

swe1d

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# Chapter 1

## Hierarchical Index

### 1.1 Class Hierarchy

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## Chapter 2

# Class Index

### 2.1 Class List

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<a href="#">scenarios::DamBreak</a>	9
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## Chapter 3

# File Index

### 3.1 File List

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CxxTests/ <b>FWave_testsuite.t.h</b>	??
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## Chapter 4

# Class Documentation

### 4.1 tools::Args Class Reference

```
#include <args.h>
```

#### Public Member Functions

- **Args** (int argc, char \*\*argv)
- unsigned int **size** ()
- unsigned int **timeSteps** ()
- unsigned int **scenario** ()

#### 4.1.1 Detailed Description

Parse command line arguments

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

- [src/tools/args.h](#)

### 4.2 writer::ConsoleWriter Class Reference

```
#include <ConsoleWriter.h>
```

#### Public Member Functions

- **ConsoleWriter** (std::ostream &ostream=std::cout)
- void [write](#) (const T time, const T \*h, const T \*hu, unsigned int size)

#### 4.2.1 Detailed Description

A simple writer class, that writes h and hu to stdout (or another ostream)

#### 4.2.2 Member Function Documentation

4.2.2.1 `void writer::ConsoleWriter::write( const T time, const T * h, const T * hu, unsigned int size )` `[inline]`

Writes all values (without boundary values) to the ostream

## Parameters

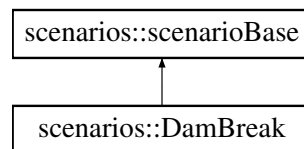
<i>size</i>	Number of cells (without boundary values)
-------------	---

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

- src/writer/[ConsoleWriter.h](#)

## 4.3 scenarios::DamBreak Class Reference

Inheritance diagram for scenarios::DamBreak:



### Public Member Functions

- [DamBreak](#) (unsigned int *size*)
- T [getHeight](#) (unsigned int *pos*)
- T [getMomentum](#) (unsigned int *pos*)
- T [getCellSize](#) ()

### Additional Inherited Members

#### 4.3.1 Constructor & Destructor Documentation

4.3.1.1 scenarios::DamBreak::DamBreak ( unsigned int *size* ) `[inline]`

Constructor for the scenario

## Parameters

<i>size</i>	The amount of cells which are simulated
-------------	---

#### 4.3.2 Member Function Documentation

4.3.2.1 T scenarios::DamBreak::getCellSize ( ) `[inline], [virtual]`

## Returns

Cell size of one cell (= domain size/number of cells)

Reimplemented from [scenarios::scenarioBase](#).

4.3.2.2 T scenarios::DamBreak::getHeight ( unsigned int *pos* ) `[inline], [virtual]`

## Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

## Returns

Initial water height at *pos*

Reimplemented from [scenarios::scenarioBase](#).

4.3.2.3 `T scenarios::DamBreak::getMomentum ( unsigned int pos ) [inline],[virtual]`

## Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

## Returns

Initial Momentum

Reimplemented from [scenarios::scenarioBase](#).

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

- [src/scenarios/dambreak.h](#)

## 4.4 solver::FWave< T > Class Template Reference

```
#include <FWave.hpp>
```

### Public Member Functions

- [FWave](#) ()
- void [computeNetUpdates](#) (T *i\_h\_l*, T *i\_h\_r*, T *i\_hu\_l*, T *i\_hu\_r*, T *i\_b\_l*, T *i\_b\_r*, T &*o\_h\_l*, T &*o\_h\_r*, T &*o\_hu\_l*, T &*o\_hu\_r*, T &*o\_max\_ws*)

#### 4.4.1 Detailed Description

```
template<typename T>class solver::FWave< T >
```

Simple solver used to compute net updates for a given set of height, momentum and bathymetry values

#### 4.4.2 Constructor & Destructor Documentation

4.4.2.1 `template<typename T> solver::FWave< T >::FWave ( ) [inline]`

The default constructor just setting gravity

#### 4.4.3 Member Function Documentation

4.4.3.1 `template<typename T> void solver::FWave< T >::computeNetUpdates ( T i_h_l, T i_h_r, T i_hu_l, T i_hu_r, T i_b_l, T i_b_r, T &o_h_l, T &o_h_r, T &o_hu_l, T &o_hu_r, T &o_max_ws ) [inline]`

Computes the next timesteps net updates



## Parameters

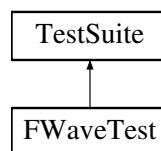
<i>i_h_l</i>	the height on the left cell of the edge
<i>i_h_r</i>	the height on the right cell of the edge
<i>i_hu_l</i>	the momentum on the left cell of the edge
<i>i_hu_r</i>	the momentum on the right cell of the edge
<i>i_b_l</i>	the bathymetry on the left cell of the edge
<i>i_b_r</i>	the bathymetry on the right cell of the edge
<i>o_h_l</i>	output: the height update for the left cell
<i>o_h_r</i>	output: the height update for the right cell
<i>o_hu_l</i>	output: the momentum update for the left cell
<i>o_hu_r</i>	output: the momentum update for the right cell
<i>o_max_wd</i>	output: the maximum wavespeed (which is the maximum of the left and right wave speed)

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

- submodules/solver/FWave.hpp

## 4.5 FWaveTest Class Reference

Inheritance diagram for FWaveTest:



### Public Member Functions

- void [test\\_steady\\_states](#) (void)
- void [test\\_both\\_lamda\\_pos\\_neg](#) (void)

#### 4.5.1 Member Function Documentation

##### 4.5.1.1 void FWaveTest::test\_both\_lamda\_pos\_neg ( void ) [inline]

Tests correctness for  $[\text{Lambda}1 < 0 \ \&\& \ \text{Lambda}2 < 0]$  and  $[\text{Lambda}1 > 0 \ \&\& \ \text{Lambda}2 > 0]$

##### 4.5.1.2 void FWaveTest::test\_steady\_states ( void ) [inline]

Tests 10000 steady states

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

- CxxTests/FWave\_testsuite.t.h

## 4.6 tools::Logger Class Reference

### Public Types

- enum **Level** { **INFO**, **WARNING**, **ERROR** }

## Public Member Functions

- void **setOutputStream** (std::ostream &output)
- void **log** (std::string &message, Level level=INFO)
- void **log** (const char \*message, Level level=INFO)
- void **info** (std::string &message)
- void **info** (const char \*message)
- std::ostream & **info** ()
- void **warning** (std::string &message)
- void **warning** (const char \*message)
- std::ostream & **warning** ()
- void **error** (std::string &message)
- void **error** (const char \*message)
- template<typename T >  
[Logger](#) & **operator<<** (T value)
- [Logger](#) & **operator<<** (std::ostream &(\*func)(std::ostream &))

## Static Public Attributes

- static [Logger](#) **logger**

### 4.6.1 Member Function Documentation

#### 4.6.1.1 template<typename T > [Logger](#)& tools::Logger::operator<< ( T value ) [inline]

Can be used to print arbitrary info messages. Does not append std::endl.

#### 4.6.1.2 [Logger](#)& tools::Logger::operator<< ( std::ostream &(\*)(std::ostream &) func ) [inline]

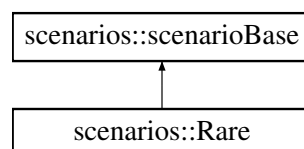
Allow to print std::endl

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

- src/tools/[logger.h](#)
- src/tools/[logger.cpp](#)

## 4.7 scenarios::Rare Class Reference

Inheritance diagram for scenarios::Rare:



## Public Member Functions

- [Rare](#) (unsigned int size)
- T [getHeight](#) (unsigned int pos)
- T [getMomentum](#) (unsigned int pos)

## Additional Inherited Members

### 4.7.1 Constructor & Destructor Documentation

#### 4.7.1.1 scenarios::Rare::Rare ( unsigned int *size* ) [inline]

Constructor for the scenario

Parameters

<i>size</i>	The amount of cells which are simulated
-------------	---

### 4.7.2 Member Function Documentation

#### 4.7.2.1 T scenarios::Rare::getHeight ( unsigned int *pos* ) [inline],[virtual]

Returns the initial height at a given cell

Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

Returns

The height of the specified cell

Reimplemented from [scenarios::scenarioBase](#).

#### 4.7.2.2 T scenarios::Rare::getMomentum ( unsigned int *pos* ) [inline],[virtual]

Returns the initial momentum at a given cell

Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

Returns

The momentum at the specified cell

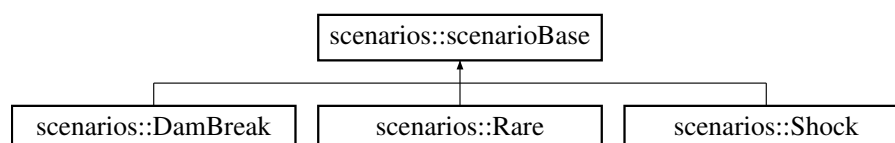
Reimplemented from [scenarios::scenarioBase](#).

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

- src/scenarios/rare.h

## 4.8 scenarios::scenarioBase Class Reference

Inheritance diagram for scenarios::scenarioBase:



## Public Member Functions

- [scenarioBase](#) (unsigned int size)
- virtual T [getHeight](#) (unsigned int pos)
- virtual T [getMomentum](#) (unsigned int pos)
- virtual T [getCellSize](#) ()

## Protected Attributes

- const unsigned int [m\\_size](#)

### 4.8.1 Constructor & Destructor Documentation

#### 4.8.1.1 `scenarios::scenarioBase::scenarioBase ( unsigned int size ) [inline]`

Constructor for the scenario

Parameters

<i>size</i>	The amount of cells which are simulated
-------------	---

### 4.8.2 Member Function Documentation

#### 4.8.2.1 `virtual T scenarios::scenarioBase::getCellSize ( ) [inline],[virtual]`

Returns the width of each cell

Returns

Width of one cell

Reimplemented in [scenarios::DamBreak](#).

#### 4.8.2.2 `virtual T scenarios::scenarioBase::getHeight ( unsigned int pos ) [inline],[virtual]`

Returns the initial height at a given cell

Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

Returns

The height of the specified cell

Reimplemented in [scenarios::DamBreak](#), [scenarios::Shock](#), and [scenarios::Rare](#).

#### 4.8.2.3 `virtual T scenarios::scenarioBase::getMomentum ( unsigned int pos ) [inline],[virtual]`

Returns the initial momentum at a given cell

Parameters

---

<i>pos</i>	The index of the cell
------------	-----------------------

**Returns**

The momentum at the specified cell

Reimplemented in [scenarios::DamBreak](#), [scenarios::Shock](#), and [scenarios::Rare](#).

**4.8.3 Member Data Documentation****4.8.3.1** `const unsigned int scenarios::scenarioBase::m_size` `[protected]`

Number of cells

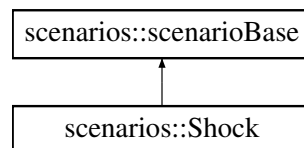
The documentation for this class was generated from the following file:

- `src/scenarios/scenario.h`

**4.9 scenarios::Shock Class Reference**

```
#include <schock.h>
```

Inheritance diagram for scenarios::Shock:

**Public Member Functions**

- [Shock](#) (unsigned int size)
- T [getHeight](#) (unsigned int pos)
- T [getMomentum](#) (unsigned int pos)

**Additional Inherited Members****4.9.1 Detailed Description**

This class offers the setup for a shock-shock scenario. The water walls are located at the outer sides (facing inwards) with a distance of one quarter of the whole amount of cells to the edges

**4.9.2 Constructor & Destructor Documentation****4.9.2.1** `scenarios::Shock::Shock ( unsigned int size )` `[inline]`

Constructor for the scenario

## Parameters

<i>size</i>	The amount of cells which are simulated
-------------	---

### 4.9.3 Member Function Documentation

#### 4.9.3.1 T scenarios::Shock::getHeight ( unsigned int *pos* ) [inline],[virtual]

Returns the initial height at a given cell

## Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

## Returns

The height of the specified cell

Reimplemented from [scenarios::scenarioBase](#).

#### 4.9.3.2 T scenarios::Shock::getMomentum ( unsigned int *pos* ) [inline],[virtual]

Returns the initial momentum at a given cell

## Parameters

<i>pos</i>	The index of the cell
------------	-----------------------

## Returns

The momentum at the specified cell

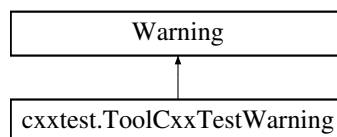
Reimplemented from [scenarios::scenarioBase](#).

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

- src/scenarios/schock.h

## 4.10 cxxtest.ToolCxxTestWarning Class Reference

Inheritance diagram for cxxtest.ToolCxxTestWarning:



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

- site\_scons/site\_tools/cxxtest.py

## 4.11 writer::VtkWriter Class Reference

```
#include <VtkWriter.h>
```

## Public Member Functions

- **VtkWriter** (const std::string &basename="swe1d", const T cellSize=1)
- void [write](#) (const T time, const T \*h, const T \*hu, unsigned int size)

### 4.11.1 Detailed Description

A writer class that generates vtk files

### 4.11.2 Member Function Documentation

4.11.2.1 void writer::VtkWriter::write ( const T *time*, const T \* *h*, const T \* *hu*, unsigned int *size* ) `[inline]`

Writes all values to vtk file

Parameters

<i>size</i>	Number of cells (without boundary values)
-------------	---

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

- src/writer/[VtkWriter.h](#)

## 4.12 WavePropagation Class Reference

```
#include <WavePropagation.h>
```

## Public Member Functions

- [WavePropagation](#) (T \*h, T \*hu, unsigned int size, T cellSize)
- T [computeNumericalFluxes](#) ()
- void [updateUnknowns](#) (T dt)
- void [setOutflowBoundaryConditions](#) ()

### 4.12.1 Detailed Description

Allocated variables: unknowns h,hu are defined on grid indices [0,..,n+1] (done by the caller) -> computational domain is [1,..,nx] -> plus ghost cell layer

net-updates are defined for edges with indices [0,..,n]

A left/right net update with index (i-1) is located on the edge between cells with index (i-1) and (i):

```
*   (i-1)   *   (i)   *
```

```

*
***
*****
*
*
```

```

NetUpdatesLeft (i-1)
    or
NetUpdatesRight (i-1)
```

## 4.12.2 Constructor & Destructor Documentation

### 4.12.2.1 WavePropagation::WavePropagation ( T \* *h*, T \* *hu*, unsigned int *size*, T *cellSize* ) [inline]

#### Parameters

<i>size</i>	Domain size (= number of cells) without ghost cells
<i>cellSize</i>	Size of one cell

## 4.12.3 Member Function Documentation

### 4.12.3.1 T WavePropagation::computeNumericalFluxes ( )

Computes the net-updates from the unknowns

#### Returns

The maximum possible time step

### 4.12.3.2 void WavePropagation::setOutflowBoundaryConditions ( )

Updates *h* and *hu* according to the outflow condition to both boundaries

### 4.12.3.3 void WavePropagation::updateUnknowns ( T *dt* )

Update the unknowns with the already computed net-updates

#### Parameters

<i>dt</i>	Time step size
-----------	----------------

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

- [src/WavePropagation.h](#)
- [src/WavePropagation.cpp](#)



## Chapter 5

# File Documentation

### 5.1 src/main.cpp File Reference

```
#include "types.h"
#include "WavePropagation.h"
#include "writer/ConsoleWriter.h"
#include "writer/VtkWriter.h"
#include "tools/args.h"
#include <cstring>
```

#### Functions

- int **main** (int argc, char \*\*argv)

#### 5.1.1 Detailed Description

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### Author

Sebastian Rettenberger [rettenbs@in.tum.de](mailto:rettenbs@in.tum.de)

## 5.2 src/scenarios/dambreak.h File Reference

```
#include "../types.h"
#include "scenario.h"
```

### Classes

- class [scenarios::DamBreak](#)

### 5.2.1 Detailed Description

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## 5.3 src/tools/args.cpp File Reference

```
#include "args.h"
```

### 5.3.1 Detailed Description

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## 5.4 src/tools/args.h File Reference

```
#include "logger.h"
#include <getopt.h>
#include <cstdlib>
#include <iostream>
#include <sstream>
#include "../scenarios/dambreak.h"
#include "../scenarios/schock.h"
#include "../scenarios/rare.h"
```

#### Classes

- class [tools::Args](#)

### 5.4.1 Detailed Description

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## 5.5 src/tools/logger.cpp File Reference

```
#include "logger.h"
```

### 5.5.1 Detailed Description

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## 5.6 src/tools/logger.h File Reference

```
#include <cstdlib>
#include <iostream>
```

### Classes

- class `tools::Logger`

### 5.6.1 Detailed Description

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## 5.7 src/types.h File Reference

### Typedefs

- typedef float `T`

### 5.7.1 Detailed Description

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## 5.8 src/WavePropagation.cpp File Reference

```
#include "WavePropagation.h"
```

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## 5.9 src/WavePropagation.h File Reference

```
#include "types.h"
#include "solvers/FWave.hpp"
```

**Classes**

- class [WavePropagation](#)

### 5.9.1 Detailed Description

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## 5.10 src/writer/ConsoleWriter.h File Reference

```
#include "../types.h"
#include <iostream>
```

**Classes**

- class [writer::ConsoleWriter](#)

### 5.10.1 Detailed Description

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## 5.11 src/writer/VtkWriter.h File Reference

```
#include "../types.h"
#include <cassert>
#include <fstream>
#include <sstream>
#include <string>
```

#### Classes

- class [writer::VtkWriter](#)

### 5.11.1 Detailed Description

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