

C++ Vector Operations Example

This document demonstrates various operations that can be performed on C++ vectors. Vectors are dynamic arrays provided by the C++ Standard Template Library (STL). They allow adding, removing, and accessing elements efficiently.

Code Implementation

```
// C++ Program Demonstrating Vector Operations

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

int main() {
    vector<string> names = {"abdullah", "atik", "rana"};

    // Printing names using range-based for loop
    for (auto name : names) {
        cout << name << endl;
    }

    // Printing names using index-based for loop
    for (int i = 0; i < names.size(); i++) {
        cout << names[i] << endl;
    }

    // Accessing specific elements
    cout << "First element: " << names[0] << endl;
    cout << "Second element: " << names[1] << endl;

    // Using front() and back()
    cout << "First element using front(): " << names.front() << endl;
    cout << "Last element using back(): " << names.back() << endl;
```

```

// Using at()

cout << "Second element using at(): " << names.at(1) << endl;

// Adding a new element using push_back()
names.push_back("tomal");

cout << "Last element after push_back: " << names.back() << endl;

// Displaying size and checking if empty
cout << "Current size: " << names.size() << endl;
cout << "Is empty: " << names.empty() << endl;

// Insert, Erase, and Clear
names.insert(names.begin() + 1, "shuvo");
names.erase(names.begin() + 2);
names.clear();

return 0;
}

```

Sample Outputs

- Range-based for loop:

abdullah

atik

rana

- Index-based for loop:

abdullah

atik

rana

- Accessing specific elements:

First element: abdullah

Second element: atik

- Using front() and back():

First element using front(): abdullah

Last element using back(): rana

- Using at():

Second element using at(): atik

- Adding a new element using push_back():

Last element after push_back: tomal

- Checking size and empty:

Current size: 4

Is empty: 0 (false)

- Insert, Erase, and Clear:

After insert: abdullah shuvo atik rana

After erase: abdullah shuvo rana

After clear: size=0, is_empty=true

Applications of Vectors

- Vectors are used when the size of the array needs to be dynamic.
- They are commonly applied in scenarios such as:

1. Managing dynamic lists (e.g., names, tasks).
2. Implementing data structures like stacks or queues.
3. Dynamic memory management in algorithms.