
Scientific Computing 1
Handout 3
October 16, 2024

Common GCC Options

Binary code optimization:

<code>-Os</code>	Optimize the code to reduce the size of the binary.
<code>-O1</code>	Turn on basic optimizations. The compiler tries to reduce code size and execution time, without performing any optimizations that take a great deal of compilation time.
<code>-O2</code>	Optimize even more. GCC performs nearly all optimizations that do not involve a space-speed trade-off. As compared to <code>-O1</code> , this option increases both compilation time and the performance.
<code>-O3</code>	Aggressive optimization. It tries to unroll loops constructs and inlines small functions. It can cause unexpected effects in the program. The output is usually larger than using <code>-O2</code> .
<code>-march=native</code>	Automatically determines the code generation options to optimally exploit your local CPU features. Code may not be executable on other machines.

Debugging:

<code>-g</code>	Include the debug symbols in the output. This is necessary for tools like <code>gdb</code> , <code>ddd</code> or <code>valgrind</code> .
<code>-pg</code>	Include the profiling information for the GNU profiler. Execution in <code>gprof</code> then produces the desired information.

Floating Point Arithmetics related:

<code>-ffast-math</code>	Turns off the IEEE754 floating point arithmetics. This option is dangerous.
<code>-ffloat-store</code>	Floating point operations store the results to the memory instead of keeping them in high accuracy CPU registers.
<code>-mfpmath=sse</code> <code>-msse2</code>	Use the SSE2 registers for floating point operations instead of the classical x86/x87 floating point unit. Only available on x86 and x86.64 platforms. <code>-mfpmath=sse</code> default on x86.64.
<code>-mavx</code> <code>-mavx2</code>	as above but for the more recent AVX and AVX2 registers.

Warnings and C Standards:

<code>-Wall</code>	The compiler displays all warnings about malformed code.
<code>-std=XXX</code>	Defines the C standard to use. Normally explicit usage is not necessary. Possible values: <code>c89</code> , <code>c99</code> or <code>c11</code> .

Finding libraries and header files:

-Ipath	Set an additional search path for the include directive. This can be used multiple times.
-Lpath	Set an additional search path for the linker.
-lNAME	Link a specified library to the program. The lib prefix is automatically added to the library.

Compilation of own libraries:

-c	Compile the source code to object files without linking it. The default output name is inputname.o .
-fPIC	Generate <i>position independent code</i> . This flag influences the assembler code production to use relative addresses. It is necessary for libraries.

Code Preprocessing and basic shared memory parallelism:

-DNAME=VALUE	Defines a preprocessor variable <i>NAME</i> and sets it to <i>VALUE</i>
-fopenmp	The OpenMP support is enabled.
-pthread	The PThread support is enabled.