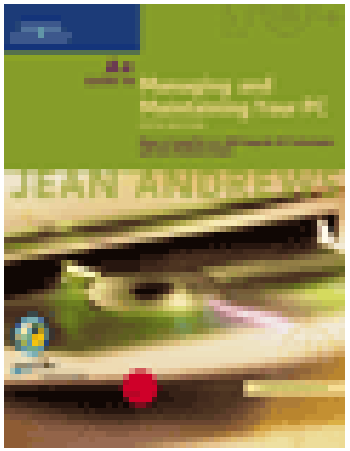
Lecture 1d



Analyzing a c program

by Quan LE-TRUNG, *Dr.techn.*

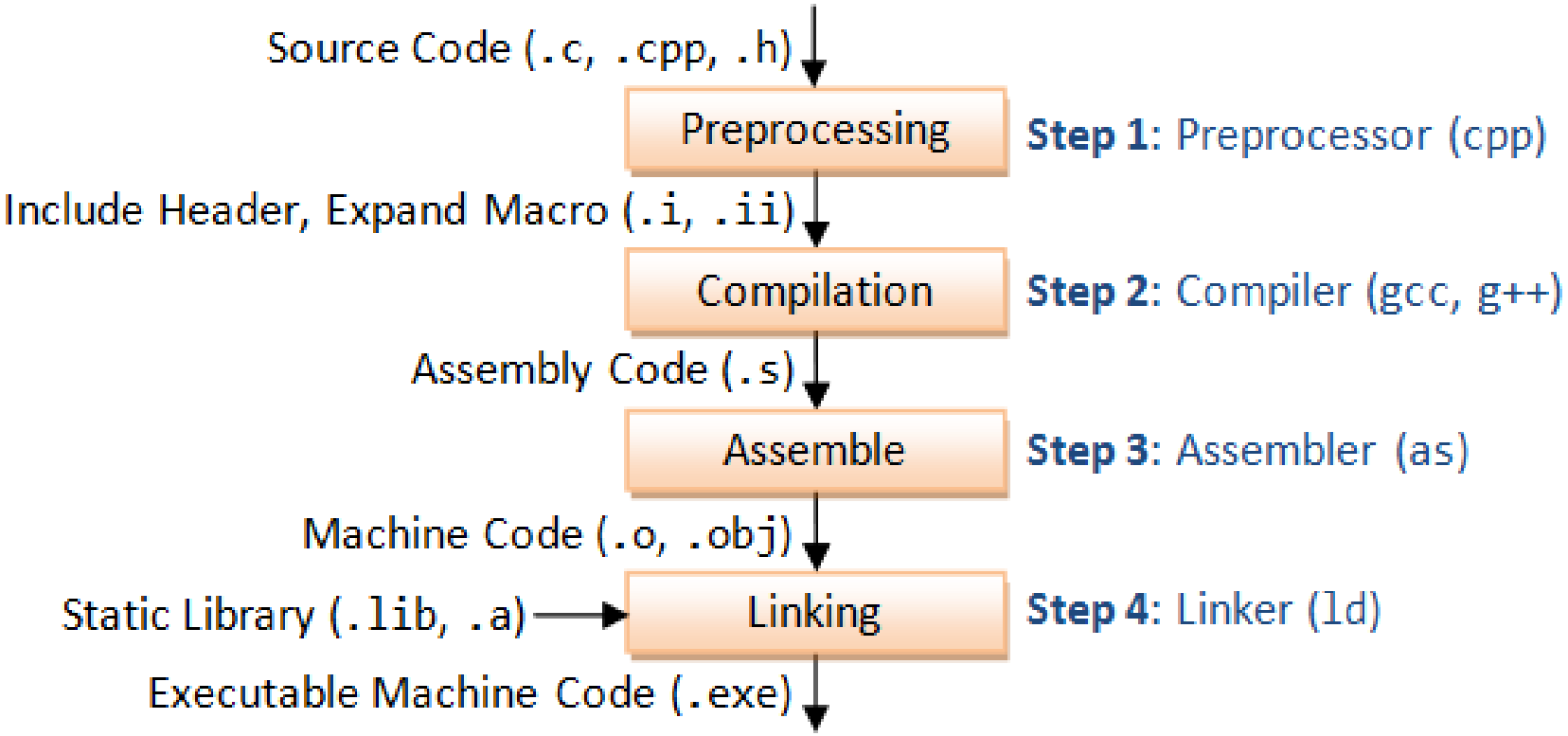
Compile/Link a Simple C Program - hello.c

Below is the Hello-world C program hello.c:

```
// hello.c
#include <stdio.h>

int main() {
    printf("Hello, world!\n");
    return 0;
}
```

GCC Compilation Process



GCC compiles a C/C++ program into executable in 4 steps as shown in the above diagram. For example, a **"gcc -o hello.exe hello.c"** is carried out as follows:

Pre-processing: via the GNU C Preprocessor (cpp.exe), which includes the headers (#include) and expands the macros (#define).

> cpp hello.c > hello.i

The resultant intermediate file "hello.i" contains the expanded source code.
Compilation: compiler compiles pre-processed source code into assembly code for a specific processor.

> gcc -S hello.i

The -S option specifies to produce assembly code, instead of object code. The resultant assembly file is "hello.s".
Assembly: The assembler (as.exe) converts the assembly code into machine code in the object file "hello.o".

> as -o hello.o hello.s

Linker: Finally, the linker (ld.exe) links the object code with the library code to produce an executable file "hello.exe".

> ld -o hello.exe hello.o ...libraries...

Verbose Mode (-v)
You can see the detailed compilation process by enabling -v (verbose) option. For example,

> gcc -v hello.c -o hello.exe