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Chapter 1

Data Structure Index

1.1 Data Structures

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Chapter 3

Data Structure Documentation

3.1 _field_dis_cap Struct Reference

Data Fields

- double **dis_cap**

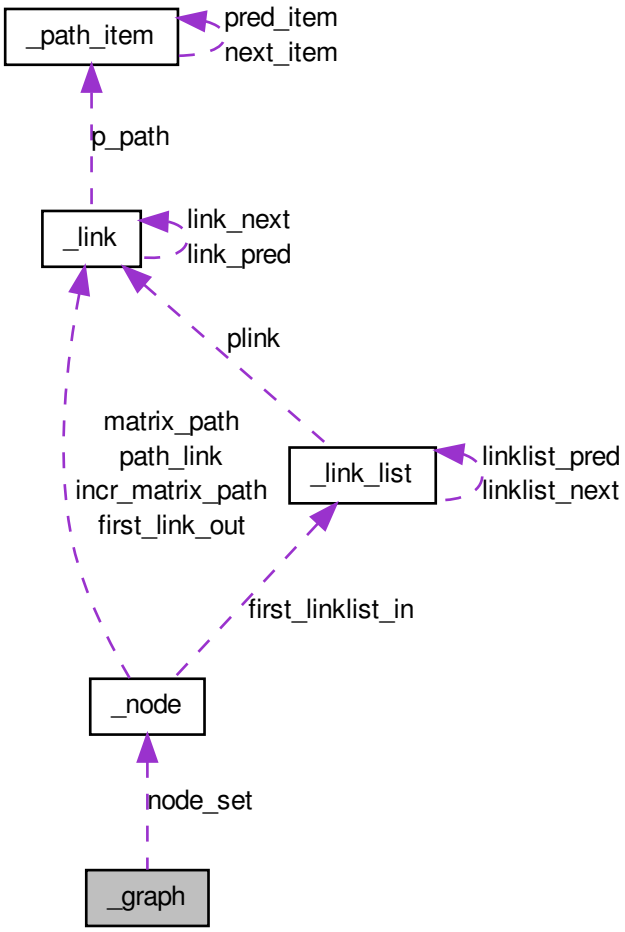
- double **cost_cap**

The documentation for this struct was generated from the following file:

- graph/matrix.h

3.2 _graph Struct Reference

Collaboration diagram for _graph:



Data Fields

- int **max_num_nodes**
- int **max_num_links**
- int **num_nodes**
- int **num_links**
- COST **cost_graph**

- COST **cost_broken_graph**
- NODE * **node_set**

The documentation for this struct was generated from the following file:

- graph/graph.h

3.3 _item_heap Struct Reference

Data Fields

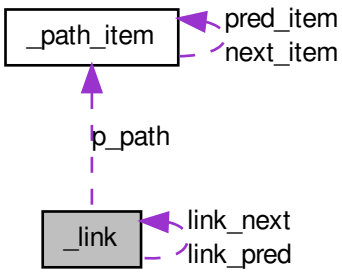
- NODEID **node_id**
- COST **path_cost**

The documentation for this struct was generated from the following file:

- graph/routing.h

3.4 _link Struct Reference

Collaboration diagram for _link:



Data Fields

- int **identif**
- NODEID **node_from**
- NODEID **node_to**

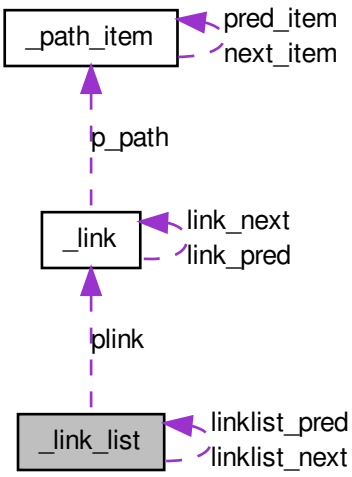
- COST(∗ **economic_cost**)(struct _link ∗p)
- COST **routing_cost**
- struct _link ∗ **link_next**
- struct _link ∗ **link_pred**
- BOOL **link_visited**
- BOOL **link_state**
- TRAFFIC **flow_aggr**
- TRAFFIC **flow_aggr_broken**
- TRAFFIC **max_flow_on_link**
- CAPACITY **capacity**
- CAPACITY **broken_capacity**
- PATH_ITEM ∗ **p_path**

The documentation for this struct was generated from the following file:

- graph/graph.h

3.5 _link_list Struct Reference

Collaboration diagram for _link_list:



Data Fields

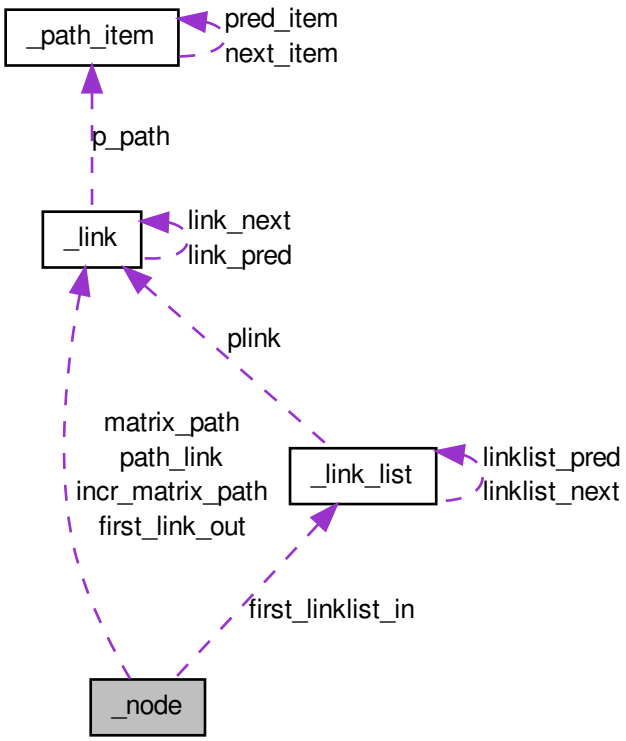
- PLINK **plink**
- struct _link_list * **linklist_next**
- struct _link_list * **linklist_pred**

The documentation for this struct was generated from the following file:

- graph/graph.h

3.6 _node Struct Reference

Collaboration diagram for _node:



Data Fields

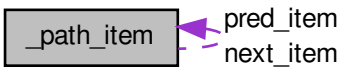
- NODEID **node_id**
- PLINK ** **matrix_path**
- PLINK ** **incr_matrix_path**
- PLINK **first_link_out**
- PLINKLIST **first_linklist_in**
- int **num_links_out**
- BOOL **node_state**
- COST **path_weight**
- PLINK **path_link**

The documentation for this struct was generated from the following file:

- graph/graph.h

3.7 _path_item Struct Reference

Collaboration diagram for _path_item:



Data Fields

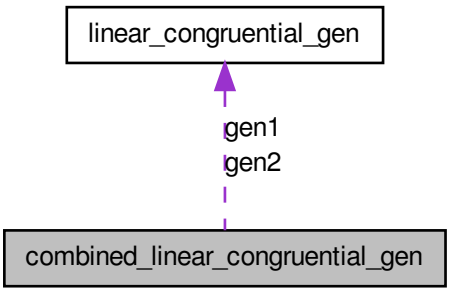
- NODEID **node_from**
- NODEID **node_to**
- TRAFFIC **flow_item**
- struct _path_item * **next_item**
- struct _path_item * **pred_item**

The documentation for this struct was generated from the following file:

- graph/graph.h

3.8 combined_linear_congruential_gen Struct Reference

Collaboration diagram for combined_linear_congruential_gen:



Data Fields

- LINEAR_LEHMER_GEN gen1

  The first Linear Congruential Generator.

- LINEAR_LEHMER_GEN gen2

  The second Linear Congruential Generator.

- unsigned long **last_value**

3.8.1 Detailed Description

Random number generator based on Combined-Linear-Congruential Generator with two Linear Congruential Generator

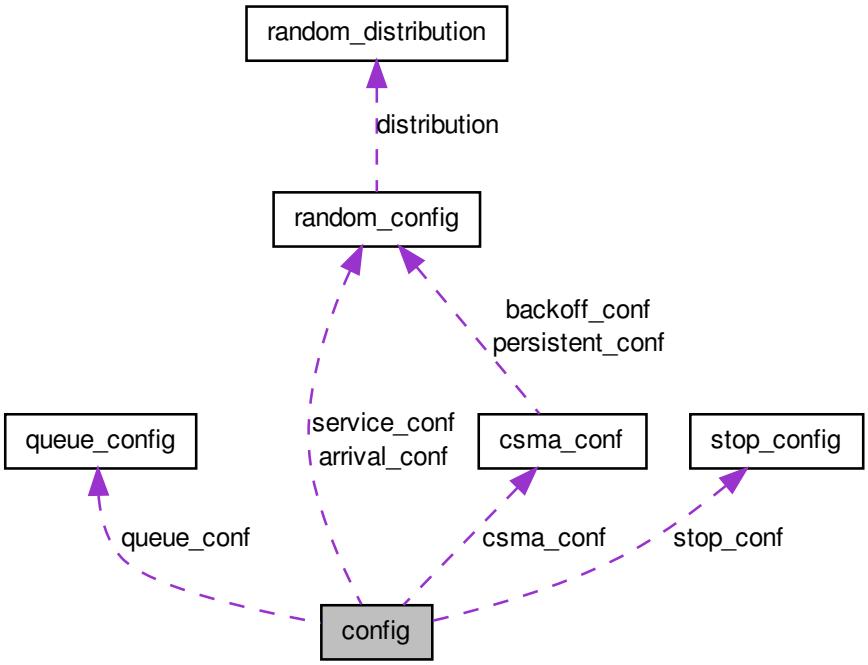
The documentation for this struct was generated from the following file:

- irand/rndnum.c

3.9 config Struct Reference

```
#include <config.h>
```

Collaboration diagram for config:



Data Fields

- RANDOM_CONF arrival_conf
  Configuration of arrival flow.
- RANDOM_CONF service_conf
  flow configuration of service time
- QUEUE_CONF queue_conf
  Configuration of queue system.
- STOP_CONF stop_conf
  Configuration of terminated conditions.
- int random_lib
  Configuration of random library (IRAND, RANDLIB)

- CSMA_CONF csma_conf

  CSMA configuration.

- int protocol

  protocol: ONE_QUEUE or CSMA

- void * runtime_state

3.9.1 Detailed Description

Configuration from user

3.9.2 Field Documentation

3.9.2.1 void* config::runtime_state

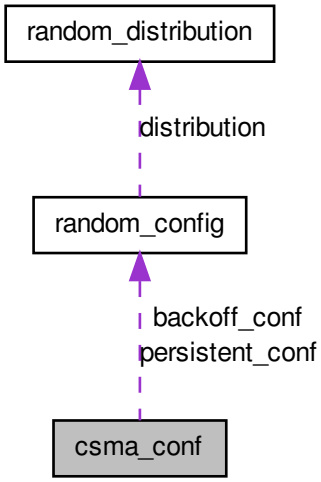
Current simulation: used for handling signal SIGINT (we dont want to wait to long time, but also want to see the itermediate result

The documentation for this struct was generated from the following file:

- netsim/conf/config.h

3.10 csma_conf Struct Reference

Collaboration diagram for csma_conf:



Data Fields

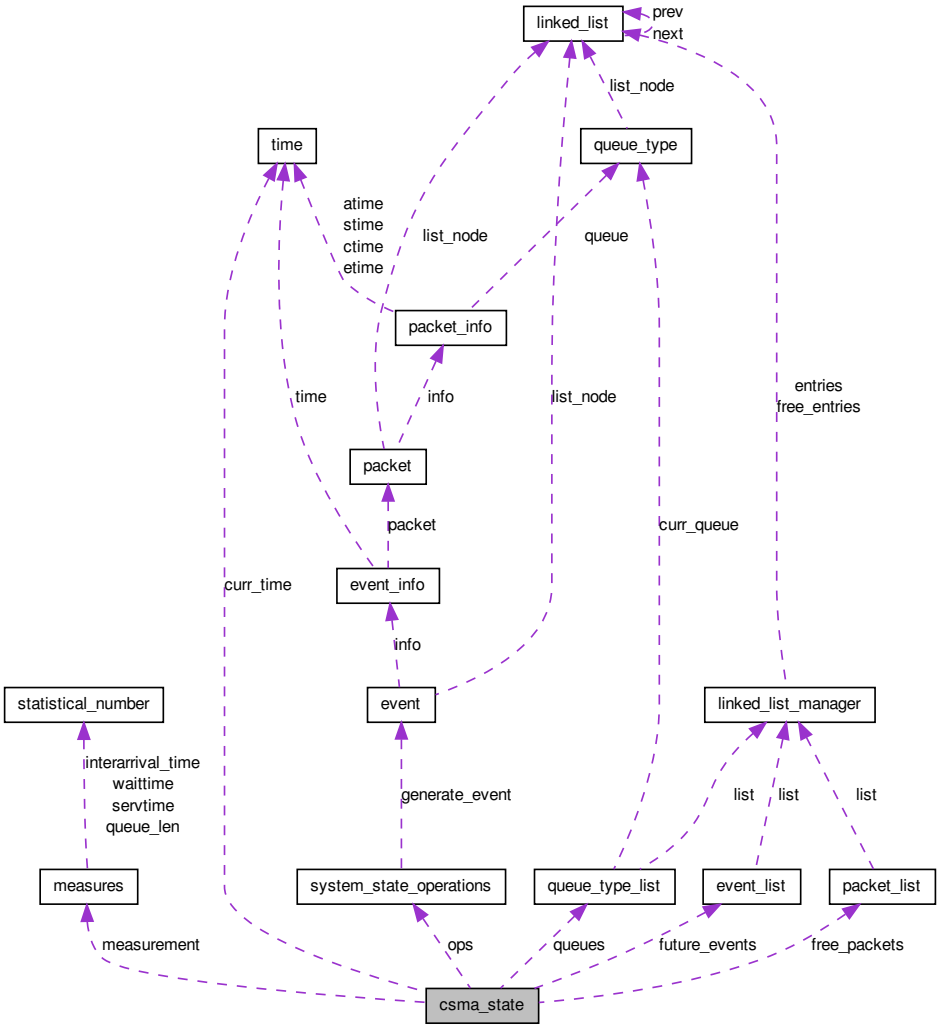
- double slot_time
  slot time
- double collision_time
  Collision time.
- int nstations
  number of queues or station
- RANDOM_CONF backoff_conf
  Backoff.
- RANDOM_CONF persistent_conf
  persistent probability

The documentation for this struct was generated from the following file:

- netsim/conf/config.h

3.11 csma_state Struct Reference

Collaboration diagram for csma_state:



Data Fields

- SYS_STATE_OPS ops

  Abstract system operations.

- int channel_state

Channel state.

- TIME curr_time

  Current time.

- EVENT_LIST future_events

  List of future events (used for scheduling events)

- QUEUE_MAN * queues

  Queue manager (support a list of queues)

- int nqueues

  Number of queues.

- MEASURES measurement

  Measurement information.

- PACKET_LIST free_packets

  Free packet list (used to avoiding malloc operations.

The documentation for this struct was generated from the following file:

- netsim/csma.h

3.12 edge Struct Reference

Data Fields

- int **source**
- int **dest**
- void * **data**

The documentation for this struct was generated from the following file:

- matrix/matrix.h

3.13 empirical_params Struct Reference

Parameters of Empirical Discrete distribution.

`#include <irand.h>`

Data Fields

- int n

  Number of possible values.

- double * values

  List of possible values.

- double * probs

  List of probabilities for each values.

3.13.1 Detailed Description

Parameters of Empirical Discrete distribution.

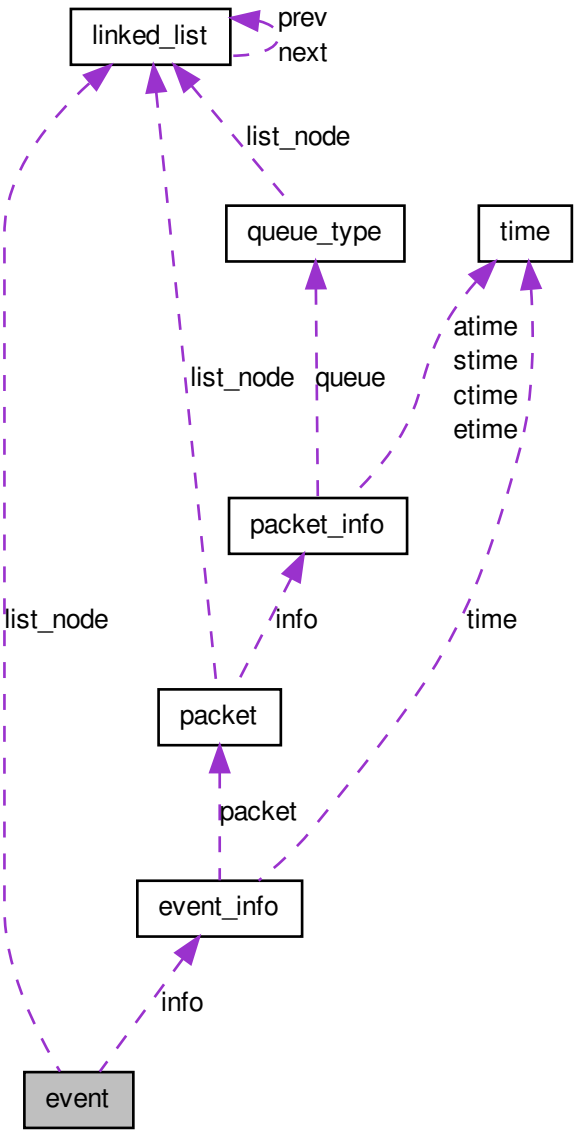
The documentation for this struct was generated from the following file:

- irand/irand.h

3.14 event Struct Reference

```
#include <event.h>
```

Collaboration diagram for event:



Data Fields

- LINKED_LIST list_node

Double linked list. This member is used to join in a list of event.

- EVENTINFO info

Event information.

3.14.1 Detailed Description

Event structure

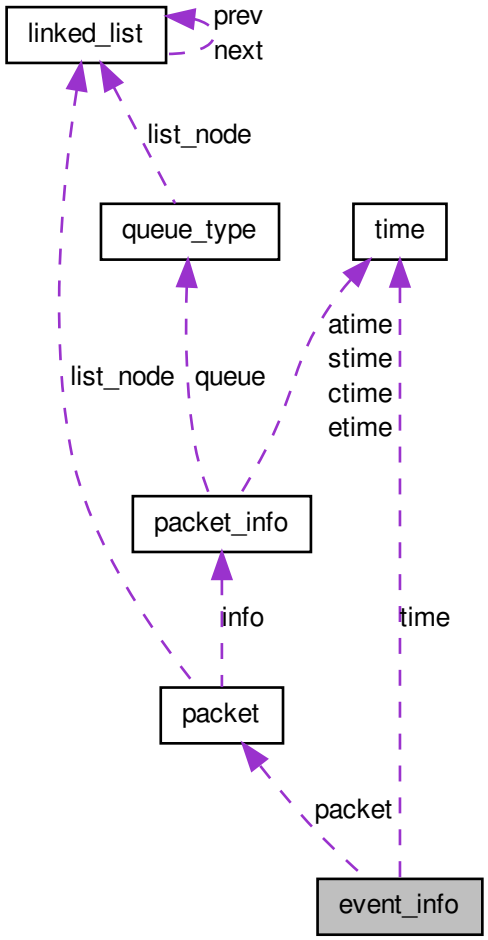
The documentation for this struct was generated from the following file:

- netsim/event.h

3.15 event_info Struct Reference

```
#include <event.h>
```

Collaboration diagram for event_info:



Data Fields

- int type

  Type of event: EVENT_ARRIVAL, EVENT_END_SERVICE,...

- TIME time

  Time that this event happens.

- PACKET * packet

Packet related to this event (used for end-service event)

3.15.1 Detailed Description

Information in an event

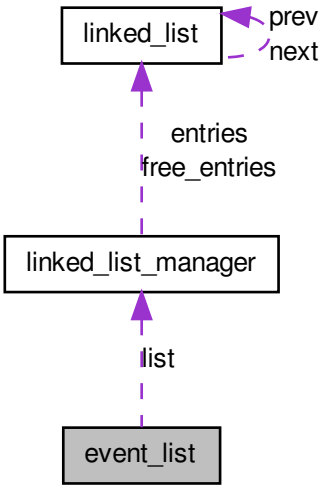
The documentation for this struct was generated from the following file:

- netsim/event.h

3.16 event_list Struct Reference

`#include <event.h>`

Collaboration diagram for event_list:



Data Fields

- LINKED_LIST_MAN list

  Manager of double linked list of event.

- int(∗ **gen**)(void ∗,...)

3.16.1 Detailed Description

Event list structure

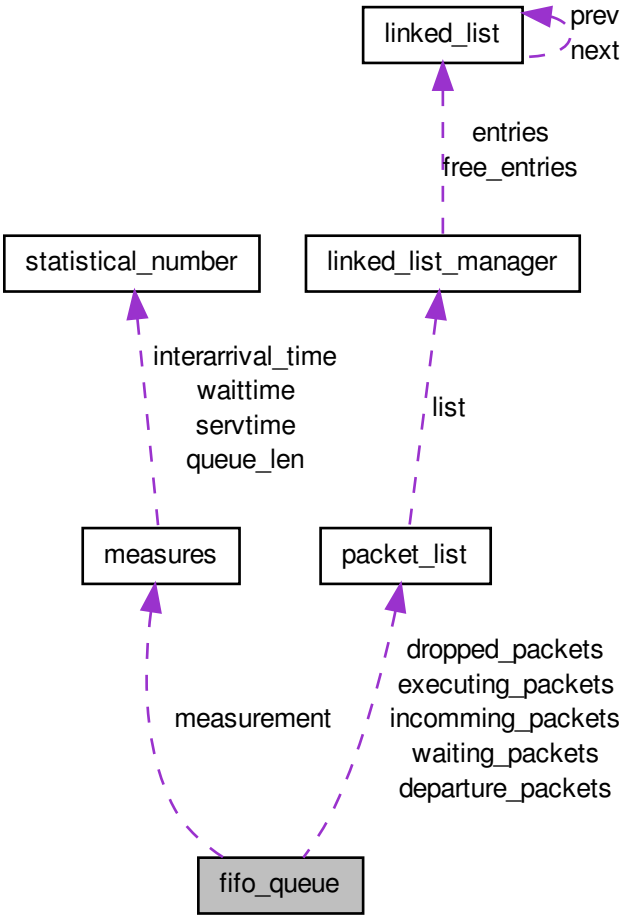
The documentation for this struct was generated from the following file:

- netsim/event.h

3.17 fifo_queue Struct Reference

`#include <fifo.h>`

Collaboration diagram for fifo_queue:



Data Fields

- PACKET_LIST incomming_packets

  Incomming packet list.

- PACKET_LIST waiting_packets

  Waiting packet list.

- PACKET_LIST executing_packets

Executing packet list.

- PACKET_LIST dropped_packets

  Dropped packet list.

- PACKET_LIST departure_packets

  Departure packet list.

- MEASURES measurement

  Queue measurement.

- int state

  Queue state.

- int max_executing

  Maximum number of executing packets.

- int max_waiting

  Maximum number of waiting packets.

3.17.1 Detailed Description

FIFO queue structure

The documentation for this struct was generated from the following file:

- queues/fifo.h

3.18 linear_congruential_gen Struct Reference

Data Fields

- unsigned long m

  Module.

- unsigned long seed

  Seed or X0.

- unsigned long mul

  Multiplier.

- unsigned long inc

  Increment.

- unsigned long last_value

  The last pseudo-random value.

3.18.1 Detailed Description

Linear Congruential Generator

The documentation for this struct was generated from the following file:

- irand/rndnum.c

3.19 linked_list Struct Reference

`#include <linked_list.h>`

Collaboration diagram for linked_list:

Data Fields

- struct linked_list * next

  Connect to previous node.

- struct linked_list * prev

  Connect to next node.

3.19.1 Detailed Description

Linked list structure

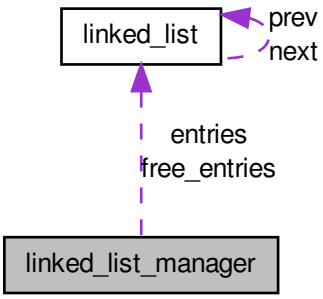
The documentation for this struct was generated from the following file:

- list/linked_list.h

3.20 linked_list_manager Struct Reference

`#include <linked_list.h>`

Collaboration diagram for linked_list_manager:



Data Fields

- LINKED_LIST entries

  List of nodes.

- LINKED_LIST free_entries

  List of free nodes.

- int conf

  List configuration: storing entries or not, storing free nodes or not.

3.20.1 Detailed Description

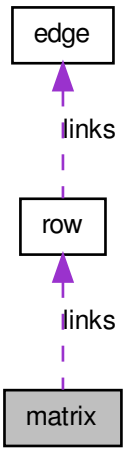
Linked list manager. Manage not only nodes of list but also free nodes (used for allocating new node)

The documentation for this struct was generated from the following file:

- list/linked_list.h

3.21 matrix Struct Reference

Collaboration diagram for matrix:



Data Fields

- int **nnodes**
- ROW * **links**

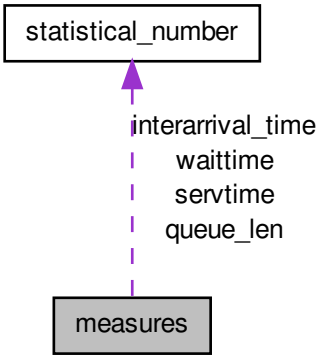
The documentation for this struct was generated from the following file:

- matrix/matrix.h

3.22 measures Struct Reference

```
#include <measures.h>
```

Collaboration diagram for measures:



Data Fields

- long total_arrivals

  Total number of arrival events appearing in simulation.

- long total_departures

  Total number of departure packets/events at output in simulation.

- long total_dropped

  Total number of dropped packets.

- float total_time

  Total time of simulation.

- STAT_NUM queue_len

  Statistical value of queue length.

- STAT_NUM servtime

  Statistical value of service time.

- STAT_NUM waittime

  Statistical value of waiting time.

- STAT_NUM interarrival_time

  Statistical value of inter-arrival time.

- float last_arrival_time

  Last value of arrival time (temporary variable supporting to compute interarrival_-time.

3.22.1 Detailed Description

MEASURE structure used to store some results when simulating queue system

The documentation for this struct was generated from the following file:

- queues/measures.h

3.23 network Struct Reference

Data Fields

- MATRIX **costs**

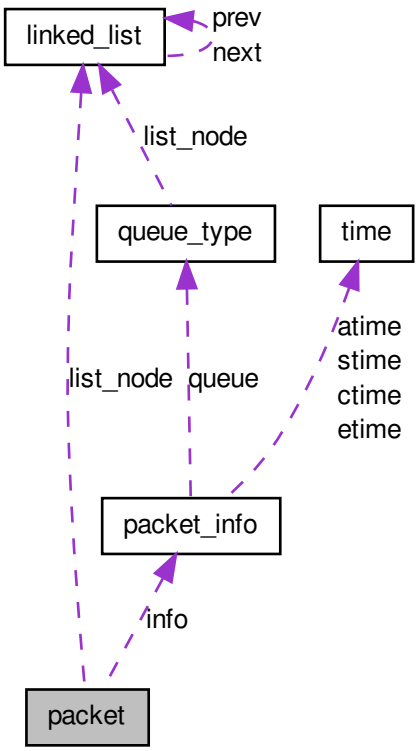
The documentation for this struct was generated from the following file:

- network.h

3.24 packet Struct Reference

```
#include <packet.h>
```

Collaboration diagram for packet:



Data Fields

- LINKED_LIST list_node

  The element is used to connect to a packet-list.

- PACKET_INFO info

  Packet information.

3.24.1 Detailed Description

Packet structure

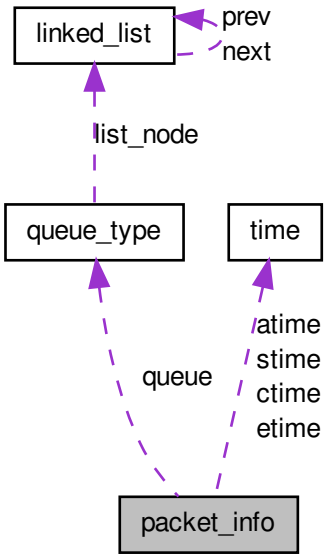
The documentation for this struct was generated from the following file:

- queues/packet.h

3.25 packet_info Struct Reference

`#include <packet.h>`

Collaboration diagram for packet_info:



Data Fields

- long id

  Packet ID (currently no used)

- QUEUE_TYPE * queue

  Queue.

- int state

  State of packet: IN, WAITING, DROPPED, PROCESSING, OUT.

- float service_time

  Service time of packet.

- TIME atime

  Arrival time.

- TIME ctime

  Collision time.

- TIME stime

  Start time (time when packet is processed)

- TIME etime

  End time (end of execution time)

3.25.1 Detailed Description

Packet information

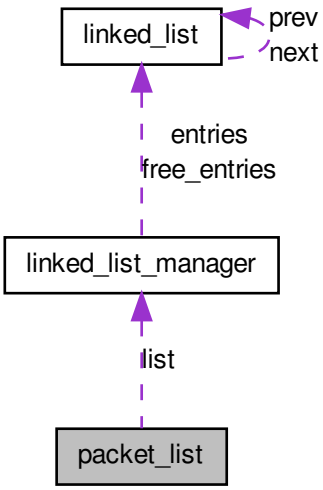
The documentation for this struct was generated from the following file:

- queues/packet.h

3.26 packet_list Struct Reference

```
#include <packet.h>
```

Collaboration diagram for packet_list:



Data Fields

- LINKED_LIST_MAN list
  Manager of packet list.
- int size
  Size of list.
- int port_type
  Port type (no used now)
- int port
  Port (no used now)

3.26.1 Detailed Description

Packet list structure

The documentation for this struct was generated from the following file:

- queues/packet.h

3.27 queue_config Struct Reference

`#include <config.h>`

Data Fields

- int type

  type of queue, now only support QUEUE_FIFO

- int num_servers

  number of servers in a system

- int max_waiters

  maximum number of clients allowing to wait in a system

- FILE * out_file

  file name used to store event of departure flow

3.27.1 Detailed Description

Queue configuration

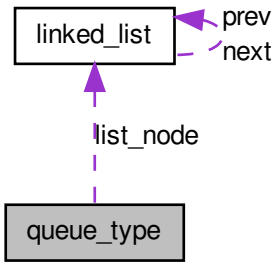
The documentation for this struct was generated from the following file:

- netsim/conf/config.h

3.28 queue_type Struct Reference

`#include <queue_man.h>`

Collaboration diagram for queue_type:



Data Fields

- LINKED_LIST list_node
  This element is used to join to a queue-manager.
- int type
  Type of queue. Now, only support QUEUE_FIFO.
- int(∗ init)(QUEUE_TYPE ∗)
  Initialize queue type, include info in this structure.
- int(∗ is_idle)(QUEUE_TYPE ∗)
  Check whether a queue is idle or not.
- int(∗ push_packet)(QUEUE_TYPE ∗, PACKET ∗)
  Push a packet into queue.
- int(∗ process_packet)(QUEUE_TYPE ∗, PACKET ∗)
  Process packet getting from queue.
- int(∗ finish_packet)(QUEUE_TYPE ∗, PACKET ∗)
  Finish processing packet.
- int(∗ get_waiting_length)(QUEUE_TYPE ∗)
  Get current queue length.
- int(∗ select_waiting_packet)(QUEUE_TYPE ∗, PACKET ∗∗)
  Get a packet from waiting queue and remove it out of list.

- int(∗ get_executing_packet)(QUEUE_TYPE ∗, PACKET ∗∗)

  Get a packet from executing queue.

- int(∗ get_waiting_packet)(QUEUE_TYPE ∗, PACKET ∗∗)

  Get a packet from waiting queue, but packet still in queue.

- void ∗ **info**

3.28.1 Detailed Description

Structure of a queue type. Can be seen as an interface of a queue object

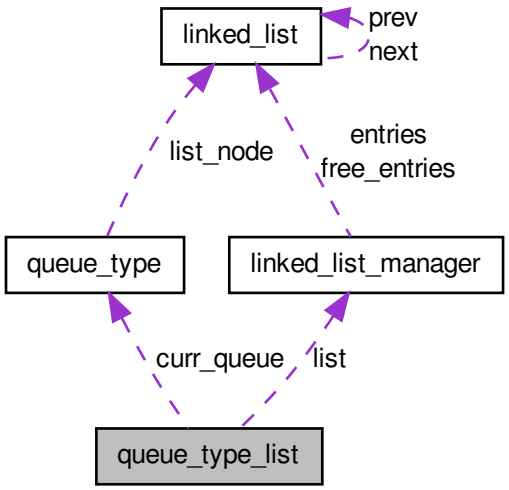
The documentation for this struct was generated from the following file:

- queues/queue_man.h

3.29 queue_type_list Struct Reference

`#include <queue_man.h>`

Collaboration diagram for queue_type_list:



Data Fields

- LINKED_LIST_MAN list

  Manager of list of queue-type.

- QUEUE_TYPE * curr_queue

  Current active queue_type.

3.29.1 Detailed Description

Queue manager structure

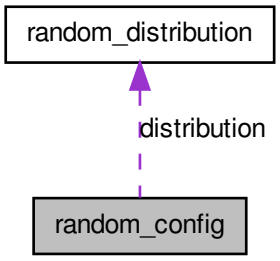
The documentation for this struct was generated from the following file:

- queues/queue_man.h

3.30 random_config Struct Reference

`#include <config.h>`

Collaboration diagram for random_config:



Data Fields

- int type

  types of flow: RANDOM_MARKOVIAN, RANDOM_UNIFORM, RANDOM_FILE, RANDOM_OTHER.

- double lambda

used when type is RANDOM_MARKOVIAN

- double from
  used for RANDOM_UNIFORM
- double to
  used for RANDOM_UNIFORM
- double prob
  used for FLOW_BERNOULLI
- FILE * to_file
  file name that storing the this flow when it is generated
- FILE * from_file
  used when type is RANDOM_FILE
- RANDOM_DIST distribution
  Random Distribution of flow.

3.30.1 Detailed Description

Flow configuration is used to characterize a flow: what is its distribution, define some parameters.

The documentation for this struct was generated from the following file:

- netsim/conf/config.h

3.31 random_distribution Struct Reference

Random distribution structure (a framework)

`#include <irand.h>`

Data Fields

- double(* gen)(RANDOM_DIST *)
  Random number generator.
- double(* cdf)(RANDOM_DIST *, double)
  Cumulative Distributed Function.
- void * params
  Parameter of distribution.

3.31.1 Detailed Description

Random distribution structure (a framework)

The documentation for this struct was generated from the following file:

- irand/irand.h

3.32 row Struct Reference

Collaboration diagram for row:

Data Fields

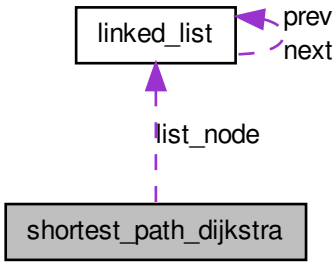
- int **nlinks**
- EDGE * **links**

The documentation for this struct was generated from the following file:

- matrix/matrix.h

3.33 shortest_path_dijkstra Struct Reference

Collaboration diagram for shortest_path_dijkstra:



Data Fields

- LINKED_LIST **list_node**
- int **node**
- int **last_node**
- double **total_cost**

The documentation for this struct was generated from the following file:

- network.h

3.34 statistical_number Struct Reference

`#include <stat_num.h>`

Data Fields

- float min

  Minimum value.

- float max

  Maximum value.

- float avg

Average value (mean)

- float var

  Variance value.

- float all_time

  Time of observing this random process.

- float tmpsum

  Temporary value calculating sum of value.

- float tmpsumsqr

  Temporary value calculating sum of value square.

- float last_time

  The last time of observation.

- int num_samples

  Number of samples in observation.

3.34.1 Detailed Description

Statistical information of a random process

The documentation for this struct was generated from the following file:

- stat_num.h

3.35 stop_config Struct Reference

```
#include <config.h>
```

Data Fields

- float max_time

  Maximum time is allowed to run simulation.

- int max_arrival

  Maximum number of arrival events.

- int queue_zero

  Stop when queue length is zero.

3.35.1 Detailed Description

Define conditions of stopping program

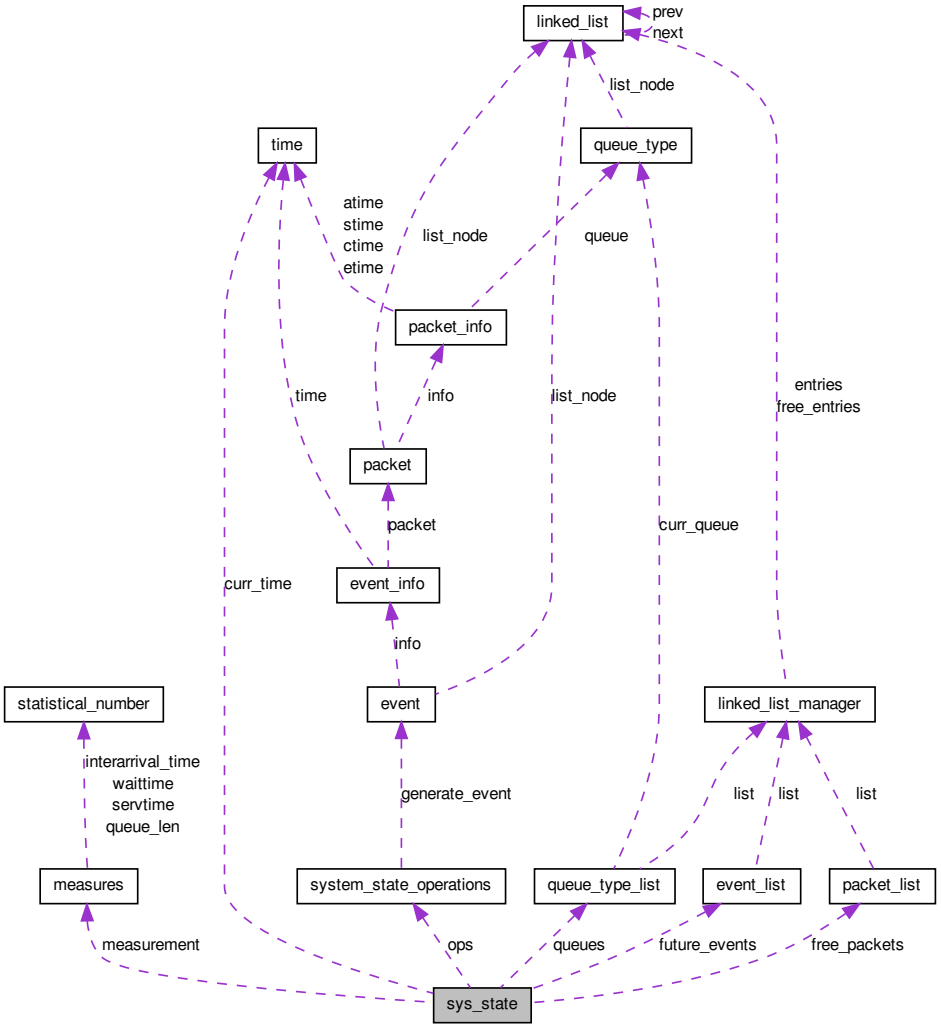
The documentation for this struct was generated from the following file:

- netsim/conf/config.h

3.36 sys_state Struct Reference

```
#include <sys_aqueue.h>
```

Collaboration diagram for sys_state:



Data Fields

- SYS_STATE_OPS ops

  Abstract operations of a simulated system.

- TIME curr_time

  Current time.

- EVENT_LIST future_events

  List of future events (used for scheduling events)

- QUEUE_MAN queues

  Queue manager (support a list of queues)

- MEASURES measurement

  Measurement information.

- PACKET_LIST free_packets

  Free packet list (used to avoiding malloc operations.

3.36.1 Detailed Description

Structure representing the system state in simulation.

The documentation for this struct was generated from the following file:

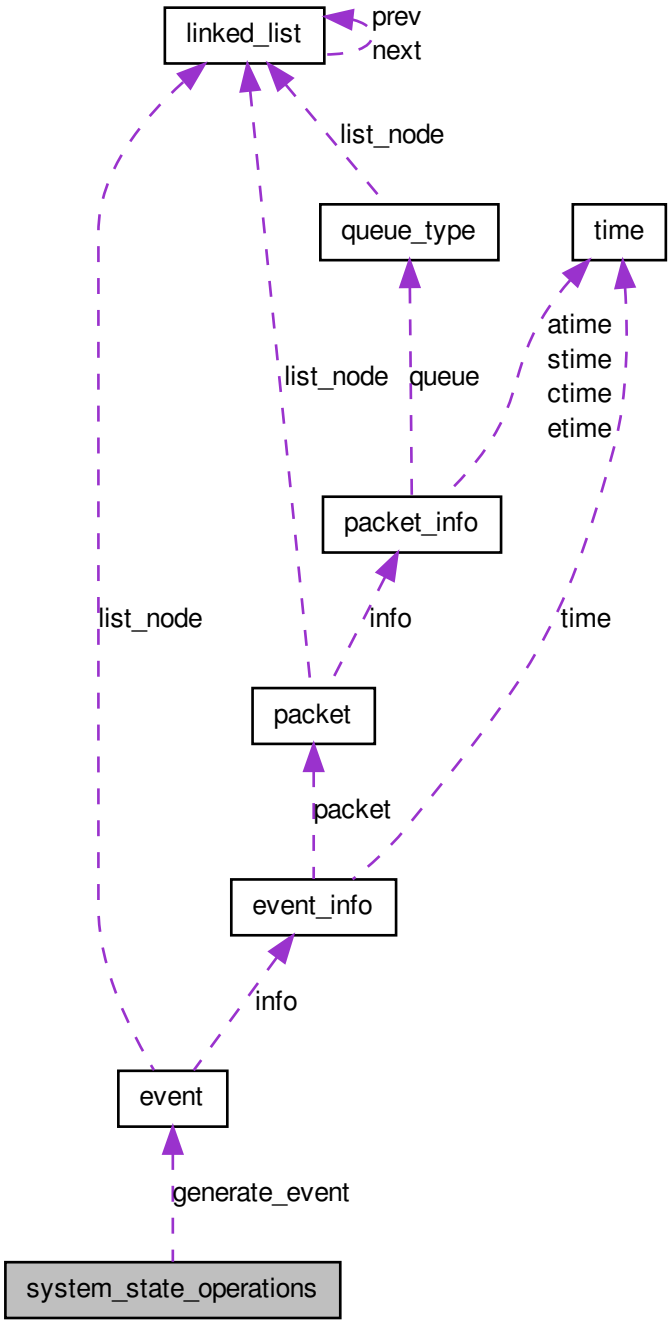
- netsim/sys_aqueue.h

3.37 system_state_operations Struct Reference

Functions of a simulated system.

`#include <netsim.h>`

Collaboration diagram for system_state_operations:



Data Fields

- int(∗ get_next_event)(SYS_STATE_OPS ∗, EVENT ∗∗e)

  Get next event from event list.

- int(∗ remove_event)(SYS_STATE_OPS ∗, EVENT ∗e)

  Remove an event out of event list.

- int(∗ allow_continue)(CONFIG ∗, SYS_STATE_OPS ∗)

  Check whether the program is stopped (from user configuration)

- EVENT ∗(∗ generate_event)(int type, PACKET ∗, CONFIG ∗, SYS_STATE_-OPS ∗)

  Generate new event.

- int(∗ process_event)(EVENT ∗e, CONFIG ∗, SYS_STATE_OPS ∗)

  Process an event.

- int(∗ clean)(CONFIG ∗, SYS_STATE_OPS ∗)

  Clean the simulated system (when finishing simulation)

3.37.1 Detailed Description

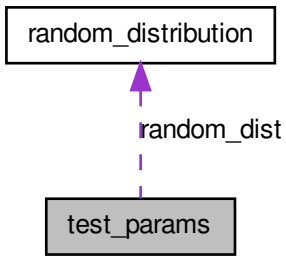
Functions of a simulated system.

The documentation for this struct was generated from the following file:

- netsim/netsim.h

3.38 test_params Struct Reference

Collaboration diagram for test_params:



Data Fields

- int **nsamples**
- int **nintervals**
- double **p_value**
- RANDOM_DIST **random_dist**

The documentation for this struct was generated from the following file:

- tests/chisqr.c

3.39 time Union Reference

```
#include <def.h>
```

Data Fields

- long slot

  time is represented as slot time

- float real

  time is considered as real time

3.39.1 Detailed Description

Time definition

The documentation for this union was generated from the following file:

- def.h

3.40 uniform_params Struct Reference

Parameters of Uniform distribution.

`#include <irand.h>`

Data Fields

- double from

  Lower-bound value.

- double to

  Upper-bound value.

3.40.1 Detailed Description

Parameters of Uniform distribution.

The documentation for this struct was generated from the following file:

- irand/irand.h

3.41 weibull_params Struct Reference

Parameters of Weibull distribution.

`#include <irand.h>`

Data Fields

- double a

  Value of a.

- double b

  Value of b.

3.41.1 Detailed Description

Parameters of Weibull distribution.

The documentation for this struct was generated from the following file:

- irand/irand.h

3.42 yy_buffer_state Struct Reference

Data Fields

- FILE * **yy_input_file**
- char * **yy_ch_buf**
- char * **yy_buf_pos**
- yy_size_t **yy_buf_size**
- int **yy_n_chars**
- int **yy_is_our_buffer**
- int **yy_is_interactive**
- int **yy_at_bol**
- int yy_bs_lineno
- int yy_bs_column
- int **yy_fill_buffer**
- int **yy_buffer_status**

3.42.1 Field Documentation

3.42.1.1 int yy_buffer_state::yy_bs_column

The column count.

3.42.1.2 int yy_buffer_state::yy_bs_lineno

The line count.

The documentation for this struct was generated from the following files:

- netsim/conf/lexer.c
- netsim/conf/lexer.h

3.43 yy_trans_info Struct Reference

Data Fields

- flex_int32_t **yy_verify**

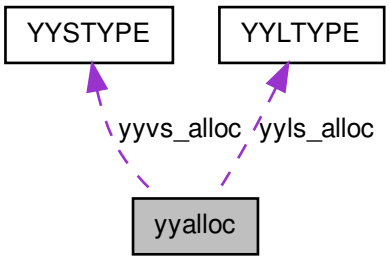
- flex_int32_t **yy_nxt**

The documentation for this struct was generated from the following file:

- netsim/conf/lexer.c

3.44 yyalloc Union Reference

Collaboration diagram for yyalloc:



Data Fields

- yytype_int16 **yyss_alloc**
- YYSTYPE **yyvs_alloc**
- YYLTYPE **yyls_alloc**

The documentation for this union was generated from the following file:

- netsim/conf/parser.c

3.45 YYLTYPE Struct Reference

Data Fields

- int **first_line**
- int **first_column**
- int **last_line**
- int **last_column**

The documentation for this struct was generated from the following files:

- netsim/conf/parser.c
- netsim/conf/parser.h

3.46 YYSTYPE Union Reference

Data Fields

- char * **str**
- int **ival**
- double **dval**

The documentation for this union was generated from the following files:

- netsim/conf/parser.c
- netsim/conf/parser.h

Chapter 4

File Documentation

4.1 def.h File Reference

Data Structures

- union time

Defines

- #define **MAX_INT** INT_MAX

Typedefs

- typedef union time TIME

4.1.1 Detailed Description

Date

Created on: Apr 8, 2011

Author

iizke

4.1.2 Typedef Documentation

4.1.2.1 typedef union time TIME

Time definition

4.2 error.h File Reference

```
#include <stdio.h>
```

Defines

- #define DEBUG

  Turn on Debug mode.

- #define LEVEL_ERROR 0b00000001

  Print out all error-labeled messages.

- #define LEVEL_WARNING 0b00000010

  Print out all warning-labeled messages.

- #define LEVEL_INFO 0b00000100

  Print out all info-labeled messages.

- #define LEVEL_EW 0b00000011

  Print out all messages labeled with Error and Warning.

- #define LEVEL_EI 0b00000101

  Print out all messages labeled with Error and Info.

- #define LEVEL_EWI 0b00000111

  LEVEL_EWI Print out all messages labeled with Error, Info, Warning.

- #define **iprintf**(level, fmt, args...)
- #define **try**(stm)
- #define **check_null_pointer**(_p)
- #define **TRUE** 1
- #define **FALSE** 0
- #define SUCCESS 0

  Return this value when a function finishes successfully.

- #define ERR_POINTER_NULL (-1)

  Error when a pointer is null.

- #define ERR_MALLOC_FAIL (-2)

  Error when not enough memory in system.

- #define ERR_RANDOM_TYPE_FAIL (-17)

  Error when user does not provide a correct Flow Type ID.

- #define ERR_EVENT_TIME_WRONG (-18)

Error when the time of event is not consistent, eg. it is late than the current time.

- #define ERR_EVENT_TYPE_FAIL (-19)

  Error when an event-type is not supported.

- #define ERR_PACKET_STATE_WRONG (-20)

  Error when packet state is not correct.

- #define ERR_CSMA_INCONSISTENT (-30)

  Error while inconsistent happen in simulating CSMA.

Variables

- long **debug**

4.2.1 Detailed Description

Define some error codes and some utility functions/macros to announce errors.

Date

Created on: Apr 6, 2011

Author

iizke

4.2.2 Define Documentation

4.2.2.1 #define check_null_pointer(_p)

Value:

```
{                                                       \
    if (!_p) {                                            \
      iprintf(LEVEL_WARNING, "NULL pointer\n");             \
      return ERR_POINTER_NULL;                            \
    }                                                     \
  }
```

4.2.2.2 #define iprintf(level, fmt, args...)

Value:

```
{                                                       \
    if (level & debug) {                                 \
      printf("File %s, line %d: \n", __FILE__, __LINE__); \
```

```
      printf(fmt, ## args);                                    \
    }                                                          \
  }
```

4.2.2.3 #define try(*stm*)

Value:

```
{                                                              \
    int _err_ = stm;                                           \
    if (_err_ < 0)                                             \
      return _err_;                                            \
  }
```

4.3 irand/irand.h File Reference

Data Structures

- struct weibull_params

  Parameters of Weibull distribution.

- struct uniform_params

  Parameters of Uniform distribution.

- struct empirical_params

  Parameters of Empirical Discrete distribution.

- struct random_distribution

  Random distribution structure (a framework)

Defines

- #define RND_TYPE_LINEAR 1

  Random generator: Linear Congruential.

- #define RND_TYPE_COMBINED 2

  Random generator: Combined Linear Congruential.

- #define RND_TYPE_TAUSWORTHE 3

  Random generator: Tausworthe (Not supported right now)

Typedefs

- typedef struct random_distribution RANDOM_DIST

  Random distribution structure (a framework)

Functions

- int irand_init ()
- int irand_new_seed (unsigned long seed)
- int irand_random_seed ()
- unsigned long irand_gen_random (int type)
- unsigned long irand_gen_srandom (int type, unsigned long seed)
- double irand_gen_random_real (int type)
- double irand_gen_srandom_real (int type, unsigned long seed)
- unsigned long **irand_gen_range_random** (int type, unsigned long from, unsigned long to)
- double irand_gen_erlang (int order, double lambda)
- double irand_gen_exp (double lambda)
- double irand_gen_uniform (double from, double to)
- double irand_gen_int_uniform (double from, double to)
- double irand_gen_bernoulli (double prob)
- double irand_gen_pareto (double lambda)

4.3.1 Detailed Description

My implementation of Random number and distribution (called irand)

Date

Created on: Apr 28, 2011

Author

iizke

4.3.2 Function Documentation

4.3.2.1 double irand_gen_bernoulli (double *prob*)

Bernoulli generator of random number

Parameters

prob	: probability of success event (value 1)

Returns

A random value (0 or 1)

Here is the call graph for this function:

4.3.2.2 double irand_gen_erlang (int *order*, double *lambda*)

Erlang Generator of random number

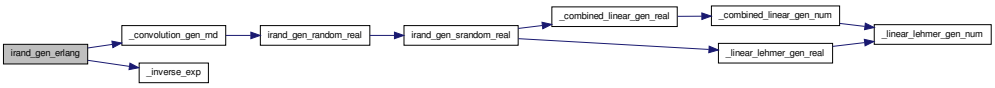
Parameters

order	: order of Erlang distribution
lambda	: the average rate of Erlang variable

Returns

A real random number of Erlang-k distribution

Here is the call graph for this function:



4.3.2.3 double irand_gen_exp (double *lambda*)

Exponential generator of random number

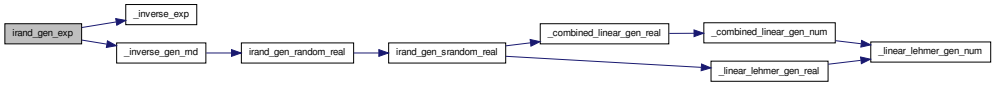
Parameters

lambda	: the average rate of random variable

Returns

A real random value

Here is the call graph for this function:



4.3.2.4 double irand_gen_int_uniform (double *from,* double *to*)

Integer Uniform generator of random number

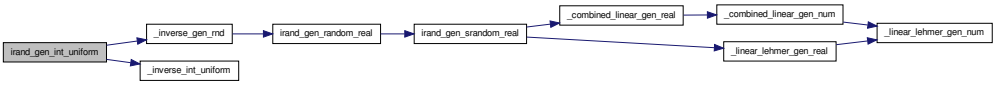
Parameters

from	: lower-bound value
to	: upper-bound value

Returns

A integer random value in range [from, to]

Here is the call graph for this function:



4.3.2.5 double irand_gen_pareto (double *lambda*)

Pareto generator of random number

Parameters

lambda	: parameter of Pareto distribution

Returns

A random number

Here is the call graph for this function:

4.3.2.6 unsigned long irand_gen_random (int *type*)

Pseudo Integer Random Uniform generator

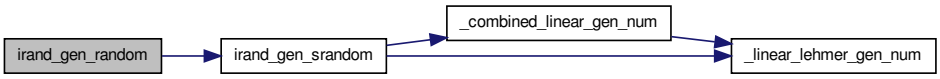
Parameters

type	: type of algorithm (linear congruential or combined linear congruential)

Returns

Random value

Here is the call graph for this function:



4.3.2.7 double irand_gen_random_real (int *type*)

Pseudo Real-value Random Uniform generator

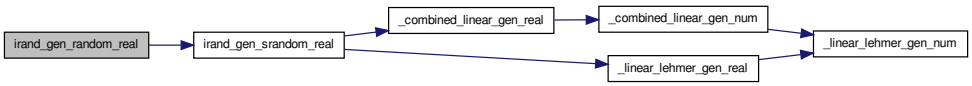
Parameters

type	: type of algorithm (linear congruential or combined linear congruential)

Returns

Random value

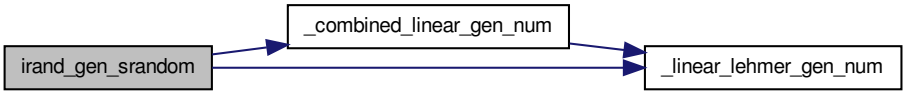
Here is the call graph for this function:



4.3.2.8 unsigned long irand_gen_srandom (int *type*, unsigned long *seed*)

Generate random number in Combined Linear Congruential

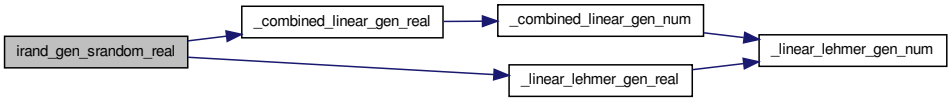
Here is the call graph for this function:



4.3.2.9 double irand_gen_srandom_real (int *type*, unsigned long *seed*)

Generate random number in Combined Linear Congruential

Here is the call graph for this function:



4.3.2.10 double irand_gen_uniform (double *from*, double *to*)

Uniform generator of random number (real value)

Parameters

from	: lower-bound value
to	: upper-bound value

Returns

A real random value in range [from, to]

Here is the call graph for this function:

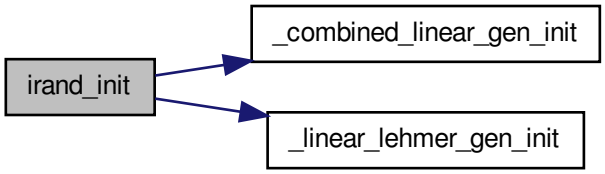
4.3.2.11 int irand_init ( )

Initialize pseudo random generator

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.3.2.12 int irand_new_seed (unsigned long *seed*)

Psuedo random generator with seed

Parameters

seed	: seed of generator

Returns

integer pseudo random value

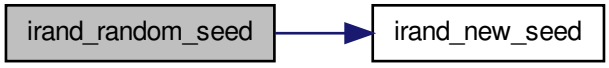
4.3.2.13 int irand_random_seed ( )

Psuedo random generator with random-selected seed

Returns

integer pseudo random value

Here is the call graph for this function:



4.4 irand/rnddist.c File Reference

```
#include <stdio.h>
#include <math.h>
#include <stdlib.h>
#include "irand.h"
#include "../error.h"
```

Functions

- double _convolution_gen_rnd (int n, double(*func)(double, void *), void *params)
- double _inverse_gen_rnd (double(*inverse_func)(double, void *), void *params)
- double _inverse_empirical (double p, void *params)
- double _composition_gen_rnd (int n, RANDOM_DIST *rnd, double *probs)
- double _inverse_exp (double p, void *params)
- double _inverse_uniform (double p, void *params)
- double _inverse_int_uniform (double p, void *params)
- double _inverse_pareto (double p, void *params)
- double _inverse_weibull (double p, void *params)
- double _inverse_bernoulli (double p, void *params)

- double _inverse_geometric (double p, void *params)
- double irand_gen_erlang (int order, double lambda)
- double irand_gen_exp (double lambda)
- double irand_gen_uniform (double from, double to)
- double irand_gen_int_uniform (double from, double to)
- double irand_gen_bernoulli (double prob)
- double irand_gen_pareto (double lambda)
- int **test_gen_distribution** ()

4.4.1 Detailed Description

Random number in a well-known distribution. Some methods are used:

(1) Inverse Transform method

(2) Convolution method

(3) Acceptance/Rejection technique (not implemented)

(4) Composition method

(5) Other (Normal, Poisson, Binomial) - not implemented

Date

Created on: May 3, 2011

Author

iizke

4.4.2 Function Documentation

4.4.2.1 double _composition_gen_rnd (int *n*, RANDOM_DIST * *rnd*, double * *probs*)

Framework of generating random variable based on composition method.

CDF(X) = p1*CDF1(X) + p1*CDF2(X) + ... + pn*CDFn(X)

Parameters

n	: Number of random variables.
rnd	: List of random variables with specification of their distribution.
probs	: List of probabilities for each random values.

Returns

A random value.

Here is the call graph for this function:

4.4.2.2 double _convolution_gen_rnd (int *n*, double(∗)(double, void ∗) *func*, void ∗ *params*)

Framework of generating random variable based on convolution method.

Y = X1 + X2 + ... + Xn

X1, X2,..., Xn are i.i.d random variable.

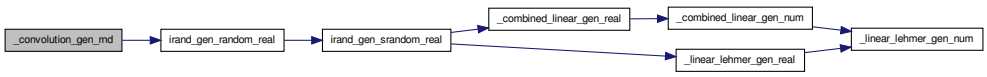
Parameters

n	: number of i.i.d random variables.
func	: Generated random function of each random variable.
params	: Parameters used for function func.

Returns

A random value.

Here is the call graph for this function:



4.4.2.3 double _inverse_bernoulli (double *p*, void ∗ *params*)

Inverse Transform function of Bernoulli distribution

Parameters

p	: a uniform random number
params	: pointer to a value that is a probability of success (1)

Returns

A real random number of Bernoulli distribution

4.4.2.4 double _inverse_empirical (double *p*, void * *params*)

Inverse Transform function of Empirical Discrete distribution.

Parameters

p	: a uniform random number
params	: parameters of this distribution includes: probabilities and appropriate values. If list of value is not determined (NULL), then the return value will be the index.

Returns

A real random number of this distribution

4.4.2.5 double _inverse_exp (double *p*, void * *params*)

Inverse Transform function of Exponential distribution

Parameters

p	: a uniform random number
params	: structure that contains lambda (parameter of exponential distribution)

Returns

A real random number of exponential distribution

4.4.2.6 double _inverse_gen_rnd (double(*)(double, void *) *inverse_func*, void * *params*)

Framework of generating a random value (of distribution) based on Inverse Transform method

Parameters

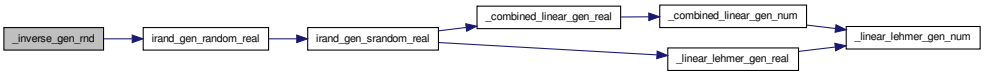
inverse_func	: inverse function (of a particular distribution).
params	: parameters used for function inverse_func.

Returns

random value.

1st step: Generate random integer number

Here is the call graph for this function:



4.4.2.7 double _inverse_geometric (double *p*, void * *params*)

Inverse Transform function of Geometric distribution

Parameters

p	: a uniform random number
params	: structure that contains parameter of Geometric distribution

Returns

A real random number of Geometric distribution

4.4.2.8 double _inverse_int_uniform (double *p*, void * *params*)

Inverse Transform function of Discrete (integer) Uniform distribution

Parameters

p	: a uniform random number
params	: structure that contains parameter of uniform distribution

Returns

A integer random number of uniform distribution

4.4.2.9 double _inverse_pareto (double *p*, void * *params*)

Inverse Transform function of Pareto distribution

Parameters

p	: a uniform random number
params	: structure that contains lambda (parameter of pareto distribution)

Returns

A real random number of Pareto distribution

4.4.2.10 double _inverse_uniform (double *p*, void * *params*)

Inverse Transform function of Uniform distribution

Parameters

p	: a uniform random number
params	: structure that contains parameter of uniform distribution

Returns

A real random number of uniform distribution

4.4.2.11 double _inverse_weibull (double *p*, void * *params*)

Inverse Transform function of Weibull distribution

Parameters

p	: a uniform random number
params	: structure that contains parameter of Weibull distribution

Returns

A real random number of Weibull distribution

4.4.2.12 double irand_gen_bernoulli (double *prob*)

Bernoulli generator of random number

Parameters

prob	: probability of success event (value 1)

Returns

A random value (0 or 1)

Here is the call graph for this function:

4.4.2.13 double irand_gen_erlang (int *order*, double *lambda*)

Erlang Generator of random number

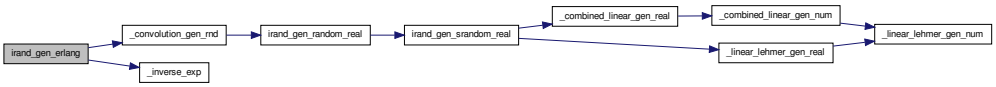
Parameters

order	: order of Erlang distribution
lambda	: the average rate of Erlang variable

Returns

A real random number of Erlang-k distribution

Here is the call graph for this function:



4.4.2.14 double irand_gen_exp (double *lambda*)

Exponential generator of random number

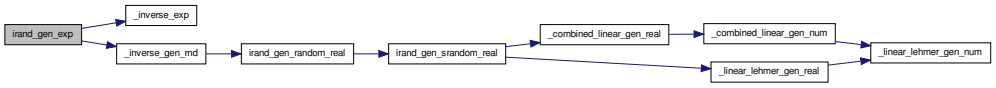
Parameters

lambda	: the average rate of random variable

Returns

A real random value

Here is the call graph for this function:



4.4.2.15 double irand_gen_int_uniform (double *from*, double *to*)

Integer Uniform generator of random number

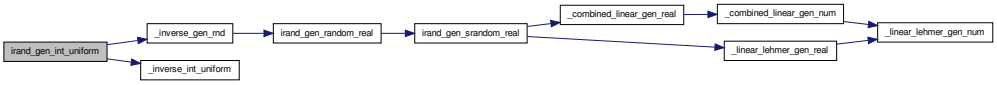
Parameters

from	: lower-bound value
to	: upper-bound value

Returns

A integer random value in range [from, to]

Here is the call graph for this function:



4.4.2.16 double irand_gen_pareto (double *lambda*)

Pareto generator of random number

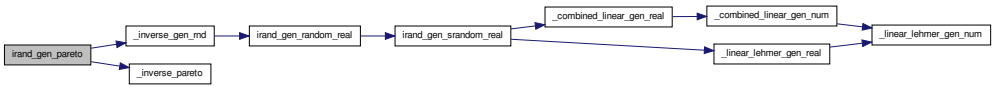
Parameters

lambda	: parameter of Pareto distribution

Returns

A random number

Here is the call graph for this function:



4.4.2.17 double irand_gen_uniform (double *from,* double *to*)

Uniform generator of random number (real value)

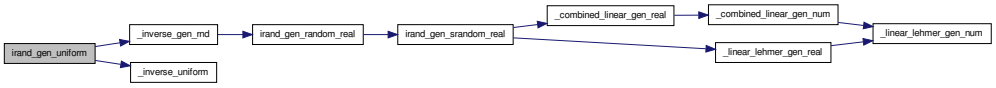
Parameters

from	: lower-bound value
to	: upper-bound value

Returns

A real random value in range [from, to]

Here is the call graph for this function:



4.5 irand/rndnum.c File Reference

```
#include <stdio.h>
#include <time.h>
#include "../error.h"
#include "irand.h"
```

Data Structures

- struct linear_congruential_gen
- struct combined_linear_congruential_gen

Typedefs

- typedef struct linear_congruential_gen LINEAR_LEHMER_GEN
- typedef struct combined_linear_congruential_gen COMBINED_LINEAR_GEN

Functions

- unsigned long _linear_lehmer_gen_num (LINEAR_LEHMER_GEN *gen)
- double _linear_lehmer_gen_real (LINEAR_LEHMER_GEN *gen)
- int _linear_lehmer_gen_init (LINEAR_LEHMER_GEN *gen)
- unsigned long _combined_linear_gen_num (COMBINED_LINEAR_GEN *gen)
- double _combined_linear_gen_real (COMBINED_LINEAR_GEN *gen)
- int _combined_linear_gen_init (COMBINED_LINEAR_GEN *gen)
- unsigned long irand_gen_random (int type)
- double irand_gen_random_real (int type)
- unsigned long irand_gen_srandom (int type, unsigned long seed)
- double irand_gen_srandom_real (int type, unsigned long seed)
- unsigned long **irand_gen_range_random** (int type, unsigned long from, unsigned long to)

- int irand_init ()
- int irand_new_seed (unsigned long seed)
- int irand_random_seed ()

Variables

- LINEAR_LEHMER_GEN linear_rnd_gen

  Pseudo Random generator using Linear Congruential technique.

- COMBINED_LINEAR_GEN combined_rnd_gen

  Pseudo Random generator using Combined Linear Congruential technique.

4.5.1 Detailed Description

Pseudo-Random number generators. Some methods are used:

(1) Linear Congruential

(2) Combined Linear Congruential

(3) TAUSWORTHE (not implemented)

Date

Created on: Apr 20, 2011

Author

iizke

4.5.2 Typedef Documentation

4.5.2.1 typedef struct combined_linear_congruential_gen COMBINED_LINEAR_GEN

Random number generator based on Combined-Linear-Congruential Generator with two Linear Congruential Generator

4.5.2.2 typedef struct linear_congruential_gen LINEAR_LEHMER_GEN

Linear Congruential Generator

4.5.3 Function Documentation

4.5.3.1 int _combined_linear_gen_init (COMBINED_LINEAR_GEN * *gen*)

Initialize Combined Linear Congruential Generator

Parameters

gen	: Combined Linear Congruential Generator structure

Returns

Error code (defined libs/error.h)

4.5.3.2 unsigned long _combined_linear_gen_num (COMBINED_LINEAR_GEN * *gen*)

Generate a pseudo random number based on Combined Linear Congruential Generator

Parameters

gen	: Combined Linear Congruential Generator

Returns

Random number

Here is the call graph for this function:

4.5.3.3 double _combined_linear_gen_real (COMBINED_LINEAR_GEN * *gen*)

generate real number in range [0,1]

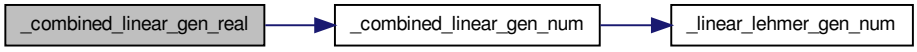
Parameters

gen	: Combined Linear Generator

Returns

real number

Here is the call graph for this function:



4.5.3.4 int _linear_lehmer_gen_init (LINEAR_LEHMER_GEN * gen)

Initialize the Linear Congruential Generator

Parameters

gen	: Linear Congruential Generator

Returns

Error code (defined in libs/error.h)

Module = 2^31 - 1 = 2147483647

Multiplier = 7^5 = 16807

Increment = 0

4.5.3.5 unsigned long _linear_lehmer_gen_num (LINEAR_LEHMER_GEN * gen)

Linear Congruential Generator

Parameters

gen	(generator)

Returns

Random number

4.5.3.6 double _linear_lehmer_gen_real (LINEAR_LEHMER_GEN * gen)

Linear Congruential Generator

Parameters

gen	(generator)

Returns

Random number

Here is the call graph for this function:

4.5.3.7 unsigned long irand_gen_random (int *type*)

Pseudo Integer Random Uniform generator

Parameters

type	: type of algorithm (linear congruential or combined linear congruential)

Returns

Random value

Here is the call graph for this function:

4.5.3.8 double irand_gen_random_real (int *type*)

Pseudo Real-value Random Uniform generator

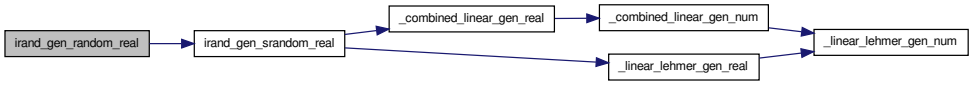
Parameters

type	: type of algorithm (linear congruential or combined linear congruential)

Returns

Random value

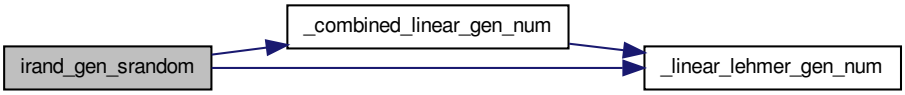
Here is the call graph for this function:



4.5.3.9 unsigned long irand_gen_srandom (int *type*, unsigned long *seed*)

Generate random number in Combined Linear Congruential

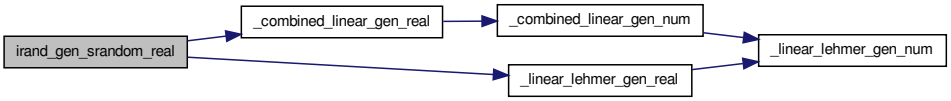
Here is the call graph for this function:



4.5.3.10 double irand_gen_srandom_real (int *type*, unsigned long *seed*)

Generate random number in Combined Linear Congruential

Here is the call graph for this function:



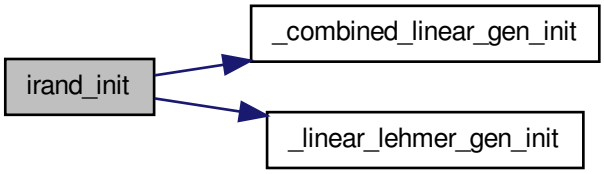
4.5.3.11 int irand_init ( )

Initialize pseudo random generator

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.5.3.12 int irand_new_seed (unsigned long *seed*)

Psuedo random generator with seed

Parameters

seed	: seed of generator

Returns

integer pseudo random value

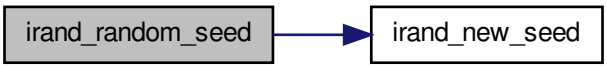
4.5.3.13 int irand_random_seed ( )

Psuedo random generator with random-selected seed

Returns

integer pseudo random value

Here is the call graph for this function:



4.6 list/linked_list.c File Reference

```
#include <stdio.h>
#include <stdlib.h>
#include "linked_list.h"
#include "../error.h"
```

Functions

- int **linked_list_init** (LINKED_LIST *l)
- int **linked_list_insert** (LINKED_LIST *l, LINKED_LIST *e)
- int **linked_list_remove** (LINKED_LIST *e)
- int **linked_list_get_first** (LINKED_LIST *l, LINKED_LIST **e)
- int **print_list** (LINKED_LIST *l)
- int **test_linked_list** ()
- int **linked_list_man_init** (LINKED_LIST_MAN *lm)
- int **linked_list_man_init_conf** (LINKED_LIST_MAN *lm, int conf)
- int **linked_list_man_insert** (LINKED_LIST_MAN *lm, LINKED_LIST *e)
- int **linked_list_man_remove** (LINKED_LIST_MAN *lm, LINKED_LIST *e)
- int **linked_list_man_get_first** (LINKED_LIST_MAN *lm, LINKED_LIST **e)
- int **linked_list_man_get_free_entry** (LINKED_LIST_MAN *lm, LINKED_LIST **e)
- int **linked_list_man_alloc** (LINKED_LIST_MAN *lm, LINKED_LIST **e, int size)
- int **test_linked_list_man** ()

4.6.1 Detailed Description

Double linked list functions

Date

Created on: Apr 6, 2011

Author

iizke

4.7 list/linked_list.h File Reference

```
#include <stddef.h>
```

Data Structures

- struct linked_list
- struct linked_list_manager

Defines

- #define LL_CONF_STORE_FREE 0b00000001

  Configure list to allow storing free nodes.

- #define LL_CONF_STORE_ENTRY 0b00000010

  Configure list to allow storing nodes in list.

- #define ERR_LL_MAN_ALLOC (-2)

  Error code when failed in allocating new memory for node.

- #define ERR_LL_CONF_WRONG (-3)

  Error code when configuration of linked list is not correct.

- #define linked_list_is_empty(_l) (_l->next == _l)

  Check linked list empty (return 1) or not (return 0)

- #define container_of(ptr, type, member)

  Return the pointer of struct TYPE having a member name MEMBER with pointer ptr.

Typedefs

- typedef struct linked_list LINKED_LIST
- typedef struct linked_list_manager LINKED_LIST_MAN

Functions

- int **linked_list_init** (LINKED_LIST *l)
- int **linked_list_insert** (LINKED_LIST *l, LINKED_LIST *e)
- int **linked_list_remove** (LINKED_LIST *e)
- int **linked_list_get_first** (LINKED_LIST *l, LINKED_LIST **e)
- int **print_list** (LINKED_LIST *l)
- int **test_linked_list** ()
- int **linked_list_man_init** (LINKED_LIST_MAN *lm)
- int **linked_list_man_init_conf** (LINKED_LIST_MAN *lm, int conf)
- int **linked_list_man_insert** (LINKED_LIST_MAN *lm, LINKED_LIST *e)
- int **linked_list_man_remove** (LINKED_LIST_MAN *lm, LINKED_LIST *e)
- int **linked_list_man_get_first** (LINKED_LIST_MAN *l, LINKED_LIST **e)
- int **linked_list_man_get_free_entry** (LINKED_LIST_MAN *lm, LINKED_LIST **e)
- int **linked_list_man_alloc** (LINKED_LIST_MAN *l, LINKED_LIST **e, int size)
- int **test_linked_list_man** ()

4.7.1 Detailed Description

Double Linked List structure

Date

Created on: Apr 6, 2011

Author

iizke

4.7.2 Define Documentation

4.7.2.1 #define container_of(*ptr, type, member*)

Value:

```
({                      \
        const typeof( ((type *)0)->member ) *__mptr = (ptr);    \
        (type *)( (char *)__mptr - offsetof(type,member) );})
```

Return the pointer of struct TYPE having a member name MEMBER with pointer ptr.

4.7.3 Typedef Documentation

4.7.3.1 typedef struct linked_list LINKED_LIST

Linked list structure

4.7.3.2 typedef struct linked_list_manager LINKED_LIST_MAN

Linked list manager. Manage not only nodes of list but also free nodes (used for allocating new node)

4.8 netlib.c File Reference

```
#include <stdio.h>
#include "error.h"
#include "netsim/netsim.h"
#include "graph/main_graph.h"
#include "graph/main_rwa.h"
```

Functions

- int **check_netsim** ()
- int **main** (int nargs, char **args)

4.8.1 Detailed Description

Date

Created on: May 24, 2011

Author

iizke

4.9 netsim/conf/config.c File Reference

```
#include <string.h>
#include "../../error.h"
#include "../../random.h"
#include "parser.h"
#include "config.h"
```

Functions

- int config_random_conf (RANDOM_CONF *rc)
- int config_init (CONFIG *conf)
- int config_setup (CONFIG *conf)
- int config_parse_file (char *f)

Variables

- CONFIG **conf**

4.9.1 Detailed Description

Some functions related to config structure

Date

Created on: May 24, 2011

Author

iizke

4.9.2 Function Documentation

4.9.2.1 int config_init (CONFIG * *conf*)

Initialize the structure of CONFIG

Parameters

conf	: configuration

Returns

Error code (see more in def.h and error.h)

4.9.2.2 int config_parse_file (char * *f*)

Parse the configuration file (for example: test.conf)

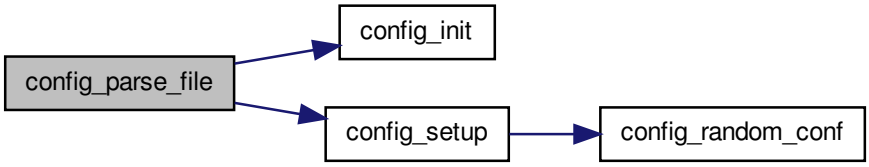
Parameters

f	: file name

Returns

: Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.9.2.3 int config_random_conf (RANDOM_CONF * *rc*)

Configure random distribution from parameters in RANDOM_CONFIG

Parameters

rc	: Random configuration

Returns

Error code (see more in def.h and error.h)

4.9.2.4 int config_setup (CONFIG * *conf*)

Configure random distribution in user configuration

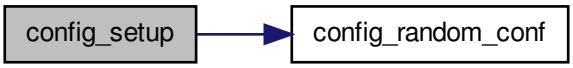
Parameters

conf	: User configuration

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.10 netsim/conf/config.h File Reference

```
#include <stdio.h>
#include "../../random.h"
```

Data Structures

- struct random_config
- struct queue_config
- struct stop_config
- struct csma_conf
- struct config

Defines

- #define **RANDOM_OTHER** 1
- #define **RANDOM_MARKOVIAN** 2
- #define **RANDOM_UNIFORM** 3
- #define **RANDOM_FILE** 4
- #define **RANDOM_BERNOULLI** 5
- #define **PROTOCOL_CSMA** 0
- #define **PROTOCOL_ONE_QUEUE** 1
- #define **STOP_QUEUE_ZERO** 0
- #define **STOP_QUEUE_NONZERO** 1

Typedefs

- typedef struct random_config RANDOM_CONF
- typedef struct queue_config QUEUE_CONF
- typedef struct stop_config STOP_CONF
- typedef struct csma_conf **CSMA_CONF**
- typedef struct config CONFIG

Functions

- int config_random_conf (RANDOM_CONF *rc)
- int config_init (CONFIG *conf)
- int config_setup (CONFIG *conf)
- int config_parse_file (char *file)

4.10.1 Detailed Description

Define user configurations

Date

Created on: Apr 16, 2011

Author

iizke

4.10.2 Typedef Documentation

4.10.2.1 typedef struct config CONFIG

Configuration from user

4.10.2.2 typedef struct queue_config QUEUE_CONF

Queue configuration

4.10.2.3 typedef struct random_config RANDOM_CONF

Flow configuration is used to characterize a flow: what is its distribution, define some parameters.

4.10.2.4 typedef struct stop_config STOP_CONF

Define conditions of stopping program

4.10.3 Function Documentation

4.10.3.1 int config_init (CONFIG * *conf*)

Initialize the structure of CONFIG

Parameters

conf	: configuration

Returns

Error code (see more in def.h and error.h)

4.10.3.2 int config_parse_file (char * f)

Parse the configuration file (for example: test.conf)

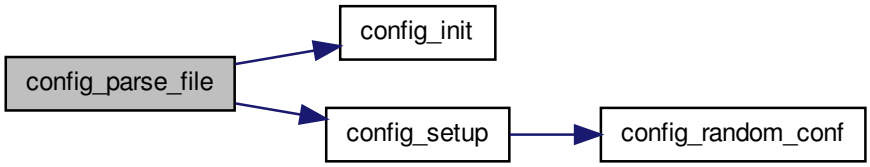
Parameters

f	: file name

Returns

: Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.10.3.3 int config_random_conf (RANDOM_CONF * rc)

Configure random distribution from parameters in RANDOM_CONFIG

Parameters

rc	: Random configuration

Returns

Error code (see more in def.h and error.h)

4.10.3.4 int config_setup (CONFIG * conf)

Configure random distribution in user configuration

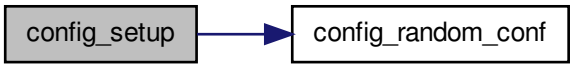
Parameters

conf	: User configuration

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.11 netsim/csma.c File Reference

```
#include <stdlib.h>
#include "conf/config.h"
#include "../error.h"
#include "../queues/fifo.h"
#include "../random.h"
#include "csma.h"
```

Defines

- #define **queue_state**(qm) (((FIFO_QINFO∗)(qm->curr_queue->info))->state)

Functions

- int csma_remove_event (SYS_STATE_OPS ∗ops, EVENT ∗e)
- EVENT ∗ csma_generate_arrival (CONFIG ∗conf, CSMA_STATE ∗state)
- EVENT ∗ csma_generate_end_service (PACKET ∗p, CONFIG ∗conf, CSMA_-STATE ∗state)
- EVENT ∗ csma_generate_access (PACKET ∗p, CONFIG ∗conf, CSMA_STATE ∗state)
- EVENT ∗ csma_generate_collision (PACKET ∗p, CONFIG ∗conf, CSMA_-STATE ∗state)

- int csma_process_access_event (EVENT *e, CONFIG *conf, CSMA_STATE *state)
- int csma_process_arrival (EVENT *e, CONFIG *conf, CSMA_STATE *state)
- int csma_process_collision (EVENT *e, CONFIG *conf, CSMA_STATE *state)
- int csma_process_end_service (EVENT *e, CONFIG *conf, CSMA_STATE *state)
- EVENT * csma_generate_event (int type, PACKET *p, CONFIG *conf, SYS_STATE_OPS *ops)
- int csma_process_event (EVENT *e, CONFIG *conf, SYS_STATE_OPS *ops)
- int csma_get_next_event (SYS_STATE_OPS *ops, EVENT **e)
- int csma_allow_continue (CONFIG *conf, SYS_STATE_OPS *ops)
- int csma_state_init (CSMA_STATE *state, CONFIG *conf)

4.11.1 Detailed Description

Model of CSMA system (Carrier Sense Multiple Access)

Date

Created on: May 16, 2011

Author

iizke

4.11.2 Function Documentation

4.11.2.1 int csma_allow_continue (CONFIG * *conf*, SYS_STATE_OPS * *ops*)

Check whether system should be stopped or not.

Parameters

conf	: User configuration
ops	: Abstract system operators

Returns

0 if system should be stopped, 1 otherwise.

Here is the call graph for this function:

4.11.2.2 EVENT* csma_generate_access (PACKET * *p*, CONFIG * *conf*, CSMA_STATE * *state*)

Generate an access event (if necessary) or change to persistent-mode

Parameters

p	: packet
conf	: user configuration
state	: system state

Returns

New event (already added in the event list)

4.11.2.3 EVENT* csma_generate_arrival (CONFIG * *conf*, CSMA_STATE * *state*)

Generate arrival event

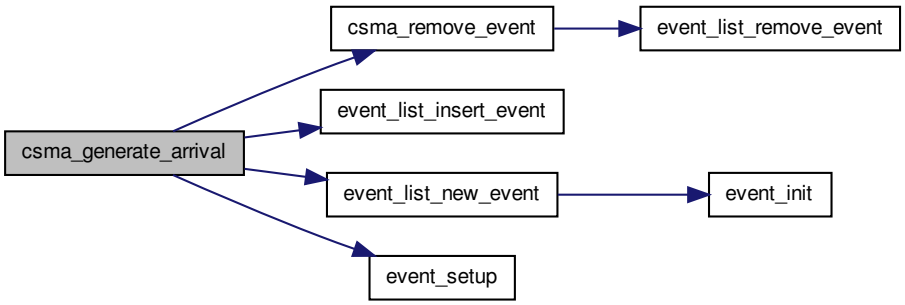
Parameters

conf	: user configuration
state	: system state

Returns

new event (already added in Event list)

Here is the call graph for this function:



4.11.2.4 EVENT* csma_generate_collision (PACKET * *p*, CONFIG * *conf*, CSMA_STATE * *state*)

Generate collision event

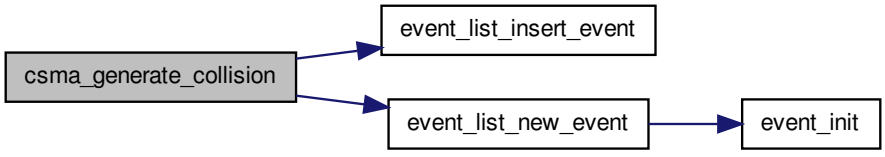
Parameters

p	: packet but should be NULL (no use)
conf	: user configuration
state	: system state

Returns

New event (already added in the event list)

Here is the call graph for this function:



4.11.2.5 EVENT* csma_generate_end_service (PACKET * *p*, CONFIG * *conf*, CSMA_STATE * *state*)

Generate new end-service event.

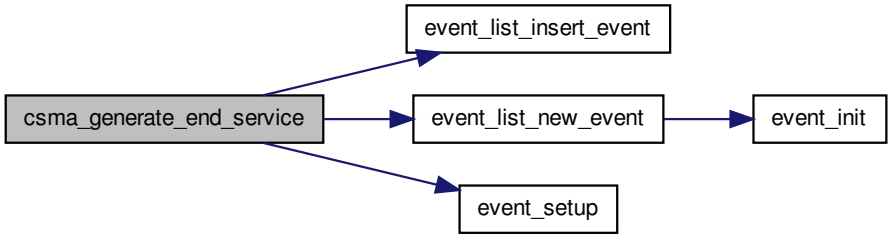
Parameters

p	: Processing packet (for this event)
conf	: user configuration
state	: System state

Returns

New event (already added in the event list)

Here is the call graph for this function:



4.11.2.6 EVENT* csma_generate_event (int *type*, PACKET * *p*, CONFIG * *conf*, SYS_STATE_OPS * *ops*)

Generate new event.

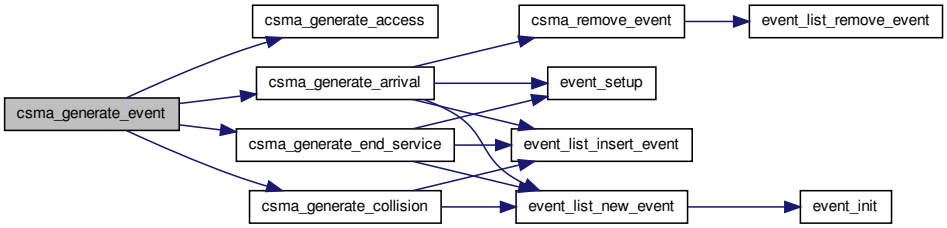
Parameters

type	: type of event
p	: Packet related to this new event
conf	: user configuration
ops	: Abstract system operations

Returns

New event

Here is the call graph for this function:



4.11.2.7 int csma_get_next_event (SYS_STATE_OPS * *ops*, EVENT ** *e*)

Get next event from event list

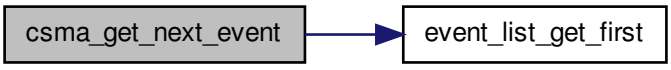
Parameters

ops	: Abstract system operations
e	: returned event

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.11.2.8 int csma_process_access_event (EVENT * *e*, CONFIG * *conf*, CSMA_STATE * *state*)

Process Access event

Parameters

e	: Event

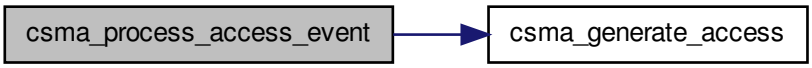
conf	: configuration from user
state	: system state

Returns

Error code (see more in def.h and libs/error.h)

If channel is idle/free then occuppy the channel

Here is the call graph for this function:



4.11.2.9 int csma_process_arrival (EVENT * *e*, CONFIG * *conf*, CSMA_STATE * *state*)

Process Arrival event

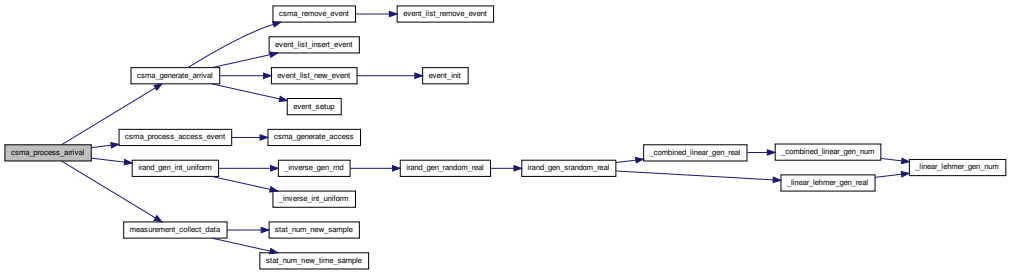
Parameters

e	: Event
conf	: configuration from user
state	: system state

Returns

Error code (see more in def.h and libs/error.h)

Here is the call graph for this function:



4.11.2.10 int csma_process_collision (EVENT * *e*, CONFIG * *conf*, CSMA_STATE * *state*)

Process Collision event

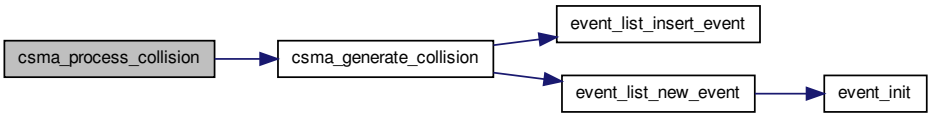
Parameters

e	: Event
conf	: configuration from user
state	: system state

Returns

Error code (see more in def.h and libs/error.h)

Here is the call graph for this function:



4.11.2.11 int csma_process_end_service (EVENT * *e*, CONFIG * *conf*, CSMA_STATE * *state*)

Process End-service event

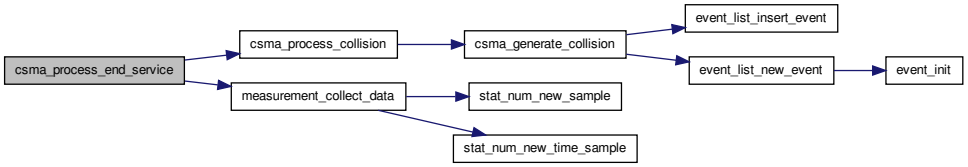
Parameters

e	: Event
conf	: configuration from user
state	: system state

Returns

Error code (see more in def.h and libs/error.h)

Here is the call graph for this function:



4.11.2.12 int csma_process_event (EVENT * *e*, CONFIG * *conf*, SYS_STATE_OPS * *ops*)

Process an event.

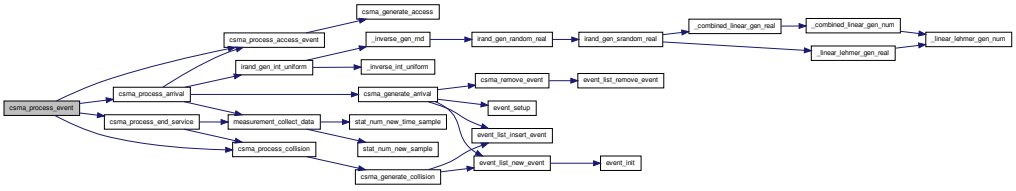
Parameters

e	: Event
conf	: User configuration
ops	:Abstract system operations

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.11.2.13 int csma_remove_event (SYS_STATE_OPS * *ops*, EVENT * *e*)

Remove an event out of event list

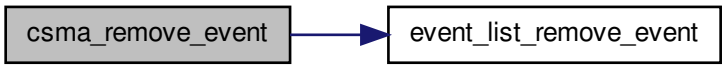
Parameters

ops	: Abstract system operations
e	: Event

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.11.2.14 int csma_state_init (CSMA_STATE * *state*, CONFIG * *conf*)

Initialize CSMA system state

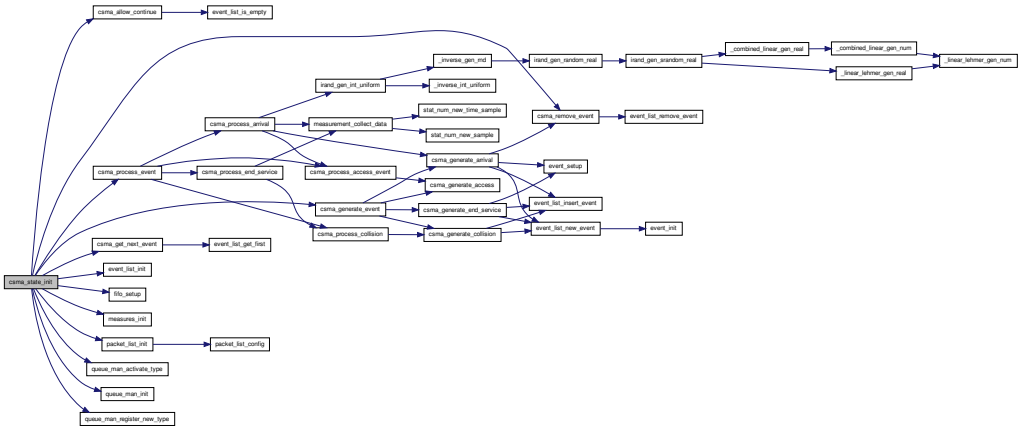
Parameters

state	: system state
conf	: user configuration

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.12 netsim/csma.h File Reference

```
#include "event.h"
#include "../queues/measures.h"
#include "netsim.h"
```

Data Structures

- struct csma_state

Defines

- #define **get_csma_state_from_ops**(_ops) (container_of(_ops, CSMA_STATE, ops))
- #define CHANNEL_BUSY 1

  Channel state is Busy.

- #define CHANNEL_FREE 0

  Channel state is Free.

- #define QUEUE_STATE_NOPERSISTENT 0

  Queue state is Non-persistent CSMA.

- #define QUEUE_STATE_PERSISTENT 1

  Queue state is persistent CSMA.

- #define QUEUE_STATE_TRANSFERING 2

  Queue is transfering packet.

Typedefs

- typedef struct csma_state **CSMA_STATE**

Functions

- int csma_state_init (CSMA_STATE *state, CONFIG *conf)

4.12.1 Detailed Description

CSMA system structure

Date

Created on: May 20, 2011

Author

iizke

4.12.2 Function Documentation

4.12.2.1 int csma_state_init (CSMA_STATE * *state*, CONFIG * *conf*)

Initialize CSMA system state

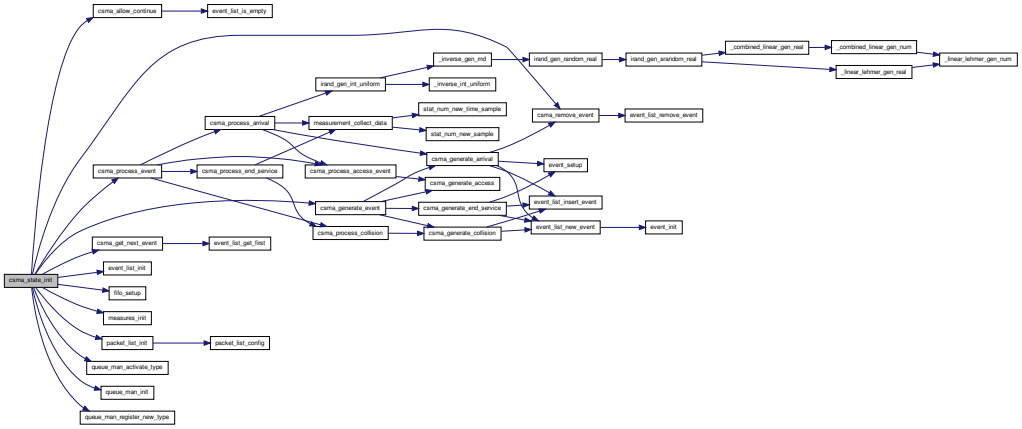
Parameters

state	: system state
conf	: user configuration

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.13 netsim/event.c File Reference

```
#include <stdlib.h>
#include "../error.h"
#include "event.h"
```

Functions

- int event_list_init (EVENT_LIST *el)
- int event_list_new_event (EVENT_LIST *el, EVENT **e)
- int event_list_insert_event (EVENT_LIST *el, EVENT *e)
- int event_list_remove_event (EVENT_LIST *el, EVENT *e)
- int event_list_get_first (EVENT_LIST *el, EVENT **e)
- int event_list_is_empty (EVENT_LIST *l)
- int event_init (EVENT *e)
- int print_event_list (EVENT_LIST *l)
- int event_save (EVENT *e, FILE *f)
- int test_event_list_insert ()

4.13.1 Detailed Description

Event and Event-list structure and related functions

Date

Created on: Apr 6, 2011

Author

iizke

4.13.2 Function Documentation

4.13.2.1 int event_init (EVENT * e)

Initialize parameters in Event structure

Parameters

e	: Event

Returns

Error-code (defined in def.h and libs/error.h)

4.13.2.2 int event_list_get_first (EVENT_LIST * el, EVENT ** e)

Get the first event in the event-list

Parameters

el	: Event-list
e	: Output -> Event

Returns

Error-code (defined in def.h and libs/error.h)

4.13.2.3 int event_list_init (EVENT_LIST * el)

Initialize parametters in EVENT_LIST

Parameters

el	: pointer to EVENT_LIST

Returns

Error-code (normal SUCCESS)

4.13.2.4 int event_list_insert_event (EVENT_LIST * el, EVENT * e)

Insert an event into event-list

Parameters

el	: Event list
e	: event

Returns

Error-code (defined in def.h and libs/error.h)

sort from end of list, assume that event_list already sorted before

4.13.2.5 int event_list_is_empty (EVENT_LIST * *l*)

Check an Event-list empty or not

Parameters

l	: event list

Returns

Return negative number if error. Return 1 if event list is empty, and return 0 otherwise.

4.13.2.6 int event_list_new_event (EVENT_LIST * *el*, EVENT ** *e*)

New event structure is allocated and init But this new event is not inserted into referenced Event-list

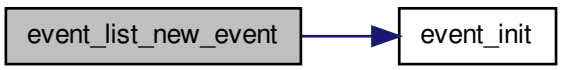
Parameters

el	: Event-list used for allocating new memory to Event structure
e	: output -> New event

Returns

Error-code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.13.2.7 int event_list_remove_event (EVENT_LIST * el, EVENT * e)

Remove an event out of event list. Note that, based on Linked-list-manager (LINKED_-LIST_MAN), this event may not be freed but holding for future use (new-event).

Parameters

el	: Event list
e	: removed event

Returns

Error-code (defined in def.h and libs/error.h)

4.13.2.8 int event_save (EVENT * e, FILE * f)

Save an event information into file

Parameters

e	: Event
f	: File pointer

Returns

Error code (see more in file def.h and libs/error.h)

4.13.2.9 int print_event_list (EVENT_LIST * l)

Print out to screen some info of every event in a list This info includes event-type, event-time

Parameters

l	: Event list

Returns

Error-code (defined in def.h and libs/error.h)

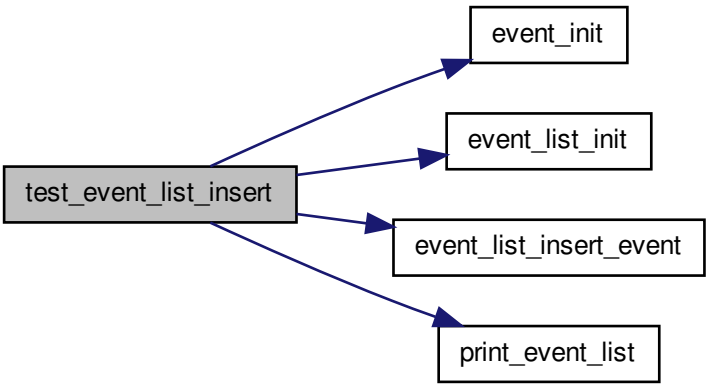
4.13.2.10 int test_event_list_insert ( )

Unit test of function event_list_insert

Returns

Error-code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.14 netsim/event.h File Reference

```
#include <stdio.h>
#include "../queues/packet.h"
```

Data Structures

- struct event_info
- struct event
- struct event_list

Defines

- #define EVENT_ARRIVAL 1

  Arrival event.

- #define EVENT_END_SERVICE 2

  End-of-Service event.

- #define EVENT_ACCESS_CHANNEL 3

  Access Channel event.

- #define EVENT_END_COLLISION 4

End Collision event.

- #define EVENT_SIGNAL_SOT 5

  Signal SoT (Start of Transmission) event.

- #define EVENT_SIGNAL_EOT 6

  Signal EoT (End of Transmission) event.

- #define swap_prev_event(e2)

  swap two adjacent event: this event and prev-event of this event

Typedefs

- typedef struct event_info EVENTINFO
- typedef struct event EVENT
- typedef struct event_list EVENT_LIST

Functions

- int event_init (EVENT *e)
- int event_save (EVENT *e, FILE *file)
- int event_list_init (EVENT_LIST *el)
- int event_list_new_event (EVENT_LIST *el, EVENT **e)
- int event_list_insert_event (EVENT_LIST *el, EVENT *e)
- int event_list_remove_event (EVENT_LIST *el, EVENT *e)
- int event_list_get_first (EVENT_LIST *el, EVENT **e)
- int event_list_is_empty (EVENT_LIST *l)
- int test_event_list_insert ()

4.14.1 Detailed Description

Event structure

Date

Created on: Apr 6, 2011

Author

iizke

4.14.2 Define Documentation

4.14.2.1 #define swap_prev_event(*e2*)

Value:

```
{                                                                   \
    LINKED_LIST * _l1 = e2->list_node.prev;                          \
    LINKED_LIST * _l2 = &e2->list_node;                              \
    _l1->next = _l2->next;                                           \
    _l2->prev = _l1->prev;                                           \
    _l1->prev = _l2;                                                 \
    _l2->next = _l1;                                                 \
    _l1->next->prev = _l1;                                           \
    _l2->prev->next = _l2;                                           \
  }
```

swap two adjacent event: this event and prev-event of this event

4.14.3 Typedef Documentation

4.14.3.1 typedef struct event EVENT

Event structure

4.14.3.2 typedef struct event_list EVENT_LIST

Event list structure

4.14.3.3 typedef struct event_info EVENTINFO

Information in an event

4.14.4 Function Documentation

4.14.4.1 int event_init (EVENT * *e*)

Initialize parameters in Event structure

Parameters

e	: Event

Returns

Error-code (defined in def.h and libs/error.h)

4.14.4.2 int event_list_get_first (EVENT_LIST * *el*, EVENT ** *e*)

Get the first event in the event-list

Parameters

el	: Event-list
e	: Output -> Event

Returns

Error-code (defined in def.h and libs/error.h)

4.14.4.3 int event_list_init (EVENT_LIST * *el*)

Initialize parametters in EVENT_LIST

Parameters

el	: pointer to EVENT_LIST

Returns

Error-code (normal SUCCESS)

4.14.4.4 int event_list_insert_event (EVENT_LIST * *el*, EVENT * *e*)

Insert an event into event-list

Parameters

el	: Event list
e	: event

Returns

Error-code (defined in def.h and libs/error.h)

sort from end of list, assume that event_list already sorted before

4.14.4.5 int event_list_is_empty (EVENT_LIST * *l*)

Check an Event-list empty or not

Parameters

l	: event list

Returns

Return negative number if error. Return 1 if event list is empty, and return 0 otherwise.

4.14.4.6 int event_list_new_event (EVENT_LIST * *el*, EVENT ** *e*)

New event structure is allocated and init But this new event is not inserted into referenced Event-list

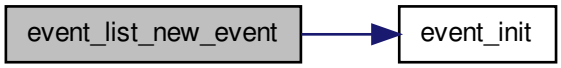
Parameters

el	: Event-list used for allocating new memory to Event structure
e	: output -> New event

Returns

Error-code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.14.4.7 int event_list_remove_event (EVENT_LIST * *el*, EVENT * *e*)

Remove an event out of event list. Note that, based on Linked-list-manager (LINKED_-LIST_MAN), this event may not be freed but holding for future use (new-event).

Parameters

el	: Event list
e	: removed event

Returns

Error-code (defined in def.h and libs/error.h)

4.14.4.8 int event_save (EVENT * *e*, FILE * *f*)

Save an event information into file

Parameters

e	: Event
f	: File pointer

Returns

Error code (see more in file def.h and libs/error.h)

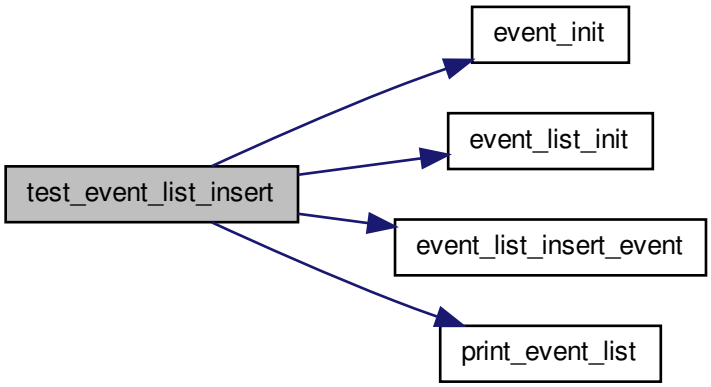
4.14.4.9 int test_event_list_insert ( )

Unit test of function event_list_insert

Returns

Error-code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.15 netsim/netsim.c File Reference

```
#include <stdlib.h>
#include <signal.h>
#include <string.h>
#include "../error.h"
#include "../queues/fifo.h"
```

```
#include "conf/parser.h"
#include "conf/config.h"
#include "sys_aqueue.h"
#include "csma.h"
#include "netsim.h"
```

Functions

- int event_setup (EVENT *e, RANDOM_CONF *fc, TIME curr_time)
- int pisas_sched (CONFIG *conf, SYS_STATE_OPS *sys_ops)
- int netsim_start (char *conf_file)

Variables

- CONFIG **conf**
- long **debug**

4.15.1 Detailed Description

Network simulator - the main framework.

Date

Created on: Apr 6, 2011

Author

iizke

4.15.2 Function Documentation

4.15.2.1 int event_setup (EVENT * *e*, RANDOM_CONF * *fc*, TIME *curr_time*)

Setup time of event based on its statistical characteristics.

Parameters

e	: Event
fc	: random configuration
curr_time	: Current time

Returns

Error code (see more in def.h and error.h)

4.15.2.2 int netsim_start (char * *conf_file*)

Main program. Do parse user configuration file, and run a chosen simulation

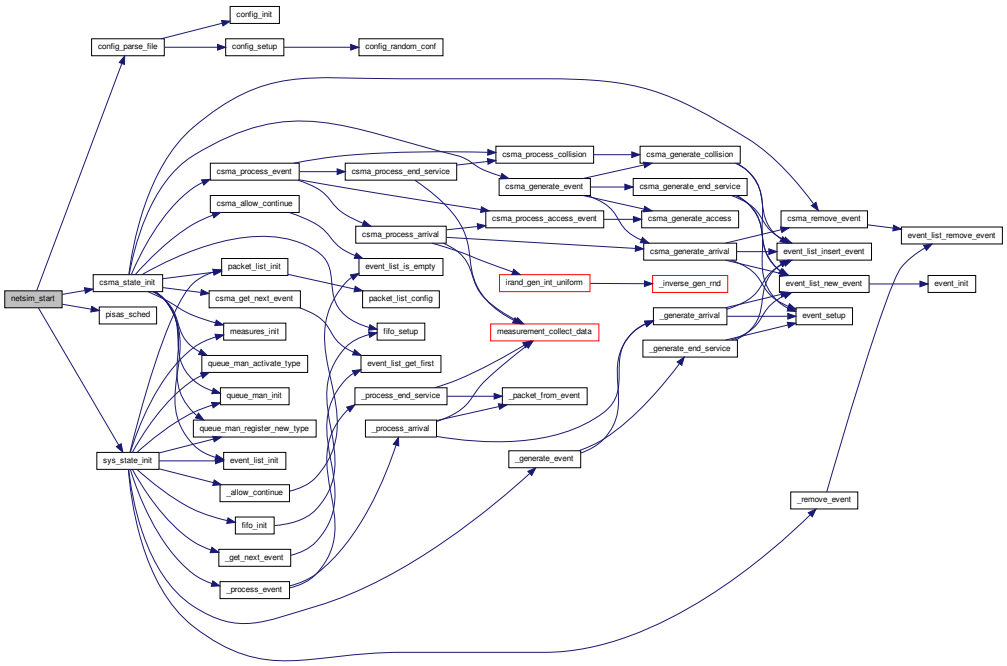
Parameters

nargs	: number of parameters
args	: parameters

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.15.2.3 int pisas_sched (CONFIG * *conf*, SYS_STATE_OPS * *sys_ops*)

Scheduling events while simulating.

Parameters

conf	: Configuration from user, including: arrival distribution, execution distribution, waiting line, ...
sys_ops	: Operations of System state.

Returns

Error code (defined in libs/error.h and def.h)

4.16 netsim/netsim.h File Reference

```
#include "event.h"
#include "../queues/measures.h"
#include "conf/config.h"
```

Data Structures

- struct system_state_operations
  Functions of a simulated system.

Typedefs

- typedef struct system_state_operations SYS_STATE_OPS
  Functions of a simulated system.

Functions

- int event_setup (EVENT *e, RANDOM_CONF *fc, TIME curr_time)
- int netsim_start (char *conf_file)

4.16.1 Detailed Description

Date

Created on: Apr 6, 2011

Author

iizke

4.16.2 Function Documentation

4.16.2.1 int event_setup (EVENT * *e*, RANDOM_CONF * *fc*, TIME *curr_time*)

Setup time of event based on its statistical characteristics.

Parameters

e	: Event

fc	: random configuration
curr_time	: Current time

Returns

Error code (see more in def.h and error.h)

4.16.2.2 int netsim_start (char * *conf_file*)

Main program. Do parse user configuration file, and run a chosen simulation

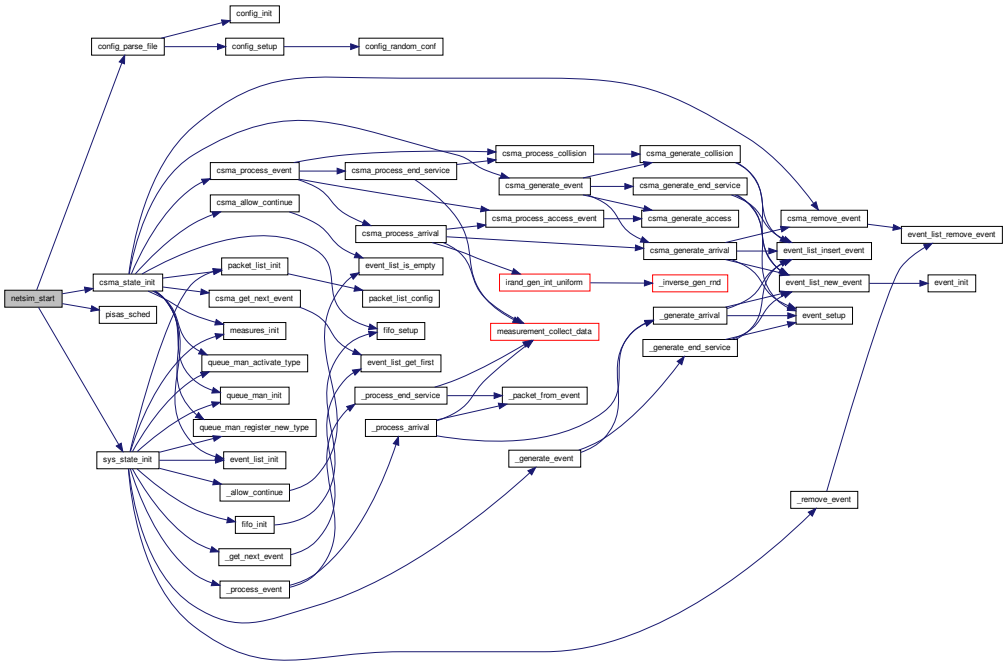
Parameters

nargs	: number of parameters
args	: parameters

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.17 netsim/sys_aqueue.c File Reference

```
#include <unistd.h>
#include <stdlib.h>
#include <string.h>
#include "../error.h"
#include "../queues/fifo.h"
#include "sys_aqueue.h"
```

Functions

- EVENT * _generate_arrival (CONFIG *conf, SYS_STATE *state)
- EVENT * _generate_end_service (PACKET *p, CONFIG *conf, SYS_STATE *state)
- int _allow_continue (CONFIG *conf, SYS_STATE_OPS *ops)
- int _packet_from_event (EVENT *e, PACKET *p)
- int _process_arrival (EVENT *e, CONFIG *conf, SYS_STATE *state)
- int _process_end_service (EVENT *e, CONFIG *conf, SYS_STATE *state)
- EVENT * _generate_event (int type, PACKET *p, CONFIG *conf, SYS_STATE_OPS *ops)
- int _process_event (EVENT *e, CONFIG *conf, SYS_STATE_OPS *ops)
- int _get_next_event (SYS_STATE_OPS *ops, EVENT **e)
- int _remove_event (SYS_STATE_OPS *ops, EVENT *e)
- int sys_state_init (SYS_STATE *state, CONFIG *conf)

4.17.1 Detailed Description

Simulation of system with one queue (but can be multi-servers)

Date

Created on: May 19, 2011

Author

iizke

4.17.2 Function Documentation

4.17.2.1 int _allow_continue (CONFIG * *conf*, SYS_STATE_OPS * *ops*)

Check whether system should be stopped or not.

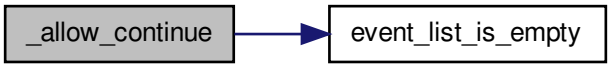
Parameters

conf	: User configuration
ops	: Abstract system operators

Returns

0 if system should be stopped, 1 otherwise.

Here is the call graph for this function:



4.17.2.2 EVENT* _generate_arrival (CONFIG * *conf*, SYS_STATE * *state*)

Generate arrival event

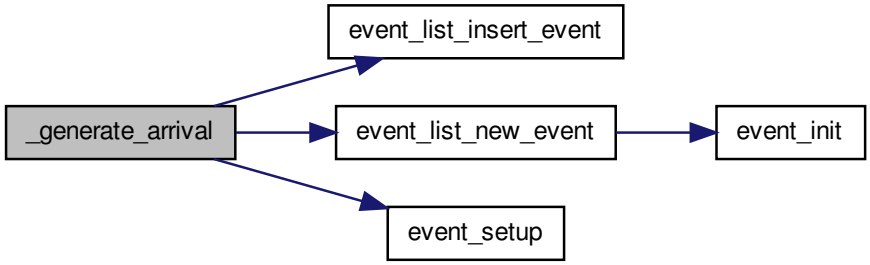
Parameters

conf	: user configuration
state	: system state

Returns

new event (already added in Event list)

Here is the call graph for this function:



4.17.2.3 EVENT* _generate_end_service (PACKET * *p*, CONFIG * *conf*, SYS_STATE * *state*)

Generate new end-service event.

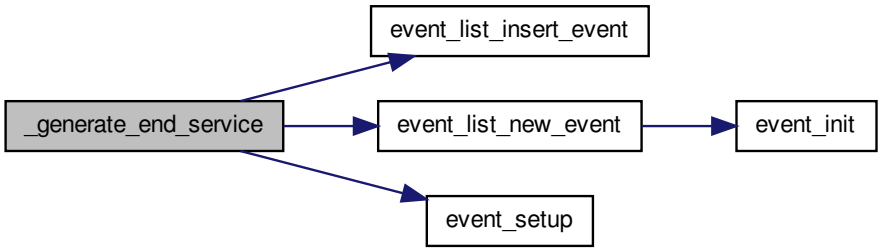
Parameters

p	: Processing packet (for this event)
conf	: user configuration
state	: System state

Returns

New event (already added in the event list)

Here is the call graph for this function:



4.17.2.4 EVENT* _generate_event (int *type*, PACKET * *p*, CONFIG * *conf*, SYS_STATE_OPS * *ops*)

Generate new event.

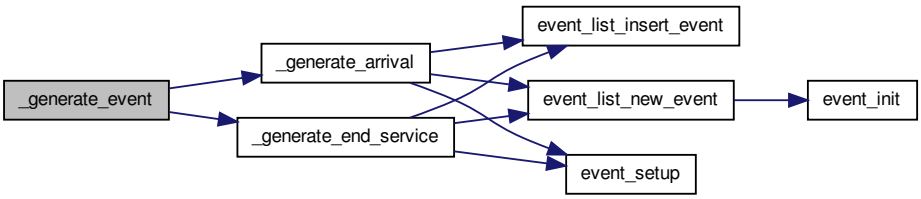
Parameters

type	: type of event
p	: Packet related to this new event
conf	: user configuration
ops	: Abstract system operations

Returns

New event

Here is the call graph for this function:



4.17.2.5 int _get_next_event (SYS_STATE_OPS * *ops*, EVENT ** *e*)

Get next event from event list

Parameters

ops	: Abstract system operations
e	: returned event

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:

4.17.2.6 int _packet_from_event (EVENT * *e*, PACKET * *p*)

Setup time and type of packet extracted from an event

Parameters

e	: Event
p	: Packet

Returns

Error code (see more in def.h and error.h)

4.17.2.7 int _process_arrival (EVENT * e, CONFIG * conf, SYS_STATE * state)

Process Arrival event

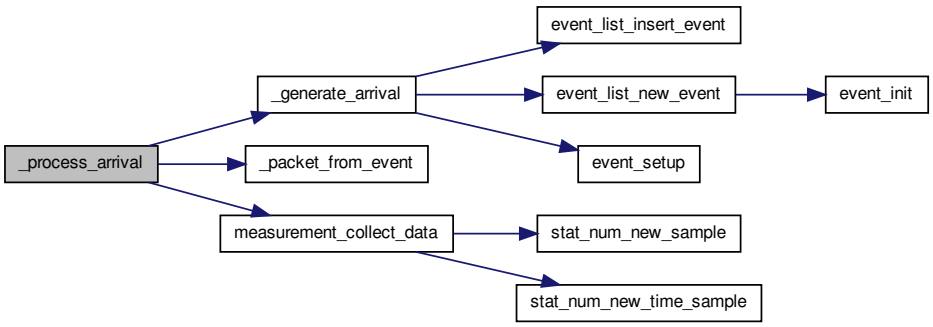
Parameters

e	: Event
conf	: configuration from user
state	: system state

Returns

Error code (see more in def.h and libs/error.h)

Here is the call graph for this function:



4.17.2.8 int _process_end_service (EVENT * e, CONFIG * conf, SYS_STATE * state)

Process end-service event

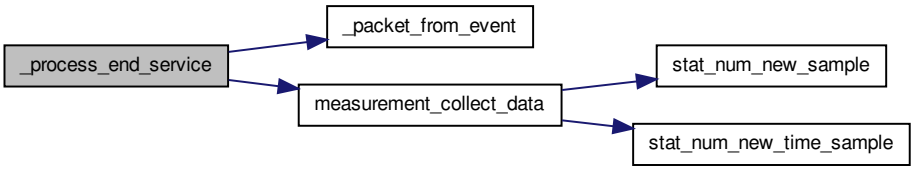
Parameters

e	: event
conf	: user configuration
state	: system state

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.17.2.9 int _process_event (EVENT * e, CONFIG * conf, SYS_STATE_OPS * ops)

Process an event.

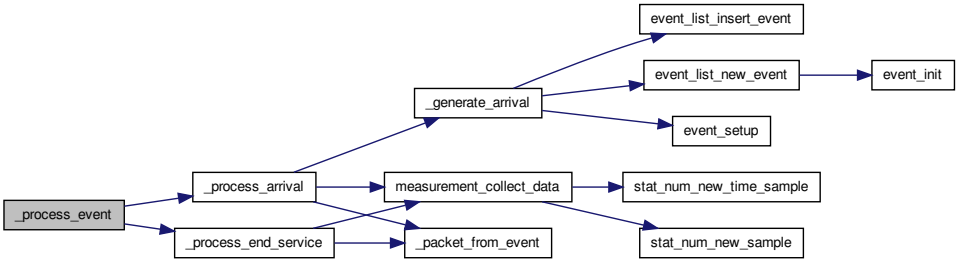
Parameters

e	: Event
conf	: User configuration
ops	:Abstract system operations

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.17.2.10 int _remove_event (SYS_STATE_OPS * ops, EVENT * e)

Remove an event out of event list

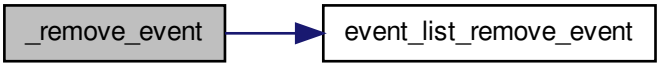
Parameters

ops	: Abstract system operations
e	: Event

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.17.2.11 int sys_state_init (SYS_STATE * *state*, CONFIG * *conf*)

Initialize system state of one-queue system

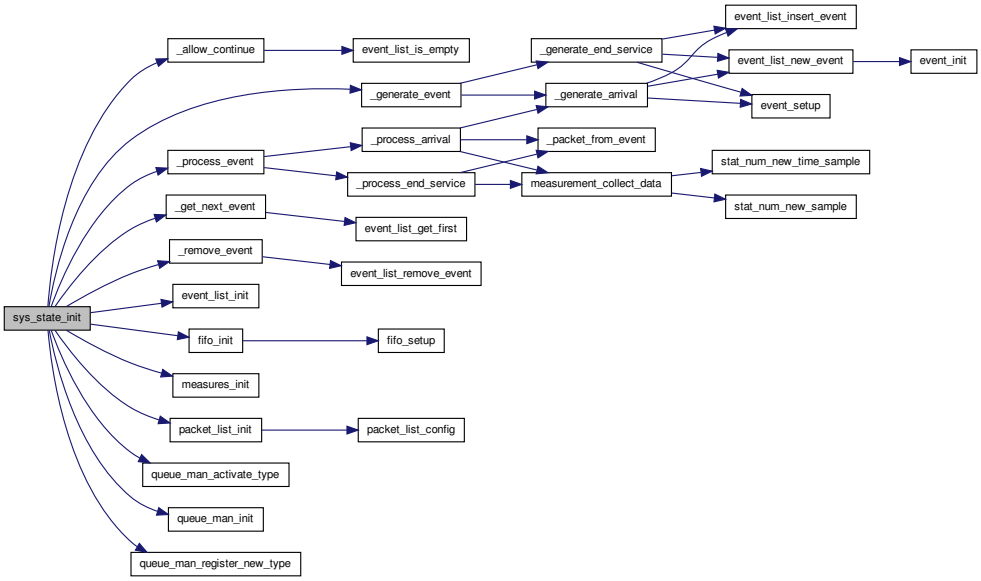
Parameters

state	: system state
conf	: user configuration

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.18 netsim/sys_aqueue.h File Reference

```
#include "../queues/measures.h"
#include "event.h"
#include "../queues/queue_man.h"
#include "netsim.h"
```

Data Structures

- struct sys_state

Defines

- #define **get_sys_state_from_ops**(_ops) (container_of(_ops, SYS_STATE, ops))

Typedefs

- typedef struct sys_state SYS_STATE

Functions

- int sys_state_init (SYS_STATE *state, CONFIG *conf)

4.18.1 Detailed Description

Specification of state in system with one queue

Date

Created on: May 19, 2011

Author

iizke

4.18.2 Typedef Documentation

4.18.2.1 typedef struct sys_state SYS_STATE

Structure representing the system state in simulation.

4.18.3 Function Documentation

4.18.3.1 int sys_state_init (SYS_STATE * *state*, CONFIG * *conf*)

Initialize system state of one-queue system

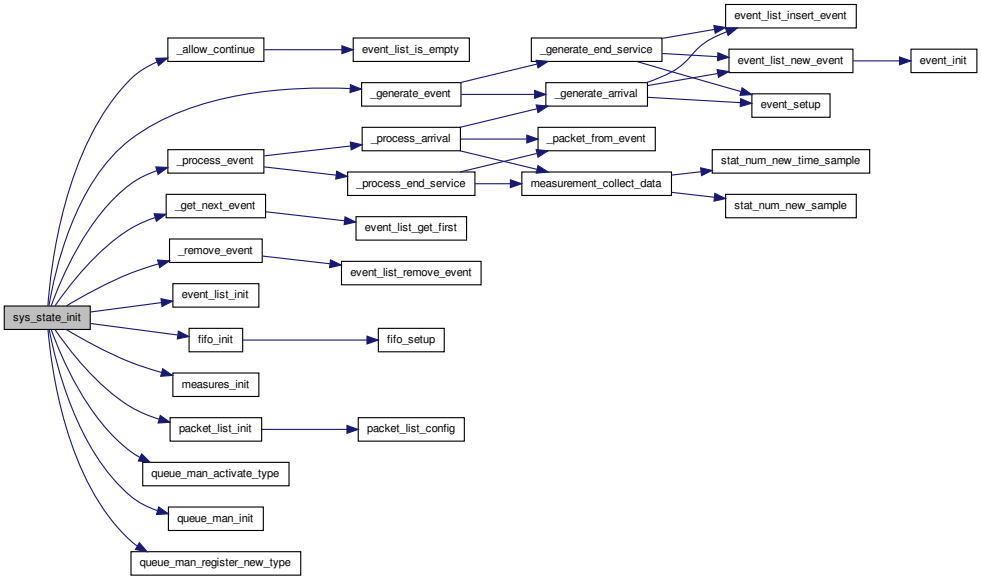
Parameters

state	: system state
conf	: user configuration

Returns

Error code (more in def.h and error.h)

Here is the call graph for this function:



4.19 network.c File Reference

```
#include <stdlib.h>
#include "error.h"
#include "network.h"
```

Functions

- SP_DIJKSTRA_LIST * **_nw_shortest_path_dijkstra** (NETWORK *net, int src)
- void * **network_find_shortest_path** (NETWORK *net, int alg, int src, int dest)

4.19.1 Detailed Description

Date

Created on: May 25, 2011

Author

iizke

4.20 network.h File Reference

```
#include "list/linked_list.h"
#include "matrix/matrix.h"
```

Data Structures

- struct shortest_path_dijkstra
- struct network

Defines

- #define **NETWORK_SP_DIJKSTRA** 1
- #define **NETWORK_SP_BELLFORD** 2

Typedefs

- typedef struct shortest_path_dijkstra **SP_DIJKSTRA**
- typedef LINKED_LIST_MAN **SP_DIJKSTRA_LIST**
- typedef struct network **NETWORK**

Functions

- void * **network_find_shortest_path** (NETWORK *, int, int, int)

4.20.1 Detailed Description

Network structure: traffic, cost, ...

Date

Created on: May 25, 2011

Author

iizke

4.21 quantile.h File Reference

Defines

- #define **pvalue_chi_id**(p_value)
- #define **get_chisqr_pvalue**(_d, _p) (chisqr_pvalues[_d - 1][pvalue_chi_id(_p)])

- #define **pvalue_normal_id**(p_value)
- #define **get_normal_pvalue**(_p) (normal_pvalues[pvalue_normal_id(_p)])

4.21.1 Detailed Description

Support quantile of essential distributions

Date

Created on: May 26, 2011

Author

iizke

4.21.2 Define Documentation

4.21.2.1 #define pvalue_chi_id(*p_value*)

Value:

```
((p_value == 0.95)? 0 : \
  ((p_value == 0.9)? 1 : \
  ((p_value == 0.8)? 2 : \
  ((p_value == 0.7)? 3 : \
  ((p_value == 0.5)? 4 : \
  ((p_value == 0.3)? 5 : \
  ((p_value == 0.2)? 6 : \
  ((p_value == 0.1)? 7 : \
  ((p_value == 0.05)? 8 : \
  ((p_value == 0.01)? 9 : \
  ((p_value == 0.001)? 10 : (-1)) \
  ))))))))))
```

4.21.2.2 #define pvalue_normal_id(*p_value*)

Value:

```
((p_value == 0.9)? 0 : \
  ((p_value == 0.95)? 1 : \
  ((p_value == 0.975)? 2 : \
  ((p_value == 0.99)? 3 : \
  ((p_value == 0.995)? 4 : \
  ((p_value == 0.999)? 5 : (-1)) \
  )))))
```

4.22 queues/fifo.c File Reference

```
#include <stdlib.h>
#include <stdio.h>
```

```
#include "../error.h"
#include "fifo.h"
```

Functions

- int fifo_init (QUEUE_TYPE **q_fifo, int max_executing, int max_waiting)
- int fifo_setup (QUEUE_TYPE *q_fifo, int max_executing, int max_waiting)

4.22.1 Detailed Description

FIFO queue implementation.

Date

Created on: Apr 16, 2011

Author

iizke

4.22.2 Function Documentation

4.22.2.1 int fifo_init (QUEUE_TYPE ** *q_fifo*, int *max_executing*, int *max_waiting*)

Initialization of FIFO queue, maybe allocate new memory if needed

Parameters

q_fifo	: A queue type based on FIFO queue
max_executing,:	Maximum number of executing packets (negative value ~ infinite)
max_waiting,:	Maximum number of waiting packets (negative value ~ infinite)

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:

4.22.2.2 int fifo_setup (QUEUE_TYPE * *q_fifo*, int *max_executing*, int *max_waiting*)

Setup parameters of a FIFO queue

Parameters

q_fifo	: FIFO queue type
max_executing,:	Maximum number of executing packets (negative value ~ infinite)
max_waiting,:	Maximum number of waiting packets (negative value ~ infinite)

Returns

Error code (see more in def.h and error.h)

4.23 queues/fifo.h File Reference

```
#include "queue_man.h"
#include "measures.h"
```

Data Structures

- struct fifo_queue

Typedefs

- typedef struct fifo_queue FIFO_QINFO

Functions

- int fifo_init (QUEUE_TYPE **q, int max_executing, int max_waiting)
- int fifo_setup (QUEUE_TYPE *q, int max_executing, int max_waiting)

4.23.1 Detailed Description

FIFO queue structure

Date

Created on: Apr 16, 2011

Author

iizke

4.23.2 Typedef Documentation

4.23.2.1 typedef struct fifo_queue FIFO_QINFO

FIFO queue structure

4.23.3 Function Documentation

4.23.3.1 int fifo_init (QUEUE_TYPE ** *q_fifo*, int *max_executing*, int *max_waiting*)

Initialization of FIFO queue, maybe allocate new memory if needed

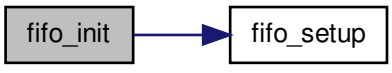
Parameters

q_fifo	: A queue type based on FIFO queue
max_executing,:	Maximum number of executing packets (negative value ~ infinite)
max_waiting,:	Maximum number of waiting packets (negative value ~ infinite)

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.23.3.2 int fifo_setup (QUEUE_TYPE * *q_fifo*, int *max_executing*, int *max_waiting*)

Setup parameters of a FIFO queue

Parameters

q_fifo	: FIFO queue type
max_executing,:	Maximum number of executing packets (negative value ~ infinite)
max_waiting,:	Maximum number of waiting packets (negative value ~ infinite)

Returns

Error code (see more in def.h and error.h)

4.24 queues/measures.c File Reference

```
#include <string.h>
#include <stdio.h>
#include "../error.h"
#include "packet.h"
#include "measures.h"
#include "queue_man.h"
```

Defines

- #define **print_statistical_value**(_var_name, _var, _conf)

Functions

- int measures_init (MEASURES *m)
- int print_measurement (MEASURES *m)
- int measurement_collect_data (MEASURES *m, PACKET *p, TIME curr_time)

4.24.1 Detailed Description

Measurement functions

Date

Created on: Apr 9, 2011

Author

iizke

4.24.2 Define Documentation

4.24.2.1 #define print_statistical_value(_var_name, _var, _conf)

Value:

```
{ \
    printf("%20s : mean %4.5f, var %4.5f, min %4.3f, max %4.3f, confidency %4.3f\
      n", \
      _var_name, \
      (_var)->avg, \
      (_var)->var, \
      (_var)->min, \
      (_var)->max, \
      stat_num_calc_confidence_interval(_var, _conf)); }
```

4.24.3 Function Documentation

4.24.3.1 int measurement_collect_data (MEASURES * m, PACKET * p, TIME curr_time)

Collect new data into measurement structure

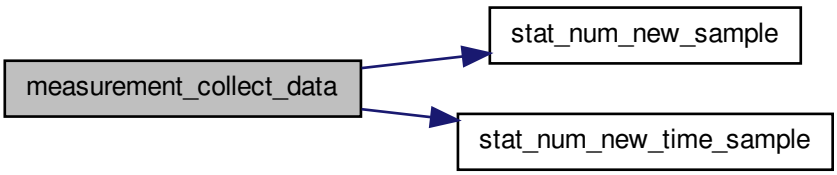
Parameters

m	: measurement
p	: packet
curr_time	: Current time

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.24.3.2 int measures_init (MEASURES * m)

Initialization of structure MEASURES

Parameters

m	: pointer to Measures structure

Returns

Error code (defined in def.h)

4.24.3.3 int print_measurement (MEASURES * m)

Print out to screen measured information

Parameters

m	: pointer to a MEASURES structure.

Returns

Error code (defined in def.h)

4.25 queues/measures.h File Reference

```
#include "../def.h"
#include "../stat_num.h"
```

Data Structures

- struct measures

Typedefs

- typedef struct measures MEASURES

Functions

- int measures_init (MEASURES *m)
- int print_measurement (MEASURES *m)
- int measurement_collect_data (MEASURES *m, PACKET *p, TIME curr_time)

4.25.1 Detailed Description

Collect statistical information of queueing system

Date

Created on: Apr 6, 2011

Author

iizke

4.25.2 Typedef Documentation

4.25.2.1 typedef struct measures MEASURES

MEASURE structure used to store some results when simulating queue system

4.25.3 Function Documentation

4.25.3.1 int measurement_collect_data (MEASURES * *m*, PACKET * *p*, TIME *curr_time*)

Collect new data into measurement structure

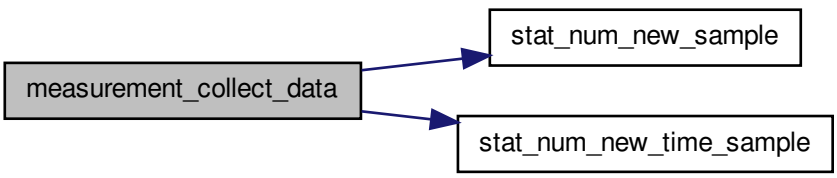
Parameters

m	: measurement
p	: packet
curr_time	: Current time

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.25.3.2 int measures_init (MEASURES * m)

Initialization of structure MEASURES

Parameters

m	: pointer to Measures structure

Returns

Error code (defined in def.h)

4.25.3.3 int print_measurement (MEASURES * m)

Print out to screen measured information

Parameters

m	: pointer to a MEASURES structure.

Returns

Error code (defined in def.h)

4.26 queues/packet.c File Reference

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include "../error.h"
#include "packet.h"
#include "fifo.h"
```

Functions

- int packet_init (PACKET *p)
- int packet_list_init (PACKET_LIST *l, int conf)
- int packet_list_new_packet (PACKET_LIST *pf, PACKET **p)
- int packet_list_insert_packet (PACKET_LIST *pf, PACKET *p)
- int packet_list_remove_packet (PACKET_LIST *pf, PACKET *p)
- int packet_list_get_first (PACKET_LIST *pf, PACKET **p)
- int packet_list_is_empty (PACKET_LIST *l)
- int packet_list_config (PACKET_LIST *pl, int conf)
- int test_packet_list_new_packet ()
- int measurement_self_collect_data (PACKET *p)

4.26.1 Detailed Description

Packet functions

Date

Created on: Apr 8, 2011

Author

iizke

4.26.2 Function Documentation

4.26.2.1 int measurement_self_collect_data (PACKET * p)

Collect data (packet) for measurement (from appropriate queue containing this packet

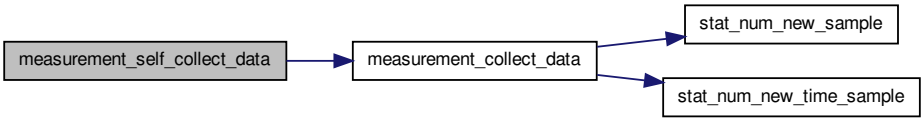
Parameters

p	: Packet

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.26.2.2 int packet_init (PACKET * p)

Initialization a packet

Parameters

p	: Packet

Returns

Error code (defined in def.h and libs/error.h)

4.26.2.3 int packet_list_config (PACKET_LIST * *pl*, int *conf*)

Configure packet list

Parameters

pl	: Packet list
conf	: see libs/list/linked_list.h for more info about this configuration

Returns

Error code (defined in def.h and libs/error.h)

4.26.2.4 int packet_list_get_first (PACKET_LIST * *pf*, PACKET ** *p*)

Get one packet from packet list.

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

4.26.2.5 int packet_list_init (PACKET_LIST * *l*, int *conf*)

Initialization of a packet list

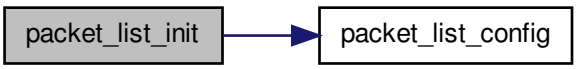
Parameters

l	: Packet list
conf	: configuration of list

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.26.2.6 int packet_list_insert_packet (PACKET_LIST * pf, PACKET * p)

Insert a packet into packet-list

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

4.26.2.7 int packet_list_is_empty (PACKET_LIST * l)

Check packet-list empty or not.

Parameters

l	: packet list

Returns

negative number if there are some errors. Return 1 if list is empty, otherwise return 0.

4.26.2.8 int packet_list_new_packet (PACKET_LIST * pf, PACKET ** p)

Create new packet. If there is no free packet in packet-list, new memory is allocated to new packet. Note: if packet list is configured to no used free-packets, always allocate new memory to packet.

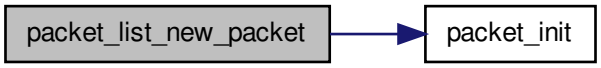
Parameters

pf	: packet list
p	: new packet (output)

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.26.2.9 int packet_list_remove_packet (PACKET_LIST * *pf*, PACKET * *p*)

Remove one packet out of packet list.

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

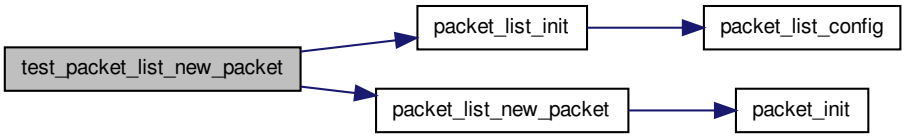
4.26.2.10 int test_packet_list_new_packet ( )

Unit test of function packet_list_new_packet

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.27 queues/packet.h File Reference

```
#include "../def.h"
#include "../list/linked_list.h"
```

Data Structures

- struct packet_info
- struct packet
- struct packet_list

Defines

- #define PACKET_STATE_IN 1

  Packet state IN: comming to queue.

- #define PACKET_STATE_OUT 2

  Packet goes out of queue.

- #define PACKET_STATE_PROCESSING 3

  Packet is going to be processed.

- #define PACKET_STATE_WAITING 4

  Packet in waiting list.

- #define PACKET_STATE_DROPPED 5

  Packet is dropped.

Typedefs

- typedef struct queue_type QUEUE_TYPE

  An alias of struct queue_type.

- typedef struct packet_info PACKET_INFO
- typedef struct packet PACKET
- typedef struct packet_list PACKET_LIST

Functions

- int packet_init (PACKET *p)
- int packet_list_init (PACKET_LIST *el, int conf)
- int packet_list_new_packet (PACKET_LIST *el, PACKET **e)
- int packet_list_insert_packet (PACKET_LIST *el, PACKET *e)

- int packet_list_remove_packet (PACKET_LIST *el, PACKET *e)
- int packet_list_get_first (PACKET_LIST *el, PACKET **e)
- int packet_list_is_empty (PACKET_LIST *l)
- int packet_list_config (PACKET_LIST *el, int conf)
- int test_packet_list_new_packet ()
- int measurement_self_collect_data (PACKET *p)

4.27.1 Detailed Description

Packet structure

Date

Created on: Apr 8, 2011

Author

iizke

4.27.2 Typedef Documentation

4.27.2.1 typedef struct packet PACKET

Packet structure

4.27.2.2 typedef struct packet_info PACKET_INFO

Packet information

4.27.2.3 typedef struct packet_list PACKET_LIST

Packet list structure

4.27.3 Function Documentation

4.27.3.1 int measurement_self_collect_data (PACKET * p)

Collect data (packet) for measurement (from appropriate queue containing this packet

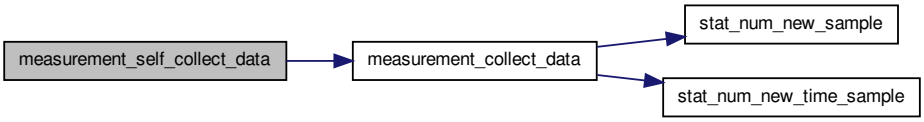
Parameters

p	: Packet

Returns

Error code (see more in def.h and error.h)

Here is the call graph for this function:



4.27.3.2 int packet_init (PACKET * p)

Initialization a packet

Parameters

p	: Packet

Returns

Error code (defined in def.h and libs/error.h)

4.27.3.3 int packet_list_config (PACKET_LIST * pl, int conf)

Configure packet list

Parameters

pl	: Packet list
conf	: see libs/list/linked_list.h for more info about this configuration

Returns

Error code (defined in def.h and libs/error.h)

4.27.3.4 int packet_list_get_first (PACKET_LIST * pf, PACKET ** p)

Get one packet from packet list.

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

4.27.3.5 int packet_list_init (PACKET_LIST * *l*, int *conf*)

Initialization of a packet list

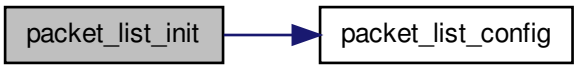
Parameters

l	: Packet list
conf	: configuration of list

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.27.3.6 int packet_list_insert_packet (PACKET_LIST * *pf*, PACKET * *p*)

Insert a packet into packet-list

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

4.27.3.7 int packet_list_is_empty (PACKET_LIST * *l*)

Check packet-list empty or not.

Parameters

l	: packet list

Returns

negative number if there are some errors. Return 1 if list is empty, otherwise return 0.

4.27.3.8 int packet_list_new_packet (PACKET_LIST * *pf*, PACKET ** *p*)

Create new packet. If there is no free packet in packet-list, new memory is allocated to new packet. Note: if packet list is configured to no used free-packets, always allocate new memory to packet.

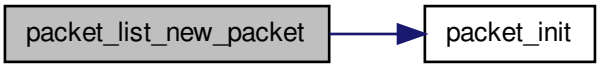
Parameters

pf	: packet list
p	: new packet (output)

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.27.3.9 int packet_list_remove_packet (PACKET_LIST * *pf*, PACKET * *p*)

Remove one packet out of packet list.

Parameters

pf	: packet list
p	: packet

Returns

Error code (defined in def.h and libs/error.h)

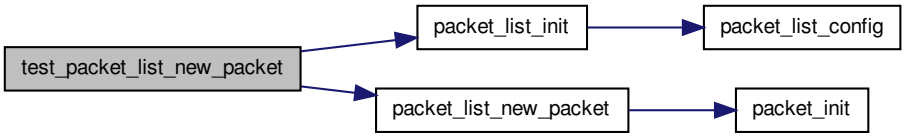
4.27.3.10 int test_packet_list_new_packet ( )

Unit test of function packet_list_new_packet

Returns

Error code (defined in def.h and libs/error.h)

Here is the call graph for this function:



4.28 queues/queue_man.c File Reference

```
#include <stdio.h>
#include "queue_man.h"
#include "../error.h"
```

Functions

- int queue_man_init (QUEUE_MAN *qm)
- int queue_man_register_new_type (QUEUE_MAN *qm, QUEUE_TYPE *qi)
- int queue_man_unregister_type (QUEUE_MAN *qm, QUEUE_TYPE *qi)
- int queue_man_activate_type (QUEUE_MAN *qm, int type)

4.28.1 Detailed Description

Implementation of essential queue operations.

Date

Created on: Apr 16, 2011

Author

iizke

4.28.2 Function Documentation

4.28.2.1 int queue_man_activate_type (QUEUE_MAN * qm, int type)

Activate a queue-type in queue-manager. Simulation is based on this queue-type.

Parameters

qm	: queue manager
type	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.28.2.2 int queue_man_init (QUEUE_MAN * qm)

Initialization of a Queue manager

Parameters

qm	: queue manager

Returns

Error code (defined in def.h and libs/error.h)

4.28.2.3 int queue_man_register_new_type (QUEUE_MAN * qm, QUEUE_TYPE * qi)

Register new queue-type into queue-manager

Parameters

qm	: queue manager
qi	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.28.2.4 int queue_man_unregister_type (QUEUE_MAN * qm, QUEUE_TYPE * qi)

Remove a queue type out of queue-manager

Parameters

qm	: queue manager
qi	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.29 queues/queue_man.h File Reference

```
#include "packet.h"
```

Data Structures

- struct queue_type
- struct queue_type_list

Defines

- #define QUEUE_FIFO 1

  Queue type FIFO.

Typedefs

- typedef struct queue_type_list QUEUE_MAN

Functions

- int queue_man_init (QUEUE_MAN *qm)
- int queue_man_register_new_type (QUEUE_MAN *qm, QUEUE_TYPE *qi)
- int queue_man_unregister_type (QUEUE_MAN *qm, QUEUE_TYPE *qi)
- int queue_man_activate_type (QUEUE_MAN *qm, int type)

4.29.1 Detailed Description

Manage all types of queue, for example: FIFO, LIFO, RR,... At this time, only FIFO is implemented.

Date

Created on: Apr 16, 2011

Author

iizke

4.29.2 Typedef Documentation

4.29.2.1 typedef struct queue_type_list QUEUE_MAN

Queue manager structure

4.29.3 Function Documentation

4.29.3.1 int queue_man_activate_type (QUEUE_MAN * qm, int type)

Activate a queue-type in queue-manager. Simulation is based on this queue-type.

Parameters

qm	: queue manager
type	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.29.3.2 int queue_man_init (QUEUE_MAN * qm)

Initialization of a Queue manager

Parameters

qm	: queue manager

Returns

Error code (defined in def.h and libs/error.h)

4.29.3.3 int queue_man_register_new_type (QUEUE_MAN * qm, QUEUE_TYPE * qi)

Register new queue-type into queue-manager

Parameters

qm	: queue manager
qi	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.29.3.4 int queue_man_unregister_type (QUEUE_MAN * *qm*, QUEUE_TYPE * *qi*)

Remove a queue type out of queue-manager

Parameters

qm	: queue manager
qi	: queue type

Returns

Error code (defined in def.h and libs/error.h)

4.30 stat_num.c File Reference

```
#include <string.h>
#include <stdio.h>
#include "stat_num.h"
#include "error.h"
#include "math.h"
#include "quantile.h"
```

Defines

- #define min(a, b) (a==0?b:(a<b?a:b))

  Calculate minimum of two values.

- #define max(a, b) (a<b?b:a)

  Calculate maximum of two value.

Functions

- int stat_num_new_sample (STAT_NUM *sn, float sample)
- int stat_num_new_time_sample (STAT_NUM *sn, float sample, float time)
- double **stat_num_calc_confidence_interval** (STAT_NUM *sn, double confidence)
- int stat_num_init (STAT_NUM *m)

4.30.1 Detailed Description

Statistical calculation

Date

Created on: Apr 12, 2011

Author

iizke

4.30.2 Function Documentation

4.30.2.1 int stat_num_init (STAT_NUM * *m*)

Initialization of STAT_NUM structure (statistical information)

Parameters

m	: STAT_NUM

Returns

Error code (defined in error.h)

4.30.2.2 int stat_num_new_sample (STAT_NUM * *sn*, float *sample*)

Calculate the statistical values of a random variable through its samples. Used for discrete random variable.

Parameters

sn	: Statistical info
sample	: new sample is collected to statistical info

Returns

Error code (defined in error.h)

4.30.2.3 int stat_num_new_time_sample (STAT_NUM * *sn*, float *sample*, float *time*)

Calculate the statistical values of a random variable through its samples. Used for continous random variable.

Parameters

sn	: statistical information
sample	: new sample value
time	: happened time for new sample

Returns

Error code (defined in error.h)

4.31 stat_num.h File Reference

Data Structures

- struct statistical_number

Typedefs

- typedef struct statistical_number STAT_NUM

Functions

- int stat_num_new_sample (STAT_NUM *snum, float sample)
- int stat_num_new_time_sample (STAT_NUM *sn, float sample, float time)
- int stat_num_init (STAT_NUM *snum)
- double **stat_num_calc_confidence_interval** (STAT_NUM *sn, double confidence)

4.31.1 Detailed Description

Statistical number structure

Date

Created on: Apr 12, 2011

Author

iizke

4.31.2 Typedef Documentation

4.31.2.1 typedef struct statistical_number STAT_NUM

Statistical information of a random process

4.31.3 Function Documentation

4.31.3.1 int stat_num_init (STAT_NUM * *m*)

Initialization of STAT_NUM structure (statistical information)

Parameters

m	: STAT_NUM

Returns

Error code (defined in error.h)

4.31.3.2 int stat_num_new_sample (STAT_NUM * *sn*, float *sample*)

Calculate the statistical values of a random variable through its samples. Used for discrete random variable.

Parameters

sn	: Statistical info
sample	: new sample is collected to statistical info

Returns

Error code (defined in error.h)

4.31.3.3 int stat_num_new_time_sample (STAT_NUM * *sn*, float *sample*, float *time*)

Calculate the statistical values of a random variable through its samples. Used for continous random variable.

Parameters

sn	: statistical information
sample	: new sample value
time	: happened time for new sample

Returns

Error code (defined in error.h)

4.32 tests/chisqr.c File Reference

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include "../error.h"
#include "../random.h"
#include "../quantile.h"
```

Data Structures

- struct test_params

Typedefs

- typedef struct test_params **TEST_PARAMS**

Functions

- int test_chisqr (TEST_PARAMS *tp)
- int **check_chisqr_pvalue** ()

4.32.1 Detailed Description

Chi-Square test

Date

Created on: May 17, 2011

Author

iizke

4.32.2 Function Documentation

4.32.2.1 int test_chisqr (TEST_PARAMS * *tp*)

Generate pseudo random samples and count them in intervals i/n <= sample < (i+1)/n ====> (sample*n - 1) < i <= sample*n

Compute and compare chi-square value

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