

Gem5 Execution

After I have Gem5 with ALL and x86 ISAs ready , I tried some basic testing for both using simple C codes .

I wrote 4 basics codes and compiled them in sub-directory "Gem5Examples"

1. hello.c

```
#include <stdio.h>
int main() {
    printf("Hello Abdullah !\nThis is your greeting code from Gem5");
    return 0;
}
```

2.loop.c (Simple loop)

```
#include <stdio.h>
int main() {
    for (int i = 0; i < 5; i++) {
        printf("Loop iteration: %d\n", i);
    }
    return 0;
}
```

3. sum.c (Arthimatic Sum Operation)

```
#include <stdio.h>
int main() {
    int a = 5, b = 3;
    printf("Sum: %d\n", a + b);
    return 0;
}
```

4.array.c (Array)

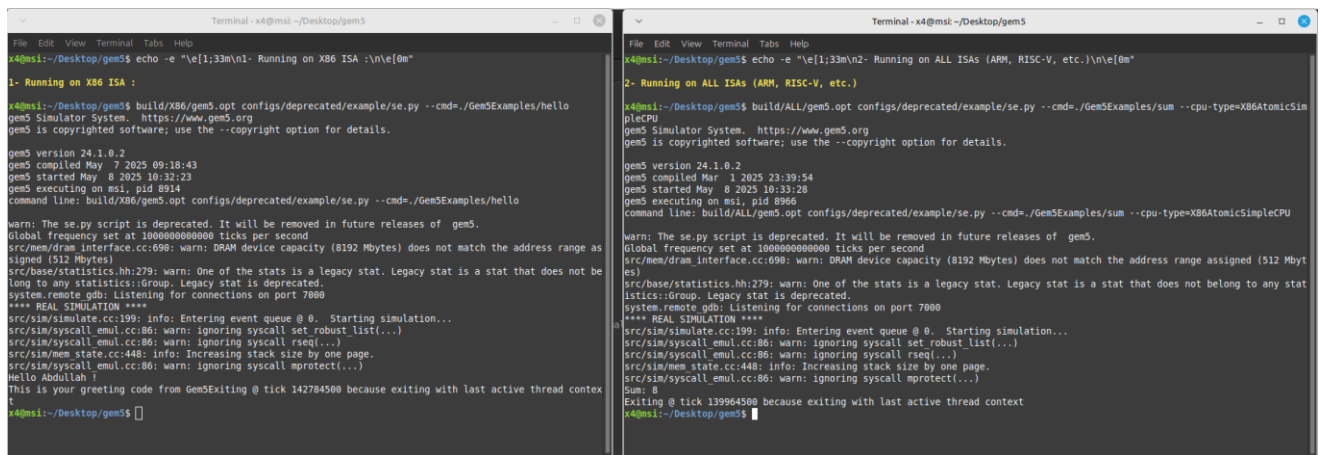
```
#include <stdio.h>
int main() {
    int arr[3] = {10, 20, 30};
    printf("Array element: %d\n", arr[1]);
    return 0;
}
```

Then I compiled them with same names as followed :

```
gcc -static hello.c -o hello
gcc -static loop.c -o loop
gcc -static sum.c -o sum
gcc -static array.c -o array
```

After that I tested each execution for these codes in both ALL(With different cpu options) and x86.

I use System Emulation script "configs/deprecated/example/se.py" which use to simulate a single process or small programm.



```
Terminal - x4@msi: ~/Desktop/gem5
File Edit View Terminal Tabs Help
x4@msi:~/Desktop/gem5$ echo -e "\e[1;33m\n1- Running on X86 ISA :\n\e[0m"
1- Running on X86 ISA :
x4@msi:~/Desktop/gem5$ build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/hello
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 24.1.0.2
gem5 compiled May 7 2025 09:18:43
gem5 started May 8 2025 10:32:23
gem5 executing on msi, pid 8914
command line: build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/hello

warn: The se.py script is deprecated. It will be removed in future releases of gem5.
Global frequency set at 1000000000000 ticks per second
src/mem/dram/interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range as signed (512 Mbytes)
src/base/statistics.hh:279: warn: One of the stats is a legacy stat. Legacy stat is a stat that does not belong to any statistics::Group. Legacy stat is deprecated.
system.remote.gdb: Listening for connections on port 7000
**** REAL SIMULATION ****
src/sim/simulate.cc:199: info: Entering event queue @ 0. Starting simulation...
src/sim/syscall_emul.cc:86: warn: ignoring syscall set robust list(...)
src/sim/syscall_emul.cc:86: warn: ignoring syscall rseq(...)
src/sim/mem/state.cc:448: info: Increasing stack size by one page.
src/sim/syscall_emul.cc:86: warn: ignoring syscall mprotect(...)
Hello Abdullah !
This is your greeting code from Gem5Exiting @ tick 142784500 because exiting with last active thread context
x4@msi:~/Desktop/gem5$

Terminal - x4@msi: ~/Desktop/gem5
File Edit View Terminal Tabs Help
x4@msi:~/Desktop/gem5$ echo -e "\e[1;33m\n2- Running on ALL ISAs (ARM, RISC-V, etc.)\n\e[0m"
2- Running on ALL ISAs (ARM, RISC-V, etc.)
x4@msi:~/Desktop/gem5$ build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/sum --cpu-type=X86AtomicSimpleCPU
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 24.1.0.2
gem5 compiled Mar 1 2025 23:39:54
gem5 started May 8 2025 10:33:28
gem5 executing on msi, pid 8966
command line: build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/sum --cpu-type=X86AtomicSimpleCPU

warn: The se.py script is deprecated. It will be removed in future releases of gem5.
Global frequency set at 1000000000000 ticks per second
src/mem/dram/interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
src/base/statistics.hh:279: warn: One of the stats is a legacy stat. Legacy stat is a stat that does not belong to any statistics::Group. Legacy stat is deprecated.
system.remote.gdb: Listening for connections on port 7000
**** REAL SIMULATION ****
src/sim/simulate.cc:199: info: Entering event queue @ 0. Starting simulation...
src/sim/syscall_emul.cc:86: warn: ignoring syscall set robust list(...)
src/sim/syscall_emul.cc:86: warn: ignoring syscall rseq(...)
src/sim/mem/state.cc:448: info: Increasing stack size by one page.
src/sim/syscall_emul.cc:86: warn: ignoring syscall mprotect(...)
sum: 0
Exiting @ tick 139964500 because exiting with last active thread context
x4@msi:~/Desktop/gem5$
```

1- Running on X86 ISA :

build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/hello

build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/loop

build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/sum

build/X86/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/array

2- Running on ALL ISAs (ARM, RISC-V, etc.)

build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/hello --cpu-type=ArmAtomicSimpleCPU

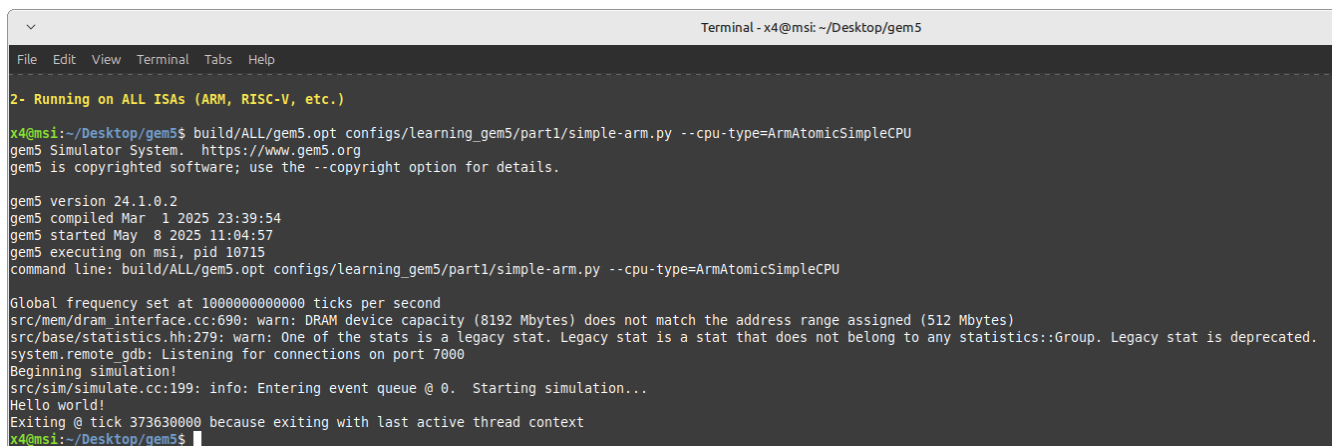
```
build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/loop --cpu-type=RiscvAtomicSimpleCPU
```

```
build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/sum --cpu-type=X86AtomicSimpleCPU
```

```
build/ALL/gem5.opt configs/deprecated/example/se.py --cmd=./Gem5Examples/array --cpu-type=ArmAtomicSimpleCPU
```

Some codes didn't work using ARM or Risc we had errors like "Segmentation fault (core dumped)", because the codes compiled to work with x86 , but i did it as an expermintal test .

I used the example of ARM:



```
Terminal - x4@msi: ~/Desktop/gem5
File Edit View Terminal Tabs Help

2- Running on ALL ISAs (ARM, RISC-V, etc.)

x4@msi:~/Desktop/gem5$ build/ALL/gem5.opt configs/learning_gem5/part1/simple-arm.py --cpu-type=ArmAtomicSimpleCPU
gem5 Simulator System. https://www.gem5.org
gem5 is copyrighted software; use the --copyright option for details.

gem5 version 24.1.0.2
gem5 compiled Mar  1 2025 23:39:54
gem5 started May  8 2025 11:04:57
gem5 executing on msi, pid 10715
command line: build/ALL/gem5.opt configs/learning_gem5/part1/simple-arm.py --cpu-type=ArmAtomicSimpleCPU

Global frequency set at 1000000000000 ticks per second
src/mem/dram_interface.cc:690: warn: DRAM device capacity (8192 Mbytes) does not match the address range assigned (512 Mbytes)
src/base/statistics.hh:279: warn: One of the stats is a legacy stat. Legacy stat is a stat that does not belong to any statistics::Group. Legacy stat is deprecated.
system.remote_gdb: Listening for connections on port 7000
Beginning simulation!
src/sim/simulate.cc:199: info: Entering event queue @ 0. Starting simulation...
Hello world!
Exiting @ tick 373630000 because exiting with last active thread context
x4@msi:~/Desktop/gem5$
```

```
build/ALL/gem5.opt configs/learning_gem5/part1/simple-arm.py --cpu-type=ArmAtomicSimpleCPU
```

examples included in configs/learning_gem5/

part1:

cache.py simple-arm.py simple.py simple-riscv.py two_level.py

part2:

hello_goodbye.py run_simple.py simple_cache.py simple_memobj.py

part3:

msi_caches.py ruby_caches_MI_example.py ruby_test.py simple_ruby.py test_caches.py

we can use them to practice small executions and simulations using Gem5

deprecated/example , the main examples we can tested :

[se.py \(System Emulation\)](#) is the most commonly used configuration script in Gem5 because:

Simple & Fast: It simulates a single process (like running a single C program) without booting a full OS.

Good for Testing: Perfect for running small programs (like your 5 C examples).

Flexible: Allows tweaking CPU, cache, and memory settings easily.

[fs.py \(Full System Simulation\)](#)

Boots a full Linux OS (like Ubuntu) inside Gem5.

When to use:

Need to test multi-process programs (e.g., fork(), threads).

Running real applications (e.g., Apache, Redis).

Testing device drivers or kernel modules.

