trailer) to the forwarding order and use it as an equipment item.

When you define an item hierarchy, the weight of the products of the lowest items in the hierarchy is aggregated up to the highest item level. On each level, the gross weight of the subordinate item is taken over as the net weight of the superordinate item and added with the tare weight to determine the gross weight. This again is taken over as the net weight of the next superordinate item, and so on.

If you've defined default units of measurement on the item level, the quantities of the lower item levels are converted to the default unit of measurement. Note that if you've chosen a product item from product master data, no quantities are moved into the forwarding order item; the quantities need to be inserted manually.

In forwarding orders, you don't necessarily need product master data records for your product items. Even though you can choose product master data for your product items, you can also insert free text into the corresponding field. This is especially handy for LSPs and carriers that transport different materials every day because they don't need to create master data for each material.

If a customer orders the transportation of 300 cell phones, you can enter this in one item line defining a quantity of 300 pieces. However, your transportation process may require you to treat each cell phone individually to enable you to enter specific data for each phone or to simplify freight unit splitting. If so, you can still enter one item line, define pieces and weight for all 300 cell phones, select this line, and click the **Split** button at the top of the item table. The item line is split automatically into 300 individual lines. In addition, the gross weight entered is distributed equally among the new items.

When you select an item line, a new screen area appears below the item table. In this screen area, you can enter several pieces of information specific to the individual item. This information is also propagated to the corresponding freight unit in FUB. The item details contain several tabs.

Let's look at the item details for a product item (the information displayed in the item details section may vary depending on the item category of the item selected) that appear on the following screen tabs:

- **Details**

You can enter item-specific details here. Some data, such as the product name, is

moved from the item table. Other data you can define only here in this screen area. If you enter a goods value for an individual item, this information is also moved to the corresponding field on the **General Data** tab of the forwarding order. The field is then not editable anymore, but the system expects you to enter this information on every item as necessary. On the **General Data** tab of the document, the values of the individual items are then added up.

- **Quantities**

The quantities entered in the item table are taken over. In the item details section, you can then define the confirmed quantities; for example, in case of under capacity, you can confirm a lower quantity to the customer if you can't fulfill the entire order volume. Furthermore, this tab also records the feedback from the drivers concerning the actual quantities. Especially in bulk transportation scenarios, the exact quantity can't be provided by customers because it might be dependent on temperature and humidity. However, the actual quantity transported is the basis for charge calculation. Therefore, the measurements performed when loading the truck are recorded and visible on this tab. If multiple measurements are performed, a history of actual quantity records can be accessed via this tab.

- **Locations and Dates/Times and Business Partner**

These tabs are visible in the item details only if it was defined in the forwarding order type Customizing that locations, dates, and business partners can't be globally defined in the forwarding order. The **Same Locations and BPs** flag in Customizing determines whether you're required to enter the transportation locations and business partners on the item level or whether it's sufficient to define them globally on the forwarding order. If the locations and business partners are defined on the item level, this differentiation is also taken into consideration by FUB as a split criterion. The tabs in the **Item Detail** screen area are exactly the same as on the forwarding order, so we don't go into detail about defining business partners and locations here but instead cover it later in this chapter.

- **Document Reference**

You can add references to the item on the **Document References** tab. In many cases, this tab needs to be filled manually because the document references might be system independent. You can reference a specific item of the referenced document. To differentiate different document types, you need to use *business transaction document types* that you can define in Customizing via the IMG menu path **Transportation Management • General Settings for Order Management • Define Business Transaction Document Type Codes**. As already mentioned, the document type codes can be defined independently of the system if you want to reference a

photo on a server, a phone call protocol, and so on. You can also reference an item from the referenced document. You can also define type codes for items following the IMG menu path **Transportation Management • General Settings for Order Management • Define Business Transaction Document Item Type Codes**. Document type codes and item type codes aren't linked to each other. For implementation projects, we recommend that you use these type codes as often as the document references are used (i.e., charge calculation or routing decisions).

■ Customs

You can define customs-relevant data. You'll find more about customs declarations when we cover SAP Global Trade Services (SAP GTS) integration in Chapter 9.

■ Discrepancies

During FUB, the quantities of the forwarding order items are moved into the freight unit. However, if it's discovered in the execution process that the actual quantities of the freight unit differ from the quantity declared in the forwarding order, the quantities are changed in the freight unit. This results in a recorded discrepancy between the freight unit's item and the forwarding order's item. This discrepancy is displayed on the **Discrepancies** tab of the item details. The current status of the discrepancy handling is also recorded here. We'll discuss more details about discrepancy handling in Chapter 8, Section 8.1.

You'll notice that there is one more item category available in the forwarding order that we haven't yet mentioned: the *service item*. A service item defines—as the name suggests—services that should be performed as part of the customer order. Services are anything except the physical movement of the goods or containers (which is handled already in detail with the freight units and subsequent processes, e.g., planning, subcontracting, etc.), such as container cleaning, customs clearance, documentation, and so on.

You can assign *instruction sets* to a service item to track the progress of the service in the forwarding order, which means you can make sure that the service ordered in the forwarding order is also performed. Charge calculation can also consider service items by adding surcharges to the forwarding order's charges.

Service items aren't transferred into the freight unit, which means they can't be seen during the planning phase on the freight unit directly. They can be assigned to any level of the item hierarchy, meaning they can be added to the forwarding order as an independent item or as a subordinate item of a resource item, container item, package item, or product item. They can't, however, be a superordinate item to any other item.

Business Partners

After you define all relevant data on the **General Data** tab and enter the items that need to be transported, you can assign business partners to the transportation contract.

To sketch a very simple example first, only two business partners are assigned to the forwarding order: the shipper where the goods are picked up and the ship-to party where the goods are delivered.

In the forwarding order, the business partners take over different responsibilities. These responsibilities are reflected by *partner functions* (or *party roles* in SAP TM 9.6) that you can see on the **Business Partners** tab. You can add party role codes in Customizing via the IMG menu path **Transportation Management • Master Data • Business Partners • Define Partner Functions**.

As you can see in Figure 4.24, the **Business Partner** tab includes a table where you can assign business partners to the party roles. The partner roles **Sold-to party**, **Shipper**, and **Ship-to party** are mandatory in every forwarding order.

Actions	Partner Function	Business Partner	Deviat... Address	Name	Street	Ho... Numt	Post...	City	Region	Country
<input type="radio"/>	Sold-to party	Y17_SHIP1	<input type="checkbox"/>	Chicago Bakeri...	S Clark Street	11...	60605	Chicago		US
<input type="radio"/>	Shipper	Y17_SHIP1	<input type="checkbox"/>	Chicago Bakeri...	S Clark Street	11...	60605	Chicago		US
<input type="radio"/>	Ship-to party	Y17_SHIP2	<input type="checkbox"/>	US food Comp...	Mile Road	15...	48235	Detroit		US

Figure 4.24 Business Partners in the Forwarding Order

The business partners you assign to the partner functions need to be maintained as master data. As you can see in the figure, the addresses of the business partners are taken from master data. However, if you want to use a different address than the one defined in the master data, you can do so by selecting the **Deviating Address** checkbox. If you select the row of the party role whose address you want to change in the forwarding order, you can change it in the **Printing Address** field below the table. This field is prepopulated with the address from master data. The address defined here is used for document printing.

Only three partner functions are mandatory in a forwarding order unless you define differently. *Partner determination profiles* define which additional partner functions are mandatory on a forwarding order. You define partner determination profiles in Customizing via the IMG menu path **Transportation Management • Master Data •**

Business Partners • Define Partner Determination Profiles. In a partner determination profile, you select the partner functions that you want to define as mandatory in the forwarding order. You can also define how business partners are copied from one partner function to another. In the example in Figure 4.24, the sold-to party and the shipper are the same business partner. Therefore, in the partner determination profile, we could define that the business partner of the sold-to party should be copied to the shipper, as shown in Figure 4.25.

Assign Partner Functions						
Function	Name	S...	Edit Level	Srcce Type	Source PF	Name
U6	Shipper	1	M Mandatory	Partner Function	SP	Sold-to party

Figure 4.25 Partner Determination Profile

You can use a partner determination profile not only for defining fixed relationships among the party roles of a forwarding order but also for assigning a discrete business partner to a particular partner function. Of course, this is only recommended if the same business partner is relevant in all scenarios.

The partner determination profile can be assigned to the forwarding order type directly in Customizing. However, depending on the transportation scenario, you might not be able to define the mandatory partner functions with only one partner determination profile. Instead, the mandatory partner functions can depend on the incoterms assigned to the forwarding order. Therefore, you can also define the partner determination profile depending on the incoterms and forwarding order type. To do so, follow the Customizing menu path **Transportation Management • Master Data • Business Partners • Assign Partner Determination Profiles Based on Incoterms**.

Although entering business partners in the forwarding order isn't really complicated, we can't understate the importance of the entries. The assignment of a business partner to the sold-to party is crucial for charge calculation, which we describe in Chapter 10.

Recall that business partners can be defined globally on the **Business Partner** tab of the forwarding order or individually for each item, depending on the Customizing of the forwarding order type. The definition is the same; it only has to be done on the item details.

Locations and Dates/Times

Some of the most important information for transportation planning is the definition of locations and times. On the **Locations and Dates/Times** tab, you can define the

source and destination location of the entire transportation. Note that the routing isn't defined here but on the **Actual Route** tab. If you've defined that locations and business partners aren't the same for every item, you can still define either a global source location or a global destination location and leave the other location empty on the global level to fill it in on the item level.

The location you choose on this tab needs to be maintained as location master data. If you've chosen location master data, you'll see that the corresponding fields in the address area of the screen are filled with that address.

In the global transportation business, locations are always assigned a global identifier, which depends on the transportation mode. Depending on the transportation mode defined for the forwarding order, the global identifiers are displayed on the **Locations and Dates/Times** tab. Because air transportation uses International Air Transport Association (IATA) codes and sea transportation uses United Nations Code for Trade and Transport Locations (UN/LOCODES), if you use an air forwarding order, you'll see a field **IATA code**, and if you use an ocean forwarding order, you'll see a field **UN/LOCODE**. The codes are assigned in the location master data and prepopulated in the forwarding order when location master data is selected.

If you've followed along with our example, you've defined business partners in the forwarding order. If you go to the **Locations and Dates/Times** tab, you'll see that locations are already entered. If the business partner assigned as the shipper has been assigned a location, this location is automatically taken as the source location of the forwarding order. The same applies to the ship-to party and destination location. It also works the other way around, meaning that if you define locations first, the partner functions of shipper and ship-to party are filled automatically. However, if both partner functions and locations are filled, and you change one of them, no changes are made to the other.

If a customer calls and wants to get a transportation service from a location that you haven't used before, you don't have to define new master data for this location. Instead, you can just leave the **Location** field in the forwarding order empty and type in the address directly, as shown on Figure 4.26. Entering the address creates a *one-time location*. The one-time location is no different from location master data—in fact, a new location master data item was created. The new location is represented by a number that you can use later to add more information in the location master data. Usually the number range for one-time locations starts with 1. If you want to change this, follow the IMG menu path **Transportation Management • Master Data • Transportation Network • Location • Define Number Range Intervals for One-time Locations**.

Figure 4.26 Locations with One-Time Location

Take the Term “One-Time Location” Seriously

If you’ve started thinking that you no longer need to create locations in master data, be aware that one time really should mean one time. Therefore, we recommend that you use one-time locations in exceptional cases only. In other cases, take the time to create a location master first.

However, when entering an address that is already used in a location master data record, the location ID of this master data record is drawn into the forwarding order. With this functionality, you can avoid having several master data records for the same address in the system.

On the same tab as the locations, you can also define the ordered transportation dates for pickup and delivery. Note that the dates entered on this tab are used for the entire cargo transport, meaning that the pickup date is the pickup date of the first stage, and the delivery date is the delivery date of the last stage of the transport. What you define here are the ordered dates; there is no validation of whether the time frame between pickup and delivery date is feasible (there is a validation of whether the delivery date is after the pickup date, in case of typing errors). Pickup and delivery dates aren’t both mandatory; one of the dates is sufficient for FUB.

The dates and times are defined in the forwarding order in the time zone that is used by the corresponding location. Transportation planning usually works with a time frame for delivery or pickup, not a single specific time. In FUB, the time defined in the forwarding order is rendered into a time frame, if this is required. You’ll find more information about pickup and delivery time windows in Chapter 6.

When you’ve defined the items of the forwarding order, you’ll probably come across some fields concerning confirmation. The LSP can confirm quantities and dates/times to the customer after order-taking. This process step can be automated with the **Automatic Confirmation** flag in the forwarding order type Customizing. In addition, you can define on what data the confirmation should be done. This Customizing mainly concerns the dates to be confirmed. The confirmation can be done based on order data, meaning the ordered dates are simply confirmed. Another option in Customizing allows you to do planning first and then confirm to the sold-to party the dates that result from planning. If you want to confirm manually, you need to enter dates in the corresponding fields of the confirmed dates.

If you don’t want automatic confirmation, you can fill in the confirmation fields by clicking the **Confirm** button in the action toolbar of the forwarding order document.

Routing

After creating source and destination locations and dates for the entire process, the LSP usually defines the exact routing, including any potential intermediate stops that are on the forwarding order. Note that in real life, these activities are often done by different employees. The forwarding order can be saved in every state and passed on to the next team, so enriching the forwarding order with more data isn’t a problem.

The team responsible for routing the forwarding order uses the **Actual Route** tab to define the route. On that tab, you’ll find a table containing all stages that have been created for the forwarding order. In many cases, some stages are predefined here, thanks to the movement type entered on the general data of the forwarding order. Recall that the movement type can be assigned mandatory and optional stage types. In Customizing, you can decide whether some stages should be proposed on the forwarding order when a particular movement type is chosen.

However, there is a second way of automatically assigning stages to the forwarding order. In Customizing of the forwarding order type, you can specify whether stage determination of the forwarding order should be done using the movement type or using a *stage profile*. Stage profiles can be defined in Customizing via the IMG menu path **Transportation Management • Forwarding Order Management • Define Stage Profiles**. This Customizing activity looks very similar to the Customizing activity of assigning stage types to the movement type, which was depicted in Figure 4.20. You can make the same settings here as in the movement type Customizing activity.

You might be wondering why there are two different ways of defining the same thing. With stage determination by movement type, you always get a fixed stage setup—the one you assigned to the movement type. With stage profiles, you can be more flexible.

Figure 4.27 shows an excerpt from Customizing of the forwarding order type. If you decide to use stage determination by stage profile, you can assign a stage profile directly to the forwarding order type. In this case, the stage setup is always the same for the forwarding order, no matter which movement type is chosen. You can also determine the stage profile using a condition. This offers the flexibility to determine the stage profile based on any data from the forwarding order, compared to a 1:1 assignment of a stage profile to a forwarding order type. We recommend that you fill in a stage profile even if you're using a condition. If the condition doesn't return a result, the assigned stage profile is considered as a fallback solution.

Stage Determination Settings	
Stage Determination	P Stage Determination by Stage Profile
Stage Profile	
Stage Profile Cond.	

Figure 4.27 Stage Determination by Stage Profile

Stage Determination

Stage determination by movement type is independent of the forwarding order type. No matter which document type is used, the stage setup assigned to the movement type is always considered.

When you use stage determination by stage profile, the stage determination depends more on the forwarding order type.

We've talked a lot about how stage types are assigned to stage profiles or movement types. Now we should take a closer look at what stage types actually are.

Stage types define the characteristic of the transportation stage in the entire transportation. In Customizing, you can create stage types by following the IMG menu path **Transportation Management • Forwarding Order Management • Define Stage Types**.

In Customizing, you simply assign a description to the stage type, as shown on the left in Figure 4.28. You also need to determine the stage category for the stage type. Stage categories are standard categories in the SAP TM functionality that can't be

enhanced. Like item categories, stage types are clustered into six groups. Several process steps in the SAP TM functionality use the stage category rather than the stage type. For example, in Transportation Charge Management, you can decide for which stage categories the rate table should be taken into consideration. In addition, the stage category **Main Carriage** has several validations, which we examine later.

Define Stage Types			
Stage Type	Description	Stage Cat.	Ins. Set
01	Pick-Up	Pre-Carriage	▼
02	Pre-Carriage	Pre-Carriage	▼
03	Main Carriage	Main Carriage	▼
04	On-Carriage	On-Carriage	▼
05	Delivery	On-Carriage	▼

Figure 4.28 Stage Type Definition

Because instruction sets can be assigned to stage types, it might make sense to restrict stage types to certain transportation modes. You can do this with the Customizing activity found via the IMG menu path **Transportation Management • Forwarding Order Management • Define Allowed Transportation Mode for Stage Types**. Here you can decide which transportation modes are allowed for a certain stage type. You can also define a default transportation mode, which is used for the stage type after the stage type has been assigned to the forwarding order's routing.

Now that we've talked a lot about Customizing and the prerequisites for the forwarding order's routing, we return to the forwarding order document and start with a manual routing of the forwarding order.

When looking at the tabs available in the forwarding order document, you can see that the SAP TM functionality differentiates between the *ordered route* and the *actual route*. As the names suggest, the *ordered route* is the routing that the customer orders or that is agreed upon with the customer in a contract. Therefore, the routing of the ordered route is also considered by Transportation Charge Management.

When you've linked a forwarding agreement item (i.e., an item of a long-term contract with a customer) to your forwarding order, you can also draw in the agreed routing from this item. In this case, the routing is defined as a default route in the agreement item and is pulled into the forwarding order. The stages of the forwarding order are then prepopulated with the stages of the default route.

However, if the LSP wants to do a different routing (e.g., to optimize costs), the LSP can insert a different actual route. The *actual route* is moved to the freight unit so

that transportation planning works with the stages and dates defined in the actual route. You can see the actual route definition also in Figure 4.29.

Stage Description	Stage Type	Mode of Transport	Source Location	City (Source)
▼ Route			TGE_CUST_DEMHG	Mannheim
Stage 1	03 (Main Carriage)	02	TGE_CUST_DEMHG	Mannheim
Stage 2	04 (On-Carriage)	01	TGE_CUST_DEBER	Berlin

Requested Pick-Up Date	Reque... Pick-Up Time	Reque... Pick-Up Time Zon	Departure Date	Depart... Time	Depart... Time Zone	Destination Location	City (Destination)
01.10.2018	00:00:...	CET		00:00:...	CET	TGE_CUST_DERSK	Rostock
01.10.2018	00:00:...	CET		00:00:...	CET	TGE_CUST_DEBER	Berlin
03.10.2018	00:00:...	CET		00:00:...	CET	TGE_CUST_DERSK	Rostock

Figure 4.29 Actual Route of the Forwarding Order

If the movement type or stage profile has already proposed some stages, those stages will be in the ordered route. The actual route will also contain those stages.

The source location and pickup date of the first stage are taken from the **Locations and Dates/Times** tab, and so are the destination location and delivery date of the last stage. If more than one stage is proposed, you need to enter the other locations and dates manually, except that the routing was drawn from a default route of the associated agreement item.

If you want to add stages, select a stage and insert another stage either before or after it. Alternatively, you can split the selected stage into two stages and enter new intermediate stops in the forwarding order.

If you've defined schedules in your transportation network, you can directly assign a schedule instance (meaning a voyage or flight) to a stage in the forwarding order. To do so, click the **Schedule** button at the top of the stage table, and then click **Assign**. A search help appears that looks for schedules that run between the locations of the stage. After a schedule is assigned, a booking for this schedule is created. The dates from the schedule are also propagated into the forwarding order's stage. The delivery date of a stage is always the earliest pickup date of the next stage unless you define a different pickup date. When you select the stage that you've chosen a schedule for,

more information from the schedule (e.g., cutoff dates) is available below the stage table.

If you don't want to assign schedules (e.g., because you're planning a road transport), you can create a freight document directly from the stage by choosing **Capacity Document • Create One per Stage**. The dates defined in the stage then serve as dates for the freight document. Alternatively, you can select an already-created freight booking for your stage.

To do all of this, you need to define in Customizing what document types should be used for the freight documents and whether the features just described should be available on the forwarding order type. You can find all of these settings by following the IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Order • Define Default Capacity Document Types for Stages**.

You can choose a freight document type based on the following information:

- Forwarding order type
- Shipping type
- Stage type
- Transportation mode
- Sales organization

The freight document type can be either a freight order type or a freight booking type.

It's also possible to create one freight document for several consecutive stages, but make sure that all stages for which you want to create a common freight document have been assigned the same freight document type.

As you learned earlier in this book, SAP TM comes with an optimizer engine that you can use for routing and scheduling instead of manually creating stages with locations and dates. As a prerequisite, you need to assign a planning profile to your forwarding order type in Customizing, and then select **Route • Transportation Proposal** on the **Actual Route** tab to start the optimizer.

The optimizer returns one or several results that you can choose from. If you accept one of the results, it's moved into the routing of the forwarding order. In the Customizing of the forwarding order type, you can choose how the transportation proposal's result should be considered in the forwarding order. If only the routing is supposed to be copied into the forwarding order, the stages are filled accordingly with dates and locations. Alternatively, freight documents may already have been

created from the transportation proposal, and they are then assigned to the forwarding order's stages.

In some cases, the actual routing differs from the ordered route. If the LSP has agreed with the customer that the actual route should be the basis for charge calculation, you can copy the actual route into the ordered route. To do so, navigate to the **Ordered Route** tab, and choose **Copy from Actual Route**. When you look at the stage table on the **Ordered Route** tab, you can see that, except for copying the actual route into the ordered route and splitting stages, there isn't much you can do here. This is because all other functions for routing would affect the routing for planning and execution and are therefore available only on the actual route. You might also have noticed that it's not possible to copy the ordered route into the actual route. This is because the actual route is always kept in sync with the ordered route automatically until any changes are done to the actual route directly.

Let's return to the **Actual Route** tab again. If the employee taking the order is also responsible for the transportation planning, he can directly access the transportation cockpit from the forwarding order. Select **Follow-Up • Start Transportation Cockpit** in the action toolbar at the top of the document. The transportation cockpit is filled with the selection criteria that were assigned to the planning profile that is supposed to be used by the forwarding order (planning profiles can be assigned to forwarding order document types in Customizing).

Because a forwarding order can contain items with different source and destination locations, the stages displayed on the **Actual Route** tab (and on the **Ordered Route** tab, as well) sometimes need to be on the item level.

SAP TM offers an item view and a stage view for the stage table. You can switch between the stages by choosing the hierarchy in the **Change Hierarchy** dropdown list at the top of the stage table.

In our example, two items in the forwarding order have the same destination location but different source locations. We want to define a routing that sends item 1 from its source location to the source location of item 2, from where both items are transported together to their common destination location.

Figure 4.30 shows the **Item View** before the insertion of the additional stage for item 10. After we split the stage of item 10, item 10 contains two stages, whereas item 20 still contains only one stage.

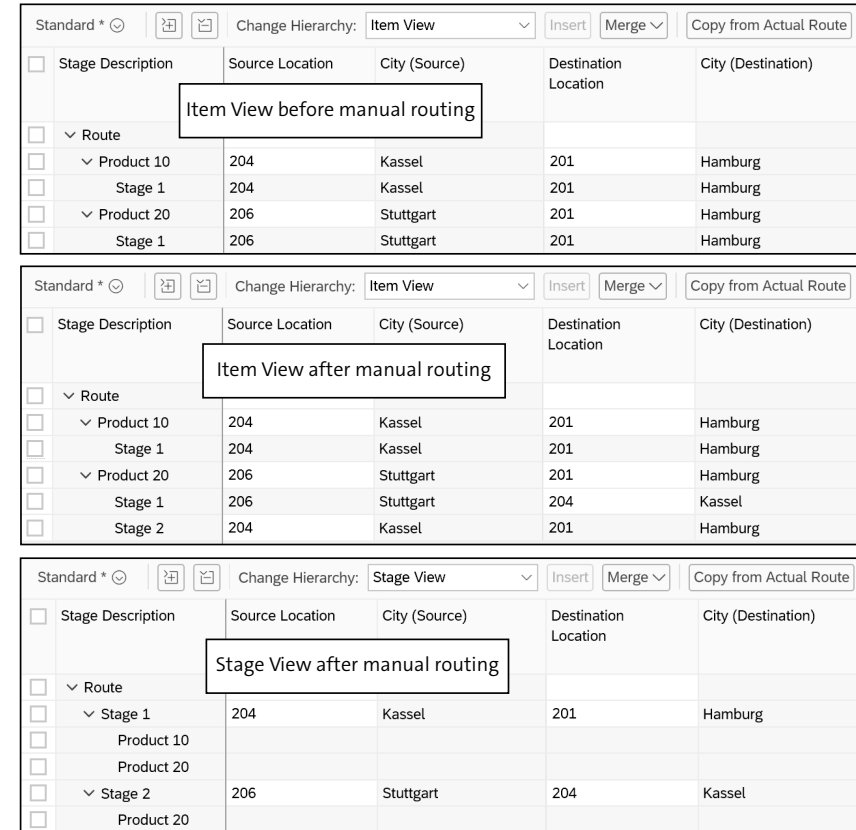


Figure 4.30 Item Views and Stage View

When we switch to the **Stage View**, we can clearly see which stages have to be planned separately for the two items and which stages can be planned together.

Some validations are performed when you do the routing of the forwarding order. Most validations concern whether all mandatory stage types have been used and whether the transportation modes assigned to the stage types are allowed. Validations also check whether the stage type representing the main carriage uses the transportation mode for which the forwarding order was created.

The sales organization is responsible for entering the order, for example, but isn't allowed to create freight bookings for specific transportation stages or send them to a carrier. Therefore, it can propose how to transport the goods (by specifying a route

and schedule and assigning a freight order or freight booking) and set the organization interaction status to **To Be Checked** to transfer the affected stages to the planning and execution organization. You can set the interaction status on the stage table by selecting **Set OI Status • To Be Checked**. The planning and execution organization checks the proposal and transportation stage details in the transportation cockpit. It can then confirm the data exactly as proposed in the forwarding order, change data such as the departure, and then confirm the proposal or reject it outright. The status for the stage in the forwarding order then changes to **Confirmed**, **Confirmed with Deviations**, or **Rejected**, respectively.

The prerequisite for this process step is that you've defined a planning and execution organization for the stage. You can directly assign an organizational unit in the stage table.

Charges and Internal Charges

The **Charges** and **Internal Charges** tabs show the result of charge calculation. Even though charge calculation is a very important topic in forwarding order management, we don't go into great detail about Transportation Charge Management until Chapter 10. In general, these two tabs show the result of a performed charge calculation.

In the Customizing of the forwarding order type, you can enable both internal and external charge calculation. Whether internal or external charge calculation is triggered depends on the combination of sales organization and sold-to party in the forwarding order. The sold-to party can also be an organizational unit from your own company.

In this Customizing activity, you can also specify whether charge calculation should be triggered manually or automatically when the document is saved. If you want to trigger charge calculation manually, select **Charges/Settlement • Calculate Charges** or **Charges/Settlement • Calculate Internal Charges** from the action toolbar at the top of the document.

Profitability

The read-only **Profitability** tab contains valuable information for the LSP business. This tab compares the expected revenue as determined by the charge calculation performed on the forwarding order and the expected costs that derive from the charge calculation on the freight documents related to the forwarding order.

On this tab, you can differentiate between *planned profitability* and *expected profitability*. Although the two terms sound very similar, they are different because the data source for the profitability analysis is different. For planned profitability, the charges from the forwarding order's charge calculation are compared to the charge calculation that is done on the related freight documents.

Cost Distribution

Often, several forwarding orders are consolidated on one freight document. However, when you perform a profitability analysis, the costs imposed on the freight document need to be distributed to the related forwarding order.

SAP TM offers a cost distribution functionality, which we discuss in Chapter 11, Section 11.2.

To calculate profitability on the forwarding order, you need to enable and configure cost distribution, no matter whether consolidation on freight orders took place.

Expected profitability, however, considers the data from the settlement documents—both the forwarding settlement document and the freight orders' or freight bookings' settlement documents.

Output Management

Like every business document in SAP TM, you can also trigger output for the forwarding order. We don't want to go into the details of setting up output here; we discuss only how to assign output-related Customizing to the forwarding order and how to see the output on the forwarding order document.

In Customizing, you assign output profiles to the forwarding order type. The output profile is defined in the Post Processing Framework (PPF) (see Chapter 2, Section 2.3.3).

After an output profile is assigned or dynamically determined, you can go to the **Output Management** tab on the forwarding order document. You'll see an empty table. When you select **Generate • Actions Including Condition Checks**, all output actions that meet the schedule conditions defined in the PPF are triggered.

The table is filled with the actions that meet the schedule conditions. You can see whether the actions have been processed and what kind of actions they are.

As you can see in Figure 4.31, we have only print actions in our example. This means the forwarding order document is supposed to be printed. When you select a line,

more details about the action are listed below the table. When you select the **Document Preview** tab in the actions details view, you get a print preview of the document, filled with all the information that we filled in during this chapter or that was derived automatically.

The screenshot shows the 'Output Management' interface. At the top, there is a toolbar with buttons for 'Standard', 'Deselect All', 'Generate', 'Regenerate', and 'Execute Actions'. Below this is a table with columns: Action Status, Processing Type, Document Number, Deactivate, and Partner Dependent. The table contains one row with 'Unprocessec' and 'Forwarding O' as processing types. Below the table is a print preview section with columns: Language, Print, Fax, E-mail, Printer, and No. of Print... The preview shows 'EN' for language, a checked 'Print' checkbox, and '\$A000 000' for the printer.

Figure 4.31 Output Management

Global Functions on the Forwarding Order

At this point, we've systematically browsed through the forwarding order tab by tab. However, there are some functionalities of the forwarding order that can't be directly assigned to tabs. We discuss these next.

Recall from Figure 4.1 that the transportation process starts with a transportation requirement and then continues with planning using the freight unit document. Consequently, the forwarding order has to build freight units to continue the transportation process.

We discuss the FUB step in Chapter 6, Section 6.1, but for now, we need to take a closer look at how to trigger it from the forwarding order either manually or automatically. You can define this in Customizing of the forwarding order type. If you choose to use automatic FUB, the freight unit is created the first time the forwarding order is saved. If you make any planning-relevant changes to the forwarding order later, the freight unit is updated accordingly.

Prerequisites for Freight Unit Building

Whether you're using automatic or manual FUB, some fields in the forwarding order need to be filled in to create a freight unit:

- Sales Organization
- Source and Destination Location

- Items with Quantities
- Dates and Times
- Movement Type
- Shipping Type
- Transportation Mode
- Business Partners for Mandatory Partner Functions

In some cases, even more fields are required. You can check whether you've filled all required fields for FUB by clicking the **Check** button in the action toolbar of the forwarding order.

You can also manually create freight units by selecting **Follow-Up • Create Freight Units** from the action toolbar, but this is only enabled if automatic FUB is disabled in Customizing of the forwarding order document type. Manual FUB is often used if freight units might be built for several forwarding orders. In this case, you can select several forwarding orders from the POWL and then create freight units from the POWL. If dates, locations, sales organization, and so on are the same on several forwarding orders, the freight unit consolidates these forwarding orders into one freight unit.

To create freight units, you need to assign an FUBR to the forwarding order type in Customizing. If the way freight units should be built depends on data in the forwarding order, you can also assign a condition to determine the FUBR. As with stage type profiles, you can specify an FUBR in addition to a condition in Customizing to have a fallback scenario in case the condition doesn't return any result.

When a customer company orders a cargo transport from its own premises to another customer, the originating customer also often needs to be provided with a container to load prior to the actual cargo transport. You can also define in the forwarding order document that an empty container should be provided to the shipper before the cargo transport happens. The transportation activities ordered with the forwarding order can then include the actual cargo movement as well as the movement of empty containers, as shown in Figure 4.32.

To do so, you can define in the item detail that this container item should be provided to the shipper and/or returned from the ship-to party to a container yard after it's unloaded. After it's defined that the container item is subject to empty provisioning and/or empty return, new tabs appear in the item detail area where you can define the container yard where the empty container is supposed to be picked up

from or returned to. Along with this information, you can also define when the container should be picked up and brought to the shipper (for empty provisioning, when it should be picked up at the ship-to party; for empty return, when it should be returned to the container yard).

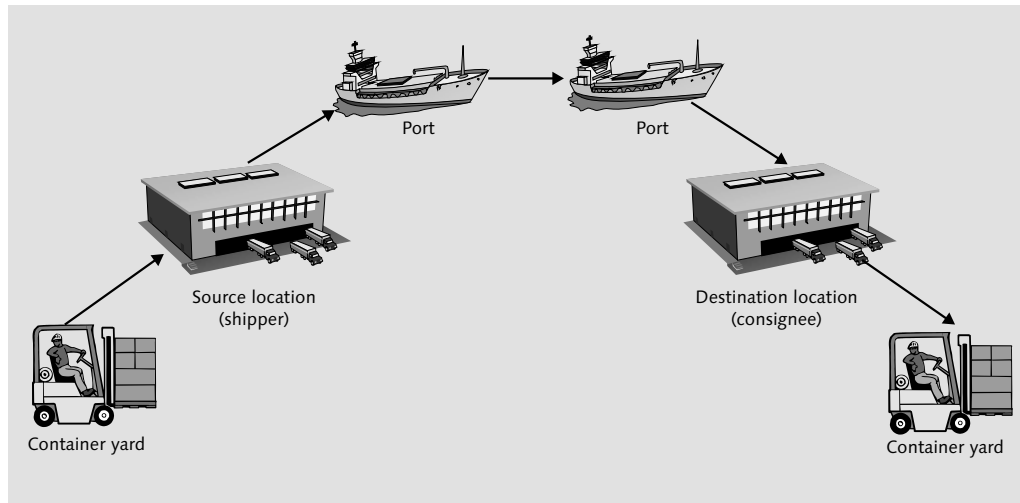


Figure 4.32 Empty Container Provisioning and Return

Note that even though empty provision and empty return are now also part of the forwarding order, the source and destination locations of the forwarding order remain the shipper and the ship-to party. The empty provisioning and empty return information remains on the container item.

When you create freight units for forwarding orders that include empty provisioning and/or empty return, FUB is triggered separately for the actual cargo movement (between shipper and ship-to party) and the empty container movements. This means that the freight unit for the cargo movement can be of a different document type than the empty container movement. Furthermore, you get a separate freight unit or container unit document for the empty container movement.

In an LSP business, there are multiple empty container movements that need to be organized. For the LSP, it's therefore often beneficial to transport an empty container directly from a ship-to party to a shipper instead of transporting the empty container back to a container yard and subsequently picking it up from there to transport it to the next shipper.

As you can see in Figure 4.33, the container travels directly from the ship-to party of one forwarding order to the shipper of another forwarding order. This process is called *triangulation*. You can triangulate empty container units on the container unit POWL. When you select all container units or a subset of them and choose **Triangulation · Create Triangulation**, the system automatically finds container units that can be triangulated based on the following information:

- Involved container yards
- Pickup and delivery dates
- Container types or container numbers

If applicable container units are found, the container unit from the container yard to the shipper of a forwarding order is merged into the container unit from the ship-to party to the container yard. This means the container yard location is no longer part of the container unit, and one of the two container units is deleted because it's now also represented with the other container unit.

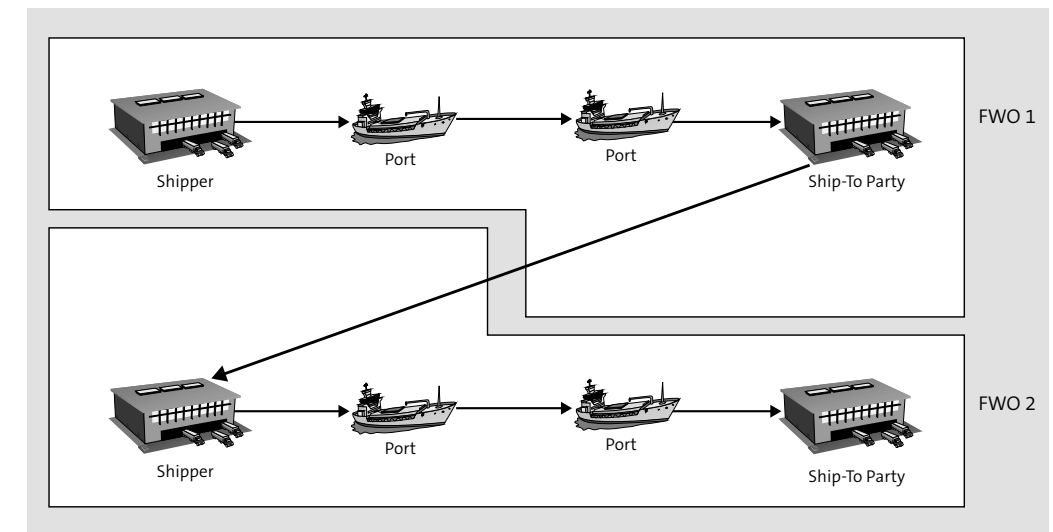


Figure 4.33 Container Triangulation

Empty Provision and Empty Return

While we've talked about empty provisioning and empty return of containers only, it's important to note that it's also possible to use the same functionality for railcar items in the forwarding orders.

However, if you have an item hierarchy that includes a railcar item containing one or several container items, empty provisioning or empty return is possible only for the railcar item (i.e., the highest level of the item hierarchy).

Sometimes, forwarding orders are created only for charge calculation and business administration reasons. In this circumstance, avoid passing these forwarding orders onto transportation planning by choosing restricted processing of the forwarding order in Customizing of the forwarding order type. This way, the forwarding order is always blocked for planning and execution.

SAP TM in SAP S/4HANA provides the credit limit check feature. You can activate the credit limit check in Customizing of the forwarding order type. The activation of the credit limit check is allowed only if forwarding settlement is also allowed; this way, the credit limit check is performed when the forwarding order is created.

In Customizing of the forwarding order type, you can decide what happens if the credit limit check fails. The negative check result can either be only informative and have no impact on the forwarding order or cause a planning and execution block until the credit limit check is successful.

A credit limit check is always performed again if any of the following information of the forwarding order has changed:

- Sales organization
- Credit limit check amount (usually the result of the charge calculation)
- Business partners
- Logistics data with influence on charge calculation

If you need to cancel a forwarding order, you can do this either from the action provided in the POWL or directly from the document. If you cancel a forwarding order, and freight units have already been created for this document, those freight units are canceled and withdrawn from the freight documents on which they might have been planned.

Canceling Freight Units from Freight Documents

If freight units are canceled (e.g., because the related forwarding order was canceled), then the planning is withdrawn, which means the freight units are taken off the freight order or freight booking. If you want to notify the planner automatically about this change, you need to set up your freight documents accordingly by using a change controller strategy that handles this situation.

You can find more information on the setup of freight documents and change controller strategies in Chapter 7.

When you cancel the forwarding order by clicking the **Cancel Document** button either on the document itself or on the POWL, you're asked to define a cancellation reason code. The code you choose can be used for analysis and is displayed on the **General Data** tab of the forwarding order below **Life Cycle Status**, which is changed to **Canceled**.

You can define cancellation reason codes in **Transportation Management • Transportation Management • Forwarding Order Management • Define Cancellation Reason Codes**. You don't need to specify a cancellation reason code when canceling a forwarding order. Canceled forwarding orders can still be used for charge calculation, for example, when the cancellation reason code indicates that the cancellations were caused by the customer only.

As you've seen, the forwarding order contains a lot of information for business administration, transportation planning, charge calculation, and organizational interaction. In many LSP processes, these different process areas are usually performed by different areas within the company.

For the person who takes the order, it would be cumbersome to navigate through all the tabs we've mentioned to enter relevant data. Therefore, he can use the page selector, which is located in the action toolbar in the top-right corner of the forwarding order document.

Recall from Chapter 2, Section 2.2.4, that you can customize the forwarding order screen according to your needs. However, it might be useful to switch between a **Fast Order Entry** screen and the full-blown forwarding order document. SAP TM provides **Fast Order Entry** screens for the air, land, and sea transportation modes because the required information depends on the transportation mode.

Figure 4.34 shows a **Fast Order Entry** screen for land transportation. It displays only the data needed for order entry, including the business partners, sales organization, general terms, locations, dates, and items.

Figure 4.34 Fast Order Entry Screen

If you need more information on the **Fast Order Entry** screen, you can add more fields in screen Customizing.

Notice that there is no action toolbar in Figure 4.34. The **Fast Order Entry** screen works only for order entry. You need to switch back to the conventional forwarding order screen for processing the forwarding order.

As already mentioned, the sold-to party can send an order via EDI messages to make the LSP or carrier create a forwarding order. This process can be automated with SAP TM because the service interface `TransportationRequestRequest_In` works for all fields that might be relevant for creating a forwarding order. Make sure you've done the setup of the field and service mapping in SAP Process Integration properly. The forwarding order is created automatically if this service interface is triggered.

If you want to confirm data back to the sold-to party, you can also use EDI communication with the service interface `TransportationRequestConfirmation_Out`. For more information about the automatic creation of documents using service interfaces and communication with web services, return to Chapter 2, Section 2.4.

4.2.2 Charge Estimation

Customers often call the LSP to request a price for a transportation service. Although you can enter and perform charge calculation on the forwarding order, it takes a lot of time, and with the customer waiting on the phone, you might require a quicker way of calculating charges.

For this reason, the **Estimate Freight Charges** tile in the **Order Management** tab of the SAP Fiori launchpad takes you to a screen where you can quickly estimate the charges for the customer's order.

Charge Estimation

To use the charge estimation, you need to have set up the Transportation Charge Management component. You can find more information on Transportation Charge Management in Chapter 10 and Chapter 12.

Notice that because the charge calculation itself usually works independently of the document type, no forwarding order type is necessary to start the charge estimation; only the transportation mode needs to be entered. The charge estimation screen in Figure 4.35 looks a little like the **Fast Order Entry** screen of a forwarding order. On this screen, you're asked to enter all data that is relevant for charge calculation. The following fields are mandatory:

- Purchasing Organization
- Source Location
- Destination Location
- Sold-to Party

Other fields may not be mandatory for system validation but are often required to perform charge calculation (e.g., **Item**).

If no pickup date is entered, the current system date is used as the pickup date for the charge calculation.

Charge Estimation Application

As described in Chapter 2, Section 2.2.1, SAP TM applications can be displayed in a browser using a hyperlink. Because this also applies to the charge estimation, think about providing the customer with the link to the charge estimation application. This allows the customer to use SAP TM's capability without contacting the LSP.

If you do this, make sure you thoroughly check your authorization setup so that the customer can only estimate its own charges.

The charge estimation is read-only information; that is, the estimated charges can't be saved or turned into a forwarding order.

Item Hierarchy	Item	Resource	Package ID	Product	Gross Weight	Gross Weight UoM	Gross Volume	Gross Volume UoM	Actual Volume	Actual Volume Unit of Measure	Quantity	Quantity UoM
<input type="checkbox"/>	Active Vehicle	1000000				KG		M3				

Figure 4.35 Charge Estimation Screen

4.2.3 Forwarding Quotations

We've spent a long time talking about the forwarding order, which is the document that represents the actual order or contract between a sold-to party and an LSP or carrier. However, before you can create an order in the transportation process, you often need to create a quotation, which is covered by SAP TM with the *forwarding quotation* document. This business document helps the sold-to party send the data of a

potential forwarding order with the quotation price. When the quotation is successful, the forwarding order can be created in relation to the quotation.

Notice that the forwarding quotation looks very similar to the forwarding order. In fact, you can do most of the things we talked about in Section 4.2.1 in the forwarding quotation. You can create forwarding quotations via the **Create Forwarding Quotation** tile in the **Order Management** tab of the SAP Fiori launchpad. Just as you did with the forwarding order, when creating a forwarding quotation, you need to define a forwarding quotation document type. You can specify a forwarding quotation document type in Customizing by following the IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Quotation • Define Forwarding Quotation Types**.

When looking at the forwarding quotation itself and customizing its type, you'll find many similarities between the forwarding quotation and the forwarding order. The following features and processes are handled exactly the same way as in the forwarding order:

- Item definition
- Item definition with different source or destination locations
- Item type assignment to document types
- Stage determination by either movement type or stage profile
- Automatic charge calculation when saving the document
- Partner determination by partner determination profile
- Transportation proposals
- Creation of one-time locations
- Cancellation of the forwarding quotation with a reason code

Note

You can find the corresponding Customizing activity via the IMG menu path **Transportation Management • Forwarding Order Management • Forwarding Quotation • Assign Item Types to Forwarding Quotation Types**. Make sure that when you create a forwarding order out of a forwarding quotation, the same item types are assigned to the forwarding order type that are used for the forwarding order creation.

Not everything is the same, though. Figure 4.36 shows the most important differences between a forwarding quotation and a forwarding order. In the quotation, you

can specify a valid-to date, which is the deadline by which the quotation must be accepted or rejected.

Just like with charge calculation on the forwarding order, SAP TM can calculate the quotation price. This takes place, for example, if the customer calls the LSP or carrier and asks for a price. The price is calculated, and you can submit it to the sold-to party by selecting **Response • Submit** from the action toolbar at the top of the screen.

Figure 4.36 Forwarding Quotation Fields and Actions

The communication that takes place during the quotation process can vary from customer to customer. When communication occurs by phone, you can simply update the status of the quotation manually using the actions provided by the **Response** button. Below the quotation price, as depicted in Figure 4.36, you can see your response to the customer—whether you've accepted the quotation or rejected the quotation. When rejecting a quotation, you can specify a rejection reason, which can also be communicated to the sold-to party. The forwarding quotation document is canceled after the quotation has been rejected.

The forwarding quotation also supports the communication between sold-to party and LSP via EDI communication. In this case, the forwarding quotation can be created via the corresponding web service `TransportationRequestQuotationCreateRequest_In`. This service interface provides all the necessary fields to create a forwarding quotation in SAP TM, just like manual creation of a forwarding quotation. The response of the carrier or LSP is then sent out to the sold-to party with the service interface `TransportationRequestQuotationConfirmation_Out`.

Service Interface

Even though the name of the service interface `TransportationRequestQuotationConfirmation_Out` suggests that you can use it only to confirm or accept quotations, you can also use it to reject quotations.

A quotation can also be made in the course of a tendering process. Imagine that the sold-to party also uses SAP TM and starts a tendering for a freight order in its system (learn more about triggering the tendering process in Chapter 7, Section 7.3). A request for quotation (RFQ) is sent out to the LSP or carrier, and a forwarding quotation is created for the customer's RFQ.

EDI Messaging from SAP TM to SAP TM

It's possible to start a tendering process and communication between a sold-to party's SAP TM system and a carrier's SAP TM system. However, you need to make sure you have the correct SAP Process Integration setup in place so that the outgoing B2B messages of the RFQ are matched to the correct incoming B2B service interfaces.

If you want to use your forwarding quotation as part of the tendering process, you need to define this in Customizing of the forwarding quotation type. In the Customizing activity, change the setting **Quotation Mode** to **With Request for Quotation**. The forwarding quotation document UI changes slightly. You get additional fields showing the response due date and a potential price limit.

As shown in the top-right corner of Figure 4.37, the response options are now restricted to **Accept** and **Reject** because you can only accept or reject an RFQ and communicate a price.

Whether you're using a forwarding quotation with or without RFQ, the processing of a forwarding quotation is mostly the same. Processing a forwarding quotation isn't much different from processing a forwarding order.

When the forwarding quotation has come in, you can do the routing of the quotation manually on the **Actual Route** or **Ordered Route** tab. (Return to Section 4.2.1 for more information on how to do manual routing on this tab.) Alternatively, you can use a transportation proposal for the route determination of the forwarding quotation by specifying an FUBR in Customizing of the forwarding quotation type, similar to Customizing of the forwarding order type. No freight units are built based on the

forwarding quotation; the FUBR is used only for the simulation of the FUB and optimizer planning in the transportation proposal.

Figure 4.37 Forwarding Quotation with Request for Quotation

After you route the forwarding quotation, you can calculate charges for the document in exactly the same way as on the forwarding order. The prerequisite is again the correct combination of sales organization, sold-to party, and existing master data in Transportation Charge Management. As before, the calculated price is displayed on the **General Data** tab, as shown in the preceding figures. You can also manually overwrite the quotation price later. Only this value is communicated to the customer.

As with the forwarding order, you can view the detailed result of charge calculation on the **Charges** tab. Because the quotation doesn't serve as an actual order or contract, settlement isn't possible based on the forwarding quotation document.

If the customer has accepted the quoted price, you can now create an actual order for the quotation. But don't worry—you don't need to create a new forwarding order from scratch; you can create the forwarding order directly from the forwarding quotation by selecting **Follow Up • Create Forwarding Order** in the action toolbar of the forwarding quotation.

The forwarding order type that is used for creation must be defined in Customizing of the forwarding quotation type in the **Default Forwarding Order Type** field. In Customizing of the forwarding quotation type, you can specify how many forwarding

orders may be created out of the forwarding order. Additionally, a forwarding order can be created out of a forwarding quotation only if the quotation was already submitted.

All relevant data is copied from the quotation to the order. The most important data copying is probably the calculated charges. Because master data in Transportation Charge Management might change during the quotation and order-taking process, you want to avoid calculating charges again on the forwarding order when a different result could occur. Therefore, the charge calculation results are copied to the forwarding order, and the status for charge calculation indicates that no further charge calculation is necessary. If you need to do a charge calculation on the forwarding order again, you can do so using the functionality covered in Section 4.2.1.

The assignment of the forwarding quotation to the forwarding order is displayed in the document flow if you've created a forwarding order from a forwarding quotation. Later, the document flow of the freight unit and freight orders will document that the process has started with a forwarding quotation.

However, in some cases, you create a forwarding order independently of the forwarding quotation even though a quotation exists for this workflow. In this case, you can subsequently assign a forwarding quotation to a forwarding order.

On the forwarding order, actions are available in the action toolbar that enable the retroactive assignment of the forwarding quotation to the forwarding order, as shown in Figure 4.38. When you want to assign a forwarding quotation to the forwarding order, click the **Forwarding Quotation • Assign FWQ** button. A new popup appears in which you can enter the document number of the forwarding quotation. However, checks are performed to determine that the selected forwarding quotation aligns with the current forwarding order. The standard checks include whether the locations and dates in both documents match and whether the combination of sold-to party and sales organization is the same.

Figure 4.38 Assignment of Forwarding Quotation to Forwarding Order

Enhancing the Standard Check

You can enhance these checks with a BAdI found via the IMG menu path **Transportation Management • Business Add-Ins (BAdIs) for Transportation Management • Forwarding Order Management • Assignment of Forwarding Quotation to Forwarding Order • BAdI: Extension of Checks for Assignment of Forwarding Quotation to FWO**.

When you're creating documents for an import/export process, you can also assign an import forwarding quotation to an export forwarding order. You'll find more information on import/export processes in Chapter 8.

4.2.4 Creating Orders and Quotations with Reference

In the transportation business, LSPs and carriers often have a stock of regular customers who frequently order transportation services for the same route or with similar items. If you don't want to create new orders or quotations from scratch, you can use existing documents and create new ones from them.

One option is to copy an existing forwarding order (e.g., from a transportation service performed in the past) and update certain information, such as dates. When you copy the forwarding order, no link is established between the existing forwarding order and the copy. A forwarding order can also be copied with a new type, meaning the new forwarding order takes over most of the data from the existing forwarding order but is assigned a different forwarding order type. This method is used in import/export processes where an import forwarding order is created from the export forwarding order. (Again, Chapter 8 offers more information about import and export forwarding orders.) When you display a forwarding order, click the **Other Copy Options • Copy with New Document Type** button in the action toolbar to open a new tab in SAP Fiori. In this tab, you can specify the new document type and, if necessary, a new transportation mode.

You can get to this screen shown in Figure 4.39 by opening the **Create Forwarding Order** tile in the **Order Management** tab of the SAP Fiori launchpad.

In the **Basic Data** upper screen area, you define information that should be assigned to the new document you want to create. In the **Create with Reference to** lower screen area, you assign references to existing documents. We revisit this screen in a few pages, so keep it in mind.

You can use this initial screen to create a forwarding order as a copy from an existing forwarding order. Enter the **Forwarding Order Type** in the upper screen area and specify a forwarding order document number in the **Create with Reference to** area. The new document acquires all the data from the reference forwarding order. However, as already mentioned, no reference is shown in the document flow.

The risk with copying an existing forwarding order is that you have to be very careful with the already-existing data. Discrepancies might result if you accidentally copy item quantities that the customer did not order.

Figure 4.39 Forwarding Order Creation Initial Screen

To avoid this risk, you can create templates for forwarding orders. To create a template, you use the same tile as when creating forwarding orders. On the initial screen, as shown in Figure 4.39, select the **Template** checkbox in the **Basic Data** area. You don't need to customize any separate forwarding order template types, but you can use the forwarding order types.

If you look at the template document, you'll see that it closely resembles the forwarding order (which is no surprise, because it's a template for creating forwarding orders). Note that you can't trigger charge calculation or FUB from forwarding order templates because these functionalities are reserved for the forwarding order document itself.

The template document is missing some tabs that appear on the actual forwarding order document: **Profitability**, **Attachments**, **Internal Charges**, **Output Management**, and **HBL or HAWB**. These forwarding order tabs are concerned with the actual execution of the transportation service. Because the template isn't meant to have anything to do with process steps that trigger transportation execution, FUB and charge calculation are disabled.

The biggest difference is that you can't define any dates in the **Locations and Dates/Times** tab. This is because templates should be timeless, meaning that, in most cases, it's the dates that differ from order to order.

After you save the template, a document number is assigned. We recommend that you use a different number range for templates and actual forwarding orders to differentiate between the two document categories. You can assign the number range of both the forwarding order documents and the forwarding order templates in Customizing of the forwarding order type.

Now when you want to create a forwarding order from a template, you have different options. One option is to use the POWL that was shown earlier in Figure 4.16 for forwarding orders. This POWL includes queries to find template documents. For example, you can search template documents for a certain combination of sales organization and sold-to party or a specific routing. When you've found the right template, you can select it in the POWL and click the **Create Forwarding Order from Template** button at the top of the screen.

Alternatively, you can display the template by using the **Display Forwarding Order** tile. If you know the document number of the template, you can insert it. The system automatically recognizes that you've chosen a template. If you don't know your document number, you can select the **Template** checkbox on the initial screen. If this checkbox is selected, the help displays only forwarding order template documents.

When displaying the template document, you can also click the **Create Forwarding Order from Template** button from the action toolbar. If you want to copy the template with a new document type, as explained previously, the new document is also a template document.

The third option is to use the initial screen of the forwarding order creation. In the **Create with Reference to** area, you can specify a template document number. All data from the template is then copied into the forwarding order. Like when you copy existing forwarding orders, no relationship between the template and order is displayed.

Creating forwarding orders from the forwarding quotation is possible not only with the features described in Section 4.2.3. If you look at Figure 4.39 again, you'll see that you can also define a forwarding quotation in the **Create with Reference to** area.

Creating a forwarding order with *reference* to a forwarding quotation is the same process as creating a forwarding order from the forwarding quotation—meaning that the prerequisites for creating a forwarding order from a forwarding quotation must be met. In this case, the forwarding quotation is added to the forwarding order's document flow as a predecessor document.

In the **Create with Reference to** area of Figure 4.39, you can assign forwarding agreements as a reference for the forwarding order that is being created. This referencing has a slightly different effect than the referencing of quotations, templates, and other orders.

No data is copied into the new forwarding order. The referencing here is used to avoid the system-based agreement determination, which is explained in detail in Chapter 10, Section 10.2. If you assign agreements as reference, these agreements are considered when calculating charges on the forwarding order.

Although we've primarily concentrated on forwarding orders during our discussion of the template, templates can also be used for forwarding quotations. The following features are also applicable for quotations:

- Defining different number ranges for templates
- Creating forwarding quotation templates
- Using the reference area on the initial screen of the forwarding quotation creation
 - Referencing forwarding quotations
 - Referencing forwarding quotation templates
 - Referencing forwarding agreements
- Disabling charge calculation of forwarding quotation template

Because the transportation requirement document marks the beginning of the transportation planning, charging, and execution process, it's a very important document for the whole process. The information entered in the transportation

requirement is passed on to the next process steps. The transportation requirement document is the only document in which information about the goods to be transported is entered into the system.

Consider Figure 4.40, which was shown at the beginning of this chapter in relation to which transportation requirement documents exist and how they are used. You should be able to explain the differences between the documents and give details about each of the documents depicted by the bottom-left boxes.

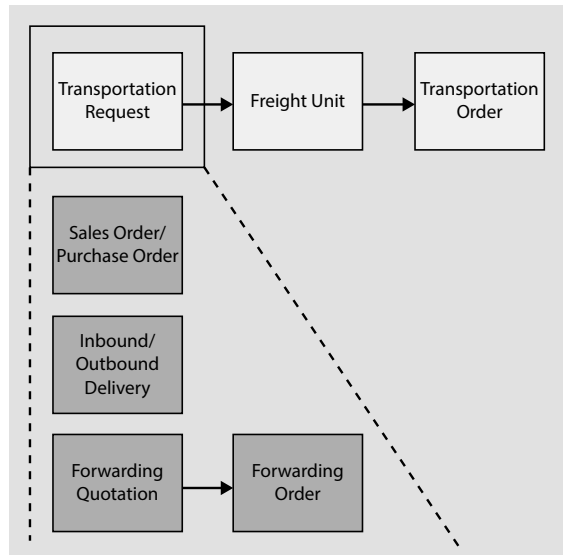


Figure 4.40 Transportation Request Documents

4.3 Summary

We've walked through quite a lot of steps in this chapter; now, let's review the process as a whole.

There are two ways of creating transportation requirement documents in SAP TM. The first option is the integration of MM or SD order and delivery documents into the SAP TM functionality, which was explained in detail in Section 4.1.1. This option is used by the shipper industry that uses SAP TM for the transportation of its own manufactured and sold or purchased materials.

You can integrate the following SAP orders:

- SOs
- POs
- STOs
- Scheduling agreements

The order integration described in Section 4.1.1 and Section 4.1.2 works using the output determination procedure. You need to do some configuration concerning the output management and the activation of the transfer of the orders to the SAP TM functionality. If you want to integrate orders created in the MM component (POs or STOs), use the output processing workflow.

After the order has been transferred to the SAP TM functionality, a freight unit is created. The freight unit doesn't differentiate between SD and MM orders.

After the freight units have been planned, the SAP TM functionality can send a delivery proposal to the orders in SD and MM. Deliveries can then be created based on the planning results in SAP TM, but the leading functionality that determines how deliveries are created is still SD or MM. The integration of created deliveries is configured like the integration of orders.

If you're using a separate instance to run SAP TM, the integration needs to be set up slightly differently. In this case, the SD or MM order or delivery is sent to the SAP TM instance via web service, and a document representing this order—the OTR—is created in SAP TM. The delivery is represented by SAP TM with the DTR document. If both order and delivery are sent to the separate SAP TM instance, an OTR consumption can take place. The integration with an external SAP TM system is described in Section 4.1.4.

The second option for creating transportation requirement documents in SAP TM is creating forwarding orders and forwarding quotations. These documents are used by LSPs and carriers who need more information about the requested transportation process than what is integrated from SAP S/4HANA orders.

Forwarding orders can be created via EDI messages or manually. The forwarding order document combines various pieces of information:

- Information relevant for business administration
- Data relevant to charge calculations
- Data crucial for transportation planning

This information is displayed in the document in different tabs. The most important tabs of the forwarding order are explained in Section 4.2.1.

If customers inquire about the price of a transportation service based on existing agreements, no order has to be created. The charge estimation, covered in Section 4.2.2, calculates the charges of transportation services without creating any documents in SAP TM. This application could possibly also be provided to the customer directly if a customer requests charge estimations very often.

In a tendering process, the customer's inquiry doesn't necessarily result in the creation of an order. Therefore, the first step of the customer engagement is to create a forwarding quotation, as described in Section 4.2.3. With the help of the forwarding quotation, the customer's inquiry can be communicated to and registered by the LSP or carrier, which then communicates a price to the customer. This communication can also be done electronically using web services.

After the customer agrees to the quoted price and terms, a forwarding order can be created from the forwarding quotation.

If forwarding orders or quotations are often created for the same routing or material, the person who takes orders can make the task easier by creating template documents up front. When an order needs to be created, the data can be reused via templates, and the employee can add data specific to the individual order. Templates are covered in Section 4.2.4.

After the transportation requirement is completely entered and confirmed, and freight units have been built, the transportation planning process can start. Let's continue in Chapter 5 with the capacity management process before going into the details of transportation planning in Chapter 6. In that chapter, you'll recognize much of the information that we've entered in either the SAP S/4HANA order/delivery or forwarding order.

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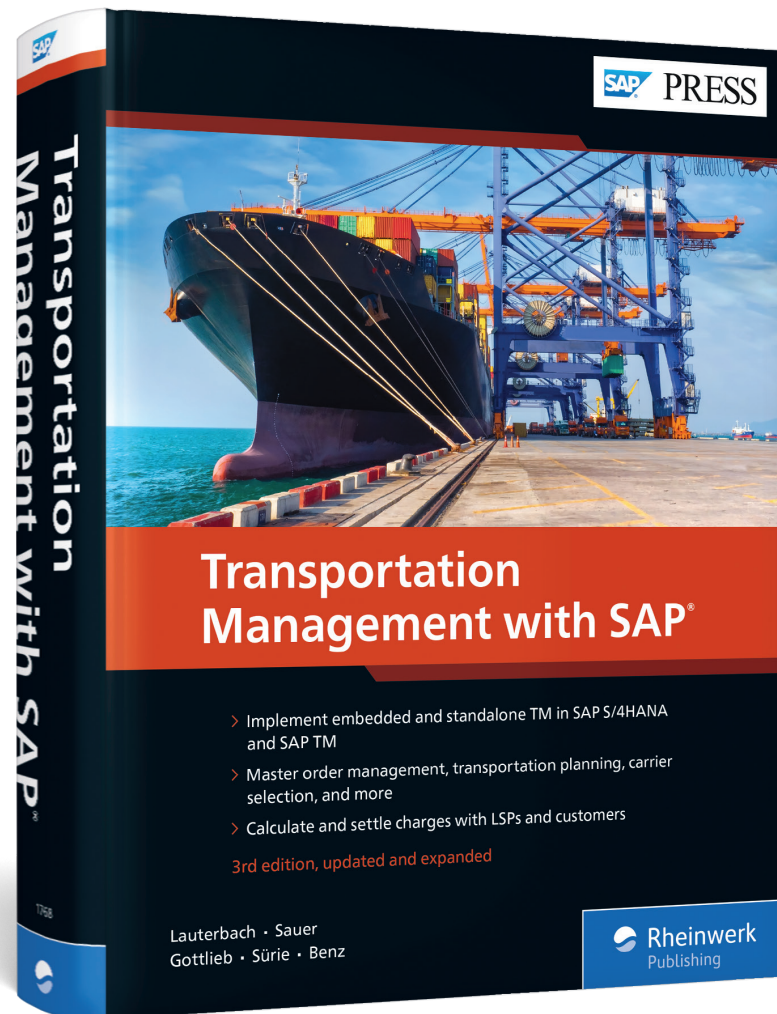
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