

Programming Techniques for Scientific Simulations

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An Introduction to C++

Part 2

The preprocessor

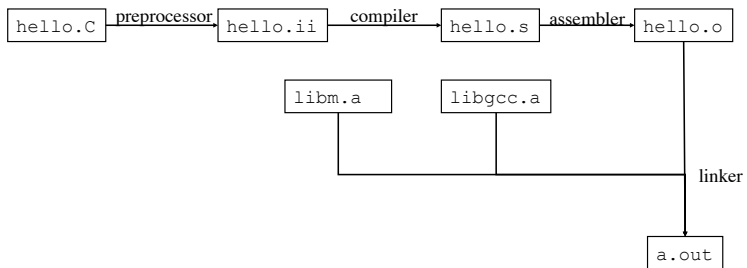
Steps when compiling a program

- ◆ What happens when we type the following?

```
g++ hello.C
```

- ◆ Observe the steps by adding some extra flags:

```
g++ --verbose -save-temps hello.C
```



The C++ preprocessor

◆ Is a text processor, manipulating the source code

◆ Commands start with #

- ◆ `#define XXX`
- ◆ `#define YYY 1`
- ◆ `#define ADD(A,B) A+B`
- ◆ `#undef ADD`
- ◆ `#ifdef XXX`
 `#else`
 `#endif`
- ◆ `#if defined(XXX) && (YYY==1)`
 `#elif defined (ZZZ)`
 `#endif`
- ◆ `#include <iostream>`
- ◆ `#include "square.h"`

#define

◆ Defines a preprocessor macro

- ◆ `#define XXX "Hello"`
 `std::cout << XXX;`
- ◆ Gets converted to
 `std::cout << "Hello"`

◆ Macro arguments are possible

- ◆ `#define SUM(A,B) A+B`
 `std::cout << SUM(3,4);`
- ◆ Gets converted to
 `std::cout << 3+4;`

◆ Definitions on the command line possible

- ◆ `g++ -DXXX=3 -DYYY`
- ◆ Is the same as writing in the first line:
 `#define XXX 3`
 `#define YYY`

#undef

- ◆ Undefines a macro

- ◆ `#define XXX "Hello"`
`std::cout << XXX;`
`#undef XXX`
`std::cout << "XXX";`
 - ◆ Gets converted to
`std::cout << "Hello"`
`std::cout << "XXX"`

- ◆ Undefines on the command line are also possible

- ◆ `g++ -UXXX`
 - ◆ Is the same as writing in the first line:
`#undef XXX`

Looking at preprocessor output

- ◆ Running only the preprocessor:

- ◆ `c++ -E`

- ◆ Running the full compile process but storing the preprocessed files

- ◆ `c++ -save-temps`

- ◆ Look at the files `pre1.C` and `pre2.C`, then at the output of

- ◆ `c++ -E pre1.C`
 - ◆ `c++ -E pre2.C`
 - ◆ `c++ -E -DSCALE=10 pre2.C`

#ifdef ... #endif

- ◆ Conditional compilation can be done using #ifdef

- ◆ `#ifdef SYMBOL`
 `something`
 `#else`
 `somethingelse`
 `#endif`

- ◆ Becomes, if SYMBOL is defined:

- `something`

- ◆ Otherwise it becomes

- `somethingelse`

- ◆ Look at the output of

- ◆ `c++ -E pre3.C`

- ◆ `c++ -DDEBUG -E pre3.C`

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