### Preview

- What is STL?
- Iterator and Containers
- Vector Container
- Vector Container Members

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# What is the Standard Template Library

- The Standard Template Library (STL) was developed by Alexander Stepanov and Meng Lee (1995) at HP.
- □ The **STL** is a fundamental part of the C++ which is defined as standard in the 1997.
- □ The **STL** is a collection C++ libraries that allow you to use several well known kinds of data structures (Stack, Queue, Linked List, Vector,...)without having to program them.

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## What is the Standard Template Library

Library	Description
<vector></vector>	A dynamic array
<li>st&gt;</li>	A randomly changing sequence of items
<stack></stack>	A sequence of items with pop and push at one end only
<queue></queue>	A Sequence of items with pop and push at opposite ends
<deque></deque>	Double Ended Queue with pop and push at both ends
 bitset>	A subset of a fixed and small set of items
<set></set>	An unordered collection of items
<map></map>	An collection of pairs of items indexed by the first one

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# What is the Standard Template Library

- The STL has been adopted as a standard by the ISO/IEC and ANSI.
- B However current implementation of the STL are not totally potable.
- The concept of STL come from reusability
- Using STL, can save time and effort to develop a software.
- There are components of STL:
  - Containers
  - Iterators

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### **Iterators and Containers**

### **Containers**

- A Container is a data structure that holds a number of object of the same type or class.
- □ Ex) Lists, Vectors, Stacks, Queues, etc are all Containers
- STL has been carefully designed so that each containers provides space for data

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### **Iterators and Containers**

### **Iterators**

- Items in **Containers** are referred to be special objects called: *iterators*.
- **iterators** are generalization of pointers.

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### Vector Container

- Vectors are a kind of sequence containers like regular array, their elements stored in contiguous storage locations (that means elements can be accessed not only using iterators but also using offsets on regular pointers
- Vector containers are implemented as dynamic arrays – unlike regular array, size of vector <u>automatically being</u> expanded and contracted

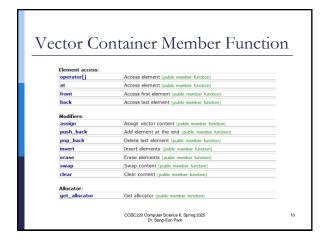
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### Vector Container

- Vector provide almost the same performance <u>as array plus have ability to</u> easily resized.
- Vector usually consume more memory than arrays in order to accommodate for extra storage space for future growth

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# Vector Container Member Function (constructor) Construct vector (public member function) (destructor) Vector destructor (public member function) (operator= Copy vector content (public member function) Iterators: begin Return iterator to beginning (public member function) Return iterator to end (public member function) regin Return reverse iterator to reverse beginning (public member function) regin Return reverse iterator to reverse beginning (public member function) Capacity: size Return size (public member function) max\_size Return maximum size (public member function) resize Change size (public member function) resize Change size (public member function) resize Return size of allocated storage capacity (public member function) reserve Request a change in capacity (public member function) reserve Request a change in capacity (public member function)



# Vector Container Member Function template < class T > void printVec(vector< T > &vec ) { vector <int>::iterator p; for (p = vec.begin(); p != vec.end(); p++) cout <<\* p << ' '; cout <<end!; } template < class T > void printVecRev(vector< T > &v ) { vector< T >::reverse\_iterator p2; for (p2 = v.rbegin(); p2 != v.rend(); ++p2 ) cout << \*p2 << ' '; cout << end!; } COSCIZO Computer Silence L Spring 2025 Dr. Sang-Gon Pask 13

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Vector Container Member Function

// vector2.cpp comparing size, capacity and max_size
#include 
#includ
```

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// vector3.cpp vector container member functions resize(), push_back()
#include (clostream)
#include (vector)
using namespace std;
template (clast T)
void printVec(vector (T) &);
int main ()
{

vector(int) myvector;

// set some initial content:
for (int i=iji(0)i++)
myvector(resize(s)) // 1, 2, 3, 4, 5, 6, 7, 8, 9

printVec(epyvector);
myvector(resize(s)) // 1, 2, 3, 4, 5, 100, 100, 100
printVec(epyvector);
myvector.resize(10); // 1, 2, 3, 4, 5, 100, 100, 100
printVec(myvector);
myvector.resize(12) // 1, 2, 3, 4, 5, 100, 100, 100, 0, 0, 0
printVec(myvector);
return 0;

// function for print vector
template (clast T)
void printVec(clast T) &v)
for (int int) icv.size(); i++)
cout <<* " <<v(i);
cout <</ >
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```

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Vector Container Member Function

// vector4.cpp front(): access front
// back(): access back
#include <iostream>
#include <vector>
using namespace std;
int main ()
{
vector<int> myvector;
myvector.push_back(77); // 77
myvector.push_back(16); // 77, 16

myvector.front() -= myvector.back(); // 61, 16
cout << "myvector.front() is now " << myvector.front() << endl;
return 0;
}

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```

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Vector for Structured Data Type

// vector6.cpp vector container member functions with structured data type finclude container member functions with structured data type finclude container member functions with structured data type finclude container for function for finclude container for finclude container function for finclude container for financing container f
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// == Operator Conviousing thanks if the numbers are equal
bool Student:operator == (Student x)
{
    return (x.ISBunber == IDBunber);
}
// > Operator Overloader: checks if the number is greater than
bool Student:operator > (Student x)
{
    return (IDBunber > x.IDBunber);
}
// < Operator Overloader: checks if the number is less than
bool Student:operator < (Student x)

    return (IDBunber < x.IDBunber);
}
// < Operator Overloader: checks if the number is less than
bool Student:operator < (Student x)

    return (IDBunber < x.IDBunber);
}
// < Operator Overloader: displays the structures information
outreams operator << (outreams streams, const Student Astudent)
outreams (or outreams streams, const Student Astudent)
outreams (of list < outreams of list < ou
```