Dual State Framework

API Document

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Contents

Chapter 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;
}
```

Chapter 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.

Chapter 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.

Chapter 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.

Chapter 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!

Chapter 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

Chapter 7

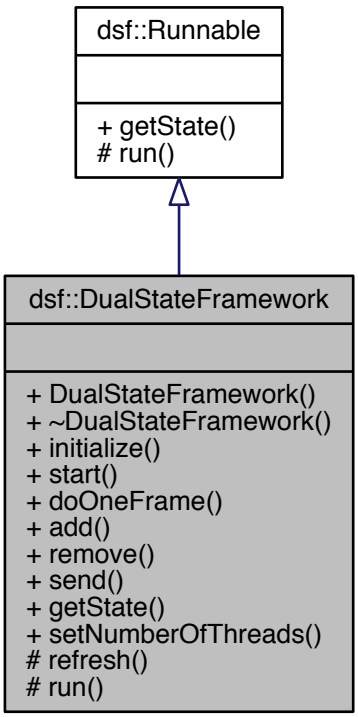
Class Documentation

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 SyncronizedObjects.

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 SyncronizedObjects 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 SyncronizedObjects 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 SyncronizedObjects associated.

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

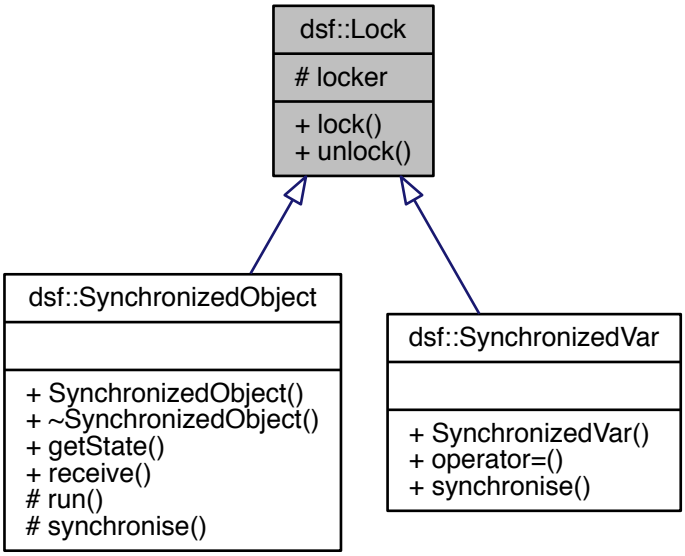
- DualStateFramework.h

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

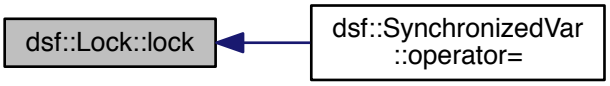
```
dsf->lock();
dsf->drawables->push_back(syncObj); //the object drawables is locked
dsf->unlock();
```

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.

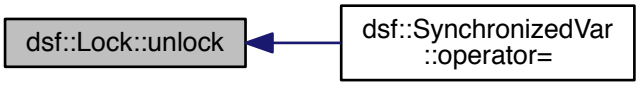
Here is the caller graph for this function:



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:

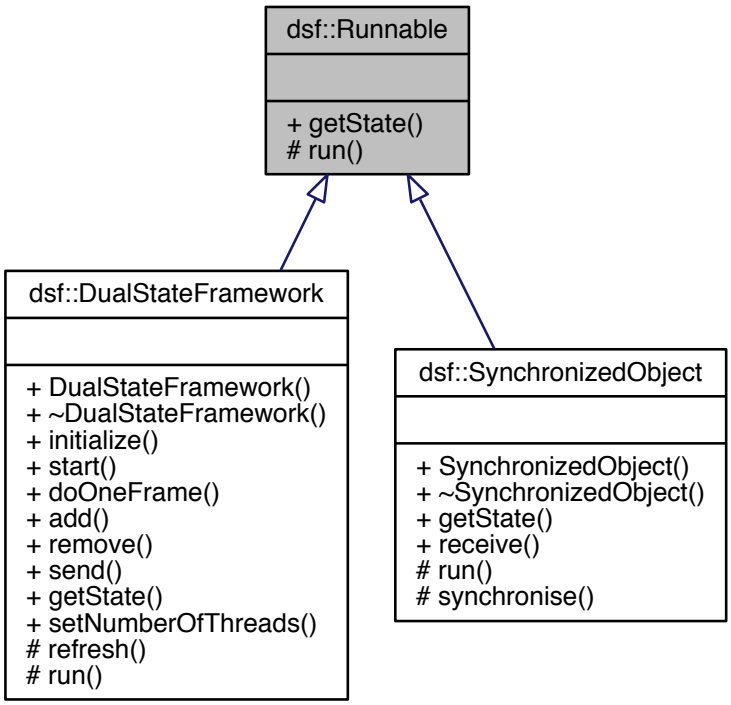
- Lock.h

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:

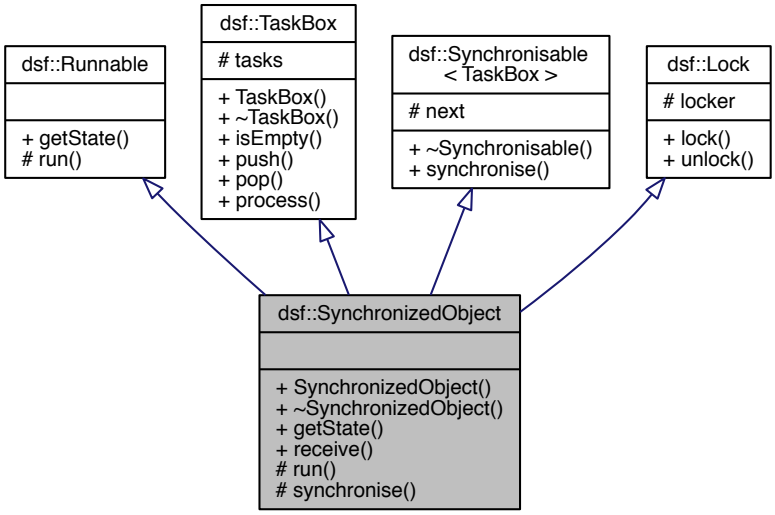
- Synchronisable.h

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:

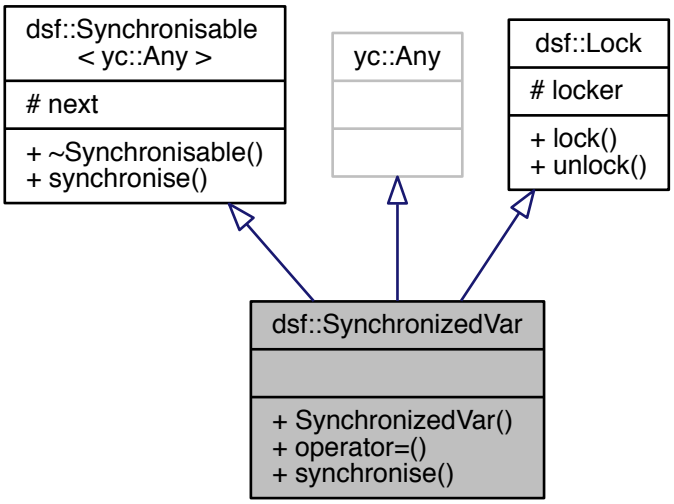
- SynchronizedObject.h

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*)

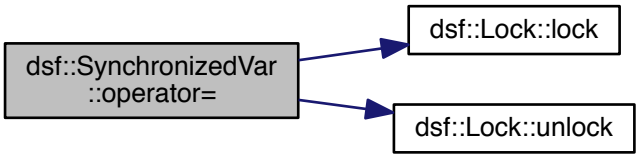
The value of "current" and the value of "next" is initialized as "value".

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:

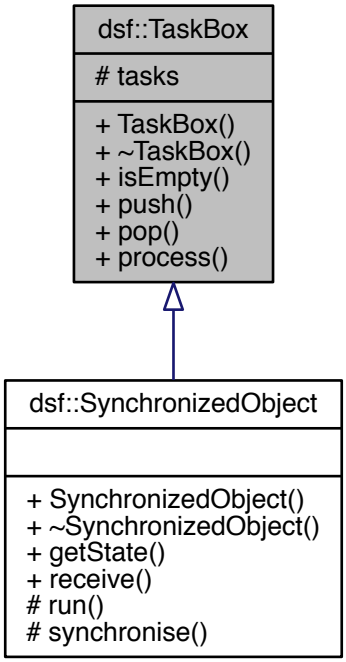
- Task.h

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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