Job Summary
Pre Silicon Validation at Intel

Co-op Work Assignment

I worked on a high end server as part of the Pre Silicon Validation Team. Our job was to validate the Register Transfer Logic (RTL), which models the inner workings of the CPU, and the Central Testing Environment (CTE), which provides stimulus and checking to the RTL to facilitate its validation. We do this with a four component feedback loop. We write a test plan to figure out what we think we should test. Then we write coverage to make sure that the tests we write are indeed testing what we think they should be testing. We write tests to fill the coverage, and the tests generate a list of error messages. Those error messages lead to fixes in both the CTE and the RTL. If the error message is not something related to the test plan, a test plan item is added, new coverage is coded, and new tests are written.

During my assignment, I had an assigned mentor who I approached with most of my questions. However, some of the team members were more knowledgeable than my mentor in specific areas, so I got to interact with most of my team. Training was provided on a need to know basis. When a job needed doing, my mentor would explain the job and most of how to do it, and I had to make sense of the rest.

Assessment of Learning Development

The curriculum at Cornell University did not prepare me at all for the work I was doing at Intel. Validation is not taught in any classes at Cornell. Verilog is taught, but neither stimulus nor coverage is covered by the curriculum. However, the concepts are not difficult to learn, and the term provided me with valuable experience of the work and life involved in the engineering profession. The culture at Intel is a relaxed one. It is an odd sight to see someone dressed fancier than jeans and a t-shirt, the hours are
Co-op Work Assignment

For my first co-op term, I worked for Intel Corporation, at the Massachusetts Microprocessor Design Center (MMDC) in Hudson, MA. I was part of the Power Management Validation Team for the new Haswell Server Chip, where I worked on testing the correctness of the logic for the Power Control Unit. My team members and I were responsible for making sure all the power management strategies and features function correctly on the chip and all cases were properly tested. Throughout my term, I worked on several different tasks that gave me exposure to all the validation tools and components that Intel uses. I debugged many test case failures, analyzed waveforms to track the states of the signals and finite state machines, enabled coverage by leveraging it from previous projects, and cleaned up all assertions in test cases. I also wrote many different scripts and C++ code for different purposes that allowed exposures to many of the RTL bugs that had to be resolved, which was one of my major tasks. All of these tasks allowed increase in overall power management health for Haswell Server.

The first few days on the job, I had to attend an orientation for new hires and complete many online courses that gave me information on working at Intel as a co-op/intern. Training for job-related functions was mainly provided by my mentor and my team leader. I had one on one meetings with them constantly to provide background knowledge on the flows and key concepts that I needed to know. There were also many internal documents and an internal Intel Wikipedia that were very helpful in answering my questions and giving me all the information I needed to know. For any assistance, I would always approach my mentor first, and he always knew who to direct me to. Training in topics outside of my team was required by Intel. Every intern and co-op had to develop a training plan within the first two weeks of their start date, which requires about 1 hour of training every week with an employee outside of your team. This gave us a general overview of all the designs and flows that we were not exposed to on our team.

Assessment of Learning and Development

The work that I did at Intel was more closely related to Digital Logic Design (ECE 2300) and Embedded Systems (ECE 3140) than any of the other courses I took. I was able to apply what I know in simulation, analyzing waveforms, and Verilog code to my daily tasks. However, many of the skills that I
needed to complete my tasks were learned on the job and through experience, such as using Linux, writing Perl scripts and C++. Having Java knowledge did help picking up the other languages much easier.

Working at Intel has definitely taught me a lot about the profession of Engineering and the professional culture. Throughout my entire work term, I was working in the collaboration room with the rest of my team, which gave me constant interaction with every one of them. Our team had daily Scrums that allowed me to listen to everyone’s issues and blocks and allowed me to practice communicating technically to others on what I have accomplished and what issues I’m facing. All tasks were prioritized based on strict deadlines, and I was able to learn and experience how to approach a problem and resolve it by the deadline. I had to constantly sync up with the logic designers to make sure my tasks are on track and that the bugs are resolved. Working on the validation team has really made me learn to take responsibility. Upon leaving this job, I have gained valuable technical knowledge, a new perspective of what working in the professional world is like, and a clearer image of what my career interests are. If I were to go through the same experience again, I would definitely make sure I receive all the information and knowledge I need before starting my tasks, because this will give me a better take on the work and a stronger understanding of how to resolve all my issues.

Life Outside of Co-op

Finding housing in the area wasn’t too hard because Intel offers a housing website that allows you to find roommates and gives many different housing options. Previous interns/co-ops had suggested BB Realty, run by Andrea Bibi, because her apartments are mainly rented for local interns and co-ops. I directly contacted her, and during my first term, I lived in one of her apartments, which was only 3 miles away from Hudson. The apartments are fully furnished with all cooking utensils, cable TV, wireless, heater, and much more. Marlborough is a fairly small and quiet town with nothing much to do in the area. On weekends, we would occasionally drive into Boston, which is about 40 minutes away. A car is definitely recommended for this area because there is no public transportation anywhere and most places are not walking distances.

Intel offers many different benefits and social activities outside of work. On the Hudson site, there are basketball courts, volleyball courts, a fitness center opened to all employees, recreational rooms with foosball, ping pong, and a Wii, and massage chairs. All fruits and drinks in the cafes are free for all employees. Furthermore, Intel has a program called, “Great Place To Work”, that hosts many different events, such as the “Loop Road Fun Run”, a few Christmas lunches, and weekly raffles. Every
Friday, there is also “cookie time”, where some employees hang out in the café and play cards. Working at Intel was not only an educational experience, but also an enjoyable one.

**Evaluation**

My overall experience working at Intel Corporation was excellent. I enjoyed all the people I worked with, the work that I was assigned to, and all the fun times I had. I truly gained a lot of knowledge and technical experience throughout my term. Intel treats their co-ops very well with their benefits and the overall program is very well organized. Every employee working at the corporation was willing to help and answer any questions I had. It was a great exposure to the real Engineering profession and to the minds of so many great Engineers. I now know how Intel truly develops a chip and all the flows that lead to the amazing end product.
Co-op Work Assignment

For my second co-op term, I continued to work for Intel Corporation, at the Massachusetts Microprocessor Design Center (MMDC) in Hudson, MA. My experience during this term was very similar to the one I had in the fall because I worked on the same team again, the Power Management Validation Team for the new Haswell Server Chip. However, for the second term, I was a lot more independent, and I dove deeper into the real tasks. I took charge of much bigger projects rather than moving from task to task. Throughout the summer, I was in charge of validating two specific interfaces on the Power Control Unit and making sure there were no bugs in the logic and design. I wrote many test cases, test libraries, debugged failures/bugs, and analyzed different waveforms. I also validated that all registers on the chip were functioning properly. Most of my projects involved scripting and many of the internal validation tools. I was exposed to a few RTL bugs that needed to be resolved, and I helped close many of the validation gaps that the team had as they approached their next big milestone.

On the first day, I had to attend a quick 3 hour orientation for new hires and complete a few online courses that gave me information on working at Intel as a co-op/intern. However, because it was my second time around, I did not have to complete as much as I did in the fall. I was not given any sort of training from my team because I was already expected to know most of it since this was my second time here. Right when I got to my office after the orientation on the first day, I was already given a few tasks and my main projects. This allowed me to go directly to working on them, and I did not have to do any sort of reading or training documents. I knew where most of the internal documents and the internal Intel Wikipedia were, so I was able to reference them when I had questions. I had the same mentor and a team member who I worked closely with, and they would help me whenever I had questions that I couldn’t answer myself. As a co-op here at MMDC, I was still required to complete trainings on topics outside of my team, and this gave me a lot of exposure to the designs and flows that were outside of the PCU and on the Haswell Server Chip.
Assessment of Learning and Development

The work I did was related to Digital Logic Design (ECE 2300) and Embedded Systems (ECE 3140), but a lot of it was internal to Intel, such as the flows and the different tools used. I was able to apply my scripting and simulation knowledge to some of my daily tasks. However, I also had to learn a lot on the job, and I became a lot more familiar with everything when I dealt hands on with these projects and talked to many other co-workers.

Working on this job has definitely taught me and allowed me to experience much more than I had expected. I learned that the profession of Engineering is always a difficult one and the professional culture and the people around you definitely help to answer many of the questions you have. Throughout my entire work term, I was working in a conference room with my entire team, which gave me constant interaction with every one of them. Our team had daily Scrums that allowed me to listen to everyone’s issues and blocks and allowed me to practice communicating technically to others on what I have accomplished and what issues I’m facing. All tasks were prioritized based on strict deadlines, and I was able to learn and experience how to approach a problem and resolve it by the deadline. I have definitely learned how to take on responsibilities by myself and understand what needs to be done. I gained valuable technical knowledge as well as how to communicate with others. This summer has really given me a strong picture as to what the professional world of technology is like and what my career interests are. If I were to go through with the same experience again, I would definitely learn to not be afraid to ask more questions and to talk to more people about my issues. I have learned that this really allows you to move forward with your problems and understand everything better. Everyone has a different level of understanding in every topic, and you will always learn more than what you know just by talking to others.

Life Outside of Co-op

Because I already lived in the Marlborough area in the fall, I knew what the town was like. For the summer, I rented out a room in a family owned house in Marlborough, which I heard from a previous co-op. The house was very clean and the landlords/family living there was also very nice. It was great living there. However, I would still recommend living in Andrea Bibi’s apartments because that is where a good number of the interns lived, and those apartments were fully furnished, even with all the kitchen utensils, cable TV, wireless, and air conditioning. Marlborough is a fairly small and quiet town with nothing much to do in the area. On weekends, we would occasionally drive into Boston, which is
about 40 minutes away. A car is definitely recommended for this area because there is no public transportation anywhere and most places are not walking distances.

Intel offers many different benefits and social activities outside of work. On the Hudson site, there are basketball courts, volleyball courts, a fitness center opened to all employees, recreational rooms with foosball, ping pong, and a Wii, and massage chairs. All fruits and drinks in the cafes are free for all employees. Furthermore, Intel has a program called, “Great Place To Work”, that hosts many different events, such as an Olympics competition during the Olympics, a few barbeques, and weekly raffles. Every Friday, there is also “cookie time”, where some employees hang out in the café and play cards. Working at Intel was not only an educational experience, but also an enjoyable one.

Evaluation

My overall experience working at Intel Corporation was excellent. I enjoyed all the people I worked with, the work that I was assigned to, and all the fun times I had meeting and hanging out with the interns during and outside of work. I truly gained so much technical experience and knowledge throughout both my terms, much more than I had ever expected. I definitely felt more capable and independent during my second term here, and it was great being back on the same team again. Intel treats their co-ops very well with their benefits and the overall program is very well organized. Every employee working at the corporation was willing to help and answer any questions I had. It was a great exposure to the real Engineering profession and to the minds of so many great Engineers. I now know how Intel truly develops a chip and all the flows that lead to the amazing end product.
Co-Op Job Summary

I worked in the Server Development Group in the Intel Architecture group as a component design engineering co-op. My group focused on developing a section of Intel’s next-gen server microprocessor. My work focused on a subset of this section, simply a functional unit block, and converging that RLS (RTL-to-Layout-Synthesis) block’s timing and power requirements. As I grew more comfortable with the environments and tools we were using I was assigned another RLS block and spent a majority of my time addressing timing issues with respect to failing timing paths. My group was one of several designing the next server chip, and therefore there was a lot of communication required with other groups to assess problems and troubleshoot fixes.

On my first day at work, I was assigned a mentor, who got me ramped up on the tools I would be using in my day to day work as well as tips on using the Unix environments at Intel. My mentor did a great job of connecting me with others who could help me with issues I was having if he didn’t know himself. Most of my work was the same throughout, converging timing on my assigned blocks, but there were smaller assignments assigned to me by mentor that looked at variations in designing an RLS block, i.e. different ways we can design a block and how that impacts our timing and power.

Training was provided in the form of sessions tailored to specific topics that either interns or other full-timers could attend if interested. These were taught by other employees, but there was no formal training given. Most training was done through day to day work and learning as you encountered snags. Intel requires all interns and co-ops to setup a training plan to either attend these sessions or setup some of their own with other employees. My mentor helped me put together my training plan in the first few weeks of work and helped me contact employees who had backgrounds working in specific
areas that I wanted to learn about. It is not uncommon for multiple interns to attend a session together as it encourages more questions and a better understanding of the material.

The work I have done over the past 7 and a half months aligns well with the work I want to do later. My interests lie in design and in that respect this work period at Intel let me explore that interest. I’m now very interested in working in the field after having the option to experience it albeit at a lower level of understanding than those who are working full time. The coursework that I have that relates to this work is Digital Logic (ECE 2300). The class did a good job of giving me a basic understanding of how logic works and how we can design using it, yet there are many other factors that go into component design that were not covered in that class. I plan on taking ECE 4750 (Computer Architecture) and ECE 4740 (Digital VLSI Design) to further my background for working in this area.

Working at Intel is very relaxed, though the work is very demanding the people are personable and very open. If I had problems it was never an issue for me to walk up to another member of my team or my mentor and ask a question. I also realized that engineering is a very innovative process. No matter how many issues were addressed in a previous design, new ones will always pop up and you must determine how to fix those errors without compromising other areas. What I learned from this is that errors will pop up no matter what and to take them as a challenge and fix them.

Intel was very helpful in finding sublets or temporary housing. They provided help with housing as well as a relocation stipend. After I received my acceptance I was sent an email with login info for internhousing.com. Through that I found an apartment for my 8 month stay. I lived at 264 Main St in Marlborough, MA which is 10 minutes from Hudson, MA where the Intel site I worked at is, which has 3 apartments for rent that the landlady tries to cater to interns. In the area you will need a car, as there is no good public transportation in the area. The area itself is quiet, but there are at least 5-10 interns at this Intel site at any given time, so planning something is always an option. Most are in the same boat
for things to do. Intel is very big about volunteer work and there are a number of volunteering opportunities over the course of the year. There is also a 24/7 gym and a basketball court on site for those interested.

Intel was a great company to work for for the past 8 months. The people are great to work with and they are always open to questions. I came into my position knowing nothing about design and knowing the very basics about logic physical implementation. Even then, I’ve brought two blocks to very good convergence and learned a lot in the process. I’ll go back to school knowing much more than I did.

For any new co-ops, I want to point out a few perks Intel gives to co-ops and interns. Intel gives free fruit and drinks to employees, you get a laptop to use for work, inclusion in the twice a year bonus, and cheap healthcare.

I very much enjoyed my work at Intel.
flexible, and the people are laid back. This co-op allowed me to develop skills that are desired by the professional community and not provided by the academic community. This gives me a large advantage coming out of college for job opportunities. On the flip side, while on co-op, I also learned to communicate effectively in order to get assignments done quickly and efficiently.

**Life Out-side of Co-op**

To find housing, I suggest that you find other people who are interning here and apply for housing with them on the website that Intel provides. For transportation, I suggest having a car or carpooling. Otherwise, there is no public transportation to the Intel campus. For social activities, there is a climbing gym in Worcester called Central Rock. You can play dodge ball in a giant trampoline area at SkyZone in Boston. Other than that, Boston is about 40 minutes away, and there are plenty of things to do there. There are plenty of opportunities for community service here at Intel, just sign up and go.

**Evaluation**

The best part of this co-op was that I was able to learn about the techniques involved in validating a several billion transistor chip, which is something that is not covered in school. It was interesting to see all of the different ways that we used to approach the task of flushing out bugs. On the social side of things, the co-op program at Intel is relatively large, so there are plenty of other people to spend time with. There is a decent sized cafeteria which has pretty good food, and work hours are completely flexible. However, this is still a classic cubicle job which can make some days long and grey. My days were made less so, because I was sharing a cubicle with another co-op.