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Electrical and Computer Engineering ‘16
Altera Corporation
Summer 2014

Job Summary, Co-op Term 1

For my engineering co-op experience, I was given the opportunity to work in the Intellectual Property and Devices (IPD) division of research and development at Altera Corporation, in San Jose, California. Altera is a semiconductor company that designs programmable logic devices, specifically field programmable gate arrays (FPGAs), and all of the surrounding technologies. Along with the FPGA devices themselves (which serve a huge variety of customers requiring reconfigurable or customizable logic solutions), Altera develops the Quartus II design software and intellectual property (IP) blocks, which are copyrighted reusable logic blocks that customers can license to program their FPGAs. I was placed in the Transceiver PHY IP Core group, which designs a highly configurable IP core that supports a large assortment of different protocols for high speed serial communication on the physical layer of the OSI computer networking model.

On my first day of work, the company organized a short networking session among the new employees, followed by an orientation provided by human resources. Immediately after, I got to meet my supervisors, and got introduced to the rest of the PHY IP team. By pure chance, it turned out I was to work on exactly the same team as a friend of mine, another ECE major from Cornell, who was interning for the summer. As part of the onboarding process, I was given an enormous amount of new information to learn and understand in a short period of time, which was a bit overwhelming. That included everything from the roles of the people on the team, to working with the code repository, to how our work integrates into the larger company product. Thankfully, I was assigned a mentor, who was amazingly helpful when I was confused, or when I wanted to know something beyond the information provided. Additionally, every single person on the team was very open and welcoming. I got to know them very well and we frequently went out to lunch as a group. It’s fantastic to work at a place where your co-workers are also your friends.
Not very long ago, I did not know much about FPGAs until I took the course ECE 2300, Digital Logic Design, the fall semester of my sophomore year at Cornell. From the course, I gained a ton of practical hands-on experience in register transfer level (RTL) design and simulation using hardware description languages like Verilog, as well as programming actual FPGA hardware to build my own microprocessor core. We used Altera Quartus II to compile our designs and programmed an Altera Cyclone FPGA. The fact that I enjoyed the course so much was one of the main things that motivated me to apply to Altera for my co-op experience.

Here at Altera, I was given the responsibility of implementing a new recently patented feature to simplify and automate the dynamic reconfiguration process of the Native PHY transceiver core between different protocols and data rates. I did a good amount of RTL design and simulation, as well as wrote regression tests to validate the functionality of my designs. I also worked on the GUI of a wizard that customers would use to customize our IP core, as well as the back-end work that automatically generates RTL code to match the customer specifications. It is amazing how my time at Cornell prepared me so well for the job I would do at Altera.

So far, my time here at Altera has taught me much more than just technical skills as an engineer. Soon after starting here, I began to feel the burden of responsibility that you get when you know that a single mistake in the code you submit might break the nightly build for the entire department. To deal with it, I have learned to be more confident in my abilities, and also to relax, not worrying so much about the possibility of making mistakes (because they will happen anyway). Additionally, through weekly group meetings, as well as one-on-one meetings with my supervisor and co-workers, I significantly developed my interpersonal skills. Most importantly, I learned to ask a lot of questions, which I was a bit hesitant to do at first.

There is a lot more to the co-op experience than just work. I was actually lucky enough to find a co-op opportunity relatively close to home, albeit a ninety-minute train and shuttle ride away. So I actually lived with my family and commuted to work and back every day. But most other interns found relatively decent-priced housing nearby (Silicon Valley housing is generally pretty expensive), assisted by a housing stipend that Altera provides. The Silicon Valley has an extensive light rail system that many people use to get to work, but beyond that, a car is usually necessary to access the multitude of attractions around the San Francisco Bay. We had a good-
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Job Summary, Co-op Term 2

I finished my first co-op term in the summer, and immediately began my second in the fall, making a consecutive twenty eight weeks of working at Altera Corporation in San Jose. I continued working with the Transceiver PHY IP team, of the Intellectual Property and Devices Support group in R&D.

During my first term, I worked to develop an automated dynamic reconfiguration solution for the Native PHY intellectual property core that streamlines the user experience for our customers. Due to the complexity of this project, and the fact that there was still a lot of work left to do, I was assigned to continue my project for the rest of my time at Altera. As most of the actual development work was done in the summer, I spent most of my fall term rigorously testing my solution, as well as integrating this feature with the existing product.

Despite working on the same project as before, I learned a lot of things that I would not have had the chance to learn had I just stayed for the summer. Coming from a college environment, I, like many other students, generally underestimated the importance of exhaustively testing all of the functionality of your code. After all, college programming assignments have extremely short deadlines, and who has time for testing their code, anyway? It turns out reality is quite different. I never imagined that at a real engineering company, I would spend significantly more time testing and debugging my code than actually writing it in the first place. I wrote a variety of different unit and integration tests for my particular feature, each of which are periodically run to detect if and when a future change happens to break any of the functionality of the code. As much as I wanted to believe that my code was good to begin with, my tests, thankfully, always managed to identify some elusive bug, or rare corner case that I had not thought of while writing the code.

Speaking of code changes, I had the chance to master the use of revision control software, which makes collaborating on a huge software project with many people a lot less of a nightmare. I also learned to write organized, well documented code, which is a necessity, especially if working with other people. I realized that I grew a lot more comfortable asking
questions about any topic that confused me, because after all, no one is expected to know everything, and this place is full of really smart people. So I might as well take advantage of that.

In terms of the social aspect, I think that Altera is a really great place to work. My team has been fantastic, not only in helping me in my work and answering all of my questions, but also in making work fun. Every lunch break we would either try some new, unique restaurant in the area, or just sit in the company cafeteria discussing anything from sports to the latest technology trends. The company also organized some impressive social events for its employees, including a huge Diwali celebration, and a fun Halloween costume competition and party.

I enjoyed my second co-op term just as much, or even more than my first. I am really glad that I was able to stay at the same company for a full seven months. My experience at Altera has built upon many of the skills I have developed as an engineering student at Cornell, and I got to use many of those skills to contribute to a real product that would be used by Altera’s customers. I realized how much more there is for me to learn, and I wish I had more time to explore different topics that I did not have enough time to touch on during my brief experience at this great company. But most importantly, I learned what it is like to work in a team toward a common goal, how to collaborate, and how to ask meaningful questions. Regardless of what I choose to do in a year and a half when I graduate, these abilities will serve me for the rest of my working career.
sized community of interns at the San Jose campus, and we frequently did fun things together, like hiking trips, site-seeing, lunch outings, etc. Altera also frequently hosts social activities for its employees.

Overall, I'm really glad that I chose to take this co-op opportunity at Altera. So far, this experience has really opened my eyes to the different options available to me in the future, and shown me that Altera, and more generally, the semiconductor industry, could be a good fit for me. The projects I was given have been challenging, yet very rewarding, as I got to personally develop a novel feature of a real product that will soon make it out to market. I had the chance to build upon the skills I developed in college, and work with other highly talented individuals toward a common goal. The only downside was the long commute times. I am looking forward to see what the second co-op term has in store for me, which I am starting right now, since I am working a continuous 28 weeks through the summer and fall.