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# Boost.Ref

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## Introduction

The Ref library is a small library that is useful for passing references to function templates (algorithms) that would usually take copies of their arguments. It defines the class template `boost::reference_wrapper<T>`, two functions `boost::ref` and `boost::cref` that return instances of `boost::reference_wrapper<T>`, a function `boost::unwrap_ref` that unwraps a `boost::reference_wrapper<T>` or returns a reference to any other type of object, and the two traits classes `boost::is_reference_wrapper<T>` and `boost::unwrap_reference<T>`.

The purpose of `boost::reference_wrapper<T>` is to contain a reference to an object of type `T`. It is primarily used to "feed" references to function templates (algorithms) that take their parameter by value.

To support this usage, `boost::reference_wrapper<T>` provides an implicit conversion to `T&`. This usually allows the function templates to work on references unmodified.

`boost::reference_wrapper<T>` is both CopyConstructible and Assignable (ordinary references are not Assignable).

The expression `boost::ref(x)` returns a `boost::reference_wrapper<X>(x)` where `X` is the type of `x`. Similarly, `boost::cref(x)` returns a `boost::reference_wrapper<X const>(x)`.

The expression `boost::unwrap_ref(x)` returns a `boost::unwrap_reference<X>::type&` where `X` is the type of `x`.

The expression `boost::is_reference_wrapper<T>::value` is true if `T` is a `reference_wrapper`, and false otherwise.

The type-expression `boost::unwrap_reference<T>::type` is `T::type` if `T` is a `reference_wrapper`, `T` otherwise.

# Reference

## Header <boost/ref.hpp>

```
namespace boost {  
    template<typename T> class reference_wrapper;  
    reference_wrapper<T> ref(T&);  
    reference_wrapper<T const> cref(T const&);  
    unwrap_reference<T>::type& unwrap_ref(T&);  
    template<typename T> class is_reference_wrapper;  
    template<typename T> class unwrap_reference;  
}
```

## Class template reference\_wrapper

boost::reference\_wrapper — Contains a reference to an object of type T.

## Synopsis

```
// In header: <boost/ref.hpp>

template<typename T>
class reference_wrapper {
public:
    // types
    typedef T type;

    // construct/copy/destruct
    explicit reference_wrapper(T&);

    // access
    operator T&() const;
    T& get() const;
    T* get_pointer() const;
};

// constructors
reference_wrapper<T> ref(T&);
reference_wrapper<T const> cref(T const&);

// access
unwrap_reference<T>::type& unwrap_ref(T&);
```

## Description

`reference_wrapper` is primarily used to "feed" references to function templates (algorithms) that take their parameter by value. It provides an implicit conversion to `T&`, which usually allows the function templates to work on references unmodified.

### reference\_wrapper public construct/copy/destruct

1. `explicit reference_wrapper(T& t);`

Effects: Constructs a `reference_wrapper` object that stores a reference to `t`.

Throws: Does not throw.

### reference\_wrapper access

1. `operator T&() const;`

Returns: The stored reference.

Throws: Does not throw.

2. `T& get() const;`

Returns: The stored reference.

Throws: Does not throw.

3. `T* get_pointer() const;`

Returns: A pointer to the object referenced by the stored reference.

Throws: Does not throw.

#### **reference\_wrapper constructors**

1. 

```
reference_wrapper<T> ref(T& t);
```

Returns: `reference_wrapper<T>(t)`

Throws: Does not throw.

2. 

```
reference_wrapper<T const> cref(T const& t);
```

Returns: `reference_wrapper<T const>(t)`

Throws: Does not throw.

#### **reference\_wrapper access**

1. 

```
unwrap_reference<T>::type& unwrap_ref(T& t);
```

Returns: `unwrap_reference<T>::type&(t)`

Throws: Does not throw.

## Class template `is_reference_wrapper`

`boost::is_reference_wrapper` — Determine if a type `T` is an instantiation of [reference\\_wrapper](#).

## Synopsis

```
// In header: <boost/ref.hpp>

template<typename T>
class is_reference_wrapper {
public:
    // static constants
    static const bool value = unspecified;
};
```

## Description

The value static constant will be `true` iff the type `T` is a specialization of [reference\\_wrapper](#).

## Class template `unwrap_reference`

`boost::unwrap_reference` — Find the type in a [reference\\_wrapper](#).

## Synopsis

```
// In header: <boost/ref.hpp>

template<typename T>
class unwrap_reference {
public:
    // types
    typedef unspecified type;
};
```

## Description

The typedef type is `T::type` if `T` is a [reference\\_wrapper](#), `T` otherwise.

## Acknowledgements

`ref` and `cref` were originally part of the Tuple library by Jaakko Järvi. They were "promoted to `boost::` status" by Peter Dimov because they are generally useful. Douglas Gregor and Dave Abrahams contributed [is\\_reference\\_wrapper](#) and [unwrap\\_reference](#). Frank Mori Hess and Ronald Garcia contributed `boost::unwrap_ref`