Gem5 and NVMain
Installation and Integration on Ubuntu 20.04 or 18.04

Deep Bhuinya

Final year M.Tech Student
CSE Department
IIT Guwahati

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Tested Machines

Specific Dependencies	Machine 1	Machine 2
lsbrelease -a	Ubuntu 20.04.3 LTS	Ubuntu 18.04.6 LTS
gcc -v	5.3.1	5.5.0
g++ -v	5.3.1	5.5.0
python -V	2.7.18	2.7.17
scons -v	3.0.5	3.0.5
swig -version	3.0.12	3.0.12

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My Directory Structure

```
Gem5-NVMain
|
+-- Gem5
|
+-- fs-image
|
+-- NVMain
```

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Dependencies

- GCC 5
- Python 2.7
- SCons 3.0.5
- SWIG 3.0.12
- Others

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- Others

Install GCC 5

1. `sudo gedit /etc/apt/sources.list`
2. Add the below two lines in the end and save
   1. deb http://dk.archive.ubuntu.com/ubuntu/ xenial main
   2. deb http://dk.archive.ubuntu.com/ubuntu/ xenial universe
3. `sudo apt update`
4. `sudo apt install gcc-5 g++-5`
5. `sudo update-alternatives --remove-all gcc`
6. `sudo update-alternatives --install /usr/bin/gcc gcc /usr/bin/gcc-5 100`
7. `sudo update-alternatives --remove-all g++`
8. `sudo update-alternatives --install /usr/bin/g++ g++ /usr/bin/g++-5 100`

Install Python 2.7

1. ``sudo apt install python2.7``
2. ``sudo update-alternatives --remove-all python``
3. ``sudo update-alternatives --install /usr/bin/python python /usr/bin/python2.7 100``

Install SCons 3.0.5

1. Download SCons 3.0.5 from here:
   https://sourceforge.net/projects/scons/files/scons/
2. Go to the SCons directory
3. `sudo python setup.py install --standard-lib`

Install SWIG 3.0.12

1. Install PCRE (Perl 5 Compatible Regular Expression) Library:
   `sudo apt install libpcre3 libpcre3-dev`
2. Download SWIG 3.0.12 from here:
   `https://sourceforge.net/projects/swig/files/swig/`
3. Go to the SWIG directory
4. `./configure`
5. `make`
6. `sudo make install`

Install Other Dependencies

```
sudo apt install build-essential git m4 zlib1g zlib1g-dev libprotobuf-dev
protobuf-compiler libprotoc-dev libgoogle-perftools-dev libpython2-dev
python2-dev python-six libboost-all-dev libhdf5-serial-dev python-pydot
libpng-dev libelf-dev pkg-config
```

If libpython2-dev, python2-dev are not installing, try these packages: libpython2.7-dev,
python2.7-dev

Install Gem5

1. Download the latest commit from my Github repository:
   https://github.com/DeepBCSE/Gem5-for-NVMain
2. Rename the folder as *Gem5*
3. Go to the Gem5 directory
4. `scons build/X86/gem5.opt -j ⟨nthreads⟩`
5. An error came in Machine 1 related to the file *timer.cc*
   1. Rename *static* as *extern* in Gem5/src/cpu/kvm/timer.cc line 63
   2. Step 3 & 4
6. An error came in both the Machines related to Permission of the file *cpt_upgrader.py*
   1. Run the command `chmod +x cpt_upgrader.py` in the directory Gem5/util
   2. Step 3 & 4

Gem5 SE mode test

1. Go to the Gem5 directory
2. `./build/X86/gem5.opt configs/example/se.py -c tests/test-progs/hello/bin/x86/linux/hello`

Configure Gem5 for Full System mode

1. Download the X86 Full System Files from here: http://www.m5sim.org/Download
2. Extract this in a folder named *fs-image* and copy the path of this folder in Gem5/configs/common/SysPaths.py line 60

Gem5 FS mode test

1. Go to the Gem5 directory
2. `./build/X86/gem5.opt configs/example/fs.py --kernel=x86_64-vmlinux-2.6.22.9 --disk-image=linux-x86.img`

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Install NVMain

1. Download the the 29 Aug 2018 commit (ad28c0c) from here:
   `https://github.com/SEAL-UCSB/NVmain/commits/master`
2. Rename the folder as *NVMain*
3. Comment out the whole line in /NVMain/SConscript line 36:
   from gem5_scons import Transform
4. Go to the NVMain directory
5. `scons --build-type=fast -j ⟨nthreads⟩`

1. Go to the NVMain directory
2. ./nvmain.fast Config/PCM_ISSCC_2012_4GB.config
   Tests/Traces/hello_world.nvt 1000000

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Integrate Gem5 and NVMain

1. Go to the Gem5 directory
2. `git apply ../NVMain/patches/gem5/nvmain2-gem5-11688+`
3. `scons EXTRAS=../NVMain build/X86/gem5.opt -j ⟨nthreads⟩`

Test the integration

1. Go to the Gem5 directory
2. `./build/X86/gem5.opt configs/example/se.py -c tests/test-progs/hello/bin/x86/linux/hello --mem-type=NVMainMemory --nvmain-config=../NVMain/Config/2D_DRAM_example.config`

Stuck somewhere? Happy to **help**

Deep Bhuinya

`deepb.cse@gmail.com`