S4TM3

Charges and Settlement in SAP S/4HANA Transportation Management

PARTICIPANT HANDBOOK
INSTRUCTOR-LED TRAINING

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American English is the standard used in this handbook.

The following typographic conventions are also used.

This information is displayed in the instructor's presentation	
Demonstration	
Procedure	
Warning or Caution	
Hint	
Related or Additional Information	
Facilitated Discussion	
User interface control	*Example text*
Window title	*Example text*

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Course Overview

TARGET AUDIENCE

This course is intended for the following audiences:

- Application Consultant
- Industry / Business Analyst Consultant
- Super / Key / Power User
- Business Process Architect
- Business Process Owner/Team Lead/Power User

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UNIT 1

Transportation Management as Part of SAP S/4HANA Enterprise Management

UNIT OBJECTIVES

- Explain the motivation behind SAP S/4HANA Enterprise Management
- Describe the main components of SAP S/4HANA Enterprise Management
- Describe the capabilities of SAP Transportation Management
- Describe the end-to-end transportation processes

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Unit 1
Lesson 1

Describing SAP S/4HANA Enterprise Management: Motivation and Overview

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Explain the motivation behind SAP S/4HANA Enterprise Management
- Describe the main components of SAP S/4HANA Enterprise Management

Motivation Behind SAP S/4HANA

As your enterprise plans to implement SAP S/4HANA, you want to get some insights into the new SAP S/4HANA Enterprise Management logistic solution.

The World is Changing

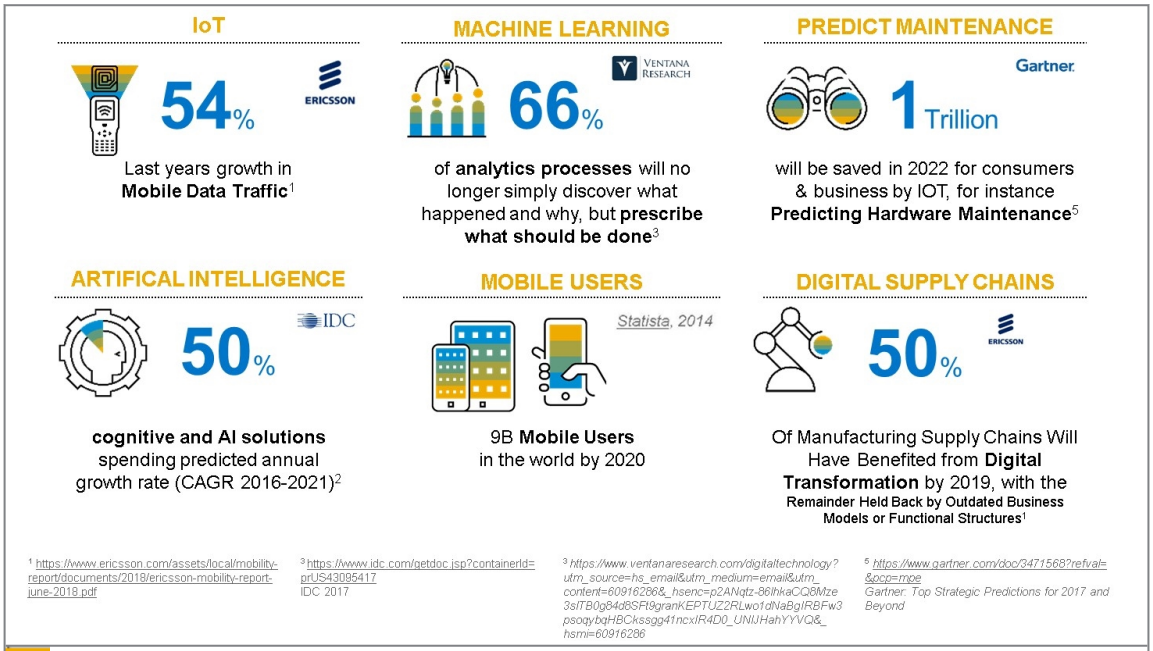

Figure 1: The World is Changing

The figure, The World is Changing, shows that the world around us is becoming more complex. There has been an unprecedented growth in digital information (social, mobile, and big data), an increase in globalization and the spread of business networks, and the Internet of Things (IoT). These changes have resulted in more complex business processes, organizations, and software solutions.

By the end of 2009, 5% of the world's population owned smart phones. Four years later, that figure jumped to 22%. Currently, there are 1.7 billion people on social networks. Emerging

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technologies are resulting in billions of devices connecting to the Internet of Things, creating a digital network of virtually everything. As cloud computing is adopted as standard by many companies, the billion-dollar business is set to grow exponentially.

This proliferation of mobile devices, social media, cloud technologies, and the staggering amounts of data they generate, have transformed the way we live and work. 61% of companies report that most of their people use smart devices for everything, from e-mail to project management to content creation.

Machine learning (ML) is the study of algorithms and statistical models that computer systems use to progressively improve their performance on a specific task. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task.

Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Some examples of the activities that computers with artificial intelligence are designed for include the following:

- Speech recognition
- Learning
- Planning
- Problem solving

These advancements have improved our lives and provided us with greater opportunities for innovation than ever before. The world may be getting smarter, but it is not getting any easier.

SAP Strategy - Deliver the Intelligent Enterprise

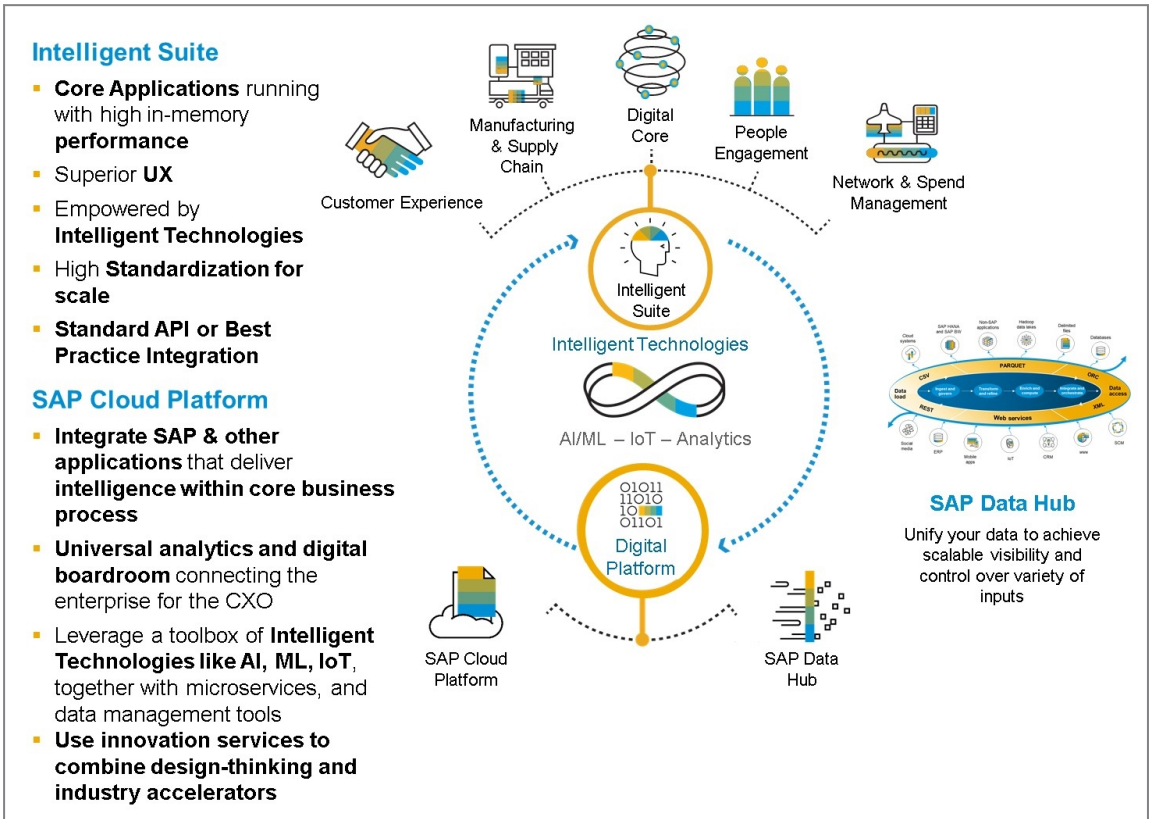

Figure 2: SAP Strategy - Deliver the Intelligent Enterprise

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As the figure, SAP Strategy – Deliver the Intelligent Enterprise, shows, the digital value network starts with a digital core, which interconnects all aspects of the value network in real time to drive business outcomes. The digital core gives companies a new platform for core business processes and brings together business processes with analytics in real time. This enables a smarter, faster, and simpler enterprise, which includes connecting every aspect of internal operations. It also enables real-time processes.

SAP is heading in the direction of Machine Learning and the Intelligent Enterprise. Machine learning technologies are critical to empowering this vision of the Intelligent Enterprise. By embedding algorithms directly into multiple SAP systems, we can continuously learn and adapt to new data as it comes in, without a user having to be involved.

The information is presented to knowledge workers in the transaction screens they are familiar with, but are enhanced with new information to make them more effective at their job. Not only is SAP delivering these types of embedded self-adapting algorithms into all our core applications, we are making it possible for our customers to customize these models or deliver entirely new models of their own with SAP Predictive Analytics, application edition.

This entire value chain, including the core, is digitized, and serves as the platform for innovation and business process automation.

Evolution of SAP S/4HANA

The Next Generation Business Suite

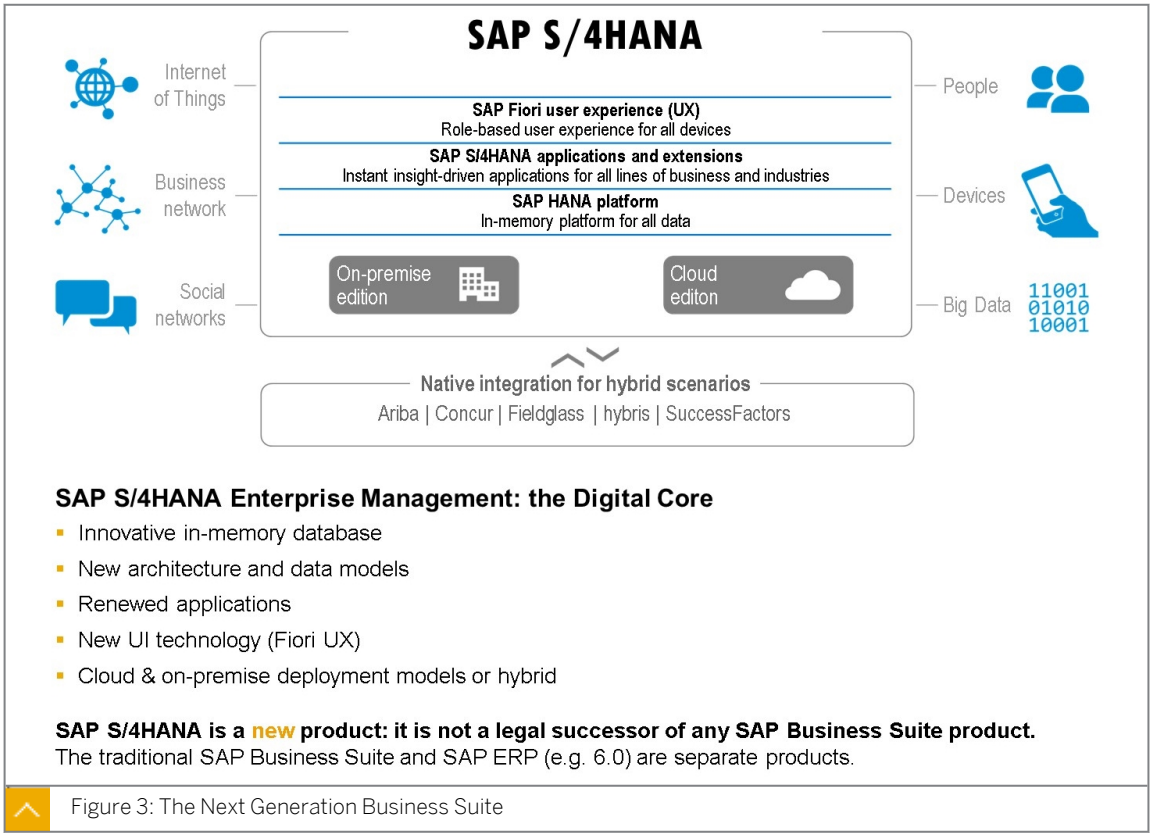

Figure 3: The Next Generation Business Suite

SAP S/4HANA is a new product. With SAP S/4HANA, we are building on the success of the SAP Business Suite, powered by SAP HANA, with a completely new and reimagined suite.

SAP S/4HANA runs on SAP HANA and provides simplicity. For example, a simplified data model with no indexes, no aggregates, no redundancies. It also promotes innovations. For

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example, open in-memory platform for advanced applications predicting, recommending, and simulating.

SAP S/4HANA is natively designed with SAP Fiori UX, and offers an integrated user experience with modern usability and instant insight on any device (role-based, a maximum of three steps to complete a job, mobile-first, consistent experience across lines of business (LoB).

SAP S/4HANA is natively connected to the Internet of Things and business networks for real-time collaboration in the networked economy. It is natively engineered, providing a choice of deployment options (on-premise, cloud, and hybrid). It is also natively born for easy adoption. For example, guided configuration and easy on-boarding, from the discovery of the solution through cloud trials to deployment with preconfigured best practices.

The Next Generation Intelligent ERP

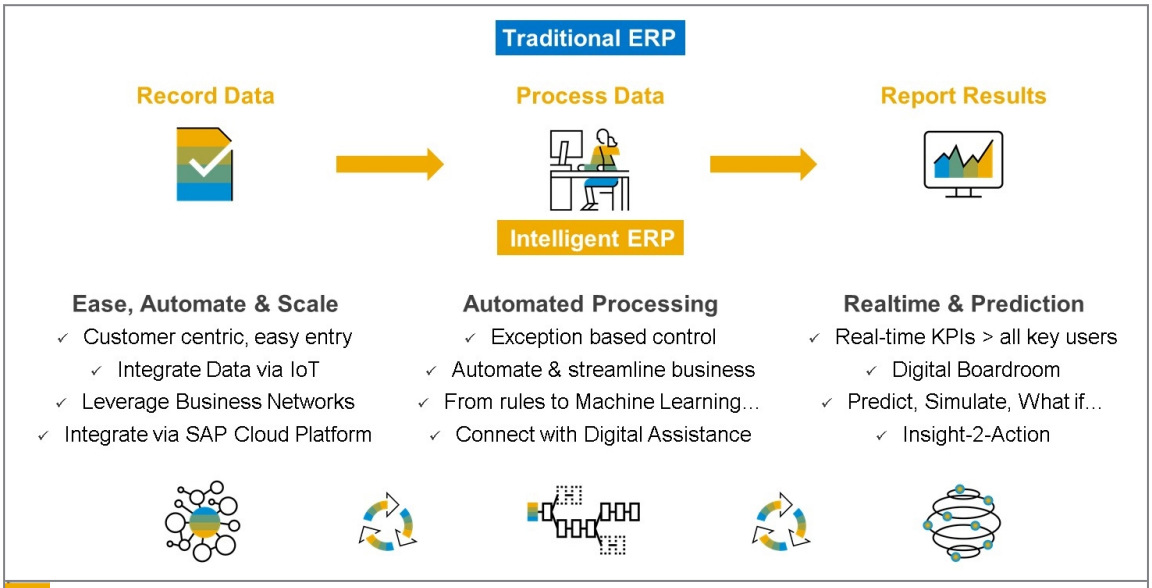

Figure 4: The Next Generation Intelligent ERP

SAP S/4HANA improves the order and data records entry management. Orders can come in via business networks or via cloud systems. IoT data is easily imported.

Execution of data is improved by heuristics, machine learning, and fast batch processing. The user just has to react if an exception is raised.

Real time analytics and transactional data are brought together to support fast and suitable decisions.

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The Evolution of the SAP S/4HANA Architecture

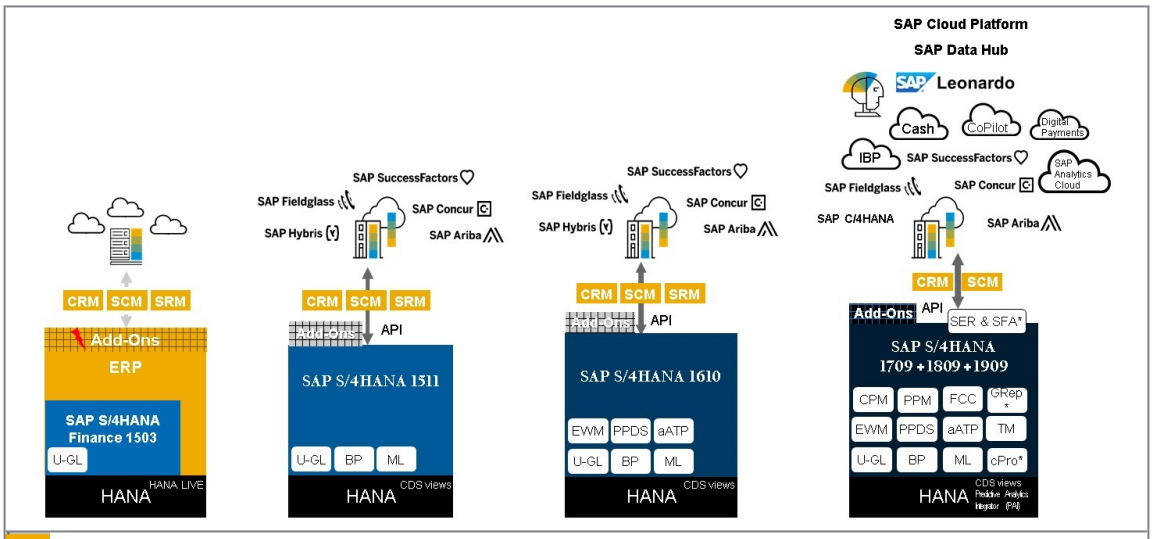

Figure 5: The Evolution of the SAP S/4HANA Architecture

In SAP S/4HANA Finance 1503, the Unified General Ledger (U-GL) was introduced. It brings together the once-separate components Financial Accounting (FI) and Controlling (CO) into one pool of relevant business data. This single source of truth collects all accounting-relevant transactions and makes them available to all relevant application components: Financial Accounting (General Ledger), Controlling, Asset Accounting, and Material Ledger.

With SAP S/4HANA 1511, the optimized data model for logistics with Business Partners (BP) and Material Ledger (ML) was introduced.

With SAP S/4HANA 1610, Extended Warehouse Management (EWM), Production Planning and Detailed Scheduling (PP/DS) where embedded and advanced ATP (aATP) was developed.

With SAP S/4HANA 1709, Transportation Management (TM) was embedded and Commercial Project Management (CPM), Portfolio and Project Management (PPM) and the Financial Closing Cockpit (FCC) were added.

With SAP S/4HANA 1809, Group Reporting (GRep), Sales Force Automation, Central Procurement (CPro) (central requisitioning was available as of 1709; central contract and central purchasing as of 1809) were added.

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SAP S/4HANA Enterprise Management Lines of Business

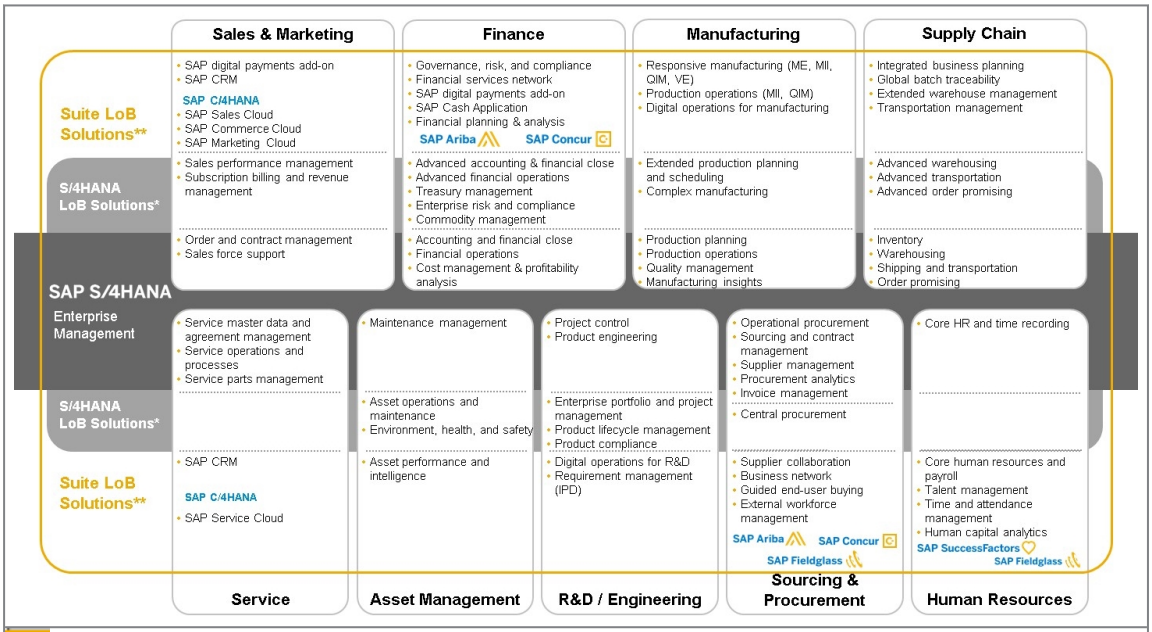

Figure 6: SAP S/4HANA Enterprise Management Lines of Business

At the center of SAP S/4HANA Suite is SAP S/4HANA Enterprise Management, which was built by simplifying the SAP ERP solution and reintegrating and simplifying portions of the SAP Business Suite products, such as SAP SRM, SAP CRM, and SAP SCM, into this core. SAP S/4HANA Enterprise Management is available on premise and in the cloud, with different licensing and subscription models.

The SAP S/4HANA Suite is completed by the integration of dedicated lines of business (LoB) and industry solutions natively into SAP S/4HANA Enterprise Management. These solutions can be cloud-based, like SAP SuccessFactors, or delivered on-premise as well (for example, SAP Transportation Management), depending on the market need.

SAP S/4HANA Deployment Options

	SAP S/4HANA Cloud, essentials edition	SAP S/4HANA Cloud, extended edition	SAP S/4HANA*
Business Process	**Standardized, core ERP**	**Flexible, ext. ERP**	**Customizable, ext. ERP**
Innovation Lifecycle	Quarterly	Semi-annual	Annual, customer-led
TCO	Lowest	Lower	Higher
System Governance	SAP-led	Customer-influenced	Customer-led
IT Infrastructure	SAP, public	SAP, dedicated	Customer-managed
Customization	With standard APIs	With SPRO	SPRO and modifications
Extension	PaaS, SCP	PaaS, SCP	Open, SCP
System Delivery	New implementation	New implementation	New or ECC conversion
Licensing	Subscription	Subscription	Classic

*Private cloud managed by SAP & On-premise managed by cloud providers or customers

Figure 7: SAP S/4HANA Deployment Options

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SAP S/4HANA is available as on-premise edition and cloud editions. This training focuses on the SAP S/4HANA on-premise edition.

Although the SAP S/4HANA on-premise edition and the SAP S/4HANA Cloud (extended edition) have the same code line, there are important differences, as follows:

- SAP S/4HANA Cloud, extended edition; you do not buy the software, but you rent it.
- The cloud provider is responsible for sizing, upgrades, and so on.
- Modifications are not allowed in a cloud environment.

To set up the SAP S/4HANA Cloud, essentials edition:

- You get one company code with one plant per country as a template.
- You can use the migration workbench to import master data.
- You can use the Adobe Designer to change or create forms.

You can extend your system using Platform as a Service (PaaS) using the build in services in SAP HANA or the SAP Cloud Platform (SCP) environment.

LESSON SUMMARY

You should now be able to:

- Explain the motivation behind SAP S/4HANA Enterprise Management
- Describe the main components of SAP S/4HANA Enterprise Management

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Unit 1
Lesson 2

Evaluating Transportation Management

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Describe the capabilities of SAP Transportation Management
- Describe the end-to-end transportation processes

Capabilities of SAP Transportation Management

Companies have been shipping products across countries and continents for centuries. The concept of managing the transportation of products is not new. However, using new methodologies and technology can make a difference in an industry. Today, most economies are wholly reliant on efficient transportation logistics.

With the shift in recent years towards a global economy, crossing borders has become commonplace. Reaching customers in more remote locations and sourcing the procurement of product from multiple vendors or locations has increased the cost of transporting products. As the world becomes smaller, the team tasked with maintaining logistics needs to respond faster and more cost-effectively.

Global natural disasters and other dangers show the vulnerability of the global supply chain. Despite these challenges, the transportation part of the supply chain, in particular, has to solve the problems that arise in order to keep factories running and customers supplied.

Executive Decisions

The following examples are issues that key executives face:

- How can I manage my logistics network in a holistic fashion?
- How can I minimize the risk factors throughout my supply chain?
- How can I reduce my operational costs and better understand transportation costs at the customer level?
- How can I ensure the best possible usage of my assets? How do I ensure high customer service levels and responsiveness to unexpected supply chain events?
- How do I ensure I am compliant with all of the varying regulations and compliance policies?

Transportation management is never an isolated process. Rather, it is always integrated into other business processes. If transportation management is poorly organized, this may have a negative impact on related business processes, for example, manufacturing or distribution.

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Evolution of Transportation Management at SAP

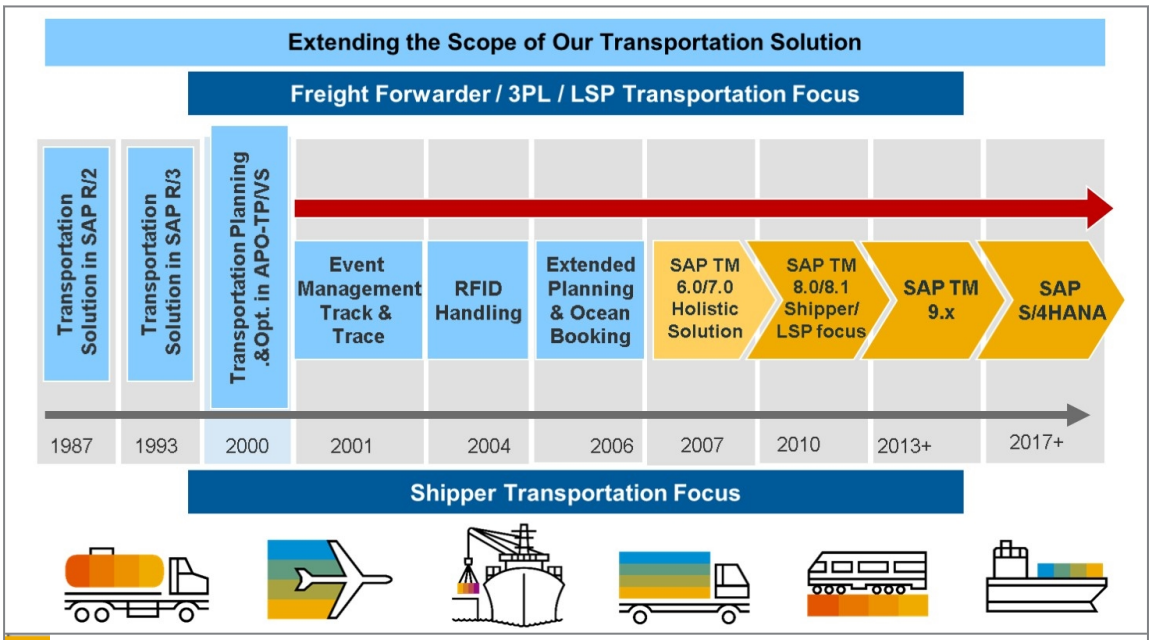

Figure 8: History of Transportation Management Functionality at SAP

SAP TM 6.0 and 7.0 evolved from the SAP Transportation Planning/Vehicle Scheduling (TPVS) solution. With SAP TM 8.0, the architecture was redesigned and the execution was improved.

As time went on, customer feedback and lessons learned from the early implementations were used as a basis for improving the solution further. As society and business make the move to mobile, SAP TM is evolving accordingly and now includes several mobile-friendly elements. For example, drivers can input updates using mobile devices and this information can be used to update customers of possible delays. While previous iterations included integration with Global Trade Services (GTS) and facilitated compliance, the focus more recently has been on improving the shipper and freight forwarder elements of SAP TM.

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Deployment Options and Migration Paths

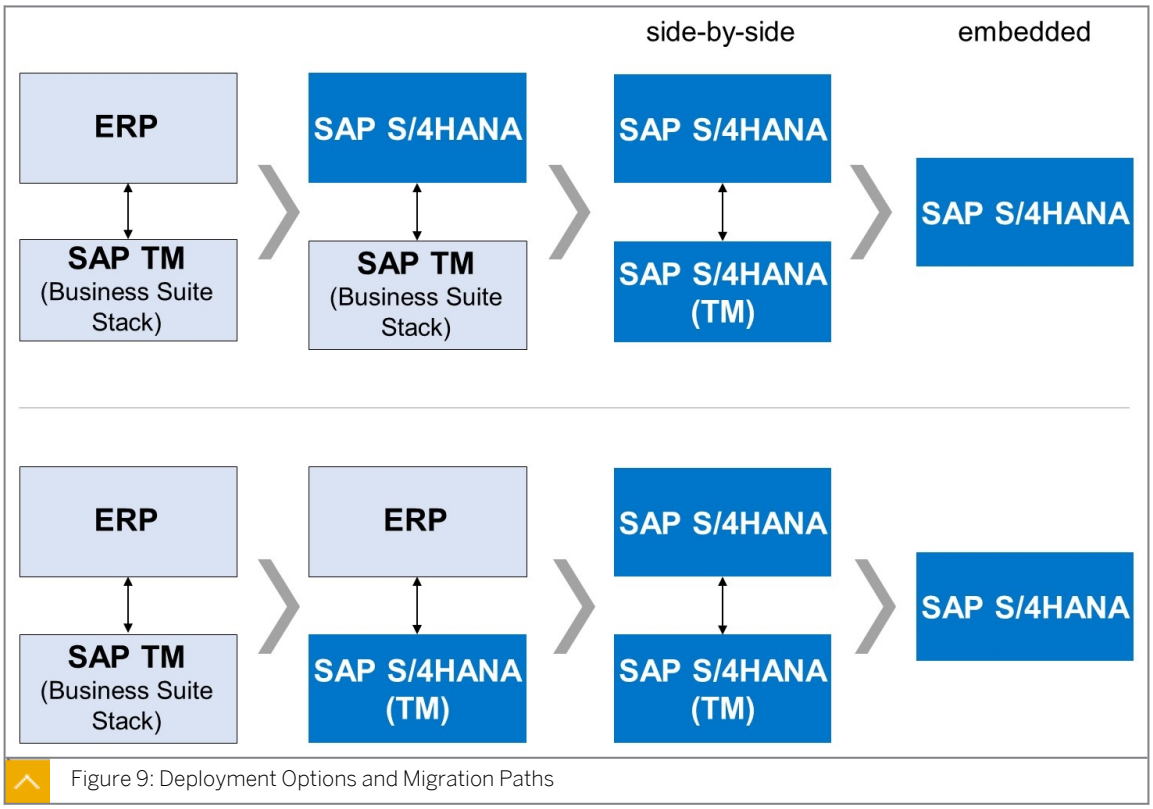

Figure 9: Deployment Options and Migration Paths

SAP Transportation Management as part of SAP S/4HANA is optimized for the processing of system internal transportation demand, with regards to data footprint and TCO:

- No replication of master data and customizing
- No replication of transactional data (for example, the freight unit is directly integrated in system internal predecessor documents without the need of the TM business object TRQ in between, which stores replicated order data)
- Direct integration of predecessor and successor documents without web service messages and monitoring of corresponding queues

As of SAP S/4HANA 1709, SAP Transportation Management as part of SAP S/4HANA also supports side-by-side scenarios, which means that transportation demand can also be received from other SAP ERP or SAP S/4HANA instances in order to process the necessary steps for planning and execution and send back the needed information to the source system of the demand. In this case, replication of data is needed and the mentioned advantages for system internal processing do not apply.

From a system perspective, an SAP S/4HANA system has to be installed and Transportation Management capabilities can be used for the following different scenarios:

1. System internal integration of SAP Transportation Management with SAP S/4HANA Enterprise Management applications in the same system instance ("Embedded")
2. System external integration of SAP Transportation Management with SAP S/4HANA Enterprise Management or ERP applications in other system instances ("Side-by-Side")

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Benefits of SAP Transportation Management

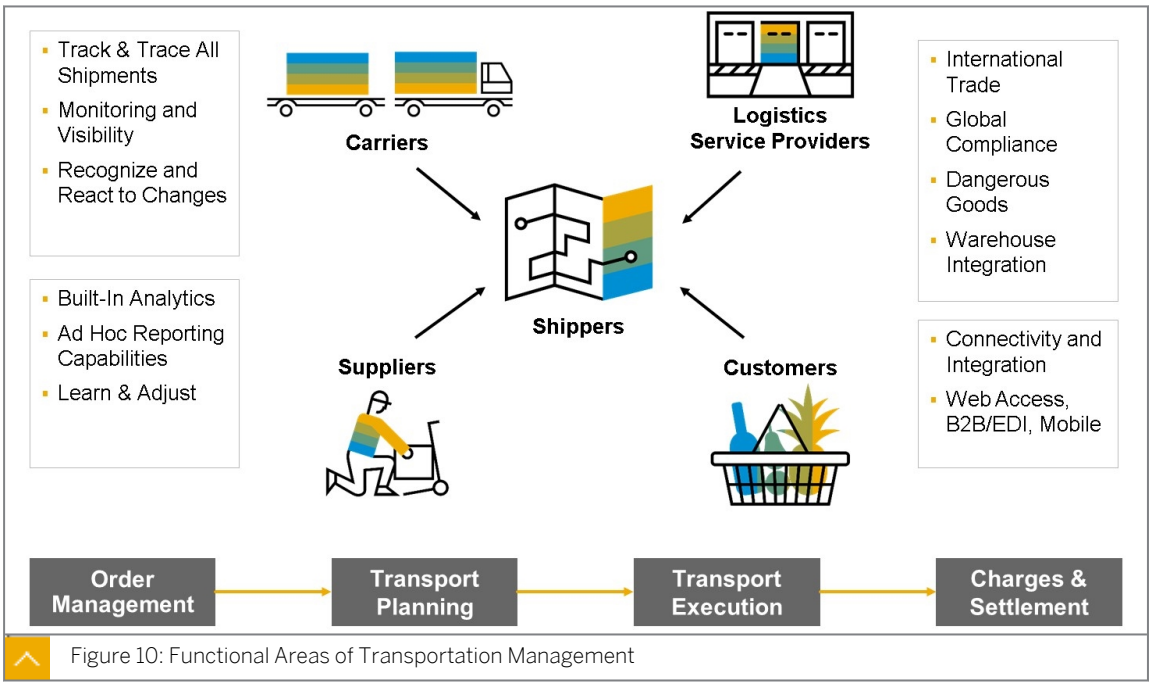

Figure 10: Functional Areas of Transportation Management

The benefits derived from using SAP TM include the following:

- Reduced costs and improved operational performance
- Improved carrier collaboration and resource utilization
- Efficient end-to-end order and process management
- Efficient logistics and fulfillment processes
- Improved execution visibility and responsiveness

In many cases, responsibility does not end by executing the shipment. Often, strategic contracts require that the shipments are traced, to provide visibility so that you can recognize and react to potential delays that could jeopardize customer service. This information is not often made available to ERP systems, whose concern is more finance-driven than service-driven. Depending upon the type of products that are being transported to different countries, compliance with regional regulations regarding dangerous goods needs to be reviewed and adhered to.

With SAP TM, existing SAP ERP customers can achieve integrated order processing and management. SAP TM is delivered with out-of-the-box integration, with order-to-cash and procure-to-pay scenarios to support timely execution updates. In addition, integrated freight settlement with SAP ERP billing and invoicing is available for customers who want to increase the speed at which business process cycles are executed. Additional planning features are available to support comprehensive order management. This includes forwarding, freight (land), and booking (sea and air) order and intermodal scenarios. This integrated environment provides full document flow and order lifecycle management, as well as a centralized order data management tool for planning, tendering, and so on.

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Transportation Management - Overview

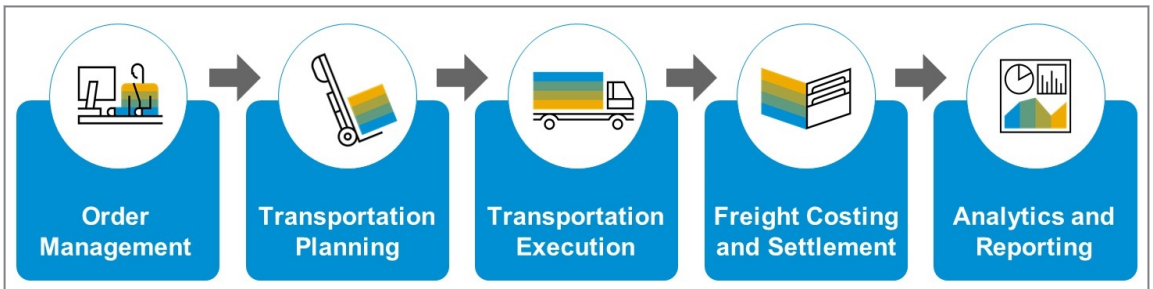

Figure 11: Transportation Management - Overview

A typical transportation process starts with order management. Order management is the process of creating a transportation requirement. Transportation requirements can be sales orders, purchase orders, deliveries, and so on. In a second step, these transportation requirements are planned. SAP TM offers manual planning functions, optimizer planning, and semi-automated processes (transportation proposal creation). Different aspects of planning supported by SAP TM are means-of-transport selection (for example, rail versus road), carrier selection based on real carrier rates, load optimization (3D-planning of container/ truck utilization). Once the planning process is finished, SAP TM also supports the execution of transports. Execution includes delivery creation, document creation (print or electronic, like waybills), event management integration (track and trace), as well as warehouse integration (EWM integration). If you do not operate your own fleet, you need to make sure that the external carrier is paid for their services. SAP TM allows you to maintain freight agreements, calculation sheets, and rate tables to accurately define real carrier costs, which can be used for charge calculation (already in the planning phase, carrier selection), but also for settlement processes after the transport has been executed. Analytics and reporting functionalities complete the available functions of SAP TM.

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End-to-End Transportation Processes

Transportation Management - Object Overview

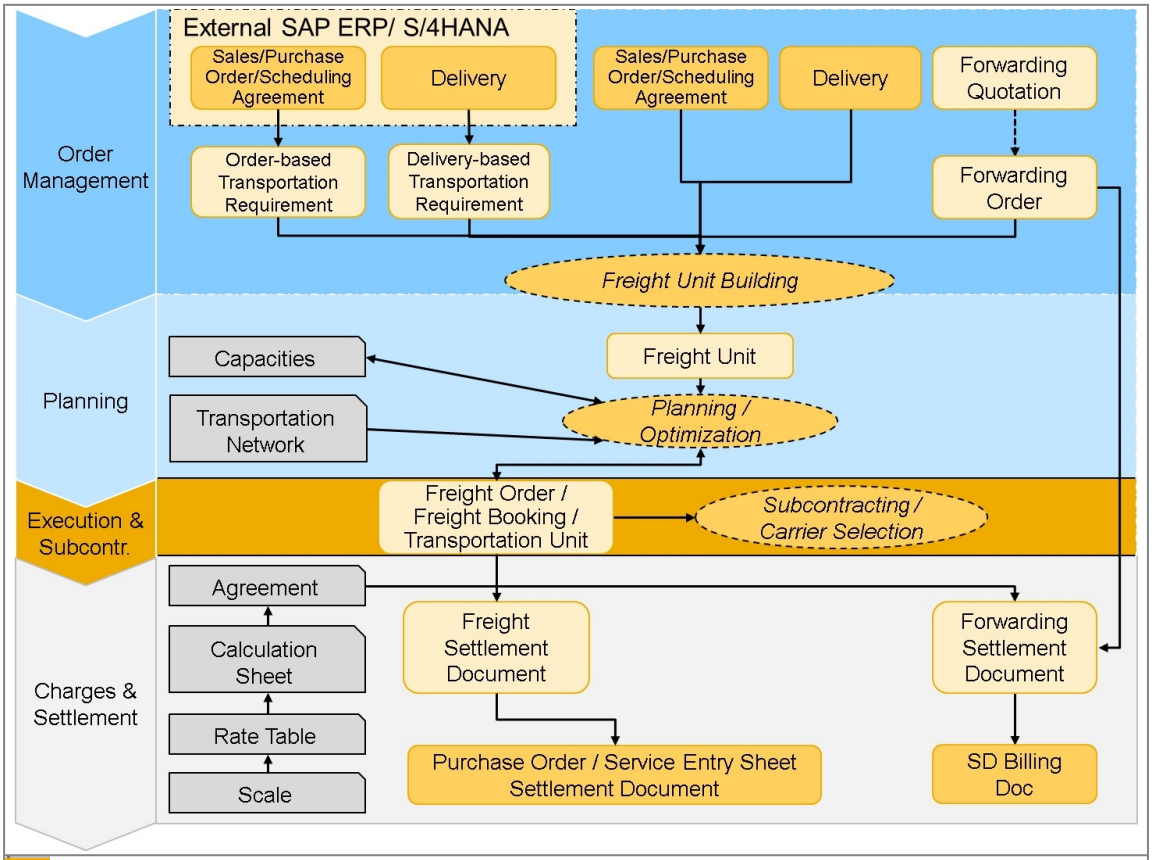

Figure 12: End-to-End Process/Document Flow

The figure, End-to-End Process/Document Flow, gives an overview of the SAP TM document model. Depending upon the extent of your integration and business requirements, different objects, documents and statuses are available. Different types of transportation requests can be created in SAP TM by the execution or order management system. The documents that are the basis for freight unit creation depend on your business scenario and deployment of SAP TM, as follows:

- If you are a shipper and you have deployed SAP TM in a side-by-side scenario, (sales/purchase) orders from your SAP ERP or SAP S/4HANA system are the basis for order-based transportation requirement creation in SAP TM.
- If you are a shipper and you have deployed SAP TM in a side-by-side scenario, (outbound/inbound) deliveries from your SAP ERP or SAP S/4HANA system are the basis for delivery-based transportation requirement creation in SAP TM.
- If you are a shipper and you have deployed SAP TM in an embedded scenario, (sales/purchase) orders from your SAP S/4HANA system are directly the basis for freight unit creation in SAP TM (no replication of data required).
- If you are a shipper and you have deployed SAP TM in an embedded scenario, (outbound/inbound) deliveries from your SAP S/4HANA system are directly the basis for freight unit creation in SAP TM (no replication of data required).

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- If you are a logistics service provider/forwarder, you create forwarding orders in SAP TM directly (or based on forwarding quotations).

Upon receiving transportation requirements, freight units are created and become the basic element for planning the movement of goods through the network. The freight unit is a transport unit used in planning. It could be a pallet or container, but it could also be two pallets that need to be transported together, for example, for customs reasons.

Freight orders will record the manual or system-generated transportation planning (intermodal) activities. These freight orders are the result of planning, consolidation of freight units on a vehicle, booked capacity, or scheduled means of transport. Once freight orders are created, carriers are assigned. Once this has been completed, transport order execution can be triggered and follow-on settlement processing can begin.

Order Management

The business purpose of order management is providing the ability to handle transportation requests, which are designated as requirements or demands from an ordering system.

One of the major benefits of SAP TM is the ability to use the system integrated to SAP ERP or SAP S/4HANA as the source demand system ("side-by-side") or as a component within SAP S/4HANA ("embedded"). So you can see the flexibility with SAP TM from an order management standpoint. If you choose to integrate with an SAP ERP or SAP S/4HANA system, SAP TM would be integrated by means of Process Integration (PI) interfaces. Orders and deliveries from SAP ERP or SAP S/4HANA can be converted into SAP TM transportation requirements automatically. LSP forwarding order creation is either done by manual entry in the SAP TM UI, or integrated from a customer's system via EDI.

You can use the Forwarding Order Management component in SAP TM to create, edit, and confirm the forwarding orders from your ordering parties. In addition to creating the forwarding order, you can also enter the data as a forwarding quotation and send it to the ordering party. You can then create a forwarding order based on the forwarding quotation.

Transportation Planning

You can use the Freight Order Management component in SAP Transportation Management to create and edit freight orders and freight bookings. You use freight orders for land transportation and you use freight bookings for sea and air transportation.

Freight orders and bookings are the result of transportation planning.

One of the major benefits of SAP TM is the ability to perform advanced planning activities. SAP TM has been developed as a planning and execution system desired to support transportation-related activities for several different industries. Some of the planning processes delivered with SAP TM are as follows:

- Vehicle Scheduling and Route Optimization
- Load Consolidation
- Load Planning
- Carrier Selection
- Freight Tendering

Transportation Execution

In addition to advanced planning capabilities in SAP TM, your organization can also gain the added benefit of integration execution activities in SAP TM.

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These integration tasks include the following:

- Integration with SAP Event Management (EM) for alerts and transportation tracking
- Trigger generation of delivery documents
- Integration with dangerous goods management
- Document printing
- Integration with SAP Extended Warehouse Management (EWM)
- Realtime analytics

Charges and Settlement

When working with customers or subcontractors, it may be necessary to collect or pay fees in relation to the movement of products. With SAP TM, it is possible to introduce a settlement process in addition to planning and execution activities. The settlement process supports the following tasks:

- Ability to define transportation charges
- Definition of freight or forwarding agreements
- Generation of settlement documents
- Posting of settlement documents and purchase order / service-entry-sheet generation
- Cost distribution
- Customer billing

LESSON SUMMARY
You should now be able to:

- Describe the capabilities of SAP Transportation Management
- Describe the end-to-end transportation processes

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Learning Assessment

1. What is included in SAP S/4HANA Enterprise Management?

   Choose the correct answers.

   - ☐ **A** A new ERP system
   - ☐ **B** An SAP HANA database
   - ☐ **C** Embedded SAP SuccessFactors
   - ☐ **D** Embedded SAP APO

2. What are the deployment options of SAP S/4HANA?

   Choose the correct answers.

   - ☐ **A** On premise
   - ☐ **B** SAP S/4HANA Cloud, extended edition
   - ☐ **C** SAP S/4HANA Cloud, essentials edition
   - ☐ **D** On desk

3. Which of the following are the main functional areas of SAP Transportation Management?

   Choose the correct answers.

   - ☐ **A** Order Management
   - ☐ **B** Transportation Planning
   - ☐ **C** Transportation Execution
   - ☐ **D** Charges and Settlement

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4. Which of the following are valid deployment options for SAP TM?

   Choose the correct answers.

   - ☐ **A** SAP ERP to SAP TM ("side-by-side")
   - ☐ **B** SAP ERP to SAP S/4HANA TM ("side-by-side")
   - ☐ **C** SAP S/4HANA to SAP S/4HANA TM ("side-by-side")
   - ☐ **D** SAP S/4HANA to SAP TM ("side-by-side")
   - ☐ **E** SAP S/4HANA ("embedded")

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Learning Assessment - Answers

1. What is included in SAP S/4HANA Enterprise Management?

   Choose the correct answers.

   - [X] A A new ERP system
   - [X] B An SAP HANA database
   - [ ] C Embedded SAP SuccessFactors
   - [ ] D Embedded SAP APO

   Correct. There is no embedded SAP Success Factors or SAP APO (although there is embedded PP/DS from SAP APO). Yet, it provides a new ERP system based on an SAP HANA database.

2. What are the deployment options of SAP S/4HANA?

   Choose the correct answers.

   - [X] A On premise
   - [X] B SAP S/4HANA Cloud, extended edition
   - [X] C SAP S/4HANA Cloud, essentials edition
   - [ ] D On desk

   Correct. There is no "on desk" version of SAP S/4HANA. It can be deployed on premise or via cloud (extended or essentials edition).

3. Which of the following are the main functional areas of SAP Transportation Management?

   Choose the correct answers.

   - [X] A Order Management
   - [X] B Transportation Planning
   - [X] C Transportation Execution
   - [X] D Charges and Settlement

   Correct. The four main functional areas of SAP Transportation Management are: Order Management, Transportation Planning, Transportation Execution, and Charges and Settlement.

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4. Which of the following are valid deployment options for SAP TM?

   Choose the correct answers.

   [X] A SAP ERP to SAP TM ("side-by-side")

   [X] B SAP ERP to SAP S/4HANA TM ("side-by-side")

   [X] C SAP S/4HANA to SAP S/4HANA TM ("side-by-side")

   [X] D SAP S/4HANA to SAP TM ("side-by-side")

   [X] E SAP S/4HANA ("embedded")

   Correct. You can deploy SAP TM either embedded or side-by-side. For side-by-side deployments all combinations of SAP ERP / SAP S/4 HANA to SAP TM / SAP S/4HANA TM are allowed.

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UNIT 2 Master Data for Transportation Charge Management

UNIT OBJECTIVES

- Describe the Charge Calculation Process and Master Data
- Configure Scale and Calculation Bases
- Create Scale Templates
- Maintain Scales
- Maintain Charge Types
- Create Rate Table Templates
- Create Rate Table Definitions
- Maintain Rate Tables
- Update and Mass Maintenance of Rate Tables

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- Define Calculation Sheets
- Create Freight Agreements

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Unit 2
Lesson 1

Managing Charge Calculation Master Data

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Describe the Charge Calculation Process and Master Data

Charge Calculations

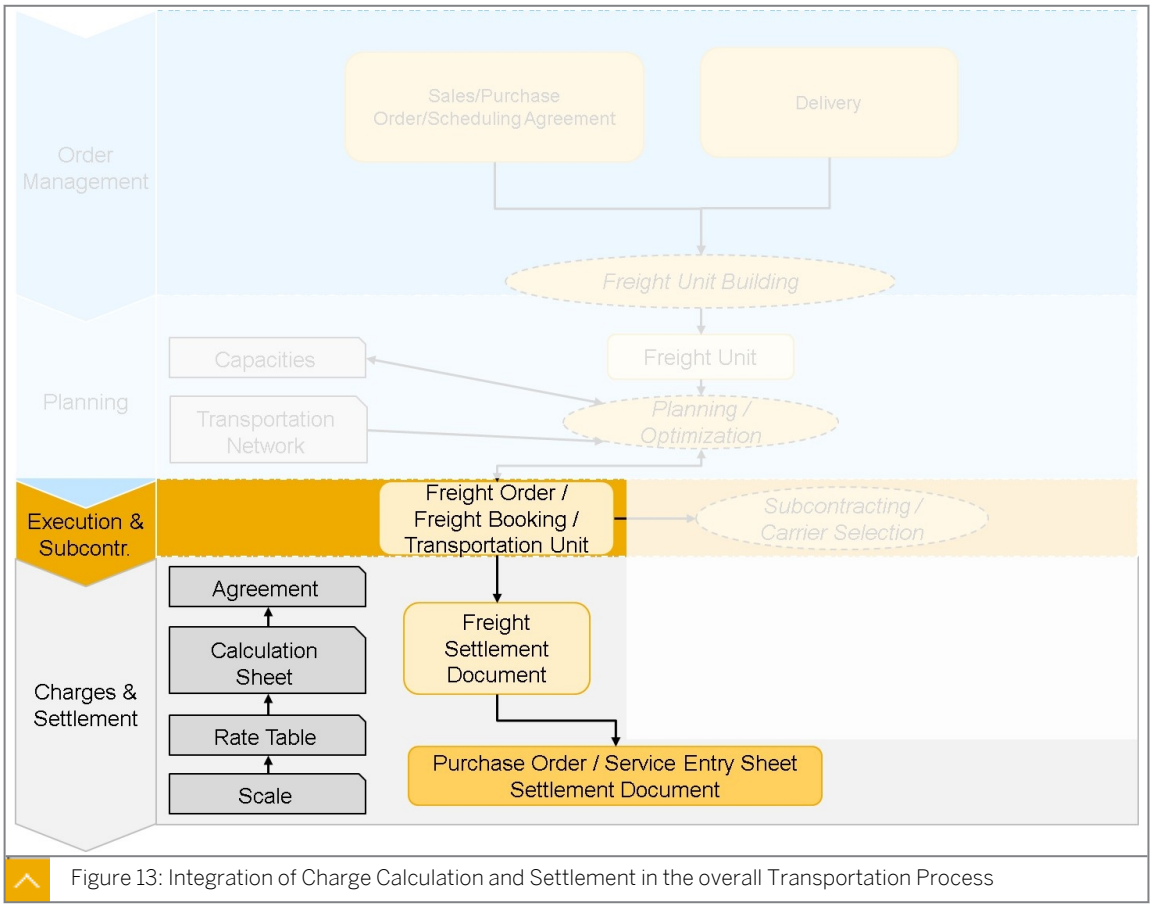

Figure 13: Integration of Charge Calculation and Settlement in the overall Transportation Process

This course focuses on the following:

- Master data for charge calculation
- Charge calculation
- Freight settlement processes

The focus of this course is on the buying side only. Charge calculation and settlement related to forwarding orders (the selling side) are not covered.

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Transportation Charge Management Solution Overview

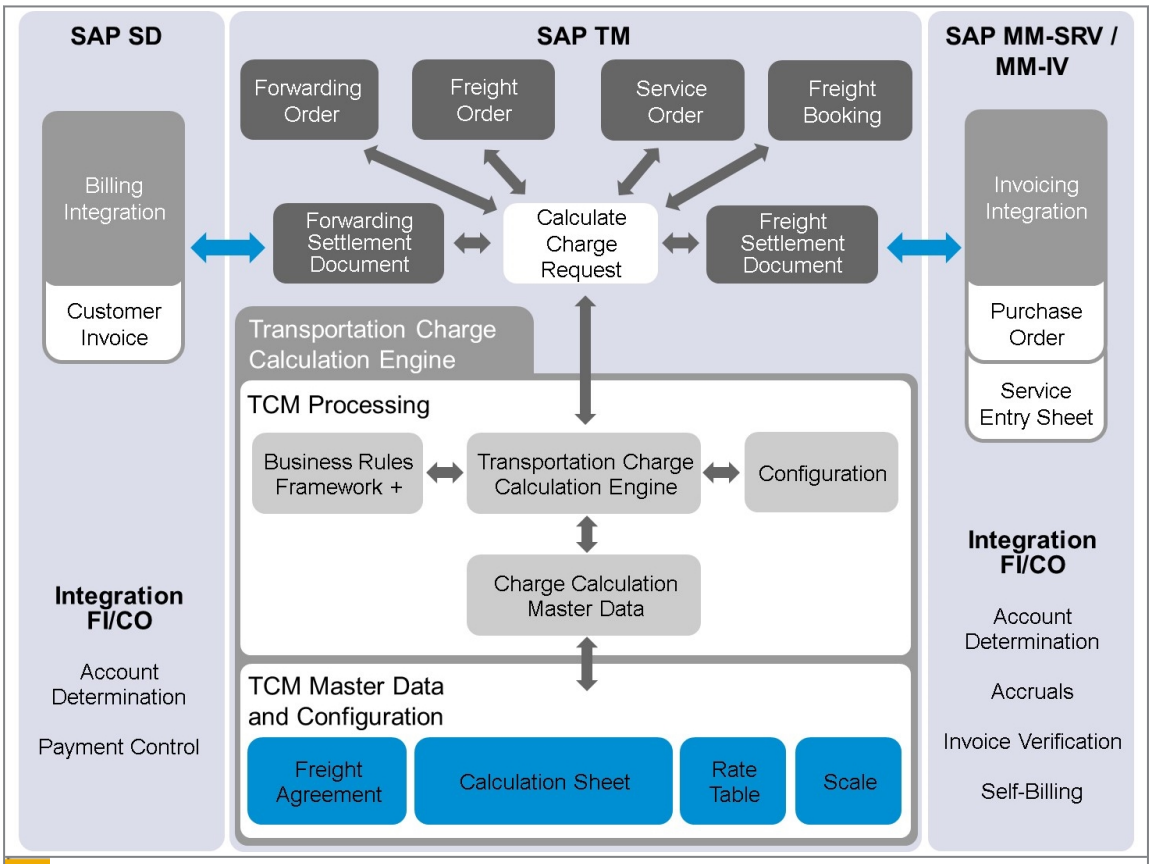

Figure 14: Transportation Charge Management Solution Overview

Examples of Possible Scenarios

- A shipper sends a request to carrier for a quotation to send a product from a distribution center to a customer.
- An LSP receives a booking request to transport a container from one port to another.
- A shipper sends a request to a carrier to move a product from the manufacturing plant to a distribution center.
- A shipper sends a service request to a service provider to execute transport-related service tasks (value-added services), such as container cleaning and customs handling.

The charge is determined based on conditions in the business rules framework, charge calculation master data, and configuration items.

The calculated charge is sent back to the requesting document.

Charge calculation also provides information on the charge type, charge category, or subcategory so that the receiving accounting processes can determine the organizational unit, cost, or revenue receivers and the general ledger account.

The transportation charge calculation process determines the freight charge for a given transportation scenario.

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Note:
Scenarios related to LSPs are not detailed in this course

Charge Requests

The calculate charge request can come from the following SAP TM documents:

- Freight order
- Freight booking
- Service order
- Dispute
- Freight agreement RFQ
- Forwarding quotation
- Forwarding order
- Forwarding settlement document
- Freight settlement document

Master Data Structure

Charge Management Master Data

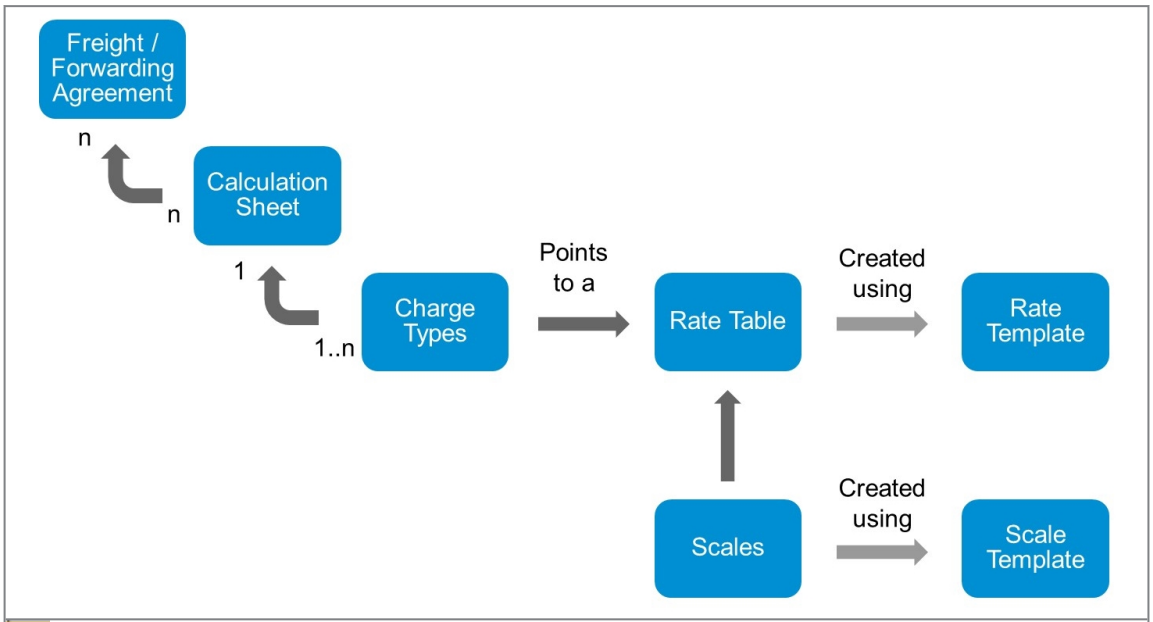

Figure 15: Master Data Structure

The system calculates transportation charges based on the following master data in Charge Management:

Scale template

A scale template can be used to create the scale easily.

Scale

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A scale is a dimension of a rate table.

Rate table

A rate is a price for a certain transportation service that is only valid for the period as defined by its validity. A rate is listed in a rate table. This is where the freight rates are maintained based upon the scale specifications.

Charge types

The charge type describes a specific charge. For example, Haul (Haulage), BAF (Bunker Adjustment Factor) or FSC (Fuel Surcharge).

Calculation sheet

The charge calculation sheet is a hierarchical table used to calculate transportation charges. It combines the charge types permitted for a document and the sequence in which the system takes these charge types into account during the calculation.

Freight agreement

A freight agreement describes the contractual relationship between the freight service provider (or customer) and the requesting organizational unit. It contains payment terms, limits, validity period, and valid calculation sheets. Information such as organizational unit, contracting parties, or conditions can be specified.

Business Example: Road-Sea-Road

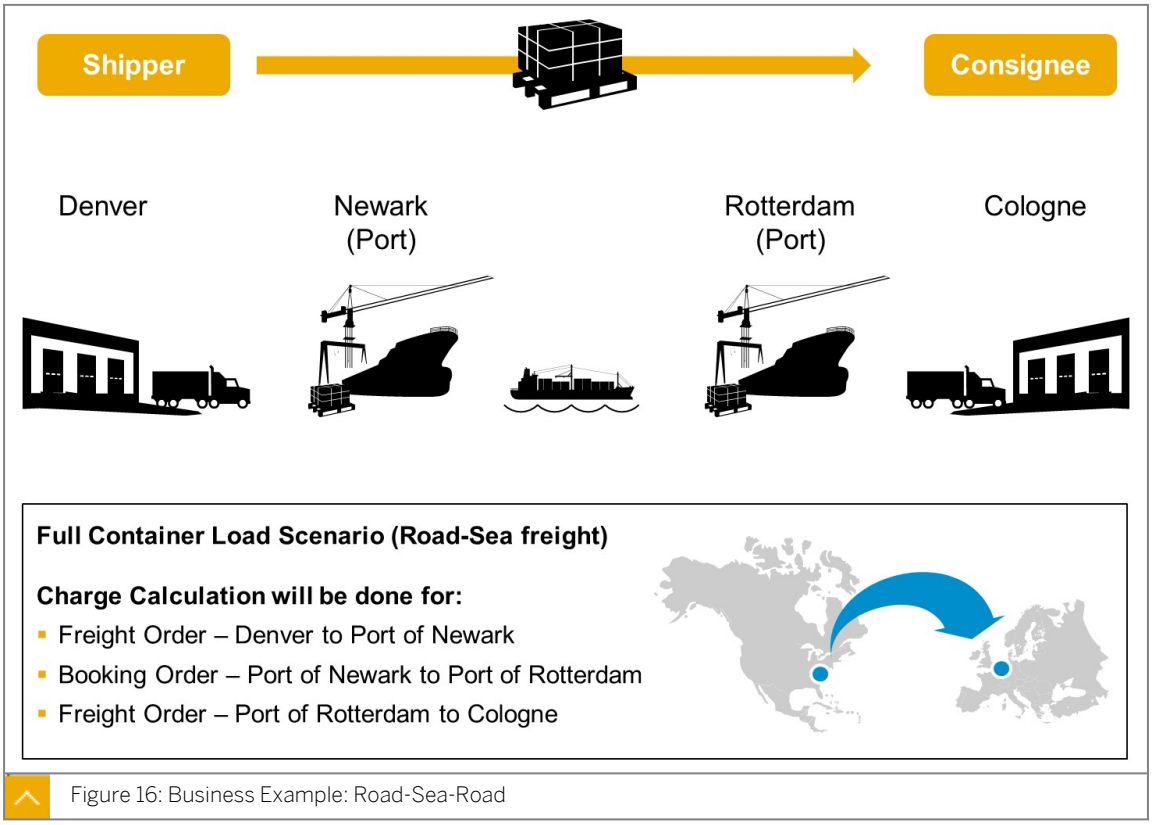

Figure 16: Business Example: Road-Sea-Road

In this scenario, a full container load is being sent via road-sea freight. In SAP SD, a sales order for the entire move is created. On save of the sales order the system automatically builds a freight unit for this move. The freight unit is then shown in the respective SAP TM planning area. The planner decides the routing for the container move, hence creating stages in the freight unit. Each stage of the freight unit is then planned separately:

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Table 1: Road-Sea Freight Example: Freight Unit Stages

Stage	Description
Pre-carriage	Truck move from shipper origin (Denver) to port (Newark)
Main carriage	Vessel move from POL (port of loading) (Newark) to POD (Port of Destination) (Rotterdam)
On-carriage	Truck move from port (Rotterdam) to customer unloading location (Cologne)

Two freight orders are created: one for the pre-carriage stage (Chicago to Newark) and one for the on-carriage stage (Rotterdam to Cologne). The amount calculated for these stages is used to pay the carrier.

A freight booking is also created for the main carriage stage (Newark to Rotterdam). The amount calculated for this stage is used to pay the ocean carrier.

Example Calculation for the Freight Booking

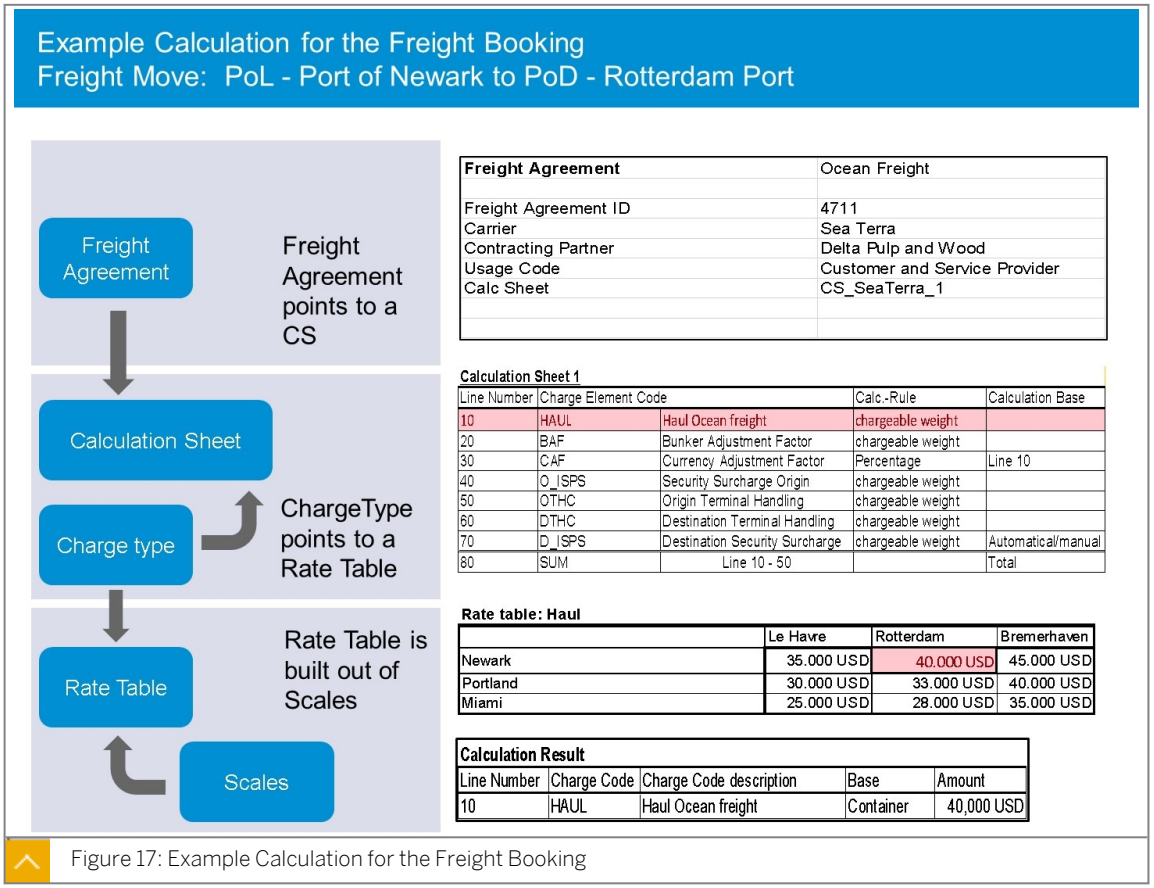

Figure 17: Example Calculation for the Freight Booking

This example demonstrates how the system calculates the charge for the transport of the container from Newark to Rotterdam via ocean freight based on the master data.

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LESSON SUMMARY

You should now be able to:

- Describe the Charge Calculation Process and Master Data

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Maintaining Scale and Calculation Bases

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Configure Scale and Calculation Bases
- Create Scale Templates
- Maintain Scales

Scale Base

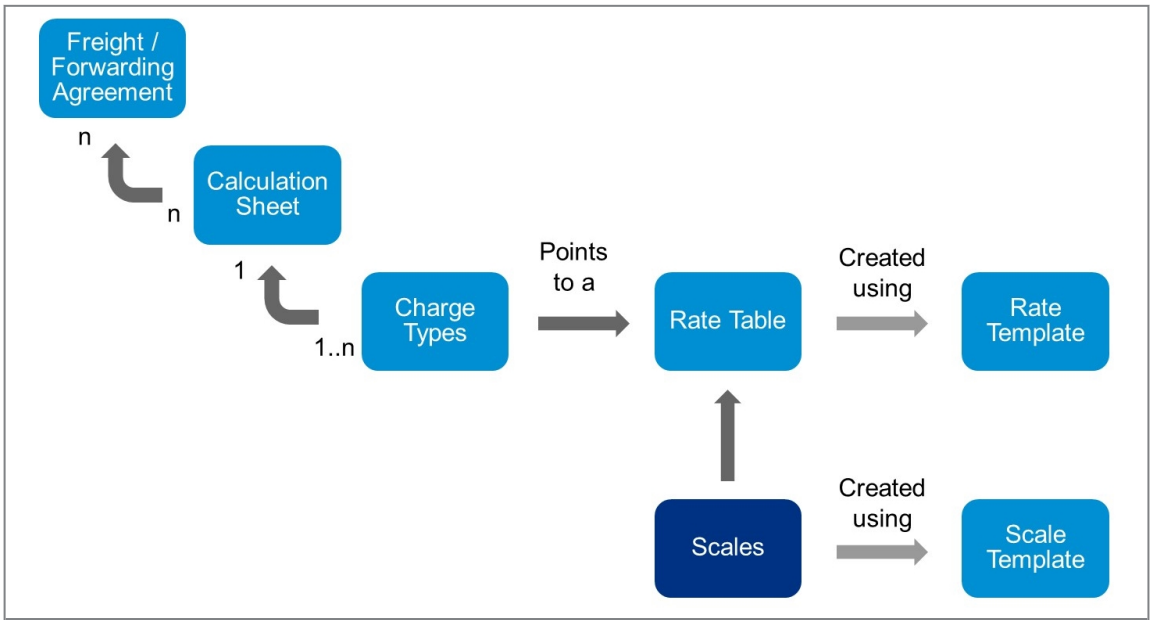

Figure 18: Transportation Charge Management - Master Data Structure

The figure shows where the scale resides in the Transportation Charge Management (TCM) master data structure.

The scale base defines how the system interprets the scale.

You can define scale bases in Customizing for Transportation Management under *Basic Functions → Charge Calculation → Data Source Binding → Define Scale Bases*.

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Rate Table with Three Scales

Scale: Dest Zone | **Scale: Weight_LBS** | **Scale: Location**

Dest Zone	Origin = Plant Chicago				
	<=100 lb	<=599 lb	<=1000 lb	<=29000 lb	<=50000 lb
TX	$ 60.00	$ 51.00	$ 45.90	$ 43.61	$ 30.52
IN	$ 30.68	$ 26.08	$ 23.47	$ 22.30	$ 15.61
KY	$ 35.68	$ 30.33	$ 27.30	$ 25.93	$ 18.15
CA	$ 85.00	$ 72.25	$ 65.03	$ 61.77	$ 43.24
FL	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
LA	$ 57.00	$ 48.45	$ 43.61	$ 41.42	$ 29.00
CO	$ 45.00	$ 38.25	$ 34.43	$ 32.70	$ 22.89
GA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
WA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44

Figure 19: Rate Table with Three Scales

A scale is used to define a parameter that then defines a rate. For example, if a rate depends upon distance and weight, you must define a separate scale for distance and for weight. The distance and weight scales are then used to define the rate. A scale can be reused in multiple rate tables.

In the example in the figure, the rate table has the following three dimensions:

- Dest zone
- Origin location
- Weight in lbs

Therefore, three scales must be defined for each dimension.

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Configuration - Scale Base

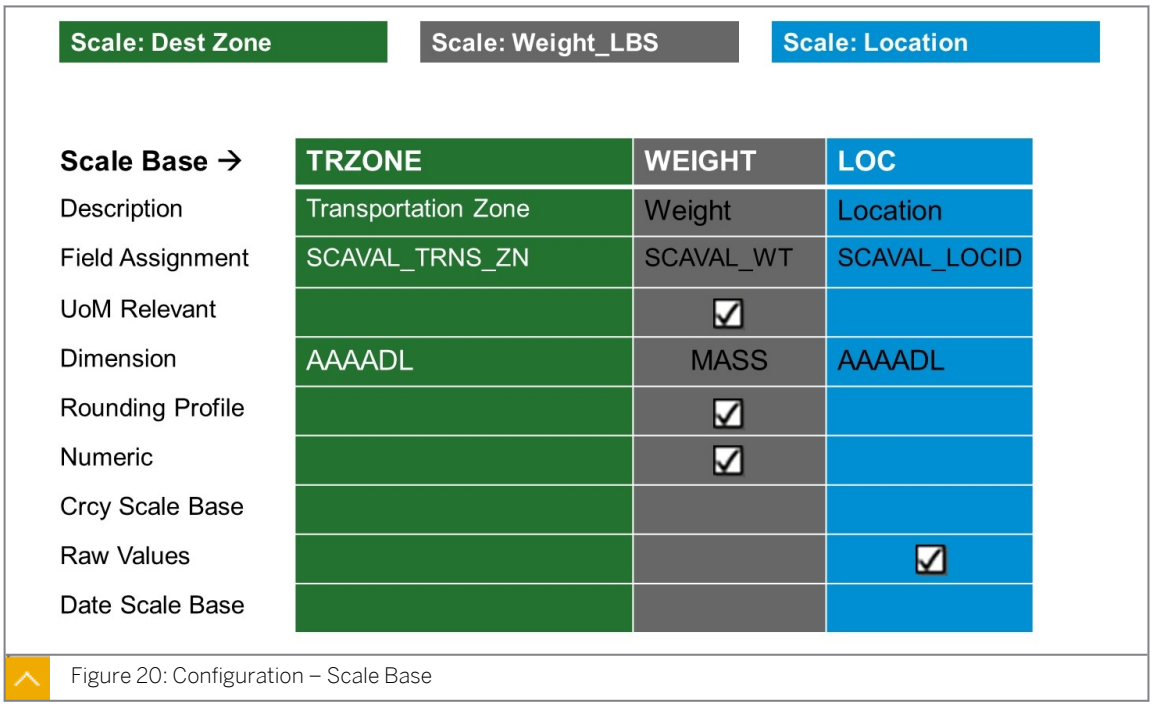

Figure 20: Configuration – Scale Base

Path for Customizing Templates

You can define scale bases in Customizing for Transportation Management under *Basic Functions → Charge Calculation → Data Source Binding → Define Scale Bases*.

Fields

Field Assignment

Field assignment denotes the internal field from /SCMTMS/S_TCSCALE_ITEM_DB, which is assigned to the corresponding scale base and stores the scale values for the scale created with this scale base.

UoM Relevant

UoM relevance checks if a scale base is relevant for the unit of measure.

Dimension

Link to the T006 dimension.

Rounding Rule

The rounding rule indicates whether a rounding rule is applicable to the scale or not.

Numeric

Numeric checks whether the input scale value is numeric or not.

Crcy Scale base

Checks if the scale base is for currencies (example: amount).

Raw values

Checks if the scale base is for raw values (examples: business partner, location).

Date Scale Base

Checks if the scale base is for dates (example: date).

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Example

The cost of a shipment depends upon the weight of the goods and the distance traveled. Therefore, the weight and distance form the scale base. To define a scale base for weight, you maintain it in Customizing in the following way:

Table 2: Scale Base Data

Field	Value
Scale Base	WEIGHT
Scale Base Desc.	SCAVAL_WT
Usage	Base for Scales
UoM Relevant	X
Dimension	Mass
Rounding Rule	X
Numeric	X

Scale Base Enhancement

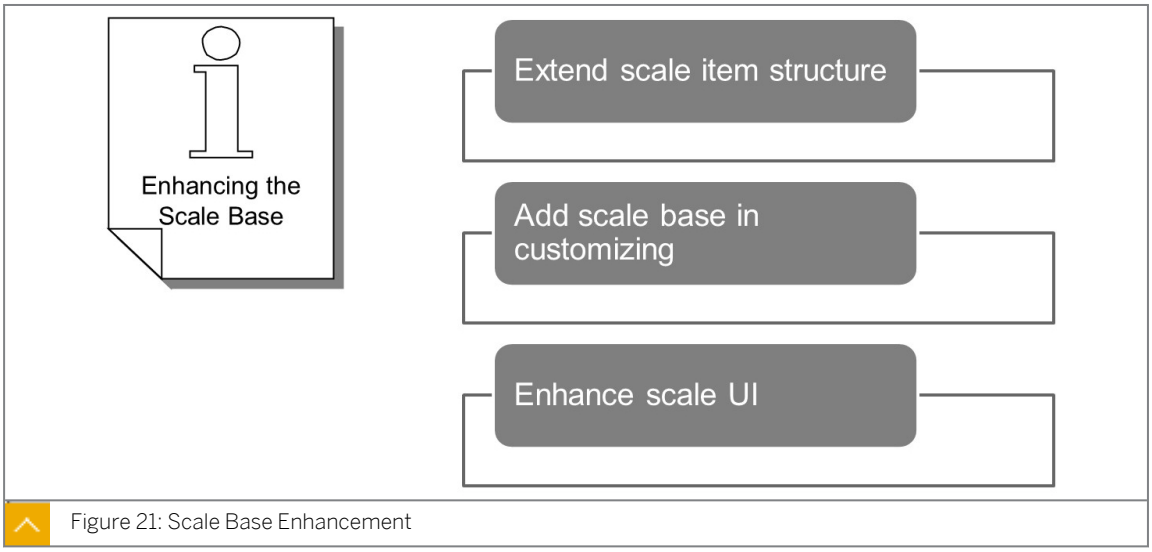

Figure 21: Scale Base Enhancement

The standard scale bases reflect the most common in the transportation industry. There are situations in which you may have unique requirements and need an enhancement.

You want to add customer-specific scale bases.

1. Extend scale item structure:

Use the extension and include /SCMTMS/INCL_EEW_TC_SCALE_ITEM. Append the new field with the corresponding data element and search help to structure.

2. Add the scale base in Customizing:

In Customizing, choose Transportation Management → Basic Functions → Charge Calculation → Data Source Binding

for Charge Calculation → Define Scale Bases.

3. Enhance the scale UI:

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a) Open the Dynpro component configuration /SCMTMS/WDCC_TCM_SCALE_ITM (package /SCMTMS/UI).

b) Use the Web Dynpro enhancement concept to add a new column. The new field from the scale item structure will be available here.

c) The column visibility is controlled by the TCM view exit class /SCMTMS/CL_UI_VIEWEXIT_TCM, method SCALE_ITEM_PROP.

No changes should be necessary.

Calculation Base

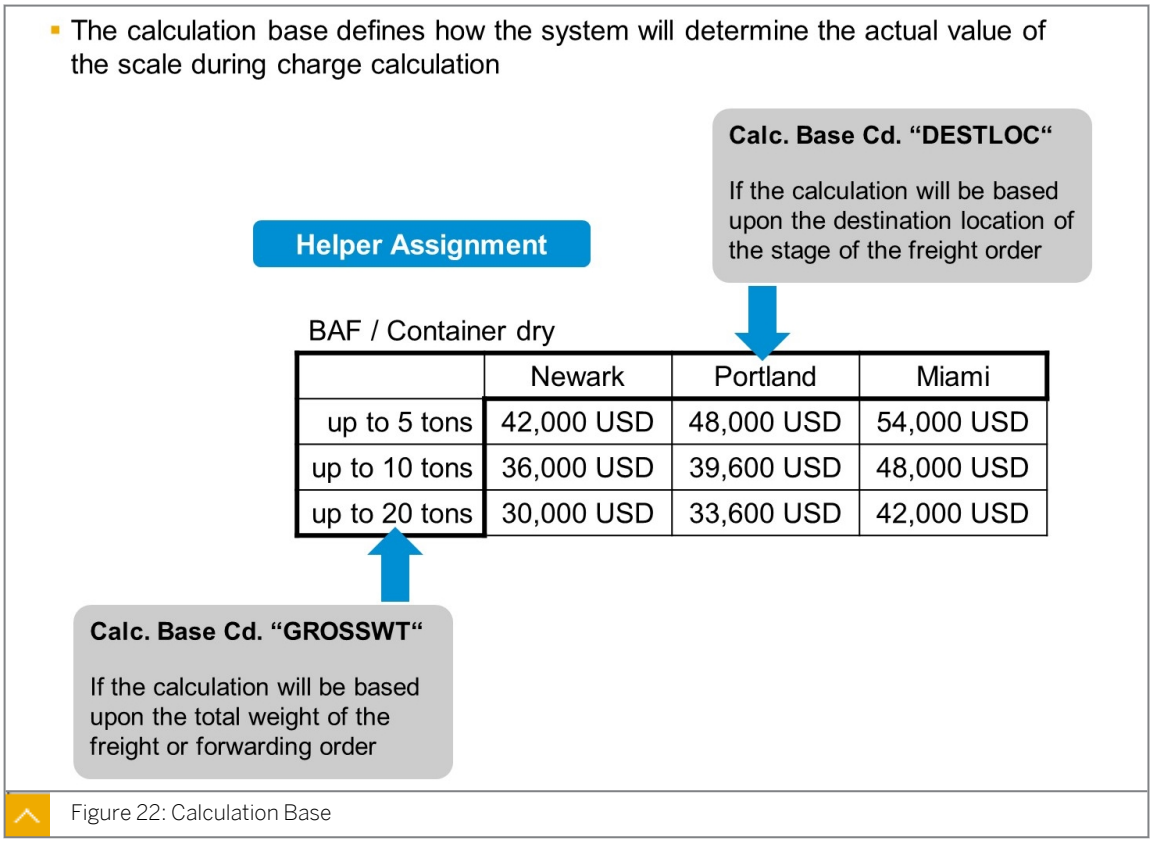

Figure 22: Calculation Base

A calculation base identifies the actual base or factor with which the system calculates the charges for the scale.

There can be various scenarios in which the system must calculate a charge for different forms of weights, for example, gross weight and net weight.

In this case, both gross weight and net weight correspond to the scale base Weight (W), whose dimension is mass. However, by definition, gross weight and net weight are two entirely different charge aspects. Therefore they have two different calculation bases, such as "W1" for gross weight and "W2" for net weight.

To follow the scenario given here, you define a calculation base for every scale base. This calculation base is the final element in the charge determination. This means that the calculation base is used to determine the charges.

In the figure, the charges are dependent on weight and the destination location. The scale has the scale base Location. This scale base defines that the scale uses locations only. The scale base can be used for both the source and destination location. The calculation base DESTLOC determines that the destination location of the freight order is used. Technically, in the

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customizing of the calculation base, you define which field is to be used and which program or class the system will call to determine the field value.

If the resolution base in the calculation sheet points to the freight order stage, the system will derive the values from the specific stage and use it in the calculation.

Configuring the Calculation Base

Calculation Base →	Location	Weight
Scale Base	LOC	WEIGHT
Description	Destination Location	Gross Weight
Field Assignment	DESTLOC_UUID	GRO_WEI_VAL
Currency Field		
Unit Field		GRO_WEI_UNI
Helper Assignment	/SCMTMS/CL_TCC_CB_LOCATION_ID	
Use BADI		
Party Role		
Calculation Type	Absolute	Relative
Calculation Usage		
TrM Category		

Figure 23: Configuring the Calculation Base

The calculation base is defined in Customizing. Choose *Transportation Management → Basic Functions → Charge Calculation → Data Source Binding → Define Calculation Bases*.

In the Customizing activity, you define a calculation base for a scale base.

The calculation base indicates on what base the charge calculation is executed for a corresponding scale. You can assign a default calculation type to the calculation base, for example, absolute or relative. You can also specify the transportation mode category. This restricts the calculation bases in a rate table to calculation bases that have the same transportation mode category as the charge type in the rate table and to those with no specified transportation mode category.

When configuring, the following fields can be specified:

Scale Base

The *Scale Base* refers to the scale base, which will be utilized for this calculation.

Field Assignment

The *Field Assignment* refers to the internal field assignment of the logistical data.

Currency Field

The *Currency Field* is used for a currency-based calculation base.

Unit Field

The *Unit Field* is used for quantity-based calculation bases such as weight, volume, pieces, and so on.

Helper Assignment

The *Helper Assignment* refers to the program logic, which links to the data source.

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Use BAdI

Select if custom-specific logic is to be specified.

Party Role

The *Party Role* is used when business partners are specified and such role assignments are required, such as consignee, sold-to or bill-to party, and so on.

Calculation Type

You can assign a default calculation type to the calculation base. For “same-scale” scale bases, the calculation type is *absolute* , whereas quantity fields, which refers to from and to will be relative.

Calculation Usage

The *Calculation Usage* specifies whether the calculation base is used for manual charges or rate tables, or whether it can be used in both situations. Leave blank for no restriction.

TrM Category

The *TrM Category* restricts the calculation bases in a rate table to calculation bases that have the same transportation mode category as the charge type in the rate table and to calculation bases with no specified transportation mode category.

Calculation Base Enhancement

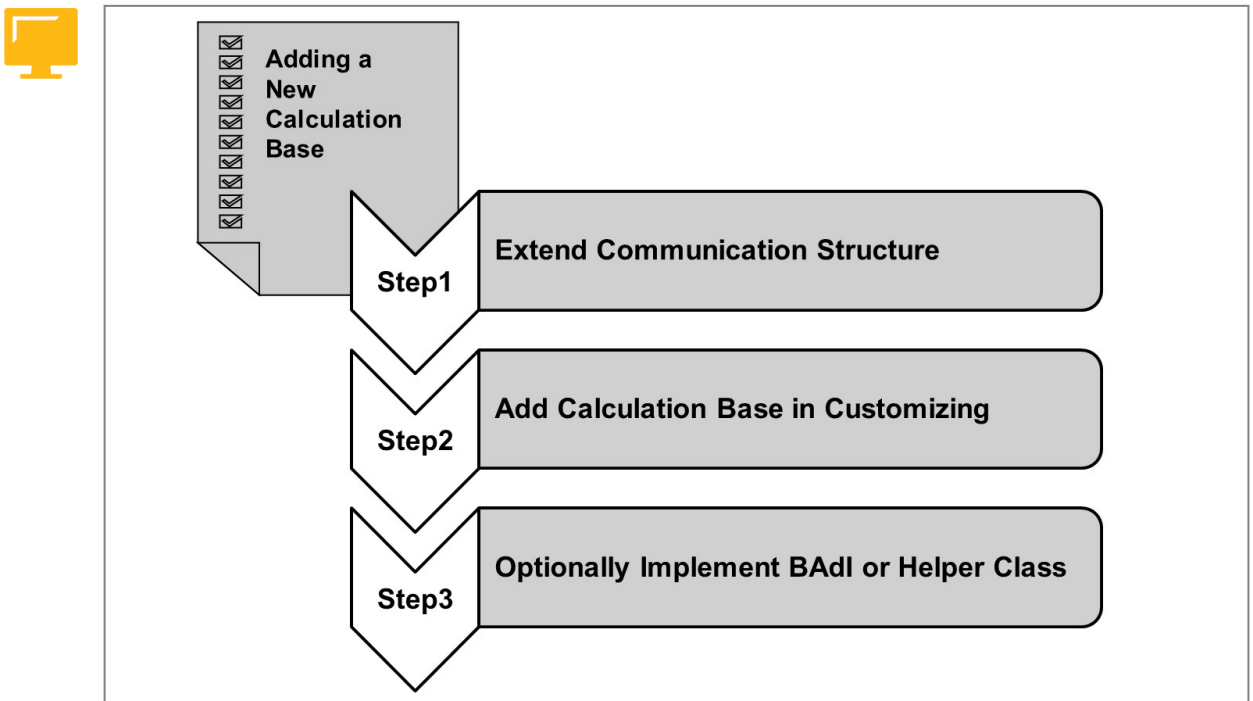

Figure 24: Calculation Base Enhancement

Calculation base enhancement involves extending the communication structure, adding the calculation base in Customizing, and (optionally) implementing the BAdI or helper class.

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Addition of the Scale and Calculation Base

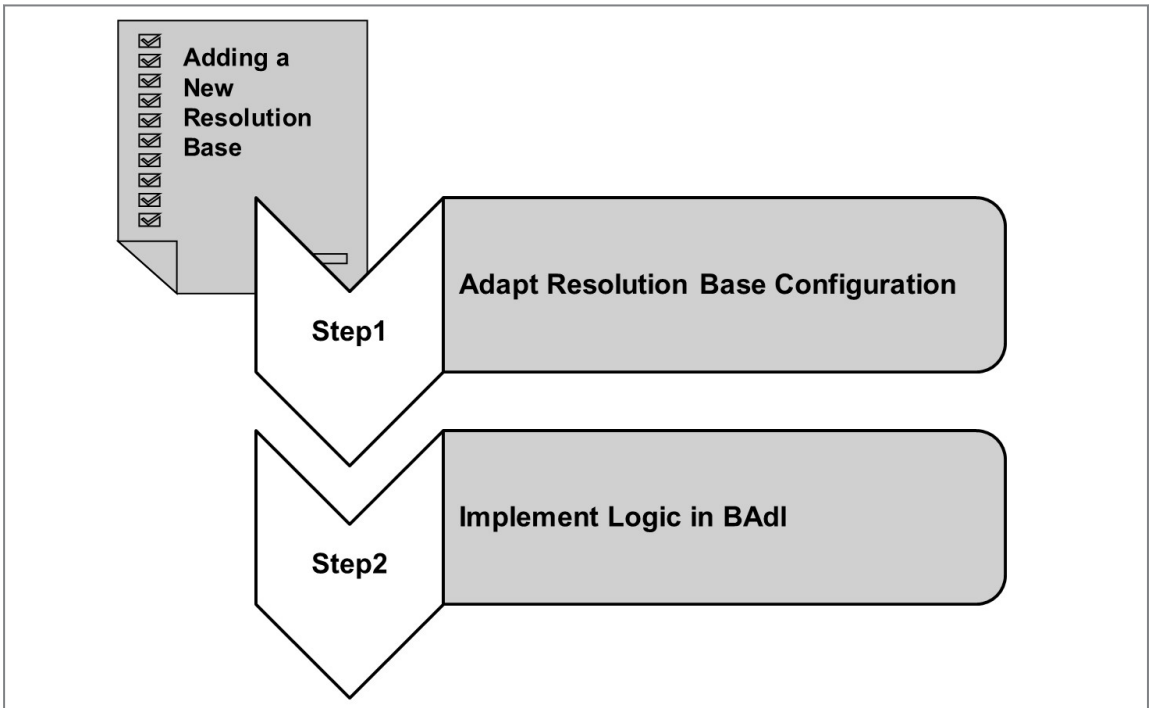

Figure 25: Adding Scale and Calculation Base

When adding the scale and calculation base, it is often necessary to add a new resolution base.

To add a new resolution base, you do the following:

- Adapt the resolution base configuration. Add a new resolution base to table /SCMTMS/C_RES_BS. This was Customizing, but is now delivered as a control table. Only the resolution base name has to be maintained. All other fields are currently not used.
- Implement logic in BAdI. The data access object provides a BAdI: /SCMTMS/TCC_BO_DATA_ACCESS for customer implementations.

Note:
When creating a custom calculation base it is always necessary to define a scale base for that calculation base.

How to Configure Enhancements to a Calculation Base

1. Extend the communication structure:

a) Use the extension included for the calculation base structure: /SCMTMS/INCL_EEW_TCC_CB.

b) Append a new field with the corresponding data element.

The component name must be the same as on the underlying document.

The field is copied over to the internal communication structure and available in the engine automatically.

2. Add a calculation base in Customizing:

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a) In Customizing, choose Transportation Management → Basic Functions → Charge Calculation → Data Source Binding

→ Define Calculation Bases.

b) Add a new entry and use the new field for the field assignment.

c) Set the scale base and other properties.

3. Implement the BAdI or helper class.

a) If the calculation base needs additional logic, use the BAdI method GET_CALC_BASE_VALUES of BAdI

/SCMTMS/TCC_BO_DATA_ACCESS. Refer to the BAdI documentation for details.

b) Set the BAdI flag in calculation base Customizing.

You can also use the helper class approach, which allows you to extend existing helper classes. The interface

/SCMTMS/IF_TCC_CALC_BASE is very similar to the BAdI interface.

c) Refer to existing helper classes /SCMTMS/CL_TCC_CB_* for sample implementations.

The BAdI or helper class is called after the value has been retrieved from the communication structure if a field

assignment is provided as well.

Scale Templates

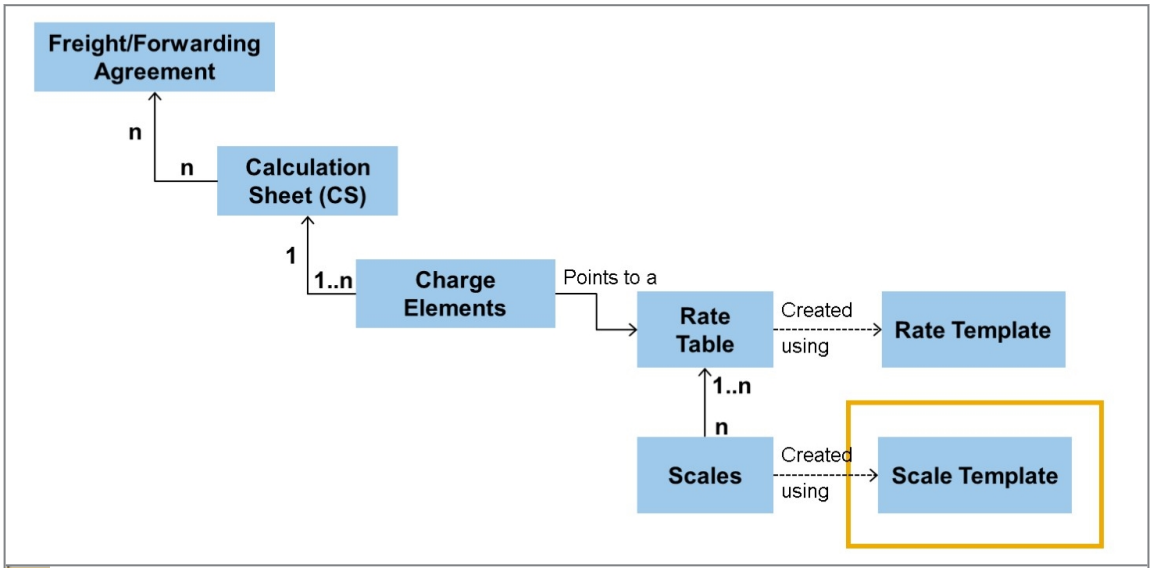

Figure 26: Scale Templates: Master Data Structure

This figure shows where the scale template resides in the TCM master data structure.

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Scale Templates Defined

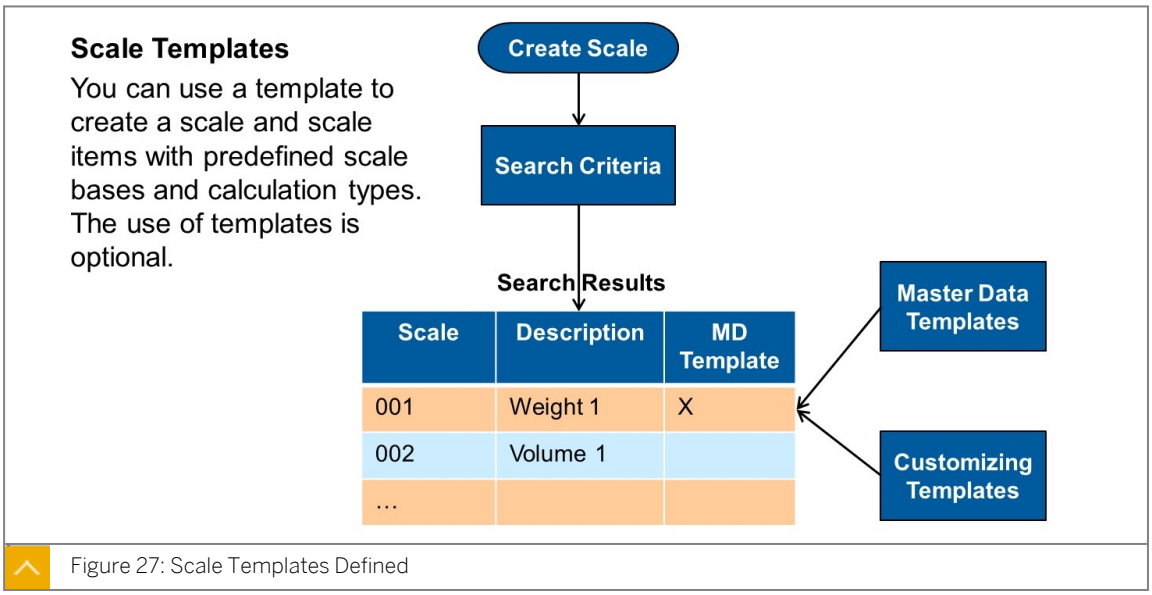

Figure 27: Scale Templates Defined

A scale template is used to create a scale automatically. The use of a scale template is optional, as you can also create a scale manually.

One advantage of using scale templates is that you can predefine available scale items, reducing the effort required for manual maintenance and avoiding errors due to typos. A scale template is an efficient way to create scales during rate table maintenance.

You can create scale templates either in Customizing or as Master Data. When using Customizing, the templates can be transported between systems and used as templates for creating scales.

In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Templates → Define Scale Templates*.

Scale Template Fields

The scale template includes the following information:

Scale template

This is the name of the scale template the system will use to create a scale.

Scale type

Indicates whether the scale values depict the upper or lower boundaries for the scale levels. The scale type defines how the system interprets the scale values during calculation, as follows:

- From a certain value and upwards (Base Scale)
- Up to a certain value (To Scale)
- Exactly one value (Same Scale)

Scale base

Defines how the system interprets the scale. It is a a parameter or a factor that can influence transportation charges.

You also have the option of creating scale template items.

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When creating scale templates using Customizing, you cannot create items for *Same Scales*, because they are usually dependent on Master Data. When creating Scale Templates as Master Data (using the SAP Fiori Launchpad), you can also maintain scale items for *Same Scales*.

Master data templates can be created and used by users who have no authorization to change customizing. In contrast to templates created in customizing, master data templates cannot be transported across different systems. In the SAP Fiori Launchpad Charge Management Worklist, master data and customizing templates are depicted in their own queries.

Scale Maintenance

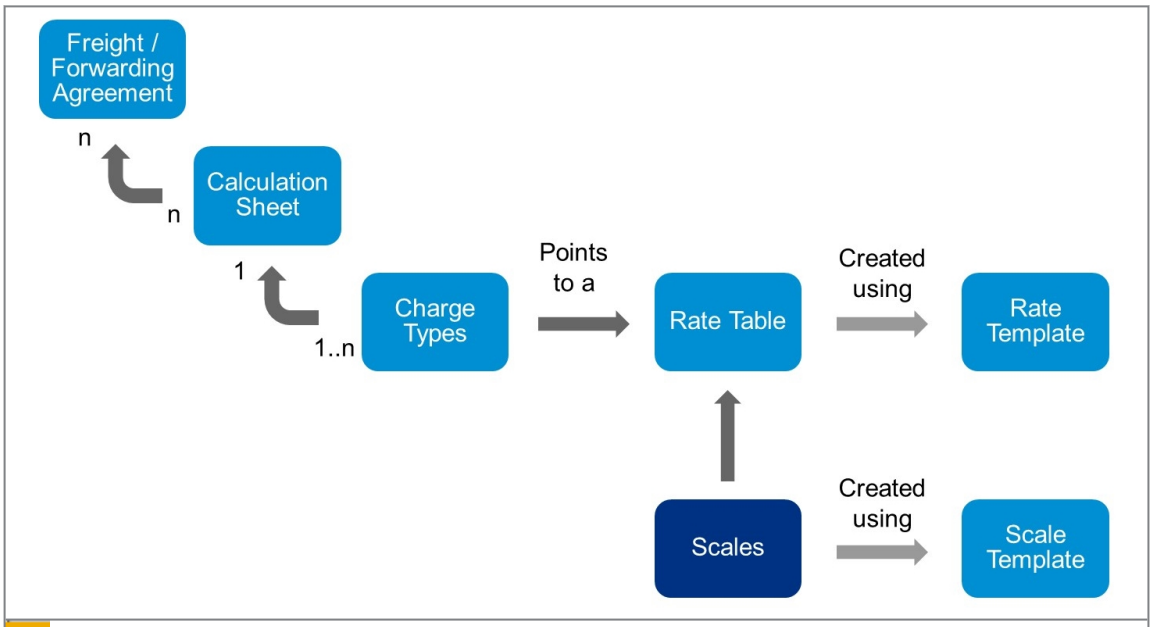

Figure 28: Master Data Structure

This diagram shows where the scale resides in the TCM master data structure.

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Scale Maintenance Function

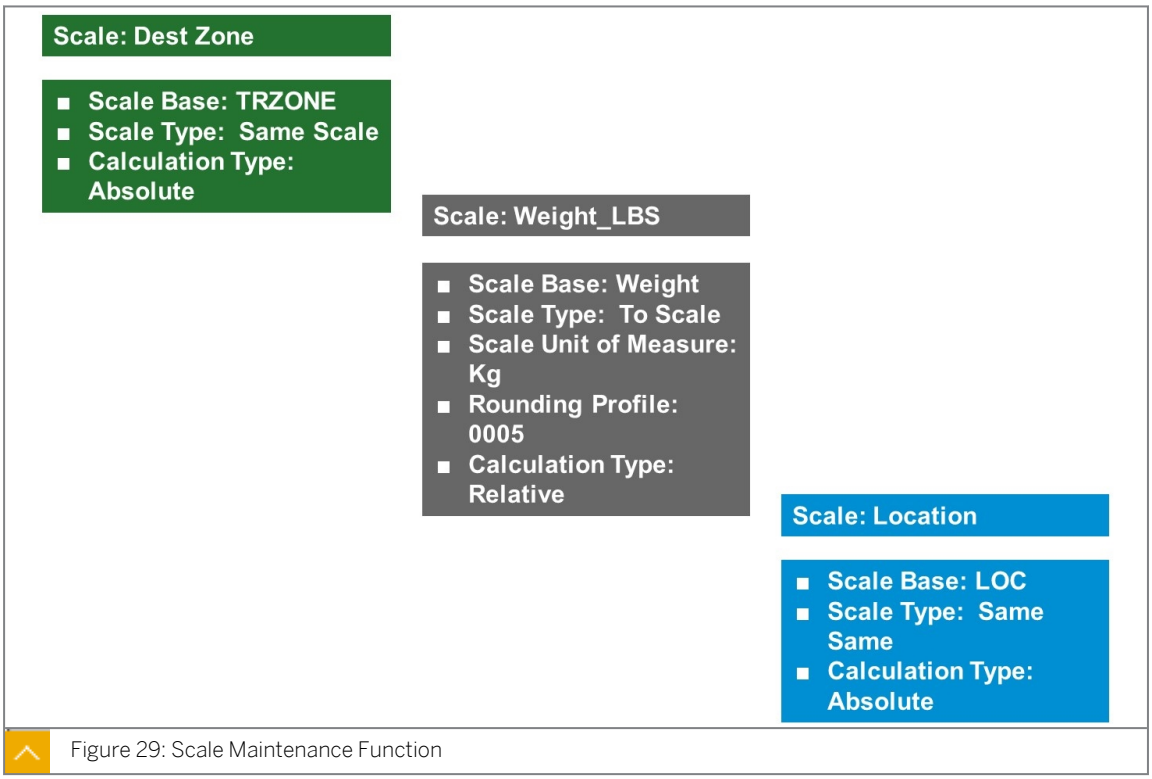

Figure 29: Scale Maintenance Function

You can use the scale maintenance function to create and change scales. For example, you can configure the items of a scale according to one of the following:

- Quantities
- Volumes
- Weights
- Distances
- Points

Scale maintenance is a prerequisite for the maintenance of rates, as scales are the dimensions of rate tables. You can create scales as own master data, or during rate table maintenance. If you maintain scales as separate master data objects independently from rate tables, you can reuse scales in multiple rate tables.

Scale Creation

You create a new scale in the SAP Fiori Launchpad.

Choose *Charge Management* → *Create Scale*.

When creating a scale, enter the following information:

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Table 3: Scale Creation Data

Field	Description	Value
Scale Base	Used to define the parameters that define the rate and is considered as a dimension of a rate table.	Length, Partner, Weight
Scale Type	Controls how the scale levels are defined. Indicates where the scale values that were specified depict the upper or lower boundaries for the scale levels.	Base scale: from a certain value (>=)
		To Scale: up to a certain value (<=)
		Same scale: for exactly one value (=)
Scale Unit of Measure	Unit of measure for the scale levels.	KG, LB, Day, Mile, KM
Rounding Profile	Before the system accesses the scale to look up a rate in a rate table, the system rounds the input value based on the rounding profile to determine the right scale level.	Round Up/Down to 0.01, 10.00,
Calculation Type	You can specify a calculation type for a scale base, which affects how the system calculates charges with the scale. The available calculation types are absolute and relative. Note that you can specify a relative calculation type for numeric scale bases only.	**Absolute**: This is used for non-numeric scales such as Region, Transportation Zone, and Business Partner.
		Relative: This is used for numeric scales such as weight, distance, length.

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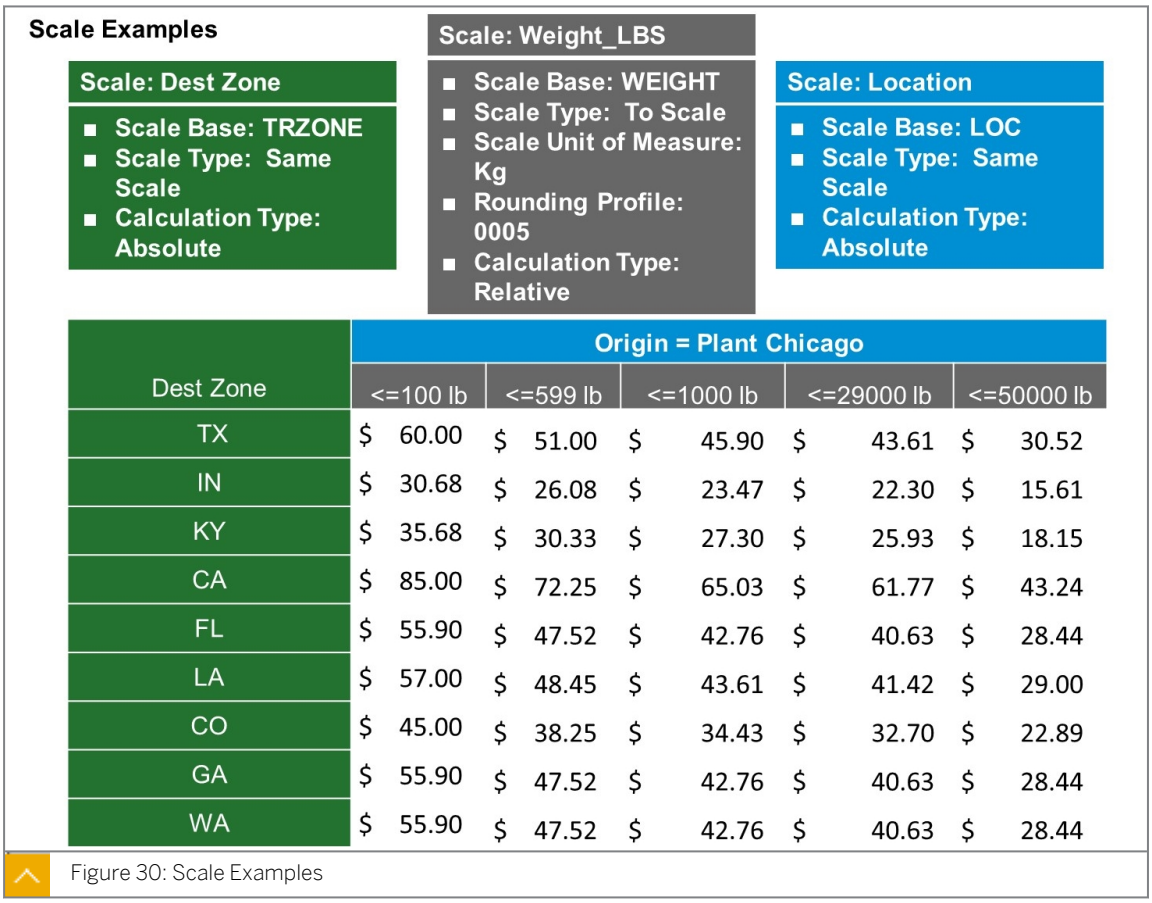
Scale Examples



Dest Zone	Origin = Plant Chicago				
	<=100 lb	<=599 lb	<=1000 lb	<=29000 lb	<=50000 lb
TX	$ 60.00	$ 51.00	$ 45.90	$ 43.61	$ 30.52
IN	$ 30.68	$ 26.08	$ 23.47	$ 22.30	$ 15.61
KY	$ 35.68	$ 30.33	$ 27.30	$ 25.93	$ 18.15
CA	$ 85.00	$ 72.25	$ 65.03	$ 61.77	$ 43.24
FL	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
LA	$ 57.00	$ 48.45	$ 43.61	$ 41.42	$ 29.00
CO	$ 45.00	$ 38.25	$ 34.43	$ 32.70	$ 22.89
GA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
WA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44

Figure 30: Scale Examples

The figure shows how scales can be created for destination zone, weight, and location.

LESSON SUMMARY

You should now be able to:

- Configure Scale and Calculation Bases
- Create Scale Templates
- Maintain Scales

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Configuring Charge Types

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Maintain Charge Types

Charge Categories

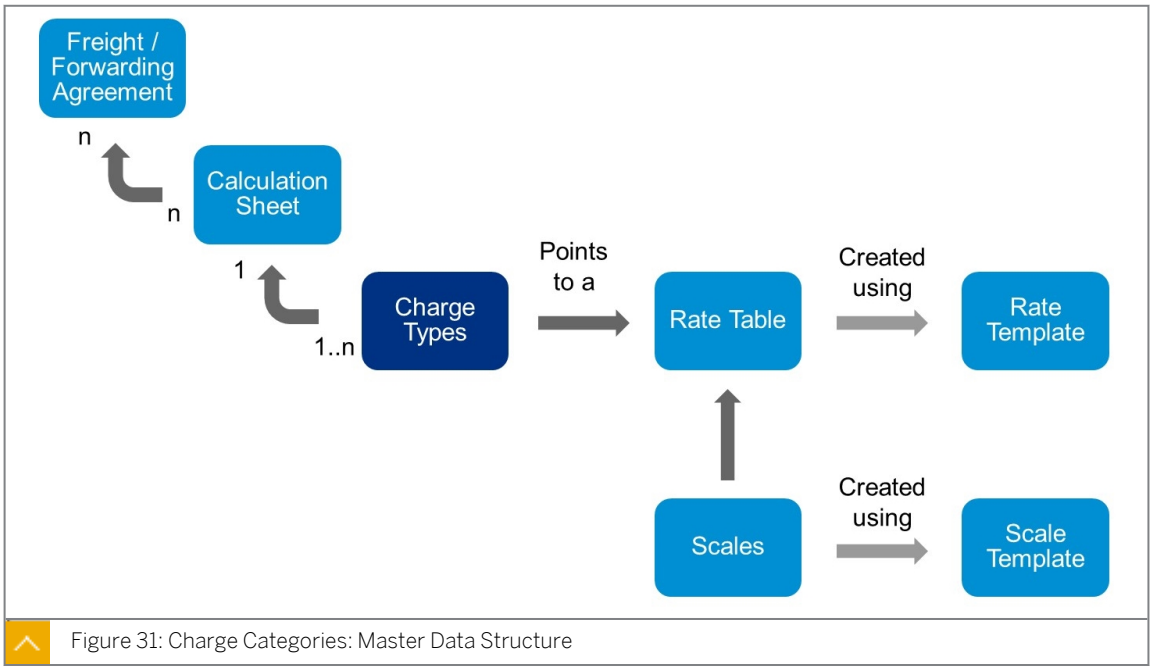

Figure 31: Charge Categories: Master Data Structure

A charge type is the classification of a charge line that plays an important role in how the system calculates the transportation charges for the charge line, for example, a base rate, surcharge, or discount.

A charge type can result in a positive or negative value for a charge line. You can also specify whether a charge type can be an amount or a percentage value.

This figure shows where the charge type resides in the TCM master data structure.

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Charge Categories and Subcategories

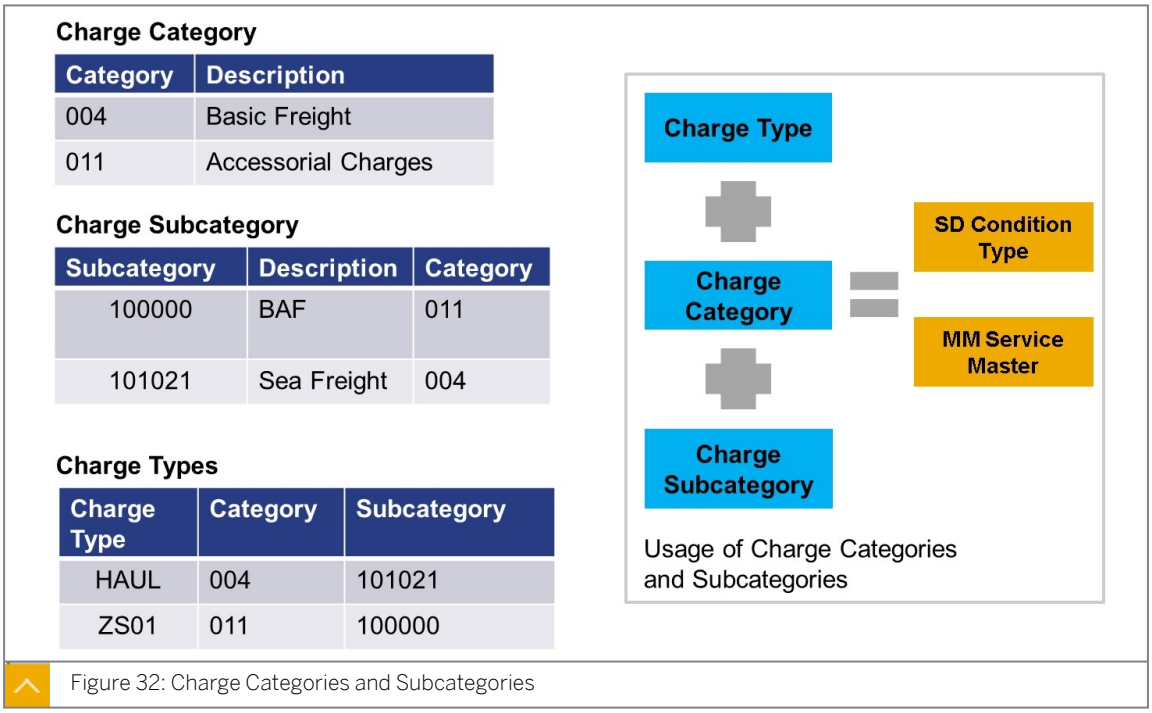

Figure 32: Charge Categories and Subcategories

Charge type can be grouped into charge categories. A useful code list is the UN/EDIFACT codelist 5237. All three entities are freely definable in Customizing.

You can use the charge subcategories of charge types to group and categorize charge types in a more granular way than charge categories. A suitable example is the code list resulting from UN/EDIFACT Recommendation 23: "FREIGHT COST CODE # FCC Harmonization of the Description of Freight Costs and Other Charges".

You define charge categories for charge types in the following Customizing activity: In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charge Categories*.

You define charge subcategories for charge types in the following Customizing activity: In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charge Subcategories*.

Charge categories and subcategories can be assigned in the charge type customizing activity, and can be used to determine the SD condition type during billing or MM service master record/ Activity number during settlement.

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Charge Types

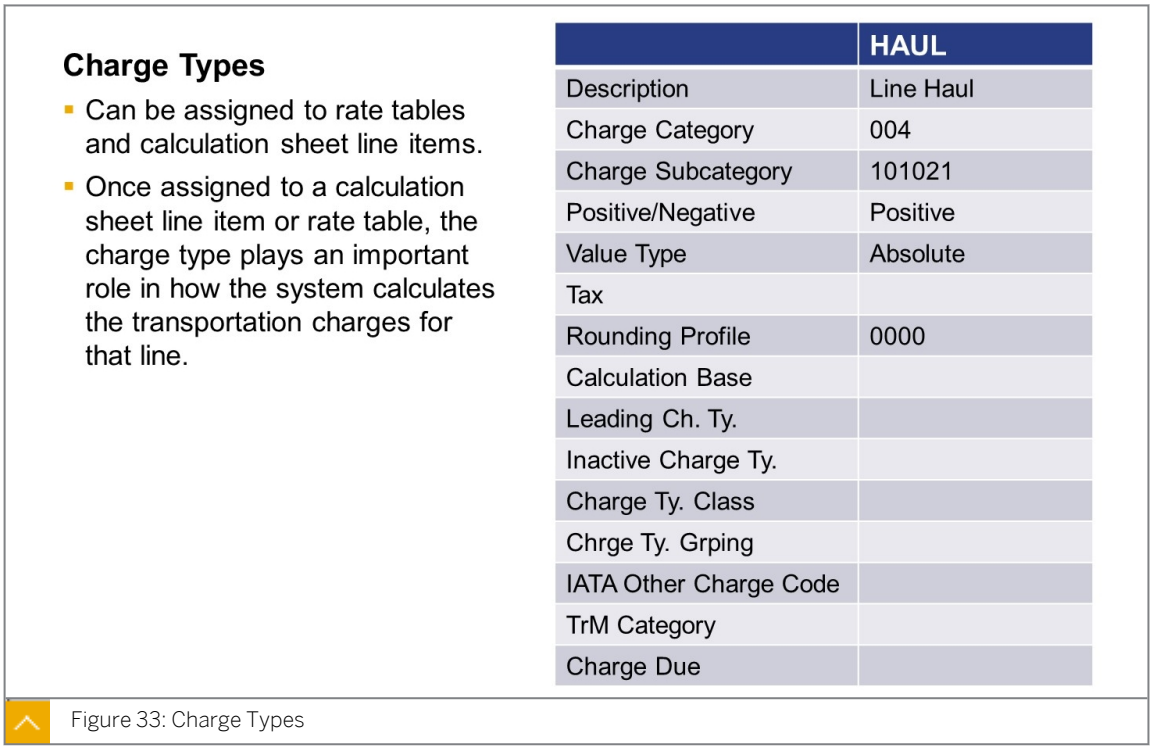

Figure 33: Charge Types

In the *Define Charge Types* Customizing activity, you define charge types that you can assign to calculation sheets and rate tables. Once assigned to a calculation sheet line item or a rate table, a charge type plays an important role in how the system calculates the transportation charges for that line.

You can define the charge types in the following Customizing activity: In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charge Types*.

Charge Type Settings

When defining charge types, you can use the following settings:

Possible Charge Type Settings

- Specify whether a charge type can result in a positive or negative value.
- Specify whether a charge type can be an absolute value or a percentage value.
- Specify whether you want to set the charge type as an absolute value or a percentage value each time you assign the charge type.
- Assign a charge type to a charge category and charge subcategory.
- Indicate if the charge is a tax.
- Specify if and how the system rounds a value.
- Assign a default calculation base to the charge type so you do not need to assign a calculation base each time you create a calculation sheet line item.

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- Indicate whether a charge type is a leading charge type and so must have a value for the system to be able to calculate the charges.
- Mark a charge type as inactive, so the system cannot use the charge type to create any new calculation sheets or rate tables.
- Specify the transportation mode category, which restricts the charge types in a calculation sheet to those with the same transportation mode category as the associated agreement, and to those with no specified transportation mode category.
- Enter a charge type description in multiple languages.
- Specify other values used for air freight calculations or forwarding charges calculation.

This figure shows how the charge type, charge category, and charge subcategory influence the integration between SAP TM and SAP S/4 Sales & Distribution as well as Materials Management.

Object Mapping of Charge Types in SAP S/4

The charge types, charge categories, and charge subcategories are mapped in SAP S/4 to the following objects:

- Pricing condition types in SAP Sales and Distribution used for customer billing.
- Service activities in SAP Materials Management for carrier invoice processing.

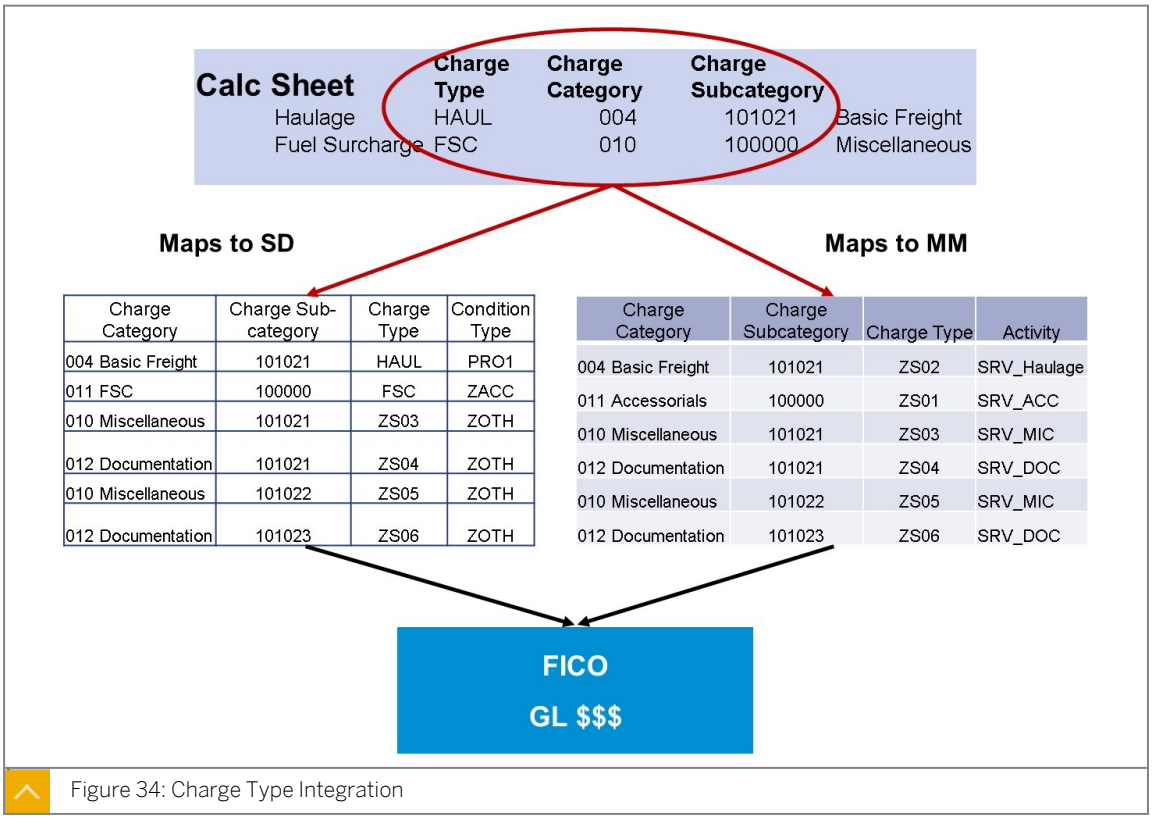

Figure 34: Charge Type Integration

LESSON SUMMARY

You should now be able to:

- Maintain Charge Types

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Maintaining Rate Tables

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Create Rate Table Templates
- Create Rate Table Definitions
- Maintain Rate Tables
- Update and Mass Maintenance of Rate Tables

Rate Table Templates

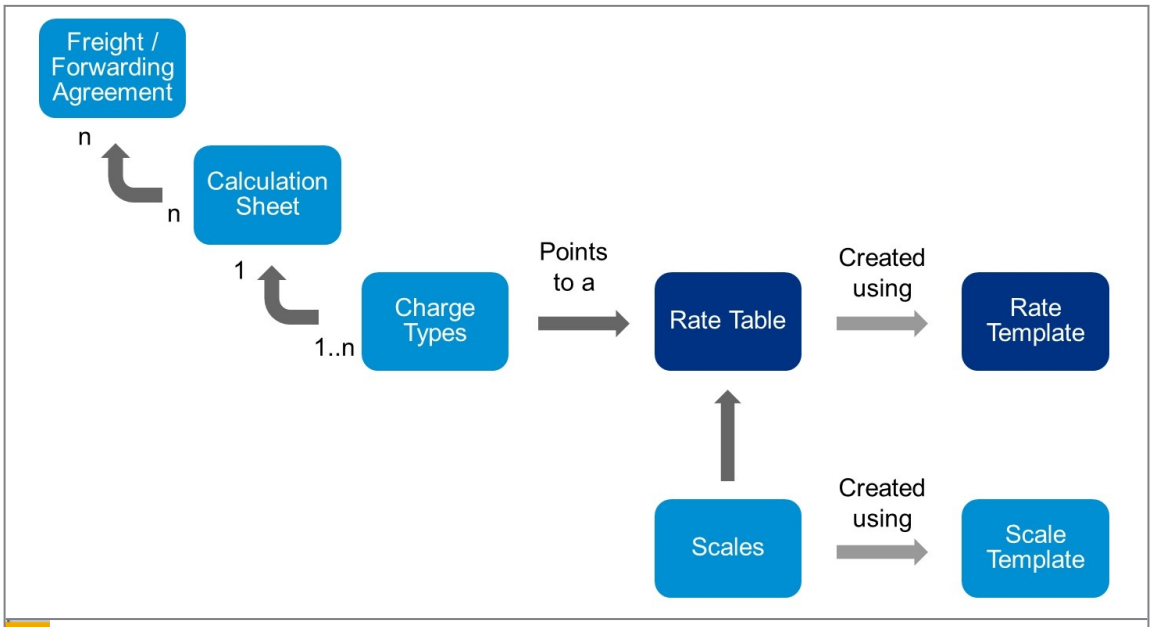

Figure 35: Rate Table Templates: Master Data Structure

This diagram shows where rate tables and rate table templates reside in the TCM master data structure.

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Rate Tables

Rate

A price for a certain transportation service that is only valid for the period as defined by its validity. A rate is listed in a rate table.

Validity Period: 01-01-2021 to 09-01-2021 **Status: Released**

Dest Zone	Origin = Plant Chicago				
	<=100 lb	<=599 lb	<=1000 lb	<=29000 lb	<=50000 lb
TX	$ 60.00	$ 51.00	$ 45.90	$ 43.61	$ 30.52
IN	$ 30.68	$ 26.08	$ 23.47	$ 22.30	$ 15.61
KY	$ 35.68	$ 30.33	$ 27.30	$ 25.93	$ 18.15
CA	$ 85.00	$ 72.25	$ 65.03	$ 61.77	$ 43.24
FL	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
LA	$ 57.00	$ 48.45	$ 43.61	$ 41.42	$ 29.00
CO	$ 45.00	$ 38.25	$ 34.43	$ 32.70	$ 22.89
GA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
WA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44

Figure 36: Rate Tables

A rate table is a grouping of prices for transportation services. It is like a price list. The prices (or rates) are listed by validity period in the rate table.

The rate table is a separate business object (/SCMTMS/TC_RATES) and can be used in various calculation sheets to provide flexible maintenance.

You can maintain up to fourteen dimensions in a rate table, however, we do not recommend that you model charge management in that way.

There are many options to reduce the number of dimensions in a table. For example, a rate table determination rule can be created to determine which rate table is to be used for the current charge item.

You can define a rate table manually or automatically by using a rate table template with predefined scales and validity dates. You can also maintain a large rate table, with or without scale items, using Microsoft Excel.

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Rate Table Template Usage

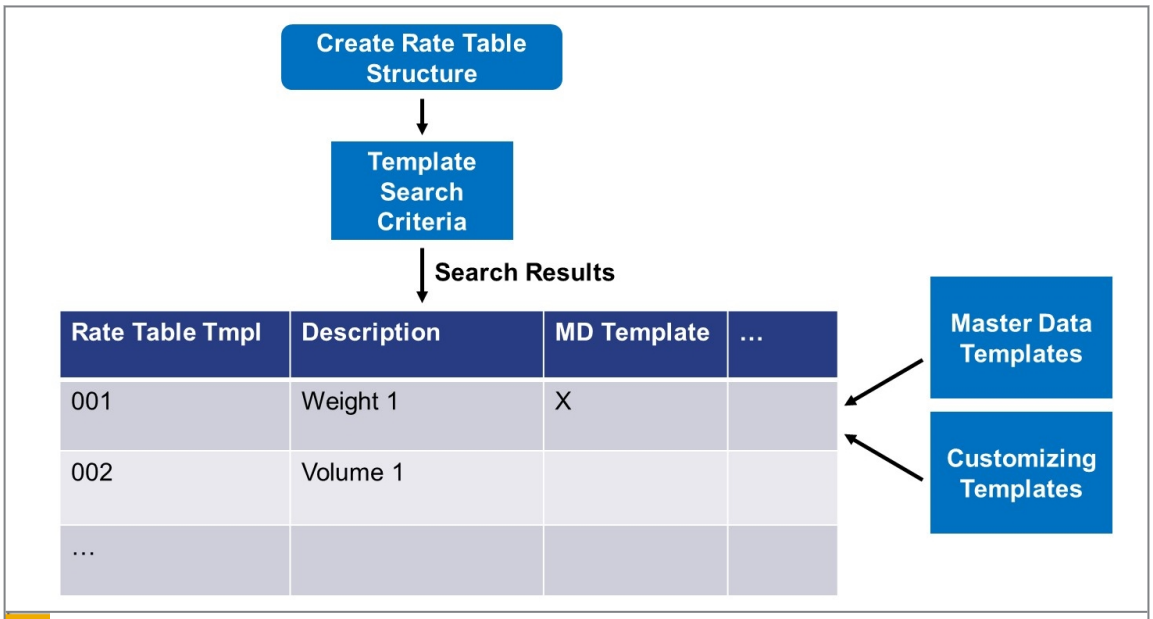

Figure 37: Rate Table Template Usage

You can use a rate table template to create a rate table with predefined scales, calculation rules, and validity dates.

In the Define Rate Table Templates Customizing activity, you define rate table templates to transport across different systems and use as templates for creating rate tables.

To define rate table templates, in Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Templates → Define Rate Table Templates*.

Master data templates can be created and used by users who have no authorization to change customizing. In contrast to templates created in customizing, master data templates cannot be transported across different systems. In the SAP Fiori Launchpad Charge Management Worklist, master data and customizing templates are depicted in their own queries.

The following transactions are available in SAP TM.

In the Customizing activity, you can do the following:

1. Create a rate table template with the following required information:
   - Rate table template
   - Charge type or allow multiple charge types
   - Charge usage
   - Currency
2. Create rate table template scales with the following required information:
   - Dimension number (indicates the order of the input scales)

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- Scale template
- Calculation base code

3. Create calculation rule with the following required information (optional - used in the Validity table):
   - Calculation base
   - Unit of measure
   - Quantity

Similar information can be specified when creating a master data template. The main difference is that if you create a master data template, you can also maintain scale items and values for non-numeric scales.

Rate Table Maintenance

Validity Period: 01-01-2021 to 09-01-2021 **Status: Released**

Dest Zone	Origin = Plant Chicago				
	<=100 lb	<=599 lb	<=1000 lb	<=29000 lb	<=50000 lb
TX	$ 60.00	$ 51.00	$ 45.90	$ 43.61	$ 30.52
IN	$ 30.68	$ 26.08	$ 23.47	$ 22.30	$ 15.61
KY	$ 35.68	$ 30.33	$ 27.30	$ 25.93	$ 18.15
CA	$ 85.00	$ 72.25	$ 65.03	$ 61.77	$ 43.24
FL	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
LA	$ 57.00	$ 48.45	$ 43.61	$ 41.42	$ 29.00
CO	$ 45.00	$ 38.25	$ 34.43	$ 32.70	$ 22.89
GA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44
WA	$ 55.90	$ 47.52	$ 42.76	$ 40.63	$ 28.44

Figure 38: Master Data - Rate Table

A rate table is a grouping of prices for transportation services. It is like a price list. The prices (or rates) are listed by validity period in the rate table.

The rate table is a separate business object (/SCMTMS/TC_RATES) and can be used in various calculation sheets to provide flexible maintenance.

You can maintain up to fourteen dimensions in a rate table, however, we do not recommend that you model charge management in that way.

There are many options to reduce the number of dimensions in a table. For example, a rate table determination rule can be created to determine which rate table is to be used for the current charge item.

You can define a rate table manually or automatically by using a rate table template with predefined scales and validity dates. You can also maintain a large rate table, with or without scale items, using Microsoft Excel.

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Rate Table Definition Versus Maintain Rate Table

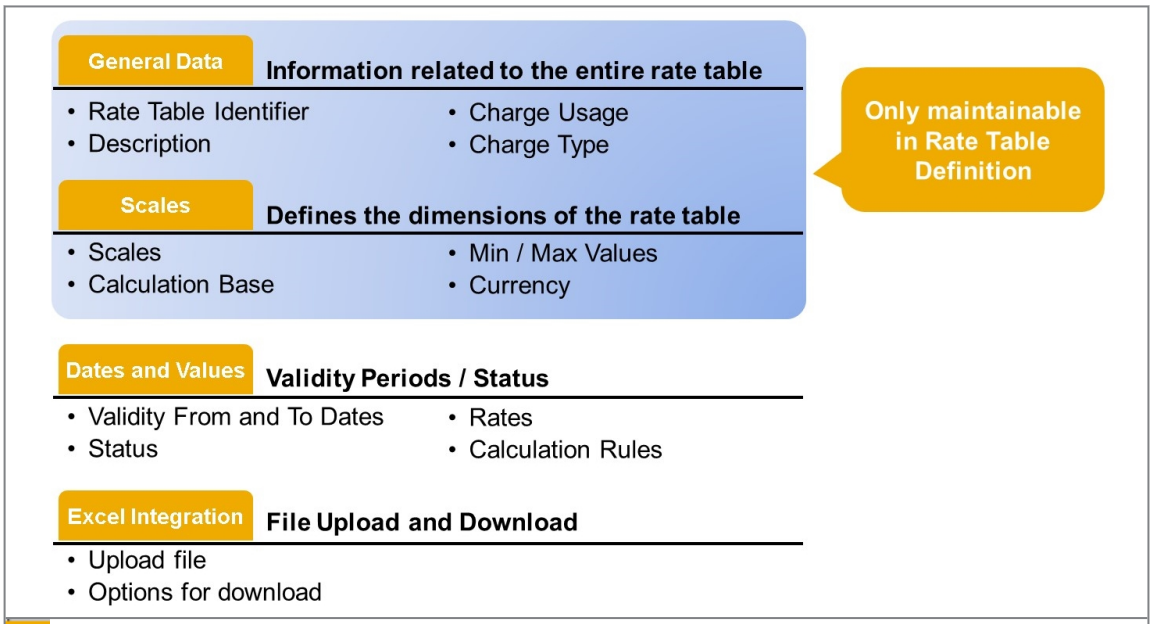

Figure 39: Rate Table Definition Versus Maintain Rate Table

The figure depicts the basic structure of the rate table and some important fields within each screen area.

Rate Table Maintenance Transactions

The following transactions are available in SAP TM for maintaining rate table information:

1. *Create Rate table Definition*: In SAP Fiori Launchpad, choose *Charge Management* → *Create Rate Table Definition*.
2. *Maintain Rate Table*: In SAP Fiori Launchpad, choose *Charge Management* → *Maintain Rate Table*.

> Note:
> In the *Maintain Rate Table* transaction, scale definition is not available.

These transactions enable different users to define rate table definitions and to maintain rate information.

Rate Table Structure

A rate table contains the following tab pages and screen areas.

Table 4: General Data Tab Page:

Field	Description
Rate Table	The rate table identifier must be unique to avoid inconsistent rates.

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Field	Description
Charge Usage	You can define the rate table to calculate transportation charges billable to your customer or to be billed to you by your carrier. A forwarding agreement, freight agreement, and calculation sheet have the same attribute for this distinction.
Charge Type	The system only assigns rate tables to a charge item in a calculation sheet if the charge type matches. You can use this field to search for a rate table.

Table 5: The Scales Tab Page

You select prepared scales to determine the dimensions of the rate table and to create a rate table based on these dimensions.

Field	Description
Dimension	You add each dimension on which you want your rate to be defined and looked up. For example, if you want the rate to be defined based on destination location and weight, add a dimension for destination location and for weight.
Scale	A scale defines the dimension of your rate table.
Calculation Base	You can define the calculation base for the scale. The calculation base is the actual base or the factor on which the charge calculation happens.
Minimum Value or *Maximum Value*	If you select these checkboxes, you can maintain a minimum or maximum value for the calculated rate. The system determines a certain rate in the rate table and multiplies this rate based on the calculation rule. Usually, the value of this multiplication result is the final amount for this specific charge, which is the actual amount equals the charge. If you set a minimum or maximum value, the system checks if the calculated value is lower than the minimum or greater than the maximum. If so, the minimum or maximum value is charged.

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Field	Description
Rel. Calc. Method (Relevant for Calculation Method)	If you select this checkbox, you are defining whether you want the system to apply a special calculation method, such as break-weight or clipping, to the rate table on the level of a charge item. This charge item then only considers those rate tables that you designated for such a special calculation method.

Table 6: Dates and Values Tab Page

Field	Description
Valid From and *Valid To*	These fields define the validity period of the rate table.
Rounding Profile	You define if and how the calculated amount or charge is rounded.

Calculation Rules **Tab Page**

Here you determine the values with which the single rate is to be multiplied. If there is more than one charge calculation rule, the system multiplies the determined rate with each of the given entries. You must select the *Relative Scale Items Only* checkbox for at least one charge calculation rule if a relative scale is involved in the rate table dimensions.

Rate Values

You can maintain single rate values or upload and download complete Microsoft Excel sheets. We recommend the following process flow:

1. Create an empty rate table in SAP TM.
2. Download this rate table from SAP TM to an xlsx file (default file type).
3. Open this xlsx file with Microsoft Excel and maintain all the rates there.
4. Save this xlsx file and upload it to SAP TM.

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Multiple Scales within a Rate Table

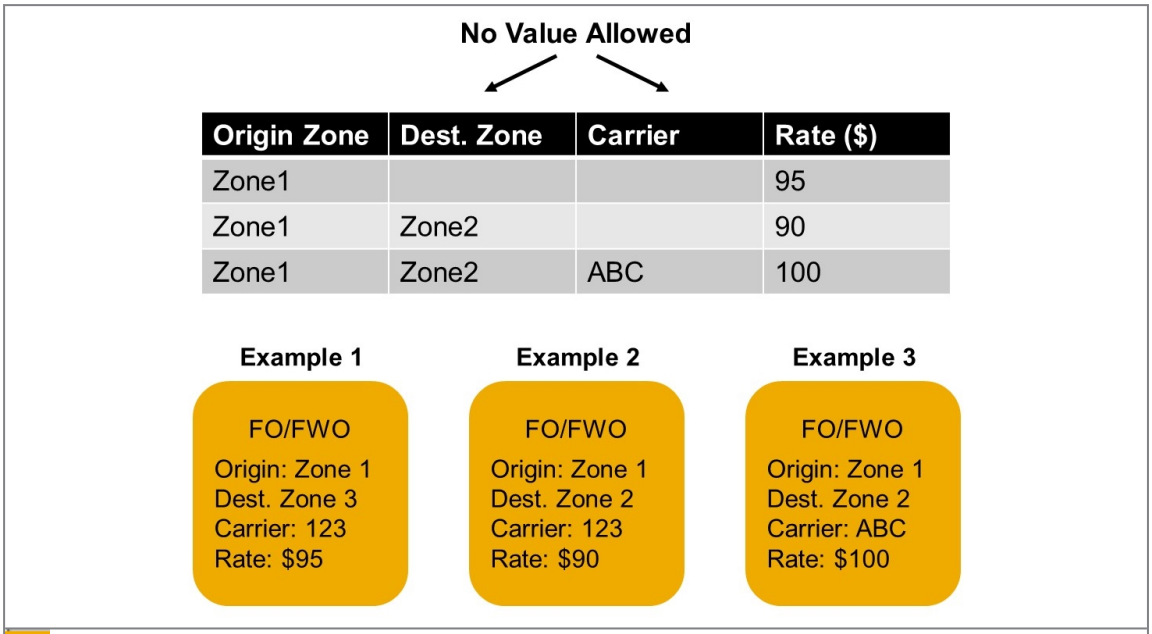

Figure 40: Multiple Scales With Initial Value Allowed in Rate Table

Master data maintenance in many organizations is a layered process, taking place at different levels of abstraction. For example, when a logistics service provider (LSP) starts operating in a new trade lane, it may offer some carrier-specific rates, as well as some carrier-agnostic rates. Sometimes, LSP may have only incomplete rate data.

In such cases, business users upload generic rates where the actual scale values are not available. For example, users may upload carrier-specific as well as carrier-agnostic rates in the same rate table. If no specific rate for the carrier exists, the normal business use is to pick up the carrier-agnostic rate.

The rate determinations in the examples in the figure are as follows:

- Example 1:

  The rate is not specified for the destination zone or the carrier, so the rate is determined from the generic entry for Zone 1.

- Example 2:

  The rate is not specified for the carrier, so the rate is determined from the rate table entry for the origin and destination zones.

- Example 3:

  The rates are specified for each of three scales in the table.

There may be multiple instances when rate-relevant information is missing, which must be considered during charge calculation.

The *No Value Allowed* flag allows for the uploading of rates that are generic across multiple dimensions. The *No Value Allowed* flag is given priority from the last dimension scale to the first dimension scale of rate table. The *No Value Allowed* feature is available only for same-scale.

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Approval Workflow

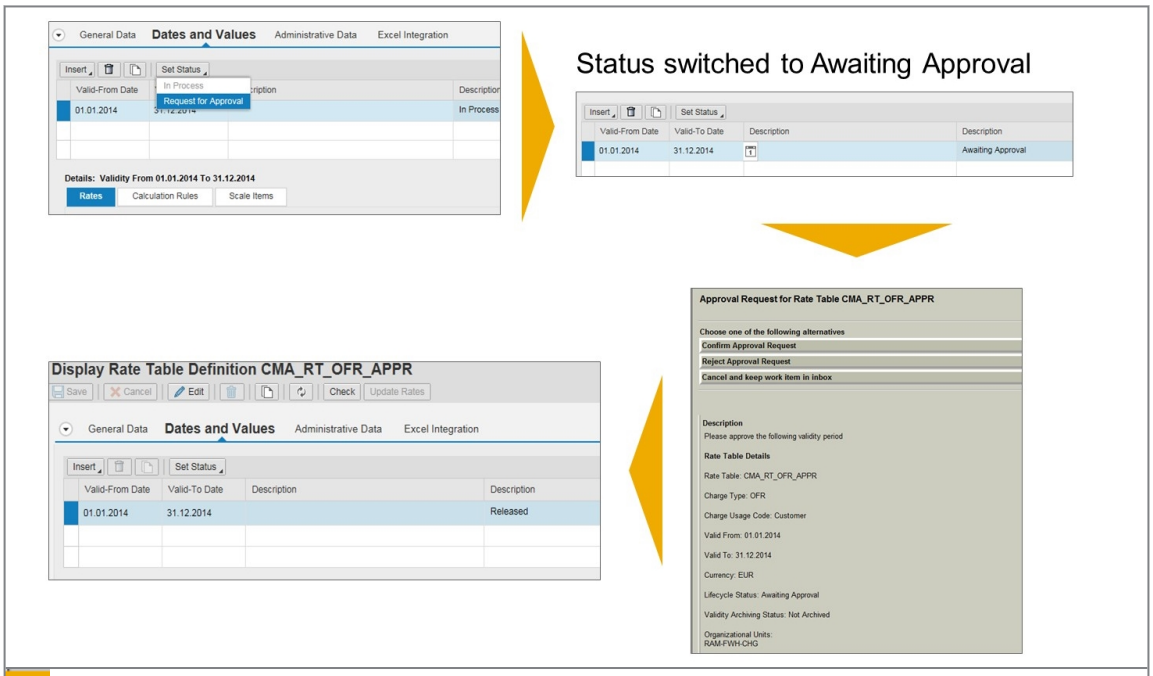

Figure 41: Approval Workflow

In certain situations, new or changed rates must be approved by a Senior Rate Administrator to become effective. An approval workflow can be activated for each rate table type. Instead of releasing the rate table for usage, the rate administrator can request an approval. The status of the rate table validity interval then switches to “Awaiting Approval”. Using SAP Business Workflow, an approval task is triggered and a notification is sent to a manager. The manager receives an approval request. Once approved, the validity interval will then be released and can be used. To use the approval process, the organizational model must be maintained.

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Microsoft Excel Integration

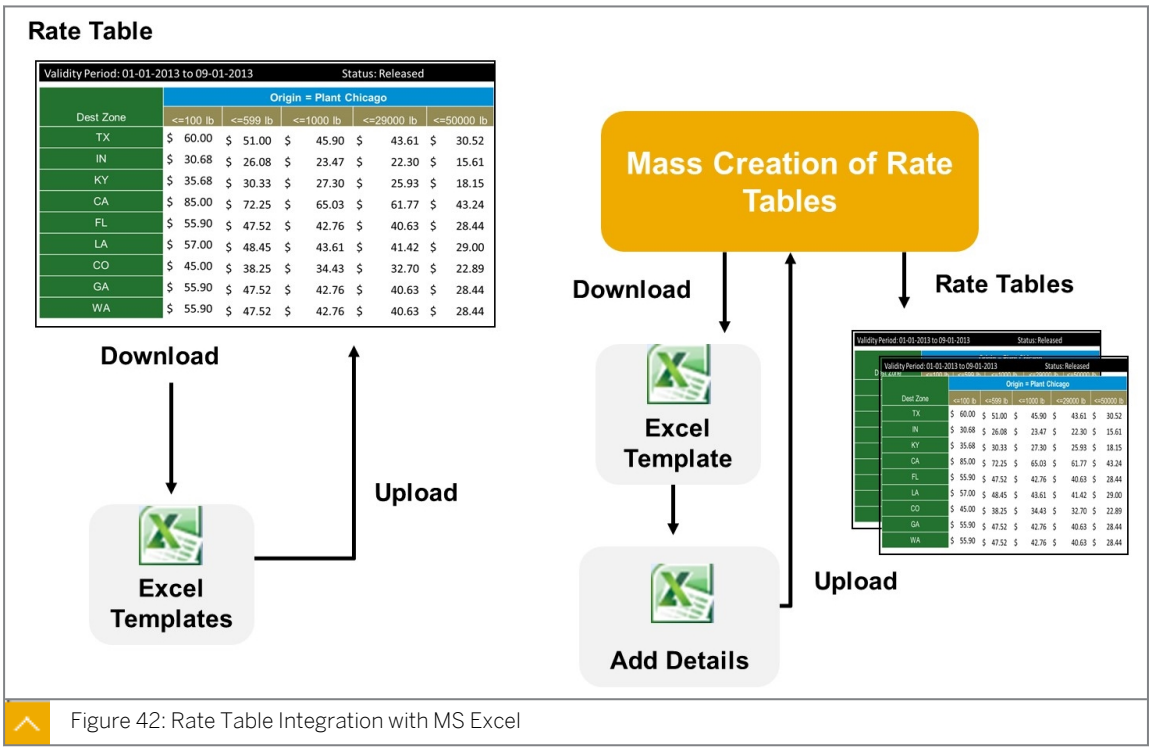

Figure 42: Rate Table Integration with MS Excel

You can maintain a large rate table, with or without scale items, using Microsoft Excel. You can enter the rates and scales into a Microsoft Excel file and upload the file to your SAP TM system.

Alternatively, you can define an empty reference rate table with validity periods in SAP TM and download it to Microsoft Excel. You can then maintain the rate table in the Microsoft Excel file and upload it to your SAP TM system.

Download Options

You can download a rate table to Microsoft Excel in one of the following ways:

- Rates for all validity periods in the rate table (scale ranges not included)
- Rates for one validity period and selected scale ranges
- Rates for multiple validity periods (scale ranges not included)
- Rates of the current validity period with scale ranges

You can view non-numeric scale items in the downloaded Excel file.

You can choose to upload all the rates and scale items of a rate table from Microsoft Excel to SAP TM.

The system provides you with a list of the created rate tables and also of those that were not created successfully.

Mass Creation of Rates Tables Using Microsoft Excel

You can create multiple rate tables in Microsoft Excel using rate table templates and upload them to SAP TM. You use the mass creation of rate tables (/SCMTMS/

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TCC_RATE_MASS_CREATE) report to download the Microsoft Excel template, in which you enter the new rate table details, and then you upload the new rate table details to SAP TM.

Template Options

In the Microsoft Excel template, you can specify the following for each row in Microsoft Excel:

- The way you want the name of the rate tables to be generated, that is, by the system, by using the rate table template name, or by using a rate table name that you provide.
- Whether you want to provide a rate table name. If you do so, you must enter the rate table name in the rate table column. The system adds a number to the end of the name of each rate table to avoid any duplication.
- The rate table template on which to base the rate tables.
- The rate table template to enable the system to create the rate tables. This must be specified.
- The quantity of rate tables. The system creates one rate table if you do not enter a quantity.

The system provides you with a list of rate tables created, and also of those that were not created successfully.

SMC3 Integration for Rate Tables

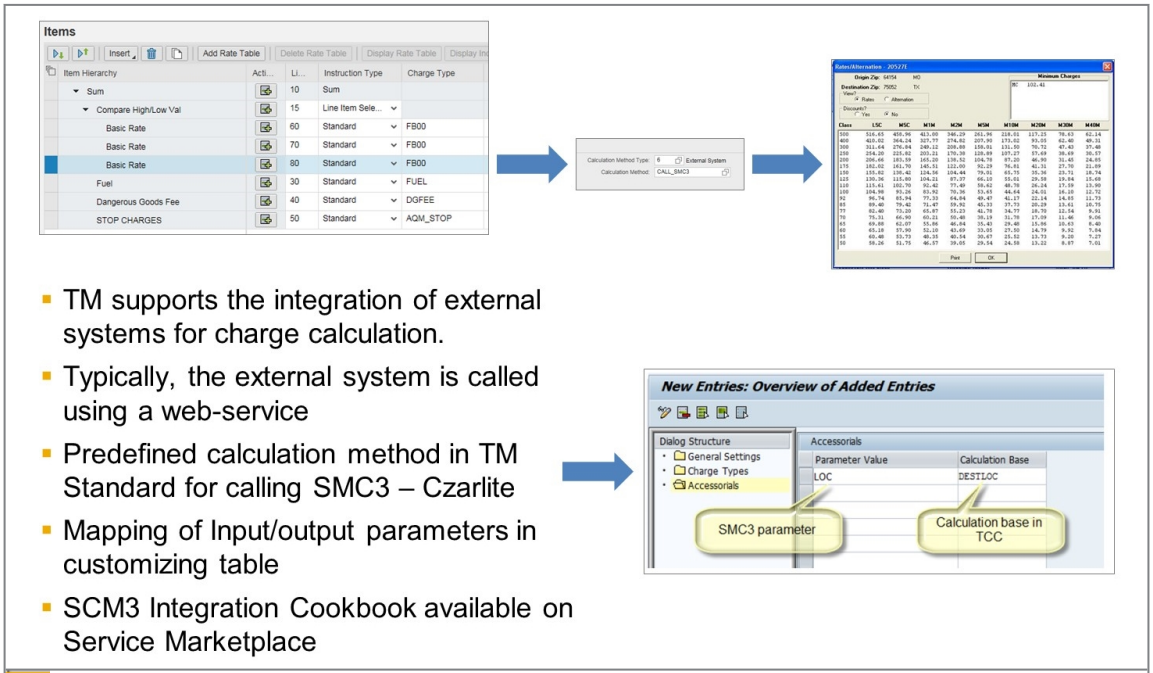

Figure 43: SMC3 Integration

In some use-cases, the integration of an external rate management system is required. In the US, RateWare by SMC3 is often used to manage LTL rates according to industry standards. Instead of replicating all rate information to the SAP TM database (which would require significant ongoing maintenance effort), integrating the data is advantageous. It is possible to combine the rates provided by RateWare with additional or manual charges calculated in SAP TM: for example, LTL base rates from SMC3, minimum charges, surcharges, and carrier-specific discounts in SAP TM.

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The technical integration is done using Web-Services. SAP Note 1636870 describes the configuration steps for technical integration.

In the SAP TM calculation sheet, a specific calculation method must be assigned to a charge item to call the external system during charge calculation. For SMC3 integration, you can use the calculation method CALL_SMC3, which is part of the TM standard. View cluster / SCMTMS/VC_SMC3 can be used for basic configuration (detailed instructions are also contained in the SAP Note). In the same view cluster, you can map SMC3 parameters to SAP TM calculation bases.

The External Ref. Number maintained in the TM Freight Agreement Header must contain the SMC3 contract ID, if rates from a specific contract are to be calculated.

Mass Maintenance of Rates

In this section, we look at several aspects of the mass maintenance of rates.

Mass Maintenance: Updating Rates

- A rate can be increased or decreased by a percentage or an amount.
- You have to specify a scale range, for example, source location, to enable the system to change only the rates in a particular scale range.
  - Only scale ranges that are already specified in an existing validity period of an existing rate can be specified.
- Rates can be updated based on the calculation type of the scale items (for example, absolute or relative, or both absolute and relative).
  - For example, you can update the rates for relative scale items with one rate change and the rates for absolute scale items with a different rate change.

Management of Validity Periods

- Values for one period, multiple periods, or all periods in an existing validity period can be changed.
- If the validity period to be updated is not already specified in the existing validity periods, you can create a new validity period in which the rate change applies.
  - Specify a new validity period within the date ranges already specified in the existing validity periods.
  - Specify a new validity period that is outside the existing validity periods in the rate table.
  - By default, the system uses the rate, calculation rule, and scale item settings in the latest validity period when it creates the new validity period.
  - For new validity periods, you can also automatically set the status to Released during the rate table update.

Integration of Mass Maintenance

You use the /SCMTMS/RATE_MASS_UPDATE program to change the values in a single rate table or in multiple rate tables at the same time.

Rate tables for forwarding, freight, and internal agreements are accessible from the master data cockpit query.

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To access the master data cockpit, in the SAP Fiori Launchpad, choose *Charge Management → Charge Management-Worklist → Master Data Cockpit*.

Choose the relevant agreement type query and enter your search criteria (Purchasing Org and Carrier).

In the personal object worklist result, when you select a line item that contains both a rate table and a calculation sheet, the system opens the *Update Rates* function when you choose *Update Rates/Calculation Sheet Amounts*. The system automatically includes the rate table from the selected line item in the update criteria when you open the function.

When you select a line item that contains a rate table and a different line item that contains a calculation sheet only, and choose *Update Rates/Calculation Sheet Amounts*, the system opens both the *Update Rates* and *Update Calculation Sheet Amounts* functions on the same screen.

Mass Update of Rates - Example

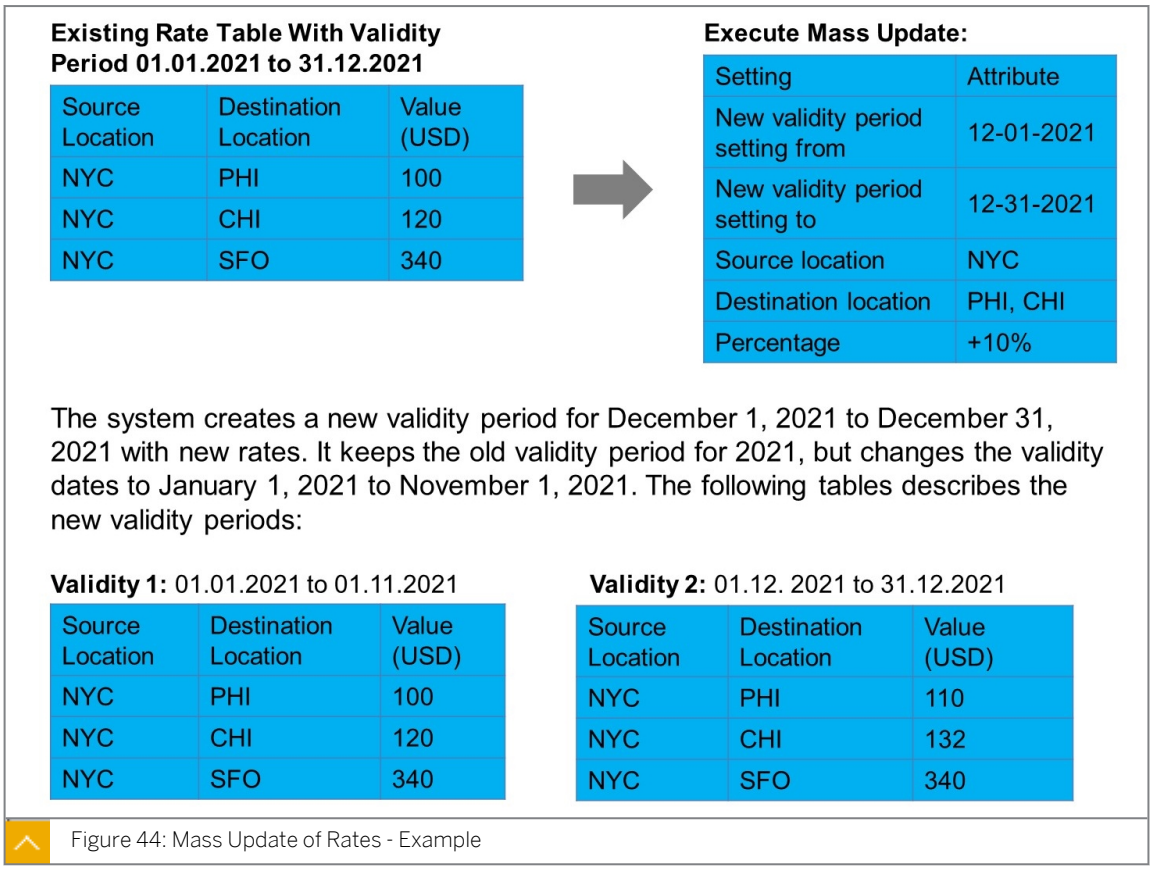

Figure 44: Mass Update of Rates - Example

An example of the mass update of rates is described here.

You want to create a new validity period that contains new rates.

The following table describes the settings in the first existing validity period of January 1, 2021 to December 31, 2021:

Table 7: Rates Table

Source Location	Destination Location	Value (USD)
NYC	PHI	100
NYC	CHI	120

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Source Location	Destination Location	Value (USD)
NYC	SFO	340

You need to create a new validity period with new rates to cover the period December 1, 2021 to December 31, 2021. The following table describes your inputs to the Update Rates function:

Table 8: Selection Criteria

Setting	Attribute
New validity period setting from	01.12.2021
New validity period setting to	31.12.2021
Source location	NYC
Destination location	PHI, CHI
Percentage	+10%

The system creates a new validity period for December 1, 2021 to December 31, 2021 with new rates. It keeps the old validity period for 2021, but changes the validity dates to January 1, 2021 to November 1, 2021. The following tables describes the new validity periods:

Table 9: Validity 1: January 1, 2021 to November 1, 2021

Source Location	Destination Location	Value (USD)
NYC	PHI	100
NYC	CHI	120
NYC	SFO	340

Table 10: Validity 2: December 1, 2021 to December 31, 2021

Source Location	Destination Location	Value (USD)
NYC	PHI	110
NYC	CHI	132
NYC	SFO	340

The system did not update the rate from NYC to SFO, since it was not included in the selection criteria.

LESSON SUMMARY

You should now be able to:

- Create Rate Table Templates
- Create Rate Table Definitions
- Maintain Rate Tables
- Update and Mass Maintenance of Rate Tables

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Unit 2
Lesson 5

Defining Calculation Sheets

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Define Calculation Sheets

Calculation Sheet Maintenance

The calculation sheet is a hierarchical table to calculate transportation charges. It combines the charge types permitted for a document and the sequence in which the system takes these charge types into account during the calculation.

The system uses the calculation sheet to specify which transportation charges to calculate and how to calculate them. This helps to bill customers for transportation services and to pay suppliers or carriers for subcontracted transportation services.

It provides for a calculation schema showing the steps and the specifications for the charges. Based on the calculation sheet, the resulting charges, sub-totals, and totals can then be displayed in the documents.

Calculation Sheet Data

When setting up the calculation sheet, you can specify the following:

General data

The general data contains charge usage. Charge usage determines if the calculation sheet is valid for customer and/or service provider.

Hierarchy items

Under the hierarchy items, you can specify the instruction, charge type, and instructions on how the charge type should be calculated. This calculation schema shows the steps and the specifications that the system takes into account during calculation.

Preconditions and general terms

Preconditions can be specified in the assignment of the calculation sheet to the freight agreement. Such conditions for applying the calculation sheet, as well as payment terms or other general terms, can be specified.

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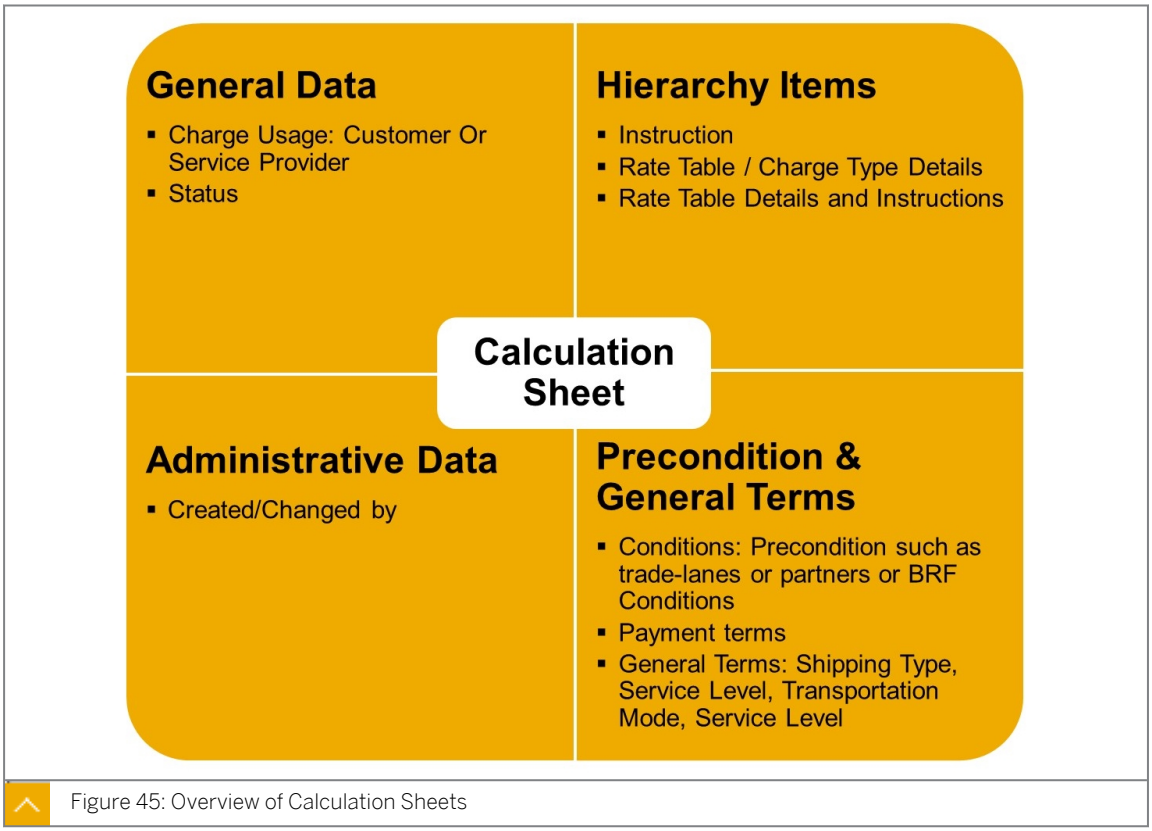

Figure 45: Overview of Calculation Sheets

Calculation Sheet Item Components

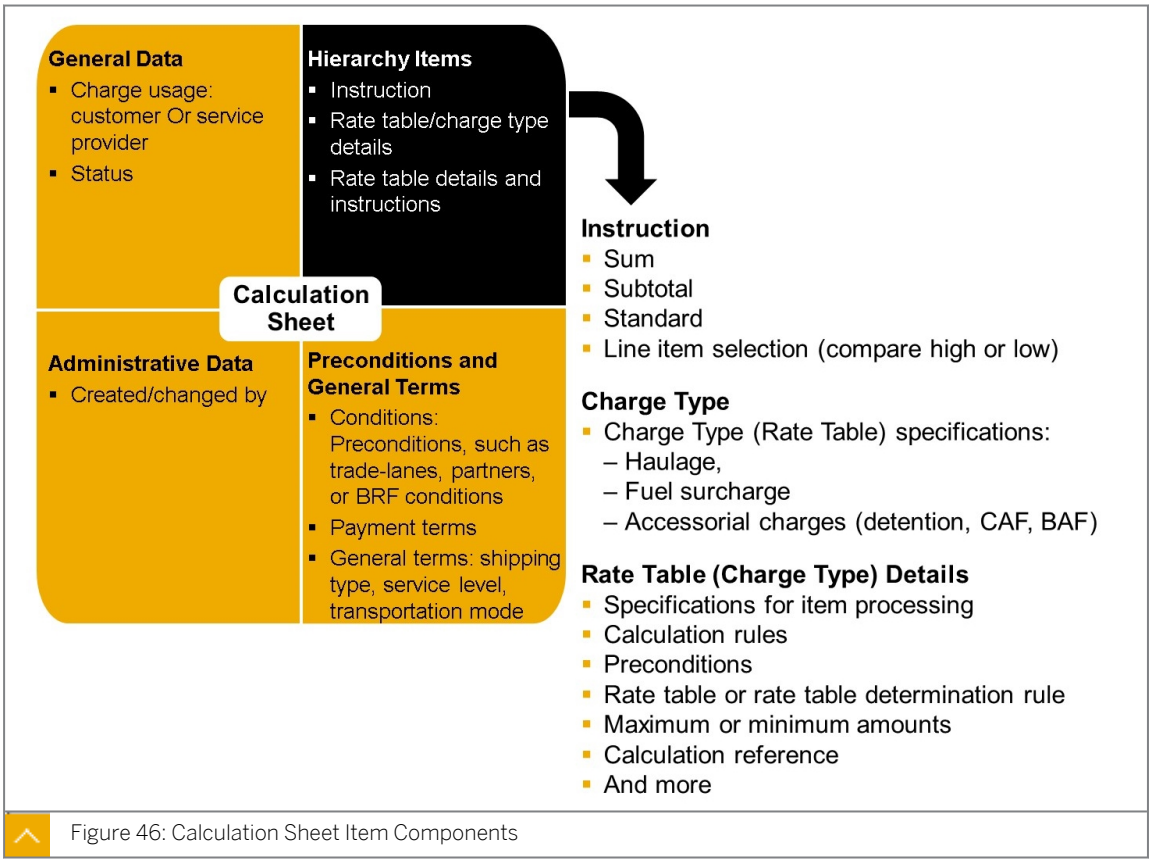

Figure 46: Calculation Sheet Item Components

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The *Items* screen area contains the details of the calculation sheet items and you can create rate tables for each calculation sheet item.

The following columns are mandatory in the *Items* screen area:

Instruction Type

Sum: This is used to evaluate the total sum of all the lines under the sum line. The charge item with the sum instruction evaluates the sum of all the lines below. Each calculation sheet has an initial mandatory sum line. You cannot delete this line. You can only maintain the rounding rule for this line because you cannot define a charge type.

Subtotal: This is used to evaluate the subtotal amount of all lines included in a range defined by a reference-from line and a reference-to line.

Standard: This is a standard line, as this charge item results in a direct charge when the item refers to a charge type.

Compare High/Low Value: This evaluates the line to be considered for the calculation among a set of two or more lines. This evaluation is based on the highest or the lowest value of the affected lines. You use this value in combination with the Operation attribute. This charge item triggers a comparison of other charge items. If you set the operation to *High*, for example, the most expensive charge item remains and the cheaper charge items are deactivated.

Charge types

This is an itemized list of valid transportation charges. Charge types can be grouped into categories or subcategories. During calculation, it can result in a positive (surcharge) or negative (discount) value. If the charge item represents a percentage, it must refer to another charge item or subtotal that produces an absolute value to result in a chargeable amount.

Rate table details

Charge type instructions are sometimes called rate table details, consisting of the specifications for how the charge type will be processed.

Charge Type Details

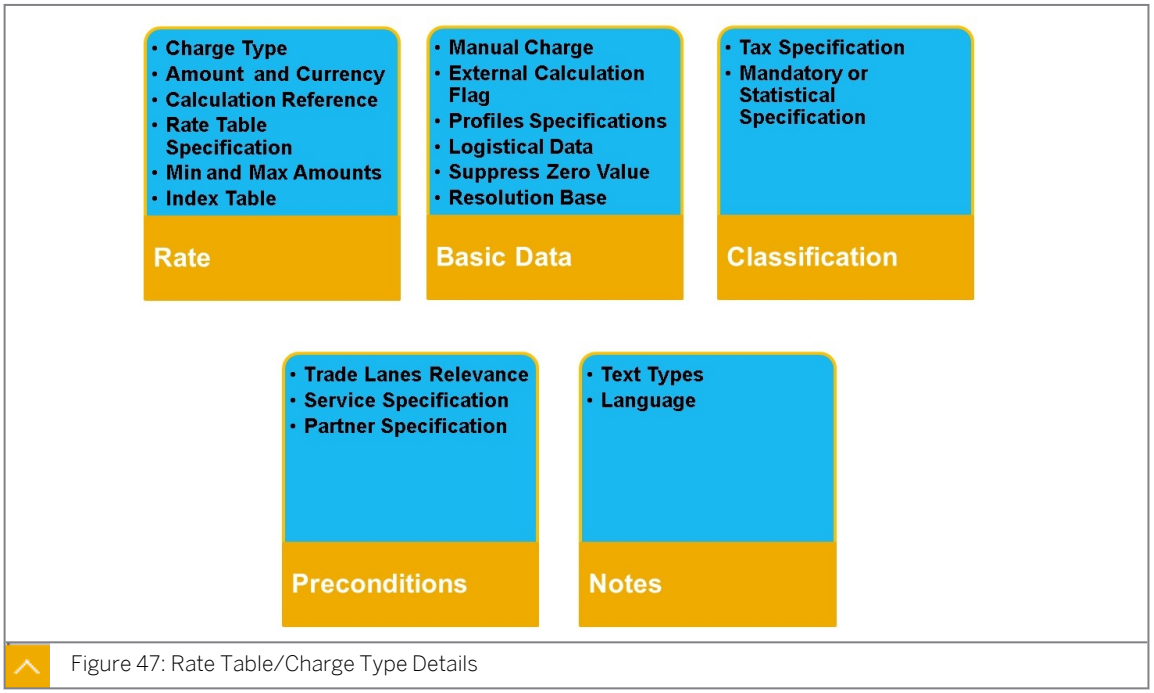

Figure 47: Rate Table/Charge Type Details

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The Rate Table/Charge Type details area contains the following important information:

- Rate
- Basic Data
- Classification
- Preconditions
- Notes

Rate Tab

The *Rate* tab page of the *Items* screen area has the following important fields:

- *Amount*: If you maintain this field, the charge item is not derived or calculated but is always equal to this amount.
- *Currency/ Percentage*: You can enter eight, the currency code, or %.
- *Reference-From* and *Reference-To* line numbers: If the calculated amount falls outside the minimum or maximum amounts specified here, these values are substituted.
- *Rate Table Determination Rule*: This rule determines the rate table from which the single charge item is derived using a condition or a BAdI.
- *Rate Table*: The rate table is fixed and predefined for each charge item. The rate calculation works in the same way as the rate table determination.
- *Calculation Rule*: The values with which the single rate is to be multiplied.
- *Index Table*: The index table is used, for example, to calculate the fuel surcharge.

Basic Data Tab

The *Basic Data* tab page of the *Items* screen area has the following important fields:

- *Charge Type*: The type of transportation charge such as haulage, ocean freight, and fuel surcharge.
- *Manual Charge Item*: If you select this checkbox, the system does not calculate the charges for this charge item, but instead expects you to enter an amount manually.
- *External Calculation Flag*: This specifies whether the system will use an external charge engine, such as SMC3.
- *Logistical Data Specification*: You can specify logistical data, such as stage category, shipping type, or dangerous goods for which the charge type is to be applied.
- *Resolution Base*: This defines which logistical data is used to determine the rate. Logistical data can be booking, container, main item, package, root (or Header of the document), or document stage. You can also determine if a grouping rule is to be used to group selected input data together, such as stages. The grouped stage is then the basis for a new charge item, that is, this rule is used together with the resolution base.
- *Rounding Profile*: You define if and how the calculated amount or charge is rounded.

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- *Adjustment Profile*: This allows you to change all involved calculation bases. You use this profile, for example, to adjust the logistical weight by any factor or logic. That is, you adjust the gross weight in such a way that the system only considers the chargeable weight for the rate table access.

- *Dimensional Weight Profile*: If the charge type is relevant for dimensional weight calculation, specification of dimensional factor, such as Imperial cubic pound factor 166 or 194, is applicable. Metric factors can also be specified.
- *Calculation Method Type* and *Calculation Method*: You can enable a special calculation method for each charge item, for example, whether the system calculates the charges by considering the break-weight or not.

Classification Tab

The *Classification* tab page has the following important fields:

- *Mandatory*: You use this field in preconditions and for checks based on Business Add-Ins (BAdIs). If the system cannot calculate the charge item properly, it creates a warning message. If the system cannot calculate a mandatory charge item, it creates an error message during invoice creation before transferring it to SAP S/4 MM.
- *Tax*: Indicates that the charge is a tax.
- *Statistical Charge*: The charge is informational or statistical only and not to be charged to the customer.

Preconditions and Notes Tab

The *Preconditions* tab page has the following important field:

- The *Preconditions* tab contains the *Precondition rule* field. The precondition rule checks if certain charge items are to be processed before charge calculation, according to the given logistical data source.
- On the *Notes* tab page, notes can be added, distinguished by text type.

Resolution Base

During charge calculation, the system determines the calculation resolution base by the origin of the data upon which the charge aspect is based.

Charge Aspect Definition for Resolution Base

You can define the charge aspect in the following resolution base objects:

- Root: This is the header of the document, such as freight order, booking order, or forwarding order.
- Stage: Refers to utilizing stage attributes, such as distance between the shipper location and the port of loading.
- Container: If an attribute stored on container level (for example, the Equipment Type: 22GP, 42G0.) is required for charge calculation, resolution base CONTAINER should be used (otherwise, this information is not available for charge calculation).
- Product: When product attributes like product quantity, weight, or volume need to be used.

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For example, you want to determine the freight rate based upon the gross weight of the order. To do this, you need to use the calculation resolution base of root. However, you want to calculate the freight on a per-package basis, the calculation resolution base should be package.

Calculation Method Type Example: Break Weight

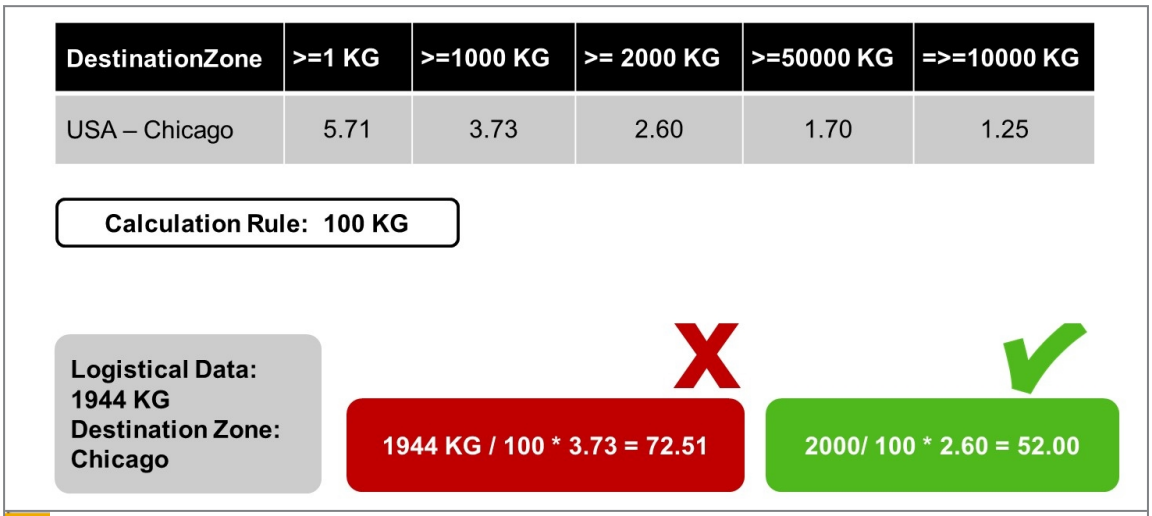

Figure 48: Calculation Method Type: Break Weight

A calculation method, such as the break-weight calculation, uses special functions to derive the rate. When a break-weight calculation is specified in the calculation sheet, the system compares the next rate to the current rate and applies the cheaper rate.

Other calculation methods common in the transportation industry include clipping, deficit weight rating, most expensive main carriage, internal charge calculation, and external systems.

Calculation method types can also help to utilize customer-specific logic or special formula for freight charge calculation.

LESSON SUMMARY

You should now be able to:

- Define Calculation Sheets

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Creating Freight Agreements

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Create Freight Agreements

Agreements Overview

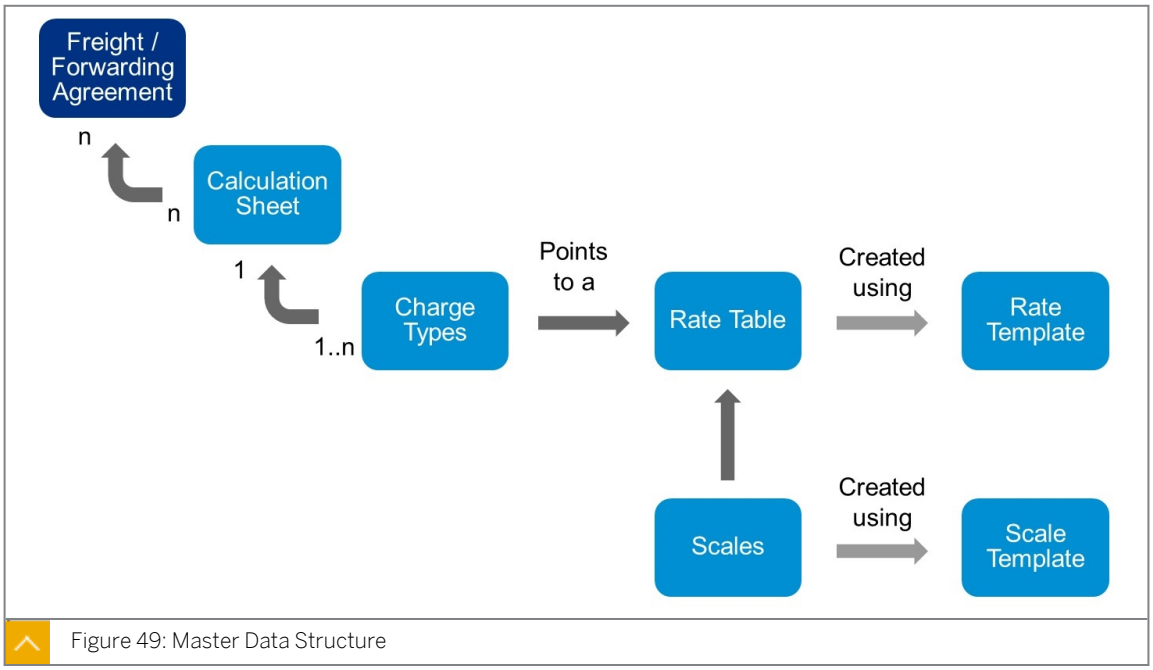

Figure 49: Master Data Structure

Agreements are the basis for calculating transportation charges and can involve one or more parties.

You use forwarding agreements (FWAs) to calculate transportation charges billable to your customer, and freight agreements (FAs) to calculate transportation charges billable to you by your carrier.

You use internal agreements (IAs) to calculate transportation charges between organizations of the same company code and between organizations of different company codes in the same company.

A service agreement is a type of freight agreement, which contains only service types or service products.

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Agreement Overview

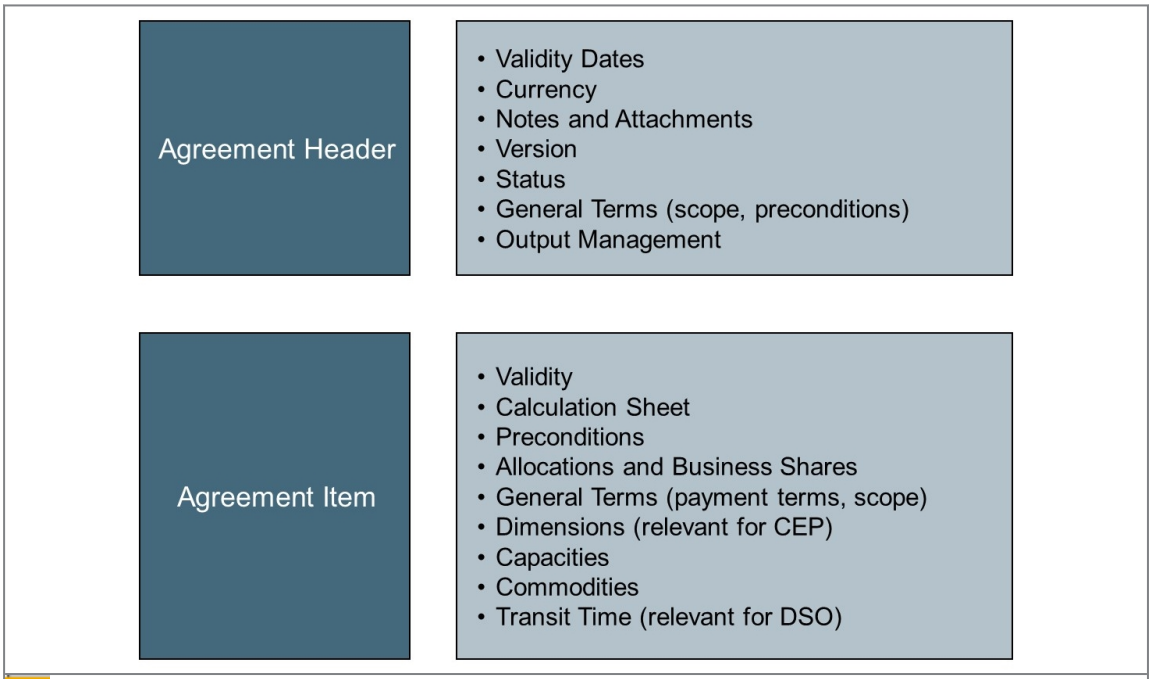

Figure 50: Agreement Overview

Organizational Units in SAP Transportation Management (TM)

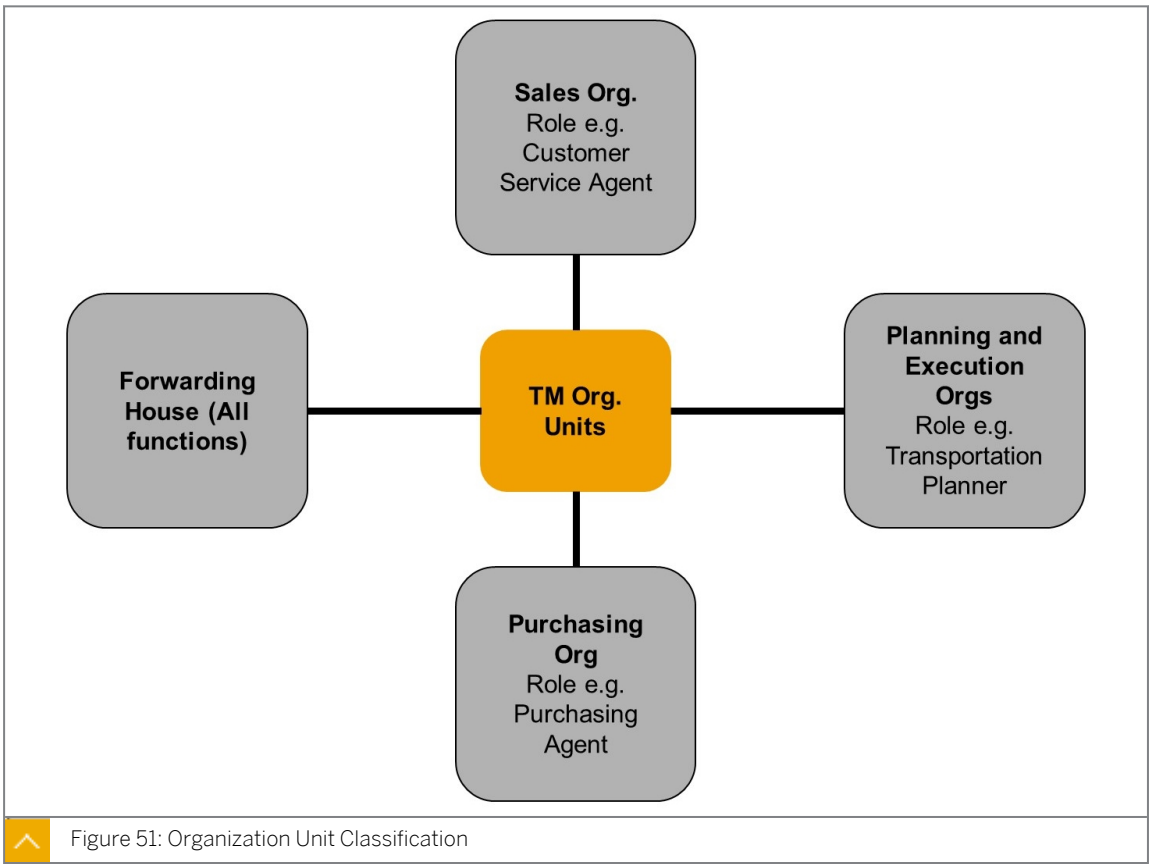

Figure 51: Organization Unit Classification

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Organizational units are used to determine responsibilities, for example, for approval processes, and authorization of who is allowed to see data or perform certain actions.

In SAP Transportation Management (TM), organizational units can be divided into sales and purchasing, and planning and execution.

Forwarding houses can be used to represent business units (LSP), and perform all functions including sales, purchasing, planning, and execution.

Organizations and Business Documents

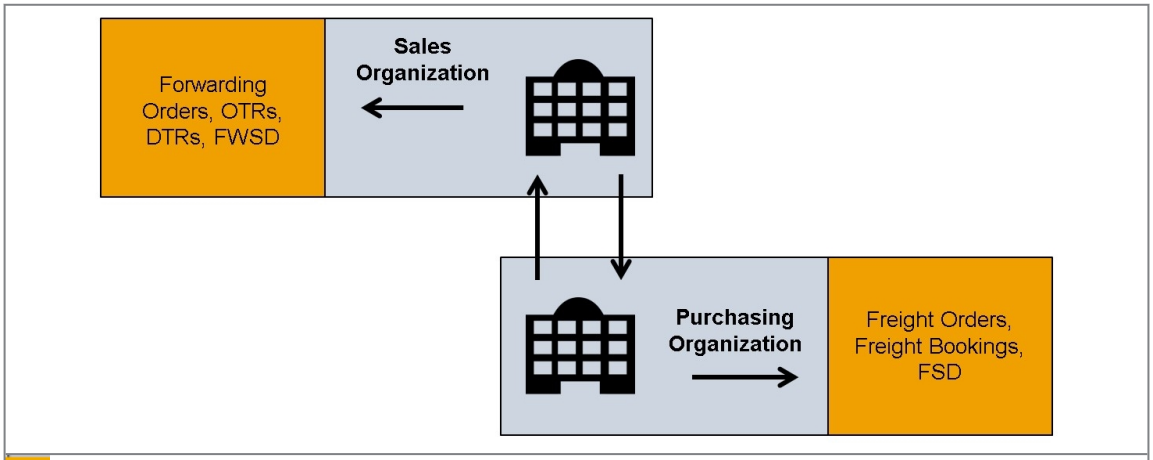

Figure 52: Organizations in Business Documents

The sales side is responsible for sales and services, such as, organizing the necessary activities for shipment transportation. For this reason, the sales organization is indicated in the business documents forwarding documents, order-based transportation requirements, delivery-based transport requirements, and forwarding settlement documents.

The purchasing side is responsible for procuring the necessary services from vendors (for example, carriers). For this reason, the purchasing organization is indicated in the business documents freight orders, freight bookings, service orders, and freight settlement documents (FSD).

Contractual Data in Agreements

An agreement includes contractual data, such as the following:

- Organizational unit (for example, the sales or purchasing organization)
- Involved parties (for example, the ordering party or carrier)
- Terms of payment
- Validity dates

The system determines the agreement based on organization, business partner, validity period, and preconditions. An agreement is most commonly determined by the purchasing organization and business partner (carrier for freight agreements, customer for forwarding agreements). In the Freight Agreement Type Customizing activity, you can configure whether one or multiple partners can be entered in the agreement; that is, if you have one freight agreement with a carrier valid for multiple purchasing organizations.

Additionally, there is the possibility of selecting agreements manually:

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Therefore the agreement determination type of the calculation profile has to be set to 'Display All Agreements' (Unit 3, Lesson 2).

Forwarding and Freight Agreement Customizing Considerations

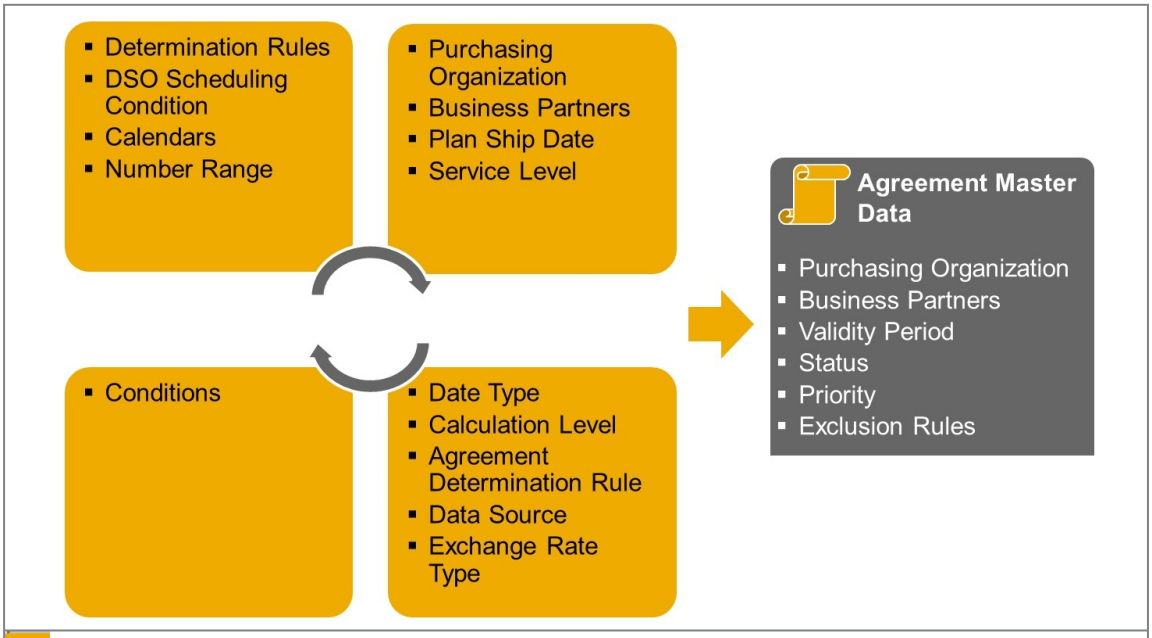

Figure 53: Forwarding and Freight Agreement Customizing Considerations

A forwarding agreement is a long-term contract that represents the contractual relationship with a customer to whom you are selling transportation services.

A freight agreement is a long-term contract that represents the contractual relationship with a carrier from whom you are buying transportation services.

When configuring agreements, it is necessary to examine the logistical model. Purchasing organizations, business partners such as customers and carriers, as well as business rules, such as plan or actual ship date, have a direct impact on how agreements are maintained.

The standard determination rule for freight agreements uses purchasing organization and carrier; for forwarding agreements, the standard determination rules uses sales organization and customer.

For complex determination rules, a BRF+ condition can be created. This allows rule-based determination based upon additional fields.

Customizing Agreements – Agreement Types

The allowed item types are:

- Preconditions that can be defined in the agreement, such as transportation mode or service level
- Text schema used store freight agreement notes
- Default calculation sheet template used when creating the calculation sheet from within the agreement
- Direct shipment order scheduling type

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- Display time determination type is used to specify if the time display can be editable or display only
- External delivery date determination rule if other system besides TM is used for the delivery date determination
- Multiple parties allowed
- Departure, transit, and arrival calendar
- Allocation type the system uses to create transportation allocation
- Setting to enable *Change Document* tab page or screen area

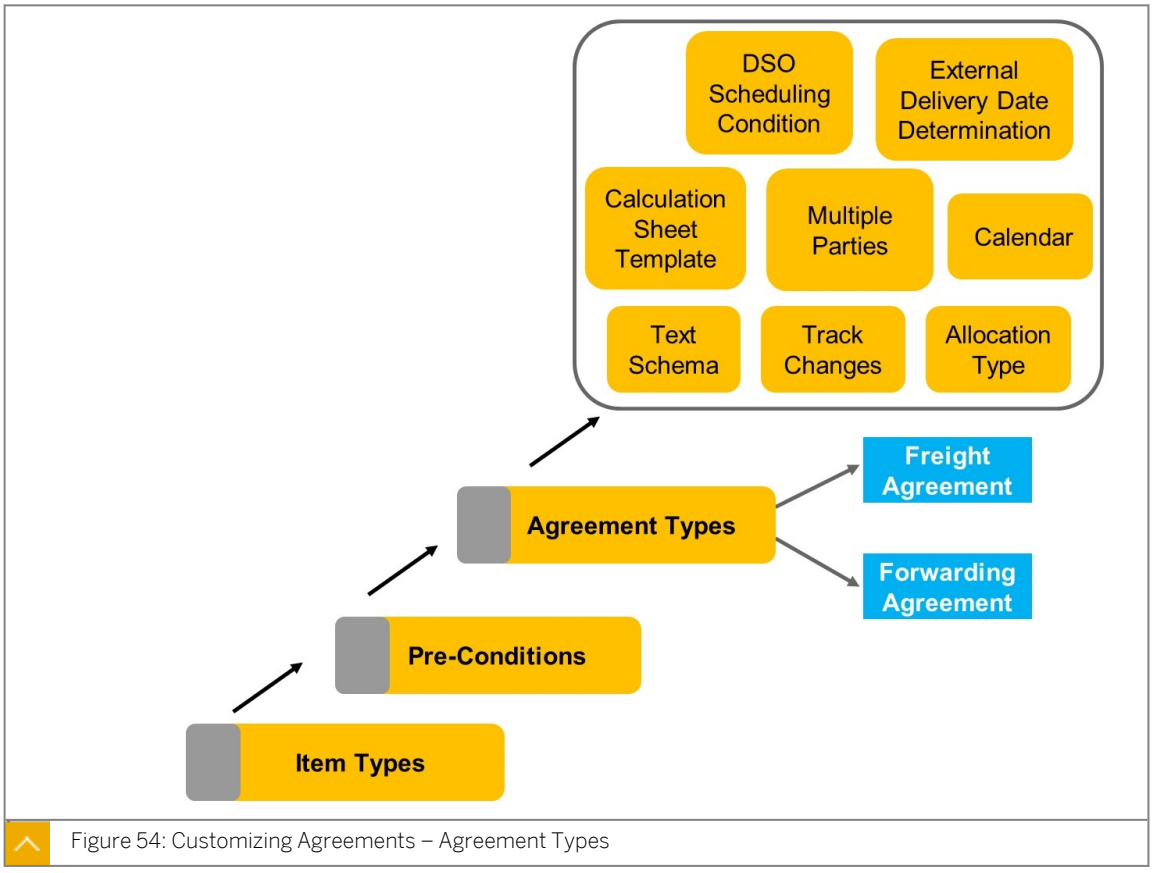

Figure 54: Customizing Agreements – Agreement Types

LESSON SUMMARY

You should now be able to:

- Create Freight Agreements

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Learning Assessment

1. A calculate charge request can come from which of the following documents?

   Choose the correct answers.

   - ☐ A Freight order
   - ☐ B Forwarding order
   - ☐ C Forwarding settlement document
   - ☐ D Sales order

2. When configuring the scale base, which field stores the scale values for the scale created with this scale base?

   Choose the correct answer.

   - ☐ A Field Assignment
   - ☐ B Raw values
   - ☐ C Numeric

3. Which of the following statements about the calculation base are correct?

   Choose the correct answers.

   - ☐ A It indicates the base on which the charge calculation is executed for a corresponding scale.
   - ☐ B You can assign a default calculation type to the calculation base.
   - ☐ C You define a calculation base for every scale base.
   - ☐ D It is considered a dimension of a rate table.

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4. When creating a scale, which of the following scales will have the calculation type set to Absolute?

   Choose the correct answers.

   - ☐ A Region
   - ☐ B Business Partner
   - ☐ C Weight
   - ☐ D Distance

5. Which of the following charge lines can a charge type classify?

   Choose the correct answers.

   - ☐ A Whether a charge line can be a positive or a negative value
   - ☐ B Whether a charge line can be an absolute value or a percentage value
   - ☐ C Whether the charge line has a default calculation base
   - ☐ D Whether the charge line has a minimum amount and a maximum amount

6. The charge categories and subcategories can be used to group charge types in a more granular way and are used to map charge types to MM service masters. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   - ☐ True
   - ☐ False

7. Which of the following statements about rate table templates are correct?

   Choose the correct answers.

   - ☐ A A rate table template is a grouping of prices for transportation services.
   - ☐ B A rate table template can be used to create a rate table with predefined scales, calculation rules, and validity dates.
   - ☐ C A rate table can be defined automatically by using a rate table template.
   - ☐ D A rate table template created in the Customizing activity can be transported across different systems.

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8. When creating a rate table definition, in which of the following fields can you specify whether transportation charges are billable to your customer or billed to you by your carrier?

   Choose the correct answer.

   - ☐ **A** Charge Usage
   - ☐ **B** Charge Type
   - ☐ **C** Calculation Base
   - ☐ **D** Rel. Calc. Method (Relevant for Calculation Method)

9. Which of the following statements about maintaining rate tables with Microsoft Excel are correct?

   Choose the correct answers.

   - ☐ **A** You can enter the rates and scales into a Microsoft Excel file and upload the file to your SAP TM system.
   - ☐ **B** You can view non-numeric scale items in the downloaded Excel file.
   - ☐ **C** You can download the rates and scale ranges for all validity periods in the rate table.
   - ☐ **D** You can create multiple rate tables in Microsoft Excel using rate table templates and upload them to SAP TM.

10. A rate can only be increased or decreased by a percentage.

    Determine whether this statement is true or false.

    - ☐ True
    - ☐ False

11. The calculation sheet specifies which transportation charges to calculate and how to calculate them.

    Determine whether this statement is true or false.

    - ☐ True
    - ☐ False

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12. Based on what you have learned about calculation sheets, place a tick beside each of the options below which is true. Choose the correct answers.

    Choose the correct answers.

    - ☐ A The CS is closely connected to rate tables and scales.
    - ☐ B The CS provides a clear view on how the final amounts owing to carriers are arrived at.
    - ☐ C Even though the final amounts for two deliveries, A and B, may vary according to the specifics of each individual delivery, the underlying rationale as defined in the CS may be the same.
    - ☐ D A new CS must be created for each delivery.

13. Match the agreement to its correct definition.

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

Billable to your customer.	Freight agreement. Used to calculate transportation charges.
Billable to you by your carrier.	Internal agreement. Used to calculate transportation charges.
Occurs between organizations of the same company code and between organizations of different company codes in the same company.	Forwarding agreement. Used to calculate transportation charges.

14. When calculating carrier charges in a freight order, the freight agreement is determined based on what? Choose the correct answers.

    Choose the correct answers.

    - ☐ A Sales organization
    - ☐ B Purchasing organization
    - ☐ C Ordering party
    - ☐ D Carrier

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Learning Assessment - Answers

1. A calculate charge request can come from which of the following documents?

   Choose the correct answers.

   [X] A Freight order

   [X] B Forwarding order

   [X] C Forwarding settlement document

   [ ] D Sales order

   Correct. A calculate charge request can come from a freight order, a forwarding order, a forwarding settlement document, a freight settlement document or an order-based transportation request.

2. When configuring the scale base, which field stores the scale values for the scale created with this scale base?

   Choose the correct answer.

   [X] A Field Assignment

   [ ] B Raw values

   [ ] C Numeric

   Correct. The *Field Assignment* field stores the scale values for the scale created with the scale base.

3. Which of the following statements about the calculation base are correct?

   Choose the correct answers.

   [X] A It indicates the base on which the charge calculation is executed for a corresponding scale.

   [X] B You can assign a default calculation type to the calculation base.

   [X] C You define a calculation base for every scale base.

   [ ] D It is considered a dimension of a rate table.

   Correct. The calculation base indicates the base on which the charge calculation is executed for a corresponding scale. You can assign a default calculation type to the calculation base and define a calculation base for every scale base.

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4. When creating a scale, which of the following scales will have the calculation type set to Absolute?

   Choose the correct answers.

   - [X] A Region
   - [X] B Business Partner
   - [ ] C Weight
   - [ ] D Distance

   Correct. The Absolute calculation type is used for non-numeric scales such as region, business partner, and destination zone.

5. Which of the following charge lines can a charge type classify?

   Choose the correct answers.

   - [X] A Whether a charge line can be a positive or a negative value
   - [X] B Whether a charge line can be an absolute value or a percentage value
   - [X] C Whether the charge line has a default calculation base
   - [ ] D Whether the charge line has a minimum amount and a maximum amount

   Correct. For a charge line, a charge type can classify whether the charge line is a positive or a negative value, has an absolute value or a percentage value, and has a default calculation base.

6. The charge categories and subcategories can be used to group charge types in a more granular way and are used to map charge types to MM service masters. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   - [X] True
   - [ ] False

   Correct. The charge categories and subcategories can be used to group charge types in a more granular way and are used to map charge types to MM service masters and SD condition types.

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7. Which of the following statements about rate table templates are correct?

   Choose the correct answers.

   [ ] A A rate table template is a grouping of prices for transportation services.

   [X] B A rate table template can be used to create a rate table with predefined scales, calculation rules, and validity dates.

   [X] C A rate table can be defined automatically by using a rate table template.

   [X] D A rate table template created in the Customizing activity can be transported across different systems.

   Correct. A rate table template can be used to create a rate table with predefined scales, calculation rules, and validity dates. A rate table template can be used to create a rate table automatically. A rate table template created in the Customizing activity can be transported across different systems.

8. When creating a rate table definition, in which of the following fields can you specify whether transportation charges are billable to your customer or billed to you by your carrier?

   Choose the correct answer.

   [X] A Charge Usage

   [ ] B Charge Type

   [ ] C Calculation Base

   [ ] D Rel. Calc. Method (Relevant for Calculation Method)

   Correct. In the *Charge Usage* field, you can define the rate table to calculate transportation charges billable to your customer or to be billed to you by your carrier.

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9. Which of the following statements about maintaining rate tables with Microsoft Excel are correct?

   Choose the correct answers.

   [X] A You can enter the rates and scales into a Microsoft Excel file and upload the file to your SAP TM system.

   [X] B You can view non-numeric scale items in the downloaded Excel file.

   [ ] C You can download the rates and scale ranges for all validity periods in the rate table.

   [X] D You can create multiple rate tables in Microsoft Excel using rate table templates and upload them to SAP TM.

   Correct. You can enter the rates and scales into a Microsoft Excel file and upload the file to your SAP TM system. You can also create multiple rate tables using rate table templates and upload them to SAP TM. You can also view non-numeric scale items in the downloaded Excel file. When you download the rates for all validity periods, the scale items are not included.

10. A rate can only be increased or decreased by a percentage.

    Determine whether this statement is true or false.

    [X] True

    [ ] False

    Correct. A rate can be increased or decreased by a percentage or an amount.

11. The calculation sheet specifies which transportation charges to calculate and how to calculate them.

    Determine whether this statement is true or false.

    [X] True

    [ ] False

    Correct. The calculation sheet specifies which transportation charges to calculate and how to calculate them.

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12. Based on what you have learned about calculation sheets, place a tick beside each of the options below which is true. Choose the correct answers.

    Choose the correct answers.

    [X] **A** The CS is closely connected to rate tables and scales.

    [X] **B** The CS provides a clear view on how the final amounts owing to carriers are arrived at.

    [X] **C** Even though the final amounts for two deliveries, A and B, may vary according to the specifics of each individual delivery, the underlying rationale as defined in the CS may be the same.

    [ ] **D** A new CS must be created for each delivery.

    Correct. The calculation sheet is closely connected to rate tables and scales. It provides a clear view on how the final amounts owing to carriers are arrived at. Even though the final amounts for two deliveries, A and B, may vary according to the specifics of each individual delivery, the underlying rationale as defined in the CS may be the same.

13. Match the agreement to its correct definition.

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

Billable to your customer.	Forwarding agreement. Used to calculate transportation charges.
Billable to you by your carrier.	Freight agreement. Used to calculate transportation charges.
Occurs between organizations of the same company code and between organizations of different company codes in the same company.	Internal agreement. Used to calculate transportation charges.

    Correct. The forwarding agreement contains the charges billable to customers. The freight agreement contains the charges that are billed to you by your carrier and the internal agreement occurs between organizations of the same company.

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14. When calculating carrier charges in a freight order, the freight agreement is determined based on what? Choose the correct answers.

    Choose the correct answers.

    - [ ] A Sales organization
    - [X] B Purchasing organization
    - [ ] C Ordering party
    - [X] D Carrier

    Correct. The freight agreement is determined based on the purchasing Organization and the Carrier.

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UNIT 3 Charge Calculation

UNIT OBJECTIVES

- Configure Charge Calculation
- Calculate Charges
- Determine Agreements and apply Calculation Rules
- Estimate Freight Charges
- Use wildcard search
- Describe Charge Levels and Through Rates
- Use Calculation Methods
- Describe event-based charge calculation

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Unit 3
Lesson 1

Configuration of Charge Calculation

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Configure Charge Calculation

Calculation and Charges Profiles

Calculation Profile Settings

Calculation Date Type**	Agreement Determination **	Calculation Sheet Determination **	Data Source	Through Rate	Dimensional Wgt **	Exchange Rate **
System Date	Default (Blank)	Default (Blank)	Actual Route	Off	Ocean Based	M-Std at average
Actual Date Complete Carriage	Condition based	Condition Based	Ordered Route	On (with stages)	Air Based Factor = 166	G-Std at bank buying rate
Expected Date Complete Carriage			Actual and Ordered Route		Air Based = Factor = 194	P-Std for cost planning

** More values possible

Figure 55: Calculation Profiles Configuration

The calculation profile function provides a central location to define the settings that you want the system to use when calculating transportation charges.

The following are examples of settings you can define in a calculation profile:

- Specify the date type that the system uses as the basis for the rate, exchange rate, and agreement validity, and ultimately the charge calculation. (For example, the order date, the invoice date, or the expected end date of the main carriage.)
- Specify the level at which the system calculates the charges, for example, at header level, item level, or stage level.
- Specify the determination rule that the system uses to determine the agreement and the calculation sheet.

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- Specify a single rate, known as a through rate, for multiple stages of a transportation route.
- Specify the default dimensional weight profile for the organizational unit and the condition that the system uses to determine the dimensional weight profile.
- Specify the source of the data that the system uses for charge calculation and invoicing, for example, actual route, ordered route, or actual and ordered route.

In the *Define Calculation Profiles Customizing* activity, you define the settings that you want the system to use when calculating transportation charges.

In Customizing, choose *Transportation Management* → *Basic Functions* → *Charge Calculation* → *Basic Settings* → *Define Calculation Profiles*.

Charges Profile

You can enable charge calculation for a purchasing organization by assigning a *Charges Profile to the Purchasing Organization* (see the **PPOCE** transaction). The charges profile groups together the general settings for charge calculation, such as the calculation profile you want the system to use when calculating transportation charges, as well as the freight settlement profile for settling your charges, the cost distribution profile and the local currency of your business documents.

Calculation Profile Assignment

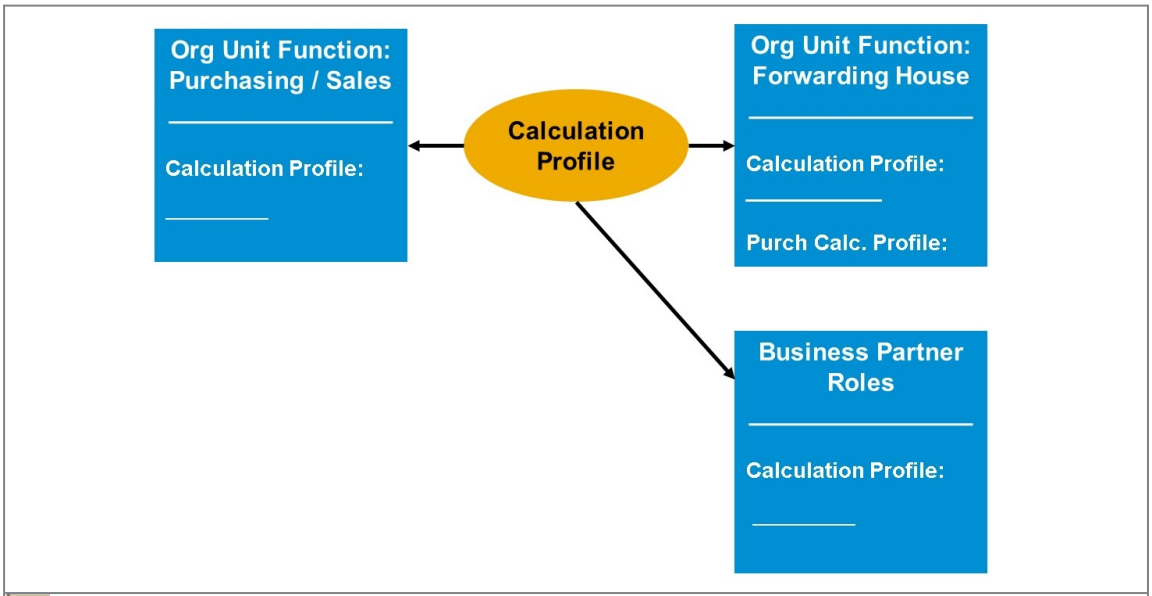

Figure 56: Calculation Profile Assignment

You can create a charges profile in the Customizing activity *Define Charges Profile*. Here you can assign your calculation profile which then gets automatically assigned to the organizational unit to which the charges profile gets assigned.

In Customizing, choose *Transportation Management* → *Basic Functions* → *Charge Calculation* → *Basic Settings* → *Define Charges Profiles*.

A purchasing calculation profile for your purchasing organization has to be maintained for charge calculation on the freight/buying side (freight order and freight booking).

If the organization is a forwarding house, both sales and purchase calculation profiles have to be maintained. The same profile can be used for both sales and purchase, depending on the scenario.

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You can also assign a calculation profile to the following business partner roles:

- Sold-to party
- Ship-to party
- Carrier
- Vendor

To assign a calculation profile to business partner roles, in SAP Fiori Launchpad, choose *Master Data → Define Business Partner*. You can assign a calculation profile on the *Vendor/ Transportation Purch. Org. Data* tab page of the business partner role. You can also use the **BP** transaction.

> Note:
> If you assign a calculation profile to an organizational unit and to a business partner role, the system only applies the calculation profile you assigned to the business partner role. You can also assign a calculation profile only to the organizational unit, but you cannot assign a calculation profile only to a business partner.

Calculation Settings in Freight Order Types

Figure 57: Charge Calculation Settings in Freight Order Types

In the Customizing activity *Define Freight Order Types*, the following settings influence charge calculation:

- *Enable Charge Calculation*: This must be selected to enable the system to calculate the charges. This setting does not influence manual freight charges, as they can be entered even when this setting is not selected. Additionally, the system also allows the quoted price of awarded freight quotations to be updated.
- *Calculate Charge After Each Save*: When this save strategy is selected, the system performs the charge calculation after each save. If a mandatory charge type cannot be determined or is missing, the freight order cannot be saved.

In the freight order, additional settings, such as *Track Changes* and *Default Charges View* (ungrouped/ grouped view), can be maintained.

To define freight order types, in Customizing, choose *Transportation Management → Freight Order Management → Freight Order → Define Freight Order Types*.

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Note: The described settings can also be applied in freight booking types and service order types.

LESSON SUMMARY

You should now be able to:

- Configure Charge Calculation

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Determining Agreements and Charge Calculation Rules

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Calculate Charges
- Determine Agreements and apply Calculation Rules
- Estimate Freight Charges

Freight Order Charge Calculation

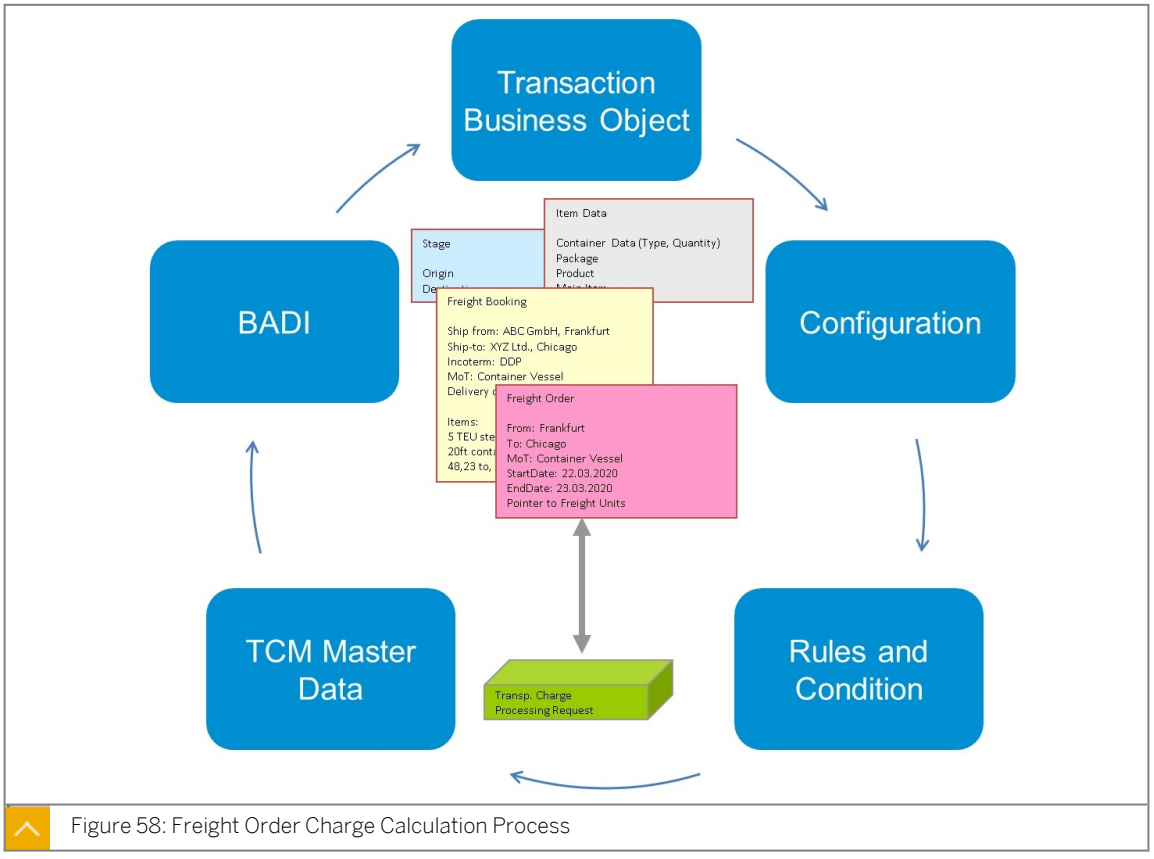

Figure 58: Freight Order Charge Calculation Process

During freight charge calculation in the freight order, the following steps occur:

1. The data is collected from the following SAP TM core objects:

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- Transaction business object: freight order, freight booking, service order, stage, item, container
- Configuration objects
- BRF+ conditions
- Master data
- Any BAdI implementation

2. The freight agreement is determined.
3. The values of each charge type in the calculation sheet are calculated.
4. The log file of the calculation run is held, and so on.
5. The calculated results are shown in the freight order.

Freight Rate Derivation Process

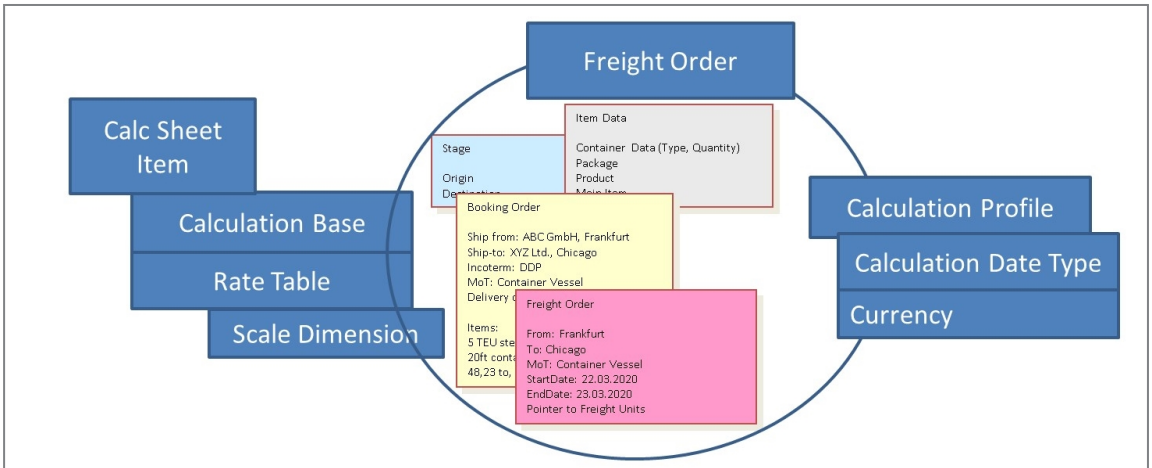

Figure 59: Freight Rate Derivation Process

During the freight rating process, the following steps are performed:

1. Based upon the calculation sheet line item, the system determines the calculation base and the rate table.
2. Given the dimension of the rate table (scales), it then obtains the logistical data.
3. Given the calculation profile, the system determines the baseline for the calculation date determination.
4. The system obtains the matching rate table record and then determines the appropriate calculation rule.
5. The system calculates the freight rate amount.

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Transportation Zone Derivation Using Zone Hierarchy

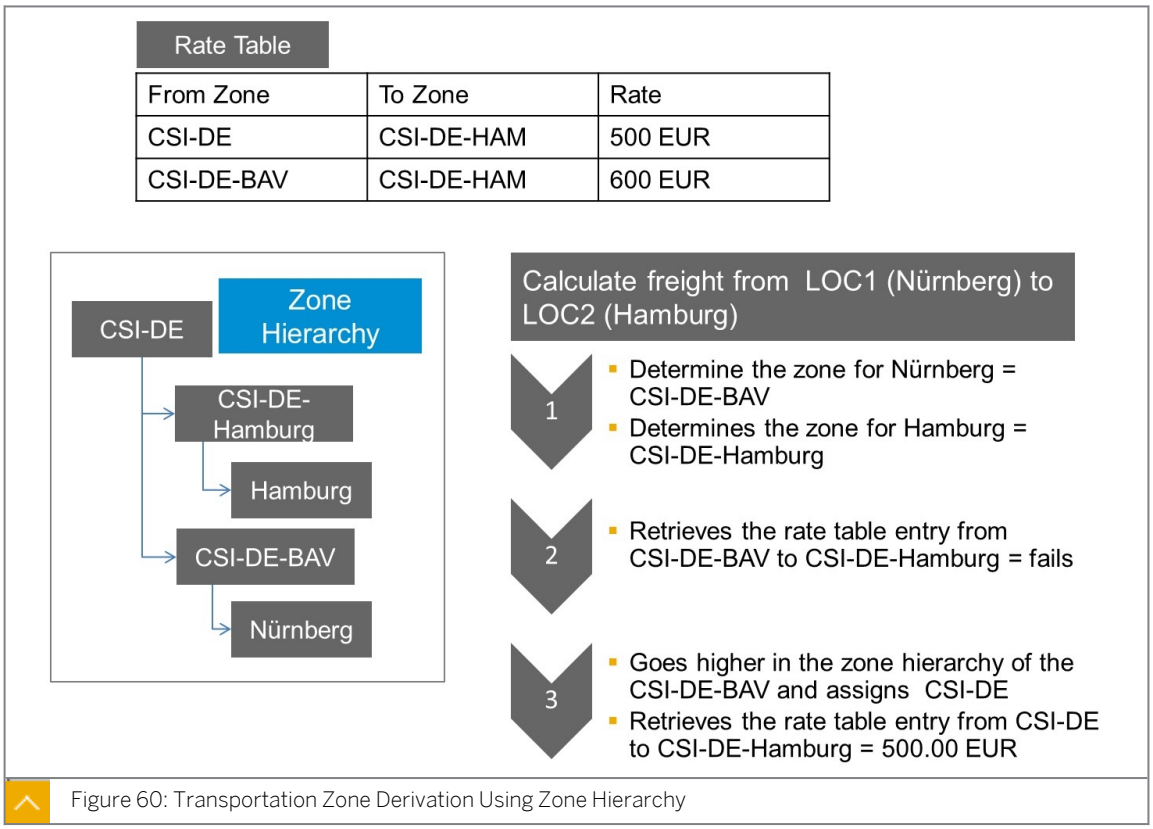

Figure 60: Transportation Zone Derivation Using Zone Hierarchy

The derivation of the transportation zone is flexible. It is not essential to maintain rates for all values - they can be maintained at the appropriate level.

The system retrieves the rate by going up in the hierarchy level until it finds the rate.

Maintain Pre-Conditions in Agreement Items

In an agreement, there are two ways of using preconditions for the agreement items (calculation sheets):

- Built-in preconditions
- BRFplus preconditions

It is possible to define a BRFplus condition or a BAdI to check if a certain calculation sheet is to be processed in a certain business context. The result of this rule is a true or false decision. If the response from BRFplus or the BAdI is true, the calculation sheet is considered for charge calculation. Some built-in preconditions are available on agreement item level.

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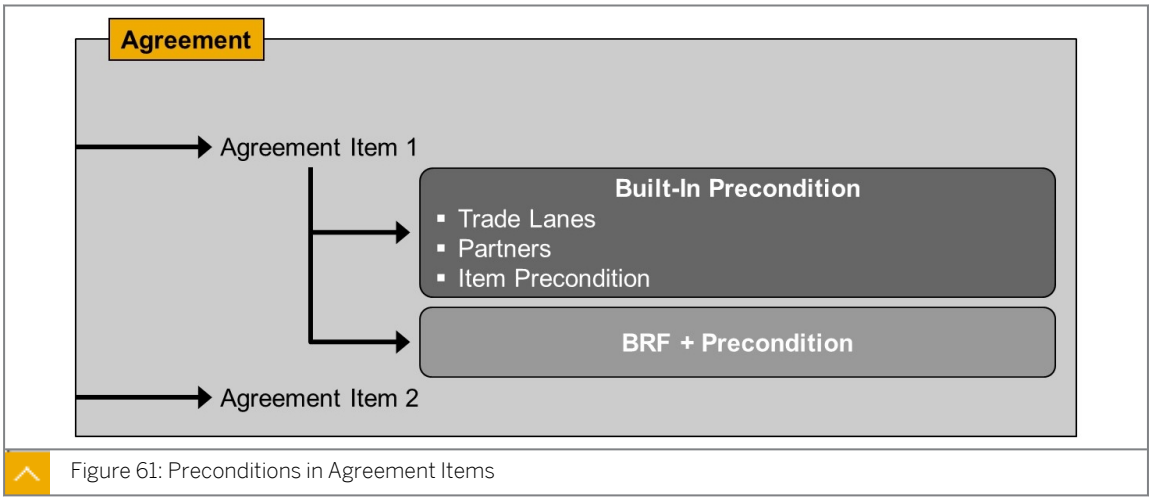

Figure 61: Preconditions in Agreement Items

Types of Built-in Preconditions in Agreement Items

Built-in preconditions in agreement items are as follows:

- Trade Lanes:

  These are based on criteria such as source location, source zone, destination location, destination zone, mode of transport, or means of transport. The agreement item can be activated or deactivated.

- Partners:

  Based on the business partner, an agreement item can be activated or deactivated.

- Item Precondition:

  Based on up to seven predefined conditions, it is possible to activate or deactivate an agreement item.

Available Item Preconditions

The table lists the available item preconditions and their descriptions.

Table 11: Available Item Preconditions

Precondition	Description
CONSL_TYPE	Allows selection of a certain Air Waybill Type
CONT_BASIS	Allows selection of a certain Contract Basis
MOT	Allows selection of a certain Transportation Mode
MOVEM_TYPE	Allows selection of a certain Movement Type
SERVICE_LV	Allows selection of a certain Service Level
SHIPMENT	Allows selection of a certain Shipping Type
STAGE_CAT	Allows selection of a certain Stage Category

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BRFplus Preconditions in Agreement Items

- Certain items (calculation sheets) in the agreement can be set to true or false based on parameters that are flexibly defined in the condition or a BAdI.
- The condition (condition type TCM_PRECON) is assigned to the agreement item.
- You maintain the condition in the Precondition Rule field of the Precondition Tab in the Agreement Item details section.

Maintain Pre-Conditions in Calculation Sheets

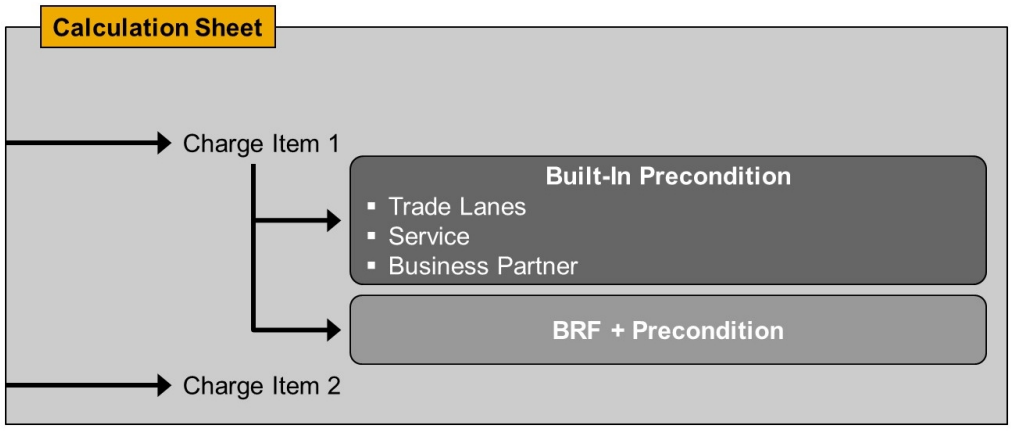

Figure 62: Calculation Sheet Preconditions

There are two ways of using conditions in the calculation sheet. There are predefined parameters in the built-in preconditions that can be used or a BRF+ precondition/BAdI can be maintained as well.

Types of Built-in Preconditions in Calculation Sheets

- Trade Lanes: Based on criteria such as source location, source zone, destination location, destination zone, mode of transport, or means of transport, the charge line can be activated or deactivated.
- Service: Based on the service level, a charge item can be activated or deactivated.
- Business Partner: Based on the business partner, a charge item can be activated or deactivated.

BRFplus Preconditions in Calculation Sheets

A BRFplus condition, or a BAdI, can be defined to check if a certain calculation sheet item is to be processed in a certain business context. The result of this rule is a true/false decision. If the response from BRFplus or the BAdI is true, the calculation sheet item is considered for charge calculation.

The precondition for the charge item can be maintained on charge item level in the *Precondition* tab.

Agreement Determination

Freight agreements (FAs) and forwarding agreements (FWAs) are the basis for calculating transportation charges. In this section, we look at how agreements are determined.

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Agreement Determination Based on Priority

- The system determines the agreement based on organization, business partner, validity period, and preconditions.
- If there are several matching agreements, which can be determined on the data from freight order/booking or from the forwarding order, it is possible to have a leading charge type (defined in charge type Customizing), and the first agreement where the defined leading charge type can be calculated is picked. Besides using leading charge types, it is possible to maintain priorities.
- If the system finds multiple matching agreements during agreement determination, the agreement priority defines the sequence in which the subsequent determination is executed.
- The agreement priority can be maintained on the *General Data* tab in the details section.

Agreement Determination and Selection Types

Often logistics service providers (LSPs) have multiple freight agreements (FAs) with the same carriers and purchasing organizations. This is due to the fact that an LSP may strike deals with carriers at various levels, for example, on a country, regional, and global basis.

Normally, the larger the contract, the better the rates. However, if a country Business Partner (BP) is pushing a lane to increase market share, then the LSP could potentially get better rates. Therefore, it makes sense to have a different contract with the country BP, or even multiple contracts.

Similar scenarios can exist on the customer side. Therefore, the ability to choose a particular context in a given scenario is a critical business requirement on both the buying and selling side.

Manual Agreement Selection: Functions

- An enhancement to the standard agreement selection, which is an automated process.
- Provides the capability to select an agreement or agreement item for charge calculation.
- Offers additional capability for automatic selection of minimum or maximum agreement items through calculation profile control setting.

Multiple Agreements Popup

The figure shows the *Multiple Agreements* dialog box, which can be used to select an agreement manually.

Note:
The *Multiple Agreement* pop-up is not supported for through rates.

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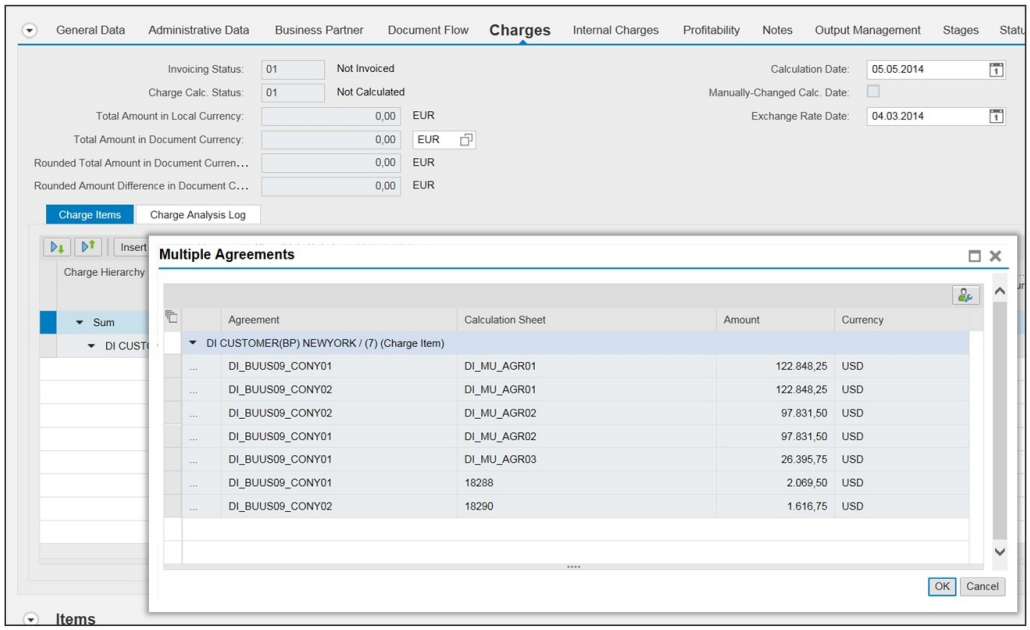
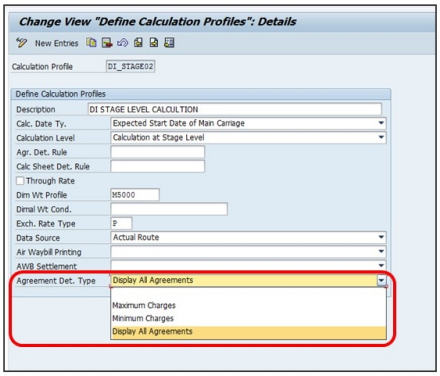


Figure 63: Multiple Agreement Popup

Agreement Determination Type

Manual Agreement Selection: Example Scenarios



Agreement Determination Type

Specifies whether the system should automatically determine an agreement between a business partner and sales organization based on cost strategy, or display all the available agreements.

- Blank: Standard Agreement Determination Process
- Minimum Charges: Minimum Final Amount
- Maximum Charges: Maximum Final Amount
- Display all Agreements: All Relevant Agreements and Items

Figure 64: Agreement Determination Type

Customizing activity for Transportation Management occurs in *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Calculation Profiles*.

If you enter *Minimum Charges*, the system finds the final amounts for all the agreement items and chooses the agreement item with the minimum final amount for charge calculation.

If you enter *Maximum Charges*, the system finds the final amounts for all the agreement items and chooses the agreement item with the maximum final amount for charge calculation.

If you enter *Determine All Agreements*, the system displays all the relevant agreements and agreement items for each charge item. You can then select an agreement or agreement item for each charge item, for charge calculation.

If you do not enter any value, the system does not consider the agreement determination type for charge calculation and follows the standard agreement determination process.

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Charge Calculation Rules

It is possible to define charge calculation rules to determine the right agreement. The standard determination logic based on purchasing organization, validity, and business partner is ignored and the logic of the condition, based on a certain business context maintained in conditions, is used.

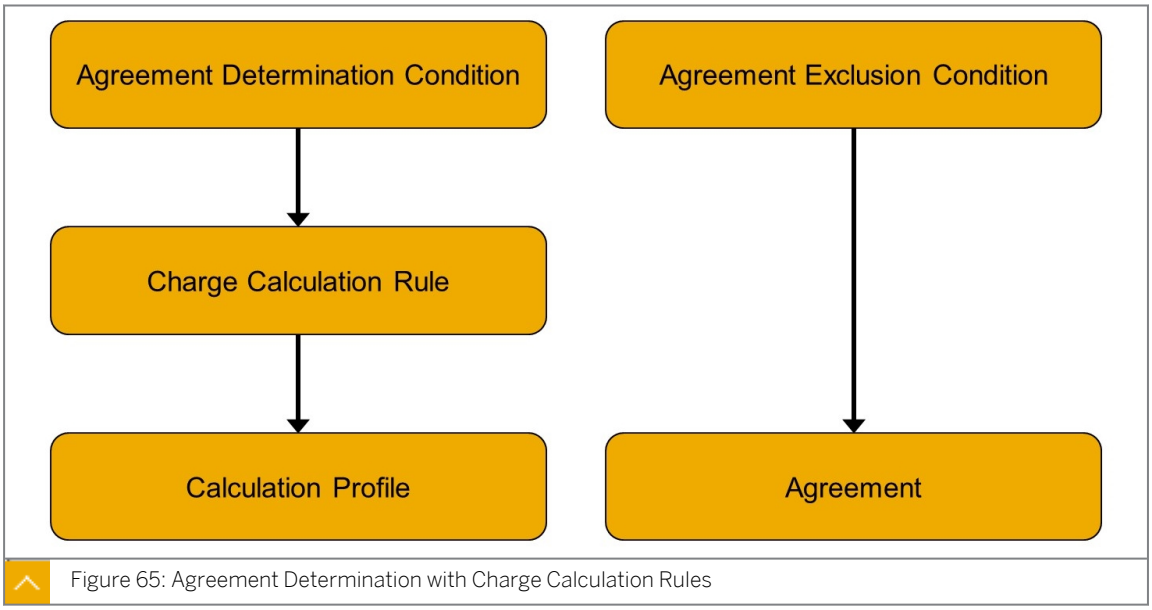

Figure 65: Agreement Determination with Charge Calculation Rules

Condition Types for Agreement Determination

- TCM_FAGDET - Freight Agreement Determination
- TCM_FAGDEX - Freight Agreement Exclusion

TCM_FAGDET - Freight Agreement Determination Standalone

- The determination condition is assigned to a charge calculation rule (Agreement Determination Rules – Standalone) in the SAP Easy Access Screen.
- In the SAP Easy Access Screen, choose *Logistics* → *Transportation Management* → *Master Data* → *Maintain Charge Calculation Conditions*.
- If you select the *Std Determ.* checkbox, the system uses the standard determination logic when the condition execution fails or returns no result.

TCM_FAGDEX - Freight Agreement Exclusion

- The system can check both the condition and the BAdI option to see if an automatically determined agreement has to be considered for the given business context.
- The system checks the list of automatically determined agreements one by one to determine if they are still applicable. If more than one agreement remains after the system has applied the exclusion rule, the system considers the agreement priority.
- This charge calculation rule can be embedded in the calculation profile for the determination condition. The exclusion condition can be maintained directly in the agreement in the *General Data* → *Details* section.

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- Once the exclusion condition is embedded in the agreement, the system can check that condition to see if an automatically determined agreement has to be considered for the given business context.

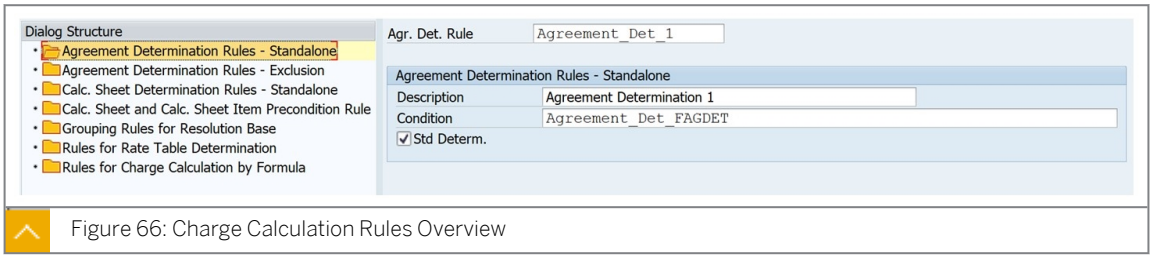

Figure 66: Charge Calculation Rules Overview

Further Charge Calculation Rules

Besides the described Agreement Determination, Charge Calculation Rules can be used also for the following activities:

- You can define rules for calculation sheet determination
  - Standalone: You have switched off standard determination, and instead, the system executes a condition that determines the calculation sheet. If you select the Std Determ. checkbox, the system uses the standard determination logic if the condition execution fails or returns no result.
- You can define a precondition rule for the calculation sheet and calculation sheet item
  - You define a BRFplus condition or a BAdI to check if a certain calculation sheet or calculation sheet item is to be processed in a certain business context. The result of this rule is a true/false decision, that is, if the response from BRFplus or the BAdI is true, the calculation sheet or calculation sheet item is considered for charge calculation. For more information, see the Precondition tab page in the Items screen area of the agreement or calculation sheet.
- You can define grouping rules for resolution bases. You have the following options:
  - Condition: The system can dynamically determine the attribute or field by which the data source is to be grouped. Both options, the direct grouping and the dynamic BRFplus-based attribute determination, work in the same way – the data source currently being processed (for example, all shipment items) is sorted by this specific attribute. The system then groups all items with the same attribute value and later handles them as one item.
  - Group By: If you know the calculation base by which the data source is to be grouped and this value is static, you can enter the calculation base directly. The system then groups all items with the same attribute value and later handles them as one item when looking up the rate table.
- You can define rate table determination rules
  - Condition: The flexible, rule-based determination of a specific rate table. To configure this determination, the complete logistical data source is available. Only a valid rate table is expected as the return parameter.
  - Determin. By BAdI (Rate Table Determination Using BAdI): The rate table determination is coded inside the BAdI.
- You can define rules for charge calculation by a formula

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- The system calculates the charge item without the normal rate table access. That is, either the BAdI or BRFplus directly returns the calculated amount for this charge item.
- If you decide to calculate the charge item through BRFplus, you can use a mathematical formula or any other BRFplus option. In this case, no information is available in the Calculation Base area.

Freight Order Charge Estimations

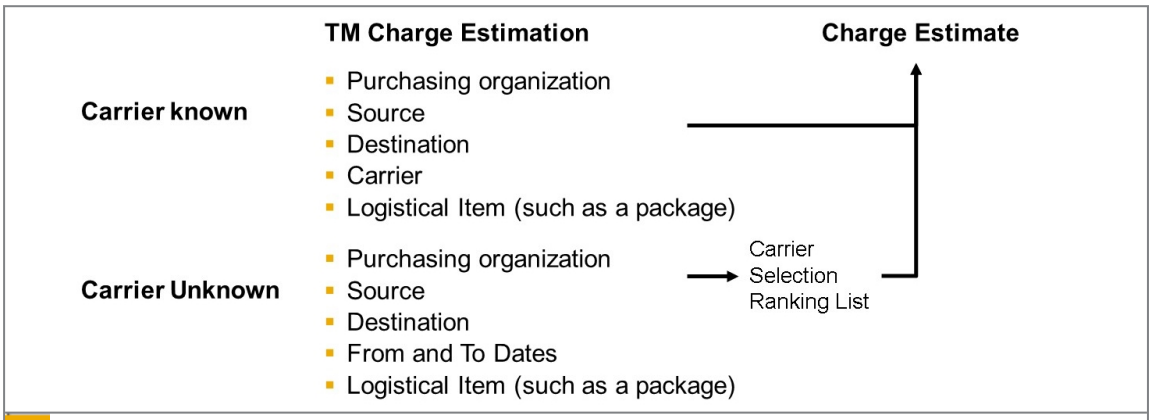

Figure 67: Charge Estimation: Freight/ Buying Side

In SAP Fiori Launchpad, you can perform carrier selection and estimate the charges for a freight order with only a minimal amount of logistical data.

You must provide the following data to estimate the charges:

- Origin
- Destination
- Purchasing Organization
- Carrier
- From and To dates (Carrier Selection): the user receives a ranking of carriers based on total cost
- Item

To estimate the charges, in SAP Fiori Launchpad, choose *Freight Order Management → Estimate Freight Charges*.

LESSON SUMMARY

You should now be able to:

- Calculate Charges
- Determine Agreements and apply Calculation Rules
- Estimate Freight Charges

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Unit 3
Lesson 3

Special Charges

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Use wildcard search
- Describe Charge Levels and Through Rates
- Use Calculation Methods
- Describe event-based charge calculation

Wildcard Search

A shipper often has freight rate agreements with carriers based on ZIP codes, ZIP code areas (often two or three-digit ZIP codes), or transportation zones.

Zone and ZIP Code (Wildcard Modeling) for Rate Search

- To minimize maintenance, a shipper can use a partial character set and wildcards in the rate table, instead of defining transportation zones. For example, the rate for postal code 12345 may be maintained as the rate for code 123*.
- During charge calculation, the system picks up the postal code that has the greatest string match with the postal code coming from the document.

  For example, for postal code 65192:

  - Rate 1: 65* = 20 USD
  - Rate 2: 651* = 25 USD
  - In this case, rate 2 will be picked up because it has the greatest string match.

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Rate Lookup by Transportation Zone

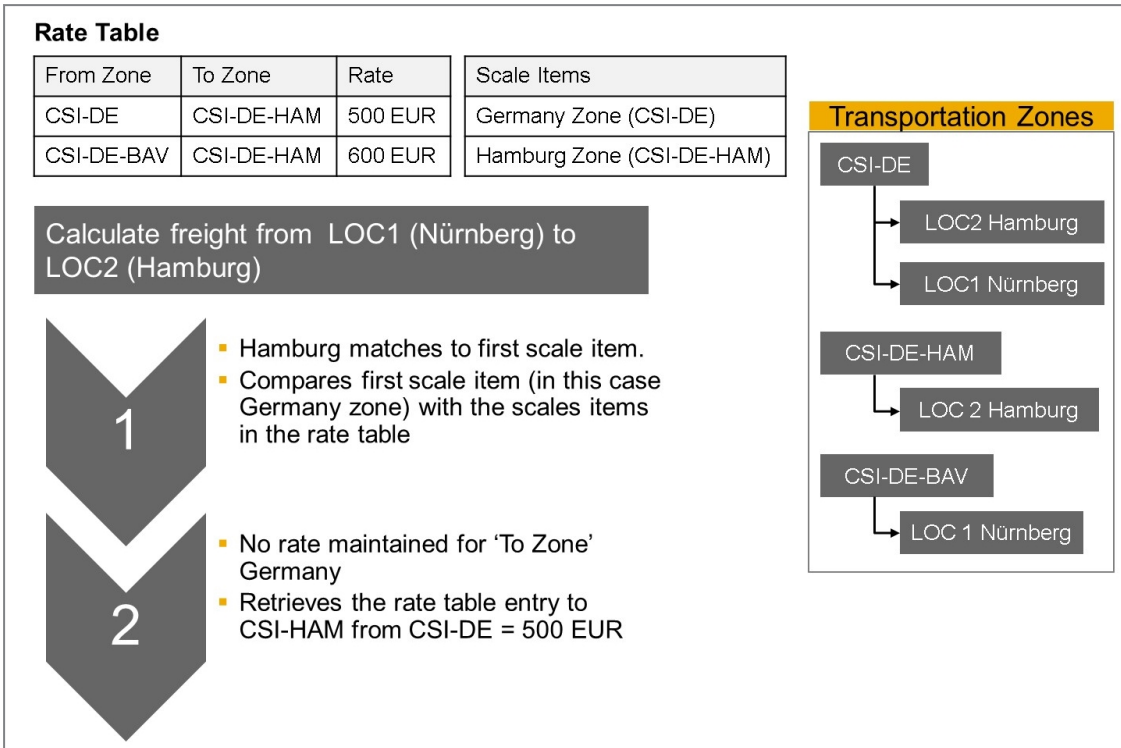

Figure 68: Rate Lookup by Transportation Zone

In SAP TM, the same location may be mapped to multiple transportation zones. For example, Hamburg may be mapped to two transportation zones: Germany zone (for example, for sourcing) and Hamburg zone (for example, for marketing).

The rate agreement is set up so that rates are provided for a location-to-zone transportation or even a zone-to-zone transportation (since it may be cumbersome to maintain multiple location-to-location rates). The system picks up a rate from the rate table and performs charge calculation in such scenarios.

The system carries out multiple comparisons until it finds a record in the rate table that matches the scale item. The engine first compares the Germany zone with the rate maintained. It finds none, so it searches with the Hamburg zone, finds a rate, and returns that rate. The engine always sends the first rate it encounters. It does not set any priority to the rates.

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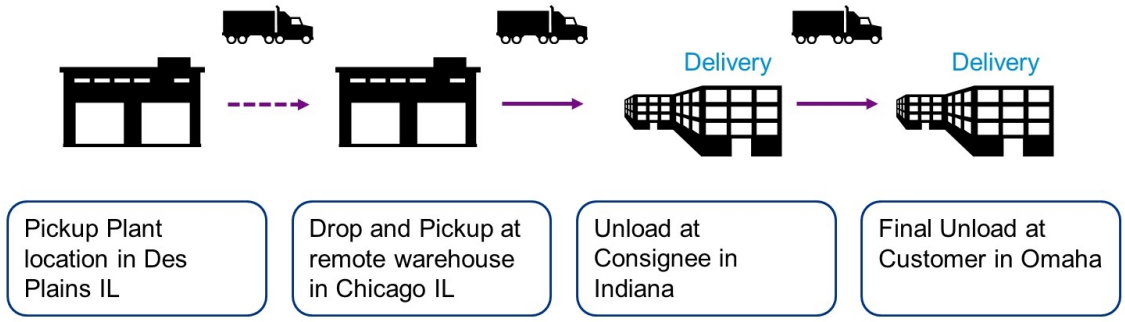
Charge Item at Header and Stage Level



Charge Item in the CS	Calculation Requirement	Calculation Level
Haulage	Des Plaines to Omaha	Header
Unloading Charge	Only for consignee in Indiana	Stage

Figure 69: Charge Calculation at Header and Stage Level

There are business scenarios that use stage-level charge calculation where some of the charges are not stage-specific. Stage-level calculation is most commonly used in freight forwarding scenarios where charges applicable to a stage are mapped to a respective calculation sheet. However, some of the charges might be stage-independent and apply for one of the business partners.

These stage-independent charges are applicable to a business partner only and cannot be assigned to a particular stage. For example, unloading fees cannot be assigned to one stage, so are applicable to a business partner.

To fulfill this requirement, a “mixed” calculation level can be used. The mixed calculation level is not a new calculation level, rather a contextual new behavior.

The system can calculate charges for an agreement item at header level, even when calculating the rest of the charges at stage level. During charge calculation, the system calculates the header-level charges independently of the stage charges. The system calculates the stage charges as usual. To enable header-level charges when calculating charges at stage level, you must maintain a calculation profile with the calculation level as stage level.

For example, in a Free On Board (FOB) incoterm scenario, the consignee responsible for the security charges across the main and on-carriage. Therefore, instead of mapping such charges to one of the stage-relevant calculation sheets, these can be defined as header-level charges in a separate calculation sheet.

Charge Calculation with Through Rates

To maintain rates that cover multiple stages of a transportation route, “through” rates can be maintained. If a through rate is available for the entire transportation route or part of the transportation route in an order, this rate can be applied during charge calculation, depending on the customizing setting.

In a freight order with multiple stages and different carriers per stage, the through rate calculation is carrier-dependent. Through rates can be maintained across stage categories without overlap.

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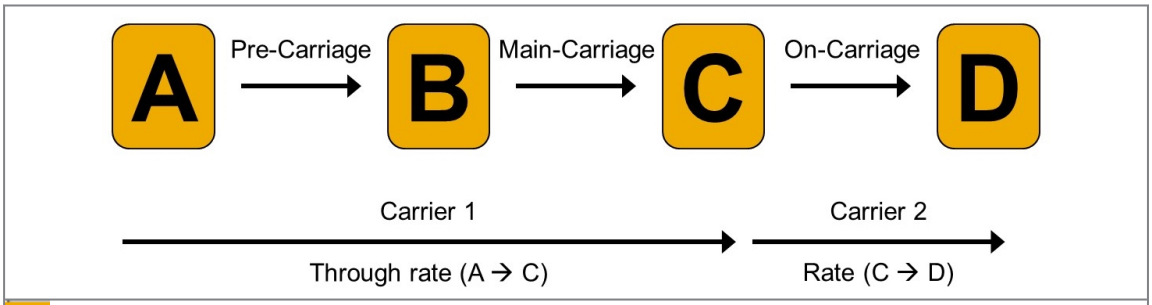

Figure 70: Through Rate Example

In the figure, Through Rate Example, the shipper negotiates a Door-Port (A to B and B to C) rate, including the carrier's haulage costs with Carrier 1. The on-carriage stage (C to D) is contracted to another carrier (Carrier 2) on the import side.

The system finds a through rate for stage A-C for Carrier 1 and a rate for stage C-D for Carrier 2.

Note:
You have to enable the through rate functionality in the calculation profile in order to use it.

Calculation Methods

Calculation methods enable the system to calculate transportation charges according to a specific logic, for example, by considering the break-weight or the deficit weight. You specify a calculation method for each charge type when defining a calculation sheet. The system applies the calculation method when calculating the charges for the charge type.

Calculation method types can also help to utilize customer-specific logic or special formula for freight charge calculation.

To define calculation methods in Customizing, go to *Transportation Management → Basic Functions → Charge Calculation → Enhancements to Charge Calculation Engine → Define Calculation Methods*.

Fuel Surcharge Calculation Method

Due to uncertainties in fuel prices, it is significant to charge the customer appropriately based on the fuel surcharge index, published by the government (common in North America) and/ or by logistics service providers, also called Diesel floater. As a logistics service provider or carrier, you need to recover, the additional charges incurred due to varying fuel costs. Transportation Management simplifies the fuel surcharge calculation by providing an easy-to-maintain fuel surcharge calculation method.

Fuel Surcharge Calculation using an index rate table

You can calculate the fuel surcharge based on a base fuel surcharge index value. The logistic service provider or carrier agrees with the customer on an index base date based on which the system determines the base fuel surcharge value. The actual fuel surcharge is calculated based on the current fuel surcharge value and base fuel surcharge value.

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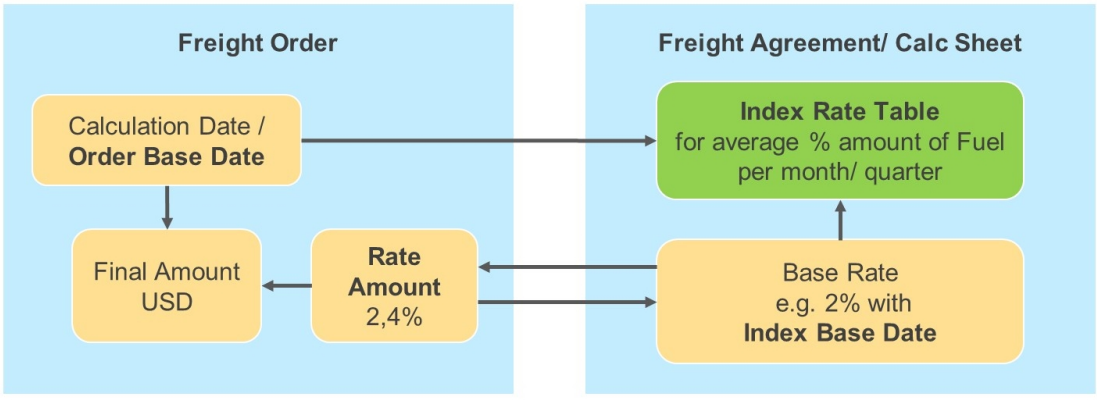

The fuel surcharge is calculated as follows:

Fuel surcharge in percentage = (Current fuel surcharge value/Base fuel surcharge value) * Base rate in calc sheet
→ Fuel surcharge in percentage = (3,6/3,0)*2,0 = 2,4% (used to calculate final amount)

Figure 71: Fuel Surcharge Calculation

Steps:

To calculate the fuel surcharge, you define an index base rate table with the fuel surcharge values for specific calculation dates or validities. Optionally, you can define a standard rate table with the fuel surcharge values for scale items such as location and calculation dates or validity periods:

1. Define an index base rate table
    a. Define an index rate table with the calculation base as Calculation Date, scale type as To Scale or Base Scale, and the value type as Absolute or Percentage. Note that you must not maintain a calculation rule in this rate table.
2. Optionally, define a standard rate table
    a. Define a standard rate table with a calculation base and scale type as either Base Scale or To Scale. Define the fuel surcharge values for scale items such as source location and destination location.

> Note:
> If you don't define a standard rate table, the system determines the fuel surcharge using the base rate specified in the calculation sheet.

3. Define a calculation sheet with a charge item for fuel surcharge and define the following attributes:
    a. Enter the charge type as Fuel.
    b. Enter the index rate table in the Index Rate Table field.
    c. Enter an index base date in the Index Base Date field.

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d. If you've defined a standard rate table, enter it in the Rate Table field. Otherwise, you must enter a rate in the Base Rate field as a percentage or absolute value.

e. Enter the calculation method type as **C** and calculation method as **FUEL_SURCHARGE** on the Basic Data tab page.

Calculation Example

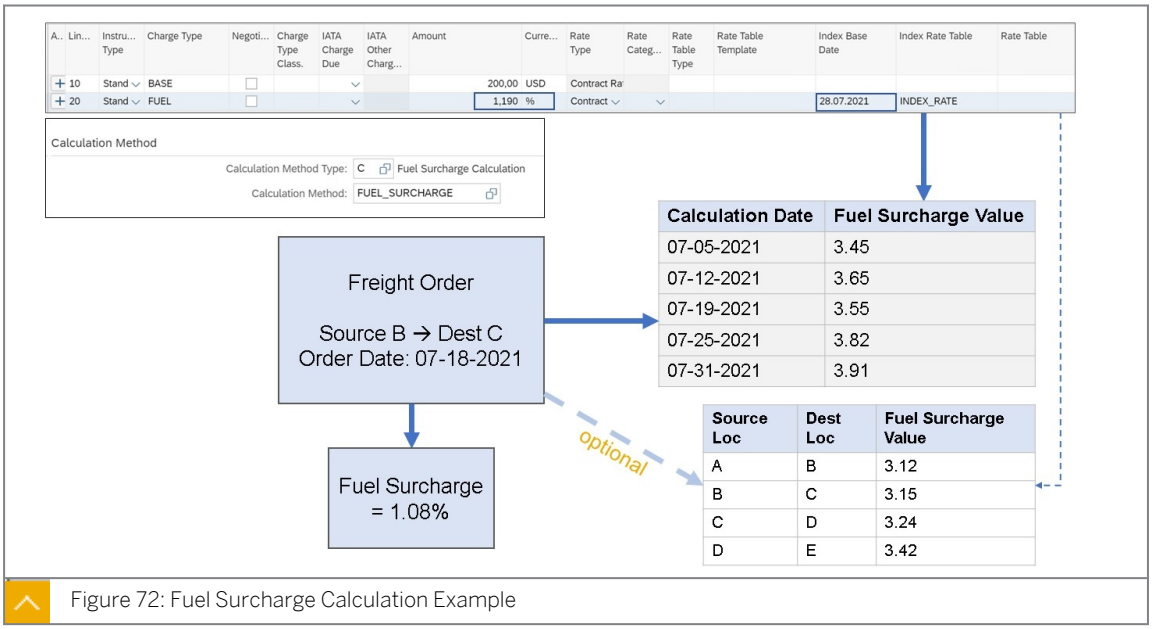

Figure 72: Fuel Surcharge Calculation Example

As the figure shows:

You maintained an index rate table with scale type as To Scale.

The calculation sheet has a base rate of **1.19 %** and the *index base date* set to **07.28.2021**.

You have a calculation profile with the calculation date type as *Order Date* and in the *freight order*, the order date is **07.18.2021**.

The system determines the current fuel surcharge using the order date. The order date 07.18.2021 occurs earlier than 07.19.2021 in the index rate table. Hence, the value 3.55 is determined as the current fuel surcharge value.

The system determines the base fuel surcharge using the index base date of 07.28.2021. The index base date 07.28.2021 occurs earlier than 07.31.2021 in the index rate table. Hence, the value 3.91 is determined as the base fuel surcharge value.

The fuel surcharge is calculated as follows:

Fuel surcharge in percentage = (Current fuel surcharge value/ Base fuel surcharge value) Base rate in calculation sheet*

Fuel surcharge in percentage = *(3.55/ 3.91)*1.19 = 1.08 %*

Optional Standard Rate Table

Once the system determines the current fuel surcharge value and the index fuel surcharge value as mentioned above, the system determines the fuel surcharge value for the source location and destination location specified in the freight order. In the *freight order*, the *source location B and the destination location C* are maintained. The system determines the fuel surcharge value of 3.15 from the standard rate table.

The fuel surcharge is calculated as follows:

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Fuel surcharge in percentage = (Current fuel surcharge value/Base fuel surcharge value) Fuel surcharge value from standard rate table*

Fuel surcharge in percentage = *(3.55/ 3.91)*3.15 = 2.86 %*

Clipping

Clipping is another calculation method offered inside the TM system. Calculation methods enable the system to calculate transportation charges according to a specific logic, for example, by considering the break-weight, fuel surcharge or clipping.

Calculation methods are specified for each charge type when defining a calculation sheet. The system applies the calculation method when calculating the charges for the charge type.

For creating or editing of a calculation sheet, in the SAP Fiori launchpad, go to *Charge Management → Create/ Edit Calculation Sheet*.

On the Basic Data tab of e.g. the charge line for the charge type BASE, enter Clipping as your calculation method type.

Clipping Example

You define a rate table for your BASE charge line and assign it in the calculation sheet. With the Clipping calculation method enabled, the system calculates the transportation charges by working through all scales level-by-level, even if the value lies outside the scale. The system then totals up the calculation results from each scale level to produce the overall result. For clipping, one scale item must have a relative calculation type.

The scale levels are defined with the following values:

- *Up to 5 tons:* USD 50 absolute
- *Up to 7 tons:* USD 14 per ton
- *Up to 10 tons:* USD 13 per ton
- *Up to 15 tons:* USD 12 per ton

Using the clipping calculation method for a load weighing 12 tons, the system calculates the transportation charges as follows:

- *5 tons at USD 50* = USD 50 (first scale level)
- *2 tons at USD 14 per ton* = USD 28 (up to the second scale level)
- *3 tons at USD 13 per ton* = USD 39 (up to the third scale level)
- *2 tons at USD 12 per ton* = USD 24 (remainder in the fourth scale level)

This results in a charge of USD 141. If you don't use the clipping calculation method, the 12 tons fall into the "up to 15 tons" scale level and the transportation charge is USD 12 per ton, resulting in a charge of USD 144.

Events

SAP Event Management (SAP EM) as well as SAP Global Track and Trace (SAP GTT) in combination with SAP Transportation Management (SAP TM), offers visibility scenarios for tracking and tracing freight orders, freight bookings, and freight units.

For each of those documents, expected and unexpected events can be reported either via TM directly or via Event Management. An expected event is a predefined process milestone and an unexpected event describes an event that is not foreseen to happen in the process.

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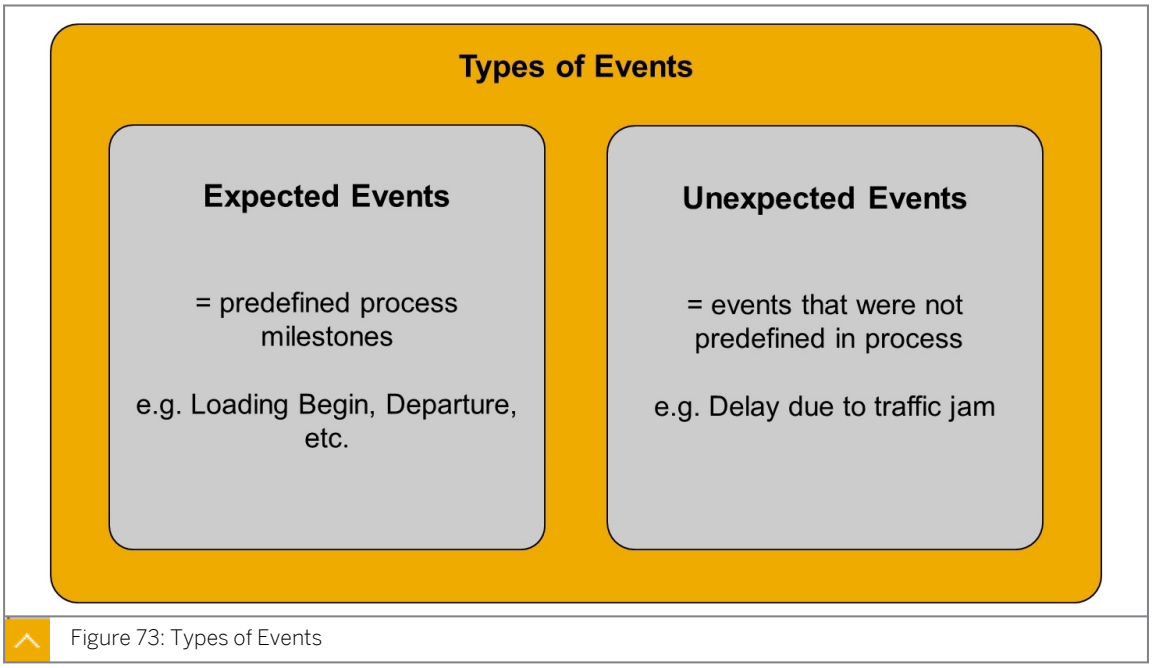

Figure 73: Types of Events

Event Types

The visibility scenario for EM-TM offers standard events that can be used. According to rules based on, for example, the departure date and loading duration, a planned date is assigned to Loading Begin, Loading End, and Departure events. This date defines the time stamp at which this event or process milestone is expected to be reported. The time stamp, at which the event is actually reported, defines the actual date. This means that it is possible to have the following:

- Regular events (reported in predefined time frame)
- Early events (reported before predefined time frame)
- Late events (reported after predefined time frame)
- Unreported events (not yet reported)

An unexpected delay or event can be caused by a traffic jam or an accident. Unexpected events do not have a planned date, as they are not foreseen to happen. These events have an actual date that can be linked to a certain expected event. For example, a traffic jam, with an estimated delay of two hours, influences the arrival date at the customer and therefore is linked to the arrival date.

Events can be propagated back to other documents using the document flow. For example, when reporting the unloading start of the freight order, the event can be propagated back to the assigned freight unit so that the unloading start of the freight order also creates the unloading start of the freight unit.

Event-Based Charges

Events can influence how the customer is charged (via the forwarding order) and how the carrier is charged (via the freight order and freight booking).

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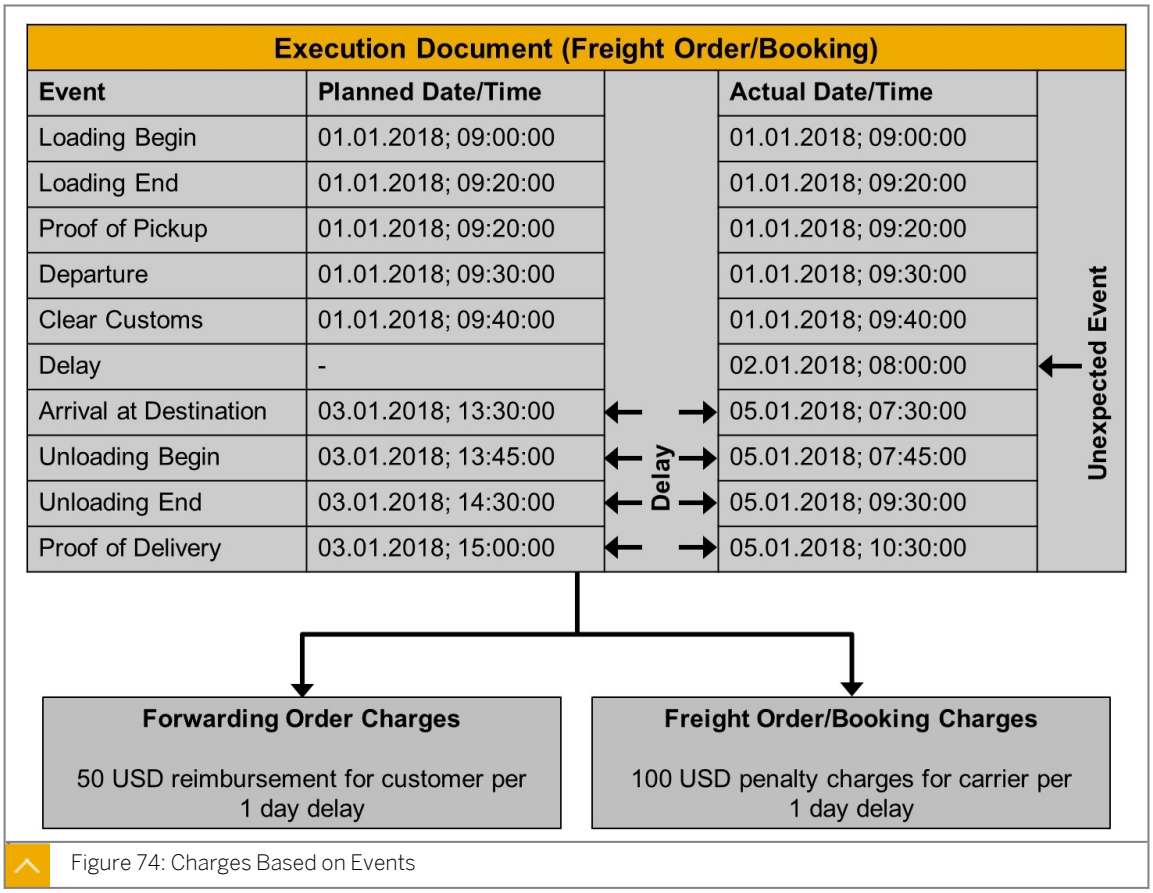

Figure 74: Charges Based on Events

Calculation of Charges Based on Delay

Charges based on the calculated delay for a specific event are calculated in the following way:

- Delay = Actual Date/Time – Planned Date/Time (or Estimated Date/Time) – Grace Days
  - The **Actual Date/Time** comes from SAP EM when a specific event is reported.
  - The **Planned Date/Time** comes from SAP EM and defines the expected date/time.
  - The **Estimated Date/Time** is used when there is no integration with SAP EM. In this case, an event is created in SAP TM directly with no planned date or time. The estimated date/time entered when the event is created in SAP TM is used.
  - **Grace Days**, or **Free Days**, can be defined in charge management master data.

Charges can be calculated within the freight order, freight booking, or forwarding order based on the number of days of the delay.

Event-Based Charge Customization

To use event-based charges, settings must be configured in Customizing.

Required Customizing Settings for Event-Based Charges

- Definition of Calculation Bases: ACTUAL_DATE, DELAY, ESTD_DATE, GRACE_DAYS, PLANNED_DATE
- Event Profile
- Assignment of Event Profile to Business Document

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Step 1: Definition of Calculation Bases

Five calculation bases are used during charge calculation to retrieve the dates and times of events, and to calculate the delay that is relevant for the charge calculation.

The calculation bases are defined in the following Customizing location:

In Customizing, choose *Transportation Management* → *Basic Functions* → *Charge Calculation* → *Data Source Binding* → *Define Calculation Bases*.

The ACTUAL_DATE, ESTD_DATE, and PLANNED_DATE are customized so that dates and times can be pulled into charge calculation. This data is derived from SAP Event Management and predefined helper classes are assigned to the calculation bases.

DELAY and GRACE_DAYS data are not derived from Event Management into charge calculation, but are necessary to calculate the exact delay. To determine the dates and times, a predefined helper class is assigned.

Table 12: Required Field Assignments and Helper Classes for Calculation Bases

Calculation Base	Field Assignment	Helper Class
ACTUAL_DATE	ACTUAL_DATE	/SCMTMS/ CL_TCC_CB_CONV_TS
ESTD_DATE	ESTIMATED_DATE	/SCMTMS/ CL_TCC_CB_CONV_TS
PLANNED_DATE	EXP_END_DATE	/SCMTMS/ CL_TCC_CB_CONV_TS
DELAY	—	/SCMTMS/ CL_TCC_CB_DELAY
GRACE_DAYS	—	/SCMTMS/ CL_TCC_CB_REL_CBASE

The amount of days for the DELAY is influenced by the GRACE_DAYS. This means that for the calculation base DELAY, the related calculation base GRACE_DAYS needs to be maintained.

In the calculation base Customizing for DELAY, the related calculation base can be maintained by choosing *Related Calculation Base* in the *Dialog Structure*. This setting influences the calculation sheet in which the number of grace days is entered.

Step 2: Event Profile

The event profile triggers the event-based charge calculation and can be maintained in Customizing.

In Customizing, choose *Transportation Management* → *Basic Functions* → *Charge Calculation* → *Basic Settings* → *Define Event Profiles*.

Event Profile Attributes

Within the event profile, the following attributes can be set up:

- Charge Type: used for event-based charging. This is the charge type used in the calculation sheet.

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- Event, Event Reason, and Event Status: To calculate a delay, define the event on which the charge is based. As there are several events, each one could potentially have different delays. As a result, this delay calculation has to be based on a specific event and, if needed, an event reason. The Event Status defines the type of event.
- Referenced Event, Reference Event Reason, and Referenced Event Status: An unexpected event, such as a Delay, can be reported several times with a different reference event each time. It is necessary to define which of those Delays is taken, whether it is the event Delay with reference to the loading begin or the event Delay with reference to the unloading end.
- Business Document where event-based charging is triggered.

Business Document Options

The following options are available for business documents:

- Forwarding Order Charge Calculation
- Freight Order Charge Calculation
- Forwarding Order Internal Charge Calculation
- Freight Order Internal Charge Calculation

Step 3: Assignment of Event Profile to Business Document

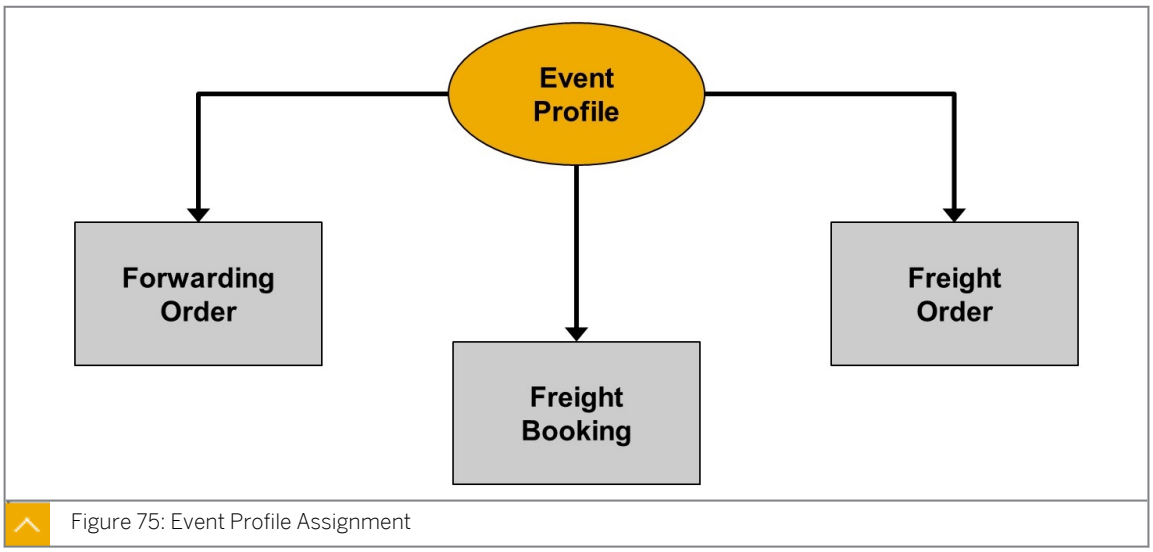

Figure 75: Event Profile Assignment

The event profile is assigned to the document type where event-based charges are activated.

The event profile can be maintained in the following document types:

- Forwarding Order Type

  In Customizing, choose *Transportation Management → Forwarding Order Management → Forwarding Order → Define Forwarding Order Types*.

- Freight Booking

  In Customizing, choose *Transportation Management → Freight Order Management → Freight Booking → Define Freight Booking Types*.

- Freight Order

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In Customizing, choose *Transportation Management* → *Freight Order Management* → *Freight Order* → *Define Freight Order Types*.

Event-Based Charges in the Calculation Sheet

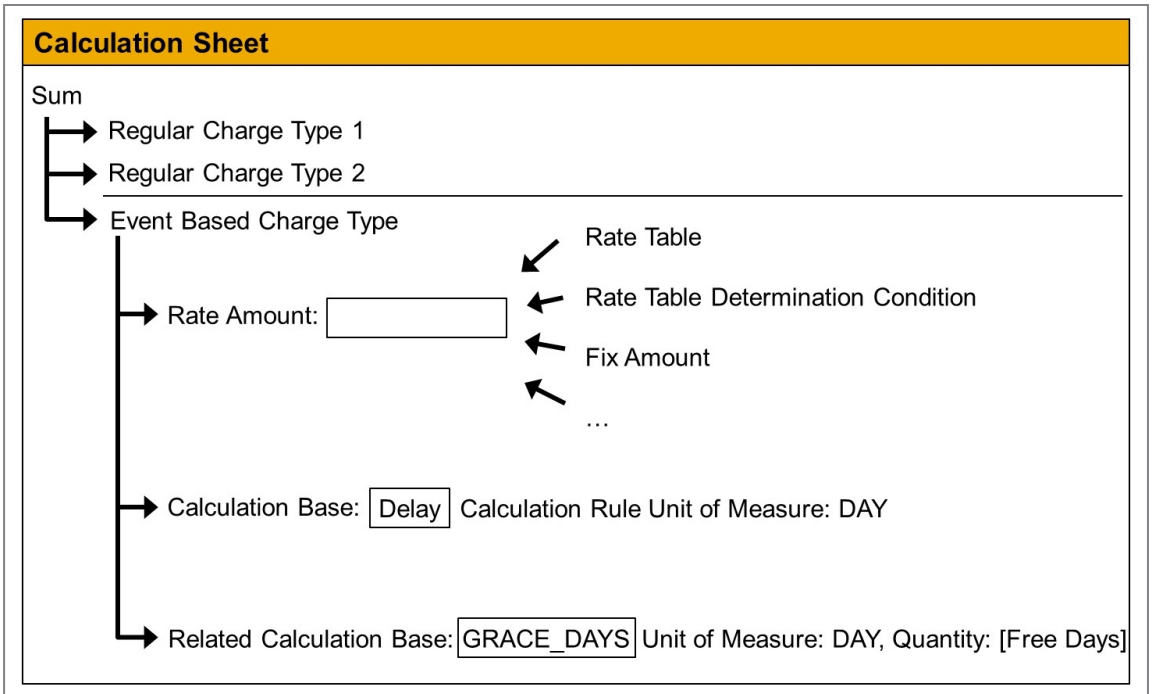

Figure 76: Calculation Sheet

Event-Based Charges in Calculation Sheets

To set up event-based charges in the calculation sheet, follow these steps:

1. Maintain a new line in the calculation sheet with the charge type customized in the event profile, which has been assigned to the appropriate document type.
2. Define where the rate amount is coming from (for example, fix amount, rate table, rate table determination condition, and so on).
3. Choose the calculation base (for a fixed amount, in the calculation sheet; for rate tables, in the rate table calculation rule section itself). This is the calculation base for the delay with the helper class /SCMTMS/CL_TCC_CB_DELAY assigned. Define the price unit and calculation rule unit of measure. For example if a price unit of **1** and a unit of measure **DAY** is defined, the rate amount is multiplied by the number of days of the delay.
4. Define the related calculation base.

Definition of the Related Calculation Base

For the calculation sheet item with the delay charge type, on the *Related Calculation Base* tab, you define the number of grace days as outlined below.

Definition of the Related Calculation Base

1. Calculation Base: GRACE_DAYS. This calculation base is maintained with helper class /SCMTMS/CL_TCC_CB_REL_CBASE.

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2. Quantity: Number of free days/hours/minutes that are subtracted from the difference between planned and actual date/time to determine the delay.
3. Unit of Measure: Defines the unit like days/hours/minutes.

Charge Calculation

Reported events and calculation sheet settings influence charge calculation. The actual date or time, and the planned date or time, are derived from event management during the charge calculation for a specific event, which is maintained in the event profile. The difference is the delay time without grace days.

Then the grace days are subtracted from the total delay, which ends up in the charge calculation-relevant delay. This charge calculation-relevant delay is multiplied with the rate amount.

With the event-based charging, it is possible to define a fixed amount per delay day or an amount coming from a rate table for a charge type, which is then multiplied by the number of days of delay.

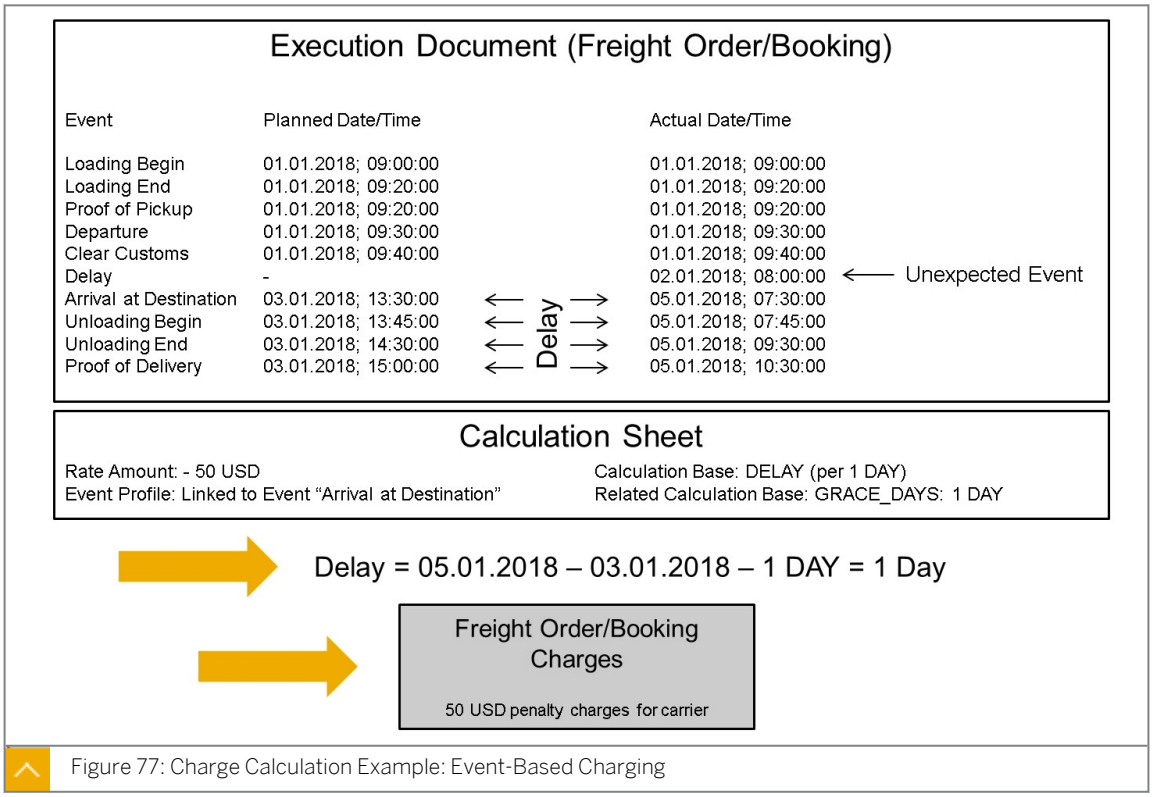

Figure 77: Charge Calculation Example: Event-Based Charging

LESSON SUMMARY

You should now be able to:

- Use wildcard search
- Describe Charge Levels and Through Rates
- Use Calculation Methods
- Describe event-based charge calculation

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Learning Assessment

1. If you assign a calculation profile to an organizational unit and to a business partner role, which calculation profile is applied during charge calculation?

   Choose the correct answer.

   - ☐ A The system applies the profile assigned to the organizational unit.
   - ☐ B The system applies the profile assigned to the business partner.
   - ☐ C Depending on the scenario, the system will apply the relevant profile.
   - ☐ D The system applies both and determines which profile is cheaper and uses that.

2. If you enable the freight order save strategy 'calculate charges after each save', what happens if a mandatory charge type cannot be calculated?

   Choose the correct answer.

   - ☐ A The system applies a standard charge.
   - ☐ B The freight order cannot be saved.
   - ☐ C Depending on the scenario, the system does not calculate the transportation charges.
   - ☐ D The system determines a different freight agreement.

3. During freight charge calculation, in what order to the following steps occur?

   Arrange these steps into the correct sequence.

   - ☐ The system calculates the value of each charge type in the calculation sheet.
   - ☐ The system displays the calculation results in the freight order.
   - ☐ The system collects the data from the SAP TM core objects.
   - ☐ The system determines the freight agreements.
   - ☐ The system holds the log file of the calculation run.

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4. When estimating the cost of a freight order, which of the following data is required?

   Choose the correct answers.

   - ☐ A Origin and destination
   - ☐ B Business partner
   - ☐ C Purchasing organization and carrier
   - ☐ D Freight agreement
   - ☐ E From and To dates
   - ☐ F Item

5. Which types can be used in built-in preconditions in calculation sheets?

   Choose the correct answers.

   - ☐ A Service
   - ☐ B Item Precondition
   - ☐ C Business Partner
   - ☐ D Trade Lane
   - ☐ E Product ID

6. What influences the determination of an agreement?

   Choose the correct answers.

   - ☐ A Agreement Priority
   - ☐ B Agreement Validity
   - ☐ C Purchasing Organization
   - ☐ D Leading Charge Type
   - ☐ E Grouping Rule

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7. Which of the following are valid options to specify a rate for a partial postal code zone?

   Choose the correct answers.

   - ☐ A Define a transportation zone and assign each location to the zone.
   - ☐ B Use the City-Name as a scale in a rate table.
   - ☐ C Use partial postal codes with wildcards in a rate table.
   - ☐ D Define transportation zones and assign one or several postal code ranges.
   - ☐ E Use a special calculation method for activating postal code ranges.

8. What are the prerequisites for applying through rates?

   Choose the correct answers.

   - ☐ A Set the indicator in the charge calculation profile.
   - ☐ B Charge calculation on header level.
   - ☐ C Charge calculation on stage level.
   - ☐ D Carrier defined on stage level.

9. To which object can the event profile be assigned?

   Choose the correct answers.

   - ☐ A Freight Booking
   - ☐ B Forwarding Order
   - ☐ C Container Unit
   - ☐ D Freight Order
   - ☐ E Freight Unit

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Learning Assessment - Answers

1. If you assign a calculation profile to an organizational unit and to a business partner role, which calculation profile is applied during charge calculation?

   Choose the correct answer.

   - [ ] A The system applies the profile assigned to the organizational unit.
   - [x] B The system applies the profile assigned to the business partner.
   - [ ] C Depending on the scenario, the system will apply the relevant profile.
   - [ ] D The system applies both and determines which profile is cheaper and uses that.

   Correct. If you assign a calculation profile to an organizational unit and to a business partner role, the system only applies the calculation profile you assigned to the business partner role.

2. If you enable the freight order save strategy 'calculate charges after each save', what happens if a mandatory charge type cannot be calculated?

   Choose the correct answer.

   - [ ] A The system applies a standard charge.
   - [x] B The freight order cannot be saved.
   - [ ] C Depending on the scenario, the system does not calculate the transportation charges.
   - [ ] D The system determines a different freight agreement.

   Correct. If you assign the save strategy for charge calculation and a mandatory charge cannot be determined, the freight order cannot be saved.

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3. During freight charge calculation, in what order to the following steps occur?

   Arrange these steps into the correct sequence.

   [3] The system calculates the value of each charge type in the calculation sheet.

   [5] The system displays the calculation results in the freight order.

   [1] The system collects the data from the SAP TM core objects.

   [2] The system determines the freight agreements.

   [4] The system holds the log file of the calculation run.

   Correct. First, the system collects the data from the SAP TM core objects. Second, the system determines the freight agreements. Third, the system calculates the value of each charge type in the calculation sheet. Fourth, the system holds the log file of the calculation run. Finally, the system displays the calculation results in the freight order.

4. When estimating the cost of a freight order, which of the following data is required?

   Choose the correct answers.

   [X] A Origin and destination

   [ ] B Business partner

   [X] C Purchasing organization and carrier

   [ ] D Freight agreement

   [X] E From and To dates

   [X] F Item

   Correct. The system requires origin and destination, purchasing organization and carrier, the from and to dates and the items of the freight order.

5. Which types can be used in built-in preconditions in calculation sheets?

   Choose the correct answers.

   [X] A Service

   [ ] B Item Precondition

   [X] C Business Partner

   [X] D Trade Lane

   [ ] E Product ID

   Correct. You can use Service, Business Partner, and Trade Lane as precondition.

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6. What influences the determination of an agreement?

   Choose the correct answers.

   - [X] A Agreement Priority
   - [X] B Agreement Validity
   - [X] C Purchasing Organization
   - [X] D Leading Charge Type
   - [ ] E Grouping Rule

   Correct. The determination of an agreement can be influenced by the agreement priority, its validity, the purchasing organization and the leading charge type.

7. Which of the following are valid options to specify a rate for a partial postal code zone?

   Choose the correct answers.

   - [ ] A Define a transportation zone and assign each location to the zone.
   - [ ] B Use the City-Name as a scale in a rate table.
   - [X] C Use partial postal codes with wildcards in a rate table.
   - [X] D Define transportation zones and assign one or several postal code ranges.
   - [ ] E Use a special calculation method for activating postal code ranges.

   Correct. To specify a rate for a partial postal code, you can either use partial postal codes with wildcards in a rate table, or define transportation zones and assign one or several postal code ranges.

8. What are the prerequisites for applying through rates?

   Choose the correct answers.

   - [X] A Set the indicator in the charge calculation profile.
   - [ ] B Charge calculation on header level.
   - [X] C Charge calculation on stage level.
   - [ ] D Carrier defined on stage level.

   Correct. Prerequisites to apply thorugh rates are to set the indicator in the charge calculation profile and charge calculation on stage level.

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9. To which object can the event profile be assigned?

Choose the correct answers.

- [X] A Freight Booking
- [X] B Forwarding Order
- [ ] C Container Unit
- [X] D Freight Order
- [ ] E Freight Unit

Correct. An event profile can be assigned to forwarding order types, freight order types and freight booking types.

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UNIT 4 Freight Settlement

UNIT OBJECTIVES

- Create Freight Settlement Documents
- Post Freight Settlement Documents
- Verify Freight Invoices
- Manage Freight Charge Corrections

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Creating Freight Settlement Documents

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Create Freight Settlement Documents

Freight Settlement Processing

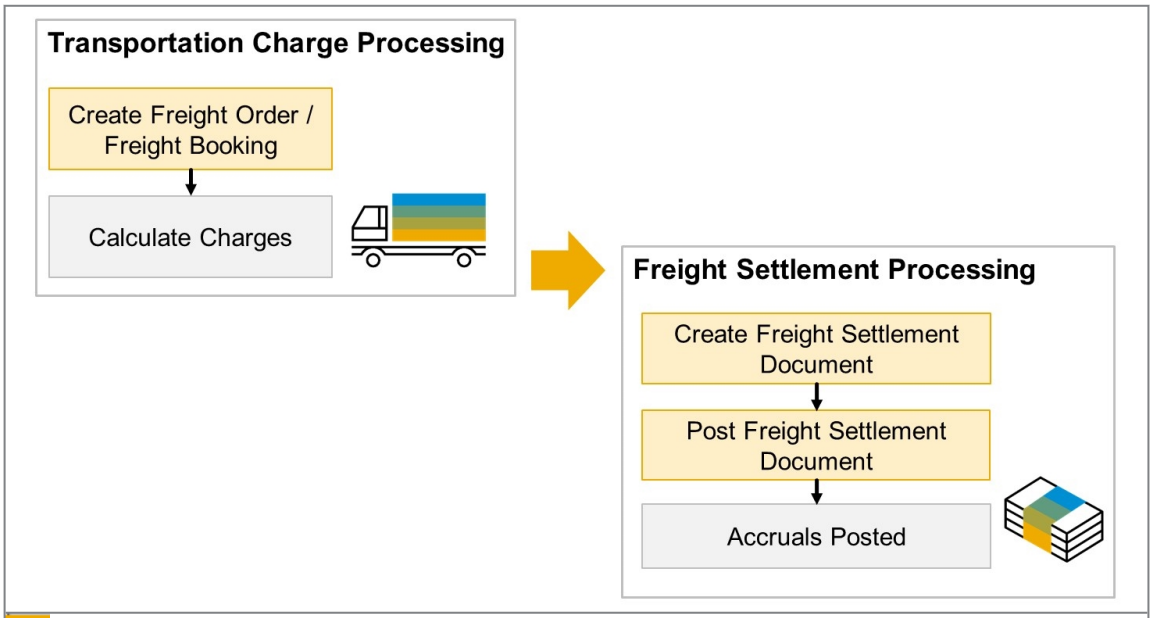

Figure 78: Freight Settlement Processing

A freight settlement document (FSD) is a business document that takes up the transportation charges from TM and is posted to SAP MM (Materials Management) creating a purchase order and a service entry sheet requesting the verification of an invoice received from a supplier or carrier. When the invoice is received, SAP MM checks it against the data from the freight settlement document (Transaction MIRO - “Logistics Invoice Verification”). If performing an evaluated receipt settlement (ERS - “Self-billing”), the automatically generated invoice is based on the data from the TM freight settlement document.

FSDs can be used to enter the data for transportation invoicing and forwarded to SAP MM for invoice verification. The transportation charges are calculated in SAP Transportation Management based on a freight order, service order, or freight booking.

Freight charges are settled with the carrier (supplier).

Settlement includes the following:

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- Assigning and transferring transportation costs to Financial Accounting to generate accruals, and assigning costs to a CO object.
- Settlement of costs with the carrier: posting payables by canceling the accruals.

You need to have entered and accepted the services provided before you can transfer costs to Financial Accounting. The system automatically creates the service entry sheet based on a purchase order for external services. Before you can settle costs with the carrier, you need to create an invoice using manual invoice verification or create a credit memo using the credit memo procedure.

You can create an individual FSD for one freight order, service order, or freight booking. You can create a collective FSD for multiple freight orders or freight bookings. You can also create multiple FSDs at the same time.

Freight Settlement Document Overview

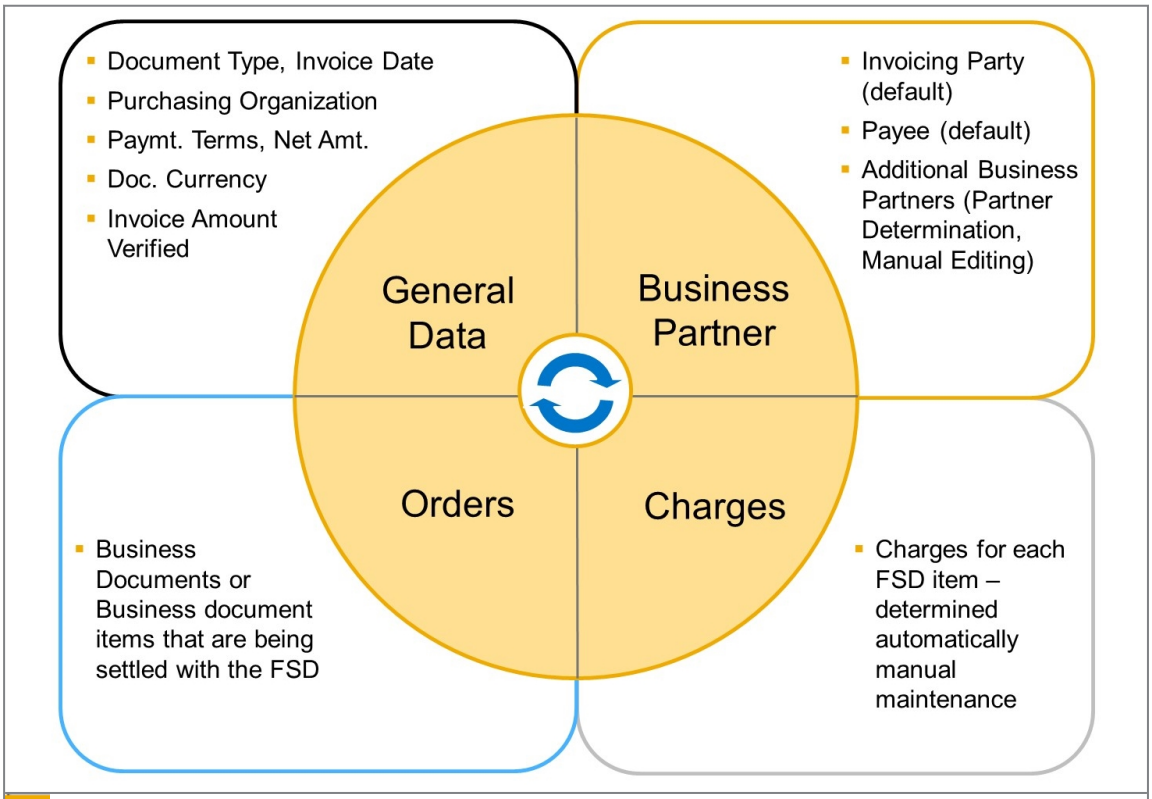

Figure 79: Freight Settlement Document Overview

An FSD contains the following information:

- General data: Document type, the purchasing organization, payment terms, document currency, and so on.
- Business partner information: Invoicing party, payee, additional business partners, which can be entered manually or automatically determined by the system.
- Orders: The business documents or the business document items that are being settled using the FSD.
- Charges: For each FSD item, the *Charges* tab page has the charges relevant for settlement with the carrier.

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Freight Settlement Document Creation

Based on a transportation requirement, the planner will carry out several planning steps and create a freight order or a freight booking to subcontract the transportation activity to a carrier.

Upon settlement, the system creates a FSD. This document contains all relevant logistical data, as well as the charges and other commercial data. The charges can be copied over from the freight order (most common), or another charge calculation is triggered based on the freight agreement between the purchasing organization and the ordering party. It is possible to manually change charges in the FSD.

FSDs can be created online or in batch. It is possible to create a collective settlement (several freight orders are settled with one FSD).

The FSD can then be posted to the SAP MM via a Background RFC or in case of a side-by-side S4 to TM landscape via the exchange infrastructure.

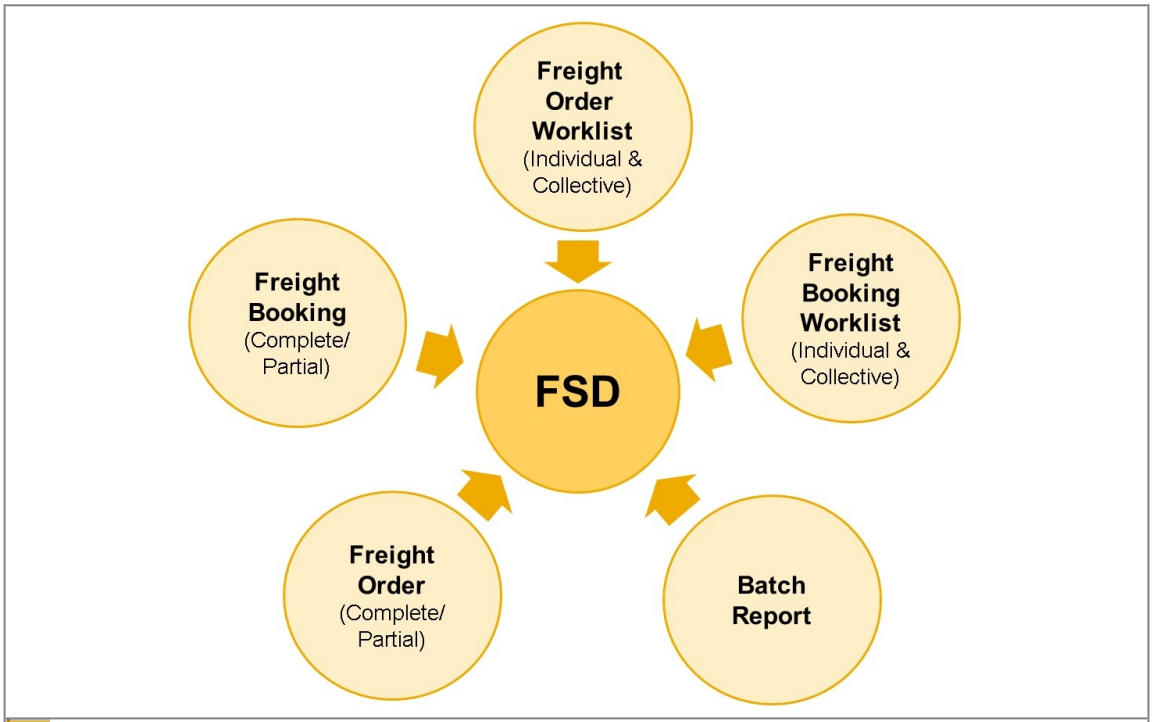

Figure 80: Freight Settlement Document Creation Methods

The FSD can be created in the following ways:

- You can create an individual FSD for one freight order or freight booking or a collective FSD for multiple freight orders or freight bookings. To do this, access freight orders or freight bookings from the worklist, in the relevant document overview, or in the freight settlement overview. The system automatically creates the FSD based on the data in the freight orders, or freight bookings and calculates the transportation charges.
- You can create FSDs directly out of the freight booking or freight order apps.
- You can create partial FSDs for previously invoiced freight documents.
- You can create multiple freight settlement documents using the mass creation FSD batch report.

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Note:
Background reports are the following:

- */SCMTMS/SFIR_CREATE_BATCH* - Creation of FSDs
- */SCMTMS/SFIR_TRANSFER_BATCH* - Posting of FSDs to MM

Partial Freight Settlement Document

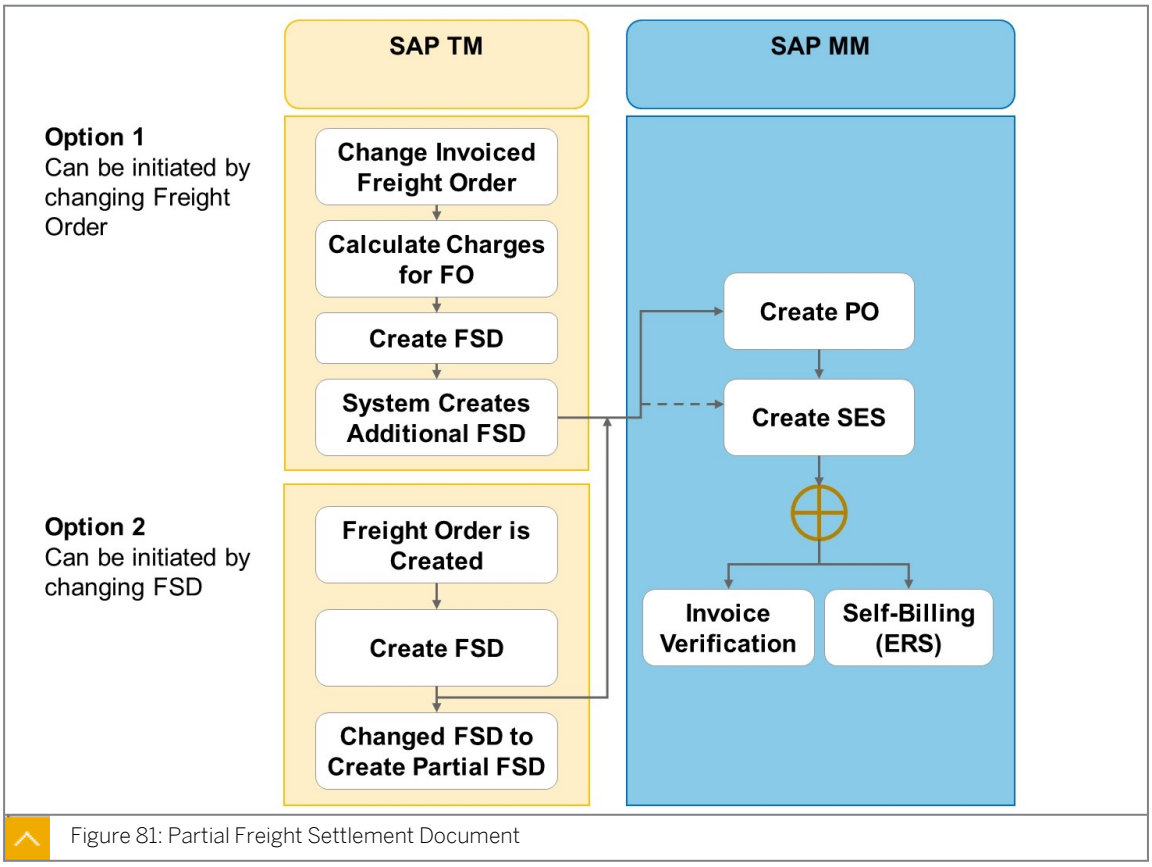

Figure 81: Partial Freight Settlement Document

It is possible to create a partial FSD for an already invoiced freight document. In this case, the invoicing status of freight order changes from Completely Invoiced to Partially Invoiced before the additional FSD is created.

It is possible to add charges to an invoiced freight order, but not to remove them.

LESSON SUMMARY

You should now be able to:

- Create Freight Settlement Documents

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Mapping Freight Settlement to Materials Management

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Post Freight Settlement Documents

Posting Freight Charges

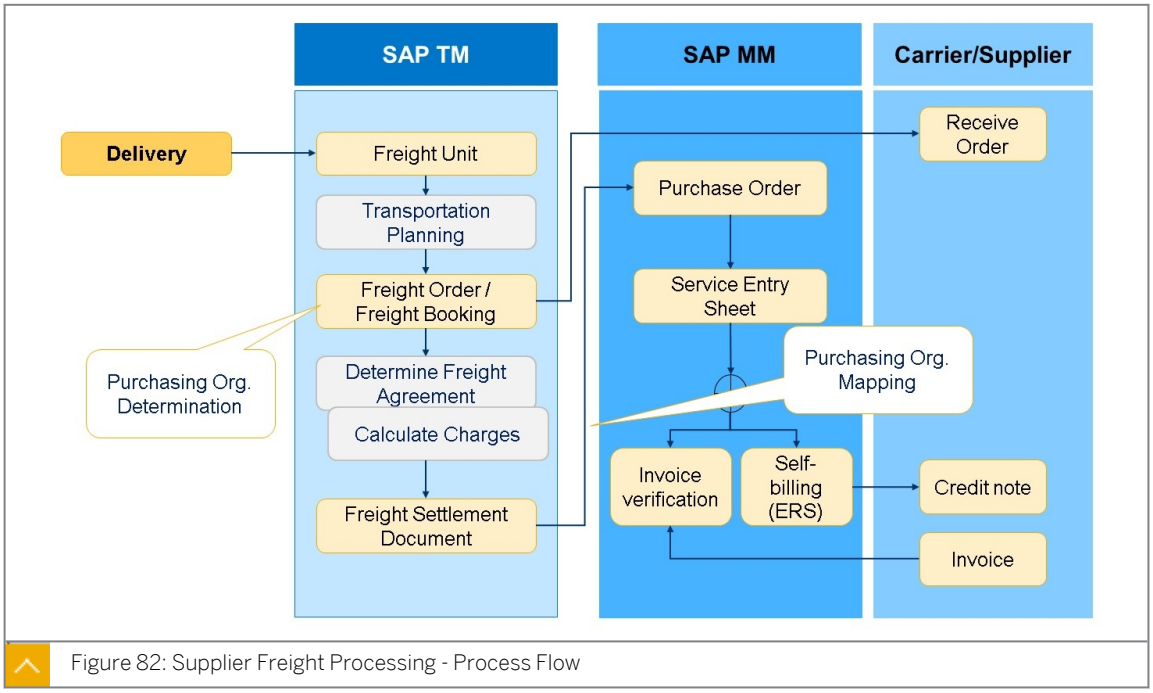

Figure 82: Supplier Freight Processing - Process Flow

As shown in the figure, Supplier Freight Processing - Process Flow, the typical freight settlement process flow is as follows:

Based on a delivery, the planner carries out several planning steps and creates a freight order or a freight booking to calculate the charges and to subcontract to a carrier.

On settlement, the system creates a Freight Settlement Document (FSD). This document contains all relevant logistical data as well as the charges and other commercial data. The charges can be copied over from the freight order or freight booking (most common) or another charge calculation is triggered based on the freight agreement between the purchasing organization and the carrier. It is possible to manually change charges in the FSD. FSDs can be created online or in batch. It is possible to do a collective settlement (several freight orders or bookings are settled with one FSD). The FSD can then be posted to MM.

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The FSD contains one or more charges sections, that will appear as PO items. In general the FSD and the Purchase Order have a one to one relationship. In case of a stage level based charge calculation the PO has as many items as there are stages in the corresponding FO and therefore more than one service entry sheets, one per PO item.

After posting, the purchase order and service entry sheet are created in MM. This constitutes the working list for invoice verification. You also have the option of self-billing.

The PO and SES can be accessed via the transaction `ME23N` or via the TM Document Flow.

Note:
The purchase order and service entry sheet are only used for technical purposes to post accruals. The service entry sheet comprises a list of services performed by a vendor on the basis of a purchase order, containing service descriptions and details of quantities and values. The descriptions of planned services deriving from the purchase order are used as default descriptions in the service entry sheet.

Purchase Order and Service Entry Sheet

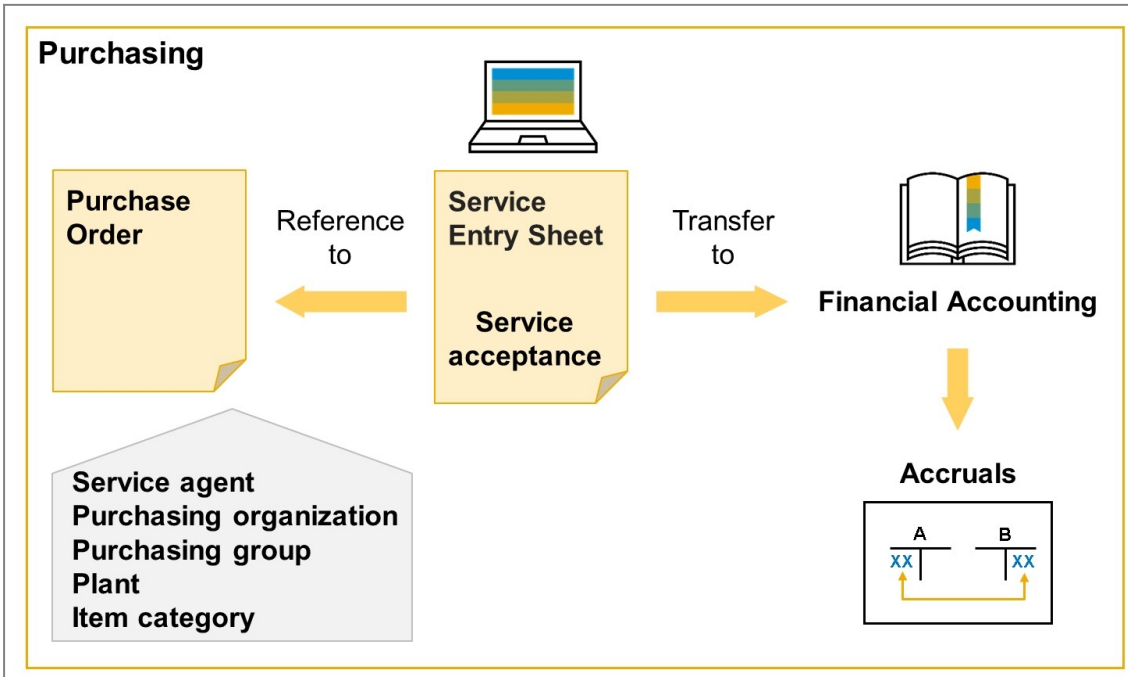

Figure 83: PO and SES Creation

Each service entry sheet is based on an external service order. Determining a valid purchase order is required for transfers to Financial Accounting and for settlements. You can also create the purchase order every month for the carrier. Important criteria for the service order include carrier, purchasing organization, purchasing group, plant, and item category.

When the system has automatically determined a valid purchase order, a service entry sheet is created that refers to the purchase order. During posting, you accept services and, in Financial Accounting, an accounting document for generating accruals is created.

During account assignment, the system automatically determines the correct G/L account in Financial Accounting for each cost item and the assignment for Controlling. Account

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assignment can be carried out at different levels, depending on the level of detail at which you want to track costs.

The transfer to Financial Accounting to establish accruals requires entering and accepting the services rendered. The system automatically creates a service entry sheet. Using the credit memo procedure, also referred to as the Evaluated Receipt Settlement (ERS) procedure, you can settle the freight costs with the carrier without having received invoices. You can choose from different settlement periods. You transfer the calculated freight costs to Financial Accounting. The invoices are verified by the carrier. If the carrier discovers variances, you can post these as subsequent debits or credits.

If you receive invoices from the carrier, you can also verify the invoices manually and create the invoices manually in logistics invoice verification.

Freight Settlement Posting Actions and Updates

Synchronous

Posting happens online i.e. the PO and SES are created simultaneously.

Asynchronous

Posting happens via BgRFC and posting is processed only after the BgRFC processing is scheduled.
PO, SES are created in background process.

Action	UI	Worklist	Batch reports
Save and Post	Asynchronous	Asynchronous	Synchronous
Cancel Document	Asynchronous	Asynchronous	–
Reverse Document	Synchronous	Asynchronous	–
Cancel PO	Synchronous	Asynchronous	–
Reprocess failed document	–	–	Synchronous

Figure 84: FSD Posting Actions

In an embedded TM S4 system landscape, the posting of the Freight Settlement Document is carried out via BgRFC (Background Remote Function Call).

There are various actions available that can be triggered directly on the FSD UI, the worklists or via background jobs:

- Save and Post: Create PO and SES, post accruals
- Cancel Document: Cancel posted Accruals, Cancel SES + PO (Lifecycle acruals posted)
- Reverse Document: Create return SES for previously created PO (Carrier has to be ERS enabled)
- Cancel PO: Cancel PO when SES creation failed for any reason, Posting must be started again after successful cancellation
- Reprocess failed Document: Used when document creation failed, Used to continue the posting process

Post FSD Directly

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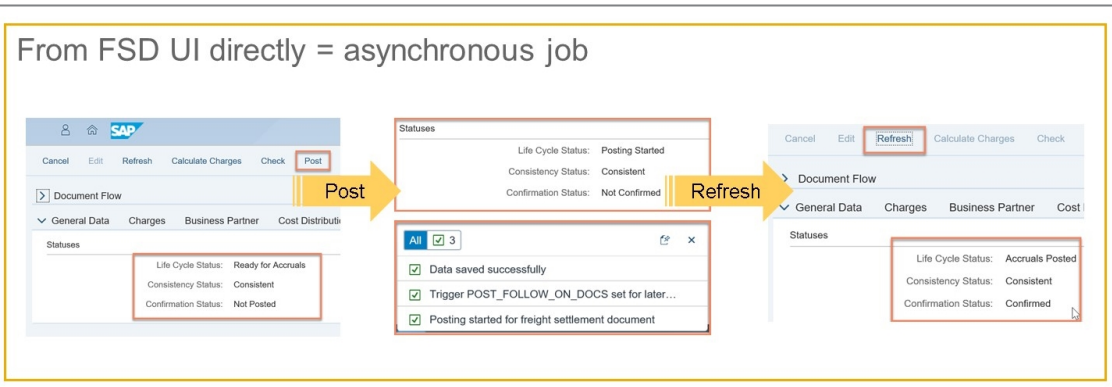

Figure 85: FSD Posting Asynchronous

Asynchronous means here, that in the backend a BgRFC unit is created, but will be executed later. At any point in time, the lifecycle status indicates the current stage of the FSD in the business process. The asynchronous job leads immediately to the following statuses:

1. Lifecycle Status = posting started
2. Confirmation Status = not confirmed

These statuses will be updated, as soon as the BgRFC unit is executed. In addition, the user will get messages about the triggered action.

In customizing, choose *Transportation Management → Basic Functions → User Interface → Define Message Settings*.

After execution of the BgRFC unit, a Refresh leads to the updated statuses:

1. Lifecycle Status = Accruals posted
2. Confirmation Status = confirmed

Post FSD via batch job

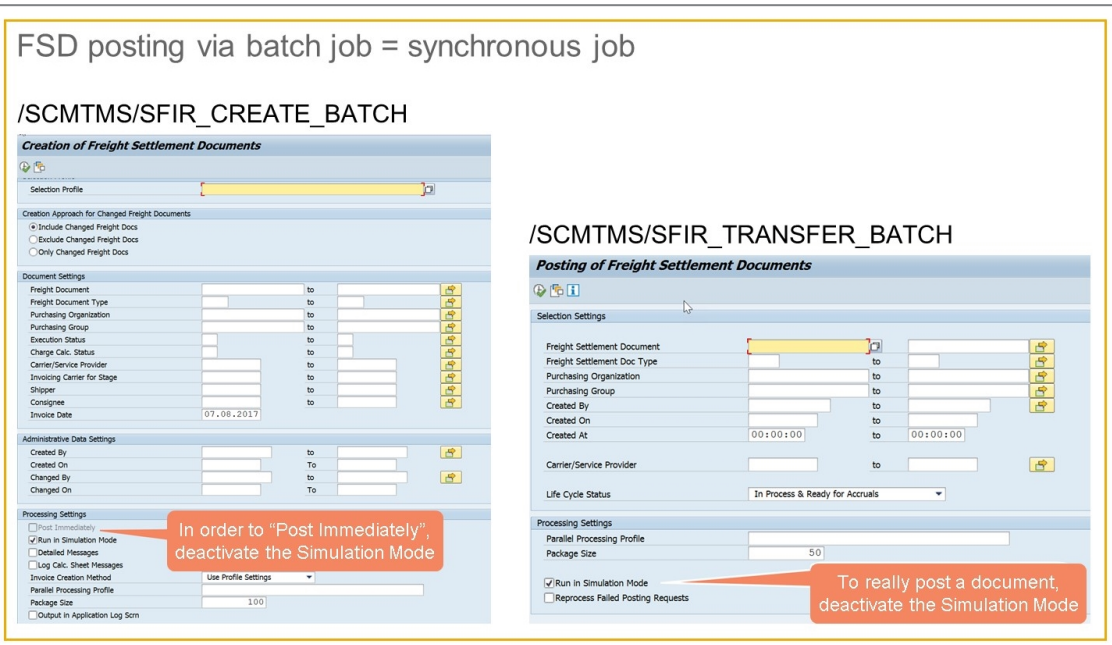

Figure 86: FSD Posting Synchronous

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To post a FSD via batch job, in the backend transaction SE38, you can set up the batch jobs:

- /SCMTMS/SFIR_CREATE_BATCH to create an FSD with the option to “Post Immediately”
- /SCMTMS/SFIR_TRANSFER_BATCH to post existing FSDs for accruals or to reprocess failed postings

These reports process the posting and reprocessing of FSD in a synchronous mode.

Check Results of Posting Action

After Posting, you can track and check the results in case of posting failures.

You can check in the FSD tab “Application Log” for errors or warnings.

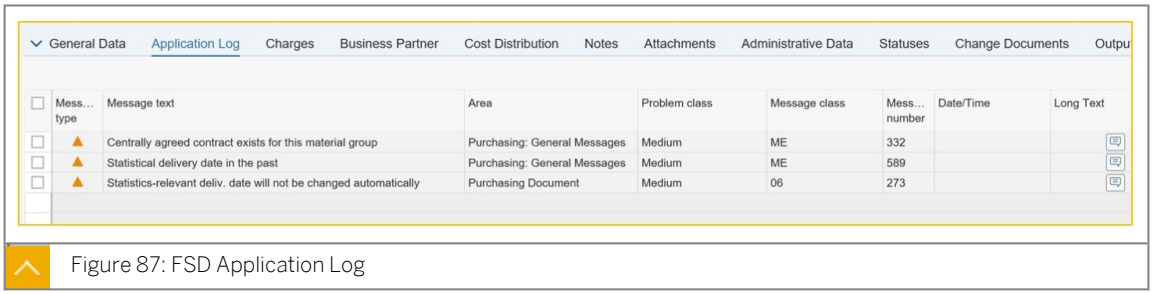

Figure 87: FSD Application Log

In case that MM configuration is missing, this cannot be alerted upfront, but will be shown in the Application log. Example: G/L account does not match (MM configuration).

In the Application log, the Error messages are listed, and in the long text you get a procedure how to solve the issue.

After completing the missing customizing, the actions “Cancel PO” (only via UI or worklist) or “Reprocess failed documents” (only via Batch report) can be triggered. After PO cancellation, the posting action must be triggered again.

To reprocess failed documents, you will have to use the /SCMTMS/SFIR_TRANSFER_BATCH. This is usually done when e.g. the SES creation or cancellation failed due to missing MM customizing. Even for a failed reversal action, the batch report can be used.

You can also monitor the processing of the BGRFC units that will be created when an asynchronous job is triggered. This can be done via backend transaction code *SBGRFCMON*.

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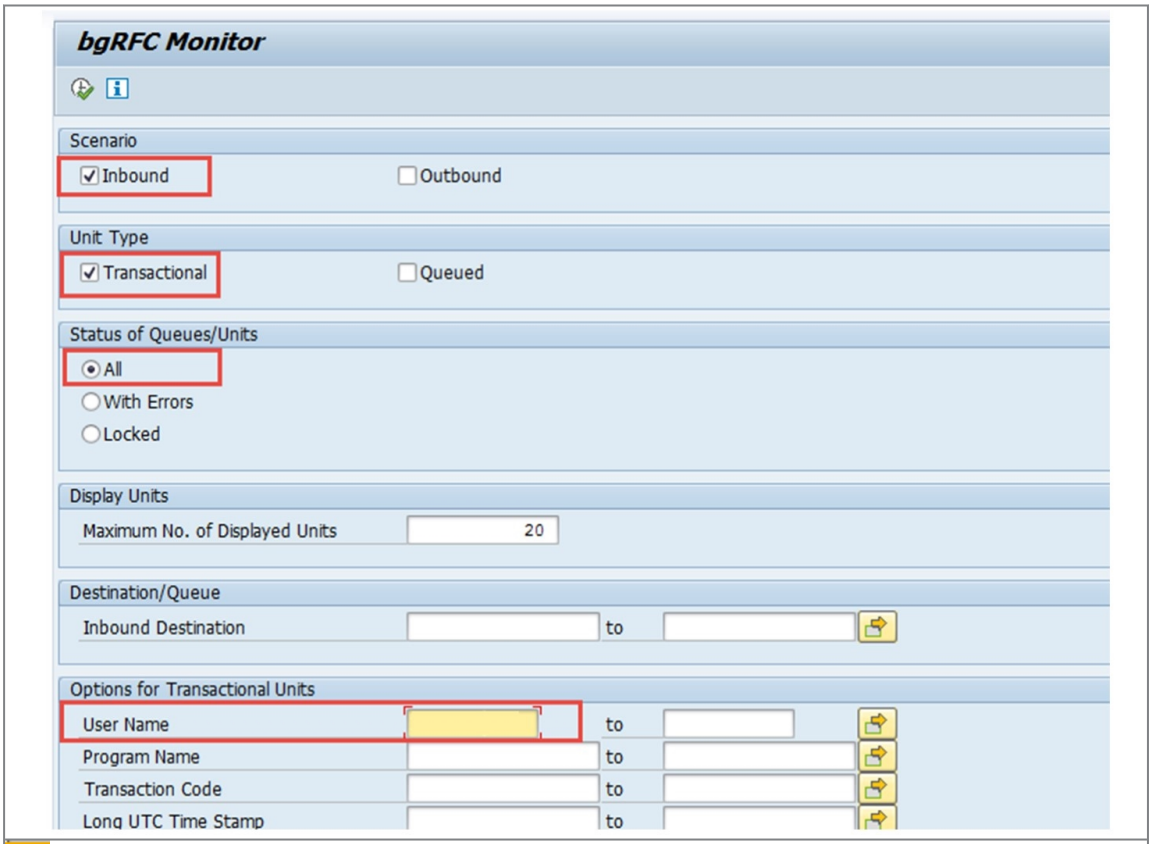

Figure 88: BGRFC Monitor

After posting, if FSD confirmation is not received for more than 2 min, go to the BGRFC Monitor and enter the data as shown in the screen shot.

After Executing you will be able to see the background processes.

- If the background process is still processing, then you will see the status as "Unit Blocked/ Locked"
- If the background process failed due to some runtime error, then you will see the status as "Unit has errors"

Select the respective entry and click on details button to see more information.

Note:
If you are in a TM side-by-side scenario, TM and the S4/ ERP system are connected via SAP Process Integration or Web Services.

In this case you will have to use the backend transaction SXMB_MONI (XML Monitor) to check the FSD integration for errors and to restart the respective service messages for transferring the document after the customizing has been corrected.

Automatic Change Management for Freight Settlements

There can be late changes in the freight order requiring changes to logistical data which may result in the change in the charges (increase or decrease). These changes can occur at time when the old values are already transferred to settlement documents and / or the settlement documents have also been transferred to financials.

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Accruals are posted as soon as the financial liability is known (example: departure or confirmed pickup of the freight by the carrier). However, there can be mid execution changes (example: diversions (consignee changes), loss of cargo (in transit), unavailability of cargo, unplanned costs due to detention, demurrages, loading and unloading activities, tolls, etc.).

These changes may only be known after execution or during the invoicing process (when carrier sends the invoice).

The system uses the automatic change management process that you specify in the relevant settlement profile. In customizing, go to*Transportation Management* → *Settlement* → *Define Settlement Profile* → *Change Process FSD*.

TM uses the following elements to determine what approach to take with the change:

- Change Process FSD setting in the settlement profile
- Life cycle status of the freight settlement document

There are two different FSD Update Strategies/ Change Processes available:

		Strategy 1: Reverse and Repost	Strategy 2: Create New Document for Delta Amount	Follow up Action
Document Type		**Freight Order**		
	Invoicing Status/ Lifecycle Status	Partially Invoiced / Over Invoiced	Partially Invoiced	
Freight Settlement Document	In Process / Ready for Accruals	Cancel the existing settlement document/item	None	Create new settlement document
	Accruals Posted/ Invoice Verified	Create credit memo to reverse settlement document/ item	None	Create new settlement document
Credit Memo	Not yet posted	Cancel the credit memo document/ item	None	Create new CM for the total amount in the FSD
	Posted	Create credit memo for the remaining credit amount in FSD	None	Create new CM for the remaining credit amount in FSD

Figure 89: FSD Update Strategies

When an order is changed and the invoicing status changes to Over Invoiced, the system automatically applies the reverse and repost strategy.

For applying the automatic change process, you use the background function "Creation of Freight Settlement Documents" (program: /SCMTMS/SFIR_CREATE_BATCH) to create, change, and transfer the freight settlement documents to Materials Management (MM). The freight settlement document contains the changes from the freight order.

Alternatively, you go to the impacted freight document from the personal worklist or the individual document, and you create the freight settlement document or apply changes to the charges directly on the UI in a manual way. This would trigger the relevant change process that is defined in the settlement profile, too.

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Configure Freight Settlement Creation in TM

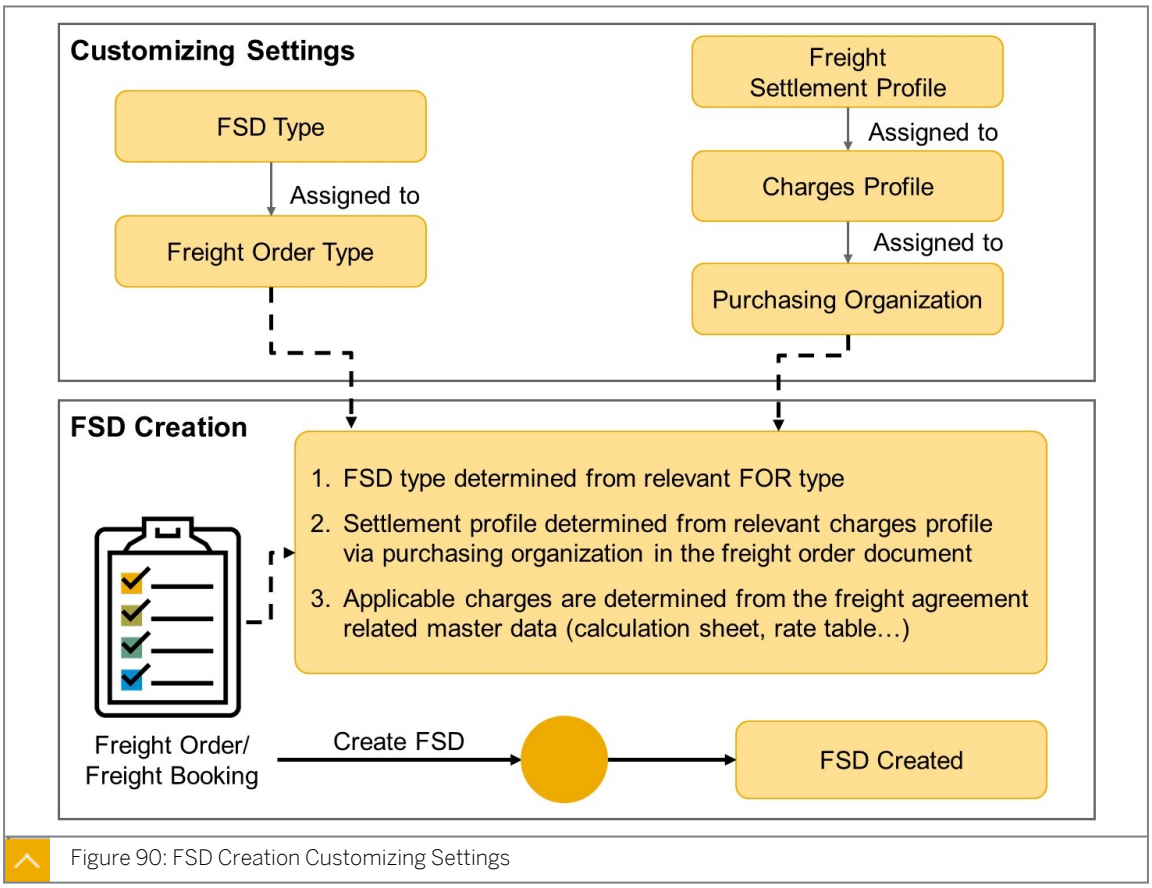

Figure 90: FSD Creation Customizing Settings

When the FSD creation is triggered for a freight order/freight booking (FO/FB), the corresponding document type is used to determine the FSD type used.

The purchasing organization specified in the FO/FB is used to determine the settlement profile. The system takes care of the relevant charges for the FO/FB. All of this information is then used to create FSDs for the selected FO/FB.

In SAP TM, there are a number of customizing steps that must be performed when configuring freight settlement:

1. *Define Settlement Profiles*
2. *Assign Settlement Profile to Charges Profile and Org Unit*
3. *Define Number Range Intervals for FSDs*
4. *Define FSD Types*
5. *Assign FSD Type to FO/FB Type*

Step 1: Define Settlement Profiles

The first stage in our configuration is to define a settlement profile.

The settlement profile consists of a set of parameters with which you can control how the system creates settlement documents.

In the *Define Settlement Profile* customizing activity, you can define the profile for creating settlement documents.

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You can specify the following activities:

- Profile category to determine whether the system can use the profile to create freight settlements, forwarding settlements, or both freight settlements and forwarding settlements
- Data source to determine the type of data that the system uses when creating a settlement document. You can specify planned and confirmed data from forwarding orders or planned data from freight orders
- Split/consolidation strategy profile to split or consolidate settlement documents
- Collective invoice to create one invoice for several orders
- Stage split to create invoices for individual stages in a freight order or forwarding order
- FSD Change Process for determining the FSD update strategy in case of late changes

To define settlement profiles, in customizing, choose *Transportation Management → Settlement → Define Settlement Profile*.

Step 2: Assign Settlement Profile to Charges Profile and Org Unit

The second step in our configuration is to assign the settlement profile to the charges profile.

In customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charges Profiles*.

The assignment makes it possible to control different settlement creation settings for different organizations. It is also possible to determine the settlement profile at runtime using the BRF+ condition of type /SCMTMS/TCM_FCP_DET. For the assignment of a charges profile to the purchasing organization, see the PPOCE transaction.

Step 3: Define Number Range Intervals for FSDs

In the third step of our configuration, number range intervals are defined for the FSD.

When an FSD is created, a unique number is assigned to it, identifying the document. The number comes from the number range, which is provided for the document type.

You define number range intervals in the *Define Number Range Intervals for Freight SDs* customizing activity.

In customizing, choose *Transportation Management → Settlement → Freight Settlement → Define Number Range Intervals for Freight SDs*.

Step 4: Define Freight Settlement Document Types

You can use the freight settlement types to specify certain parameters for certain types of FSDs.

To define freight settlement document types, in customizing, choose *Transportation Management → Settlement → Freight Settlement → Define Freight Settlement Document Types*.

You can specify the following parameters:

- Business partner determination profile to assign business partners to the freight settlement document.
- Number range interval of FSDs.

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- FSD categories (to define either a freight settlement document or charge correction advice).
- Separate categories are available to define a freight settlement document and a charge correction advice document.
- Tracking of changes.
- BW relevance.
- Enable Cost Distribution.
- Default UoMs.
- Residence period for archiving.
- Output profile for printing and transferring (by default, this is set to /SCMTMS/TOR_INV_PREP).
- Default view for the charges tab.

Step 5: Assign FSD Type to FO/FB Types

The final step in our configuration is the assignment of the FSD type to freight order and freight booking types.

You can assign the FSD type to one or several freight order types in the *Define Freight Order Types* customizing activity.

In customizing, choose *Transportation Management* → *Freight Order Management* → *Freight Order* → *Define Freight Order Types*.

You can assign the FSD type to one or several freight booking types in the *Define Freight Booking Types* customizing activity.

In customizing, choose *Transportation Management* → *Freight Order Management* → *Freight Booking* → *Define Freight Booking Types*.

Note:
Both the freight order and freight booking types have to be enabled for settlement by checking the respective box during FSD Type assignment.

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Configure Freight Settlement Integration to MM

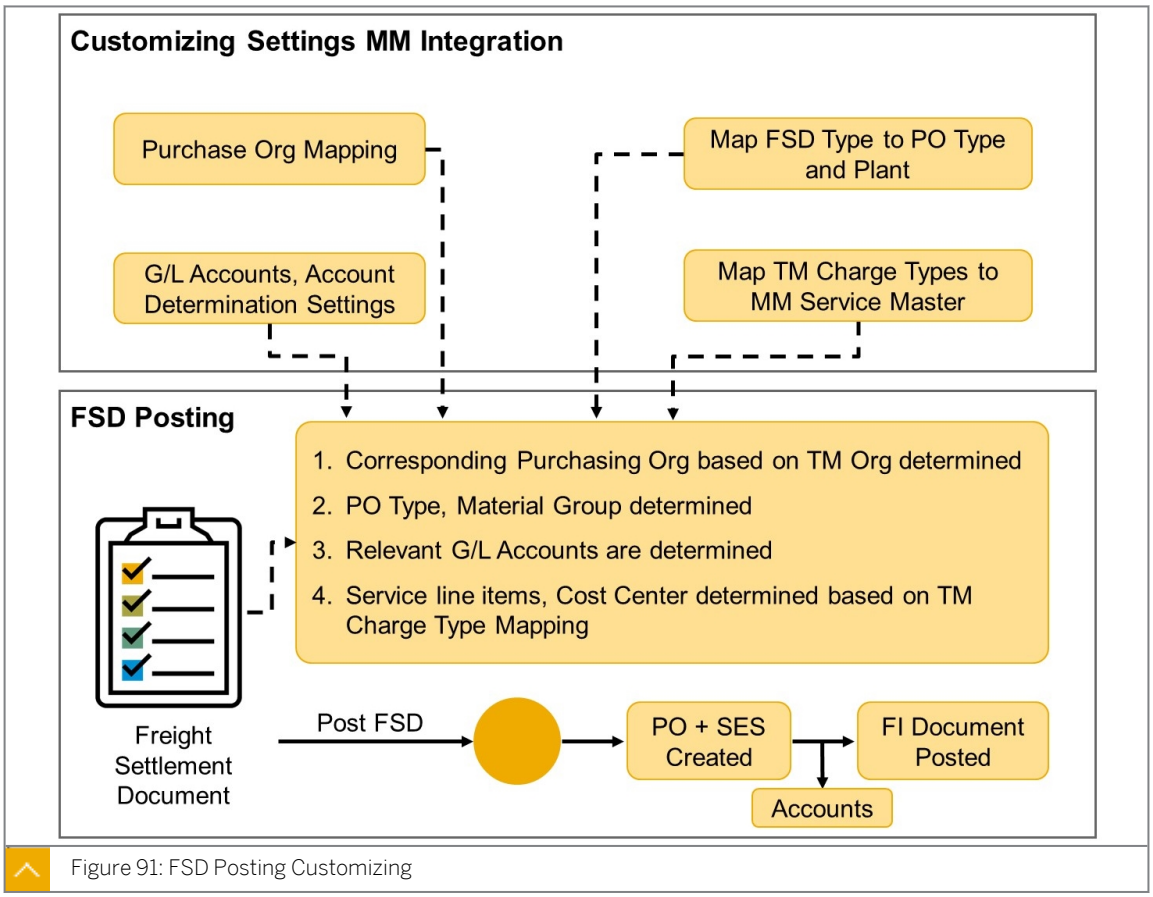

Figure 91: FSD Posting Customizing

When the FSD is posted to MM, the accruals are posted and a PO and a service entry sheet (SES) per PO line item are created. The SES serves as the basis for invoice verification.

In SAP TM and SAP MM there are a number of customizing steps that must be performed when configuring freight settlement integration:

1. *Map Purchasing Organization*
2. *Map FSD Type to PO Type and Plant*
3. *Map Transportation Charge Types to MM Service Master*
4. *Configure Automatic Determination of G/L Account*
5. *Enable User for Invoice Verification*

Step 1: Map Purchasing Organization

TM documents contain different information than MM documents. The TM organizational structure is different to MM organizational structure. Therefore the organizational units must be mapped when a MM document (PO) is created out of a TM document (FSD).

To find the Purchasing Organization in MM, in customizing, choose *Enterprise Structure → Definition → Materials Management → Maintain purchasing organization*.

Maintain the MM Purchasing Organization/ group in the corresponding TM Purchasing Organizational Unit:

In the backend go to transaction *PPOME* and choose your TM Purchasing Organization.

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In the tab Org. Data, field *BSG Org. Unit*, enter the MM Purchasing Organization.

Note:
In a S4 TM to S4 HANA side-by-side deployment, the settings above have to be applied. In a S4 TM to SAP ERP side-by-side deployment, the organizational unit mapping requires a slightly different set-up. Here you have to assign the TM purchasing organization to the MM purchasing organization directly in the ERP customizing:

In the customizing settings Mapping of Organizational Units, activity *Assign Organizational Units for Purchasing*, you assign the TM purchase organization, TM purchase group, and freight settlement document type to the MM organizational data.

In ERP, choose Integration with Other SAP Components → Transportation Management → Invoice Integration → Invoicing → Mapping of Organizational Units → Assign Organizational Units for Purchasing.

Step 2: Map FSD Type to PO Type and Plant

For each FSD type the following must be defined:

- Purchase Order Type
- Material Group
- Plant
- Purchasing Group

This mapping enables the system to find the right PO type, assigned to the responsible plant and material group to take up the settled charges and create the respective FI and material documents.

In customizing, choose *Transportation Management → Settlement → Freight Settlement → Integration for Settlement Posting → Assign Purchasing Information for Posting*.

Step 3: Map Transportation Charge Types to MM Service Master

It is crucial to assign the transportation charge item categories, transportation charge item subcategories, and transportation charge types to MM service master records, also called activity numbers, and account assignment categories.

The account assignment category, usually set to "K" for cost center, specifies which account assignment data is necessary for an item. The cost center serves as an organizational unit within a controlling area that represents a defined location of cost incurrence.

The MM Service Master Record/ Activity number represents the purchased service based on the TM Charge Type. The services are depicted in the PO Item section. In transaction *AC01* the activity numbers can be set-up. Here, they are also linked to a valuation class which enables the system to find the respective G/L accounts that are updated when services are entered.

In customizing, choose *Transportation Management → Settlement → Freight Settlement → Integration for Settlement Posting → Assign Service Master Record and Account Assignment Category*.

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Note:
In a S4 TM to SAP ERP side-by-side deployment, at first you have to set-up the TM Charge Types, Categories and Subcategories in the ERP system. After you have done that, you can map the Charge Types to MM Service Masters.

In SAP ERP, in customizing choose Integration with Other SAP Components → Transportation Management → Invoice Integration → Invoicing → Definition of Transportation Charges → Define Charge Type.

Step 4: Configure Automatic Determination of G/L Account

During settlement cost processing, the system can determine G/L accounts for the transportation costs automatically. This process uses the settings that you configure in the following Customizing activity to find the correct G/L accounts:

In customizing, choose *Materials Management → Valuation and Account Assignment → Account Determination → Account Determination without wizard → Configure Automatic Postings*.

Here you define the determination of e.g. the GR/IR clearing account which takes up the accruals for the transportation charges and is balanced when the carrier invoice is received and verified. Furthermore you set-up the determination of material Inventory and consumption accounts as well as freight clearing accounts.

Note:
This activity is usually performed in close corporation with the financial department of customers and demands close alignments. A further prerequisite is the complete set-up of the respective MM and FI/CO basic settings (e.g. PO types, posting periods, valuation classes, movement types aso.).

Step 5: Enable User for Invoice Verification

To enable invoice verification, set up the user parameter TM_INVOICE_CLERK in the user data. With the user parameter TM_INVOICE_CLERK, you control which tabs the user sees when entering or changing incoming invoices in the transactions `MIRO` and `MIR7`, in change mode in the transaction `MIR4`, and in GR/IR clearing account maintenance in the transaction `MR11`.

In logistics invoice verification (MIRO), the user is now able to see the TM Ref. Tab. Here you can enter e.g. the freight order ID or the carrier ID to bring up the freight settlement transportation charges for comparing them with the carrier invoice.

In transaction `SU01` or `SU3`, enter the respective user name and maintain the parameter ID in the tab Parameters plus parameter value X.

LESSON SUMMARY
You should now be able to:

- Post Freight Settlement Documents

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Unit 4
Lesson 3

Verifying Carrier Invoices and Self-Billing

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Verify Freight Invoices

Carrier Invoice Verification & ERS

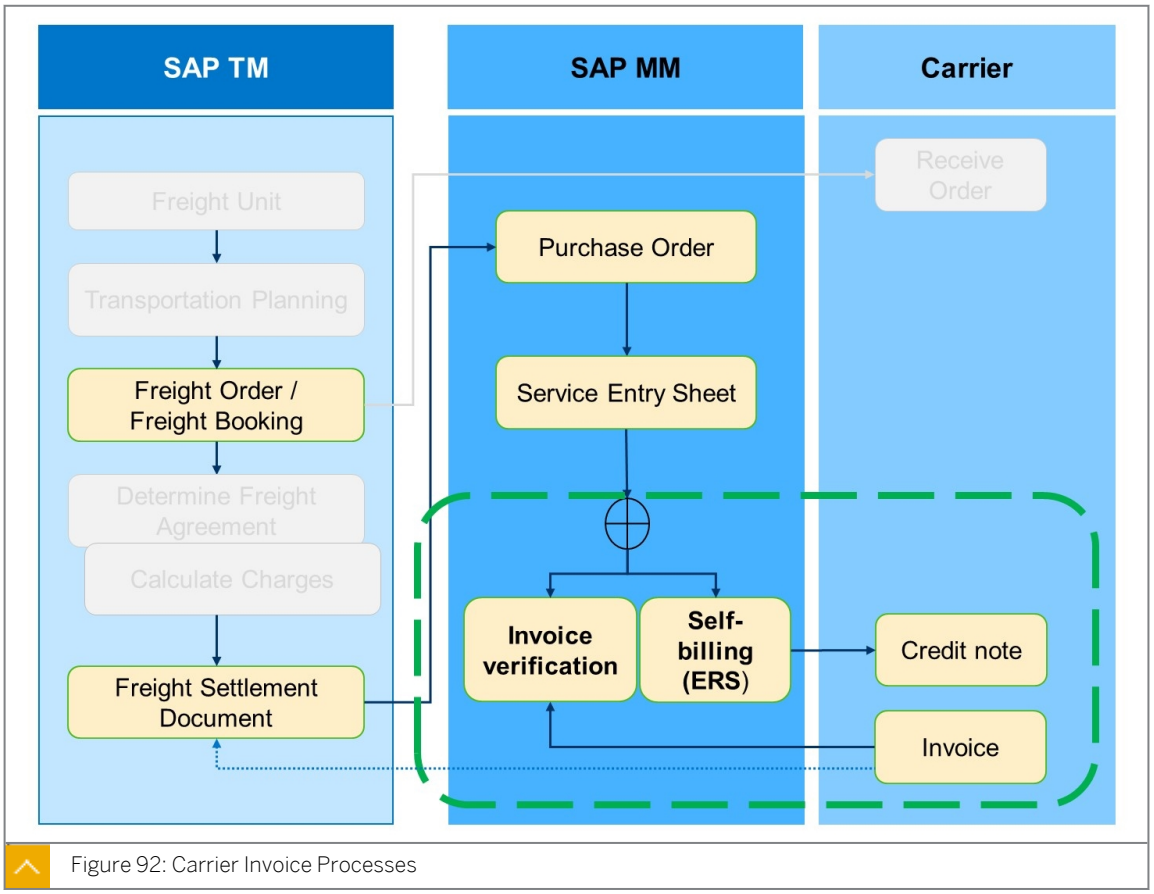

Figure 92: Carrier Invoice Processes

In SAP MM, the purchase order and service entry sheets are created using the worklist for the invoice verification. There is also an option to do a self-billing (ERS).

The invoice verification is performed in SAP MM and can be done with reference to an SAP TM freight order, carrier, bill of lading, air waybill, flight number, or voyage number. If SAP MM successfully verifies the actual invoice against the expected invoice, SAP TM is notified by updating the freight settlement document (FSD) with the invoice ID and actual amounts. SAP TM updates the Life Cycle Status of the FSD to Invoice Verified. Once the FSD has reached this status, it is not possible to cancel the invoice.

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In MM, for logistics invoice verification, internal documents such as a purchase order and a service entry sheet that the system requires for invoice creation are created based on TM data. When incoming invoices are entered or canceled, external TM is informed by enterprise service Supplier Invoice Notification (InvoiceNotification_Out). When working with TM as an internal component, the updates to the freight settlement document are done online.

When verifying invoices in MM, you can navigate to the TM freight order details by clicking on the Details for the invoice item.

Ready for Settlement

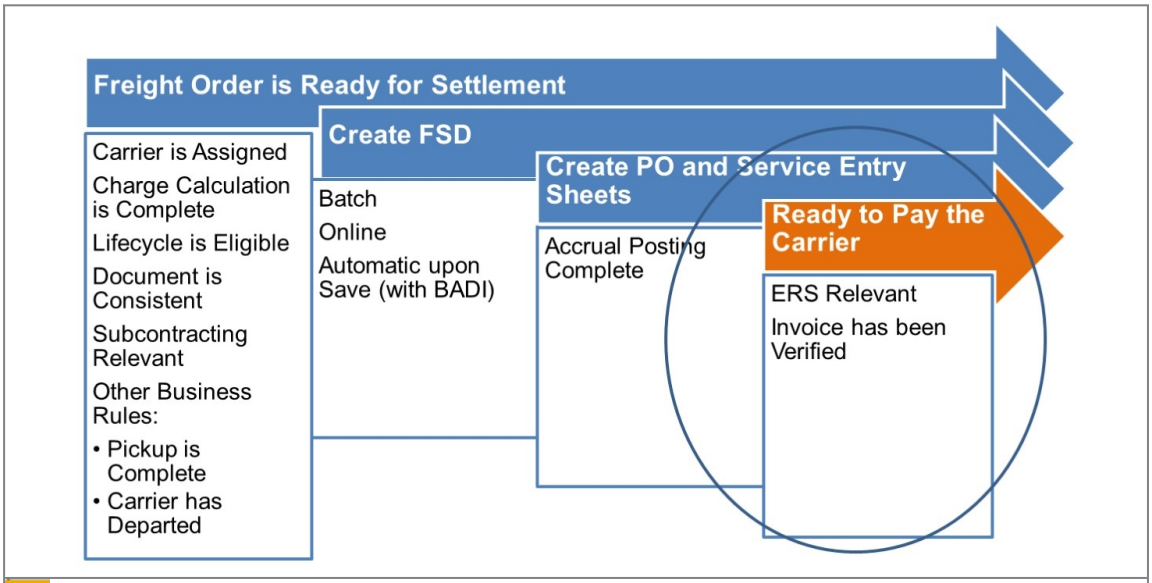

Figure 93: Ready for Settlement

Once the settlement process is completed, the process for paying the carrier invoice can begin. Using transaction `MIRO`, the vendor invoice can be entered. However, if the evaluated receipt settlement (ERS) procedure is in place, this process occurs automatically.

For SAP TM-related invoices, there is a *TM Reference* tab in the `MIRO` transaction. To view this tab, you must set up the user parameter TM_INVOICE_CLERK in the user data. With the user parameter TM_INVOICE_CLERK, you control which tabs the user sees when entering or changing incoming invoices in the transaction. The user parameter can be set to **`Blank`** (where the user sees both the *TM Reference* and *PO Reference* tabs) or X (where the user sees the *TM Reference* tab only).

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Financial Postings

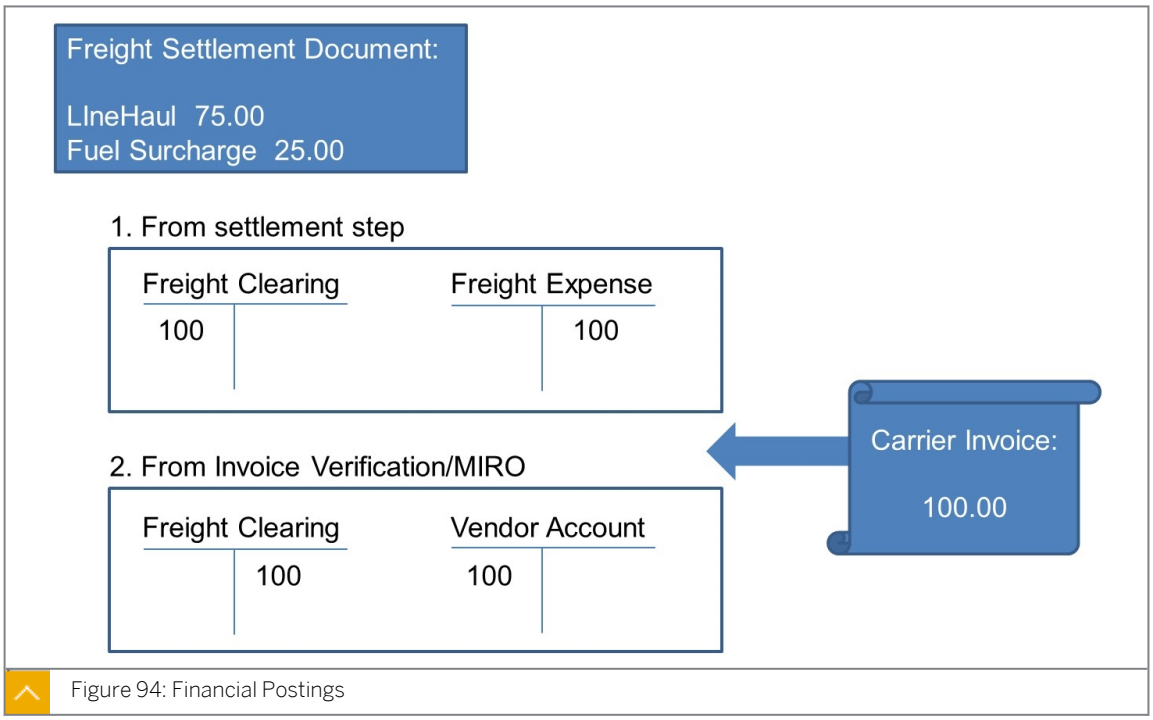

Figure 94: Financial Postings

When a payment is made, financial postings are carried out. These are the same postings that would be made for non-TM related invoices.

Evaluated Receipt Settlement (ERS)

Evaluated Receipt Settlement, also known as "self-billing" is the process of settling goods receipts directly without receiving an invoice from the carrier. The system can generate the corresponding invoices and post them. A carrier invoice is no longer required. You can execute evaluated receipt settlement with reference to documents in Transportation Management.

If you have a long-term partnership with your carriers and the respective carrier executes a large amount of orders for your company with an outstanding performance, this process is a common practice to reduce the administrative effort regards financial settlement.

In the same way as when incoming invoices are entered, in evaluated receipt settlement TM is informed by enterprise service (SupplierInvoiceNotification - InvoiceNotification_Out) when you use an external SAP TM system. When you use an internal TM system, the ERS process notifies the freight settlement document when the system creates an invoice online.

For using the self billing scenario, the carrier business partner has to be enabled for ERS.

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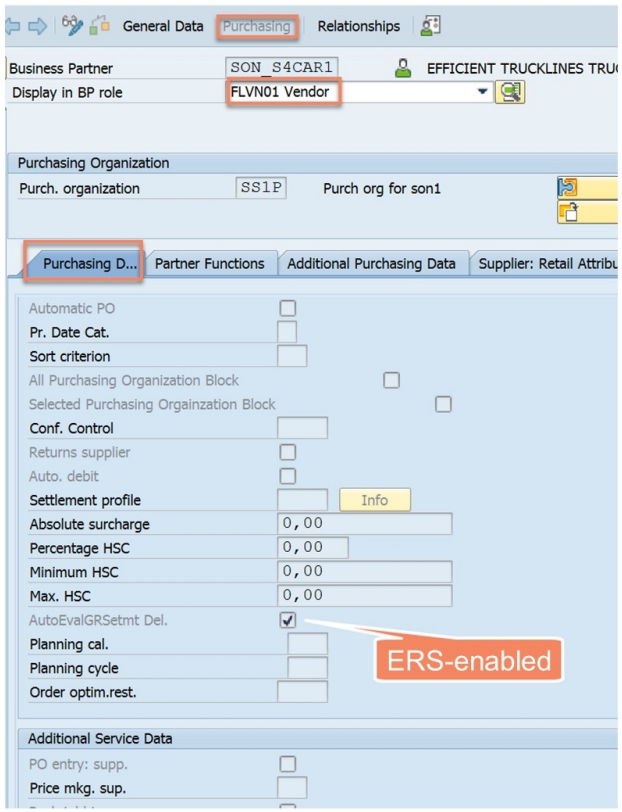

Figure 95: ERS BP Information

To check if the carrier is enabled, go to Transaction BP, choose your carrier and the role FLVN01 MM Vendor. In the header bar click on Purchasing. In the tab Purchasing Data check if the flag for ERS is set.

Note:
The ERS flag comes from the MM BP settings, it cannot be set in the TM.

In the same tab, section Additional Control Data check if the flag “Auto GRSet. Ret.” is set. This "Automatic evaluated receipt settlement for return items" flag enables the creation of the Credit Memo via the ERS process. If the carrier is ERS-enabled, a posted and invoiced FSD (lifecycle status ”invoice verified”) can be reversed via the “Reverse Document” action button directly in the FSD or in the worklist. A new SES with the returns indicator set will be created.

The ERS process as well as a variance called carrier invoice submission, can also be performed using the SAP Logistics Business Network (SAP LBN), which is a cloud-based carrier portal solution available with a separate licence.

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Submitting Carrier Invoices

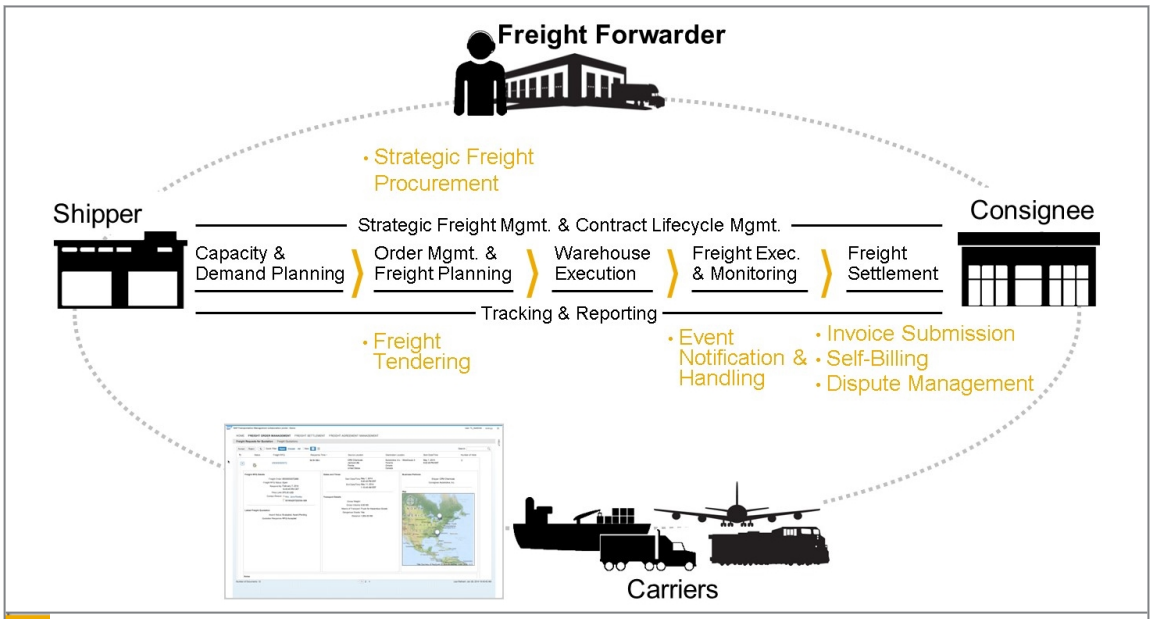

Figure 96: Functionality Overview LBN

Invoice submission is the process of publishing the freight charges in the logistics business network (LBN) and resolving differences in charges in a freight order (FO) or booking between a carrier or logistics service provider (LSP) and a requester of transportation services, such as a shipper or an LSP. This functionality simplifies and accelerates the carrier invoicing and correction processes. Additionally, there is no need to set up additional interfaces from third parties to SAP MM for uploading incoming carrier invoices for invoice verification. The carrier creates an invoice directly in the portal. This invoice gets matched to the calculated freight order amount, and the freight settlement process can be executed subsequently.

The carrier can verify all relevant logistical and the respective charge amounts. If the carrier wants to change or add data, the collaborative invoice dispute management functionality can be triggered. The dispute can involve changes in logistics item quantities (weight, volume, and distance) or item charges, and can lead to changes in charge amounts in freight order.

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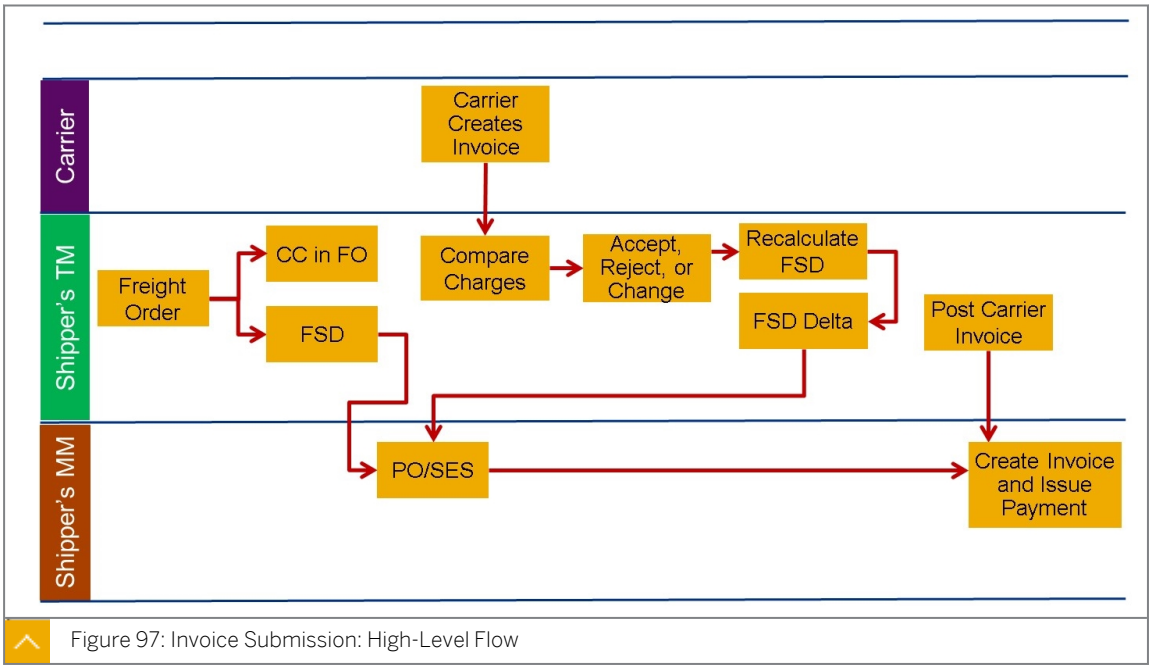

Figure 97: Invoice Submission: High-Level Flow

Invoice Submission: High-Level Process

1. The shipper creates a freight order and executes the charge calculation.

   If invoice submission via SAP LBN is enabled for the carrier, the FOs are visible for the carrier on the html portal and the charges get published.

2. The carrier creates an invoice directly in the LBN.

   This invoice gets matched to the calculated FO amount.

3. If applicable, a collaborative dispute process is triggered

   If that dispute process is solved, it results in a delta freight settlement document (FSD) or credit memo posted to MM.

4. After the invoice amounts and the amounts of the FSD and FO match, a carrier invoice is automatically created in SAP TM to be posted from TM to MM.

5. The carrier invoice can then be automatically verified with the respective FSD and PO/SES in SAP MM, posted to the accounts, and the payments can be arranged.

The dispute management for self-billing functionality remains untouched and both scenarios can run in parallel. However, a shipper will probably use either dispute management for self-billing or let the carrier submit the invoices directly.

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Freight Order Display

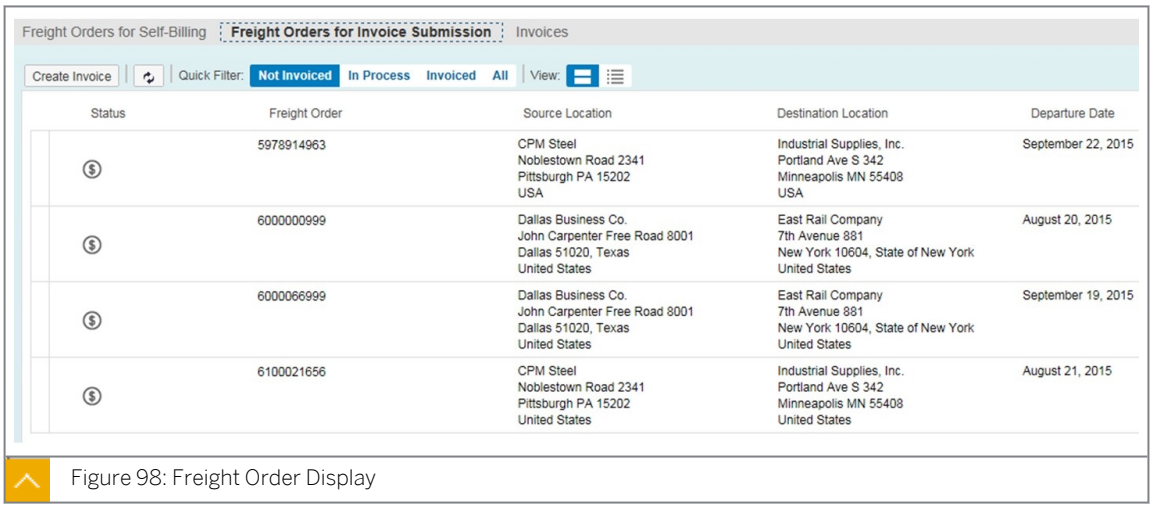

Figure 98: Freight Order Display

To enable the display of freight orders in the LBN the assigned carrier must be onboarded by SAP and enabled for invoice submission.

Freight Settlement Sub-Screens

The carrier *Freight Settlement* main screen is subdivided into the following three sub-screens:

- *Freight Orders for Self-Billing*
- *Freight Orders for Invoice Submission*
- *Invoices*

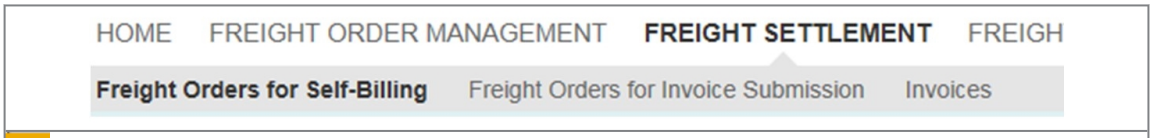

Figure 99: Freight Settlement Main Screen: Sections

Each line represents an FO and gives already an overview about logistical data. Quick filters to select the FOs can be used.

The carrier can open the Charge Details of the FO by clicking the freight order number, and then compare the details with its own data.

The charge details for the freight order contain general data (logistical information such as gross volume, weight, and total distance) and charges (per stage) listing all charge items and the total amount.

Invoice Creation for FOs

To create an invoice for a specific FO, the carrier navigates directly to the *Create Invoice* function.

Invoice Creation for FOs: Process

- The invoice number and date are entered.
- The number of FOs depends on the FSD creation rule.

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- Logistical data changes are entered, and charges or change rates are added.

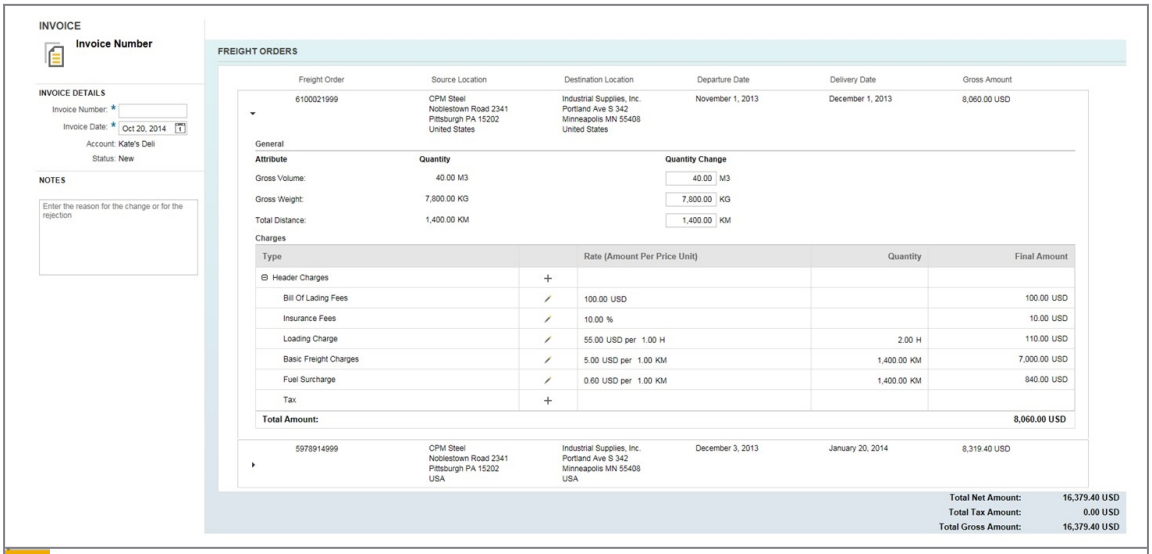

Figure 100: Carrier Invoice Creation

A carrier invoice type has to be specified as the default carrier invoice type in SAP TM. When the service provider creates an invoice in the SAP LBN, the system automatically uses the default carrier invoice type to create the carrier invoice in SAP TM.

The carrier invoice type is specified in Customizing under *Transportation Management → Settlement → Freight Settlement → Define Carrier Invoice Types*.

When the service provider submits a carrier invoice, they must enter a unique carrier reference ID. As standard, SAP TM checks the carrier reference ID, carrier, and invoice date to ensure that the service provider has not already used the same carrier reference ID in the same day. If SAP TM finds that the carrier reference ID has been used previously to create a carrier invoice, it blocks the carrier invoice.

Carrier Invoice Worklist

In the freight settlement worklist - Carrier Invoice Query in SAP TM Fiori launchpad, the shipper can see all submitted invoices and their status. Here it is possible to do the following:

- Reject invoices or post them in MM.
- Enter logistical data change, add charges, or change rates.

Carrier Invoice: Detail View

In the *Detail* view of the carrier invoice, additional information is available, such as tax amount, and calculated and invoiced amounts.

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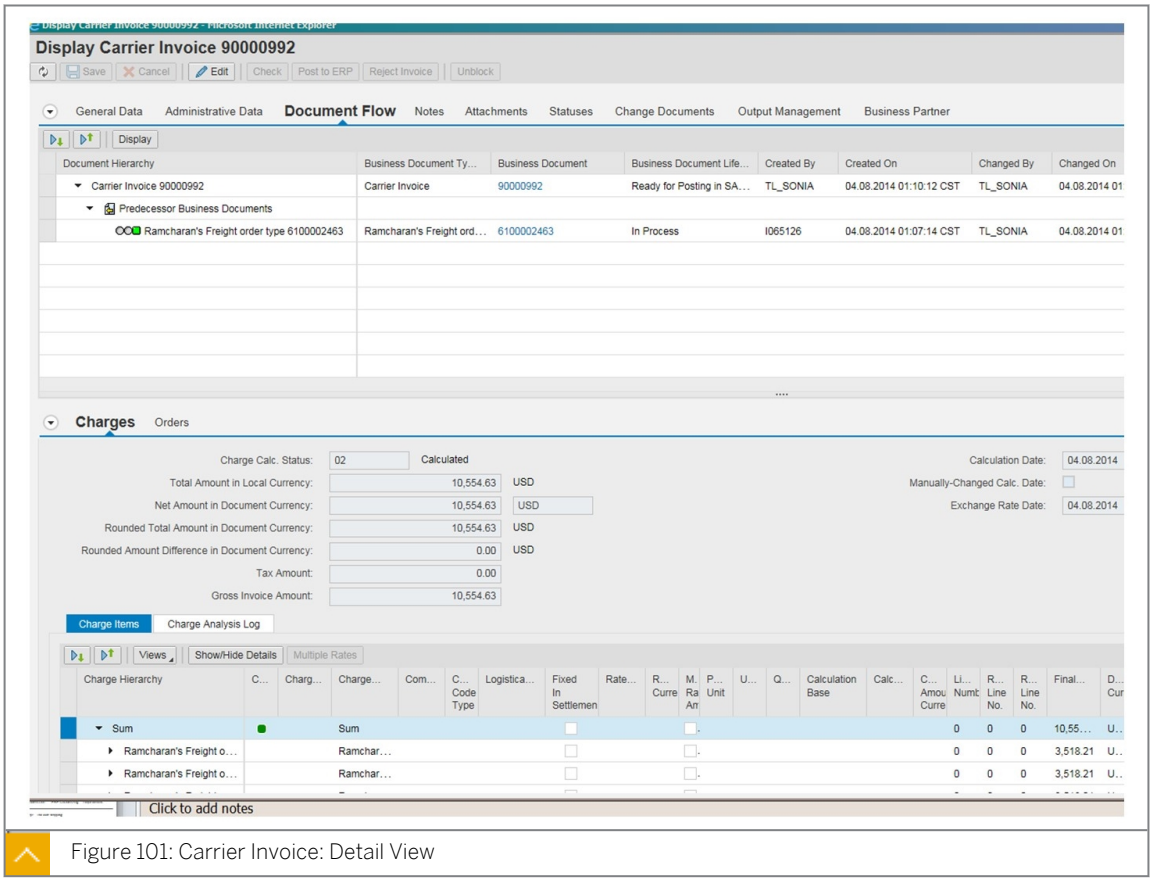

Figure 101: Carrier Invoice: Detail View

LESSON SUMMARY

You should now be able to:

- Verify Freight Invoices

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Correcting Freight Charges

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Manage Freight Charge Corrections

Freight Charge Correction

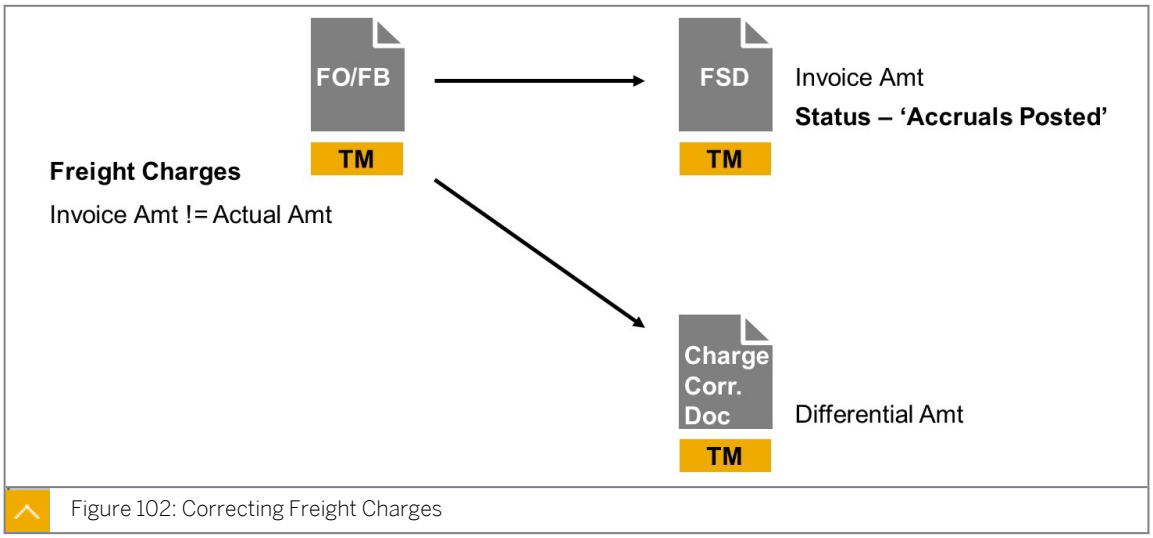

Figure 102: Correcting Freight Charges

After the posting of a freight settlement document (FSD), if the actual freight charges are identified as different, then a charge correction document can be created to correct the charges for the differential amounts.

The following charge correction documents are supported in SAP TM:

- *Credit memo (CM)*
- *Charge correction advice (CCA)*

Credit memos are used for charge correction on freight documents for all modes of transportation except air. For air freight processes (freight booking), a charge correction advice is used. Both of these two documents are freight settlement document of a specific category (CM & CCA). The category for a freight settlement can be set in the respective FSD Type customizing activity.

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Note:
As mentioned, both the Credit Memo and the CCA are FSD Types. That also means they have to be mapped to MM and the integration customizing activities have to be carried out as you learned in the Post FSD section of this course.

Credit Memo for Freight Orders

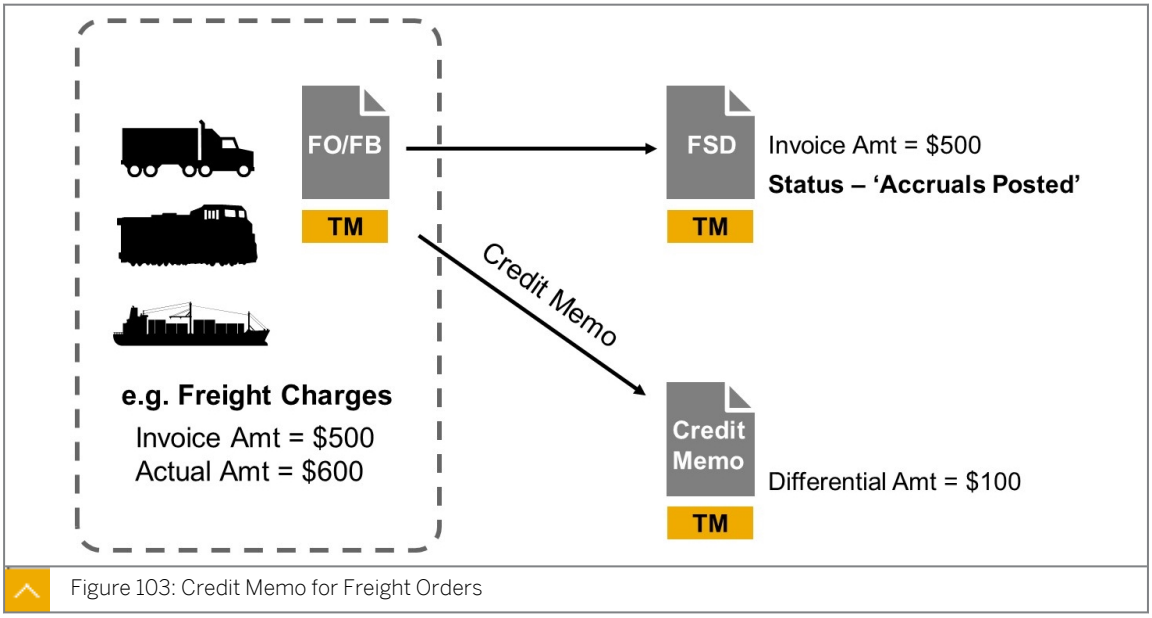

Figure 103: Credit Memo for Freight Orders

You can use a credit memo to get a credit from a carrier in a freight settlement when you have overpaid for transportation services. You use a freight order, freight booking, or service order as a reference when you create a freight credit memo.

Carrier Overcharge

A carrier could overcharge for transportation services in the following circumstances:

- The carrier demands an amount, which is over the current planned amount (and is above the tolerance).
- You demand a lower amount to be billed than what the carrier has billed you or is expecting.
- You expect credit from the carrier for the excess billing or the excess amount that you have paid the carrier.
- Reversal of the billing item/amount due to incorrect billing.

Credit Memo

You create a credit memo for an individual freight order, freight booking, or service order with relationship to the respective freight settlement documents or FSD items, in case of collective settlement, for these orders. You can access the credit memos from the freight settlement documents overview screen.

You can create a credit memo from a freight settlement document on the overview screen for the freight settlement documents.

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The system creates the credit memo based on the data in the associated freight settlement documents and displays the amount that has already been invoiced.

When you use the automatic change process, the system uses the existing freight settlement document to create a credit memo. This enables the system to process a large-scale change to the freight document charges, for example, a change in the agreement or in the calculation sheet, or the addition or deletion of a charge line.

Example Flow for Credit Memo Process

The change process "Reverse and Repost with new FSD" is used:

- In a freight order the transportation charges are 2000 USD. The FO is completely invoiced with a FSD as well a PO and SES in MM.
- Due to a granted discount from the carrier, the FO charges are reduced to 1800 USD. The FO is over-invoiced.
- The system creates a credit memo to reverse the current FSD and posts the CM to MM. Here a new PO and a SES with returns indicator are created.
- In the last step a new FSD for the updated amount of 1800 USD is created and posted to MM. A new PO and SES are created. The FO is in the status completely invoiced again.

As a result, the FO is linked to two FSDs, one CM and three SES in MM.

Note:
A credit memo can only be created for a freight document that has been invoiced completely and has the status Accruals Posted.

Prerequisites for creating a Credit Memo

- Types of credit memo and credit memo reason codes
  - In customizing, choose*Transportation Management → Settlement → Freight Settlement → Define Credit Memo Reason Codes and Types for Freight SDs.*
- Influence invoicing status
  - You can specify the Influence Invoicing Status setting in the relevant default credit memo type. When you create a credit memo, either manually or by using the background processing function, the credit memo has a role in determining the invoicing status of the freight orders, freight bookings, or service orders.
  - In customizing, choose *Transportation Management → Settlement → Freight Settlement → Define Credit Memo Reason Codes and Types for Freight SDs. → Define Credit Memo Types Influence Invoicing Status*.
- Automatically enter credit amount
  - When you specify that the system automatically enters the credit amount, the system automatically copies the remaining credit amount to the credit amount in a credit memo
  - In customizing, choose *Transportation Management → Settlement → Freight Settlement → Define Credit Memo Reason Codes and Types for Freight SDs. → Define Credit Memo Types Automatically Propose Credit Amount.*

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For invoice verification, in transaction MIRO, select *Credit Memo*. Then enter the freight order for which the credit memo was created. Enter the amount of the freight order and post the invoice. The credit memo is now verified. The status of credit memo is in SAP TM.

Dispute Management

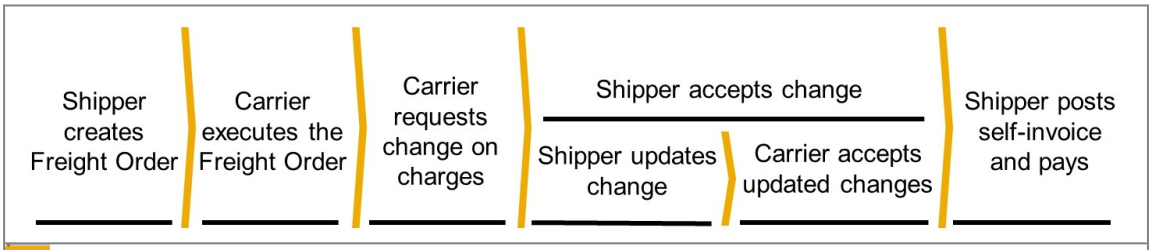

Figure 104: Dispute Management: High-Level Process

Freight dispute management is the process of resolving differences in logistics quantities and charges in a freight order (FO) or booking between a carrier or logistics service provider (LSP) and a requester of transportation services, such as a shipper or an LSP.

The expected charges of an FO are exposed on a portal (SAP LBN), which the carrier can access. The carrier can then verify relevant logistical data as well as charges. If the carrier wants to change or add data, it is then possible to create a dispute. The dispute can involve changes in logistics item quantities (such as weight, volume, and distance) or item charges (USD or hour), and can lead to changes in charge amounts in the FO.

Dispute management with self-billing can also be established between an LSP and a carrier or a carrier and another subcontracted carrier.

The figure, Dispute Management: High-Level Process, shows a common example.

The SAP Logistics Business Network can be seen as another UI for the SAP TM system. The carrier requires an onboarding process carried out by SAP and a user ID and password for logging on.

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Dispute Management for Self-Billing: Detailed Process Flow

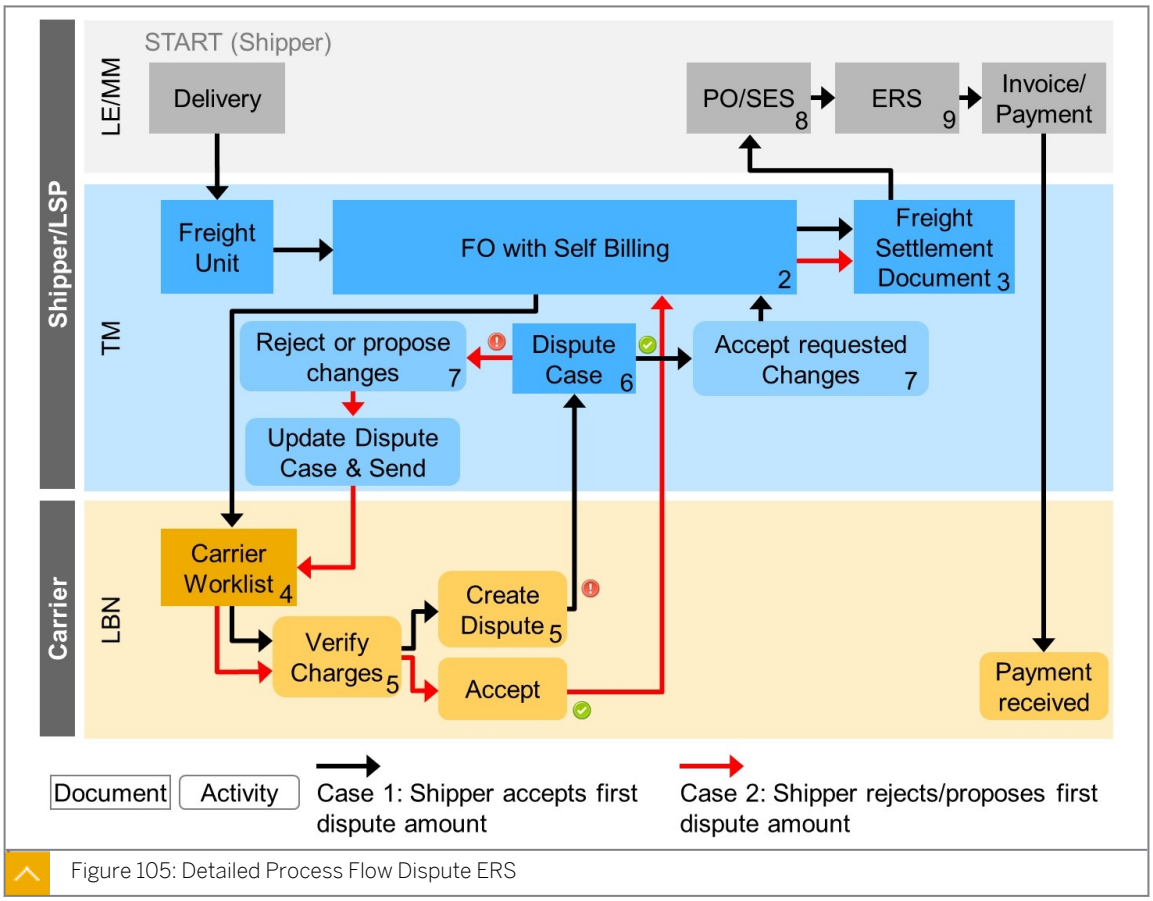

Figure 105: Detailed Process Flow Dispute ERS

1. A Delivery is created in SAP S4 Logistics Execution by the shipper. This triggers the creation of a Freight Unit in TM.
2. The Freight Unit is planned in SAP TM, resulting in an freight order or freight booking. In this scenario, self-billing is enabled for the carrier.
3. A freight settlement document (FSD) is created and charges are accrued in SAP MM. A purchase order (PO) and service entry sheet (SES) are created in MM. During this process, the shipper or LSP may have agreed a time period with the carrier, within which the carrier can make changes or raise a dispute. If necessary, the FSD can be created after the time period has elapsed to avoid multiple updates to MM. For example, if the shipper has an agreement with the carrier that the carrier has up to three days to confirm or update the FO after the execution, then an FSD can be created after this period has elapsed.
4. Simultaneous to step 3, upon calculating the FO charges, the shipper exposes the FO in the Logistics Business Network (LBN) for the carrier to verify.
5. The carrier verifies the charges and can also add additional charges (e.g. a detention charge). If a mismatch is found or due to the addition of charges, the carrier creates a change request (or *dispute*) for the logistical or charge data, and then submits the changes for approval. The carrier can also capture the reason and upload files as justification.

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6. On submission, a dispute case is created in SAP TM, which captures the dispute data. Technically, the FO in the SAP TM system is the basis for comparing the charges (what the carrier claims versus what the shipper expected to pay). If any deviation is found, the dispute case is created. Tolerance rules, if defined by shipper, will run on the charge dispute item. This enables automatic acceptance of a dispute without any manual intervention. If workflow is enabled, a work item is also created in case tolerance rules fail, enabling the shipper to take further action. Even if workflow is not enabled, the shipper can see and access the dispute cases via a dedicated personal worklist.
7. The shipper can accept or reject the charges and propose new charges. There can be multiple iterations of negotiation between the shipper and the carrier until they reach a consensus. (After the shipper proposes new charges, the carrier can edit the proposal and further action by the shipper is required.) As soon as the dispute is resolved, the FO is updated, and the FSD can be created. (The creation of the FSD depends on whether or not it was already created before the dispute case.)
8. The updated FSD updates the PO and SES in SAP MM with the revised charges using the FSD change process setting strategy in the settlement profile:
   - *Create new FSD for delta-amount*.
   - *Reverse and repost with new FSD*.
9. An evaluated receipt settlement (ERS) process runs in SAP MM. During this process, a self-invoice is created and payment is made to the carrier for the service provided.

Note:
The straightforward process of self-billing with no dispute raised by the carrier is described. The step “Accept” on the carrier side is only required, and only possible if a dispute has been created beforehand and the shipper has proposed updates or rejected the case.

Business Scenario Examples

In this section, we look at examples of common disputes that arise between shipper and carrier.

Table 13: Business Scenario Examples

Scenario	Example
Automatic tolerance acceptance	The carrier raises a dispute about the logistical data, for example, the gross weight is 5500 KG instead of 5000 KG, which results in the base freight value increasing from 500 USD to 550 USD. The dispute case is automatically approved by tolerance rules set by the shipper.

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Scenario	Example
Dispute on unplanned costs	The carrier raises a dispute to charge the shipper for detention or demurrage. The tolerance defined by the shipper fails to approve the dispute and triggers the workflow. The shipper accepts that there was a detention or demurrage and manually approves the dispute.
Dispute on revised rate amount	The carrier feels that the rate for base freight is incorrect and raises a dispute with revised rates. The shipper then proposes a new rate with the carrier. The carrier then can either accept the new rate or start a second round of negotiation.
Dispute on manual charge coming from an agreement	The carrier raises a dispute on the manual charge coming from the agreement. In the agreement, loading charges of 100 USD per hour are defined. If according to the shipper, loading took 4 hours, the final amount is 400 USD in the FO. The carrier can raise a dispute on QTY (hours), RATE (total rate), or both (but not on Price per unit).
Reject a dispute	If a shipper rejects a dispute case, the carrier can accept the rejection or propose a new amount and re-submit it to the shipper via the Logistics Business Network.
Mixed Scenario	The shipper can accept, reject, and propose some or all of the charge dispute items.

LESSON SUMMARY

You should now be able to:

- Manage Freight Charge Corrections

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Learning Assessment

1. Which of the following statements about freight settlement documents (FSDs) are correct?

   Choose the correct answers.

   - [ ] **A** An FSD is a business document that is sent to SAP MM requesting the verification of an invoice received from a supplier or carrier.
   - [ ] **B** You can create a collective FSD for multiple freight orders or freight bookings.
   - [ ] **C** The FSD calculates the transportation charges.
   - [ ] **D** An FSD is sent to SAP SD to request the creation of an invoice to be sent to a customer.

2. During freight settlement, a separate FSD is created for every freight order.

   Determine whether this statement is true or false.

   - [ ] True
   - [ ] False

3. Which of the following business documents are created when posting a freight settlement document?

   Choose the correct answers.

   - [ ] **A** Sales Order
   - [ ] **B** Purchase Order
   - [ ] **C** Service Entry Sheet
   - [ ] **D** Delivery

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4. In SAP TM, there are a number of steps required to configure the settings for freight settlement. In what order should they be completed?

   Arrange these steps into the correct sequence.

   ☐ Define freight settlement document types.

   ☐ Assign settlement profile to purchasing organization.

   ☐ Assign FSD type to FO/FB types.

   ☐ Define number range intervals.

   ☐ Define settlement profiles.

5. When configuring the mapping for freight settlement in SAP TM and MM, in what order should the following steps be performed?

   Arrange these steps into the correct sequence.

   ☐ Map the TM charge types to the service master.

   ☐ Map organizations in SAP S/4HANA.

   ☐ Enable invoice verification.

   ☐ Map transportation charge types between SAP TM and SAP MM.

   ☐ Configure automatic determination of G/L account.

6. Once the lifecycle status of the FSD is invoice-verified, it is possible to cancel the invoice.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

7. When using the Evaluated Receipt Settlement process, an invoice sent by the carrier is no longer required.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

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8. A credit memo can only be created for a freight document that has which of the following statuses?

   Choose the correct answer.

   - ☐ **A** Accruals Posted
   - ☐ **B** Invoice Verified
   - ☐ **C** Canceled
   - ☐ **D** Invoice Canceled

9. What functionality is triggered in the SAP LBN if the carrier changes or adds data in relation to charge amounts?

   Choose the correct answer.

   - ☐ **A** Dispute Management
   - ☐ **B** Invoice Payment
   - ☐ **C** Freight Procurement
   - ☐ **D** Tracking and Tracing

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Learning Assessment - Answers

1. Which of the following statements about freight settlement documents (FSDs) are correct?

   Choose the correct answers.

   - [X] A An FSD is a business document that is sent to SAP MM requesting the verification of an invoice received from a supplier or carrier.
   - [X] B You can create a collective FSD for multiple freight orders or freight bookings.
   - [X] C The FSD calculates the transportation charges.
   - [ ] D An FSD is sent to SAP SD to request the creation of an invoice to be sent to a customer.

   Correct. An FSD is a business document that is sent to SAP MM requesting the verification of an invoice received from a supplier or carrier. You can create a collective FSD for multiple freight orders or freight bookings and the FSD calculates the transportation charges.

2. During freight settlement, a separate FSD is created for every freight order.

   Determine whether this statement is true or false.

   - [ ] True
   - [X] False

   Correct. Collective settlement is also supported.

3. Which of the following business documents are created when posting a freight settlement document?

   Choose the correct answers.

   - [ ] A Sales Order
   - [X] B Purchase Order
   - [X] C Service Entry Sheet
   - [ ] D Delivery

   Correct. A purchase order and a service entry sheet are created after posting the FSD.

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4. In SAP TM, there are a number of steps required to configure the settings for freight settlement. In what order should they be completed?

   Arrange these steps into the correct sequence.

   [4] Define freight settlement document types.

   [2] Assign settlement profile to purchasing organization.

   [5] Assign FSD type to FO/FB types.

   [3] Define number range intervals.

   [1] Define settlement profiles.

   Correct. First, you should define settlement profiles. Second, you should assign the settlement profile to the purchasing organization. Third, you define number range intervals. Fourth, you define freight settlement document types. Finally, you assign the FSD type to FO/FB types.

5. When configuring the mapping for freight settlement in SAP TM and MM, in what order should the following steps be performed?

   Arrange these steps into the correct sequence.

   [3] Map the TM charge types to the service master.

   [1] Map organizations in SAP S/4HANA.

   [5] Enable invoice verification.

   [2] Map transportation charge types between SAP TM and SAP MM.

   [4] Configure automatic determination of G/L account.

   Correct. First, you should map organizations in SAP S/4HANA. Second, you should map transportation charge types between SAP TM and SAP MM. Third, you map the TM charge types to the service master. Fourth, you configure automatic determination of G/L account. Finally, you enable invoice verification.

6. Once the lifecycle status of the FSD is invoice-verified, it is possible to cancel the invoice.

   Determine whether this statement is true or false.

   [ ] True

   [X] False

   Correct. Once verified, the invoice cannot be canceled anymore and a freight charge correction process has to be triggered.

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7. When using the Evaluated Receipt Settlement process, an invoice sent by the carrier is no longer required.

   Determine whether this statement is true or false.

   - [ ] True
   - [X] False

   Correct. When using ERS, the system generates the corresponding invoices and post them automatically.

8. A credit memo can only be created for a freight document that has which of the following statuses?

   Choose the correct answer.

   - [X] A Accruals Posted
   - [ ] B Invoice Verified
   - [ ] C Canceled
   - [ ] D Invoice Canceled

   Correct. A credit memo can only be created for a freight document that has been invoiced completely and has the status Accruals Posted.

9. What functionality is triggered in the SAP LBN if the carrier changes or adds data in relation to charge amounts?

   Choose the correct answer.

   - [X] A Dispute Management
   - [ ] B Invoice Payment
   - [ ] C Freight Procurement
   - [ ] D Tracking and Tracing

   Correct. Changing or adding charge data triggers the dispute management to resolve differences in logistical data between carrier and shipper.

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UNIT 5 Transportation Cost Distribution

UNIT OBJECTIVES

- Distribute Freight Costs
- Understand Cost Distribution in Settlement Document
- Bill Freight Costs in SD

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Unit 5
Lesson 1

Distributing Freight Costs

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Distribute Freight Costs

Cost Distribution

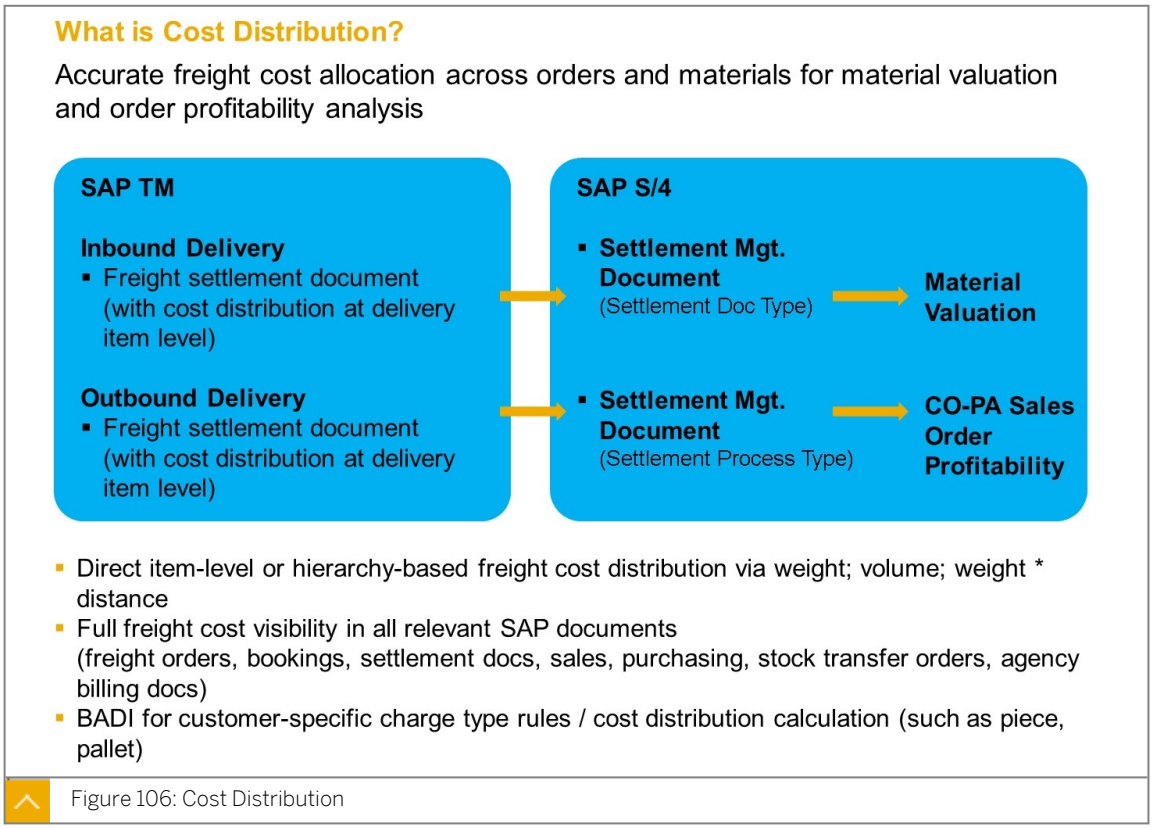

Figure 106: Cost Distribution

Cost distribution takes place in a freight order (FO), a freight booking (FB), or a freight settlement document (FSD). Posting of the distributed cost to SAP S/4 HANA is done with the freight settlement document (FSD).

In the shipper scenario, the distribution level is set to ERP item (Order/ Delivery item). In the logistics service provider (LSP) scenario (for cost-based internal settlement), the distribution level is set to forwarding order.

Cost Distribution Steps

Cost distribution involves the following steps:

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1. Distribution of the freight costs at the level of delivery items based on some rules, such as *Weight of the Delivery items*. This step is executed in SAP TM.
2. Processing of the distributed freight costs in the financials for either processing the freight cost for material valuation or for expensing at the product level. This step is executed in the respective SAP S/4 HANA modules.

For example, the inbound delivery freight cost is typically posted for material valuation. Outbound delivery costs are posted to cost objects or modules, such as CO-PA segments from the sales order, to calculate the profitability during sales order processing.

Freight Cost Posting via Settlement Management Integration

SAP TM uses SAP S/4 HANAs LO Settlement Management module for distributed freight cost posting.

Settlement Management provides a flexible posting engine where you can define the type of processing that is carried out from a financial processing perspective via customizing. SAP TM uses this posting engine to hand over the distributed freight cost to SAP S/4.

The Settlement Management document provides a documented way of posting distributed freight costs in SAP S/4.

The Settlement Management document item created for TM freight cost postings has references to the following:

- Order and order item – sales order, purchase order, or stock transfer order and the corresponding item reference.
- Delivery and delivery item – Inbound or outbound delivery and the corresponding item references. During order and delivery integration processing, SAP TM transfers these references.
- Service purchase order – The service purchase order (for freight cost), linked to the FSD integration with SAP MM.
- TM freight settlement document (FSD)
- TM freight order (FO)

Settlement Management provides native integration to financial functions, such as financial accounting, controlling, CO profitability analysis, material valuation, and material ledger. For example, based on a given reference document, you can specify that the freight cost processing should be posted to the material account.

Settlement documents do not create or update any accounts receivables or accounts payables. The document is used only for material adjustment postings to either expense general ledger (G/L) accounts or to material accounts.

Document Types in Freight Cost Posting

For posting freight costs, SAP LO Settlement Management uses the following document types:

1. Settlement Document Generic: This document type enables you to post freight costs to material valuation.
2. Settlement Process Type: This document type enables you to post freight costs to the GL accounts.

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Existing processes in Settlement Management and posting options are determined via use case types and document categories during mapping for cost distribution.

Customer Scenarios: Examples

The following are examples of customer scenarios:

SAP S/4 HANA Integration

- Transfer transportation cost as a delivery cost for the inbound material (material-level tracking).

  The transportation cost flows to material valuation. The freight cost transfer as delivery cost is not updated in the purchase order of the material. The delivery cost posting is achieved via the posting carried out by the Settlement Management document.

- Post the cost back to CO objects linked from order/delivery/material.

  The material-relevant costs are tracked directly down to the CO objects from the transactions but more likely at an aggregated level, not necessarily at material level. That is, there is no material valuation update. For example, all material-relevant costs, including indirect costs such as transportation, are tracked at the profit center level. Costs are segregated based on material movements (inbound, inter/intra, and customer deliveries).

- Post cost back to the sales order /CO-PA responsible for the delivery (outbound scenario).

  This scenario occurs on the seller's side. Costs associated with the sales order directly are tracked and have an impact on profitability analysis (CO-PA) segments.

Customer Scenario: Goods Calculation

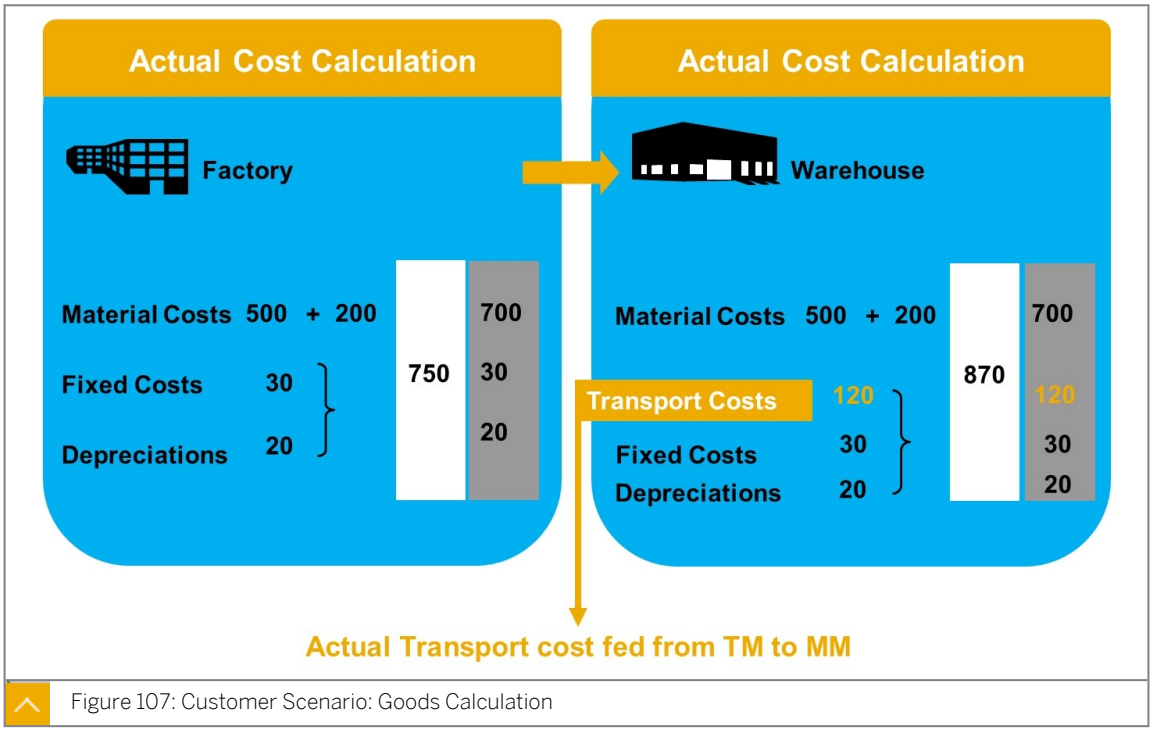

Figure 107: Customer Scenario: Goods Calculation

In the example in the figure, we see how the final cost of a finished good is calculated.

Before the finished good leaves the factory, the material cost consists of different cost components, such as the cost of material and manufacturing overheads. In CO-PA, some

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other costs can be displayed, such as fixed costs based on material costs or depreciations, and so on.

In the case of a stock transfer order where finished goods are moved from the manufacturing plant to an external warehouse, a transportation cost is incurred. Cost distribution is required to assign this cost to the responsible material.

The material in the external warehouse is charged with the transportation costs based on a certain distribution key, such as weight or volume.

The scenario illustrates how the freight cost distribution functionality allocates the freight cost to the level of material and then processes the cost for material valuation. This is one example where the TM freight cost distribution functionality plays a role in allocating the freight cost to the level of material from the freight orders, before processing this cost information for material valuation.

From the example, you can extrapolate that the material cost valuation increased from $750 to $870, including the $120 actual transport cost from SAP TM. This $120 represents the distributed cost for a given material in a transport. If the material valuation type is set to *moving average*, the cost increases upon receipt of the product. If the material valuation type is set to *standard pricing* the cost does not change until the next valuation run.

Freight Cost Distribution Process

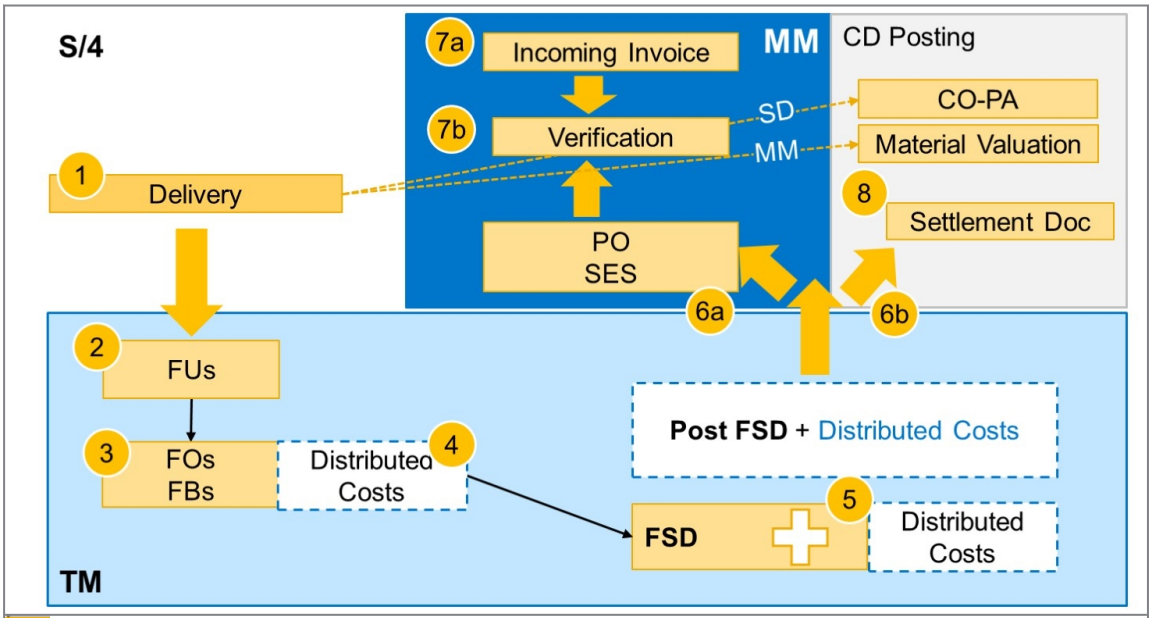

Figure 108: Freight Cost Distribution Process S/4 (Shippers Scenario)

1. In SAP LE, create a delivery.
2. In SAP TM, based on the delivery, freight units (FUs) are created in the background.
3. The freight units are assigned to certain freight orders (FOs) or freight bookings (FBs) for subcontracting to a carrier (air/ocean/land) and charge calculation.
4. In SAP TM, create a freight settlement document (FSD) to post to SAP S/4 for invoicing and cost distribution.
5. In SAP TM, cost distribution occurs in the FSD based on certain distribution rules such as weight, volume, distance-times-weight, or a customer-specific rule such as the number of product pieces in an SD order item.

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6. Send the FSD containing all the freight costs and the distributed freight cost details to SAP S/4. Here the following two process subsets are executed:
   - The overall freight costs are posted to SAP Materials Management (MM) (step 6a in the figure) where a purchase order and a service entry sheet (SES) are created.
   - The distributed freight costs from the FSD are transferred to the settlement management posting engine in SAP S/4 for posting to the responsible cost collector (step 6b in the figure). Based on information such as an SD order item, the settlement management distributes the cost to the appropriate cost object in Controlling or to CO-PA. In the case of inbound deliveries for purchase orders or stock transfer orders, the freight cost may be posted to material valuation and to different CO object-level cost centers, determined from the production order or stock transport order. This step takes place in the background. In SAP S/4, you can monitor this event using transaction `WLFLTM2` or the Fiori Launchpad and view the list of such freight cost documents.
7. In SAP MM, based on the purchase order with a service entry sheet (SES), an incoming carrier invoice is verified and posted using transaction `MIRO`. Any deviation in the verification will create a new Adjustment settlement management document for the difference. The adjustment document uses the same splitting logic as the original document for the planned costs coming from SAP TM. (See step 7a and step 7b in the figure)

Distributed Freight Costs Posting

Inbound Freight Cost Posting

2a. Freight Settlement Document (FSD) (Step 6a)	Freight Clearing Account (GBB)		GR/IR Freight (WRX)	
	100			100
2b. Settl. Mgt. posting for distributed costs (Step 6b)	**Freight Clearing Account (FR1)**		**BSX/PRD Inventory or Material Price difference**	
for Mat 1		50	50	
for Mat 2		30	30	
for Mat 3		20	20	

Outbound Freight Cost Posting

2a. Freight Settlement Document (FSD) (Step 6a)	Freight Clearing Account (GBB)		GR/IR Freight (WRX)	
	100			100
2b. Settl. Mgt. posting for distributed costs (Step 6b)	**Freight Clearing Account (FR1)**		**Freight Expense Account (FRE)**	
for Mat 1 / Delivery 1		50	50	
for Mat 2 / Delivery 1		30	30	
for Mat 3 / Delivery 2		20	20	

Figure 109: Typical Posting Pattern for FSD and Cost Distribution

The figure shows an example of a typical posting pattern. The setup has to ensure the following:

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1. From a financial posting perspective, at the material level, there are two steps in the process of posting freight costs to either material valuation or GL account. In the first step (2a in the figure), the total freight costs are posted to an intermediate account, such as a freight clearing account. In the second step (2b in the figure), the amounts are moved from the freight clearing account to the material or GL (expense) account, based on material information from the relevant sales, purchase, or stock transfer orders.
2. The account posting key GBB, which is set up for the FSD, should point to the freight clearing account (transaction `OBYC`).
3. The step 6b is derived from the Settlement Management postings setup.
   a. In case of inbound freight cost posting, the VBD setup picks up the freight clearing entry based on the account key maintained in the pricing schema (see example WT0001). The inventory posting account is determined by the material and its attributes, and determine whether it is posted to BSX or PRD.
   b. For outbound freight cost posting, the settlement document picks up both the accounts from the pricing schema. The freight clearing account is picked up from the account key accrual field, and the freight expense account from the accounting key. (For example, see pricing schema WT0002.)
4. For outbound freight cost posting, if the freight cost components are to be posted to different GL accounts, then map TM charge types to both the condition types (which are SAP MM conditions) and the account posting keys that were set up for the settlement document type. (For example, see pricing schema WT0002.)

Cost Distribution Configuration TM

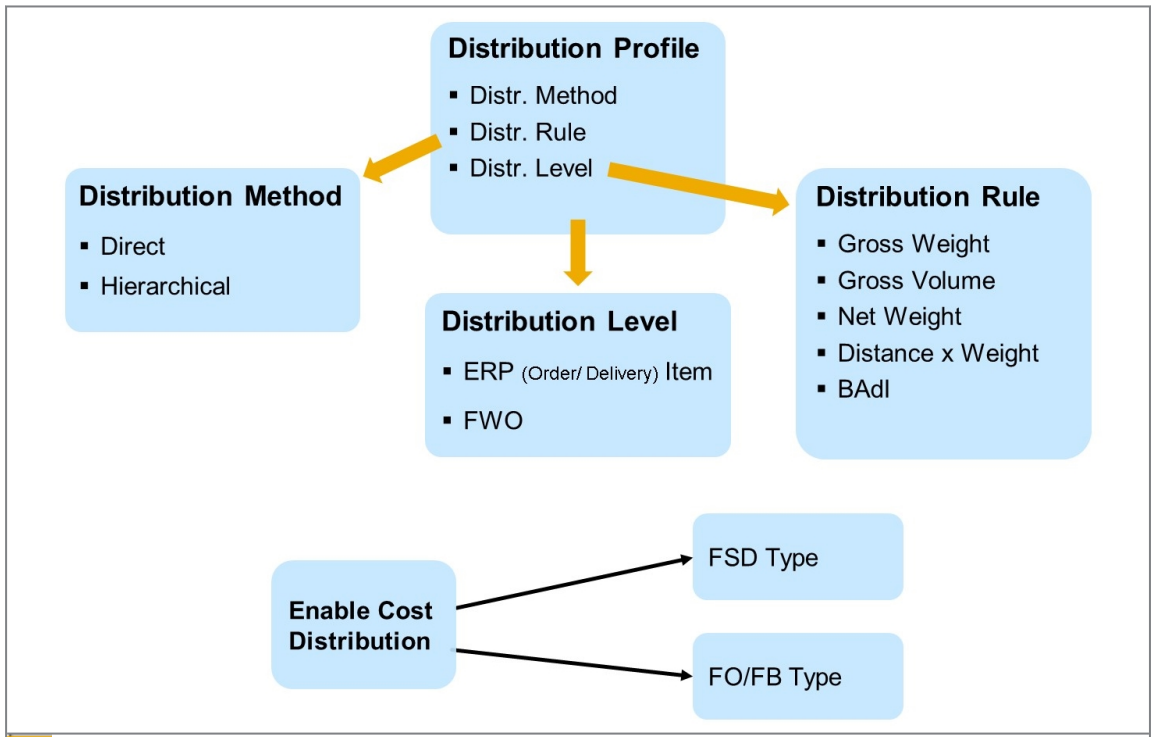

Figure 110: SAP TM Cost Distribution Configuration – Overview

Cost Distribution Configuration

Cost distribution configuration consists of the following:

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- Defining cost distribution methods
- Assigning cost distribution methods to distribution profiles
- Defining the organizational unit settings for charge calculation
- Enabling the freight settlement and freight order/booking types for cost distribution

Step 1: Define Cost Distribution Methods

Distribution Method	Distribution Class
DIRECT	/SCMTMS/CL_TCD_ALLOC_CHRG_DIR
HIERARCHICAL	/SCMTMC/CL_TCD_ALLOC_CHRG_HIE

Figure 111: TM Cost Distribution Configurations

In Customizing, choose *Transportation Management* → *Basic Functions* → *Cost Distribution* → *Define Cost Distribution Methods*.

In the *Define Cost Distribution Methods* customizing activity, you assign a distribution method to a distribution class, in which you have specified your own distribution logic. This enables you to specify your own distribution method for cost distribution.

The standard settings deliver two default methods: direct distribution and hierarchical distribution.

If required, you can add your own distribution methods in this customizing activity.

Direct Distribution

Profile	Distr. Method	Distr. Rule	Distr. Lvl
DIR_ITEM	DIRECT	Gross Weight	ERP Item

- **Charge Type: Applicable to the whole document**
- **Calc. Resolution Base = Root**
- **Total Freight Cost = USD 2000**

Example data from FSD:

Item Hierarchy	Item	Gr Wt (kg)	Tare Wt (kg)
Container	10	7500	3000
Package	20	4250	250
Product	30	1500	0
Product	40	2500	0
Package	50	250	250
Container	60	2000	2000

In a direct distribution method for product 40, the system performs the following calculations:

Step 1:

- **Product 30 = 1500 kg**
- **Product 40 = 2500 kg**

The distribution for product 40 is 2500 kg/ (1500 kg + 2500 kg) * USD 2000 = USD 1250

Figure 112: Example of a Direct Distribution Method

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In a direct distribution, the system distributes costs according to the attributes you specify in the distribution rule and distribution level, without reference to where in the item hierarchy you package a product. For example, if you specify a distribution rule of Gross Weight and a distribution level of ERP Item, the system uses the gross weight of the ERP item in the cost distribution, regardless of where the ERP item appears in the item hierarchy of the freight order or freight booking.

In the example in the figure, the distribution method is set to *Direct*, the distribution rule is *Gross Weight*, and the distribution level is *ERP Item* (that is, the product).

In a direct distribution for product 40, the system performs the following calculations:

Product 30 = 1500 kg.

Product 40 = 2500 kg.

The distribution for product 40 is 2500 kg/ (1500 kg+ 2500 kg) * USD 2000 = USD 1250.

In general, whether it is hierarchical or direct distribution, costs are applied to those products that are accruing costs. For example, there is a freight order with two stages, and in the charge management master data, the calculation resolution base for basic charges is defined as STAGE. This means for that freight order, each stage is calculated separately. As this freight order has two stages, the basic charges are calculated twice. Then during cost distribution, the basic charges of each stage are allocated to only those products that are being transported on that specific stage. Therefore, costs accruing on the first stage are allocated to the products that are transported on the first stage. The same applies to the second stage.

Hierarchical Distribution

Profile	Distr. Method	Distr. Rule	Distr. Lvl
HIE_ITEM	HIERARCHICAL	Gross Weight	ERP Item

- **Charge Type: Applicable to the whole document**
- **Calc. Resolution Base = Root**
- **Total Freight Cost = USD 2000**

Example data from FSD:

Item Hierarchy	Item	Gr Wt (kg)	Tare Wt (kg)
Container	10	7500	3000
Package	20	4250	250
Product	30	1500	0
Product	40	2500	0
Package	50	250	250
Container	60	2000	2000

In a hierarchical distribution method for product 40, the system performs the following calculations:

Step 1:

- **Container 10 = 7500 kg**
- **Container 60 = 2000 kg**

The distribution for container 10 is 7500 kg/ (7500 kg + 2000 kg) * USD 2000 = USD 1578.95

Step 2:

- **Package 20 = 4250 kg**
- **Package 50 = 250 kg**

The distribution for package 20 is 4250 kg/ (4250 kg + 250 kg) * USD 1578.95 = USD 1491.23

Step 3:

- **Product 30 = 1500 kg**
- **Product 40 = 2500 kg**

The distribution for product 40 is 2500 kg/ (2500 kg + 1500 kg) * USD 1491.23 = USD 932.02

Figure 113: Example of a Hierarchical Distribution Method

In the hierarchical distribution method, the system uses a step-by-step approach to take each level of the packaging hierarchy into account in the cost distribution. For example, if you

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specify a distribution rule of *Gross Weight* and a distribution level of *ERP Item*, the system uses the gross weight at each level of the item hierarchy to distribute the higher-level costs to the ERP item level. The system takes into account the tare weight of the packaging in the packaging hierarchy.

In the figure, you can see a a table containing an example of data from a freight settlement document. In this example, the cost distribution is done first to move all Root (header) level charges of the freight order to the containers. Then the cost is distributed from each of the container items to the packages in the container, and finally to the product.

You perform a cost distribution for product 40. You specify a distribution level of *ERP Item* and a distribution rule of *Gross Weight*. The charge type is applicable to the whole document, with a calculation resolution base of root. The total freight cost is USD 2000.

In a hierarchical distribution for product 40, the system performs the following calculations:

Step 1

Container 10 = 7500 kg.

Container 60 = 2000 kg.

The distribution for container 10 is 7500 kg/(7500 kg+2000 kg) * USD 2000 = USD 1578.95.

Step 2

Package 20 = 4250 kg.

Package 50 = 250 kg.

The distribution for package 20 is 4250 kg/(4250 kg+ 250 kg) * USD 1578.95 = USD 1491.23.

Step 3

Product 30 = 1500 kg.

Product 40 = 2500 kg.

The distribution for product 40 is 2500 kg/(2500 kg+ 1500 kg) * USD 1491.23 = USD 932.02.

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Step 2: Define Cost Distribution Profile

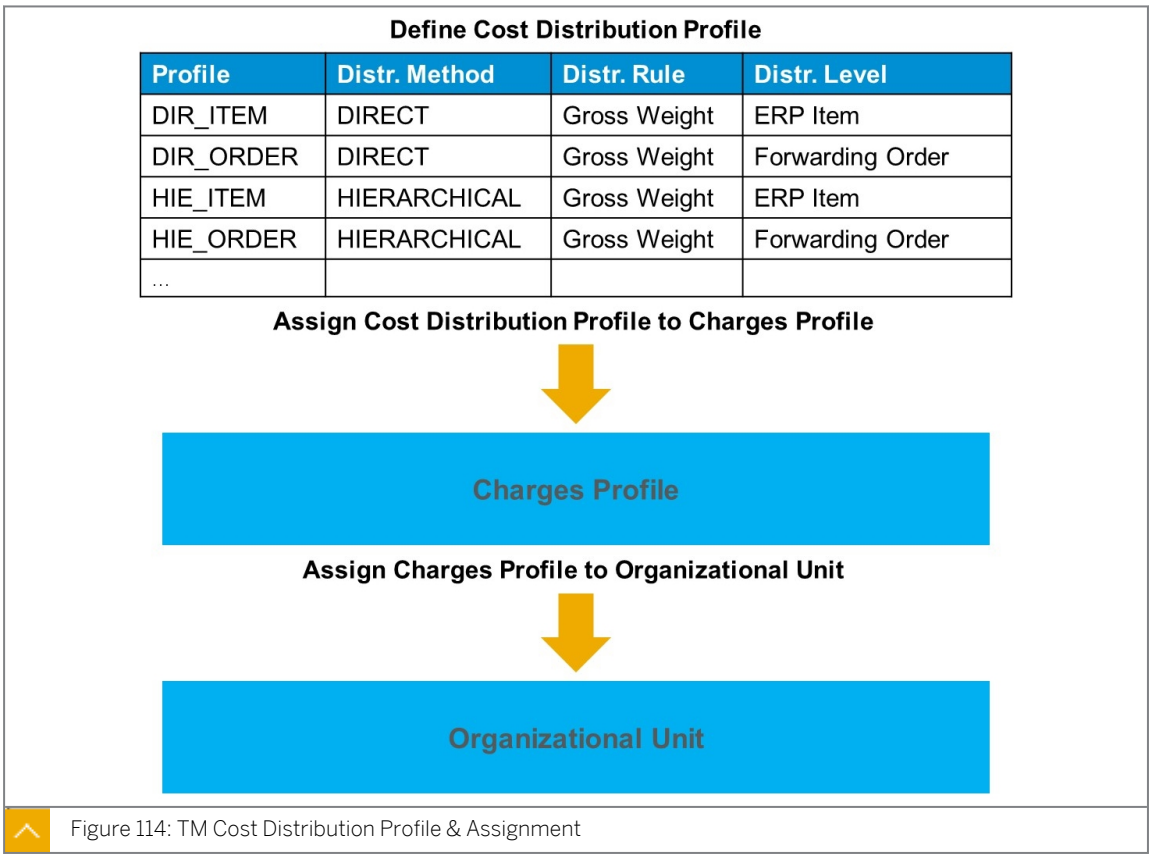

Figure 114: TM Cost Distribution Profile & Assignment

In Customizing, choose *Transportation Management → Basic Functions → Cost Distribution → Define Cost Distribution Profiles*.

In this Customizing activity, you specify the settings you want the system to use to perform cost distribution in a freight order, freight booking, or freight settlement document. You can specify the following settings:

- Distribution Method - Specifies the analysis approach the system takes in performing a cost distribution.
- Distribution Rule - Specifies the criteria the system uses to perform a cost distribution. Criteria can include gross weight, net weight, gross volume, distance times weight, and a custom rule (based on a BAdI).
- Distribution Level - Specifies the target level to which the system allocates costs for a freight order or freight settlement document (FWO or ERP Item).

Step 3: Assign the Cost Distribution Profile to the Organizational Unit

In the *Charge Calculation* customizing activity, you can assign the distribution profile to the organizational unit for charge calculation.

In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charges Profiles*.

Step 4: Assign Charges Profile to Organizational Unit

Assign the charges profile to the purchasing organization in transaction *PPOME*.

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Step 5: Enable Cost Distribution in Document Types

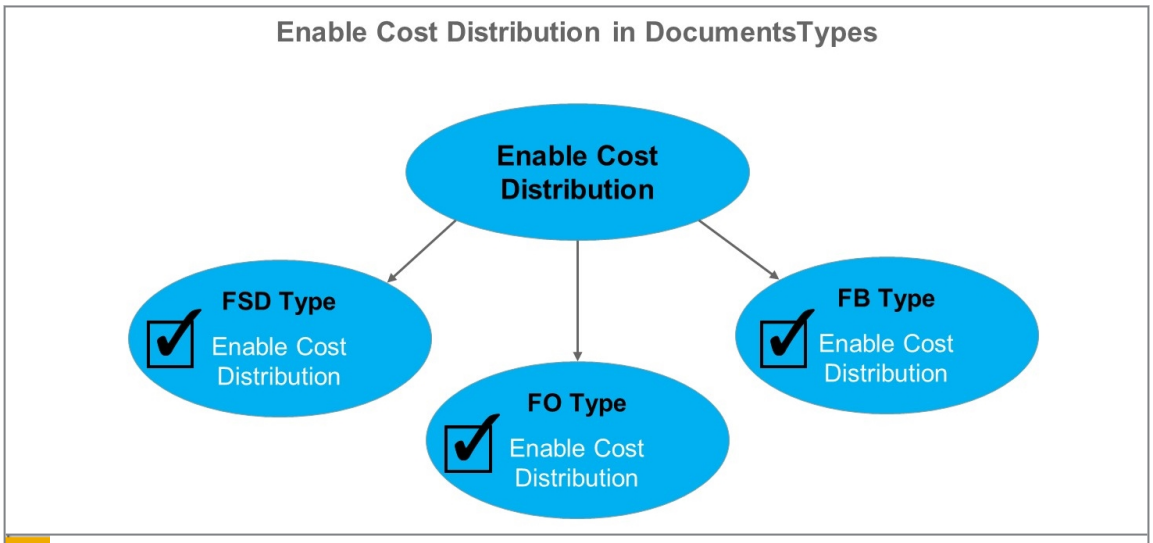

Figure 115: Cost Distribution Enablement

Cost distribution takes place in the freight order (FO), the freight booking (FB), and the freight settlement document (FSD).

The posting of distributed costs to SAP S/4 is done with the FSD.

Cost Distribution Enablement

To enable cost distribution, choose one of the following paths in Customizing:

- FSD type:

  Transportation Management → Settlement → Freight Settlement → Define Freight Settlement Document Types.

- Freight order type:

  Transportation Management → Freight Order Management → Freight Order → Define Freight Order Types.

- Freight booking type:

  Transportation Management → Freight Order Management → Freight Booking → Define Freight Booking Types.

Customer-specific Cost Distribution Settings

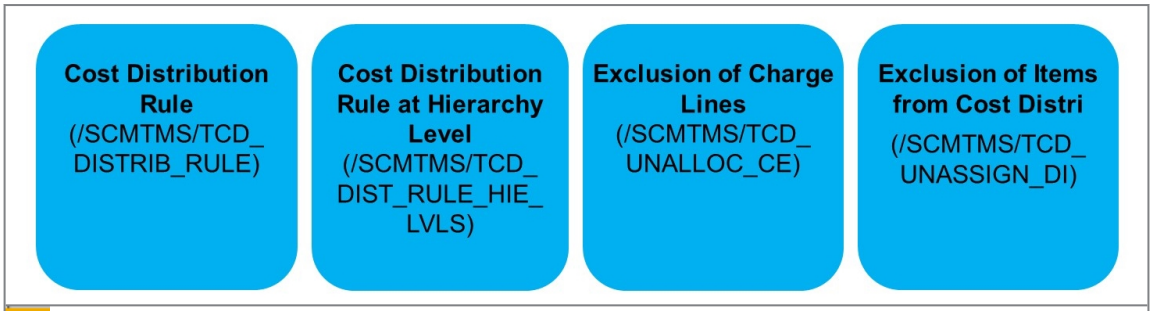

Figure 116: Cost Distribution – BAdIs in SAP TM

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SAP Business Add-Ins (BAdIs) for Cost Distribution

SAP Business Add-Ins (BAdIs) are used to adapt SAP TM to specific cost distribution requirements:

- Cost distribution rule (/SCMTMS/TCD_DISTRIB_RULE)

  You can use this BAdI to perform the following tasks:

  - Overwrite the distribution rule for the individual charge types provided in the Define Cost Distribution Profiles Customizing activity (the standard distribution rule in the Customizing activity covers all charge types in a business document). For example, you can specify a distribution rule for gross volume instead of gross weight for an individual charge type.
  - Provide your own distribution rule for any quantity field.

- Cost distribution rule at hierarchy level (/SCMTMS/TCD_DIST_RULE_HIE_LVLS)

  You can use this BAdI to specify a different distribution rule at each level of a hierarchical distribution. For example, in a freight order for a trailer, you can use one rule for the trailer, another rule for the packages in the trailer, and another rule for the products in the packages.

- Exclusion of charge lines (/SCMTMS/TCD_UNALLOC_CE)

  - You can use this BAdI to prevent the system from distributing charge lines during a cost distribution analysis. The system stores these items as unallocated.
  - The system calls this BAdI before it runs the distribution logic on charge lines.

- Exclusion of Items from a Cost Distribution (/SCMTMS/TCD_UNASSIGN_DI)

  - You can use this BAdI to change the way the system distributes costs for one or more distribution items in a freight document.
  - The system does not allocate a cost to one or more distribution items that you exclude from a cost distribution in a freight document, such as a freight order. Instead, the system allocates the cost to the remaining distribution items in the freight document.

You can activate the BAdI implementations in Customizing.

In Customizing, choose *Transportation Management → Business Add-Ins (BAdIs) for Transportation Management → Basic Functions → Cost Distribution*.

For information about implementing BAdIs as part of the enhancement concept, see SAP Library under *BAdIs - Embedding in the Enhancement Framework*.

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Cost Distribution S4 Mapping Configuration

Map Transportation Charge for Cost Distribution

Cat.Code	Subcat. Cd	Charge Code	Sales Cnd.Type	Purchase Cnd.Type
001	120000	OCEAN_FREIGHT		WTF2
001	100000	BAF		WTF1
001	100000	CAF		WTF1

Mapping of TM Charge Types to MM Condition Types

Sales Condition Types (SD) – optional

Purchase Condition Types (MM)

Figure 117: Cost Distribution Charge Type Mapping

In the *Assign Transportation Charge Types to Condition Types* Customizing activity, you can assign a transportation charge types to a MM condition type for cost distribution.

This setting is needed for shipper scenarios in SAP TM, where the freight cost distribution is activated with the TM freight settlement document (FSD) to the SAP order item. The SAP S/4 system uses this assignment and mapping when processing the settlement management document for processing the distributed freight cost posting to Financials.

In Customizing, choose the following path: *Transportation Management → Settlement → Freight Settlement → Integration for Settlement Posting → Mapping for Cost Distribution → Assign Transportation Charge Types to Condition Types*.

Cost Distribution Configuration: Settlement Management

For inbound & outbound freight costs, the system creates Settlement Management Document and Process Types for SAP TM integration.

Settlement Document Types

Settlement document types control the processing of settlement documents, such as invoices, credit, and debit memos, as well as cancellation documents.

In the *Settlement Document Types* customizing activity, you define the settlement document types that model the different business transactions involved with cost distribution activities.

Settlement document type 1600 Cost Distribution, is the generic document type for posting freight costs.

For canceling/ reversal of the posting, the settlement management uses document type 1601.

In the section Control of Account Determination the settings for determining the accounting procedure (MM Account Determination) and the clearing account assignment is done.

You can adapt these document types during implementation.

In Customizing for Logistics - General, choose the following: *Logistics - General → Settlement Management → Settlement Documents → All Document Types*.

To process outbound freight costs, the system creates and uses settlement process types in combination with settlement documents to determine the right settlement procedure for SAP TM integration purposes.

Settlement Process Types

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In the *Settlement Process Types* customizing activity, you define process types that determine and depict the different business transactions involved in processing payments for vendors and customers.

Process type 1600 Cost Distribution on G/L accounts - TM, is the settlement process type for posting freight costs on G/L accounts. It has settlement document type 1600 assigned to be used for processing the freight costs and right accounts.

You can adapt this process type during implementation.

In Customizing for Logistics - General, choose the following: *Logistics - General → Settlement Management → Settlement Process → Define Settlement Process Types*.

Basic Settings for Settlement Document creation

- Specify the customizing used for creation of settlement management Docs
- With these settings the S/4 system creates the Settlement Management Documents automatically in the background

Application: Transportation Management

Reference Category	Posting Type	Use Case Type	Condition Application	Document Category	Settl. Process Type	Settl. Doc Type
Sales Order / Contract		Freight Distribution on G/L Account	Purchase	Settlement	1600	
Delivery		Freight Distribution on material account	Purchase	Invoice		1600
Delivery		Freight Distribution on G/L Account	Purchase	Settlement	1600	
Inbound Delivery		Freight Distribution on material account	Purchase	Invoice		1600
Purchase Order		Freight Distribution on material account	Purchase	Invoice		1600

Figure 118: Cost Distribution Configuration of Mapping for Posting

In the *Basic Settings for Creation of Settlement Management Documents Customizing* activity, you can specify the customizing used for creation of the specific settlement documents based on reference documents, such as orders and deliveries as well as use cases. This configuration drives the freight cost posting via the settlement management documents.

You have to specify settlement document types and process types. If you input calculation procedures, the settlement management procedure determination is overruled. Some of the keys of this table are set in BAdI Determine Fields That Control Settlement Management Document Creation.

Configuration Fields

The following fields are filled out during the configuration:

- *Reference Document Category*: Indicates the classification for the various document categories that you can process in the system (for example purchase orders, sales orders, or invoices). It corresponds to the direct reference of SAP S/4 objects in the FO or FB in

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SAP TM. For example, if the FO is linked to a sales order, then while posting distributed freight costs to SAP S/4, this line is referenced to pick up the posting rule.

- *Posting Type*: Blank is the default value. If there are other business scenarios and the customer would like to extend the posting rules, this field allows special posting.
- *Use Case Type*: The use case characterizes existing business processes within Settlement Management. For freight cost posting, the following two rules are relevant:
  - 30 - Freight Cost Posting on Material Account
  - 31 - Freight Cost Posting on G/L Account

  This use case drives the type of posting: Use case type 30 creates Settlement Documents to post to material account and use case type 31 posts to expense account.
- *Condition Application*: Subdivides the usage of a condition (for example, pricing) for use in different application areas (for example, sales and distribution or purchasing). *Purchase* is the default use for the pricing procedure from the MM module (Purchasing).
- *Document Category*: This is directly related to the use case type. The value **`Settlement`** is used to post to the G/L account (outbound), and **`Invoice`** for posting to material valuation (inbound).
- *Settlement Process Type* and *Settlement Document Type* fields: You assign the document types here that will be used to post to the G/L account via the process type or the material valuation via the settlement document type.

For example, for inbound delivery, the use case type is 30 - Freight Cost Posting on Material Account. You then assign the settlement document type 1600 for such a line.

In Customizing, choose the following: *Transportation Management* → *Settlement* → *Freight Settlement* → *Integration for Settlement Posting* → *Mapping for Cost Distribution* → *Posting Using Settlement Management* → *Basic Settings for Creation of Settlement Management Documents*.

Note:
As a prerequisite all basics settings in SAP S/4 LO, MM and FI/CO are required and have to be set-up properly. This activity is usually performed in close corporation with the financial department of customers and demands close alignments. SAP also delivers BAdis to alter the behaviour of the integration and posting processes.

LESSON SUMMARY
You should now be able to:

- Distribute Freight Costs

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Unit 5
Lesson 2

Freight Costs in Settlement Documents

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Understand Cost Distribution in Settlement Document

Analyze Cost Distribution Postings

The SAP S/4 integration for freight cost distribution processing occurs in the following stages:

Integration for Freight Cost Processing

1. Transfer the transportation costs as "delivery costs" for the material *(inbound scenario)*.

   Have the transportation costs flow to material valuation.

2. Post the transportation costs back at the level of the sales order/CO-PA/CO objects that are responsible for the shipment costs *(outbound scenario)*.

   Post all the freight costs at the level of sales order or other controlling object, or CO-PA to track the costs associated with the shipment.

Freight Order Distribution: Based Upon Weight

	Weight	Basic Freight 5000.00	BAF 500.00	CAF <125.00>	
Delivery1 – Item1	5000 KG	1135.00	113.50	<28.38>	22.7%
Delivery2 – Item2	10000 KG	2275.00	227.50	<56.88>	45.5%
Delivery3 – Item3	7000 KG	1590.00	159.00	<39.75>	31.8%

Figure 119: Freight Order Distribution: Based Upon Weight

In the example in the figure, there is a freight order with three charge codes: Basic Freight (5000 USD), BAF (500 USD), and CAF (-125 USD).

Each delivery consists of only one item with the weight specified as 5000 KG for Delivery 1, 10000 KG for Delivery 2, and 7000 KG for Delivery 3. The distribution will be performed based upon the weight for each charge type. The total weight of the freight order is 22000 KG.

To perform the calculation, you first calculate what percentage of the total weight that each delivery represents. Then you multiply the percentage by the costs.

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The cost distribution is calculated as follows:

Delivery 1

% of Total Weight = 5000/22000 * 100 = 22.7%

Basic Freight = 5000 * 22.7/100 = 1135.00 USD

BAF = 500 *22.7/100 = 113.50 USD

CAF = -125 USD * 22.7/100 = -28.38 USD

Delivery 2

% of Total Weight = 10000/22000 * 100 = 45.5%

Basic Freight = 5000 * 45.5/100 = 2275.00 USD

BAF = 500 * 45.5/100 = 227.50 USD

CAF = -125 USD * 45.5/100 = -56.88 USD

Delivery 3

% of Total Weight = 7000/22000 * 100 = 31.8%

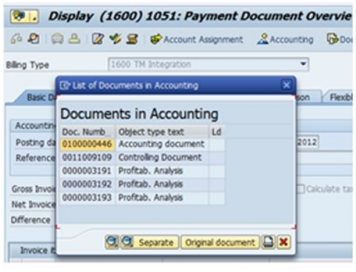
Basic Freight = 5000 * 31.8% = 1590.00 USD

BAF = 500 * 31.8% = 159.00 USD

CAF = -125 USD * 31.8% = -39.75 USD

Analyze Postings for FSD and Settlement Management

Outbound Freight Cost Posting					
6a. Freight Settlement Document (FSD) (Step 6a)	**Freight Clearing Account (GBB)**			**GR/IR Freight (WRX)**	
	5375				5375
6b. Posting for distributed costs (Step 6b)	**Freight Clearing Account (FR1)**			**Freight Expense Account (FRE)**	
for Mat 1 / Delivery 1		1220.12		1220.12	
for Mat 2 / Delivery 2		2445.63		2445.63	
for Mat 3 / Delivery 3		1709.25		1709.25	



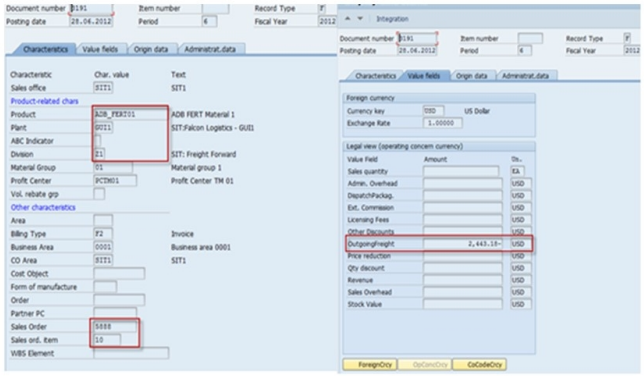


Figure 120: Typical Posting Pattern for FSD and Settl. Mgt. Doc for Cost Distribution

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The figure shows the posting for the outbound deliveries. The documents that will be created include financial accounting for the G/L, controlling document for the cost center-related postings, and profitability analysis.

In order to check if all amounts and postings are correct, you can access the Service Entry Sheet of the respective Purchase Order (Step 6a) for the freight costs postings and the Settlement Management Document for the distributed amounts and postings (Step 6b).

To access the Settlement Doc overview and the accounting documents, in the SAP Fiori launchpad, go to *Settlement → Display Cost Distribution Documents* or use the backend transaction *WLFLTM2*.

Here you can enter the freight settlement document (FSD) ID and execute.

In the *Overview of Freight Cost Allocation Documents* screen, in the *Freight Cost Allocation Documents* section, click the document number to open it.

Review the data in the *Basic Data* and *Flexible Overview* tabs.

In case of cost distribution for an outbound scenario, you can take a look onto the CO-PA profitability segment. Here you can monitor the assignment of the distributed costs to the sales order item and the respective customer assigned to the order. This provides an overview of the revenue to transportation costs relationship for the respective order.

In case of cost distribution for an inbound scenario, the distributed costs get posted into material valuation and are assigned to the respective order material price analysis. You can access the detailed distributed amount on material level:

To access the price analysis for the respective material, note the material number from the Settlement Doc overview and go to transaction *MM03*. Enter the material number, click *Select View(s) → Accounting 1 → enter the plant the material is assigned to*. In the Accounting 1 tab of the material click the button "Mat. Price Analysis". The "Prices details view" depicts the overview of the inventory and price development for the material which also shows the distributed freight costs of the settlement document overview.

LESSON SUMMARY

You should now be able to:

- Understand Cost Distribution in Settlement Document

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Unit 5
Lesson 3

Billing of Freight Cost to SD

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Bill Freight Costs in SD

Billing of Freight Costs in SD

When you sell your products to a customer you may also take the responsibility of delivering these products to that customer. For this you incur costs for transportation, for example, through a carrier. You can pass on these costs to your customer.

You use integration of sales orders and deliveries to facilitate transportation planning and execution in Transportation Management (TM). The TM component creates or updates freight units directly for sales orders or deliveries. You plan transportation for these freight units by creating freight orders that you then subcontract to the carrier. The freight order determines the freight costs to be paid to the carrier. You configure TM to distribute the freight costs in the freight order according to delivery items. You can then add the distributed costs for each delivery item to the final amount in the billing document that you send to your customer.

This involves integration of the following processes:

- Freight orders in TM
- Pricing in SD
- Billing in SD

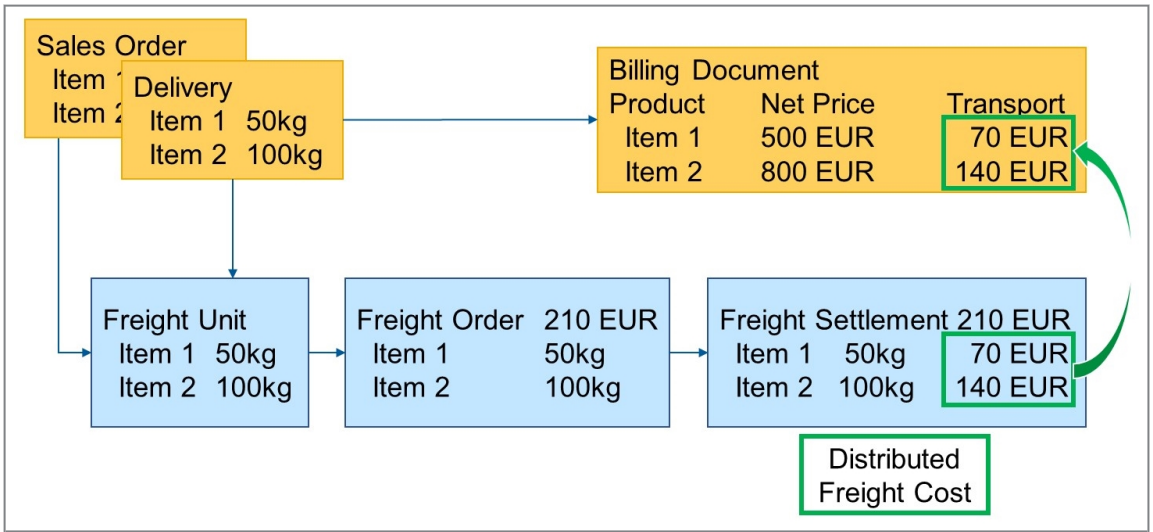

Figure 121: Billing TM Freight Costs in SD

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Transportation costs are now part of the billing document and can be invoiced to the customer. Details can be checked in the Pricing Elements section while creating the billing document. Locate the condition type which lists the freights costs. The amount shown there should be equal to the respective amount in the Freight Order under Cost Distribution > Distribution Items.

- The transfer of the freight costs to the SD billing document is achieved via copy control from the delivery to the billing document using the TM freight order as a source:
  - In customizing, choose *Sales and Distribution → Billing → Billing Documents → Maintain Copying Control for Billing Documents*.
- Furthermore the pricing procedure has to include a condition type with condition function FCTM:
  - In customizing, choose *Sales and Distribution → Basic Functions → Pricing Control → Define Condition Types*.
- The condition type has to be assigned to the pricing procedure.
  - In customizing, choose *Sales and Distribution → Basic Functions → Pricing Control → Define and Assign Pricing Procedures*.

Note:
You must integrate SD with an internal TM component to be able to include the freight cost in the billing document for all deliveries of products.

You can only include the freight cost in a billing document when you have one freight order document for the delivery and the freight order has only one currency in which you calculate the cost.

LESSON SUMMARY
You should now be able to:

- Bill Freight Costs in SD

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Learning Assessment

1. Cost distribution takes place in which of the following documents?

   Choose the correct answers.

   - ☐ A Freight order
   - ☐ B Freight booking
   - ☐ C Freight settlement document
   - ☐ D Forwarding order
   - ☐ E Forwarding settlement document

2. Which settings can be configured in the cost distribution profile?

   Choose the correct answers.

   - ☐ A Distribution Method
   - ☐ B Charge Profile Assignment
   - ☐ C Distribution Class
   - ☐ D Distribution Rule
   - ☐ E Distribution Level

3. Which of the following options are methods of cost distribution provided in TM?

   Choose the correct answers.

   - ☐ A Direct distribution
   - ☐ B Indirect distribution
   - ☐ C Sequential distribution
   - ☐ D Hierarchical distribution

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4. In SAP S/4, when configuring cost distribution integration, which of the following Customizing activities do you need to perform?

   Choose the correct answers.

   - ☐ A Create Settlement Document Types
   - ☐ B Create Settlement Process Types
   - ☐ C Mapping of TM Charge Type to MM Purchase Condition Types
   - ☐ D Create Invoice Document Types
   - ☐ E Define Text Schema

5. You want to analyze the distributed freight costs for an outbound scenario. Where can you check the distributed amounts and postings for the order items?

   Choose the correct answers.

   - ☐ A Settlement Management Document
   - ☐ B Invoice
   - ☐ C CO-PA Segment
   - ☐ D Forwarding Settlement Document

6. With SAP TM, it is possible to pass the distributed freight costs to your customers. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   - ☐ True
   - ☐ False

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Learning Assessment - Answers

1. Cost distribution takes place in which of the following documents?

   Choose the correct answers.

   - [X] A Freight order
   - [X] B Freight booking
   - [X] C Freight settlement document
   - [ ] D Forwarding order
   - [ ] E Forwarding settlement document

   Correct. The cost distribution takes place in FOs/ FBs, as well as the Freight Settlement Document (FSD).

2. Which settings can be configured in the cost distribution profile?

   Choose the correct answers.

   - [X] A Distribution Method
   - [ ] B Charge Profile Assignment
   - [ ] C Distribution Class
   - [X] D Distribution Rule
   - [X] E Distribution Level

   Correct. In the distribution profile you choose the Distribution method, rule and the level.

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3. Which of the following options are methods of cost distribution provided in TM?

   Choose the correct answers.

   - [X] A Direct distribution
   - [ ] B Indirect distribution
   - [ ] C Sequential distribution
   - [X] D Hierarchical distribution

   Correct. TM supports the distribution on direct item level and the hierarchical distribution method, which uses a step-by-step approach to take each level of the packaging hierarchy into account.

4. In SAP S/4, when configuring cost distribution integration, which of the following Customizing activities do you need to perform?

   Choose the correct answers.

   - [X] A Create Settlement Document Types
   - [X] B Create Settlement Process Types
   - [X] C Mapping of TM Charge Type to MM Purchase Condition Types
   - [ ] D Create Invoice Document Types
   - [ ] E Define Text Schema

   Correct. The Cost Distribution integration is performed via Settlement Management Document and Process Types. The mapping of the respective TM charge types to purchase condition types is also required.

5. You want to analyze the distributed freight costs for an outbound scenario. Where can you check the distributed amounts and postings for the order items?

   Choose the correct answers.

   - [X] A Settlement Management Document
   - [X] B Invoice
   - [X] C CO-PA Segment
   - [ ] D Forwarding Settlement Document

   Correct. The distributed amounts and posting can be checked on the related settlement management document and the assigned CO-PA segment in the overview of freight costs allocation document transaction.

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6. With SAP TM, it is possible to pass the distributed freight costs to your customers. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   ☐ True

   ☒ False

   Correct. With TM, the distributed freight costs for delivery items can be added to the final amount in the SD billing document that you send to your customer.

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UNIT 6 Strategic Freight Procurement

UNIT OBJECTIVES

- Understand the Strategic Freight Procurement Process
- Prepare a Freight Agreement RFQ
- Submitting an RFQ
- Evaluate Responses and Generate Agreements
- Optimize the Freight Procurement Process

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Unit 6
Lesson 1

Understanding Strategic Freight Procurement

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Understand the Strategic Freight Procurement Process

Strategic Freight Procurement Process

Strategic freight procurement (SFP) is tailored to support (mainly shippers) with the procurement of long-term transportation services for logistics service providers (LSPs) or carriers. However, LSPs can also use this scenario to procure transportation services from carriers while offering transportation services to clients.

Process Steps

The SFP process is divided into four steps that are depicted in the figure Strategic Freight Procurement Process:

1. Prepare RFQ:

   The shipper prepares the required procurement. There is no interaction with the carrier. Historic transportation is analyzed and used as a forecast for the next period. Once the need for procurement is determined, it is divided by the shipper into different scenarios according to the trade lane, commodity code, or transportation mode.

   It is not necessary to use the SAP TM system for the first stage of the preparation work. You can use the legacy systems to analyze historic data, forecast transport volumes, and classify procurement needs.

   The final task of the first step is the creation of a central document for the SFP process, the freight agreement master RFQ. All of the procurement needs and classifications are entered into the master RFQ.

2. Submit RFQ:

   The interaction with the carrier is started. The carriers assigned to the SFP process are added to the master RFQ. If necessary, the target business shares are assigned amongst them. If the optional approval is selected within the purchasing organization, the individual RFQs are created and sent for each carrier.

3. Evaluate responses and optimize:

   Once the carriers have responded to the RFQ, the responses are evaluated and compared. SAP TM supports the comparison by creating ranking lists and suggesting the optimal business shares. You can start negotiation rounds with the carriers at this stage.

4. Generate agreements:

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The optimal business shares and carriers can be awarded once they are selected for the next period. Freight agreements are generated by one-click freight agreement creation when the carriers are awarded in the SFP process. A freight agreement acts as the contract signed between the shipper and the carrier.

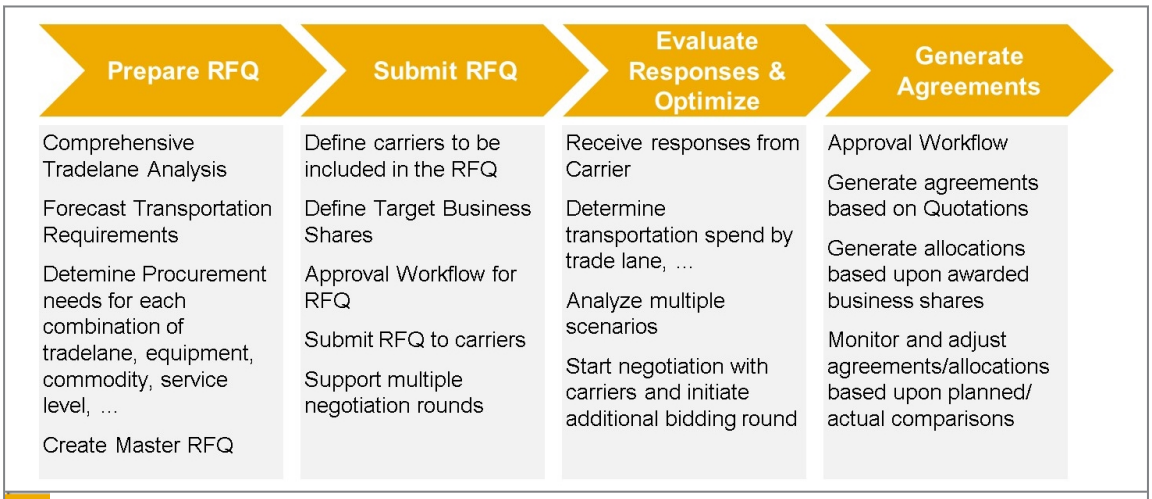

Figure 122: Strategic Freight Procurement Process

LESSON SUMMARY

You should now be able to:

- Understand the Strategic Freight Procurement Process

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Unit 6
Lesson 2

Preparing Freight Agreement RFQ Master

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Prepare a Freight Agreement RFQ

Determination of Procurement Needs

SAP Analytic tools can be used to analyze historic transportation volumes for determination of procurement needs. The analysis of historic data is helpful when creating a forecast for the next period.

Transportation Management analytics provide apps, called overview pages, that show the key performance indicators (KPIs) that you need to manage your operational business. At a glance, you can see all the vital data you need for your daily decision-making. Each overview page displays information from a different area of TM, for example, freight booking, freight ordering, tendering, business share analysis and allocation analysis.

Besides overview pages, analytics provides CDS views. These are query views, that are, an SQL queries on the database requesting certain data to be returned. One (or more) CDS view feeds this information into each overview page (OVP).

You must activate the respective OData service for each Fiori ID of the analytics area in the Gateway system in order to use this functionality. SAP help provides lists of all existing analytics areas and technical IDs under the search topic "Analytics".

However, the analysis of historic data and the creation of a forecast are not related to the freight agreement master RFQ that is created based on this information. Therefore, the use of SAP analysis tools is not mandatory for the strategic freight procurement (SFP) process.

Master RFQ Creation

The central document used in the SFP process is the freight agreement master RFQ. It contains all of the procurement needs and classifications for the shipper and also states which carriers are to be included in the process.

The freight agreement master RFQ can seem similar to a freight agreement. The freight agreement master RFQ contains information about the validity period of the prospective freight agreement.

After assigning carriers and RFQ item details to the document, the RFQ master has to be approved by the head of the purchasing organization. Therefore, the approval workflow functionality is integrated. Once the RFQ master document is approved, the RFQ is submitted to each carrier, creating individual RFQs out of the master RFQ.

Creating Freight Agreement Master RFQs

The creation of the master RFQ is shown in the figure, Master RFQ Creation. Freight agreement master RFQs can be created in the following ways:

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- Using an existing freight agreement. This method is used when the same trade lanes are to be tendered periodically.
- Creating templates, on which new RFQ masters are based.
- Creating a new RFQ.
- Copying an existing RFQ.

Figure 123: Master RFQ Creation

Master RFQ Versioning

The RFQ master allows versioning, therefore a new version can be created at any time. The version is copied from the current master RFQ, a new version is created, and the version counter is incrementally updated. An overview of all of the existing versions of an RFQ master is located on the *Versions* tab.

> Note:
> The currently displayed or edited version is not shown in the version overview.

Several negotiation rounds can be started by choosing *Follow up* → *Create Negotiation Round*. The RFQ can be resubmitted to the carriers for a new negotiation round. The counter displayed in the RFQ general data is incrementally updated.

RFQ Header Data

The following RFQ header data is also shown in the figure, Master RFQ:

- The RFQ has *Valid-From* and *Valid-To* dates, which can be maintained in the RFQ header.

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- The *RFQ Response Deadline* date determines the date until which the invited carriers can respond.
- The *Carrier KPI Profile* controls which KPIs are shown on the carrier fact-sheet.
- The *Valid-From* and *Valid-To* dates are related to the validity period of the resulting freight agreement.
- The RFQ master can be valid for several purchasing organizations, as well as multiple carriers. For current carriers, the indicator *Incumbent* is maintained.

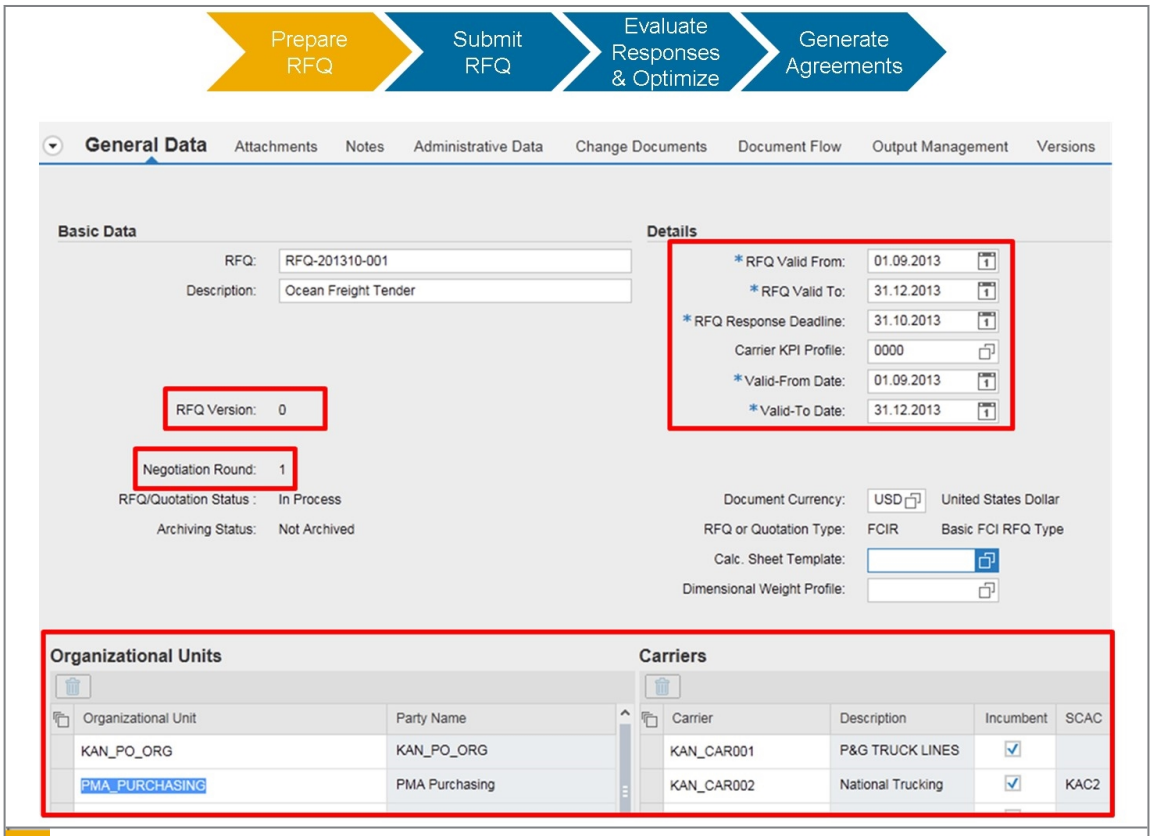

Figure 124: Master RFQ

Master RFQ Items

The carriers are copied from the RFQ header. If the RFQ item is not sent to the specific carrier, the carrier can be deleted on the item level.

The valid trade lane for the item is specified on the *Trade Lanes* tab. The logic used for defining trade lanes in freight agreements is used.

The requested capacity is specified in various dimensions on the *Capacities* tab. TEU is typically used for ocean transportation.

Transportation Spend Specifications

The periodicity and the dimension for calculating the transportation spend are specified, as follows:

- Capacity driver:

  Specifies the dimensions that you want the system to use to determine the capacity requirements. If the capacity requirements are available at a granular level, rather than just

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at trade lane level, then it is specified at the granular level. This level is defined in the system using capacity drivers. If one or more scales in the rate table are marked as capacity drivers, the capacity requirement is specified for all of the relevant combinations of the scale items in the capacity drivers.

- Capacity dimension:

  Specifies the dimension that you use to enter the capacity requirements for an item in a trade lane.

The valid item is specified for the commodity codes on the *Commodity Code* tab.

Uploaded notes and attachments are specified on the *Notes* and *Attachments* tabs. The tabs outlined are shown in the figure Master RFQ Items.

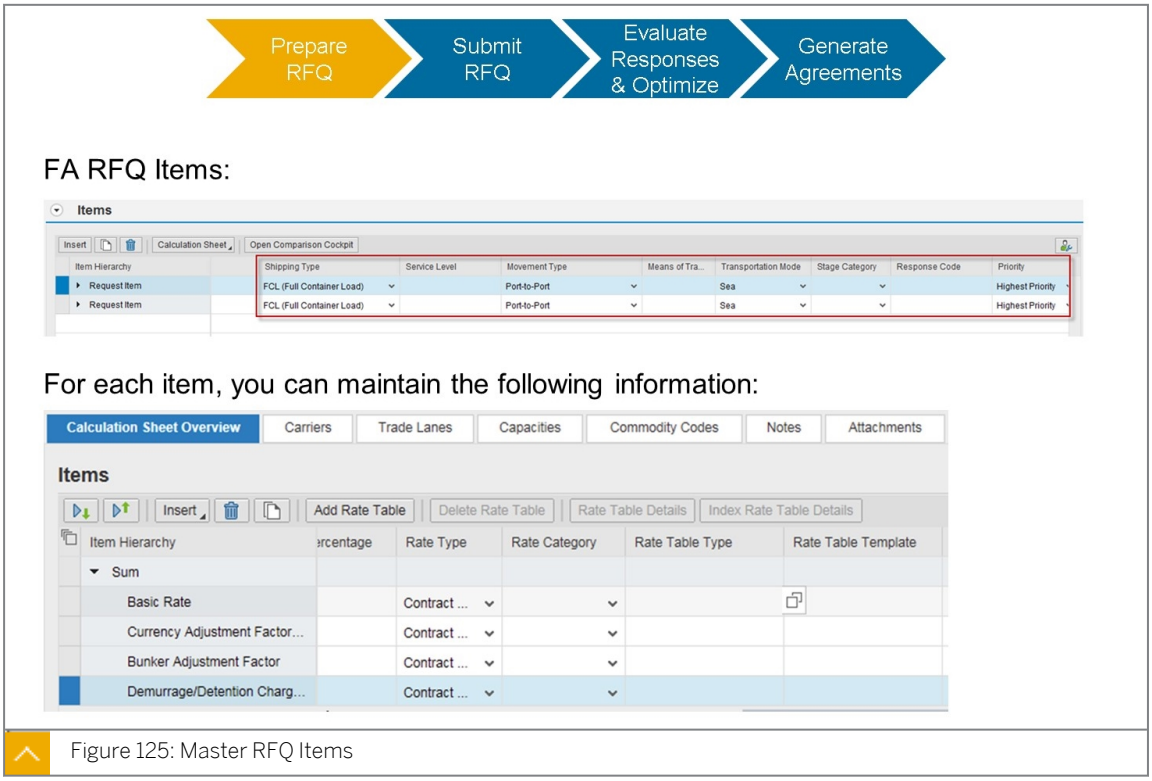

Figure 125: Master RFQ Items

LESSON SUMMARY

You should now be able to:

- Prepare a Freight Agreement RFQ

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Submitting and Evaluating Quotations and Award Process

LESSON OBJECTIVES

After completing this lesson, you will be able to:

- Submitting an RFQ
- Evaluate Responses and Generate Agreements

RFQ Carrier Definition

Carriers are maintained on the header level of the freight agreement master RFQ. However, the exact carriers for each item can be defined again on the item level by deleting specific carriers from an item. All of the carriers taking part in the strategic freight procurement (SFP) process must be first maintained on the header level. A carrier cannot be added on a separate item. The defined carriers are depicted in the figure, Carrier Definition.

If a master RFQ is created from an existing freight agreement, the carriers assigned to the agreement are flagged as *Incumbent*. It is preferable to use incumbent carriers in a response evaluation by the optimizer at a later point.

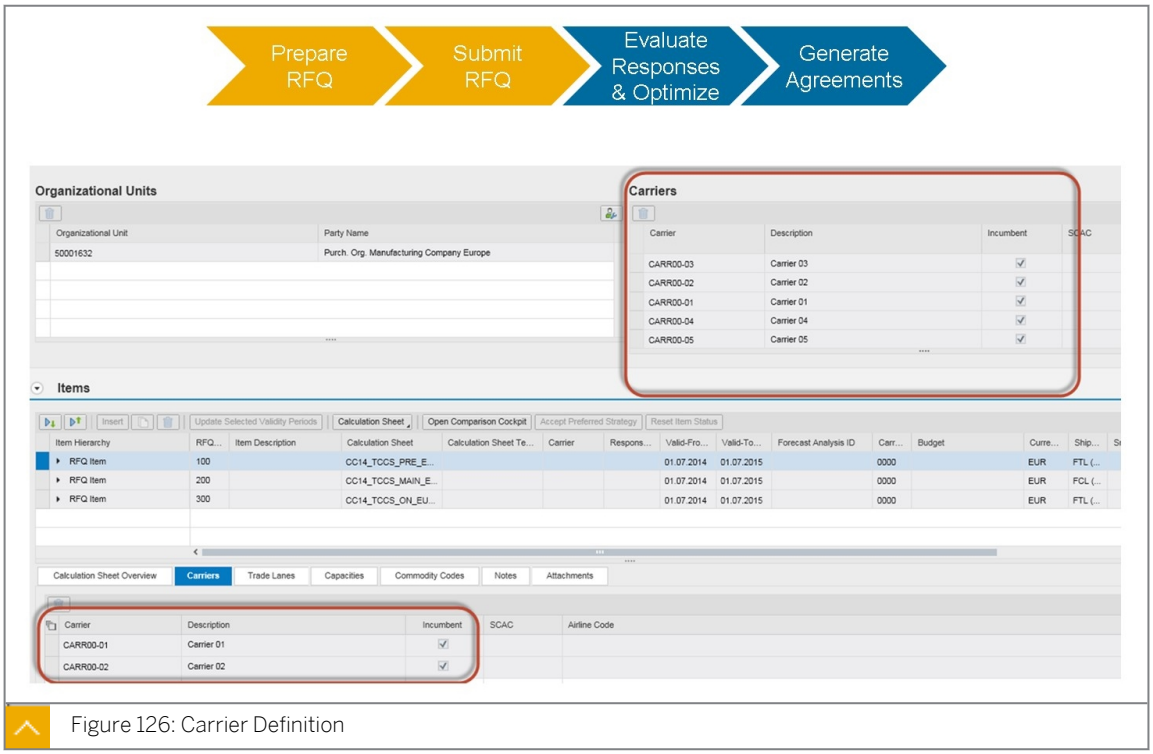

Figure 126: Carrier Definition

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Trade Lane

In SAP TM, the available geographical locations and relations are called trade lanes.

There are several differences between transportation lanes and trade lanes. While transportation lanes are crucial for optimizer planning and carrier selection, trade lanes do not influence optimizer planning. Trade lanes are master data that are used in Trade and Commodity Management (TCM), and sometimes as restrictions for carrier selections (in the case of allocations). Trade lanes are also important to analytics.

Trade lanes describe a geographical area or relation. Trade Lanes can include a defined source and destination (along) or only one defined source or destination (from or to). The source and destination are exact locations or zones.

Target Business Shares and Individual RFQs

You can request capacities for each item requested. The requested capacities must represent the total capacities for the item. The capacities can be maintained in the most common units. Therefore, the requested capacity of the item already resembles the allocation information, as shown in the figure. At the end of the SFP process, agreement allocations are created for the items.

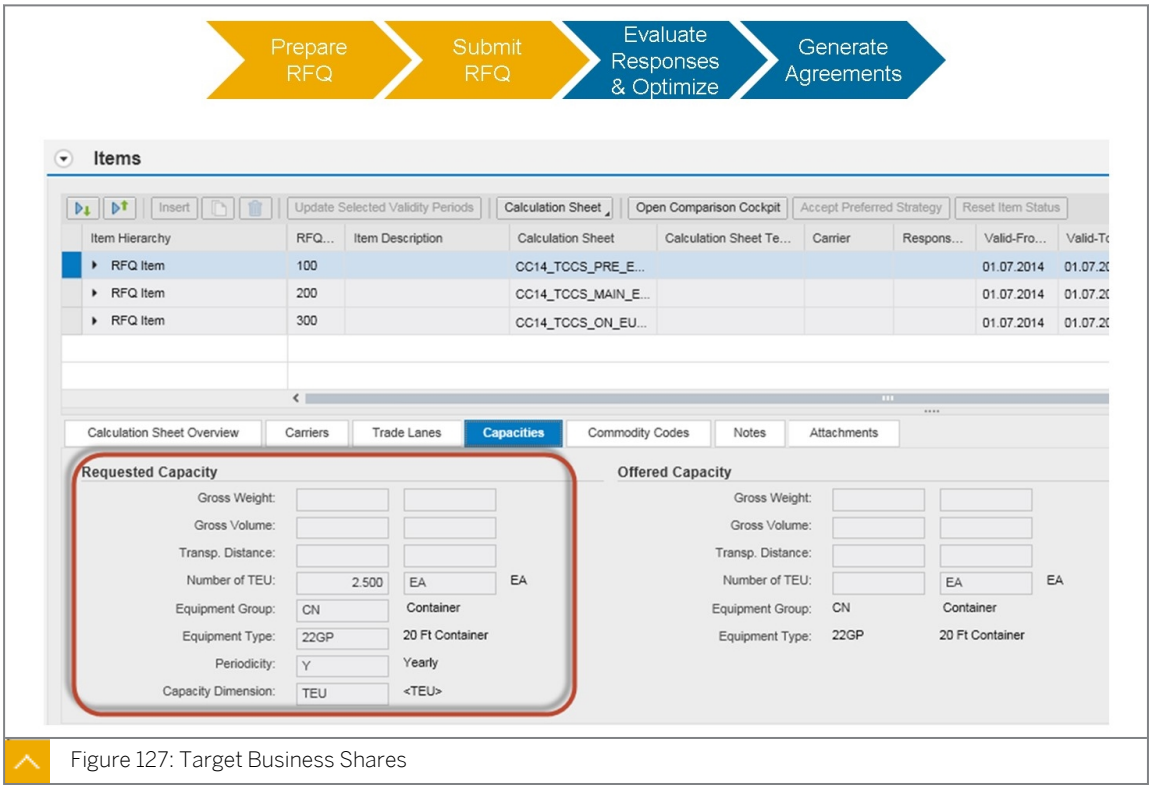

Figure 127: Target Business Shares

Individual RFQ

Once the freight agreement master RFQ is created and finalized, the agent responsible for creating the RFQ sends the freight agreements master RFQ to the supervisor of the purchasing organization for approval. The standard SAP approval workflow is triggered and the approval task is shown in the supervisor's SAP Inbox. Once approval is given, the agent creates individual freight agreement RFQs, as shown in the figure.

Individual freight agreement RFQs contain information from the master RFQ, but only the information designed for the individual carrier. Therefore, if a carrier is removed from a response item, the item will not be shown in the individual RFQ.

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The agent can review the individual RFQs, which are also visible in the document flow of the master RFQ. Once the individual RFQs are reviewed, they are published or sent to the carrier.

If no further review of the individual RFQs is required, they are created and published in one step. This function is enabled by setting the indicator *Create & Publish* in the configuration of the RFQ type.

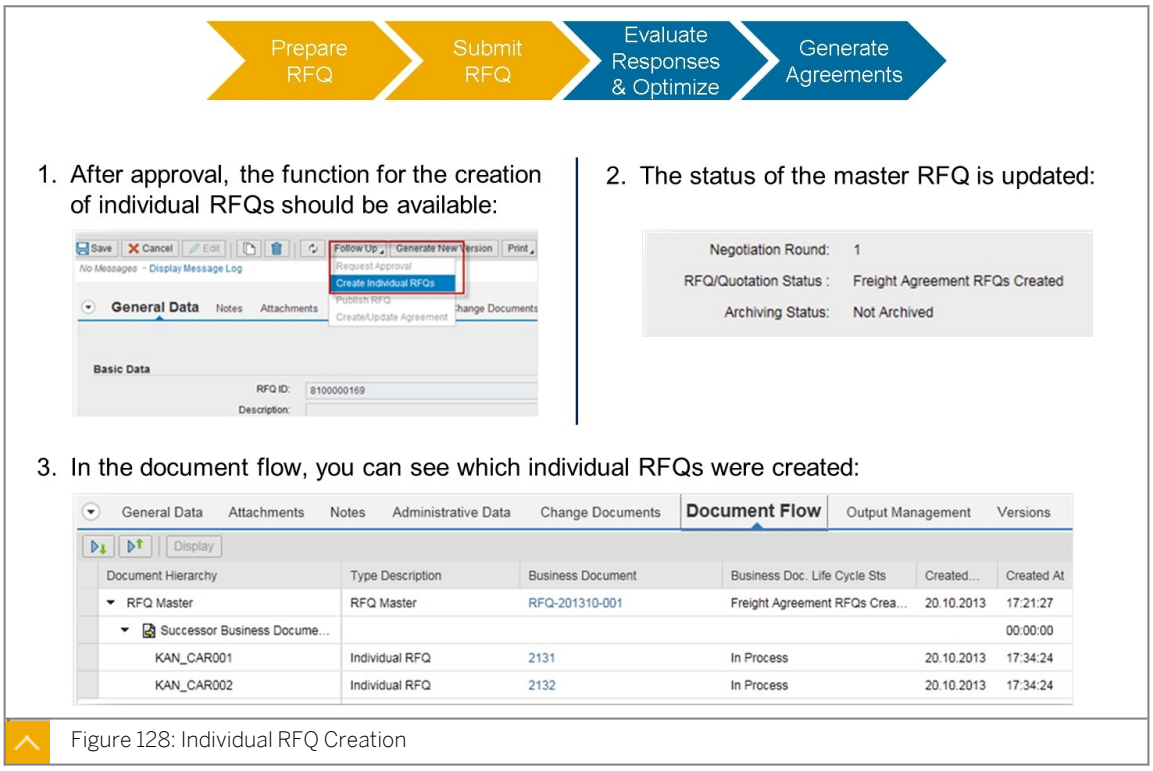

Figure 128: Individual RFQ Creation

Responses to RFQs and Agreement Creation

The carrier can access all the request for quotations (RFQs) submitted by the shipper in the SAP LBN (Logistics Business Network) if they are provided with an individual user. The RFQ shows all of the required information in the portal.

The most important part of the RFQ, an Excel sheet, can be shown in the portal. The Excel workbook contains the following: RFQ header, item, capacity, commodity, calculation sheet, and rate table information. For every rate table, there is a separate worksheet for rate table details. The carrier can download the Excel sheet and fill it with rates. Once this is completed, the Excel sheet can be uploaded to the LBN again, where SAP TM interprets it and creates the relevant TCM master data.

Evaluation and Freight Agreement Creation

Once the carriers have responded to the RFQ, the responses can be evaluated and compared. The SAP TM system supports the comparison by creating ranking lists and suggesting the optimal business shares. Negotiation rounds with carriers can also be started from here.

Carrier responses are shown in the freight agreement master RFQ as response items under the request items, as shown in the figure, Receiving Carrier Responses.

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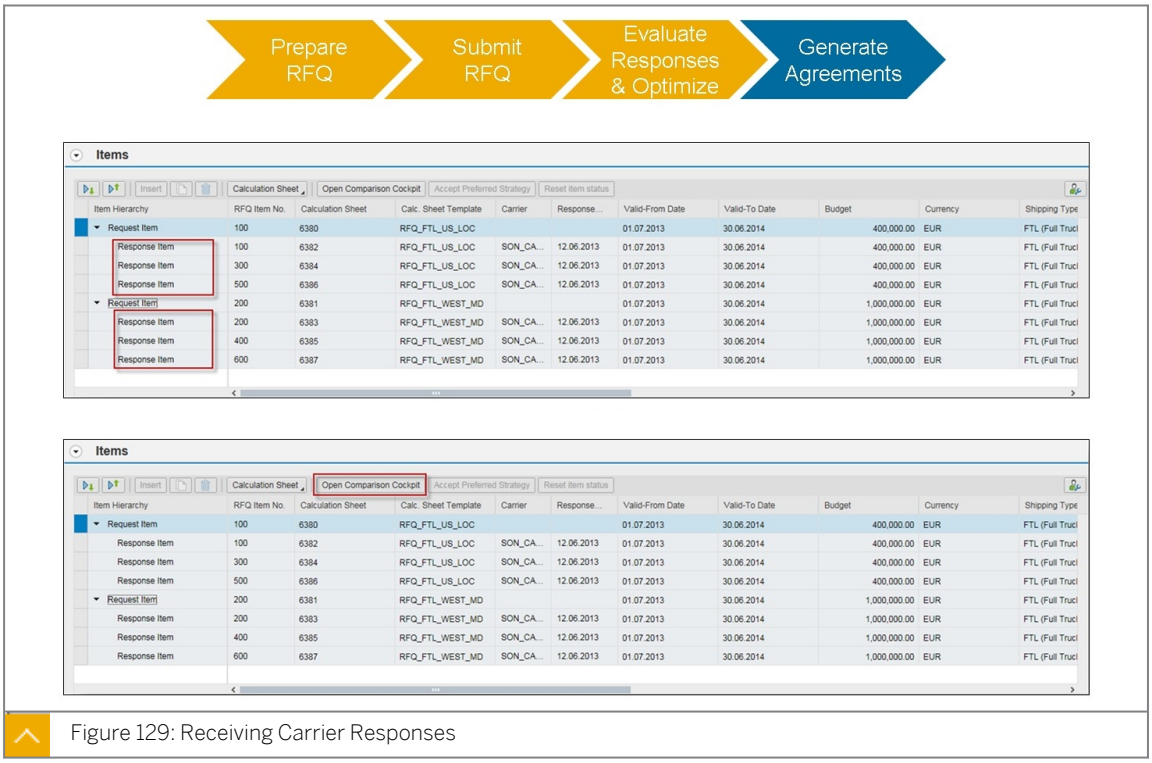

Figure 129: Receiving Carrier Responses

In the Comparison Cockpit, the response for an individual RFQ or several RFQ items are compared. You select the relevant items before navigating to the Comparison Cockpit, or add additional items once the comparison of the initially selected RFQ items is completed.

There are two possible types of comparisons supported by two sections in the Comparison Cockpit:

- The transportation manager can use manual response comparison if the following criteria are met:
  - The only objective is rate minimization without any other constraints.
  - The scenario is quite simple, for example, the number of carriers responding to the requirement is much less.
- The transportation manager uses the automated comparison for the objective to minimize rates with constraints, such as the following:
  - Minimum or maximum number of carriers
  - Carrier-specific minimum or maximum target shares
  - Incumbents' minimum or maximum target shares
  - Risk-related constraints
  - Bonus/Malus, historical carrier performance linked to carrier selection:

    The automated comparison uses the carrier selection optimizer, which proposes the target business shares that are spread across carriers, bearing in mind the given constraints.

Response Comparison and Ranking

The rates defined by the carriers are compared and a ranking is shown in the Comparison Cockpit, as shown in the figure, Comparison Cockpit: Response Comparison and Ranking.

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The *Response Comparison* section of the Comparison Cockpit offers the following selection options:

- Select all items: Every item in the column "Select for Comparison is selected.
- Select matching items: Select a certain item type (for example, pick up charges) and choose *Select Matching Items* all pick up charges are selected.

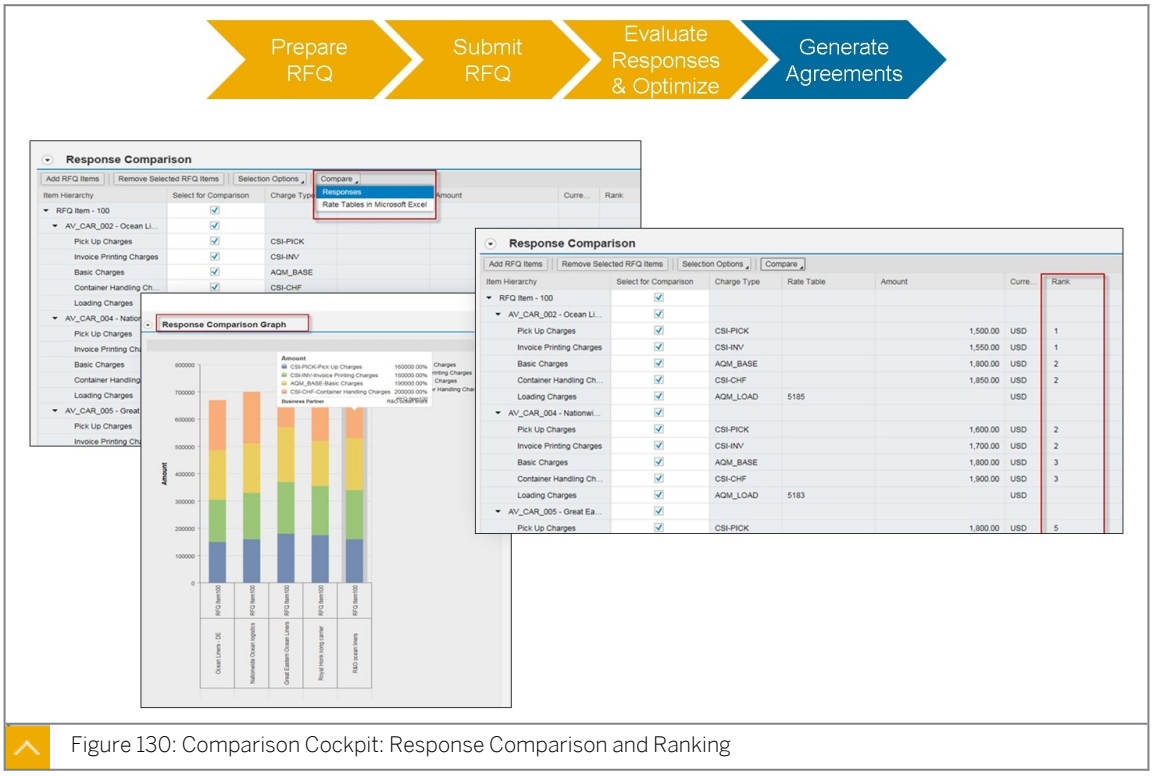

Figure 130: Comparison Cockpit: Response Comparison and Ranking

Agreement Generation

Once the optimal business shares and carriers are selected for the next period, they can be awarded. Awarding the carriers in the SFP process means freight agreements are generated for them. Freight agreements act as the contract between shipper and carrier.

As previously mentioned, agreement allocations are created per carrier while freight agreements are generated. The generation is based on the requested capacities in the request item of the master RFQ and the target business share defined for the carrier.

1. Upon completing the request for quotation (RFQ) and finalization of the evaluation, choose *Create/Update Agreement* in the RFQ master.
2. For each carrier, you can choose to have a new agreement or to update an existing agreement. Additionally, you can decide if you want to convert each RFQ item into a separate agreement.
3. Upon saving, the freight agreement is shown as a successive *Business Document* within the RFQ document flow.

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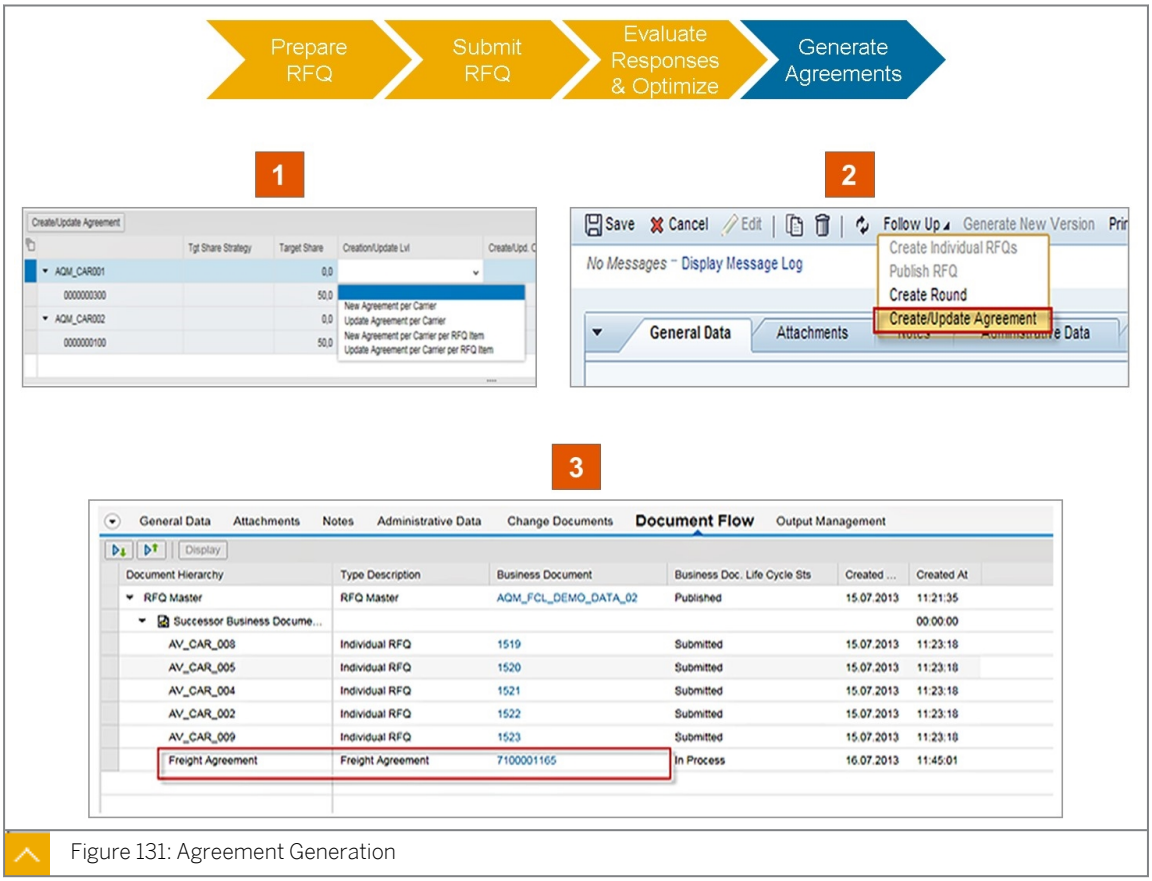

Figure 131: Agreement Generation

FA RFQ Assignments

A shipper might get a response to a request for quotation from a carrier, which includes the request for rates in many different segments. Since the responsibilities for those segments are spread among different purchase organizations or departments, the freight agreement request for quotation (RFQ) needs to be distributed to different users, who should be able to work on the request for quotation at the same time.

The shipper wants to distribute the work on an RFQ to the responsible persons or departments. The responsible persons or departments want to work on the preparation and comparisons of the freight agreement RFQ responses at the same time.

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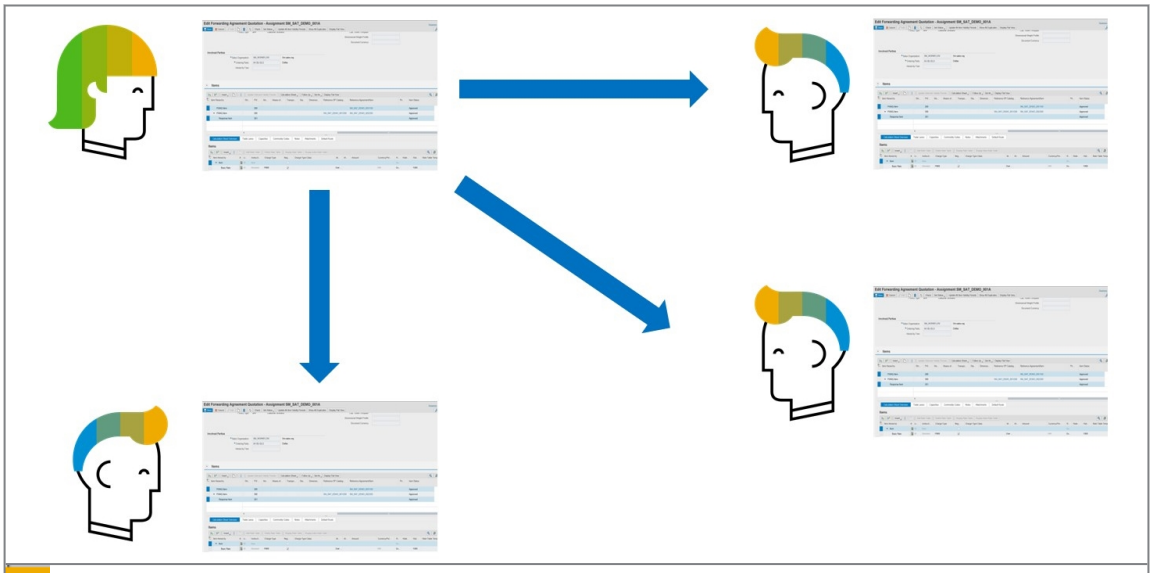

Figure 132: Freight Agreement RFQ Distribution

The freight agreement RFQ serves as the master document, consolidating all requested transportation services (that is, items) of the request. After approving and publishing the master RFQ, the shipper can distribute the items to different users or organizations by creating an RFQ assignment document for one item of the freight agreement RFQ master.

To create an RFQ assignment document, you proceed as follows:

- Within a freight agreement RFQ master, in the *Items* section, you choose *Create/Update RFQ Assignment*.
- For the chosen RFQ item, a separate freight agreement RFQ master assignment is created with one transportation requirement item (based on trade lanes) inside, including a copy of previous responses, as shown in the figure.

Freight Agreement RFQ Master Assignment Creation

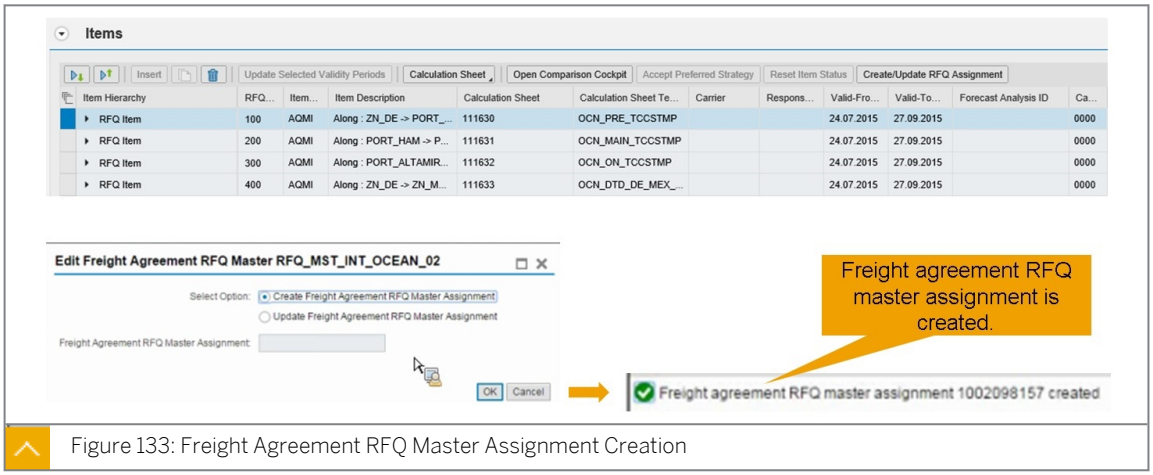

Figure 133: Freight Agreement RFQ Master Assignment Creation

When finishing the work in the RFQ master assignment, the user can transfer the information to the freight agreement RFQ master document, with a follow-up action on the RFQ assignment item. The prerequisite for merging an assignment item to the freight agreement RFQ master is that the item is already approved in the RFQ master assignment document.

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Note:
RFQ assignment documents have the same capabilities as freight agreement RFQ master documents. However, the publication to the carrier is only possible in the freight agreement RFQ master document.

LESSON SUMMARY
You should now be able to:

- Submitting an RFQ
- Evaluate Responses and Generate Agreements

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Special Functions in Freight Procurement

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Optimize the Freight Procurement Process

Optimization and Target Share Strategies

Optimization and Estimated Spend Simulation

The final result of the strategic freight procurement (SFP) process is the optimal generation of freight agreements for carriers. It is referred to as optimal generation because the best business shares are created for the request items. To do so, the optimizer helps to define optimal business shares. The optimizer proposes target shares, which are then used to calculate the estimated total spend for each carrier and each request item.

Spend estimation can be done separately from target share determination. Target shares can also be manually overwritten to simulate the estimated spend for individual carriers and request items.

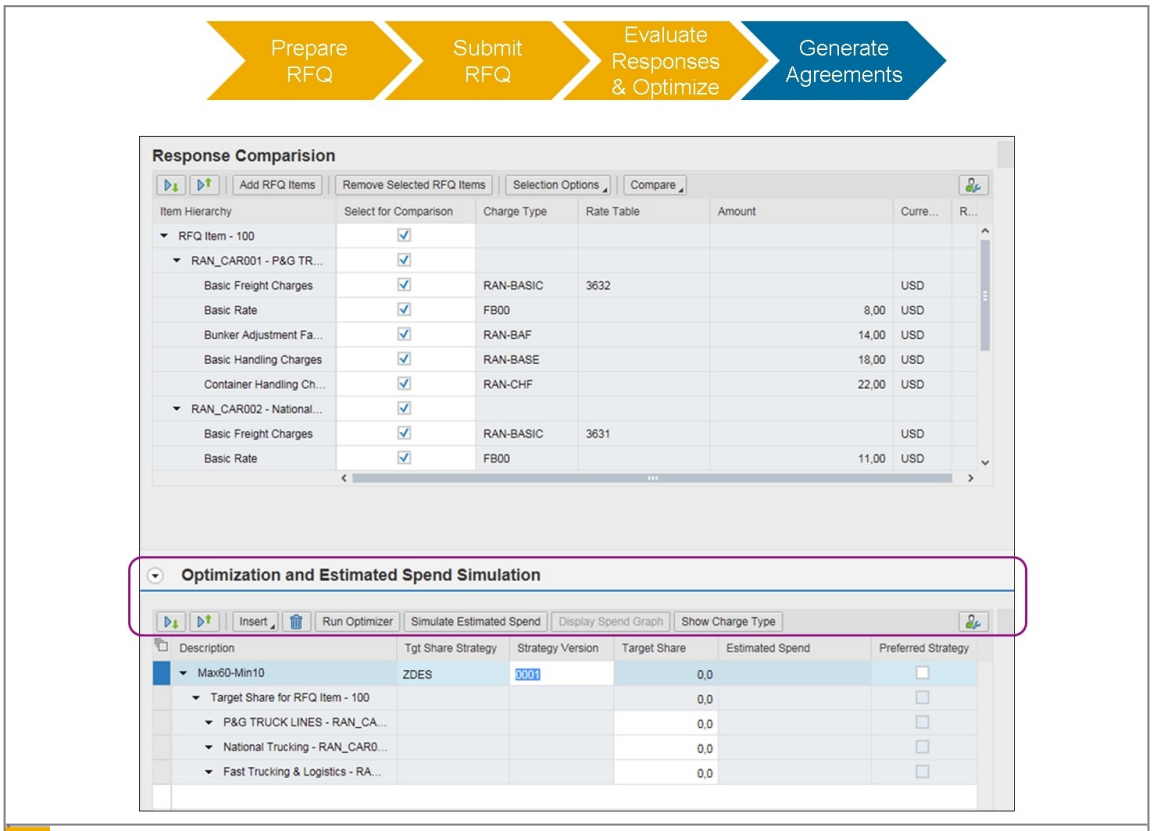

Figure 134: Comparison Cockpit: Optimization and Estimated Spend Simulation

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Target Share Strategies

When using the optimizer for target share calculation, you can define strategies that restrict optimizer calculations. Strategies contain conditions that define the restrictions for the optimization, as shown in the figure, Preparing Optimizer Analysis.

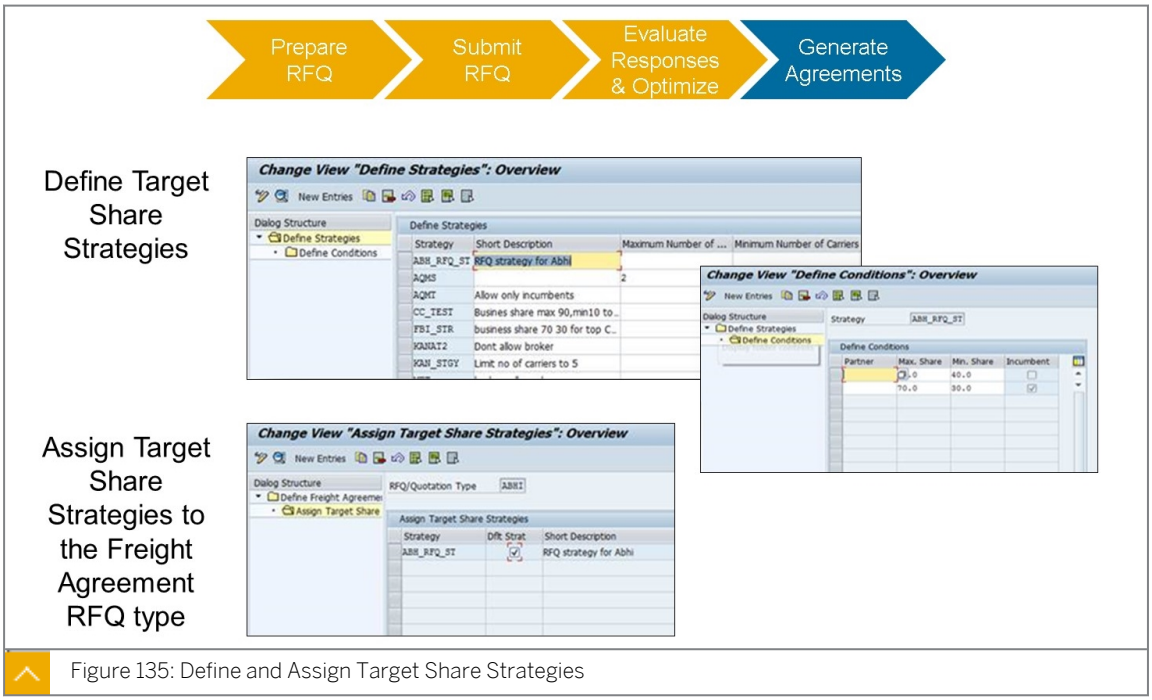

Figure 135: Define and Assign Target Share Strategies

Condition Parameters

Certain parameters are assigned to a strategy and can be maintained per condition.

Condition Parameters

- Incumbent:

  This option is selected to indicate that the carrier is incumbent, but is deselected if the carrier is non-incumbent.

- Maximum business share:

  Enter the maximum business share given to the carrier.

- Minimum business share:

  Enter the minimum business share given to the carrier.

- Maximum number of carriers:

  Enter the number of carriers to get the same maximum business share.

- Minimum number of carriers:

  Enter the number of carriers to get the same minimum business share.

In the RFQ type, you can define whether the optimizer processes one item, or all of the available items. It specifies the mapping between the agreement type and the freight agreement RFQ type.

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Target Share Determination and Estimated Spend Simulation

Target share optimization takes rate table values into account by creating a simulated freight order and calculating its values

This process can be repeated for many different scenarios, with different *Tgt Share Strategies* or conditions.

You can add an additional *Target Share Strategy* by choosing *Insert*. The same strategy is used multiple times, but with different strategy versions. You maintain the strategy version in order to define different versions, as shown in the previous figure, Comparison Cockpit: Optimization and Estimated Spend Simulation.

For each strategy, choose *Insert* → *Conditions* to add conditions.

As shown in the top part of the figure, Target Share Determination and Estimated Spend Simulation, *Target Shares* are calculated for each carrier by choosing *Run Optimizer*.

By choosing *Simulate Estimate Spend*, the system calculates the spend per carrier for each strategy, as shown in the bottom part of the figure.

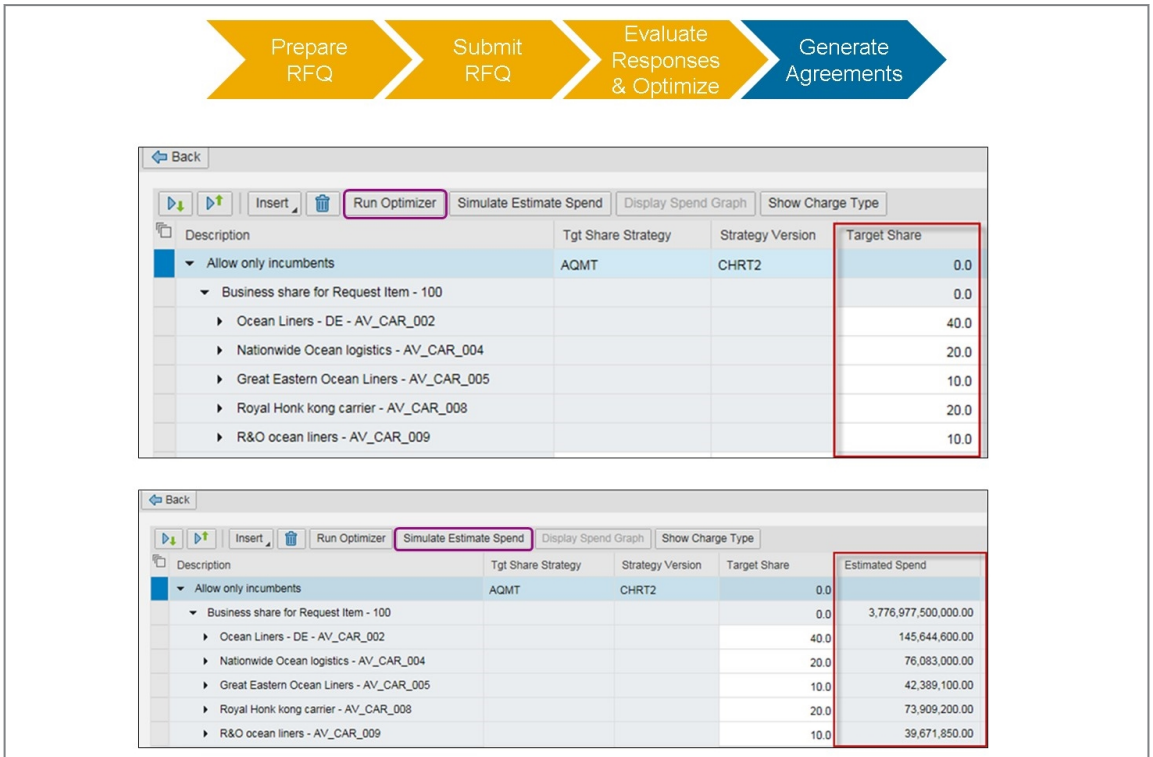

Figure 136: Target Share Determination and Estimated Spend Simulation

Strategy Spend Comparison Graph and Selection of Preferred Strategy

The left part of the figure, Strategy Spend Comparison Graph and Selection of Preferred Strategy, shows a graphical spend comparison graph, which compares the business shares and total spend between different strategy versions.

The optimization, simulated estimated spend, and graphical strategy spend comparison are created per RFQ item or for the entire RFQ.

Once the RFQ has been analyzed, you select *Accept Preferred Strategy*, and the RFQ status is set to *Awarded*. The right part of the figure shows a selected strategy.

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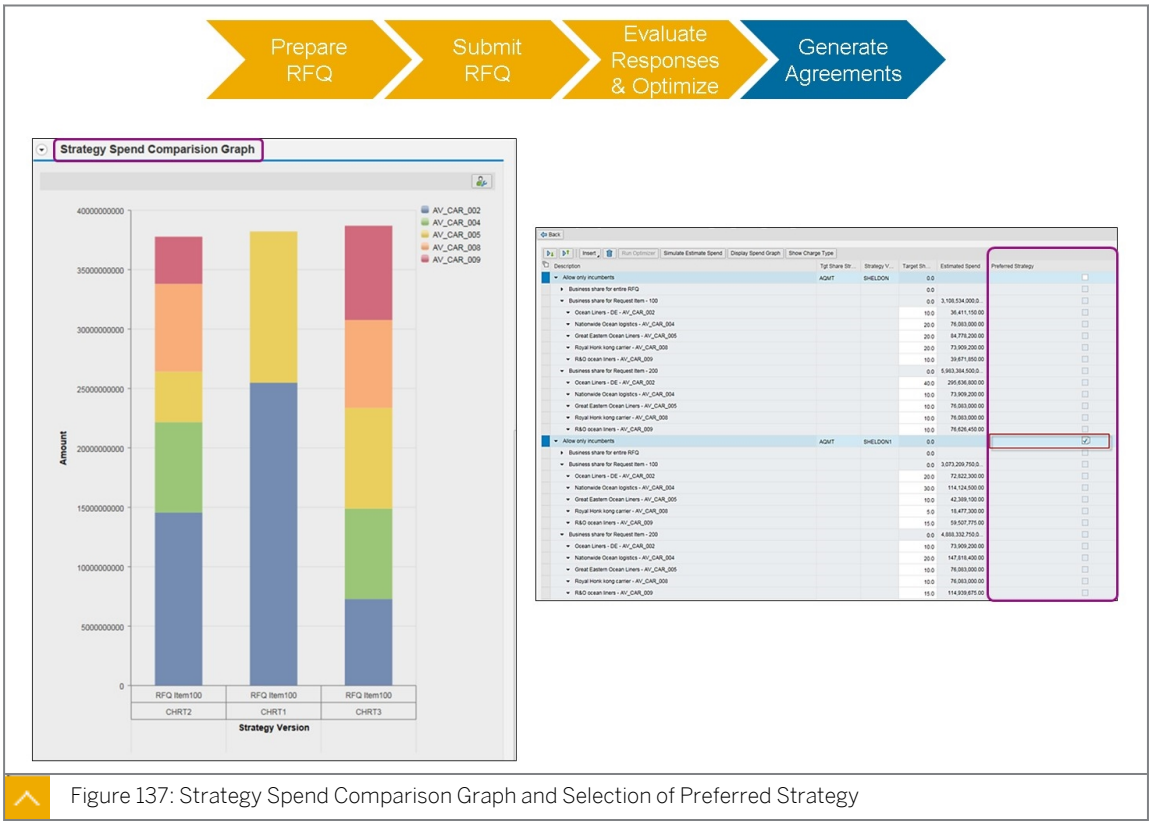

Figure 137: Strategy Spend Comparison Graph and Selection of Preferred Strategy

Target Rates in Freight Procurement

A shipper only wants to receive carrier responses within an acceptable range of values. Outside this range, rates are considered too expensive for a transportation service. Therefore, the shipper can publish acceptable target rates in the rate tables and calculation sheet to the carrier when publishing the request for quotation (RFQ). The carrier can view these defined target rates.

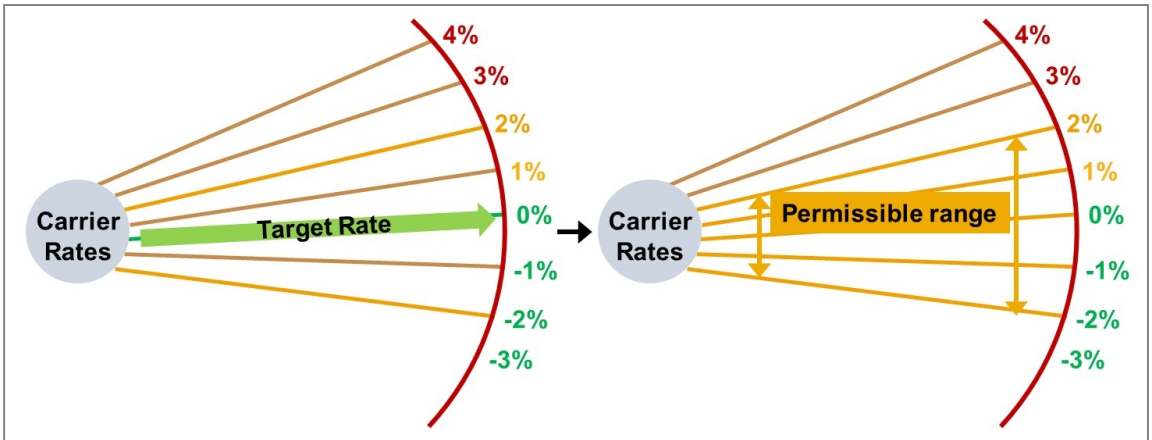

Figure 138: Target Rates

Target Rate Settings

The target rates are shown directly in the *Agreement RFQ Calculation Sheet Items* section and in the rate table of the respective item. Here you can enter a target value, including a tolerance range for every specified charge line item.

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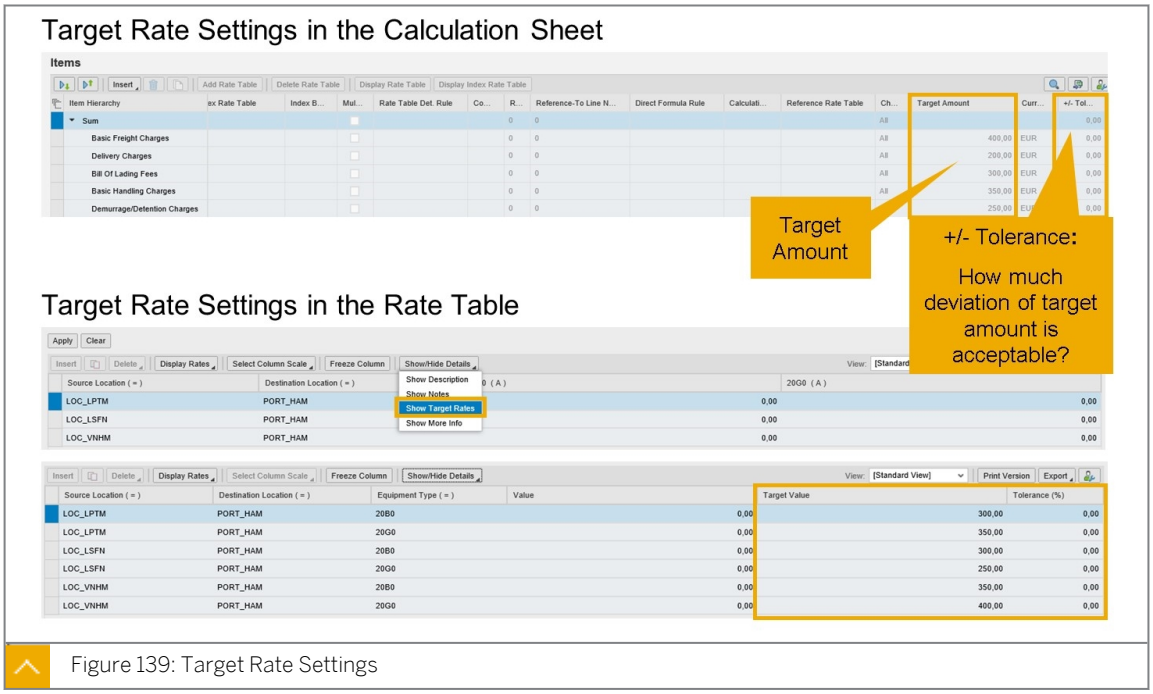

Figure 139: Target Rate Settings

Target Rate Publishing

The target rate specifies the maximum acceptable rate that you have determined for a transportation service. If you select the *Publish Target Rate* checkbox, the carrier can view the target rate when you publish an individual freight agreement RFQ.

In customizing, choose the following: *Transportation Management → Master Data → Agreement RFQs and Quotations → Define Freight Agreement RFQ Types*.

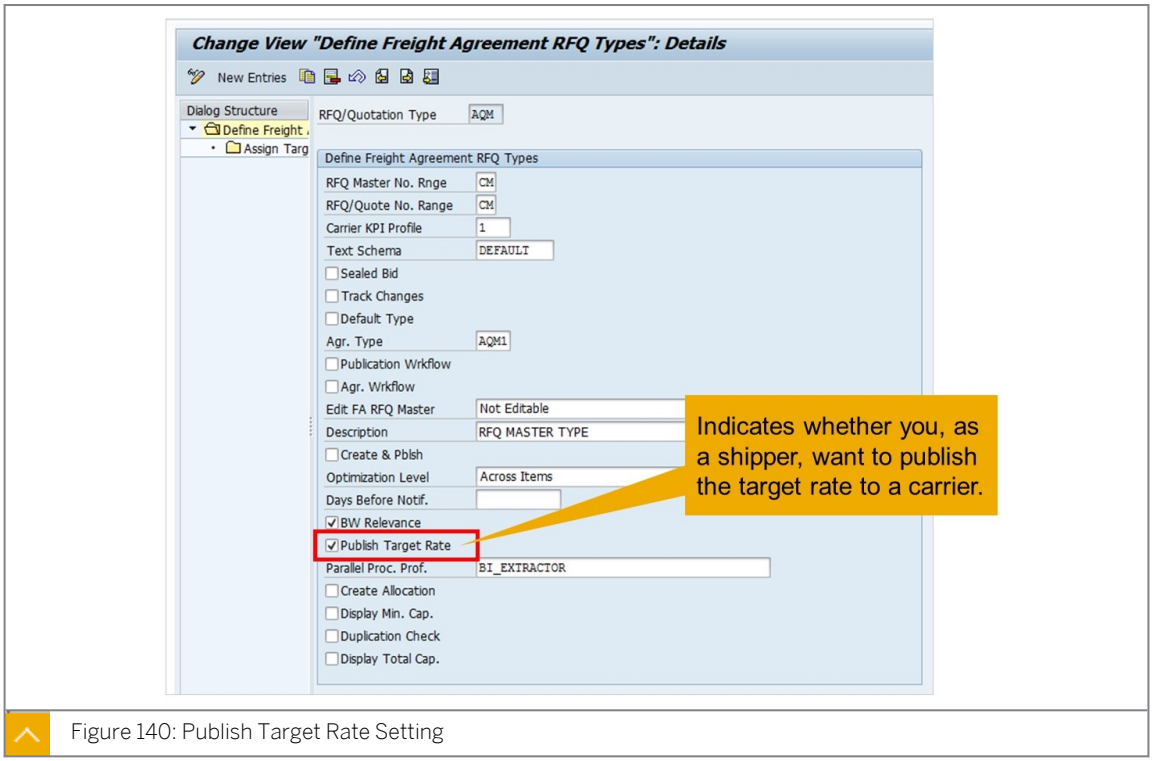

Figure 140: Publish Target Rate Setting

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Bonus-Malus Functionality

Bonus-malus is a concept that can influence and optimize the freight procurement process with the carrier performance data. For example, if the carrier performed well last year, in the current RFQ cycle, the shipper might like to give this carrier a bonus and influence the optimizer to give a higher target share to this carrier.

In a case in which the carrier performed badly last year, in the current RFQ cycle, the shipper might like to give this carrier a malus (or penalty), and influence the optimizer to give a smaller target share to this carrier.

Bonus-Malus Functionality

- With SAP TM, it is possible to influence the target share proposed by the carrier using carrier performance scores received from the SAP Business Information Warehouse (SAP BW) system.
- A flag is available in the Customizing activity target share strategy, which enables the bonus-malus functionality.

In customizing, choose *Transportation Management → Master Data → Agreement RFQs and Quotations → Define Target Share Strategies*.

Business Add-In (BAdI)

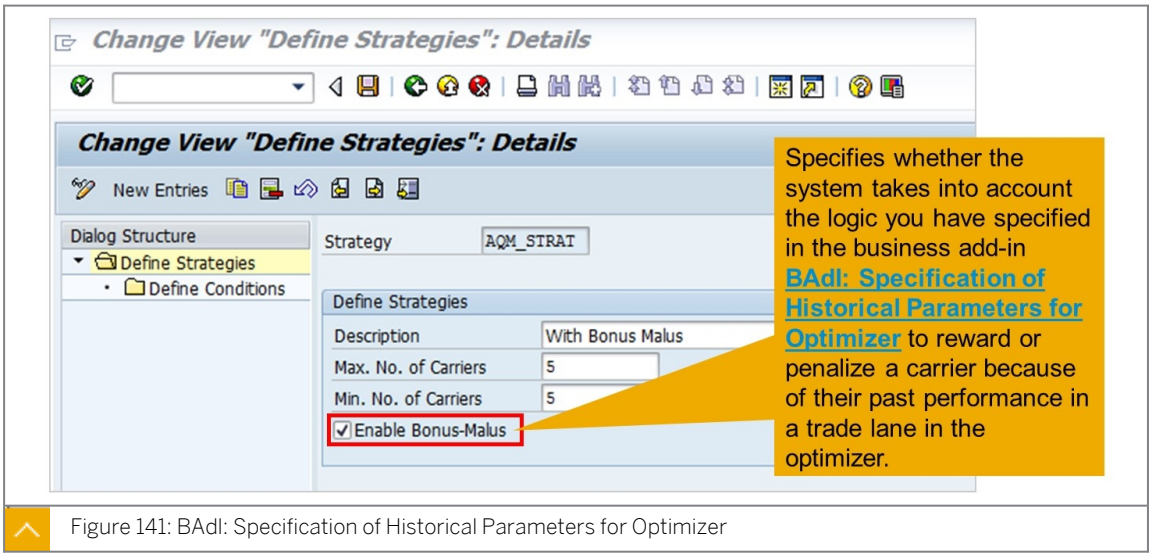

Figure 141: BAdI: Specification of Historical Parameters for Optimizer

This Business Add-In (BAdI) is used in the freight agreement RFQ (TM-FRA-RFQ) component. You can use this BAdI to define a logic to reward or penalize a carrier because of their past performance in a trade lane in the optimizer. When you run the optimizer, the system takes into account the strategy conditions and other constraints, and then takes into account the reward or penalty for a carrier from this BAdI. For example, if a carrier has a history of delays in delivery, you can add 10% additional cost to the cost a carrier has proposed. This ensures that the carrier is penalized when you run the optimizer.

This BAdI uses the GET_BONUS_MALUS_VALUE method.

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Bonus-Malus Values in Freight RFQ Carrier Section

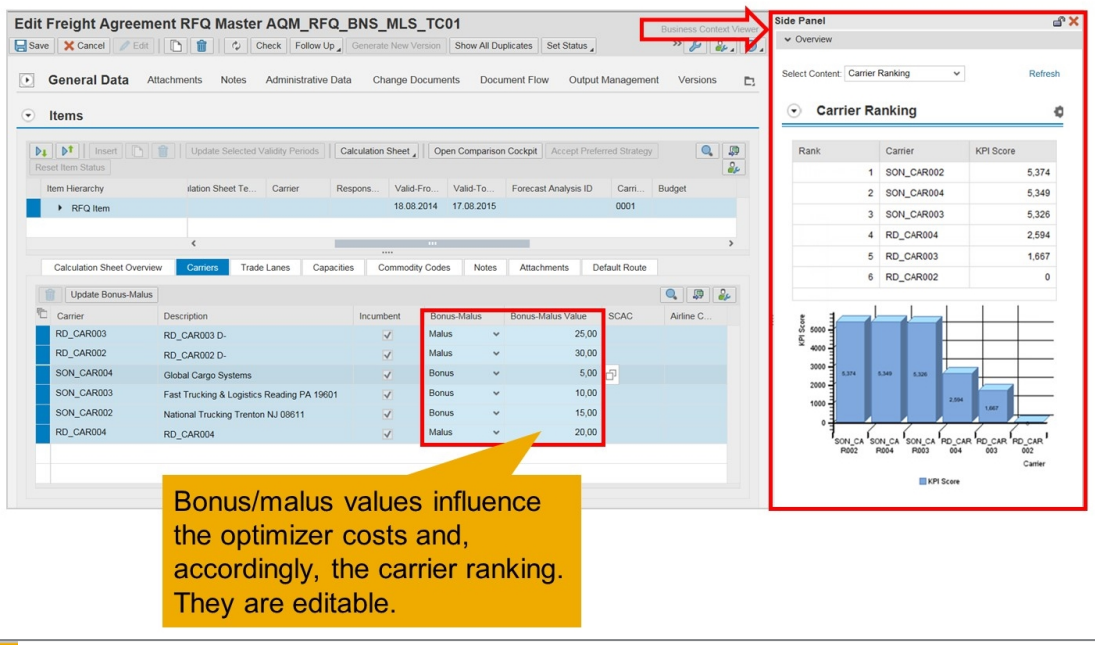

Figure 142: Bonus Malus Values in Freight RFQ Carrier Section

The values for the bonus-malus functionality are taken into account in the optimizer run for carrier ranking in the comparison cockpit. The bonus-malus values influence the target share of the carriers, and therefore deliver a different position in the carrier ranking.

Estimated Spend Simulation and Carrier Ranking

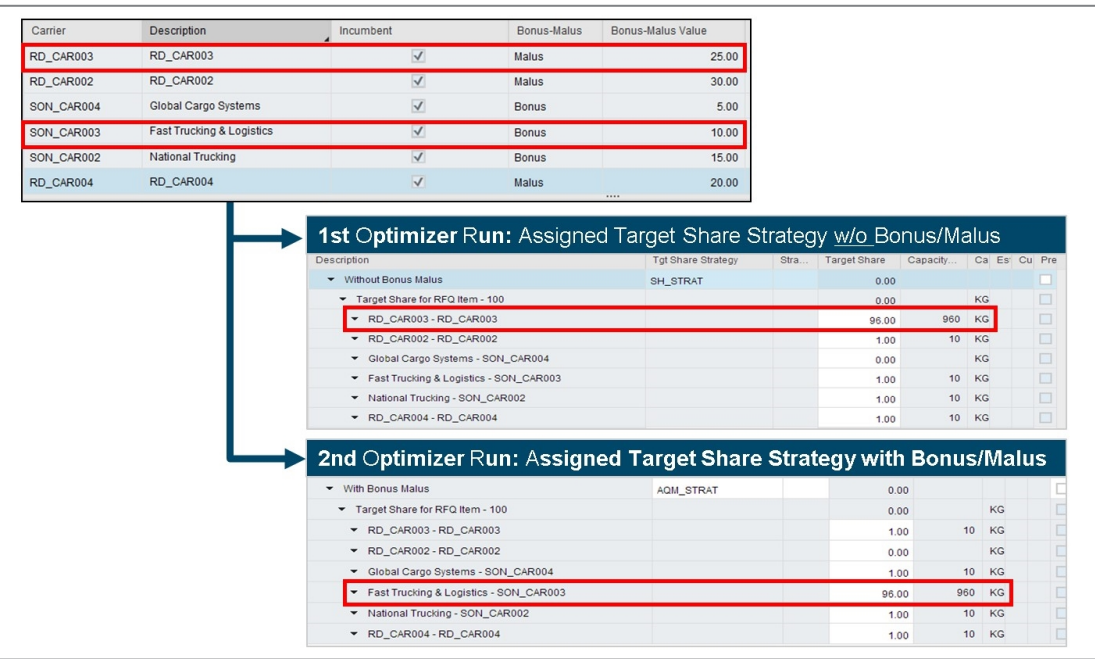

Figure 143: Estimated Spend Simulation and Carrier Ranking in the Comparison Cockpit

The figure shows an estimated spend simulation and carrier ranking in the comparison cockpit.

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LESSON SUMMARY

You should now be able to:

- Optimize the Freight Procurement Process

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Learning Assessment

1. Put the SFP process steps into a sequential order.

   Arrange these steps into the correct sequence.

   - ☐ Submit RFQ
   - ☐ Generate agreements
   - ☐ Prepare RFQ
   - ☐ Evaluate response and optimize

2. To determine and analyze the procurement needs for Strategic Freight Procurement, it is necessary to use SAP TM. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   - ☐ True
   - ☐ False

3. How are freight agreement master RFQs created?

   Choose the correct answers.

   - ☐ **A** From scratch
   - ☐ **B** From an existing freight agreement
   - ☐ **C** From a freight order
   - ☐ **D** From a freight agreement master RFQ template

4. Who approves the freight agreement master RFQ?

   Choose the correct answer.

   - ☐ **A** The chief of the purchasing organization
   - ☐ **B** The chief of the sales organization
   - ☐ **C** The carrier
   - ☐ **D** The chief of the planning and execution organization

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5. Carriers can see all of the freight agreement RFQs that the shipper has published in the Logistics Business Network.

   Determine whether this statement is true or false.

   - ☐ True
   - ☐ False

6. What is generated from a freight agreement master RFQ that has been responded to?

   Choose the correct answers.

   - ☐ A Freight orders
   - ☐ B Freight agreements
   - ☐ C Agreement allocations
   - ☐ D Freight agreement master RFQ templates

7. Under which of the following circumstances can an RFQ assignment item be merged with the freight agreement RFQ master assignment document?

   Choose the correct answer.

   - ☐ A The item has been requested by the shipper, but not approved.
   - ☐ B The item is already approved in the RFQ master assignment document.
   - ☐ C The item is pending approval in the RFQ master assignment document.
   - ☐ D The item is already published to the carrier.

8. The target rate specifies the minimum acceptable rate that you have determined for a transportation service.

   Determine whether this statement is true or false.

   - ☐ True
   - ☐ False

9. Which of the following statements about values for bonus-malus functionality are true?

   Choose the correct answers.

   - ☐ A They influence the target share of carriers.
   - ☐ B They are taken into account in the optimizer run for carrier ranking.
   - ☐ C They can be used to penalize a carrier with a bad performance history.
   - ☐ D They have no influence on the position of carriers in the carrier ranking.

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Learning Assessment - Answers

1. Put the SFP process steps into a sequential order.

   Arrange these steps into the correct sequence.

   [2] Submit RFQ

   [4] Generate agreements

   [1] Prepare RFQ

   [3] Evaluate response and optimize

   Correct. First, you prepare the RFQ. Second, you submit the RFQ. Third, you evaluate responses and optimize. Last, you generate agreements.

2. To determine and analyze the procurement needs for Strategic Freight Procurement, it is necessary to use SAP TM. Determine whether this statement is true or false.

   Determine whether this statement is true or false.

   [ ] True

   [X] False

   Correct. It is not necessary to use the SAP TM system for the first stage of the preparation work. You can use the legacy systems and other sources to analyze historic data, forecast transport volumes, and classify procurement needs.

3. How are freight agreement master RFQs created?

   Choose the correct answers.

   [X] A From scratch

   [X] B From an existing freight agreement

   [ ] C From a freight order

   [X] D From a freight agreement master RFQ template

   Correct. The FA Master RFQ can be created newly from scratch, from an existing agreement or from a FA Master RFQ template.

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4. Who approves the freight agreement master RFQ?

   Choose the correct answer.

   - [X] A The chief of the purchasing organization
   - [ ] B The chief of the sales organization
   - [ ] C The carrier
   - [ ] D The chief of the planning and execution organization

   Correct. The FA Master RFQ is approved by the chief of the purchasing organization via workflow.

5. Carriers can see all of the freight agreement RFQs that the shipper has published in the Logistics Business Network.

   Determine whether this statement is true or false.

   - [X] True
   - [ ] False

   Correct. All FA RFQs that have been submitted to the respective carrier can be reviewed in the SAP LBN.

6. What is generated from a freight agreement master RFQ that has been responded to?

   Choose the correct answers.

   - [ ] A Freight orders
   - [X] B Freight agreements
   - [X] C Agreement allocations
   - [ ] D Freight agreement master RFQ templates

   Correct. Freight Agreements and respective allocations for the carrier are generated as the result of a closed master RFQ at the end of the SFP process.

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7. Under which of the following circumstances can an RFQ assignment item be merged with the freight agreement RFQ master assignment document?

   Choose the correct answer.

   - [ ] A The item has been requested by the shipper, but not approved.
   - [x] B The item is already approved in the RFQ master assignment document.
   - [ ] C The item is pending approval in the RFQ master assignment document.
   - [ ] D The item is already published to the carrier.

   Correct. The prerequisite for merging an assignment item to the freight agreement RFQ master is that the item is already approved in the RFQ master assignment document.

8. The target rate specifies the minimum acceptable rate that you have determined for a transportation service.

   Determine whether this statement is true or false.

   - [ ] True
   - [x] False

   Correct. The target rate specifies the maximum acceptable rate that you have determined for a transportation service. Tolerance ranges for every specified charge line item can be defined, too.

9. Which of the following statements about values for bonus-malus functionality are true?

   Choose the correct answers.

   - [x] A They influence the target share of carriers.
   - [x] B They are taken into account in the optimizer run for carrier ranking.
   - [x] C They can be used to penalize a carrier with a bad performance history.
   - [ ] D They have no influence on the position of carriers in the carrier ranking.

   Correct. The bonus-malus influences target shares, are used to penalize carriers with a bad performance and are therefore taken into account for carrier ranking.

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UNIT 7 Embedded Logistics Service Provider Process

Lesson 1

UNIT OBJECTIVES

- Describe the Embedded LSP Scenarios

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Unit 7
Lesson 1

Understanding the Embedded LSP Process

LESSON OBJECTIVES
After completing this lesson, you will be able to:

- Describe the Embedded LSP Scenarios

Embedded LSP Business Scenarios

Companies are adopting various models to consolidate the transportation (and logistics) operations within a company to achieve various benefits.

Transportation and Logistics Consolidation Models

- Strategic reasons
  - Better visibility of transport costs across business units
  - Complete transportation demand visibility
- Consolidation
  - Higher volume of better rates
  - Centralized handling of goods and logistical operations
- Standardization
  - Tracking and tracing across companies
  - Document handling and design across companies

Embedded LSP Scenarios

In the embedded LSP business scenarios, some organizational units take care of the logistical activities of the group company. These units can either be separate business units, exclusively managing the transportation activity, or business units that take care of transportation for their own needs and those of other business units.

This leads to a scenario in which such embedded organizational units need to take care of the settlement with carriers for outsourced transportation, as well the settlement with internal business units, billing them for the transportation service provided.

You need support for external and internal financial reporting of all such relevant financial transactions to reflect on the financial statements, such as balance sheet and profit and loss statements, and other management accounting statements.

Models for Embedded LSP Scenarios

The main models for embedded LSP scenarios are outlined below:

Embedded LSP Scenarios: Models

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- *Model 1 Exclusive logistics and transportation with own company code*
  - One organizational unit cares for the logistical activities of the group.
- *Model 2 Exclusive logistics and transportation with own company code and external orders*
  - One organizational unit cares for logistical activities of the group and serves for external companies.
- *Model 3 One organizational unit has transportation services, additionally*
  - One organizational unit participates in the core business of the group and cares for the logistical activities of the group.

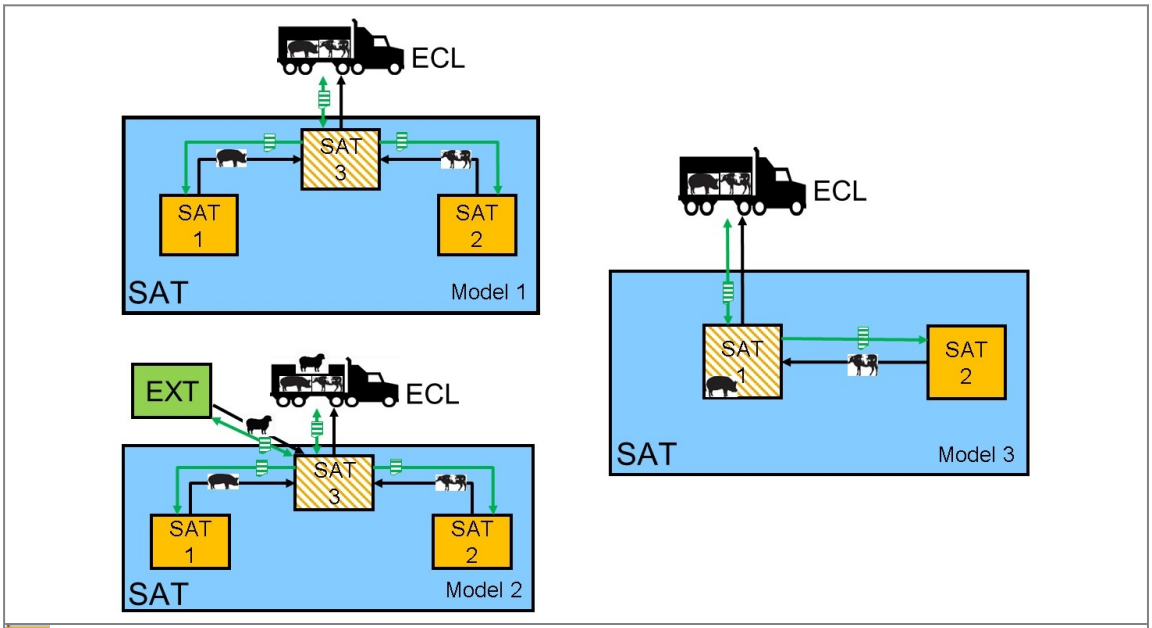

Figure 144: Group Company Embedded LSP Scenarios

For the Embedded LSP models shown in the figure, the relevant terminology is as follows:

- *Group company:* A financially and legally independent organizational center that is not tied to a geographical location and that is registered under business law. In this example, Super Animal Trading (SAT) is the group company.
- *Company Code:* The smallest organizational unit for which a complete, self-contained set of accounts can be drawn up for the purposes of external reporting. In this example, SAT 1 (producing pigs), SAT 2 (producing cows) and SAT 3 (internal LSP) are covered under the group company SAT.
- ECL stands for “Efficient Cargo Lines”, a carrier doing business with SAT3 & 1.
- EXT is an external company using SAT3 as carrier/ service provider in model 2.

Process Example Group Logistics Model 3

Company_C1, Company_C2, and Company_C3 belong to the same enterprise. *Company_C1 manufactures products, but also provides transportation services* for Company_C2 and Company_C3.

Company_C2 and Company_C3 act as internal shipper companies, buying transportation services from Company_C1. Company_C1 acts as a forwarding house. It buys transportation

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services from Logistics_Service_Provider_LSP, and sells transportation services to Company_C2 and Company_C3.

Transportation Management (TM) creates an order-based transportation requirement (OTR) or delivery-based transportation requirement (DTR) for each of the sales orders or deliveries that each company has in place with their respective customers in Sales and Distribution on an external S/4 HANA or SAP ERP system. Company_C1 then creates a freight order for the OTRs or DTRs, with itself as the purchasing organization in TM. It sends the freight order to Logistics_Service_Provider_LSP.

Logistics_Service_Provider_LSP collects the cargo at the warehouse and delivers the cargo to multiple destinations. The destination locations are geographically close together. Logistics_Service_Provider_LSP sends an invoice to Company_C1 for the freight order. Company_C1 pays Logistics_Service_Provider_LSP. Company_C1 uses the internal settlement process to recover the cost of providing the transportation service from Company_C2 and Company_C3.

In a group logistics scenario, Company_C1 can create and post internal settlement documents when the life cycle status of the freight order is In Execution.

To run a group logistics process, you must integrate orders based on orders created in Sales and Distribution (SD) or Materials Management (MM), and deliveries created in Logistics Execution (LE) from an external S/4 HANA or SAP ERP system with a TM component.

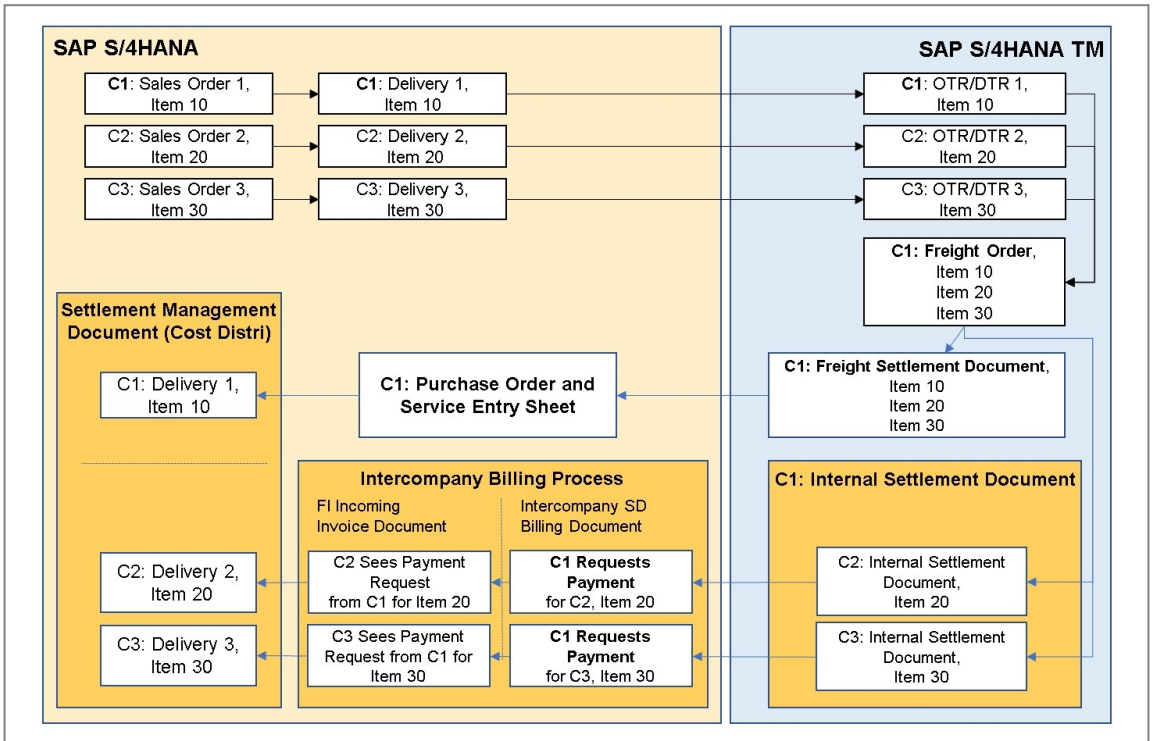

Figure 145: Document Flow Group Logistics Model 3

Embedded LSP Basic Settings in TM

The Customizing and master data settings that have to be set up and enabled in SAP TM have already been covered in previous lessons. The relevant internal settlement settings are described here:

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Prerequisites and Configuration

- Create the internal settlement document type.
- Define the shipping type.
- Define the transportation modes allowed for stage types.
- Define the stage profile.
- Define the order-based transportation requirement (OTR) type.
- Define the freight settlement document type.
- Define the freight order type.
- Create settlement profiles for both forwarding and freight settlement.
- Set up organizational data.
- Assign the business partner to the organization.
- Create the calculation profile.
- Create cost distribution methods.
- Create cost distribution profiles.
- Assign the created settlement profiles, calculation profile, and distribution profile to the charges profile assigned to the organizational unit.

Internal settlement document types can be defined.

Configuration Steps

The steps for embedded LSP configuration are as follows:

- Assign the settlement profile and calculation profile to the organization unit:

  In Customizing, choose *Transportation Management → Basic Functions → Charge Calculation → Basic Settings → Define Charges Profiles*.

- Create the internal settlement document type:

  In Customizing, choose *Transportation Management → Settlement → Forwarding Settlement → Define Forwarding Settlement Document Types*.

- Create an internal agreement:

  In the SAP Fiori launchpad, choose *Contract Management → Create Internal Agreement*.

- Enable the freight order (FO) or freight booking (FB) type for cost distribution:

  In Customizing, choose *Transportation Management → Freight Order Management → Define Freight Order Types*.

- Specify the purchasing organization of the freight order or freight booking that is executing the stage as a forwarding house:

  In transaction PPOME, choose *your Purchase Organization → tab Org. Data → Field Org. Unit Function: Forwarding House*.

These steps are common to setting up both intracompany and intercompany settlements.

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By default, the SAP TM system creates an intercompany settlement document for organizations that belong to different company codes. If you want to use an intracompany settlement for a company organization, you must select the *Intracompany Settlement* checkbox in the *Org. Data* tab page of the relevant organization structure. You can access the structure using transaction `PPOME`.

Note:
The further and detailed Forwarding Settlement integration settings to SAP SD, as well as the intercompany settlement process and the LSP based Cost Distribution, are covered in the respective LSP-based TM courses.

LESSON SUMMARY
You should now be able to:

- Describe the Embedded LSP Scenarios

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Learning Assessment

1. Match each embedded LSP scenario model with its correct description:

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

Exclusive logistics and transportation with own company code	One organizational unit cares for the logistical activities of the group
Exclusive logistics and transportation with own company code and external orders	One organizational unit cares for logistical activities of the group and serves for external companies
One organizational unit has additional transportation services	One organizational unit participates in the core business of the group and care for the logistical activities of the group

2. The embedded LSP process uses the internal settlement document for invoicing the logistical activities of the embedded LSP to the organizational units of the group.

   Determine whether this statement is true or false.

   ☐ True

   ☐ False

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Learning Assessment - Answers

1. Match each embedded LSP scenario model with its correct description:

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

Exclusive logistics and transportation with own company code	One organizational unit cares for the logistical activities of the group
Exclusive logistics and transportation with own company code and external orders	One organizational unit cares for logistical activities of the group and serves for external companies
One organizational unit has additional transportation services	One organizational unit participates in the core business of the group and care for the logistical activities of the group

   Correct. In an exclusive logistics and transportation scenario with own company code, the one organizational unit cares for the logistical activities of the group. In an exclusive logistics and transportation scenario with own company code and external orders, the one organizational unit cares for logistical activities of the group and serves also external companies. If one organizational unit has additional transportation services, it participates in the core business of the group and cares for the logistical activities of the group.

2. The embedded LSP process uses the internal settlement document for invoicing the logistical activities of the embedded LSP to the organizational units of the group.

   Determine whether this statement is true or false.

   - [X] True
   - [ ] False

   Correct. The embedded LSP organizes the logistical activities inside the group and bills the charges to the other organizations with the internal settlement document which is a Forwarding Settlement category.

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