

Iterators pair constructors for stack and queue

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1 Abstract

This paper proposes to add iterators-pair constructors to `std::stack` and `std::queue`

2 Tony tables

Before	After
<pre>std::vector<int> v(42); std::queue<int> q({v.begin(), v.end()}); std::stack<int> s({v.begin(), v.end()});</pre>	<pre>std::vector<int> v(42); std::queue q(v.begin(), v.end()); std::stack s(v.begin(), v.end());</pre>

3 Motivation

`std::stack` and `std::queue` do not provide iterators based constructors which is inconsistent. This paper is an offshoot of [P1206], for which I conducted a review of existing containers and containers adapters constructors.

The lack of these constructors forces the implementation of `ranges::to` to special case container-adapters or to not support them. Their absence make it also impossible to deduce their type using CTAD.

While this is a a small change, we believe its impact on the standard is low and consistent designs are less surprising and therefore easier to use: with this change, all container-like types, whether they are *Containers* or container adapters, can be constructed from an iterators pair, making them more compatible with `ranges`.

4 Proposed Wording

4.1 Definition

[queue.defn]

xrefindex]queue.defn(4.1)

```
namespace std {
    template<class T, class Container = deque<T>>
    class queue {
    public:
        using value_type      = typename Container::value_type;
        using reference       = typename Container::reference;
        using const_reference = typename Container::const_reference;
        using size_type       = typename Container::size_type;
        using container_type  = Container;

    protected:
        Container c;

    public:
        queue() : queue(Container()) {}
        explicit queue(const Container&);
        explicit queue(Container&&);

        template<class InputIterator>
        queue(InputIterator first, InputIterator last);

        template<class Alloc> explicit queue(const Alloc&);
        template<class Alloc> queue(const Container&, const Alloc&);
        template<class Alloc> queue(Container&&, const Alloc&);
        template<class Alloc> queue(const queue&, const Alloc&);
        template<class Alloc> queue(queue&&, const Alloc&);

        //...
    };

    template<class Container>
    queue(Container) -> queue<typename Container::value_type, Container>;

    template<class InputIterator>
    queue(InputIterator, InputIterator)
    -> queue<typename iterator_traits<InputIterator>::value_type>;

    template<class Container, class Allocator>
    queue(Container, Allocator) -> queue<typename Container::value_type, Container>;

    template<class T, class Container>
    void swap(queue<T, Container>& x, queue<T, Container>& y) noexcept(noexcept(x.swap(y)));
}
```

```

    template<class T, class Container, class Alloc>
    struct uses_allocator<queue<T, Container>, Alloc>
    : uses_allocator<Container, Alloc>::type { };
}

```

4.2 Constructors

[queue.cons]

xrefindex]queue.cons(4.2)

```
explicit queue(const Container& cont);
```

Effects: Initializes c with cont.

```
explicit queue(Container&& cont);
```

Effects: Initializes c with std::move(cont).

```

template<class InputIterator>
queue(InputIterator first, InputIterator last);

```

Effects: Initializes c from the range [first, last)

4.2.1 Definition

[stack.defn]

xrefindex]stack.defn(4.2.1)

```

namespace std {
    template<class T, class Container = deque<T>>
    class stack {
    public:
        using value_type      = typename Container::value_type;
        using reference       = typename Container::reference;
        using const_reference = typename Container::const_reference;
        using size_type       = typename Container::size_type;
        using container_type  = Container;

    protected:
        Container c;

    public:
        stack() : stack(Container()) {}
        explicit stack(const Container&);
        explicit stack(Container&&);

        template<class InputIterator>
        stack(InputIterator first, InputIterator last);

        template<class Alloc> explicit stack(const Alloc&);
        template<class Alloc> stack(const Container&, const Alloc&);
        template<class Alloc> stack(Container&&, const Alloc&);
        template<class Alloc> stack(const stack&, const Alloc&);
}

```

```

        template<class Alloc> stack(stack&&, const Alloc&);

        //...
};

template<class Container>
stack(Container) -> stack<typename Container::value_type, Container>;

template<class InputIterator>
stack(InputIterator, InputIterator)
-> stack<typename iterator_traits<InputIterator>::value_type>;

template<class Container, class Allocator>
stack(Container, Allocator) -> stack<typename Container::value_type, Container>;

template<class T, class Container, class Alloc>
struct uses_allocator<stack<T, Container>, Alloc>
: uses_allocator<Container, Alloc>::type { };
}

```

4.2.2 Constructors

[stack.cons]

xrefindex]stack.cons(4.2.2)

```
explicit stack(const Container& cont);
```

Effects: Initializes c with cont.

```
explicit stack(Container&& cont);
```

Effects: Initializes c with std::move(cont).

```
template<class InputIterator>
stack(InputIterator first, InputIterator last);
```

Effects: Initializes c from the range [first, last)

5 References

- [P1206] Corentin Jabot *A function to convert any range to a container*
<https://wg21.link/P1206>