



Oral History of Kevin Hughes

Interviewed by:
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START PART ONE

Jon Plutte: This is Jon Plutte, interviewing Kevin Hughes on August 16th, 2010. Welcome to the Computer History Museum.

Kevin Hughes: Aloha.

Plutte: Start off by giving a little bit of your personal history and I know that we're going to end up in Honolulu, but how did you end up being in Hawaii? Were you born there? Did you move there?

Hughes: My great-grandparents on my mother's side came from China, came to Hawaii and started a dry goods store in Chinatown. My grandmother was born in the family store that was just a general store that supplied a lot of the workers in the fields that came in, back in the time when sugar cane was big and a lot of crops there were huge. You had a lot of Japanese workers coming into that area and they came into the store and bought all manner of supplies; everything from clothing to artwork to tools. My grandmother was born there in the stockroom. Eventually, they had a family house downtown in Honolulu. My grandparents were married after World War II and had the family house in Manoa, which was right next to the University of Hawaii campus; the main campus at Manoa, UH-Manoa. From there, in the '60s, my mother left Oahu and went to school at Mills College in Berkeley, California. She married there and raised myself and my sister in Marin County when we were growing up. That was in Novato, California. During summers, I would always go back to my grandparents' and visit them in Hawaii. I usually went to summer school back there as well at Punahou School, where both my mother and my grandmother had gone. That is my Hawaii connection. I learned to drive there. I'd always grown up half in California and half in Hawaii; very much a Pacific environment. The other time, I was living in Lucas Valley with my parents and my sister, growing up there at the same time when Skywalker Ranch was being built. I remember all the construction equipment going down the road and while they were putting that together. I went to elementary school there in Lucas Valley and after living there and growing up in Novato, California, I went to UC-Berkeley, but I'm getting ahead of myself.

Plutte: That's okay. Go ahead.

Hughes: My grandparents were all born and raised in Hawaii. [They] were married at the Royal Hawaiian Hotel, at least—I'm sorry. I should rephrase that. There are so many topics, I'm trying to work in, in my brain.

Plutte: Let me give you a little guidance here. What high school did you go to?

Hughes: I sent to San Marin High School in Novato, California.

Plutte: Were you using computers at all when you were at that school? Talk about your involvement with computers and as early as you were involved with computers.

Hughes: When I went to high school in Lucas Valley—but this would've been before the high school grades—it was both a kind of pre-middle school and high school. Before I went to high school proper, I went to Lucas Valley and there they had a computer lab full of Apple II computers. Now, my family couldn't really afford a computer at the time. Most people didn't really have computers in their houses, but I somehow wandered into this lab and started playing around. At the time, the adventure game on the Apple II was really big and I went to the library and checked out a book on Applesoft BASIC. I read the whole thing and spent time at the lab learning how to program, and I had just an awful lot of fun with that. When we moved to Novato, California, we still didn't have a computer but in those years, I actually contracted childhood leukemia. Due to that process, a lot of relatives chipped in to buy my first computer, and that was my Apple IIe. Our house had a split-level smaller basement area and down below was where they put my computer. It was the room where they put all the books and miscellaneous things in storage, and I spent a huge part of my teenage years in that room playing games, programming, just having fun with this thing, this machine. I had a number of Hayes modems early on. I ventured into the world of BBSes [Bulletin Board Systems] back when 2400 baud modems gave you the mark of elite. I had a lot of fun in that world and met a lot of interesting characters. I did a lot of software trading, a lot of 'warez' trading, with friends in high school. I remember a lot of bins of floppy discs. I remember the hole punch you used to put on a floppy disk to turn it into a two-sided floppy disk so you could store something on the other side. There was a lot of that. There was just a lot of software I went through, a lot of early games. I applied to be a games tester for Broderbund Software Company, at the time. I never got in but because Novato was the headquarters of Broderbund at the time, it was really close by. It was something that I was really vying for. For one reason or another, I never had the chance. Going through high school, I would spend a lot of time doing things like generating fractals on the computer. I bought the first book about fractals that came out that was published by Springer-Verlag and took the algorithms and created a BASIC program which actually generated some of the Julia sets. I would basically go to the computer lab in the morning, have it start one of these programs, come back at lunch, check on the progress and then when school was done, I'd come back [and] it would have just finished generating this little three-color fractal on the computer monitor. That's when I started learning a little bit of machine language for the processor, a 6800 Motorola processor and I did some fun things there. I did a Max Headroom-like simulation. I was very big into sci-fi and I think a lot of that influenced me; the whole Max Headroom '80s Coke pastel colored era. I was big into Devo and Rubik's Cube and Legos; all of these things which informed a software programmer's young mind in the '80s. Tron. Tron was just a watershed moment for me—but all of these things I grew up with and a lot of Broderbund software. When the time came for me to go into college, it was time to upgrade, so to speak. I saved up and bought a Macintosh Plus. I was going into UC-Berkeley, going into mechanical engineering. I originally wanted to do something that was more a mixture of art and engineering. I really wanted to go into industrial design. I had a lot of idols in that world that I really appreciated growing up; people like Raymond Lowe who did the Avanti car, Lucky Strike packaging, many things like this. I always appreciated simplicity of design and how you could take something with such clarity and allow that to be useful to people and used by people. Not knowing much about how one gets an education in such a thing, I asked my high school guidance counselor what I should do. He said "Well, industrial design combines both art and engineering. Maybe you should try to get an engineering degree first and then an art degree and see what happens." I applied to a number of engineering schools like Harvey Mudd and mechanical engineering at UC-Berkeley. I managed to get into UC-Berkeley, mechanical engineering program. In preparation for this, I got a Macintosh Plus; no hard drives at that time. It was all the hard three-and-a-half inch disks. Every time you wanted to boot it up and play Bill Budge's pinball on it, you had to go through this convoluted five minute process of constantly swapping in floppy disks, first to boot it and second to load the game, as well as writing a paper, drawing something, anything. I remember that very well because that whole process of doing that was just carried over from the Apple II days — no hard drives, just all floppies. When I got into college, I had my little Macintosh Plus with me in my dorm room in Cheney Hall, which was part of one of the dorm complexes there next to the campus. Each of these complexes was a block with a building on each side of the block facing inwards.

That was where I resided, there, and a place called Deutsch Hall when I was there as a student. I had a Macintosh Plus there in the dorm room. That was when I bought my first hard drive. I remember it well. It was an Eaman Engineering 20 megabyte drive, really quite big for its time. Everyone was impressed. Unfortunately one day, it actually started sparking and caught fire and caused smoke in my room. I had to unplug the thing and it was pretty much destroyed, but that was the last piece of computer equipment I ever had that had such a spectacular meltdown. That was unique to those days.

Plutte: How did you get from Berkeley to Honolulu Community College?

Hughes: I hated mechanical engineering. In 1989 to 1990, I was at University of California at Berkeley, trying to take a traditional mechanical engineering course. That entailed taking things like Introduction to Physics. Even though I'd done a lot of advance placement physics in high school, and chemistry, I generally hated it and didn't understand it. At that point, it was linear algebra. I had to take FORTRAN classes, which I never went to. I went to the finals for the course and aced the final, but they flunked me out because I never did any of the coursework. Of course, it was right for them to kick me out of the College of Engineering, not necessarily because I didn't find it interesting, but the level of technical detail involved a certain kind of logic to have a very mathematical mind, to really think in numbers that way about physics, physical objects, linear algebra, chemical reactions. It didn't fit my way of thinking. After a year and a half of that and despite the fact I had a full pass to Berkeley through a scholarship I had, which would've given me a good few years, I just couldn't do it anymore. The time came for me to be in the College of Engineering and they sat down and gave me my talk, [they said], "You're not going to make it here at this college anymore," I said, "Why can't I switch my major to art?" I made a large case for me wanting to go into art. I wrote a letter to the chancellor, which I got a really nice understanding reply to, but it was basically, "Thank you, but no." At that point, I was out of college. I didn't know what to do but I had a vague sense that maybe I should continue this art course. In about 1990-'91, I decided to stay with my grandparents in Honolulu, in Manoa, and take summer courses at UH-Manoa in graphic design. Then I figured from there, I would be able to transfer to UH-Manoa properly, take art courses, go into design, and that would be the plan for my life. I went to my grandparents. I stayed upstairs in the room where my aunt grew up, and upstairs is where my mom grew up, growing rats for her scientific experiments. She was quite a geek herself growing up, with the full tortoise shell glasses and braces. I was back here, and I really enjoyed taking graphic design courses in Hawaii. At the end of the summer, I decided to apply for UH-Manoa and basically after that process, they said "Thank you, but no. Your grades were so poor at UC-Berkeley in engineering, basically flunking out in nearly every course, that there's no way we can accept you as an art major here." That avenue was cut off to me. I'd heard a lot about Honolulu Community College because it had a very good reputation for commercial arts courses, basically trades-based courses. Now, HCC was and has been well-known as a vocational-based campus. There are roughly a dozen different community colleges in the state of Hawaii but HCC in particular is concentrated on trades such as air conditioning and auto repair, cosmetology, and not just commercial art but it was also fairly well known at the time for IT training. I decided to start taking commercial art courses there, and in 1992 I started at Honolulu Community College. I had a lot of credits from high school that I could apply to my courses. I walked in pretty much with a blank slate as if my years at Berkeley had never existed, and I could do anything I chose to. One of the first things I did was try to see if there was some kind of computer access there. At the time—this would've been '92—there was no Internet access on campus at all. There was only a computer lab with Unix terminals, a number of Windows PCs running Windows 3.1. I had just come from UH-Manoa which did have Internet access but did not allow summer school students to have any computer access. In fact, I rallied quite hard with the computer department to try to get a Unix account, which they denied. But at HCC, there was no hope of that for a while. I spent the first six months to a year taking a variety of courses in a general liberal arts major, and spending a lot of time as a

computer lab monitor, working on having fun. It was at that time when the campus established its first Internet connection, not just to the rest of the campus system but [to] the rest of the world, and that was really when it all began. I had learned Unix at UC-Berkeley. I spent a lot of time at the OCF, the Open Computing Facility, at Berkeley as a student, learning about the Internet and learning how Unix worked, all the basics of Unix, VI, customizing one's shell, the X-Windows system.

[When] I was at Honolulu Community College working in the computer lab, I was there so often I was actually asked to be a student systems administrator for the campus. Honolulu Community College was very well known at its time for training on the Sun Solaris system for people in IT, particularly the military, and had a number of courses in that area. I, of course, said yes because this would allow me to get back to the UNIX environment. This allowed me to basically work on my own UNIX workstation. I jumped at the chance [because] I only had [a] brief time on [it] at Berkeley. At this point my mandate as a student systems administrator was to look online and see if there were any interesting technologies which could be applicable towards distance learning on the campus. Hawaii, having a campus system that was so spread out among multiple islands, had been highly involved in many kinds of distance learning technologies over satellite. The premier example of this would have been the development of ALOHAnet back in the '70s. [It was] a great influence on the development of packet switching, and ideas in that timeframe. At this point, the campus had full Internet access. After my courses I would work on the workstation, go out on the net, find all manner of things and basically play around. My boss was a man named Ken Hensarling, who was the Director of Academic Computing there. We sat in the same air-conditioned florescent-lighted room where the main mainframe was for that section of the campus. [It was] a six or so story building, which housed what was called the Matsuda Technological Center, which is where the computer lab was centered as well as all of the Sun classes. This was a very networked building, internally. The room we worked in was the home of our Sun mainframe which we called Polua [ph?]. I forget what Polua means, but that was the only other computer of its type on the campus. The other mainframe was a [DEC] VAX system which was in the administrative offices and stored all the student records. That was the state of computing on the campus, at the time. During this time I did a lot of HyperCard development and programming. At HCC I took my first C course, so I only really knew how to program BASIC before then. I didn't know much about the other programming languages, but I had done a lot of HyperCard work at Berkeley just creating my own shareware HyperCard stacks, spending a lot of time on my modem getting software from America Online and the Berkeley Macintosh User's Group, which was one of the largest Mac users groups in the nation. I took all of these ideas and design work and started—all of these ideas got mixed up with things I was looking for online. I developed a system which allowed instructors to basically create a forum for students. It allowed students to basically write essays online, submit them to their instructors and get comments about them back; a self-contained system. It was based on software called Curses, which allowed you to create a very textual yet somewhat graphical interface as much as you could with a text-only interface. Software like Gopher and the first text-based web browser, Lynx, were all written using Curses. Curses [came] from the word for cursor because you use the arrow keys and your cursor in order to navigate. You might see a textual menu, use the arrow keys to go up and down in the menu, then press return and then that would take you to another text screen. This was very much the realm of software I was working in at the time. Gopher [was] very prevalent and the University of Hawaii system [had] a main Gopher site which was connected to some of their library database. You could do some very basic preliminary searching through it, but it was very bare bones. Most of the content on Gopher was in other servers on the mainland. I also looked at a lot of X Windows-based software, anything that ran on Solaris. It was back in mid-to-early 1993 when the first alpha versions of Mosaic for X Windows came out. Even before then I had taken a look at the Macintosh World Wide Web Client. I'm just in the process of looking for new software to discover, and I had seen it but there were no images. It was only text and links. Coming from a Gopher-based perspective, this is not really out of the ordinary, but for a Mac program, boy, did it suck. I abandoned following up on the Mac

browser on that platform. In the meantime Mosaic for X Windows was progressing quite rapidly, and it was in early 1993 when support for images first appeared. Before then it was nothing but text and links. There was support for connecting to Gopher sites and FTP sites through the browser, but when images first appeared a light bulb went on. I said to Ken, "This looks really interesting. I have a feeling we could use this for all manner of things."

Marc Weber: Let me back you up just a little bit. Why don't you give a quick description of what Mosaic was [and] where it came from?

Hughes: Mosaic was the first popular web browser. It was developed at the NCSA by Eric Bina and Marc Andreessen. The two of them [were] working together at the time in the basement of one of NCSA's buildings. There were a number of early browsers back then such as Midas, which was developed by Tony Johnson at SLAC; Stanford Linear Accelerator Center. The difference between these other browsers and this other software and Mosaic was that Mosaic was very easy to install, configure and run. Back then, much software that was online—that you downloaded yourself for the X Windows System, for UNIX,—you were expected to know how to compile it and configure it yourself. Doing this for the X Windows System and different UNIX systems was not always easy. Depending on the variation of equipment you had there was always some configuration issues, some compilation flags you had to fiddle with, things you had to do to make it work with your particular hardware, even among different models on the same operating system. Mosaic, however, was considerably easier because they released binary versions, executable versions of the browser. The way they had packaged it made it considerably easier to compile than other similar software; other browsers. The other thing about the fact that this was a UNIX-based browser is very important because most people that were online in 1992 were scientists. They were physicists. They were in large well-funded corporations or they were college students. Corporations being online at this time, was not necessarily new but because of infrastructure like the National Science Foundation Network—the NSFNet—which had just been online in the previous few years—it had established a number of connections through campuses throughout the United States. There was a lot of infrastructure already built up for sharing software and doing high bandwidth experiments between campuses. Because of this, you had a large college population online. [They were] mostly interns like me that had a lot of time on their hands and were very geeky. We're working on UNIX workstations with comparatively large screens, support for large color palettes and at high resolutions where most of the computing world was stuck in [the] 16 or 256-color Windows 3.1 world or with a black and white Macintosh Plus. Of course, I spent as much time as I possibly could in the world of the browser because it was either go home to my black and white Macintosh Plus, which I still did a lot of artwork on, or spend time in this new world of color and layout that was not previously accessible. Even by then I had used early versions of PageMaker, but that was a black and white world. Even though you had the ability to do layout and things like that, when you looked at a browser it seemed so much simpler. When you first launched the Mosaic browser it went to the Mosaic page: a list that was compiled of websites to go to, information about what the web was, a tutorial about HTML. Anyone that went online in those days, or at least a huge majority saw that page as their first webpage. Anyone that seriously learned HTML took the tutorial from NCSA about how to do it even if it had mistakes, even if they were completely technically wrong from how SGML should have been used. Whatever Eric and Marc learned about SGML at NCSA became part of how the early web was designed, every site. Anything that they did or did not put in the Mosaic browser became part of the early web culture. Where Tim Berners-Lee on his next browser had full read and write capability, on the Mosaic browser—because they basically had no idea how, or were too lazy, or didn't even have the knowledge to put a word processor like capability in it—it was a read only. All of us that wanted to put content online had to type in HTML manually in the style of the NCSA tutorial, the

way they taught us. This became my world quite intensely for the next year and a half; working upstairs with Ken going heads-first into this new world and thinking about what could be done in it.

Weber: So this led on to you creating an innovative website, if I'm not incorrect, and also creating the Image Map stuff, so why don't we go to the what? So this led to you doing what?

Hughes: Images were introduced to Mosaic in February 1993. That resulted in a huge explosion of content on the web, relatively speaking. As soon as this happened, I realized we could put publications online. We could put courseware online. We could put course listings. We could put the campus catalog online. We could put movies, pictures, news, a student directory. The next few months were furious. I spent all my waking time trying to think about every single thing that used to have a physical service [and] how to translate that into this new world because it seemed imminently possible. One of the first things I did after looking at the kinds of sites that were online—. At the time you had very, very simple sites. There was the World Health Organization. There was National Library of Australia. There were some interactive experiments by Steve Putz at Xerox where you had a black and white map—a globe—and you could click on the globe and the place where you clicked zoomed in and you could keep clicking and zooming in on a map area. Because there was this rudimentary support for doing this kind of interactivity online, and because by nature there are a lot of programmers that were developing content, you had a lot of interactive experiments going on. The general structure of a website was an image and some links. I said, "Okay, I'll put up the HCC campus logo and I'll put together some links. I'll make some different pages for things." I simply started putting together everything I could think of. We had a video camera and I went around and I took shorts of different areas on campus. We had sculptures. I took a short pan of the Dole Cannery, which had a huge pineapple water tower on top. We had a dinosaur exhibit in the same building, of all things, which I went down to and took some video of. The Sun, the Solaris system [had] some preliminary software for [taking] video input and converting that into MPEG, which was relatively new. The other thing about the technology back then is Sun was a very large proponent of live video, and video, so they had a lot of support in their workstations for video input and very rudimentary video processing. I was able to attach the video camera, extract all of the pictures frame by frame and then using software that I had found online or cobbled together from a series of scripts, took all of these frames and concatenated them into something resembling an MPEG movie file. These movies [had] no sense of time synchronicity, so you would play these frame animations as fast as a machine would go. There's no way to say, "Oh, this is so many frames per second." Even then the color depth was really horrible. I think 256 colors maybe, 512 maybe, so they were tiny little postage stamp sized movies, but I was able to put a little movie gallery online. I created a thumbnail frame for each of these movies and placed it on the page, and said, "Here's a list of movies from the campus." I then took a number of student publications and faculty publications and started thinking about how [to] translate a publication which has images and articles in it into a webpage. We had a scanner there, and I scanned in all of the photo-based artwork in the magazine and I typed up by hand all of the paragraphs in these magazines. There was a faculty publication called *The Pleiades* which was poetry and stories by faculty, and there was a student equivalent of that called *The Trades Magazine*. A lot of short stories, images and so on. For each image I created a thumbnail image and when you clicked on the image it would take you to a larger image so you could see it in more detail. To separate stories, I created a little separator between articles so it wouldn't look like this large run-on book because it would be too confusing. You wanted some kind of semblance of standalone articles. At the top of each page I created a little bulleted list. Here's the index of the stories to go to. I did this for a few other publications. I took our provost's signature and scanned it in and created a little bit map of that so it looked like he was signing, which he did in the actual publication, and put that online underneath the paragraph so it gave it a very newspaper-y, designer-y feel. I took campus course listings and put those online. During all of this I had photos and stills from all over the

campus, so one of the things I did was I took photos of every building and I created a small webpage about each building with phone numbers for the departments, a paragraph or two of information about the building. Then I said, "Why don't I assemble a campus map which would tie all of this together?" I said, "Where am I going to find a campus map?" I went to the administration building and I said, "Do you have the campus map in electronic format?" They said, "Maybe our drafting department, the people working on CAD, I think they have something." They were able to give me, in DXF [Drawing Exchange Format], one of the CAD formats of the actual campus map. I was able to translate that into Postscript format somehow. In assembling all of this graphics work I did a lot of work in Illustrator and Photoshop. For me having had some experience with these Adobe tools, it was a very natural workflow to me. I didn't know of anyone at the time that was using Adobe tools to do any web work because you had so many people that were coming from the UNIX programming world. A lot of people were putting together graphics using graphics tools on the X Windows System, or UNIX based tools, or by programming the graphics manually. To my knowledge there's no one really taking these concepts from the desktop publishing revolution or using this very graphic software to assemble this kind of content. Using Illustrator, I made a version of the map which had lettered and numbered coordinates on the sides, and I created a bit map and scaled it down to fit the roughly 650 pixel or so width of the Mosaic's browser window, the default of which was pretty tiny in comparison to today. I really wanted there to be some way where you could click on a building and go to information about that building. I was very heavily involved in [www-talk](mailto:www-talk@w3.org) [www-talk@w3.org], which is the main mailing list [that] anyone involved with anything about the World Wide Web participated in. You had everyone from Tim Berners-Lee to Marc Andreessen, the folks at NCSA to people all around the world, from CERN, Geneva, other people in Europe, all the early SGML people, anyone that was using Mosaic or creating other browsers figuring out ways to make it better, making suggestions about what should or shouldn't be in the markup [language]. All of these things went into this mailing list. Every day we all scanned through it and everyone of us that was on the list read it and there was a lot feedback, a lot of interactivity, a lot of excitement going on because we might propose something, a week or two later Marc or Eric would code it up and boom, they'd release another alpha release of the Mosaic browser, or another point release. It would be, "Wow, our wishes are answered. Here's now a support for some kind of a forum. Here's support for sending some data back to the server." It was about this time where they had added in the ability to take the mouse coordinates of where a person clicked and send it back to the web server. Just this rudimentary capability of sending the X and Y coordinates; that's it. That coupled with some ability to define a hotspot, to define some area of an image where you could click and do something. I'd looked at some web servers, particularly the CERN web server which was the first web server software. There was some very preliminary support for defining some areas where you could click in an image like a square area. It was very rudimentary, and the format was very programmer-ish. I think you could only do squares. I asked on the mailing list and said, "Are there any other ways to do this?" People suggested, "For each hot spot you want to make, why not create a separate image?" If you made a separate image of the same size but masked out a little rectangle there and for each image you could have a separate image which had that region. I said, "If I have this map I'd have to create a dozen different images and it would be incredibly tedious, especially for a person doing the graphics," but all these programmer people said, "Oh, that shouldn't be a problem." I figured there must be a better way, so I came up with the idea of creating a little file which would describe all the different regions; a square region, a circular region, a region made up of a polygon. Usenet was the place to go if you had questions, so I asked comp.graphics, the big computer graphics newsgroup, I asked, "Does anyone have a good algorithm for detecting a point within a polygon," and they said, "Oh, yes. Here's a few." I took that, coded up the program to run on the web server software I was running and now I could click on a place on the map and using this little configuration file format I'd come up with where you could define the points of a square—or a circle, or a polygon—now where you define where a square was to be I defined the URL that the web browser could then be re-directed to after you clicked on that region. That made all of this interactivity within a single image happen. Now I was able to click on a building and now go into information about the library or the computer lab. After all of this development in May 1993, I

announced all of this to www.talk. I said, "Here's the software for Image Map," which I called Mapper back then. "I've created this website for the campus, basically. It's got our course listings and these publications, movie galleries, dinosaur exhibit," and I just kind of shoved it out there and let people process. In the previous months there are always announcements about new sites going out on the mailing list. It was really commonplace; it made it very fun to see what people were coming up with on www.talk any day of the week. People were always announcing new experiments, new websites, new ideas about what to put on web pages. My announcement was nothing new, in a sense a drop in the bucket, but then I got a lot of queries. "Hey, can we incorporate these algorithms into httpd [Hypertext Transfer Protocol Daemon]?" Later one of the Netscape people asked me for the polygon algorithm I'd used for implementing that as client-side image maps where it was built into the browser instead of on the server.

Weber: Your site visitation bumped up, too?

Hughes: Throughout 1993, almost immediately within a month or so, we began getting a lot of notoriety. In Mosaic for X Windows, Marc and/or Eric had maintained what's called a hot list. This was a hard-coded list of interesting sites on the web where when you ran the browser there was a little button, hot list, and you could click on that and the menu appeared with maybe 10 or 20 sites. Boom, they made Honolulu Community College one of the sites. Anyone that was browsing the web using Mosaic had access to or was able to very easily get to Honolulu Community College. I began looking at the server logs and I saw people coming in from Australia, from Europe, from Japan. Just to be able to know where people were coming from was hugely exciting. At home on my Macintosh Plus I would connect into the mainframe through my modem and look at the server logs coming through in real-time as people actually downloaded things. At night in Hawaii it was daytime in Europe and you could see all these European addresses scrolling through the screen as people were clicking on things. You got a sense of what was popular and what wasn't; the links that people actually liked to click on, the content that they found interesting. It was very, very exciting. I said to myself, "Wow, some day someone's going to write a book about this," because previously we lived in a world of email, very basic X Windows programs. The interactivity you did on the Internet was just so basic in comparison. Now you had a real sense of instantaneous feedback in everything you did. That's what fueled a lot of development. There was so much back and forth between Eric and Marc at NCSA, Tim at CERN, and the rest of the community, and all the other college students that were just playing around. It was just hugely exciting, hugely exciting.

Weber: With that done how did you make your way to California? What happened at that point?

Hughes: When the HCC site was launched it was the first website in Hawaii, and likely within the first 100 web servers in the world, definitely within the first 200. Before that it was just a lot of physics sites, a lot of technical sites, nothing with a lot of design in it outside of O'Reilly, which had done some of the most pioneering work on the web. All of a sudden we had people calling up Ken and asking for Professor Hughes. I was just a student intern. I was having fun. I didn't know what was going on, but you had people from academic institutions all over the world making inquiries into this little campus in Hawaii wondering where this Professor Hughes was, wanting to take me to conferences, wanting me to talk about this new technology, so I did. In '94 I was able to go to the First International Web Conference at CERN. It got me into the early web conference circuit back then, and that whole world. Because of this, one day I got this email from Palo Alto, California from this little company called EIT [Enterprise Integration Technologies] saying, "We've seen your work online and we love it. How'd you like to visit us and see if

you'd like to come and work with us?" This would have been in late 1993, I believe. They were pretty serious about it. They paid for my plane trip down to Palo Alto. I flew into Palo Alto. I had my first experience with driving through what I perceived as this garden area, University Avenue. It's almost like driving into a castle. I saw these expensive mansions and houses on each side as you go in from the highway, and now all of a sudden you're in this nicely manicured, beautiful, semi-wooded, one storied area and I was at EIT. I sat down and I showed them everything I had done on the campus. By that time I had created a virtual tour of the campus. I took the campus map. I made a huge blowup of it.

Weber: Let me stop you here for second. Are you hearing that plane? Okay. I want to hold on until this plane goes over. Okay, start off...

<break in audio>

Weber: Now you're in a room with a group of people. I want you to describe the people and what you showed these guys.

Hughes: In late 1993, my first trip to Enterprise Integration Technologies and my introduction to Palo Alto—the EIT offices were on Hamilton Avenue in Palo Alto, almost right across from the city hall there. It was a small little office on the ground floor and it was split up into different, separate rooms where each of the programmers worked. I sat down on the conference table with everyone there, with a workstation on it, and showed them everything I'd been doing at Honolulu Community College. The first person I'd met that emailed me was Jay Webber and he was one of the principal software engineers there who worked on a number of projects. I guess, perhaps, a definition of an older school software engineer, he had a more of a SRI-ish [Stanford Research Institute] background. He was more formal in his demeanor. The thing about EIT was that they did a lot of contracts, basically ARPA contracts. They had a lot of ties with SRI. EIT was founded by Marty Tannenbaum and two others, Jeff Pann and Jay Klicksman at Stanford University, and they spent some time in Stanford's offices before they moved to Hamilton Avenue. Their specialty was in fulfilling advanced software contracts with military purposes. That had something to do with online technology, something having to do with the Internet. For instance, they were very interested in agile manufacturing: software that allowed collaboration for engineers for building military equipment, for exchanging technical information and papers, for doing video conferencing. All of this was very pervasive and in the air and in the expertise of the company. At the time, there were maybe 10, 15 people. Marty, the founder, had a long history of artificial intelligence work at Stanford; a very well respected man who had previously worked at Schlumberger, the oil [services] company, where he ran a research division. He'd also produced some seminal papers on computer vision. He was a very talkative, brilliant man. He has that kind of very homely, Jewish demeanor, almost I would say like a father figure. In many ways, he has been to me. My first take was, "Here's this man running this rag-tag group of engineers out of Stanford, doing military contracts, and now they're looking at hiring this 22-year-old kid from Hawaii. What a world." <laughter> I was in the process of showing some of this stuff. They had some offices on the second floor of the building they were at. I went upstairs and in walks this man with long hair past his shoulders, bare feet, ragged jeans, and a t-shirt. His name was Erik Rescula and he liked to be known by the name of EKR, his online user name, E K R. He was one of the main programmers behind a lot of the Internet-based software that they were doing, most particularly having to do with early electronic commerce. He had primarily worked on a system which allowed people to pay for electronic documents with their credit card online. All of this was based on a little terminal in the back room, and they called this project "Public Disk": one of the very first, if not the first, of its kind. Erik was

very much involved in writing this system and architecting the system. He was the very prototypical stereotype of your Unix hacker back in the day. Back then when you thought of Unix hacker, you thought of big, pudgy old grey haired men with hair down to their shoulders and beards, and he very much fit the mold. He talked fast, he thought fast, he was a million miles a minute in many different directions. Everyone there at the company was very smart in a number of areas and was able to synthesize a lot of ideas to build what they needed to build. There is another man upstairs, Niels Meyer I believe, who worked on a Unix workstation developing graphical interfaces for doing engineering work; collaborative engineering, white boarding software. Another man, Venet Kumar [ph?], who worked on the Mbone [Multicast Backbone] multimedia video and other collaborative applications when it came to video work. Generally, everyone was fairly young, either early 30's or late 20's. I was the kid in the room.

Weber: This is also where you met Marc Andreessen, right?

Hughes: Not at that time.

Weber: Okay.

Hughes: Not at that time. This was my introduction to the start up. I knew nothing about programming for money. I didn't know what a startup was. I didn't know how this world worked. I had no formal training in computer science courses outside of the one C course I'd taken at Honolulu Community College. The whole world was new to me. But they hired me because I had graphic design skills which none of them had, as well as programming skills, and most importantly had experience with creating and making interesting web applications. They said, "We're going to make a business card for you. What do you want on it?" I didn't feel comfortable really calling myself a software engineer and neither did they. I said, "I really want to be called a Webmaster." At the time, no one used the word "webmaster." It started because, people that ran Gopher sites were called Gopher masters informally. On the www.talk mailing list, there was some talk about it. They said, "If they call them Gopher masters, why not Webmasters? Makes a lot of sense." I want to put on my business card that I am a Webmaster, one word. They said, "If we put that name on your business card, no one is going to know what in the world it is. You might as well call yourself a three wing dodo." We settled on graphic designer and [I] was accordingly paid a graphic designer's entry salary of 40,000-ish. I started. By that time, I had [an] offer from Honolulu Community College to become part of the faculty, to teach hypermedia courses. I'd already given demonstrations of the web and basic lectures to the faculty and students about the web. They said, "If you stay at UH, we'll give you free tuition. You'll be part of the faculty, do what you like," Or I can take my chances at this little company in California and see what happens. After some thinking about it—it was not an easy decision—I said, "Let's do it. Let's go on a great adventure." I Packed up my stuff and moved to Palo Alto. There were a lot of vacancies for rentals. Palo Alto felt half empty. I went and saw a number of apartments, all of which were about 500 bucks, all near the campus and around the area. It was your typical small town feel. I got an apartment which was literally on the block next to the office, so I could wake up in the morning, walk a minute to the office and work. It was right next to the parking complex on Hamilton and Cowper,, right near where there's a California Pizza Kitchen today. I'd get up in the morning, I'd walk there, I'd do web work, work till late or anytime I really wanted, I'd eat out somewhere downtown, and that was my life for the next few years while they were in that location. I'd just started for about a month or two, and Brian Smithson, who was a project manager there who basically gave me my first tour of Palo Alto in his old Mercedes Benz, said, "We're going to hire Marc Andreessen." Everyone knew who Marc Andreessen was. I think EIT felt [that] because of hiring me, they said, "You know, I think we have a pretty

good reputation right now as being the hot company on the web outside of maybe O'Reilly. If we find the best people we can that are doing web work and have them come work with us, we'll hit a home run." I don't know how the process happened. Maybe Marty contacted him, I don't know the details, but one day Marc Andreessen came in. He was to work with both EKR and Allen Shiftman. Allen Shiftman was another principal of the company, an older man who was one of the more legendary figures in the Smalltalk world. He had worked [with]—I'm embarrassed, I forgot his name—Mr. Doigt, on the Doigt-Shiftman compiler, for Smalltalk and was very well known in the community. He was managing projects there, so he was managing the Secure Mosaic Project or what we call the SHTTPD project. SHTTPD stood for Secure Hypertext Transport Protocol Demon. This was the web's first secure protocol before there were things we knew of as SSL or HTTPS. It was called SHTTP. Obviously named by a programmer, because if any normal user saw it they would pronounce it as Shit-P, but that was not my decision. I was the graphic designer. My job was to work with Marc and Erik and Alan as needed to create a secure version of Mosaic. So when you browse the web, you knew that the contents were encrypted and authenticated. We had to figure out how to present this information to the user so they knew, when they went to a web page, that the contents were verified as being authentic and that were sent in a way that they could not be eavesdropped upon. I developed some icons that looked like a combination lock, that looked like you were signing a piece of paper, that looked like you were putting things in an envelope and sending them, put these all up in an animation and Marc coded these animations in the browser. When you went to a web page, it would look like a little tumbler lock is spinning, it would look like you were signing a little thing, and then it would say, "Ah, it's secure." We had a picture of a lock or something like that to indicate that this page you were viewing was verified and secure. I worked with him briefly on that; I would say that period didn't last more than a month or two months. It's hard to say. I do remember one time after hours, [I was] just going up to Marc's office. He had a little enclosed office like the rest of us, and he had his UNIX workstation there on the desk. In the corner was a pile of books. I think anyone that was interested in the software industry, pretty typical books you would have. You had Brenda Laurel's *Interface as Theatre [Computers as Theater]* book. I forget, it was a green-covered book; a very well-known book in the user interface world. He had one of the early, unofficial biographies of Steve Jobs, who he absolutely idolized and adored. There he was, he was just browsing online on the web. While we were there just talking, he would be visiting many different sites and this practice, even though I had done a lot of work on the web, was a bit new to me. If I were in my apartment just a block away, even though I had a modem, I was on this tiny little black and white Mac laptop, grey scale laptop, one with the trackball on it, which is very thick. You couldn't realistically view a webpage on that device, not with speed or color or the size that you were accustomed to on a Unix workstation, so I really had to be at work if I were to do this. Outside of working on software projects, I just didn't have the time to browse the web freely like that all the time. But Marc, he looked—it looked like he was completely an old hand at it. I realized what he was doing is what most people do today; they simply browse the web for entertainment. As time went on, of course, that became part of my daily schedule, but it wasn't then. It was almost a novel idea.

Weber: So after EIT, what got you to move from EIT to your next situation and what was the circumstances?

Hughes: EIT was very well known at successfully landing a lot of ARPA contracts; working with folks at SRI, working with the engineering community at Stanford, artificial intelligence community at Stanford. Marty's great goal of EIT was to create technologies that enabled businesses to collaborate online, to basically bring them together using the Internet and realize all the benefits that would entail. Everything he did, starting with Public Disc, was an outshoot of that. The next major project by EIT was something called CommerceNet. CommerceNet was a joint project—an advanced technology program project—

between the Air Force and EIT. The goal of CommerceNet was to bring together a consortium of companies to figure out how to do business online using the Internet and this nascent web technology to figure out how to enable e-commerce. My task was to build CommerceNet's first website. As part of this website we would have what we called a CommerceNet directory, a directory of businesses. CommerceNet signed up a number of initial members and initially all of these pages were simply information about the company. We tried as much as possible to give these companies their first worldwide web presence. If they did have some sort of a website, a web-based content that their directory entry would go to their web page. In almost all of the cases, none of them had any idea what to do. They would say, "You guys are the experts, why don't you create some content for us?" CommerceNet's launch date was slated for April 1994. In the months from—since I was hired—from January to April, I worked on CommerceNet pretty feverishly and a number of companies, trying to get them ready for this launch presentation. What we really wanted to do was to show this directory, show a number of web content from member companies. We wanted to show a number of mock ups of what an actual working web-based storefront would look like from the process of selecting a product—finding a product, selecting a product, ordering it online, entering in your billing and shipping information, and having that as part of a unified design experience. Me being the only graphic designer in the place and general hypermedia wrangler, author, or designer anyway, I was the point person for these companies. I remember getting a call from someone at Apple saying, "As part of this launch," they said, "We want to do something on the worldwide web. No one in the company knows anything about the worldwide web. I'm the Apple librarian, so they figure, 'You have something to do with information technology. Why don't you call them?'" I was talking with this guy and gave some introductory senses about the web and what it was and he, like many others, ended up just sending over some official looking graphics to put on the web page. I remember getting CDs of pictures from Wells Fargo. Some of the folks would come in. They'd say, "Here's like a splash screen we'd like you to put up for our first web page." It was just a photo of two guys on a stagecoach saying, "Under construction. Be back soon." That was Wells Fargo's first web presence.

Weber: Why don't you give us a listing of some of the companies that are on it, with a description, and then talk about the launch of the site.

Hughes: Tandy, I believe, had some web content which was more than just a page and an image. Hewlett-Packard put up a site which was somewhat controversial at the time because, although they had multiple pages, every page was represented by a single large image and each image was of a size which was rather considered gauche at the time, maybe 80 KB. They figured how can you use a modem to view the site, if the image is 80 KB, it's going to take them half a minute just to download the page or more. Those were the notable ones I could recall.

Weber: Then what happened on launch?

Hughes: As part of the launch of Commerce Net, another company called the Internet Shopping Network also launched. The Internet Shopping Network was created by a man named Randy Adams who had previously worked both at Adobe and at NeXT. He wanted the Internet Shopping Network to be the first real online shopping experience, so I worked with Randy to develop the website, to design all of the graphics and what the user experience would be to people. Then Randy [was] working with others at EIT—notably a man named Jason Blooming—to do all the service side work and integration work to insure that things went to the database and it'd be integrated with his other systems and so on. We wanted to launch the Internet Shopping Network at the CommerceNet launch so we were very busy

preparing for that as well as getting all of these other companies going. This was held in San Jose at one of the major conference centers there. I forgot what it was called. We had a video tape of an introduction from one of the local supervisors. Was it Ron Brown or? Someone in the local government there gave a very nice introduction to CommerceNet. We received a letter from Al Gore complimenting CommerceNet on its launch. Marty still has the original. We had a number of brochures for the Internet Shopping Network that had been prepared. This was in a conference room, wide, rectangular conference room. At the front was a podium and a projector screen where we showed both the introductory opening remarks from video tape as well as a snapshot of what the web was like then as well as our CommerceNet mockups. On one side of the conference room was a series of workstations provided by Hewlett-Packard and others showcasing each of the different companies' web presences as well as CommerceNet. We had a lot of press there, a lot of people. I would estimate two, three hundred more. By all accounts, it was a success. After that, CommerceNet's membership increased. For member companies this was a paid membership, I believe annually, to be part of this consortium, to try to hammer out e-commerce standards or ways of interoperating. CommerceNet was a great success for EIT. The Internet Shopping Network went online and was used for some time and was subsequently acquired by the Home Shopping Network. I don't know what they did with it after that, but that was one of EIT's large early acquisitions successes.

Weber: What did this lead to for you?

Hughes: At this point we are able to move in to larger offices. EIT was 25, 30 people at the time. We moved to Menlo Park at the next to top story of a building there near the intersection where Arby's is; not too far down the street from the Stanford shopping mall. Right under B Incorporated, which was making the B computer at the time. We subsequently were able to take on a lot of work from companies that wanted web presences. We did the first early website for a company called software.net which was—I forget who they were bought by, maybe Amazon. I'm not sure. We did the first early logo work and I think web presence for a company called I-Pro which was later acquired by Neilson Media Research. They were the first online commercial analytics companies. I-Pro was headed by Aerial Polar who today is an angel investor.

Weber: How did CommerceNet lead to Commerce One, what was the path?

Hughes: Between CommerceNet and Commerce One were a number of different twists and turns. As we got notoriety and clients—C-Net wanted us to do their first website, which we ended up not doing—as we gained in notoriety, we got a lot of interest from VeriFone, which everyone knew then as the company which made the point of sale terminals that you swiped your credit card through to make purchases,[was] very much a hardware company. They wanted to acquire EIT for its Internet expertise and see how they could merge their hardware knowledge with our Internet knowledge and build systems that could allow people to make credit card purchases online in all manner of variations of such solutions. I believe in '95, we were acquired by VeriFone. We then moved downtown—down the street a little bit, where I believe the Bank of America building is in Palo Alto—and moved into offices there. During that short period, VeriFone was then acquired by Hewlett-Packard for a billion dollars, half a billion? Billion-ish. It was pretty impressive at the time. <laughs> I stayed on as an official Hewlett Packard employee for all of a week because I could not see myself working at Hewlett-Packard, or in a company of such size. My good friend Dave Ragget [ph?] who we'd all known from www.talk days, [was] in the conference circuit. Dave Ragget was the architect of tables and a number of other browser W3C [World Wide Web Consortium] standards body work. He had regaled me in the past of many fairytales of terror from Hewlett-Packard. I didn't want

to stay on. By that time the options I had were pretty good. I was able to cash out at that time and buy a house. Or at least, put a down payment on a house off of Middlefield Road in Palo Alto. This is my first tangible, physical win from the stock opt—from the idea of stock. When I first started [at] EIT Marty said, “Oh, yes, we’ll give you some stock options.” I said, “What’s that? What are stock options? What are those?” He explained the idea to me; how that worked. My co-worker William Wong—who was next to me—was very business savvy. [He] explained how the business worked. How things went. As this EIT stock went from there to VeriFone and inflated a bit, and then went from there to Hewlett-Packard and inflated a bit. All of a sudden, I had this stuff which was this paper money; something I could actually tangibly convert into real money. So I had fun with it. I said, “Now I can do it. Let’s get a house.” I moved into Middlefield Road all of 23, 24. I talked to the neighbors who are shocked that anyone my age could actually afford a house in that area. Even then there were the houses, and this typical sized house. Small, one story, suburban house; they were not expensive. You could get a pretty decent place in Palo Alto for \$500,000.00. After that and after leaving the VeriFone/HP merged company Marty said, “Now let’s do the next thing.” Marty went to concentrate on [CommerceNet](#), which by then had moved into offices by the VA Hospital in Palo Alto down Sand Hill Road in the foothill research triangle. I believe [it] was the former site of Fairchild Semiconductor. One of the earlier luminaries of that world in that era. This is a little research park made up of multiple buildings. Real Networks was in one of the buildings. [CommerceNet](#) was in one. Across the hall from us was a company called Virtuality, and they made a lot of VR goggles and arcade games, which when you put the goggles you did virtual boxing with gloves and so on. At [CommerceNet](#), we simply continued on with projects there, including one company called TRUSTe . [It was] initially called e-Trust. We had to rename it. That was helmed by a woman named Susan Scott. The idea behind the company is that it would go to different online companies, take a survey, and verify them as being someone trustworthy to do business with online; like the equivalent of the Better Business Bureau online. At the time of the VeriFone/HP merger, ’95-ish, moving into maybe ’96, ’97, the buzz around the Valley began to get louder. You heard of deals which were just increasingly larger in magnitude. Fancier cars out on the street. More people out on the street where previously it was mostly just students. Even then only at night when they were going to pubs. Now you’re starting to see all manner of business folks around town. There was another colleague who had come up with an idea around TRUSTe. He had sold it in a matter of months for \$200 million. That was the first story I had heard when one began to think, “Wow, things are getting out of hand.” <laughs> Or at least if not getting out of hand, [it was] something you were really awestruck by. It was no problem to create technology or websites that were used by thousands of people all over the world. When you were dealing with real money like this, this is quite something. We were fishing around—Marty and I—for the next big idea. We decided to create a spinoff, a startup out of CommerceNet, which we called CN Group, CommerceNet Group. Our idea was that you could create some data schema for things, which could be used as an interchange format. We took the example of SGML, which was heavily in people’s thoughts among the really technical W3C-ish people. We said, “What if we described a business document using SGML using some kind of structured markup?” We figured, “Things in databases, things stored in insurance companies, things stored in product databases; if these can be structured as columns, and tables, and rows if information in catalogues can be parsed and structured as paragraphs, and items, and prices; if we had some intermediate structure which could take in both of these structured things, merge them together, and transform them to allow and make this data available online in a way that a person could query this merged structure, then effectively search for catalogue and product information in both of these worlds simultaneously— We figured, that would be a great boon to business. I came up with an idea, which I called TOE; the Taxonomy Of Everything. You could think of it as a gigantic outline of things, each of which had a little numerical address. This was very similar to another EIT employee’s work. His name was Tom Gruber and he was also well entrenched in the AI Stanford community. He had come up with the first Lisp version of software called HyperMail, which converted email archives into web pages. I took his work and made a C version of that which actually still exists today. It’s in use. Tom was all about the idea of ontologies; how you describe something. What is the syntax of something? What is the language you come up to describe things? I had

no AI background, and knew nothing about 50 cent words like ontologies. I knew from this world that it would be very simple to describe something as an outline or in some structured way like HTML. Marty and I sat down bubbling over these ideas. We started hiring the people that were working on the early XML [Extensible Markup Language] specification. This included people like Bob Glushko from Passage Systems who was one of the premiere XML document architects. We hired Terry Allen who came from O'Reilly and Associates, who did the really pioneering work online. [He] created web-like hypermedia content using his own XML schema. He had previously developed something called Doc Book, which was the structured schema for technical documentation, very complete. We hired Murray Maloney who had also been very active in that world and [who] I knew from www.talk days. I'd known all of these people before from different companies. I had met Bob Glushko from 1993 when I was a student pushing him these pamphlets on the web [and] asking him to distribute these at the early hypertext conferences because he an organizer. All of them came from this very formal world of documents. They were all very exacting, very much about defining things properly. I came from the shoot from the hip world of software, web stuff. Let's make it first and argue about it later. We got along really well. We ended up hiring Matt Fuchs who had a lot of mathematical papers on converting different schema; document schema, mathematical schema from one to the other, different transformations that could be done. We hired some very good software engineers: a man named Andy Davidson, who had done a lot of Java work in the past. Previously these two classes of people did not talk to each other. We had people that worked on documentation, on SGML, and you had people that worked in software. What we wanted to do was create a way to convert things from SGML to software objects and back so [that] it would be easy for businesses to convert their data to different formats. I remember very clearly there was one time when Murray Maloney and Andy Davidson got into a room. [They] had this heated argument at the top of their lungs for what seemed like hours. This continued on for a few days. One day they emerged from this room with just smiles on their faces and said, "We got it. We understand it. We figured out how to do this." What they figured out was a way to take a document using SGML markup—the same markup that had powered the web with HTML all these years—and how to translate that into a software object using a language like Java, and then to take that software object and manipulate it, transform it, and then convert that back into a structured XML document. Their early work became part of what's called XML schema today, which is used in many different places to do XML document conversion.

Plutte: I'm getting a little lost. So in the end you had a company? Or are you creating a company? What was this company we were talking about?

Hughes: CN Group was meant to be a startup. We didn't know how it would end up. As we ended up hiring more people, and came up with these software solutions for things, we started fishing around for contracts as Marty knew that world best. We started working on a joint project with NTT and a lot of software engineers from Japan on creating something called National Information Infrastructure Marketplace, NTT Marketplace and a number of related projects. [They] mostly [had] to do with something called NTT Marketplace where we wanted to present a unified storefront to users but something that would query a lot of different product databases and would use this document to software conversion technology to allow users to query vast product databases online in order to shop for things and then fulfill transactions. The project went off well. It was fulfilled. I don't know if it was ever seen by the public. We thought we had something pretty good. We had a really great software architecture. We had a server that was running. CN Group changed its name to Ver Systems, Ver in Spanish means to see. We were looking more and more like a company and less of a nameless consortium-oriented startup. It was at this time we were talking to various VCs for funding. We were looking at potential partners that could partner with Ver Systems to maybe turn it into something larger. At that time, Commerce One came along. Commerce One was a company [that] started in Pleasanton or around Walnut Creek in California just a year or two

before.. It really started off as software for online procurement. When they talked with us they were [about] the size of what EIT was when EIT was bought by VeriFone. CN Group was maybe ten people, fifteen people or less. Everyone sat down in a room and said, "Let's take a look at what we have. We have a procurement system over here, which can allow people to fulfill purchase orders. We have a system over here which will connect that to the Internet and allow you to query many different business document formats, and software, and databases for getting product information. Sounds like a very interesting combination." So CN Group and Commerce One merged. An architectural vision of something more akin to what we came up with became the basis of what Commerce One proper became. It became the real foundation of the company where they—the Commerce One always had procurement software, but now we were talking about something we called B-to-B, Business-to-Business. We wanted to create software that allowed businesses to interoperate. One of the ideas that Marty was always talking about was we wanted to allow radical interoperation, which means, "We don't care if you want to integrate your databases with us or not. If you put content online we'll suck it in, we'll parse it, and make it available to other businesses, suppliers, other vendors, middleman companies. We're going to create this gigantic marketplace of businesses where people can find products, schedule them, put together complex orders with workflow so you can fulfill assembly lines, streamline manufacturing, streamline procurement, streamline online business in a way that EDI [Electronic Data Interchange] had done many years before but which was somewhat complex with very convoluted protocols and syntaxes." We wanted to make something with a very clean syntax like HTML; something that was XML-based. Something that ran over the Internet using open protocols like HTTP—and secure HTTP, which now we had going for some time now—which was, thanks to Netscape, SSL.

Plutte: So you formed the company. Were you part-owner at this point?

Hughes: One of the things about Marty is that he could very easily have given the engineers in the company the short end of the stick. There's no shortage of stories in the Silicon Valley where you have a lot of higher executive CEOs taking the money and running, which has happened in my experience peripherally. Marty was very generous. He knew, being a software engineer himself and coming from an engineering background the sense of fairness that we all had. It was not about having the right share of the money. It was about being fairly compensated, and recognized for what you did and enjoying the challenge of what you did. That was our culture. That was what the web came out of. My stock option grant was pretty good being the number one engineer at CN Group. When Commerce One merged with Ver Systems that had a slight adjustment in prices. After that is when the really large hype started to happen. Now this is something that was not generated internally, or something we had any overt knowledge about. We started touting our idea of B-to-B, and e-commerce and how great things could be in the world where all these things are linked together, and interoperable, and unified. This is a great story in the press. This was something a lot of people were wondering how [to] get a piece of [it] We were able to get a sizeable amount of funding from VCs. We were working with people like Goodrich and Lazzatti off of Sand Hill [Road] to do all of the lawyerly paperwork. We were able to move into the top floor or two of a building in Mountain View, which is a gigantic white building overlooking the San Antonio shopping mall. I had a corner cubicle overlooking the entire bottom of the Bay. You could see all the way clear out to Fremont over the hills with this beautiful wrap-around glass window vista. That's where we seriously started working on the first version of the Commerce One software. At the time things were really heating up for everyone, not just the company but throughout the Valley. Just driving down the street I saw help wanted signs everywhere. People I knew were leaving companies and going to other companies in a heartbeat. They were just going to wherever suited them. It didn't really matter. They knew they could always get a job somewhere. At that point it was just, "Where do you want to work? Things began to feel a bit faster paced, more frenetic. Commerce One, leading up to 1999, was just a lot of work in that area.

Then we made another move. Commerce One began acquiring a lot of companies. They had to move their headquarters to a large building in Walnut Creek. It was maybe 2,000-ish people. The IPO happened when our offices were in Mountain View. The main Commerce One headquarters were in Walnut Creek around 1999, but all of us that had come from the Ver Systems world were in Mountain View. That's where I worked on the interface to something they called Marketsite.net. This was their main business-to-business trading portal. I worked on prototype interfaces for their next generation procurement software and other e-commerce related software and initiatives. It was there that Commerce One went public. Commerce One ended up being one of the most, if not the most, allotted IPO of 1999. The hype was outstanding. The press was outstanding. We were in negotiations with the General Motors for them to use our software for coordinating with all of their suppliers. This would have been a massive contract and a huge undertaking. Of course, if this is something that Commerce One put off we would have had it set. We would have been the Google of business. Then the IPO happened, and the stock went up. Then it went up again. Then it split, and went up again, and it split again. This within six months. I cashed out an amount as early as I could. Having had some experience with the HP stock, I knew I'd better get as much as I could right away. I took out about \$6 million. I finished up my mortgage on the house, or at least paid it off fully. I recall walking into a Mercedes Benz dealership, giving them a check, and driving off with a white SLK. I had no experience with these things. My family was a middle class family. We didn't have a whole lot. We had a Toyota Camry, and a dog, and a cat. We lived in a slightly upscale middle class house in the suburbs. We were never ostentatious. We were like any other of my friends that went to high school and their parents just growing up in the suburbs. Here I am, I'm dealing with millions of dollars in cash in my bank account. I walked into Charles Schwab where I had my account one day. I said, "I'd like to get some investment advice." I was 28 years old. The woman looks at my stock certificate and types it in. She says, "Come this way, please." She takes me to another woman at a desk. She sits me down. She says, "What would you like?" I said, "I have this money. I don't know what to do with it. What should I do with it? How do I invest it? What do I do?" She said, "Oh." She mumbled something about long term bonds, government bonds, mutual market funds. [It] went right over my head. I don't know. I had no idea what all that stuff was. She seemed to explain it pretty well. I didn't feel it was anything that helped my situation. I walked out of there just confused wondering what to do at that point. The stock continued to increase and in Hawaii a friend of mine found an accountant who was used to dealing with large accounts; Hollywood celebrities and the like. I started using him and getting his advice from him. He knew stock brokers that were working in the World Trade Center. He was an independent accountant. He introduced me to the people at Morgan Stanley Dean Whitter. Here is where I got an introduction to the people that deal with the highest-end clients in the world. If you were a Hollywood celebrity, you would deal with these people. If you had a large account, they'd give you things like concert tickets in Aspen every once in a while as a freebie just for having an account with them. Concierges and all manner of roles pop up when you hit this strata of society, apparently. At this point they said, "Let's transfer your certificates from Charles Schwab to Morgan Stanley. We'll make it easier. We can split up these certificates and make this large amount easier to handle and deal with." I said, "That sounds fine with me." I walk into Charles Schwab. I said, "I'd like to move my stock from here to Morgan Stanley, please." She said, "Fine, please sit down." I sit down with a person. A few minutes later, someone from the back room comes in, whispers in her ear, and says, "Come with me please." They take me into the back room of the Charles Schwab office where everyone else is working at their workstations. A guy sits me down at his desk. He's got this long workstation in front of him, a lot of green text. He pulls up my account information. He points to it, and he says, "Is this right? This account says over \$100 million here. Is this correct?" I said yes. <laughs> He says, "Are you sure you want to transfer your business from us?" I said, "Oh, yes, I'm sure. Thank you." About a week or less later, I get this call from one of their vice presidents saying, "Is there anything we can do Mr. Hughes to retain your business?" Basically pleading on the phone with me. I said, "No, I can't think of anything." I knew other people in the same situation. I said, "We'll just keep on seeing how things happen." That was that. At this point I was commuting to Walnut Creek more often. They had just bought a huge, gleaming, mirrored two, three-story building there where they housed 2,000 employees. At their peak, I believe there were

3,500 employees. They had gained all this in the space of maybe less than two years. There was just a lot going on. What had ultimately happened was that at Commerce One, although we had a very architecturally and technically solid foundation, the company began believing its own hype. Commerce One is the second coming for business. We were on the covers of Upside magazine. This is Mark Hoffman's comeback; Mark Hoffman, formerly the CEO of Sybase. This will be a home run for him. You could feel things starting to get out of hand. All of a sudden I would be working in the corner in an empty floor of a sea of cubicles. Next month, all filled. You didn't know who anyone was. What their names were. Who am I reporting to? Who am I working for? I have no idea. Okay, what am I working on? Marty, who became the chief scientist of Commerce One took me under his wing to do R & D for the company. [I was] looking at other kinds of software and systems that could help bring about the next generation of evolution of the software. At that point, the only person I had to report to was Marty. I was on a very flexible schedule. The company was so huge that no one was keeping track of me. I had all this paper money and a good amount in the bank, and a \$6 million portfolio of about a dozen tech stocks with Morgan Stanley, which I thought was pretty *akamai* as they say in Hawaii; smart. I decided [that] the company is going to do what it's going to do. I'm going to buy a place in Hawaii.

Plutte: Can I stop you for one second? Can you stop the tape?

END PART ONE

START PART TWO

Hughes: So when Commerce Net stock was at its peak it was really flying high at that time. This would've been '98, late '99. I had decided to move back to Hawaii. I bought a mountaintop estate—a designer house designed by architect Vladimir Ossipoff who is a well-known architect in the islands—which was built in the '70s. I bought this house and started living there with a few friends and began living the rock star life. This house is a very unique house and it was all wood and it really is literally on a mountaintop straddling the ridge which is on the middle of two valleys on Oahu. You'd look on one side and you'd see one valley and you'd look on the other side and you'd see the other valley from the bedroom. On the top of the mountain is a little swimming pool in the back which is right on the top of the ridgeline. The area used to be a hiking trail up to a network of trails on the mountain ridgeline and way up above there is a brick structure which used to be used for radio communications back in World War II and in the 60s. This brick structure had been turned into a private gym and you could walk up the hill all the way up to the gym which is completely outfit with Olympic-quality weightlifting gear and machines. It was as if someone had taken a 24-hour nautilus and transplanted it onto the top of this hill. I shipped my Mercedes SLK and my Honda Civic both over. I only drove the SLK on Sundays. <laughs> No, actually, I mostly drove my Honda just because I was used to it. I basically had a lot of fun. I threw a lot of parties for friends. We had something called the Tiki-Gras. Around Mardi Gras time, I invited about 200-300 people, got a shuttle bus to take them all the way up the hill to the estate. Everyone had costumes. For people that didn't have costumes, we had a room full of costumes for them to pick out and wear. Masks, full body suits. We had decorated every room in different decorations. We had landscaping all over. We had a DJ in one room, a steel drum band in the carport, and another drumming group in the living room and it was a wild night. If anything, I'm happy. You have to hold at least one legendary party in your life if you can. If it's not going to Burning Man and being a part of it, maybe something else. I'll tell you, the morning after it was empty bottles, used condoms on the lawn, hot tub in disarray, but everyone had a great time.

Sometimes those stories you hear about dot-com millionaires doing things like that, it's true. I was also doing consulting and working on my own software projects.

Plutte: Did you still own stock in Commerce One?

Hughes: I still owned stock in Commerce One and the thing I had done was basically purchase everything against my stock. Instead of buying any of the house I had in cash, I bought it with stock. At that time, when you have such a large account, you wonder, "What could happen? What could possibly happen to something like this?" I asked my accountant. He said, "Well, you have such large positions in your portfolio, I'd say, if something bad ever happens you just tell the IRS to wait for a while." I said, "What do you mean, wait for a while?" and he said, "It's all right. You could just kick the can down the road." I'll never forget those words. Kick the can down the road. I was doing my own work, doing a lot of local work. I started a non-profit which I called the Ford Foundation. We helped out a lot of local arts and sustainable non-profits that were oriented towards arts, culture, and the environment and we did a lot of work during that time becoming a funding organization. I really didn't go back to Commerce One that much. I just sort of drifted off until one day in the mail came the termination letter. [It] said, "Oh, we're sorry. You're no longer working at Commerce One." I figured, "Okay, works for me." The last few times I was there at Commerce One you could feel it in the air. There was a sense that people didn't know what was going on. In developing our software, just the procurement of software itself, it had gotten so large and complex. We had design specifications which were a huge stack of papers that no one even read because they were so thick. You'd spend hours going through that and if I was designing the interface, I wouldn't even know where to start. There were so many people in the company, you didn't know who's who, which departments were what, who you were reporting with. In the higher levels there was a lot of loss of leadership. There were people brought in that didn't really have the experience that was needed to take this corporation to the next level or to really be a sustainable venture. The industry began to see what this really was; not having any proof of any forward momentum or further progress began to say, "Wait a minute. What's going on here?" Of course the driving factor being that the stock market started to slip and I recall being home one day sitting on the couch watching Bush's inauguration and getting some data about the stock market. Oh wait, it's starting to wobble a little bit. Thinking, "Hm, that's kind of interesting." This continued to happen while I was in Hawaii and I began thinking surely this is going to fix itself and I began to think of some moments in the valley that indicated to me that maybe things were getting out of control. I remember one late night I was working at Commerce Net at the research park off of Sand Hill, going home around 11:00 p.m. in my Honda, driving down Sand Hill and at the intersection was this burned out hulk of a Porsche being loaded onto a truck that had crashed and burned in the intersection between Sand Hill and El Camino Real. There was something about that imagery that I never forgot that was a symbol of something; that maybe things were getting a little out of hand. As the stock continued to decline, Commerce One as a whole panicked. Everyone panicked. We tried to sell multiple times at different positions and then it turns out a lot of the stock certificates I had at Commerce One were restricted where I had thought that they weren't or I had had enough or had taken out enough to be able to pay taxes on, but the market was dropping so fast, I didn't even have time to do that. Not just because of regulations, but the sheer fact that the numbers were dropping so fast, there was no time to take out enough to even pay taxes on the stock I'd taken out previously to pay for the house; to pay for landscaping; to pay for all these other things. Then I started to panic. I started to think, "Now what's going on?" All the tech stocks I had, every single one—and I had bought stock in Sun, Solectron, Yahoo. I'd done my research. I didn't think I was stupid—all of these stocks in a year or two or more prior to that had a positive line on their graph charts going up. I said, "Surely this cannot happen on all of these companies." Every single one tanked. Every single one. The hardware manufacturers, the software manufacturers. It just went down to pretty much nothing and at that point I was trying to sell things back to

Morgan Stanley. I sold the SLK, put the house up for sale and this is not the everyday kind of house. We were trying to sell this house to actors, to musicians. Nobody wanted it. It's a large monthly fee upkeep and it's not something that's every day. It was the end of the road and I said, "Well, maybe I should look into bankruptcy." I got a good bankruptcy lawyer and said, "What are my options here?" He said, "If you do declare bankruptcy, for one thing you will never get under the shadow of the IRS and for another thing, you will never be able to take legal action if you feel there is some provable wrongdoing in terms of anything that happened to exacerbate this problem. You can't take legal action for bad financial advice and if you don't know any better, then that's your problem in that world." That was pretty much the end of it and I ended up moving to another part of Oahu to a house that was currently unoccupied but was still on the real estate market. The woman who had sold me the previous house let me stay in for a while and pay rent on. During the next couple years I lived at a friend's house, had a little room in their apartment and made \$500 a month doing web sites for people. I did that for a good year. All those years after 1999 you just kept hearing the tales of people laid off, companies going down, people can't find jobs where, wow, the whole five years prior to this, you could pretty much work wherever you wanted. Now you better get your act together. You better put together a good resume. Things became stagnant, but I kept my Honda. It got dented once after that. A collision on the side, not my fault. [It] had its car radio ripped off twice. [It] got stolen once by some kids, took it on a joy ride and left fast food in it in a hotel parking lot, but it's still my car and that is what I kept. I had no other assets. I had sold everything else. All the furniture I had bought was sold. I had some books that a friend let me store at his place. That was it. I had a guitar and a laptop and a bunch of other miscellaneous knick-knacks. The only thing I wish I had—when I went to the first World Wide Web Conference, Tim Berners-Lee presented me with this engraved wristwatch and it was a very unique kind of wristwatch in that it had rainbow colors on the top and as the dial turned, it uncovered one of these colors and each color represented an hour and on the back was engraved "World Wide Web Award" with the original web logo at Geneva, 1994. One day when I was out in Hawaii, the house was broken into and [it was] stolen along with a bunch of other stuff in the living room and the server I had running in my closet and a few other things. I don't miss any of those other things except for that watch. I came back to Mountain View and met with Lou Montulli and others from the Netscape team and I gave Lou a watch for him. He'd also gotten one. I brought one back for him and kind of tooled around there, but those guys didn't seem to be affected. They were a slightly prior life in the corporate cycle. They were able to get out before this boom, so they got a little lucky, but there was a few other very interesting tales of what they did after that.

Plutte: I have one final question. After all that, what good do you think has come out from that big bust that happened?

Hughes: The boom was caused by irrational exuberance on everyone's part. People were working around the clock, people with really good ideas, but I think in all areas of that ecosystem, people began to believe the hype themselves and that's when it got dangerous. You have to look at things more in the long view. Money does not buy you happiness. I'll tell you that. It's one of the oldest clichés in the book, but it is so true. Yes, I've met people in interesting sections of culture that I would never have met before, but I also met people that were affected by that mentally. People got ugly. People you thought were your friends ended up not being or they ended up acting slightly differently. But what would you do? It's such an unheard of thing to go through. The whole valley was like that. No one had seen anything like that before, so their responses and actions in turn fed upon themselves. I do think it was absolutely necessary. You always have to go back to square one. You don't have to redo things completely, but you do have to re-think things every once in a while. This is a story that's been played out many times, not just in the history of computers as hardware, but in software. You're always re-inventing. You're always taking parts from other places and making something new. If the boom had not happened, if the bust had not

happened, we'd be fine. If the bust had never happened, I can't imagine how this world would be. It would be unsustainable. People would be thinking they could just create anything and do irrational things with it. You have to be pragmatic. You have to be cognizant of what you're doing and what the context of what you're doing is in. Certainly having been part of early web history helped ground me to that because I knew that when we started all this, nobody knew what in the world we were doing, but if we kept that same level of common sense and enthusiasm, I guess, to mix it up a little, we would have been much better off.

Weber: Okay, this is Marc Weber, the Computer History Museum, with Kevin Hughes. This is the 16th of August 2010. This is following on his earlier oral history this day. A few questions. You've mentioned briefly going to the first web conference. Just briefly tell the story of what that was like and the significance of meeting the people for the first time and of course the award you got.

Hughes: When there was talk of the first web conference, there was only one prior meeting of people that had been doing development on the web and that was at O'Reilly and Associates, what they called the Web Wizards Meeting.

Weber: Wizards Workshop.

Hughes: Yes, the Wizards Workshop in Sebastopol..

Weber: No, Cambridge.

Hughes: Cambridge?

Weber: But you weren't there, right?

Hughes: No, I didn't go.

Weber: Don't worry about it.

Hughes: Anyway, in early '94 I was at EIT and preparing to go to the first international web conference in Geneva. EIT paid my way to go. This was the first truly international meeting of web developers as well as people just interested in the web for its potential and possibilities. I first remember flying into Geneva. I'd never been to Europe before, so it was really quite exciting for me and driving into there, I recall we had a hotel provided for us that seemed like a pretty typical European hotel. As I met people that I had heard about or read about online, you got a real sense of excitement. People that you'd only known about on the www.talk mailing list. People that you might have known elsewhere for writing certain software or for having developed a certain web site. Seeing everyone initially was a great thrill. I remember walking into CERN where they had a big lobby with a few exhibits on pedestals—I don't know if they were actual pieces of machines or sculptures—but I was looking at the sculptures and someone said, "Kevin," and I turned around and here's a fairly, to me, tall guy with a nametag that said Tim Berners-Lee on it. He said,

“Hello, good to meet you,” and it was really nice to see him. Everything was very matter of fact. There were so many people it was just kind of a challenge trying to match the faces and voices with the names that one had seen online. A huge majority of people were in suits, in more formalwear. Actually, I think this being more of a technical European community, it felt that way. I do think I might have brought in a little hot shirt there at the time. At some point the keynote started and we all assembled in the auditorium at CERN or right next to the lobby. It looked like your classic physicist lecture hall. It could’ve been at any major old-school Cambridge-like university. Everyone sat down and Tim talked. We heard a talk by Dave Raggett about the new work that was being done with tables and showing off the prototype browsers that were under development at the time for testing out new kinds of markup experiments and the whole room was just silent. Robert recounted a story about once when trains were invented how they could go so fast relative to anything that had existed before and there were people saying, “But surely if we go more than 20 miles an hour it would be physically impossible. Our brains would explode.” Not quite in those words, but the anecdote is similar. He said, “Imagine now, we’ve all communicated online. Think of how much faster things will be, how much faster we will go.” Everyone had a real sense of excitement to be there. All of the different working groups there were people hashing out issues and talking about ideas that really laid the foundation for a lot of things. In one working group, which I didn’t attend, there was Brian Behlendorf, who had spearheaded the Apache project and Mark Pesce, who is basically the cheerleader for VRML [Virtual Reality Modeling Language]. Back then there was no VRML term. They just came up with it right there I think maybe with Dave Raggett in the room saying, “Oh, let’s do this. Let’s decide on calling it this and we’ll need a couple of initiatives like that.” It was just a lot of talking about ideas and what could be and everyone there was pretty much there to do that.

Weber: And the award?

Hughes: One night we all boarded a boat to sail on Lake Geneva. This was an older-style kind of European boat, almost like a tugboat, but it was more.

Weber: Paddleboat?

Hughes: Paddleboat, I don’t know. It was more ornate. I remember some wood paneling inside. Me and a bunch of the other folks from NCSA were there, and I remember being there, and as well as other folks from other colleges around the US that were doing web work. We all took a really nice trip out on the lake, and then, on one end of the boat, they had, in the cabin, a microphone, and Tim Berners-Lee, just got up there and he started giving out these little awards. They were these white square thin boxes, and each of them contained an engraved watch. There were only six of them because these were based off of the World Wide Web Hall of Fame voting that had been done earlier that year, basically Brandon Plewe, a student at Buffalo, he took a vote of everyone on the web at the time, and asked them, “What’s your favorite entertainment website, what’s your favorite educational website, what do you think is the best campus online, or the best research institute?” He asked a number of questions like that, and then finally, he asked, “Who do you feel are the most influential people online? Who do you think deserves a first mention in this Web Hall of Fame?” He said, “ I intend to have more each year, so we’ll keep this going.” So the first vote—and I think there were a good few hundred people voted—[had] some really good results. In the end, there were six people. There was Tim, Rob Hartill, Eric Bina, and Marc. So The Best Of The Web, '94 contest, or whatever it was called. They ended up with six people on the Web Hall of Fame there: Lou Montulli, who had done the first text based web browser links, Rob Hartill, who later went on to do the Internet Movie Database, Tim Berners-Lee, and Robert Cailliau, being the co-founders of the

web, Eric Bina and Marc Andreessen for developing Mosaic for [the] X Window system, and myself, and if I'm forgetting someone, then I'm forgetting someone. It was really a great honor to be put on such a short list with great people, especially Tim and Robert. On one hand, even if we weren't on it, I don't think anyone would have taken it too poorly, because the community felt a lot more tightly knit then. It was more like you were—if you were on the web at all, you kind of felt like you were part of some sort of special club. We had all met and known of each other already, so it was sort of like, "Oh wow, he got the best whatever site, entertainment website, and good for him." It's like we all knew each other, so we were cheering each other on. We had expected that Brandon would do this every year. I don't know what happened; that had that stop after the first year. I think he tried to do something in '95, but for one reason or another, never did, or only did it partially. From then on out, there was no recognition like that in the web community until something like the Webbies, which was not until some years later. For better or for worse, those results remain probably the best indicator of what the general community thought about what people were doing at the time.

Weber: Then I wanted to ask you about the—so go forward a bit, when Marc Andreessen was working at EIT, now there were, I think in the past, you've told me about the story of his Mustang and his, kind of reaction to being out there, and you had also been offered work by Netscape. So just give your recollections of Marc at EIT, and their attempt to recruit you and others.

Hughes: Right. I didn't remember the Mustang until you mentioned it. If I recall correctly, he went out and bought himself a red Mustang. He was a tall blonde kid from the Midwest. He was this fast talking, smart, fast-paced kid, and he seemed very cagey. He never really seemed to be around when we wanted to take photographs of the company, and I didn't really see him all that much. Nevertheless, we all respected him and what he was doing, and I think part of the reason why he was like that, is because he was talking with Jim Clark, and talking with his old NCSA colleagues, and trying to get them over to California. EIT was just a very small step in his adventure, and certainly if you talk with Marty, he will have other ideas about what happened. He said that he gave Marc the idea to talk with Jim, but that's all hearsay, and you'd have to ask him. One day, Marc and I were eating out—at probably the Peninsula Creamery in Palo Alto, downtown Palo Alto—and he said, "Look, I'm going to get all the guys from NCSA, and we're going to come down here, we're going to start a new company." I said, "What are you going to do?" He said, "We want to make a great web browser." He asked me if I could join them and I thought about it. I hadn't been at EIT for all that long. I had been there for maybe, less than six months, if that. I was doing such a variety of things, and I felt I had such good camaraderie with everyone, especially Marty, and I knew that I could do whatever I really wanted at EIT. I asked Marc, "How is this going to work?" He said, "We want to be a competitor to Time Magazine. We want to be a competitor to magazines, we want to be the equivalent of America Online, we want to offer great content and make it available to people." I said, "It sounds great, and you're assembling a great team, but I have to think about it." All of this was very new to me. A few days later, I met with Jim Clark, down at [the] Verona Café in Palo Alto and he said, "What do you want? What do you need to do, to come work with us? You'd be one of the first engineers here, in the first 20 people hired, working with all the folks from NCSA." I really thought about that decision. I'd never been offered a job at a potentially new startup in this way before, and it was quite the hard sell. I knew that if I stayed at EIT, I would just feel more comfortable. Even though I'd worked with Marc for a little bit, I didn't know anybody; I was like a fish out of water, new to this whole environment, this whole world. I felt safer where I was, so I stayed. Over the next couple of years, I watched Netscape explode, and then I saw Marc on the cover of Time Magazine one day, walking through the supermarket. I just stood there, my mouth was open. I could not believe it, that someone I knew is now on the cover of Time. That sort of experience is very rare. There it was, it happened, and that also led many people in the valley to realize that maybe this world is ours for the taking. Maybe we can change things in a large way. That was a very influential

moment, just the fact that Marc became the media's poster boy, the media darling to represent the revolution of the web, and to represent the birth of this technology. That was a huge moment for everybody involved. For years after that sometimes I did kick myself in the legs, saying, "What would have happened if I had gone there?" I'd hear stories of Lou buying thousand dollar bottles of champagne at dinners and everyone buying houses for them or their parents, and having fun, and building aquariums in their cubicles, and basically living the big startup life, and all the things that go along with it. Here I was, still working at this tiny 20-person outfit, doing great things, doing very influential things, but without all the rock star stories and rock star life.

Weber: Now this is just to fill in a tiny bit of information. Netscape was a member of Commerce Now, later, or not?

Hughes: I don't remember.

Weber: Okay, and you did the two books online, Webspace to Cyber Space, what was it, Approaching The World Wide Web?

Hughes: One was called, "Entering the World Wide Web, a Guide to Cyberspace," this was made in late 1993.

Weber: But why did you do these? Who—

Hughes: First I did this for the University of Hawaii System. I wanted to create a guide for everyone going to the website, which described the basics of what the Internet was, what the web was, what hypertext and hypermedia was, and basically something that provided a good overview on what all of this was, and where people could go online, some good websites they could go to, to explore the web. This became a fairly popular document online. I got a call once from some librarians who told me they had given it a Library of Congress Number. I got calls from universities all over, wanting to add it to their collection. The first conference I went to on the mainland, was ACM Hypertext '93, and I basically brought the files of that guide with me, and what I wanted to do was have it printed out and distributed to all people there at the conference. I asked the conference organizer, Bob Glushko—who I would work with eventually years later, at another company—if they'd be willing to make copies, and give them out to everyone. I'd say, they made 100 to 200 copies of the guide, put it on the table. They were all gone in half an hour or less. People just ate it up. After that, I continued to modify the guide at EIT and make it available online. The next book after that, "From Webspace to Cyberspace," was not so much a tutorial but more of a lot of ideas taken from work we had done with VRML and a lot of different projects we had worked with, and a lot of ideas regarding interface. What the web of the future could look like. That was a few hundred pages, and developed while I was working at EIT and then released online later. I don't know how popular it was, but I know that a lot of people in a lot of different organizations, like Microsoft and Xerox, read it. I also want to note that it was at the Hypertext Conference in '93, as well as other of the early web conferences, I met Chris Wilson, as well as Chris Mittelhauser—

Weber: John Mittelhauser?

Hughes: Oh sorry. Yes, that's where I met Chris Wilson and John Mittelhauser. Chris Wilson became the lead for Internet Explorer at Microsoft. John Mittelhauser became one of the leads, if not the lead, for Netscape's browser, which is very interesting because they both came from NCSA, developing Windows browsers. One went to Microsoft, and one went to Netscape. Chris Wilson remained in that position for many years. As a web designer, I will tell you, Internet Explorer almost killed the web. I don't know how much of that I can or should attribute to Chris himself, but it was an interesting time. I don't know if, or how that ever affected their relationship.

Weber: You mentioned earlier that during the height of the boom and the crash, that people got ugly in different ways. You saw sides of people that were not pleasant. Any particular examples come to mind, or stories?

Hughes: At a certain level, you meet people that are used to dealing with people with a lot of money. They treat you that way. You realize, at the point where you don't have money, they won't be there anymore. For, some professions in finance or the legal world they will be your friends if you can pay them. In some sense, that's just business. I'm not a business person, and I'm not completely socially adept, in my own words. I'm an engineer. I could care less about finance or numbers or the higher echelons of high finance. But there are friends I knew that suddenly had grandiose plans to do things, because I had the resources to make it happen. Things that they would not have necessarily come up with themselves, normally. I wouldn't say anyone got violent, or out of control, I wouldn't even say people got manipulative, but small subtle changes in people. If you've worked with people or known people all your life, and suddenly they're a millionaire or a billionaire you have to think about, "How do I react to this?— What is the situation?" Whether you're the person with the money or without the money, it can change everyone if you don't keep a level head.

Weber: How are we?

Plutte: Twenty-nine minutes.

Weber: By the way, I don't want to keep you too long. You talked a bit earlier about the whole point of Commerce One and CN Group before that, with B-to-B, but could you just give a very concrete example of how the B-to-B dream could translate into a real service? Give an example, a sort of real-world example.

Hughes: A real-world example would be one of our clients using our procurement system, where they might want to ask dozens, hundreds of suppliers for a certain kind of mechanical component. Each of these suppliers may have stored information about that product, using different existing standards, some may not have used any standards at all, so some may have put this information in a database, some might have used product classification schema that might have come from, say the United Nations, or other organizations. How is a person that wants to assemble an item going to get any information about this part? How are they going to know that it's going to be available in X quantity at a certain time, among all of these different vendors? What our software would do is it would basically ask a question through the

software, of this supplier marketplace, and say, "If you have this part, let me know how much you can manufacture by a certain time, and make it available and ship it to this place." At that point, you might have an auction-like process going on, negotiations going on behind the scenes, so that order is fulfilled in the best, most efficient possible way.

Weber: Who would a typical user be? I mean, this is for fairly large items or large quantities.

Hughes: This would have been for organizations, large companies—like General Motors—that are doing very complex assemblies of products.

Weber: It's not for the Computer History Museum to order more printer paper, it's for a car maker to order—

Hughes: No, it would have been for manufacturers, manufacturing organizations, people that have typically needed to deal with a lot of different suppliers of hardware parts.

Weber: I take it the total market would have been huge for this.

Hughes: Oh, yes. Billions.

Weber: Could you just, for my curiosity, [say] your actual title at Commerce One, what were you?

Hughes: Senior Software Engineer.

Weber: The IPO, do you remember what the valuation was?

Hughes: Let's see, at its peak, I believe the Commerce Net stock hit 350-some, or 360-some, almost 400.

Weber: Which would be a market cap of what?

Hughes: I don't know, a lot. Right.

Weber: I must say, I was curious about what the price of this mansion was.

Hughes: Hmm?

Weber: The price of this mansion, if you want to share it.

Hughes: Oh, the second house—the house I bought in Hawaii was about six, seven million. But it was a drop in the bucket, according to the numbers on paper.

Weber: When you were trying to sell it, you were trying to sell it for how much?

Hughes: Less than that. Three or four, maybe. The prior owner actually ended up buying back the house. He was very, very accommodating about it. Eventually the International World Wide Web Conference Series made its way to Hawaii, and naturally, I kept on top of the situation and helped a little bit with organizing. When, finally everyone showed up at the convention center, and all the presenters and everyone was there, they handed out these wonderful aloha shirts, with the conference logo printed on them. One of those nights, I had Tim Berners-Lee, and a lot of the W3C folks and early web folks that were there, come up to my place, and have a nice evening get together party to reminisce. We were all there, talking. I remember Rohad Kari, [ph?] Rohad Karr [ph?] from the W3C. I believe Dave was there and Tim was there. I had to explain to my friends who these people were. I said, "Oh, this is Tim, he invented the World Wide Web." They said, "Ooh, ahh, nice." It was a real coming around of the circle for me. The fact that everyone came to Hawaii this time. Instead of me making the content that went out on the web, now it brought all these people I'd known online over the years, back to where I was. It was a really good feeling to see everyone and I think it gave some people a sense of the success stories that could be had. Typically, the crowd I ran with, were all just engineers and techies. All the people we had known prior to then, who had been a success, were all the Netscape people and the Yahoo folks, and they pretty much kept to themselves. Once they got ensconced in these companies, it was almost like a cone of silence. I always was around at all the first early conferences, and a lot of that early crowd was not so much into the startup business, and there—although there were a few people that we knew made it big, quote-unquote, and people like Tom Pinkerton, who made one of the first earliest web search engines. Oh, Brian Pinkerton, he made World Wide Web Crawler, and he sold that for a lot of money. I think, to Inktomi, one of the early search engines. In any case, there were some stories like that in our crowd, but nothing really outrageous. I was probably, outside of the folks at Netscape, the other outrageous example of blatant dot-com wealth. If nothing but to have them there for that night, I think it meant a lot to me, even if it was all gone just a year or two later. There's a Chinese curse, "May you live in interesting times." I can definitely say that in spades.

END OF INTERVIEW