Simulation Model for Port Operations
(HASPORT-II)

Volume 4: Users Manual

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J.B.P. van Driel
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Delft University of Technology
Faculty of Civil Engineering, Hydraulic Engineering Division

HASKONING Royal Dutch Consulting Engineers and Architects
International Projects Division
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Introduction

1.1 Outline of the model

HASPORT-II is a computer-model for simulation of port operations and can be a strong aid to port planners. It can be used to analyze operations in ports and on terminals and to investigate the performance of all aspects of a port system. The model can be applied to studies of existing and proposed port-situations c.q. present and future cargo-flows.

The model regards the following aspects of port-activities:

* Marine operations: the arrival, residence in the port and departure of ships
* Landside operations: the arrival, storage and departure of cargo
* The interface of marine and landside operations: the cranes and ship’s gear handling cargo from ship to shore and vice versa
* The connection with the inland transport

The cargo-types which are handled on the terminals are determined on the basis of:

* Commodity: containers, breakbulk, liquid bulk, dry bulk
* Import or export cargo
* Transhipment-mode: 1) directly from the inland transport modes (trucks, trains, barges) to the ships and vice versa; 2) indirectly from the inland transport to the ships and vice versa, using storage-facilities on the terminal; 3) transhipment from one ship to another (for example a feeder-ship), also using intermediate storage.

Varying environmental, human and operational conditions, which can possibly restrict the operations, are taking into consideration: a tidal window, bad weather conditions, shifts, strikes, equipment-breakdowns and absence of inland transport on weekend-days.

The input-data of the model consists of the characteristics of the ship-classes which attend the port, the characteristics of the terminals and their facilities, the cargo storage- and transport-data, the characteristics of the restrictions and other general information.

The results which are produced by the model concern the performances of the terminals (throughput, storage-utilisation, berth-occupancy, crane-utilisation), the performances of the ships (waiting times and service times) and the specifications of the restrictions on the operations.

HASPORT-II has been developed using the simulation-software Prosim. It has been created as a successor to the HASPORT Fortran- and Prosim-programs. However, HASPORT-II,
offers the facility to simulate bigger and more detailed ports and to produce more extensive and specified results.

1.2 Outline of the user

As stated above, HASPORT-II has been developed using Prosim simulation software. On the basis of this, two types of users can be specified. In the first place users who are not or barely acquainted with Prosim; secondly, users who do have experience with this simulation language.

HASPORT-II is a general model for port-simulation. In case a port with very specific characteristics has to be simulated, the latter type of user may wish to adapt the model. This manual is not for this type of user; he/she should use the extensive model description, which has also been written for HASPORT-II, to understand the structure of the model but may of course use this manual as a guide to performing simulation-runs.

This manual is aimed primarily at the first type of user: a port planner with insufficient knowledge of Prosim. To him/her this manual offers guidance in understanding the principles of the model, in producing a set of input data, in performing a simulation-run and in analyzing the results.

1.3 Outline of the manual

The next chapter of this manual will explain the simulation principles of HASPORT-II by means of a verbal description of the model of the program. It will also give a summary of the requested input data and of the output data which are produced. Chapter 3 will discuss the aspects of the simulation software Prosim: the principles of performing a HASPORT-II-simulation with Prosim, the required hardware, the installation-procedure and the use of Prosim-menu’s.

The fourth chapter will describe the procedure for creating a set of input data and the fifth chapter will explain how to perform a simulation-run with that set of data. Chapter 6 deals with the facilities for showing the results of a simulation and chapter 7 will discuss the means of analysis of the results. Finally, the last chapter will demonstrate the application of HASPORT-II, with the use of an example.
Description of the model

2.1 Verbal model

The model describes a port-system which has the following general characteristics:

The port which is described by the model consists of a user-defined number of terminals. Each terminal is operated separately and can handle a user-defined number of cargo-types. These cargo-types have to be chosen from one or more of the four commodities: containers, breakbulk, liquid bulk or dry bulk. Each terminal has a user-defined number of berths. Berths are either single berths at which only one ship can moor or so-called multiple berths at which several ships can moor at the same time. At multiple berths ships can be shifted, if that would create space for an extra ship, and cranes can be shifted from one ship to another. At the berths ships are unloaded and loaded. Up to five types of cargo can be handled at one berth. Each berth has a user-defined number of cranes at its disposal and each terminal has a user-defined total capacity of other terminal-equipment.

The ships which arrive at the harbour are divided into classes. Each class has its own generator, which generates ships at random inter-arrival times, drawn from user-defined distributions. The generators also allocate several attributes to the ships (for example: DWT, draught, length, consignment-size, the type of cargo it carries, the terminal at which the ship is served).

The movements of the ship in the model are the following:

* A ship, which has been generated by the generator of its class, enters the system; it asks the harbour-master of the port for permission to go to a berth; when waiting for permission the ships stays in a waiting-row at the anchorage.

* The harbour-master performs a check-up of the berths, to find a berth, at which the ship can fit and which is free. If the harbour-master finds a positive answer, the harbour-master allocates the ship to that particular berth and gives permission to the ship to sail to the berth.

* When the ship joins the berth, the terminal-master is alerted. He allocates cranes to the ship. When the unloading and loading has finished, the terminal-master registers the amount of cargo which has been unloaded and loaded; next he allows the ship to leave the harbour.
Each terminal has storage-facilities for each type of cargo at that terminal. For containers there are import-, export- and empties-stacks, for breakbulk there is covered storage (in sheds/warehouses) and open storage. Each type of cargo has a user defined dwell-time distribution, for the cargo which arrives at the terminal with inland transport and has to be exported as well as for the cargo which is unloaded from the ships and has to be imported. The dwell-time distribution can be defined for inland transport by road, by rail and by inland-waterway. Cargo can also loaded and unloaded directly to and from trucks, wagons and barges or can be transhipped from one ship to another (for example: cargo brought and collected by feeder-ships).

Once a day the storagemaster of the port registers the size of the deliveries of cargo at all stacks on that day. The quantity of daily arrivals of export-cargo and departures of import-cargo of each cargotype depends on the dwell-time distribution of that cargo-type. This distribution is made dependant of the moment of arrival of the ship at the port for the export-cargo and of the moment at which the ship leaves the port for the import-cargo. This means that during a number of days before the ship arrives it is already artificially present and causes a flow of incoming cargo and that during a number of days after leaving the port it is still artificially present and causing a flow of outgoing cargo.

Consequently, the movements of export-cargo in the system are as follows:

* Arrival at the terminal by inland transport; the moment of arrival depends on the dwelltime-distribution of the cargo-type and on the time of arrival of the ship it will be exported with; the quantity also depends on that specific ship.

* Direct loading onto the ship or a stay in the storage of the terminal; in the latter case it is loaded onto ship when the ship has moored at the terminal.

* Elimination from the port-system.

The route of the import-cargo is vice versa: the cargo enters the system when it is unloaded from a ship; it either continues directly by inland transport or is stored on the terminal. In the latter case the departure from the terminal by inland transport takes place at a later date, again depending on the dwell-time-distribution and on the moment of departure of the ship with which the cargo was imported.

The movements of ships and cargo in the port-system are illustrated in Figure 2.1.
Port-activities can be restricted by an extensive range of circumstances:

* Weekends: on saturdays and/or sundays inland transport may be absent; secondly unloading and loading may not take place in weekends.

* Shifts: during times when no shifts are active on the terminal, loading and unloading cargo is stopped.

* Tide: ships that wish to enter or leave the port through the entrance channel of the harbour may be restricted in doing so due a tidal window.

* Bad weather conditions: typhoons can occur, causing windspeeds which may be to high for terminal-activities, inland-transport and sailing of ships and causing waveheights which may be to high for ship-manoeuvring.

* Strikes: all terminal-activities are cancelled when a strike is called.

* Breakdowns of cranes: loading and unloading is restricted when one of the active cranes suffers a breakdown.

2.2 Summary of the input

The input information for HASPORT-II is divided into three groups (corresponding with four input-files for the program, as is explained later): the harbour-environment, the shipclasses, the DWT-tables and the terminals with their cargo-types.

The set of input-data for creating a harbour-environment is as follows:

* Characteristics of a typhoon (bad weather conditions): the bad weather-season, the interval-time of bad weather and the length of a bad weather-spell
* Characteristics of a strike: the interval-time of strikes and the length of strikes
* Characteristics of the tidal window: two tidal factors can be simulated (daily low tide and high tide, monthly high tide and dead tide)
* Miscellaneous information: switches for restrictions, simulation-time
The ship-classes are created on the basis of the following input information:

* Characteristics of the interarrival-time in casu the type of distribution, from which the interarrival-time is extracted (Poisson/normal)
* Characteristics of the consignment-size of the import-cargo and the export-cargo of the ship
* Ships' characteristics: DWT, length, draught, capacity of ships' gear etc.
* Characteristics of the ships' cargo
* Miscellaneous: possible destinations within the port for the ships

The set of input-data to create the terminals is as follows:

* General characteristics of a terminal: number of cargo-types, number of berths, number of shifts, availability of cargo-handling-equipment, availability of inland-transport on weekend-days, storage-capacities, operating conditions
* Characteristics of shifts: starting time, duration, availability on weekend-days
* Characteristics of berths: size, compatibility for cargo-types, number of cranes, for multiple berths: capacity of ships
* Characteristics of cranes: capacity, breakdown-characteristics and maintenance-requirements
* Characteristics of cargotypes: type, storage characteristics, requirements for inland transport, dwell-time distributions of indirectly transferred cargo, percentages of directly transferred cargo, both depending on the mode of inland transport

2.3 Summary of the output

HASPORT-II is an aid to the process of port planning and functional design. Therefore the model produces the following output:

* Annual throughput per terminal (in tons or TEU)
* Utilisation of terminal storage for each cargo-type (in $m^2$ for open or covered storage of breakbulk, in $m^3$ for liquid and dry bulk storage or in groundslots for container storage)
* Occupancy-rate of the total storage-facility of a terminal (as a percentage of the available storage-capacity)
* Number of trucks, wagons and barges leaving/entering the terminal per year
* Daily quantities of arrivals and departures of cargo at a terminal (in tons/TEU)
* Berth-occupancy (as a percentage of availability)
* Distribution of the time that berths are occupied (in hours per years for single berths, in quay-meter-days per year for multiple-ship berths)
* Utilisation of ship-quay/quay-ship cargohandling equipment (hours per year)
* Indication of the utilisation of other cargo-handling equipment on the terminal (hours per year)
* Ships' waiting time, ships' service time and ships' total time at berth per class of ships (hours)
* Occupied number of waiting spots at the anchorage for entering the port
* Delays to ships and to cargo-handling activities due to equipment breakdowns, climatic downtime, strikes, tide (in hours or quay-meter-days per year for berths, in hours for ships)
3 Using Prosim

3.1 Introduction

Prosim is a simulation-language which has been developed at Delft University of Technology. It originates from computer-language PL1 and can perform both discrete and continuous simulations. Prosim is based on the principle of process simulation: for each component in a system its process in the system is described in a chronological sequence. This sequence is then simulated simultaneously for all components that are present in the system.

The version of Prosim for use on personal computers is Personal Prosim, which has been developed by Sierenberg & de Gans b.v., Waddinxveen. The simulation-model for this model has been developed with the use of version 2.05 of Personal Prosim.

Paragraph 3.2 will discuss the hardware and installation-procedure of Prosim and paragraph 3.3 will describe the use of Prosim menu-structure. However, first this chapter will give details of the procedure to which a simulation-run of HASPORT-II in Prosim is subjected to.

The requirement for performing a simulation-run with HASPORT-II in Prosim is that the model is fed with correct input data. In Prosim input data are assembled in so called User Data Files. These User Data Files are created by the user: HASPORT-II requires four, one with data for the harbour-environment, two with data about the ship-classes and one with information of the terminals and their cargo-commodities. The procedure of setting up User Data Files for the input of a port-system is described in the next chapter.

When the user wishes to perform a simulation-run, he/she must first create a so called environment in which the run can take place. This environment consists of the input-files of the port that the user wishes to simulate and the output-files to which the user wishes the results of a simulation to be written. The names of these files must be entered by the user.

When an environment has been created, the simulation-run can be started. HASPORT-II first reads all the input information and checks this information for errors. After correcting the possible errors in User Data Files, the user can restart the simulation-run and wait for results. The procedure of creating an environment, checking the error-specification and running the program is discussed in Chapter 5.

After HASPORT-II has finished the simulation-run, the user can investigate the results of the run. The results are divided over four modes, of which two are of importance to the non-Prosim-acquainted user. These two are a written report-file, which is shaped as a User Data File, and a set of storestreams of data, with which graphs and histograms can be produced. The handling of the output information is dealt with in chapter 6. This chapter also briefly
Figure 3.1: routes through prosim menus

**PRINCIPAL SELECTION**
- Model handling (A)
- Quit

**MODEL HANDLING**
- Load (A)
- Quit

**MODEL MAINTENANCE**
- Link
- Run (D)
- Environments (C)
- File handling (B/E)
- Graphics (F)
- Animation (F)
- Quit

**RUN CONTROL MENU**
- Data handling
- Proceed run
- Quit

**DATA HANDLING**
- Display storestreams
- Quit

**ENVIRONMENTS**
- Update
- Create
- Duplicate
- Name
- Erase
- Quit

**FILE HANDLING**
- User data files
- Store files
- Quit

**USER DATA FILES**
- Update
- Create
- Duplicate
- Name
- Print
- Backup
- Restore
- Erase
- Quit

**STORE FILES**
- Name
- Backup
- Restore
- Erase
- Stream handling
- Quit
mentions the possibilities of the other two output-modes: graphics and animation. These options can be viewed by the user for the example model which is described in Chapter 8 of this manual.

3.2 Installation

HASPORT-II can be performed on personal computers which have Prosim installed. Prosim is severely protected and cannot be copied from PC to another without the aid of Sierenberg & de Gans. It is also possible to demonstrate a simulation with HASPORT-II with the use of an executable-file. This manual is not aimed at working with an executable but the procedure is similar to working with Prosim.

Prosim can be started by typing at the DOS-prompt, depending on the DOS-path in the autoexec.bat file: C:\...\prosim <ENTER>. Prosim is then loaded and the Principal selection-menu is shown on the screen. The first action to be taken then is to load HASPORT-II. This is explained in the next paragraph, because it requires certain knowledge of menu-handling in Prosim.

3.3 Finding one's way in Prosim

Using Prosim involves finding one's way through a big set of menu's. Figure 3.1 shows the tree of menu's which are of importance to the non-Prosim-acquainted user. In each menu options can be chosen in three ways:

* Moving the enlightened beam in the menu with the keys ↑ and ↓ and pressing <ENTER> at the required option;
* Typing the first letter of the option
* Using the Function-key <F10> for quitting a menu

The routes through the menus which are of importance to the user (and their return-routes) are now explained.

Route A Loading HASPORT-II

* Menu: Principal selection
  Choose: Model handling
* Menu: Model handling
  Choose: Load
This last choice will show a list of models on the C:disc. Choose HASPORT-II by moving the enlightened beam to HASPORT2 - HASKONING model for simulation of port operations, press <ENTER> and press <F2>.

If HASPORT-II is not on the C:drive, you must restore HASPORT-II from a diskette. To do this return to

* Menu: Model handling
  Choose: Restore

Then choose the drive you want Prosim to restore HASPORT-II from and choose HASPORT-II from the list that is then shown on the screen in the same way as is indicated above.

After loading c.q. restoring HASPORT-II the following menu (Model maintenance menu) is shown. This is the menu from which the following options can be chosen:

* Producing/adapting/reading User Data Files (Route B)
* Creating an environment (Route C)
* Performing a simulation run (Route D)
* Producing storestream-graphs and histograms (Route E)
* Viewing the graphics and animation facility (Route F)

Quitting HASPORT-II and leaving Prosim is performed by choosing the following path:

* Menu: Model maintenance
  Choose: Quit
* Menu: Model handling
  Choose: Quit
* Menu: Principal selection
  Choose: Quit

Route B User Data Files

* Menu: Model maintenance
  Choose: File handling
* Menu: File handling
  Choose: User Data Files
* Menu: User Data Files
  Choose: Create (to create a new file) or Update (to adapt an existing file)
This last menu also offers the possibility to backup, erase, rename, restore, print or duplicate User Data Files. After choosing an option a list of all User Data Files appears; the user can make a choice by moving the enlightened beam and pressing <ENTER>. The procedure for creating or adapting User Data Files is described in the next chapter.

Leaving a User Data File can be performed with saving (by pressing <F9>) or without saving (by pressing <F10>). The list of User Data Files can be quitted by pressing <F10>; then choose the following route for going back to Model maintenance-Menu:

* Menu: User Data Files  
  Choose: Quit
* Menu: File handling  
  Choose: Quit

Route C  Environments

* Menu: Model maintenance  
  Choose: Environments
* Menu: Environments  
  Choose: Create (to create a new environment) or Update (to adapt an existing environment)

This last menu also offers the possibility to rename, erase or duplicate environments. After choosing an option a list of environments appears; the user can make a choice by moving the enlightened beam and pressing <ENTER>. The procedure for creating or adapting an environment is described in chapter 6.

Leaving an environment can be performed with saving (by pressing <F9>) or without saving (by pressing <F10>). The list of environments can be quitted by pressing <F10>; then choose the following route for going back to Model maintenance-menu:

Menu: Environments  
Choose: Quit

Route D  Performing a simulation-run

When HASPORT-II has not been loaded from C:disc but restored from diskette, the program first has to be linked. This is performed by the following command:
To start a simulation-run, choose the following command:

* Menu: Model maintenance
  Choose: Run

Unless only one environment has been created the user is then asked to choose an environment in which the run will be performed. This choice can be made by moving the enlightened beam to the desired environment and pressing <ENTER>. Consequentially the following menu appears in which the run can be started with:

* Menu: Run control
  Choose: Proceed run

NB: before the run is proceeded, the options in the Run control-menu should be set as follows:

* Trace: off
* Clockrate: 0
* Window: Interrup 20
* Breakpoint: -
* Integration: General

Options can be changed by selecting the option, performing the adaptations and returning to the Run control-menu.

The return-route from the Run control-menu starts with:

* Menu: Run control
  Choose: Quit

If a simulation-run has been performed the user is then asked whether he/she wishes to keep or discard the Store File of the run (which contains the storestream-information) and the Figure File (which contains animation-information). If keeping is not desired, choosing <Discard> will show the Model maintenance-menu. If these files are required, <Keep> has to be chosen; the user is then asked to specify a name for the files. By pressing <F2> the Model maintenance-menu is shown on the screen.
Route E  Storestreams

* Menu:  Model maintenance
  Choose:  File handling
* Menu:  File handling
  Choose:  Store files
* Menu:  Store files
  Choose:  Stream-handling

This last menu also offers the possibility to backup, erase, rename, restore or duplicate Store-files. After choosing an option a list of all Store-files appears; the user can make a choice by moving the enlightened beam and pressing <ENTER>. Prosim then displays a list of all streams in that Store-file. In the same way, a stream can be selected with the beam and with <ENTER>. The procedure for reading store-streams and shaping and printing their graphs and histograms is described in the chapter 6.

The list of store-streams can be quitted by pressing <F10>; the list of Store-files idem dito. Then choose the following route for going back to Model maintenance-Menu:

* Menu:  Store files
  Choose:  Quit
* Menu:  File handling
  Choose:  Quit

Store-streams of a simulation-run can also be viewed directly after that simulation-run has been performed. The route to followed is as follows:

* Menu:  Run control
  Choose:  Data handling
* Menu:  Data handling
  Choose:  Display storestreams

As stated above, the procedure for reading store-streams and shaping and printing their graphs and histograms is described in the chapter 6. The list of store-streams can be quitted by pressing <F10>; then choose the following route for going back to Run control-menu:

* Menu:  Data handling
  Choose:  Quit
Route F     Graphics/Animation

These facilities can be applied for the example model of chapter 8; an animation of this
model is not available yet. They can also be used for other simulated ports, if the correct
Graphics-files and Figure-files have been created. This must be performed by advanced
Prosim-users.

To perform a graphics-demonstration, follow this path:

* Menu:       Model maintenance
  Choose:     Graphics

The user is then asked to insert the name of the Picture file he/she wants to view; by pressing
<F8>, a list is shown with the Picture files, from which the user can chose. Select a file,
press <ENTER> and press <F10>. A graph is now shown. If required, an advanced
Prosim-user can use this kind of graph to perform a dynamic graph-animation. To return to
the Model maintenance-menu: press <F10> twice.

To perform an animation-demonstration, follow this path:

* Menu:       Model maintenance
  Choose:     Animation

In the same way as choosing a Picture file for the Graphics-facility, choose a Figure file and
a Compilation for the Animation-facility. Besides this, the user is also asked to specify some
extra animation-characteristics. Choose the following values:

* Start time:    0
* Stop time:     100
* Duration 1 time-unit: 0.5
* Smoothing factor: 10

Press <F2> for go and the simple animation for the demo-model is shown. The animation
is interrupted by pressing <F10> and another two times <F10> takes you back to the
Model maintenance-menu.
4 Input into the model

4.1 Introduction

HASPORT-II has one important option for the user to feed input-information into the model; this concerns the use of so called User Data Files. In these files all external information which is needed for the model is stored: one containing information about the harbour-environment, two concerning the data of the ship-classes which attend the port and one containing information about the terminal- and cargotype-characteristics. These files can be created or edited before running the program.

A possible alternative for using User Data Files is to adapt values of parameters during a simulation-run. This can be performed with the option <State Analysis> in the Runtime-menu. This option will not be discussed here because it is only of significance to the advanced user. The main options will now be explained, followed by a list of all the input-information that is required.

4.2 User Data Files

As stated above, HASPORT-II requires four input User Data Files; from now on they will be called:

* H-file (for the harbour-environment)
* S-file (for the ship-classes)
* D-file (for the DWT-tables)
* T-file (for the terminals)

The exact meaning of these files will be explained further on this chapter. The files consist of extensive lists of data; it is advised that the data in these lists receive comment-lines, to facilitate editing the files. All characters between @-signs on one line is considered by Prosim as comment.

When a user wishes to build a new set of input-files for a new port-system he/she wishes to simulate, the user can create new files for the input-information or can use existing files and edit them. The latter option is advised because it saves much time in typing the comment-lines. Special dummy-files have been created (called D-dummy, H-dummy, S-dummy and T-dummy), which can be used to act as a basis for the creating input-files. All comments are already in the dummy file; the input-data have entered at the #-signs. Prints of the dummy-files have added to this manual.
The procedure for using the dummy-files is as follows: go to the User Data File-menu, choose option <Duplicate>, duplicate the three dummy-files and name them in accordance to the port which will be simulated. A name consists of up to 10 characters (alphanumeric or ' ', a low dash) and must start with a letter. It is advised to use the letters D, H, S and T as first letter for respectively the DWT-tables-, harbour-, shipclasses- and terminals-files.

The input-files can then be edited. (For changing existing files the procedure, which is described further on in this paragraph, can also be applied. First choose <Update> in the User Data File-menu; then choose the suitable file.)

The required number of data in the H-file is identical for all port-system but the D-files, S-files and T-files have varying lengths, according to the number of ship-classes and the number of terminals/berths/cranes/shifts/cargotypes. This requires the user to be able to copy, repeat, move, delete and insert lines and blocks of lines. This can be performed by typing codes at the line number-indications and by using <F4> to close blocks and by using <F2> to delete commands. The codes are as follows:

**Copy**: copies a line/block at a user defined place in the file
- `c...` Copy one line
- `cc...` Copy a block of lines, starting with this line (and close the block with <F4> on the last line of the block)
- `a...` Copy the line, chosen with c..., or the block, chosen with cc..., after this line
- `b...` Copy the line, chosen with c..., or the block, chosen with cc..., before this line

**Repeat**: repeats a line/block directly after the line/block
- `rN...` Repeat this line N times (default value N=1)
- `rrN...` Repeat a block of lines, start with this line (and close the block with <F4> on the last line of the block and enter N for the number of repetitions; default value N=1)

**Move**: moves a line/block at a user defined place in the file
- `m...` Move one line
- `mm...` Move a block of lines, starting with this line (and close the block with <F4> on the last line of the block)
- `a...` Move the line, chosen with m..., or the block, chosen with mm..., after this line
- `b...` Move the line, chosen with m..., or the block, chosen with mm..., before
this line

Delete: deletes a line/block
   d... Delete one line
   dd... Delete a block of lines, starting with this line (and close the block with
          <F4> on the last line of the block)

Insert: insert an empty line
   iN... Insert N empty lines directly after this line (default value N = 1)

As stated above, the H-file does not require any copying of lines or blocks; H-dummy can be adapted without changing lines or blocks.

For the S-file and the D-file, the procedures are quite simple. For the S-file, the procedure is as follows. For every terminal the percentage of a ship-class going to that terminal and the reference number of the cargotype at that terminal (last two lines of S-dummy, between the lines of stars) have to be repeated (N-1) times, with N = the number of terminals. For every ship-class that attends the port, the thus created block of data in S-dummy (between the lines of dashes) is then copied once.

The D-file contains eight tables, in which, for each of the four types of ships (containership, general cargo ships, tankers and bulkcarriers), the user can define the relationship between the dead weight tonnage (DWT) of a ship and either its draught or length. The length of a table (e.g. the number of lines, containing DWT-values against draught or length, which have to be copied) depends on the quantity of information which is available to the user and on the level of detail which the user wishes to apply in the tables.

Creating the T-file is a little more complicated. This file contains data which are valid for all terminals and data which are different for each terminal. The dummy-file consists of the required lines for one terminal, with four cargotypes (one for each commodity - containers, breakbulk, dry bulk and liquid bulk), one berth, one crane and one shift. The form of data of the cargo-type differs for each commodity because each commodity has different storage-characteristics.

First, the complete block for one terminal (between the lines of %-signs) must be repeated for (N-1) times, with N = number of terminals). Then, for each terminal the blocks for the cargotypes (between the lines of dashes) have to be repeated or deleted, depending on the number and commodities of the cargo-types at the terminal. Finally, for each terminal, the lines of the berths and cranes and the blocks of the shifts (two lines, between the lines of stars) have to be repeated, depending on their number.
Each input file ends with the value -1 to close the list of data. Also each block of cargotype data in the T-file ends with a closing value -1.

Added to this manual are the files D-dummy, H-dummy, S-dummy and T-dummy and the files D-demo, H-demo, S-demo and T-demo of the example of chapter 8. Please refer to these files as examples of the procedures explained in this paragraph.

4.3 Required input information

H-FILE

CHARACTERISTICS OF A TYPHOON (BAD WEATHER CONDITION)
* Number of the first day of the bad weather-season
* Number of the last day of the bad weather-season
  NB: January 1st = 1; December 31st = 365
* Mean interval-time of typhoons during the season (days)
  NB: The interval-time of typhoons is drawn from an exponential distribution
* Mean duration of a bad weather period (days)
* Standard deviation of duration of a bad weather period (days)
  NB: The duration of a bad weather-spell is drawn from a normal distribution

CHARACTERISTICS OF A STRIKE
* Mean interval-time of strikes (days)
  NB: The interval-time of strikes is drawn from an exponential distribution
* Mean duration of a strike (days)
* Standard deviation of duration of a strike (days)
  NB: The duration of a strike is drawn from a normal distribution

CHARACTERISTICS OF THE TIDE
* Mean water-depth in the entrance channel (m)
* Amplitude of the first tidal-factor (m)
* Period of the first tidal-factor (days)
* Phase angle of the first tidal factor (rad)
* Amplitude of the second tidal-factor (m)
* Period of the second tidal-factor (days)
* Phase angle of the second tidal factor (rad)
  NB: If the user does not want to consider the tidal window, the depth of the entrance-channel should chosen big enough for ships of all shipclasses to enter and the amplitudes of the tidal factor should be set at zero.
MISCELLANEOUS

* Strike-switch (on/off)
* Bad weather-switch (on/off)
* Simulation-time (days)

NB: The minimum number of ships attending one terminal is 1000, to ensure that the results of the simulation have sufficient accuracy. The simulation time should be chosen on the basis of the minimum number of ships.

S-FILE

* Number of shipclasses

FOR EACH CLASS OF SHIPS:

* CHARACTERISTICS OF THE INTERARRIVAL-TIME
  - Type of the distribution of the interarrival-time (Poisson/normal)
  - Mean interarrival-time (days)
  - Standard deviation of the interarrival-time (days)

  NB: An exponential Poisson-distribution is the regularly chosen distribution for interarrival-times of ships (In this case the value of the standard deviation is not relevant). However, shipping lines can agree with terminal authorities on fixed arrivaltimes of ships. If required, this can be simulated by choosing a normal distribution.

* CHARACTERISTICS OF THE CONSIGNMENT-SIZE
  - Mean total quantity of export-cargo
  - Standard deviation of total quantity of export-cargo
  - Lower boundary of total quantity of export-cargo
  - Upper boundary of total quantity of export-cargo
  - Mean total quantity of import-cargo
  - Standard deviation of total quantity of import-cargo
  - Lower boundary of total quantity of import-cargo
  - Upper boundary of total quantity of import-cargo

  NB: The values for these characteristics are expressed in TEU’s for containers and in tons for breakbulk, liquid and dry bulk. A correct way of defining these values is regarding them as percentages of the DWT-values of the ships.

  NB: The import and export quantities are drawn from normal distributions, truncated by the user defined lower and upper boundaries.
**SHIPS' CHARACTERISTICS**
- Lower boundary of DWT
- Upper boundary of DWT
- Reference to the corresponding DWT-table in D-file

NB: The ships' DWT is drawn from a uniform distribution. Depending on the DWT, the length and draught of a ship are drawn from the DWT-tables of the ships' type (containership, general cargo ship, tanker, bulk carrier). HASPORT-II multiplies the values of the length and draught with a safety/operational-margin: 1.10 for the length and 1.15 for the draught.

- Mean mooring time: time required for sailing from the anchorage to a berth (hours)
- Standard deviation of mooring time (hours)
- Lower boundary of mooring time (hours)

NB: The mooring time is drawn from an unknown distribution. This is a Prosim-facility for creating a distribution which is the sum of several normal distribution. The unknown distribution is used in cases where creating the exact distribution would involve extensive investigations and where the results only concern first order effects.

- Required number of cranes to load/unload the ship: this may correspond with the number of hatches
- Net loading capacity of ships' gear (box/hour for container-ships; tons/hours for other ship-types)
- Net unloading capacity of ships' gear (box/hour for container-ships; tons/hours for other ship-types)

**CHARACTERISTICS OF THE SHIPS' CARGO**
- Code of the cargo (A for containers, B for breakbulk, C for liquid bulk and D for dry bulk)
- Reference-number of the cargo-type, depending on at which terminal it is transhipped. In order for the user to keep a clear view of the cargotype-reference-number, it is advised to use the three digit number XYZ, in which X depends on the commodity (1 for containers, 2 for breakbulk, 3 for liquid bulk and 4 for dry bulk), in which Y depends on the cargotype and and in which Z depends on the terminal of destination. See chapter 8 for an example.
- Percentage of cargo that is transhipped (imported/exported by other ships, not by inland transport)
- Mean percentage of ships’ cargo that is stored under cover
- Standard deviation of percentage of ships’ cargo that is stored under cover

NB: The percentage of the ships’ cargo that is stored under cover is only of
importance to breakbulk-ships. For the other commodities the value of zero should be entered.

NB: The percentage of the ships' cargo that is stored under cover is drawn from a normal distribution, truncated by a value of the mean percentage +/- twice the standard deviation.

* MISCELLANEOUS
  - Name of the class
  - Percentage of the class destined for each terminal

D-FILE

This file consists of eight tables: one pair for each of the four types of ships. Of a pair of tables, one contains the relationship between the DWT-values of a ship and its draught and the other contains the relationship between the DWT-values of a ship and its length. The four types of ships are: containerships, general cargo ships, tankers, bulkcarriers. The DWT/draught-table consists of a user-defined number of DWT-values and for each DWT value a draught-value. The DWT/length-table consists of a user-defined number of DWT-values and for each DWT value a length-value.

The number of values which are entered into a table by the user depends on the available information which is at the user's disposal and on the level of accuracy which the user desires. A favourable option for the user is to use the file D-demo. The tables in this file correspond with the standard ship-size data, as represented in Figures 4.1 to 4.4.

T-FILE

GENERAL INFORMATION

* Number of terminals
* Default value for the length of the arrival-pattern of cargo with inland transport (number of days)
* Default value for the length of the departure-pattern of cargo with inland transport (number of days)

NB: The default value for the length of the patterns should be equal to the length of the dwelltime of the cargotype with the longest dwelltime.
Figure 4.1
Containerships

Figure 4.2
General cargo ships
Figure 4.3
Tankers

Figure 4.4
Bulk carriers
* Interval-time of maintenance to a crane (hours)
* Mean duration of interval to a crane (hours)
* Mean interval-time of breakdowns of a crane (days)
* Mean duration of a breakdown of a crane (hours)
* Standard deviation of duration of a breakdown of a crane (hours)

NB: The interval-time of breakdowns of a crane is drawn from an exponential distribution
NB: The duration of breakdowns of a crane is drawn from a normal distribution

FOR EACH TERMINAL:

* GENERAL CHARACTERISTICS OF A TERMINAL
  - Number of cargo-types
  - Number of berths
  - Number of cranes (or crane-substituting units, for example manual labour or tractors handling Roro-containers from Roro-ships)
  - Daily number of shifts
  - Availability of inland-transport on saturdays
  - Availability of inland-transport on sundays
  - Availability of shifts on saturdays
  - Availability of shifts on sundays
  - Number of equipment-units at the terminal, other than cranes
  - Mean percentage of throughput of cargo that is handled by these equipment-units; this percentage is required to indicate if a certain part of the cargo at a terminal is not handled by terminal-equipment but only by cranes or crane-substituting units.
  - Mean cargo-handling capacity of one equipment unit (tons/hour): also equipment handling containers; in this case the capacity should be calculated using the mean weight of a containers (10 - 15 tons)
  - Total capacity for storage of containers and breakbulk (m³)
  - Total capacity for storage of liquid and dry bulk (m³)
  - Net operation factor; this factor indicates the loss of gross capacity during shifts

* FOR EACH SHIFT:
  - Starting time (hours)
  - Gross duration (hours)

NB: the first shift is the one with the earliest starting time; the maximum of the sum of the durations is 24.
* FOR EACH BERTH:
- Serial number
- Type (single/multiple)
- Capacity (number of ships, one for a single berth; two or more for a multiple berth)
- Length (m)
- Water-depth (m)
- Number of cranes or crane-substituting units
- Number of cargo-types handled at that berth (maximum: three)
- For each cargo-type: serial-number

* FOR EACH CRANE OR CRANE-SUBSTITUTING UNIT:
- Name
- Serial number
- Reference number to the berth to which the crane or crane-substituting unit belongs
- Gross capacity for loading (for containers boxes per hour; for other cargo-types tons/hour)
- Gross capacity for unloading (for containers boxes per hour; for other cargo-types tons/hour)
- Minimum and maximum of the crane range on the quay (m): the crane range indicates for a multiple berth the physical range on the quay; if a crane can cover the entire quay the values zero and berth-length should be entered; for cranes at a single berth default values should be entered (they are not of importance)

* FOR EACH CARGO-TYPE:

- GENERAL CHARACTERISTICS
  + Name
  + Reference number (which corresponds with the cargo-type-numbers of the ship-classes and the numbers of the cargo-types that are handled each berth)
  + Code of the cargo type (A for containers, B for breakbulk, C for liquid bulk, D for dry bulk; the code corresponds which the code of the shipclass’ cargo)

- STORAGE CHARACTERISTICS
  + Gross factor (factor for travelling lanes etc.)
  + Only for breakbulk, liquid and dry bulk: mean density (ton/m³)
  + Only for breakbulk: mean stackheight (m)
  + Only for containers: mean stackheight of the export-stack, the import-stack and the empties-stack (expressed in the number of containers)
  + Only for containers: the mean percentage of empties in the export-containers and in the import-containers
Only for containers: the mean percentage of forty feet-containers in the export-containers and in the import-containers

- CHARACTERISTICS OF INLAND TRANSPORT MODES
  + Mean capacity of trucks (TEU/truck for containers, ton/truck for the other commodities)
  + Mean capacity of wagons (TEU/wagon for containers, ton/wagon for the other commodities)
  + Mean capacity of barges (TEU/barge for containers, ton/barge for the other commodities)

- CHARACTERISTICS OF ARRIVAL-PATTERN WITH INLAND TRANSPORT
  + For each day in the pattern: the sum of the percentages of cargo arriving on that day with the three modes of transport
  + For each of the three modes: the percentage of arrivals that are loaded directly
    NB: The sum of all these percentages is 100

- CHARACTERISTICS OF DEPARTURE-PATTERN WITH INLAND TRANSPORT
  + For each day in the pattern: the sum of the percentages of cargo departing on that day with the three modes of transport
  + For each of the three modes: the percentage of departures that are unloaded directly
    NB: The sum of all these percentages is 100
Performing a simulation

5.1 Introduction

When the user has created or adapted the input-files H-file, S-file, D-file and T-file, a simulation-run can be performed. Summarized, the procedure is as follows:

* The user creates an environment for the simulation-run: this is explained in the next paragraph.
* Next, the user starts the simulation-run, according to the procedure which is stated in chapter 3.
* When HASPORT-II has read all input-data, it interrupts the run; HASPORT-II then indicates the number of errors in the input-files and invites the user to correct these possible errors and to check if all reference-numbers of cargotypes and cranes have been entered correctly. HASPORT-II has created a User Data File which shows a specification of the errors and a summary of the used reference-number. From now on this file is called C-file.
* The user goes to the <Update>-list of User Data Files, checks the C-file, corrects possible errors in the H-file, S-file, D-file and T-file. The error-specification is dealt with in paragraph 5.3.
* Next, the user starts the simulation-run again. Once again the run is interrupted after reading the data and the user may again go to the User Data Files. When the user decides that the input is correct, he/she can continue the simulation-run from the interruption-point, by choosing the option <Proceed> in the Runtime-menu. Specifications of running the program are discussed in paragraph 5.4
* When HASPORT-II finishes the simulation-run, the user can view the results. The facilities for doing so are explained in the next chapter.

5.2 Creating an environment

The environment of a simulation-run consists of the files from which the input-information of the run is extracted and of the files to which the output-information of the run is transferred. (In case graphics or animation are performed for the port-system, the environment also consists of the files that support these facilities. They are called Picture file and Storestream for the graphics-facility and Compilation file for the animation-facility.)

The user must enter names for each of these files. For each input-file (H-file, S-file, D-file, T-file), Picture file, Storestream and Compilation-file Prosim shows the list of files to choose from by pressing <F8>. For the output-files C-file (containing the error-specification and
reference-checklist) and R-file (containing the simulation-report) the user can also choose a name using <F8> but then the chosen report will be overwritten; therefore it is advised to enter new names for the C-file and R-file.

The third output-file of the simulation-run, the Store-file containing the Storestreams does not specifically belong to the environment which has to be specified before a run. The Store-file is given a name after the simulation-run.

5.3 Error-handling

When the user has started a run, HASPORT-II reads the input-data and then interrupts the run, giving the user the possibility to ensure that the input-data is faultless. HASPORT-II shows the number of errors in the input-data on the screen. If errors have been made, the user should look into the C-file for the specifications of the errors and update the input-files accordingly. If the number of errors is zero the user can continue the run by choosing the option <Proceed> in the Runtime-menu; however if it is the first time the run has been started, it is advised that the user checks the reference-numbers of the cargotypes and cranes which he/she applied in the input. Errors in the reference-numbers may be a source for an incorrect simulation; nevertheless they are not found by HASPORT-II. The C-file therefore also shows a checklist of reference-numbers.

HASPORT-II distinguishes the following sorts of mistakes:

* Illegal values for a mean interarrival-time (these values should not be 0)
* Values which are too big or too small (for example: boundaries compared to mean values)
* Illegal values for switches (these values should be 0 or 1)
* Sets of percentages which should add up to 100 but do not do so
* Incorrect number of values for the storage-characteristics of a cargo-type
* Input-files which contain too much data

The errors of the above categories are specified in the C-file. Besides this, Prosim automatically stops reading data when the types of variables (characters, reals, integers) are mixed up or when a file does not contain enough data, both indicating the user that errors in the input-files have been made. Naturally these errors are not directly specified in the C-file.
As stated above, the C-file also shows a checklist of reference-numbers. The checklist for reference-numbers of cargotypes consists of:

* (1) A matrix of cargo-reference-numbers, showing the reference-number of cargo of a shipclass at each terminal the ships of that shipclass can attend (this matrix is created on the basis of the information from the S-file)
* (2) For each terminal: the reference-numbers of the cargotypes which are handled at that terminal, according to the T-file
* (3) For each berth: the reference-numbers of the cargo-types which are handled at that berth, according to the T-file

The user can compare checks (1) and (2) and checks (2) and (3) to find possible faults in the cargotype-references.

The checklist for crane-reference numbers consists of:

* (4) For each berth: the number of cranes at that berth, according to the berth-data in the T-file
* (5) For each berth: the names of the cranes at that berth, according to the crane-data in the T-file

The user can compare checks (4) and (5) to find possible faults in the crane-references.

Needless to say, it is advised to not fully perform a simulation-run until all errors have corrected and all references are in order.

5.4 Running the program

When all errors have been excluded from the input-files, the simulation-run can be performed. At the moment HASPORT-II interrupts the run to show the number of errors, the user can proceed the run by choosing <Proceed> in the Runtime-menu. Please note the conditions for the switches in the Runtime-menu (as stated in paragraph 3.3).

In the left-bottom corner of the Runtime-screen, the simulated period of time that has elapsed is shown (in the number of days); the user can use this as a standard to determine the time required until the end of the run.

During the run, the user can freeze the simulation, by pressing <F9> and any key to continue, and the user can interrupt the simulation, by pressing <Esc>. An interruption
causes the Runtime-menu to appear, offering the user several options. The main options for the non-Prosim-acquainted user is:

* Quitting the run.
* Data handling. This option offers the facility to view the graphs and histograms of the storestreams of a simulation-run during or directly after the run. During the run, it shows the streams up to the moment of interruption. The procedure of dealing with storestreams is discussed in paragraph 6.2.
* Proceeding the run.

At the end of the run, any key can be pressed to return to the Runtime-menu. The same options as in the case of interrupting a run are available, except for <Proceed>.
6 Output-facilities

6.1 Introduction

In chapter 2.3 the output-results, which can be achieved with a port simulation using HASPORT-II, are summarized. HASPORT-II offers two important modes to show this information to the user. The first is a written report which Prosim shapes as a User Data File (from now on called R-file). The second is a set of Storestreams based on which graphs, histograms and barcharts can be produced.

Storestreams are discussed in paragraph 6.2. The output-data which can be viewed with Storestreams consist of:

* Utilisation of terminal storage for each cargo-type
* Occupancy-rate of the total storage-facility of a terminal
* Daily quantities of arrival and departing cargo at a terminal
* Occupied number of waiting spots at the anchorage for entering the port
* Number of ships at a berth

The R-file is explained in paragraph 6.3. The output-data which are written to the R-file are:

* Annual throughput per terminal (in tons or TEU)
* Number of trucks, wagons and barges leaving/entering the terminal per year
* Berth-occupancy
* Distribution of the time that berths are occupied
* Utilisation of ship-quay/quay-ship cargohandling equipment
* Indication for the utilisation of other cargo-handling equipment on the terminal
* Ships’ waiting time, ships’ service time and ships’ total time at berth per class of ships
* Delays to ships and to cargo-handling activities due to equipment breakdowns, climatic downtime, strikes, tide

As stated earlier, Prosim also offers facilities for Graphics and Animation. These conditions for these facilities (Pictures files, Figures files etc.) have to be especially created for each model, which is outside the reach of the non-Prosim-acquainted user. However, the example of chapter 8 does possess the possibility for a Graphics-demonstration and a simple Animation-viewing. These facilities are therefore briefly discussed in the fourth paragraph of this chapter.
6.2 Storestreams

Storestreams are arrays of figures, representing the time-dependant behaviour of variables. Prosim can automatically shape these data into graphs, barcharts and histograms. These facilities, especially the histograms, are of great importance for the user for viewing and analyzing the results of a simulation.

As stated above, storestreams are used in HASPORT-II to show the results concerning the utilisation of terminal-storage, the occupancy of the anchorage and the number of ships at berths. When the user has followed the route to the list of storestreams, as indicated in chapter 3, he/she chooses the stream which is required to be viewed; then the user is asked whether the stream should be shaped to a graph, a histogram, a forward-barchart or a backward-barchart. If the streamhandling-facility has been chosen, using the route via the File Handling-menu, then the user has some extra possibilities to create output with the streams, including an option <Info>, which gives a short list of information about the stream.

For graphs and barcharts the user can use the arrow-keys to zoom in on parts of the charts. For histograms it is possible to adapt the class-width and class-boundaries (using <F8> and <F9> to select the option and <F2> to enter the chosen value). For all three charts, prints can be made by pressing <F7>.

The following streams are advised to be viewed as barcharts or histograms:

- **ROW** Distribution of the number of ships at the anchorage.
- **Q_BERTHx** Distribution of the number of ships at berth x

The other streams are advised to be viewed as histograms or graphs. They are:

- **xEXSLyyy** Distribution of the number of occupied groundslots for export-containers on terminal x for (container-) cargotype yyy
- **xIMSLyyy** Distribution of the number of occupied groundslots for import-containers on terminal x for (container-) cargotype yyy
- **xEMSLyyy** Distribution of the number of occupied groundslots for empty containers on terminal x for (container-) cargotype yyy
- **xOPENyyy** Distribution of the occupied open storage area for (container/breakbulk-)
cargotype yyy on terminal x (m³)

xCOVyyy  Distribution of the occupied covered storage area (sheds, warehouses, etc.) for (breakbulk-) cargotype yyy on terminal x (m³)

xVOLyyy  Distribution of the occupied storage volume for (liquid or dry bulk) cargotype yyy on terminal x (m³)

xARRyyy  Distribution of the daily quantity of arrivals of cargotype yyy on terminal x (tons or TEU)

xDEPyyy  Distribution of the daily quantity of departures of cargotype yyy on terminal x (tons or TEU)

xFEEDyyy Distribution of the quantity of feeder-cargo (cargo which is transhipped from one ship to another without leaving the terminal) of cargotype yyy on terminal x (tons or TEU)

xAREA_OR Distribution of the occupancy-rate of the total storage-area of terminal x

xSTO_OR  Distribution of the occupancy-rate of the total storage-volume of terminal x

Together with the histogram, the mean, standard deviation, 90%-boundary, 95%-boundary, minimum and maximum values are shown on the screen.

6.3  Report-file

The output-information which is supplied by the T-file can be split up in three basic categories: the performance of the terminals (including all terminal-parts like berths and cranes), the performance of the ships and the delays due to the restrictions on the operations.

The output-data for each terminal consist of:

*  Average annual number of ships at the terminal
*  Annual throughput of each cargotype
*  Annual number of trucks, wagons and barges leaving and entering the terminal
*  Annual occupancy-rate of each berth
* Performance of each berth; annual time c.q. quaylength-time not occupied, annual time c.q. quaylength-time occupied; the latter is specified in:
  - Full operation
  - Partial operation, due to the breakdown of a crane
  - Not in operation due to delays: no shifts at work, bad weather, strikes, shifting of ships

* Performance of each crane; specified in:
  - Annual time in operation
  - Annual time not in operation due to a breakdown
  - Annual time not in operation due to delays: no shifts at work, bad weather, strikes, shifting of ships
  - Annual time in maintenance (maintenance is considered to take place during times the quay is not occupied)
  - Annual time at rest

* Average annual number of shifting of ships
* Average annual number of shiftings of cranes
* Indication of the annual average annual time in operation of the terminal equipment

The output-data for each shipclass consist of:

* Average annual number of ships of that shipclass visiting the port
* Average ratio of the annual time spent at the anchorage divided by the time spent at the quay
* Average time spent at the anchorage
* Average mooring time (sailing from the anchorage to the quay)
* Average time spent at the quay; specified in:
  - Time in full operation
  - Time in partial operation (due to the breakdown of a crane)
  - Time not in operation due to a delay: no shifts at work, bad weather, strike, shifting of the ship

The performances of the berths and of the shipclasses are described in greater detail in the part of the R-file which specifies the consequences of the restrictions on the operations: strikes, bad weather, tidal window, breakdowns of cranes, no shifts at work (= gross - net operation time).

For each berth the causes of the delays to the operations at that berth are specified (breakdowns of cranes, strikes, bad weather, shifting of ships, gross - net operation time) and
the causes of the periods of time that the berth is not occupied are specified (tidal window, bad weather, no ships at the anchorage which can moor at the berth).

For each shipclass the causes of the waiting time at the anchorage are specified (all suitable berths are occupied, tide, bad weather) and the causes of delays while moored at the quay are specified (breakdowns of cranes, strikes, bad weather, shifting of ships, gross - net operation time).

A note of caution when reading these specified data is the following: delays can take place at the same time. When this is the case during the simulation, the delayed time is attributed to the restriction on the operations which started first.

6.4 Graphics and animation

With the Graphics-facility of Prosim, different kinds of pictures can be created. For HASPORT-II, the main objective of using this facility concerns the display on the monitor of information on the basis of the Storestreams. Prosim offers two possibilities to do this. The first is depicting graphs and histograms statically, the second is depicting a dynamic graph-animation.

The advantage of using the Graphics-facility for creating graphs instead of the facilities for Stream-handling and Data-handling is that the graphs and histograms can be constructed with user defined features. This means for example that the user can define the size of the graphs, the range of the axes, the number of streams in one graph and the number of graphs on the monitor and that the user can add text to the graphs. Therefore this is a useful facility for demonstrating HASPORT-II. The disadvantage is that the graphs have to be made especially while the Streamhandling and Data-handling facilities create the graphs automatically.

The possibility for depicting a dynamic graph-animation is another way of displaying streams and thereby demonstrating the simulation-model. During a run, the time-dependant behaviour of a stream can be shown. A dynamic graph is created in the same way as a static graph; it is also shaped with user defined characteristics.

The Animation-facility of Prosim can be used to visualize the activities which are simulated by a model. For HASPORT-II several aspects of the port operations are interesting to animate and, if required by the user, such an animation can be produced. For ships the movements through the port-system can be shown: the arrival at the port, the waiting-period at the anchorage, the mooring-operation, the period of unloading and loading at the quay and the operation of sailing out the port. For the cargo-types the cargo-flow in the port-system can
be animated: arrival and departure with inland transport, arrival and departure with ships, storage on the terminal. For the terminals, the operational phases of the cranes and other equipment (in operation, at rest, breakdown) can be depicted. For the port-system, the presence of restrictions (tide, strike, bad weather) can be visualized.

Naturally the behaviour of all these system-components cannot be animated at the same time, so when performing an animation a choice has to be made. However the Animation-facility offers a useful possibility to form a better understanding of the behaviour of different aspects of the model and secondly, to demonstrate the features of HASPORT-II.
Analysis of results

To ensure that a user of HASPORT-II makes proper use of the output-information of a simulation-run, this chapter will give some remarks which deal with several aspects of the analysis of produced results.

* All data on the performances of terminals, berths and cranes in the Report-file are on an annual basis.

* All data on the performance of ship-classes are average values for one ship of that class.

* The results for storage-occupation of the first 100 days of the simulation are left out of the output-data in order to give an undistorted view of storage-requirements.

* The results can be considered valid if a sufficient length of time and a sufficient number of arriving ships at each terminal have been simulated. A period of time which corresponds with 1000 arriving ships per terminal is suitable.

* HASPORT-II has been verified; results which are produced by the model are of the correct order of magnitude. When a port is simulated, it is of importance that first a calibration of the model is performed by the user, using input-information of the existing port- and terminal-configuration and comparing the output-data with current performances of terminals and ship-classes.

* The output-data in the Report-file for the detailed performances of the berths and the ship-classes contain specifications of the origins of the delays to the berths and ship-classes. As stated in the previous chapter, delays can take place at the same time. In those cases the delay is attributed to the restriction which started first. This implies that, if the user is interested in analyzing the possible causes of delays, several simulation-runs are required to point out those delays. During these runs the effect of the restrictions on the operations should first be analyzed separately, by simultaneously switching the several restrictions on and off, and should only then be considered jointly. This routine is required to ensure that the user does not misinterpret the produced results.
The last chapter of this manual is contributed to an example of an imaginary port which is modelled and simulated with HASPORT-II. The input-files of this model are D-demo, H-demo, S-demo and T-demo; prints of these files are added to this manual.

The demo-port has four terminals, with the following general characteristics:

* Terminal 1; cargo-types are containers and general breakbulk; three berths, two single and one multiple with capacity for two ships; 6 cranes; 3 shifts

* Terminal 2; cargo-types are bananas and general breakbulk; one multiple berth with capacity for three ships; 3 cranes; 3 shifts

* Terminal 3; cargo-types are vegetable_oil; two single berths; 2 cranes; 3 shifts

* Terminal 4; cargo-types are wheat and general breakbulk; one multiple berth with capacity for two ships; 2 cranes; 3 shifts

Five shipclasses attend the port, with the following general characteristics:

* Shipclass 1; container-ship carrying containers; Poisson-interarrival-time; no ships’ gear; no priority; destination is terminal 1

* Shipclass 2; general cargo-ship carrying breakbulk; Poisson-interarrival-time; ships’ gear included; no priority; destinations are terminal 1, 2 and 4

* Shipclass 3; general cargo-ship carrying bananas; Poisson-interarrival-time; ships’ gear included; has priority; destination is terminal 2

* Shipclass 4; liquid bulk carrier carrying vegetable oil; Poisson-interarrival-time; ships’ gear included; no priority; destination is terminal 3

* Shipclass 5; dry bulk (grains) carrier carrying wheat; Poisson-interarrival-time; ships’ gear included; no priority; destination is terminal 4

The port has a tidal window and the switches for strikes and bad weather conditions are on.
Added to this manual are the prints of the checklist-file and the report-file C-demo and R-demo. The store-file of the demo-model is STORE_DE. From this file, the histograms of the following streams have been added:

ROW Waiting row at the anchorage
Q_BERTH4 Number of ships at (multiple) berth 4
1EXSL101 Number of occupied groundslots for export-containers on terminal 1
1IMSL101 Number of occupied groundslots for export-containers on terminal 1
2OPEN202 Occupied open storage area for general breakbulk on terminal 2 (m²)
2COV202 Occupied covered storage area for general breakbulk on terminal 2 (m²)
3ARR301 Daily arrivals of tons of vegetable oil with inland transport at terminal 3
3DEP301 Daily departures of tons of vegetable oil with inland transport from terminal 3
4VOL401 Occupied storage-volume (in m³) for wheat on terminal 4
4_AREA_OR Occupation-rate of the total storage-area on terminal 4

With the Graphics-facility the Picture-file Gr-demo1 can be selected. With this file four Storestreams are depicted: a histogram of the stream ROW and graphs of the streams 2OPEN202, 2COV202 and 4_AREA_OR.

The Picture-file Gr-demo2 contains the information for showing the dynamic behaviour of 4VOL401. The dynamic graph-animation can be performed by running the demo-model and choosing the option Window: <Graphics> in the Run Control Menu. After 100 days, the dynamic graph-animation starts.

The Figure-file F-demo and the Compilation-file A-demo contain the information for showing a simple animation of the demo-model. This animation is not yet available.
@ INFORMATION-FILE OF HARBOUR @

M, number of first day of typhoon-season (M<365) @ #
N, number of last day of typhoon-season (M<N<366) @ #
Mean inter-arrivaltime of typhoons (days) @ #
Mean duration of typhoons (days) @ #
Deviation of duration of typhoons (days) @ #
Mean inter-arrivaltime of strikes (days) @ #
Mean duration of strikes (days) @ #
Deviation of duration of strikes (days) @ #
Seed of typhoon-inter-arrivaltime @ 12346
Seed of typhoon-duration @ 45678
Seed of strike-inter-arrivaltime @ 56780
Seed of strike-duration @ 67890

Mean water-depth at entrance channel (m.) @ #
Amplitude of S2-tide (m.) @ #
Period of S2-tide (days) @ #
Phase angle of S2-tide (rad.) @ #
Amplitude of M2-tide (m.) @ #
Period of M2-tide (days) @ #
Phase angle of M2-tide (rad.) @ #

Strike-restriction: 1=on 0=off @ #
Typhoon-restriction: 1=on 0=off @ #

Simulation time (days) @ #
Close file @ ~1
### 1: CONTAINERSHIPS

<table>
<thead>
<tr>
<th>DWT</th>
<th>(m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2: GENERAL CARGO SHIPS

<table>
<thead>
<tr>
<th>DWT</th>
<th>(m.)</th>
</tr>
</thead>
<tbody>
<tr>
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<td></td>
</tr>
</tbody>
</table>

### 3: TANKERS

<table>
<thead>
<tr>
<th>DWT</th>
<th>(m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 4: BULK CARRIERS

<table>
<thead>
<tr>
<th>DWT</th>
<th>(m.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>@ INFORMATION-FILE OF SHIPS @</td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>@ Number of classes @ #</td>
<td></td>
</tr>
<tr>
<td>@ Choose distribution of inter-arrivaltime: @</td>
<td></td>
</tr>
<tr>
<td>@ Poisson=0 Normal(for feeder-service)=1 @ #</td>
<td></td>
</tr>
<tr>
<td>@ Mean interarrivaltime (days) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Deviation of interarrivaltime (days; 0 if distr=Pois) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Percentage of transshipment cargo @ #</td>
<td></td>
</tr>
<tr>
<td>@ Mean total quantity of import-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Deviation of total quantity of import-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Minimum value of total quant. of imp.-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Maximum value of total quant. of imp.-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Mean total quantity of export-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Deviation of total quantity of export-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Minimum value of total quant. of exp.-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Maximum value of total quant. of exp.-cargo (TEU) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Minimum value of DWT @ #</td>
<td></td>
</tr>
<tr>
<td>@ Maximum value of DWT @ #</td>
<td></td>
</tr>
<tr>
<td>@ Mean mooring time (hours) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Deviation of mooring time (hours) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Lower boundary of mooring time (hours) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Mean percentage of cargo to be stored under cover @ #</td>
<td></td>
</tr>
<tr>
<td>@ Deviation of percentage of cargo under cover @ #</td>
<td></td>
</tr>
<tr>
<td>@ Required number of cranes to unload\load the ship @ #</td>
<td></td>
</tr>
<tr>
<td>@ Net loading cap. of ships' gear (box c.q. ton\hour) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Net unloading cap. of ships' gear (box c.q. ton\hour) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Do ships of this class receive priority by the @ #</td>
<td></td>
</tr>
<tr>
<td>@ harbour-master (1=yes 0=no) @ #</td>
<td></td>
</tr>
<tr>
<td>@ Cargo-code: # @ #</td>
<td></td>
</tr>
<tr>
<td>@ Number of terminals: # @</td>
<td></td>
</tr>
<tr>
<td>@ For each terminal xxxxxxxxxxxxxxxxxxxxxxxxxxxxxx @</td>
<td></td>
</tr>
<tr>
<td>@ Percentage of ships going to terminal @ #</td>
<td></td>
</tr>
<tr>
<td>@ Reference number of the cargotype at this terminal @ #</td>
<td></td>
</tr>
<tr>
<td>@ xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx @</td>
<td></td>
</tr>
<tr>
<td>----------------------------- @</td>
<td></td>
</tr>
<tr>
<td>@ Close file @ ~1 @</td>
<td></td>
</tr>
</tbody>
</table>
1 INFORMATION-FILE OF TERMINAL(S) @

2 @ Number of terminals @ #

3 @ Number of days of inland transport-arrivals (M1) @ #

4 @ Number of days of inland transport-departures (M2) @ #

5 @ %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

6 @ TERMINAL # @

7 @ Number of handled cargo-types at this terminal @ #

8 @ ------------------ FOR EACH CARGO-TYPE: CONTAINERS -----------------------

9 @ Cargo-type nr. 1 @

10 @ Name (max. 10 char.) @ CONTAINERS

11 @ Reference number @ #

12 @ Cargotype-code @ #

13 @ Percentage of arrivals on day N (-M1 ≤ N ≤ -1) @

14 @ N Road\Rail\Barge Total @

15 @ -M1 # # # @ #

16 @ -(M1-1) # # # @ #

17 @ . . . @ .

18 @ . . . @ .

19 @ . . . @ .

20 @ . . . @ .

21 @ . . . @ .

22 @ . . . @ .

23 @ -2 # # # @ #

24 @ -1 # # # @ #

25 @ Direct # # # @ #

26 @ --- --- --- --- @

27 @ Total @ # # # @ 100 @

28 @ Percentage of departures on day N (1 ≤ N ≤ M2) @

29 @ N Road\Rail\Barge Total @

30 @ Direct # # # @ #

31 @ 1 # # # @ #

32 @ 2 # # # @ #

33 @ . . . @ .

34 @ . . . @ .

35 @ . . . @ .

36 @ . . . @ .

37 @ M2-1 # # # @ #

38 @ M1 # # # @ #

39 @ --- --- --- --- @

40 @ Total @ # # # @ 100 @

41 @ Mean stackheight of import-containers @ #

42 @ Mean stackheight of export-containers @ #

43 @ Mean stackheight of empty containers @ #

44 @ Mean percentage of empty import-containers @ #

45 @ Mean percentage of empty export-containers @ #

46 @ Mean percentage of fortyfeet import-containers @ #

47 @ Mean percentage of fortyfeet export-containers @ #

48 @ Gross factor @ #

49 @ Mean capacity of trucks (TEU\truck) @ #

50 @ Mean capacity of wagons (TEU\wagon) @ #

51 @ Mean capacity of barges (TEU\barge) @ #

52 @ Close input for this cargotype ("1) @ ~1

53 @ --- --- --- --- @

54 @ FOR EACH CARGO-TYPE: BREAKBULK -------------------------------

55 @ Cargo-type nr. 2 @

56 @ Name (max. 10 char.) @ #
FOR EACH CARGO-TYPE: LIQUID BULK

Name (max. 10 char.) Reference number Cargotype-code

Percentage of arrivals on day N (-M1 ≤ N ≤ -1)

N Road\Rail\Barge Total

-M1 # # # @ #
-(M1-1) # # # @ #
... # # # @ #
... # # # @ #
-2 # # # @ #
-1 # # # @ #
Direct # # # @ #

Total @ # # # @ 100 @

Percentage of departures on day N (1 ≤ N ≤ M2)

N Road\Rail\Barge Total

Direct # # # @ #
1 # # # @ #
2 # # # @ #
... # # # @ #
M2-1 # # # @ #
M1 # # # @ #

Total @ # # # @ 100 @

Mean stackheight (m) Mean relative density (ton\m^3)

Gross factor Mean capacity of trucks (ton\truck) Mean capacity of wagons (ton\wagon)
Mean capacity of barges (ton\barge)

Close input for this cargotype (~1)

-------------------------- FOR EACH CARGO-TYPE: LIQUID BULK --------------------------
<table>
<thead>
<tr>
<th>Percentage of arrivals on day N ((-M1 &lt; N &lt; -1)) @</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>122</td>
</tr>
<tr>
<td>123</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

127 @ Mean relative density (ton\m³) @ #

129 @ Gross factor @ #

130 @ Mean capacity of trucks (ton\truck) @ #

131 @ Mean capacity of wagons (ton\wagon) @ #

132 @ Mean capacity of barges (ton\barge) @ #

133 @ Close input for this cargotype (~1) @ ~1

135 @ ----------------- FOR EACH CARGO-TYPE: DRY BULK ------------------

136 @ Cargo-type nr. 4 @

137 @ Name (max. 10 char.) @ #

138 @ Reference number @ #

139 @ Cargotype-code @ #

140 @ Percentage of arrivals on day N (\(-M1 < N < -1)\) @

141 @ N | Road\Rail\Barge | Total @
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>142</td>
<td>-M1</td>
<td>#</td>
</tr>
<tr>
<td>143</td>
<td>-(M1-1)</td>
<td>#</td>
</tr>
<tr>
<td>144</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>145</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>146</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>147</td>
<td>-2</td>
<td>#</td>
</tr>
<tr>
<td>148</td>
<td>-1</td>
<td>#</td>
</tr>
<tr>
<td>149</td>
<td>Direct</td>
<td>#</td>
</tr>
<tr>
<td>150</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>151</td>
<td>Total</td>
<td>@</td>
</tr>
</tbody>
</table>

152 @ Percentage of departures on day N (1 < N < M2) @

153 @ N | Road\Rail\Barge | Total @
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>154</td>
<td>Direct</td>
<td>#</td>
</tr>
<tr>
<td>155</td>
<td>1</td>
<td>#</td>
</tr>
<tr>
<td>156</td>
<td>2</td>
<td>#</td>
</tr>
<tr>
<td>157</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>158</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>159</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>160</td>
<td>M2-1</td>
<td>#</td>
</tr>
<tr>
<td>161</td>
<td>M1</td>
<td>#</td>
</tr>
<tr>
<td>162</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>163</td>
<td>Total</td>
<td>@</td>
</tr>
</tbody>
</table>

164 @ Mean relative density (ton\m³) @ #

166 @ Gross factor @ #

168 @ Mean capacity of trucks (ton\truck) @ #

169 @ Mean capacity of wagons (ton\wagon) @ #

170 @ Mean capacity of barges (ton\barge) @ #

171 @ Close input for this cargotype (~1) @ ~1

172 @

173 @ Number of berths @ #

174 @ Berth-Single=1 | Length\|Depth\|Nr. of|Number of |Ship name\|Multiple=0|(m) |(m) |cranes\|cargotype\|cargotype\|Cap.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td>@</td>
<td>#</td>
</tr>
<tr>
<td>176</td>
<td>@</td>
<td>---</td>
</tr>
<tr>
<td>177</td>
<td>@</td>
<td>#</td>
</tr>
<tr>
<td>178</td>
<td>@</td>
<td>Total number of cranes @ #</td>
</tr>
</tbody>
</table>

179 @ Total number of cranes @ #

180 @ Name (max 10 | Crane-| Range | Load-| Unload-|Berth @

181 @ characters) | number\|Min. | Max. | cap. | cap. |number @
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>182</td>
<td>@</td>
<td>#</td>
</tr>
</tbody>
</table>
| 183 | NB: 1) The crane-capacity-unit for container-berths is boxes\hour @

184 @
The crane-capacity-unit for other berths is boxes/hour

2) Use all sequential numbers for the crane-numbers; allocate the crane-numbers in order of physical appearance

3) Enter dummy values for the minimum and maximum of the crane-range if they belong to a single berth

Is there inland-transport on saturday? (1=yes 0=no) @ #
Is there inland-transport on sunday? (1=yes 0=no) @ #
Are shifts taking place on saturday? (1=yes 0=no) @ #
Are shifts taking place on sunday? (1=yes 0=no) @ #

Capacity of storage-area (m2) @ #
Capacity of storage-volume (m3) @ #
Number of terminal-equipment-units @ #
Mean capacity of one equipment-unit (ton/hour) @ #
Percentage of cargo that is handled by the equip. @ #
Net operation factor (0 < N < 1) @ #

Number of shifts per day (1\2\3) @ #
Starting time of shift nr. # (hours) @ #
Duration of shift nr. # (hours) @ #

FOR ALL TERMINALS @

Mean cranebreakdown-interarrivaltime (days) @ #
Mean cranebreakdown-duration (hours) @ #
Deviation of cranebreakdown-duration (days) @ #
Intervaltime of maintenance to cranes (hours) @ #
Duration of maintenance to cranes (hours) @ #
Seed of cranebreakdown-interarrivaltime @ 121121
Seed of cranebreakdown-duration @ 122122
Seed of UNIF23 @ 123123

Close file @ ~1
<table>
<thead>
<tr>
<th></th>
<th>INFORMATION-FILE OF HARBOUR</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M, number of first day of typhoon-season (M&lt;365)</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>N, number of last day of typhoon-season (M&lt;N&lt;366)</td>
<td>365</td>
</tr>
<tr>
<td>3</td>
<td>Mean inter-arrivaltime of typhoons (days)</td>
<td>125</td>
</tr>
<tr>
<td>4</td>
<td>Mean duration of typhoons (days)</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Deviation of duration of typhoons (days)</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Mean inter-arrivaltime of strikes (days)</td>
<td>125</td>
</tr>
<tr>
<td>7</td>
<td>Mean duration of strikes (days)</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>Deviation of duration of strikes (days)</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>Seed of typhoon-inter-arrivaltime</td>
<td>12346</td>
</tr>
<tr>
<td>10</td>
<td>Seed of typhoon-duration</td>
<td>45678</td>
</tr>
<tr>
<td>11</td>
<td>Seed of strike-inter-arrivaltime</td>
<td>56780</td>
</tr>
<tr>
<td>12</td>
<td>Seed of strike-duration</td>
<td>67890</td>
</tr>
<tr>
<td>13</td>
<td>Mean water-depth at entrance channel (m.)</td>
<td>13</td>
</tr>
<tr>
<td>14</td>
<td>Amplitude of S2-tide (m.)</td>
<td>0.75</td>
</tr>
<tr>
<td>15</td>
<td>Period of S2-tide (days)</td>
<td>0.517361</td>
</tr>
<tr>
<td>16</td>
<td>Phase angle of S2-tide (rad.)</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>Amplitude of M2-tide (m.)</td>
<td>0.25</td>
</tr>
<tr>
<td>18</td>
<td>Period of M2-tide (days)</td>
<td>14.76</td>
</tr>
<tr>
<td>19</td>
<td>Phase angle of M2-tide (rad.)</td>
<td>0</td>
</tr>
<tr>
<td>20</td>
<td>Strike-restriction: 1=on 0=off</td>
<td>1</td>
</tr>
<tr>
<td>21</td>
<td>Typhoon-restriction: 1=on 0=off</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>Simulation time (days)</td>
<td>300</td>
</tr>
<tr>
<td>23</td>
<td>Close file</td>
<td>~1</td>
</tr>
</tbody>
</table>
1 @ INFORMATION-FILE OF DWT-TABLES FOR SHIPCLASSES @

4 @ 1: CONTAINERSHIPS @

<table>
<thead>
<tr>
<th>DWT</th>
<th>d (m.)</th>
</tr>
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<tbody>
<tr>
<td>10000</td>
<td>8.3</td>
</tr>
<tr>
<td>15000</td>
<td>9.2</td>
</tr>
<tr>
<td>20000</td>
<td>10.0</td>
</tr>
<tr>
<td>25000</td>
<td>10.5</td>
</tr>
<tr>
<td>30000</td>
<td>11.1</td>
</tr>
<tr>
<td>35000</td>
<td>11.6</td>
</tr>
<tr>
<td>40000</td>
<td>12.1</td>
</tr>
<tr>
<td>45000</td>
<td>12.5</td>
</tr>
<tr>
<td>50000</td>
<td>12.8</td>
</tr>
<tr>
<td>55000</td>
<td>13.2</td>
</tr>
<tr>
<td>60000</td>
<td>13.5</td>
</tr>
</tbody>
</table>

21 @ DWT  | l (m.) |
| 10000    | 140    |
| 15000    | 168    |
| 20000    | 190    |
| 25000    | 210    |
| 30000    | 230    |
| 35000    | 248    |
| 40000    | 266    |
| 45000    | 273    |
| 50000    | 276    |
| 55000    | 278    |
| 60000    | 279    |

35 @ 2: GENERAL CARGO SHIPS @

<table>
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</tr>
<tr>
<td>30000</td>
<td>10.4</td>
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</table>

47 @ DWT  | l (m.) |
| 5000    | 110    |
| 10000   | 127    |
| 15000   | 142    |
| 20000   | 156    |
| 25000   | 168    |
| 30000   | 180    |

56 @ 3: TANKERS @

<table>
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<tbody>
<tr>
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<td>DWT (m.)</td>
<td>Length (m.)</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
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<tr>
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<tr>
<td>300000</td>
<td>27.6</td>
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@ Close file @ ~1
1 @ INFORMATION-FILE OF SHIPS @

3 @ Number of classes @ 5

5 @ ---- For each class ------------------------------ @

6 @ Name @ CONT-CLASS

7 @ Choose distribution of inter-arrivaltime: @

8 @ Poisson=0 Normal(for feeder-service)=1 @ 0

9 @ Mean interarrivaltime (days) @ 1.3

10 @ Deviation of interarrivaltime (days; 0 if distr=Pois) @ 0

11 @ Percentage of transshipment cargo @ 5

12 @ Mean total quantity of import-cargo (TEU) @ 400

13 @ Deviation of total quantity of import-cargo (TEU) @ 200

14 @ Minimum value of total quant. of imp.-cargo (TEU) @ 100

15 @ Maximum value of total quant. of imp.-cargo (TEU) @ 600

16 @ Mean total quantity of export-cargo (TEU) @ 400

17 @ Deviation of total quantity of export-cargo (TEU) @ 200

18 @ Minimum value of total quant. of exp.-cargo (TEU) @ 100

19 @ Maximum value of total quant. of exp.-cargo (TEU) @ 600

20 @ Minimum value of DWT @ 14000

21 @ Maximum value of DWT @ 18000

22 @ Mean mooring time (hours) @ 6

23 @ Deviation of mooring time (hours) @ 0

24 @ Lower boundary of mooring time (hours) @ 1

25 @ Mean percentage of cargo to be stored under cover @ 0

26 @ Deviation of percentage of cargo under cover @ 0

27 @ Required number of cranes to unload\load the ship @ 2

28 @ Net effective loading cap. of ships' gear(box\hour) @ 0

29 @ Net effective unloading cap. of ships' gear(box\hour) @ 0

30 @ Do ships of this class receive priority by the @ 0

31 @ harbour-master (1=yes 0=no) @ 0

32 @ Cargo-code: A @ 1

33 @ Number of terminals: 4 @

34 @ Percentage of ships going to terminal 1 @ 100

35 @ Reference number of the cargo-type at this terminal @ 101

36 @ Percentage of ships going to terminal 2 @ 0

37 @ Reference number of the cargo-type at this terminal @ 0

38 @ Percentage of ships going to terminal 3 @ 0

39 @ Reference number of the cargo-type at this terminal @ 0

40 @ Percentage of ships going to terminal 4 @ 0

41 @ Reference number of the cargo-type at this terminal @ 0

42 @ Reference number of the cargo-type at this terminal @ 0

43 @ Reference number of the cargo-type at this terminal @ 0

44 @ Reference number of the cargo-type at this terminal @ 0

45 @ ---- For each class ------------------------------ @

46 @ Name @ GEN_CARGO1

47 @ Choose distribution of inter-arrivaltime: @

48 @ Poisson=0 Normal(for feeder-service)=1 @ 0

49 @ Mean interarrivaltime (days) @ 0.7

50 @ Deviation of interarrivaltime (days; 0 if distr=Pois) @ 0

51 @ Percentage of transshipment cargo @ 0

52 @ Mean total quantity of import-cargo (ton) @ 4000

53 @ Deviation of total quantity of import-cargo (ton) @ 2000

54 @ Minimum value of total quant. of imp.-cargo (ton) @ 1000

55 @ Maximum value of total quant. of imp.-cargo (ton) @ 7000

56 @ Mean total quantity of export-cargo (ton) @ 4000

57 @ Deviation of total quantity of export-cargo (ton) @ 2000

58 @ Minimum value of total quant. of exp.-cargo (ton) @ 1000

59 @ Maximum value of total quant. of exp.-cargo (ton) @ 7000

60 @ Minimum value of DWT @ 16000
<table>
<thead>
<tr>
<th>Column</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum value of DWT</td>
<td>18000</td>
</tr>
<tr>
<td>Mean mooring time (hours)</td>
<td>6</td>
</tr>
<tr>
<td>Deviation of mooring time (hours)</td>
<td>0</td>
</tr>
<tr>
<td>Lower boundary of mooring time (hours)</td>
<td>1</td>
</tr>
<tr>
<td>Mean percentage of cargo to be stored under cover</td>
<td>40</td>
</tr>
<tr>
<td>Deviation of percentage of cargo under cover</td>
<td>5</td>
</tr>
<tr>
<td>Required number of cranes to unload\load the ship</td>
<td>1</td>
</tr>
<tr>
<td>Net effective loading cap. of ships' gear(ton\hour)</td>
<td>250</td>
</tr>
<tr>
<td>Net effective unloading cap. of ships' gear(ton\hour)</td>
<td>250</td>
</tr>
<tr>
<td>Do ships of this class receive priority by the harbour-master (1=yes 0=no)</td>
<td>0</td>
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<tr>
<td>Cargo-code: B</td>
<td></td>
</tr>
<tr>
<td>Number of terminals: 4</td>
<td></td>
</tr>
<tr>
<td>Percentage of ships going to terminal 1</td>
<td>40</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>201</td>
</tr>
<tr>
<td>Percentage of ships going to terminal 2</td>
<td>50</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>202</td>
</tr>
<tr>
<td>Percentage of ships going to terminal 3</td>
<td>0</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of ships going to terminal 4</td>
<td>10</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>203</td>
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</table>

--- For each class ---

<table>
<thead>
<tr>
<th>Name</th>
<th>GEN CARGO2</th>
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<tbody>
<tr>
<td>Choose distribution of inter-arrivaltime:</td>
<td>Poisson=0 Normal(for feeder-service)=1</td>
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<tr>
<td>Mean interarrivaltime (days)</td>
<td>0.1</td>
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<tr>
<td>Deviation of interarrivaltime (days; 0 if distr=Pois)</td>
<td>0</td>
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<tr>
<td>Percentage of transshipment cargo</td>
<td>0</td>
</tr>
<tr>
<td>Mean total quantity of import-cargo (ton)</td>
<td>4000</td>
</tr>
<tr>
<td>Deviation of total quantity of import-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of imp.-cargo (ton)</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum value of total quant. of imp.-cargo (ton)</td>
<td>7000</td>
</tr>
<tr>
<td>Mean total quantity of export-cargo (ton)</td>
<td>4000</td>
</tr>
<tr>
<td>Deviation of total quantity of export-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of exp.-cargo (ton)</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum value of total quant. of exp.-cargo (ton)</td>
<td>7000</td>
</tr>
</tbody>
</table>

| Minimum value of DWT | 16000    |
| Maximum value of DWT | 18000    |
| Mean mooring time (hours) | 6       |
| Deviation of mooring time (hours) | 0       |
| Lower boundary of mooring time (hours) | 1       |
| Mean percentage of cargo to be stored under cover | 40      |
| Deviation of percentage of cargo under cover | 5       |
| Required number of cranes to unload\load the ship | 1       |
| Net effective loading cap. of ships' gear(ton\hour) | 250     |
| Net effective unloading cap. of ships' gear(ton\hour) | 250     |
| Do ships of this class receive priority by the harbour-master (1=yes 0=no) | 1       |
| Cargo-code: B        | 2        |
| Number of terminals: 4 |         |
| Percentage of ships going to terminal 1 | 0       |
| Reference number of the cargo-type at this terminal | 0       |
| Percentage of ships going to terminal 2 | 100      |
| Reference number of the cargo-type at this terminal | 211     |
| Percentage of ships going to terminal 3 | 0       |
| Reference number of the cargo-type at this terminal | 0       |
| Percentage of ships going to terminal 4 | 0       |
| Reference number of the cargo-type at this terminal | 0       |
### For each class

#### LIQ CARRIERS

<table>
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<th>Value</th>
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<tr>
<td>Choose distribution of inter-arrival time:</td>
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</tr>
<tr>
<td>Poisson=0 Normal(for feeder-service)=1</td>
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</tr>
<tr>
<td>Mean interarrival time (days)</td>
<td>1.2</td>
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<tr>
<td>Deviation of interarrival time (days; 0 if distr=Pois)</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of transshipment cargo</td>
<td>0</td>
</tr>
<tr>
<td>Mean total quantity of import-cargo (ton)</td>
<td>8000</td>
</tr>
<tr>
<td>Deviation of total quantity of import-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of imp.-cargo (ton)</td>
<td>5000</td>
</tr>
<tr>
<td>Maximum value of total quant. of imp.-cargo (ton)</td>
<td>11000</td>
</tr>
<tr>
<td>Mean total quantity of export-cargo (ton)</td>
<td>8000</td>
</tr>
<tr>
<td>Deviation of total quantity of export-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of exp.-cargo (ton)</td>
<td>5000</td>
</tr>
<tr>
<td>Maximum value of total quant. of exp.-cargo (ton)</td>
<td>11000</td>
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<tr>
<td>Maximum value of DWT</td>
<td>33000</td>
</tr>
<tr>
<td>Mean mooring time (hours)</td>
<td>6</td>
</tr>
<tr>
<td>Deviation of mooring time (hours)</td>
<td>0</td>
</tr>
<tr>
<td>Lower boundary of mooring time (hours)</td>
<td>1</td>
</tr>
<tr>
<td>Mean percentage of cargo to be stored under cover</td>
<td>0</td>
</tr>
<tr>
<td>Deviation of percentage of cargo under cover</td>
<td>0</td>
</tr>
<tr>
<td>Required number of cranes to unload</td>
<td>load the ship</td>
</tr>
<tr>
<td>Net effective loading cap. of ships' gear(ton\hour)</td>
<td>400</td>
</tr>
<tr>
<td>Net effective unloading cap. of ships' gear(ton\hour)</td>
<td>400</td>
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<tr>
<td>Do ships of this class receive priority by the harbour-master (1=yes 0=no)</td>
<td>0</td>
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<td>Cargo-code: C</td>
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<tr>
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</tr>
<tr>
<td>Percentage of ships going to terminal 1</td>
<td>0</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of ships going to terminal 2</td>
<td>0</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of ships going to terminal 3</td>
<td>100</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
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</tr>
<tr>
<td>Percentage of ships going to terminal 4</td>
<td>0</td>
</tr>
<tr>
<td>Reference number of the cargo-type at this terminal</td>
<td>0</td>
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#### GRAINSHIPS

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<tr>
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<tr>
<td>Choose distribution of inter-arrival time:</td>
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<tr>
<td>Poisson=0 Normal(for feeder-service)=1</td>
<td></td>
</tr>
<tr>
<td>Mean interarrival time (days)</td>
<td>1.4</td>
</tr>
<tr>
<td>Deviation of interarrival time (days; 0 if distr=Pois)</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of transshipment cargo</td>
<td>0</td>
</tr>
<tr>
<td>Mean total quantity of import-cargo (ton)</td>
<td>8000</td>
</tr>
<tr>
<td>Deviation of total quantity of import-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of imp.-cargo (ton)</td>
<td>5000</td>
</tr>
<tr>
<td>Maximum value of total quant. of imp.-cargo (ton)</td>
<td>11000</td>
</tr>
<tr>
<td>Mean total quantity of export-cargo (ton)</td>
<td>8000</td>
</tr>
<tr>
<td>Deviation of total quantity of export-cargo (ton)</td>
<td>2000</td>
</tr>
<tr>
<td>Minimum value of total quant. of exp.-cargo (ton)</td>
<td>5000</td>
</tr>
<tr>
<td>Maximum value of total quant. of exp.-cargo (ton)</td>
<td>11000</td>
</tr>
<tr>
<td>Minimum value of DWT</td>
<td>25000</td>
</tr>
<tr>
<td>Maximum value of DWT</td>
<td>35000</td>
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<tr>
<td>Mean mooring time (hours)</td>
<td>6</td>
</tr>
<tr>
<td>Deviation of mooring time (hours)</td>
<td>0</td>
</tr>
<tr>
<td>Lower boundary of mooring time (hours)</td>
<td>1</td>
</tr>
<tr>
<td>Mean percentage of cargo to be stored under cover</td>
<td>0</td>
</tr>
<tr>
<td>Deviation of percentage of cargo under cover</td>
<td>0</td>
</tr>
</tbody>
</table>
196 @ Required number of cranes to unload\load the ship @ 1
198 @ Net effective loading cap. of ships' gear (ton\hour) @ 350
199 @ Net effective unloading cap. of ships' gear (ton\hour) @ 350
200 @ Do ships of this class receive priority by the @
201 @ harbour-master (1=yes 0=no) @ 0
202
203 @ Cargo-code: D @ 4
204 @ Number of terminals: 4 @
205 @ Percentage of ships going to terminal 1 @ 0
206 @ Reference number of the cargo-type at this terminal @ 0
207 @ Percentage of ships going to terminal 2 @ 0
208 @ Reference number of the cargo-type at this terminal @ 0
209 @ Percentage of ships going to terminal 3 @ 0
210 @ Reference number of the cargo-type at this terminal @ 0
211 @ Percentage of ships going to terminal 4 @ 100
212 @ Reference number of the cargo-type at this terminal @ 401
213 @ ---------------------------------
214 @ Close file @ -1
215
1 INFORMATION-FILE OF TERMINAL(S) @

2 Number of terminals @ 4

3 Number of days of inland transport-arrivals (M1) @ 10

4 Number of days of inland transport-departures (M2) @ 10

5 TERMINAL 1 @

6 Number of handled cargo-types at this terminal @ 2

7 .................... FOR EACH CARGO-TYPE: CONTAINERS ....................

8 Cargo-type nr. 1 @

9 Name (max. 10 char.) @ CONTAINERS

10 Reference number @ 101

11 Cargotype-code @ A

12 Percentage of arrivals on day N (-M1 < N ≤ -1) @

13 N Road\Rail\Barge Total @

14 -10 5 0 0 @ 5

15 -9 10 0 0 @ 10

16 -8 15 0 0 @ 15

17 -7 20 10 0 @ 30

18 -6 15 0 0 @ 15

19 -5 10 0 0 @ 10

20 -4 5 0 0 @ 5

21 -3 0 0 0 @ 0

22 -2 0 0 0 @ 0

23 -1 0 0 0 @ 0

24 Direct 10 0 0 @ 10

25 Total @ 90 10 0 @ 100

26 Percentage of departures on day N (1 ≤ N ≤ M2) @

27 N Road\Rail\Barge Total @

28 Direct 10 0 0 @ 10

29 1 0 0 0 @ 0

30 2 0 0 0 @ 0

31 3 0 0 0 @ 0

32 4 5 0 0 @ 5

33 5 10 0 0 @ 10

34 6 15 0 0 @ 15

35 7 20 10 0 @ 30

36 8 15 0 0 @ 15

37 9 10 0 0 @ 10

38 10 5 0 0 @ 5

39 Total @ 90 10 0 @ 100

40 Mean stackheight of import-containers @ 1.5

41 Mean stackheight of export-containers @ 1.5

42 Mean stackheight of empty containers @ 1.5

43 Mean percentage of empty import-containers @ 20

44 Mean percentage of empty export-containers @ 20

45 Mean percentage of fortyfeet import-containers @ 20

46 Mean percentage of fortyfeet export-containers @ 20

47 Gross factor @ 2

48 Mean capacity of trucks (TEU\truck) @ 1.5

49 Mean capacity of wagons (TEU\wagon) @ 2

50 Mean capacity of barges (TEU\barge) @ 50
FOR EACH CARGO-TYPE: BREAKBULK

<table>
<thead>
<tr>
<th>Cargo-type nr. 2</th>
<th>Name (max. 10 char.)</th>
<th>Reference number</th>
<th>Cargotype-code</th>
<th>Percentage of arrivals on day N (-M1 &lt; N &lt; -1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>@ 201</td>
<td>@ B</td>
<td>N Road\Rail\Barge Total</td>
</tr>
<tr>
<td>-10</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>-9</td>
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</tr>
<tr>
<td>-1</td>
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<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Direct</td>
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</tr>
<tr>
<td>Total</td>
<td>90</td>
<td>10</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>

| Percentage of departures on day N (1 < N < M2) |
| N Road\Rail\Barge Total |
| Direct | 10 0 0 @ 10 |
| 1      | 0 0 0 @ 0  |
| 2      | 0 0 0 @ 0  |
| 3      | 0 0 0 @ 0  |
| 4      | 5 0 0 @ 5  |
| 5      | 10 0 0 @ 10 |
| 6      | 15 0 0 @ 15 |
| 7      | 20 10 0 @ 30 |
| 8      | 15 0 0 @ 15 |
| 9      | 10 0 0 @ 10 |
| 10     | 5 0 0 @ 5  |
| Total  | 90 10 0 @ 100 |

Mean stackheight (m) @ 2
Mean relative density (ton\m3) @ 0.8

Gross factor @ 2
Mean capacity of trucks (ton\truck) @ 10
Mean capacity of wagons (ton\wagon) @ 30
Mean capacity of barges (ton\barge) @ 200

Close input for this cargotype (~1)

Number of berths @ 3
Berth-|Single=1 |Length|Depth|Nr. of|Number of |Ref. nr’s of|Ship
number|Multiple=0|(m) |(m) |cranes|cargo-types|cargo-types|Cap.
112 1 1 225 11.5 2 1 101 1
113 2 1 225 11.5 2 1 101 1
114 3 0 450 11.5 2 1 201 2

Total number of cranes @ 6
Name (max 10 |Crane-|Range |Load-|Unload-|Berth @
characters) |number|Min.|Max. |cap. |cap. |number @
116 |CONT.CR1| 1 |0 |0 |12 |12 |1
117 |CONT.CR2| 2 |0 |0 |12 |12 |1
NB: 1) Use all sequential numbers for the crane-numbers; allocate the crane-numbers in order of physical appearance.
2) Enter dummy values for the minimum and maximum of the crane-range if they belong to a single berth.

Is there inland-transport on saturday? (1=yes 0=no) @ 1
Is there inland-transport on sunday? (1=yes 0=no) @ 0
Are shifts taking place on saturday? (1=yes 0=no) @ 1
Are shifts taking place on sunday? (1=yes 0=no) @ 1
Capacity of storage-area (m²) @ 150000
Capacity of storage-volume (m³) @ 0
Number of terminal-equipment-units @ 24
Mean capacity of one equipment-unit (ton\hour) @ 50
Percentage of cargo that is handled by the equip. @ 100
Net operation factor (0 < N < 1) @ 0.875
Number of shifts per day (1\2\3) @ 3
Starting time of shift nr. 1 (hours) @ 0
Duration of shift nr. 1 (hours) @ 8
Starting time of shift nr. 2 (hours) @ 8
Duration of shift nr. 2 (hours) @ 8
Starting time of shift nr. 3 (hours) @ 16
Duration of shift nr. 3 (hours) @ 8

Number of handled cargo-types at this terminal @ 2

FOR EACH CARGO-TYPE: BREAKBULK

<table>
<thead>
<tr>
<th>Cargo-type nr. 1</th>
<th>Name (max. 10 char.)</th>
<th>Reference number</th>
<th>Cargo-type-code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cargo-type nr.</td>
<td>Name</td>
<td>Reference number</td>
<td>Cargo-type-code</td>
</tr>
<tr>
<td>1</td>
<td>BREAKBULK</td>
<td>202</td>
<td>B</td>
</tr>
</tbody>
</table>

Percentage of arrivals on day N (-M1 ≤ N ≤ -1) @

<table>
<thead>
<tr>
<th>N</th>
<th>Road\Rail\Barge Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>5 0 0 @ 5</td>
</tr>
<tr>
<td>-9</td>
<td>10 0 0 @ 10</td>
</tr>
<tr>
<td>-8</td>
<td>15 0 0 @ 15</td>
</tr>
<tr>
<td>-7</td>
<td>20 10 0 @ 30</td>
</tr>
<tr>
<td>-6</td>
<td>15 0 0 @ 15</td>
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<tr>
<td>-5</td>
<td>10 0 0 @ 10</td>
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<tr>
<td>-4</td>
<td>5 0 0 @ 5</td>
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<tr>
<td>-3</td>
<td>0 0 0 @ 0</td>
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<td>-2</td>
<td>0 0 0 @ 0</td>
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<tr>
<td>-1</td>
<td>0 0 0 @ 0</td>
</tr>
<tr>
<td>Direct</td>
<td>10 0 0 @ 10</td>
</tr>
<tr>
<td>Total @</td>
<td>90 10 0 @ 100 @</td>
</tr>
</tbody>
</table>

Percentage of departures on day N (1 ≤ N ≤ M2) @

<table>
<thead>
<tr>
<th>N</th>
<th>Road\Rail\Barge Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>10 0 0 @ 10</td>
</tr>
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<td>0 0 0 @ 0</td>
</tr>
<tr>
<td>2</td>
<td>0 0 0 @ 0</td>
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<td>3</td>
<td>0 0 0 @ 0</td>
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<tr>
<td>4</td>
<td>5 0 0 @ 5</td>
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<tr>
<td>5</td>
<td>10 0 0 @ 10</td>
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<tr>
<td>6</td>
<td>15 0 0 @ 15</td>
</tr>
<tr>
<td>N</td>
<td>Road</td>
</tr>
<tr>
<td>----</td>
<td>------</td>
</tr>
<tr>
<td>-10</td>
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<td>-9</td>
<td>10</td>
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<tr>
<td>-7</td>
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<td>-6</td>
<td>15</td>
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<td>10</td>
</tr>
<tr>
<td>-4</td>
<td>5</td>
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<tr>
<td>-3</td>
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<tr>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Direct</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>90</td>
</tr>
</tbody>
</table>

**Gross factor**

**Mean stackheight (m)**

**Mean relative density (ton/m³)**

**Gross factor**

**Mean capacity of trucks (ton/truck)**

**Mean capacity of wagons (ton/wagon)**

**Mean capacity of barges (ton/barge)**

**Close input for this cargotype (-1)**
Number of berths @ 1
Berth-|Single=1  |Length|Depth|Nr. of|Number of |Ref. nr's of|Ship
number|Multiple=0|(m)   |(m)  |cranes|cargo-types|cargo-types|Cap.
4      0     675  11.5  3     2     202 211 3

Total number of cranes @ 3
Name (max 10 | Crane-| Range | Load-| Unload-|Berth @
characters)  | number | Min. | Max. | cap.   | cap.   | number @
CRANE3       7     0     675  120  120  4
CRANE4       8     0     675  120  120  4
CRANE5       9     0     675  120  120  4

NB: 1) Use all sequential numbers for the crane-numbers; allocate the crane-numbers in order of physical appearance
2) Enter dummy values for the crane-range if they belong to a single berth

Is there inland-transport on saturday? (1=yes 0=no) @ 1
Is there inland-transport on sunday? (1=yes 0=no) @ 0
Are shifts taking place on saturday? (1=yes 0=no) @ 1
Are shifts taking place on sunday? (1=yes 0=no) @ 1
Capacity of storage-area (m2) @ 150000
Capacity of storage-volume (m3) @ 0
Number of terminal-equipment-units @ 18
Mean capacity of one equipment-unit (ton\hour) @ 50
Percentage of cargo that is handled by the equip. @ 100
Net operation factor (0 < N < 1) @ 0.875
Number of shifts per day (1\2\3) @ 3
Starting time of shift nr. 1 (hours) @ 0
Duration of shift nr. 1 (hours) @ 8
Starting time of shift nr. 2 (hours) @ 8
Duration of shift nr. 2 (hours) @ 8
Starting time of shift nr. 3 (hours) @ 16
Duration of shift nr. 3 (hours) @ 8

TERMINAL 3 @
Number of handled cargo-types at this terminal @ 1

.............. FOR EACH CARGO-TYPE: LIQUID BULK ..............
Cargo-type nr. 1 @
Name (max. 10 char.) @ VEGET_OIL
Reference number @ 301
Cargo-type-code @ C
Percentage of arrivals on day N (-M1 < N < -1) @
N Road\Rail\Barge Total @
-10  25  0  0  @ 25
-9   30  10  0  @ 40
-8   25  0  0  @ 25
-7   0  0  0  @ 0
-6   0  0  0  @ 0
-5   0  0  0  @ 0
-4   0  0  0  @ 0
-3   0  0  0  @ 0
-2   0  0  0  @ 0
-1   0  0  0  @ 0
Direct 10  0  0  @ 10
---  ---  ---  --- @
Total @ 90 10 0 @ 100 @
Percentage of departures on day N (1 < N < M2) @
<table>
<thead>
<tr>
<th>Column 1</th>
<th>Column 2</th>
<th>Column 3</th>
<th>Column 4</th>
<th>Column 5</th>
<th>Column 6</th>
<th>Column 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road-Rail-Barge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct</td>
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</tr>
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<td>0</td>
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</tr>
<tr>
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<tr>
<td>6</td>
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<td>0</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
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</tr>
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<td>0</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>90</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Mean relative density (ton/m³) @ 0.5

Gross factor @ 2

Mean capacity of trucks (ton/truck) @ 10

Mean capacity of wagons (ton/wagon) @ 30

Mean capacity of barges (ton/barge) @ 200

Close input for this cargotype ("1") @ ~1

Number of berths @ 2

<table>
<thead>
<tr>
<th>Berth</th>
<th>Single=1</th>
<th>Length</th>
<th>Depth</th>
<th>Nr. of</th>
<th>Number of</th>
<th>Ref. nr's of</th>
<th>Ship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multiple=0</td>
<td>(m)</td>
<td>(m)</td>
<td>cranes</td>
<td>cargo-types</td>
<td>cargo-types</td>
<td>Cap.</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>280</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>301</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>255</td>
<td>13</td>
<td>1</td>
<td>1</td>
<td>301</td>
<td>1</td>
</tr>
</tbody>
</table>

Total number of cranes @ 2

<table>
<thead>
<tr>
<th>Name</th>
<th>Crane-</th>
<th>Range</th>
<th>Load-</th>
<th>Unload-</th>
<th>Berth</th>
</tr>
</thead>
<tbody>
<tr>
<td>characters</td>
<td>number</td>
<td>Min.</td>
<td>Max.</td>
<td>cap.</td>
<td>cap.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crane</th>
<th>number</th>
<th>Min.</th>
<th>Max.</th>
<th>Range</th>
<th>(ton/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUMP1</td>
<td>10</td>
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<td>0</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>PUMP2</td>
<td>11</td>
<td>0</td>
<td>0</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

NB: 1) Use all sequential numbers for the crane-numbers; allocate the crane-numbers in order of physical appearance.

2) Enter dummy values for the minimum and maximum of the crane-range if they belong to a single berth.

Is there inland-transport on saturday? (1=yes 0=no) @ 1

Is there inland-transport on sunday? (1=yes 0=no) @ 1

Are shifts taking place on saturday? (1=yes 0=no) @ 1

Are shifts taking place on sunday? (1=yes 0=no) @ 1

Capacity of storage-area (m²) @ 0

Capacity of storage-volume (m³) @ 500000

Number of terminal-equipment-units @ 10

Mean capacity of one equipment-unit (ton/hour) @ 100

Percentage of cargo that is handled by the equip. @ 100

Net operation factor (0 < N < 1) @ 0.875

Number of shifts per day (1\2\3) @ 3

Starting time of shift nr. 1 (hours) @ 0

Duration of shift nr. 1 (hours) @ 8

Starting time of shift nr. 2 (hours) @ 8

Duration of shift nr. 2 (hours) @ 8

Starting time of shift nr. 3 (hours) @ 16

Duration of shift nr. 3 (hours) @ 8

TERMINAL 4 @
For each cargo-type: Dry Bulk

<table>
<thead>
<tr>
<th>Cargo-type nr. 1</th>
<th>Name (max. 10 char.)</th>
<th>Reference number</th>
<th>Cargo-type-code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>WHEAT</td>
<td>401</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of arrivals on day N (-M1 ≤ N ≤ -1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Road\Rail\Barge Total @</td>
</tr>
<tr>
<td>-10</td>
</tr>
<tr>
<td>25</td>
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<tr>
<td>Percentage of departures on day N (1 ≤ N ≤ M2)</td>
</tr>
<tr>
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<tr>
<td>Road\Rail\Barge Total @</td>
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<tr>
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</tr>
<tr>
<td>Mean relative density (ton\m3) @ 0.8</td>
</tr>
<tr>
<td>Gross factor @ 2</td>
</tr>
<tr>
<td>Mean capacity of trucks (ton\truck) @ 10</td>
</tr>
<tr>
<td>Mean capacity of wagons (ton\wagon) @ 30</td>
</tr>
<tr>
<td>Mean capacity of barges (ton\barge) @ 200</td>
</tr>
<tr>
<td>Close input for this cargotype (‘1) @ ~1</td>
</tr>
</tbody>
</table>

For each cargo-type: Breakbulk

<table>
<thead>
<tr>
<th>Cargo-type nr. 1</th>
<th>Name (max. 10 char.)</th>
<th>Reference number</th>
<th>Cargo-type-code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BREAKBREAK</td>
<td>203</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of arrivals on day N (-M1 ≤ N ≤ -1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
</tr>
<tr>
<td>Road\Rail\Barge Total @</td>
</tr>
<tr>
<td>-10</td>
</tr>
<tr>
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Direct @ 
-2 0 0 0 @ 0
-1 0 0 0 @ 0
Direct @ 
10 0 0 @ 10
Total @ 
90 10 0 @ 100

Percentage of departures on day N (1 < N < M2) @
N Road\Rail\Barge Total @
Direct 10 0 0 @ 10
1 0 0 0 @ 0
2 0 0 0 @ 0
3 0 0 0 @ 0
4 5 0 0 @ 5
5 10 0 0 @ 10
6 15 0 0 @ 15
7 20 10 0 @ 30
8 15 0 0 @ 15
9 10 0 0 @ 10
10 5 0 0 @ 5

Total @ 
90 10 0 @ 100

Mean stackheight (m) @ 2
Mean relative density (ton\m3) @ 0.8
Gross factor @ 2
Mean capacity of trucks (ton\truck) @ 10
Mean capacity of wagons (ton\wagon) @ 30
Mean capacity of barges (ton\barge) @ 200
Close input for this cargotype ("1") @ ~1

Number of berths @ 1
Berth-Single=1 |Length|Depth|Nr. of|Number of |Ref. nr's of|Ship
number|Multiple=0|(m) |(m) |cranes|cargo-types|cargo-types|Cap.
7 0 550 13 2 2 401 203 2
Total number of cranes @ 2
Name (max 10 Crane-|Range |Load-|Unload-Berth @
characters) |number|Min.|Max.|cap.|cap.|number @
CRANE6 12 0 450 200 200 7
CRANE7 13 0 450 200 200 7

NB: 1) Use all sequential numbers for the crane-numbers; allocate @
the crane-numbers in order of physical appearance @
2) Enter dummy values for the minimum and maximum of the @
crane-range if they belong to a single berth @

Is there inland-transport on saturday? (1=yes 0=no) @ 1
Is there inland-transport on sunday? (1=yes 0=no) @ 0
Are shifts taking place on saturday? (1=yes 0=no) @ 1
Are shifts taking place on sunday? (1=yes 0=no) @ 1
Capacity of storage-area (m2) @ 50000
Capacity of storage-volume (m3) @ 250000
Number of terminal-equipment-units @ 16
Mean capacity of one equipment-unit (ton\hour) @ 50
Percentage of cargo that is handled by the equip. @ 100
Net operation factor (0 < N < 1) @ 0.875
Number of shifts per day (1\2\3) @ 3
Starting time of shift nr. 1 (hours) @ 0
Duration of shift nr. 1 (hours) @ 8
Starting time of shift nr. 2 (hours) @ 8
Duration of shift nr. 2 (hours) @ 8
<table>
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<th>Parameter Description</th>
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<td>Duration of shift nr. 3 (hours)</td>
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<td>FOR ALL TERMINALS</td>
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<tr>
<td>Mean cranebreakdown-interarrivaltime (hours)</td>
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<td>Mean cranebreakdown-duration (hours)</td>
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<td>Deviation of cranebreakdown-duration (days)</td>
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<td>Intervaltime of maintenance to cranes (hours)</td>
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<tr>
<td>Seed of cranebreakdown-duration</td>
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<td>Seed of UNIF23</td>
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CHECKLIST FOR:
- ERRORS IN INPUT-FILES
- CORRECTNESS OF REFERENCES

REPORT OF ERRORS

TOTAL NUMBER OF ERRORS IS 0

CARGOTYPE-REFERENCES

ACCORDING TO S-FILE:

TERMINAL 1 2 3 4
CLASS 1 101 - - -
CLASS 2 201 202 - 203
CLASS 3 - 211 - -
CLASS 4 - - 301 -
CLASS 5 - - - 401

ACCORDING TO T-FILE:

CARGOTYPES ON TERMINAL 1: 101 201
CARGOTYPES AT BERTH:
1: 101
2: 101
3: 201

CARGOTYPES ON TERMINAL 2: 202 211
CARGOTYPES AT BERTH:
4: 202 211

CARGOTYPES ON TERMINAL 3: 301
CARGOTYPES AT BERTH:
5: 301
6: 301

CARGOTYPES ON TERMINAL 4: 401 203
CARGOTYPES AT BERTH:
7: 401 203

BERTH\CRANE-REFERENCES

BERTH 1 NUMBER OF CRANES 2
ALLOCATED TO THIS BERTH: CONT_CR1 CONT_CR2

BERTH 2 NUMBER OF CRANES 2
ALLOCATED TO THIS BERTH: CONT_CR3 CONT_CR4

BERTH 3 NUMBER OF CRANES 2
ALLOCATED TO THIS BERTH: CRANE1 CRANE2

BERTH 4 NUMBER OF CRANES 3
ALLOCATED TO THIS BERTH: CRANE3 CRANE4 CRANE5
BERTH 5  NUMBER OF CRANES 1
ALLOCATED TO THIS BERTH:  PUMP1

BERTH 6  NUMBER OF CRANES 1
ALLOCATED TO THIS BERTH:  PUMP2

BERTH 7  NUMBER OF CRANES 2
ALLOCATED TO THIS BERTH:  CRANE6  CRANE7

CHECK ALL REFERENCES !!
### PERFORMANCE OF THE TERMINALS ###

---

**TERMINAL 1**

---

**AVERAGE ANNUAL NUMBER OF SHIPS AT THIS TERMINAL** = 496.45

**ANNUAL THROUGHPUT OF CONTAINERS** = 222494 TEU

**DISTRIBUTION OF OCCUPIED STORAGE-AREA FOR CONTAINERS**: SEE STORESTREAM 1OPEN101

**DISTRIBUTIONS OF OCCUPIED GROUNDSLOTS OF CONTAINERS**:
- **EXPORT**: SEE STORESTREAM 1EXSL101
- **IMPORT**: SEE STORESTREAM 1IMSL101
- **EMPTIES**: SEE STORESTREAM 1EMSL101

**ANNUAL THROUGHPUT**

**DISTRIBUTION OF BREAKBULK** = 1643427 TONS

**OCCUPIED OPEN STORAGE-AREA FOR BREAKBULK**: SEE STORESTREAM 1OPEN201

**OCCUPIED COVERED STORAGE-AREA FOR BREAKBULK**: SEE STORESTREAM 1COV201

**DISTRIBUTIONS OF THE OCCUPANCY-RATE OF THE TOTAL STORAGE-AREA**

**C. Q. THE TOTAL STORAGE-VOLUME**

**SEE STORESTREAMS 1AREA_OR AND 1VOL_OR**

---

**ANNUAL NUMBER OF TRUCKS LEAVING THIS TERMINAL** = 139292

**ANNUAL NUMBER OF TRUCKS ENTERING THIS TERMINAL** = 142113

**ANNUAL NUMBER OF WAGONS LEAVING THIS TERMINAL** = 8264

**ANNUAL NUMBER OF WAGONS ENTERING THIS TERMINAL** = 8339

**ANNUAL NUMBER OF BARGES LEAVING THIS TERMINAL** = 0

**ANNUAL NUMBER OF BARGES ENTERING THIS TERMINAL** = 0

---

**PERFORMANCE OF BERTH... 1**

**THIS BERTH IS A SINGLE BERTH**

**ANNUAL OCCUPATION-RATE** = 0.586

**ANNUAL OCCUPATIONTIME (HOURS):**
- **A)** IN OPERATION (NET OPERATION TIME) = 4977
- **B)** NOT IN OPERATION DUE TO A BREAKDOWN = 45
- **C)** NOT IN OPERATION DUE TO DELAYS = 153
- **D)** IN MAINTENANCE = 119
- **E)** AT REST = 3504

**TOTAL** = 5130

**ANNUAL TIME NOT OCCUPIED (HOURS)** = 3630

---

**PERFORMANCE OF CRANES AT THIS BERTH**

**CONT_CR1** ; **ANNUAL TIME SPENT (HOURS):**
- **A)** IN OPERATION = 4939
- **B)** NOT IN OPERATION DUE TO A BREAKDOWN = 45
- **C)** NOT IN OPERATION DUE TO DELAYS = 153
- **D)** IN MAINTENANCE = 119
- **E)** AT REST = 3504

**CONT_CR2** ; **ANNUAL TIME SPENT (HOURS):**
- **A)** IN OPERATION = 4941
- **B)** NOT IN OPERATION DUE TO A BREAKDOWN = 40
- **C)** NOT IN OPERATION DUE TO DELAYS = 153
- **D)** IN MAINTENANCE = 119
- **E)** AT REST = 3508

---

**PERFORMANCE OF BERTH... 2**

**THIS BERTH IS A SINGLE BERTH**

**ANNUAL OCCUPATION-RATE** = 0.439

**ANNUAL OCCUPATIONTIME (HOURS):**

---
A) IN OPERATION (NET OPERATION TIME) = 3842
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION DUE TO DELAYS = -0
TOTAL = 3842
ANNUAL TIME NOT OCCUPIED (HOURS) = 4918

PERFORMANCE OF CRANES AT THIS BERTH
CONT CR3 ; ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 3842
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 92
D) IN MAINTENANCE = 92
E) AT REST = 4826
CONT CR4 ; ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 3842
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 92
D) IN MAINTENANCE = 92
E) AT REST = 4826

PERFORMANCE OF BERTH.... 3
THIS BERTH IS A MULTIPLE BERTH
ANNUAL OCCUPATION-RATE = 0.190
ANNUAL OCCUPATIONTIME (METER-DAYS):
A) IN OPERATION = 30375
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION DUE TO DELAYS = 907
TOTAL = 31282
ANNUAL TIME NOT OCCUPIED (METER-DAYS) = 132968
(TOTAL ANNUAL AVAILABLE METER-DAYS = 365 x 450 = 164250)
DISTR. OF NUMBER OF SHIPS AT THIS BERTH: SEE STORESTREAM Q_BERTH 3
ANNUAL AVERAGE NUMBER OF SHIFTINGS OF SHIPS = 15
ANNUAL AVERAGE NUMBER OF SHIFTINGS OF CRANES = 0

PERFORMANCE OF CRANES AT THIS BERTH
CRANE1 ; ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 2731
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 92
D) IN MAINTENANCE = 66
E) AT REST = 5871
CRANE2 ; ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 1592
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 31
D) IN MAINTENANCE = 38
E) AT REST = 7100

---------
TERMINAL 2
---------

AVERAGE ANNUAL NUMBER OF SHIPS AT THIS TERMINAL = 624.07

ANNUAL THROUGHPUT OF BREAKBULK = 2128177 TONS
SEE STORESTREAM 2OPEN202
ANNUAL THROUGHPUT OF BANANAS = 2930912 TONS
SEE STORESTREAM 2OPEN211
DISTRIBUTIONS OF THE OCCUPANCY-RATE OF THE TOTAL STORAGE-AREA
C.Q. THE TOTAL STORAGE-VOLUME
SEE STORESTREAMS 2AREA_OR AND 2VOL_OR

ANNUAL NUMBER OF TRUCKS LEAVING THIS TERMINAL = 229142
ANNUAL NUMBER OF TRUCKS ENTERING THIS TERMINAL = 226176
ANNUAL NUMBER OF WAGONS LEAVING THIS TERMINAL = 8487
ANNUAL NUMBER OF WAGONS ENTERING THIS TERMINAL = 8377
ANNUAL NUMBER OF BARGES LEAVING THIS TERMINAL = 0
ANNUAL NUMBER OF BARGES ENTERING THIS TERMINAL = 0

PERFORMANCE OF BERTH: 4
THIS BERTH IS A MULTIPLE BERTH
ANNUAL OCCUPATION-RATE = 0.399
ANNUAL OCCUPATION-RATE (METER-DAYS):
A) IN OPERATION = 96217
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION DUE TO DELAYS = 2122
TOTAL = 98338
ANNUAL TIME NOT OCCUPIED (METER-DAYS) = 148037
(TOTAL ANNUAL AVAILABLE METER-DAYS = 365 x 675 = 246375)

DISTRIBUTION OF NUMBER OF SHIPS AT THIS BERTH: SEE STORESTREAM Q_BERTH 4
ANNUAL AVERAGE NUMBER OF SHIFTINGS OF SHIPS = 9
ANNUAL AVERAGE NUMBER OF SHIFTINGS OF CRANES = 0

PERFORMANCE OF CRANES AT THIS BERTH
CRANE3: ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 4552
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 61
D) IN MAINTENANCE = 109
E) AT REST = 4038
CRANE4: ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 3408
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 123
D) IN MAINTENANCE = 82
E) AT REST = 5148
CRANE5: ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 2953
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 92
D) IN MAINTENANCE = 71
E) AT REST = 5644

AVERAGE ANNUAL NUMBER OF SHIPS AT THIS TERMINAL = 285.87
ANNUAL THROUGHPUT OF VEGET OIL = 4677125 TONS
DISTRIBUTION OF STORAGE-VOLUME FOR VEGET OIL:
SEE STORESTREAM 3VOL301

DISTRIBUTIONS OF THE OCCUPANCY-RATE OF THE TOTAL STORAGE-AREA
C.Q. THE TOTAL STORAGE-VOLUME
SEE STORESTREAMS 3AREA_OR AND 3VOL_OR

ANNUAL NUMBER OF TRUCKS LEAVING THIS TERMINAL = 206942
ANNUAL NUMBER OF TRUCKS ENTERING THIS TERMINAL = 214000
ANNUAL NUMBER OF WAGONS LEAVING THIS TERMINAL = 7665
ANNUAL NUMBER OF WAGONS ENTERING THIS TERMINAL = 7926
ANNUAL NUMBER OF BARGES LEAVING THIS TERMINAL = 0
ANNUAL NUMBER OF BARGES ENTERING THIS TERMINAL = 0

PERFORMANCE OF BERTH...5
THIS BERTH IS A SINGLE BERTH
ANNUAL OCCUPATION-RATE = 0.522
ANNUAL OCCUPATIONTIME (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 4535
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 39
C) NOT IN OPERATION DUE TO DELAYS = 0
TOTAL = 4574
ANNUAL TIME NOT OCCUPIED (HOURS) = 4186

PERFORMANCE OF CRANES AT THIS BERTH
PUMP1; ANNUAL TIME SPENT (HOURS):
A) IN OPERATION = 4535
B) NOT IN OPERATION DUE TO A BREAKDOWN = 39
C) NOT IN OPERATION DUE TO DELAYS = 0
D) IN MAINTENANCE = 109
E) AT REST = 4077

TERMINAL 4
AVERAGE ANNUAL NUMBER OF SHIPS AT THIS TERMINAL = 319.06
ANNUAL THROUGHPUT OF WHEAT = 4240491 TONS
DISTRIBUTION OF STORAGE-VOLUME FOR WHEAT:
SEE STORESTREAM 4VOL401
ANNUAL THROUGHPUT OF BREAKBULK = 482419 TONS
DISTRIBUTION OF OCCUPIED OPEN STORAGE-AREA FOR BREAKBULK:
SEE STORESTREAM 4OPEN203
DISTRIBUTION OF OCCUPIED COVERED STORAGE-AREA FOR BREAKBULK:
SEE STORESTREAM 4COV203

DISTRIBUTIONS OF THE OCCUPANCY-RATE OF THE TOTAL STORAGE-AREA
C. Q. THE TOTAL STORAGE-VOLUME
SEE STORESTREAMS 4AREA OR AND 4VOL OR
ANNUAL NUMBER OF TRUCKS LEAVING THIS TERMINAL = 211192
ANNUAL NUMBER OF TRUCKS ENTERING THIS TERMINAL = 213870
ANNUAL NUMBER OF WAGONS LEAVING THIS TERMINAL = 7822
ANNUAL NUMBER OF WAGONS ENTERING THIS TERMINAL = 7921
ANNUAL NUMBER OF BARGES LEAVING THIS TERMINAL = 0
ANNUAL NUMBER OF BARGES ENTERING THIS TERMINAL = 0

PERFORMANCE OF BERTH.... 7

THIS BERTH IS A MULTIPLE BERTH

ANNUAL OCCUPATION-RATE = 0.351

ANNUAL OCCUPATION TIME (METER-DAYS):

A) IN OPERATION = 68786
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION DUE TO DELAYS = 1608
TOTAL = 70394

ANNUAL TIME NOT OCCUPIED (METER-DAYS) = 130356
(TOTAL ANNUAL AVAILABLE METER-DAYS = 365 x 550 = 200750)

DISTR. OF NUMBER OF SHIPS AT THIS BERTH: SEE STORESTREAM Q_BERTH 7

ANNUAL AVERAGE NUMBER OF SHIFTINGS OF SHIPS = 28
ANNUAL AVERAGE NUMBER OF SHIFTINGS OF CRANES = 0

PERFORMANCE OF CRANES AT THIS BERTH

CRANE 6; ANNUAL TIME SPENT (HOURS):

A) IN OPERATION = 4472
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 31
D) IN MAINTENANCE = 107
E) AT REST = 4150

CRANE 7; ANNUAL TIME SPENT (HOURS):

A) IN OPERATION = 3584
B) NOT IN OPERATION DUE TO A BREAKDOWN = 0
C) NOT IN OPERATION DUE TO DELAYS = 92
D) IN MAINTENANCE = 86
E) AT REST = 4998

PERFORMANCE OF SHIPS

CLASS 1: CONT-CLASS

ANNUAL NUMBER OF SHIPS = 299.91
AVERAGE RATIO (TIME AT ANCHORAGE\TIME AT QUAY) = 0.274
AVERAGE TIME AT ANCHORAGE (HOURS) = 8.20
AVERAGE MOORING TIME (HOURS) = 5.97
AVERAGE TIME AT QUAY (HOURS):

A) IN OPERATION = 29.16
B) IN PARTIAL OPERATION = 0.25
C) NOT IN OPERATION DUE TO DELAYS = 0.51
TOTAL = 29.92

CLASS 2: GEN_CARGO1

ANNUAL NUMBER OF SHIPS = 515.59
AVERAGE RATIO (TIME AT ANCHORAGE\TIME AT QUAY) = 0.342
AVERAGE TIME AT ANCHORAGE (HOURS) = 7.84
AVERAGE MOORING TIME (HOURS) = 5.97
AVERAGE TIME AT QUAY (HOURS):

A) IN OPERATION = 22.50
B) IN PARTIAL OPERATION = 0.00
C) NOT IN OPERATION DUE TO DELAYS = 0.44
TOTAL = 22.94
CLASS 3: GEN CARGO

ANNUAL NUMBER OF SHIPS = 362.45
AVERAGE RATIO (TIME AT ANCHORAGE/TIME AT QUAY) = 0.476
AVERAGE TIME AT ANCHORAGE (HOURS) = 11.08
AVERAGE MOORING TIME (HOURS) = 6.00
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION = 22.50
B) IN PARTIAL OPERATION = 0.00
C) NOT IN OPERATION DUE TO DELAYS = 0.78
TOTAL = 23.28

CLASS 4: LIQ CARRRIE

ANNUAL NUMBER OF SHIPS = 285.87
AVERAGE RATIO (TIME AT ANCHORAGE/TIME AT QUAY) = 0.213
AVERAGE TIME AT ANCHORAGE (HOURS) = 5.89
AVERAGE MOORING TIME (HOURS) = 5.95
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION = 27.53
B) IN PARTIAL OPERATION = 0.14
C) NOT IN OPERATION DUE TO DELAYS = 0.00
TOTAL = 27.67

CLASS 5: GRAINSHIP

ANNUAL NUMBER OF SHIPS = 260.35
AVERAGE RATIO (TIME AT ANCHORAGE/TIME AT QUAY) = 0.422
AVERAGE TIME AT ANCHORAGE (HOURS) = 12.87
AVERAGE MOORING TIME (HOURS) = 5.97
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION = 29.94
B) IN PARTIAL OPERATION = 0.00
C) NOT IN OPERATION DUE TO DELAYS = 0.57
TOTAL = 30.50

DETAILLED PERFORMANCE OF THE BERTHS

BERTH ... 1 (SINGLE BERTH)
ANNUAL OCCUPATION TIME (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 4977
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = 0
2) DUE TO STRIKE = 123
3) DUE TO BAD WEATHER = 31
ANNUAL TIME NOT OCCUPIED (HOURS):
A) DUE TO BAD WEATHER = 31
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 3599

BERTH ... 2 (SINGLE BERTH)
ANNUAL OCCUPATION TIME (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 3842
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0

C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = -0
2) DUE TO STRIKE = 0
3) DUE TO BAD WEATHER = 0

ANNUAL TIME NOT OCCUPIED (HOURS):
A) DUE TO BAD WEATHER = 0
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 4918

BERTH .... 3 (MULTIPLE BERTH)

ANNUAL OCCUPATIONTIME (METER-DAYS):
A) IN OPERATION (NET OPERATION TIME) = 30375
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = 0
2) DUE TO STRIKE = 414
3) DUE TO BAD WEATHER = 415
4) DUE TO SHIFTING OF SHIPS = 78

ANNUAL TIME NOT OCCUPIED (METER-DAYS):
A) DUE TO BAD WEATHER = 415
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 132553

BERTH .... 4 (MULTIPLE BERTH)

ANNUAL OCCUPATIONTIME (METER-DAYS):
A) IN OPERATION (NET OPERATION TIME) = 96217
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = 0
2) DUE TO STRIKE = 1658
3) DUE TO BAD WEATHER = 403
4) DUE TO SHIFTING OF SHIPS = 61

ANNUAL TIME NOT OCCUPIED (METER-DAYS):
A) DUE TO BAD WEATHER = 403
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 147634

BERTH .... 5 (SINGLE BERTH)

ANNUAL OCCUPATIONTIME (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 4535
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 39
C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = 0
2) DUE TO STRIKE = 0
3) DUE TO BAD WEATHER = 0

ANNUAL TIME NOT OCCUPIED (HOURS):
A) DUE TO BAD WEATHER = 0
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 4186

BERTH .... 6 (SINGLE BERTH)

ANNUAL OCCUPATIONTIME (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 3336
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION:
1) GROSS - NET OPERATION TIME = 0
2) DUE TO STRIKE = 0
3) DUE TO BAD WEATHER = 0

ANNUAL TIME NOT OCCUPIED (HOURS):
A) DUE TO BAD WEATHER = 0
B) DUE TO TIDE = 0
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 5424

BERTH .... 7 (MULTIPLE BERTH)

ANNUAL OCCUPATIONTIME (METER-DAYS):
A) IN OPERATION (NET OPERATION TIME) = 68786
B) IN PARTIAL OPERATION (BREAKDOWN OF CRANE) = 0
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0
   2) DUE TO STRIKE = 901
   3) DUE TO BAD WEATHER = 505
   4) DUE TO SHIFTING OF SHIPS = 203

ANNUAL TIME NOT OCCUPIED (METER-DAYS):
A) DUE TO BAD WEATHER = 505
B) DUE TO TIDE = 985
C) NO SHIPS FOR THIS BERTH AT ANCHORAGE = 128867

INDICATION FOR PERFORMANCE OF TERMINAL-EQUIPMENT

INDICATION OF ANNUAL AVERAGE NUMBER OF HOURS IN OPERATION

TERMINAL. 1: 3466 HOURS
TERMINAL. 2: 6044 HOURS
TERMINAL. 3: 5029 HOURS
TERMINAL. 4: 6348 HOURS

DETAILED PERFORMANCE OF SHIPS

CLASS 1: CONT-CLASS
AVERAGE TIME AT ANCHORAGE (HOURS):
A) WAITING DUE TO FULL PORT = 8.10
B) WAITING DUE TO BAD WEATHER = 0.10
C) WAITING DUE TO TIDE = 0.00
AVERAGE MOORING TIME (HOURS) = 5.97
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 29.16
B) IN PARTIAL OPERATION (CRANE-BREAKDOWN) = 0.25
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0.00
   2) WAITING DUE TO STRIKES = 0.41
   3) WAITING DUE TO BAD WEATHER = 0.10
   4) WAITING DUE TO SHIFTING = 0.00
NB. AVERAGE WAITING IN PORT DUE TO TIDE = 0.00

CLASS 2: GEN CARG01
AVERAGE TIME AT ANCHORAGE (HOURS):
A) WAITING DUE TO FULL PORT = 5.97
B) WAITING DUE TO BAD WEATHER = 0.17
C) WAITING DUE TO TIDE = 0.00
AVERAGE MOORING TIME (HOURS) = 22.50
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 11.00
B) IN PARTIAL OPERATION (CRANE-BREAKDOWN) = 0.00
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0.00
   2) WAITING DUE TO STRIKES = 0.24
   3) WAITING DUE TO BAD WEATHER = 0.17
   4) WAITING DUE TO SHIFTING = 0.03
NB. AVERAGE WAITING IN PORT DUE TO TIDE = 0.00

CLASS 3: GEN CARG02
AVERAGE TIME AT ANCHORAGE (HOURS):
A) WAITING DUE TO FULL PORT = 11.00
B) WAITING DUE TO BAD WEATHER = 0.08
C) WAITING DUE TO TIDE = 0.00
AVERAGE MOORING TIME (HOURS) = 6.00
AVERAGE TIME AT QUAY (HOURS):

A) IN OPERATION (NET OPERATION TIME) = 22.50
B) IN PARTIAL OPERATION (CRANE-BREAKDOWN) = 0.00
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0.00
   2) WAITING DUE TO STRIKES = 0.68
   3) WAITING DUE TO BAD WEATHER = 0.08
   4) WAITING DUE TO SHIFTING = 0.02
NB. AVERAGE WAITING IN PORT DUE TO TIDE = 0.00

CLASS 4: LIQCARRIE

AVERAGE TIME AT ANCHORAGE (HOURS):
A) WAITING DUE TO FULL PORT = 5.89
B) WAITING DUE TO BAD WEATHER = 0.00
C) WAITING DUE TO TIDE = 0.00
AVERAGE MOORING TIME (HOURS) = 5.95
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 27.53
B) IN PARTIAL OPERATION (CRANE-BREAKDOWN) = 0.14
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0.00
   2) WAITING DUE TO STRIKES = 0.00
   3) WAITING DUE TO BAD WEATHER = 0.00
   4) WAITING DUE TO SHIFTING = 0.00
NB. AVERAGE WAITING IN PORT DUE TO TIDE = 0.00

CLASS 5: GRAINSHIP

AVERAGE TIME AT ANCHORAGE (HOURS):
A) WAITING DUE TO FULL PORT = 12.17
B) WAITING DUE TO BAD WEATHER = 0.24
C) WAITING DUE TO TIDE = 0.46
AVERAGE MOORING TIME (HOURS) = 5.97
AVERAGE TIME AT QUAY (HOURS):
A) IN OPERATION (NET OPERATION TIME) = 29.94
B) IN PARTIAL OPERATION (CRANE-BREAKDOWN) = 0.00
C) NOT IN OPERATION:
   1) GROSS - NET OPERATION TIME = 0.00
   2) WAITING DUE TO STRIKES = 0.24
   3) WAITING DUE TO BAD WEATHER = 0.24
   4) WAITING DUE TO SHIFTING = 0.10
NB. AVERAGE WAITING IN PORT DUE TO TIDE = 0.27

AVERAGE ANNUAL NUMBER OF TYPHOONS IN THIS PORT = 1.28
AVERAGE ANNUAL NUMBER OF STRIKES IN THIS PORT = 2.55
### PERSONAL PROSIM HISTOGRAM FACILITY — FILE STORE DE — SELECTION ROW

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Mean: 2.660503
Minimum: 0.000
Deviation: 2.393445
Maximum: 15.000
90%: 5.157143
95%: 6.608

### PERSONAL PROSIM HISTOGRAM FACILITY — FILE STORE DE — SELECTION Q_BERTH 4

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Mean: 1.957621
Minimum: 0.000
Deviation: 0.793662
Maximum: 3.000
90%: 2.617898
95%: 2.808
### PERSONAL PROSIM HISTOGRAM FACILITY — FILE STORE_DE— SELECTION 1EXSL101
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Mean: 1437.463867
Deviation: 469.555969
90%: 2212.500000
95%: 2450.000000

### PERSONAL PROSIM HISTOGRAM FACILITY — FILE STORE_DE— SELECTION 1IMSL101
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Mean: 1107.493286
Deviation: 366.439484
90%: 1583.333252
95%: 1806.250000
Mean : 299977.125000 Minimum : 180502.062
Deviation: 60843.917969 Maximum: 439119.687
90%: 378235.281250 95%: 395000.000

= PERSONAL PROSIM HISTOGRAM FACILITY == FILE STORE_DE== SELECTION 4VOL401
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