Αρχιτεκτονική Προηγμένων Υπολογιστών και Επιταχυντών Gem5 Report

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December 25, 2025

Contents

Chapter 1

Gem5 Assignment

In this assignment we are going to be System call Emulation (SE) where we focus on running a specific program in contrast with Full System (FS) mode where we emulate an entire operating system.

1.1   Step 1: Downloading Gem5

In this assingment we utilize a ready built virtual machine which has the correct ubuntu version, the necessary dependencies and the gem5 tool preinstalled.

1.2   Step 2: Hello World

Here the starter_se.py script configures the gem5 emulator by defining the following parameters:

Parameter	Value
CPU Type	Minor
Operation Frequency	1GHz
Basic Units	
Caches	
Memory	

- CPU Type: Minor
    - 1 core
    - Clock 1GHz
    - Voltage 3.3V
- Caches
    - Cache line size = 64 columns
    - L1 Instruction cache
    - L1 Data cache
    - Page Table Walker cache
- Memory
    - DDR3 1600 8x8
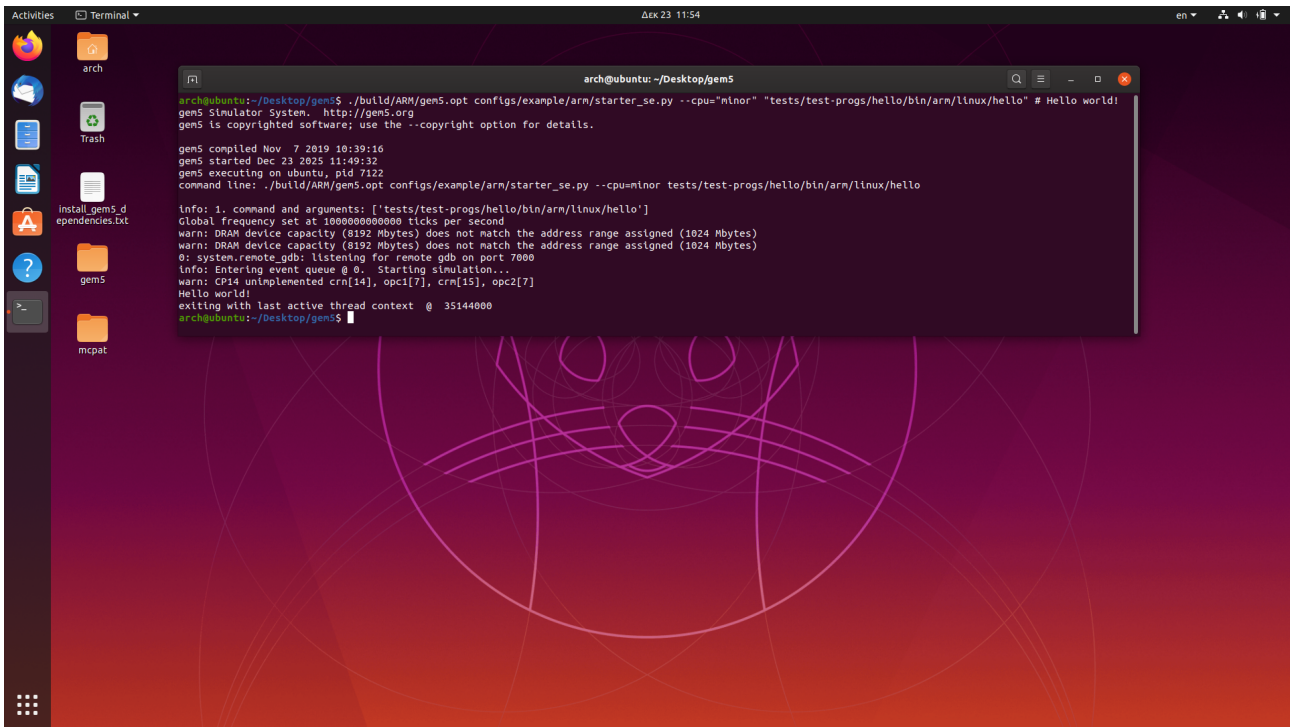   - 2 memory channels
    - 2 GB

Figure 1.1: hello-world

Parameter	Value
sim_seconds	
sim_ticks	
sim_insts	
host_inst_rate	
# committed instructions	
L1 data cache accesses	
L2 cache accesses	

1.2.1 The different CPU models

In the documentation we can explore and learn more about the different cpu models gem5 provides:

atomic

minor

hpi

1.3 Step 3: First Program

Next step has us create a simple Clang trinagular number generator program and cross compiling it to run on the gem5 simulator. A triangular number can be defined as:

$$T_N = \frac{(N+1)*N}{2}$$

```
./build/ARM/gem5.opt configs/example/se.py
    --cpu-type=MinorCPU
    --caches -c "/home/arch/Downloads/tri" --options "7"
```

1.4 Step 4: SPEC CPU2006 Benchmark

SPEC CPU2006 is a benchmarking suite that stresses a system's:

- CPU
- Memory
- Compiler

It is trying to emulate computationally intensive real usage scenarios.