

# 计算机体系结构gem5实验一实验报告

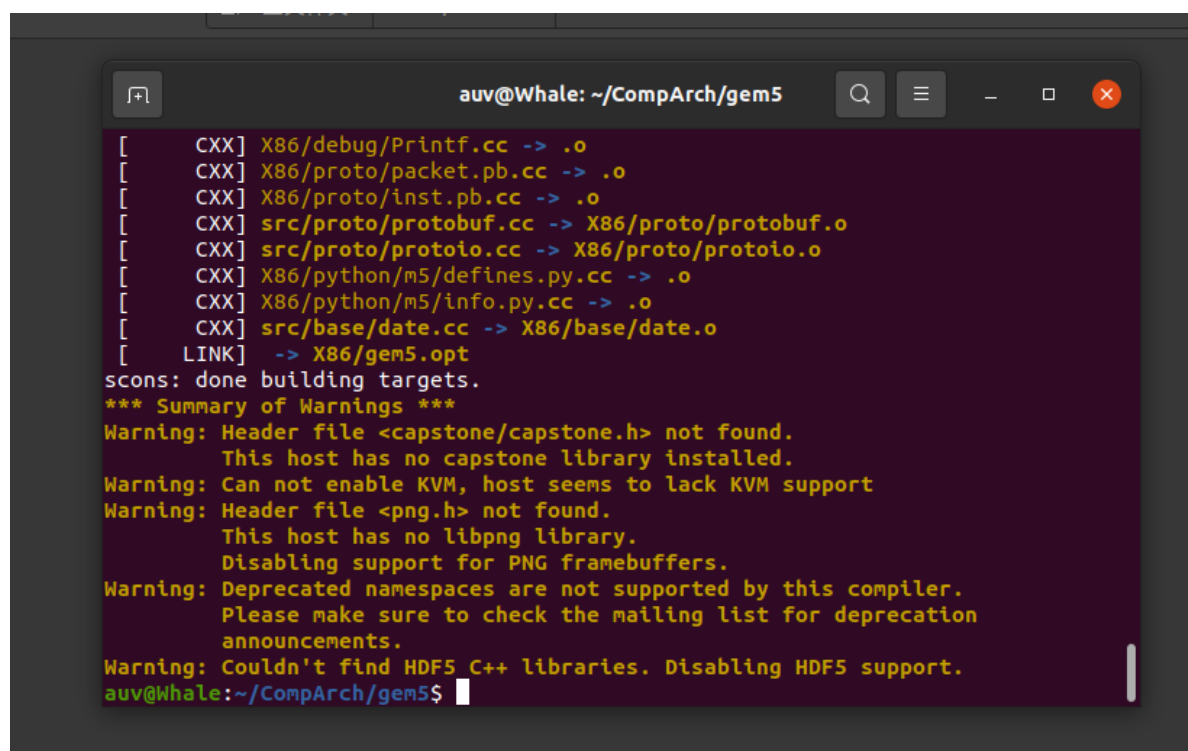
PB21111681 朱炜荣

## 一、在虚拟机上编译gem5

我使用的是操作系统课上配置的虚拟机，但是当时分配的内存只有35G，只剩下了11G的空间。所以我做的第一件事是给虚拟机扩容，扩充到了55G，并将新动态分配的空间激活，分配到CompArch文件夹下。

中间的大部分过程都是在下载安装环境依赖。 `sudo apt install xx`

然后成功git clone gem5的仓库，进入gem5文件夹，执行给出的编译指令。（中间出现了很多次的编译失败，究其原因貌似是认为是虚拟机内存不足造成的。通过创建swap分区解决了这个问题）其中并没有errors。



```
auv@Whale: ~/CompArch/gem5
[ CXX] X86/debug/Printf.cc -> .o
[ CXX] X86/proto/packet.pb.cc -> .o
[ CXX] X86/proto/inst.pb.cc -> .o
[ CXX] src/proto/protobuf.cc -> X86/proto/protobuf.o
[ CXX] src/proto/protoio.cc -> X86/proto/protoio.o
[ CXX] X86/python/m5/defines.py.cc -> .o
[ CXX] X86/python/m5/info.py.cc -> .o
[ CXX] src/base/date.cc -> X86/base/date.o
[ LINK] -> X86/gem5.opt
scons: done building targets.
*** Summary of Warnings ***
Warning: Header file <capstone/capstone.h> not found.
This host has no capstone library installed.
Warning: Can not enable KVM, host seems to lack KVM support
Warning: Header file <png.h> not found.
This host has no libpng library.
Disabling support for PNG framebuffers.
Warning: Deprecated namespaces are not supported by this compiler.
Please make sure to check the mailing list for deprecation
announcements.
Warning: Couldn't find HDF5 C++ libraries. Disabling HDF5 support.
auv@Whale:~/CompArch/gem5$
```

## 二、运行simple.py文件

主要是简要编写运行了一遍简单的模拟配置文件，包括各种库的引入、系统的创建和参数设置、CPU的创建、ICache和DCache的创建、内存控制系统的创建、进程的创建以及模拟运行。

在没有添加Cache之前的仿真执行情况如下：

```
gem5 > config > learning_gem5 > part1 > simple.py
83 system.mem_ctrl.dram = DOR3_1600_8x8()
84 system.mem_ctrl.dram.range = system.mem_ranges[0]
85 system.mem_ctrl.port = system.membus.mem_side_ports
86
87 # Connect the system up to the membus
88 system.system_port = system.membus.cpu_side_ports
89
90 # Here we set the X86 "hello world" binary. With other ISAs you must specify
91 # workloads compiled to those ISAs. Other "hello world" binaries for other ISAs
92 # can be found in "tests/test-progs/hello"
93 thispath = os.path.dirname(os.path.realpath(__file__))
94 binary = os.path.join(
95     thispath,
96     "hello_world.o"
97 )
98
99 # Run the simulation
100 sim = system
101 sim.run()
102
103 # Print the results
104 print("Hello world!")
105
106 # Exit the simulation
107 sys.exit(0)
```

Global frequency set at 1000000000000 ticks per second  
warn: No dot file generated. Please install pydot to generate the dot file and pdf.  
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 499308000 because exiting with last active thread context

### 三、运行two\_level.py文件

主要工作为为第二部分编写的模拟系统添加一级缓存。首先是根据文档给出的介绍，定义了Cache的缓存对象，并根据ICache和DCache的种类不同分配重定义了对总线和CPU的连接方法。

然后将相对应的组件加入到simple.py的模拟文件中，不同的部分在于，Cache的创建和连接方法要与我们在Cache.py中给出的一致，在对应的地方进行修改。然后跟据文档最后部分，加入了类似args的参数调用部分。

添加了Cache之后的运行模拟结果，可以看到运行时间明显有了减少。

```
gem5 > config > learning_gem5 > part1 > two_level.py
1 # Copyright (c) 2015 Jason Power
2 # All rights reserved.
3 #
4 # Redistribution and use in source and binary forms, with or without
5 # modification, are permitted provided that the following conditions are
6 # met: redistributions of source code must retain the above copyright
7 # notice, this list of conditions and the following disclaimer;
8 # redistributions in binary form must reproduce the above copyright
9 # notice, this list of conditions and the following disclaimer in the
10 # documentation and/or other materials provided with the distribution;
11 # neither the name of the copyright holders nor the names of its
12 # contributors may be used to endorse or promote products derived from
13 # this software without specific prior written permission.
```

Global frequency set at 1000000000000 ticks per second  
warn: No dot file generated. Please install pydot to generate the dot file and pdf.  
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 58125000 because exiting with last active thread context