

Task 11: STL Vectors in C++

Objective:

To understand and demonstrate the use of the STL vector container in C++. This task involves storing integers in a vector and writing separate functions to calculate the sum and average of the elements.

1. Concept Overview

The Standard Template Library (STL) vector is a dynamic array that can automatically resize itself. It provides fast random access and is widely used for storing and manipulating collections of data.

2. Program Code

```
#include <iostream>
#include <vector>
using namespace std;

int findSum(const vector<int>& v) {
    int sum = 0;
    for (int num : v)
        sum += num;
    return sum;
}

double findAverage(const vector<int>& v) {
    int sum = findSum(v);
    return static_cast<double>(sum) / v.size();
}

int main() {
    vector<int> numbers;

    numbers.push_back(10);
    numbers.push_back(20);
    numbers.push_back(30);
    numbers.push_back(40);
    numbers.push_back(50);

    cout << "Vector elements: ";
    for (int n : numbers)
        cout << n << " ";
    cout << endl;
```

```
        cout << "Sum = " << findSum(numbers) << endl;
        cout << "Average = " << findAverage(numbers) << endl;

        return 0;
    }
```

3. Compilation Instructions

```
g++ vector_demo.cpp -o vector_demo
```

4. Sample Output

```
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day21$ g++ vector_demo.cpp -o vector_demo
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day21$ ./vector_demo
Vector elements: 10 20 30 40 50
Sum = 150
Average = 30
student@student-virtual-machine:~/25SUB4508_LSP/25SUB4508_56133/ClassWork/day21$
```

5. Observations & Explanation

1. A `vector<int>` is used to store integer values dynamically.
2. Elements are added using the `push_back()` function.
3. The `findSum()` function calculates the total of all elements.
4. The `findAverage()` function calculates the average using the sum and size of vector.
5. Range-based for loops simplify iteration over vector elements.

6. Advantages of STL Vector

- Dynamic resizing
- Efficient random access
- Easy integration with STL algorithms
- Safer than traditional arrays

7. Conclusion

This task demonstrates how STL vectors can be used to store and manipulate collections of data efficiently. Writing separate functions for sum and average improves modularity and code readability.