

Experimenting the 1149.1 and 1149.4 test infrastructures in a Web-accessible remote Lab (without Plug-ins!)

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Abstract

The expansion of the Internet has supported the development of online teaching resources based on this communication media (e-learning). However, the possibility to run experiments on remote-accessible Labs, in a teaching context, is a more recent fact. This paper describes the framework for delivering through the Web, a course on Design for Debug and Test that contains several practical exercises involving the use of the IEEE 1149.1 and 1149.4 test infrastructures. The exercises are done in a remote-accessible Lab, installed at our facilities, through a simple interface readable on any web browser. By using a complete Java-based solution, there is no need for installing any sort of plug-ins at the client computer as it happens in other similar approaches that require some sort of downloading extra software or the development of Common Gateway Interfaces (CGIs).

1. Introduction

The work described in this paper is a result of previous and on-going projects:

- INSIGHT II (1996 to 1999) [1]
- ASTEP (Mar 1997 – Feb 2000) [2]
- ALLEGRO (Jan 2000 – Jul 2001) [3]
- PEARL (Mar 2000 – Feb 2003) [4]

The Leonardo INSIGHT II project provided the opportunity to develop classic course materials (lecture notes + overheads) on modern electronic systems design, which included a complete workpackage on “Development and Test of Digital and Mixed-signal Systems”. This has been the main working area of the authors for the past ten years, with a special focus on the IEEE 1149.x suite of standards [5, 6, 7, 8]. The ASTEP project enabled the Web-based delivery of a select portion of the materials developed under INSIGHT II. Pitfalls pointed out at the end of ASTEP have been addressed by the on-going ALLEGRO and PEARL projects. The first includes the quality control and pedagogical aspects of Internet / Intranet course

management and delivery. These pedagogical aspects are observed in the passage of course materials on Design for Debug and Test (developed during the INSIGHT II project) to a Web-based format, which is reflected in the definition of a sound assessment methodology. The second addresses the development of an Internet-accessible Lab infrastructure for remote experimentation, the main idea being that if a course is delivered through the Internet then the hands-on materials that support the practical exercises (one of the three components of the course assessment scheme) should also be made available through the same media (and not delivered as course material boxes sent to each and every student). This idea has been pursued in the past [9], although only more recent solutions have dispensed the use of plug-ins [10, 11].

The following sections describe in more detail these components (the web-based course delivery system and its main features, the course development process and the associated assessment methodology, and the web-accessible lab supporting the remote experimentation), leading the way to the presentation of one actual exercise involving the IEEE 1149.1 test infrastructure [12].

2. Course contents, assessment methodology and delivery system

The selected course delivery system was the well-known WebCT®, which is one of the most widely accepted solutions in this domain. WebCT® allows the management of student databases, HTML content modules and several assessment/monitoring and communication tools consisting of a restricted e-mail system, a multi-subject message forum and a real-time chat environment. The assessment methodology defined for this course in consistence with the principles established in [13], comprehends three main components:

- Self-tests associated to each content page
- Assignments presented at the end of each chapter
- A final test at the end of the course