

Processes

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1 Process versus flows

1.1 Purpose

The purpose of this training is to improve the awareness and knowledge of the processes within a container terminal. The terminal processes are required to prepare, enable, execute and allow the terminal flows. If no order from a customer is received to discharge a container, the terminal will not discharge that container.

The terminal flows are the various movements of containers to ensure that the products which the terminal offers to its customers are being delivered. Terminal flows can be identified as follows:

- Container flows: being the actual movement of a container on the terminal. The physical characteristics of the container usually determine the routing.
- Terminal products: being the products that can be delivered to the customers.

1.2 Primary and secondary process

The primary process is the process supporting the activities for which the terminal generates revenues and are directly linked to the customers of the terminal. The primary process is directly linked to the operations and can be divided in 6 sub-processes being:

- Order process
- Planning process
- Scheduling process
- Execution process
- Reporting process
- Invoice process

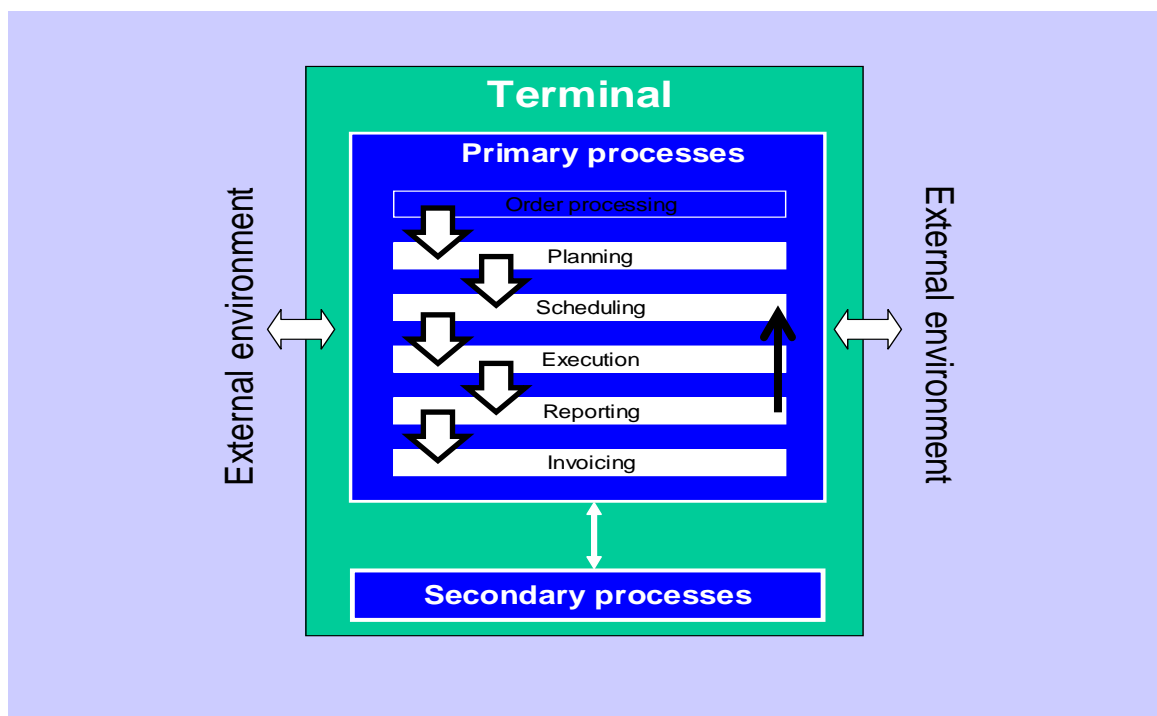


Figure 1: Processes and environment

Besides the primary process, we can also identify the secondary processes. These are the processes supporting the activities to support the revenue generating activities of the terminal.

Examples are the processes for:

- Sales and Marketing
- Procurement
- HRM
- Finance departments

These are not directly connected to the products that a terminal offers to it's customers.

Figure 1 above pictures the relations between these processes and the environment.

The mentioned primary processes are not standardized. These depend on the modalities that are visiting the terminal. The matrix below pictures the various applicable processes necessary to serve the modalities of the customer of the terminal.

processes

modality					
	Truck	Train	Barge	Vessel	Stack - Stack
Order processing	Order processing land			Order processing sea	Order processing miscellaneous
Planning	Gate planning	Rail track plan.	Berth planning		Stack capacity planning
	Truck planning	Train planning	Vessel/ barge planning		
	Internal transport planning				
		Equipment planning			
	Human resource planning				
Scheduling	Container scheduling				
	RS scheduling	RMRC sch.	QC scheduling		RS scheduling
			AGV scheduling		
	ARMG scheduling				
		TT and TC scheduling			
	Stack scheduling				
	Transfer point scheduling				
Execution	Container inspection				Manned equipment execution
	Truck process	RMRC exec.	QC execution		Stack execution
			AGV execution		
	ARMG execution				
	Transfer point execution				
Reporting	Reporting				
Invoicing	Invoicing				

Figure 2: Processes per modality

1.3 Primary process

The six sub processes of the primary process are:

- Order process
Everything that is linked to information and data exchange, manual as well as electronic (EDI).

-
- Planning process
This is the preparing phase. No work can be performed without a plan. There are various levels of planning:
 - Object or modality level
 - Container level
 - Resource level
 - Scheduling process
Following the planning, all activities need to be sequenced in time
 - Execution process
The scheduled activities are executed. These are the physical activities.
 - Reporting process
Reporting of all activities and events in a system or a log.
 - Invoicing process
If the planned order is executed, the customer will have to be pay for the service.
So the process requires proper reporting.

2 Order process

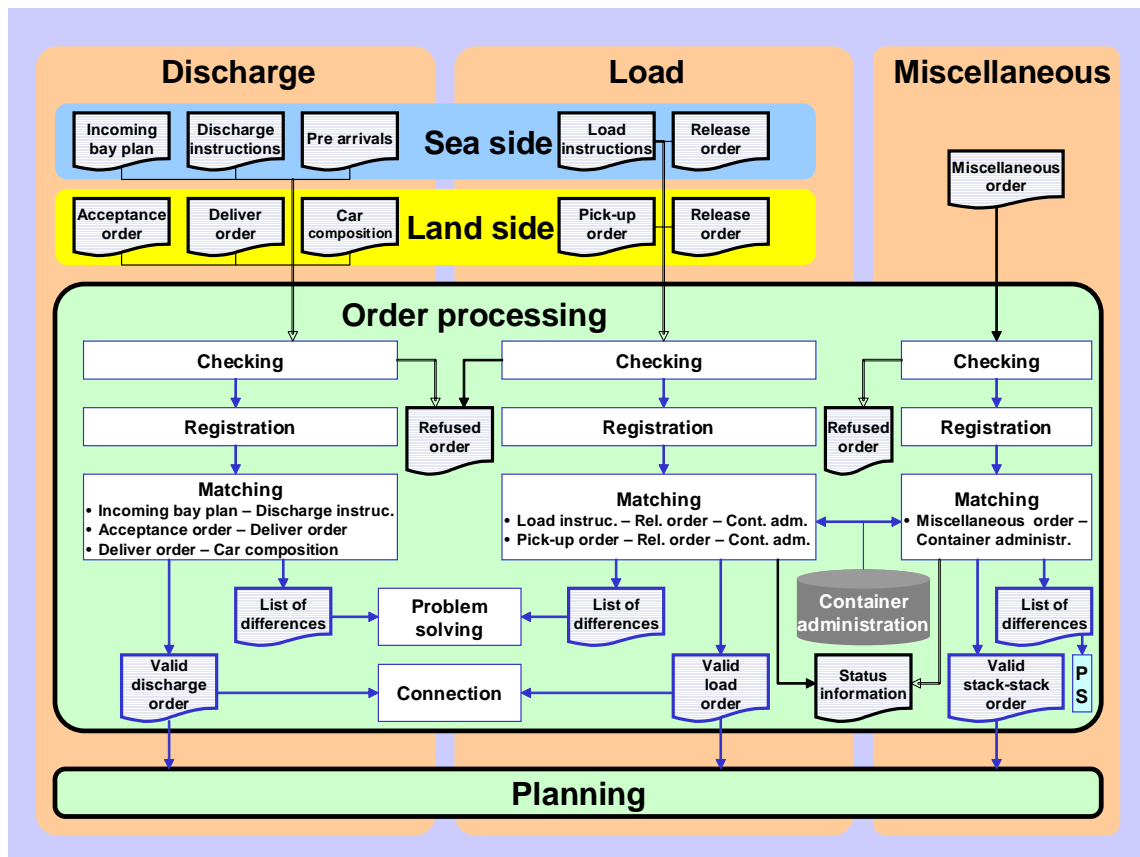


Figure 3: Order process

2.1 Orders

Orders are instructions received from customers or truckers explaining what, who, where, when and how many. There are three groups of orders:

- Orders connected with discharge and load activities of vessels, for the water-side
- Orders connected with discharge and load activities of trains, trucks and barges, for the land-side.
- Orders for miscellaneous activities.

Every order requires a minimum amount of information before it can be processed. Therefore, after receipt of an order, every order needs to be verified on correctness and completeness. Having verified the correctness and completeness of the order, the order is registered. Following registration most orders will be matched with other orders or data.

Minimum information required to allow an order to be accepted are:

- container number
- container size-type
- reference number
- customer code
- modality

Should some of this information be missing, the order will be dismissed.

The matching of orders is necessary to allow a valid order to be created. For most activities multiple messages will be sent to create a valid order. An Acceptance order must match a Delivery order to allow the terminal to accept the container on the terminal. So these two orders must match to create a valid order. If only one of these is received, the container cannot be accepted on the terminal.

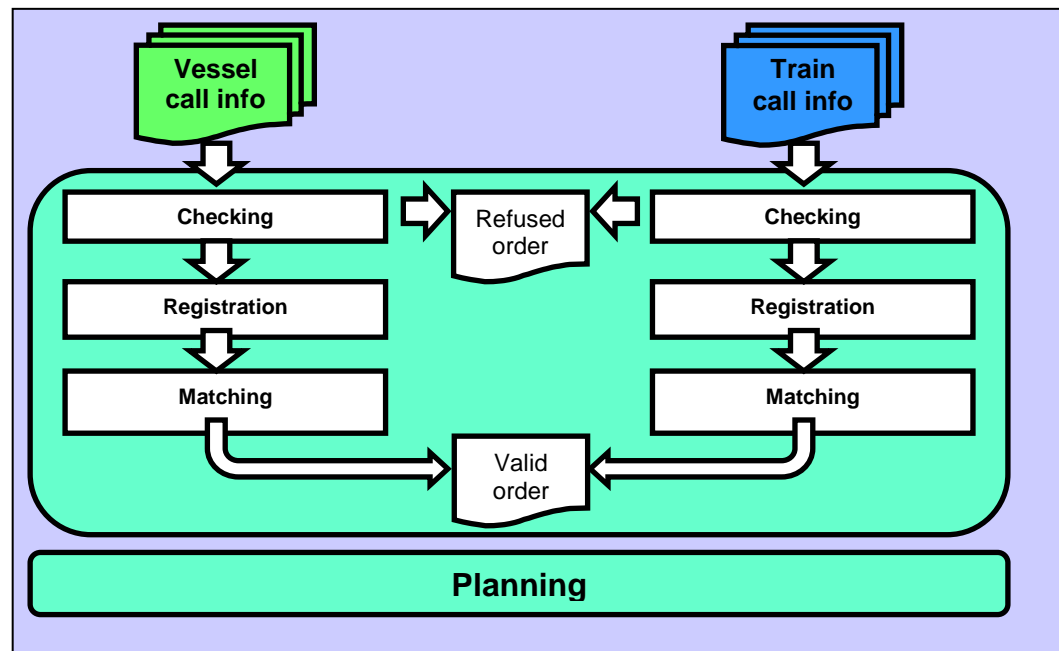


Figure 4: Order process steps

Customers can send a number of messages relating to one container, but to order different actions for the container. As the container number is unique, these multiple actions may be reason for confusion because all these messages are being matched based on the container number.

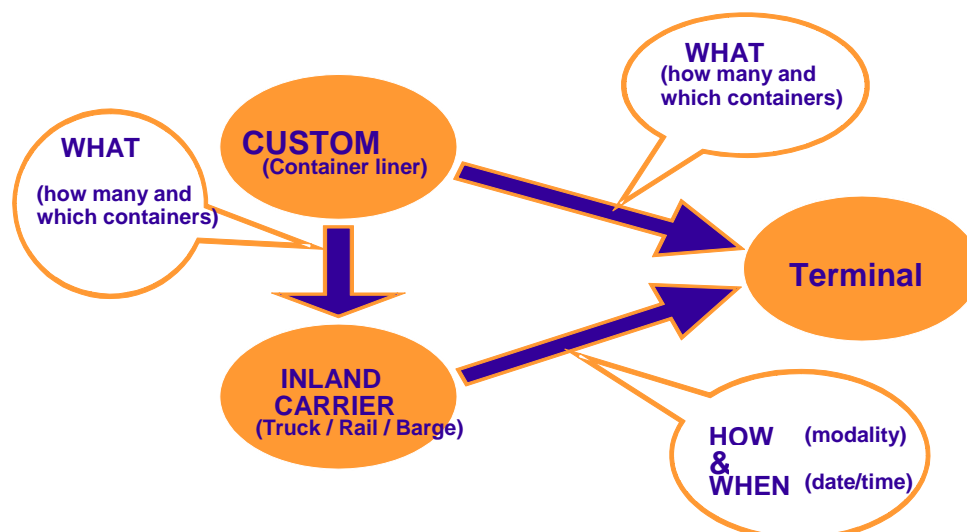


Figure 5: Information flow landside order process

To prevent this confusion, the matching process is based on the reference number instead. The reference numbers are unique. So an Acceptance order will form a match, a valid order, with a Delivery order in case the reference numbers are the same.

2.2 Transmission of orders

Orders can be transmitted hardcopy, via fax or plain letter, verbally via phone or electronically via EDI, Electronic Data Interchange. These days most orders are transmitted via EDI.

EDI is a standard for electronic interchange of information between different companies, e.g. orders, invoices or confirmations. It is part of E-commerce and is used by companies active in the transport chain. There are a number of EDI-standards, e.g. EDIFACT, developed by the UN, TRADACOMS, developed by British supermarkets and ODETTE for the automotive industry.

Until some 10 years ago, the investment involved for software capable of generating and processing EDI was too high. Internet increased the opportunities to make EDI also available for the smaller companies. Meantime EDI is also available as open source. Most large terminals do have an EDI handler. This is an electronic device which receives the EDI messages from the customers, verifies the messages on completeness and correctness, registers the messages and matches the various EDI messages. Also the EDI handler will ensure a correct sequencing for all messages received.

2.3 EDI messages

These days, most terminals receive and send their orders, confirmations and messages via EDI. As advised above, some EDI messages need to be matched to create a valid order. This is especially the case for the orders on the land-side: Acceptance order needs to be matched with a Delivery order, and a Release order matched with the corresponding Pick-up order. Examples of water-side orders are Incoming bayplan, Discharge instructions and Load instructions. Orders for e.g. (dis)connecting reefers, stuffing/stripping, weighing containers, etcetera, are grouped under miscellaneous orders. EDI messages can be identified by their 6 characters. A non comprehensive list is included in the presentation.

Most EDI messages are container related. These are up- or down-loaded automatically in the terminal systems. EDI messages received related to object calls are mostly processed manually.

For one container a number of different EDI messages can be send for one load- or discharge move. A container terminal that handles one million containers, several million EDI messages are being received, perhaps 10.000 per day. A lot of staff would be required to receive, verify, register and match all these messages. This is why a EDI-handler is developed. This is a software program that will execute the actions required. The result of this EDI-handler are valid orders. The EDI-handler is connected to the Terminal Operating System (TOS) to allow the valid orders to be downloaded into the TOS.

3 Planning process

3.1 Why planning

To prevent chaos, the matched or valid orders need to be planned. A planning will be created for the object and a planning will be created for the resources required for the operation.

Planning is the processing of information leading to decisions regarding the actions to be taken in the future to assist in ensuring that these actions are controlled.

The planning is created to be executed. The execution is being monitored and progress compared to the planning. In case of discrepancies, actions can be taken to ensure that the operation continues according to the original plan or continue with an alternative plan. This is a visual circle: Plan-Do-Check-Act and has it's origin in the quality theories developed by mr. Deming, a quality expert, teaching this theory in the 1950-ies.

3.2 Object versus Resource

There are two main planning functions:

- Object planning
High level Object planning is the planning of the high level workload for that object in relation to the required or available resources.
Following step in Object planning is the panning of the containers. A planned container move results in a demand for resources for which resources need to be planned.

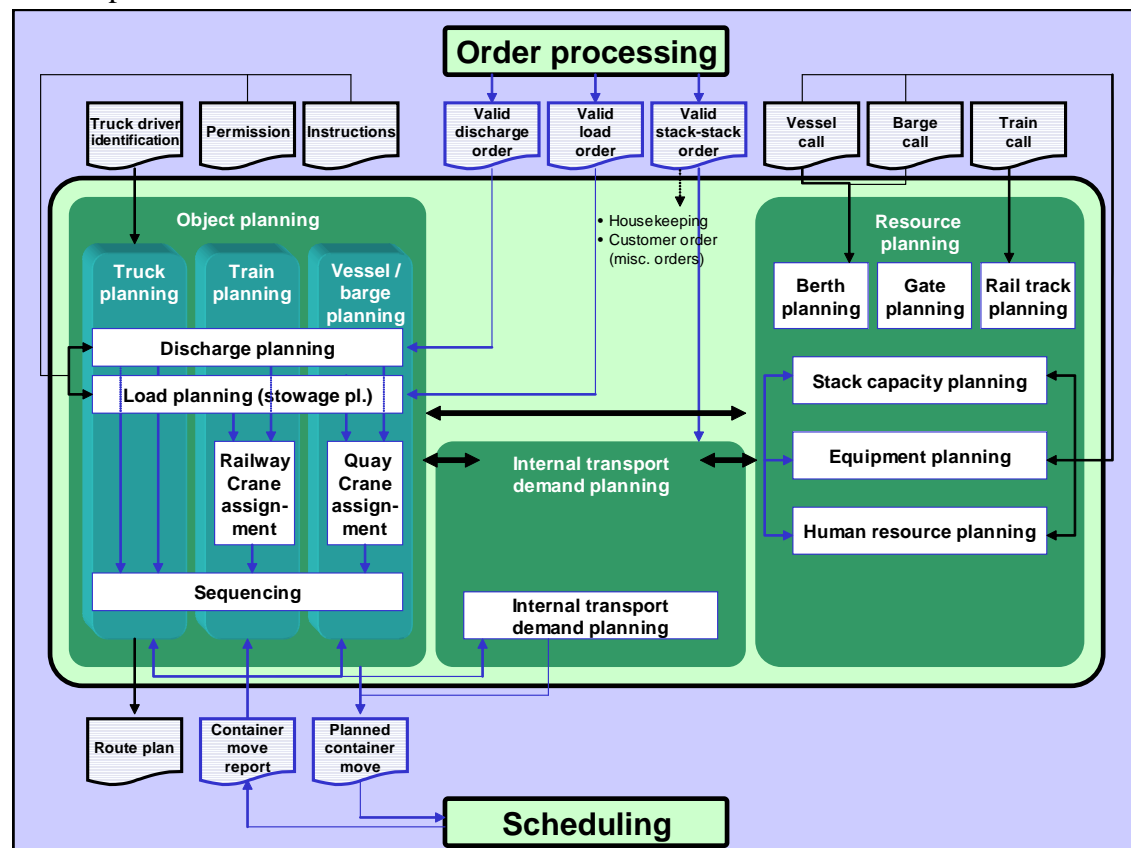


Figure 6: Planning process

- Resource planning

To optimize the resources of the terminal the resources will be planned following the expected workload for the terminal.

Resources are space, equipment and staff.

Combining the object planning with the resource planning result in a demand for what is called internal transport.

3.3 Dependencies

The various plans are related: Berth planning has a direct relation with Stack planning and Equipment planning. Object plans, e.g. a vessel plan also influences Equipment planning requiring an 'x' number of STS and 'y' number of TT/TC to allow for a fluent operation. The following diagram tries to give insight in the various dependencies.

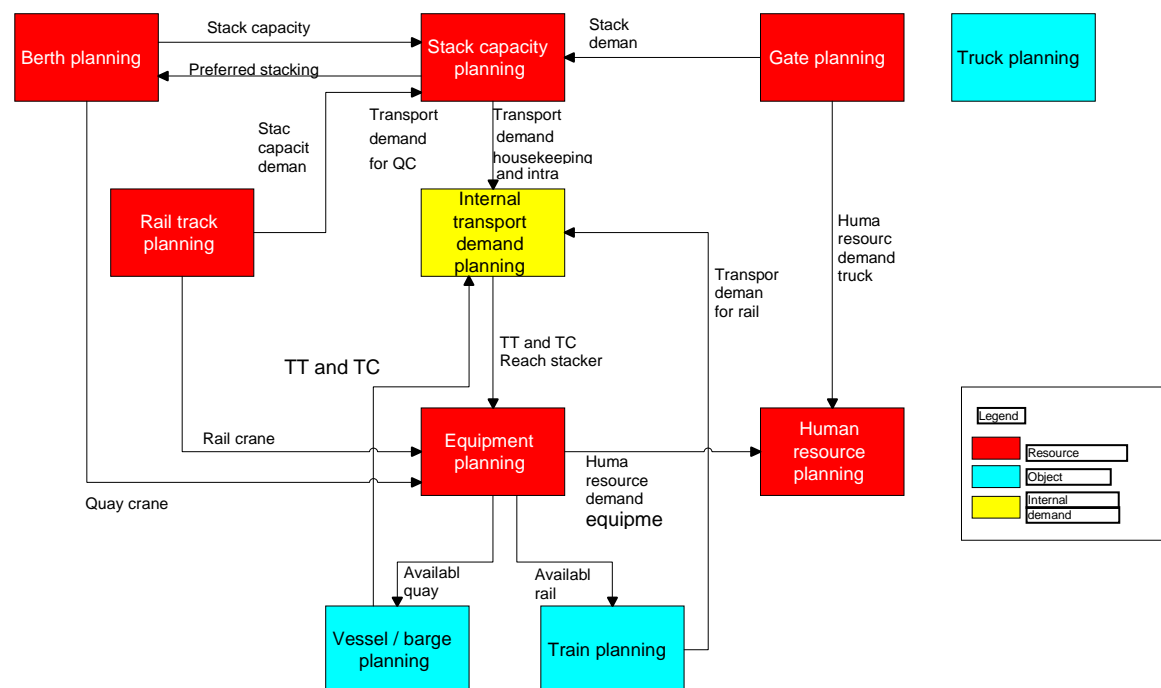


Figure 7: Dependencies of plans

4 Scheduling process

Scheduling is a planning process triggered by the Terminal Operating System to translate the correct priority of planned container moves to equipment moves.

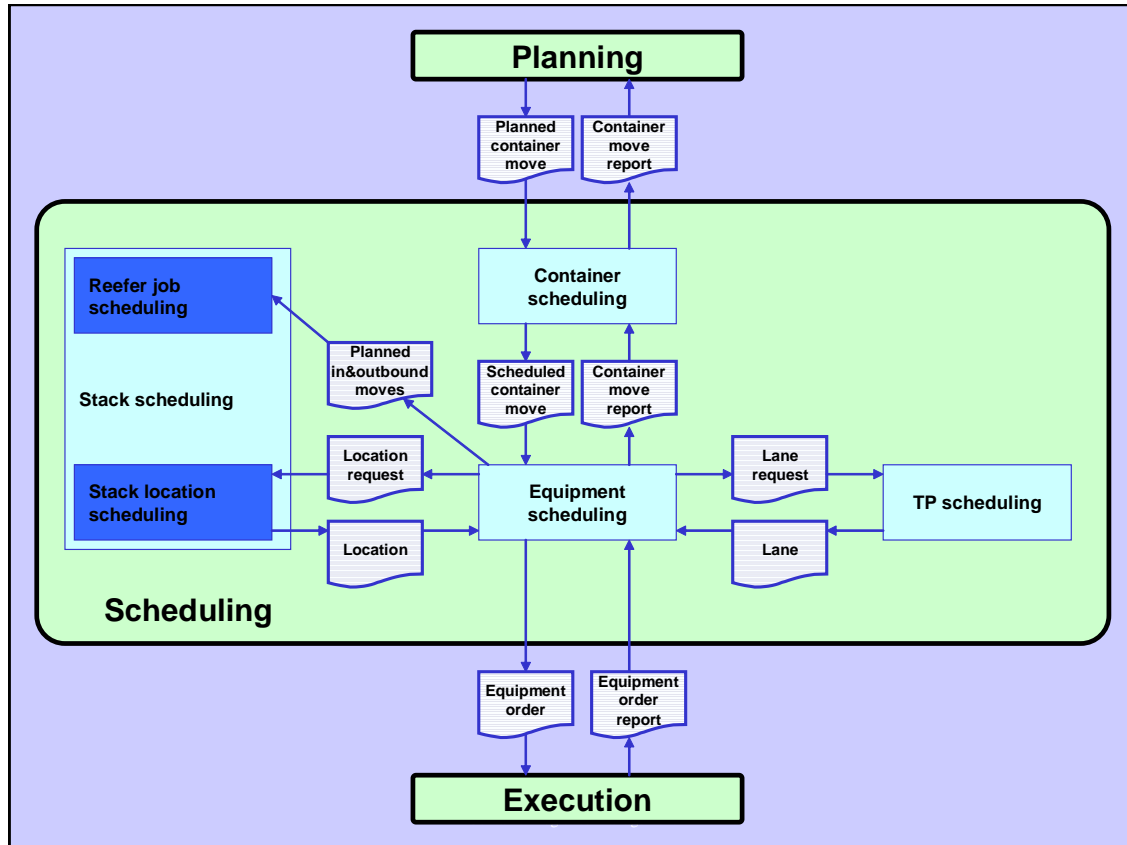


Figure 8: Scheduling process

The result, or product of the object planning is a work sequence, the planned container moves. These container moves are released into the Terminal Operating System or TOS. The TOS will arrange for the Scheduling process which:

- Translates the container move to equipment moves required to arrange for the container to move in accordance with the planning.
- Allows for an efficient use of resources.

The TOS will consider a number of criteria to prioritize and plan resources to allow for the execution of the container move, considering a.o.:

- ✓ When is the container to be loaded on the object
- ✓ Present location of the container
- ✓ Equipment required to transport the container from present location to object
- ✓ Is container a reefer container, in which case a reefer engineer needs to be scheduled to (dis)connect the reefer to the power supply

The scheduling process is always focused on the future but will consider the present status of the container and the resources.

5 Execution process

The scheduling process will lead to orders generated by the system to the various resources for their next jobs. During the execution process two types of inspections will take place:

- Container inspection
- Object inspection

The findings of the inspections and the findings of monitoring the progress of the discharge/load process of the objects are kept by staff in a log or entered into the system. These entries are being used for reports, to assess the productivity and initiate improvement projects.

5.1 Container inspection

Container inspections will take place for following reasons:

- Verify that received information is correct:
The information received, e.g. by EDI, is being validated when the container arrives or leaves the terminal.
 - Prefix and container number
 - Size and type
 - Oversize dimensions
 - IMO labels
 - CSC plate
 - Availability of top and/or bottom rail for tanktainers
- Date and time stamp regarding responsibility and liability:
When a container arrives at the terminal, the terminal operator will be responsible for the container. When the container is loaded on a vessel and passed the railing of the vessel, the responsibility and liability for that container is transferred to the vessel. Therefore a timestamp is generated and the condition of the container verified.
 - Physical condition of container
 - Apparent condition of the cargo inside the container
- Seal check
Verifying the correctness of the seal attached to the container can give evidence of tempering with seal, container and/or it's contents.
- Door direction
The door direction is important to ensure that containers are loaded with the front of the containers forward on the objects.

5.2 Object inspection

The objects are being inspected to minimize operational disturbances. In principle all objects are being inspected, be it sometimes automated, e.g. trucks are being photographed or filmed while entering the terminal in the gate process. Trucks are only being inspected for damage.

Trains are inspected, not only for damage, but also for correct settings of wagon sequence and fitting setting, track number and position on the track and the train direction.

Vessels are inspected for damage. This inspection usually takes place during the ongoing process of discharge and loading.

6 Reporting process

Reports are very much dependent on the quality of the input. Reports are being used to assess progress of the operation and initiate improvement projects. The system not only releases operational reports. It will also send a report to the finance department to be used for the invoice process and to HRM for payment and management of the staff.

Terminal Performance and Departure Report			
Line or Group:	AES	Vessel Voy nr:	LIGB34E
Vessel:	LIONS GATE BRIDGE	ECT Voyage nr:	69712
Vessel Operator:	KKK	ECT Employee:	Ed Reus
<u>Expect</u>		<u>Arrival</u>	
ETA:	08-JAN-08 16:15	Actual Arrival:	08-JAN-08 16:33
ETD:	10-JAN-08 11:45	Actual Sailing:	10-JAN-08 06:00
Berth prospect:	43:30	Actual Berthing Time:	37:26
Agreed Sailing:			
Agr. Berthing Time:			
<u>Vessel Operation Time</u>		<u>Vessel Handling Time</u>	
Start Vessel Operation:	08-JAN-08 17:06	First Lift:	08-JAN-08 17:17
Finish Vessel Operation:	10-JAN-08 06:00	Last Lift:	10-JAN-08 05:59
Gross Operating Time:	36:53	Gross Handling Time:	36:42
Meal Breaks during Oper.:	3:20	Meal Breaks during Handling:	3:20
Oper. Inter. during Oper.:		Oper. Inter. during Handling:	
Net Operating Time:	33:33	Net Handling Time:	33:22
<u>Moves</u>		<u>Handlings</u>	
	<u>Standard</u>	<u>Off Standard</u>	
Discharged:	1801	16	
Loaded:	1269		
Shifted:			
Restowed Via Quay:	30		
Container Moves:	3100	16	
<u>Production</u>			
Berth Productivity (BMPH):	92.3	Total handlings / (Last lift - ATA) - (Ext.inter./Average cranes)	
Plan. berth prod.:	72.9	Total handlings / Berth prospect	
Deviation:	+19.4	Berth prod. - Plan. berth prod.	
Handling Productivity:	95.1	Total handlings / Net Handling Time	
Crane Productivity:	25.4	Total handlings / (Gross Crane hrs. - Ext. inter. - Breaks)	
Crane Split:	4.1	Gross Crane hrs / (Gross Operating time)	

Figure 9: Departure report

7 Invoice process

Perhaps the most important process is the invoice process, which however is not executed by the Operations department. Based on the input, the reports of the Operations department, the finance department will generate the invoice for the executed orders. Not all orders are being invoiced. This will depend on the contract the container operator has with the terminal operator. Often only the first and second waterside moves are being invoiced. Included in the tariff of this move are the additional handlings by equipment in the stack.

Invoices are also raised for storage days extending the free-storage period and special activities like stuffing and stripping, CFS activities, internal transport by order of customs and reefer (dis-)connecting and monitoring.

The TOS will send the billable completed orders to the finance back-office system via an interface. The back-office system will run the invoice.

8 Terminal flows

Terminal flows are identified by the activities, or products, on the terminal and the container flows over the terminal. The activities, or products, are the services offered to the customer to handle objects. We can identify two types of products:

- Core products
- Non-core products

8.1 Core product

Core products are the product the terminal offers to its customers which are key to its existence, the reason of being for the terminal and are derived from the modalities served by the terminal.

out / to in / from	Deepsea	Feeder	Barge	Rail	Road
Deepsea	Transshipment	Transshipment	Import	Import	Import
Feeder	Transshipment	Transshipment	Import	Import	Import
Barge	Export	Export	Transshipment	Transshipment	Transshipment
Rail	Export	Export	Transshipment	Transshipment	Transshipment
Road	Export	Export	Transshipment	Transshipment	Transshipment

Figure 10: Product matrix

To ensure that the core activities are being executed uninterrupted, directly linked activities can be seen as core as well:

- Temporary storage:
To prevent chaos caused by traffic to deliver containers directly from out of the terminal to the vessel (or vice versa) and to ensure a smooth operation, a stock of containers is being kept on the terminal, the stack. Usually the contract between terminal operators and its customers stipulate a number of free storage days.
- Acceptance and delivery:
To allow the stack being build for export, containers will have to be accepted to the terminal. For import, containers will also have to leave the stack for delivery of the container to the final destination of the receiver of the cargo.

8.2 Non-core activities

Non-core activities are activities related to a container during the period the container is on the terminal and which are not core activities. If the terminal has a CFS and/or MT depot, related to the activities of CFS and/or MT depot. Also for other services:

- Storage
For a fluent operation and to prevent substantial external traffic during vessel operations the containers will be stored in the stacking area. Usually the storage facility is only temporarily costs of which are included in the load- or discharge move price. Should a container exceed the free-storage period, the terminal will be charging storage.
- Stuffing/stripping
Usually stuffing (the packing of cargo inside a container) or stripping (the

unpacking of a container) takes place at the CFS, the container freight station. In case a terminal does not have a CFS, incidental stuffing and/or stripping will occur e.g. during a customs inspection of the container. The terminal will be charging for the cost (handling of the container and/or the labors to stuff/strip) involved.

- Bundle flats.

Collapsible flat-racks are often bundled to reduce the moves. Moving one bundle of 3 or 4 flats will cost less than moving 3 or 4 individual flats.

- Inspection of container

Inspection of a container can be ordered by:

- Authorities, e.g. customs.
The container operator will bear the costs.
- Master of the vessel.
The container operator will bear the costs.

- IMO labeling

Either remove existing labels or add labels due to incorrect labeling.

- Change door direction

To prevent pilferage, containers are often stowed door to door. This may be on board of the vessels, but also on a truck. This may require additional handling, especially if the loading process is (partly) automated.

- Fumigation

- Restow and/or shifting

A restow or shifter is a container move on board of a vessel that is required to positively influence the operation. Reasons for a restow or shifter can be:

- Overstow
- Change of destination
- Inspection
- Reefer breakdown

The difference between a restow and a shifter is that a restow is always via the quay, while a shifter can be completed in one move and will be within the same bay.

Restows and their reasons must be reported correctly to ensure that the correct party is being billed for the costs involved. In some cases, to improve the load- or discharge operation of a vessel, restows initiated by the terminal operator are made. Costs involved with these restows are for the account of the terminal operator.

- Weighing a container

Figure 11 describes the various possible combinations of methods to arrange for a container flow.

In blue is the modality at the start- and at the end of the flow or product. In green is the required equipment, red are the various transfer points where the container is being transferred from the one resource to the other and in white is the destination of the flow or the start of the next flow.

9.2 *Flows to resources*

The product a terminal offers can be executed using different methods. The methods consist of a (number of) activity(ies). Listing these activities will give insight in the required resources.