Hardware Design/Verification Engineer

A Road Map

By: Muhammad Bilal Sakhawat

Introduction

- Verification Engineer
  - 2 years of experience
  - Verification of single/multi-core in-order/out-of-order RISC-V Processors
  - 10xEngineers, Lampro Mellon
- Open Source Contributions
  - RISC-V International
  - Maintainer of riscv-arch-tests repo
  - Active Contributor of riscv-sail (RISC-V Golden Reference Model)
- Education
  - B.Sc. Electrical Engineering from University of Engineering and Technology, Lahore
  - Major Subjects: Power

Agenda

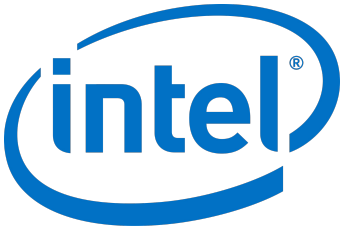
- Semiconductor Industry
- Design vs Verification Engineer
- Prerequisites
- Related Fields
- Who is good fit for this field ?
- Some Possible Final Years Projects
- Online Training Courses

Semiconductor Industry

- Semiconductors are the brains of modern electronics.
- Semiconductor industry expected to reach $600B in 2022
- The industry has grown by an average of 13% per year for the past 20 years
- There are dozens of semiconductor companies that each play a unique role in the ecosystem, e.g. analog and digital semiconductor designs are entire separate fields
- Chips are going to be more important than ever, with increased semiconductor content in everything from cars to appliances to factories, in addition to the usual products such as computers, data centers, and smartphones
- Inclusion of modern trends AI, ML and BigData

Semiconductor Industry

Global Players:



Pakistan:

Design Engineer

- Reads specs
- Implementation Plan
- Logic/RTL design
- Run Analysis
- Optimize the design

Verification Engineer

- Reads specs
- Prepare Test Plan
- Set Verification Environment
- Write and Run Tests
- Report Coverage

Processor Verification

Prerequisites

Must to have:

1. Digital Logic Design and Verilog
2. Microprocessors / Embedded Sys
3. Basic Programming
   C/C++/Java/Python
4. Object Oriented Programming

Good to have:

1. VLSI
2. Computer Architecture
3. Operating Systems
4. Advance Digital Systems
5. Data Structures and Algorithms

Related Fields

Electrical, Electronics, Telecommunication, Computer, Software, Mechatronics Engineering and Computer Science

Who is good fit for this field?

Some Good Final Year Projects

Below are some good final year projects:

- Proof the RISC-V Compliance of some good open source cores like CVA6, XuanTie, Ibex etc.
- Pipeline the FWRISC-S (Featherweight RISC-V implementation of the RV32IMC) and prove that it's Compliant with the RISC-V.
- Verify an ML/DL Accelerator using CocoTB and PyUVM.
- Design a High Performance L2 Cache
- Design custom RISC-V Instructions For an AI/ML algorithm.
    - Hardware support can be added to any open-source core
    - Add Software support to spike or sail, Instruction Set Simulator (ISS)

Online Training Courses

LINUX, GIT, MAKE

1. Linux CLI by ubuntu 2. Learn Git in 1 Hour 3. Makefile tutorial

Computer Architecture (Machine Structures)

1. Great Ideas in CA by UC berkeley 2. CA Course in Urdu by Renzym Edu

Programming Language C/Python

CS50 by Harvard

Verilog, SV

1. Verilog tutorial for beginners 2. SystemVerilog tutorial for beginners

You can reach out to me on Linkedin