# Substring in C++ and STL

## Introduction

A substring is a contiguous sequence of characters within a string. Extracting substrings is a common operation in programming, and C++ provides efficient ways to handle substrings using the Standard Template Library (STL).

## Substring Extraction

In C++, substrings can be extracted from strings using the substr() function provided by the std::string class.

### Example 1: Basic Substring Extraction

Consider the following string:  
std::string str = "Hello, World!";  
To extract the substring 'Hello', we can use:  
std::string sub = str.substr(0, 5);  
Here, 0 is the starting index and 5 is the length of the substring.

### Example 2: Substring from Middle

To extract 'World' from the same string:  
std::string sub = str.substr(7, 5);  
Here, 7 is the starting index and 5 is the length of the substring.

### Example 3: Substring to End

To extract a substring from a starting index to the end of the string:  
std::string sub = str.substr(7);  
This will give us 'World!'. Here, 7 is the starting index and length is omitted.

## Edge Cases

When extracting substrings, consider the following edge cases:  
1. If the starting index is out of range, std::out\_of\_range exception is thrown.  
2. If the length exceeds the string length, substring till the end of string is extracted.

### Example 4: Edge Case Handling

std::string str = "Example";  
try {  
 std::string sub = str.substr(10, 5);  
} catch (const std::out\_of\_range& e) {  
 std::cout << "Exception: " << e.what() << std::endl;  
}  
Here, attempting to start at index 10 will throw an exception.

## Finding Substrings

To find a substring within a string, use the find() function. It returns the index of the first occurrence of the substring.

### Example 5: Finding Substrings

std::string str = "Hello, World!";  
std::size\_t pos = str.find("World");  
if (pos != std::string::npos) {  
 std::cout << "Found at position: " << pos << std::endl;  
} else {  
 std::cout << "Not found" << std::endl;  
}  
This will output: Found at position: 7.

## Conclusion

Substrings are a fundamental concept in string manipulation. Using functions like substr() and find(), C++ allows efficient and flexible handling of substrings in strings.