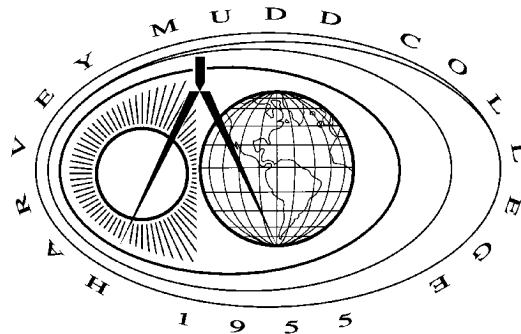


A Cross-Cultural VLSI Design Project

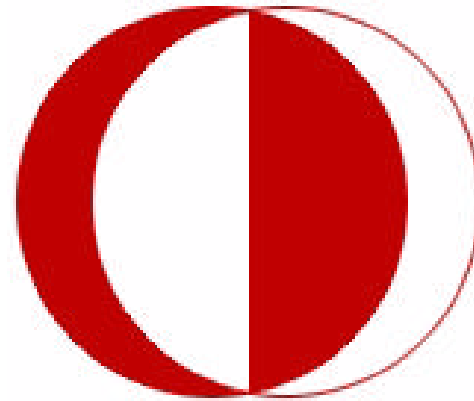
David Harris

David_Harris@hmc.edu
Harvey Mudd College
Claremont, CA



Tayfun Akin

Tayfun-Akin@metu.edu.tr
Middle East Technical University
Ankara, TURKEY

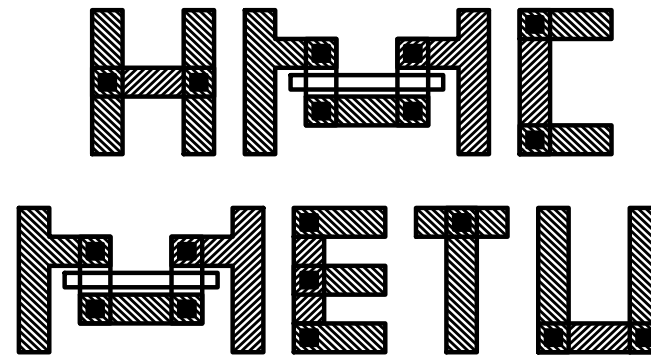


June 2003

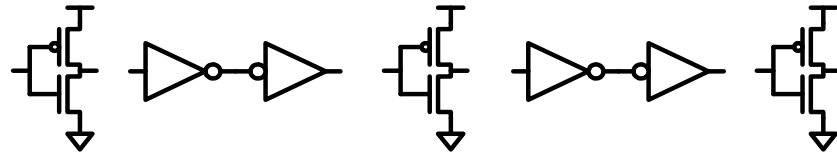
Outline

- ☐ Introduction
- ☐ Course Structure
- ☐ Cross-Cultural Collaboration
- ☐ Travel
- ☐ Projects
- ☐ Assessment
- ☐ Conclusion

E158 Spring 2003



CMOS VLSI INTERCONNECT



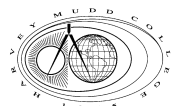
Introduction

Engineering is increasingly done in large teams spanning multiple sites

- Ex: Itanium microprocessor used teams in CA, AZ, CO, and Israel
- Students need to learn to function well in teams
- Upper division design projects are ideal to mirror realities of industry
- International experience is challenging to arrange but very valuable

Joint HMC-METU VLSI Design Project

- Supported by Mellon Foundation grant for *Intercultural Education with Technology*
- Both schools teach engineering in English to top-notch students
- Separated by nine time zones, native languages and culture
- Spring 2002: First project with virtual collaboration over the Internet
- Spring 2003: Second project with travel to METU as well as Internet



Course Structure

Participants:

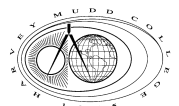
- Professor Harris at HMC and Professor Akin at METU
- 5-6 at HMC (sophomore-senior) out of class of 15-20 in spring semester
- 6 volunteer seniors from METU who completed VLSI in the fall

Credit

- HMC students take E158: Intro to CMOS VLSI Design (3 units)
- METU students did not receive credit because of red tape at METU

CAD & Labs

- Open-source Electric Editor VLSI software available on PC and Unix
- HMC students spend first five weeks learning VLSI design with Electric
- Series of labs to build 8-bit MIPS microprocessor adapted from H&P
 - Lab 1: Schematics and Layout (NAND, AND); DRC, ERC, IRSIM, LVS
 - Lab 2: Full adder design
 - Lab 3: ALU design and bitslice assembly
 - Lab 4: Controller FSM with Verilog: ADDI op, synthesis, place&route
 - Lab 5: Full chip assembly & verification
- METU students already know Cadence and do labs to learn Electric



Project Schedule

Date	Milestone
2/25	Preliminary Proposal
3/4	Project Proposal
3/13	Floorplan
3/15-3/23	Spring Break: travel to Turkey
3/27	Schematics Complete
4/8	Unit Layout Review
4/8, 4/10	In-Class Design Reviews
4/17	Final Project Checkoff
4/19	Final Report Due, Tapeout
5/8	Project Presentations



Cross-Cultural Collaboration

Three teams of two students from HMC and two from METU

Challenges of communicating across space, time zones, cultures, and accent

Technologies available:

- Course web page with assignments, bios and photos of each participant
- Email
- Microsoft NetMeeting
 - Chat
 - Virtual whiteboarding
 - Webcam for videoconferencing
- Prepaid phone cards
- ~~Mimio~~
- Scanner & digital camera

Initially students met by videoconference and exchanged project ideas

Ultimately email and chat were most effective ways to overcome accent problems

First year projects were successful technically, but offered little cultural exchange



Travel

In the second year, four of the five HMC students flew to METU over Spring Break
Students paid \$900, HMC covered remainder + my expenses

Item	Cost / Person
Airfare	\$805
Visa	\$100
Transportation	\$60
Lodging	\$82
Food	\$96
Museums	\$24
Total	\$1167

Safety

- Drew on resources and emergency plans from Pitzer in Turkey program
- Usual precautions for unsafe water, crossing roads, pickpocketing
- Trip took place as war was breaking out in Iraq, but surprisingly little impact



Itinerary

Friday-Saturday March 14-15

18:55 Air France Flight 69 depart LAX (arrives Istanbul IST Saturday 23:20)

Sunday March 16

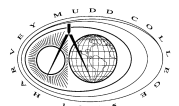
01:00 Check into Sinbad Hostel in Sultanhamet

11:00 Bus from Istanbul to Ankara

17:30 Arrive at Ankara, check into METU dorms

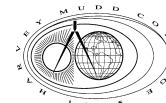
18:30 Introductions & Orientation

19:30 Welcome Dinner with METU partners (Kebab grill)



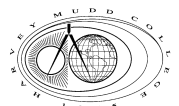
Monday March 17

- 9:00 Breakfast in dorm canteen
- 9:30 Ankara tour: Kizilay, Kocatepe Camii, Anit Kabir
- 15:45 Meet partners at Sunshine Cafe for tour of METU
- Evening Free time with partners



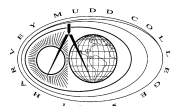
Tuesday March 18

- 9:00 Breakfast in dorm canteen
- 10:15 Turkish language survival course
- 12:00 Tour Ankara Castle and Museum of Anatolian Civilization
- 16:00 Technical session
- Evening Free time with partners



Wednesday March 19

- 8:00 Breakfast in dorm canteen
- 9:00 Technical session
- 12:00 Basketball game with partners
- Evening Free time with partners



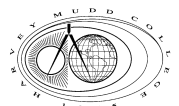
Thursday March 20

Morning Free time

13:00 Technical session

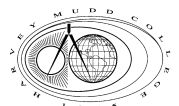
19:00 Closing dinner (Alumni house)

22:30 Sleeper train to Istanbul



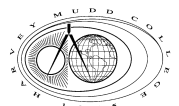
Friday March 21

- 08:20 Arrive Istanbul, ferry to Eminonu, walk to hotel along sea wall
- 10:00 Check into Sinbad Hostel
- 11:00 Hippodrome, Aya Sophia, Blue Mosque, Basilica Cistern



Saturday March 2

- 10:00 Mosaic Museum, Topkapi Palace, Museum of Turkish and Islamic Art
13:00 Shopping at Grand Bazaar, Egyptian Bazaar, markets in Eminonu

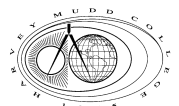


Sunday March 23

06:00 Taxi to airport
09:05 Air France Flight 2391 depart IST

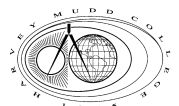
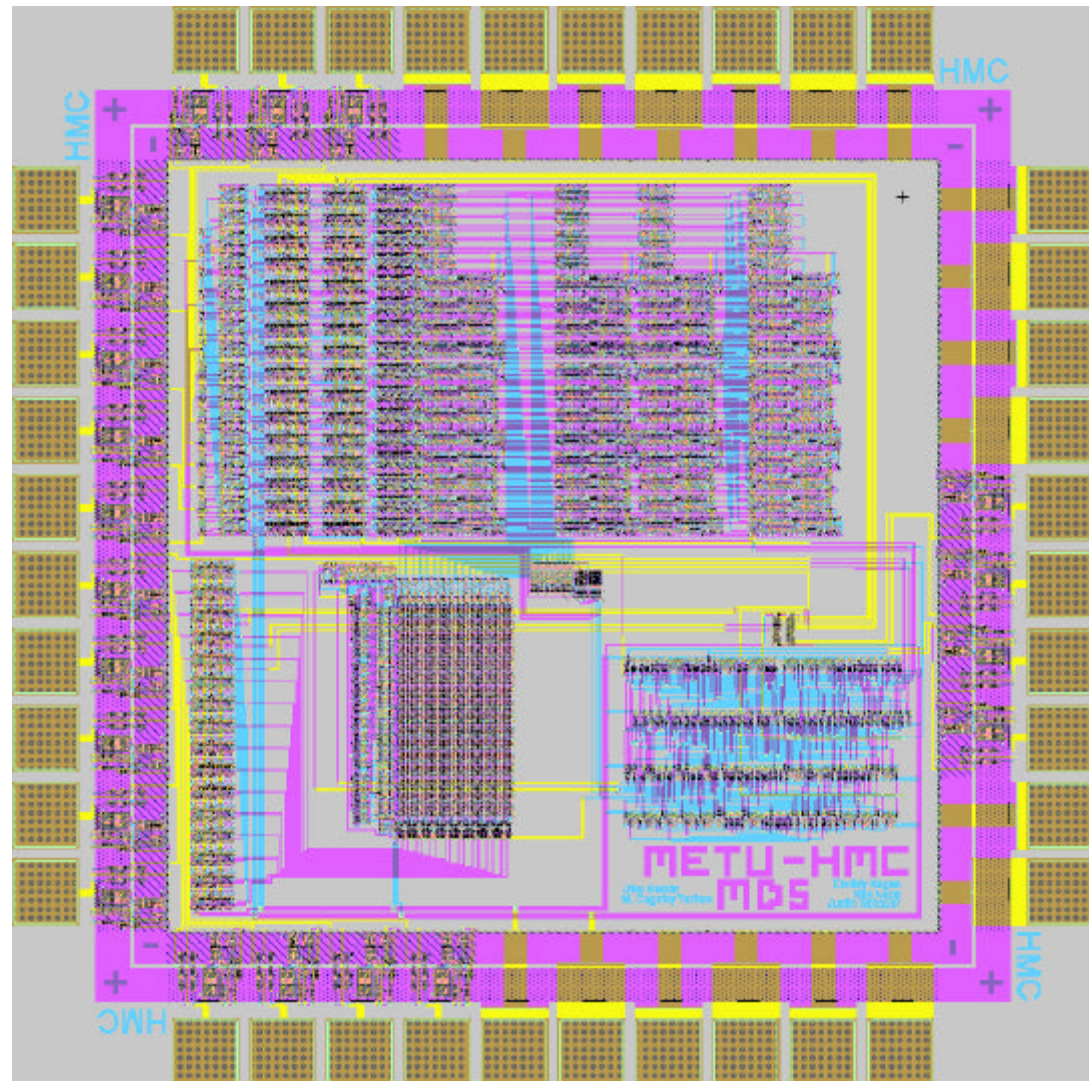


19:00 Back to HMC



Projects: MD5 Decryption Chip

Dmitriy Kogan
Nils Napp
Justin Schauer
Utku Sekin
Cagatay Tarhan



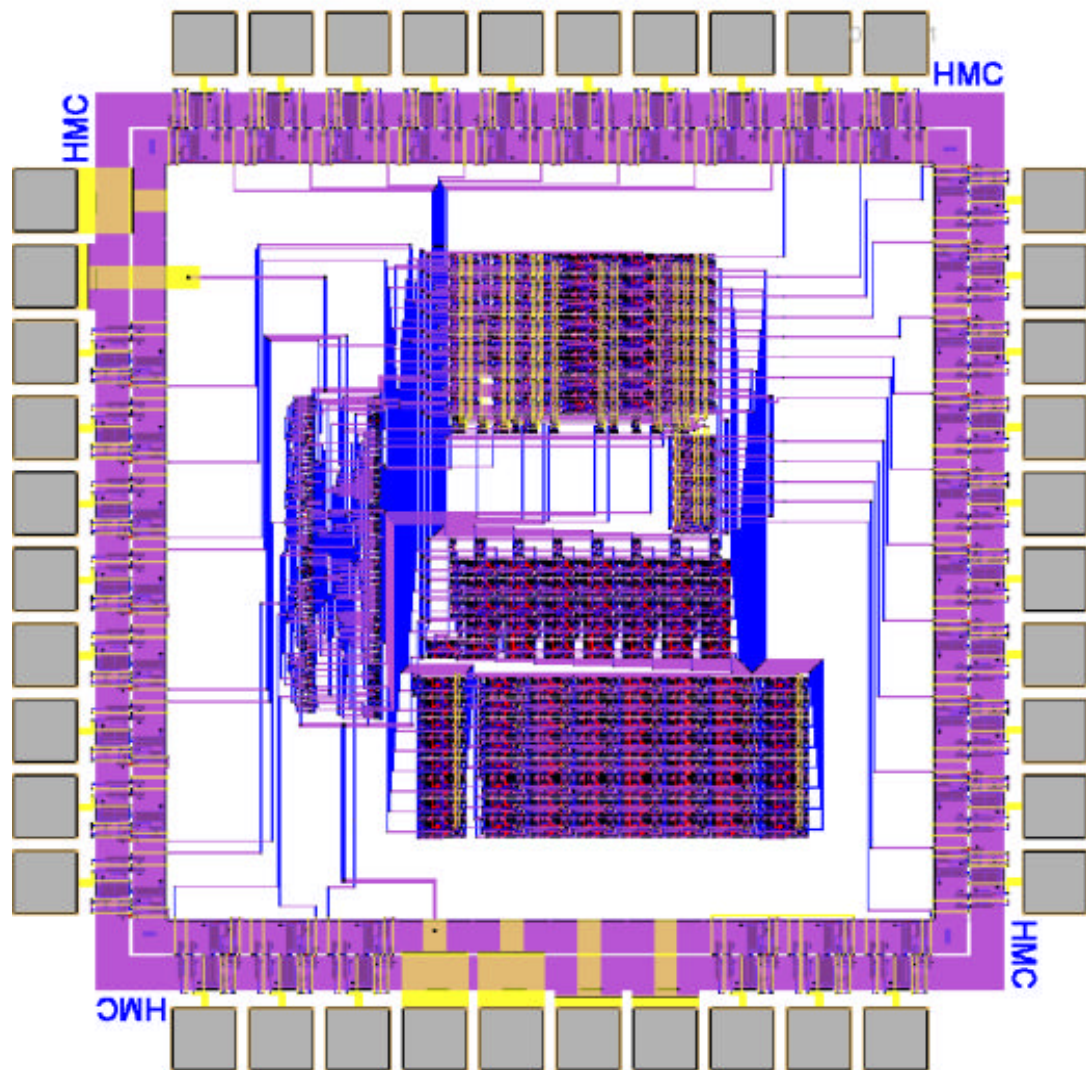
Projects: Audio DSP

Chris Wottawa

Trevor Gile

Suat Tukul

Fatih Kamisli



Assessment

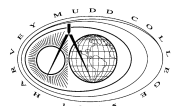
Course Evaluations

- Spring 2002: 6.50 / 7
- Spring 2003: 6.54 / 7

Student Surveys

- Reported desire to meet partners in 2002
- Very satisfied in 2003

“Working across time zones and cultures was both an interesting and educational experience. Seeing how other teams approached design issues and how their thought processes differed from ours was valuable experience for future projects in the industry or academia. It was also interesting to learn about a different culture by interacting with people from that cultural, instead of through the traditional abstract method of learning... Working with a team in Turkey was a valuable experience, and we were very glad to have had the chance to do so.”



Future Improvements

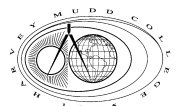
Credit and strict deadlines for METU students

Funding for METU travel to HMC in January

More funding for HMC travel to METU

Every team should have at least two members at each site

Earlier signed deadlines to obtain better airfare



Conclusion

Cross-cultural VLSI Design Project between HMC and METU

Benefits

- Major team design experience
- Develop communication skills across space, time, language, and culture
- Cultural interchange and new friendships

Costs

- Minor costs for WebCam, building web pages
- Time: spring break trip, advanced planning
- Money: \$1200 / person + faculty support for travel

Applications of technology

- Web conferencing is useful for making initial contacts
 - Associate face and voice with name
 - But too slow and awkward for serious design work
 - Accents also pose a difficulty
- Chat and email were most popular for design work
- Communication is hard, so students must partition work and set deadlines

Travel in person is much more rewarding than virtual collaboration

