Co-Op Work Assignment

For my co-op term I worked at Intel Corporation in Hudson, MA as part of the Massachusetts Microprocessor Design Center (MMDC). Initially, I started in the Cache/RF team doing VLSI design, but a project cancellation after the first week resulted in me being switched over to the Architecture/Validation tools group. The group served to provide tool support to the architecture and validation teams across many sites and projects. While there are many industry standard tools and languages used by these teams, one of Intel’s more valuable assets are the tools that have been created or modified in house. One very common practice around the company is to take a third party tool and build wrappers around it to make the tool better suited for their needs.

I had an assigned mentor who I spoke with virtually every day, and he was always willing to take the time to answer my questions. For about two months, I also worked on a separate project based out of Oregon and had to communicate with another software engineer at that site. It was an interesting learning experience having to rely solely on an individual who I could only communicate via phone and remote desktop. It’s very common at a large company like Intel to have projects split across different sites, and it is valuable to understand how to make the best of that kind of situation and keep lines of communication open regardless of the distance. Training regarding my actual project took place mostly with my mentor as needed. MMDC also requires that Co-Ops create a training plan in which we schedule meetings with individuals in different groups every one or two weeks. This was extremely valuable because it provided a broader view of the process of creating a microprocessor and helped to educate me on the variety of positions available.
My first work assignment was in IP development. Starting with a large source code of System Verilog files, my goal was to take a smaller block within the full chip and create a stand-alone version. My approach to the problem involved a large amount of scripting in Perl, and using a compiler and synthesizer tool to create the actual block. My initial work involved understanding new compiler errors, changing the script to account for those errors, and continuing that process until I achieved a clean build. My second assignment was to improve the runtime of a file processing tool involved in the build flow. This tool consumed a group of files that specified information about thousands of control registers included on the chip. I was able to reconfigure the tool to run in parallel and cut the runtime in half. Again, this was accomplished with Perl.

Assessment of Learning and Development

I had some background in scripting from taking CS 4110 (Operating Systems), in which we used Python, but my experience at Intel really helped me to more fully understand the Linux operating system and the power of scripting. Perl was not too difficult to pick up, and I was also able to participate in a full two-day class on Perl with a few of the co-ops. The concepts I learned in ECE 2300 (Digital Logic) and ECE 4750 (Computer Architecture) were also useful in providing context to my work as well as providing me with a background in Verilog.

This experience really helped me understand what each of the different jobs in computer engineering jobs actually is, since classes do not really provide the full picture. In a class project, we generally focus more on the design aspect and tend to pay far less attention to the rest of the work required to put out a physical product. I was happy to have gained some skills in the software area, but at the same time I would like to work full time doing more hardware oriented work. Also, I had an opportunity to sit in and even lead a few meetings, helping me to further develop my technical communication skills. If I were to do this again, I would take even more advantage of the training sessions. It is extremely important to be aware of and understand how the surrounding groups operate.
At the end of the day, a full system relies on all of the pieces working together and the best engineers understand the bigger picture rather than only their particular assignment.

**Life Outside of Co-Op**

I would recommend going through the intern housing portal that Intel provides, which essentially points you to BB Realty. I stayed at 264 Main St., and the realtor has a few four bedroom apartments at that location, and she will generally be able to house you with either other Co-Ops at Intel or Co-Ops/Interns from surrounding tech companies. The place is reasonably priced and is less than a ten minute car ride from work. I recommend having a car, especially to do grocery shopping and get around on the weekends, but it would be feasible to ride a bike to work. Intel provides many opportunities for social activities and community service, especially with the recent college graduate group which includes both Co-Ops and full time employees. Also, Boston is only a 45 minute drive away.

**Evaluation**

Overall I had a positive experience at Intel. My co-workers were friendly and helpful, and the environment was very relaxed. I never felt pressured to get my work done, allowing me time to learn other skills on the job without fearing a looming deadline. For the most part, the assignments were engaging, and during those times the work was fulfilling. I was trusted with work that was definitely above and beyond what might be considered busy work and felt like I was contributing to the team. However, there were still times between projects during which I was not as engaged as I would have like. The worst part was trying to stay motivated and using that time to learn.
Job Summary Guidelines

My work here at Intel has consisted of Implementation and Design of Microprocessors, specifically, the next generation Itanium chip. My working group was in charge of the physical design of the chip itself, running electrical and reliability checks and creating a physical design that met certain quality goals. For the most part, I helped with much of the global routing of the chip, as well as helped converge sequential repeater units to certain revision qualities. I also helped drive two functional blocks to a revision level. I worked closely with my mentor Sanjay Newton, and later on I also worked with a previous co-op Laura Castrale. Most of my questions were directed at my mentor and my sub-mentor (Laura), although they would sometimes direct me to other coworkers for questions. On the side I also received training on general topics that did not necessarily have to do with my field of work, giving me a very broad field of experience.

The work I did was very close to one of the potential fields of employment I can pursue after graduation. As an electrical and computer engineer, working in computer architecture is directly related to computer engineering, so I feel that I learned a lot about the different opportunities I have in this career path. This position definitely helped convince me to pursue a career related to computer engineering, if job opportunities permit, and I feel that I have gained some networks within the computer engineering industry. As for personal development, because of the position my mentor was in, I could not get to work with others quite as much as I wanted, although I did learn about the responsibilities that employees have, and how to fulfill those responsibilities.

For my final evaluation, I think Intel has a great program set up for interns, especially those who are motivated and enjoy the work that they do. It helps interns to gain knowledge about specific careers, as well as give a broad picture of the field of computer engineering in general. The hours were
Better understand the implementation aspects of computer architecture

Learn about other disciplines concerning computer architecture

Understand the overall process from beginning to end of designing microprocessors.
Job Summary

My group was responsible for testing for manufacturing defects in chips. This is important because we want to find the errors so we don’t ship defected chips to customers. The major project I worked on was the next generation Intel Xeon processor. More specifically within my group, my main task was to automate the test generation flow. When we first arrived, we had an orientation for new employees. This is where they taught about the company, its values and work practices, and set us up with a work computer. There was plenty of training provided within my group as well as different groups in the company. Some of my training was done through readings on wiki pages about specific tools. There were also instances when people came to my cube to explain to me in person (my white board was full within the first month!). In addition, there were trainings with members of other groups so we could get a better understanding of their work. My mentor was assigned to me approximately a week before I arrived. I approached my mentor with general questions, and other team members with more specific questions regarding their work.

My work activity was completely dependent on my education background. While the knowledge I used didn’t directly pertain to the material I learned in school, the skills I learned at Cornell prepared me well for my co-op. During this internship, I learned how to operate in a group and to work in a professional environment. This position allowed me to understand what it was like to work at a technical job from 8am-5pm, which I had never experience before. The experience was obviously quite different from what I had been doing at school (class and studying). In my group, there were times where individuals were responsible for specific parts, so that taught me about being accountable for my own work. This position made me understand the importance of the relationships between people not only in my group, but also with people in other groups to get a better understanding of the overall structure of the company.

For housing, I would recommend finding other interns to live with. I did this through the Facebook group created for Intel interns. For apartments in the surrounding area, it is difficult to find short term leases. In Marlborough, MA, I would recommend going through BB Realty. With flexible leases and a fully furnished apartment, it was very convenient. For transportation, I would definitely recommend having your own car. It gives you the flexibility of going anywhere at your own convenience. Considering most of the places I went to were 30 minutes away, this was necessary for me. There are plenty of other interns to meet and hang out with. For social activities, I would go into Boston with other interns or meet up with some friends who were in the area as well. There are plenty of museums and attractions in Boston to see. The employer offered many opportunities for community service that I thought was really great.
This summer, I completed my co-op at the same company, but at a different site. I began my co-op last fall in Hudson, MA and this summer I finished it up in Santa Clara, CA, where Intel’s headquarters are. I remained in the same group—Test Technology, which is part of the Server Development Group. Test Technology is responsible for preparing the test content that will be used to detect manufacturing (opposed to logic) defects in a chip. The testing methodology my sub-group focused on was Automatic Test Pattern Generation (ATPG).

The major project I worked on was one of the future Xeon servers. My main task was to enable the indicator page, which reported up-to-date coverage percentages regarding parts of the chip that were tested using ATPG. I also worked on a brand new testing flow that allowed us to get estimate coverage feedback while the chip design was still in RTL. My manager and my mentor were my primary sources for training. When I first arrived, my mentor gave me a thorough run-through about the group, the work the group was currently doing, as well as my specific tasks for the summer. In addition, my mentor was easily accessible whenever I had questions. My manager also met with me every other week to review any concerns or questions I had and helped me set up informative trainings with other groups.

My work activity directly related to my educational background and career interests. I’ve always admired Intel and it was definitely very helpful seeing what kind of positions exist in the company and understanding how my educational background has prepared me for these positions. I was able to apply the knowledge from my coding classes to learn Perl scripting. Similarly, I was able to apply the knowledge from my Digital Logic & Computer Organization course to understand how the tests functioned and targeted specific areas. As for my career, I’m very interested in working in the industry right after graduation and this co-op was extremely beneficial in showing me the work culture and different types of jobs that exist at a technology company. If I were to go through the same experience, I’d talk to more employees. I met a lot of interns, but I should have gone out of my way to meet more employees, not just in my group, but also throughout the company. I really should’ve taken advantage of being inside the company and getting to know the talent at Intel personally!

The downside of a summer in the Bay Area is that finding housing is really difficult. I was debating between shipping my car (from DC) to CA, which was dependent on whether or not I could find housing near public transportation. There are not many places that advertise short-term leases and if they do, they’re unfurnished which can be inconvenient. I have friends who found apartments in Santa Clara and San Jose. Then, they were able to pitch in and get some furniture
and beds from craigslist or they just rented furniture on a monthly basis. I have other friends who rented a room out of someone else’s house. Personally, I got really lucky and lived right next to the Mountain View Caltrain station, but even I know that that’ll never happen again! If possible, I’d recommend having a car. The public transportation isn’t that great or convenient. For social activities, there’s plenty to do (especially if you have a car). You can go to the beach, hiking, wine tasting, and explore San Francisco. My employer provided many opportunities to be involved in community service whether on or off campus.

The best features of this job were how I was treated in my group, the amount of knowledge I learned about the company and its different groups as well as technology plans, and the work culture. I really enjoyed being part of a team. I stress this because I had a friend who wasn’t quite on a team and directly reported all of his work to a single person. He never had the opportunity to attend team meetings since they didn’t exactly exist. On the other hand, I attended team meetings frequently and believe that I gained a lot from them. For example, I learned some social aspects like how people share their ideas and interject between others as well as technical aspects like the focus of each meeting, how different people contribute, and understanding the importance of different meetings. A company like Intel is so large, it can be difficult to see all of the different job functions that exist. One of the best parts of this co-op was that I was able to really understand how the company is organized to run in an efficient manner. As a student, we often discuss technology trends, the constraints and issues we face today, and how we think the industry will respond. This job allowed me to see from the other side and showed me what direction the company was taking, which was amazing! As for the work culture, I liked that the dress code was dependent on what you thought was appropriate, whether that’s casual or business casual. It definitely made me feel more comfortable.

Overall, I had a great experience at Intel in Santa Clara, CA this summer. The work I did was challenging and I think I got a realistic view of the company as an employee. As for the area, it was a huge contrast to my previous location (Hudson, MA) and it was definitely more to my liking. Also, Intel’s headquarters are in Santa Clara and I was able to meet the CEO and actually have a brief discussion with him! Those types of encounters are less likely to occur at other sites. I understand it can be difficult to take that leap from coast to coast sometimes, but it’s really worth trying out before graduating, and I’m so thankful I did.