Acknowledgments

The work presented in this dissertation deals with many levels of the system architecture and builds on the results of several research communities; clearly, this would not have been possible without the support of a large number of colleagues at Berkeley and around the country. Nobody, however, contributed more to the success of my research than the members of our research group.

Foremost, David Culler was a great advisor for my work on Active Messages. He acted as if he was "just" a senior graduate student sharing great ideas and giving advice, yet he did everything one can possibly expect from an advisor: he generated as many new ideas as I could handle, spent all the hours of the world discussing whatever technical issue was on my mind, made sure I had the best environment to work in, gave me many opportunities to present my own work outside of the group, and had a warm heart in difficult moments. Finally, he waded through drafts of this dissertation and gave me extensive feed-back.

My life as a graduate student would have been grim without my office buddies, in particular Klaus Erik Schauser. How many night hours did we spend debating over the details of the TAM implementation? In all of that, it is Klaus' fault that all of us remained honest (well, mostly...): it's impossible to trick this guy! No eloquence, no fervor, no beauty, no wishing, no fudging, no bribing, nothing but the pure facts will convince him. But Klaus is also the best office buddy I can imagine: we consulted each other on everything and many times I would have done something foolish without him. In the final stages of the dissertation writing, Klaus offered careful proofreading and invaluable critical insight, he helped with the bibliography, and he even bought me four extra days of fixing by volunteering to print and file the dissertation for me.

Seth Goldstein joined the TAM project part-way and immediately poured all his energy into it. Upon becoming our third office buddy, he enlivened our TAM and Split-C discussions with his sharp ideas and his wit. I am particular indebted to him for starting the Split-C compiler and for gathering the measurements for TAM presented in Chapter 6. Many of the Split-C statistics in Chapter 6 draw on the research of other members of the group. In particular, I would like to thank Andrea Dusseau, Arvind Krishnamurthy, Steve Lumetta, and Rich Martin for making their work on Split-C available to me.

Many heartfelt thanks go to John Wawrzynek with whom I spent many hours brainstorming on VLSI for musical sound synthesis during my first two years in Berkeley. Even though we had a great time, we had to drop the project and ended up going each our own way. Nevertheless, John has supported me all these years and he helped "debug" this document in the final stages. Special thanks also to David Wessel and Tom Anderson for having agreed to be part of my committee; their suggestions helped me complete my dissertation successfully. I met David through the musical sound synthesis project and he taught me the fun of computer music. Tom, coming from another part of the systems world, contributed different perspectives on many of the issues I was trying to deal with, even though I have not always been able to incorporate them.

John Ousterhout quizzed me in my qualifying exam, inspiring new ideas and making the name “Active Messages” stick, for which I am very grateful. As I found out later, the name was already overloaded [Wal82, LM85], but fortunately in a quite different context.

I developed the first implementation of Active Messages on the nCUBE/2. The kernel hacking necessary would not have been possible without the help of nCUBE Corp. which supplied not only the kernel sources, but also loaned us a 4-processor “baby cube” to reboot at leisure. I would particularly like to thank Steve Colley, Erik de Benedictis, and Kevin Kissell who helped put all the pieces together. The big-machine benchmark runs were made on the 1024-node machine at Sandia Nat’l Labs and I am grateful to the Sandia crew for being able to take the machine over one evening during Supercomputing ‘91 while the habitual users were enjoying the cocktails in the hospitality suites...

The kind folks at Thinking Machine Corp. were invaluable in getting Active Messages onto the CM-5 quickly. The technicians rolled a great machine into the basement and Moose (Adam Greenberg) gave us a jump-start lecture on the CM-5 which got us up and running in a week. In an uncomplicated manner, which we immediately appreciated, he just walked into our office and explained how the CM-5 network interface worked. As simple as that. No top secrets, no NDAs, no signing-your-life-away. Back in Cambridge, Moose remained our primary source for help. I can’t recount how many times I sent him a question at 2am (PST) just to receive an answer three minutes later (no, he didn’t get up early). This was just the beginning for great relationships with many others at TMC, most of which Steve Heller helped coordinate. He made sure our problem reports didn’t fall through the cracks, he translated our requests into TMC-speak with humor, and otherwise pulled the right strings at the right time. Thanks for your dedication Steve! I am also immensely thankful to Lew Tucker who invited me as a consultant during the summer of ‘92 to infect the CMMD team with Active Messages. During my stay in Cambridge, the entire CMMD team was wonderful to work with, in particular, Alan Mainwaring and Moose taught me about all the intricacies of send&receive implementations using interrupts and about the CM5 vector units. My final thanks go to whomever was responsible for keeping the references to Active Messages and to Berkeley alive in the product literature.

East coast versus west coast: many thanks to the members of the MIT Dataflow group and to Ellen Spertus and Bill Dally, all which let us steal their good ideas and took-up the challenge to measure their research machines against the CM-5. The collaboration made the whole project more interesting and we would have never gotten this far without it.

The date at the end of the preface says it all: this dissertation was not completed by the time I took off from Berkeley to join the faculty at Cornell. I would like to thank my new colleagues, in particular Bob Constable and Ken Birman, for creating an environment in which I was able to finish this work while teaching a graduate course.

The person who first put U.C. Berkeley on my map was Wolfgang Fichtner at the ETH in Zürich. He was a wonderful mentor, got me started with VLSI design, and he let me pursue independent research while I was still finishing my Diploma. It was him who suggested I might jump across the Atlantic and into grad school. Without him, I would not be here!

Last but no way least, Angela Moll has made my life so much more worth it than anyone else, specially in the hard times of dissertation writing. In the last months, she gave me the support I needed and suffered with me as I was trying to juggle dissertation, teaching, sleeping, and didn’t have much energy left for anything else. While her academic expertise is in the humanities, she even acquired enough parallel computer architecture knowledge to discuss high-level concepts and to give me helpful feed-back.

Thanks y’all!