Remote boundary-scan testing through micro-webservers

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Abstract

The IEEE 1149.1 standard test access port and boundary-scan architecture [1] was approved in 1990 in response to the need for coping with shrinking sizes due to advanced packaging and mounting technologies, and also with the increasing complexity of modern microelectronic devices. Boundary-scan test (BST) was quickly adopted by all industry sectors, including test equipment manufacturers, CAD tool providers, and microcircuit designers and manufacturers. Many tools and integrated solutions are now available on the market to support BST, but they are essentially dedicated to production test environments. The work presented in this document addresses the development of a network of low-cost distributed BST controllers, based on micro-webserver boards.

Micro-webserver technology

Maxim's micro-webserver technology is based on their DS80C410/DS80C411 network microcontrollers, which are widely available on the market. Their DS80C400 evaluation kit hosts the TINI Runtime Environment in a validated hardware design (DSTINIm410), includes an integrated 1-Wire® Network Master, a hardware CAN 2.0B port, software support for I²C and SPI™, a real-time clock, and flash ROM / NV SRAM for program and data storage [2]. With a price tag slightly above 100 USD, the DS80C400 evaluation kit comprises the DSTINIm410 reference board and offers system designers all the resources needed to develop distributed applications supporting FTP, telnet and web services.

The distributed boundary-scan test controllers

The work presented in this paper may be represented as shown in figure 1, where a single client accesses three BST controllers. The client can be located anywhere in the world, and the BST controllers and the target hardware can also be placed in different geographical locations. In an educational setting, figure 1 may represent a student that accesses a workbench comprising one or more BST controllers and the hardware under test. Alternatively, we may also envisage distributed systems comprising hardware under test located in various places.

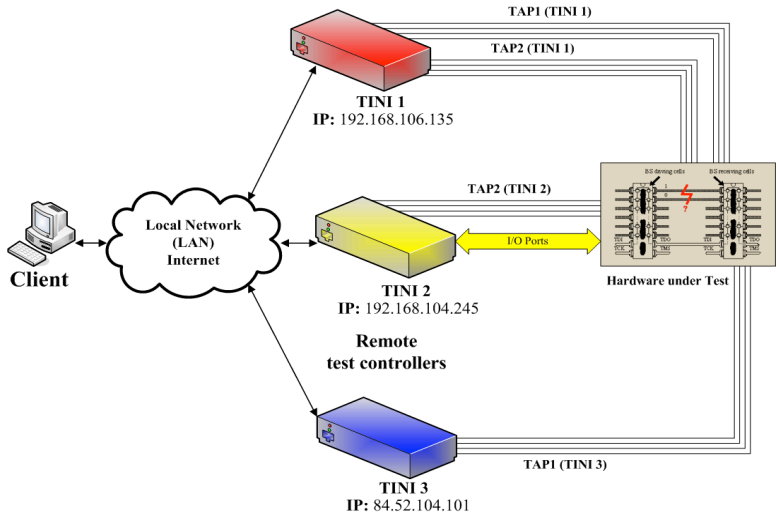

Fig. 1: A workbench supporting remote three boundary-scan test controllers.

Figure 2 shows a client software version that consists of a JAVA environment enabling the user to specify a test program in SVF, and to run it remotely. In educational settings, a webcam will broadcast a live image of the hardware under test, enabling the students to receive visual feedback from certain test commands (e.g. when they change the logic value of outputs driving an array of leds).

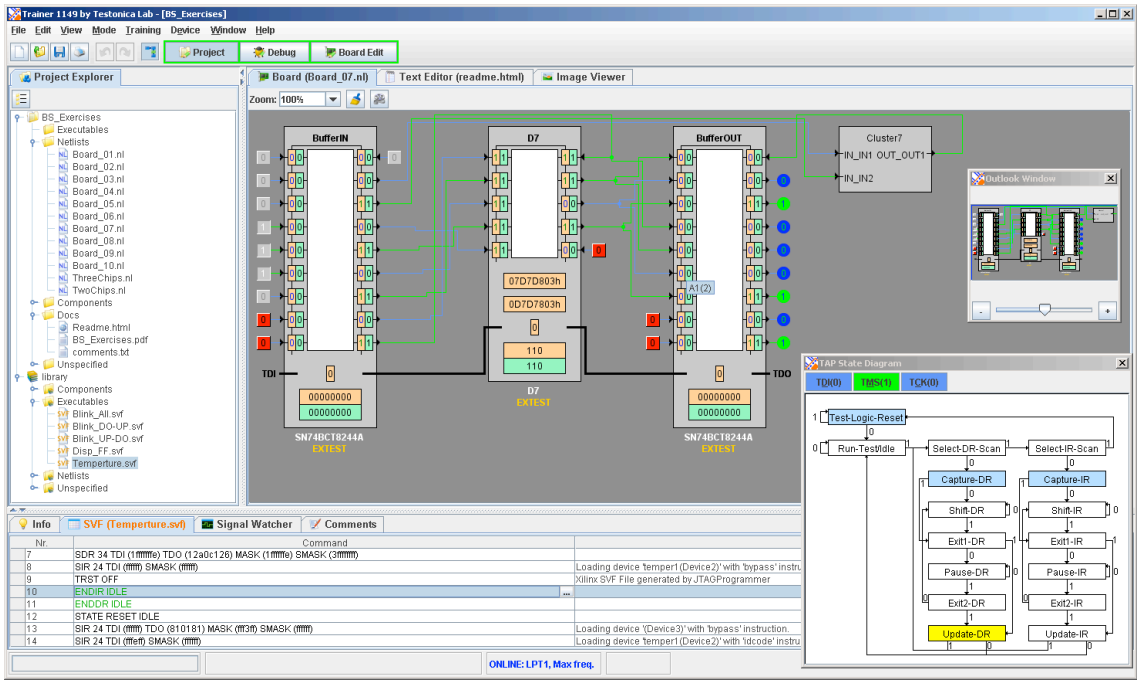

Fig. 2: Client application.

The exhibition planned for ICELIE'2009 will include the micro-webserver boundary-scan test controller, a board under test comprising two boundary-scan chains, and live image feedback. It represents an educational deliverable of this project that is being used collaboratively in various digital electronics test courses.

References

[1] IEEE 1149.1-2001 (Revision of IEEE Std 1149.1-1990) Standard Test Access Port and Boundary-Scan Architecture, IEEE Computer Society (Test Technology Standards Committee), 25 October 2001.

[2] Maxim-Dallas DS80C400 evaluation kit [Online], http://www.maxim-ic.com/quick_view2.cfm/qv_pk/4983 (visited on April 16th, 2009).

[3] J. M. Ferreira, E. Sousa, A. Nafalski, J. Machotka, Z. Nedic, "Collaborative learning based on a micro-webserver remote test controller," 6th International Conference on Remote Engineering and Virtual Instrumentation (REV'09), Bridgeport (USA), June 22-25, 2009.