

Dual State Framework

API Document

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1 | Get Started

1.1 Welcome

Welcome to the official DSF documentation. Here you will find a detailed view of all the DSF classes and functions. If you have not installed DSF, you may be interested in how to install DSF on [Mac OS X](#) , [MS Windows](#) , and [Linux](#) . You may also be interested in how to [compile source code](#) .

1.2 Short example

Here is a short example, to show you how simple it is to use DSF:

1.2.1 Implementing DualStateFramework

MyDSF.h

```
#ifndef __DSFExample__MyDSF__
#define __DSFExample__MyDSF__

#include <dsf/DualStateFramework.h>

class MyDSF : public dsf::DualStateFramework // Extends dsf::DualStateFramework
{
public:
    explicit MyDSF() : DualStateFramework() {} // Uses default super constructor
    void initialize() override {}
};

#endif
```

1.2.2 Implementing dsf::SynchronizedObject

SyncObj.h

```
#ifndef DSFExample_SyncObj_h
#define DSFExample_SyncObj_h

#include <dsf/SynchronizedObject.h>

class SyncObj : public dsf::SynchronizedObject // Extends dsf::SynchronizedObject
{
public:
    SyncObj(int v) : SynchronizedObject(), v(v) {} // Uses default super constructor
    int getValue() {
        return this->v;
    }
protected:
    void run() override { // Overrides pure virtual function
        if(this->receive()) // Returns the number of message received
            this->process(); // Executes received messages
    }
private:
    int v;
};

#endif
```

1.2.3 Creating a manager class

ObjManager.h

```
#ifndef DSFExample_ObjManager_h
#define DSFExample_ObjManager_h

#include "MyDSF.h"
#include "SyncObj.h"
#include <iostream>

class ObjManager
{
public:
    MyDSF* dsf;
    dsf::TaskFunction* print;

    ObjManager(MyDSF* dsf) : dsf(dsf) { // Alias DSF pointer
        // Initialises TaskFunctions
        this->print = new dsf::TaskFunction([this](
            dsf::SynchronizedObject* to,
            dsf::SynchronizedObject* from,
            dsf::TaskArgument* args)
        {
            auto syncObj = args->to<SyncObj*>();
            std::cout << syncObj->getValue();
            this->dsf->remove(to);
        });
    }

    ~ObjManager() {
        delete this->print;
    }
};

#endif
```

1.2.4 Running DSF

main.cpp

```
#include "MyDSF.h"
#include "SyncObj.h"
#include "ObjManager.h"

int main(int argc, const char * argv[]) {
    const int NUMBER_OF_OBJS = 100;
    auto dsf = new MyDSF();
    auto om = new ObjManager(dsf);
    SyncObj* sos[NUMBER_OF_OBJS];
    for(int i = 0; i < NUMBER_OF_OBJS; i++) { // Creates NUMBER_OF_OBJS SyncObj objects
        sos[i] = new SyncObj(i);
        dsf->add(sos[i]); // Adds objects to DSF object
        dsf->send(sos[i], sos[i], om->print, new dsf::TaskArgument(sos[i])); // Sends
        messages
    }
    dsf->start();
    delete dsf;
    delete om;
    return 0;
}
```


2 | Mac OS X

Dual State Framework uses yctools and Intel tbb . Before the installation you need to install them first.

2.1 Install Dependencies

2.1.1 yctools

Download: <https://sourceforge.net/projects/yctools/>

Download the pkg file and install it.

2.1.2 Intel tbb

Download: <https://www.threadingbuildingblocks.org/download>

Download the OS X version and unzip it.

Inside the directory, copy "libtbb.dylib" in the subdirectory "lib" to "/usr/lib" or "/usr/local/lib".

Next, copy the directory "include/dsf" to "/usr/include" or "/usr/local/include".

2.2 Install Dual State Framework

Download: <https://sourceforge.net/projects/dualstateframework/>

Download the pkg file and install it.

2.3 Use DSF in Xcode

To use this framework in Xcode is very simple. You just need to drag dsf.framework and yctools.framework to your project explorer.

3 | Microsoft Windows

Dual State Framework uses [yctools](#) and [Intel tbb](#) . Before the installation you need to install them first.

3.1 Install Dependencies

3.1.1 yctools

Download: <https://sourceforge.net/projects/yctools/>

Download the exe file and install it.

The installation will create an environment variable "yctools" which refers to the program installed path.

3.1.2 Intel tbb

Download: <https://www.threadingbuildingblocks.org/download>

Download the Window OS version and unzip it.

Inside the directory, copy "tbb.lib" in the subdirectory "lib/your architecture/your visual studio version" to "where you want to store them/lib".

Copy "tbb.dll" in the subderectory "bin/your architecture/your visual studio version" to "where you want to store them/bin".

Add an environment variable "tbb", and set its value to "where you want to store them".

Next, copy the directory "include/dsf" to "where you want to store them/include".

3.2 Install Dual State Framework

Download: <https://sourceforge.net/projects/dualstateframework/>

Download the exe file and install it.

The installation will create an environment variable "dsf" which refers to the program installed path.

3.3 Use DSF in Visual Studio

3.3.1 Add additional header path

In project properties -> C/C++ -> General -> Additional Include Directories, add \$(yctools)\include, \$(dsf)\include, and \$(tbb)\include.

3.3.2 Add Dependencies

In project properties -> Linker -> General -> Additional Library Directories, add \$(yctools)\lib, \$(dsf)\lib, and \$(tbb)\lib.

In project properties -> Linker -> Input -> Additional Dependencies, add yctools.lib, tbb.lib, and dsf.lib.

4 | Linux

This page is only for Linux with Debian package management tools (Debian, ubuntu, and etc.). Other Linux users please visit [Compile source code](#) .

Dual State Framework uses yctools and Intel tbb . Before the installation you need to install them first.

4.1 Install Dependencies

4.1.1 yctools

Download: <https://sourceforge.net/projects/yctools/>

Download the deb file and install it.

4.1.2 Intel tbb

In terminal or console, type

```
$ sudo apt-get install libtbb2
```

4.2 Install Dual State Framework

Download: <https://sourceforge.net/projects/dualstateframework/>

Download the deb file and install it.

5 | Compile source code

To compile the code, you need a C++ compiler with c++11 supported, git, and CMake.

5.1 Pre-Build

5.1.1 Get source code

```
$ git clone https://github.com/kuyoonjo/DualStateFramework.git
```

5.1.2 Generate project for compiler

GUI version of CMake is recommended to generate the project. For more information about cmake, please visit <http://www.cmake.org>.

5.2 Build the project

If you generate an Xcode, Visual Studio, or any other GUI IDE project, just open the project and build it.
If you generate a Makefile project, in a terminal or console, type

```
$ cd "your project directory"  
$ make
```

Good luck!

6 | Namespace Documentation

6.1 dsf Namespace Reference

Classes

- class [DualStateFramework](#)
The starting pointer for the framework is the abstract class [dsf::DualStateFramework](#).
- class [Lock](#)
Locking variables.
- class [Runnable](#)
Executing messages.
- class [Synchronisable](#)
Synchronising two states.
- class [SynchronizedObject](#)
Dual state object interface.
- class [SynchronizedVar](#)
A Class which implements [dsf::Synchronisable](#).
- class [Task](#)
Class [Task](#).
- class [TaskBox](#)
A [dsf::Task](#) queue.

Typedefs

- typedef `yc::Any` [TaskArgument](#)
- typedef `yc::Exception::AnyException` [TaskArgumentException](#)
- typedef `std::function< void(dsf::SynchronizedObject *, dsf::SynchronizedObject *, TaskArgument *)>`
[TaskFunction](#)
- typedef `void` [function](#)

Variables

- class DSF_API [Task](#)
- class DSF_API [TaskBox](#)
- class DSF_API [DualStateFramework](#)
- class DSF_API [SynchronizedObject](#)

6.1.1 Typedef Documentation

6.1.1.1 `typedef void dsf::function`

6.1.1.2 `typedef yc::Any dsf::TaskArgument`

6.1.1.3 `typedef yc::Exception::AnyException dsf::TaskArgumentException`

6.1.1.4 `typedef std::function<void (dsf::SynchronizedObject*, dsf::SynchronizedObject*, TaskArgument*)>
dsf::TaskFunction`

6.1.2 Variable Documentation

6.1.2.1 `class DSF_API dsf::DualStateFramework`

6.1.2.2 `class DSF_API dsf::SynchronizedObject`

6.1.2.3 `class DSF_API dsf::Task`

6.1.2.4 `class DSF_API dsf::TaskBox`

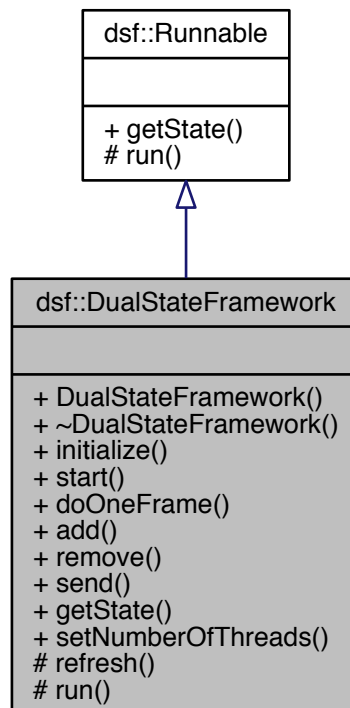
7 | Class Documentation

7.1 dsf::DualStateFramework Class Reference

The starting pointer for the framework is the abstract class [dsf::DualStateFramework](#).

```
#include <DualStateFramework.h>
```

Inheritance diagram for dsf::DualStateFramework:



Public Member Functions

- [DualStateFramework](#) ()
- [~DualStateFramework](#) ()
- virtual void [initialize](#) ()=0
- void [start](#) ()

- void [doOneFrame](#) ()
- void [add](#) ([SynchronizedObject](#) *syncObj)
- void [remove](#) ([SynchronizedObject](#) *syncObj)
- void [send](#) ([SynchronizedObject](#) *to, [SynchronizedObject](#) *from, [TaskFunction](#) *taskFunction, [TaskArgument](#) *args)
- [State](#) [getState](#) () override
- void [setNumberOfThreads](#) (int NumberOfThreads)

Protected Member Functions

- virtual void [refresh](#) ()
- virtual void [run](#) () override

Additional Inherited Members

7.1.1 Detailed Description

The starting pointer for the framework is the abstract class [dsf::DualStateFramework](#).

It provides essential functions for associating and managing its components ([SynchronizedObject](#) objects, function points, and etc.).

7.1.2 Example

```
#ifndef __DSFExample_MyDSF__
#define __DSFExample_MyDSF__

#include <dsf/DualStateFramework.h>

class MyDSF : public dsf::DualStateFramework // Extends dsf::DualStateFramework
{
public:
    explicit MyDSF() : DualStateFramework() {} // Uses default super constructor
    void initialize() override {}
};

#endif
```

7.1.3 Constructor & Destructor Documentation

7.1.3.1 [dsf::DualStateFramework::DualStateFramework \(\)](#)

7.1.3.2 [dsf::DualStateFramework::~~DualStateFramework \(\)](#)

7.1.4 Member Function Documentation

7.1.4.1 void [dsf::DualStateFramework::add](#) ([SynchronizedObject](#) * *syncObj*)

Add a [SynchronizedObject](#).

7.1.4.2 void [dsf::DualStateFramework::doOneFrame](#) ()

Do one frame of all [SynchronizedObjects](#).

7.1.4.3 **State** [dsf::DualStateFramework::getState](#) () [override],[virtual]

Return the state of the object.

Implements [dsf::Runnable](#).

7.1.4.4 virtual void dsf::DualStateFramework::initialize () [pure virtual]

For Signing TaskFunction Pointers

7.1.5 Example

```
this->printHello = new dsf::TaskFunction([this](
    dsf::SynchronizedObject* to,
                                dsf::SynchronizedObject* from,
                                dsf::TaskArgument* args)
{
    std::string str;
    float f;
    std::tie(str, f) = args->to<std::tuple<std::string, float>>();
    std::cout << str << " " << f << std::endl;
    this->remove(from);
});
```

7.1.5.1 virtual void dsf::DualStateFramework::refresh () [protected],[virtual]

Clear all SynchronizedObjects which is marked as DELETE

7.1.5.2 void dsf::DualStateFramework::remove (SynchronizedObject * syncObj)

Remove a [SynchronizedObject](#).

7.1.5.3 virtual void dsf::DualStateFramework::run () [override],[protected],[virtual]

Start all SynchronizedObjects associated.

Implements [dsf::Runnable](#).

7.1.5.4 void dsf::DualStateFramework::send (SynchronizedObject * to, SynchronizedObject * from, TaskFunction * taskFunction, TaskArgument * args)

Send messages

7.1.5.5 void dsf::DualStateFramework::setNumberOfThreads (int NumberOfThreads)

Set the number of threads. 0 is automatic.

7.1.5.6 void dsf::DualStateFramework::start ()

Start all SynchronizedObjects associated.

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

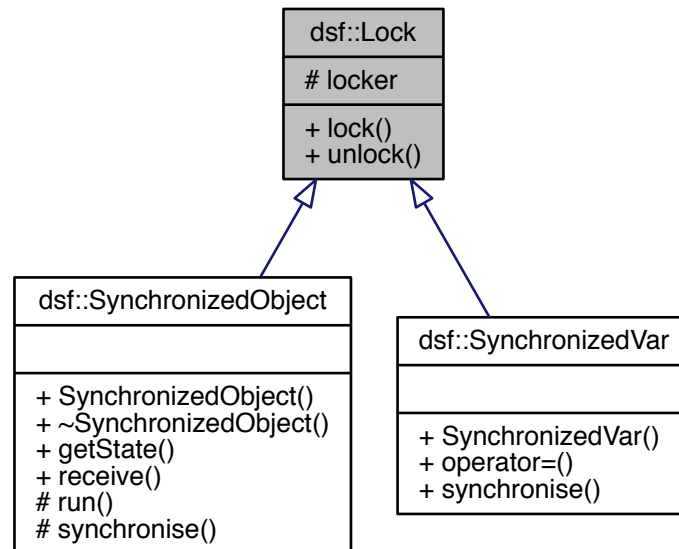
- DualStateFramework.h

7.2 dsf::Lock Class Reference

Locking variables.

```
#include <Lock.h>
```

Inheritance diagram for dsf::Lock:



Public Member Functions

- void `lock()`
- void `unlock()`

Protected Attributes

- std::mutex `locker`

7.2.1 Detailed Description

Locking variables.

The class can lock the objects using an unspecified sequence of calls to their members `lock` and `unlock` that ensures that all arguments are locked on return (without producing any deadlocks).

7.2.2 Example

```

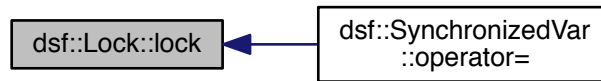
dsf->lock();
dsf->drawables->push_back(syncObj); //the object drawables is locked
dsf->unlock();
  
```

7.2.3 Member Function Documentation

7.2.3.1 void dsf::Lock::lock()

Locks all the objects passed as arguments, blocking the calling thread if necessary.

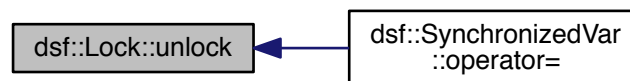
Here is the caller graph for this function:



7.2.3.2 void dsf::Lock::unlock ()

Unlocks all the objects.

Here is the caller graph for this function:



7.2.4 Member Data Documentation

7.2.4.1 std::mutex dsf::Lock::locker [protected]

The locker

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

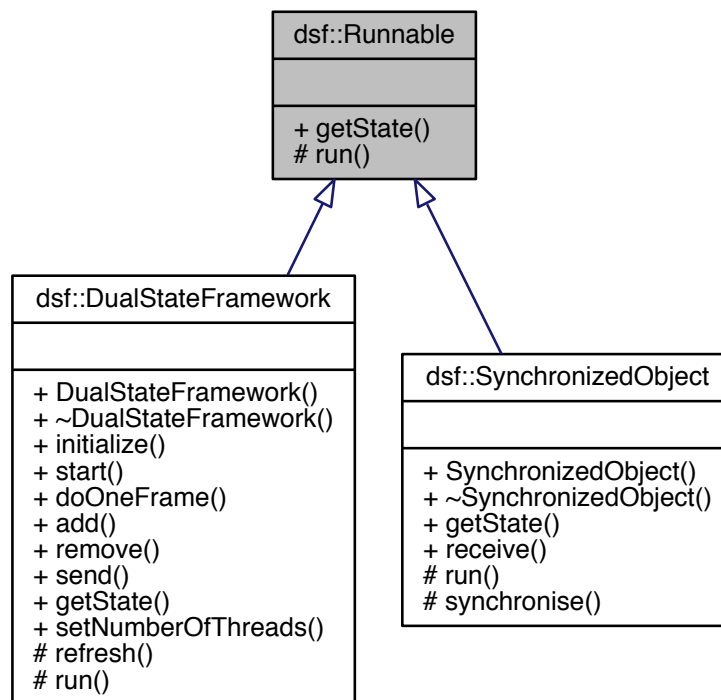
- Lock.h

7.3 dsf::Runnable Class Reference

Executing messages.

```
#include <Runnable.h>
```

Inheritance diagram for dsf::Runnable:



Public Types

- enum `State` { `RUNNING`, `STOPPED`, `READY`, `DELETED` }
- State of the object.*

Public Member Functions

- virtual `State getState ()`=0

Protected Member Functions

- virtual void `run ()`=0

7.3.1 Detailed Description

Executing messages.

The interface provides a run method which executes messages.

7.3.2 Member Enumeration Documentation

7.3.2.1 enum dsf::Runnable::State

State of the object.

RUNNING: The object is running.

STOPPED: The object is stopped.

READY: The object is ready to run.

DELETED: The object is marked as deleted. System will automatically delete it.

Enumerator

RUNNING

STOPPED

READY

DELETED

7.3.3 Member Function Documentation

7.3.3.1 virtual State dsf::Runnable::getState () [pure virtual]

Returns the current state.

Implemented in [dsf::DualStateFramework](#), and [dsf::SynchronizedObject](#).

7.3.3.2 virtual void dsf::Runnable::run () [protected],[pure virtual]

Executes messages

Implemented in [dsf::DualStateFramework](#), and [dsf::SynchronizedObject](#).

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

- Runnable.h

7.4 dsf::Synchronisable< T > Class Template Reference

Synchronising two states.

```
#include <Synchronisable.h>
```

Public Member Functions

- virtual [~Synchronisable](#) ()
- virtual void [synchronise](#) ()=0

Protected Attributes

- T * [next](#)

7.4.1 Detailed Description

```
template<class T>class dsf::Synchronisable< T >
```

Synchronising two states.

The template interface provides a copy of current object, and a synchronise method which synchronise two copies.

7.4.2 Example

```
#include <dsf/Synchronisable.h>

class Vector3D
{
public:
    float x, y, z;
    Vector3D(float x, float y, float z) : x(x), y(y), z(z){}
}

class SyncVector : public dsf::Synchronisable<Vector3D>, public Vector3D
{
public:
    SyncInt(float x, float y, float z) : Vector3D(x, y, z) {
        this->next = new Vector3D(x, y, z);
    }
    void synchronise() override {
        this->x = this->next->x;
        this->y = this->next->y;
        this->z = this->next->z;
    }
}
```

7.4.3 Constructor & Destructor Documentation

7.4.3.1 `template<class T> virtual dsf::Synchronisable< T >::~Synchronisable ()` [inline],[virtual]

7.4.4 Member Function Documentation

7.4.4.1 `template<class T> virtual void dsf::Synchronisable< T >::synchronise ()` [pure virtual]

Signs current value to next value.

Implemented in [dsf::SynchronizedObject](#), and [dsf::SynchronizedVar](#).

7.4.5 Member Data Documentation

7.4.5.1 `template<class T> T* dsf::Synchronisable< T >::next` [protected]

A copy of current object.

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

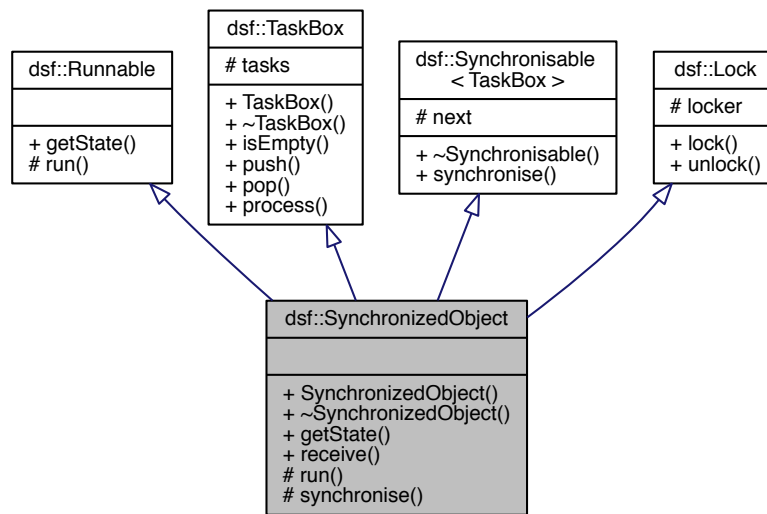
- Synchronisable.h

7.5 dsf::SynchronizedObject Class Reference

Dual state object interface.

```
#include <SynchronizedObject.h>
```

Inheritance diagram for dsf::SynchronizedObject:



Public Member Functions

- [SynchronizedObject \(\)](#)
- virtual [~SynchronizedObject \(\)](#)
- [State getState \(\)](#) override
- int [receive \(\)](#)

Protected Member Functions

- virtual void [run \(\)](#) override=0
- void [synchronise \(\)](#) override

Friends

- class [DualStateFramework](#)

Additional Inherited Members

7.5.1 Detailed Description

Dual state object interface.

The [dsf::SynchronizedObject](#) is a subclass of [dsf::TaskBox](#). In this framework, you can regard it as thread. It provides methods for implementing parallelism such as “send”, “receive”, and etc.

7.5.2 Example

```
// SyncCircle.h
#include <dsf/SynchronizedObject.h>
```

```

#include <SFML/Graphics.hpp>

class SyncCircle : public dsf::SynchronizedObject, public sf::CircleShape
{
public:
    SyncCircle();
protected:
    void run() override;
};

// SyncCircle.cpp

#include "SyncCircle.h"

SyncCircle::SyncCircle() : dsf::SynchronizedObject::SynchronizedObject(), sf::CircleShape::CircleShape()
{
}

void SyncCircle::run()
{
    if(this->receive())
        this->process();
}

```

7.5.3 Constructor & Destructor Documentation

7.5.3.1 `dsf::SynchronizedObject::SynchronizedObject ()`

7.5.3.2 `virtual dsf::SynchronizedObject::~~SynchronizedObject ()` [virtual]

7.5.4 Member Function Documentation

7.5.4.1 `State dsf::SynchronizedObject::getState ()` [override],[virtual]

Returns the current state.

Implements [dsf::Runnable](#).

7.5.4.2 `int dsf::SynchronizedObject::receive ()`

Returns the number of message received

7.5.4.3 `virtual void dsf::SynchronizedObject::run ()` [override],[protected],[pure virtual]

Executes messages

7.5.5 Example

```

void run() override { // Overrides pure virtual function
    if(this->receive()) // Returns the number of message received
        this->process(); // Executes received messages
}

```

Implements [dsf::Runnable](#).

7.5.5.1 `void dsf::SynchronizedObject::synchronise ()` [override],[protected],[virtual]

Signs current taskbox to next taskbox.

Implements [dsf::Synchronisable< TaskBox >](#).

7.5.6 Friends And Related Function Documentation

7.5.6.1 friend class DualStateFramework [friend]

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

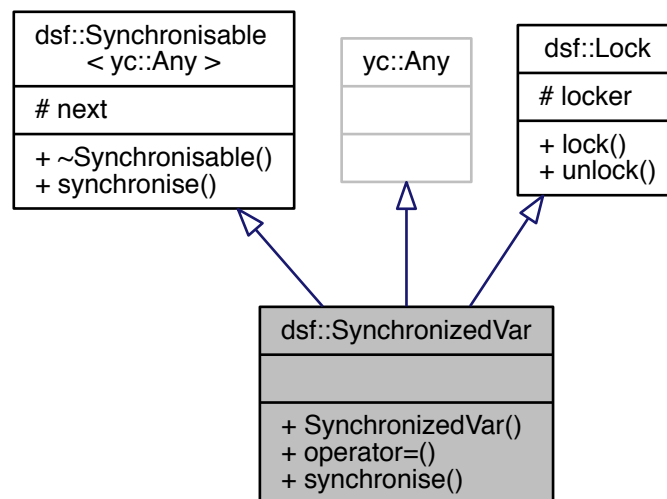
- SynchronizedObject.h

7.6 dsf::SynchronizedVar Class Reference

A Class which implements [dsf::Synchronisable](#).

```
#include <SynchronizedVar.h>
```

Inheritance diagram for dsf::SynchronizedVar:



Public Member Functions

- `template<typename T>`
[SynchronizedVar](#) (T &&value)
- `template<typename T>`
 void `operator=` (T &&value)
- void [synchronise](#) () override

Additional Inherited Members

7.6.1 Detailed Description

A Class which implements [dsf::Synchronisable](#).

The purpose of this class is to make thread-safe variables for [dsf::SynchronizedObject](#) objects. A [dsf::SynchronizedVar](#) object has two states - "current" and "next". The "current" is for read operation, and the "next" is for write operation. The function "synchronise" signs "next" to "current".

7.6.2 Example

```
dsf::SynchronizedVar myInt;
myInt = int(8); // value == NULL, next == 8
myInt.synchronize(); // value == 8, next == 8
std::cout << myInt.to<int>() << std::endl; // output 8
myInt = int(9); // value == 8, next == 9
std::cout << myInt.to<int>() << std::endl; // output 8
myInt.synchronize(); // value == 9, next == 9
std::cout << myInt.to<int>() << std::endl; // output 9
```

7.6.3 Constructor & Destructor Documentation

7.6.3.1 `template<typename T > dsf::SynchronizedVar::SynchronizedVar (T && value)`

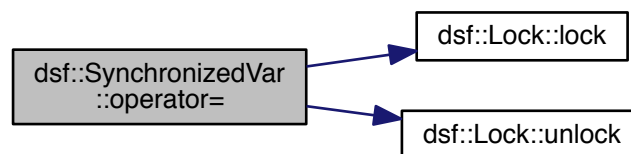
The value of "current" and the value of "next" is initialized as "value".

7.6.4 Member Function Documentation

7.6.4.1 `template<typename T > void dsf::SynchronizedVar::operator= (T && value)`

Signs a value to "next".

Here is the call graph for this function:



7.6.4.2 `void dsf::SynchronizedVar::synchronise () [override],[virtual]`

Signs current value to next value.

Implements [dsf::Synchronisable< yc::Any >](#).

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

- SynchronizedVar.h

7.7 dsf::Task Class Reference

Class [Task](#).

```
#include <Task.h>
```

Public Member Functions

- [Task](#) ([SynchronizedObject](#) *to, [SynchronizedObject](#) *from, [TaskFunction](#) *taskFunction, [TaskArgument](#) *taskArgument)
- [~Task](#) ()

Public Attributes

- [SynchronizedObject](#) * to
- [SynchronizedObject](#) * from
- [TaskFunction](#) * taskFunction
- [TaskArgument](#) * taskArgument

7.7.1 Detailed Description

Class [Task](#).

This class have four members: from, to, function, and arguments, where "from" is a [dsf::SynchronizedObject](#) object who sent message to you.

7.7.2 Constructor & Destructor Documentation

7.7.2.1 [dsf::Task::Task](#) ([SynchronizedObject](#) * to, [SynchronizedObject](#) * from, [TaskFunction](#) * taskFunction, [TaskArgument](#) * taskArgument) [explicit]

7.7.2.2 [dsf::Task::~~Task](#) ()

7.7.3 Member Data Documentation

7.7.3.1 [SynchronizedObject*](#) [dsf::Task::from](#)

Where the message is sent from.

7.7.3.2 [TaskArgument*](#) [dsf::Task::taskArgument](#)

The arguments for the function pointer.

7.7.3.3 [TaskFunction*](#) [dsf::Task::taskFunction](#)

The function pointer.

7.7.3.4 [SynchronizedObject*](#) [dsf::Task::to](#)

Where the message is sent to.

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

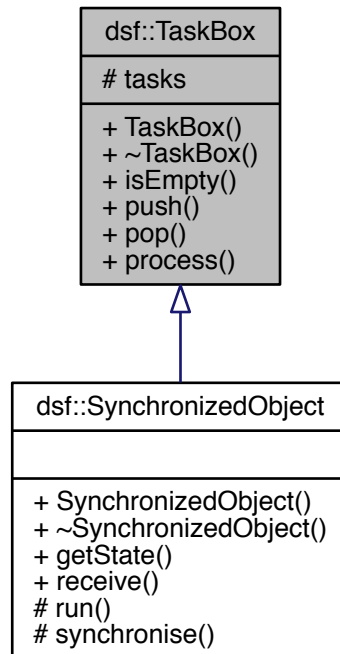
- [Task.h](#)

7.8 dsf::TaskBox Class Reference

A [dsf::Task](#) queue.

```
#include <TaskBox.h>
```

Inheritance diagram for dsf::TaskBox:



Public Member Functions

- `TaskBox ()`
- virtual `~TaskBox ()`
- bool `isEmpty ()`
- void `push (Task *task)`
- `Task * pop ()`
- void `process ()`

Protected Attributes

- `std::vector< Task * > * tasks`

7.8.1 Detailed Description

A `dsf::Task` queue.

The `dsf::TaskBox` contains a list of `def::Task` objects. It provides essential methods to control the list such as “push”, “pop”, and “isEmpty”.

7.8.2 Constructor & Destructor Documentation

7.8.2.1 `dsf::TaskBox::TaskBox ()`

7.8.2.2 `virtual dsf::TaskBox::~~TaskBox ()` `[virtual]`

7.8.3 Member Function Documentation

7.8.3.1 `bool dsf::TaskBox::isEmpty ()`

Checks wheather the queue is empty or not.

7.8.3.2 `Task* dsf::TaskBox::pop ()`

Pops out a task and returns it

7.8.3.3 `void dsf::TaskBox::process ()`

Pops out all tasks in the queue and executes them.

7.8.3.4 `void dsf::TaskBox::push (Task * task)`

Pushes a task into the queue.

7.8.4 Member Data Documentation

7.8.4.1 `std::vector<Task*>* dsf::TaskBox::tasks` `[protected]`

The list of [dsf::Task](#).

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

- TaskBox.h

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