

# WiMAX Reference Manual

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# Chapter 1

## WiMAX Hierarchical Index

### 1.1 WiMAX Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

active_flows . . . . .	7
allocation_time . . . . .	8
bs_conf_param . . . . .	9
bs_snd_timer_list . . . . .	10
bs_statistics . . . . .	11
bsqnode . . . . .	13
downstream_channel . . . . .	21
downstream_flow_record . . . . .	22
downstream_sflow . . . . .	25
flow_classifier . . . . .	26
hdr_mac802_16 . . . . .	27
hdr_mac802_16extd . . . . .	29
hdr_mac802_16map . . . . .	31
hdr_mac802_16mgmt . . . . .	33
job . . . . .	35
Mac802_16 . . . . .	36
Mac802_16BS . . . . .	45
Mac802_16SS . . . . .	68
mac802_16_extended_header_element . . . . .	43
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# Chapter 2

## WiMAX Class Index

### 2.1 WiMAX Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

<b>active_flows</b> . . . . .	7
<b>allocation_time</b> . . . . .	8
<b>bs_conf_param</b> . . . . .	9
<b>bs_snd_timer_list</b> . . . . .	10
<b>bs_statistics</b> . . . . .	11
<b>bsqnode</b> . . . . .	13
<b>BsRng802_16Timer</b> . . . . .	14
<b>BsServiceFlowSendTimer</b> . . . . .	15
<b>BsSync802_16Timer</b> . . . . .	16
<b>BsToken802_16Timer</b> . . . . .	17
<b>BsTxPkt802_16Timer</b> . . . . .	18
<b>BsUcd802_16Timer</b> . . . . .	19
<b>BsUplinkSchedWindowTimer</b> . . . . .	20
<b>downstream_channel</b> . . . . .	21
<b>downstream_flow_record</b> . . . . .	22
<b>downstream_sflow</b> . . . . .	25
<b>flow_classifier</b> . . . . .	26
<b>hdr_mac802_16</b> . . . . .	27
<b>hdr_mac802_16extd</b> . . . . .	29
<b>hdr_mac802_16map</b> (802_16 map packet header) . . . . .	31
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<b>job</b> . . . . .	35
<b>Mac802_16</b> . . . . .	36
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<b>Mac802_16BsClass</b> . . . . .	63
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<b>Mac802_16HeaderClass</b> . . . . .	65
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SSRng802_16Timer	97
SSServiceFlowRequestTimer	98
SSServiceFlowSendTimer	99
token_timer_list	100
TxPkt802_16Timer	101
up_flow_record	102
upstream_channel	104
upstream_flow_record	105
upstream_sflow	106

# Chapter 3

## WiMAX File Index

### 3.1 WiMAX File List

Here is a list of all files with brief descriptions:

ns-2.28/mac/ <b>hdr-802_16.h</b> . . . . .	111
ns-2.28/mac/ <b>mac-802_16-base.cc</b> . . . . .	118
ns-2.28/mac/ <b>mac-802_16-bs.cc</b> . . . . .	119
ns-2.28/mac/ <b>mac-802_16-FSM.cc</b> . . . . .	121
ns-2.28/mac/ <b>mac-802_16-ss.cc</b> . . . . .	122
ns-2.28/mac/ <b>mac-802_16-timers.cc</b> . . . . .	124
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ns-2.28/mac/ <b>mac-802_16.h</b> . . . . .	126



## Chapter 4

# WiMAX Class Documentation

### 4.1 active\_flows Struct Reference

```
#include <hdr-802_16.h>
```

#### Public Attributes

- `acflows_ptr` next
- `u_int16_t` flow\_id
- `u_int16_t` backlogged\_tmp
- `int16_t` granted\_bw\_tmp

#### 4.1.1 Member Data Documentation

4.1.1.1 `acflows_ptr` active\_flows::next

4.1.1.2 `u_int16_t` active\_flows::flow\_id

4.1.1.3 `u_int16_t` active\_flows::backlogged\_tmp

4.1.1.4 `int16_t` active\_flows::granted\_bw\_tmp

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

- ns-2.28/mac/hdr-802\_16.h

## 4.2 allocation\_time Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **start\_time**
- double **end\_time**
- u\_int32\_t **num\_slots**
- aptr **next**
- u\_char **type**
- u\_char **used**

### 4.2.1 Member Data Documentation

4.2.1.1 double allocation\_time::start\_time

4.2.1.2 double allocation\_time::end\_time

4.2.1.3 u\_int32\_t allocation\_time::num\_slots

4.2.1.4 aptr allocation\_time::next

4.2.1.5 u\_char allocation\_time::type

4.2.1.6 u\_char allocation\_time::used

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

- ns-2.28/mac/hdr-802\_16.h

## 4.3 bs\_conf\_param Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `mgmt_conf_param` mgtparam
- `map_conf_param` mapparam

### 4.3.1 Detailed Description

This structure contains all the configurable parameters of the BS node

### 4.3.2 Member Data Documentation

**4.3.2.1 struct mgmt\_conf\_param bs\_conf\_param::mgtparam**

**4.3.2.2 struct map\_conf\_param bs\_conf\_param::mapparam**

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

- `ns-2.28/mac/hdr-802_16.h`

## 4.4 bs\_snd\_timer\_list Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `expiration_time`
- `bs_sptr` `next`
- int `cindex`
- int `findex`

### 4.4.1 Member Data Documentation

4.4.1.1 double `bs_snd_timer_list::expiration_time`

4.4.1.2 `bs_sptr` `bs_snd_timer_list::next`

4.4.1.3 int `bs_snd_timer_list::cindex`

4.4.1.4 int `bs_snd_timer_list::findex`

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

- `ns-2.28/mac/hdr-802_16.h`



## 4.5 bs\_statistics Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **avg\_interdpr\_map**
- u\_int32\_t **avg\_datagrants**
- u\_int32\_t **num\_req**
- u\_int32\_t **avg\_contentionslots**
- u\_int32\_t **data\_sent**
- u\_int32\_t **fragmented\_count**
- u\_int32\_t **concatenation\_count**
- u\_char **num\_IE**
- u\_int32\_t **num\_creq**
- u\_int32\_t **num\_piggyreq**
- u\_int32\_t **num\_creqgrant**
- u\_int32\_t **num\_creqdenied**
- u\_int32\_t **total\_num\_cslots**
- u\_int32\_t **total\_num\_mgmtslots**

### 4.5.1 Detailed Description

Simulation output statistics variable

## 4.5.2 Member Data Documentation

4.5.2.1 `double bs_statistics::avg_interdpr_map`

4.5.2.2 `u_int32_t bs_statistics::avg_datagrants`

4.5.2.3 `u_int32_t bs_statistics::num_req`

4.5.2.4 `u_int32_t bs_statistics::avg_contentionslots`

4.5.2.5 `u_int32_t bs_statistics::data_sent`

4.5.2.6 `u_int32_t bs_statistics::fragmented_count`

4.5.2.7 `u_int32_t bs_statistics::concatenation_count`

4.5.2.8 `u_char bs_statistics::num_IE`

4.5.2.9 `u_int32_t bs_statistics::num_creq`

4.5.2.10 `u_int32_t bs_statistics::num_piggyreq`

4.5.2.11 `u_int32_t bs_statistics::num_creqgrant`

4.5.2.12 `u_int32_t bs_statistics::num_creqdenied`

4.5.2.13 `u_int32_t bs_statistics::total_num_cslots`

4.5.2.14 `u_int32_t bs_statistics::total_num_mgmtslots`

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

- `ns-2.28/mac/hdr-802_16.h`

## 4.6 bsqnode Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- Packet \* **pkt**
- double **enq\_time**
- int **cindex**
- int **findex**
- qlist **next**

### 4.6.1 Member Data Documentation

4.6.1.1 Packet\* **bsqnode::pkt**

4.6.1.2 double **bsqnode::enq\_time**

4.6.1.3 int **bsqnode::cindex**

4.6.1.4 int **bsqnode::findex**

4.6.1.5 qlist **bsqnode::next**

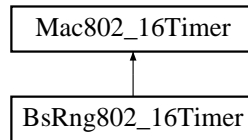
The documentation for this struct was generated from the following file:

- ns-2.28/mac/**hdr-802\_16.h**

## 4.7 BsRng802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsRng802\_16Timer::



### Public Member Functions

- `BsRng802_16Timer (Mac802_16 *m)`
- `void handle (Event *e)`

#### 4.7.1 Constructor & Destructor Documentation

4.7.1.1 `BsRng802_16Timer::BsRng802_16Timer (Mac802_16 * m) [inline]`

#### 4.7.2 Member Function Documentation

4.7.2.1 `void BsRng802_16Timer::handle (Event * e) [virtual]`

Reimplemented from `Mac802_16Timer` (p. 86).

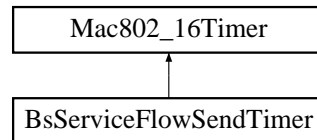
The documentation for this class was generated from the following files:

- `ns-2.28/mac/mac-802_16-timers.h`
- `ns-2.28/mac/mac-802_16-timers.cc`

## 4.8 BsServiceFlowSendTimer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsServiceFlowSendTimer::



### Public Member Functions

- BsServiceFlowSendTimer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.8.1 Constructor & Destructor Documentation

- 4.8.1.1 BsServiceFlowSendTimer::BsServiceFlowSendTimer (Mac802\_16 \* m) [inline]

#### 4.8.2 Member Function Documentation

- 4.8.2.1 void BsServiceFlowSendTimer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

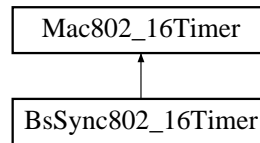
The documentation for this class was generated from the following files:

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.9 BsSync802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsSync802\_16Timer::



### Public Member Functions

- BsSync802\_16Timer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.9.1 Constructor & Destructor Documentation

4.9.1.1 BsSync802\_16Timer::BsSync802\_16Timer (Mac802\_16 \* m) [inline]

#### 4.9.2 Member Function Documentation

4.9.2.1 void BsSync802\_16Timer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

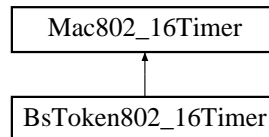
The documentation for this class was generated from the following files:

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.10 BsToken802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsToken802\_16Timer::



### Public Member Functions

- `BsToken802_16Timer (Mac802_16 *m)`
- `void handle (Event *e)`

#### 4.10.1 Constructor & Destructor Documentation

4.10.1.1 `BsToken802_16Timer::BsToken802_16Timer (Mac802_16 * m) [inline]`

#### 4.10.2 Member Function Documentation

4.10.2.1 `void BsToken802_16Timer::handle (Event * e) [virtual]`

Reimplemented from `Mac802_16Timer` (p. 86).

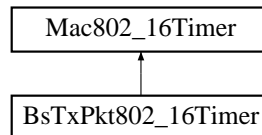
The documentation for this class was generated from the following files:

- `ns-2.28/mac/mac-802_16-timers.h`
- `ns-2.28/mac/mac-802_16-timers.cc`

## 4.11 BsTxPkt802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsTxPkt802\_16Timer::



### Public Member Functions

- BsTxPkt802\_16Timer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.11.1 Constructor & Destructor Documentation

4.11.1.1 BsTxPkt802\_16Timer::BsTxPkt802\_16Timer (Mac802\_16 \* m)  
[inline]

#### 4.11.2 Member Function Documentation

4.11.2.1 void BsTxPkt802\_16Timer::handle (Event \* e) [virtual]

Send Timer

Reimplemented from Mac802\_16Timer (p. 86).

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

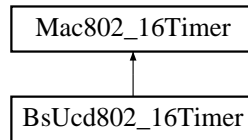
- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc



## 4.12 BsUcd802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsUcd802\_16Timer::



### Public Member Functions

- BsUcd802\_16Timer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.12.1 Detailed Description

Timers to schedule transmission of Management messages

#### 4.12.2 Constructor & Destructor Documentation

4.12.2.1 BsUcd802\_16Timer::BsUcd802\_16Timer (Mac802\_16 \* m) [inline]

#### 4.12.3 Member Function Documentation

4.12.3.1 void BsUcd802\_16Timer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

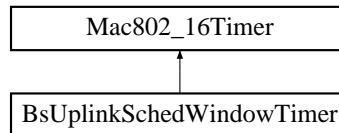
The documentation for this class was generated from the following files:

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.13 BsUplinkSchedWindowTimer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for BsUplinkSchedWindowTimer::



### Public Member Functions

- BsUplinkSchedWindowTimer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.13.1 Detailed Description

Window used to control the provision of the minimum BW requested by rtPS and nrtPS services.

#### 4.13.2 Constructor & Destructor Documentation

- 4.13.2.1 BsUplinkSchedWindowTimer::BsUplinkSchedWindowTimer (Mac802\_16 \* m) [inline]

#### 4.13.3 Member Function Documentation

- 4.13.3.1 void BsUplinkSchedWindowTimer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

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

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.14 downstream\_channel Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **data\_rate**
- double **prop\_delay**
- u\_int32\_t **overhead\_bytes**

### 4.14.1 Member Data Documentation

4.14.1.1 double downstream\_channel::data\_rate

4.14.1.2 double downstream\_channel::prop\_delay

4.14.1.3 u\_int32\_t downstream\_channel::overhead\_bytes

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

- ns-2.28/mac/hdr-802\_16.h

## 4.15 downstream\_flow\_record Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- **flow\_classifier** classifier
- **SchedType** sched\_type
- **plist** packet\_list
- **u\_int16\_t** max\_qsize
- **u\_char** state
- **Packet \*** pkt
- **u\_char** pending
- **allocation\_time \*** alloc\_list
- **double** ugsjitter
- **int** jitterSamples
- **double** last\_granttime
- **double** nominal\_alloctime
- **double** last\_jittercaltime
- **double** ginterval
- **u\_int16\_t** gsize
- **double** latency
- **u\_int32\_t** min\_bw
- **u\_int16\_t** flow\_id
- **PhsType** PHS\_profile
- **PacketQueue \*** tokenq\_
- **double** tokens\_
- **double** rate\_
- **int** bucket\_
- **int** tokenqlen\_
- **double** lastupdatetime\_
- **int** init\_
- **Event** intr
- **char** ratecontrol
- **double** util\_total\_bytes\_DS
- **int** util\_total\_pkts\_DS
- **int** total\_pkts\_dropped
- **int** dropped\_tokenq
- **double** dsq\_delay
- **int** num\_qsamples
- **int** dropped\_dsq

### 4.15.1 Detailed Description

This structure defines attributes of downstream service flow of a SS

## 4.15.2 Member Data Documentation

- 4.15.2.1 struct flow\_classifier downstream\_flow\_record::classifier
- 4.15.2.2 SchedType downstream\_flow\_record::sched\_type
- 4.15.2.3 plist downstream\_flow\_record::packet\_list
- 4.15.2.4 u\_int16\_t downstream\_flow\_record::max\_qsize
- 4.15.2.5 u\_char downstream\_flow\_record::state
- 4.15.2.6 Packet\* downstream\_flow\_record::pkt
- 4.15.2.7 u\_char downstream\_flow\_record::pending
- 4.15.2.8 struct allocation\_time\* downstream\_flow\_record::alloc\_list
- 4.15.2.9 double downstream\_flow\_record::ugsjitter
- 4.15.2.10 int downstream\_flow\_record::jitterSamples
- 4.15.2.11 double downstream\_flow\_record::last\_granttime
- 4.15.2.12 double downstream\_flow\_record::nominal\_alloctime
- 4.15.2.13 double downstream\_flow\_record::last\_jittercaltime
- 4.15.2.14 double downstream\_flow\_record::ginterval
- 4.15.2.15 u\_int16\_t downstream\_flow\_record::gsize
- 4.15.2.16 double downstream\_flow\_record::latency
- 4.15.2.17 u\_int32\_t downstream\_flow\_record::min\_bw
- 4.15.2.18 u\_int16\_t downstream\_flow\_record::flow\_id
- 4.15.2.19 PhsType downstream\_flow\_record::PHS\_profile
- 4.15.2.20 PacketQueue\* downstream\_flow\_record::tokenq\_
- 4.15.2.21 double downstream\_flow\_record::tokens\_
- 4.15.2.22 double downstream\_flow\_record::rate\_
- 4.15.2.23 int downstream\_flow\_record::bucket\_
- 4.15.2.24 int downstream\_flow\_record::tokenqlen\_
- 4.15.2.25 double downstream\_flow\_record::lastupdatetime\_
- 4.15.2.26 int downstream\_flow\_record::init\_
- 4.15.2.27 Event downstream\_flow\_record::intr
- 4.15.2.28 char downstream\_flow\_record::ratecontrol
- 4.15.2.29 double downstream\_flow\_record::util\_total\_bytes\_DS
- 4.15.2.30 int downstream\_flow\_record::util\_total\_pkts\_DS

- ns-2.28/mac/hdr-802\_16.h

## 4.16 downstream\_sflow Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `downstream_flow_record` `downstream_record`

#### 4.16.1 Detailed Description

To store the Upstream flow information so that it could be sent to BS during the Registration Phase

#### 4.16.2 Member Data Documentation

##### 4.16.2.1 `struct downstream_flow_record` `downstream_sflow::downstream_record`

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

- `ns-2.28/mac/hdr-802_16.h`

## 4.17 flow\_classifier Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `int32_t src_ip`
- `int32_t dst_ip`
- `packet_t pkt_type`

#### 4.17.1 Detailed Description

This defines the classifier to be used for matching packets to upstream/downstream flows

#### 4.17.2 Member Data Documentation

**4.17.2.1** `int32_t flow_classifier::src_ip`

**4.17.2.2** `int32_t flow_classifier::dst_ip`

**4.17.2.3** `packet_t flow_classifier::pkt_type`

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

- `ns-2.28/mac/hdr-802_16.h`



## 4.18 `hdr_mac802_16` Struct Reference

```
#include <hdr-802_16.h>
```

### Public Member Functions

- `mac802_16_frame_hdr & dshdr ()`
- `int & dt_conv_overhead ()`

### Static Public Member Functions

- `static int & offset ()`
- `static hdr_mac802_16 * access (const Packet *p)`

### Public Attributes

- `mac802_16_frame_hdr dshdr_`
- `int dt_conv_overhead_`

### Static Public Attributes

- `static int offset_`

#### 4.18.1 Detailed Description

802\_16 packet header

#### 4.18.2 Member Function Documentation

4.18.2.1 `static int& hdr_mac802_16::offset ()` [inline, static]

4.18.2.2 `static hdr_mac802_16* hdr_mac802_16::access (const Packet * p)`  
[inline, static]

4.18.2.3 `struct mac802_16_frame_hdr& hdr_mac802_16::dshdr ()` [inline]

4.18.2.4 `int& hdr_mac802_16::dt_conv_overhead ()` [inline]

#### 4.18.3 Member Data Documentation

4.18.3.1 `struct mac802_16_frame_hdr hdr_mac802_16::dshdr_`

4.18.3.2 `int hdr_mac802_16::dt_conv_overhead_`

4.18.3.3 `int hdr_mac802_16::offset_` [static]

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

- `ns-2.28/mac/hdr-802_16.h`

- ns-2.28/mac/mac-802\_16-bs.cc

## 4.19 `hdr_mac802_16extd` Struct Reference

```
#include <hdr-802_16.h>
```

### Public Member Functions

- `int & num_hdr_ ()`
- `mac802_16_extended_header_element * exthdr ()`

### Static Public Member Functions

- `static int & offset ()`
- `static hdr_mac802_16extd * access (const Packet *p)`

### Public Attributes

- `mac802_16_extended_header_element exthdr_ [NUM_EXTENDED_HDR_ELEMENTS]`
- `int num_hdr`

### Static Public Attributes

- `static int offset_`

#### 4.19.1 Detailed Description

802\_16 extended packet header

## 4.19.2 Member Function Documentation

4.19.2.1 `static int& hdr_mac802_16extd::offset ()` [inline, static]

4.19.2.2 `static hdr_mac802_16extd* hdr_mac802_16extd::access (const Packet * p)` [inline, static]

4.19.2.3 `int& hdr_mac802_16extd::num_hdr_ ()` [inline]

4.19.2.4 `struct mac802_16_extended_header_element* hdr_mac802_16extd::exthdr_ ()` [inline]

## 4.19.3 Member Data Documentation

4.19.3.1 `struct mac802_16_extended_header_element hdr_mac802_16extd::exthdr_ [NUM_EXTENDED_HDR_ELEMENTS]`

4.19.3.2 `int hdr_mac802_16extd::num_hdr`

4.19.3.3 `int hdr_mac802_16extd::offset_` [static]

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

- ns-2.28/mac/hdr-802\_16.h
- ns-2.28/mac/mac-802\_16-bs.cc

## 4.20 `hdr_mac802_16map` Struct Reference

802\_16 map packet header

```
#include <hdr-802_16.h>
```

### Public Member Functions

- double & `allocstarttime` ()
- double & `allocendtime` ()
- double & `acktime` ()
- u\_char & `numIE` ()
- u\_char & `bkoff_start` ()
- u\_char & `bkoff_end` ()

### Static Public Member Functions

- static int & `offset` ()
- static `hdr_mac802_16map` \* `access` (const Packet \*p)

### Public Attributes

- double `allocstarttime`
- double `allocendtime`
- double `acktime`
- u\_char `numIE`
- u\_char `bkoff_start`
- u\_char `bkoff_end`

### Static Public Attributes

- static int `offset` \_

#### 4.20.1 Detailed Description

802\_16 map packet header

The information elements will be send in DATA portion of packet

## 4.20.2 Member Function Documentation

- 4.20.2.1 `static int& hdr_mac802_16map::offset ()` [inline, static]
- 4.20.2.2 `static hdr_mac802_16map* hdr_mac802_16map::access (const Packet * p)` [inline, static]
- 4.20.2.3 `double& hdr_mac802_16map::allocstarttime_ ()` [inline]
- 4.20.2.4 `double& hdr_mac802_16map::allocendtime_ ()` [inline]
- 4.20.2.5 `double& hdr_mac802_16map::acktime_ ()` [inline]
- 4.20.2.6 `u_char& hdr_mac802_16map::numIE_ ()` [inline]
- 4.20.2.7 `u_char& hdr_mac802_16map::bkoff_start_ ()` [inline]
- 4.20.2.8 `u_char& hdr_mac802_16map::bkoff_end_ ()` [inline]

## 4.20.3 Member Data Documentation

- 4.20.3.1 `double hdr_mac802_16map::allocstarttime`
- 4.20.3.2 `double hdr_mac802_16map::allocendtime`
- 4.20.3.3 `double hdr_mac802_16map::acktime`
- 4.20.3.4 `u_char hdr_mac802_16map::numIE`
- 4.20.3.5 `u_char hdr_mac802_16map::bkoff_start`
- 4.20.3.6 `u_char hdr_mac802_16map::bkoff_end`
- 4.20.3.7 `int hdr_mac802_16map::offset_` [static]

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

- `ns-2.28/mac/hdr-802_16.h`
- `ns-2.28/mac/mac-802_16-bs.cc`

## 4.21 `hdr_mac802_16mgmt` Struct Reference

```
#include <hdr-802_16.h>
```

### Public Member Functions

- `int & dstaddr_ ()`
- `int & srcaddr_ ()`
- `u_char & type_ ()`

### Static Public Member Functions

- `static int & offset ()`
- `static hdr_mac802_16mgmt * access (const Packet *p)`

### Public Attributes

- `int dstaddr`
- `int srcaddr`
- `u_char msg_payload_ [MANAGEMENT_MSG_PAYLOAD_SIZE]`
- `u_char type`

### Static Public Attributes

- `static int offset_`

#### 4.21.1 Detailed Description

802\_16 management packet header

## 4.21.2 Member Function Documentation

4.21.2.1 `static int& hdr_mac802_16mgmt::offset ()` [inline, static]

4.21.2.2 `static hdr_mac802_16mgmt* hdr_mac802_16mgmt::access (const Packet * p)` [inline, static]

4.21.2.3 `int& hdr_mac802_16mgmt::dstaddr_ ()` [inline]

4.21.2.4 `int& hdr_mac802_16mgmt::srcaddr_ ()` [inline]

4.21.2.5 `u_char& hdr_mac802_16mgmt::type_ ()` [inline]

## 4.21.3 Member Data Documentation

4.21.3.1 `int hdr_mac802_16mgmt::dstaddr`

4.21.3.2 `int hdr_mac802_16mgmt::srcaddr`

4.21.3.3 `u_char hdr_mac802_16mgmt::msg_payload_[MANAGEMENT_MSG_PAYLOAD_SIZE]`

4.21.3.4 `u_char hdr_mac802_16mgmt::type`

4.21.3.5 `int hdr_mac802_16mgmt::offset_` [static]

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

- ns-2.28/mac/hdr-802\_16.h
- ns-2.28/mac/mac-802\_16-bs.cc



## 4.22 job Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `release_time`
- double `period`
- double `deadline`
- `u_int32_t` `mini_slots`
- `jptr` `next`
- `u_int16_t` `flow_id`
- `SchedType` `sclass`
- `u_char` `type`
- `u_char` `flag`
- `u_char` `retry_count`
- double `ugsjitter`
- int `jitterSamples`
- double `last_jittercaltime`

### 4.22.1 Member Data Documentation

4.22.1.1 `double job::release_time`

4.22.1.2 `double job::period`

4.22.1.3 `double job::deadline`

4.22.1.4 `u_int32_t job::mini_slots`

4.22.1.5 `jptr job::next`

4.22.1.6 `u_int16_t job::flow_id`

4.22.1.7 `SchedType job::sclass`

4.22.1.8 `u_char job::type`

4.22.1.9 `u_char job::flag`

4.22.1.10 `u_char job::retry_count`

4.22.1.11 `double job::ugsjitter`

4.22.1.12 `int job::jitterSamples`

4.22.1.13 `double job::last_jittercaltime`

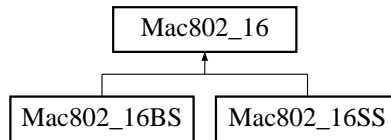
The documentation for this struct was generated from the following file:

- `ns-2.28/mac/hdr-802_16.h`

## 4.23 Mac802\_16 Class Reference

```
#include <mac-802_16.h>
```

Inheritance diagram for Mac802\_16::



### Public Member Functions

- **Mac802\_16** ()
- virtual **~Mac802\_16** ()
- virtual void **BsUcdHandler** (Event \*e)
- virtual void **BsSyncHandler** (Event \*e)
- virtual void **BsRngHandler** (Event \*e)
- virtual void **BsMapHandler** (Event \*e)
- virtual void **SSRngHandler** (Event \*e)
- virtual void **SSSndTimerHandler** (Event \*e)
- virtual void **SSReqTimerHandler** (Event \*e)
- virtual void **RecvFrame** (Packet \*p, int i)
- virtual void **BsSendHandler** (Event \*e)
- virtual void **BsSndTimerHandler** (Event \*e)
- virtual void **BsWindowTimerHandler** (Event \*e)
- virtual void **BsTokenHandler** (Event \*e)
- int **command** (int argc, const char \*const \*argv)
- void **recvHandler** (Event \*e)
- void **sendHandler** (Event \*e)
- void **recv** (Packet \*p, Handler \*h)
- void **configure\_upstream** ()
- void **set\_bit** (u\_char \*, int, int)
- void **dump\_pkt** (Packet \*)
- char **ClassifyDataMgmt** (Packet \*)
- int **is\_idle** ()
- int **match** (Packet \*, struct **flow\_classifier**)
- int **bit\_on** (u\_char, int)
- u\_int32\_t **calculate\_slots** (double, double)
- u\_int32\_t **power** (u\_int32\_t, u\_int32\_t)
- double **TX\_Time** (Packet \*p, int)
- Packet \* **AllocPkt** (int)
- void **insert\_alloclist** (aptr &, u\_int16\_t, double, double, u\_int16\_t, u\_int32\_t)
- int **CanBeSent** (aptr &, Packet \*, u\_int32\_t)
- int **len\_queue** (plist)
- int **CanErtPSBeSent** (aptr &, Packet \*)

## Public Attributes

- TxPkt802\_16Timer mhTxPkt\_
- RxPkt802\_16Timer mhRxPkt\_
- upstream\_channel upchannel
- downstream\_channel downchannel
- char collision
- u\_int16\_t bytes\_pminislot
- u\_int32\_t minislots\_psec
- double size\_mslots
- u\_int16\_t size\_ureqgrant
- u\_int32\_t avg\_pkts
- u\_int32\_t avg\_bytes
- u\_int32\_t num\_pkts
- double num\_bytes
- u\_int32\_t total\_num\_sent\_pkts
- double total\_num\_sent\_bytes
- u\_int32\_t total\_num\_mgt\_pkts\_US
- u\_int32\_t total\_num\_rng\_pkts\_US
- u\_int32\_t total\_num\_concat\_pkts\_US
- u\_int32\_t total\_num\_frag\_pkts\_US
- u\_int32\_t total\_num\_req\_pkts\_US
- u\_int32\_t total\_num\_plaindata\_pkts\_US
- u\_int32\_t total\_num\_concatdata\_pkts\_US
- u\_int32\_t total\_num\_frames\_US
- u\_int32\_t total\_num\_BE\_pkts\_US
- u\_int32\_t total\_num\_RTVBR\_pkts\_US
- u\_int32\_t total\_num\_UGS\_pkts\_US
- u\_int32\_t total\_num\_OTHER\_pkts\_US
- u\_int32\_t total\_num\_rx\_pkts
- double total\_num\_rx\_bytes
- double total\_num\_BW\_bytesUP
- double total\_num\_BW\_bytesDOWN
- double total\_num\_appbytesUS
- double total\_num\_appbytesDS
- u\_int32\_t total\_packets\_dropped
- double last\_BWCalcTime
- double last\_rtime
- u\_int32\_t avg\_mgmtpkts
- u\_int32\_t num\_mgmtpkts
- u\_int32\_t avg\_mgmtbytes
- u\_int32\_t num\_mgmtbytes
- double last\_mmgmttime
- MacState rx\_state\_
- MacState tx\_state\_
- int tx\_active\_

## Static Public Attributes

- static int lan\_num
- static Mac802\_16BS \* bs\_arr [NUM\_802\_16\_LANS]

## Friends

- class `TxPkt802_16Timer`
- class `RxPkt802_16Timer`

### 4.23.1 Detailed Description

`Mac802_16` (p. 36) class

### 4.23.2 Constructor & Destructor Documentation

#### 4.23.2.1 `Mac802_16::Mac802_16 ()`

Constructor function

#### 4.23.2.2 `virtual Mac802_16::~~Mac802_16 ()` [inline, virtual]

### 4.23.3 Member Function Documentation

#### 4.23.3.1 `virtual void Mac802_16::BsUcdHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51), and `Mac802_16SS` (p. 72).

#### 4.23.3.2 `virtual void Mac802_16::BsSynchHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51), and `Mac802_16SS` (p. 72).

#### 4.23.3.3 `virtual void Mac802_16::BsRngHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51), and `Mac802_16SS` (p. 72).

#### 4.23.3.4 `virtual void Mac802_16::BsMapHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 50), and `Mac802_16SS` (p. 71).

#### 4.23.3.5 `virtual void Mac802_16::SSRngHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 50), and `Mac802_16SS` (p. 72).

#### 4.23.3.6 `virtual void Mac802_16::SSSndTimerHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 50), and `Mac802_16SS` (p. 72).

#### 4.23.3.7 `virtual void Mac802_16::SSReqTimerHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 50), and `Mac802_16SS` (p. 72).

**4.23.3.8** `virtual void Mac802_16::RecvFrame (Packet * p, int i)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51), and `Mac802_16SS` (p. 74).

**4.23.3.9** `virtual void Mac802_16::BsSendHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 54), and `Mac802_16SS` (p. 72).

**4.23.3.10** `virtual void Mac802_16::BsSndTimerHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 59).

**4.23.3.11** `virtual void Mac802_16::BsWindowTimerHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51).

**4.23.3.12** `virtual void Mac802_16::BsTokenHandler (Event * e)` [inline, virtual]

Reimplemented in `Mac802_16BS` (p. 51), and `Mac802_16SS` (p. 72).

**4.23.3.13** `int Mac802_16::command (int argc, const char *const * argv)`

Reimplemented in `Mac802_16BS` (p. 50), and `Mac802_16SS` (p. 71).

**4.23.3.14** `void Mac802_16::recvHandler (Event * e)`

**4.23.3.15** `void Mac802_16::sendHandler (Event * e)`

**4.23.3.16** `void Mac802_16::recv (Packet * p, Handler * h)`

To handle incoming packet.

**4.23.3.17** `void Mac802_16::configure_upstream ()`

To configure the mini-slot parameters

**4.23.3.18** `void Mac802_16::set_bit (u_char *, int, int)`

**4.23.3.19** `void Mac802_16::dump_pkt (Packet *)`

**4.23.3.20** `char Mac802_16::ClassifyDataMgmt (Packet * p)`

This returns a 0 if this frame contains data

else it returns a 1 in which case it contains a MAC specific header (i.e., request)

#### 4.23.3.21 int Mac802\_16::is\_idle ()

Test if the channel is idle.

#### 4.23.3.22 int Mac802\_16::match (Packet \*, struct *flow\_classifier*)

#### 4.23.3.23 int Mac802\_16::bit\_on (u\_char, int)

#### 4.23.3.24 u\_int32\_t Mac802\_16::calculate\_slots (double *stime*, double *etime*)

##### Parameters:

*stime* starting time for the map

*etime* ending time

##### Returns:

the number of slots in the map.

#### 4.23.3.25 u\_int32\_t Mac802\_16::power (u\_int32\_t *bs*, u\_int32\_t *in*)

Calculate  $bs$  raised to  $in$

#### 4.23.3.26 double Mac802\_16::TX\_Time (Packet \* *p*, int)

#### 4.23.3.27 Packet \* Mac802\_16::AllocPkt (int)

#### 4.23.3.28 void Mac802\_16::insert\_alloclist (aptr &, u\_int16\_t, double, double, u\_int16\_t, u\_int32\_t)

#### 4.23.3.29 int Mac802\_16::CanBeSent (aptr &, Packet \*, u\_int32\_t)

#### 4.23.3.30 int Mac802\_16::len\_queue (plist)

#### 4.23.3.31 int Mac802\_16::CanErtPSBeSent (aptr & *alloc\_list*, Packet \* *p*)

Check if there is a grant for the ertPS service and if this grant is greater than the packet size.

##### Parameters:

*p*,: The frame that already has been adjusted for all headers

##### Returns:

0: If there is no grant for ertPS service; 1: If there is a grant, but it is lesser than the packet size; 2: If there is a grant greater or equal to the packet size;

#### 4.23.4 Friends And Related Function Documentation

4.23.4.1 friend class TxPkt802\_16Timer [friend]

4.23.4.2 friend class RxPkt802\_16Timer [friend]

#### 4.23.5 Member Data Documentation

4.23.5.1 TxPkt802\_16Timer Mac802\_16::mhTxPkt\_

4.23.5.2 RxPkt802\_16Timer Mac802\_16::mhRxPkt\_

4.23.5.3 struct upstream\_channel Mac802\_16::upchannel

4.23.5.4 struct downstream\_channel Mac802\_16::downchannel

4.23.5.5 char Mac802\_16::collision

4.23.5.6 u\_int16\_t Mac802\_16::bytes\_pminislot

4.23.5.7 u\_int32\_t Mac802\_16::minislots\_psec

4.23.5.8 double Mac802\_16::size\_mslots

4.23.5.9 u\_int16\_t Mac802\_16::size\_ureqgrant

4.23.5.10 u\_int32\_t Mac802\_16::avg\_pkts

4.23.5.11 u\_int32\_t Mac802\_16::avg\_bytes

4.23.5.12 u\_int32\_t Mac802\_16::num\_pkts

4.23.5.13 double Mac802\_16::num\_bytes

4.23.5.14 u\_int32\_t Mac802\_16::total\_num\_sent\_pkts

4.23.5.15 double Mac802\_16::total\_num\_sent\_bytes

4.23.5.16 u\_int32\_t Mac802\_16::total\_num\_mgt\_pkts\_US

4.23.5.17 u\_int32\_t Mac802\_16::total\_num\_rng\_pkts\_US

4.23.5.18 u\_int32\_t Mac802\_16::total\_num\_concat\_pkts\_US

4.23.5.19 u\_int32\_t Mac802\_16::total\_num\_frag\_pkts\_US

4.23.5.20 u\_int32\_t Mac802\_16::total\_num\_req\_pkts\_US

4.23.5.21 u\_int32\_t Mac802\_16::total\_num\_plaindata\_pkts\_US

4.23.5.22 u\_int32\_t Mac802\_16::total\_num\_concatdata\_pkts\_US

4.23.5.23 u\_int32\_t Mac802\_16::total\_num\_frames\_US

~~4.23.5.24 u\_int32\_t Mac802\_16::total\_num\_BE\_pkts\_US~~

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4.23.5.25 u\_int32\_t Mac802\_16::total\_num\_RTVBR\_pkts\_US

4.23.5.26 u\_int32\_t Mac802\_16::total\_num\_UGS\_pkts\_US

4.23.5.27 u\_int32\_t Mac802\_16::total\_num\_OTHER\_pkts\_US

- ns-2.28/mac/mac-802\_16.h
- ns-2.28/mac/mac-802\_16-base.cc
- ns-2.28/mac/mac-802\_16-bs.cc
- ns-2.28/mac/mac-802\_16-FSM.cc



## 4.24 mac802\_16\_extended\_header\_element Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- u\_char eh\_type: 4
- u\_char eh\_len: 4
- u\_int16\_t eh\_data [6]

#### 4.24.1 Detailed Description

802\_16 Extended header element

#### 4.24.2 Member Data Documentation

4.24.2.1 u\_char mac802\_16\_extended\_header\_element::eh\_type

4.24.2.2 u\_char mac802\_16\_extended\_header\_element::eh\_len

4.24.2.3 u\_int16\_t mac802\_16\_extended\_header\_element::eh\_data[6]

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

- ns-2.28/mac/hdr-802\_16.h

## 4.25 mac802\_16\_frame\_hdr Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `u_char fc_type`: 2
- `u_char fc_parm`: 5
- `u_char ehdr_on`: 1
- `u_int16_t mac_param`
- `u_int16_t len`

### 4.25.1 Detailed Description

802\_16 header format

### 4.25.2 Member Data Documentation

**4.25.2.1** `u_char mac802_16_frame_hdr::fc_type`

**4.25.2.2** `u_char mac802_16_frame_hdr::fc_parm`

**4.25.2.3** `u_char mac802_16_frame_hdr::ehdr_on`

**4.25.2.4** `u_int16_t mac802_16_frame_hdr::mac_param`

**4.25.2.5** `u_int16_t mac802_16_frame_hdr::len`

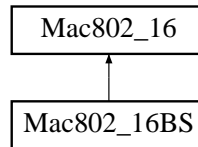
The documentation for this struct was generated from the following file:

- `ns-2.28/mac/hdr-802_16.h`

## 4.26 Mac802\_16BS Class Reference

```
#include <mac-802_16.h>
```

Inheritance diagram for Mac802\_16BS::



### Public Member Functions

- `int register_to_bs` (int macaddr, u\_int16\_t priority, u\_char def\_up, u\_char def\_dn, struct `upstream_sflow` \*UpEntry, u\_char UpSize, struct `downstream_sflow` \*DownEntry, u\_char DownSize)
- `int compare_priority` (priority\_array\_p A, priority\_array\_p B)
- `Mac802_16BS` ()
- `~Mac802_16BS` ()

### Public Attributes

- `ss_record` \*SSRecord
- u\_int16\_t CurrIndexSSTable

### Protected Member Functions

- `int command` (int argc, const char \*const \*argv)

### Private Member Functions

- void `SSRngHandler` (Event \*e)
- void `SSSndTimerHandler` (Event \*e)
- void `SSReqTimerHandler` (Event \*e)
- void `UnlockQueue` ()
- void `BsMapHandler` (Event \*e)  
*This is called when a MAP is to be sent.*
- void `BsSyncHandler` (Event \*e)
- void `BsUcdHandler` (Event \*e)
- void `BsRngHandler` (Event \*e)
- void `BsWindowTimerHandler` (Event \*e)
- void `RateControl` (Packet \*, int, int, int)
- double `getupdatedtokens` (int, int)
- void `BsTokenHandler` (Event \*)
- void `insert_tokenlist` (double, int, int)
- void `sendUp` (Packet \*p)
- void `sendDown` (Packet \*p)

- void **RecvFrame** (Packet \*, int)
- void **PassDownstream** (Packet \*)
- void **HandleInData** (Packet \*, int, int)
- void **HandleInMgmt** (Packet \*)
- void **HandleFrag** (Packet \*)
- void **HandleConcat** (Packet \*, int, int)
- void **ReleaseJobs** ()
- void **fill\_job** (struct **job** \*, char, char, double, u\_int32\_t, double, double, u\_int16\_t)
- void **InsertJob** (struct **job** \*, int)
- void **HandleReq** (u\_int16\_t, int, int, bool)
- void **tune\_parameters** ()
- void **alloc\_bw** ()
- void **delete\_joblist** (int)
- void **PhUnsupress** (Packet \*, int, int)
- void **ApplyPhs** (Packet \*, int, int)
- void **MakeAperiodicAlloc** (struct **job** \*, **mapptr**, int)
- void **AllocMemSSrecord** ()
- void **MakePeriodicAllocation** (int, **mapptr**, double)
- void **ReOrder** (**mapptr**)
- void **MarkOtherSlots** (**mapptr**, u\_int32\_t, int)
- void **jobdrop** (**mapptr**)
- void **MarkGrantPending** (u\_int32\_t \*, double)
- void **SendMap** ()
- u\_int32\_t **MarkUnusedSlots** (u\_int32\_t)
- void **find\_flowindex** (u\_int16\_t, int \*, int \*)
- void **SendFrame** (Packet \*, int)
- void **BsSendHandler** (Event \*)
- void **dump\_stats** ()
- void **ParseExtHdr** (Packet \*)
- void **dumpUGSJITTER** (char \*)
- void **UpdateJitter** (int, u\_int16\_t, double)
- int **find\_size\_map** ()
- int **NumContSlots** (**mapptr** \*)
- int **ChkQoSJobs** (double, double)
- int **classify** (Packet \*, char, int \*)
- int **insert\_mapjob** (int, **jp**tr, u\_int32\_t \*, int)
- int **insert\_mapjob** (struct **job** \*, u\_int32\_t \*)
- int **find\_ss** (int)
- u\_int32\_t **MarkOtherAlloc** (u\_int32\_t)
- u\_int32\_t **FillMap** (int, int, int, int, int)
- **mapptr** **find\_best\_hole** (u\_int32\_t)
- **mapptr** **find\_next** (**mapptr**)
- **mapptr** **find\_prv** (**mapptr**)
- **mapptr** **TryAlloc** (double, u\_int32\_t)
- double **determine\_deadline** (char, int, int)
- double **FitMap** (**mapptr**, double)
- double **CalculateAckTime** ()
- void **print\_job\_list** (int)
- void **print\_map\_list** ()
- void **print\_short\_map\_list** (Packet \*Pkt)

*This method dumps all IE's associated with the map.*

- void **delete\_maplist** ()
- void **dumpBWBS** (char \*fileName)
- void **dumpFinalBSStats** (char \*fileName, int DSBW, int USBW)
- void **dumpFinalSIDStats** (int cindex, int findex, char \*fileName, int DSBW)
- void **dumpFinalDSSIDS** (char \*fileName, int DSBW)
- void **dump802\_16QueueStats** (char \*fileName, int channelBW)
- void **dump802\_16UtilStats** (char \*fileName, int channelDSBW, int channelUSBW)
- void **insert\_pkt\_at\_Head** (Packet \*, int, int)
- int **len\_mgmtqueue** ()
- Packet \* **deque\_pkt** ()
- int **packetTrace** (Packet \*p, int direction)
- void **HandleOutData** (Packet \*, int, int)
- int **down\_idle** (int, int, **EventType**, Packet \*)
- int **down\_decision** (int, int, **EventType**, Packet \*)
- int **down\_tosend** (int, int, **EventType**, Packet \*)
- int **down\_waitformap** (int, int, **EventType**, Packet \*)
- void **UpdateAllocationTable** (int, int)
- void **UpdateJitter** (int, int)
- bool **insert\_pkt** (Packet \*, int, int)
- double **timer\_expiration** (int, int, Packet \*)
- Packet \* **deque\_pkt** (int, int)
- void **insert\_mgmtpkt** (Packet \*, int, int)
- void **insert\_sndlist** (double, int, int)
- void **BsSndTimerHandler** (Event \*e)
- void **alloc\_ul\_bw** (double, double, u\_int32\_t)
- void **alloc\_dl\_bw** (double, double, u\_int32\_t)
- void **checkDeadline** (double, double, u\_int32\_t &)
- void **checkMinimumBW** (u\_int32\_t &, **priority\_array\_p** &, int &)
- void **MakeAllocation** (jptr, int, **mapptr**, char, int)
- int **CanBeSent** (aptr &, Packet \*)

### Private Attributes

- double **window\_**
- Map802\_16Timer **mhMap\_**
- BsRng802\_16Timer **mhRng\_**
- BsUcd802\_16Timer **mhUcd\_**
- BsSync802\_16Timer **mhSync\_**
- BsTxPkt802\_16Timer **mhBsTxPkt\_**
- BsServiceFlowSendTimer **mhBsSend\_**
- BsUplinkSchedWindowTimer **mhWdw\_**
- BsToken802\_16Timer **mhToken\_**
- tkptr **TokenList**
- bs\_conf\_param **Conf\_Table\_**
- u\_int16\_t **SizeSSTable**
- bs\_statistics **SSStatistics\_**
- job \* **job\_list** [8]
- **mapptr** **mptr**

- **bs\_sptr** BsSndList
- double **map\_stime**
- double **omap\_stime**
- double **map\_etime**
- double **omap\_etime**
- double **map\_acktime**
- double **AckTime**
- double **max\_slots\_pmap**
- double **next\_map**
- int **numIE**
- int **map\_lookahead**
- int **MAP\_LOOKAHEAD**
- int **max\_burst\_slots**
- int **rem\_overhead**
- int **MapPropDelay**
- int **size\_rtqueue**
- int **avg\_szrtqueue**
- double **last\_mrqttime**
- int **size\_bfqueue**
- int **avg\_szbqueue**
- double **last\_mbfqtime**
- int **num\_bfreq**
- int **avg\_bfreq**
- double **last\_mbfreq**
- int **num\_rtreq**
- int **avg\_rtreq**
- double **last\_mrtreq**
- double **last\_dmptime**
- u\_int32\_t **num\_dgrant**
- u\_int32\_t **num\_contention**
- u\_int32\_t **num\_req**
- u\_int32\_t **num\_gpend**
- u\_int32\_t **avg\_dgrant**
- u\_int32\_t **avg\_contention**
- u\_int32\_t **avg\_req**
- u\_int32\_t **avg\_gpend**
- u\_int32\_t **dropped\_tokenq**
- u\_int32\_t **dropped\_dsq**
- double **proportion**
- u\_char **contention\_thrhold**
- u\_char **network\_status**
- u\_int32\_t **rtpoll\_ddlinemiss**
- u\_int32\_t **beffort\_ddlinemiss**
- int32\_t **num\_rtslots**
- int32\_t **num\_nrtslots**
- int32\_t **num\_befslots**
- u\_int32\_t **num\_adjust\_slots**
- Event **intr**
- Event **uintr**
- Event **sintr**

- Event `rintr`
- Event `rxintr`
- Event `wintr`
- `qlist txq`
- int `qnp`
- int `qnb`
- int `max_qnp`
- int `max_qnb`
- int `min_qnp`
- int `min_qnb`
- int `queue_total_bytes_in`
- int `queue_total_bytes_out`
- double `util_total_bytes_US`
- double `util_total_bytes_DS`
- int `util_total_pkts_US`
- int `util_total_pkts_DS`
- double `util_bytes_US`
- double `util_bytes_DS`
- int `qlim`
- double `lastDumpTime`
- double `lastUtilDumpTime`
- int(`Mac802_16BS::* DOWNswitch [DOWNSTATES]`)(int, int, `EventType`, `Packet *`)

### Static Private Attributes

- static int `next_flowid`

### Friends

- class `Map802_16Timer`
- class `BsUcd802_16Timer`
- class `BsRng802_16Timer`
- class `BsSync802_16Timer`
- class `BsTxPkt802_16Timer`
- class `BsServiceFlowSendTimer`
- class `BsToken802_16Timer`

#### 4.26.1 Detailed Description

`Mac802_16` (p. 36) class

#### 4.26.2 Constructor & Destructor Documentation

##### 4.26.2.1 `Mac802_16BS::Mac802_16BS ()`

Constructor

4.26.2.2 `Mac802_16BS::~~Mac802_16BS ()` [inline]

### 4.26.3 Member Function Documentation

4.26.3.1 `int Mac802_16BS::register_to_bs (int macaddr, u_int16_t priority, u_char def_up, u_char def_dn, struct upstream_sflow * UpEntry, u_char UpSize, struct downstream_sflow * DownEntry, u_char DownSize)`

4.26.3.2 `int Mac802_16BS::compare_priority (priority_array_p A, priority_array_p B)`

4.26.3.3 `int Mac802_16BS::command (int argc, const char *const * argv)` [protected]

Reimplemented from `Mac802_16` (p.39).

4.26.3.4 `void Mac802_16BS::SSRngHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p.38).

4.26.3.5 `void Mac802_16BS::SSSndTimerHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p.38).

4.26.3.6 `void Mac802_16BS::SSReqTimerHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p.38).

4.26.3.7 `void Mac802_16BS::UnlockQueue ()` [inline, private]

4.26.3.8 `void Mac802_16BS::BsMapHandler (Event * e)` [private, virtual]

This is called when a MAP is to be sent.

This is called when a MAP is to be sent.

- Overview:
- Figure out the start/stop times for this MAP
- Call `calculate_slots` to make sure the MAP does not go > 4096 slots in the future (this would violate `802_16`).
- Call `alloc_bw()` (p.53) to assign slots
- Figure out when to reset the `bs 802_16` timer for the next MAP

#### Parameters:

`e` timer event



Reimplemented from `Mac802_16` (p. 38).

**4.26.3.9** `void Mac802_16BS::BsSyncHandler (Event * e) [private, virtual]`

Reimplemented from `Mac802_16` (p. 38).

**4.26.3.10** `void Mac802_16BS::BsUcdHandler (Event * e) [private, virtual]`

Reimplemented from `Mac802_16` (p. 38).

**4.26.3.11** `void Mac802_16BS::BsRngHandler (Event * e) [private, virtual]`

Reimplemented from `Mac802_16` (p. 38).

**4.26.3.12** `void Mac802_16BS::BsWindowTimerHandler (Event * e) [private, virtual]`

Reimplemented from `Mac802_16` (p. 39).

**4.26.3.13** `void Mac802_16BS::RateControl (Packet * p, int cindex, int findex, int type) [private]`

The type filed is used to indicate whether packet was picked from IFQ queue or not..If yes, then unlock the IFQ

**4.26.3.14** `double Mac802_16BS::getupdatedtokens (int, int) [private]`

**4.26.3.15** `void Mac802_16BS::BsTokenHandler (Event *) [private, virtual]`

Reimplemented from `Mac802_16` (p. 39).

**4.26.3.16** `void Mac802_16BS::insert_tokenlist (double, int, int) [private]`

**4.26.3.17** `void Mac802_16BS::sendUp (Packet * p) [private]`

Packet coming up from PHY layer...

**4.26.3.18** `void Mac802_16BS::sendDown (Packet * p) [private]`

Send packet down to the physical layer...only packets passed by upper layers will be sent by this function..No Management messages..

**4.26.3.19** `void Mac802_16BS::RecvFrame (Packet * p, int concat_flag) [private, virtual]`

Called from the recvHandler when a frame has arrived on the upstream channel.

Needed to make sure we increment byte stats only once as this routine is reentered if the frame is concatenated static int RecvFrameEntered = 0; This routine will invoke HandleInData or HandleInMgmt ....

**Parameters:**

- p* A packet that already has been adjusted for all headers
- concat\_flag* true if we are being reentered due to a concatenated frame. In this case, we've already counted the packet, but we need to count the size.

Reimplemented from `Mac802_16` (p. 39).

**4.26.3.20 void Mac802\_16BS::PassDownstream (Packet \* *p*) [private]**

A simple ethernet PDU is carried in the 802\_16 payload.. No Fragmentation or Concatenation

**4.26.3.21 void Mac802\_16BS::HandleInData (Packet \* *p*, int *cindex*, int *findex*) [private]**

overHeadBitsStripped is 1 if the packet already has had the OH bits taken off (This occurs when multiple frames are concatenated)

**4.26.3.22 void Mac802\_16BS::HandleInMgmt (Packet \* *p*) [private]**

This routine receives a Mgt message of the following types:

- case 2: request header
- case 3: Fragmentation frame header
- case 26: Concatenation frame header
- case 1: RNG msg

Note: if it's a concat frame- this means its a concat request.

**Parameters:**

- p* the packet

**4.26.3.23 void Mac802\_16BS::HandleFrag (Packet \* *p*) [private]**

**Parameters:**

- p* The frame containing a fragment

**4.26.3.24 void Mac802\_16BS::HandleConcat (Packet \*, int, int) [private]**

**4.26.3.25 void Mac802\_16BS::ReleaseJobs () [private]**

Function called during the starting of simulation to release all the UGS jobs & VBR unicast req jobs

**4.26.3.26** void Mac802\_16BS::fill\_job (struct job \* *node*, char *class*, char *type*, double *period*, u\_int32\_t *size*, double *release*, double *deadline*, u\_int16\_t *flow\_id*) [private]

**Parameters:**

*node* job queue element (i.e., a job)

**4.26.3.27** void Mac802\_16BS::InsertJob (struct job \* *node*, int *index*) [private]

a job (bw request or periodic grant) in the job\_list

**4.26.3.28** void Mac802\_16BS::HandleReq (u\_int16\_t *req*, int *cindex*, int *findex*, bool *aggregate*) [private]

Is called when there has been a request for bw from a SS. The routine creates a new job entry (node)

**4.26.3.29** void Mac802\_16BS::tune\_parameters () [private]

**4.26.3.30** void Mac802\_16BS::alloc\_bw () [private]

This is called when a MAP is to be sent. It allocates the bw.

**4.26.3.31** void Mac802\_16BS::delete\_joblist (int) [private]

**4.26.3.32** void Mac802\_16BS::PhUnsupress (Packet \*, int, int) [private]

**4.26.3.33** void Mac802\_16BS::ApplyPhs (Packet \*, int, int) [private]

**4.26.3.34** void Mac802\_16BS::MakeAperiodicAlloc (struct job \*, mapptr, int) [private]

**4.26.3.35** void Mac802\_16BS::AllocMemSSrecord () [private]

**4.26.3.36** void Mac802\_16BS::MakePeriodicAllocation (int, mapptr, double) [private]

**4.26.3.37** void Mac802\_16BS::ReOrder (mapptr) [private]

**4.26.3.38** void Mac802\_16BS::MarkOtherSlots (mapptr *t*, u\_int32\_t *num*, int *jk*) [private]

This method marks the cr and mgt slots in the map. *jk* will be used as sid for distinguishing between various slots. a 0 says its mgt , a 1 says it CR.

**Parameters:**

*t* The map

*num* Number of slots.

*jk* Indicates if mgt or CR slots (value 0 and 1 respectively)

**4.26.3.39** void Mac802\_16BS::jobdrop (mapptr) [private]

**4.26.3.40** void Mac802\_16BS::MarkGrantPending (u\_int32\_t \*, double) [private]

**4.26.3.41** void Mac802\_16BS::SendMap () [private]

This method creates the MAP message, creates the packet that contains the message and sends it.

**4.26.3.42** u\_int32\_t Mac802\_16BS::MarkUnusedSlots (u\_int32\_t num\_slots) [private]

This method fills unused slots of the current map as unused. Or, if FILLWITHCONTOPS is defined, it fills with CR slots. The global mptr points to the current map.

**Parameters:**

*num\_slots* Number of unused slots in the map

**Returns:**

The final number of unused slots (hopefully 0 if FILLWITHCONTOPS is on)

**4.26.3.43** void Mac802\_16BS::find\_flowindex (u\_int16\_t, int \*, int \*) [private]

**4.26.3.44** void Mac802\_16BS::SendFrame (Packet \* p, int type) [private]

All frames that are to be sent over the DS channel will be sent down through this method.

**4.26.3.45** void Mac802\_16BS::BsSendHandler (Event \*) [private, virtual]

Reimplemented from Mac802\_16 (p. 39).

**4.26.3.46** void Mac802\_16BS::dump\_stats () [private]

**4.26.3.47** void Mac802\_16BS::ParseExtHdr (Packet \*) [private]

**4.26.3.48** void Mac802\_16BS::dumpUGSJITTER (char \* outputFile) [private]

This is called periodically (as of 3/26/05 it is piggybacked off the dumpBWBS mechanism). It computes a jitter statistic based on stats gathered since the last time this method was called. Each time a UGS allocation is made, the jitter is updated. This running total of jitter is simply the difference between the scheduled allocation time (based on the UGS grant interval) and the actual.

**4.26.3.49** void Mac802\_16BS::UpdateJitter (int ugs, u\_int16\_t flow\_id, double t) [private]

Called when the BS has allocated BW for this job in the next map.

**Parameters:**

- flow\_id* The flow or job to look at  
*t* The allocated time (j->alloc\_stime) of the job

**4.26.3.50 int Mac802\_16BS::find\_size\_map () [private]**

Calculate the size of MAP, all the IEs plus data-grant pending sizes..

**4.26.3.51 int Mac802\_16BS::NumContSlots (mapptr \*) [private]****4.26.3.52 int Mac802\_16BS::ChkQoSJobs (double, double) [private]****4.26.3.53 int Mac802\_16BS::classify (Packet \* p, char dir, int \* find) [private]**

Examines the packet and matches it to a flow in the SSRecord. The dir param determines if the upstream or downstream flow are looked at.

**Parameters:**

- p* The packet  
*dir* DOWNSTREAM or UPSTREAM  
*find* This ptr variable is set with the index of the flow table entry.

**Returns:**

The index of the matching ss's SSRecord table entry.

**4.26.3.54 int Mac802\_16BS::insert\_mapjob (int, jptr, u\_int32\_t \*, int) [private]****4.26.3.55 int Mac802\_16BS::insert\_mapjob (struct job \*, u\_int32\_t \*) [private]****4.26.3.56 int Mac802\_16BS::find\_ss (int t) [private]**

Given the mac address parameter, this routine searches the SS table to return the SSRecord table index of the correct SS.

**4.26.3.57 u\_int32\_t Mac802\_16BS::MarkOtherAlloc (u\_int32\_t num\_slots) [private]**

This function will mark contention-slots and SM slots in map list

**Parameters:**

- num\_slots* Number of slots in the map

**4.26.3.58** `u_int32_t Mac802_16BS::FillMap (int i, int ugs, int rt_poll, int nrt_poll, int be) [private]`

This is called when a MAP is to be sent. The `mptr` contains the start of the map.

**Returns:**

The number of slots used in the allocation

**4.26.3.59** `mapptr Mac802_16BS::find_best_hole (u_int32_t n) [private]`

This function returns a pointer to the map node where the best hole begins

**Parameters:**

*n* The number of slots that we need to allocate

**Returns:**

A ptr to a MAP

**4.26.3.60** `mapptr Mac802_16BS::find_next (mapptr m) [private]`

**Returns:**

The next job in the map list.

**4.26.3.61** `mapptr Mac802_16BS::find_prv (mapptr) [private]`

**4.26.3.62** `mapptr Mac802_16BS::TryAlloc (double, u_int32_t) [private]`

**4.26.3.63** `double Mac802_16BS::determine_deadline (char, int, int) [private]`

**4.26.3.64** `double Mac802_16BS::FitMap (mapptr j, double t) [private]`

Try to fit job '*j*' starting at '*t*'. Keep on trying till you reach the end of the MAP.

**4.26.3.65** `double Mac802_16BS::CalculateAckTime () [private]`

**4.26.3.66** `void Mac802_16BS::print_job_list (int i) [private]`

Prints to stdout the contents of the desired job queue:

- `job_list[0]` which is UGS periodic
- `job_list[1]` which is rt-VBR periodic
- `job_list[2]` which is rt-VBR non periodic
- `job_list[3]` which is best effort

**Parameters:**

*i* Indicates which job list to print

**4.26.3.67** void Mac802\_16BS::print\_map\_list () [private]

**4.26.3.68** void Mac802\_16BS::print\_short\_map\_list (Packet \* *p*) [private]

This method dumps all IE's associated with the map.

This method dumps all IE's associated with the map. The format: each MAP will begin with a code of 0 and have zero or more codes of 1,2,3.

- 0 timestamp mapstart mapstop numberIE's
- 1 timestamp flow\_id start stop release time deadline IUC numberslots

**Parameters:**

*p* The packet that contains the map message

**4.26.3.69** void Mac802\_16BS::delete\_maplist () [private]

**4.26.3.70** void Mac802\_16BS::dumpBWBS (char \* *fileName*) [private]

**4.26.3.71** void Mac802\_16BS::dumpFinalBSStats (char \* *fileName*, int *DSBW*, int *USBW*) [private]

**4.26.3.72** void Mac802\_16BS::dumpFinalSIDStats (int *cindex*, int *findex*, char \* *fileName*, int *DSBW*) [private]

**4.26.3.73** void Mac802\_16BS::dumpFinalDSSIDS (char \* *fileName*, int *DSBW*) [private]

**4.26.3.74** void Mac802\_16BS::dump802\_16QueueStats (char \* *outputFile*, int *channelBW*) [private]

Called periodically by a TCL script to monitor the queue in the DS direction. This method also computes the utilization of the DS channel for each iteration.

**4.26.3.75** void Mac802\_16BS::dump802\_16UtilStats (char \* *outputFile*, int *DSBW*, int *USBW*) [private]

Called periodically by a TCL script to monitor the queue in the DS direction.

**4.26.3.76** void Mac802\_16BS::insert\_pkt\_at\_Head (Packet \* *p*, int *cindex*, int *findex*) [private]

This method inserts the packet in the downstream Tx queue. It inserts at the head of the queue. If the Q is full, the packet at the tail is removed.

**Parameters:**

*p* ptr to the frame

*cindex* Holds the SSRecord table index associated with the SS that is the target.

*findex* Holds the flow record entry index.

4.26.3.77 `int Mac802_16BS::len_mgmtqueue ()` [private]

4.26.3.78 `Packet * Mac802_16BS::deque_pkt ()` [private]

4.26.3.79 `int Mac802_16BS::packetTrace (Packet * p, int direction)` [private]

**Parameters:**

*p* A 802\_16 frame

*direction* direction is 0 when sent DS and 1 when arrival at US

**Returns:**

a 0 on success.

4.26.3.80 `void Mac802_16BS::HandleOutData (Packet * p, int cindex, int findex)`  
[private]

Packet enters the BS for respective flow from this function

4.26.3.81 `int Mac802_16BS::down_idle (int cindex, int findex, EventType e, Packet * p)` [private]

**Parameters:**

*tbindex* denotes the service-flow entry on which packet has been mapped

4.26.3.82 `int Mac802_16BS::down_decision (int, int, EventType, Packet *)`  
[private]

4.26.3.83 `int Mac802_16BS::down_tosend (int, int, EventType, Packet *)`  
[private]

4.26.3.84 `int Mac802_16BS::down_waitformap (int cindex, int findex, EventType e, Packet * p)` [private]

This is called when certain events occur while a downstream flow is waiting for a MAP.

4.26.3.85 `void Mac802_16BS::UpdateAllocationTable (int cindex, int findex)`  
[private]

This function updates the allocation table for a service-flow when a MAP is received

4.26.3.86 `void Mac802_16BS::UpdateJitter (int cindex, int findex)` [private]

This is called whenever a MAP is received by a UGS flow. The statistic adds all error (scheduled allocation time from actual). Then the dumpUGSJitter method periodically obtains the mean jitter = runningJitter / samples



- 4.26.3.87 `bool Mac802_16BS::insert_pkt (Packet *, int, int) [private]`
- 4.26.3.88 `double Mac802_16BS::timer_expiration (int, int, Packet *) [private]`
- 4.26.3.89 `Packet * Mac802_16BS::deque_pkt (int, int) [private]`
- 4.26.3.90 `void Mac802_16BS::insert_mgmtpkt (Packet * p, int cindex, int findex) [private]`

This method inserts the packet in the downstream Tx queue. It drops the packet if it's full.

**Parameters:**

*p* ptr to the frame

*cindex* Holds the SSRecord table index associated with the SS that is the target.

*findex* Holds the flow record entry index.

- 4.26.3.91 `void Mac802_16BS::insert_sndlist (double, int, int) [private]`
- 4.26.3.92 `void Mac802_16BS::BsSndTimerHandler (Event * e) [private, virtual]`

Send timer to data packets from QoS scheduling services

Reimplemented from `Mac802_16` (p. 39).

- 4.26.3.93 `void Mac802_16BS::alloc_ul_bw (double map_stime, double map_etime, u_int32_t num_slots) [private]`

This is called when a MAP is to be sent. It allocates bw to the UL subframe.

- 4.26.3.94 `void Mac802_16BS::alloc_dl_bw (double map_stime, double map_etime, u_int32_t num_slots) [private]`

This is called when a MAP is to be sent. It allocates bw to the DL subframe.

- 4.26.3.95 `void Mac802_16BS::checkDeadline (double map_stime, double subframe_duration, u_int32_t & num_slots) [private]`

check which rtPS requests must be sent in the next frame in order to satisfy the maximum latency request.

- 4.26.3.96 `void Mac802_16BS::checkMinimumBW (u_int32_t & num_slots, priority_array_p & pri_array, int & size) [private]`

Assign priority values for the requests in the intermediate queue to decide which ones will be scheduled. The priority computation considers the `min_bw` request, backlogged BW and granted BW in order to provide the `min_bw` request of each flow. The higher priority requests will be inserted in the high queue.

Allocate the array. Warning. You should deallocate this array after using it.

4.26.3.97 void Mac802\_16BS::MakeAllocation (jptr, int, mapptr, char, int)  
[private]

4.26.3.98 int Mac802\_16BS::CanBeSent (aptr & alloc\_list, Packet \* p) [private]

**Parameters:**

*p* The frame that already has been adjusted for all headers

**Returns:**

1, if this frame can be send; 0, if this frame can NOT be send

#### 4.26.4 Friends And Related Function Documentation

- 4.26.4.1 friend class Map802\_16Timer [friend]
- 4.26.4.2 friend class BsUcd802\_16Timer [friend]
- 4.26.4.3 friend class BsRng802\_16Timer [friend]
- 4.26.4.4 friend class BsSync802\_16Timer [friend]
- 4.26.4.5 friend class BsTxPkt802\_16Timer [friend]
- 4.26.4.6 friend class BsServiceFlowSendTimer [friend]
- 4.26.4.7 friend class BsToken802\_16Timer [friend]

#### 4.26.5 Member Data Documentation

- 4.26.5.1 struct ss\_record\* Mac802\_16BS::SSRecord
- 4.26.5.2 u\_int16\_t Mac802\_16BS::CurrIndexSSTable
- 4.26.5.3 double Mac802\_16BS::window\_ [private]
- 4.26.5.4 Map802\_16Timer Mac802\_16BS::mhMap\_ [private]
- 4.26.5.5 BsRng802\_16Timer Mac802\_16BS::mhRng\_ [private]
- 4.26.5.6 BsUcd802\_16Timer Mac802\_16BS::mhUcd\_ [private]
- 4.26.5.7 BsSync802\_16Timer Mac802\_16BS::mhSync\_ [private]
- 4.26.5.8 BsTxPkt802\_16Timer Mac802\_16BS::mhBsTxPkt\_ [private]
- 4.26.5.9 BsServiceFlowSendTimer Mac802\_16BS::mhBsSend\_ [private]
- 4.26.5.10 BsUplinkSchedWindowTimer Mac802\_16BS::mhWdw\_ [private]
- 4.26.5.11 BsToken802\_16Timer Mac802\_16BS::mhToken\_ [private]
- 4.26.5.12 tkptr Mac802\_16BS::TokenList [private]
- 4.26.5.13 struct bs\_conf\_param Mac802\_16BS::Conf\_Table\_ [private]
- 4.26.5.14 u\_int16\_t Mac802\_16BS::SizeSSTable [private]
- 4.26.5.15 struct bs\_statistics Mac802\_16BS::SSStatistics\_ [private]
- 4.26.5.16 struct job\* Mac802\_16BS::job\_list[8] [private]
- 4.26.5.17 mapptr Mac802\_16BS::mptr [private]
- 4.26.5.18 bs\_sptr Mac802\_16BS::BsSndList [private]
- ~~4.26.5.19 double Mac802\_16BS::map\_stime [private]~~
- 4.26.5.20 double Mac802\_16BS::omap\_stime [private]
- 4.26.5.21 double Mac802\_16BS::map\_etime [private]
- 4.26.5.22 double Mac802\_16BS::omap\_etime [private]

- `ns-2.28/mac/mac-802_16.h`
- `ns-2.28/mac/mac-802_16-bs.cc`
- `ns-2.28/mac/mac-802_16-FSM.cc`

## 4.27 Mac802\_16BsClass Class Reference

### Public Member Functions

- `Mac802_16BsClass ()`
- `TclObject * create (int, const char *const *)`

#### 4.27.1 Detailed Description

TCL Hooks for the simulator

#### 4.27.2 Constructor & Destructor Documentation

4.27.2.1 `Mac802_16BsClass::Mac802_16BsClass ()` [inline]

#### 4.27.3 Member Function Documentation

4.27.3.1 `TclObject* Mac802_16BsClass::create (int, const char *const *)` [inline]

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

- `ns-2.28/mac/mac-802_16-bs.cc`

## 4.28 Mac802\_16EHeaderClass Class Reference

### Public Member Functions

- `Mac802_16EHeaderClass ()`

### 4.28.1 Detailed Description

`Mac802_16EHeaderClass` (p. 64) class

### 4.28.2 Constructor & Destructor Documentation

#### 4.28.2.1 `Mac802_16EHeaderClass::Mac802_16EHeaderClass ()` [inline]

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

- `ns-2.28/mac/mac-802_16-bs.cc`

## 4.29 Mac802\_16HeaderCode Class Reference

### Public Member Functions

- `Mac802_16HeaderCode ()`

### 4.29.1 Detailed Description

`Mac802_16HeaderCode` (p. 65) class

### 4.29.2 Constructor & Destructor Documentation

#### 4.29.2.1 `Mac802_16HeaderCode::Mac802_16HeaderCode ()` [inline]

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

- `ns-2.28/mac/mac-802_16-bs.cc`

## 4.30 Mac802\_16MapHeaderCodeClass Class Reference

### Public Member Functions

- `Mac802_16MapHeaderCodeClass ()`

### 4.30.1 Detailed Description

`Mac802_16MHeaderCodeClass` (p. 67) class

### 4.30.2 Constructor & Destructor Documentation

#### 4.30.2.1 `Mac802_16MapHeaderCodeClass::Mac802_16MapHeaderCodeClass ()` [inline]

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

- `ns-2.28/mac/mac-802_16-bs.cc`



## 4.31 Mac802\_16MHeaderClass Class Reference

### Public Member Functions

- `Mac802_16MHeaderClass ()`

#### 4.31.1 Detailed Description

`Mac802_16MHeaderClass` (p. 67) class

#### 4.31.2 Constructor & Destructor Documentation

##### 4.31.2.1 `Mac802_16MHeaderClass::Mac802_16MHeaderClass ()` [inline]

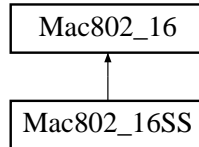
The documentation for this class was generated from the following file:

- `ns-2.28/mac/mac-802_16-bs.cc`

## 4.32 Mac802\_16SS Class Reference

```
#include <mac-802_16.h>
```

Inheritance diagram for Mac802\_16SS::



### Public Member Functions

- **Mac802\_16SS** ()
- **~Mac802\_16SS** ()

### Protected Member Functions

- **int command** (int argc, const char \*const \*argv)

### Private Member Functions

- void **BsMapHandler** (Event \*e)
- void **BsSyncHandler** (Event \*e)
- void **BsUcdHandler** (Event \*e)
- void **BsRngHandler** (Event \*e)
- void **BsSendHandler** (Event \*e)
- void **BsTokenHandler** (Event \*e)
- void **SSRngHandler** (Event \*e)
- void **SSSndTimerHandler** (Event \*e)
- void **SSReqTimerHandler** (Event \*e)
- void **sendUp** (Packet \*p)
- void **sendDown** (Packet \*p)
- void **Initialize\_entry** (char direction, char index)
- void **HandleMap** (Packet \*)
- void **HandleOutData** (Packet \*, char)
- void **SendData** (Packet \*, char)
- int **SendReq** (char, Packet \*)
- void **decide\_frag** (Packet \*, char)
- void **send\_frag\_data** (Packet \*, char)
- void **fill\_extended\_header** (int, Packet \*, char)
- void **send\_concat** (Packet \*, char)
- void **RecvFrame** (Packet \*, int)
- void **handle\_indata** (Packet \*, char)
- void **handle\_inmgmt** (Packet \*, char)
- void **SetDefaultFlow** ()
- void **PhUnsupress** (Packet \*, char)
- void **ApplyPhs** (Packet \*, char)

- void **print\_alloclist** (char)
- void **print\_short\_map\_list** (Packet \*Pkt)
- void **print\_classifiers** ()
- void **dump\_stats** ()
- char **classify** (Packet \*, char)
- int **check\_concat\_req** (char)
- int **check\_frag\_req** (u\_int32\_t, char)
- int **fill\_piggyback\_req** (char)
- void **MarkUsedContentionSlots** (int, char)
- void **turn\_off\_contention** (char)
- int **back\_off** (char, Packet \*)
- void **insert\_sndlist** (double, char)
- void **insert\_reqlist** (double, char)
- void **refresh\_reqlist** (char)
- void **reinsert\_reqlist** (char)
- void **insert\_pkt** (Packet \*, char)
- void **UpdateAllocationTable** (char)
- void **HandleOtherMgmt** (Packet \*)
- void **print\_ssalloclist** ()
- void **HandleOutMgmt** (Packet \*, char)
- void **FillPiggyReq** (char, Packet \*)
- int **FillPiggyExtHdr** (char, Packet \*, int)
- void **UpdateJitter** (char)
- int **CanBeSent** (aptr &, Packet \*, char)
- int **CanUnicastReqBeSent** (char)
- int **CanContentionReqBeSent** (char)
- int **DataGrantPending** (char)
- int **MapSentAfterReq** (char)
- int **NumContentionSlots** (char)
- void **USRateMeasure** (char, Packet \*)
- void **us\_getupdatedtokens** (char)
- int **look\_at\_queue** (char)
- int **filterACKPackets** (Packet \*pkt, char tindex)
- int **packetMatch** (Packet \*pkt1, Packet \*pkt2)
- double **find\_contention\_slot** (char, u\_int32\_t)
- double **timer\_expiration** (char, Packet \*, int)
- Packet \* **deque\_pkt** (char)
- Packet \* **pkt\_lookup** (char tindex, int i)
- void **dumpBWSS** (char \*fileName)
- void **dumpUGSJITTER** (char, char \*filename)
- void **dumpFinalSSStats** (char \*fileName)
- void **dump802\_16QueueStats** (char \*fileName, int channelBW)
- void **dump802\_16UtilStats** (char \*fileName, int channelDSBW, int channelUSBW)
- int **packetTrace** (Packet \*p, int direction)
- int **timingsTrace** (Packet \*p, int id)
- int **ugs\_idle** (char, **EventType**, Packet \*)
- int **ugs\_decision** (char, **EventType**, Packet \*)
- int **ugs\_tosend** (char, **EventType**, Packet \*)
- int **ugs\_waitformap** (char, **EventType**, Packet \*)
- int **rtpoll\_idle** (char, **EventType**, Packet \*)

- int **rtpoll\_\_decision** (char, **EventType**, Packet \*)
- int **rtpoll\_\_tosend** (char, **EventType**, Packet \*)
- int **rtpoll\_\_waitformap** (char, **EventType**, Packet \*)
- int **rtpoll\_\_tosendreq** (char, **EventType**, Packet \*)
- int **ertpoll\_\_idle** (char, **EventType**, Packet \*)
- int **ertpoll\_\_decision** (char, **EventType**, Packet \*)
- int **ertpoll\_\_tosend** (char, **EventType**, Packet \*)
- int **ertpoll\_\_waitformap** (char, **EventType**, Packet \*)
- int **ertpoll\_\_tosendreq** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_idle** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_decision** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_tosend** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_waitformap** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_tosendreq** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_reqsent** (char, **EventType**, Packet \*)
- int **nrtpoll\_\_contention** (char, **EventType**, Packet \*)
- int **beffort\_\_idle** (char, **EventType**, Packet \*)
- int **beffort\_\_decision** (char, **EventType**, Packet \*)
- int **beffort\_\_tosend** (char, **EventType**, Packet \*)
- int **beffort\_\_waitformap** (char, **EventType**, Packet \*)
- int **beffort\_\_tosendreq** (char, **EventType**, Packet \*)
- int **beffort\_\_reqsent** (char, **EventType**, Packet \*)
- int **beffort\_\_contention** (char, **EventType**, Packet \*)
- int **beffort\_\_ratecheck** (char, **EventType**, Packet \*)
- void **FillErtPSPiggyReq** (char, Packet \*)
- int **SendErtPSReq** (char, Packet \*)

### Private Attributes

- RNG \* **rng\_\_**
- **SSRng802\_\_16Timer** **mhSSRng\_\_**
- **SSServiceFlowSendTimer** **mhSSSend\_\_**
- **SSServiceFlowRequestTimer** **mhReq\_\_**
- Packet \* **map\_\_**
- char **debug\_\_ss**
- u\_int32\_t **ss\_\_id**
- u\_char **my\_\_lan**
- u\_char **SizeUpFlowTable**
- **upstream\_\_sflow** **UpFlowTable** [MAX\_NUM\_UPFLOWS\_PERSS]
- u\_char **SizeDownFlowTable**
- **downstream\_\_sflow** **DownFlowTable** [MAX\_NUM\_DOWNFLOWS\_PERSS]
- u\_char **default\_\_upstream\_\_index\_\_**
- u\_char **default\_\_dstream\_\_index\_\_**
- u\_int16\_t **priority**
- double **rng\_\_freq**
- int **bs\_\_addr**
- double **map\_\_acktime**
- u\_int32\_t **total\_\_num\_\_frag**
- u\_int32\_t **total\_\_num\_\_collisions**
- u\_int32\_t **total\_\_num\_\_bkoff**

- `u_int32_t total_collision_drops`
- `u_int32_t total_queue_drops`
- `sptr SndList`
- `rprr ReqList`
- `rprr tempReqList`
- `int(Mac802_16SS::* UGSswitch [UGSSTATES])(char, EventType, Packet *)`
- `int(Mac802_16SS::* RTPOLLswitch [RTPOLLSTATES])(char, EventType, Packet *)`
- `int(Mac802_16SS::* ERTPELLswitch [ERTPELLSTATES])(char, EventType, Packet *)`
- `int(Mac802_16SS::* NRTPELLswitch [NRTPELLSTATES])(char, EventType, Packet *)`
- `int(Mac802_16SS::* BEFFORTswitch [BEFFORTSTATES])(char, EventType, Packet *)`
- Event `rintr`
- double `last_dmptime`
- int `reqFlag`
- int `reqFlagCounter`

## Friends

- class `SSRng802_16Timer`
- class `SSServiceFlowSendTimer`
- class `SSServiceFlowRequestTimer`

### 4.32.1 Detailed Description

`Mac802_16SS` (p. 68) class

### 4.32.2 Constructor & Destructor Documentation

#### 4.32.2.1 `Mac802_16SS::Mac802_16SS ()`

Constructor Function

#### 4.32.2.2 `Mac802_16SS::~~Mac802_16SS () [inline]`

### 4.32.3 Member Function Documentation

#### 4.32.3.1 `int Mac802_16SS::command (int argc, const char *const * argv) [protected]`

Reimplemented from `Mac802_16` (p. 39).

#### 4.32.3.2 `void Mac802_16SS::BsMapHandler (Event * e) [inline, private, virtual]`

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.3** `void Mac802_16SS::BsSyncHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.4** `void Mac802_16SS::BsUcdHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.5** `void Mac802_16SS::BsRngHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.6** `void Mac802_16SS::BsSendHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p. 39).

**4.32.3.7** `void Mac802_16SS::BsTokenHandler (Event * e)` [inline, private, virtual]

Reimplemented from `Mac802_16` (p. 39).

**4.32.3.8** `void Mac802_16SS::SSRngHandler (Event * e)` [private, virtual]

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.9** `void Mac802_16SS::SSSndTimerHandler (Event * e)` [private, virtual]

Timer handler function

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.10** `void Mac802_16SS::SSReqTimerHandler (Event * e)` [private, virtual]

Reimplemented from `Mac802_16` (p. 38).

**4.32.3.11** `void Mac802_16SS::sendUp (Packet * p)` [private]

So a packet has been received by the PHY, and we want to send it up to the 802\_16 link...

**4.32.3.12** `void Mac802_16SS::sendDown (Packet * p)` [private]

Send packets passed by LLC to physical layer..So, NO MAC level Management Messages will be sent via this fuction

**4.32.3.13** void Mac802\_16SS::Initialize\_entry (char *direction*, char *index*)  
[private]

**4.32.3.14** void Mac802\_16SS::HandleMap (Packet \* *p*) [private]

This routine invokes every flow handler (in whatever state they are in) to process the map. If a flow sees an opportunity to send- it updates the SS's allocation table.

**Parameters:**

*p* The packet containing the MAP

**4.32.3.15** void Mac802\_16SS::HandleOutData (Packet \* *p*, char *tindex*) [private]

Packet enters the SM for respective flow from this function

**4.32.3.16** void Mac802\_16SS::SendData (Packet \*, char) [private]

**4.32.3.17** int Mac802\_16SS::SendReq (char *tindex*, Packet \* *p*) [private]

This is called when the SS wants to send a request to the BS It is invoked off the REQ\_TIMER thread. The routine check\_concat\_req(*tindex*) is called to see if we can send a concat request. The routine also calls beffort\_ratecheck to see if it is even allowed to request bandwidth yet (subject to rate control).

**Parameters:**

*p* This is the current packet that we want to send.

**Returns:**

A 0 if an error occurs and the request is not sent, else a 1.

**4.32.3.18** void Mac802\_16SS::decide\_frag (Packet \* *p*, char *tindex*) [private]

This routine is called at the slot time that has been allocated as the beginning transmission time for this packet.

**Parameters:**

*p* frame (not concatenated)

*tindex* index to US flow table

**4.32.3.19** void Mac802\_16SS::send\_frag\_data (Packet \* *p*, char *tindex*)  
[private]

This routine is called when the packet *p* is a part of a frag or must be sent as a frag.

**Parameters:**

*p* frame (not concatenated)

*tindex* index to US flow table

**4.32.3.20** void Mac802\_16SS::fill\_extended\_header (int *i*, Packet \* *p*, char *tindex*) [private]

**Parameters:**

*i* if (*i* == 1) it's a fragment, else not.

**4.32.3.21** void Mac802\_16SS::send\_concat (Packet \* *p*, char *tindex*) [private]

This is called by SendData when a concatenated frame is ready to be sent. The number to send depends on the grant size

**Parameters:**

*p* Packet to send

*tindex* Flow ptr

**4.32.3.22** void Mac802\_16SS::RecvFrame (Packet \*, int) [private, virtual]

Reimplemented from Mac802\_16 (p. 39).

**4.32.3.23** void Mac802\_16SS::handle\_indata (Packet \*, char) [private]

**4.32.3.24** void Mac802\_16SS::handle\_inmgmt (Packet \*, char) [private]

**4.32.3.25** void Mac802\_16SS::SetDefaultFlow () [private]

**4.32.3.26** void Mac802\_16SS::PhUnsupress (Packet \*, char) [private]

**4.32.3.27** void Mac802\_16SS::ApplyPhs (Packet \*, char) [private]

**4.32.3.28** void Mac802\_16SS::print\_alloclist (char) [private]

**4.32.3.29** void Mac802\_16SS::print\_short\_map\_list (Packet \* *p*) [private]

This method dumps all IE's associated with the map. The format: each MAP will begin with a code of 0 and have zero or more codes of 1,2,3.

- 0 timestamp SSID mapstart mapstop numberIE's maplength in slots
- 1 timestamp flowid (null IE)
- 2 timestamp flowid (indicates a grant is pending to the SS)
- 3 timestamp flowid starttime endtime iucode slots

**Parameters:**

*p* The packet that contains the map message



4.32.3.30 void Mac802\_16SS::print\_classifiers () [private]

4.32.3.31 void Mac802\_16SS::dump\_stats () [private]

4.32.3.32 char Mac802\_16SS::classify (Packet \*, char) [private]

4.32.3.33 int Mac802\_16SS::check\_concat\_req (char *tindex*) [private]

returns a 1 if there is at least one packet waiting in the queue AND concat is enabled.

4.32.3.34 int Mac802\_16SS::check\_frag\_req (u\_int32\_t, char) [private]

4.32.3.35 int Mac802\_16SS::fill\_piggyback\_req (char) [private]

4.32.3.36 void Mac802\_16SS::MarkUsedContentionSlots (int, char) [private]

4.32.3.37 void Mac802\_16SS::turn\_off\_contention (char) [private]

4.32.3.38 int Mac802\_16SS::back\_off (char, Packet \*) [private]

4.32.3.39 void Mac802\_16SS::insert\_sndlist (double, char) [private]

4.32.3.40 void Mac802\_16SS::insert\_reqlist (double, char) [private]

4.32.3.41 void Mac802\_16SS::refresh\_reqlist (char) [private]

4.32.3.42 void Mac802\_16SS::reinsert\_reqlist (char) [private]

4.32.3.43 void Mac802\_16SS::insert\_pkt (Packet \*, char) [private]

4.32.3.44 void Mac802\_16SS::UpdateAllocationTable (char *tindex*) [private]

This function updates the allocation table for a service-flow when a MAP is received

4.32.3.45 void Mac802\_16SS::HandleOtherMgmt (Packet \*) [private]

4.32.3.46 void Mac802\_16SS::print\_ssalloclist () [private]

4.32.3.47 void Mac802\_16SS::HandleOutMgmt (Packet \*, char) [private]

4.32.3.48 void Mac802\_16SS::FillPiggyReq (char *tindex*, Packet \* *p*) [private]

This is called to see if a request can be piggybacked to this packet, *p*. Nothing happens if (len\_queue(UpFlowTable[tindex].packet\_list) = 0). IF there is at least one packet in the queue, deque it and save it in the flow table: UpFlowTable[tindex].pkt = deque\_pkt(tindex);

This routine pulls this next packet, sees how many slots are required and then calls ratecheck\_returnval = FillPiggyExtHdr(tindex,p,slots);

This sets the current packet with a piggyback request for bandwidth for the next packet that was just dequeued

**4.32.3.49** `int Mac802_16SS::FillPiggyExtHdr (char, Packet *, int) [private]`

**4.32.3.50** `void Mac802_16SS::UpdateJitter (char tindex) [private]`

This is called whenever a MAP is received by a UGS flow. The statistic adds all error (scheduled allocation time from actual). Then the `dumpUGSJitter` method periodically obtains the mean jitter = runningJitter / samples

**4.32.3.51** `int Mac802_16SS::CanBeSent (aptr &, Packet *, char) [private]`

**4.32.3.52** `int Mac802_16SS::CanUnicastReqBeSent (char) [private]`

**4.32.3.53** `int Mac802_16SS::CanContentionReqBeSent (char) [private]`

**4.32.3.54** `int Mac802_16SS::DataGrantPending (char) [private]`

**4.32.3.55** `int Mac802_16SS::MapSentAfterReq (char) [private]`

**4.32.3.56** `int Mac802_16SS::NumContentionSlots (char) [private]`

**4.32.3.57** `void Mac802_16SS::USRateMeasure (char tindex, Packet * p) [private]`

This routine updates the available tokens subject to the BW rate taking into account the transmission of this packet.

**4.32.3.58** `void Mac802_16SS::us_getupdatedtokens (char tindex) [private]`

This routine computes the available tokens subject to BW rate limits.

**4.32.3.59** `int Mac802_16SS::look_at_queue (char tindex) [private]`

This routine is for debug purposes. It displays packets in the queue.

**Parameters:**

*tindex* Indicates the service-flow entry to which the packet has been mapped

**4.32.3.60** `int Mac802_16SS::filterACKPackets (Packet * pkt, char tindex) [private]`

This routine is called only if you want to do ack filtering at a SS. Before the packet is inserted in the queue (to await upstream transmission) packets that are already in the queue are scanned. All older ACK packets for this TCP connection (identified by matching the flowid, src/dst addr/port) and with a seqno less than the seqno of this ACK are removed from the queue and the packets are freed.

**Parameters:**

*pkt* ptr to a packet that has arrived and is to be queued

*tindex* Indicates the service-flow entry to which the packet has been mapped

**Returns:**

The number of ACK packets that are removed from the Queue.

**4.32.3.61 int Mac802\_16SS::packetMatch (Packet \* *pkt1*, Packet \* *pkt2*) [private]**

This routine compares the 2 packets and sees if their flowid, src/dst addr/port all match. If so, they are from the same flow.

**Parameters:**

*pkt1* : ptr to a one packet

*pkt2* : ptr to the second packet

**Returns:**

a 1 if *pkt2* and *pkt1* are from the same flow. Else a 0.

**4.32.3.62 double Mac802\_16SS::find\_contention\_slot (char *tindex*, u\_int32\_t *num*) [private]**

Find the starting time of the '*num*' contention slot

**4.32.3.63 double Mac802\_16SS::timer\_expiration (char, Packet \*, int) [private]****4.32.3.64 Packet \* Mac802\_16SS::deque\_pkt (char) [private]****4.32.3.65 Packet \* Mac802\_16SS::pkt\_lookup (char *tindex*, int *i*) [private]****4.32.3.66 void Mac802\_16SS::dumpBWSS (char \* *fileName*) [private]****4.32.3.67 void Mac802\_16SS::dumpUGSJITTER (char *tindex*, char \* *outputFile*) [private]**

This is called periodically (as of 3/26/05 it is piggybacked off the dumpBWSS mechanism). It computes a jitter statistic based on stats gathered since the last time this method was called. Each time a UGS allocation is made, the jitter is updated. This running total of jitter is simply the difference between the scheduled allocation time (based on the UGS grant interval) and the actual.

**4.32.3.68 void Mac802\_16SS::dumpFinalSSStats (char \* *fileName*) [private]****4.32.3.69 void Mac802\_16SS::dump802\_16QueueStats (char \* *outputFile*, int *channelBW*) [private]**

Is called via a tcl script to dump the queue length of The first upstream flow in the table

**4.32.3.70** void Mac802\_16SS::dump802\_16UtilStats (char \* *fileName*, int *channelDSBW*, int *channelUSBW*) [private]

**4.32.3.71** int Mac802\_16SS::packetTrace (Packet \* *p*, int *direction*) [private]

**Parameters:**

*p* A 802\_16 frame.

*direction* direction is 0 when sent DS and 1 when arrival at US.

**Returns:**

0 on success.

**4.32.3.72** int Mac802\_16SS::timingsTrace (Packet \* *p*, int *id*) [private]

**Parameters:**

*p* A 802\_16 frame

*id* The ID that goes in the first field of the trace line

**4.32.3.73** int Mac802\_16SS::ugs\_idle (char *tindex*, EventType *e*, Packet \* *p*) [private]

**Parameters:**

*tindex* denotes the service-flow entry on which packet has been mapped

**4.32.3.74** int Mac802\_16SS::ugs\_decision (char, EventType, Packet \*) [private]

**4.32.3.75** int Mac802\_16SS::ugs\_tosend (char, EventType, Packet \*) [private]

**4.32.3.76** int Mac802\_16SS::ugs\_waitformap (char *tindex*, EventType *e*, Packet \* *p*) [private]

This is called when certain events occur while a UGS flow is waiting for a MAP.

**4.32.3.77** int Mac802\_16SS::rtpoll\_idle (char *tindex*, EventType *e*, Packet \* *p*) [private]

**Parameters:**

*tindex* denotes the service-flow entry on which packet has been mapped

- 4.32.3.78 int Mac802\_16SS::rtpoll\_decision (char, EventType, Packet \*)  
[private]
- 4.32.3.79 int Mac802\_16SS::rtpoll\_tosend (char, EventType, Packet \*) [private]
- 4.32.3.80 int Mac802\_16SS::rtpoll\_waitformap (char, EventType, Packet \*)  
[private]
- 4.32.3.81 int Mac802\_16SS::rtpoll\_tosendreq (char, EventType, Packet \*)  
[private]
- 4.32.3.82 int Mac802\_16SS::ertpoll\_idle (char *tindex*, EventType *e*, Packet \* *p*)  
[private]

**Parameters:**

*tindex* denotes the service-flow entry on which packet has been mapped

- 4.32.3.83 int Mac802\_16SS::ertpoll\_decision (char, EventType, Packet \*)  
[private]
- 4.32.3.84 int Mac802\_16SS::ertpoll\_tosend (char, EventType, Packet \*)  
[private]
- 4.32.3.85 int Mac802\_16SS::ertpoll\_waitformap (char, EventType, Packet \*)  
[private]
- 4.32.3.86 int Mac802\_16SS::ertpoll\_tosendreq (char, EventType, Packet \*)  
[private]
- 4.32.3.87 int Mac802\_16SS::nrtpoll\_idle (char *tindex*, EventType *e*, Packet \* *p*)  
[private]

**Parameters:**

*tindex* denotes the service-flow entry on which packet has been mapped

- 4.32.3.88 `int Mac802_16SS::nrtpoll_decision (char, EventType, Packet *)`  
[private]
- 4.32.3.89 `int Mac802_16SS::nrtpoll_tosend (char, EventType, Packet *)`  
[private]
- 4.32.3.90 `int Mac802_16SS::nrtpoll_waitformap (char, EventType, Packet *)`  
[private]
- 4.32.3.91 `int Mac802_16SS::nrtpoll_tosendreq (char, EventType, Packet *)`  
[private]
- 4.32.3.92 `int Mac802_16SS::nrtpoll_reqsent (char, EventType, Packet *)`  
[private]
- 4.32.3.93 `int Mac802_16SS::nrtpoll_contention (char tindex, EventType e,  
Packet * p)` [private]

**Parameters:**

*p* The frame that already has been adjusted for all headers

- 4.32.3.94 `int Mac802_16SS::beffort_idle (char tindex, EventType e, Packet * p)`  
[private]

**Parameters:**

*tindex* denotes the service-flow entry on which packet has been mapped

- 4.32.3.95 `int Mac802_16SS::beffort_decision (char, EventType, Packet *)`  
[private]
- 4.32.3.96 `int Mac802_16SS::beffort_tosend (char, EventType, Packet *)`  
[private]
- 4.32.3.97 `int Mac802_16SS::beffort_waitformap (char, EventType, Packet *)`  
[private]
- 4.32.3.98 `int Mac802_16SS::beffort_tosendreq (char, EventType, Packet *)`  
[private]
- 4.32.3.99 `int Mac802_16SS::beffort_reqsent (char, EventType, Packet *)`  
[private]
- 4.32.3.100 `int Mac802_16SS::beffort_contention (char tindex, EventType e,  
Packet * p)` [private]

**Parameters:**

*p* The frame that already has been adjusted for all headers

**4.32.3.101** `int Mac802_16SS::beffort_ratecheck (char tindex, EventType e, Packet * p)` [private]

This is called at before sending a request for bandwidth (including a piggy req) to see if the rate control has provided enough tokens. The `dshdr_.mac_param` contains the number of slots in the request for the case of a `REQ_TIMER`. Normally this is 1 or 6 for a piggy request. For the case of a `PIGGY_REQ`, the `exthrd_[].eh_data[1]` is set to # slots requested.

**Parameters:**

*e* Specifies the asynch event that led to this invocation: `REQ_TIMER`, `PIGGYBACK_REQ`

**Returns:**

If 1, then can send, if -1, then can NOT send

**4.32.3.102** `void Mac802_16SS::FillErtPSPiggyReq (char tindex, Packet * p)` [private]

This is called to send a request piggybacked to packet *p*. The request informs the BS the new packet size of the ertPS service.

**4.32.3.103** `int Mac802_16SS::SendErtPSReq (char tindex, Packet * p)` [private]

This is called when the ertPS service wants to send a request to the BS. It is invoked off the `REQ_TIMER` thread. The request will inform the new packet size to the BS.

**Parameters:**

*p* This is the current packet that we want to send.

**Returns:**

0 if an error occurs and the request is not sent, else a 1.

#### 4.32.4 Friends And Related Function Documentation

4.32.4.1 friend class SSRng802\_16Timer [friend]

4.32.4.2 friend class SSServiceFlowSendTimer [friend]

4.32.4.3 friend class SSServiceFlowRequestTimer [friend]

#### 4.32.5 Member Data Documentation

4.32.5.1 RNG\* Mac802\_16SS::rng\_ [private]

4.32.5.2 SSRng802\_16Timer Mac802\_16SS::mhSSRng\_ [private]

4.32.5.3 SSServiceFlowSendTimer Mac802\_16SS::mhSSSend\_ [private]

4.32.5.4 SSServiceFlowRequestTimer Mac802\_16SS::mhReq\_ [private]

4.32.5.5 Packet\* Mac802\_16SS::map\_ [private]

4.32.5.6 char Mac802\_16SS::debug\_ss [private]

4.32.5.7 u\_int32\_t Mac802\_16SS::ss\_id [private]

4.32.5.8 u\_char Mac802\_16SS::my\_lan [private]

4.32.5.9 u\_char Mac802\_16SS::SizeUpFlowTable [private]

4.32.5.10 struct upstream\_sflow Mac802\_16SS::UpFlowTable[MAX\_NUM\_UPFLOWS\_PERSS] [private]

4.32.5.11 u\_char Mac802\_16SS::SizeDownFlowTable [private]

4.32.5.12 struct downstream\_sflow Mac802\_16SS::DownFlowTable[MAX\_NUM\_DOWNFLOWS\_PERSS] [private]

4.32.5.13 u\_char Mac802\_16SS::default\_upstream\_index\_ [private]

4.32.5.14 u\_char Mac802\_16SS::default\_dstream\_index\_ [private]

4.32.5.15 u\_int16\_t Mac802\_16SS::priority [private]

4.32.5.16 double Mac802\_16SS::rng\_freq [private]

4.32.5.17 int Mac802\_16SS::bs\_addr [private]

4.32.5.18 double Mac802\_16SS::map\_acktime [private]

4.32.5.19 u\_int32\_t Mac802\_16SS::total\_num\_frag [private]

4.32.5.20 u\_int32\_t Mac802\_16SS::total\_num\_collisions [private]

4.32.5.21 u\_int32\_t Mac802\_16SS::total\_num\_bkoff [private]

~~4.32.5.22 u\_int32\_t Mac802\_16SS::total\_collision\_drops [private]~~

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4.32.5.23 u\_int32\_t Mac802\_16SS::total\_queue\_drops [private]

4.32.5.24 sptr Mac802\_16SS::SndList [private]

4.32.5.25 rprr Mac802\_16SS::ReqList [private]



- 
- [ns-2.28/mac/mac-802\\_16.h](#)
  - [ns-2.28/mac/mac-802\\_16-FSM.cc](#)
  - [ns-2.28/mac/mac-802\\_16-ss.cc](#)

## 4.33 Mac802\_16SSClass Class Reference

### Public Member Functions

- `Mac802_16SSClass ()`
- `TclObject * create (int, const char *const *)`

#### 4.33.1 Detailed Description

TCL Hooks for the simulator

#### 4.33.2 Constructor & Destructor Documentation

4.33.2.1 `Mac802_16SSClass::Mac802_16SSClass ()` [inline]

#### 4.33.3 Member Function Documentation

4.33.3.1 `TclObject* Mac802_16SSClass::create (int, const char *const *)` [inline]

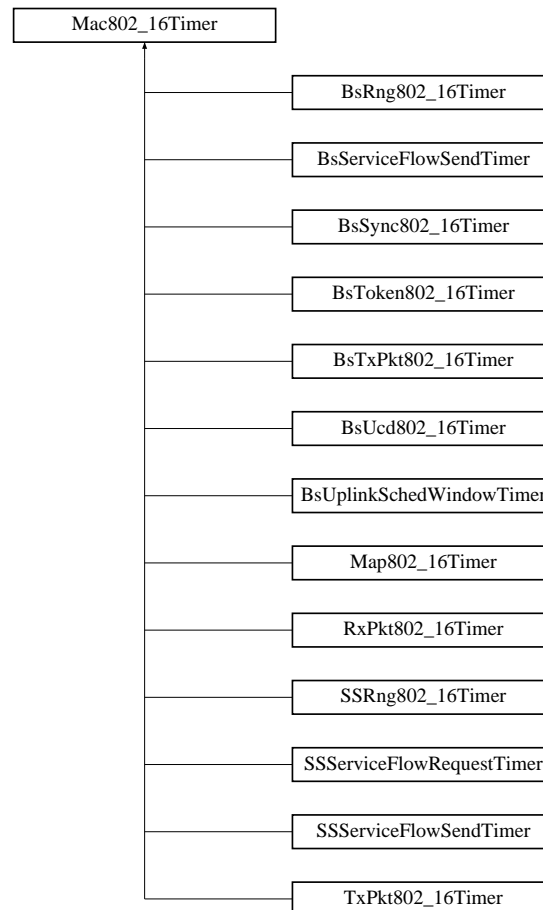
The documentation for this class was generated from the following file:

- `ns-2.28/mac/mac-802_16-ss.cc`

## 4.34 Mac802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for Mac802\_16Timer::



### Public Member Functions

- **Mac802\_16Timer** (**Mac802\_16** \*m)
- virtual void **handle** (Event \*e)
- void **start** (Packet \*e, double time)
- virtual void **stop** (Packet \*e)
- int **busy** (void)
- double **expire** (void)

### Protected Attributes

- **Mac802\_16** \* mac
- int **busy\_**
- int **paused\_**
- Event **intr**

- double `stime`
- double `rtime`

#### 4.34.1 Detailed Description

Base class for all the timer classes

#### 4.34.2 Constructor & Destructor Documentation

4.34.2.1 `Mac802_16Timer::Mac802_16Timer (Mac802_16 * m)` [inline]

#### 4.34.3 Member Function Documentation

4.34.3.1 `virtual void Mac802_16Timer::handle (Event * e)` [inline, virtual]

Reimplemented in `RxPkt802_16Timer` (p. 94), `TxPkt802_16Timer` (p. 101), `BsTxPkt802_16Timer` (p. 18), `Map802_16Timer` (p. 87), `BsUcd802_16Timer` (p. 19), `BsRng802_16Timer` (p. 14), `BsSync802_16Timer` (p. 16), `BsToken802_16Timer` (p. 17), `BsServiceFlowSendTimer` (p. 15), `BsUplinkSchedWindowTimer` (p. 20), `SSRng802_16Timer` (p. 97), `SSServiceFlowSendTimer` (p. 99), and `SSServiceFlowRequestTimer` (p. 98).

4.34.3.2 `void Mac802_16Timer::start (Packet * e, double time)`

4.34.3.3 `void Mac802_16Timer::stop (Packet * e)` [virtual]

4.34.3.4 `int Mac802_16Timer::busy (void)` [inline]

4.34.3.5 `double Mac802_16Timer::expire (void)` [inline]

#### 4.34.4 Member Data Documentation

4.34.4.1 `Mac802_16* Mac802_16Timer::mac` [protected]

4.34.4.2 `int Mac802_16Timer::busy_` [protected]

4.34.4.3 `int Mac802_16Timer::paused_` [protected]

4.34.4.4 `Event Mac802_16Timer::intr` [protected]

4.34.4.5 `double Mac802_16Timer::stime` [protected]

4.34.4.6 `double Mac802_16Timer::rtime` [protected]

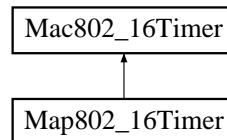
The documentation for this class was generated from the following files:

- ns-2.28/mac/`mac-802_16-timers.h`
- ns-2.28/mac/`mac-802_16-timers.cc`

## 4.35 Map802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for Map802\_16Timer::



### Public Member Functions

- **Map802\_16Timer** (Mac802\_16 \*m)
- void **handle** (Event \*e)

#### 4.35.1 Detailed Description

Timers to schedule transmission of MAPS.

#### 4.35.2 Constructor & Destructor Documentation

4.35.2.1 **Map802\_16Timer::Map802\_16Timer** (Mac802\_16 \* m) [inline]

#### 4.35.3 Member Function Documentation

4.35.3.1 void **Map802\_16Timer::handle** (Event \* e) [virtual]

Reimplemented from **Mac802\_16Timer** (p. 86).

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

- ns-2.28/mac/**mac-802\_16-timers.h**
- ns-2.28/mac/**mac-802\_16-timers.cc**

## 4.36 map\_conf\_param Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **time\_covered**
- double **map\_interval**
- u\_int32\_t **num\_contention\_slots**
- u\_int32\_t **num\_sm\_slots**
- u\_char **bkoff\_start**
- u\_char **bkoff\_end**

### 4.36.1 Member Data Documentation

4.36.1.1 double map\_conf\_param::time\_covered

4.36.1.2 double map\_conf\_param::map\_interval

4.36.1.3 u\_int32\_t map\_conf\_param::num\_contention\_slots

4.36.1.4 u\_int32\_t map\_conf\_param::num\_sm\_slots

4.36.1.5 u\_char map\_conf\_param::bkoff\_start

4.36.1.6 u\_char map\_conf\_param::bkoff\_end

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

- ns-2.28/mac/hdr-802\_16.h

## 4.37 map\_list Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **alloc\_stime**
- double **alloc\_etime**
- double **release\_time**
- double **deadline**
- u\_int32\_t **nslots**
- **mapptr** **next**
- u\_int16\_t **flow\_id**
- u\_int16\_t **flag**

### 4.37.1 Member Data Documentation

**4.37.1.1** double map\_list::alloc\_stime

**4.37.1.2** double map\_list::alloc\_etime

**4.37.1.3** double map\_list::release\_time

**4.37.1.4** double map\_list::deadline

**4.37.1.5** u\_int32\_t map\_list::nslots

**4.37.1.6** mapptr map\_list::next

**4.37.1.7** u\_int16\_t map\_list::flow\_id

**4.37.1.8** u\_int16\_t map\_list::flag

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

- ns-2.28/mac/hdr-802\_16.h

## 4.38 mgmt\_conf\_param Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `sync_msg_interval`
- double `rng_msg_interval`
- double `ucd_msg_interval`

### 4.38.1 Detailed Description

The frequency of generation of management messages

### 4.38.2 Member Data Documentation

**4.38.2.1** double `mgmt_conf_param::sync_msg_interval`

**4.38.2.2** double `mgmt_conf_param::rng_msg_interval`

**4.38.2.3** double `mgmt_conf_param::ucd_msg_interval`

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

- `ns-2.28/mac/hdr-802_16.h`



## 4.39 pnode Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- Packet \* **pkt**
- double **enq\_time**
- **plist** next

### 4.39.1 Member Data Documentation

#### 4.39.1.1 Packet\* pnode::pkt

#### 4.39.1.2 double pnode::enq\_time

#### 4.39.1.3 plist pnode::next

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

- ns-2.28/mac/**hdr-802\_16.h**

## 4.40 `priority_array` Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `int priority`
- `jptr job_pointer`

#### 4.40.1 Detailed Description

\$A8 - auxiliar struct to compute the priority of the rtPS and nrtPS in the intermediate queue

#### 4.40.2 Member Data Documentation

4.40.2.1 `int priority_array::priority`

4.40.2.2 `jptr priority_array::job_pointer`

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

- `ns-2.28/mac/hdr-802_16.h`

## 4.41 req\_timer\_list Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `expiration_time`
- `rptr` `next`
- `u_char` `rindex`

### 4.41.1 Member Data Documentation

4.41.1.1 `double req_timer_list::expiration_time`

4.41.1.2 `rptr req_timer_list::next`

4.41.1.3 `u_char req_timer_list::rindex`

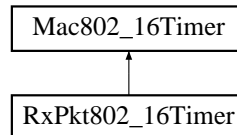
The documentation for this struct was generated from the following file:

- `ns-2.28/mac/hdr-802_16.h`

## 4.42 RxPkt802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for RxPkt802\_16Timer::



### Public Member Functions

- **RxPkt802\_16Timer** (**Mac802\_16** \*m)
- void **handle** (**Event** \*e)

#### 4.42.1 Detailed Description

Timers to control packet sending and receiving time.

#### 4.42.2 Constructor & Destructor Documentation

4.42.2.1 **RxPkt802\_16Timer::RxPkt802\_16Timer** (**Mac802\_16** \* m) [inline]

#### 4.42.3 Member Function Documentation

4.42.3.1 void **RxPkt802\_16Timer::handle** (**Event** \* e) [virtual]

Receive Timer

Reimplemented from **Mac802\_16Timer** (p. 86).

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

- ns-2.28/mac/**mac-802\_16-timers.h**
- ns-2.28/mac/**mac-802\_16-timers.cc**

## 4.43 snd\_timer\_list Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `expiration_time`
- `sptr` `next`
- `u_char` `tindex`

### 4.43.1 Member Data Documentation

4.43.1.1 `double` `snd_timer_list::expiration_time`

4.43.1.2 `sptr` `snd_timer_list::next`

4.43.1.3 `u_char` `snd_timer_list::tindex`

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

- `ns-2.28/mac/hdr-802_16.h`

## 4.44 ss\_record Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `downstream_flow_record d_rec` [MAX\_NUM\_DOWNFLOWS\_PERSS]
- `up_flow_record u_rec` [MAX\_NUM\_UPFLOWS\_PERSS]
- `int ss_macaddr`
- `u_int16_t priority`
- `u_char SizeDnFTable`
- `u_char SizeUpFTable`
- `u_char default_upstream_index_`
- `u_char default_downstream_index_`

### 4.44.1 Member Data Documentation

4.44.1.1 `struct downstream_flow_record ss_record::d_rec`[MAX\_NUM\_DOWNFLOWS\_PERSS]

4.44.1.2 `struct up_flow_record ss_record::u_rec`[MAX\_NUM\_UPFLOWS\_PERSS]

4.44.1.3 `int ss_record::ss_macaddr`

4.44.1.4 `u_int16_t ss_record::priority`

4.44.1.5 `u_char ss_record::SizeDnFTable`

4.44.1.6 `u_char ss_record::SizeUpFTable`

4.44.1.7 `u_char ss_record::default_upstream_index_`

4.44.1.8 `u_char ss_record::default_downstream_index_`

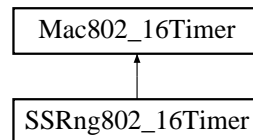
The documentation for this struct was generated from the following file:

- `ns-2.28/mac/hdr-802_16.h`

## 4.45 SSRng802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for SSRng802\_16Timer::



### Public Member Functions

- `SSRng802_16Timer (Mac802_16 *m)`
- `void handle (Event *e)`

#### 4.45.1 Detailed Description

Timers to schedule transmission of Management messages

#### 4.45.2 Constructor & Destructor Documentation

4.45.2.1 `SSRng802_16Timer::SSRng802_16Timer (Mac802_16 * m) [inline]`

#### 4.45.3 Member Function Documentation

4.45.3.1 `void SSRng802_16Timer::handle (Event * e) [virtual]`

Reimplemented from `Mac802_16Timer` (p. 86).

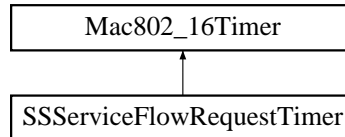
The documentation for this class was generated from the following files:

- `ns-2.28/mac/mac-802_16-timers.h`
- `ns-2.28/mac/mac-802_16-timers.cc`

## 4.46 SSServiceFlowRequestTimer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for SSServiceFlowRequestTimer::



### Public Member Functions

- SSServiceFlowRequestTimer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.46.1 Detailed Description

REQUEST timer..(per service-flow timer)

#### 4.46.2 Constructor & Destructor Documentation

- 4.46.2.1 SSServiceFlowRequestTimer::SSServiceFlowRequestTimer (Mac802\_16 \*  
m) [inline]

#### 4.46.3 Member Function Documentation

- 4.46.3.1 void SSServiceFlowRequestTimer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

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

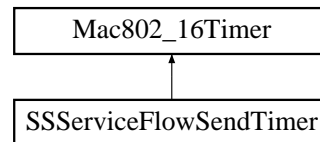
- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc



## 4.47 SSServiceFlowSendTimer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for SSServiceFlowSendTimer::



### Public Member Functions

- SSServiceFlowSendTimer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.47.1 Detailed Description

SEND timer..(per service-flow timer)

#### 4.47.2 Constructor & Destructor Documentation

- 4.47.2.1 SSServiceFlowSendTimer::SSServiceFlowSendTimer (Mac802\_16 \* m) [inline]

#### 4.47.3 Member Function Documentation

- 4.47.3.1 void SSServiceFlowSendTimer::handle (Event \* e) [virtual]

Reimplemented from Mac802\_16Timer (p. 86).

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

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.48 token\_timer\_list Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double `expiration_time`
- `tkptr` `next`
- int `cindex`
- int `findex`

### 4.48.1 Member Data Documentation

4.48.1.1 double `token_timer_list::expiration_time`

4.48.1.2 `tkptr` `token_timer_list::next`

4.48.1.3 int `token_timer_list::cindex`

4.48.1.4 int `token_timer_list::findex`

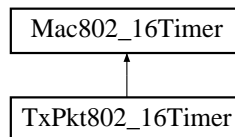
The documentation for this struct was generated from the following file:

- `ns-2.28/mac/hdr-802_16.h`

## 4.49 TxPkt802\_16Timer Class Reference

```
#include <mac-802_16-timers.h>
```

Inheritance diagram for TxPkt802\_16Timer::



### Public Member Functions

- TxPkt802\_16Timer (Mac802\_16 \*m)
- void handle (Event \*e)

#### 4.49.1 Constructor & Destructor Documentation

4.49.1.1 TxPkt802\_16Timer::TxPkt802\_16Timer (Mac802\_16 \* m) [inline]

#### 4.49.2 Member Function Documentation

4.49.2.1 void TxPkt802\_16Timer::handle (Event \* e) [virtual]

Send Timer

Reimplemented from Mac802\_16Timer (p. 86).

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

- ns-2.28/mac/mac-802\_16-timers.h
- ns-2.28/mac/mac-802\_16-timers.cc

## 4.50 up\_flow\_record Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- **flow\_classifier** classifier
- Packet \* **frag\_pkt**
- SchedType **sched\_type**
- PhsType **PHS\_profile**
- double **ginterval**
- u\_int32\_t **frag\_data**
- u\_int16\_t **flow\_id**
- u\_int16\_t **gsize**
- u\_int16\_t **seq\_num**
- u\_char **flag**
- double **latency**
- u\_int32\_t **min\_bw**
- double **last\_granttime**
- u\_int16\_t **backlogged**
- int16\_t **granted\_bw**

### 4.50.1 Detailed Description

This structure contains all the information excluding scheduling algorithm information about a SS at the BS node

## 4.50.2 Member Data Documentation

4.50.2.1 struct flow\_classifier up\_flow\_record::classifier

4.50.2.2 Packet\* up\_flow\_record::frag\_pkt

4.50.2.3 SchedType up\_flow\_record::sched\_type

4.50.2.4 PhsType up\_flow\_record::PHS\_profile

4.50.2.5 double up\_flow\_record::ginterval

4.50.2.6 u\_int32\_t up\_flow\_record::frag\_data

4.50.2.7 u\_int16\_t up\_flow\_record::flow\_id

4.50.2.8 u\_int16\_t up\_flow\_record::gsize

4.50.2.9 u\_int16\_t up\_flow\_record::seq\_num

4.50.2.10 u\_char up\_flow\_record::flag

4.50.2.11 double up\_flow\_record::latency

4.50.2.12 u\_int32\_t up\_flow\_record::min\_bw

4.50.2.13 double up\_flow\_record::last\_granttime

4.50.2.14 u\_int16\_t up\_flow\_record::backlogged

4.50.2.15 int16\_t up\_flow\_record::granted\_bw

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

- ns-2.28/mac/hdr-802\_16.h

## 4.51 upstream\_channel Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- double **data\_rate**
- double **prop\_delay**
- u\_int32\_t **max\_burst\_size**
- u\_int32\_t **overhead\_bytes**
- u\_char **physlots\_p\_minislot**

#### 4.51.1 Detailed Description

This structure defines all the user-configurable parameters for upstream channel

#### 4.51.2 Member Data Documentation

**4.51.2.1** double upstream\_channel::data\_rate

**4.51.2.2** double upstream\_channel::prop\_delay

**4.51.2.3** u\_int32\_t upstream\_channel::max\_burst\_size

**4.51.2.4** u\_int32\_t upstream\_channel::overhead\_bytes

**4.51.2.5** u\_char upstream\_channel::physlots\_p\_minislot

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

- ns-2.28/mac/hdr-802\_16.h

## 4.52 upstream\_flow\_record Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- **flow\_classifier** classifier
- **SchedType** sched\_type
- **PhsType** PHS\_profile
- **double** ginterval
- **double** latency
- **u\_int32\_t** min\_bw
- **u\_int16\_t** flow\_id
- **u\_int16\_t** gsize
- **u\_char** flag

### 4.52.1 Detailed Description

This structure defines attributes of an upstream service flow of a SS node

### 4.52.2 Member Data Documentation

4.52.2.1 **struct flow\_classifier** upstream\_flow\_record::classifier

4.52.2.2 **SchedType** upstream\_flow\_record::sched\_type

4.52.2.3 **PhsType** upstream\_flow\_record::PHS\_profile

4.52.2.4 **double** upstream\_flow\_record::ginterval

4.52.2.5 **double** upstream\_flow\_record::latency

4.52.2.6 **u\_int32\_t** upstream\_flow\_record::min\_bw

4.52.2.7 **u\_int16\_t** upstream\_flow\_record::flow\_id

4.52.2.8 **u\_int16\_t** upstream\_flow\_record::gsize

4.52.2.9 **u\_char** upstream\_flow\_record::flag

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

- ns-2.28/mac/hdr-802\_16.h

## 4.53 upstream\_sflow Struct Reference

```
#include <hdr-802_16.h>
```

### Public Attributes

- `upstream_flow_record` `upstream_record`
- `allocation_time` \* `alloc_list`
- `plist` `packet_list`
- `u_int16_t` `max_qsize`
- `Packet` \* `pkt`
- `Packet` \* `frag_pkt`
- `char` `debug`
- `double` `map_acktime`
- `double` `req_time`
- `double` `avg_queuing_delay`
- `u_int32_t` `queuing_samples`
- `double` `avg_req_stime`
- `double` `enqueue_time`
- `u_int32_t` `num_delay_samples`
- `u_int32_t` `curr_gsize`
- `u_int32_t` `num_pkt_snt`
- `u_int32_t` `drop_count`
- `u_int32_t` `seq_num`
- `u_int32_t` `frag_data`
- `double` `last_mfrtime`
- `u_int32_t` `avg_pkts`
- `u_int32_t` `avg_bytes`
- `u_int32_t` `num_bytes`
- `u_int32_t` `num_pkts`
- `u_int32_t` `SID_num_sent_bytes`
- `u_int32_t` `SID_num_sent_pkts`
- `u_int32_t` `avg_slotspermap`
- `u_int32_t` `totalACKs`
- `u_int32_t` `totalACKsFiltered`
- `u_int32_t` `total_piggyreq`
- `u_int32_t` `total_creq`
- `u_int32_t` `total_fcoll`
- `u_int32_t` `avg_fcont`
- `u_int32_t` `fcont_count`
- `u_int32_t` `total_collision_drops`
- `u_int32_t` `total_queue_drops`
- `int` `bs_addr`
- `u_int16_t` `max_concat_threshold`
- `u_char` `state`
- `u_int32_t` `bk_offwin`
- `u_int32_t` `bk_offcounter`
- `u_int32_t` `bk_offend`
- `u_int32_t` `bk_offstart`
- `u_char` `num_retries`



- 
- `u_char max_retries`
  - `u_char contention_on`
  - `u_char pending`
  - Event `intr`
  - Event `rintr`
  - `double ugsjitter`
  - `int jitterSamples`
  - `double last_granttime`
  - `double nominal_alloctime`
  - `double last_jittercaltime`
  - `double acceptance_rate`
  - `double prev_acceptance_rate`
  - `float wt_factor`
  - `u_int32_t num_slots_req`
  - `double tokens_`
  - `double rate_`
  - `int bucket_`
  - `double lastupdatetime_`
  - `int init_`
  - `char ratecontrol`
  - `int totalPacketsInConcatFrames`
  - `int totalConcatFrames`
  - `int not_requested_pkts`
  - `u_int16_t aggreginterval`
  - `u_int16_t req_counter`

### 4.53.1 Member Data Documentation

4.53.1.1 struct upstream\_flow\_record upstream\_sflow::upstream\_record

4.53.1.2 struct allocation\_time\* upstream\_sflow::alloc\_list

4.53.1.3 plist upstream\_sflow::packet\_list

4.53.1.4 u\_int16\_t upstream\_sflow::max\_qsize

4.53.1.5 Packet\* upstream\_sflow::pkt

4.53.1.6 Packet\* upstream\_sflow::frag\_pkt

4.53.1.7 char upstream\_sflow::debug

4.53.1.8 double upstream\_sflow::map\_acktime

4.53.1.9 double upstream\_sflow::req\_time

4.53.1.10 double upstream\_sflow::avg\_queuing\_delay

4.53.1.11 u\_int32\_t upstream\_sflow::queuing\_samples

4.53.1.12 double upstream\_sflow::avg\_req\_stime

4.53.1.13 double upstream\_sflow::enqueue\_time

4.53.1.14 u\_int32\_t upstream\_sflow::num\_delay\_samples

4.53.1.15 u\_int32\_t upstream\_sflow::curr\_gsize

4.53.1.16 u\_int32\_t upstream\_sflow::num\_pkt\_snt

4.53.1.17 u\_int32\_t upstream\_sflow::drop\_count

4.53.1.18 u\_int32\_t upstream\_sflow::seq\_num

4.53.1.19 u\_int32\_t upstream\_sflow::frag\_data

4.53.1.20 double upstream\_sflow::last\_mfrtime

4.53.1.21 u\_int32\_t upstream\_sflow::avg\_pkts

4.53.1.22 u\_int32\_t upstream\_sflow::avg\_bytes

4.53.1.23 u\_int32\_t upstream\_sflow::num\_bytes

4.53.1.24 u\_int32\_t upstream\_sflow::num\_pkts

4.53.1.25 u\_int32\_t upstream\_sflow::SID\_num\_sent\_bytes

4.53.1.26 u\_int32\_t upstream\_sflow::SID\_num\_sent\_pkts

~~4.53.1.27 u\_int32\_t upstream\_sflow::avg\_slotspermap~~

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4.53.1.28 u\_int32\_t upstream\_sflow::totalACKs

4.53.1.29 u\_int32\_t upstream\_sflow::totalACKsFiltered

4.53.1.30 u\_int32\_t upstream\_sflow::total\_piggyreq

- ns-2.28/mac/hdr-802\_16.h



# Chapter 5

## WiMAX File Documentation

### 5.1 ns-2.28/mac/hdr-802\_16.h File Reference

```
#include <arp.h>
#include <connector.h>
#include <delay.h>
#include <ll.h>
#include <mac.h>
#include "mac-802_16-timers.h"
#include <marshall.h>
#include <packet.h>
#include <queue.h>
#include <random.h>
```

#### Classes

- struct **mac802\_16\_frame\_hdr**
- struct **mac802\_16\_extended\_header\_element**
- struct **hdr\_mac802\_16**
- struct **hdr\_mac802\_16extd**
- struct **hdr\_mac802\_16mgmt**
- struct **hdr\_mac802\_16map**

*802\_16 map packet header*

- struct **pnode**
- struct **flow\_classifier**
- struct **allocation\_time**
- struct **downstream\_flow\_record**
- struct **upstream\_flow\_record**
- struct **upstream\_channel**
- struct **downstream\_channel**
- struct **up\_flow\_record**

- struct `ss_record`
- struct `mgmt_conf_param`
- struct `map_conf_param`
- struct `bs_conf_param`
- struct `bs_statistics`
- struct `job`
- struct `map_list`
- struct `token_timer_list`
- struct `bsqnode`
- struct `bs_snd_timer_list`
- struct `active_flows`
- struct `priority_array`
- struct `snd_timer_list`
- struct `req_timer_list`
- struct `upstream_sflow`
- struct `downstream_sflow`

## Defines

- #define `EPSILON` 0.00000000000005
- #define `UPSTREAM` 0
- #define `DOWNSTREAM` 1
- #define `OFF` 0
- #define `ON` 1
- #define `BROADCAST_SID` 1
- #define `DATA_PKT` 0
- #define `MGMT_PKT` 1
- #define `SUPRESS_ALL_SIZE` 100
- #define `SUPRESS_TCPIP_SIZE` 40
- #define `SUPRESS_UDPIP_SIZE` 28
- #define `SUPRESS_MAC_SIZE` 28
- #define `DATA_GRANT` 0
- #define `UREQ_GRANT` 1
- #define `CONTENTION_GRANT` 2
- #define `SM_GRANT` 3
- #define `ETHER_HDR_LEN` ((ETHER\_ADDR\_LEN << 1) + ETHER\_TYPE\_LEN)
- #define `MAC802_16_HDR_LEN` 6
- #define `MAX_NUM_IE` 240
- #define `MAX_GRANT` 255
- #define `MAX_RETRY` 10
- #define `SIZE_MGMT_HDR` 24
- #define `SIZE_MAP_HDR` 4
- #define `MANAGEMENT_MSG_PAYLOAD_SIZE` 5
- #define `NUM_EXTENDED_HDR_ELEMENTS` 2
- #define `MAX_NUM_DOWNFLOWS_PERSS` 10
- #define `MAX_NUM_UPFLOWS_PERSS` 10
- #define `NUM_802_16_LANS` 5
- #define `MAX_NUM_SS_NODES` 500
- #define `MAX_NUM_RETRIES` 15

- #define FRAG\_ENABLE\_BIT 8
- #define CONCAT\_ENABLE\_BIT 7
- #define FRAG\_ON\_BIT 6
- #define CONCAT\_ON\_BIT 5
- #define PIGGY\_ENABLE\_BIT 4
- #define NO\_PIGGY\_BIT 3
- #define PIGGY\_NOT\_SEND 2
- #define CONCAT\_THRESHOLD 1
- #define QUEUE\_THRESHOLD 25
- #define UGSSTATES 4
- #define RTPOLLSTATES 6
- #define ERT POLLSTATES 5
- #define NRTPOLLSTATES 7
- #define BEFFORTSTATES 8
- #define DOWNSTATES 4
- #define UGS\_IDLE 0
- #define UGS\_DECISION 1
- #define UGS\_TOSEND 2
- #define UGS\_WAITFORMAP 3
- #define RTPOLL\_IDLE 0
- #define RTPOLL\_DECISION 1
- #define RTPOLL\_TOSEND 2
- #define RTPOLL\_WAITFORMAP 3
- #define RTPOLL\_TOSENDREQ 4
- #define RTPOLL\_REQSENT 5
- #define ERT POLL\_IDLE 0
- #define ERT POLL\_DECISION 1
- #define ERT POLL\_TOSEND 2
- #define ERT POLL\_WAITFORMAP 3
- #define ERT POLL\_TOSENDREQ 4
- #define NRTPOLL\_IDLE 0
- #define NRTPOLL\_DECISION 1
- #define NRTPOLL\_TOSEND 2
- #define NRTPOLL\_WAITFORMAP 3
- #define NRTPOLL\_TOSENDREQ 4
- #define NRTPOLL\_REQSENT 5
- #define NRTPOLL\_CONTENTION 6
- #define BEFFORT\_IDLE 0
- #define BEFFORT\_DECISION 1
- #define BEFFORT\_TOSEND 2
- #define BEFFORT\_WAITFORMAP 3
- #define BEFFORT\_TOSENDREQ 4
- #define BEFFORT\_REQSENT 5
- #define BEFFORT\_CONTENTION 6
- #define BEFFORT\_RATECHECK 7
- #define DOWN\_IDLE 0
- #define DOWN\_DECISION 1
- #define DOWN\_TOSEND 2
- #define DOWN\_WAITFORMAP 3
- #define T16\_TIMER 1

## Typedefs

- typedef **pnode** \* **plist**
- typedef **allocation\_time** \* **aptr**
- typedef **job** \* **jptr**
- typedef **map\_list** \* **mapptr**
- typedef **token\_timer\_list** \* **tkptr**
- typedef **bsqnode** \* **qlist**
- typedef **bs\_snd\_timer\_list** \* **bs\_sptr**
- typedef **active\_flows** \* **acflows\_ptr**
- typedef **priority\_array** \* **priority\_array\_p**
- typedef **snd\_timer\_list** \* **sptr**
- typedef **req\_timer\_list** \* **rptr**

## Enumerations

- enum **SchedType** {  
**UGS** = 0x0000, **RT\_POLL** = 0x0001, **ERT\_POLL** = 0x0002, **NRT\_POLL** = 0x0003,  
**BEST\_EFFORT** = 0x0004 }
- enum **PhsType** {  
**SUPRESS\_ALL** = 0x0000, **SUPRESS\_TCPIP** = 0x0001, **SUPRESS\_UDPIP** =  
0x0002, **SUPRESS\_MAC** = 0x0003,  
**NO\_SUPRESSION** = 0x0004 }
- enum **EventType** {  
**PKT\_ARRIVAL** = 0x0000, **MAP\_ARRIVAL** = 0x0001, **SEND\_TIMER** = 0x0002,  
**REQ\_TIMER** = 0x0003,  
**SEND\_PKT** = 0x0004, **SEND\_UREQ** = 0x0006, **CONTENTION\_ON** = 0x0007,  
**CONTENTION\_SLOTS** = 0x0008,  
**CONTENTION\_BKOFF** = 0x0009, **UNLOCK\_QUEUE** = 0x00010,  
**PIGGYBACK\_REQ** = 0x00011 }

### 5.1.1 Detailed Description

This file contains:

- the 802\_16 frame formats (i.e., headers)
- the map structure
- the upstream flow table structure
- All global enum and defines needed by the code



## 5.1.2 Define Documentation

5.1.2.1 `#define BEFFORT_CONTENTION 6`

5.1.2.2 `#define BEFFORT_DECISION 1`

5.1.2.3 `#define BEFFORT_IDLE 0`

5.1.2.4 `#define BEFFORT_RATECHECK 7`

5.1.2.5 `#define BEFFORT_REQSENT 5`

5.1.2.6 `#define BEFFORT_TOSEND 2`

5.1.2.7 `#define BEFFORT_TOSENDREQ 4`

5.1.2.8 `#define BEFFORT_WAITFORMAP 3`

5.1.2.9 `#define BEFFORTSTATES 8`

5.1.2.10 `#define BROADCAST_SID 1`

5.1.2.11 `#define CONCAT_ENABLE_BIT 7`

5.1.2.12 `#define CONCAT_ON_BIT 5`

5.1.2.13 `#define CONCAT_THRESHOLD 1`

5.1.2.14 `#define CONTENTION_GRANT 2`

5.1.2.15 `#define DATA_GRANT 0`

5.1.2.16 `#define DATA_PKT 0`

5.1.2.17 `#define DOWN_DECISION 1`

5.1.2.18 `#define DOWN_IDLE 0`

5.1.2.19 `#define DOWN_TOSEND 2`

5.1.2.20 `#define DOWN_WAITFORMAP 3`

5.1.2.21 `#define DOWNSTATES 4`

5.1.2.22 `#define DOWNSTREAM 1`

5.1.2.23 `#define EPSILON 0.0000000000005`

5.1.2.24 `#define ERTPOLL_DECISION 1`

5.1.2.25 `#define ERTPOLL_IDLE 0`

5.1.2.26 `#define ERTPOLL_TOSEND 2`

5.1.2.27 `#define ERTPOLL_TOSENDREQ 4`

---

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5.1.2.28 `#define ERTPOLL_WAITFORMAP 3`

5.1.2.29 `#define ERTPOLLSTATES 5`

5.1.2.30 `#define ETHER_HDR_LEN ((ETHER_ADDR_LEN << 1) + ETHER_TYPE_LEN)`

5.1.3.2 typedef struct allocation\_time\* aptr

5.1.3.3 typedef struct bs\_snd\_timer\_list\* bs\_sptr

5.1.3.4 typedef struct job\* jptr

Scheduling algorithm data structures

5.1.3.5 typedef struct map\_list\* mapptr

5.1.3.6 typedef struct pnode\* plist

5.1.3.7 typedef struct priority\_array\* priority\_array\_p

5.1.3.8 typedef struct bsqnode\* qlist

Packet queue structure

5.1.3.9 typedef struct req\_timer\_list\* rptr

5.1.3.10 typedef struct snd\_timer\_list\* sptr

5.1.3.11 typedef struct token\_timer\_list\* tkptr

List of token timer requests

## 5.1.4 Enumeration Type Documentation

### 5.1.4.1 enum EventType

Enumerator:

*PKT\_ARRIVAL*

*MAP\_ARRIVAL*

*SEND\_TIMER*

*REQ\_TIMER*

*SEND\_PKT*

*SEND\_UREQ*

*CONTENTION\_ON*

*CONTENTION\_SLOTS*

*CONTENTION\_BKOFF*

*UNLOCK\_QUEUE*

*PIGGYBACK\_REQ*

#### 5.1.4.2 enum PhsType

Enumerator:

*SUPRESS\_ALL*  
*SUPRESS\_TCPIP*  
*SUPRESS\_UDPIP*  
*SUPRESS\_MAC*  
*NO\_SUPPRESSION*

#### 5.1.4.3 enum SchedType

Enumerator:

*UGS*  
*RT\_POLL*  
*ERT\_POLL*  
*NRT\_POLL*  
*BEST\_EFFORT*

## 5.2 ns-2.28/mac/mac-802\_16-base.cc File Reference

```
#include "mac-802_16.h"  
#include "mobilenode.h"
```

### 5.2.1 Detailed Description

This file contains methods for the base **Mac802\_16** (p. 36) class.

## 5.3 ns-2.28/mac/mac-802\_16-bs.cc File Reference

```
#include "mac-802_16.h"  
#include "random.h"  
#include "math.h"  
#include "ping.h"
```

### Classes

- class `Mac802_16EHeaderClass`
- class `Mac802_16HeaderClass`
- class `Mac802_16MHeaderClass`
- class `Mac802_16MapHeaderClass`
- class `Mac802_16BsClass`

### Defines

- `#define FLOW_ID 0`
- `#define SS_ID 0`
- `#define DUMPBSMAP 0`
- `#define FILLWITHCONTOPS 0`
- `#define SHORT_STATS 1`

### Functions

- `int compare_priority (const void *a, const void *b)`

### Variables

- `int lan_num`
- `Mac802_16BS * bs_arr [NUM_802_16_LANS]`
- `Mac802_16EHeaderClass class_hdr_mac802_16extd`
- `Mac802_16HeaderClass class_hdr_mac802_16`
- `Mac802_16MHeaderClass class_hdr_mac802_16mgmt`
- `Mac802_16MapHeaderClass class_hdr_mac802_16map`
- `Mac802_16BsClass class_mac_802_16bs`
- `Mac802_16BS * global_compare_obj`

#### 5.3.1 Detailed Description

This file contains the BS object class method implementations.

## 5.3.2 Define Documentation

5.3.2.1 `#define DUMPBSMAP 0`

5.3.2.2 `#define FILLWITHCONTOPS 0`

5.3.2.3 `#define FLOW_ID 0`

5.3.2.4 `#define SHORT_STATS 1`

5.3.2.5 `#define SS_ID 0`

## 5.3.3 Function Documentation

5.3.3.1 `int compare_priority (const void * a, const void * b)`

## 5.3.4 Variable Documentation

5.3.4.1 `Mac802_16BS* bs_arr[NUM_802_16_LANS]`

5.3.4.2 `Mac802_16HeaderClass class_hdr_mac802_16 [static]`

`Mac802_16HeaderClass` (p. 65) class

5.3.4.3 `Mac802_16EHeaderClass class_hdr_mac802_16extd [static]`

`Mac802_16EHeaderClass` (p. 64) class

5.3.4.4 `Mac802_16MapHeaderClass class_hdr_mac802_16map [static]`

`Mac802_16MHeaderClass` (p. 67) class

5.3.4.5 `Mac802_16MHeaderClass class_hdr_mac802_16mgmt [static]`

`Mac802_16MHeaderClass` (p. 67) class

5.3.4.6 `Mac802_16BsClass class_mac_802_16bs [static]`

TCL Hooks for the simulator

5.3.4.7 `Mac802_16BS* global_compare_obj`

5.3.4.8 `int lan_num`

## 5.4 ns-2.28/mac/mac-802\_16-FSM.cc File Reference

```
#include "mac-802_16.h"
```

### Defines

- `#define ACK_SUPPRESSION 0`
- `#define DUMPSSMAP 0`
- `#define DUMPSSID 0`
- `#define US_RATE_CONTROL 1`

### 5.4.1 Detailed Description

This file contains implementation of state machines for the three types of service-flows

### 5.4.2 Define Documentation

5.4.2.1 `#define ACK_SUPPRESSION 0`

5.4.2.2 `#define DUMPSSID 0`

5.4.2.3 `#define DUMPSSMAP 0`

5.4.2.4 `#define US_RATE_CONTROL 1`

## 5.5 ns-2.28/mac/mac-802\_16-ss.cc File Reference

```
#include "mac-802_16.h"
#include "random.h"
#include <stdio.h>
#include "ping.h"
```

### Classes

- class `Mac802_16SSClass`

### Defines

- `#define US_RATE_CONTROL 1`
- `#define SHORT_STATS 1`
- `#define SET_RX_STATE(x)`
- `#define SET_TX_STATE(x)`

### Variables

- int `lan_num`
- `Mac802_16BS * bs_arr [NUM_802_16_LANS]`
- `Mac802_16SSClass class_mac_802_16ss`

#### 5.5.1 Detailed Description

This file contains the SS object class method implementations

#### 5.5.2 Define Documentation

##### 5.5.2.1 `#define SET_RX_STATE(x)`

**Value:**

```
{
    rx_state_ = (x);
}
```

##### 5.5.2.2 `#define SET_TX_STATE(x)`

**Value:**

```
{
    tx_state_ = (x);
}
```



5.5.2.3 `#define SHORT_STATS 1`

5.5.2.4 `#define US_RATE_CONTROL 1`

### 5.5.3 Variable Documentation

5.5.3.1 `Mac802_16BS* bs_arr[NUM_802_16_LANS]`

5.5.3.2 `Mac802_16SSClass class_mac_802_16ss [static]`

TCL Hooks for the simulator

5.5.3.3 `int lan_num`

## 5.6 ns-2.28/mac/mac-802\_16-timers.cc File Reference

```
#include "mac-802_16.h"  
#include "mac-802_16-timers.h"
```

### 5.6.1 Detailed Description

This file contains c++ methods for implementing various timer classes

## 5.7 ns-2.28/mac/mac-802\_16-timers.h File Reference

### Classes

- class **Mac802\_16Timer**
- class **RxPkt802\_16Timer**
- class **TxPkt802\_16Timer**
- class **BsTxPkt802\_16Timer**
- class **Map802\_16Timer**
- class **BsUcd802\_16Timer**
- class **BsRng802\_16Timer**
- class **BsSync802\_16Timer**
- class **BsToken802\_16Timer**
- class **BsServiceFlowSendTimer**
- class **BsUplinkSchedWindowTimer**
- class **SSRng802\_16Timer**
- class **SSServiceFlowSendTimer**
- class **SSServiceFlowRequestTimer**

### 5.7.1 Detailed Description

This file contains Timer class definitions.

## 5.8 ns-2.28/mac/mac-802\_16.h File Reference

```
#include "hdr-802_16.h"
```

### Classes

- class `Mac802_16`
- class `Mac802_16BS`
- class `Mac802_16SS`

### Defines

- `#define SET_RX_STATE(x)`
- `#define SET_TX_STATE(x)`
- `#define UP_HIGH_QUEUE 0`
- `#define UP_INTERM_QUEUE 1`
- `#define UP_LOW_QUEUE 2`
- `#define DOWN_UGS_QUEUE 3`
- `#define DOWN_RT_QUEUE 4`
- `#define DOWN_ERT_QUEUE 5`
- `#define DOWN_NRT_QUEUE 6`
- `#define DOWN_BE_QUEUE 7`

#### 5.8.1 Detailed Description

This file contains SS and BS class definitions. Both of these classes are derived from an abstract base class

#### 5.8.2 Define Documentation

**5.8.2.1** `#define DOWN_BE_QUEUE 7`

**5.8.2.2** `#define DOWN_ERT_QUEUE 5`

**5.8.2.3** `#define DOWN_NRT_QUEUE 6`

**5.8.2.4** `#define DOWN_RT_QUEUE 4`

**5.8.2.5** `#define DOWN_UGS_QUEUE 3`

**5.8.2.6** `#define SET_RX_STATE(x)`

**Value:**

```
{
    rx_state_ = (x);
}
```

**5.8.2.7 #define SET\_TX\_STATE(x)****Value:**

```
{          \
    tx_state_ = (x);      \
}
```

**5.8.2.8 #define UP\_HIGH\_QUEUE 0****5.8.2.9 #define UP\_INTERM\_QUEUE 1****5.8.2.10 #define UP\_LOW\_QUEUE 2**

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