Part II: Integrate riscv-dv test generator

- Generate a random test using riscv-dv https://github.com/google/riscv-dv. This has a UVM based flow as well as python based to generate any test. It's suggested to use Python based flow: https://github.com/google/riscv-dv/tree/master/pygen/pygen_src

Install RISCV-DV-PyFlow

- Open the terminal in any directory of your choice.
- Clone the repository in your local terminal. It will not run in VNC due to the old Ubuntu version.
- Enter the command git clone https://github.com/chipsalliance/risc v-dv.git
- cd riscv-dv
- Install pip3 in your terminal using `sudo apt-get install python3-pip`
- pip3 install -r requirements.txt   # install dependencies (only once)
- python3 run.py --help

Running the Generator

- python3 run.py --test=riscv_arithmetic_basic_test --simulator=pyflow
- After running the above command. An output directory will be generated with format like this out_yyyy-mm-dd (here y,m, and d represents the actual year, month and date).
- cd to this out_yyyy-mm-dd directory.
- Then cd asm-test directory.
- In this directory two single tests riscv_arithmetic_basic_test_0.S and riscv_arithmetic_basic_test_1.S will have been created.
- Create a new directory assembly_test in some other place and copy these tests in it.
- Again go to riscv-dv directory.
- cd to user_extension directory.
- Copy user_define.h and user_init.s from here in your assembly_test directory.

Riscv toolchain

- Make a new folder toolchain in any directory.
- Go to https://github.com/riscv-collab/riscv-gnu-toolchain/releases
- Choose and download a pre-built riscv32-elf-ubuntu toolchain compatible with the version of your ubuntu.
- Now extract the tar file in the toolchain directory.
- Open the terminal here.
- cd <extracted_folder_name>/riscv/bin
- pwd #it will print the complete address of the present working directory
- copy the <address>
- export RISCV=<address>
- echo $RISCV #it must provide the address you just assigned to it

- export PATH=$PATH:$RISCV
- echo PATH #now the address of RISCV must be appended at the end of other addresses in PATH variable
- echo ~/.bashrc #the basrc file will be opened
- Add these two lines at the end of this file
    1. export RISCV=<address> #the same RISCV address
    2. export PATH=$PATH:$RISCV
- Close the file.

Back to the terminal

- source ~/.bashrc
- Close the terminal.
- Go to this link: https://github.com/riscv-software-src/riscv-isa-sim/blob/master/arch_test_target/spike/link.ld
- Place this link.ld file in assembly_test directory
- Stay in the assembly_test directory.
- Open the terminal in this directory and run the following three commands:

    1. riscv32-unknown-elf-gcc -march=rv32imc -mabi=ilp32 -nostdlib -Tlink.ld riscv_arithmetic_basic_test_0.S -o riscv_arithmetic_basic_test_0.elf

    2. riscv32-unknown-elf-objdump -d riscv_arithmetic_basic_test_0.elf &> dis.ass

    3. riscv32-unknown-elf-objcopy -O binary riscv_arithmetic_basic_test_0.elf riscv_arithmetic_basic_test_0.bin

- riscv_arithmetic_basic_test_0.bin and dis.ass will be generated in this directory.
- Now provide riscv_arithmetic_basic_test_0.bin to your UVM testbench to test Ibex core.
- To automate the above process you can create a makefile.