COMP6771

🍓 STL Iterators

Lecture 2.2

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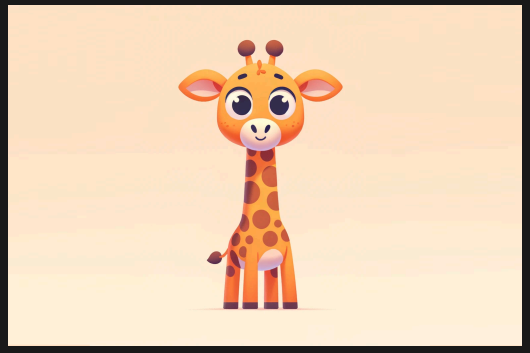

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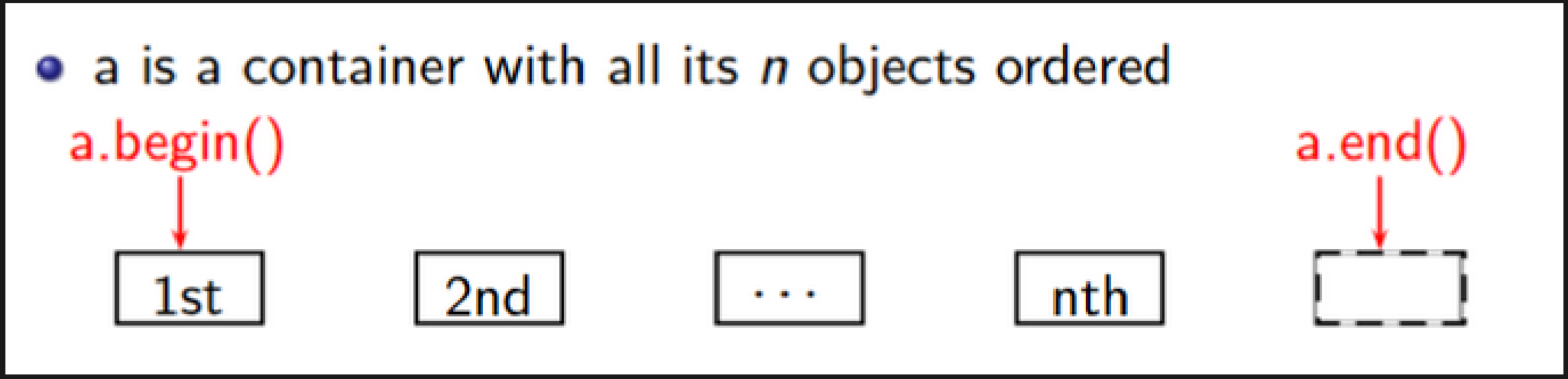
🤜 STL Iterators

- Iterator is an abstract notion of a pointer
- Iterators are types that abstract container data as a **sequence** of objects (i.e. linear)
- Iterators will allow us to connect a wide range of containers with a wide range of algorithms via a common interface

👈 Iterator Explanation

- a.begin(): abstractly "points" to the first element
- a.end(): abstractly "points" to one past the last element
  - a.end() is not an invalid iterator value
- If iter abstractly points to the k-th element, then:
  - *p is the object it abstractly points to
  - ++p abstractly points to the (k + 1)-st element



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```cpp
#include <iostream>
#include <string>
#include <vector>

int main()
{
    std::vector<std::string> names;
    for (auto iter = names.begin(); iter != names.end(); ++iter) {
        std::cout << *iter << "\n";
    }
    for (std::vector<std::string>::iterator iter = names.begin();
         iter != names.end(); ++iter) {
        std::cout << *iter << "\n";
    }
}
```

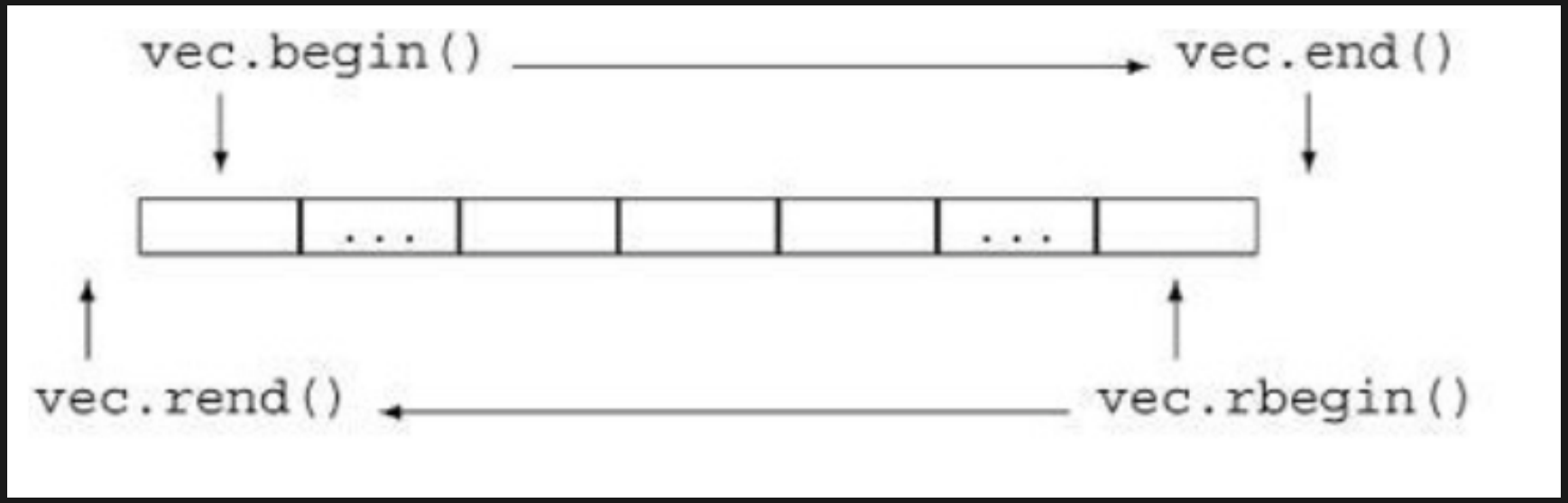
vector-iterator.cpp

🎨 Constness & Reverse

```cpp
#include <iostream>
#include <vector>

int main()
{
    std::vector<int> ages;
    ages.push_back(18);
    ages.push_back(19);
    ages.push_back(20);

    // type of iter would be std::vector<int>::iterator
    for (auto iter = ages.begin(); iter != ages.end(); ++iter) {
        (*iter)++; // OK
    }

    // type of iter would be std::vector<int>::const_iterator
    for (auto iter = ages.cbegin(); iter != ages.cend(); ++iter) {
        //(*iter)++; // NOT OK
    }

    // type of iter would be std::vector<int>::reverse_iterator
    for (auto iter = ages.rbegin(); iter != ages.rend(); ++iter) {
        std::cout << *iter << "\n"; // prints 20, 19, 18
    }

    // Can also use crbegin and crend
}
```

constness-reverse.cpp

🎨 Constness & Reverse



💦 Stream Iterators

```cpp
#include <fstream>
#include <iostream>
#include <iterator>

int main()
{
    std::ifstream in("data.in");

    std::istream_iterator<int> begin(in);
    std::istream_iterator<int> end;
    std::cout << *begin++ << "\n"; // read the first int

    ++begin; // skip the 2nd int
    std::cout << *begin++ << "\n"; // read the third int
    while (begin != end) {
        std::cout << *begin++ << "\n"; // read and print the rest
    }
}
```

stream-iterators.cpp

🦻 Feedback

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