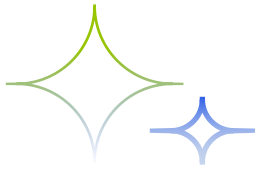

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Programming with C I

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2024.10.21

C Source Files

- A C program may be divided among any number of ***source files***.
- By convention, source files have the extension **.c.**
- Each source file contains part of the program, primarily definitions of functions and variables.
- One source file must contain a function named **main**, which serves as the starting point for the program.

Advantage of Splitting

- Splitting a program into multiple source files has significant advantages:
  - Grouping related functions and variables into a single file helps clarify the structure of the program.
  - Each source file can be compiled separately, which saves time.
  - Functions are more easily reused in other programs when grouped in separate source files.

Header

- Problems that arise when a program is divided into several source files:
  - How can a function in one file call a function that's defined in another file?
  - How can a function access an external variable in another file?
  - How can two files share the same macro definition or type definition?
- The answer lies with the **#include** directive, which makes it possible to share information among any number of source files.

Header

- The **#include** directive tells the preprocessor to insert the contents of a specified file.
- Information to be shared among several source files can be put into such a file.
- **#include** can then be used to bring the file's contents into each of the source files.
- Files that are included in this fashion are called ***header files*** (or sometimes ***include files***).
- By convention, header files have the extension **.h.**

MACRO

- Most large programs contain macro definitions and type definitions that need to be shared by several source files.
- These definitions should go into header files.

Example MACRO

- Suppose that a program uses macros named **BOOL**, **TRUE**, and **FALSE**.
- Their definitions can be put in a header file with a name like **boolean.h**:

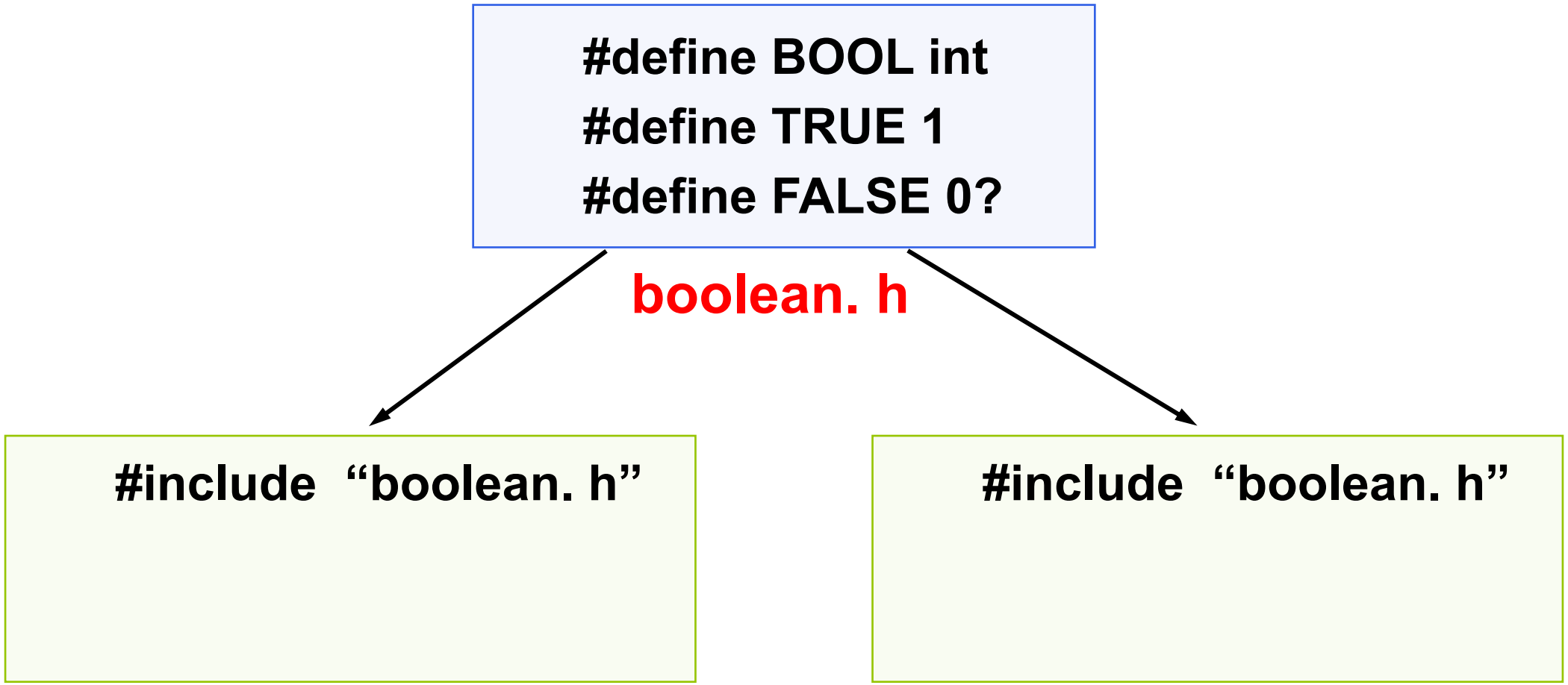
```
#define BOOL int
#define TRUE 1
#define FALSE 0?
```

- Any source file that requires these macros will simply contain the line

```
#include "boolean.h"
```

Example Sharing MACRO

A program in which two files include **boolean.h**:



MACRO Sharing – Why?

- Advantages of putting definitions of macros and types in header files:
  - Saves time. We don’t have to copy the definitions into the source files where they’re needed.
  - Makes the program easier to modify. Changing the definition of a macro or type requires editing a single header file.
  - Avoids inconsistencies caused by source files containing different definitions of the same macro or type.

Sharing Function Prototype

- Suppose that a source file contains a call of a function **f** that's defined in another file, **foo.c.**
- Calling **f** without declaring it first is risky.
  - The compiler assumes that **f**'s return type is **int**.
  - It also assumes that the number of parameters matches the number of arguments in the call of **f**.
- So, we put **f**'s prototype in a header file (**foo.h**), then include the header file in all the places where **f** is called.
- We'll also need to include **foo.h** in **foo.**c, enabling the compiler to check that **f**'s prototype in **foo.h** matches its definition in **foo.c.**

Sharing Variable

- To share a variable among files, we put its ***definition*** in one source file, then keyword **extern** is used to declare a variable without defining it.
- For example,
  - int i; // in file1.c
  - extern int i; // in file2.c
- **extern** informs the compiler that **i** is defined elsewhere in the program, so there's no need to allocate space for it.

Compiling Multiple Source Files

hello.h

```
void hello (const char * name);
```

helloExample.c

```
#include<stdio.h>
#include “hello.h”
extern int shared_variable;
int main (void)
{
    hello (“ICEN 200”);
printf("Value of shared_variable in
helloFn.c: %d\n", shared_variable);
    return 0;}
```

helloFn.c

```
#include <stdio.h>
#include “hello.h”
int shared_variable = 10;
void hello (const char * name)
{
    printf (“Hello %s!\n”, name);
}
```

```
$gcc helloExample.c helloFn.c -o hello
$./hello
Hello ICEN 200!
```

THE END

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