The Emerging Standard for Embedded Core Test: IEEE P1500

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Abstract

Under the name IEEE P1500 a standard is being proposed for testing of embedded cores. This activity of IEEE defines the interoperability needs for SoC designs such that the integrated chip is completely testable. P1500 is developing a hardware structure to create predictable flows for system integration and a language to represent the information flow between the core provider and the system integrator. In this paper a high-level view of the standard is presented.

1 Introduction

Design reuse methodologies have allowed for the partitioning of effort needed to create a complete design at the expense of some communication between the teams creating the design. When partitioned tasks are performed by teams that are in close proximity to each other they can get together with frequent formal meetings, share common documentation or discuss problems informally in coffee breaks. This is typically the business as usual process for any company that has a reasonably sized project under way. This breaks down when the design teams are separated in time and space. To avoid unreasonable communication problems the process needs to be formalized and the interface between the core providers and the integrators needs to be standardized. This is where standards step in. P1500 [1, 2] is proposing a standard to address the interoperability needs of testing embedded cores.

IEEE P1500 is defining a hardware structure namely a wrapper that can isolate cores from the environment that they are embedded in. Furthermore, IEEE P1500 is defining a language to support all the information that the core provider needs to give the system integrator such that the integrator can successfully test the embedded core and test the user-defined logic around the core. All the work being defined by P1500 should work with all types of cores, their different test methodologies and the different ways in which they are integrated in the design.

2 Wrapper Technology

Just like full scan creates predictable flows in the creation of designs a scanable wrapper around a core creates predictable flows for SoC testing. As part of the P1500 activities, wrapper cells and configurations to the core are being defined. A standard mechanism to set the core in the various configurations will be defined to allow for a uniform interface between the core provider and the system integrator.

3 Core Test Language

When a core is created the test patterns of the core are packaged along with it for reuse at the chip level. The test patterns have certain needs from the environment that they are embedded in. These requirements are to be specified to the system integrator such that he/she could ensure they are met. Furthermore, the different test configurations supported by the core need to be specified to the system integrator so that they could be used. CTL provides the vehicle to specify all the test information that passes between the core provider and the system integrator.

4 The Standard

While the structure is defined and a language is made available, some guidelines need to be created for system integration. The standard is primarily a packaging of a set of guidelines. The guidelines are defined in terms of the base technology (wrapper and CTL). These guidelines are named to describe all the features that are available in a nut shell.

P1500 is looking to create different levels of compatibility with the guidelines to allow for the different usage of the standard. For example, a core provider may or may-not choose to include the wrapper with the core. To that effect, two levels of compliance are being considered. At one level the core does not have a wrapper and the core comes with information in CTL on the boundary such that system integration can be performed. This level of compliance is called IEEE 1500 Unwrapped. At the second level of compliance, the core comes with a wrapper and information in CTL on the boundary that would allow for system integration tasks that use the wrapper that was packaged with the core. This level of compliance to the standard is termed IEEE 1500-Wrapped.

5 The Standard and Different Test Methods

The standard positions itself orthogonal to different test methods that are currently being used in the industry. While being neutral to all the methods, the standard is defined to allow for the different test methodologies that are in place.

6 Conclusion

The package that the core provider delivers to the core user needs to include, among others, a test-related element. This test element can either solely contain the test knowledge of the given core, or it may also include a hardware core test access function. In either case, IEEE P1500 eases the test interoperability between the core provider and the core user by standardizing the test-related elements.

References

[1] Erik Jan Marinissen, Yervant Zorian, Rohit Kapur, Tony Taylor, and Lee Whetsel. Towards a Standard for Embedded Core Test: An Example. In *Proceedings IEEE International Test Conference (ITC)*, pages 616–627, Atlantic City, NJ, September 1999. IEEE Computer Society Press.

[2] IEEE P1500 Web Site. http://grouper.ieee.org/groups/1500/.