

SUPPLY CHAIN DIGITAL TWIN TRAINING MANUAL PART 1

Manual v6 - 2023-12-18
Model version 1.50.0

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1 Application Overview

1.1 Supply Chain Digital Twin background

The SCDT is a simulation model that allows supply chain managers to build and explore digital copies of their supply chain. The SCDT realistically simulates a supply chain using the following key capabilities:

- It combines Supply Chain Management best practices, simulation, and human intuition into a single platform.
- It incorporates ALL critical Variabilities, Uncertainties, Complexities, Constraints, and the Ambiguity of competing objectives. It can help businesses to:
 - Make reliable operational and financial commitments without compromising on performance.
 - Select the best strategies and tactics for your unique circumstances.
 - Quickly determine the impact of and best response to unplanned events.
 - Improve your availability and performance.
 - Reduce inventory and cost without compromising on performance.

The model answers the following key questions:

- Can we fulfill our commitments? How? If not, why not?
- Can we do better if we change our supply chain management rules? How much better? Which changes will have the most significant impact?
- Should we add capacity, storage, or new forms of transportation? If yes, how much better will our supply chain performance, responsiveness, and reliability be?
- How will these changes impact the whole system? How can we mitigate negative changes and capitalize on positive changes in demand, supply, or product mix?
- How do supply chain disruptions affect the company? How should we deal with, mitigate, or capitalize on the effects of the disruptions?
- How much better can we do financially if we always have enough inventory (not too little and not too much) to eliminate shortages and surpluses?

1.2 Workflow

The model uses either an Excel Workbook or a collection of text files as an input file to create a scenario in the model. All required information, including the execution rule parameters, is available within the Scenario file allowing the user to create a data-driven model with no hard-coded values in the simulation. The user can then execute various experiments in the platform, from single simulation runs to scenario comparisons and sensitivity analysis. At the end of any of these experiments, the results can be reviewed in the UI or analyzed in detail using the output logs provided. Figure 1 shows a schematic overview of the SCDT architecture workflow.

SCDT Architecture

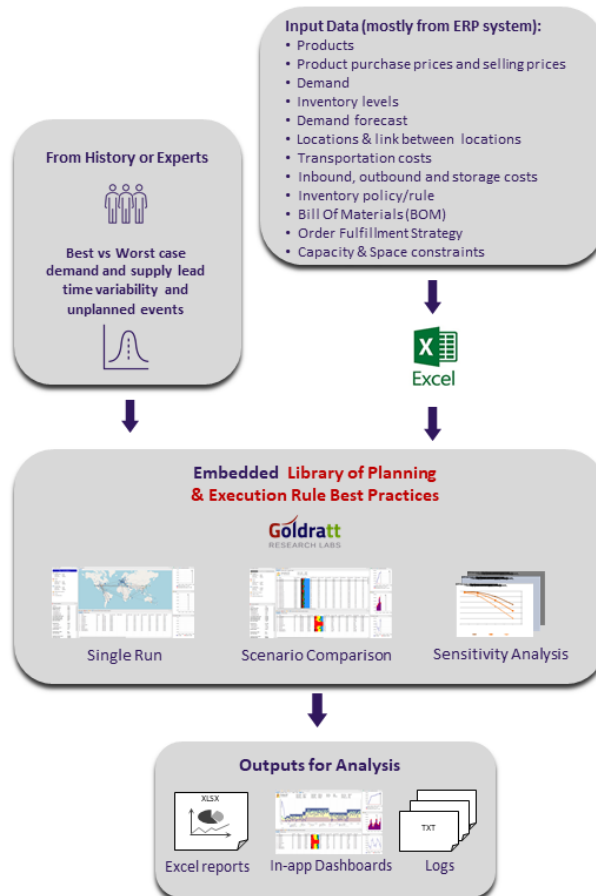


Figure 1: SCDT Architecture

1.3 Application setup and execution

The latest model version is available on the Google Drive shared file system unique for each customer. For Windows, the model consists of several supporting objects and an executable file. On Macintosh, the app is installed using the standard .dmg format and added to the applications folder.

The following steps will guide you through the model installation and initialization for Windows.

- 1. Download and install the latest version.**
 - 1.1 Select the latest version from the shared folder.
 - 1.2 Right-click on the .zip folder and select "Download" as shown in Figure 2.

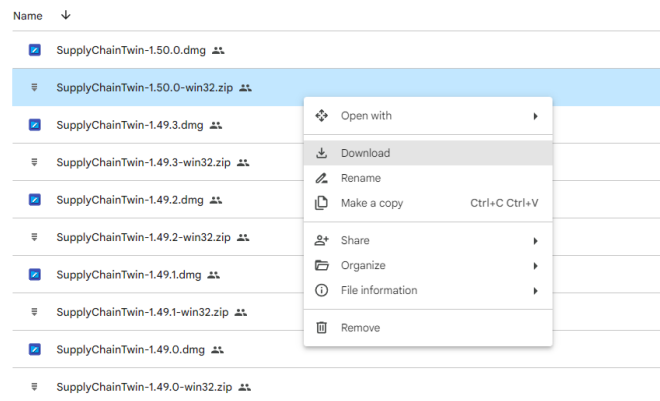


Figure 2: Download the Model

2. Extract the model files

- 2.1 Once the zipped file is downloaded, locate the file on your computer. It should be in your "Downloads" folder unless you specified a different location for the downloaded file.
- 2.2 Extract the zipped folder using 7-Zip, Win-Zip, Windows File Explorer, or a similar program. Then copy or move it to a folder that you will easily be able to locate in the future. View Figure 3.

Example: Windows Explorer

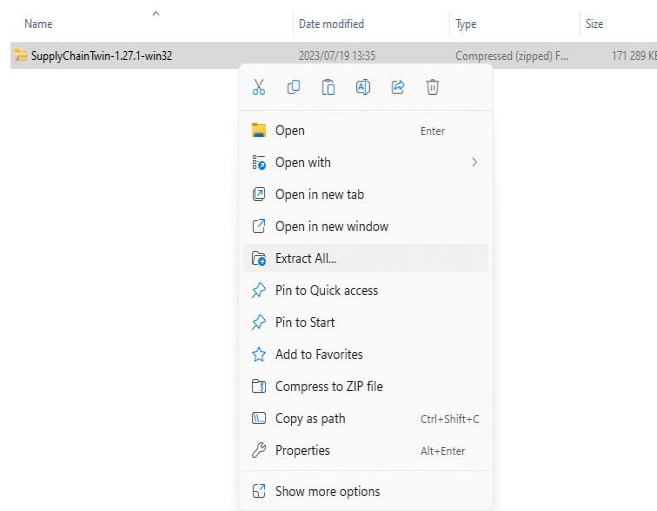


Figure 3: Extract Model using Windows File Explorer

3. Run the model executable file

- 3.1 Navigate to the extracted folder. You will see two executable files. Run the .exe file named "SupplyChainTwin.exe," as shown in Figure 4. Depending on your computer security settings, you can either:
 - a. Double-click the .exe file to execute it.
 - b. Right-click on the .exe file and select "Run as administrator," as shown in Figure 4.

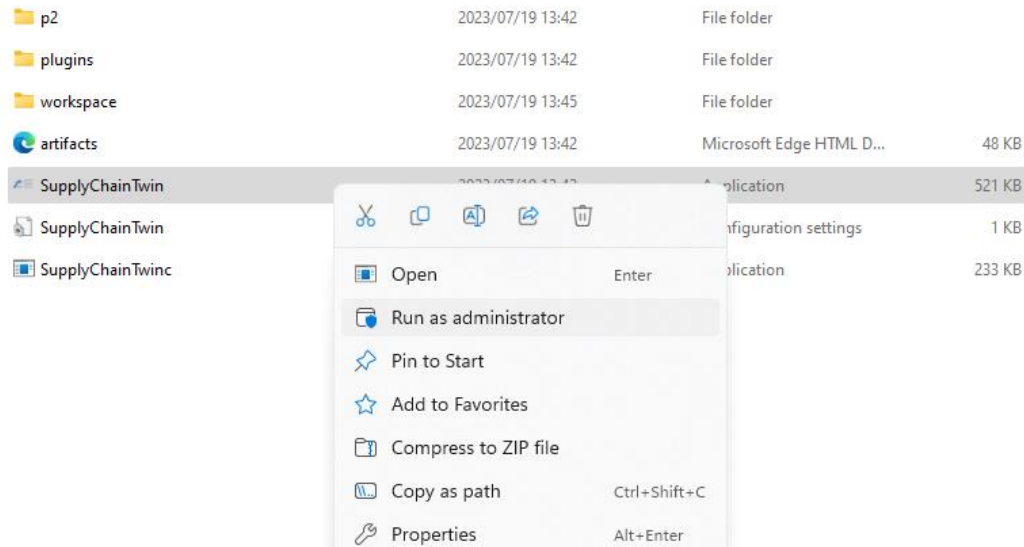


Figure 4: Run as Administrator

If you get a security warning, you might need to unblock the file to allow it to run, as shown in Figure 5 and Figure 6.

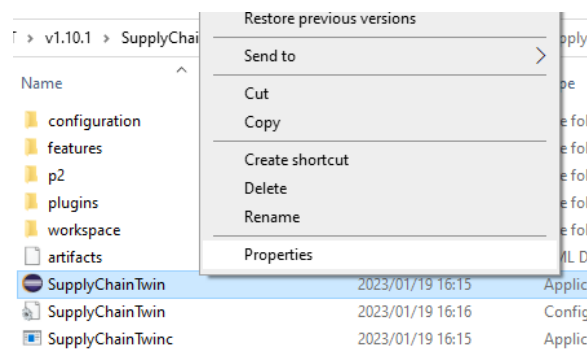


Figure 5: Properties

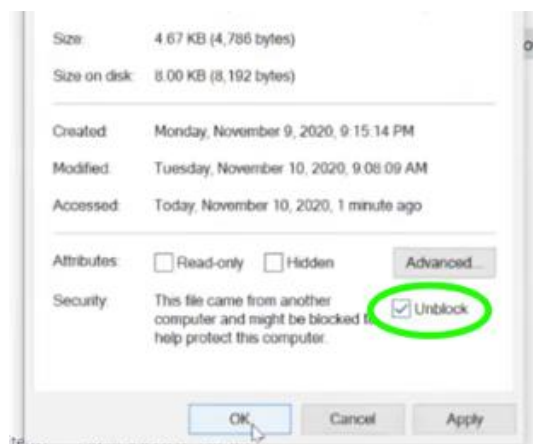


Figure 6: Unblock from Security Restrictions

4. License Activation

After clicking on the model, the following popup will appear, as shown in Figure 7.

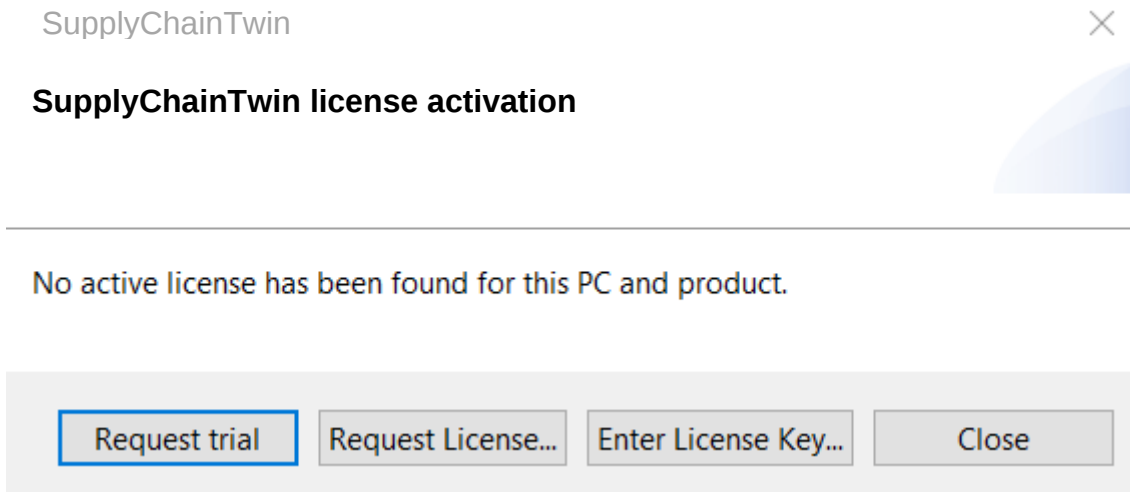


Figure 7: License Activation

You can request a trial to use the model for a 30-day evaluation period. If you want to try the model, select "Request trial," and you will immediately be given access to the model for 30 days. Note that this requires an active internet connection. You can request a text-based license key for locations that do not have an internet connection using the step below.

Select "Request License..." and see the following popup shown in Figure 8. The contents of the popup should be sent to support@goldrattresearchlabs.com. You can click the "Copy Message to Clipboard" button and paste that text into the email. A license key will be sent to you via email after review and confirmation of your subscription eligibility by our support team.

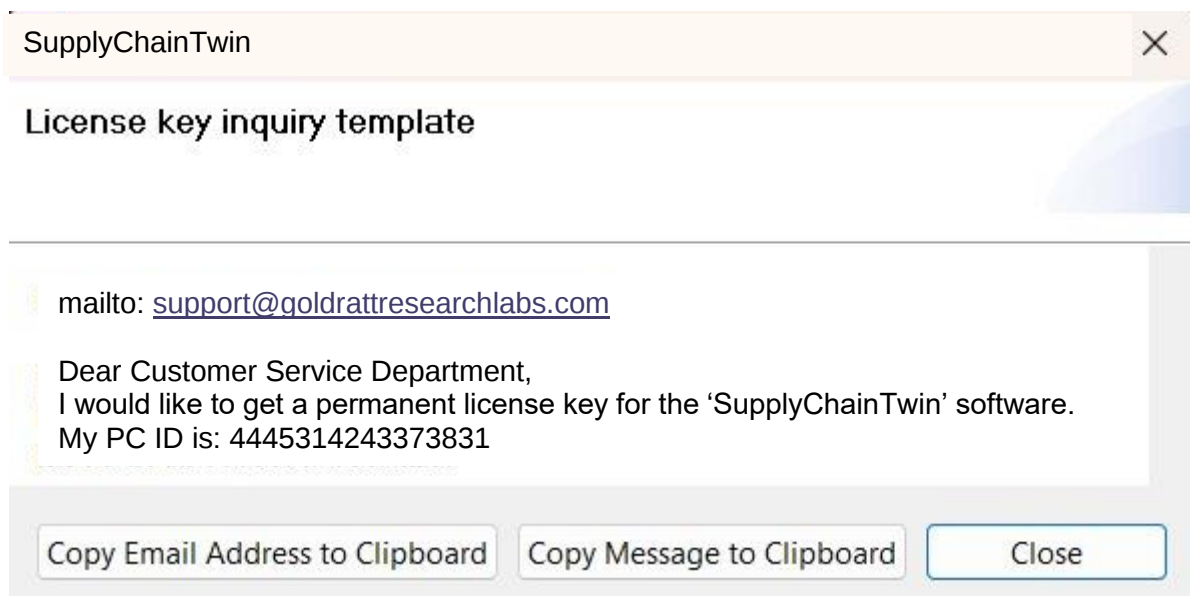


Figure 8: License Key Enquiry

Once you have received a text-based license from the support team, navigate to the first popup message (Figure 7) and click on the "Enter License Key" button. A popup will appear,

as shown in Figure 9. Enter your license key and then click on the "Activate License Key" button, and you will be given access to the model.

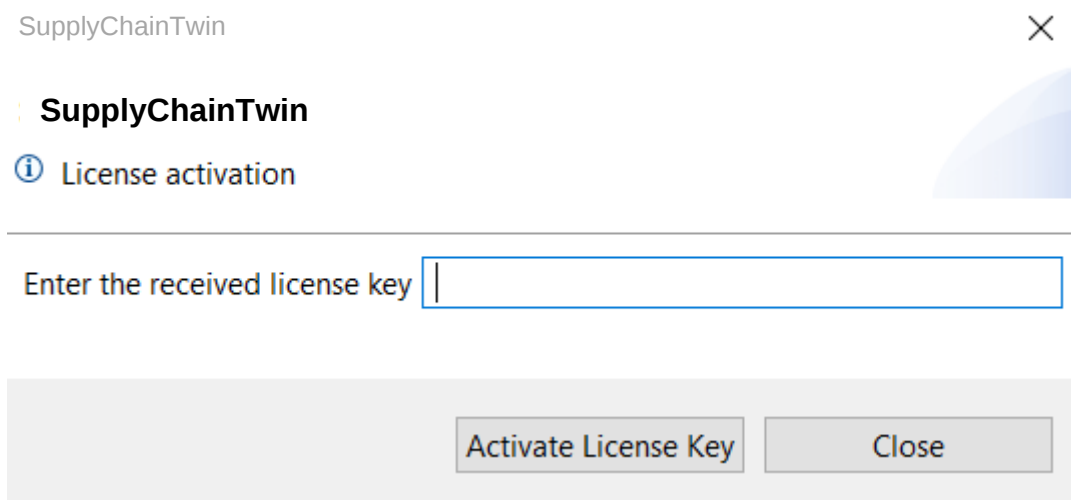


Figure 9: License Activation

5. Running the model

Once you have an active license key, the model will open and display the welcome page (Figure 10). It may take a few seconds for the model to open.

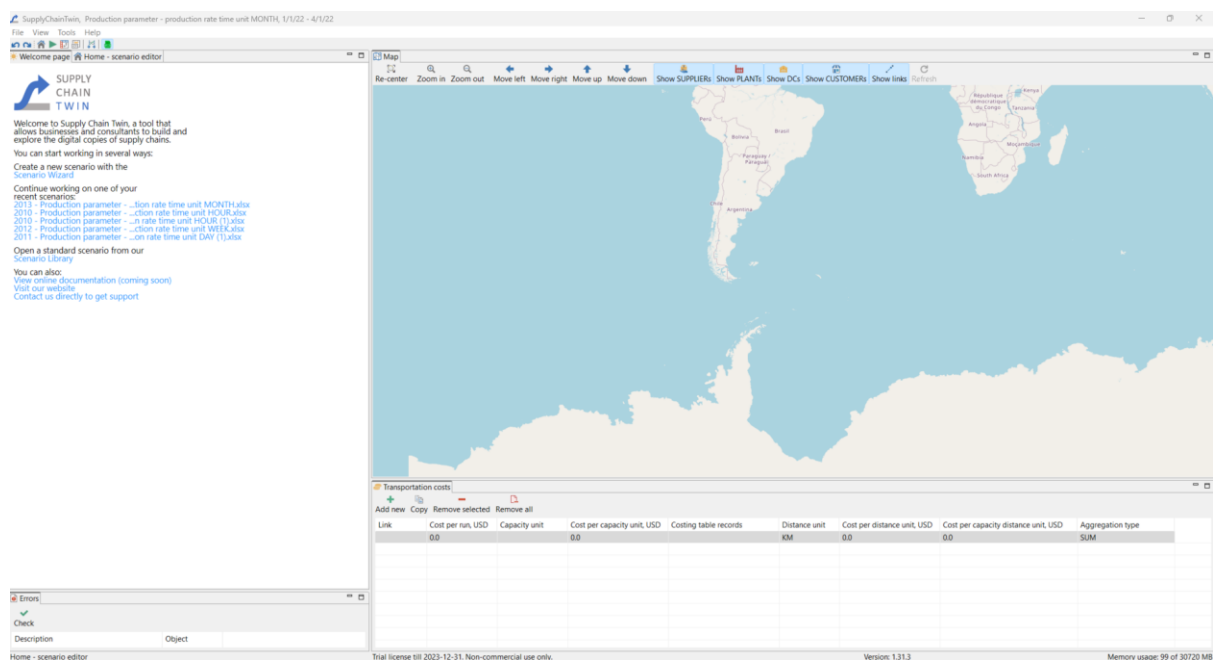


Figure 10: Welcome Page

If you have any trouble running the model, please contact support@goldrattresearchlabs.com.

2 Creating a Scenario

Scenarios for the SCDT can be set up either using the user interface (UI) or from scratch using Excel or text files. For the latter two options, it is always advised to start from a blank scenario template created in the UI, save it in your desired format, either Excel or zip, and then populate the required table as needed.

How to set up a scenario using the UI

To create a scenario from scratch, click "File" in the upper left corner and then "New blank scenario" OR select "New blank scenario" on the welcome page as seen in Figure 11. The scenario editor can be accessed by clicking on the "Home - scenario editor" tab next to the welcome page. See Figure 11 and Figure 12.

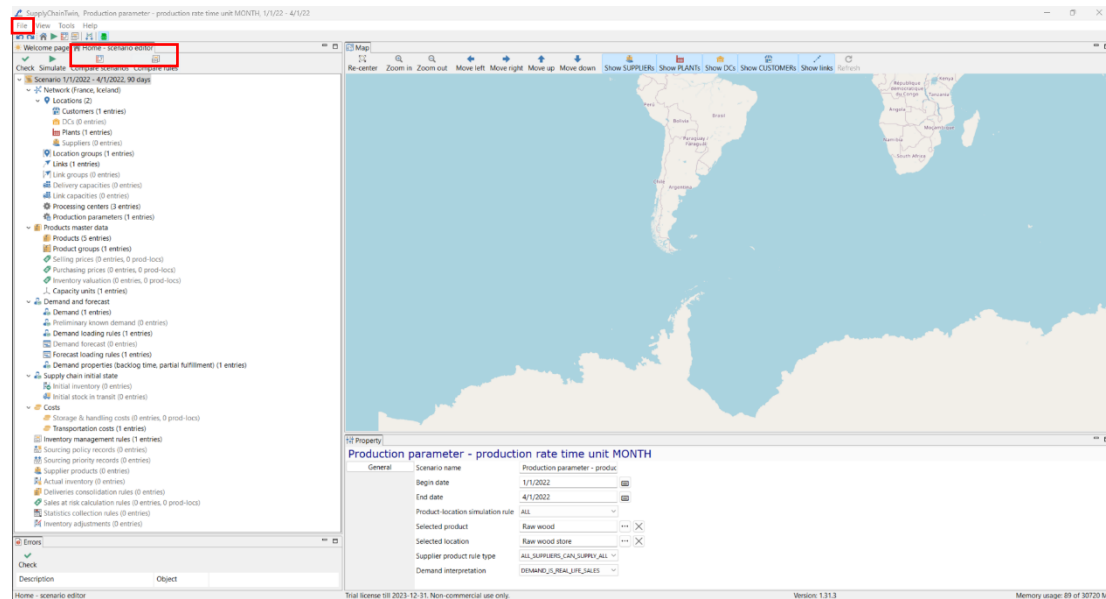


Figure 11: Home Page

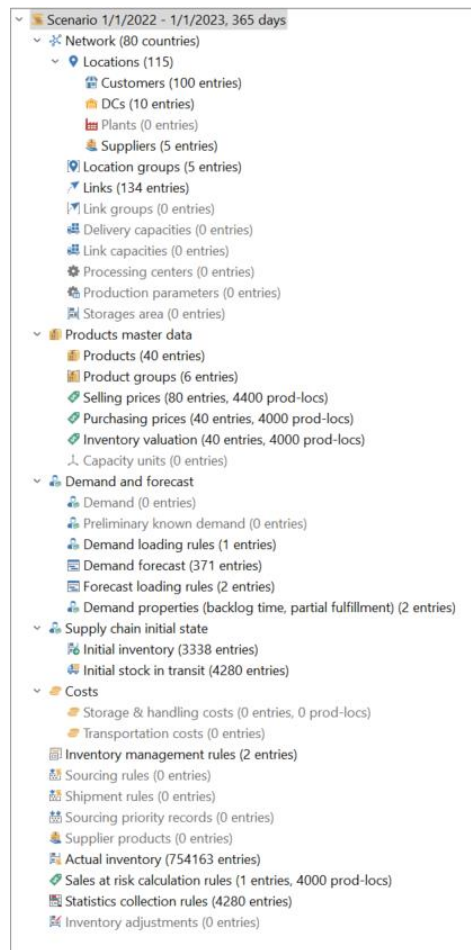


Figure 12: Scenario editor

When you select any tab on the left, the relevant property will open in the window below the map. The tabs on the left will be grayed out if it is not used in the scenario, i.e., they do not have any data in them.

In the tables below, the first column represents the Data Field name as seen in Excel. The second column is the tab name as present in the Supply Chain Digital Twin App. the description of the names of the columns is in the third column, and an example is in column four. The required input format will be indicated in bold at the bottom of the description. All fields are mandatory unless stated as optional.

Some fields have predefined options to choose from, these options will be indicated in bold text and all upper-case letters.

2.1 Supply Chain Digital Twin Scenario

Data field explanation for UI, Excel, and Text input

Data Field name in Excel	Column name in SCDT	Description	Example
name	Scenario name	This heading is the scenario name that will be printed out in all the model outputs in the first column. Text value	Base Case
beginDate	Begin date	The date on which the simulation starts modeling. Short date format	2021/06/01
endDate	End date	The date on which the simulation stops modeling. Short date format	2022/06/01
description		A description of the created scenario. It has no impact on the logic of the model. Text value; optional	
checkDescription		A specific expected outcome value. It can be used to check assumptions and help prove or disprove a user's hypothesis. It has no impact on the logic of the model. Text value; optional	
productLocationSimulationRuleType	Product-location simulation rule	HAS_DEMAND_OR_INVENTORY A product location is displayed in model output only when the Location has inventory and/or demand. ALL All product locations are displayed in the model output, regardless of the product location having demand or inventory.	HAS_DEMAND_OR_INVENTORY
selectedProduct	Selected Product	The product ID of the Product that will be modeled in the simulation. Text value	732789
selectedLocation	Selected Location	The location ID of the Location that will be modeled in the simulation. Text value	JC
supplierProductRuleType	Supplier product rule type	ALL_SUPPLIERS_CAN_SUPPLY_ALL_PRODUCTS All suppliers can supply all products. AS_DEFINED_BY_SUPPLIER_PRODUCT_RECORD Suppliers can only supply the products as defined on the Supplier Product Record sheet/tab	ALL_SUPPLIERS_CAN_SUPPLY_ALL_PRODUCTS
demandInterpretation	Demand interpretation	DEMAND_IS_REAL_LIFE_SALES Choose this option if the demand in the scenario is based on the actual sales recorded in the system and does not reflect the true demand TRUE_DEMAND_IS_KNOWN Select the option if either the demand was known (i.e. actually recorded) or if the demand was generated as part of some experiment	DEMAND_IS_REAL_LIFE_SALES

Data Field name in Excel	Column name in SCDT	Description	Example
quotedLeadTimeCalculationRule	Quoted Lead time calculation rule	USE_PLANNED_LEAD_TIMES USE_ACTUAL_LEAD_TIMES	USE_PLANNED_LEAD_TIMES
actualLeadTimeDistributionPercentile	Actual lead time distribution percentile	Defines what percentile of actual lead times that occurred during the simulation should be used during the dynamic quoted lead time calculation.	0.80
leadTimeStatsBackwardLookingHorizon	Lead time stats backward looking horizon, days	Defines the number of days we will look backward when using the actual historical lead times for the dynamically quoted lead time.	30
demandRejectionPolicy	Demand rejection	NEVER_REJECT Demand generated at a customer is never rejected regardless of backlog. REJECT_IF_ALL_PC_BACKLOG_LIMITS_EXCEEDED If all processing centers along all possible productions paths exceed their respective backlog limits at the time of demand generation, a demand generated at a customer may be rejected.	NEVER_REJECT

User Interface

The user interface is shown in attached Figure 13. The scenario name can be changed by typing the desired scenario name into the text box. The dates can be selected by clicking on the calendar next to the text box. The product-location simulation rule and supplier product rules can be selected via the dropdown list. The Product and locations can be selected by clicking on the three dots next to the text box, which will provide a list of options to select.

Property

Generated scenario

General

Scenario name: Generated scenario

Begin date: 1/1/2022

End date: 1/1/2023

Product-location simulation rule: ALL

Selected product: Product A1

Selected location: Korea DC

Supplier product rule type: ALL_SUPPLIERS_CAN_SUP

Demand interpretation: TRUE_DEMAND_IS_KNOWN

Quoted lead time calculation rule: USE_PLANNED_LEAD_TIME

Actual lead time distribution percentile: 0.80

Lead time stats backward looking horizon, days: 30

Demand rejection: NEVER_REJECT

Figure 13: Property UI

Excel

In Excel, the desired information can be typed or selected from the dropdown lists shown in Figure 14.

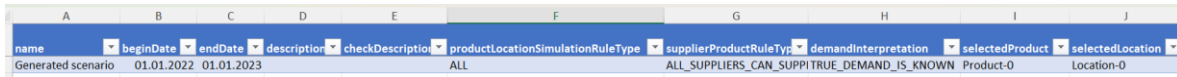


Figure 14: Excel Scenario Creation

2.2 Network

The network represents the physical network of the locations. The network includes the location groups, links between locations, delivery capacities, and locations.

2.2.1 Locations

A similar setup is used in the subcategories (Customers, DCs, Suppliers). You can either set up all your locations in this table and then just specify the type of location, or you can specify the different locations in the created tables.

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	The ID of the Location. It must be unique across all source locations, i.e., it cannot be duplicated in the column. Text value	Location-0
Name	Name	The name of the Location. Has no impact on the logic of the model. Text value	Supplier
City	City	The name of the city in which the Location is located. It has no impact on the logic of the model. Text value; optional	New York
Country	Country	The name of the country in which the Location is situated. It has no impact on the logic of the model. Text value; optional	United States
longitude	Longitude	Coordinates of the latitude of the Location. Numerical value	0
latitude	Latitude	Coordinates of the longitude of the Location. Numerical value	0
monthlyFixedCost	Monthly fixed cost	The operational/fixed costs of using this Location per month. Numerical value; optional	0.0
type	Type	The type of Location. It can be a supplier, distribution center (DC), or customer. CUSTOMER This specified Location is a Customer in the model. DC This specified Location is a Distribution Centre in the model. SUPPLIER This specified Location is a Supplier in the model.	SUPPLIER

Data Field name in Excel	Tab name in SCDT	Description	Example
	Groups	The groups with which the Location is associated. Refer to section 2.2.2.	LocationGroup-1
	Planned unavailability	The planned amount of time that the location will be unavailable. Refer to section 2.2.3.	Scheduled 28% of time
	Unplanned unavailability	The unplanned amount of time that the location will be unavailable. Refer to section 2.2.4.	Scheduled
	Storage capacity limits	This is the storage capacity of the location. Refer to section 2.2.5.	Unit of product: 5000.0
priority	Priority	The priority rating. A numerical value, with one being the highest priority, 2 second highest, etc. Numerical value	1

User Interface

All of the locations present in the simulation are displayed in the Location tab (Figure 15). The location tab can be used to log the displayed information. However, it may be easier to log the location types and relevant information separately in the Customer, DC, and Supplier subcategories and then to use the Location type to view the information.

Press the green + button on the left. A unique Location ID that cannot be changed will be assigned to the row. The remainder of the columns can be filled in by typing or using a dropdown list. See

Location groups for the Group setup.

Identifier	Name	City	Country	Longitude	Latitude	Monthly fixed ...	Type	Groups	Planned u...	Unplanned un...	Storage capac...	Priority
Location-11...	Basel	Basel	Switzerla...	7.58782...	47.558...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-182	TUNIS	TUNIS	Tunisia	9.400138	33.843...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-515	Vitez	Vitez	Bosnia a...	17.7914...	44.150...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-261	Abuja	Abuja	Nigeria	7.39	9.07	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-134	Amman	Amman	Jordan	35.9239...	31.951...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-12...	Amsterdam	Amsterdam	Netherla...	4.89799...	52.374...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-302	Asunción	Asunción	Paraguay	-57.631...	-25.29...	0.0	Custo...	All custom	Not set	Not set	Unit of product...	0.0
Location-166	Athens	Athens	Greece	23.7279...	37.984...	0.0	Custo...	All custom	Not set	Not set		0.0
Location-12...	BANGALORE	BANGALORE	India	77.5912...	12.979...	0.0	Custo...	All custom	Not set	Not set		0.0
Location-11...	Barcelona	Barcelona	Spain	2.17713...	41.382...	0.0	Custo...	All custom	Not set	Not set		0.0
Location-16...	Beaumont	Beaumont	United S...	-94.101...	30.086...	0.0	Custo...	All custom	Not set	Not set		0.0
Location-18...	T2 Supplier	Beijing	China	104.1954	35.8617	0.0	Suppl...	All location	Not set	Not set		0.0
Location-204	Beirut	Beirut	Lebanon	35.47843	33.895...	0.0	Custo...	All custom	Not set	Not set		0.0
Location-180	Ben Nghe ...	Ben Nghe ...	Vietnam	108.426...	13.290...	0.0	Custo...	All custom	Not set	Not set		0.0

Figure 15: Locations

Excel

In Excel, there are no subcategories. Subcategories are distinguished by selecting the appropriate category in the "customer type" column. Enter the information into the relevant field (Figure 16).

In Excel, the Groups, Planned unavailability, Unplanned unavailability and Storage capacity limits are logged in different sheets. Refer to sections 2.2.2, 2.2.3, 2.2.4 and 2.2.5.

ID	name	city	count	latitude	longitude	monthlyFixe	dCost	type	priorit
Angul	Angul	ANGUL	India	20,91	85,01	0		PLANT	1
Patratu	Patratu	PATRATU	India	23,63	85,32			PLANT	3
Raigarh-BF	Raigarh-BF	RAIGARH	India	21,92	83,35			PLANT	2
Raigarh-SMS2	Raigarh-SMS2	RAIGARH	India	21,92	83,35			PLANT	2
Raigarh-SMS3	Raigarh-SMS3	RAIGARH	India	21,92	83,35			PLANT	2
Raigarh-Mills	Raigarh-Mills	RAIGARH	India	21,92	83,35			PLANT	2
Nalwa	Nalwa	Nalwa	India	22,02	83,38			PLANT	4
Domestic	Domestic	Domestic	India	23,00	87,00			CUSTOMER	2
Export	Export	Export	India	21,00	87,00			CUSTOMER	1
Supplier	Supplier	Supplier	India	24,00	84,00			SUPPLIER	5
External Plant	External Plant	External Plan	India	22,00	81,00			PLANT	6

Figure 16: Location in Excel

Customers

Same setup logic as the Location User Interface (Figure 17).

Identifier	Name	City	Country	Longitude	Latitude	Monthly fix...	Groups	Planned unavailability	Unplanned unavailability	Storage capac...	Priority
Customer-1	Customer-1	Salt Lake City	United States	-111.89105	40.76078	20.0		Scheduled 28% of time	Not set	Unit of product...	0.0
Customer-2	Customer-2	Miami	United States	-80.19366	25.77427	0.0		Not set	Not set		0.0
Customer-3	Customer-3	Chicago	United States	-87.65005	41.85003	0.0		Not set	Not set		0.0
Customer-4	Customer-4	Milan	Italy	9.18951	45.46427	0.0		Not set	Not set		0.0
Customer-5	Customer-5	London	United King...	-0.12574	51.50853	0.0		Not set	Not set		0.0

Figure 17: Customers

Distribution Centers

Same setup logic as the Location User Interface (Figure 18).

Identifier	Name	City	Country	Longitude	Latitude	Monthly fix...	Groups	Planned unavailability	Unplanned unavailability	Storage capac...	Priority
Customer-1	Customer-1	Salt Lake City	United States	-111.89105	40.76078	20.0		Scheduled 28% of time	Not set	Unit of product...	0.0
Customer-2	Customer-2	Miami	United States	-80.19366	25.77427	0.0		Not set	Not set		0.0
Customer-3	Customer-3	Chicago	United States	-87.65005	41.85003	0.0		Not set	Not set		0.0
Customer-4	Customer-4	Milan	Italy	9.18951	45.46427	0.0		Not set	Not set		0.0
Customer-5	Customer-5	London	United King...	-0.12574	51.50853	0.0		Not set	Not set		0.0

Figure 18: Distribution Center (DC)

Plants

Same setup logic as the Location User Interface

Identifier	Name	Processing ce...	City	Country	Longitude	Latitude	Monthly fix...	Groups	Planned unavail...	Unplanned una...	Storage capac...
Plant-1	Plant-1	0 PCs	Barcelona	Spain	2.15899	41.38879	0.0		Not set	Not set	
Plant-2	Plant-2	0 PCs	Buenos Aires	Argentina	-58.37723	-34.61315	0.0		Not set	Not set	
Plant-3	Plant-3	0 PCs	Tokyo	Japan	139.69171	35.6895	0.0		Not set	Not set	
Plant-4	Plant-4	0 PCs	Beijing	China	116.39723	39.9075	0.0		Not set	Not set	
Plant-5	Plant-5	0 PCs	Istanbul	Turkey	28.94966	41.01384	0.0		Not set	Not set	
Plant-6	Plant-6	0 PCs	Mexico City	Mexico	-99.12766	19.42847	0.0		Not set	Not set	

Figure 19: Plants

Suppliers

Same setup logic as the Location User Interface (Figure 20).

Identifier	Name	City	Country	Longitude	Latitude	Monthly fix...	Groups	Planned unavailability	Unplanned unavailability	Priority
Supplier-1	Supplier-1	Manhattan	United States	-73.96625	40.78343	20.0		Scheduled 28% of time	Not set	1.0
Supplier-2	Supplier-2	San Francis...	United States	-122.41942	37.77493	50.0		Scheduled 43% of time	Scheduled	2.0
Supplier-3	Supplier-3	Houston	United States	-95.36327	29.76328	60.0		Scheduled 14% of time	Not set	3.0

Figure 20: Suppliers

2.2.2 Location groups

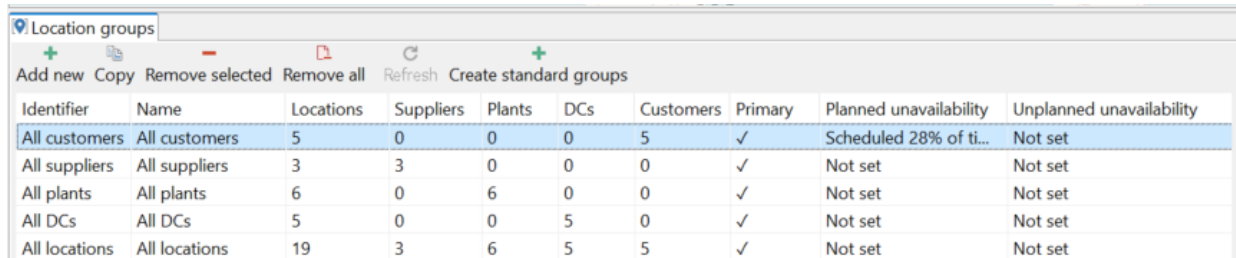
Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the location group as defined in the LocationGroup tab. Text value	All Suppliers
name	Name	The name given to the location group. The location name is associated with the Location group. Text value	All Suppliers
number of locations	Locations	The number of Locations in the location group. Numerical value	0
	Suppliers	The number of Suppliers in the location group. Numerical value	1
	Plants	The number of Plants in the location group. Numerical value	2
	DCs	The number of DCs in the location group. Numerical value	3
	Customers	The number of Customers in the location group. Numerical value	4
	Primary	Primary groups can be selected to do an automatic analysis on the specified product in the primary group. Primary groups must be mutually exclusive i. e. objects in primary groups must not be allowed to exist in any other primary groups.	
	Planned unavailability	The planned amount of time that the location will be unavailable. Refer to section 2.2.3.	Scheduled 28% of time
	Unplanned unavailability	The unplanned amount of time that the location will be unavailable. Refer to section 2.2.4.	Scheduled

The following table shows the connection between locations and location groups. This is found in the Excel spreadsheet but not in the UI. See Figure 22 to understand the method to follow in the UI.

Data Field name in Excel	Tab name in SCDT	Description	Example
LocationGroup		This is the ID of the location group as defined in the LocationGroup tab. Text value	All DCs
locations		This is the ID of the Location as defined in the Location tab. This specific Location ID is associated with the Location group. Text value	JC

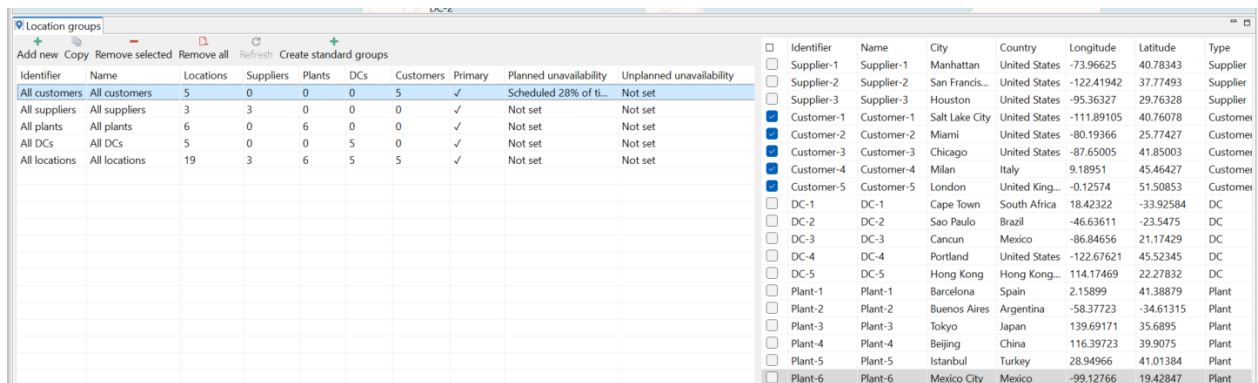
User Interface

In the user interface, there are two ways to allocate a location to a specific location group. The first is via the location group tab. Press the green + on the left to create a new group and fill out the different fields. When selecting a row, the locations associated with that group are shown on the right (Figure 21 and Figure 22). You can tick the boxes to add more locations to the selected group.



Identifier	Name	Locations	Suppliers	Plants	DCs	Customers	Primary	Planned unavailability	Unplanned unavailability
All customers	All customers	5	0	0	0	5	✓	Scheduled 28% of ti...	Not set
All suppliers	All suppliers	3	3	0	0	0	✓	Not set	Not set
All plants	All plants	6	0	6	0	0	✓	Not set	Not set
All DCs	All DCs	5	0	0	5	0	✓	Not set	Not set
All locations	All locations	19	3	6	5	5	✓	Not set	Not set

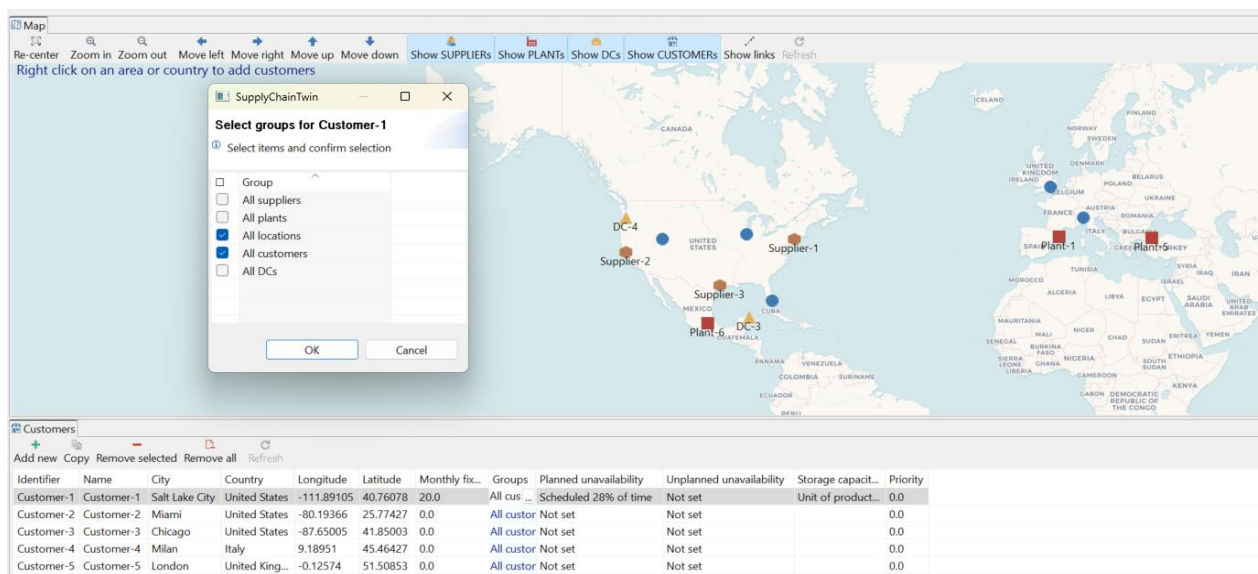
Figure 21: Location Groups



Identifier	Name	City	Country	Longitude	Latitude	Type
Supplier-1	Supplier-1	Manhattan	United States	-73.96625	40.78343	Supplier
Supplier-2	Supplier-2	San Francisco	United States	-122.41942	37.77493	Supplier
Supplier-3	Supplier-3	Houston	United States	-95.36327	29.76328	Supplier
Customer-1	Customer-1	Salt Lake City	United States	-111.89105	40.76078	Customer
Customer-2	Customer-2	Miami	United States	-80.19366	25.77427	Customer
Customer-3	Customer-3	Chicago	United States	-87.65005	41.85003	Customer
Customer-4	Customer-4	Milan	Italy	9.18951	45.46427	Customer
Customer-5	Customer-5	London	United Kingdom	-0.12574	51.50853	Customer
DC-1	DC-1	Cape Town	South Africa	18.42322	-33.92584	DC
DC-2	DC-2	Sao Paulo	Brazil	-46.63611	-23.5475	DC
DC-3	DC-3	Cancun	Mexico	-86.84656	21.17429	DC
DC-4	DC-4	Portland	United States	-122.67621	45.52345	DC
DC-5	DC-5	Hong Kong	Hong Kong	114.17469	22.27832	DC
Plant-1	Plant-1	Barcelona	Spain	2.15899	41.38879	Plant
Plant-2	Plant-2	Buenos Aires	Argentina	-58.37723	-34.61315	Plant
Plant-3	Plant-3	Tokyo	Japan	139.69171	35.6895	Plant
Plant-4	Plant-4	Beijing	China	116.39723	39.9075	Plant
Plant-5	Plant-5	Istanbul	Turkey	28.94966	41.01384	Plant
Plant-6	Plant-6	Mexico City	Mexico	-99.12766	19.42847	Plant

Figure 22: Location Groups

The second method is to use the location (or any of the subcategories) tab. Select a specific row. In the "Group" column, click on the three dots. In the expansion, you can tick the boxes to add a location group to the selected Location (Figure 23).



Identifier	Name	City	Country	Longitude	Latitude	Monthly fix...	Groups	Planned unavailability	Unplanned unavailability	Storage capac...	Priority
Customer-1	Customer-1	Salt Lake City	United States	-111.89105	40.76078	20.0	All cus ...	Scheduled 28% of time	Not set	Unit of product...	0.0
Customer-2	Customer-2	Miami	United States	-80.19366	25.77427	0.0	All custor	Not set	Not set		0.0
Customer-3	Customer-3	Chicago	United States	-87.65005	41.85003	0.0	All custor	Not set	Not set		0.0
Customer-4	Customer-4	Milan	Italy	9.18951	45.46427	0.0	All custor	Not set	Not set		0.0
Customer-5	Customer-5	London	United Kingdom	-0.12574	51.50853	0.0	All custor	Not set	Not set		0.0

Figure 23: Select Groups

Excel

In Excel, there are two tabs to edit. The first is the LocationGroup, where the groups are defined, as shown in Figure 23. The second tab is the Locationgroup_locations tab, where you associate specific Location IDs with specific LocationGroup IDs, as shown in Figure 24.

	A	B	C
1	ID	name	
2	LocationGroup-0	All customers	
3	LocationGroup-1	DCs	
4	LocationGroup-2	Suppliers	
5	LocationGroup-3	All locations	
6	Testing Group	Testing Group	
7	Longer LT locations	Longer LT locations	
8			
9			

Figure 24: Groups in Excel

	A	B
1	locations	LocationGroup
2	Location-56	LocationGroup-0
3	Location-58	LocationGroup-0
4	Location-61	LocationGroup-0
5	Location-63	LocationGroup-0
6	Location-77	LocationGroup-0
7	Location-79	LocationGroup-0
8	Location-80	LocationGroup-0
9	Location-89	LocationGroup-0

Figure 25: Location Groups in Excel

2.2.3 Planned Unavailability

Planned unavailability can be set up for any location, location group, link, link group or processing center. For the sake of this explanation, we will use screenshots of Plant unavailability.

Planned unavailability is used to simulate routine maintenance or any known downtime.

User Interface

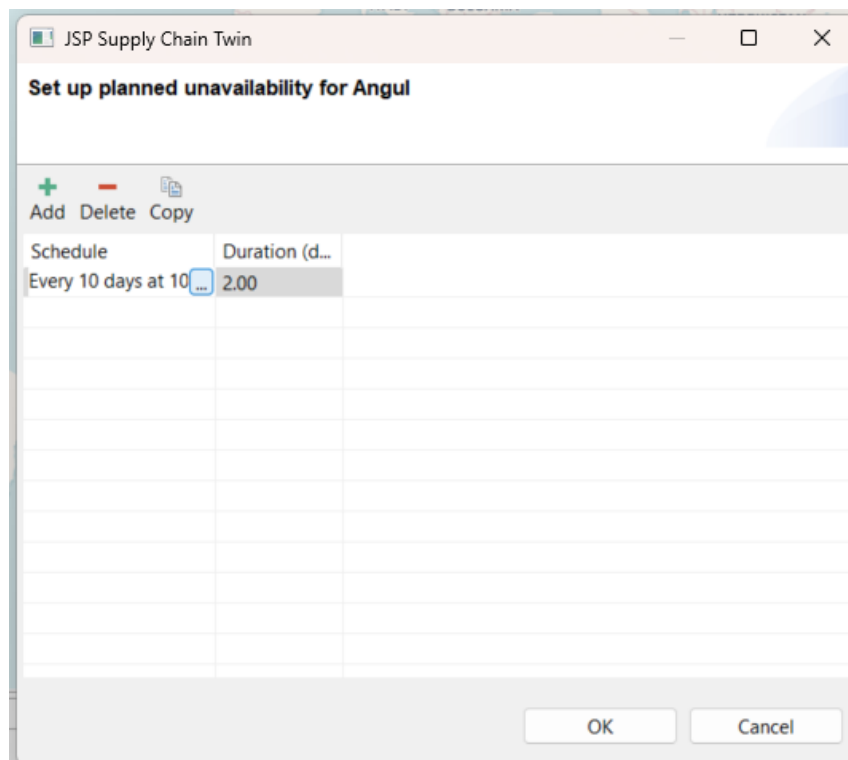
In the User Interface, there is only one way to set up planned unavailability. Go to the Plant tab. Press the green + on the left to create a new plant and fill out the different fields. When scheduling planned unavailability, click on the row for which you want to set up the planned unavailability, three dots will appear, click on the three dots. See Figure 26.



Identifier	Name	Processin...	City	Country	Longitude	Latitude	Month...	Groups	Planned unavailabil...	Unplanned unavail
Angul	Angul	15 PCs	ANGUL	India	85.0135	20.905	0.0	All Locations	Not set	Not set
Patraru	Patraru	4 PCs	PATRA...	India	85.32	23.633	0.0	All Locations	Not set	Not set
Raigarh-BF	Raigarh-BF	3 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-SMS2	Raigarh-SMS2	8 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-SMS3	Raigarh-SMS3	5 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-Mills	Raigarh-Mills	6 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Nalwa	Nalwa	2 PCs	Nalwa	India	83.37964	22.022	0.0	All Locations	Not set	Not set
External Plant	External Plant	1 PCs	Extern...	India	81.0	22.0	0.0		Not set	Not set

Figure 26: Planned unavailability

A pop-up will appear, as shown in Figure 27.



JSP Supply Chain Twin

Set up planned unavailability for Angul

+ - Copy

Add Delete Copy

Schedule	Duration (d...)
Every 10 days at 10	2.00

OK Cancel

Figure 27: Set up planned unavailability

Click on the green + to add a planned unavailability. To schedule when the plant will be unavailable, click on the row you created, three dots will appear, click on the three dots. Another pop-up will appear (Figure 28).

In the first drop down, you can set up the unavailability to repeat every month, the last day of every month, every week, every certain amount of days, or to be a one-time event. In the time of day text box, you can set the exact time of day the unavailability starts. In the third text box, you will specify the details, according to the selection you made in the first dropdown. This includes day of week or every N amount of days the unavailability happens.

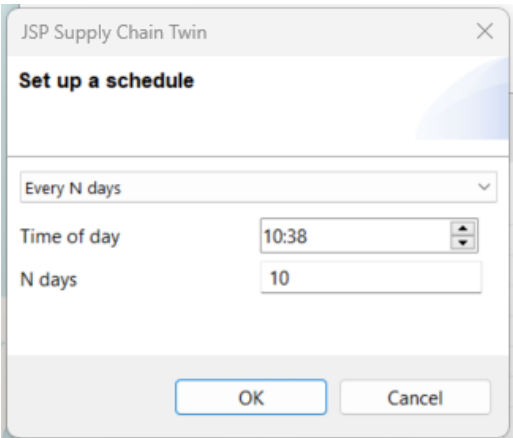


Figure 28: Planned unavailability schedule set up

Click OK when you are done. Then specify the duration of downtime. See Figure 29. Click OK when you are done.

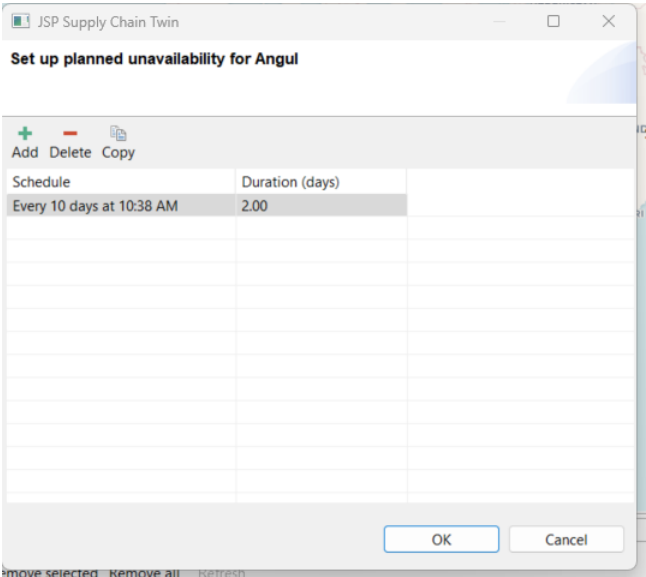


Figure 29: Duration of planned unavailability

Excel

Data Field name in Excel	Tab name in SCDT	Description	Example
schedule	Schedule	This is the schedule ID for the scheduled unavailability. Text value	EveryNDaysTimeSeries-0
duration	Duration (days)	This is the duration of the unavailability in days. Numerical value	2
asset		This is the location ID of the location for which the unavailability is specified Text value	Angul

The associated excel sheet for Figure 29 is the “PlannedUnavailability” sheet in excel. (Figure 30)

duration	schedule	asset
2	EveryNDaysTimeSeries-0	Angul
0	SingleTimeSeries-0	Angul NOF
0	SingleTimeSeries-1	Angul NOF

Figure 30: Planned unavailability sheet in Excel

The associated sheet in excel for the schedule set up for this example above (Figure 28) is “EveryNDaysTimeSeries”. See Figure 31.

nDays	instantTime	ID
10	10:38:00	EveryNDaysTimeSeries-0

Figure 31: Planned unavailability schedule setup in Excel

There are 5 sheets with the different time series in Excel (Figure 33). Use the one associated with the time series you would like to use (Figure 32) to specify the schedule planned unavailability with their unique columns.

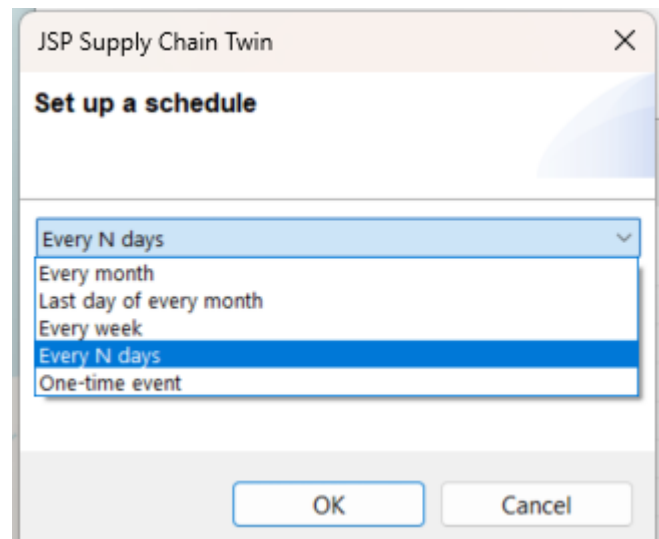


Figure 32: Time series options in User Interface

```
EveryWeekTimeSeries
EveryNDaysTimeSeries
EveryMonthTimeSeries
EveryMonthLastDayTimeSeries
SingleTimeSeries
```

Figure 33: Time series sheet names in Excel

2.2.4 Unplanned Unavailability

Unplanned unavailability can be set up for any location, location group, link, link group or processing center. For the sake of this explanation, we will use screenshots of Plant unavailability.

Unplanned unavailability is used to simulate unexpected events or any unknown downtime.

User Interface

In the User Interface, there is only one way to set up unplanned unavailability. Go to the Plant tab. Press the green + on the left to create a new plant and fill out the different fields. When scheduling unplanned unavailability, click on the row for which you want to set up the unplanned unavailability, three dots will appear, click on the three dots. See Figure 34.

Identifier	Name	Processin...	City	Country	Longitude	Latitude	Month...	Groups	Planned unavailabl...	Unplanned unavail...
Angul	Angul	15 PCs	ANGUL	India	85.0135	20.905	0.0	All Locations	Scheduled 20% of ...	Scheduled
Patratu	Patratu	4 PCs	PATRA...	India	85.32	23.633	0.0	All Locations	Not set	Not set
Raigarh-BF	Raigarh-BF	3 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-SMS2	Raigarh-SMS2	8 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-SMS3	Raigarh-SMS3	5 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Raigarh-Mills	Raigarh-Mills	6 PCs	RAIGA...	India	83.348	21.922	0.0	All Locations	Not set	Not set
Nalwa	Nalwa	2 PCs	Nalwa	India	83.37964	22.022	0.0	All Locations	Not set	Not set
External Plant	External Plant	1 PCs	Extern...	India	81.0	22.0	0.0		Not set	Not set

Figure 34: Unplanned unavailability

A pop-up will appear, as shown in Figure 35.

[illegible]

Figure 35: Set up unplanned unavailability

Click on the green + to add an unplanned unavailability. To schedule the time to failure and the time it takes to repair, click on the row you created, three dots will appear, click on the three dots. Another pop-up will appear (Figure 36).

Refer to section 2.16 to see how the different distributions work

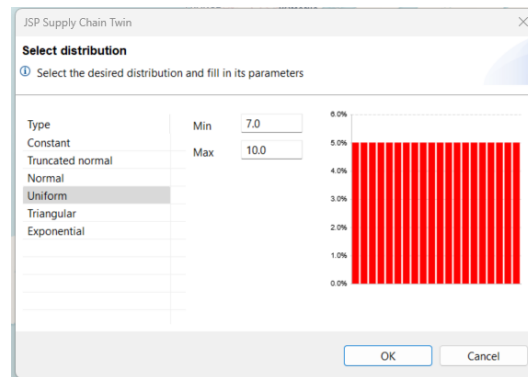


Figure 36: Unplanned unavailability schedule set up

Click OK when you are done.

Excel

Data Field name in Excel	Tab name in SCDT	Description	Example
timeToFailure	Time to failure (days)	The amount of days that will pass from the beginning of the simulation period, to when the selected plant will fail. Text value	Uniform (7.00; 10.00)
timeToRepair	Time to repair	The time it will take in days before the plant is operational again. Numerical value	Constant (1.00)
asset		This is the location ID of the location for which the unavailability is specified Text value	Angul

The associated excel sheet for Figure 35 is the “UnplannedUnavailability” sheet in excel. (Figure 37)

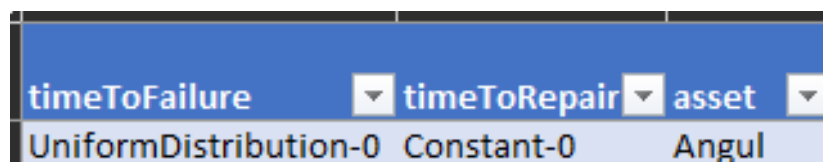


Figure 37: Unplanned unavailability sheet in Excel

The associated sheet in excel for the schedule set up for this example above (Figure 36) is “UniformDistribution”. See Figure 38. There are much more distributions (Section 2.16) that could be specified for “Time to Failure” and “Time to repair”.

name	min	max	ID
7	10	UniformDistribution-0	

Figure 38: Unplanned unavailability schedule setup in Excel

2.2.5 Storage Capacity Limit

Storage Capacity Limit can be set up for any location, location group, link, link group or processing center. For the sake of this explanation, we will use screenshots of Plant storage capacity limit.

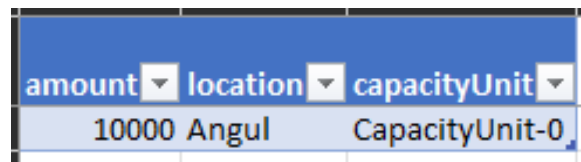
In the User Interface, there is only one way to set up storage capacity limit. Go to the Plant tab. Press the green + on the left to create a new plant and fill out the different fields. When scheduling storage capacity limit, click on the row for which you want to set up the storage capacity limit, three dots will appear, click on the three dots. See Figure 39.

Figure 39: Storage capacity limit

Figure 40: Set up storage capacity limits

Data Field name in Excel	Tab name in SCDT	Description	Example
capacityUnit	Capacity Unit	The capacity unit type in which the location capacities are measured. E.g., KG, parcels, unit of Product. Text value value The single location capacity will have a capacity of 1000 KG storage limit.	KG
amount	Amount	The number of capacity units that can be stored at his location. Numerical value	1000
asset		This is the location ID of the location for which the capacity limit is specified Text value	Angul

The associated excel sheet for Figure 40 is the “LocationCapacityRecord” sheet in excel. (Figure 41)



amount	location	capacityUnit
10000	Angul	CapacityUnit-0

Figure 41: Storage Capacity Limit sheet in Excel

The associated sheet in excel for the Capacity Unit set up for this example above (Figure 40) is “CapacityUnit”. See Figure 42.

name	min	max	ID
	7	10	UniformDistribution-0

Figure 42: Capacity Units in Excel

2.2.6 Links

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the link. It must be unique across all source links, i.e., it cannot be duplicated in the column. Text value	Link-S-JC-
name	Name	The name of the link. Has no impact on the logic of the model. Text value	Link-S-JC-
sourceLocation	Source location	A source location defines the Location that is used to supply products to a different location. Numerical value	S
destLocation	Dest Location	A destination location defines the Location where the products are received from a source location.	JC

Data Field name in Excel	Tab name in SCDT	Description	Example
mode	Transportation mode	ROAD Transport by road. SEA Transport by ocean. AIR Transport by air. RAIL Transport by rail. MIXED A mixed transport mode can be any of the above modes combined.	MIXED
plannedLeadTime	Planned lead time	The planned amount of time for a product to be delivered, as committed to the customer. Numerical value	1,998
distance	Direct distance (km)	Qualitative measurement of how far apart objects or points are. Numerical value	999
	Transportation time (days)	The actual amount of time for a product to be delivered. Numerical value	Constant-Link-S-JC-
distanceUnit	Distance Unit	MILE Unit is which distance is measured in miles. KM Unit is which distance is measured in kilometers.	MILE
	Groups	The groups with which the Link is associated.	Link Group-1
	Planned unavailability	The planned amount of time that the link will be unavailable. Refer to section 2.2.3.	Scheduled 28% of time
	Unplanned unavailability	The unplanned amount of time that the link will be unavailable. Refer to section 2.2.4.	Scheduled

User Interface

To create a new link, press the green + button on the left. A unique Link ID that cannot be changed will be assigned to the row (Figure 43). The remainder of the columns can be filled in by typing or dropdown lists. See the Link groups for the Group setup.

Links

+

📄

−

🗑️

🔄

+

Add new
Copy
Remove selected
Remove all
Refresh
Link customers to DCs

Identifier	Name	Source loca...	Dest location	Transportati...	Direct distance (...)	Transportation time (d...	Planned lea...	Distance	Distance unit	Groups	Planned una...	Unplanned una...
Link-1		Taiwan sup...	Korea DC	ROAD	1,484	triangular(4.00; 4.00; 5.00	5.0	0.0	KM		Not set	Not set
Link-7		Japan DC	Tokyo	AIR	0	triangular(1.00; 2.00; 3.00	3.0	0.0	KM		Not set	Not set
Link-9		Taiwan sup...	China DC 1	AIR	1,096	triangular(1.00; 2.00; 3.00	3.0	0.0	KM		Not set	Not set
Link-10		Korea DC	Seoul	AIR	0	triangular(1.00; 2.00; 3.00	3.0	0.0	KM		Not set	Not set
Link-12		Taiwan sup...	Netherland...	MIXED	9,447	triangular(4.00; 6.00; 9.00	9.0	0.0	KM		Not set	Not set
Link-13		China DC 3	Shanghai	AIR	0	triangular(1.00; 2.00; 3.00	3.0	0.0	KM		Not set	Not set
Link-25		Netherland...	LONDON	ROAD	422	triangular(4.00; 4.00; 5.00	5.0	0.0	KM		Not set	Not set
Link-36		Netherland...	Buenos Aires	ROAD	11,444	triangular(4.00; 4.00; 5.00	5.0	0.0	KM		Not set	Not set
Link-53		Netherland...	Zagreb	ROAD	970	triangular(4.00; 4.00; 5.00	5.0	0.0	KM		Not set	Not set
Link-156		Netherland...	Curno	ROAD	703	triangular(4.00; 4.00; 5.00	5.0	0.0	KM		Not set	Not set

Figure 43: Links Interface

Excel

In excel, information can be completed via typing or dropdown lists (Figure 44).

	A	B	C	D	E	F	G	H	I
1	destLocation	ID	name	mode	plannedLeadTim	distance	distanceUnit	sourceLocation	leadTime
88	Location-1695	Link-1276	ROAD		5	0 KM		Location-6	TriangularDistribution-86
89	Location-332	Link-1284	MIXED		9	0 KM		Location-5	TriangularDistribution-87
90	Location-10	Link-1292	ROAD		5	0 KM		Location-1799	TriangularDistribution-88
91	Location-2	Link-1321	ROAD		5	0 KM		Location-1799	TriangularDistribution-89
92	Location-441	Link-1324	AIR		3	0 KM		Location-5	TriangularDistribution-90
93	Location-58	Link-1335	ROAD		5	0 KM		Location-5	TriangularDistribution-91
94	Location-7	Link-1337	ROAD		5	0 KM		Location-1799	TriangularDistribution-92
95	Location-280	Link-1343	AIR		3	0 KM		Location-6	TriangularDistribution-93
96	Location-6	Link-1355	SEA		12	0 KM		Location-1799	TriangularDistribution-94
97	Location-1622	Link-1364	AIR		3	0 KM		Location-6	TriangularDistribution-95
98	Location-592	Link-1369	AIR		3	0 KM		Location-6	TriangularDistribution-96
99	Location-147	Link-1387	AIR		3	0 KM		Location-5	TriangularDistribution-97
100	Location-1764	Link-1405	ROAD		5	0 KM		Location-4	TriangularDistribution-98

Figure 44: Links in Excel

2.2.7 Link groups

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the link group. It must be unique across all link groups, i.e., it cannot be duplicated in the column. Text value	LTL, MO-AL
name	Name	The name of the link group. Has no impact on the logic of the model. Text value	LTL, MO-AL
Links	Links	The number of links in the link group. Numerical value	494
	Planned unavailability	The planned amount of time that the link group will be unavailable. Refer to section 2.2.3.	Scheduled 28% of time
	Unplanned unavailability	The unplanned amount of time that the link group will be unavailable. Refer to section 2.2.4.	Scheduled

Excel

The following table describes the connection between locations and link groups. The table is in the Excel spreadsheet but is not shown in the UI. See Figure 46 to understand the method to follow in the UI.

Data Field name in Excel	Tab name in SCDT	Description	Example
LinkGroup		This is the ID of the link group as defined in the LinkGroup tab. Text value	Parcel, 5 UPS Zones
links		This is the ID of the link as defined in the Link tab. This specific Link ID is associated with the Link group. Text value	Link-JC-82001-Parcel

User Interface

In the user interface, there are two ways to allocate a link to a specific link group. The first is to use the link group tab. Press the green + on the left to create a new group and fill out the different fields. When selecting a row, the links associated with that group are shown on the right (Figure 45). You can tick the boxes to add more links to the selected link group.

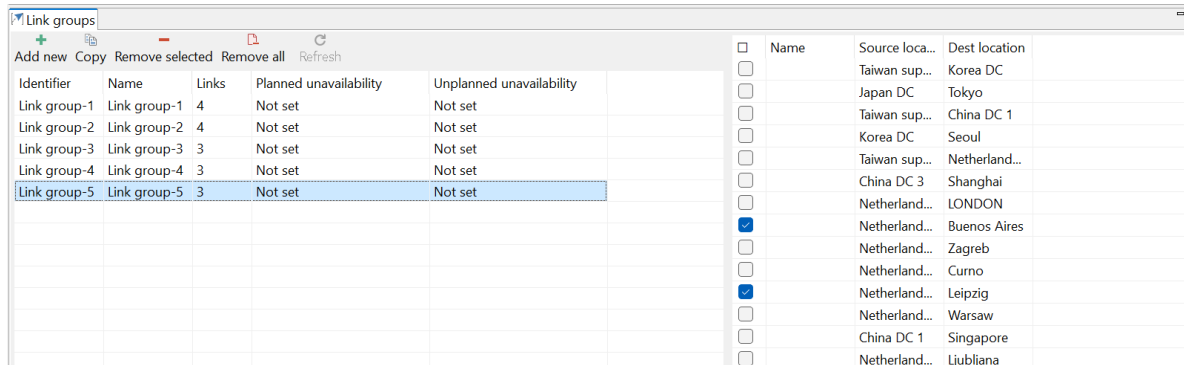


Figure 45: Link groups

The second is to use the link tab. Select a specific row. In the "Group" column, click on the three dots. In the expansion, you can tick the boxes to add a link group to the selected link (Figure 46).

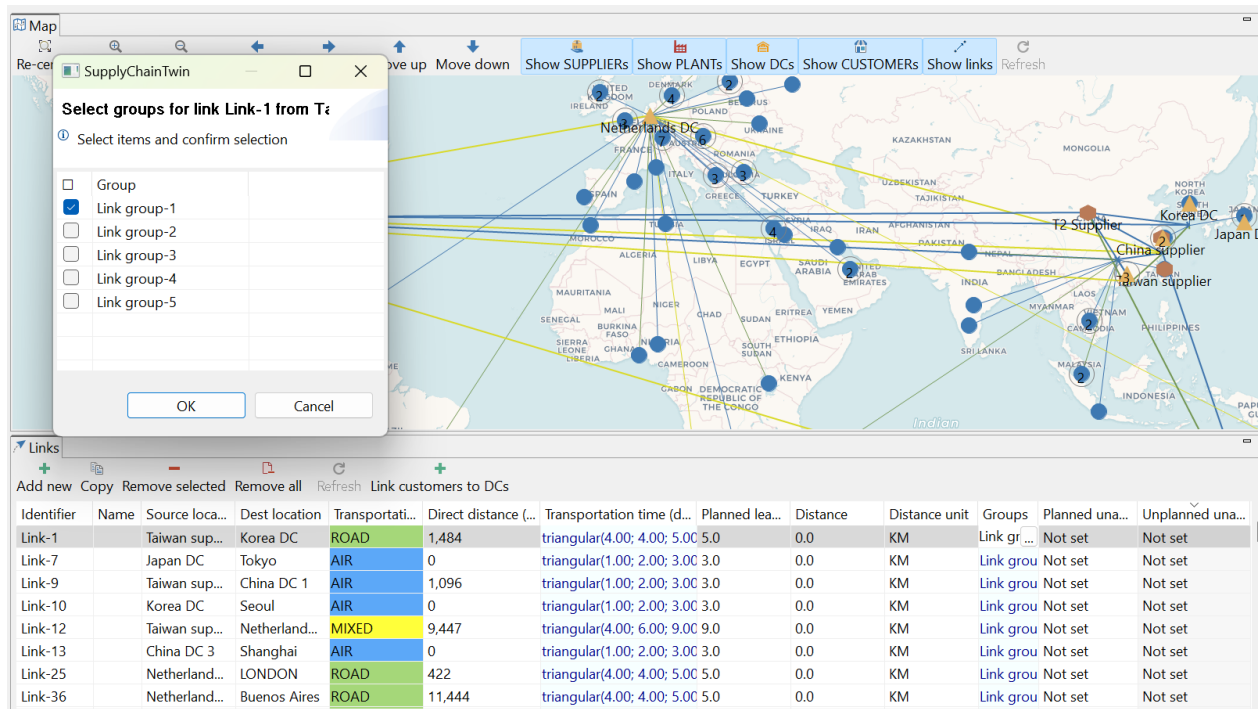


Figure 46: Link Groups UI

Excel

In Excel, there are two tabs to edit. The first is the LinkGroup, where the groups are defined, as shown in Figure 47. The second tab is the LinkGroup_locations tab, where you associate specific Link IDs with specific LinkGroup IDs, as shown in Figure 48.

	A	B	C	D	E
1	Identifier	Name	Links	Planned unavailability	Unplanned unavailability
2	Link group-1	Link group-4	Not set	Not set	
3	Link group-2	Link group-4	Not set	Not set	
4	Link group-3	Link group-3	Not set	Not set	
5	Link group-4	Link group-3	Not set	Not set	
6	Link group-5	Link group-3	Not set	Not set	

Figure 47: Link Groups in Excel

	LinkGroup	links
3	Parcel, 5 UPS Zones	Link-JC-82003-Parcel
4	Parcel, 5 UPS Zones	Link-JC-82005-Parcel
5	Parcel, 5 UPS Zones	Link-JC-82007-Parcel
6	Parcel, 5 UPS Zones	Link-JC-82009-Parcel
7	Parcel, 5 UPS Zones	Link-JC-82050-Parcel
8	Parcel, 5 UPS Zones	Link-JC-82053-Parcel
9	Parcel, 5 UPS Zones	Link-JC-82054-Parcel
10	Parcel, 5 UPS Zones	Link-JC-82070-Parcel
11	Parcel, 5 UPS Zones	Link-JC-82072-Parcel
12	Parcel, 5 UPS Zones	Link-JC-82082-Parcel
13	Parcel, 5 UPS Zones	Link-JC-82083-Parcel

Figure 48: Link Group Locations

2.2.8 Delivery capacities

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLink	Link	The link for which the delivery capacities are specified.	LTL, MO-AL
capacityUnit	Capacity unit	The capacity unit type in which delivery capacities are measured. E.g., KG, parcels, unit of Product. The single delivery capacity will have a capacity of 1000 parcels per delivery if the capacity units are in parcels. OR The single delivery capacity will have a capacity of 2000 kg per delivery if the capacity units are in KG.	Unit of Product
minLoadFactorToSendDelivery	Min load factor to send delivery	The minimum percentage of the single delivery capacity that must be in demand to justify making the delivery. The delivery consolidation rule can overrule this. If Order consolidation is on, the min load factor will be overruled. Decimal value	0,5
singleDeliveryCapacity	Single delivery capacity, units	The number of capacity units that can be delivered in a single delivery. Numerical value	15000
hardMinLoadFactor	Hard min load factor	The absolute minimum percentage of the single delivery capacity that must be in demand to justify making the delivery. The delivery consolidation rule cannot overrule this. Decimal value	0

User Interface

Press the green + on the left to create a new delivery capacity entry. Select the link for which the delivery capacity constraints are applicable. Fill out the different fields (Figure 49).

Delivery capacities				
+ 📄 – 🗑️ 🔗 Add new Copy Remove selected Remove all Edit in Excel				
Link	Capacity unit	Min load factor to send delivery	Single delivery capacity, units	Hard min load factor
LTL, MO-AL	Weight	0.0	15000.0	0.0
LTL, MO-AR	Weight	0.0	15000.0	0.0
LTL, MO-AZ	Weight	0.0	15000.0	0.0
LTL, MO-CA	Weight	0.0	15000.0	0.0
LTL, MO-CO	Weight	0.0	15000.0	0.0
LTL, MO-CT	Weight	0.0	15000.0	0.0
LTL, MO-DC	Weight	0.0	15000.0	0.0
LTL, MO-DE	Weight	0.0	15000.0	0.0
LTL, MO-FL	Weight	0.0	15000.0	0.0
LTL, MO-GA	Weight	0.0	15000.0	0.0
LTL, MO-IA	Weight	0.0	15000.0	0.0
LTL, MO-ID	Weight	0.0	15000.0	0.0
LTL, MO-IL	Weight	0.0	15000.0	0.0
LTL, MO-IN	Weight	0.0	15000.0	0.0

Figure 49: Delivery Capacity

Excel

In the DeliveryCapacityRecord tab, fill in the empty fields in the correct format (Figure 50).

	A	B	C	D	E
	minLoadFactorToSe				
1	singleDeliveryCapacity	ndDelivery	hardMinLoadFactor	abstractLink	capacityUnit
2	15000	0%	0,00%	LTL, MO-AL	CapacityUnit-1
3	15000	0%	0,00%	LTL, MO-AR	CapacityUnit-1
4	15000	0%	0,00%	LTL, MO-AZ	CapacityUnit-1
5	15000	0%	0,00%	LTL, MO-CA	CapacityUnit-1
6	15000	0%	0,00%	LTL, MO-CO	CapacityUnit-1
7	15000	0%	0,00%	LTL, MO-CT	CapacityUnit-1
8	15000	0%	0,00%	LTL, MO-DC	CapacityUnit-1
9	15000	0%	0,00%	LTL, MO-DE	CapacityUnit-1
10	15000	0%	0,00%	LTL, MO-FL	CapacityUnit-1

Figure 50: Delivery Capacity in Excel

2.2.8.1 Delivery capacities example

There are 2 orders during the simulation model, but stock is only received once (although if you let the model run longer, one more order will be received). The single delivery capacity is set to 3 product units, as shown in Figure 51.

Delivery capacities				
+ 📄 – 🗑️ 🔗 Add new Copy Remove selected Remove all Edit in Excel				
Link	Capacity unit	Min load factor to send delivery	Single delivery capacity, units	Hard min load factor
	Unit of product	0.0	3.0	0.0

Figure 51: Delivery Capacities

10 product units need to be delivered to the customer.

So, the number of deliveries that must be done is $10/3 = 3.33$. Rounded up, it is 4 deliveries. Transportation costs are \$4 per delivery. Therefore, the total transportation cost is 4 deliveries multiplied by \$4 per delivery = \$16.

The expected outcome is shown in the outputs in Figure 52, which shows that 4 deliveries took place and that the total costs are \$16.

ID	Name	Source	Dest	Deliverie...	Planned transp. le...	Avg. transp. lead ti...	Total delive...	Avg. load f...	Total costs, \$	Avg cost p...	Conveyed, Unit of ...
Li...		Supplier	Main	4	5.00	5.00	4	83.33%	\$ 16	\$ 4.00	10.00

Figure 52: Delivery Capacity Links

2.2.9 Link Capacities

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLink	Link	The link or link group for which the delivery capacities are specified.	LTL, MO-AL
capacityUnit	Capacity unit	The capacity unit type in which delivery capacities are measured. E.g., KG, parcels, unit of Product. The single delivery capacity will have a capacity of 1000 parcels per delivery if the capacity units are in parcels. OR The single delivery capacity will have a capacity of 2000 kg per delivery if the capacity units are in KG.	Unit of product
maxCapacityUnitsCount	Max capacity units per period	The maximum number of capacity units that can be delivered using a single link within the specified period. Numerical value	15000
maxCapacityUnitsCountDistribution		The Distribution ID in Excel that is associated with the specified max capacity units per period.	
maxDeliveriesCount	Max deliveries per period	The maximum number of deliveries that can be made using a single link within the specified period. Numerical value	5
maxDeliveriesCountDistribution		The Distribution ID in Excel that is associated with the specified max delivery count per period.	
period	Period, days	This is the time period in days for which the limitations are specified. After the time period passes, the rules are applied again to the next period interval. Numerical value	10
capacitySetupRule	Capacity setup rule	Individual Specified Capacity is for the specified link or for each link in the specified link group. Shared Specified Capacity is shared amongst all the links in the link group.	Individual

User Interface

Press the green + on the left to create a new delivery capacity entry. Select the link for which the link capacity constraints are applicable. Fill out the different fields (Figure 49).

Link capacities					
+ + + Add new Copy Remove selected Remove all					
Link	Capacity unit	Max capacity units per period	Max deliveries per period	Period, days	Capacity setup rule
Link-2	Unit of prod...	constant(4.00)	uniform(0.00; 1.00)	0.0	Individual

Figure 53: Link Capacity

Excel

In the LinkCapacityRecord tab, fill in the empty fields in the correct format (Figure 50).

maxCapaci									
tyUnitsCo maxDeliverie									
maxCapacityU	variesCo	perio	capacitySetu	abstractLi	capacity	untDistrib	sCountDistrib		
nitsCount	unt	d	pRule	nk	Unit	ution	ution		
40	20	0	INDIVIDUAL	Link-Raiga Capacity TruncatedN	Constant-29				

Figure 54: Link Capacity in Excel

2.2.10 Processing Centers

Data Field name in Excel	Tab name in SCDT	Description	Example
name	Name	The name of the processing center. Has no impact on the logic of the model. Text value	Painting Shop
ID	Identifier	This is the ID of the Processing Center. It must be unique across all link groups, i.e., it cannot be duplicated in the column. Text value	Processing center-1
plant	Plant	The plant for which the processing center are specified. Text value	Plant-1
	Production parameters	This the item/s defined in the production parameter associated with the specific Processing center. Text value	1 item
	Planned unavailability	The planned amount of time that the processing center will be unavailable. Refer to section 2.2.3.	Scheduled 28% of time
	Unplanned unavailability	The unplanned amount of time that the processing center will be unavailable. Refer to section 2.2.4.	Scheduled
BacklogLimitDays	Backlog limit, days	If demand rejection is allowed in scenario properties, then this is the max backlog size (days) used to decide whether to reject the new production demand. Numerical Value	30

User Interface

Press the green + on the left to create a new processing center entry. Fill out the different fields (Figure 49).

Processing centers						
+ 📄 – 🔍 Add new Copy Remove selected Show all processing centers						
Identifier	Name	Plant	Production pa...	Planned unavail...	Unplanned una...	Backlog limi...
Processing c...	Processing ...	Plant-3	1 item	Scheduled 29%...	Scheduled	999999.0
Processing c...	Processing ...	Plant-1	Not set	Scheduled 29%...	Scheduled	999999.0
Processing c...	Processing ...	Plant-2	Not set	Scheduled 29%...	Scheduled	999999.0
Processing c...	Processing ...	Plant-4	Not set	Scheduled 29%...	Scheduled	999999.0

Figure 55: Processing Centers

Excel

In the ProcessingCenter tab, fill in the empty fields in the correct format (Figure 50).

	A	B	C	D	E	F	G
1	Identifier	Name	Plant	Production parameters	Planned unavailability	Unplanned unavailability	Backlog limit, days
2	Processing c	Processing	Plant-3	1 item	Scheduled 29% of time	Scheduled	999999
3	Processing c	Processing	Plant-1	Not set	Scheduled 29% of time	Scheduled	999999
4	Processing c	Processing	Plant-2	Not set	Scheduled 29% of time	Scheduled	999999
5	Processing c	Processing	Plant-4	Not set	Scheduled 29% of time	Scheduled	999999

Figure 56: Processing Center in Excel

2.2.11 Production parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
sourceProduct	Source Product	The product being used as raw material to produce the produced product. Can be empty Text value	Raw wood
producedProduct	Produced Product	The product being produced at the specified processing center and plant Text value	Chair
processingCenter	Processing Center	The processing center for which the production parameters are specified. Text value	Chair Factory
	Plant	The plant for which the production parameters are specified. Text value	Plant-1
conversionRate	Conversion rate	How many of the source products are converted to produce one produced product. Numerical value Example. If 2 raw wood pieces is needed to produce a chair, the conversion rate will be 2.	2
productionRate	Production rate	How many sourced/produced products are used/produced each HOUR/DAY/WEEK/MONTH Numerical value Example:	5

Data Field name in Excel	Tab name in SCDT	Description	Example
		If the Production rate is 5 and the Production rate type is set to PER_PRODUCED_PRODUCT and the Production rate time unit is set to DAY, that means 5 produced products is produced every day.	
productionRate Type	Production Rate Type	PER_PRODUCED_PRODUCT Production rate is measured by the produced product output. PER_SOURCED_PRODUCT Production rate is measured by the sourced product input.	PER_PRODUCED_PRODUCT
productionRate TimeUnit	Production rate time unit	HOUR Production rate is measured by units per HOUR. DAY Production rate is measured by units per DAY. WEEK Production rate is measured by units per WEEK. MONTH Production rate is measured by units per MONTH.	DAY
minProduction BatchSize	Min production batch size	The MINIMUM amount of products that should be in demand before production is started. Numerical value Example: If the min production batch size is 10 and the Production batch size type is set to PER_PRODUCED_PRODUCT. This means a minimum of 10 produced product must be produced at a time.	10
maxProduction BatchSize	Max production batch size	The MAXIMUM amount of products that can be produced in one production batch. Numerical value Example: If the max production batch size is 100 and the Production batch size type is set to PER_PRODUCED_PRODUCT. This means a maximum of 100 produced product can be produced at a time.	100
productionBatchSizeType	Production Batch size type	PER_PRODUCED_PRODUCT Production batch size is measured by the produced product output. PER_SOURCED_PRODUCT Production batch size is measured by the sourced product input.	PER_PRODUCED_PRODUCT
productionCost	Production cost	How much it cost to produce one product. It can be measure by sourced or produced product.	\$5
productionCost Type	Production cost type	PER_PRODUCED_PRODUCT	PER_PRODUCED_PRODUCT

Data Field name in Excel	Tab name in SCDT	Description	Example
		Production rate is measured by the produced product output. PER_SOURCED_PRODUCT Production rate is measured by the sourced product input.	
productionTimeBuffer	Production time buffer, days	This is the production time buffer, it is measured in days. It is used for the quoted lead time calculation (if scenario's 'Quoted lead time calculation rule' is set to USE_PLANNED_LEAD_TIMES) Numerical value	14

User Interface

Press the green + on the left to create a new Production parameter entry. Fill out the different fields (Figure 49).

Source product	Produced product	Processing center	Plant	Conversion rate	Production rate	Production rate type	Production rate time unit	Min production batch size	Max production batch size	Production batch size type	Production cost	Production cost type	Production time buffer
Product A9	Product A6	Processing center-1	Plant-3	1.0	1.0	PER_PRODUCED	DAY	0.0	9999.0	PER_PRODUCED	7.0	PER_PRODUCED	1.0

Figure 57: Production Parameters

Excel

In the ProductionParametersRecord tab, fill in the empty fields in the correct format (Figure 50).

Source product	Produced product	Processing center	Plant	Conversion rate	Production rate	Production rate type	Production rate time unit	Min production batch size	Max production batch size	Production batch size type	Production cost	Production cost type	Production time buffer
Product A9	Product A6	center-1	Plant-3	1	1	_PRODUCT	DAY	0	9999	PRODUCT	7	D_PRODUCT	1

Figure 58: Production Parameters in Excel

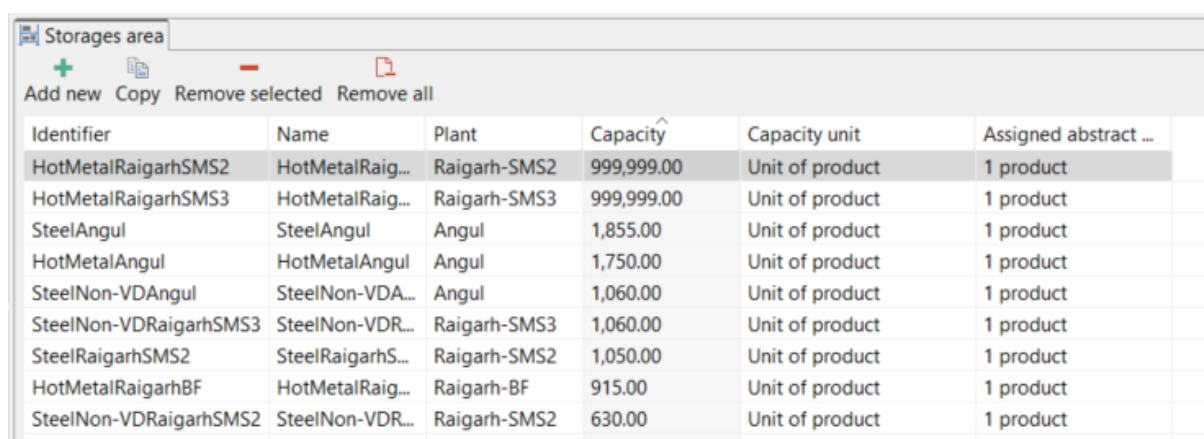
2.2.12 Storages Area

This is the storage area that is dedicated to certain plant for specific products.

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the Storage area. It must be unique across all storage area entries, i.e., it cannot be duplicated in the column. Text value	HotMetalRaigarhSMS2
name	Name	The name of the storage area. Has no impact on the logic of the model. Text value	Storage area-1
plant	Plant	The ID of the Plant for which the storage area is specified. Text value	Plant-1
storageCapacity	Capacity	The number of capacity units that can be stored at the specified location	500.00
capacityUnit	Capacity unit	The capacity unit type in which storage area space are measured. E.g., KG, parcels, unit of Product. The single storage area will have a capacity of 1000 parcels if the capacity units are in parcels. OR The single storage area will have a capacity of 2000 kg if the capacity units are in KG.	KG
	Assigned abstract products	The products that can be stored at this storage area.	2 products

User Interface

Press the green + on the left to create a new Production parameter entry. Fill out the different fields (Figure 59/Figure 49). Assign the selected product, similarly as you would assign them to product groups in section 2.3.2.



Identifier	Name	Plant	Capacity	Capacity unit	Assigned abstract ...
HotMetalRaigarhSMS2	HotMetalRaig...	Raigarh-SMS2	999,999.00	Unit of product	1 product
HotMetalRaigarhSMS3	HotMetalRaig...	Raigarh-SMS3	999,999.00	Unit of product	1 product
SteelAngul	SteelAngul	Angul	1,855.00	Unit of product	1 product
HotMetalAngul	HotMetalAngul	Angul	1,750.00	Unit of product	1 product
SteelNon-VDAngul	SteelNon-VDA...	Angul	1,060.00	Unit of product	1 product
SteelNon-VDRaigarhSMS3	SteelNon-VDR...	Raigarh-SMS3	1,060.00	Unit of product	1 product
SteelRaigarhSMS2	SteelRaigarhS...	Raigarh-SMS2	1,050.00	Unit of product	1 product
HotMetalRaigarhBF	HotMetalRaig...	Raigarh-BF	915.00	Unit of product	1 product
SteelNon-VDRaigarhSMS2	SteelNon-VDR...	Raigarh-SMS2	630.00	Unit of product	1 product

Figure 59: Storage areas in the User Interface

Excel

In the StorageArea tab, fill in the empty fields in the correct format (Figure 60). The capacity unit ID will link to the Capacity Unit specified in the CapacityUnit sheet, as seen in Figure 61.

ID	name	storageCapacity	location	capacityUnit
HotMetalAngul	HotMetalAngul	1750	Angul	CapacityUnit-0
SteelNon-VDAngul	SteelNon-VDAngul	1060	Angul	CapacityUnit-0
SteelAngul	SteelAngul	1855	Angul	CapacityUnit-0
SteelNon-VDRaigarhSMS2	SteelNon-VDRaigarhSMS2	630	Raigarh-SMS2	CapacityUnit-0
SteelRaigarhSMS2	SteelRaigarhSMS2	1050	Raigarh-SMS2	CapacityUnit-0
SteelNon-VDRaigarhSMS3	SteelNon-VDRaigarhSMS3	1060	Raigarh-SMS3	CapacityUnit-0
SteelRaigarhSMS3	SteelRaigarhSMS3	630	Raigarh-SMS3	CapacityUnit-0
HotMetalRaigarhSMS2	HotMetalRaigarhSMS2	999999	Raigarh-SMS2	CapacityUnit-0
HotMetalRaigarhSMS3	HotMetalRaigarhSMS3	999999	Raigarh-SMS3	CapacityUnit-0
HotMetalRaigarhBF	HotMetalRaigarhBF	915	Raigarh-BF	CapacityUnit-0

Figure 60: Storage areas in Excel

name	ionType	isEmbedded	ID
Unit of product	LINEAR	TRUE	CapacityUnit-0

Figure 61: Capacity Units in Excel

2.3 Products master data

2.3.1 Products

Note that there is a selection box on the left. Only the selected products will be simulated in simulation mode. The unselected ones will be ignored.

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the Product. It must be unique across all source products, i.e., it cannot be duplicated in the column. Text value	215
name	Name	The name of the Product. Has no impact on the logic of the model. Text value	SIR CONFERENCE & FIRST ROU...
	Groups	The groups with which the Product is associated.	Product Group - A
	Capacity usage	The capacity usage of the product specifies the amount, capacity unit and capacity unit amount of the product.	Weight
priority	Priority	The priority rating. A numerical value, with one being the highest priority, 2 second highest, etc. Numerical value	1

User Interface

Press the green + on the left to create a new product entry. Fill out the different fields (Figure 62). See Product groups for the Group and Product Capacity Unit for the Capacity usage setup.

Products					
+ Add new Copy - Remove selected Remove all Refresh					
☒	Identifier	Name	Groups	Capacity usage	Priority
☒	Product-0	Product A1	Product group A, All products	Pallets	0.0
☒	Product-1	Product A2	Product group A, All products	Pallets	0.0
☒	Product-2	Product A3	Product group A, All products	Volume	0.0
☒	Product-3	Product A4	Product group A, All products	Pallets	0.0
☒	Product-4	Product A5	Product group A, All products	Carton	0.0
☒	Product-5	Product A6	Product group A, All products	Carton	0.0
☒	Product-6	Product A7	Product group A, All products	Carton	0.0
☒	Product-7	Product A8	Product group A, All products	Volume	0.0
☒	Product-8	Product A9	Product group A, All products	Weight	0.0
☒	Product-9	Product A10	Product group A, All products	Weight	0.0

Figure 62: Products

Excel

In the Products tab, fill in the empty fields in the correct format (Figure 63).

	A	B	C	D	E
1	Identifier	Name	Groups	Capacity usage	Priority
2	Product-0	Product A1	Product group A, All products, Testing group	Pallets	0
3	Product-1	Product A2	Product group A, All products, Testing group	Pallets	0
4	Product-2	Product A3	Product group A, All products	Volume	0
5	Product-3	Product A4	Product group A, All products, Testing group	Pallets	0
6	Product-4	Product A5	Product group A, All products	Carton	0
7	Product-5	Product A6	Product group A, All products	Carton	0
8	Product-6	Product A7	Product group A, All products	Carton	0
9	Product-7	Product A8	Product group A, All products	Volume	0
10	Product-8	Product A9	Product group A, All products	Weight	0
11	Product-9	Product A10	Product group A, All products	Weight	0

Figure 63: Products in Excel

2.3.2 Product groups

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Identifier	This is the ID of the product group. It must be unique across all source product groups, i.e., it cannot be duplicated in the column. Text value	Stocked in Hubs
name	Name	The name of the product group. Has no impact on the model logic. Text value	Stocked in Hubs
	Products	This is the Number of Products associated with the product group. Numerical Value	10

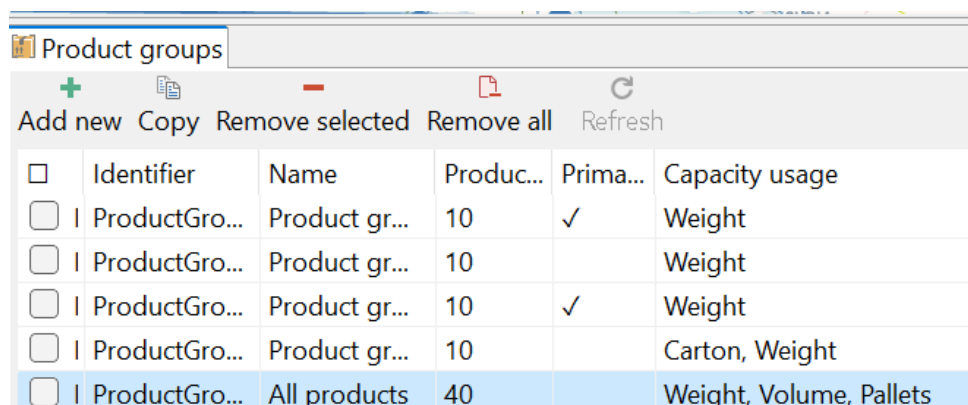
Data Field name in Excel	Tab name in SCDT	Description	Example
enabled		Only the enabled product groups will be simulated in simulation mode. The unselected ones will be ignored.	✓
primary	Primary	Primary groups can be selected to do an automatic analysis on the specified product in the primary group. Primary groups must be mutually exclusive i. e. objects in primary groups must not be allowed to exist in any other primary groups.	✓
	Capacity usage	The product group capacity usage, it specifies the product amount, capacity unit amount and capacity unit.	Weight

The following table describes the connection between products and product groups. This is found in Excel, but not in the UI. See Figure 65 to understand the method to follow in the UI.

Data Field name in Excel	Tab name in SCDT	Description	Example
ProductGroup		This is the ID of the product group as defined in the ProductGroup tab. Text value	Stocked in Hubs
products		This is the ID of the Product as defined in the Product tab. This specific Product ID is associated with the Product group. Text value	Product A1

User Interface

In the user interface, there are two ways to allocate a product to a specific product group. The first is to use the product group tab. Press the green + on the left to create a new group and fill out the different fields. When selecting a row, the products associated with that group are shown on the right (Figure 64). You can tick the boxes to add more products to the selected product group.



Product groups				
Add new Copy Remove selected Remove all Refresh				
☐	Identifier	Name	Produc...	Prima...
☐	I ProductGro...	Product gr...	10	✓
☐	I ProductGro...	Product gr...	10	
☐	I ProductGro...	Product gr...	10	✓
☐	I ProductGro...	Product gr...	10	
☐	I ProductGro...	All products	40	

Figure 64: Product Groups

The second is via the product tab. Select a specific row. In the "Group" column, click on the three dots. In the expansion, you can tick the boxes to add a product group to the selected Product (Figure 65).

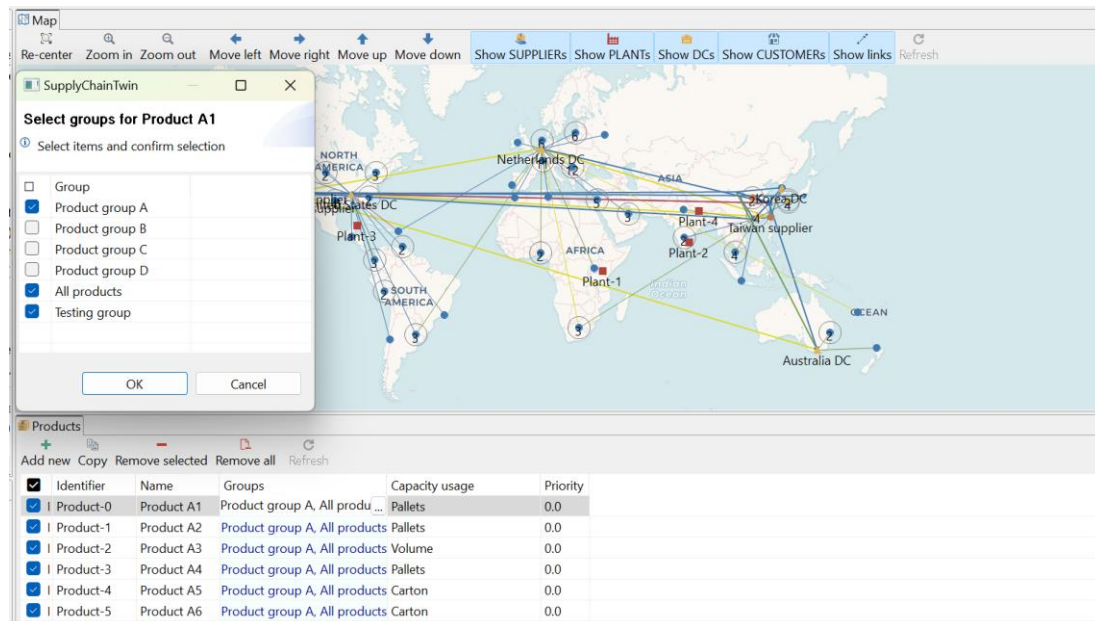


Figure 65: Select Groups

Excel

In Excel, there are two tabs to edit. The first is ProductGroup, where the groups are defined, as shown in Figure 66. The second tab is the ProductGroup_products tab, where specific product IDs are associated with specific ProductGroup IDs, as shown in Figure 67.

	A	B	C
1	ID	name	enabled
2	ProductGroup-0	Product group A	FALSE
3	ProductGroup-1	Product group B	FALSE
4	ProductGroup-2	Product group C	FALSE
5	ProductGroup-3	Product group D	FALSE
6	ProductGroup-4	All products	FALSE

Figure 66: Product Group

	A	B
1	ProductGroup	products
82	Testing group	Product-0
83	Testing group	Product-1
84	Testing group	Product-3
85	Testing group	Product-26
86	Testing group	Product-27
87	Testing group	Product-31
88	Testing group	Product-51
89	Testing group	Product-52
90	Testing group	Product-53
91	Testing group	Product-75
92	Testing group	Product-81
93	Testing group	Product-82
94	Low sales velocity	Product-76
95	Low sales velocity	Product-57
96	Low sales velocity	Product-26

Figure 67: Product Group Products Tab

2.3.3 Capacity units

Data Field name in Excel	Tab name in SCDT	Description	Example
name	Name	The name of the Capacity Unit. Has no impact on the logic of the model. Text value	Unit of Product
interpolationType	Interpolation type	The interpolation type is used by the capacity unit. Linear interpolation is "smoother" than step interpolation. LINEAR Data points in one spatial dimension. Linear interpolation calculates the average of two adjacent data points by drawing a straight line of best fit. STEP Data points in one spatial dimension. With step interpolation, the value at a point is assigned the value of the closest contour that encloses the point.	LINEAR
isEmbedded		TRUE The capacity unit is embedded. FALSE The capacity unit is not embedded.	TRUE
ID		This is the ID of the capacity unit. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	CapacityUnit-0

User Interface

Press the green + on the left to create a Capacity and fill out the different fields (Figure 68). See how to associate a specific capacity unit with a product.

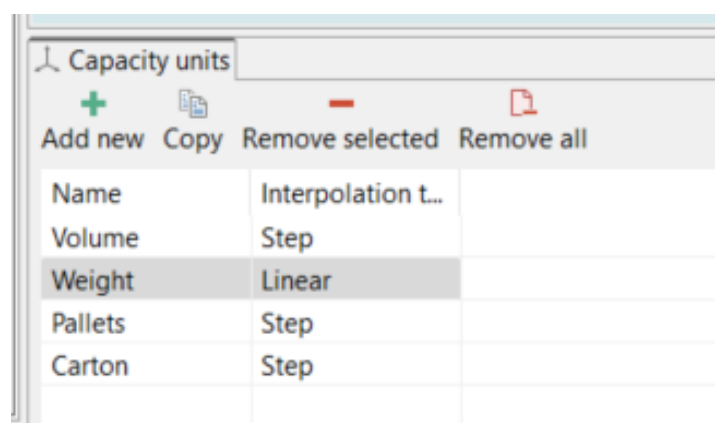


Figure 68: Capacity Units

Excel

In the CapacityUnits tab, fill in the empty fields in the correct format (Figure 69).

	A	B
1	Name	Interpolation type
2	Volume	Step
3	Weight	Linear
4	Pallets	Step
5	Carton	Step

Figure 69: Capacity Units in Excel

2.3.4 Product Capacity Unit

The Product's capacity constraints are specified for each Product at the products tab in the UI.

Data Field name in Excel	Tab name in SCDT	Description	Example
productAmount	Product amount	The number of products that correlate to the capacity unit. Numerical value	1
capacityUnitAmount	Capacity unit amount	The capacity unit amount is proportional to the product amount. For example, if the Product amount is 1 and the Capacity Unit amount is in Lbs and has a value of 0,5, it means that 1 product weighs 0,5 lbs. Decimal value	0,5
capacityUnit	Capacity unit	The unit in which capacity is measured, e.g., KG, parcels, unit of Product. Text value	KG
abstractProduct		The product ID of the Product for which these capacity unit records apply. Text value	215

User Interface

In the user interface, go to the product tab and select the three dots in the "Capacity usage" column. Here you specify the product and capacity amount proportions to each other in the specified capacity unit. See Figure 70.

Figure 70: Capacity Usage

Excel

In the 'CapacityUnitRecord' sheet, fill in the fields in the correct format. See Figure 71.

	A	B	C
1	Product amount ▼	Capacity unit amount ▼	Capacity unit ▼
2	20	0	Pallets
3			

Figure 71: Capacity Usage in Excel

2.3.5 Selling Prices

The Selling Prices are specified for each Product.

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractProduct	Product	The product ID of the Product in stock. Text value	Product-1
abstractLocation	Location	The location ID of the Location where the products are in stock. Text value	All Locations
date	Effective date	The specified selling price is applied from this specific date. Short date format	2022/03/24
sellingPrice	Selling Price	The Selling price for each specified product. Numerical value	\$20

User Interface

In the user interface, Press the green + on the left to create a Selling price entry and fill out the different fields. See Figure 70.

Location	Product	Effective date	Selling price (...)
All customers	Product group...	1/1/2020	80.0
All customers	Product group...	1/1/2020	50.0
All customers	Product group...	1/1/2020	25.0
All customers	Product group...	1/1/2020	5.0
DCs	Product group...	1/1/2020	40.0
DCs	Product group...	1/1/2020	25.0
DCs	Product group...	1/1/2020	12.0
DCs	Product group...	1/1/2020	2.0

Figure 72: Selling Prices

Excel

In the 'SellingPriceRecord' sheet, fill in the fields in the correct format. See Figure 71.

	A	B	C	D
1	date	sellingPrice	abstractProduct	abstractLocation
2	01.01.2020	55	Product-0	LocationGroup-0
3	01.01.2020	50	Product-1	LocationGroup-0
4	01.01.2020	58	Product-2	LocationGroup-0
5	01.01.2020	54	Product-3	LocationGroup-0
6	01.01.2020	60	Product-4	LocationGroup-0
7	01.01.2020	66	Product-5	LocationGroup-0
8	01.01.2020	70	Product-6	LocationGroup-0
9	01.01.2020	65	Product-7	LocationGroup-0
10	01.01.2020	63	Product-8	LocationGroup-0
11	01.01.2020	60	Product-9	LocationGroup-0

Figure 73: Selling Prices in Excel

2.3.6 Purchasing Prices

The Selling Prices are specified for each Product.

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the products are in stock. Text value	All Locations
abstractProduct	Product	The product ID of the Product in stock. Text value	Product-1

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the products are in stock. Text value	All Locations
date	Effective date	The specified selling price is applied from this specific date. Short date format	2022/03/24
purchasingPrice	Purchasing Price	The Purchasing price for each specified product. Numerical value	\$10

User Interface

In the user interface, Press the green + on the left to create a Purchasing price entry and fill out the different fields. See Figure 74.

Location	Product	Effective date	Purchase pri...
All customers	Product A1	1/1/2020	27.5
All customers	Product A2	1/1/2020	25.0
All customers	Product A3	1/1/2020	28.75
All customers	Product A4	1/1/2020	26.75
All customers	Product A5	1/1/2020	30.0
All customers	Product A6	1/1/2020	33.0
All customers	Product A7	1/1/2020	35.0
All customers	Product A8	1/1/2020	32.5
All customers	Product A9	1/1/2020	31.25

Figure 74: Purchasing Prices

Excel

In the 'PurchasingPriceRecord' sheet, fill in the fields in the correct format. See Figure 74.

	A	B	C	D
1	Location	Product	Effective date	Purchase price (USD)
2	All customers	Product A1	01.01.2020	28
3	All customers	Product A2	01.01.2020	25
4	All customers	Product A3	01.01.2020	29
5	All customers	Product A4	01.01.2020	27
6	All customers	Product A5	01.01.2020	30
7	All customers	Product A6	01.01.2020	33
8	All customers	Product A7	01.01.2020	35
9	All customers	Product A8	01.01.2020	33
10	All customers	Product A9	01.01.2020	31
11	All customers	Product A10	01.01.2020	30
12	All customers	Product B1	01.01.2020	100
13	All customers	Product B2	01.01.2020	110
14	All customers	Product B3	01.01.2020	125
15	All customers	Product B4	01.01.2020	140
16	All customers	Product B5	01.01.2020	150
17	All customers	Product B6	01.01.2020	133
18	All customers	Product B7	01.01.2020	128

Figure 75: Purchasing Prices in Excel

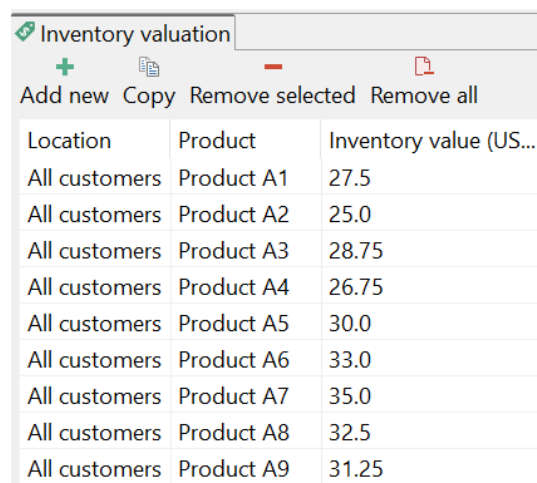
2.3.7 Inventory Valuation

The Selling Prices are specified for each Product.

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the products are in stock. Text value	All Locations
abstractProduct	Product	The product ID of the Product in stock. Text value	Product-1
purchasingPrice	Inventory value (USD / unit of product)	The Purchasing price for each specified product. Numerical value	\$10

User Interface

In the user interface, Press the green + on the left to create a Inventory Valuation entry and fill out the different fields. See Figure 70.



Location	Product	Inventory value (US...)
All customers	Product A1	27.5
All customers	Product A2	25.0
All customers	Product A3	28.75
All customers	Product A4	26.75
All customers	Product A5	30.0
All customers	Product A6	33.0
All customers	Product A7	35.0
All customers	Product A8	32.5
All customers	Product A9	31.25

Figure 76: Inventory Valuation

Excel

In the 'InventCostRecord' sheet, fill in the fields in the correct format. See Figure 71.

	A	B	C
1	Location	Product	Inventory value (USD / unit of product)
2	All customers	Product A1	28
3	All customers	Product A2	25
4	All customers	Product A3	29
5	All customers	Product A4	27
6	All customers	Product A5	30
7	All customers	Product A6	33
8	All customers	Product A7	35
9	All customers	Product A8	33
10	All customers	Product A9	31
11	All customers	Product A10	30
12	All customers	Product B1	100
13	All customers	Product B2	110
14	All customers	Product B3	125
15	All customers	Product B4	140
16	All customers	Product B5	150
17	All customers	Product B6	133

Figure 77: Inventory Valuation in Excel

2.4 Demand and forecast.

2.4.1 Demand

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where there is demand. Text value	46143
abstractProduct	Product	The product ID of the Product in demand. Text value	424745
date	Date	The date on which the demand is applied to the product-location combination. Short date format	2022/03/24
demand	Demand (units of Product)	The demand (in units) at the applicable product location on the specified date. Numerical value	12

User Interface

Press the green + on the left to create a new demand entry. Specify the Product and Location and the demand at that product location (Figure 78).

Demand			
+ 📄 - 🗑️ Add new Copy Remove selected Remove all			
Location	Product	Date	Demand (u...
TUNIS	Product A5	1/1/2022	50.0
Basel	Product A5	1/1/2022	546.0
Athens	Product gr...	1/1/2022	34.0
Curno	Product A2	1/1/2022	76.0
HYDERABAD	Product A3	1/1/2022	235.0
Lincolnshire	product D3	1/1/2022	67.0

Figure 78: Demand UI

Excel

In the 'DemandRecord' sheet, fill in the fields in the correct format (Figure 79).

	A	B	C	D
1	Location	Product	Date	Demand (units of product)
2	TUNIS	Product A5	01.01.2022	50
3	Basel	Product A5	01.01.2022	546
4	Athens	Product group D	01.01.2022	34
5	Curno	Product A2	01.01.2022	76
6	HYDERABAD	Product A3	01.01.2022	235
7	Lincolnshire	product D3	01.01.2022	67

Figure 79: Demand in Excel

2.4.2 Preliminary known demand

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where there is demand. Text value	46143
abstractProduct	Product	The product ID of the Product in demand. Text value	424745
date	Date	The date on which the demand is applied to the product-location combination. Short date format	2022/03/24
demand	Demand (units of Product)	The demand (in units) at the applicable product location on the specified date. Numerical value	12
demandKnown Date	Demand known date	The date on which the demand is known to the product-location combination – i.e. rules like Demand Driven MRP can adjust the target stock levels from this date if the prerequisites are satisfied. Short date format	2022/03/24

User Interface

Press the green + on the left to create a new preliminary known demand entry. Specify the Product and Location and the preliminary known demand at that product location (Figure 78).

Preliminary known demand				
+ 📄 – 🗑️ Add new Copy Remove selected Remove all				
Location	Product	Date	Demand (u...	Demand known date
Amman	Product A4	1/1/2022	65.0	1/1/2022
Vitez	Product A5	1/1/2022	67.0	1/1/2022
CASABLAN...	product C3	1/1/2022	889.0	1/1/2022
Helsinki	product D5	1/1/2022	76.0	1/1/2022
LONDON	product D5	1/1/2022	80.0	1/1/2022

Figure 80: Preliminary know demand UI

Excel

In the 'PreliminaryKnownDemandRecord' sheet, fill in the fields in the correct format (Figure 79).

	A	B	C	D	E
1	Location	Product	Date	Demand (units of product)	Demand known date
2	Amman	Product A4	01.01.2022	65	01.01.2022
3	Vitez	Product A5	01.01.2022	67	01.01.2022
4	CASABLANCA	product C3	01.01.2022	889	01.01.2022
5	Helsinki	product D5	01.01.2022	76	01.01.2022
6	LONDON	product D5	01.01.2022	80	01.01.2022

Figure 81: Preliminary known demand in Excel

2.4.3 Demand loading rules

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the demand loading rule applies. Text value	All Customers
abstractProduct	Product	The product ID of the Product where the demand loading rule applies. Text value	All Products
type	Type	Choose the source that you want to use to load demand. FROM_INPUT_DATA Demand is determined through the demand input data. FROM_FORECAST Demand is determined through the forecasted demand input data.	FROM_INPUT_DATA
aggregationPeriod	Aggregation period	The Aggregation Period defines the periodicity of the demand data that determines the amount of stock required for a specific period. An aggregation Period of 1 day means a calculated value will be derived daily.	DAY
forecastingError	Forecasting error	The forecast error percentage (fraction) that should be applied to get the demand. Forecast error is a measure of forecast accuracy.	0

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the demand loading rule applies. Text value	All Customers
abstractProduct	Product	The product ID of the Product where the demand loading rule applies. Text value	All Products
		Decimal value	
dailyVariability	Daily variability	The fluctuations that occur between one day and the next. Decimal value	0

User Interface

Press the green + on the left to create a new demand loading rule entry. Fill in the fields in the correct format (Figure 82).

Location	Product	Type	Aggregation period	Forecasting error	Daily variability
All customers	All products	From forecast	Week	0.3	0.1

Figure 82: Demand Loading UI

Excel

In the 'DemandLoadingRuleRecord' sheet, fill in the fields in the correct format (Figure 83).

	A	B	C	D	E	F
1	Location	Product	Type	Aggregation period	Forecasting error	Daily variability
2	All customers	All products	From forecast	Week	5	15

Figure 83: Demand Loading in Excel

2.4.4 Demand forecast

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where there is demand. Text value	46143
abstractProduct	Product	The product ID of the Product in demand. Text value	424745
date	Date	The date on which the demand is applied to the product-location combination. Short date format	2022/01/01
endDate	End date (optional)	In the case that an end date is entered, the "Date" and "End date" will be used in combination. The forecast entered will be evenly distributed between the "Date" and "End date" dates.	2022/01/10

Data Field name in Excel	Tab name in SCDT	Description	Example
		Short date format Example: Date is 2022/01/01 and End date is 2022/01/10. The forecast entered is 10 units. The 10 units will be evenly distributed between the 10 days. So each day will have a forecast of 1.	
demandForecast	Demand Forecast	The demand (in units) at the applicable product location on the specified date. Numerical value	10

User Interface

Press the green + on the left to create a new Demand forecast entry. Specify the Product and Location and the demand at that product location (Figure 78).

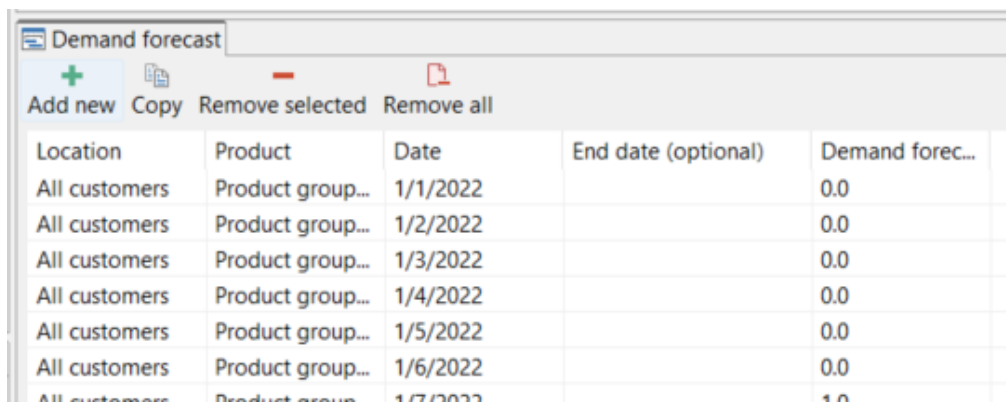


Figure 84: Demand Forecast UI

Excel

In the 'DemandForecastRecord' sheet, fill in the fields in the correct format (Figure 79).

	A	B	C	D	E
	demandForecast				
1	date	recast	endDate	abstractProduct	abstractLocation
2	01.01.2022	819	31.01.2022	Product-0	LocationGroup-0
3	01.01.2022	270	31.01.2022	Product-1	LocationGroup-0
4	01.01.2022	375	31.01.2022	Product-2	LocationGroup-0
5	01.01.2022	505	31.01.2022	Product-3	LocationGroup-0
6	01.01.2022	900	31.01.2022	Product-4	LocationGroup-0
7	01.01.2022	327	31.01.2022	Product-5	LocationGroup-0
8	01.01.2022	345	31.01.2022	Product-8	LocationGroup-0
9	01.01.2022	900	31.01.2022	Product-9	LocationGroup-0

Figure 85: Demand Forecast in Excel

2.4.5 Forecast loading rules

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where the forecast loading rule applies. Text value	All Customers

abstractProduct	Product	The product ID of the Product where the forecast loading rule applies. Text value	All Products
type	Type	Choose the source that you want to use to load demand. FROM_INPUT_DATA Forecast is determined through the forecast input data. FROM_DOWNSTREAM_FORECAST Forecast at Distribution Centers (DCs) or Suppliers are determined through the aggregated forecasted input data from the downstream.	FROM_INPUT_DATA
aggregationPeriod	Aggregation period	The Aggregation Period defines the periodicity of the forecast data that determines the amount of stock required for a specific period. An aggregation Period of 1 day means a calculated value will be derived daily.	DAY
forecastingError	Forecasting error	The forecast error percentage (fraction) that should be applied to get the forecast. Forecast error is a measure of forecast accuracy. Decimal value	0

User Interface

Press the green + on the left to create a new forecast loading rule entry. Fill in the fields in the correct format (Figure 82).

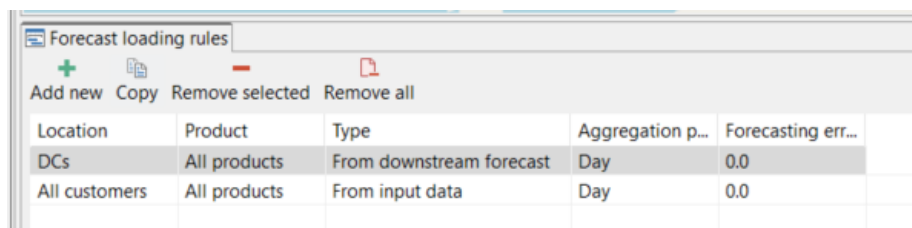


Figure 86: Forecast Loading UI

Excel

In the 'ForecastLoadingRuleRecord' sheet, fill in the fields in the correct format (Figure 83).

	A	B	C	D	E	F
1	type	aggregationPeriod	forecastingError	abstractProduct	abstractLocation	
2	FROM_DOWNSTREAM_FORECAST	DAY	0	ProductGroup-4	LocationGroup-1	
3	FROM_INPUT_DATA	DAY	0	ProductGroup-4	LocationGroup-0	

Figure 87: Forecast Loading in Excel

2.4.6 Demand properties

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location where there is backlog. Text value	All Customers

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractProduct	Product	The product ID of the Product in backlog. Text value	All Products
daysAllowedInBacklog	Days allowed in backlog	The number of days an order can spend in the backlog before it is canceled, and the unfulfilled order is marked as a stockout. Numerical value	10000
partialOrdersFulfillmentAllowed	Partial Order fulfillment allowed	TRUE Orders can be split and partially fulfilled. FALSE Whole order must be complete before shipping it to the customer.	TRUE

User Interface

Press the green + on the left to create a new demand properties entry. Fill in the fields in the correct format (Figure 88).

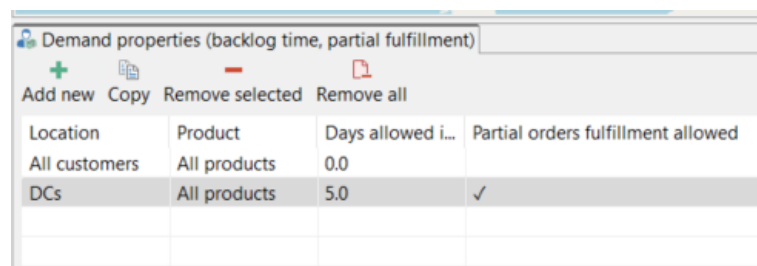


Figure 88: Demand properties UI

Excel

In the 'DemandpropertiesRecord' sheet, fill in the fields in the correct format. See Figure 89.

	A	B	C	D
1	Backlog	daysAllowedInBacklog	partialOrdersFulfillmentAllowed	abstractProduct abstractLocation
2	0	FALSE	ProductGroup-4	LocationGroup-0
3	5	TRUE	ProductGroup-4	LocationGroup-1
4				
5				
6				

Figure 89: Demand properties in Excel

2.5 Supply chain initial state

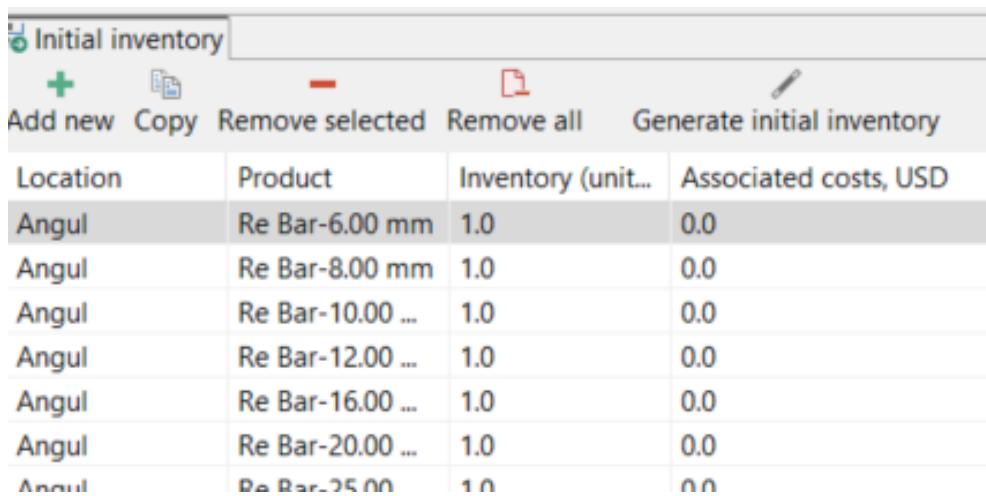
2.5.1 Initial inventory

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location that has the products in stock. Text value	JC

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractProduct	Product	The product ID of the Product in stock. Text value	215
inventory	Inventory (units of Product)	The number of product units in stock at the specified locations. Numerical value	1416
associatedCosts	Associated costs, USD	Costs associated with the initial inventory, used only if the initial inventory is non-zero.	0

User Interface

Press the green + on the left to create a new initial inventory entry. Fill in the fields in the correct format (Figure 90).

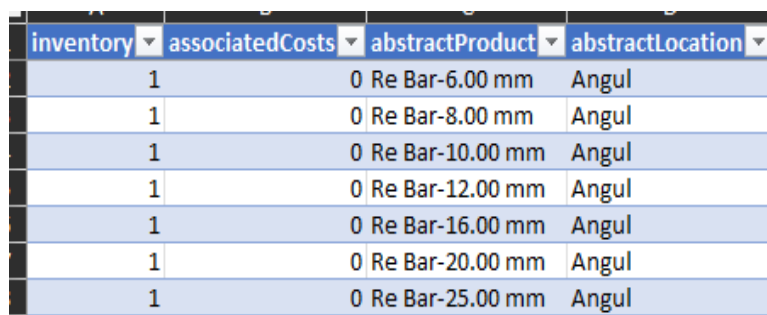


Location	Product	Inventory (unit...)	Associated costs, USD
Angul	Re Bar-6.00 mm	1.0	0.0
Angul	Re Bar-8.00 mm	1.0	0.0
Angul	Re Bar-10.00 ...	1.0	0.0
Angul	Re Bar-12.00 ...	1.0	0.0
Angul	Re Bar-16.00 ...	1.0	0.0
Angul	Re Bar-20.00 ...	1.0	0.0
Angul	Re Bar-25.00 ...	1.0	0.0

Figure 90: Initial Inventory

Excel

In the 'InitialInventoryRecord' sheet, fill in the fields in the correct format (Figure 91).



inventory	associatedCosts	abstractProduct	abstractLocation
1	0	Re Bar-6.00 mm	Angul
1	0	Re Bar-8.00 mm	Angul
1	0	Re Bar-10.00 mm	Angul
1	0	Re Bar-12.00 mm	Angul
1	0	Re Bar-16.00 mm	Angul
1	0	Re Bar-20.00 mm	Angul
1	0	Re Bar-25.00 mm	Angul

Figure 91: Initial Inventory in Excel

2.5.2 Initial stock in transit

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the destination Location of the stock in transit. Text value	Location-1
abstractProduct	Product	The product ID of the Product in transport. Text value	Product-0
stockInTransit	Stock in transit (units of Product)	The number of product units in transit. Numerical value	5
daysToArrival	Days to arrival (days)	The number of days until the associated stock arrives at the specified Location. Decimal value	3

User Interface

Press the green + on the left to create a new initial stock in transit entry. Fill in the fields in the correct format (Figure 92).

Location	Product	Stock in transit (units of product)	Days to arrival (days)
Customer-2	Product-1	43.0	1.0
Plant-1	Product-4	3.0	15.0
DC-2	Product-2	4.0	12.0

Figure 92: Initial Stock in Transit

Excel

In the 'InitialStockInTransit' sheet, fill in the fields in the correct format. See Figure 93.

	A	B	C	D
1	stockInTr ansit	daysToAr rival	abstractP roduct	abstractL ocation
2				
3				

Figure 93: Initial Stock in Transit Excel Sheet

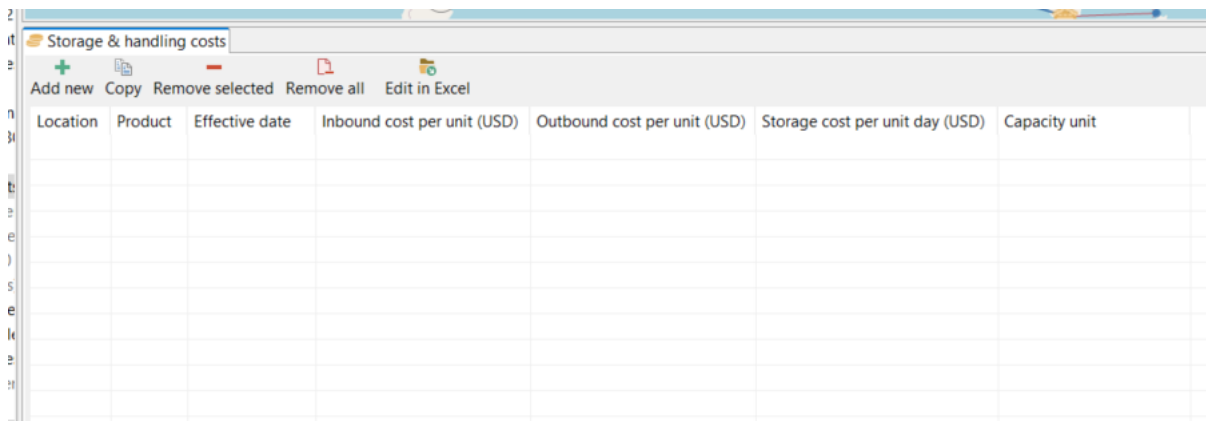
2.6 Costs

2.6.1 Storage & handling costs

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location for which this product location cost record is specified. Text value	46143
abstractProduct	Product	The product ID of the Product for which this product location cost record is specified. Text value	424745
date	Effective date	The specified costs are applied from this specific date. Short date format	2022/03/24
inboundCostPerUnit	Inbound cost per unit day (USD)	The fixed inbound costs per capacity unit. Numerical value	4
outboundCostPerUnit	Outbound cost per unit day (USD)	The fixed outbound costs per capacity unit. Numerical value	3
storageCostPerUnitDay	Storage cost per unit day (USD)	The storage cost per capacity unit per day. Numerical value	1
capacityUnit	Capacity unit	The capacity unit type in which delivery capacities are measured, e.g., KG, parcels, unit of Product. Text value	KG

User Interface

Press the green + on the left to create a new storage and handling cost entry. Fill in the fields in the correct format (Figure 94).



Location	Product	Effective date	Inbound cost per unit (USD)	Outbound cost per unit (USD)	Storage cost per unit day (USD)	Capacity unit

Figure 94: Storage and Handling Costs

Excel

In the 'ProductLocationCostRecord' sheet, fill in the fields in the correct format. See Figure 95.

	A	B	C	D	E	F	G	H
		storageC	inbound	outbound				
		ostPerUn	CostPerU	dCostPer	abstractP	abstractLo	capacity	
1	date	itDay	nit	Unit	roduct	cation	Unit	
2	01.01.2020	2	3	4	Product-0	Location-0	CapacityUnit-0	
3								
4								

Figure 95: Storage and Handling Costs Excel Sheet

2.6.2 Transportation costs

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLink	Link	The link for which the transportation costs are specified.	LTL, MO-IN
costPerRun	Cost per run, USD	The cost per delivery that takes place, regardless of the delivery capacity used. E.g., The cost per delivery is \$34, and 1 delivery is shipped. The total transportation cost is \$34. Numerical value	34
capacityUnit	Capacity unit	The capacity unit type in which transportation costs are measured. Eg, KG, parcels, unit of Product.	Unit of Product
costPerCapacityUnit	Cost per capacity unit, USD	The transportation cost per unit = \$1. The CapacityUnit used is "Units of Product". E.g., The transportation cost per unit = \$1. The demand is 10 units. Thus, the total transportation cost equals the number of products delivered x transportation cost per unit. = 10*\$1. Numerical value	1.0
	Costing Table Records	This is the costing record for the link. The capacity unit count, fixed cost and cost per capacity unit is specified here.	1 lines...
distanceUnit	Distance unit	A unit of length that refers to any arbitrarily chosen and accepted reference standard for measurement of length. MILE The distance is measured in Miles. KM The distance is measured in Kilometers.	KM
costPerDistanceUnit	Cost per distance unit, USD	You pay a fixed price per Distance Unit per delivery. The transportation costs are set to be calculated per distance unit of every delivery at \$2 per KM. E.g., One delivery gets shipped. The distance of the link is 100 KM. Thus, the total transportation cost is \$2/KM * 100KM = \$200. Numerical value	2.0
costPerCapacityDistanceUnit	Cost per capacity	You pay a fixed price per capacity unit per Distance Unit per delivery.	1.0

Data Field name in Excel	Tab name in SCDT	Description	Example
	distance unit, USD	E.g., The transportation costs are set to be calculated as \$1 per product unit * KM. 10 product units get delivered. The distance of the link is 100 KM. So, total transportation costs are 10 units*100km*\$1 = \$1000. Numerical value	
aggregationType	Aggregation type	MAX The Maximum cost is calculated when considering (1) cost per run, (2) cost per capacity unit, (3) cost per distance unit, and (4) cost per capacity distance unit. The highest cost between them is chosen as the transportation cost. MIN The Minimum cost is calculated when considering (1) cost per run, (2) cost per capacity unit, (3) cost per distance and t, (4) and cost per capacity distance unit. The lowest cost between them is chosen as the transportation cost. SUM The total cost is calculated when considering (1) cost per run, (2) cost per capacity unit, (3) cost per distance unit, and, (4) cost per capacity distance unit. The sum of all these costs is chosen as the transportation cost. E.g., If the Aggregation type is set to MAX, it means that the Total Transportation cost = the maximum of the aforementioned amounts = \$1000.	MAX

User Interface

Transportation Costs setup (Figure 96).

Link	Cost per run, USD	Capacity unit	Cost per capacity unit, USD	Costing table records	Distance unit	Cost per distance unit, USD	Cost per capacity distance unit, U...	Aggregation type
LTL, MO-AL	111.6107272	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-AR	99.8935868	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-AZ	146.4694812	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-CA	146.4694812	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-CO	166.45447	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-CT	106.3241496	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-DC	150.51456	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-DE	138.7138004	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX
LTL, MO-FL	171.7338368	Weight	0.0	3 lines...	MILE	0.0	0.0	MAX

Figure 96: Transportation Costs Records

Excel

In the 'TransportationCost' tab, fill in the empty fields in the correct format. See Figure 97.

	A	B	C	D	E	F	G	H	I
1	costPerRun	costPerCapacityUnit	distanceUnit	costPerDistanceUnit	costPerCapacityUnit	aggregationType	abstractLink	capacityUnit	ID
15	90	0	MILE	0	0	MAX	LTL, MO-IN	CapacityUnit-1	TransportationCost
162	500	0	MILE	3,74	0	MAX	FTL, MO-IN	CapacityUnit-1	TransportationCost

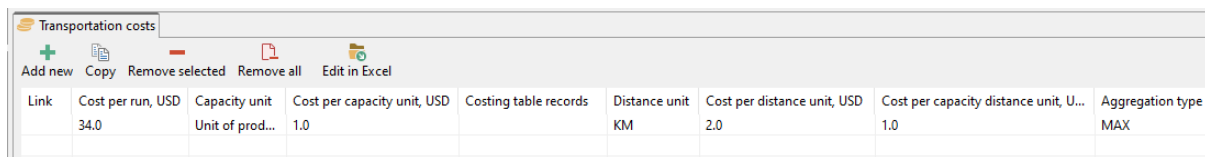
Figure 97: Excel Products Tab

2.6.2.1 Transportation costs example

There is one order that is received during the simulation period and another order that is still on order at the end of the simulation period (not delivered during the period). Each of these orders contains 10 units per delivery. The distance of the link is 100km.

The transportation costs are set to the following (as shown in Figure 98):

- Cost per run = \$34
- Cost per capacity unit = \$1
- Cost per distance unit = \$2
- Cost per capacity distance unit = \$1
- Aggregation type = MAX



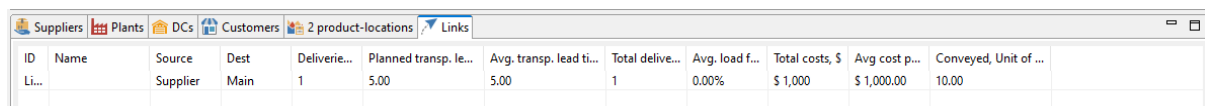
Link	Cost per run, USD	Capacity unit	Cost per capacity unit, USD	Costing table records	Distance unit	Cost per distance unit, USD	Cost per capacity distance unit, U...	Aggregation type
	34.0	Unit of prod...	1.0		KM	2.0	1.0	MAX

Figure 98: Transportation Costs

The aggregation type is MAX, therefore the maximum of the costs will be used as the transportation cost. The different costs are calculated as follows:

- Cost per run = \$34. There is 1 delivery (run) and therefore the total cost for this cost type is \$34.
- Cost per capacity unit = \$1 multiplied by 10 units. Therefore, the total cost for this calculation is \$10.
- Cost per distance unit = \$2 multiplied by 100km = \$200. Therefore the total cost for this calculation is \$200.
- Cost per capacity distance unit = \$1 multiplied by 10 units multiplied by 100km = \$1000. Therefore, the total cost for this calculation is \$1000.

The Aggregation type is set to MAX, meaning that the Total Transportation cost = the maximum of the above amounts = \$1000 and can be seen in the links output section in Figure 99.



ID	Name	Source	Dest	Deliverie...	Planned transp. le...	Avg. transp. lead ti...	Total delive...	Avg. load f...	Total costs, \$	Avg cost p...	Conveyed, Unit of ...
Li...		Supplier	Main	1	5.00	5.00	1	0.00%	\$ 1,000	\$ 1,000.00	10.00

Figure 99: Transportation Cost Links

2.6.3 Costing Table Records

Data Fed name in Excel	Tab name in SCDT	Description	Example
unitsCount	Capacity unit count	The number of units that qualify for a specific fixed price or a specific cost per unit. Note that if you type 1500, 1500, and unit deliveries less than 1500 units will qualify for the specified fixed cost and specified cost per unit. Numerical value	1500
fixedCost	Fixed cost	The fixed cost is paid per delivery.	0.00

	A	B	C	D
1	unitsCount▼	fixedCost▼	costPerUnit▼	transportationCostRecord
1005	0	0,00	0,17	TransportationCostRecord-LTL, MO-AL
1006	1501	0,00	0,12	TransportationCostRecord-LTL, MO-AL
1007	5001	0,00	0,08	TransportationCostRecord-LTL, MO-AL
1014	0	0,00	0,12	TransportationCostRecord-LTL, MO-AR
1015	1501	0,00	0,12	TransportationCostRecord-LTL, MO-AR
1016	5001	0,00	0,08	TransportationCostRecord-LTL, MO-AR
1023	0	0,00	0,41	TransportationCostRecord-LTL, MO-AZ
1024	1501	0,00	0,27	TransportationCostRecord-LTL, MO-AZ

Figure 101: Excel Costing Table Records Sheet

2.7 Inventory management rules

Every rule has its own description at the bottom as shown in Figure 103 and Figure 104.

2.7.1.1 MTO

Data Field name in Excel	Tab name in SCDT	Description	Example
orderingFrequency	Order frequency	Order frequency is how often you can place orders at suppliers. Numerical value	1
minOrderQuantity	Minimum order quantity	The minimum order quantity is the minimum number of units that can be ordered at a time. Numerical value	1
orderingQuantum	Order lot size	The Order Lot size/order quantum is the quantity in which the item will be ordered. Numerical value	1
abstractProduct	Product	The product ID of the Product where there is backlog. Text value	All Products
abstractLocation	Location	The location ID of the Location where there is backlog. Text value	All Customers

User Interface

In the user interface, a user will start by clicking on the green + above the "Add MTO rule" text. Then select the locations and products to which this rule is applied (Figure 102).

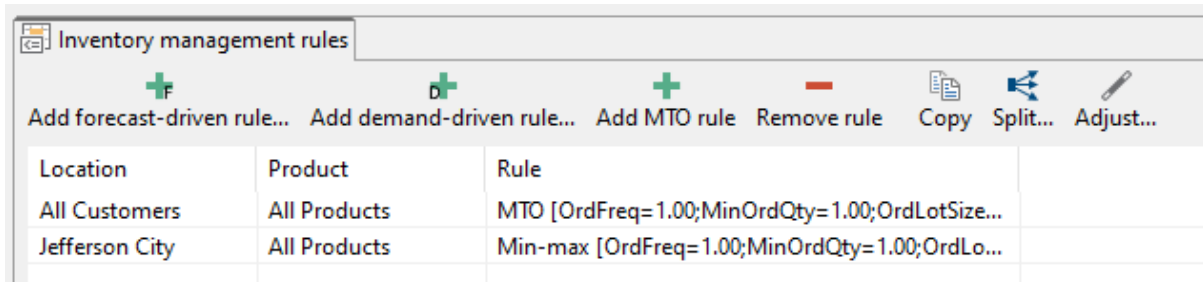


Figure 102: Inventory Management UI

Then select the rule's row to aid the execution, advanced, or all parameters (Figure 103). Use the table view (Figure 104) to see a summary of all the editable parameters.

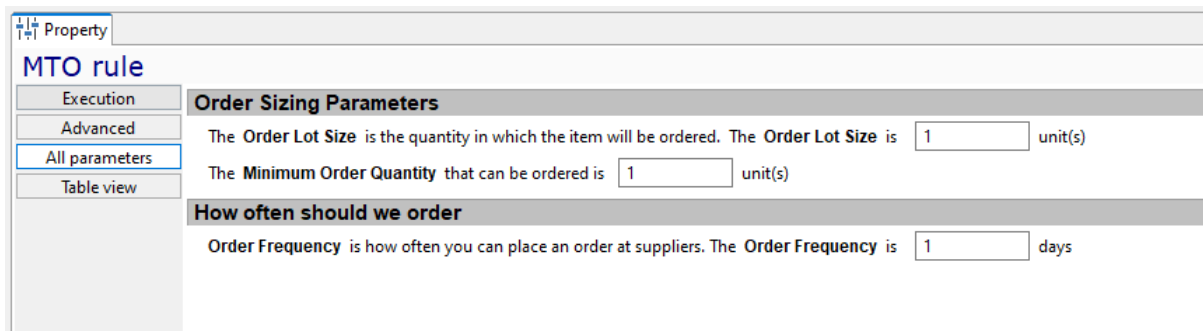


Figure 103: All Parameters

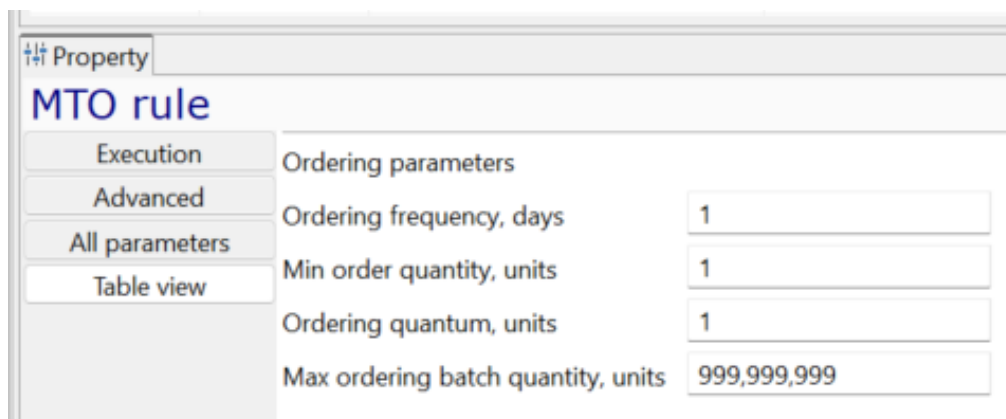


Figure 104: MTO Table View

Excel

In the 'MTORule' sheet, fill in the fields in the correct format. See Figure 105.

	A	B	C	D	E	F
1	orderingFrequency	minOrderQuantity	orderingQuantum	useEOLRule	abstractProduct	abstractLocation
2	1	1	1	✓	All Products	All Customers

Figure 105: MTO Rule Sheet

2.7.1.2 MinMax

The Min-Max inventory rule attempts to keep the SOH (stock on hand) within a specific range. This policy is often referred to as the two-bin model. When the first bin is empty, the organization places an order. The amount of inventory in the second bin represents the quantity needed until the new order arrives.

The initial stock for min-max is determined by multiplying the average lead time with the average daily demand

Initial stock = Average Lead Time * Average Daily Demand

Safety stock is calculated using a simplified method. Therefore, it is called Simplified Safety Stock. Firstly, the user has to decide how many days of coverage is needed per product, and this is called Safety Stock Coverage (SSC). This will vary for different types of products. The Safety Stock is then calculated by multiplying the SSC period (in days) with the average daily demand.

Safety Stock = Safety Stock Coverage * Average Daily Demand

Minimum inventory is the stock level that triggers an order. It is calculated as the average supply lead time multiplied by the average daily demand plus safety stock.

Minimum = Average Supply Lead Time * Average Daily Demand + Simplified Safety Stock

The maximum inventory level is calculated by multiplying the maximum daily demand with the maximum SLT.

Max = Maximum Daily Demand * Maximum Supply Lead Time

2.7.1.2.1 Min-Max Parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
maxDemandFactor	Maximum daily demand factor	An indication of how much bigger the maximum daily demand is compared to the mean daily demand. Numerical value	3
meanDailyDemandForwardLookingPeriod	Forward-looking period, days	The average daily demand will be calculated, taking the average forecasted daily demand of the number of specified days. Numerical value	14
updateFrequency	Update Frequency, days	How often the minimum and maximum levels should be recalculated and updated. Numerical value	30

2.7.1.2.2 Ordering Parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
orderingFrequency	Order frequency, days	Order frequency is how often you can place orders at suppliers.	1

Data Field name in Excel	Tab name in SCDT	Description	Example
		An order should be placed when the total stock (Stock on hand (SOH) + stock on order (SOO)) reaches the minimum. Numerical value	
minOrderQuantity	Minimum order quantity, units	The minimum order quantity is the minimum number of units that can be ordered at a time. <i>Minimum = Average Supply Lead Time * Average Daily Demand + Simplified Safety Stock</i> Numerical value	1
orderingQuantum	Ordering quantum, units	The Order Lot size/order quantum is the quantity in which the item will be ordered. <i>Order Quantity = Maximum – (Stock On Hand + Stock On Order)</i> Numerical value	1
maxOrderBatchQuantity	Max ordering batch quantity, units	The maximum batch size allowed to be ordered. Numerical value	10000

User Interface

In the user interface, a user will start by clicking on the green + above the "Add Forecast-driven rule" text. See Figure 106.

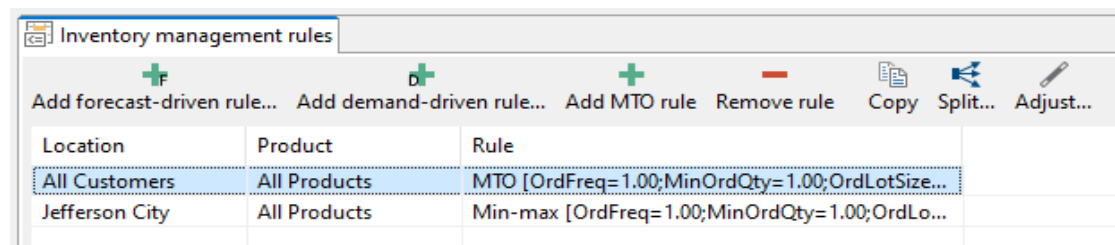


Figure 106: Inventory Management UI

Then select "Min-Max" (Figure 107).

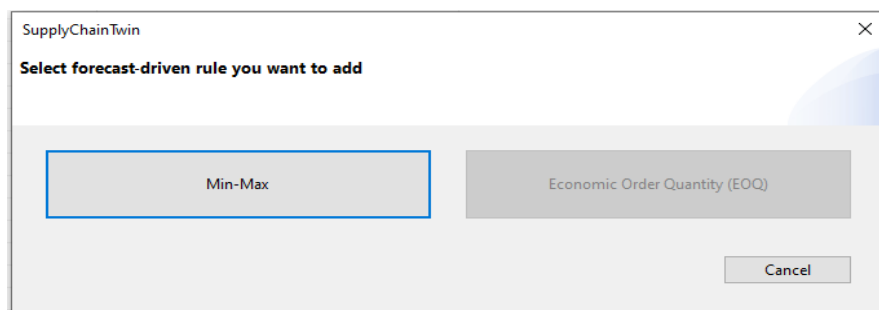


Figure 107: Select MinMax

Double-click on the row to edit the input parameters of the Min-Max rules (Figure 108).

Property

Min-max rule

Basic

Maximum Daily Demand Factor
The **Maximum Daily Demand Factor** is an indication of how much bigger the maximum daily demand is compared to the mean daily demand

Planning

The **Maximum Daily Demand Factor** is 3.0

Execution

Improvement

Advanced

Maximum Level
Maximum Level is calculated by multiplying the **Maximum Daily Demand Factor** with the **Forecasted Mean Daily Demand (units)** and the **Maximum Supplier Lead Time (days)**

All parameters

Safety Stock
Safety Stock is calculated using a simplified method. Therefore, it is called **Simplified Safety Stock (SSS)**.

The **Safety Stock** is calculated by multiplying the difference between the **Maximum Supplier Lead Time** and **Average Supplier Lead Time** with the **Average Daily Demand (units)**.

Table view

Minimum Level
Minimum Level is the stock level that triggers an order.

Minimum Level is calculated by multiplying the **Average Supply Lead Time (days)** with the **Average Daily Demand (units)** plus **Safety Stock (units)**

When to place an order
Place Order when the **Stock On Order (SOO)** is smaller or equal to the **Minimum Inventory**

Order Sizing Parameters
The **Order Lot Size** is the quantity in which the item will be ordered. The **Order Lot Size** is 1 unit(s)

The **Minimum Order Quantity** that can be ordered is 1 unit(s)

How much to order
Order the maximum between:

1. **Maximum Level minus Stock On Hand** minus **Backlog** (if backlog is allowed and if you haven't placed an order for the backlog yet)
2. The **Minimum Order Quantity (MOQ)**

The actual order quantity should be larger than the MOQ and in multiples of the Lot Size

Update Frequency
The **Min** and **Max levels** based on the **Forecasted Mean Daily Demand** should be updated every 30.0 days

How often should we order
Order Frequency is how often you can place an order at suppliers. The **Order Frequency** is 1 days

Note: MinMax is a reorder point policy and thus not normally have an ordering frequency.

End of Life (EOL) Rule
☐ Use end of life (EOL) rule. If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of the remaining forecasted demand

Figure 108: MinMax Rule

Property

Min-max rule

Basic

Planning

Execution

Improvement

Advanced

All parameters

Table view

Min-max parameters

Max demand factor 3.0

Forward looking period, days 14.0

Update frequency, days 30.0

Use EOL rule ☐

Ordering parameters

Ordering frequency, days 1

Min order quantity, units 1

Ordering quantum, units 1

Max ordering batch quantity, units 999,999,999

Figure 109: Min-Max Table View

Excel

In the 'MinMaxRule' sheet, fill in the fields in the correct format. See Figure 110.

	A	B	C	D	E	F	G	H	I	J
	orderingFrequency	minOrderQuantit	orderingQuantum	useEOLRule	Factor	ForwardLookingPeriod	orwardLookingPeri	updateFrequency	abstractProduct	abstractLocation
1	1	1	1	FALSE	5	-1	30	60	ProductGroup-4	LocationGroup-0
2	1	1	1	FALSE	5	-1	30	60	ProductGroup-4	LocationGroup-1

Figure 110: MinMax Excel Sheet

2.7.1.3 TOC Rule

The heuristic that we use in TOC is to ensure that we are paranoid but not hysterical. We do not want to react to noise, we only want to react to signals. Events or delays that are unlikely to be repeated, should not be considered.

The Reliable Replenishment Time (RRT), measured in days, is calculated by adding the Maximum Supply Lead Time (in days) to the Order frequency (OF)

The Initial Target Stock Level (TSL) is determined based on either the **forecast within a period** or **actual inventory**. The RRT is the time unit used to consider the historical demand/forecast to determine the TSL.

The TSL is calculated by determining the **Max** or **Average** amount of demand over a set number of RRTs.

The initial inventory is then calculated by dividing the TSL by 2.

Strategic safety is not normally used in TOC, unless there is a specific company requirement of it. The strategic safety stock is the amount of days the user wants safety stock coverage for.

The order frequency is to be done as frequently as possible to allow TOC to be agile.

The reliable replenishment time is calculated by adding the reliable supply lead time and the ordering frequency.

RRT = Order Lead Time + Reliable Supply Lead Time

The RSLT (Reliable Supply Lead Time) can be either the max SLT, or the 95th percentile of the SLT (the lead time in which 95% of the orders will be on time).

The target stock level is calculated by looking at the maximum demand within the specified number of RRTs.

TSL = Maximum demand within the specified RRTs

2.7.1.3.1 Penetration-Based TSL Calculation

Data Field name in Excel	Tab name in SCDT	Description	Example
targetBufferIncreasePercent	Target buffer increase percent	Percentage with which the TSL should be increased expressed a decimal. Numerical Value.	0.33
targetBufferDecreasePercent	Target buffer decrease percent	Percentage with which the TSL should be decreased expressed a decimal. Numerical Value.	0.33
redSlidingWindow	Red sliding window, RRTs	Number of RRTs to be considered for an increase in buffer zones. Numerical Value.	3.0
greenSlidingWindow	Green sliding window, RRTs	Number of RRTs to be considered for an decrease in buffer zones. Numerical Value.	2.0
redToleranceTime	Red tolerance time, RRTs	Maximum number of RRTs to wait until starting to count Red Penetration Numerical Value	2.0

Data Field name in Excel	Tab name in SCDT	Description	Example
redPenetrationThreshold	Red penetration threshold	The percentage of the current Red Zone that Red Penetration has to exceed to over the set number of RRTs to increase TSL, expressed as a decimal.	1.0
redPenetrationCountingCriteria	Red penetration counting criteria	TIME_AND_ORDER_ARRIVAL Either wait for the specified RRT period to pass OR until the day that today's replenishment order actually arrives before starting to count Red penetration again TIME_OR_ORDER_ARRIVAL Either wait for the specified RRT period to pass AND until the day that today's replenishment order actually arrives before starting to count Red penetration again	TIME_AND_ORDER_ARRIVAL

2.7.1.3.2 Safety Stock Rules

Data Field name in Excel	Tab name in SCDT	Description	Example
strategicSafetyStock	Strategic safety stock type	NONE No safety stock is kept CONSTANT A constant amount of products is kept as safety stock DAYS_COVER_BACKWARD Look backward at actual past demand for the specified horizon and use the sum of demand in that period as safety stock. DAYS_COVER_FORWARD Look forward at forecasted demand for the specified horizon and use the sum of demand in that period as safety stock.	NONE
SafetyStockSize	Safety stock size, units	The amount of units to be held as safety stock. Numerical Value.	0.33
SafetyStockHorizon	Safety stock horizon, days	The amount of days to look forward or backward for safety stock cover. Numerical Value.	3.0
EOLRule	Use EOL rule	Use the end of life rule If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of remaining forecasted demand.	TRUE

2.7.1.3.3 Hybrid Parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
hybridRule	Use hybrid rule	Consider forecasted demand	TRUE

Data Field name in Excel	Tab name in SCDT	Description	Example
hybridAdjustmentHorizon	Hybrid adjustment horizon, RRTs	The number of RRTs to use for the Hybrid Adjustment Horizon Numerical Value.	3.0
hybridIncreaseThreshold	Hybrid increase threshold	Percentage by how much to increase the threshold, expressed as a decimal.	0.3
hybridDecreaseThreshold	Hybrid decrease threshold	Percentage by how much to decrease the threshold, expressed as a decimal.	0.3

2.7.1.3.4 Initial TSL Parameters:

Data Field name in Excel	Tab name in SCDT	Description	Example
initialTSLCalculation	Initial TSL Calculation Rule	FORECAST_WITHIN_PERIOD The TSL is determined by looking at the forecasted demand and determining the maximum/average demand expected during the set RRTs. ACTUAL_INVENTORY The TSL is determined by looking at the historic demand and determining the maximum/average demand that happened during the set RRTs.	FORECAST_WITHIN_PERIOD
aggregationType	Aggregation Type	MAX The TSL is determined by using the maximum demand over the set RRTs. TOC uses Max by default. AVERAGE The TSL is determined by using the average demand over the set RRTs.	MAX
initialTSLCalculationWindow	Initial TSL Calculation window, RRTs	Number of RRTs to consider for TSL. TOC uses 1.0 RRTs as a default. Numerical Value	1.0

2.7.1.3.5 Advanced Parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
TSLRedLevel	TSL Red Level	The red zone is the “emergency” level. By default TOC calculates it as 1/3 of the TSL. It is a percentage expressed as a decimal.	0.33
TSLYellowLevel	TSL Yellow Level	The yellow zone is the level at which the SOH should ideally be in. By default TOC calculates it as 2/3 of the TSL. It is a percentage expressed as a decimal.	0.67
absoluteMinimumTSL	Absolute minimum TSL, units	Numerical Value	1

Data Field name in Excel	Tab name in SCDT	Description	Example
TSLRounding Multiple	TSL rounding multiple, units	The rounding of TSL multiple as you cannot purchase 0.33 of a product.	1

2.7.1.3.6 Ordering Parameters

Data Field name in Excel	Tab name in SCDT	Description	Example
orderFrequency	Ordering Frequency, days	TOC is an order frequency based policy, an order is placed based on frequency not on stock level. The more frequent an order is placed the lower the amount of inventory needing to be held can be, and the more agile the company can be. TOC by default recommends daily ordering. Numerical Value	1
minOrderQuantity	Min order quantity, units	This is the smallest number of units that can be ordered, it is a policy and not a TOC calculated rule. Numerical Value	1
orderingQuantity	Ordering Quantum, units	This is the order lot size in which the product will be ordered Numerical Value	1
maxOrderingBatchQuantity	Max ordering batch quantity, units	This is the maximum ordering batch quantity that the product will be ordered in. Numerical Value	999,999,999

12 Property	
Penetration-based TOC rule	
Basic	Reliable Replenishment Time (RRT)
Planning	The Reliable Replenishment Time (RRT) , measured in days*, is calculated by adding the Maximum Supply Lead Time (in days) to the Order Frequency (OF) .
Execution	Initial Target Stock Level (TSL)
Improvement	Determine the Initial Target Stock Level based on FORECAST_WITHIN_PERIOD
Advanced	Look ahead for 1.0 RRTs
All parameters	Set Initial TSL equal to MAX historical demand/forecast within the time window of 1 RRT
Table view	If initial TSL is equal to 0 at model start, and forward looking is disabled the model will continue to look forward everyday until a TSL is set greater than 0
Buffer Zones	
In the TOC DBM rule, there are three, typically equally sized, Buffer Zones . The order of the zones is RED, YELLOW, GREEN	
1. Red Zone	
The Red Zone is up to 33.33 % of the TSL	
2. Yellow Zone	
The top of Yellow Zone is up to 66.66 % of the TSL	
3. Green Zone	
The top of Green Zone is up to the TSL 100.00 % of the TSL	
How often should we order	
Order Frequency is how often you can place an order at suppliers. The Order Frequency is every 1 days	
How much to order	
Order the maximum between the following:	
1. The difference between the TSL and the Total Stock plus Backlog (if backlog is allowed and if you haven't placed an order for the backlog yet)	
2. The Minimum Order Quantity (MOQ)	
The Minimum Order Quantity that can be ordered is 1 units	
Order Lot Size	
The Order Lot size is the quantity in which the item will be Ordered. Order Lot Size is 1 units	
What option do you want to use to dynamically resize your buffers? BUFFER_PENETRATION	
BUFFER_PENETRATION : The Target Stock Level (TSL) will be adjusted based on the buffer penetration of the Stock On Hand (SOH).	
If SOH is too long in the red zone the TSL will increase. If SOH stays too long in the green it will decrease the TSL.	
DEMAND_WITHIN_RRT : the Target Stock Level (TSL) will be calculated based on either the historical or forecasted demand within an RRT	
Increase Buffer Zones	
Increase TSL by 33.30 % if the sum of the Red Penetration over 3.0 RRT(s) is greater than 100.00 % of the current Red Zone	
After a TSL increase wait for TIME_AND_ORDER_ARRIVAL before starting to count red Penetration again.	
TIME_OR_ORDER_ARRIVAL : You will wait for either (1) the specified RRT period to pass OR	
(2) until the day when today's Replenishment Order actually arrives before starting to count Red Penetration again	
TIME_AND_ORDER_ARRIVAL : You will wait for both (1) the specified RRT period to pass AND	
(2) until the day when today's Replenishment Order actually arrives before starting to count Red Penetration again	
Wait for the max of 2.0 RRT(s) AND : until the day when today's Replenishment Order actually arrives before starting to count again	
Decrease Buffer Zones	
Decrease the TSL by 33.30 % if the Stock on Hand (SOH) stays in the Green for 2.0 RRT(s)	
Wait until the Stock on Hand (SOH) is in the Green Zone before starting to count the time in green again	
Consider Demand Forecast	
Consider Demand Forecast ☐	
If TRUE , look ahead 3.0 RRT's into the Future Forecasted Demand data	
Increase TSL to the max demand in the RRT found in the future time frame if the max demand in the RRT is greater than 33.30 % of the current TSL	
Decrease TSL to the max demand in the RRT found in the future time frame if the max demand in the RRT is less than 33.30 % of the current TSL	
Do not decrease TSL if current SOH is lower than current Red Zone level	
Strategic Safety Stock	
Implement Strategic Safety Stock ☐	
Strategic Safety Stock is only used in exceptional cases where Safety Stock is a specific company requirement. In that case, the Safety Stock will be shown as a dark red line on the inventory charts, and will stay constant at the initial level (it will not increase/decrease with the buffer sizes).	
It is calculated by multiplying the Safety Stock Coverage (in days) with the Average Daily Demand (units) .	
Advanced TSL Rules	
Absolute minimum TSL	
Set the Absolute Minimum TSL equal to 1 units	
TSL Rounding	
Round TSL to multiples of 1 units	
Small TSL Rule	
Apply a special logic in cases where the TSL is very small. This is to ensure that we are not over- or underreacting to any changes when demand is infrequent and in small quantities. ☐	
End of Life (EOL) Rule	
☐ Use end of life (EOL) rule. If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of the remaining forecasted demand	

Figure 111: TOC All Parameters

Property	
Penetration-based TOC rule	
Basic	Penetration-based TSL calculation
Planning	Target buffer increase percent 0.33
Execution	Target buffer decrease percent 0.33
Improvement	Red sliding window, RRTs 3.0
Advanced	Green sliding window, RRTs 2.0
All parameters	Red tolerance time, RRTs 2.0
Table view	Red penetration threshold 1.00
	Red penetration counting criteria TIME_AND_ORDER_ARRIV
	Strategic safety stock type NONE
	Safety stock size, units 0
	Safety stock horizon, days 0
	Use EOL rule ☐
	Hybrid parameters
	Use hybrid rule ☐
	Hybrid adjustment horizon, RRTs 3.0
	Hybrid increase threshold 0.3
	Hybrid decrease threshold 0.3
	Initial TSL parameters
	Initial TSL calculation rule FORECAST_WITHIN_PERIC
	Aggregation type MAX
	Initial TSL calculation window, RRTs 1.0
	Advanced parameters
	TSL Red level 0.33
	TSL Yellow level 0.67
	Absolute minimum TSL, units 1
	TSL rounding multiple, units 1
	Ordering parameters
	Ordering frequency, days 1
	Min order quantity, units 1
	Ordering quantum, units 1
	Max ordering batch quantity, units 999,999,999

Figure 112: TOC Table view

2.7.1.4 Penetration-based TOC with small TSL rule

The small TSL rule applies a special logic in cases where the TSL is very small. This is to ensure that we are not over- or underreacting to any changes when demand is infrequent and in small quantities.

A few extra settings will then be set up and the TOC UI expands when this option is selected.

To select this option see the **Advanced** tab. See Figure 113

Penetration-based TOC rule

Strategic Safety Stock
 Implement ☐ Strategic Safety Stock
 Strategic Safety Stock is only used in exceptional cases where Safety Stock is a specific company requirement. In that case, the Safety Stock will be shown as a dark red line on the inventory charts, and will stay constant at the initial level (it will not increase/decrease with the buffer sizes).
 It is calculated by multiplying the Safety Stock Coverage (in days) with the Average Daily Demand (units).

Advanced TSL Rules
Absolute minimum TSL
 Set the Absolute Minimum TSL equal to units
TSL Rounding
 Round TSL to multiples of units

Small TSL Rule
 Apply a special logic in cases where the TSL is very small. This is to ensure that we are not over- or underreacting to any changes when demand is infrequent and in small quantities. ☒

End of Life (EOL) Rule
☐ Use end of life (EOL) rule. If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of the remaining forecasted demand

Figure 113: Small TOC rule

The expanded decisions are as follows:

Round TSL to multiples of units

Small TSL Rule
 Apply a special logic in cases where the TSL is very small. This is to ensure that we are not over- or underreacting to any changes when demand is infrequent and in small quantities. ☒

When to Use Small TSL Rule
 For TSL Smaller than units

Backward looking horizon
 This is the period in which red days / stockout days are counted in order to increase the TSL.
 Red days backwards-looking horizon RRT(s)

Number of red days
 This is the number of red/stockout days that should be in the specified period to trigger an increase in the TSL.
 Number of red days to increase TSL days
 A red day is a day where a sale caused a stockout. Stockout days after the sale are not counted.

Green Period to decrease TSL
 If the stock has been in the green for this specified period, the model will decrease the TSL.
 Green period to decrease TSL RRT(s)

Waiting Period
 Once a model increase is recommended, the system will wait this specified period before recommending another TSL increase.
 The purpose of this is to allow time for the additional stock to arrive at the store so we do not overreact and increase the model too much before the additional inventory has had a chance to have an effect.
 Waiting period before checking to increase TSL RRT(s)

End of Life (EOL) Rule
☐ Use end of life (EOL) rule. If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of the remaining forecasted demand

Figure 114: Small TSL rule

2.7.1.4.1 Small TSL Settings

Data Field name in Excel	Tab name in SCDT	Description	Example
useRedDaysBasedForTSLBelow	Use red days based for TSL below	The small TSL rule will be used when the TSL goes below this level.	
redDaysBackwardsLookingHorizon	Red days backward-looking horizon, RRTs	This is the period in which red days / stockout days are counted in order to increase the TSL.	
redDaysNumberToIncreaseTSL	Red days number to increase TSL	This is the number of red/stockout days that should be in the specified period to trigger an increase in the TSL.	
greenPeriodToDecreaseTSL	Green period to decrease TSL, RRTs	If the stock has been in the green for this specified period, the model will decrease the TSL.	
waitingPeriodToIncreaseTSL	Waiting period before checking to increase TSL, RRTs	Once a model increase is recommended, the system will wait this specified period before recommending another TSL increase. The purpose of this is to allow time for the additional stock to arrive at the store so we do not	

Data Field name in Excel	Tab name in SCDT	Description	Example
		overreact and increase the model too much before the additional inventory has had a chance to have an effect	

2.7.1.5 DDMRP Rule

2.7.1.5.1 DDMRP Parameters

Initial stock is calculated as half of the top of green.

Initial stock level = Top of green / 2

The decoupled lead time is the maximum lead time between buffers. In the case of a retail shop, it would be the maximum lead time between the finished goods at the DC and the Finished goods at the store, so basically it would be the transportation lead time (Standard Lead Time Max) and the Order Lead Time (OLT).

DLT = Standard Lead Time Max + Order Lead Time

This is an estimate of the lead time of the longest cumulative unprotected leg in the Bill of Materials (BOM).

When trying to calculate the DLT, draw out the BOM, add routing/cycle times and add the times of all of the legs. Then determine which leg is the longest unprotected leg (leg without buffers).

The ADU (Average Daily Usage) is the average daily demand . The model should then sample the ADU from the input distribution.

The period of consideration is the period that DDMRP will look forward or backward to calculate the Average Daily Usage (ADU).

This is the percentage that DDMRP looks forward (forecast) or backward (historic demand) to calculate the ADU.

0% -> Only past data is considered

50% -> looking forward and backward half/half

100% -> Only looking forward

The size of the green zone (GZ) is determined by taking the maximum of either the Minimum Order Quantity (MOQ) or the Average Daily Usage (ADU) multiplied by the DLT and the green zone lead time factor (GZLTF).

The Green Zone Lead Time Factor (GZLTF) is determined by the length of the lead time. Lead times of different products or product groups can be classified into 3 categories - short, medium, and long. For each of these categories, there are different GZLTF.

- Short lead times have a GZLTF of between 0.6 and 1.0
- Medium lead times have a GZLTF of between 0.4 and 0.6
- Long lead times have a GZLTF of between 0.2 and 0.4

The reason for the different lead time factors, is that we want to have a smaller green zone for long lead times so orders can be placed more frequently to reduce risk and increase cash flow.

The Red Zone Lead Time Factor is determined in the same way.

The top of green is then calculated by adding the Red Safety (RS), the Red Base (RB), the Yellow Zone (YZ) and the Green Zone (GZ).

Data Field name in Excel	Tab name in SCDT	Description	Example
zonesRoundingMultiple	Zones rounding multiple	The rounding rule for the zones to the number of units. Numerical Value	1
recalculationPeriod	Recalculation period, days	How often to recalculate the zones. Numerical Value	1
considerationPeriod	Consideration period, DLTs	The period of consideration is the period that DDMRP will look forward or backward to calculate the Average Daily Usage (ADU). The period is in number of DLTs. Numerical Value	3.0
forwardConsideration	Forward consideration	This is the percentage that DDMRP looks forward (forecast) or backward (historic demand) to calculate the ADU. A percentage expressed as a decimal.	0.5
variabilityFactor	Variability factor	The Variability Factor is defined per product or product category. A higher variability factor, like 80%-100%, is associated with high variability whereas a lower variability factor, like 10-30%, is associated with a low level of variability. This is a user input. A percentage expressed as a decimal.	0.5
redZoneLeadTimeFactor	Red zone lead time factor	The Red Zone Lead Time Factor (RZLTF) is determined by the length of the lead time. Lead times of different products or product groups can be classified into 3 categories - short, medium, and long. For each of these categories, there are different RZLTF. - Short lead times have a RZLTF of between 0.6 and 1.0 - Medium lead times have a RZLTF of between 0.4 and 0.6 - Long lead times have a RZLTF of between 0.2 and 0.4	0.5
greenZoneLeadTimeFactor	Green zone lead time factor	The Green Zone Lead Time Factor (GZLTF) is determined by the length of the lead time. Lead times of different products or product groups can be classified into 3 categories - short, medium, and long. For each of these categories, there are different GZLTF. - Short lead times have a GZLTF of between 0.6 and 1.0 - Medium lead times have a GZLTF of between 0.4 and 0.6 - Long lead times have a GZLTF of between 0.2 and 0.4	0.5

Data Field name in Excel	Tab name in SCDT	Description	Example
considerPreorders	Consider preorders	When considering pre-orders, it enables the qualified spikes feature of DDMRP by looking into the pre-order demand (like online orders).	TRUE
qualifiedSPike Horizon	Qualified spike horizon, days	The spike horizon is the amount of time (in days) that should be added to the DLT time horizon to look for spikes in known demand. Numerical Value	7
qualifiedSpike Size	Qualified spike size, % top of red	The combined daily actual demand within the order spike horizon with known demand that is equal to or larger than XX% of the top of red, will be counted as a qualified order spike. Percentage expressed as a decimal.	0.5
RecalculateDLT	Recalculate DLT	Make DLT adaptable by recalculating it at every resizing event based on past performance.	P
DLTRecalculationHorizon	DLT recalculation horizon, DLTs	How far should we look into previous deliveries to recalculate the new Decoupled Lead time. Number of RRTs. Numerical Value	3.0
EOLRule	Use EOL rule	Use the end of life rule If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of remaining forecasted demand.	TRUE

12 Property: DDMRPRule

Basic

Decoupled Lead Time (DLT)
The Decoupled Lead Time is the average lead time between buffers. The model uses the Average Supplier Lead Time between supply chain network points.

Planning

Average Daily Usage (ADU) and ADU Consideration Period
The ADU (Average Daily Usage) is the average daily demand.

Execution

The Period Of Consideration is the period that DDMRP will look forward or backward to calculate the Average Daily Usage (ADU).

Improvement

The Period Of Consideration is 3.0 DLT(s)

Advanced

ADU Forward consideration

All parameters

The Percentage Looked Forward is 50.00 %

Table view

Green Zone
The size of the Green Zone (GZ) is determined by taking the maximum of either the Minimum Order Quantity (MOQ) or the Average Daily Usage (ADU) multiplied by the DLT and the Green Zone Lead Time Factor (GZLTF).

The Green Zone Lead Time Factor (GZLTF) is 50.00 %

Yellow Zone
The size of the Yellow Zone is calculated by multiplying the ADU with the DLT.

Red Zone
The size of the Red Zone (RZ) is determined by taking the Maximum of either the Minimum Order Quantity (MOQ) or the Average Daily Usage (ADU) multiplied by the DLT and the Red Zone Lead Time Factor (RZLTF).

The Red Zone Lead Time Factor (RZLTF) is 50.00 %

Red Safety
The size of the Red Safety is determined by multiplying the Red Base (RB) with the Variability Factor (VF).

The Variability Factor is a user input. A higher Variability Factor is associated with high demand variability

The Variability Factor is 50.00 %

Order Frequency
Order Frequency is how often you can place an order onto your upstream node.

The Order Frequency is 1 days

Net Flow Position
The Net Flow Position is equal to the Stock On Hand (SOH) plus the Stock On Order (SOO) minus the Qualified Sales Order Demand

Qualified Sales Order Demand is defined as the sum of sales orders past due, due today and qualified spikes.

Consider Preorders
When considering preorders, it enables the Qualified Spikes feature of DDMRP by looking into the preorder demand (like online orders).

Should we consider preorders? ☒

Qualified Spikes
The Qualified Spike Horizon is the amount of time (in days) that should be added to the DLT time horizon to look for spikes in known demand.

Qualified Spike Horizon in days 7

The combined Daily Actual Demand within the Order Spike Horizon with known demand that is >= than the Qualified Spike Size (% of the top of red), will be counted as a Qualified Order Spike.

Qualified Spike Size is 50.00 % top of red

When should we place an order?
Place an order if the Net Flow Position is less than the Top Of Yellow.

How much to order
Order the maximum between the following:

1. The Order Quantity should be the difference between the Top Of Green and the Total Stock (SOH + SOO)
2. The Minimum Order Quantity (MOQ)

The Minimum Order Quantity (MOQ) that can be ordered is 1 units

Note: DDMRP already caters for the MOQ in the Green zone calculation

Order Lot Size
The Order Lot size is the quantity in which the item will be Ordered. The Order Lot Size is 1 units

Recalculate Buffer Zones
The Resizing Frequency is the period of days between each buffer resizing calculation

Recalculate the buffer sizes every 1 day(s)

Recalculate DLT
Recalculate DLT? ☐

Zones Rounding Multiple
Round the Zones to the nearest 1 unit(s)

End of Life (EOL) Rule
☐ Use end of life (EOL) rule. If the TSL is greater than the sum of the remaining forecasted demand, then decrease the TSL to the sum of the remaining forecasted demand

Figure 115: DDMRP All Parameters

Property: DDMRPRule

Basic

DDMRP parameters

Planning

Zones rounding multiple 1

Execution

Recalculation period, days 1

Improvement

Consideration period, DLTs 3.0

Advanced

Forward consideration 0.5

All parameters

Variability factor 0.5

Table view

Red zone lead time factor 0.5

Green zone lead time factor 0.5

Consider preorders ☒

Qualified spike horizon, days 7

Qualified spike size, % top of red 0.50

Recalculate DLT ☐

DLT recalc. horizon, DLTs 3.0

Use EOL rule ☐

Ordering parameters

Ordering frequency, days 1

Min order quantity, units 1

Ordering quantum, units 1

Max ordering batch quantity, units 999,999,999

Figure 116: DDMRP table view

2.8 Sourcing rules

A sourcing rule is defined for a combination of a product and a location. Each being either a single item or a group of items.

2.8.1 Sourcing rule

Data Field name in Excel	Tab name in SCDT	Description	Example
ID		The product ID of the SourcingRule. Text value	SourcingRule-0
abstractLocation	Location	The location ID of the Location associated with this sourcingPolicyType. Text value	All Customers
abstractProduct	Product	The product ID of the Product associated with this sourcingPolicyType. Text value	All Products
producedProductImportPolicy	Produced product import policy	Do not import produced products. Allow import of produced products. Whether to allow importing from another location a product that has at least one production record setting up its production at this plant. This setting applies only to products produced at plants, it has no effect on other product-locations.	Allow import of produced products.

User Interface

Press the green + on the left to create a new sourcing rule entry. Fill out the different fields (see Figure 117).

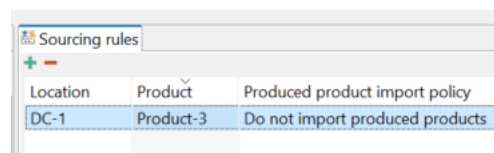


Figure 117: Sourcing rules User interface

Excel

In excel, go to the “SourcingRule” sheet to set up a sourcing rule. See Figure 118.

producedProductImportPolicy	abstractProduct	abstractLocation	ID
DENY	MTA Products	All Customers	SourcingRule-0
DENY	Finished Goods - M	All Customers	SourcingRule-1
DENY	Billets	Patratu	SourcingRule-2
DENY	Semis	All Customers	SourcingRule-3
DENY	All Products	Angul	SourcingRule-4

Figure 118: Sourcing Rule In Excel

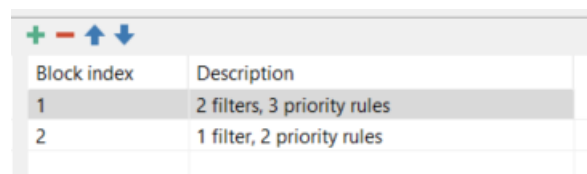
2.8.2 Block index

A sourcing rule consists of blocks. (Figure 119) Each block has an index (1, 2, 3, ...). When selecting an upstream sourcing location, sourcing rule blocks are applied sequentially as follows:

1. Split the upstream locations left from the previous block into two groups – those that meet the criteria and those that don't.
2. If any upstream locations meet the current block's filters, pick and return the best one according to the current block's sorting rules.
3. Pass the upstream locations that do not met the current block's filter conditions to the next block.

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Block index	Automatically given by the model. Index number of the block. Move up or down using the blue arrows. Numerical value	1
sourcingRule	Description	Automatically given by the model. Gives you the number of filters and priority rules within the block. Text value	2 filters, 3 priority rules

User interface

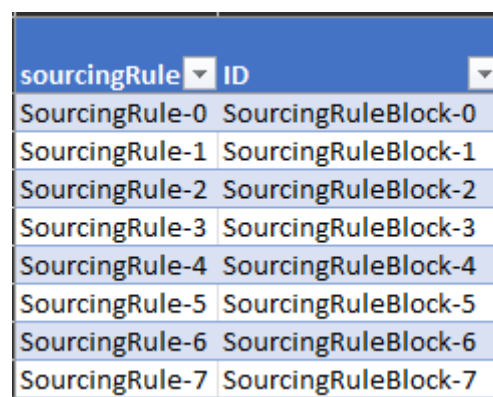


Block index	Description
1	2 filters, 3 priority rules
2	1 filter, 2 priority rules

Figure 119: Block index

Excel

The following table describes the connection between sourcing rules and sourcing blocks. Go to the "SourcingRuleBlock" sheet to set up a sourcing rule, block combination. See Figure 120.



sourcingRule	ID
SourcingRule-0	SourcingRuleBlock-0
SourcingRule-1	SourcingRuleBlock-1
SourcingRule-2	SourcingRuleBlock-2
SourcingRule-3	SourcingRuleBlock-3
SourcingRule-4	SourcingRuleBlock-4
SourcingRule-5	SourcingRuleBlock-5
SourcingRule-6	SourcingRuleBlock-6
SourcingRule-7	SourcingRuleBlock-7

Figure 120: Sourcing rule block in Excel

2.8.3 Sourcing rule properties

Sourcing rule properties contains a filter functionality and a sorting functionality. You can sort and filter according to categories and specified numerical requirements.

2.8.3.1 Filtering

Data Field name in Excel	Tab name in SCDT	Description	Example
	Values Type	Numeric filter Choose to filter by numerical requirements Category filter Choose to filter according to category	Category Filter
filterType	Filter Type	ALLOW ONLY Only allow the selected criteria DISABLE Only disable the selected criteria	DISABLE
function	Category filter function	<i>Only used when Category filter is selected</i> Type of source location Only source locations can be selected, thus all but customers.	Type of source location
values	Prioritized values	<i>Only used when Category filter is selected.</i> Choose the type of source location. Plants, DCs, and Suppliers can be source locations, but Customers cannot. More than one option can be selected.	Plants
function	Numeric filter function	<i>Only used when Numeric filter is selected</i> Source location priority Filter according to location priority Relative inventory buffer size at source location Absolute inventory buffer size at source location, units Minimum delivery distance Choose source location with the shortest delivery distance Estd. Best planned relative time buffer at arrival Estd. worst planned relative time buffer at arrival Estd. min planned transportation time, days Choose the source location with the minimum planned transportation time Estd. max planned transportation time, days Choose the source location with the maximum planned transportation time Backlog size at source location, units Choose the source location with the minimum/maximum backlog size in units on the day the order is placed	Backlog size at source location, days

Data Field name in Excel	Tab name in SCDT	Description	Example
		Backlog size at source location, days Choose the source location with the minimum/maximum backlog size in days on the day the order is placed Relative (to order qty) inventory buffer size at source location Relative (to TSL) inventory buffer size at source location	
comparisonOperator	Comparison operator	<i>Only used when Numeric filter is selected</i> = Equal to != Not equal to > Larger than < Smaller than >= Larger or equal to <= Smaller or equal to	=
comparisonValue	Comparison value	<i>Only used when Numeric filter is selected</i> Numerical value	5

User Interface

To add a new category or numeric filter, press the green + for either category filter or numeric filter. Fill out the fields.

Filters	Values type	Filter type	Category filter function	Prioritized values	Numeric filter function	Comparison op...	Comparison value
Priority rules	Category filter	ALLOW_ONLY	Type of source location	Plant, DC, Supplier	Minimum delivery distance, KM ≥	≥	12.00

Figure 121: Sourcing rule filters in the User Interface

Excel

To set up a numeric filter, go to the 'SourcingNumericFilterItem' sheet in Excel. See Figure 122. To set up a category filter, go to the 'SourcingCategoryFilterItem' sheet in Excel. See Figure 123.

filterType	function	comparisonOperator	comparisonValue	sourcingRuleBlock
ALLOW_ONLY	SOURCE_PRIORITY	LESS_OR_EQUAL_THAN	2	SourcingRuleBlock-3
ALLOW_ONLY	SOURCE_PRIORITY	EQUAL	0	SourcingRuleBlock-8
ALLOW_ONLY	SOURCE_BACKLOG_SIZE_DAYS	LESS_THAN	5	SourcingRuleBlock-8

Figure 122: Sourcing Numeric filter item in Excel

filterType	function	values	sourcingRuleBlock
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-1
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-2
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-3

Figure 123: Sourcing Category Filter Item in Excel

2.8.3.2 Sorting

Data Field name in Excel	Tab name in SCDT	Description	Example
index	Index	Unique ID associated with this priority rule. Numeric value	1
	Values Type	Numeric priority Choose to filter by numerical requirements Category priority Choose to filter according to category	Category Priority
function	Category priority function	<i>Only used when Category priority is selected</i> Type of source location Only source locations can be selected, thus all but customers.	Type of source location
values	Prioritized values	<i>Only used when Category priority is selected.</i> Choose the type of source location. Plants, DCs, and Suppliers can be source locations, but Customers cannot. More than one option can be selected.	Plants
sortingType	Sorting Type	<i>Only used when Numeric filter is selected</i> MIN Sort according to the minimum priority function MAX Sort according to the minimum priority function	MAX
function	Numeric filter function	<i>Only used when Numeric filter is selected</i> Source location priority Filter according to location priority Relative inventory buffer size at source location Absolute inventory buffer size at source location, units	Backlog size at source location, days

Data Field name in Excel	Tab name in SCDT	Description	Example
		Minimum delivery distance Choose source location with the shortest delivery distance Estd. Best planned relative time buffer at arrival Estd. worst planned relative time buffer at arrival Estd. min planned transportation time, days Choose the source location with the minimum planned transportation time Estd. max planned transportation time, days Choose the source location with the maximum planned transportation time Backlog size at source location, units Choose the source location with the minimum/maximum backlog size in units on the day the order is placed Backlog size at source location, days Choose the source location with the minimum/maximum backlog size in days on the day the order is placed Relative (to order qty) inventory buffer size at source location Relative (to TSL) inventory buffer size at source location	
quantum	Quantum	<i>Only used when Numeric filter is selected</i> Numerical value	10

User Interface

To add a new category or numeric priority, press the green + for either category priority or numeric priority. Fill out the fields.

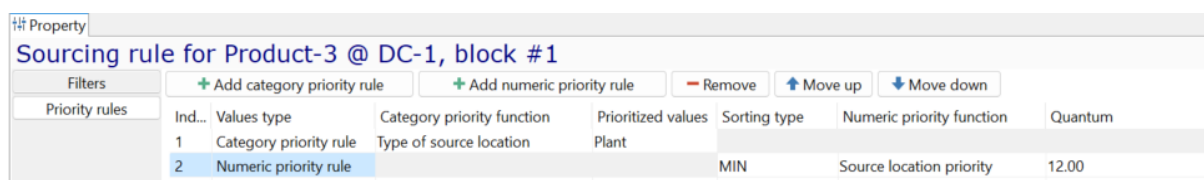


Figure 124: Sourcing Rule priority in the User Interface

Excel

To set up a numeric priority, go to the 'SourcingNumericPriorityItem' sheet in Excel. See Figure 125. To set up a category priority, go to the 'SourcingCategoryPriorityItem' sheet in Excel. See Figure 126.

itemIndex	function	sortingType	quantum	sourcingRuleBlock
2	SOURCE_BA MIN		0	SourcingRuleBlock-0
1	SOURCE_BA MIN		0	SourcingRuleBlock-1
1	SOURCE_IN MAX		0	SourcingRuleBlock-2
2	SOURCE_BA MIN		0	SourcingRuleBlock-2
1	SOURCE_BA MIN		0	SourcingRuleBlock-3
1	SOURCE_BA MIN		0	SourcingRuleBlock-4
1	SOURCE_BA MIN		0	SourcingRuleBlock-5

Figure 125: Sourcing Numeric Priority item in Excel

filterType	function	values	sourcingRuleBlock
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-1
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-2
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-3

Figure 126: Sourcing Category Priority Item in Excel

2.9 Shipment Rules

A shipment rule is defined for a combination of a product and a location. Each being either a single item or a group of items.

2.9.1 Shipment rule

Data Field name in Excel	Tab name in SCDT	Description	Example
ID		The product ID of the SourcingRule. Text value	SourcingRule-0
abstractLocation	Location	The location ID of the Location associated with this sourcingPolicyType. Text value	All Customers
downstreamOrderSplittingAllowed	Downstream order splitting allowed	TRUE Orders can be split and delivered with more than 1 shipment. FALSE Orders cannot be split and must be delivered in 1 shipment.	TRUE
MaxOrderConsolidationTime	Max Order Consolidation	Order consolidation is when you send out several individual items from an order in a single shipment. Multiple orders going to the same shipping address are consolidated into the same shipment so they can be sent out together. Max order consolidation time is the maximum time that passes before orders are consolidated and shipped and delivery capacity rules are overruled. Numerical value	0

User Interface

Press the green + on the left to create a new sourcing rule entry. Fill out the different fields (see Figure 127).

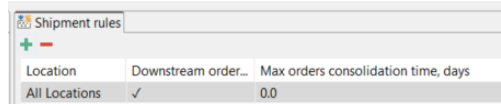


Figure 127: Shipment rules User interface

Excel

In excel, go to the “ShipmentRule” sheet to set up a sourcing rule. SeeFigure 128.

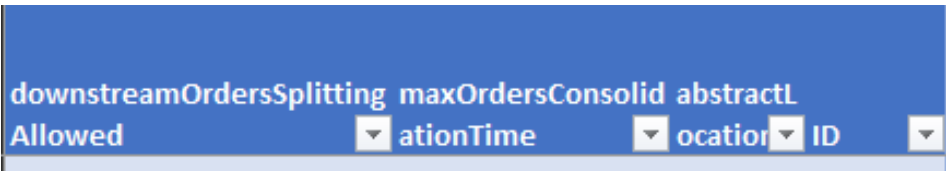


Figure 128: Shipment Rule In Excel

2.9.2 Block index

A shipment rules consists of blocks. (Figure 129) Each block has an index (1, 2, 3, ...). When selecting an upstream sourcing location, shipment rule blocks are applied sequentially as follows:

- 4. Split the upstream locations left from the previous block into two groups – those that meet the criteria and those that don't.
- 5. If any upstream locations meet the current block's filters, pick and return the best one according to the current block's sorting rules.
- 6. Pass the upstream locations that do not met the current block's filter conditions to the next block.

Data Field name in Excel	Tab name in SCDT	Description	Example
ID	Block index	Automatically given by the model. Index number of the block. Move up or down using the blue arrows. Numerical value	1
sourcingRule	Description	Automatically given by the model. Gives you the number of filters and priority rules within the block. Text value	2 filters, 3 priority rules

User interface

Block index	Description
1	1 link filter, 1 link priority rule, 1 delivery fi...

Figure 129: Shipment rule Block index

Excel

The following table describes the connection between shipment rules and shipment blocks. Go to the “ShipmentRuleBlock” sheet to set up a shipment rule, block combination. See Figure 130.



Figure 130: Shipment rule block in Excel

Shipment rule properties contains a filter functionality and a sorting functionality. You can sort and filter according to categories and specified numerical requirements.

2.9.2.1 Link Filtering

Data Field name in Excel	Tab name in SCDT	Description	Example
	Values Type	Numeric filter Choose to filter by numerical requirements Category filter Choose to filter according to category	Category Filter
filterType	Filter Type	ALLOW ONLY Only allow the selected criteria DISABLE Only disable the selected criteria	DISABLE
function	Category filter function	<i>Only used when Category filter is selected</i> Type of source location Inly source locations can be selected, thus all but customers.	Type of source location
values	Prioritized values	<i>Only used when Category filter is selected.</i> Choose the type of source location. Plants, DCs, and Suppliers can be source locations, but Customers cannot. More than one option can be selected.	Plants
function	Numeric filter function	<i>Only used when Numeric filter is selected</i> Source location priority Filter according to location priority Relative inventory buffer size at source location Absolute inventory buffer size at source location, units Minimum delivery distance Choose source location with the shortest delivery distance Estd. Best planned relative time buffer at arrival Estd. worst planned relative time buffer at arrival	Backlog size at source location, days

Data Field name in Excel	Tab name in SCDT	Description	Example
		Estd. min planned transportation time, days Choose the source location with the minimum planned transportation time Estd. max planned transportation time, days Choose the source location with the maximum planned transportation time Backlog size at source location, units Choose the source location with the minimum/maximum backlog size in units on the day the order is placed Backlog size at source location, days Choose the source location with the minimum/maximum backlog size in days on the day the order is placed Relative (to order qty) inventory buffer size at source location Relative (to TSL) inventory buffer size at source location	
comparisonOperator	Comparison operator	<i>Only used when Numeric filter is selected</i> = Equal to != Not equal to > Larger than < Smaller than >= Larger or equal to <= Smaller or equal to	=
comparisonValue	Comparison value	<i>Only used when Numeric priority is selected</i> Numerical value	5

User Interface

To add a new category or numeric filter, press the green + for either category filter or numeric filter. Fill out the fields.

Values type	Filter type	Category filter function	Prioritized value...	Numeric filter function	Compar...	Comparison value
Category filter	ALLOW_ONLY	Link transportation mode				
Numeric filter	ALLOW_ONLY			Minimum delivery distan =		0.00

Figure 131: Shipment rule filters in the User Interface

Excel

To set up a numeric filter, go to the “ShipmentLinkNumericFilterItem” sheet in Excel. See Figure 132. To set up a category filter, go to the “ShipmentLinkCategoryFilterItem” sheet in Excel. See Figure 133.

filterType	function	comparisonOperator	comparisonValue	sourcingRuleBlock
ALLOW_ONLY	SOURCE_PRIORITY	LESS_OR_EQUAL_THAN	2	SourcingRuleBlock-3
ALLOW_ONLY	SOURCE_PRIORITY	EQUAL	0	SourcingRuleBlock-8
ALLOW_ONLY	SOURCE_BACKLOG_SIZE_DAYS	LESS_THAN	5	SourcingRuleBlock-8

Figure 132: Shipment link numeric rule filter item in Excel

filterType	function	values	sourcingRuleBlock
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-1
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-2
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-3

Figure 133: Shipment link category filter Item in Excel

2.9.2.2 Sorting

Data Field name in Excel	Tab name in SCDT	Description	Example
index	Index	Unique ID associated with this priority rule. Numeric value	1
	Values Type	Numeric priority Choose to filter by numerical requirements Category priority Choose to filter according to category	Category Priority
function	Category priority function	<i>Only used when Category priority is selected</i> Type of source location Inly source locations can be selected, thus all but customers.	Type of source location
values	Prioritized values	<i>Only used when Category priority is selected.</i> Choose the type of source location. Plants, DCs, and Suppliers can be source locations, but Customers cannot. More than one option can be selected.	Plants
sortingType	Sorting Type	<i>Only used when Numeric filter is selected</i> MIN Sort according to the minimum priority function MAX Sort according to the minimum priority function	MAX
function	Numeric filter function	<i>Only used when Numeric filter is selected</i> Source location priority	Backlog size at source location, days

Data Field name in Excel	Tab name in SCDT	Description	Example
		Filter according to location priority Relative inventory buffer size at source location Absolute inventory buffer size at source location, units Minimum delivery distance Choose source location with the shortest delivery distance Estd. Best planned relative time buffer at arrival Estd. worst planned relative time buffer at arrival Estd. min planned transportation time, days Choose the source location with the minimum planned transportation time Estd. max planned transportation time, days Choose the source location with the maximum planned transportation time Backlog size at source location, units Choose the source location with the minimum/maximum backlog size in units on the day the order is placed Backlog size at source location, days Choose the source location with the minimum/maximum backlog size in days on the day the order is placed Relative (to order qty) inventory buffer size at source location Relative (to TSL) inventory buffer size at source location	
quantum	Quantum	<i>Only used when Numeric filter is selected</i> Numerical value	10

User Interface

To add a new category or numeric priority, press the green + for either category priority or numeric priority. Fill out the fields.

Ind...	Values type	Category priority function	Prioritized values	Sorting type	Numeric priority function	Quantum
1	Category priority rule	Type of source location	Plant			
2	Numeric priority rule			MIN	Source location priority	12.00

Figure 134: Shipment Rule priority in the User Interface

Excel

To set up a numeric priority, go to the ‘ShipmentNumericPriorityItem’ sheet in Excel. See Figure 135. To set up a category priority, go to the ‘ShipmentCategoryPriorityItem’ sheet in Excel. See Figure 136.

itemIndex	function	sortingType	quantum	sourcingRuleBlock
2	SOURCE_BA MIN		0	SourcingRuleBlock-0
1	SOURCE_BA MIN		0	SourcingRuleBlock-1
1	SOURCE_IN MAX		0	SourcingRuleBlock-2
2	SOURCE_BA MIN		0	SourcingRuleBlock-2
1	SOURCE_BA MIN		0	SourcingRuleBlock-3
1	SOURCE_BA MIN		0	SourcingRuleBlock-4
1	SOURCE_BA MIN		0	SourcingRuleBlock-5

Figure 135: Shipment Numeric Priority item in Excel

filterType	function	values	sourcingRuleBlock
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-1
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-2
ALLOW_ONLY	SOURCE_TYPE	PLANT	SourcingRuleBlock-3

Figure 136: Shipment Category Priority Item in Excel

2.9.2.3 Delivery Filtering

Data Field name in Excel	Tab name in SCDT	Description	Example
filterType	Filter Type	ALLOW ONLY Only allow the selected criteria DISABLE Only disable the selected criteria	DISABLE
function	Numeric filter function	Delivery load factor 0..1 The delivery load factor is how loaded in percentage, the delivery load is.	Delivery load factor 0..1
comparisonOperator	Comparison operator	<i>Only used when Numeric filter is selected</i> = Equal to != Not equal to > Larger than < Smaller than >= Larger or equal to <=	=

Data Field name in Excel	Tab name in SCDT	Description	Example
		Smaller or equal to	
comparisonValue	Comparison value	Only used when Numeric priority is selected Numerical value	5

User Interface

To add a new category or numeric filter, press the green + for either category filter or numeric filter. Fill out the fields.

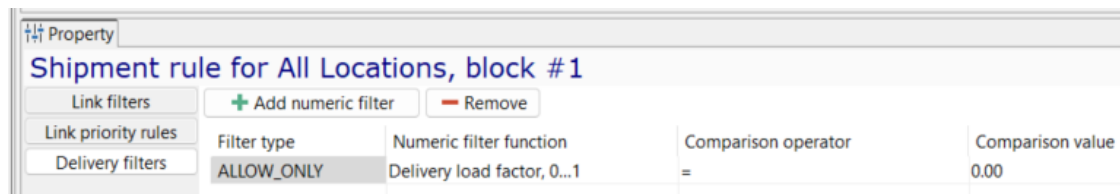


Figure 137: Shipment rule delivery filters in the User Interface

Excel

To set up a numeric filter, go to the “ShipmentDeliveryFilterItem” sheet in Excel. See Figure 138.

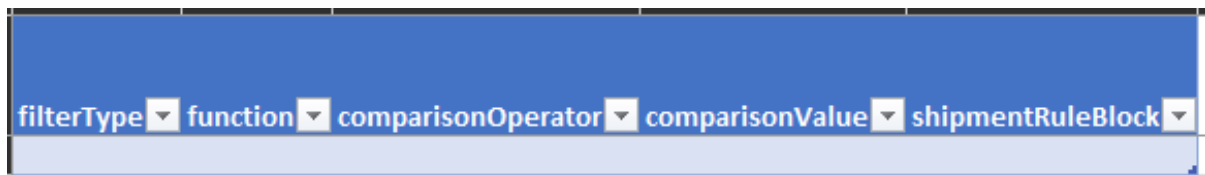


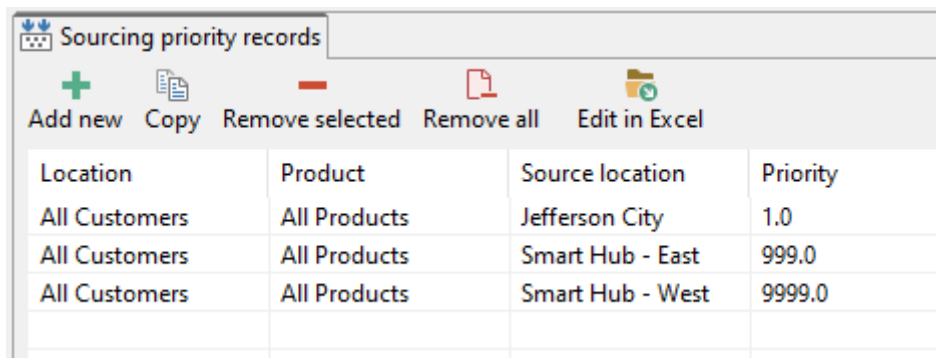
Figure 138: Shipment link numeric rule filter item in Excel

2.10 Sourcing priority records

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location associated with this sourcingPolicyType. Text value	CLT Regionally Optimal
abstractProduct	Product	The product ID of the Product associated with this sourcingPolicyType. Text value	Stocked in Hubs
sourceLocation	Source location	A source location defines the starting Location from where you want to transfer products to another location. Numerical value	SH-E
priority	Priority	The priority rating. A numerical value, with one being the highest priority, 2 second highest, etc. Numerical value	1

User Interface

Press the green + on the left to create a new sourcing priority entry. Fill out the different fields (see Figure 139).

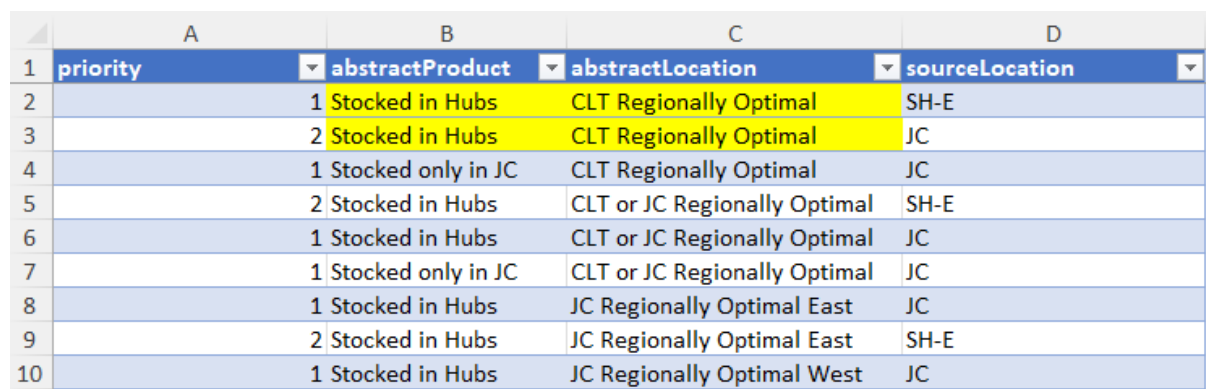


Location	Product	Source location	Priority
All Customers	All Products	Jefferson City	1.0
All Customers	All Products	Smart Hub - East	999.0
All Customers	All Products	Smart Hub - West	9999.0

Figure 139: Sourcing Priority Records

Excel

In the SourcingPriorityRecord tab, fill in the empty fields in the correct format (Figure 140).



	A	B	C	D
1	priority	abstractProduct	abstractLocation	sourceLocation
2		1 Stocked in Hubs	CLT Regionally Optimal	SH-E
3		2 Stocked in Hubs	CLT Regionally Optimal	JC
4		1 Stocked only in JC	CLT Regionally Optimal	JC
5		2 Stocked in Hubs	CLT or JC Regionally Optimal	SH-E
6		1 Stocked in Hubs	CLT or JC Regionally Optimal	JC
7		1 Stocked only in JC	CLT or JC Regionally Optimal	JC
8		1 Stocked in Hubs	JC Regionally Optimal East	JC
9		2 Stocked in Hubs	JC Regionally Optimal East	SH-E
10		1 Stocked in Hubs	JC Regionally Optimal West	JC

Figure 140: Sourcing Priority Record tab in Excel

2.11 Supplier products

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractProduct	Product	The product ID of the Product associated with the Supplier. Text value	Stocked in Hubs
abstractLocation	Location	The location ID of the Supplier associated with supplying the Product. Text value	CLT Regionally Optimal

User Interface

Press the green + on the left to create a new supplier product entry. Fill out the different fields (see Figure 141).

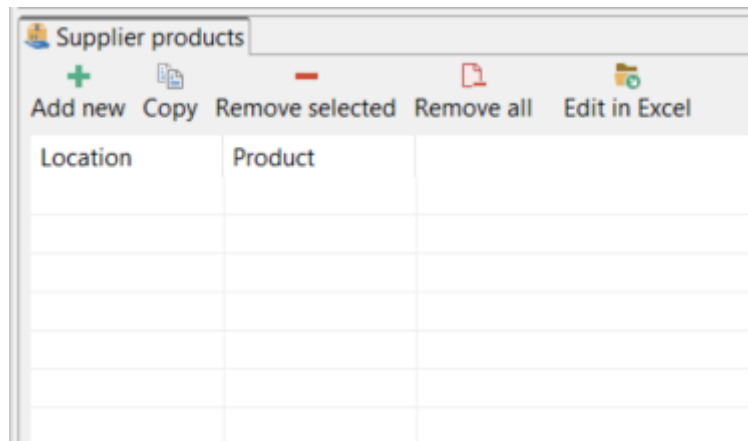


Figure 141: Supplier Products in UI

Excel

In the SupplierProductRecord tab, fill in the empty fields in the correct format (Figure 142).

	A	B
	abstractPr	abstractLo
1	oduct	cation
2	Product-0	Location-1

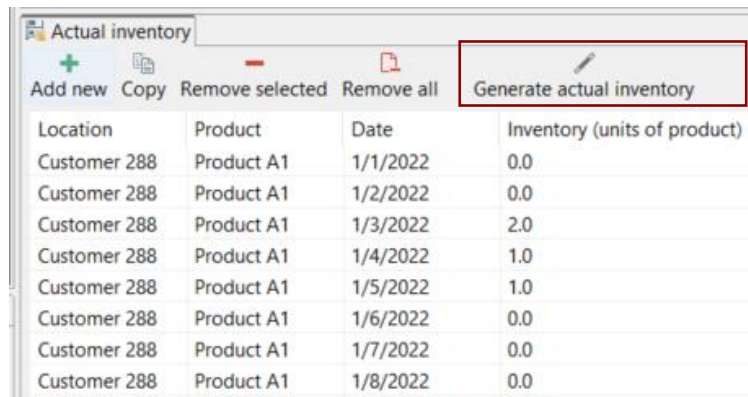
Figure 142: Supplier Product Record Tab in Excel

2.12 Actual Inventory

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location for which the actual inventory level is recorded. Text value	Location-1
abstractProduct	Product	The product ID of the Product for which the actual inventory level is recorded. Text value	Product-1
date	Date	The date on which the actual inventory level was recorded Short date format	2022/02/01
inventory	Inventory (units of product)	The number of units in stock for the specified product-location. Numerical value	5

User Interface

Press the green + on the left to create a new actual inventory entry. Fill out the different fields (see Figure 143). Note that actual inventory can also be generated by clicking the “Generate actual inventory” button.

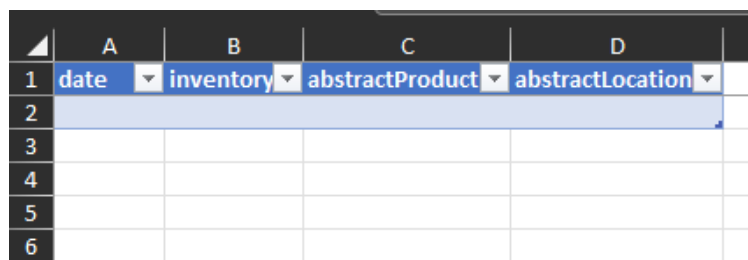


Location	Product	Date	Inventory (units of product)
Customer 288	Product A1	1/1/2022	0.0
Customer 288	Product A1	1/2/2022	0.0
Customer 288	Product A1	1/3/2022	2.0
Customer 288	Product A1	1/4/2022	1.0
Customer 288	Product A1	1/5/2022	1.0
Customer 288	Product A1	1/6/2022	0.0
Customer 288	Product A1	1/7/2022	0.0
Customer 288	Product A1	1/8/2022	0.0

Figure 143: Actual inventory in UI

Excel

In the ActualInventoryRecord tab, fill in the empty fields in the correct format (Figure 142).



	A	B	C	D
1	date	inventory	abstractProduct	abstractLocation
2				
3				
4				
5				
6				

Figure 144: Actual Inventory Record Tab in Excel

2.13 Sales at risk calculation rules

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractLocation	Location	The location ID of the Location for which the Sales at risk calculation rule applies. Text value	Location-1
abstractProduct	Product	The product ID of the Product for which the Sales at risk calculation rule applies. Text value	Product-1
salesVelocityCalculationHorizon	Sales at risk calc. horizon (days)	The number of days we look back at the start of a stockout, to calculate the sales velocity. We will only look at days where there was stock. Numerical value	30

User Interface

Press the green + on the left to create a new sales at risk calculation rule entry. Fill out the different fields (see Figure 141).

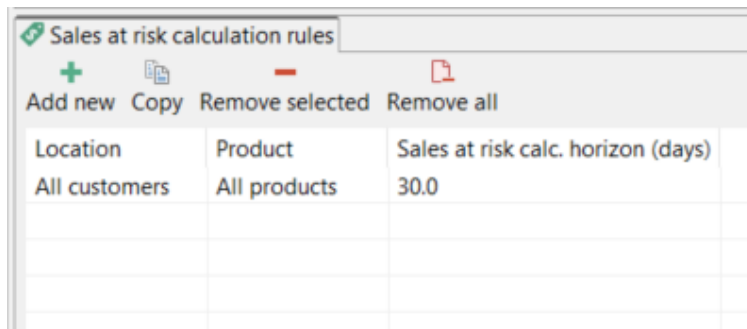


Figure 145: Sales at risk calculation rule in UI

Excel

In the SalsAtRiskCalculationRecord tab, fill in the empty fields in the correct format (Figure 142).

	A	B	C
1	ationHorizon	abstractProduct	abstractLocation
2	30	ProductGroup-4	LocationGroup-0
3			
4			
5			

Figure 146: Sales at risk calculation Record Tab in Excel

2.14 Statistic Collection rules

Data Field name in Excel	Tab name in SCDT	Description	Example
beginDate	Begin date	The begin date on which the statistic collection rules starts to apply if 'SPECIFIED_DATE" is selected Short date format	2022/01/01
endDate	End date	The end date to which the statistic collection rules apply if 'SPECIFIED_DATE" is selected Short date format	2022/02/01
statisticsCollectionBeginTimeRule	Begin time rule	EXPERIMENT_BEGIN_DATE Statistics is calculated from the begin date of the simulation SPECIFIED_DATE Statistics is calculated from a specified date FIRST_DAY_WITH_DEMAND Statistics is calculated from the first day of demand	EXPERIMENT_BEGIN_DATE
statisticsCollectionEndTimeRule	End time rule	EXPERIMENT_END_DATE Statistics is calculated to the end date of the simulation SPECIFIED_DATE Statistics is calculated to a specified date LAST_DAY_WITH_DEMAND Statistics is calculated to the last day of demand	EXPERIMENT_END_DATE

Data Field name in Excel	Tab name in SCDT	Description	Example
abstractProduct	Product	The product ID of the Product for which the statistic collection rule applies. Text value	Product-1
abstractLocation	Location	The location ID of the Location for which the statistic collection rule applies. Text value	Location-1

User Interface

Press the green + on the left to create a statistic collection rule entry. Fill out the different fields (see Figure 141).

Location	Product	Begin date	End date	Begin time rule	End time rule
DCs	All products	1/1/2022	1/1/2023	EXPERIMENT_BEGIN_DATE	EXPERIMENT_END_DATE

Figure 147: Statistic Rule collection in UI

Excel

In the StatisticCollectionRuleRecord tab, fill in the empty fields in the correct format (Figure 142).

	A	B	C	D	E	F
1	statisticsCollectionBeginTimeRule	statisticsCollectionEndTimeRule	beginDate	endDate	abstractProduct	abstractLocation
2	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-0	Location-298
3	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	01-May-22	Product-1	Location-298
4	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-2	Location-298
5	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	30-Jul-22	Product-3	Location-298
6	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-4	Location-298
7	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-5	Location-298
8	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-8	Location-298
9	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-9	Location-298
10	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-25	Location-298
11	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-27	Location-298
12	SPECIFIED_DATE	SPECIFIED_DATE	01-Jan-22	14-Feb-23	Product-29	Location-298

Figure 148: Statistic Collection Rule Tab in Excel

2.15 Inventory adjustments

Data Field name in Excel	Tab name in SCDT	Description	Example
date	Effective date	The specified inventory adjustment is applied from this specific date. Short date format	2022/03/24
abstractProduct	Product	The product ID of the Product for which the actual inventory level is recorded. Text value	Product-1
abstractLocation	Location	The location ID of the Location for which the actual inventory level is recorded. Text value	Location-1
inventory	Inventory delta	The value by which the inventory will be adjusted on the specific day. Positive values means an increase in inventory and negative means a decrease.	5

Data Field name in Excel	Tab name in SCDT	Description	Example
		If the negative number is greater than the current stock on hand on this date the stock on hand will only be reduced to 0. Numerical value	

User Interface

Press the green + on the left to create a new inventory adjustment entry. Fill out the different fields (see Figure 141).

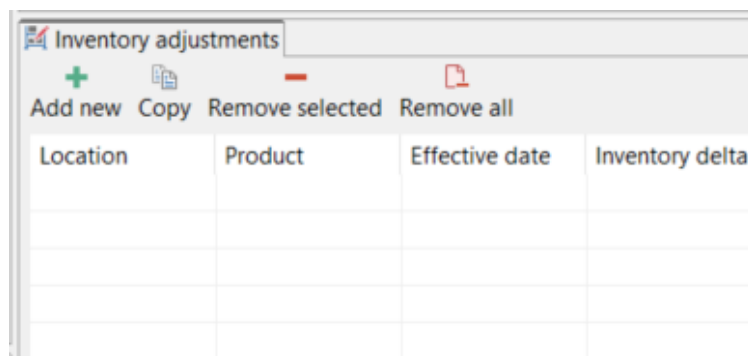


Figure 149: Inventory adjustment in UI

Excel

In the InventoryAdjustmentRecord tab, fill in the empty fields in the correct format (Figure 142).

Figure 150: Actual Inventory Record Tab in Excel

2.16 Distributions

In the User Interface, the distributions are selected when specifying the transportation time for links. See Figure 151 below.

Figure 151: Lead time

When clicking on "Transportation time (days)," a popup will appear (see Figure 152), where you can select the distribution that you want to use. Each distribution is explained below.

SupplyChainTwin

Select distribution

i Select the desired distribution and fill in its parameters

Type	Value
Constant	1.998
Truncated normal	
Normal	
Uniform	
Triangular	
Exponential	

OK Cancel

Figure 152: Transportation Time Distribution selection

2.16.1 Constant

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the Constant. Has no impact on the logic of the model. Text value	constant(1.998)
value	Value	The constant lead time delivery takes. Decimal value	1,998
ID		This is the ID of the Constant. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	Constant-Link-S-JC-

User Interface

Fill in your constant value (Figure 153).

SupplyChainTwin

Select distribution

i Select the desired distribution and fill in its parameters

Type	Value
Constant	1.998
Truncated normal	
Normal	
Uniform	
Triangular	
Exponential	

OK Cancel

Figure 153: Constant distribution

Excel

Fill in the necessary fields (Figure 154).

	A	B	C
1	name	value	ID
2	constant{.	5	Constant-0
3			
4			

Figure 154: Constant distribution in Excel

2.16.2 Truncated Normal

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the Truncated Normal distribution. Has no impact on the logic of the model. Text value	Truncated normal (1.00; 1.50; 2.00)
mean	Mean	The mean is the average lead time a delivery takes. Decimal	0
sigma	Sigma	Sigma can either be 1, 2, or 3. 1. One standard deviation, or one sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 68 percent of all the data points.	1

Data Field name in Excel	Tab name in SCDT	Description	Example
		2. Two standard deviations, or two sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 95 percent of all the data points. 3. Three standard deviations, or three sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 99.7 percent of all the data points. Numerical value	
min	Min	The minimum lead time delivery takes. Decimal value	0
max	Max	The maximum lead time a delivery takes. Decimal value	1
ID		This is the ID of the Truncated Normal distribution. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	

User Interface

Fill in your values (Figure 155).

SupplyChainTwin

Select distribution

Select the desired distribution and fill in its parameters

Type	Mean	0.0
Constant	Sigma	1.0
Truncated normal	Min	0.0
Normal	Max	1.0
Uniform		
Triangular		
Exponential		

Bar chart showing a decreasing distribution of red bars, with values ranging from 0.0% to 6.0%.

OK Cancel

Figure 155: Truncated normal distribution

Excel

Fill in all fields (Figure 156).

	A	B	C	D	E	F
1	name	mean	sigma	min	max	ID
2						
3						

Figure 156: Truncated normal distribution in Excel

2.16.3 Normal

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the Normal distribution. Has no impact on the logic of the model. Text value	Normal (1.00)
mean	Mean	The mean is the average lead time a delivery takes. Decimal value	0
sigma	Sigma	Sigma can either be 1, 2, or 3. 1. One standard deviation, or one sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 68 percent of all the data points. 2. Two standard deviations, or two sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 95 percent of all the data points. 3. Three standard deviations, or three sigma, plotted above or below the average value on that normal distribution curve, would define a region that includes 99.7 percent of all the data points.	2
ID		This is the ID of the Normal Distribution. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	

User Interface

Fill in your values (Figure 157).

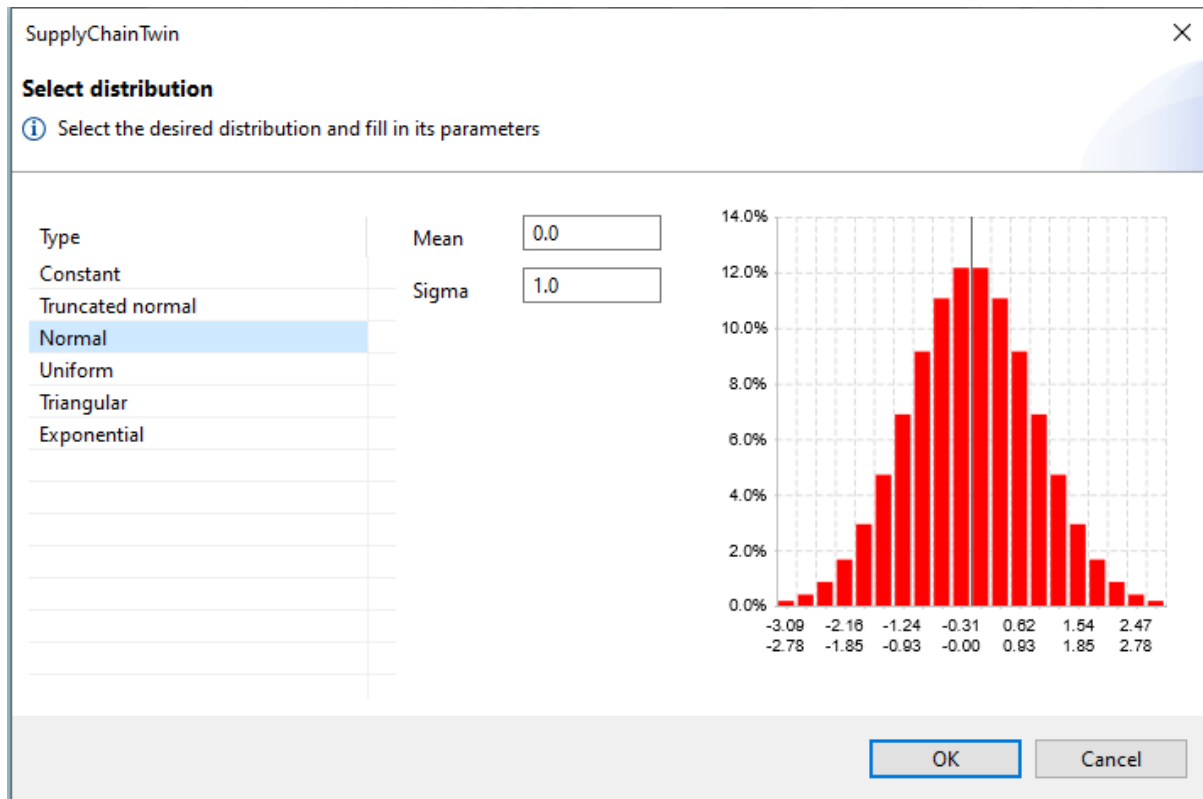


Figure 157: Normal distribution

Excel

Fill in all fields (Figure 158).

	A	B	C	D
1	name	mean	sigma	ID
2				
3				

Figure 158: Normal distribution in Excel

2.16.4 Uniform

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the Uniform distribution. Has no impact on the logic of the model. Text value	Uniform(0.00; 1.00)
min	Min	The minimum lead time a delivery takes. Decimal value	0
max	Max	The max is the maximum lead time a delivery takes. Decimal value	1
ID		This is the ID of the uniform distribution. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	

User Interface

Fill in the values (Figure 159).

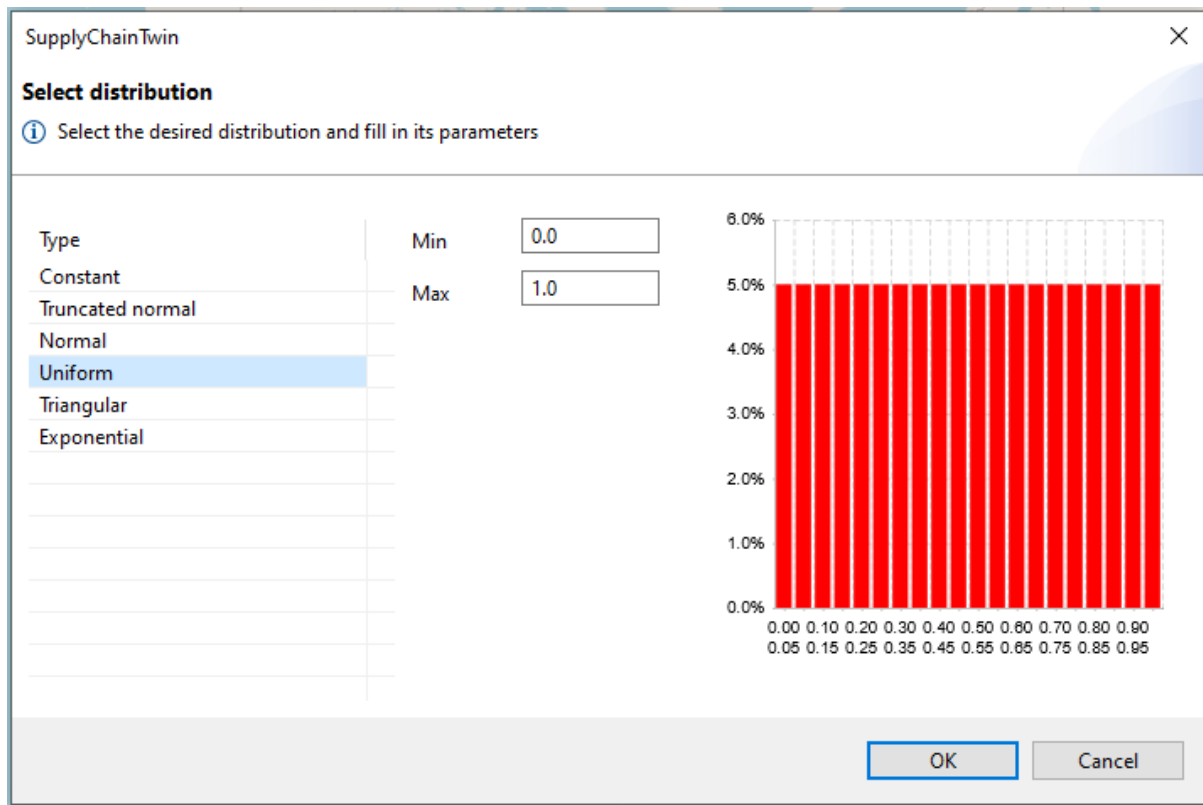


Figure 159: Uniform distribution

Excel

Fill in all fields (Figure 160).

	A	B	C	D
1	name	min	max	ID
2				
3				
4				

Figure 160: Uniform distribution in Excel

2.16.5 Triangular

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the triangular distribution. Has no impact on the logic of the model. Text value	Triangular (1.00; 1.50; 2.00)
min	Min	The minimum lead time a delivery takes. Decimal value	1
likely	Likely	The likely is the likely lead time a delivery takes. Decimal value	1.5

Data Field name in Excel	Tab name in SCDT	Description	Example
max	Max	The max is the maximum lead time a delivery takes. Decimal value	2
ID		This is the ID of the triangular distribution. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	

User Interface

Fill in all values (Figure 161).

SupplyChainTwin

Select distribution

Select the desired distribution and fill in its parameters

Type

- Constant
- Truncated normal
- Normal
- Uniform
- Triangular**
- Exponential

Min: 0.0

Likely: 1.0

Max: 2.0

OK Cancel

Figure 161: Triangular distribution

Excel

Fill in all fields (Figure 162).

	A	B	C	D	E
1	name	min	likely	max	ID
2					
3					
4					
5					
6					

Figure 162: Triangular distribution in Excel

2.16.6 Exponential

Data Field name in Excel	Tab name in SCDT	Description	Example
name		The name of the Exponential distribution. Has no impact on the logic of the model. Text value	Exponential (1.00)
mean	Mean	The mean is the average lead time a delivery takes. Decimal value	
ID		This is the ID of the exponential distribution. It must be unique across all source capacity units, i.e., it cannot be duplicated in the column. Text value	

User Interface

Fill in all values (Figure 163).

SupplyChainTwin

Select distribution

Select the desired distribution and fill in its parameters

Type

- Constant
- Truncated normal
- Normal
- Uniform
- Triangular
- Exponential**

Mean

30.0%
28.0%
24.0%
22.0%
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
0.0%

OK Cancel

Figure 163: Exponential distribution

Excel

Fill in all fields (Figure 164).

	A	B	C
1	name	mean	ID
2			
3			

Figure 164: Exponential distribution in Excel



**Contact us with questions, bug reports, or
any other improvement suggestions.**

Prepared for

Supply Chain digital Twin

Prepared by

Jaco-ben Vosloo

VP Simulations and technology, Goldratt Research Labs

jacoben@goldrattresearchlabs.com

Karini Goosen

Industrial Engineer, Goldratt Research Labs

karini@goldrattresearchlabs.com

Danielle Sparrow

Industrial Engineer, Goldratt Research Labs

danielle@goldrattresearchlabs.com



Goldratt Research Labs LLC

1180 N. Town Center Drive, Suite 100,

Las Vegas, NV, 89144



Tel: +1 617 440 4402



www.goldrattresearchlabs.com



info@goldrattresearchlabs.com