String

1 What is a String in C++?

A **string** is a sequence of characters.

In C++, we mostly use:

```cpp
#include <string>
```

`std::string` is a **class** (not a primitive type).

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2 Declaration

```cpp
string s;
```

With namespace:

```cpp
std::string s;
```

3 Initialization (ALL WAYS)

```cpp
string s1 = "hello";
string s2("hello");
string s3(5, 'a');       // "aaaaa"
string s4 = s1;          // copy
string s5 = s1 + s2;     // concatenation
```

Input:

```cpp
string s;
cin >> s;              // no spaces
getline(cin, s);       // with spaces
```

⚠ If using `getline` after `cin`:

```cpp
cin.ignore();
getline(cin, s);
```

4 Access Characters

```cpp
s[i];        // no bounds check
s.at(i);     // bounds checked
s.front();   // first char
s.back();    // last char
```

Return type: `char`

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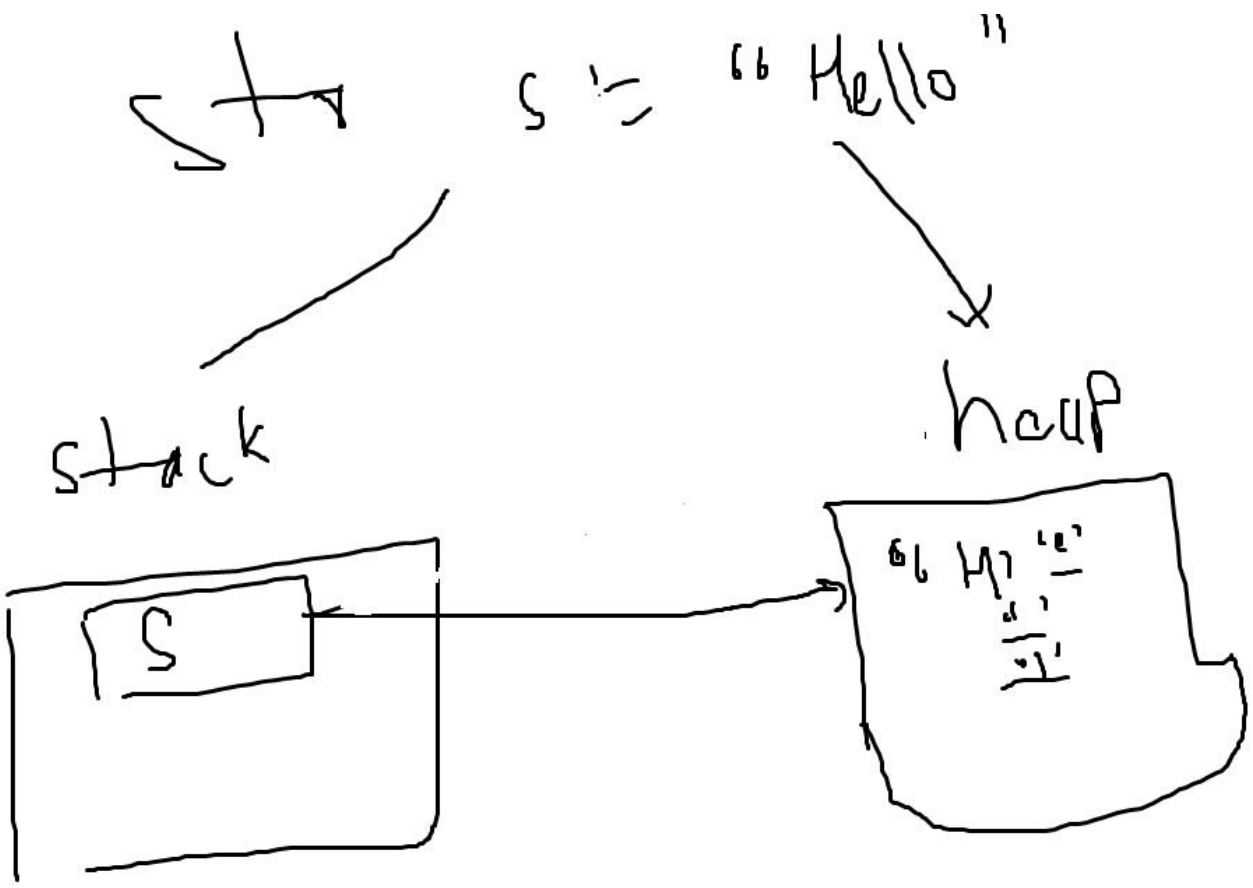
5 Length / Size

```cpp
s.length();
s.size();
```

Return type: `size_t` (unsigned int)

Memory Allocation



In C++. Vars (local) are usually stored in stack, but large/dynamic data is stroed in heap & the variable stores a pointer to it.

IMP Methods

6 Commonly Used STRING METHODS (VERY IMPORTANT)

◆ append()

```cpp
s.append("abc");
s += "abc";
```

Return type: `string&`

◆ push_back() / pop_back()

```cpp
s.push_back('a');
s.pop_back();
```

Return type:

- `push_back()` → `void`
- `pop_back()` → `void`

◆ substr()

```cpp
string sub = s.substr(pos, len);
```

Return type: `string`

Example:

```cpp
s = "hello";
s.substr(1, 3);  // "ell"
```

◆ find()

```cpp
s.find("abc");
s.find('a');
```

Return type: `size_t`

If NOT found:

```cpp
string::npos
```

◆ erase()

```cpp
s.erase(pos, len);
```

Return type: `string&`

◆ insert()

```cpp
s.insert(pos, "abc");
```

Return type: `string&`

◆ replace()

```cpp
s.replace(pos, len, "abc");
```

Return type: `string&`

◆ clear()

```cpp
s.clear();
```

Return type: `void`

◆ empty()

```cpp
s.empty();
```

Return type: `bool`

◆ compare()

```cpp
s1.compare(s2);
```

Return type: `int`

Returns:

- `0` → equal
- `<0` → s1 < s2
- `>0` → s1 > s2

String Comparison

7 String Comparison (MOST USED)

cpp Copy code

```cpp
if (s1 == s2)
if (s1 != s2)
if (s1 < s2)
```

Lexicographical comparison.

Conversion String <-> Number

8 Convert String ↔ Number

cpp Copy code

```cpp
int x = stoi("123");
long l = stol("123");
double d = stod("12.3");

string s = to_string(123);
```

Traversing

9 Traverse a String

Using index

cpp Copy code

```cpp
for (int i = 0; i < s.length(); i++)
    cout << s[i];
```

Range-based

cpp Copy code

```cpp
for (char c : s)
    cout << c;
```

Reverse & Sorting

10 Reverse a String

```cpp
reverse(s.begin(), s.end());
```

Header:

```cpp
#include <algorithm>
```

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11 Sorting a String

```cpp
sort(s.begin(), s.end());
```