University Scene

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There's been a lot of VLSI design activity in the universities the past few months, leading to exciting news to report in this issue of LAMBDA: *The fall design courses went extremely well, producing many outstanding projects. - - - MPC79 was successful, leading to planning of an ongoing implementation service for the universities. - - - We've received reports of new VLSI design courses at many schools. - - - At last, the new Hon and Sequin* **Guidebook** *is available!*

The Fall Courses and MPC79

Project-oriented VLSI design courses were presented last fall by Jonathan Allen at M I T , by Rob Mathews and John Newkirk at Stanford, by Doug Fairbairn at Caltech, by Jacob Abraham at University of Illinois, and by a group of faculty at University of Rochester. All of these courses were very successful in rapidly instructing students in the techniques of VLSI design, and then providing students with the facilities and the opportunity to create design projects. These successes are remarkable, because all these instructors were teaching the material for the first time, and in several schools the course itself was being introduced for the first time.

A spectacular collection of innovative designs were created during the fall by university researchers and by the students in the VLSI design courses. Particularly impressive examples are the Scheme-79 LISP Microprocessor, by Jack Holloway, Gerry Sussman, Guy Steele, and Alan Bell (MIT-AI/Xerox PARC), the Geometry Engine, by Jim Clark (Stanford), and the Stack Data Engine, by Greg Efland and Richard Mosteller (Caltech).

At M I T , efficient analysis aids were created that help locate many bugs in projects before implementation. These aids proved extremely valuable in actual use last fall. For example, after preliminary debugging using Clark Baker's circuit extractor and Randy Bryant's and Chris Terman's MOSSIM switch-level simulators, the large Scheme-79 chip worked on the first implementation. This M I T work sets an important precedent for others to follow.

While the fall courses were underway, a team at Xerox PARC completed a new type of "VLSI Implementation System", and used the system to coordinate rapid implementation of course projects and research designs in a network adventure known as "MPC79" (see MPC79 article in this issue).

MIT Conference a Great Success

The M I T Conference on Advanced Research in Integrated Circuits was held in Cambridge on January 28-30 (see report in this issue). The 250 invited attendees were able to share many recent research results and make many new contacts with others active in the field. The conference generated an atmosphere of excitement about the field and the future. Paul Penfield, the conference chairman, and Barbara Lory, who supervised conference arrangements, are to be congratulated for their success in creating this remarkable event.

New Network Adventure Underway: MPC580

A new group has been formed at Xerox PARC to further develop the VLSI implementation system used for MPC79. This group, led by Ted Strollo, has already launched "MPC580" to implement projects for U. S. university courses this spring, and will run a similar effort ("MPC1280") next fall. A large number of projects are expected for MPC580: Ted estimates the chip-set will contain 120 to 180 projects, requiring 3 or 4 E-beam mask-sets with each mask-set containing 5 to 7 different multiproject chip-types. The organizations that worked with Xerox on MPC79 are helping again with MPC580: data is being communicated via the ARPANET (and in a few cases, via GTE Telenet); maskmaking will be done by Micro Mask; wafer fabrication (LAMBDA=2.5 microns) will be done at the HP Integrated Circuit Processing Laboratory managed by Pat Castro.

The MPC580 Participants

Many readers have asked where they can take VLSI design courses, especially courses providing the opportunity to do design projects. Here's a list of schools participating in MPC580, with the names of instructors, course names and numbers, and related information about the schools' VLSI activities; many of you will find schools in your own area listed that offer project-oriented courses:

At Caltech, Carver Mead and Chuck Seitz are teaching CS181c, "Integrated Circuit Design", to a group of 25 students; Lennart Johnsson is project coordinator. In addition to the student projects produced, Caltech researchers will complete several designs for implementation in MPC580, including experimental self-timed designs, a tree machine processor, and an array processor for PC board routing.

Bob Sproull is now teaching course 15-940 "Introduction to VLSI Systems", to 20 students at Carnegie-Mellon University; Ed Frank is TA and project coordinator. In addition, several research designs efforts are underway at CMU, including a graphics display chip by Bob Sproull.

Some major designs will be submitted to MPC580 by researchers at M I T, including an RSA encryption chip by Ron Rivest. There are rumors of a group working to do a PDP-10 on a chip. Randy Bryant and Jim Cherry are coordinating project activity. Jonathan Allen's very successful course 6.371, "Introduction to VLSI Systems", will be offered again next fall.

Rob Mathews and John Newkirk had such success last fall at Stanford that they're offering EE292V, "Introduction to VLSI Systems", again this spring; 50 students are attending. Several research designs are also being prepared for MPC580, including an improved Ethernet Synchronizer by Forest Baskett, and a larger version of the Geometry Engine by Jim Clark. In parallel with the Stanford course, Rob and John are working with Doug Fairbairn of VTI to present an in-house course at Hewlett-Packard. The HP course is being videotaped, and may soon be available commercially.

Carlo Sequin has just concluded the winter-quarter course CS 248, "Structured MOS-LSI Design", at U C Berkeley; 40 students attended; Howard Landman was TA. A number of Carlo's students are now working on projects for MPC580.

At the University of Colorado (Colorado Springs) John Murray is presenting the new course VLSI-1, "Introduction to VLSI Systems", to 23 grad students and a number of auditors from DEC and HP. Bryan Gunter is TA for the course.

In a repeat of his very successful fall course at University of Illinois, Jacob Abraham is now presenting EE371-JA "Introduction to VLSI System Design"; 30 students are attending, and Nick Fiduccia is TA. Jacob is also working on a fault-tolerant-logic research design for MPC580.

At U C L A , Vance Tyree of USC-ISI is presenting the new course CS 259/ES&E 219, "LSI in Computer System Design". Research designs are also being prepared for MPC580. Burt Bussell is project coordinator for these activities.

Doug Fairbairn

Blair Proctor

Blair Proctor

University of Rochester has project activity continuing from the fall course, and research designs also underway; Gershon Kedem is project coordinator. The design course will be offered again next fall, with Jerry Feldman as instructor and Mark Kahrs as TA.

University of Southern California is offering the new course EE599 "VLSI System Design". John Nelson is instructor, Cevat Kumbasar is TA; 40 students are attending.

At Washington University, St. Louis, EE463 "Integrated Circuit Design & Architecture" is being taught by Frederic Rosenberger to a group of 30 students. Several research designs are also being prepared for MPC580.

More Reports of VLSI Design Courses

Ted Kehl of the University of Washington, Seattle, presented graduate-level VLSI design courses during both fall and winter quarters. This spring Ted will present the course to undergraduates, and a large enrollment is expected. He's also preparing an intensive one-month project-oriented course for Seattle-area engineers; participants are expected from Boeing, Honeywell Marine Systems, and Fluke. The intensive course will be offered again this summer.

We've received reports of the following new VLSI design courses: Richard Sites is now presenting a graduate seminar course at U C San Diego; Noble Powell of the GE Electronics Laboratory in Syracuse, N.Y., is offering a course at Syracuse University; Louis Johnson has just introduced a course at Oklahoma State University. Philip Ordung plans to introduce a course next fall at U C Santa Barbara, and Dan Lewis of the CS department at University of Santa Clara informs us that his department may offer a course next year.

Some reports from abroad: Yngvar Lundh is introducing a VLSI design course at University of Oslo, Norway. Irene Buchanen's course is now underway at the University of Edinburgh, Scotland. The VLSI systems activities at the University of Kaiserslautern in West Germany are going very well; we've heard from Reiner Hartenstein that his graduate students are now working on design projects.

New Guidebook Available

The 2nd Edition of the *Guide to LSI Implementation*, by Bob Hon (CMU) and Carlo Sequin (U.C.Berkeley), has just been printed as Xerox PARC Technical Report SSL79-7, and is being distributed to participants in MPC580 project courses. The *Guidebook* contains a wealth of information for designers and project coordinators, including a detailed description of the multiproject chip concept with an example starting frame, and a set of library cells with color plots and corresponding CIF2.0 code. It also contains a complete CIF primer, with information on how to build software to parse, interpret, and generate graphical output from CIF files. The Hon and Sequin *Guidebook* is a timely and valuable addition to the literature.

Future Sponsoring of U. S. University MPC's by DARPA

MPC79 has generated a lot of university interest in future access to such services. We're very pleased to report that a transfer of the VLSI implementation system technology is underway from Xerox PARC to the Information Sciences Institute (ISI) at U S C , in order to establish an ongoing MPC service for the universities. Danny Cohen is leading the development of the ISI system, and his group is already collaborating on MPC580 and MPC1280 with Ted Strollo's team at PARC. Once ISI's system is operational, ISI will run the MPC service and coordinate subcontracted maskmaking, wafer fabrication, and packaging. Network access and funding for the service will be provided by DARPA for selected U.S. universities.

And so, the past few months have been an active and productive period. The new VLSI system research and design activities are becoming well established in the universities. There are bound to be lots of exciting university happenings to report on in future issues of **LAMBDA**! If you have news to report, ideas for interesting topics for this column, or would like to contribute descriptions or photos of activities at your school, we'd really like to hear from you. Contact us by writing to: The University Scene, **LAMBDA** Magazine, P.O. Box 50503, Palo Alto, CA 94303.