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## Subject: Refactoring Moveable

Posted by [mirek](#) on Fri, 23 Aug 2024 06:52:08 GMT

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In order to make U++ more compatible and future proof, I am changing Moveable mechanisms a bit. U++ will now use C++17 inline template features to simplify Moveable and allow putting "non-U++ guest types" in Vector/BiVector/Index. On the way I hope to fix some other problems (e.g. `auto [a, b] = MakeTuple("x", 1)` does not work yet) and remove all "dangerous" (ok, all possibly undefined behaviour) code, except Moveable, which is de facto standard now anyway (<https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2024/p1144r10.html>).

Development is so far in the branch Core2024, critical part for your kind review:

<https://github.com/ultimatepp/ultimatepp/blob/3638778b2e0e1819622424a70a7f04ef0950741d/uppsrc/Core/Topt.h#L158>

This now works:

```
template<>
inline constexpr bool Upp::is_upp_guest<std::string> = true;

template<> inline hash_t Upp::GetHashValue(const std::string& a)
{
    return memhash(a.data(), a.length());
}
```

```
CONSOLE_APP_MAIN
{
    {
        Vector<std::string> h;
        for(int i = 0; i < 20; i++)
            h << AsString(i).ToStd();
        RDUMP(h);
        Vector<int> rem = { 1, 2, 3 };
        h.Remove(rem);
        RDUMP(h);
        h.RemoveAll([&](int i) { return h[i].back() == '8'; });
        RDUMP(h);
        Vector<std::string> n = { "21", "22", "23" };
        h.Insert(2, n);
        RDUMP(h);
        h.Insert(2, pick(n));
        RDUMP(h);
        h.Remove(2, 3);
        RDUMP(h);
    }
}
```

```
{
  Index<std::string> x { "one", "two", "three" };
  RDUMP(x);
  RDUMP(x.Find("two"));
}
}
```

(This works legally, using `std::move` instead of `memmove/memcpy` for `std::string`).

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Subject: Re: Refactoring Moveable  
Posted by [Oblivion](#) on Sun, 08 Sep 2024 11:18:37 GMT  
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Hello Mirek,

Good to be on C++17

Hovewer, this seems to break a lot of things.

For example, If I derive something from `MoveableAndDeepCopyOption<T>`, which is now derived from `TriviallyRelocatable<T>` (Say, `T = Vector<T>`, which was possible up until now) then I can't access the methods or members of `T`.

Reason: `TriviallyRelocatable<T>` is defined as:

```
template <class T>
struct TriviallyRelocatable {};
```

Any ideas on how to proceed, or am I missing something?

Best regards,  
Oblivion

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Subject: Re: Refactoring Moveable  
Posted by [mirek](#) on Sun, 08 Sep 2024 13:41:53 GMT  
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Oblivion wrote on Sun, 08 September 2024 13:18Hello Mirek,

Good to be on C++17

However, this seems to break a lot of things.

For example, If I derive something from `MoveableAndDeepCopyOption<T>`, which is now derived from `TriviallyRelocatable<T>` (Say, `T = Vector<T>`, which was possible up until now) then I can't access the methods or members of `T`.

Reason: `TriviallyRelocatable<T>` is defined as:

```
template <class T>
struct TriviallyRelocatable {};
```

Any ideas on how to proceed, or am I missing something?

Best regards,  
Oblivion

Uhm, normal use is like

```
struct Foo : MoveableAndDeepCopyOption<Foo> {
...
};
```

- obviously, you can access methods of `Foo` in `Foo...`

Example of what you need?

Note: There is one small issue I was unable to solve. `U++` had two parameter `Moveable`, where second parameter was optional base class. It is supposed to help with `MSC++` big with empty base class optimisations. It does not seem possible to use template magic with that which would go well `MSC++` optimiser, putting `Moveable` first in the base class list seems to work fine wrt `MSC++` optimisation and it really was used very sparsely even in `U++` code and I guess almost never in client code.

Anyway

```
struct Foo : Moveable<Foo, FooBase> ...
```

now has to be rewritten as

struct Foo : Moveable<Foo>, FooBase ...

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Subject: Re: Refactoring Moveable

Posted by [mirek](#) on Sun, 08 Sep 2024 13:44:37 GMT

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Ah, and another issue, more positive change: PODs do not need Moveable anymore as all `std::is_trivial_copyable` types are now trivially relocatable (aka Moveable)

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Subject: Re: Refactoring Moveable

Posted by [Novo](#) on Thu, 02 Jan 2025 20:41:43 GMT

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A little bit of criticism.

Code below won't compile out of the box:

```
namespace test {  
    struct Test;  
}
```

```
namespace test {  
    struct Test : Moveable<Test> {
```

```
        Vector<Test> children;  
    };  
}
```

Adding of

```
template <> inline constexpr bool is_upp_guest<test::Test> = true;
```

won't help.

You need to add

```
template <> inline constexpr bool is_trivially_relocatable<test::Test> = true;
```

All this stuff is inconvenient and unnatural.

And I have no idea how to make code below compile.

```
struct Test01;
```

```
struct Test01 {
```

```
    struct Test02 : Moveable<Test02> {
```

```
        Vector<Test02> children;  
    };
```

};

## File Attachments

1) [test\\_moveable.tar.gz](#), downloaded 49 times

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Subject: Re: Refactoring Moveable

Posted by [mirek](#) on Fri, 03 Jan 2025 07:37:25 GMT

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Novo wrote on Thu, 02 January 2025 21:41A little bit of criticism.

Code below won't compile out of the box:

```
namespace test {  
    struct Test;  
}
```

```
namespace test {  
    struct Test : Moveable<Test> {
```

```
        Vector<Test> children;  
    };  
}
```

Adding of

```
template <> inline constexpr bool is_upp_guest<test::Test> = true;
```

won't help.

You need to add

```
template <> inline constexpr bool is_trivially_relocatable<test::Test> = true;
```

All this stuff is inconvenient and unnatural.

And I have no idea how to make code below compile.

```
struct Test01;
```

```
struct Test01 {  
  
    struct Test02 : Moveable<Test02> {  
  
        Vector<Test02> children;  
    };  
};
```

Well, it is sort of obvious, right?

Anyway, easy fix is to move the static\_assert to destructor. It however has the price of less clear error and also only gets triggered when you instantiate Test02.

Do we want to go there? Or any other ideas?

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Subject: Re: Refactoring Moveable

Posted by [Novo](#) on Sat, 04 Jan 2025 05:46:31 GMT

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mirek wrote on Fri, 03 January 2025 02:37

Do we want to go there?

Something has to be done. IMHO, a situation when very simple code cannot be compiled is unacceptable.

mirek wrote on Fri, 03 January 2025 02:37

Or any other ideas?

Please give me some time. I'll check with my old code where I was doing autodetection. Maybe I'll find something interesting.

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Subject: Re: Refactoring Moveable

Posted by [mirek](#) on Sat, 04 Jan 2025 08:05:19 GMT

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Moving static\_assert here

```
template <class T>
inline typename std::enable_if_t<is_trivially_relocatable<T>> Relocate(T *dst, T *src)
{
    static_assert(is_upp_guest<T>);
    new(dst) T(pick(*src));
    Destruct(src);
}
```

instead of destructor makes a lot of sense and perhaps adds a bit of self-explanation to the error, but there is still that small disadvantage that it only gets displayed when building, not while editing. Is that acceptable drawback?

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Subject: Re: Refactoring Moveable

Posted by [mirek](#) on Sat, 04 Jan 2025 08:10:51 GMT

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OK, I have for now changed the code (experimentally), let me know if this is better.

<https://github.com/ultimatepp/ultimatepp/commit/f6e62772853c3de391879d70da8cbf11672eb74a>

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