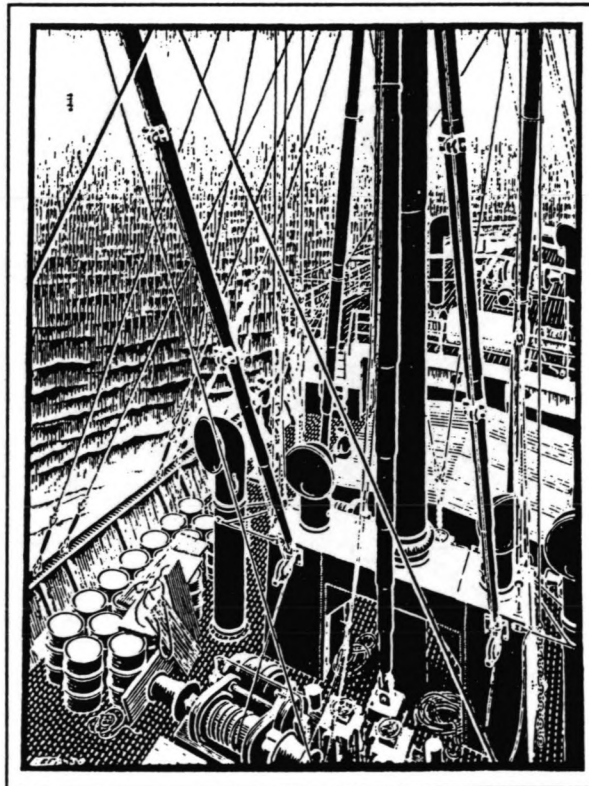


*Simulation Model for Port Operations
(HASPORT-II)*

Volume 3: Lexicon



*Master Thesis
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Volume 3 Lexicon

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1 Description of components/macros/queues/streams

1.1 Class components

<u>Name</u>	<u>Description</u>
ARRIVALDAY	Auxiliary class component (data component); describes the arrivals with inland-transport of export-cargo of one cargo-type during one day; belongs to an arrivalpattern of a cargo-type
BERTH	Auxiliary class component (data component); place at which a ship can be unloaded and loaded; belongs to a terminal
CARGOTYPE	Auxiliary class component (data component); a type of cargo which is handled on a terminal in the model
CRANE	Component with its own process-description; transports cargo from ship to shore v.v.
DEPARTUREDAY	Auxiliary class component (data component); describes the departures by inland-transport of import-cargo of one cargo-type during one day; belongs to an departurepattern of a cargotype
GENERATOR	Component with its own process-description; generates ships and assigns attributes to the ships
SHIFT	Component with its own process-description; determines whether or not a shift is taking place at a terminal
SHIP	Component with its own process-description; transports import-cargo into the model and export-cargo out of the model
SHIPCLASS	Auxiliary class component (data component); describes the attributes of one class of ships which visits the port

TERMINAL Auxiliary class component (data component);
place at which cargo arrives and departs, with ships and with inland
transport

1.2 Single components

<u>Name</u>	<u>Description</u>
HARBOUR_MASTER	Component with its own process-description; finds a suitable berth for each ship and accompanies the ship from the anchorage into the harbour to a berth
MAIN	Component with its own process-description; creates the harbour, berths, equipment, ship-classes and starts and finishes a simulation-run
REPORTER	Component with its own process-description; makes a report of the performance of the terminals, berths and ships at the end of a simulation-run
STORAGE_MASTER	Component with its own process-description; registers the arrivals and departures of cargo by inland-transport and the required amount of storage-area
STRIKE	Component with its own process-description; restricts the activities on the terminals
TERMINAL_MASTER	Component with its own process-description; allocates cranes to ships
TYPHOON	Component with its own process-description; restricts the activities on the terminals and in the harbour

1.3 Macros

<u>Name</u>	<u>Description</u>
ARRIVALPATT	Translates the general arrivalpattern of a cargotype to the particular

	arrivalpattern of the cargo of one ship
DEPARTUREPATT	Translates the general departurepattern of a cargotype to the particular departurepattern of the cargo of one ship
DWT_TABLES	Reads tables of the relation between DWT and length c.q. draught of shipclasses
ERROR1	Specifies an <i>illegal entry</i> error in the checklist
ERROR2	Specifies a <i>percentage do no add up to 100</i> error in the checklist
ERROR3	Specifies a <i>data overflow</i> error in the checklist
PATTERNCHANGE	Changes the arrivalpattern of the export-cargo of ships in the queue <i>Arrivingships</i> in case of typhoons and strikes
PATTERNS	Defines the general arrival- and departurepatterns of one cargotype
SHIFTSHIPS	Shifts ships at a multiple berth, when needed

1.4 Queues

<u>Name</u>	<u>Description</u>
ARRIVINGSHIPS	Set of ships which are artificially present in the model but have not yet arrived at the anchorage (in order to registrate the arrivals of export-cargo)
BUOY	Set of ships which are inside the port and have left the berth but are waiting to leave the port due to the tidal window
CHANNEL	Set of ships which are in the first quarter hour after leaving the anchorage; the maximum length of this queue is one, meaning that the interval-time of ships leaving the anchorage is a quarter hour
DEPARTINGSHIPS	Set of ships which have left the port but are still are artificially present in the model (in order to registrate the departures of import-cargo)

PORT	Set of ships which are inside the port (either berthed or mooring)
PRIORITY_ROW	Set of ships which are waiting at the anchorage and have priority to other ships at the anchorage
QUAY	Set of ships which are inside the port and are being unloaded/loaded at a berth
ROW	Set of all ships which are waiting at the anchorage

1.5 Outputstreams

REPORT	Information of the performances of berths, terminals and ships
CHECKLIST	Specification of errors in the input-files and display of all system-references

1.6 Inputstreams

DFILE	Information on ship-characteristics DWT/length/draught
HFILE	Information of the harbour
SFILE	Information of the shipclasses
TFILE	Information of the terminals

1.7 Randomstreams

<u>Name</u>	<u>Distribution of..</u>	<u>Shape</u>
EXP_IAT[x]	Inter-arrivaltime of ships	Exponential
EXP_IAT_B	Inter-arrivaltime of breakdowns	Exponential
EXP_IAT_S	Inter-arrivaltime of strikes	Exponential

EXP_IAT_T	Inter-arrivaltime of typhoons	Exponential
NORM_BD	Duration of breakdowns	Normal
NORM_C[x]	Perc.of cargo stored under cover	Normal
NORM_IAT[x]	Interarrivaltime of feeder-ships	Normal
NORM_SD	Duration of strikes	Normal
NORM_TD	Duration of typhoons	Normal
NORM_E[x]	Total export-cargo of ships	Normal/Exponential
NORM_I[x]	Total import-cargo of ships	Normal/Exponential
UNIF	Auxiliary randomstream	Uniform
UNIF_DWT[x]	DWT of ships	Uniform
UNKN_M[x]	Mooringtime of ships	Unknown

2 Description of attributes

2.1 Attributes: A - B

ARRDAY_NUM	(Attribute of <i>Arrivalday</i> ; Integer) Serial-number of an arrivalday
ARRDAY_PERC	(Attribute of <i>Arrivalday</i> ; Integer) Percentage of cargo of a particular ship, arriving on an arrivalday
BERTH_CAP	(Attribute of <i>Berth</i> ; Integer) Maximum number of ships permitted to moor at a multiple berth
BERTH_CARGOTYPE[5]	(Attribute of <i>Berth</i> ; Integer) Array of serial-numbers of cargotypes which are handled at a berth
BERTH_CARGOTYPES	(Attribute of <i>Berth</i> ; Integer) Number of cargotypes which are handled at one berth (maximum: 5)
BERTH_CRANES	(Attribute of <i>Berth</i> ; Ref. to set) Reference to set containing all cranes of one berth
BERTH_CRANESHIFTS	(Attribute of <i>Berth</i> ; Integer) Number of times a crane is shifted at a (multiple) berth
BERTH_CRANE_SUPPLY	(Attribute of <i>Berth</i> ; Integer) Number of cranes at one berth
BERTHDELAY_ BREAKDOWN	(Attribute of <i>Berth</i> ; Real) Sum of periods of time at which activities at a single berth are delayed due to a breakdown of one of the cranes at that berth (days); multiplied by the length of ships for multiple berths (meter-days)

BERTHDELAY_LEAVING	(Attribute of <i>Berth</i>; Real) Sum of periods of delay of activities at a single berth due to waiting of a ship at the berth; during these periods a berth remains occupied because the ship that is moored at the berth cannot leave because another ship is manoeuvring to closely (days); multiplied by the length of ships for multiple berths (meter-days)
BERTHDELAY_STRIKE	(Attribute of <i>Berth</i>; Real) Sum of periods of delay of activities at a single berth due to strikes (days); multiplied by the length of ships for multiple berths (meter-days)
BERTHDELAY_SHIFTING	(Attribute of <i>Berth</i>; Real) Sum of periods of delay of activities at a multiple berth due to shifting of ships, multiplied by the length of the ships that are delayed (meter-days)
BERTHDELAY_TYPHOON	(Attribute of <i>Berth</i>; Real) Sum of periods of delay of activities at a single berth due to bad weather; during these periods a berth remains occupied because the ship that is moored at that berth cannot leave the port due to bad weather (days); multiplied by the length of ships for multiple berths (meter-days)
BERTH_DEPTH	(Attribute of <i>Berth</i>; Real) Water-depth at a berth (m)
BERTH_LENGTH	(Attribute of <i>Berth</i>; Real) Length of a berth (m)
BERTH_LENGTH_FREE	(Attribute of <i>Berth</i>; Real) Length of free space at a multiple berth (m)
BERTH_NUMBER	(Attribute of <i>Berth</i>; Integer) Serial-number of a berth
BERTH_OCC_TIME	(Attribute of <i>Berth</i>; Real) Sum of periods of time at which a single berth is occupied (days); multiplied by the length of ships for multiple berths

	(meter-days)
BERTH_SHIPS	(Attribute of <i>Berth</i> ; Ref. to set) Reference to a set containing all ships which are moored at one multiple berth
BERTH_SHIP_SHIFTS	(Attribute of <i>Berth</i> ; Integer) Number of times a ship has been shifted at a multiple berth
BERTH_SINGLE	(Attribute of <i>Berth</i> ; Logical) TRUE = this berth is a single berth, at which only ship can moor at one time FALSE = this berth is a multiple berth, at which more than one ship can moor at one time, depending on their length
BERTH_SPACE_FREE	(Attribute of <i>Berth</i> ; Real) Length of a free space between two ships at a multiple berth (m)
BERTH_TERM_NUMBER	(Attribute of <i>Berth</i> ; Integer) Serial-number of the terminal to which a berth belongs
BERTHWAIT_TIDE	(Attribute of <i>Berth</i> ; Real) Sum of periods of delay of berth-activities due to the effect of the tide; during these periods a berth remains empty because the ship that will moor at the berth cannot enter the port due to the tide (days); multiplied by the length of ships for multiple berths (meter-days)
BERTHWAIT_TYPHOON	(Attribute of <i>Berth</i> ; Real) Sum of periods of delay of berth-activities due to bad weather; during these periods a berth remains empty because the ship that will moor at the berth cannot enter the port due to bad weather (days); multiplied by the length of ships for multiple berths (meter-days)
BERTH_WORKTIME	(Attribute of <i>Berth</i> ; Real) Sum of periods of time at which cranes at a berth are active (days); multiplied by the length of ships for multiple berths (meter-days)

2.2 Attributes: C

C	(Local parameter in <i>Error-macro's</i> ; Integer) Auxiliary attribute
CLASS_ALLSHIPS	(Attribute of <i>Shipclass</i> ; Integer) Total number of ships of one ship-class during a simulation-run
CLASS_BERTHTIME	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time at which ships of one ship-class occupy a berth (days)
CLASS_CARGOTYPE[x]	(Attribute of <i>Shipclass</i> ; Integer) Array of serial-numbers indicating the cargotype which a ship of a class is carrying and corresponding to the terminals in the port (x is the number of a terminal; for a terminal to which a ship cannot be allocated, the value at x is 0; for a terminal to which the ship can be allocated, the value at x is the serial-number (<i>Ct_number</i>) of the cargotype at that terminal)
CLASS_CODE	(Attribute of <i>Shipclass</i> ; Integer) Number indicating the DWT-table from which the length and the draught of the ship are drawn
CLASS_CRANE_DEMAND	(Attribute of <i>Shipclass</i> ; Integer) Required number of cranes for the unloading/loading of a ship of one shipclass
CLASSDELAY_ BREAKDOWN	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time at which ships of one ship-class are delayed due to a breakdown of one of the cranes at the berth at which the ship is moored (days)

CLASSDELAY_LEAVING	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to waiting of the ship at its berth; during these periods the ship cannot leave its berth because another ship is manoeuvring to closely (days)
CLASSDELAY_SHIFTING	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time at which ships of one ship-class, moored at a multiple berth, are delayed because they have to be shifted (days)
CLASSDELAY_STRIKE	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to strikes (days)
CLASSDELAY_TIDE	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to the effect of the tide; during these periods a ship cannot leave the port due to the tide (days)
CLASSDELAY_TYPHOON	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to bad weather; during these periods a ship cannot leave the port due to bad weather (days)
CLASSES	(Attribute of <i>Main</i> ; Ref. to set) Reference to a set containing all ship-classes of the model
CLASS_FEEDER	(Attribute of <i>Shipclass</i> ; Logical) TRUE = ships of this class have a regular feeder service FALSE = ships of this class do not have a regular feeder service
CLASS_FEEDER_PERC	(Attribute of <i>Shipclass</i> ; Integer) Percentage of cargo on ships of this ship-class which has been imported and will be exported by a feeder-ship
CLASS_GEAR_LOADCAP	(Attribute of <i>Shipclass</i> ; Real) Net total capacity of the ships' gear for loading the ships' cargo (boxes per hour/tons per hour)

CLASS_GEAR_UNLOADCAP	(Attribute of <i>Shipclass</i> ; Real) Net total capacity of the ships' gear for unloading the ships' cargo (boxes per hour/tons per hour)
CLASS_MAXWAIT	(Attribute of <i>Shipclass</i> ; Real) Maximum waitingtime at the anchorage of one ship-class (days)
CLASS_MOORINGTIME	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time needed for ships of one ship-class to sail from the anchorage to the berth (days)
CLASS_NUMBER	(Attribute of <i>Shipclass</i> ; Real) Serial number of a ship-class
CLASS_TERM_TAB[9]	(Attribute of <i>Shipclass</i> ; Integer) Array of cumulative percentages, indicating the number of ships of one ship-class going to each terminal
CLASS_TERM_PERC	(Attribute of <i>Shipclass</i> ; Integer) Cumulative percentages, indicating the number of ships of one ship-class going to each terminal
CLASS_WAITINGTIME	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time of ships of one ship-class spent at the anchorage, waiting to enter the port and go to a berth (days)
CLASSWAIT_TIDE	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to the effect of the tide; during these periods a ship cannot enter the port due to the tide (days)
CLASSWAIT_TYPHOON	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of delay of ships of one ship-class due to bad weather; during these periods a ship cannot enter the port due to bad weather (days)

CLASS_WORKTIME	(Attribute of <i>Shipclass</i> ; Real) Sum of periods of time at which ships of one ship-class occupy a berth and the cranes at that berth are active (days)
CRANE_AVAILABILITY	(Attribute of <i>Crane</i> ; Logical) TRUE = a crane is available to be allocated to a berth FALSE = a crane is not available to be allocated to berth
CRANE_BERTHNUMBER	(Attribute of <i>Crane</i> ; Integer) Serial-number of the berth to which a crane belongs
CRANE_BREAKDOWN_DURATION	(Attribute of <i>Crane</i> ; Real) Duration of a breakdown of a crane (days)
CRANE_BREAKDOWN_TIME	(Attribute of <i>Crane</i> ; Real) Moment of time at which the breakdown of a crane starts (days)
CRANECALL	(Attribute of <i>Crane</i> ; Real) Moment of time at which a crane becomes active; this attribute is needed to calculate the worktime of cranes (days)
CRANE_DELAYTIME	(Attribute of <i>Crane</i> ; Real) Sum of periods at time at which a crane should be active but is at rest because of a typhoon, a strike, absence of a shift, etc. (days)
CRANE_DOWNTIME	(Attribute of <i>Crane</i> ; Real) Sum of periods of time of breakdowns of cranes (days)
CRANE_LOADCAP	(Attribute of <i>Crane</i> ; Real) Gross crane-capacity during loading (tons per hour/boxes per hour)
CRANE_MYSHIP	(Attribute of <i>Crane</i> ; Ref. to <i>Ship</i>) Reference to the ship which is being unloaded/loaded by the crane

CRANE_NUMBER	(Attribute of <i>Crane</i> ; Integer) Serial-number of a crane
CRANE_PREV_SHIP	(Attribute of <i>Crane</i> ; Ref. to <i>Ship</i>) Reference to the ship which was worked on by a crane before suffering a breakdown and continuing to work on another ship after the breakdown
CRANE_RESTTIME	(Attribute of <i>Crane</i> ; Real) Sum of periods of time at which the crane is at rest and no ship is moored at the berth to which the crane belongs (days)
CRANESET	(Attribute of <i>Main</i> ; Ref. to set) Reference to a set containing all cranes in the model
CRANE_UNLOADCAP	(Attribute of <i>Crane</i> ; Real) Gross crane-capacity during unloading (boxes per hour/tons per hour)
CRANE_WORKTIME_A	(Attribute of <i>Crane</i> ; Real) Sum of periods of time during which a crane is active (in between two breakdowns of the crane)
CRANE_WORKTIME_B	(Attribute of <i>Crane</i> ; Real) Sum of periods of time during which a crane is active (during the complete simulation-run)
CRANE_X_MAX	(Attribute of <i>Crane</i> ; Real) The x-coordinate of the upper boundary of the range of a crane on the quay of a multiple berth (m; x-axis parallel along the berth)
CRANE_X_MIN	(Attribute of <i>Crane</i> ; Real) The x-coordinate of the lower boundary of the range of a crane on the quay of a multiple berth (m; x-axis parallel along the berth)
CT_ARRIVALPATT	(Attribute of <i>Cargotype</i> ; Ref. to set) Reference to a set containing all arrivaldays of a cargotype

CT_CAP_BARGE	(Attribute of <i>Cargotype</i> ; Real) Transport-capacity of barges (tons/TEU's)
CT_CAP_TRUCK	(Attribute of <i>Cargotype</i> ; Real) Transport-capacity of trucks (tons/TEU's)
CT_CAP_WAGON	(Attribute of <i>Cargotype</i> ; Real) Transport-capacity of wagons (tons/TEU's)
CT_CODE	(Attribute of <i>Cargotype</i> ; Character[1]) Letter indicating the sort of cargotype A = containers B = breakbulk C = liquid bulk D = dry bulk
CT_DENSITY	(Attribute of <i>Cargotype</i> ; Real) Density of breakbulk goods, necessary to calculate the required storage-area
CT_DEPARTUREPATT	(Attribute of <i>Cargotype</i> ; Ref. to set) Reference to a set containing all departedays of a cargotype
CT_EMPTIESPERC_EXP	(Attribute of <i>Cargotype</i> ; Integer) Percentage of empties among the export-containers of one cargotype
CT_EMPTIESPERC_IMP	(Attribute of <i>Cargotype</i> ; Integer) Percentage of empties among the import-containers of one cargotype
CT_EXP_ARR_COV	(Attribute of <i>Cargotype</i> ; Real) The amount of export-cargo of one cargotype (to be stored under cover) arriving on one day at the terminal with inland transport (tons/TEU)
CT_EXP_ARR_OPEN	(Attribute of <i>Cargotype</i> ; Real) The amount of export-cargo of one cargotype (to be stored open on the quay) arriving on one day at the terminal with inland transport (tons/TEU)

CT_FORTYFEETPERC_EXP	(Attribute of <i>Cargotype</i> ; Integer) Percentage of forty feet-containers among the export-containers of one cargotype
CT_FORTYFEETPERC_IMP	(Attribute of <i>Cargotype</i> ; Integer) Percentage of fortyfeet-containers among the import-containers of one cargotype
CT_GROSS_FAC	(Attribute of <i>Cargotype</i> ; Real) Factor to indicate the gross/net storage-area requirements (traffic-lanes etc.)
CT_GRSLOT_EMP	(Attribute of <i>Cargotype</i> ; Real) Number of occupied groundslots (size: 1 TEU) for empty containers
CT_GRSLOT_EXP	(Attribute of <i>Cargotype</i> ; Real) Number of occupied groundslots (size: 1 TEU) for export-containers
CT_GRSLOT_IMP	(Attribute of <i>Cargotype</i> ; Real) Number of occupied groundslots (size: 1 TEU) for import-containers
CT_IMP_DEP_COV	(Attribute of <i>Cargotype</i> ; Real) The amount of import-cargo of one cargotype (stored under cover) departing on one day from the terminal with inland transport (tons/TEU)
CT_IMP_DEP_OPEN	(Attribute of <i>Cargotype</i> ; Real) The amount of import-cargo of one cargotype (stored open on the quay) departing on one day from the terminal with inland transport (tons/TEU)
CT_NUMBER	(Attribute of <i>Cargotype</i> ; Integer) Serial-number of a cargotype, which is handled at a terminal

CT_PERC_ARR_DIRECT	(Attribute of <i>Cargotype</i> ; Integer) Percentage of export-cargo of one cargotype which is not stored on the terminal but loaded directly from the inland transport onto a ship
CT_PERC_ARR_IWT	(Attribute of <i>Cargotype</i> ; Integer) Percentage of export-cargo of one cargotype which arrives at the terminal by inland water transport (barges)
CT_PERC_ARR_RAIL	(Attribute of <i>Cargotype</i> ; Integer) Percentage of export-cargo of one cargotype which arrives at the terminal by rail (wagons)
CT_PERC_ARR_ROAD	(Attribute of <i>Cargotype</i> ; Integer) Percentage of export-cargo of one cargotype which arrives at the terminal by road (trucks)
CT_PERC_DEP_DIRECT	(Attribute of <i>Cargotype</i> ; Integer) Percentage of import-cargo of one cargotype which is not stored on the terminal but loaded directly from the ship onto the inland transport
CT_PERC_DEP_IWT	(Attribute of <i>Cargotype</i> ; Integer) Percentage of import-cargo of one cargotype which departs from the terminal by inland water transport (barges)
CT_PERC_DEP_RAIL	(Attribute of <i>Cargotype</i> ; Integer) Percentage of import-cargo of one cargotype which departs from the terminal by rail (wagons)
CT_PERC_DEP_ROAD	(Attribute of <i>Cargotype</i> ; Integer) Percentage of import-cargo of one cargotype which departs from the terminal by road (trucks)
CT_STACK_EMP_EXP	(Attribute of <i>Cargotype</i> ; Real) Number of export-containers in the empties-stack of a terminal

CT_STACK_EMP_IMP	(Attribute of <i>Cargotype</i> ; Real) Number of import-containers in the empties-stack of a terminal
CT_STACK_EXP	(Attribute of <i>Cargotype</i> ; Real) Number of containers in the export-stack of a terminal
CT_STACKHEIGHT_EMP	(Attribute of <i>Cargotype</i> ; Real) Mean stackheight of a stack of empty containers (in numbers of containers)
CT_STACKHEIGHT_EXP	(Attribute of <i>Cargotype</i> ; Real) Mean stackheight of a stack of export-containers (in numbers of containers)
CT_STACKHEIGHT_GEN	(Attribute of <i>Cargotype</i> ; Real) Mean stackheight of a breakbulk-stack, open and covered (m)
CT_STACKHEIGHT_IMP	(Attribute of <i>Cargotype</i> ; Real) Mean stackheight of a stack of import-containers (in numbers of containers)
CT_STACK_IMP	(Attribute of <i>Cargotype</i> ; Real) Number of containers in the import-stack of a terminal
CT_STORAGE_AREA_COV	(Attribute of <i>Cargotype</i> ; Real) The total occupied amount of covered storage-area (sheds, warehouses, etc.) for one type of breakbulk at a terminal (m ²)
CT_STORAGE_AREA_OCCUPIED	(Attribute of <i>Cargotype</i> ; Real) The total occupied amount of open storage-area for one type of breakbulk at a terminal (m ²)
CT_STORAGE_EXP_COV	(Attribute of <i>Cargotype</i> ; Real) The total amount of export-cargo in storage under cover at a terminal (tons)

CT_STORAGE_EXP_OPEN	(Attribute of <i>Cargotype</i> ; Real) The total amount of export-cargo in storage open on the quay at a terminal (tons)
CT_STORAGE_FEEDER	(Attribute of <i>Cargotype</i> ; Real) The total amount of containers in storage which arrived by or will depart with feederships
CT_STORAGE_IMP_COV	(Attribute of <i>Cargotype</i> ; Real) The total amount of import-cargo in storage under cover at a terminal (tons)
CT_STORAGE_IMP_OPEN	(Attribute of <i>Cargotype</i> ; Real) The total amount of import-cargo in storage open on the quay at a terminal (tons)
CT_STORAGE_VOLUME	(Attribute of <i>Cargotype</i> ; Real) The total occupied amount of storage-volume for one type of liquid bulk or dry bulk at a terminal (m ³)
CT_THROUGHPUT_EXP	(Attribute of <i>Cargotype</i> ; Real) Throughput of export-cargo of one cargotype at a terminal (tons/TEU's)
CT_THROUGHPUT_IMP	(Attribute of <i>Cargotype</i> ; Real) Throughput of import-cargo of one cargotype at a terminal (tons/TEU's)

2.3 Attributes: D - L

DAYNUMBER	(Attribute of <i>Main</i> ; Integer) Serial-number of a day during the week (1 = monday, 2 = tuesday, etc.)
DEPDAY_NUM	(Attribute of <i>Departureday</i> ; Integer) Serial-number of a departureday
DEPDAY_PERC	(Attribute of <i>Departureday</i> ; Integer) Percentage of cargo of a particular ship, departing on a departureday
DEV_BD	(Attribute of <i>Main</i> ; Real) Deviation of the distribution from which the duration of breakdowns of cranes is drawn (days)
DEV_C	(Attribute of <i>Shipclass</i> ; Real) Deviation of the distribution from which the percentage of cargo of ships of one shipclass which is stored under cover, is drawn
DEV_E	(Attribute of <i>Shipclass</i> ; Real) Deviation of the distribution from which the total amount of export-cargo of ships of one ship-class is drawn (tons/TEU's)
DEV_I	(Attribute of <i>Shipclass</i> ; Real) Deviation of the distribution from which the total amount of import-cargo of ships of one ship-class is drawn (tons/TEU's)
DEV_IAT	(Attribute of <i>Shipclass</i> ; Real) Deviation of the distribution from which the interarrivaltime of ships with a regular feeder service is drawn (days)
DEV_M	(Attribute of <i>Shipclass</i> ; Real) Deviation of the distribution from which the mooringtime of ships of one shipclass is drawn (hours)

DEV_SD	(Attribute of <i>Main</i> ; Real) Deviation of the distribution from which the duration of strikes is drawn (days)
DEV_TD	(Attribute of <i>Main</i> ; Real) Deviation of the distribution from which the duration of typhoons is drawn (days)
ENTRANCE_DEPTH	(Attribute of <i>Main</i> ; Continuous[0]) Water-depth in the entrance-channel of the port (m)
ERRORS	(Attribute of <i>Main</i> ; Integer) Counter
H	(Attribute of <i>Main</i> ; Integer) Counter
HM_CHECKBERTH	(Attr. of <i>Harbour_master</i> ; Ref. to <i>Berth</i>) Reference to the berth which is being checked by the harbour-master
HM_CHECKSHIP	(Attribute of <i>Harbour_master</i> ; Ref. to <i>Ship</i>) Reference to the ship for which the harbour-master is looking for a place at a suitable berth
HM_PORTLENGTH	(Attribute of <i>Harbour_master</i> ; Integer) Length of the queue <i>Port</i> at the beginning of a check-up of the port by the Harbourmaster
HM_ROWLENGTH	(Attribute of <i>Harbour_master</i> ; Integer) Length of the queue <i>Row</i> at the beginning of a check-up of the anchorage(= row) by the Harbourmaster
HM_PRIORITY_SHIP	(Attribute of <i>Harbour_master</i> ; Ref. to <i>Ship</i>) Reference to a ship at the anchorage of a ship-class that has priority to other ships
HM_SHIFTSHIP	(Attribute of <i>Harbour_master</i> ; Ref. to <i>Ship</i>) Reference to the ship which is being shifted by the harbour-master

I	(Attribute of <i>Main</i> ; Integer) Counter
IAT	(Attribute of <i>Shipclass</i> ; Real) Mean inter-arrivaltime of ships of one shipclass (days)
INTERARRIVALTIME	(Attribute of <i>Generator</i> ; Real) Inter-arrivaltime of ships, generated by this generator (days)
J	(Attribute of <i>Main</i> ; Integer) Counter
K	(Attribute of <i>Shift</i> ; Integer) Counter
KARAKTER	(Local parameter in <i>Error</i> -macro's; Character) Auxiliary attribute
L	(Attribute of <i>Main</i> ; Integer) Counter
LENGTH_ARRIVALPATT	(Attribute of <i>Main</i> ; Integer) Number of days on which export-cargo can arrive at the terminal with inland transport
LENGTH_ DEPARTUREPATT	(Attribute of <i>Main</i> ; Integer) Number of days on which import-cargo can depart from the terminal with inland transport
LOW_DWT	(Attribute of <i>Shipclass</i> ; Real) Minimum value of the distribution from which the DWT of ships of one ship-class is drawn (m.)
LOW_E	(Attribute of <i>Shipclass</i> ; Real) Minimum value of the total amount of export-cargo of a ship (tons/TEU's)

LOW_I

(Attribute of *Shipclass*; Real)

Minimum value of the total amount of import-cargo of a ship (tons/TEU's)

LOW_M

(Attribute of *Shipclass*; Real)

The lower boundary of the distribution from which the mooringtime of ships of one ship-class is drawn (hours)

2.4 Attributes: M - R

M	(Attribute of <i>Main</i> ; Integer) Counter
MAINTENANCE_ DURATION	(Attribute of <i>Main</i> ; Real) Duration of maintenance-check-ups for cranes (hours)
MAINTENANCE_TIME	(Attribute of <i>Main</i> ; Real) Intervaltime of maintenance-check-ups for cranes (hours)
MEAN_BD	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the duration of breakdowns of cranes is drawn (days)
MEAN_C	(Attribute of <i>Shipclass</i> ; Real) Mean value of the distribution from which the percentage of cargo of ships of one shipclass which is stored under cover, is drawn
MEAN_DEPTH	(Attribute of <i>Main</i> ; Real) Mean water-depth of the entrance-channel of the port (m)
MEAN_E	(Attribute of <i>Shipclass</i> ; Real) Mean value of the distribution from which the total amount of export-cargo of ships of one ship-class is drawn (tons/TEU's)
MEAN_I	(Attribute of <i>Shipclass</i> ; Real) Mean value of the distribution from which the total amount of import-cargo of ships of one ship-class is drawn (tons/TEU's)
MEAN_IAT_B	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the inter-arrivaltime of breakdowns of cranes is drawn (days)
MEAN_IAT_S	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the inter-

	arrivaltimes of strikes is drawn (days)
MEAN_IAT_T	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the inter-arrivaltime of typhoons is drawn (days)
MEAN_M	(Attribute of <i>Shipclass</i> ; Real) Mean value of the distribution from which the mooring time of ships of one shipclass is drawn (hours)
MEAN_SD	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the duration of strikes is drawn (days)
MEAN_TD	(Attribute of <i>Main</i> ; Real) Mean value of the distribution from which the duration of typhoons is drawn (days)
MOORING[10]	(Attribute of <i>Main</i> ; Logical) Array, indicating if a ship is manoeuvring in front of a berth: MOORING[x] = TRUE means that a ship is mooring or leaving berth x and thereby obstructing the manoeuvring of other ships at berth x (and possible adjacent berths) MOORING[x] = FALSE means that no ship is mooring or leaving berth x
MYCLASS	(Attribute of <i>Generator</i> ; Ref. to <i>Shipclass</i>) Reference to ship-class; auxiliary attribute
N	(Attribute of <i>Main</i> ; Integer) Counter
NEXTSHIP	(Attribute of <i>Generator</i> ; Ref. to <i>Ship</i>) Reference to a ship: auxiliary attribute
NR_CLASSES	(Attribute of <i>Main</i> ; Integer) Number of ship-classes in the model
NR_STRIKES	(Attribute of <i>Main</i> ; Integer) Number of strikes during the simulation

NR_TERMINALS	(Attribute of <i>Main</i> ; Integer) Number of terminals in the model
NR_TYPHOONS	(Attribute of <i>Main</i> ; Integer) Number of typhoons during the simulation
NUM	(Local parameter in <i>Error</i> -macro's; Integer) Auxiliary attribute
PORT_CAP	(Attribute of <i>Main</i> ; Integer) Capacity of ships inside the port
RAND	(Attribute of <i>Main</i> ; Real) Random number drawn from the UNIF-distribution
RESTR_STRIKE	(Attribute of <i>Main</i> ; Logical) TRUE = the facility for generating strikes will be/has been activated FALSE = the facility for generating strikes will not be/has not been activated
RESTR_TYPHOON	(Attribute of <i>Main</i> ; Logical) TRUE = the facility for generating typhoons will be/has been activated FALSE = the facility for generating typhoons will not be/has not been activated
RIGHTBERTH	(Attribute of <i>Ship</i> ; Ref. to <i>Berth</i>) Reference to a berth; a ship moors at this berth
RIGHTCLASS	(Attribute of <i>Ship</i> ; Ref. to <i>Shipclass</i>) Reference to a ship-class; a ship belongs to this ship-class
RIGHTCRANE	(Attribute of <i>Ship</i> ; Ref. to <i>Crane</i>) Reference to the crane, which is the crane with the lowest x-coordinate which is serving a ship at a multiple berth
RIGHTTERM	(Attribute of <i>Ship</i> ; Ref. to TERM_MASTER) Reference to a terminal; a ship is moored at this terminal

2.5 Attributes: S

SATSUN	(Attribute of <i>Main</i> ; Integer) Number of saturdays and sundays during the arrivalpattern
SHIFT_DURATION[3]	(Attribute of <i>Shift</i> ; Real) Array of durations of shifts (hours)
SHIFT_TERM	(Attribute of <i>Shift</i> ; Ref. to TERM_MASTER) Reference to the terminal to which the shift belongs
SHIFT_TIME[3]	(Attribute of <i>Shift</i> ; Real) Array of starting-times of shifts (hours)
SHIPCALL1	(Attribute of <i>Ship</i> ; Real) Moment of time in the process of a ship; auxiliary attribute needed to calculate delays and waitingtimes (days)
SHIPCALL2	(Attribute of <i>Ship</i> ; Real) Moment of time in the process of a ship; auxiliary attribute needed to calculate the waitingtime at the berth before leaving the port and in the queue <i>Departingships</i> (days)
SHIPCALL3	(Attribute of <i>Ship</i> ; Real) Moments of time in the process of a ship; auxiliary attribute needed to calculate delays due to crane-breakdowns (days)
SHIP_CARGOTYPE	(Attribute of <i>Ship</i> ; Integer) Serial-number of the cargotype which is transported by a ship
SHIP_COVER_FAC	(Attribute of <i>Ship</i> ; Real) Percentage of cargo of a ship which is stored under cover (in sheds, warehouses, etc.)
SHIP_CRANE_ALLOC	(Attribute of <i>Ship</i> ; Logical) TRUE = cranes have been allocated to this ship FALSE = cranes have not yet been allocated to this ship
SHIP_CRANE_SUPPLY	(Attribute of <i>Ship</i> ; Integer) Number of cranes that are serving a ship

SHIP_DAY	(Attribute of <i>Ship</i> ; Integer) Counter of the amount of days spent by a ship in the queue's <i>Arrivingships</i> and <i>Departingships</i>
SHIP_DRAUGHT_ BERTHED	(Attribute of <i>Ship</i> ; Real) Draught of a ship, inclusive of a safety-margin (m)
SHIP_DWT	(Attribute of <i>Ship</i> ; Real) Value of DWT for a ship
SHIP_EXPORTTOTAL	(Attribute of <i>Ship</i> ; Real) Total amount of export-cargo of a ship (tons/TEU's)
SHIP_EXTRA_ARR	(Attribute of <i>Ship</i> ; Integer) Extra number of days for ships to stay in the queue <i>Arrivingships</i> ; these are days due to strikes or typhoons, which overlap the end of the arrival-pattern of a cargotype
SHIP_EXTRA_DEP	(Attribute of <i>Ship</i> ; Integer) Extra number of days for ships to stay in the queue <i>Departingships</i> ; these days are saturdays and/or sundays on which there is no inland transport
SHIP_FORTYFEET PERC_EXP	(Attribute of <i>Ship</i> ; Real) Percentage of forty feet-containers among the export-containers of a ship
SHIP_FORTYFEET PERC_IMP	(Attribute of <i>Ship</i> ; Real) Percentage of forty feet-containers among the import-containers of a ship
SHIP_IMPORTTOTAL	(Attribute of <i>Ship</i> ; Real) Total amount of import-cargo of a ship (tons/TEU's)
SHIP_LENGTH_BERTHED	(Attribute of <i>Ship</i> ; Real) Length of a ship, inclusive of a safety-margin (m)

SHIP_LOAD	(Attribute of <i>Ship</i> ; Continuous[1]) Amount of cargo unloaded from and loaded onto a ship (tons/TEU's)
SHIP_LOAD_RATE	(Attribute of <i>Ship</i> ; Real) Effective capacity of all active cranes for loading cargo of one ship (tons per day/boxes per day)
SHIP_LOADING	(attribute of <i>Ship</i> ; Logical) TRUE = ship is being loaded FALSE = ship is not being loaded
SHIP_MOORINGTIME	(Attribute of <i>Ship</i> ; Real) Time needed by a ship to sail from the anchorage to a berth (hours)
SHIP_MOORING_EXTRA	(Attribute of <i>Ship</i> ; Real) Extra time needed by a ship to sail from the anchorage to a berth, due to waiting for other ships which are manoeuvring near the berth in question (hours)
SHIP_PERC_ARR[20]	(Attribute of <i>Ship</i> ; Integer) Array of percentages of arrivals of export-cargo of ships on arrivaldays; this array is in fact the description of the dwell-time of export-cargo
SHIP_PERC_DEP[20]	(Attribute of <i>Ship</i> ; Integer) Array of percentages of departures of import-cargo of ships on departuredays; this array is in fact the description of the dwell-time of import-cargo
SHIP_RATE	(Attribute of <i>Ship</i> ; Real) Sum of the effective capacity of all cranes at a berth during loading or unloading; this attribute is used to describe the derivative of the attribute <i>ship-load</i> (tons per day/boxes per day)
SHIP_SHIFTED	(Attribute of <i>Ship</i> ; Logical) TRUE = this ship is being shifted FALSE = this ship is not being shifted

SHIP_TERM_NUMBER	(Attribute of <i>Ship</i> ; Integer) Serial-number of the terminal at which a ship is unloaded/loaded
SHIP_UNLOAD_RATE	(Attribute of <i>Ship</i> ; Real) Effective capacity of all active cranes for unloading cargo of one ship (tons per day/boxes per day)
SHIP_UNLOADING	(Attribute of <i>Ship</i> ; Logical) TRUE = ship is being unloaded FALSE = ship is not being unloaded
SHIP_X_BOW	(Attribute of <i>Ship</i> ; Real) The x-coordinate of a the bow of a ship, moored at a multiple berth (m; x-axis parallel along the berth)
SHIP_X_STERN	(Attribute of <i>Ship</i> ; Real) The x-coordinate of a the stern of a ship, moored at a multiple berth (m; x-axis parallel along the berth)
SIMULATIONTIME	(Attribute of <i>Main</i> ; Real) Duration of the simulation (days)
SPECIFIED	(Attribute of <i>Main</i> ; Logical) TRUE = the continuous attribute <i>ship-load</i> has been specified FALSE = the continuous attribute <i>ship-load</i> has not yet been specified
STRIKE_ALARM	(Attribute of <i>Strike</i> ; Logical) TRUE = a strike is taking place, no activities are possible at the berths FALSE = no strike are taking place at the moment
STRIKE_CALL	(Attribute of <i>Strike</i> ; Real) Moment of time at which a strike starts (days)
STRIKE_DURATION	(Attribute of <i>Strike</i> ; Real) Duration of a strike (days)

STRIKE_

INTERARRIVALTIME

(Attribute of *Strike*; Real)

Inter-arrivaltimes of strikes (days)

STRIKE_SPELL

(Attribute of *Strike*; Integer)

Duration of a strike in an integer number of days

2.6 Attributes: T - Z

TAB_DRAUGHT[x]	(Attribute of <i>Main</i> ; Table) Table with values indicating the relationship between DWT and draught of ships for one type of ships
TAB_LENGTH[x]	(Attribute of <i>Main</i> ; Table) Table with values indicating the relationship between DWT and length of ships for one type of ships
TAB_X	(Attribute of <i>Main</i> ; Real) Auxiliary attribute for reading DWT-tables
TAB_Y	(Attribute of <i>Main</i> ; Real) Auxiliary attribute for reading DWT-tables
TERM_ALLSHIPS	(Attribute of <i>Terminal</i> ; Integer) Total number of ships calling at a terminal during a simulation-run
TERM_AREA_CAPACITY	(Attribute of <i>Terminal</i> ; Real) Capacity of storage-area of a terminal (m ²)
TERM_AREA_OCCUPIED	(Attribute of <i>Terminal</i> ; Real) Total amount of occupied storage-area on a terminal (m ²)
TERM_ARR_BARGE	(Attribute of <i>Terminal</i> ; Real) Annual number of barges arriving at a terminal with export-cargo
TERM_ARR_TRUCK	(Attribute of <i>Terminal</i> ; Real) Annual number of trucks arriving at a terminal with export-cargo
TERM_ARR_WAGON	(Attribute of <i>Terminal</i> ; Real) Annual number of wagons arriving at a terminal with export-cargo

TERM_BERTHS	(Attribute of <i>Terminal</i> ; Integer) Number of berths at the terminal
TERM_BERTHSET	(Attribute of <i>Terminal</i> ; Ref. to set) Reference to a set containing all berths of a terminal
TERM_BREAKDOWNS	(Attribute of <i>Terminal</i> ; Integer) Number of breakdowns at one terminal
TERM_CARGO	(Attribute of <i>Terminal</i> ; Ref. to set) Reference to a set containing all types of cargo which are handled at that terminal
TERM_CARGOTYPES	(Attribute of <i>Terminal</i> ; Integer) Number of cargotypes handled at one terminal
TERM_CRANES	(Attribute of <i>Terminal</i> ; Integer) Number of cranes at the terminal
TERM_DEP_BARGE	(Attribute of <i>Terminal</i> ; Real) Annual number of barges arriving at a terminal with import-cargo
TERM_DEP_TRUCK	(Attribute of <i>Terminal</i> ; Real) Annual number of trucks arriving at a terminal with import-cargo
TERM_DEP_WAGON	(Attribute of <i>Terminal</i> ; Real) Annual number of wagons arriving at a terminal with import-cargo
TERM_EQUIP_CAP	(Attribute of <i>Terminal</i> ; Real) Mean capacity of one equipment-unit on this terminal (tons/hour)
TERM_EQUIP_PERC	(Attribute of <i>Terminal</i> ; Real) Percentage of cargo that is handled by the equipment on the terminal

TERM_EQUIP_UNITS	(Attribute of <i>Terminal</i> ; Integer) Number of equipment-units on this terminal
TERMINAL_NUMBER	(Attribute of <i>Terminal</i> ; Integer) Serial-number of a terminal
TERMINALSET	(Attribute of <i>Main</i> ; Ref. to set) Reference to a set containing all terminal-masters
TERM_NET_FAC	(Attribute of <i>Terminal</i> ; Real) Factor indicating the net amount of time at which shifts are taking place during a day ($0 < \text{net-factor} \leq 1$)
TERM_OPERATIONFAC	(Attribute of <i>Terminal</i> ; Real) Factor indicating the effective operation period during shifts
TERM_SAT_LOAD	(Attribute of <i>Terminal</i> ; Logical) TRUE = shifts are taking place on this terminal on saturdays FALSE = shifts are not taking place on this terminal on saturdays
TERM_SAT_TRANS	(Attribute of <i>Terminal</i> ; Logical) TRUE = inland transport is available on saturdays on this terminal FALSE = inland transport is not available on saturdays on this terminal
TERM_SHIFT	(Attribute of <i>Terminal</i> ; Logical) TRUE = a shift is taking place at this moment at the terminal FALSE = a shift is not taking place at this moment at the terminal
TERM_SHIFTS	(Attribute of <i>Terminal</i> ; Integer) Number of shifts per day at one terminal
TERM_SHIPS	(Attribute of <i>Terminal</i> ; Ref. to set) Reference to a set containing all ships which have moored at a terminal

TERM_SUN_LOAD	(Attribute of <i>Terminal</i> ; Logical) TRUE = shifts are taking place on this terminal on sundays FALSE = shifts are not taking place on this terminal on sundays
TERM_SUN_TRANS	(Attribute of <i>Terminal</i> ; Logical) TRUE = inland transport is available on sundays on this terminal FALSE = inland transport is not available on sundays on this terminal
TERM_VOL_CAPACITY	(Attribute of <i>Terminal</i> ; Real) Capacity of storage-volume of a terminal (m ³)
TERM_VOL_OCCUPIED	(Attribute of <i>Terminal</i> ; Real) Total amount of occupied storage-volume on a terminal (m ³)
TIDE_ALPHA_1	(Attribute of <i>Main</i> ; Real) Phase angle of the S2-tide (rad)
TIDE_ALPHA_2	(Attribute of <i>Main</i> ; Real) Phase angle of the M2-tide (rad)
TIDE_AMPLITUDE_1	(Attribute of <i>Main</i> ; Real) Amplitude of the S2-tide (m)
TIDE_AMPLITUDE_2	(Attribute of <i>Main</i> ; Real) Amplitude of the M2-tide (m)
TIDE_PERIOD_1	(Attribute of <i>Main</i> ; Real) Period of the S2-tide (days)
TIDE_PERIOD_2	(Attribute of <i>Main</i> ; Real) Period of the M2-tide (days)
TM_LOAD_A	(Attribute of <i>Terminal_master</i> ; Real) The consignment-size (sum of import- and exporttotal) of a ship at a multiple berth which is adjacent to the ship which is being checked by the terminal-master

TM_LOAD_B	(Attribute of <i>Terminal_master</i> ; Real) The consignment-size (sum of import- and exporttotal) of a ship at a multiple berth which is adjacent to the ship which is being checked by the terminal-master
TM_LOAD_C	(Attribute of <i>Terminal_master</i> ; Real) The consignment-size (sum of import- and exporttotal) of a ship at a multiple berth which is adjacent to the ship which is being checked by the terminal-master
TM_QUAYLENGTH	(Attribute of <i>Terminal_master</i> ; Real) Length of the queue <i>Quay</i> at the beginning of a check-up by the terminal-master
TM_SHIP_A	(Attr. of <i>Terminal_master</i> ; Ref. to <i>Ship</i>) Reference to a ship, which is adjacent (on the side with a lower x-coordinate) to the ship which is being checked by the terminal-master
TM_SHIP_B	(Attr. of <i>Terminal_master</i> ; Ref. to <i>Ship</i>) Reference to a ship, which is adjacent (on the side with a higher x-coordinate) to the ship which is being checked by the terminal-master
TM_SHIP_C	(Attr. of <i>Terminal_master</i> ; Ref. to <i>Ship</i>) Reference to a ship, which is adjacent to the ship which is being checked by the terminal-master and which has to put one of its cranes at the disposal of the ship which is being checked by the terminal-master
TYPHOON_ALARM	(Attribute of <i>Typhoon</i> ; Logical) TRUE = the sailing of ships in the port and the terminal-activities on all terminals are being restricted by a typhoon FALSE = the sailing of ships in the port and the terminal-activities on all terminals are not being restricted by a typhoon at this moment
TYPHOONBEGIN	(Attribute of <i>Typhoon</i> ; Integer) First day of the typhoon-season (days, 0 < typhoonbegin < 365)

TYPHOON_CALL	(Attribute of <i>Typhoon</i> ; Real) Moment of time at which a typhoon starts (days)
TYPHOON_DURATION	(Attribute of <i>Typhoon</i> ; Real) Duration of a typhoon (days)
TYPHOONEND	(Attribute of <i>Typhoon</i> ; Integer) Last day of the typhoon-season (days, $0 < \text{typhoonend} < 365$)
TYPHOON_ INTERARRIVALTIME	(Attribute of <i>Typhoon</i> ; Real) Inter-arrivaltime of typhoons during the typhoon-season (days)
TYPHOON_SPELL	(Attribute of <i>Typhoon</i> ; Integer) Duration of a typhoon in an integer number of days
UP_DWT	(Attribute of <i>Shipclass</i> ; Real) Maximum value of the distribution from which the DWT of ships of one ship-class is drawn (m.)
UP_E	(Attribute of <i>Shipclass</i> ; Real) Maximum value of the total amount of export-cargo of a ship (tons/TEU's)
UP_I	(Attribute of <i>Shipclass</i> ; Real) Maximum value of the total amount of import-cargo of a ship (tons/TEU's)



