Introduction to IEEE P1687/IJTAG

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***Abstract* – This paper introduces the basics of the IEEE P1687 *Standard for Access and Control of Instrumentation Embedded within a Semiconductor Device*. The standard introduces a new language called Instrument Connectivity Language for describing how to connect internal IEEE 1149.1 Test Data Registers inside a device. IEEE P1687 leverages the IEEE 1149.1 TAP to access these Test Data Registers via Procedural Description Language extensions to the open source Tool Command Language. This paper represents the views and experience only of the authors and does not represent a position of the P1687 or 1149.1 working group. The standard is still in development as of May 2010 and the information here may be subject to change. See http://www.intellitech.com/ijtag for additional information.**

Keywords: IJTAG, P1687, TAP, JTAG, 1149.1, Instrument, DFT, DFx, BIST

I. INTRODUCTION

The IEEE P1687 working group is developing a standard for connecting and communicating with on-chip DFx structures via the 1149.1 TAP. Using the TAP for on-chip access to DFT was presented throughout the 1990s by Sun Microsystems, Motorola, Xilinx, LogicVision and others. (Despite this fact, the press and board test companies still continue refer to 1149.1 as "boundary-scan" even though that is only one half of the standard). Early presentations show how the TAP could be used for access to on-chip health monitors, BIST, BISRs and other test IP in 2003.[1] The P1687 effort started in 2004 and the IEEE PAR (Project Authorization Request) was approved in 2005. On chip DFx structures and infrastructure IP such as BIST and scan are called 'instrumentation' by the working group[2].

The purpose of the standard is to provide a description of how to connect the on-chip instruments and describe a language for communicating with the instruments via 1149.1 Test Data Registers. The goal is greater test re-use throughout the SoC life cycle using common languages of ICL/PDL/TCL and operation via the 1149.1 TAP (see Figure 1). The working group has had many language proposals for describing the JTAG communication to the instrument including C API libraries and in-house developed languages. Several members were in favor of TCL and Intellitech's presentation in late 2008 probably was the tipping point in getting agreement on TCL and the use model.[3]

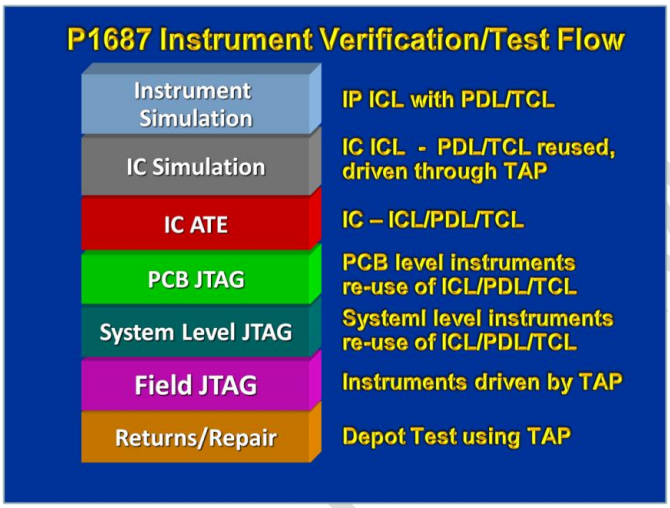

Figure 1. Life-Cycle JTAG re-use

Great progress has been made over five years of development, however we will not speculate on when the standard will go to ballot or when it will pass balloting. A lot of hard work from many smart engineers is required to develop a standard. One fellow already said it was 'done' but that was nearly four years ago now.[4] We think CEOs should not be in the position of predicting when engineers will finish the work in an IEEE standard.

IEEE P1687 is poised to be a very useful standard. We have read white-papers and attended conference presentations however that have hyped the proposed standard like a blender on a late night infomercial. One explanation for the hype is that those positioned as 'boundary-scan' players, have found that boundary-scan tool sales have run out of steam. This may also explain the non-1149.x numbering chosen for the standard; a 'new' capability would allow new feature pricing and potentially not be included in the usual 1149.x annual maintenance contract.

We are actively working in the WG and developing solutions in P1687, but our view is pragmatic in the rate of adoption. Standards and tool vendors don't drive the industry, the industry uses useful standards that uniquely solve a problem, and are as easy as or easier to implement than another method. Here are some standards related to test and their status:

IEEE 1149.1 - Standard - Widely adopted
IEEE 1149.4 - Standard – little/no adoption
IEEE 1149.5 - Withdrawn - System Level Standard
IEEE 1149.6 - Standard – Good acceptance for AC-coupled
IEEE 1149.7 - New Standard - little adoption – Royalties[5]
IEEE 1532 - Admin Withdrawn - bit/pof and SVF work fine
IEEE 1500 -Standard – little adoption, NXP, Virage, Synopsys

Completion of a standard does not guarantee wide-spread adoption, especially when competing technologies exist. Business models are probably the biggest driver. IEEE 1500

[1] http://www.intellitech.com/pdf/internal-jtag.htm
[2] Eklow, Bill, Bennets, Ben, "New Techniques for Accessing Embedded Instrumentation: IEEE P1687 (IJTAG)", ETS 2006
[3] http://www.intellitech.com/powerpoint/IJTAG-presentation-by-Intellitech.pdf
[4] Nelson, Rick, "SJTAG, IJTAG claims premature", ITC06 Interview. http://www.tmworld.com/article/320833-Guest_commentary_IJTAG_SJTAG_claims_premature.php
[5] http://standards.ieee.org/db/patents/pat1149.html