PEY Internship Report

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Disclosure

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This is to confirm that I have read the report and that the information enclosed is correct and contains no confidential information.

Company: _____

Supervisor's Name: _____

Supervisor's Signature: _____

Date: _____

Introduction

This report will provide a general overview of my responsibilities as an intern at AMD and describe the skills and knowledge I have gained throughout this Professional Experience Year (PEY). This also includes a technical review of a project I was responsible for and an evaluation of how this PEY intership fits into my future career plans.

Job Description

Job Title: *Mainstrm SOC Verification Methodology (PEY Intern)*

My primary role as part of the SOC Verif. Methodology team was the development and maintenance of verification tools & flows used by Graphics Northbridge (GNB) IP's. These tools encompass test generation, checkers and required infrastructure components to integrate such tools into verification testbenches.

For each particular project, I was responsible for the development of project specific features in the test generation tool. This included debugging and maintenance throughout the entire span of the project, ensuring the tools fulfilled our users needs. For several IP's, our tools were used entirely for random test generation, whereby our group would also be responsible for regression passing rates. I also assisted in the bring-up of OVM verification components (OVC's), which provided assertion checks and coverage collection for each project. Additionally, I developed and maintained a sanity checking website and e-mail system for the test-generating tools and OVC's.

Project Report

Problem

Our team required an independent testbench environment to develop and test components in our new testing methodologies. Existing testbenches were unusable due to code freezes and environment changes. I was assigned to bring-up this new testbench by myself.

Research Methods

The specific requirements for the testbench were established after an lengthy discussion within our team. During this discussion process, we contacted colleagues from the infrastructure team to obtain implementation specific details of setting up such an environment. Details for specific sub-components that would be imported were available through published documentation. This included release notes, API's, etc... that were available via the company's own internal wiki system. Prior knowledge obtained from training courses and mentorship also proved useful. Whenever a problem could not be solved independently, team members and colleagues could be contacted via the company's internal messaging system, or in person.

Experiments/Techniques

AMD's workflow readily allowed experimentation to happen concurrently with the development process. After setting up a codeline for the testbench utilizing company-standard version control software, I could easily edit and

code within a local testbench. I could experiment within this local testbench, and commit completed features and components as they were being developed, without worrying about affecting other users. This allowed for an iterative process where I could test certain solutions and revert to older versions as needed.

In terms of development, I first imported all external tools and components that we would require within the testbench. I then integrated the random test generating and listing tools, and configured them so they would work in the new environment. With test listing and generation working properly, my next step was to bring in several different OVCs to emulate the simplest testing environment in GNB. I then had to add all the remaining essential components such as: configuring source code compilation, linking, and publishing infrastructure, creating interface bindings and clock generators, and finally reporting mechanisms through OVM monitor dump logs.

Discussion

The information gathered through the experimentation and research stages were paramount to the development and completion of the project. Without this knowledge it would have been impossible for me to have successfully setup this testbench.

Results & Conclusions

The testbench was published to the main codeline for public use after completion. I notified my fellow team members that the testbench was ready for use. I also had the opportunity to create a powerpoint presentation to give a brief overview architecture of the testbench. The solution was deemed acceptable and is still currently being used as a verification environment for the development of several new methodology tools.

Recommendations

I believe I could have accomplished this task in a shorter time frame if I had a deeper understanding of the technologies and tools I was trying to integrate into the testbench. Better time management skills could have also helped complete the task quicker.

Technical & Professional Skills

This internship has helped me develop both my technical and professional skills. I have learned a lot about design verification, and the standard methodologies and technologies used by the industry. I was introduced to Open Verification Methodology (OVM) and Universal Verification Methodology (UVM), which are standardized testing methodologies used in the verification of practically all silicon designs in industry. OVM & UVM provides a collection of SystemVerilog class libraries that contain verification building blocks and commonly used tools and utilities. With the framework provided by this methodology, one could easily create highly reusable & scalable verification components that can be easily be moved from project to project, or scaled from small IP's to large scale System on Chip designs. The methodology utilizes Transaction Level Modelling, which is a high level approach to modelling complex digital systems here details of communication among modules are separated from the details of the implementation of functional units or of the communication architecture. This level of abstraction, allows for engineers to experiment with different communication architectures without having to recode models that interact with any of the buses, provided these models interact with the bus through some common interface

I also learned alot about computer architecture and the many different component that make-up a Northbridge. I have gained a better understanding of each IP's different functions and capabilities, and how they fit into a

SOC design to provide our customers with a product that has a rich feature set that they desire. I also have a much better understanding of industry standard protocols such as HyperTransport and PCIE. I also learned about how the SOC design process functions and the essential role the verification provides. Most SoCs are developed from pre-qualified hardware blocks for the hardware elements described above, together with the software drivers that control their operation. Of particular importance are the protocol stacks that drive industry-standard interfaces like HyperTransport. Functional verification works concurrently check for design errors and bugs. Functional verification is often the most time-consuming portion of the chip design process, often quoted as taking over 70% of the whole design life cycle.

Due to the mixed nature of design verification, I had to pick up many new technologies, in a relatively short amount of time. I have grown a lot more proficient in Perl and C++ development, since the majority of my work during my PEY was writing new randomization methods using those languages. I also had to pick-up Ruby programming which was necessary to fully utilize the source & test flow management infrastructure in our testbenches. I also had to learn some PHP to help publish sanity results to the web front-end I developed for the sanity reporting program.

Values

The following five attributes are the values I believe I exemplify the most as an employee:

Cooperation: I fully understand the structure and dynamics of a successful team, and the role cooperation plays in working as a group. Especially within a large corporation, with many independent teams and work groups, it is essential for people to co-ordinate and cooperate with their efforts to accomplish certain projects and tasks. Even though we sometime have different ulterior motivations, as employees of the same organization we ultimately have the same goal in mind: to help the company generate more revenue and increase shareholder value. Cooperation is the cornerstone to achieving this.

Flexibility: It is important to be able to change and be accommodating in a work environment due to constantly changing variables and settings. Projects requirements are in a constant state of flux, and issues and crises will always require employees to be flexible and be willing to accommodate them into their work schedules.

Intelligence/Knowledge: In a technical field such as design verification, being knowledgeable about a multitude of different technologies is vital in becoming a successful verification engineer. Being an interdisciplinary field, combining elements from digital electronics and software engineering, it is

vital that one be well versed in technologies from both fields.

Learning: Technologies are always changing with ever changing feature sets and additional layers of complexity. It is important to be able and willing to continue learning throughout one's career to keep up with current technology trends.

Sociability: In order to be successful in the workspace, one must be sociable and willing to communicate openly with fellow colleagues and teammates. Within an enterprise of several thousand employees, it is impossible of anyone to work independently and expect to be successful. One must be willing to work with others and be sociable to his/her fellow comrades.

Career Plans

Design verification is becoming an increasingly important field in silicon design industry. With designs becoming ever more complex, companies are requiring more engineers to help with their verification efforts. I believe that a future career in this industry would be viable, and the work experience I obtained during this internship will be invaluable towards this goal.

Conclusion

This PEY internship has been a wonderful experience, and will undoubtingly be an essential stepping stone on my path to a successful career. The support I have received from my supervisor, teammates and engineering career center staff have allowed this internship a resounding success.