



Oral History of Frank Belvin

Interviewed by:
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Frank Belvin

Conducted by Software Industry Special Interest Group

Abstract: After Frank Belvin talks about his personal and educational background, he discusses his professional relationships and projects at MIT's Lincoln Laboratory, Computer Communications Center, Interactive Data Corporation, Software Arts, and the MITRE Corporation. He describes technical developments in the early days of the timesharing and microcomputer industries.

Thomas Haigh: This oral history interview of Frank Belvin is being conducted on June 4th, 2009, at the Computer History Museum in Mountain View, California. This interview is part of a series of oral histories sponsored by the Software Industry Special Interest Group, which is part of the Computer History Museum. I am Thomas Haigh and I'll be interviewing Frank Belvin in association with a pioneer meeting on the history of time sharing and remote processing services. Frank, thanks for taking part in the interview. I should mention that, over the last two days, you have already said quite a bit as part of the roundtable discussions so someone who's interested in this interview should definitely also track down the transcript from those sessions. I'm sure that you'll be making references throughout the interview to items from that discussion. However, this interview is focused more on the continuity of your own life and career, so would you please start off by saying a little bit about your family background and childhood experiences.

Personal and Educational Background to 1961

Frank Belvin: I was born in Berlin, Germany, in the same year (1933) that Hitler became chancellor. I have really very few memories of my childhood. We left Germany when I was six in August of 1939, just before Hitler invaded Poland. We spent a few weeks in The Netherlands and a year in The United Kingdom until we got our permission to immigrate to the United States. We then settled in Raleigh, North Carolina for four years and then in Atlanta, where I spent the rest of my childhood. It was an ordinary, I think, childhood. Of course, with immigrant parents who had lost almost all of their possessions, my father had to start essentially from scratch. It wasn't the easiest kind of life but we didn't suffer at all. My father was always interested in music. He and one of his brothers used to play piano four hands in their small town in Germany, going through the repertoire of learning the Beethoven symphonies. Of course, before Victrola, before radio and anything else, that was the only way to be familiar with them. He imbued that

in both of his children. I have a sister two years older than I am. Both my sister and I took piano and music lessons. I still play chamber music. It's a big part of my life and I was fortunate enough to be in Atlanta when the youth symphony was making its transition to a professional symphony orchestra. I stayed during that transition and met my wife, who was hired into the cello section. We flirted across the viola section. I went to Georgia Tech, which was convenient and I lived at home. Georgia Tech was not the greatest school in the world to attend then. It's become a much better school than when I was there.

Haigh: What subjects were you studying?

Belvin: I studied electrical engineering and I was also part of the NROTC [Naval Reserve Officer Training Corps] program. I got my degree in four years and was commissioned as an Ensign in the Navy and went on active duty.

Okay. Now, while you were in school, were you drawn particularly to science and mathematics in high school and in junior school?

Belvin: I was always interested in the sciences, especially mathematics, and I was fairly proficient in it. When I went to Georgia Tech the electrical engineering department was poor in the sense that it focused on power. They had courses on generators because some of the funding came from the Georgia Power Company, the local utility. As poor as that was for me, they had some wonderful instructors in the mathematics department and, along with a few friends, I got them to offer math courses that were wonderful for us.

Haigh: What attracted you to engineering?

Belvin: I think it must have been I had a sense that I had an aptitude for it. I did things, mechanically, toyed around with things when I was a youngster and in casting about for a future it seemed like an appropriate use of my talents.

Haigh: And looking back over your career, do you think the immigrant experience shaped anything about how you approached your later life?

Belvin: I'm not sure that I see that. The fact that my father was interested in music and had a fairly high cultural background, I think set me somewhat apart from my peers in Atlanta. It certainly wouldn't set me apart from people in a more affluent area, but it gave me some more background than I think some of my peers had.

Haigh: And you married while you were in college?

Belvin: I married a year after I was on active duty in the Navy. I met my wife while I was in college. She was already out.

Haigh: Now, when you signed up for NROTC, did that reflect an interest in military service?

Belvin: No, the Korean War was going on and I was draft eligible and I wasn't interested in serving in the infantry, so this was a way of avoiding that.

Haigh: Okay. And to get the dates on that, do you know what year it was when you had entered Georgia Tech?

Belvin: Fall of 1951.

Haigh: Okay. So then you take four years for the studies and, in 1955, you entered the Navy?

Belvin: Right.

Haigh: Right. And then you were an Ensign and Lieutenant junior grade 1955 to 1958?

Belvin: That's correct.

Haigh: So how was that experience?

Belvin: I couldn't have had a better experience in that regard. I was assigned to a mine sweeper, a very small ship, and we went across the Pacific. I was stationed in Long Beach, California. We went across to Japan, spent half a year in Japan, came back and the ship was due to be decommissioned because it was an old steel-hulled mine sweeper and they were shifting to wooden-hulled ones. On the way back, when we got to Midway, I got orders to be separated from the ship and go to a division of mine sweeping boats, which was great for me because decommissioning is a horrible experience to have to go through, I've been told. You have to inventory everything because they want the ship to be ready to come out of mothballs. I was getting married, and being assigned to this mine sweeping fleet of boats, which was home ported in Long Beach meant that even though I was technically on sea duty, I had essentially an office job. I got an apartment, brought my wife out after we were married and, for the rest of my two years in the Navy, I would drop her off at work in downtown Long Beach, drive out to my duty station, spend the day, and come back. It was like an office job but it was great experience.

Haigh: Your term just came naturally to an end, right?

Belvin: My active duty commitment came to an end.

Haigh: And did you already know what you wanted to do next?

Belvin: I decided I really wanted to go to graduate school. I didn't have a career path as such other than doing something with electrical engineering and so I applied at MIT and was accepted. I got out of the Navy in June, due to go to MIT in the fall. We had to get from Los Angeles to Boston and my wife, who had never been west of the Mississippi before we were married, and was born in Indiana and went to school at Northwestern, came down to Atlanta for the Atlanta Symphony [and had never left the United States]. Courtesy of the Navy and courtesy of my original background, I'd been to Europe, I'd been to Japan, and we decided to get from Los Angeles to Boston on a route that took us around the world, so we went from San Francisco on a freighter for a month, ended up in Hong Kong, then went across southeast Asia, up to Switzerland, where we met my mother and some of my relatives who were spread out all over South America, Israel, U.K., and then came to Boston. So it was a nice way of breaking the gap between the Navy and my graduate school experience.

Haigh: Was there anything in particular that attracted you to MIT other than its general reputation for excellence?

Belvin: No, its reputation.

Haigh: Now the time you were out at MIT, did you know anything at all about computers?

Belvin: No. I took a course called switching circuits, which today would be called digital logic. Back then, we focused on the telephone company and its relays. In fact, our laboratory setup was using relays and that really interested me quite a bit. I ended up becoming a teaching assistant. I actually taught the course for a year. But I was trying to get a fairly well rounded education with a little bit of continuing my interests in math, taking some math courses. To me, the handwriting seemed to be on the wall that communications was the place to go, communications theory. There was a Professor Lee who was very strong on communications. This was also the time that Claude Shannon and information theory had been really discovered. So I thought I would venture to that. I found it quite interesting, as an academic pursuit.

Haigh: That degree took two years, right?

Belvin: Yes.

Haigh: 1959 to 1960.

Belvin: Yes. I was considering going on to a doctorate and stopped without going through all the process. I didn't do well on the exam and I didn't feel like trying again, so decided to go out and find employment instead.

Haigh: Okay. So you took some of the coursework?

Belvin: Oh, yes.

Haigh: So that brings you up to 1961.

MIT and Lincoln Laboratory, 1961-1968

Haigh: So, at that point, you looked around. What kind of options did you consider for what to do next?

Belvin: I used the college placement facilities to look for work and there was some on-campus recruiting from Lincoln Laboratory. I happened to hit it off very well with the interviewer, who painted a wonderful picture of Lincoln Laboratory. Back then, the world for an engineer was his oyster. The jobs were plentiful, the offers were certainly adequate and so I had a choice. I got offers from several places, including one out in Los Angeles. I guess it was TRW or one of those. I ended up deciding that the kind of work that might come out of Lincoln Laboratory would be more interesting, even though their salary offer was not as high as some of the others, but it sounded interesting.

Haigh: Now, at that point, Lincoln Laboratory, that was part of MIT conducting government sponsored research, right?

Belvin: Yes. And still is.

Haigh: Yes. And was that physically in Cambridge with the rest of the institute or was it off somewhere else?

Belvin: It was off somewhere else, it was in Lexington, Massachusetts, on Hanscom Air Force Base. The Air Force was one of their main customers.

Haigh: So was the fact that it was part of MIT something that was appealing to you or was that coincidental?

Belvin: That was coincidental, although, as I mentioned, they did on-campus recruiting. There was some appeal to the notion that I might be able to continue with my graduate work, might pursue the doctorate because they were very gracious in funding employees for post-graduate work.

Haigh: What were your early experiences there like?

Belvin: I think I felt a little bit like a-- to say a fish out of water is wrong, but I felt there were a lot of very bright people there, and I really hadn't sized up what communications was. In fact, I ended up in a group that was quite eclectic, and had a visionary kind of group leader who was not exactly pragmatic. We pursued lots of different things, and that's when I was assigned, at one point, to do a communications analysis of a system that the laboratory had just launched for proposing to the Air Force a system of orbiting dipoles, Project Westford, which was to put a belt of passive dipoles around the earth.. Dipoles, you know, filaments of metal that were 3 cm long put into an orbit around the earth to be used as a means of sending signals from one part of the earth to the other without having to go through the atmosphere-- beyond line of sight or the limit of sight.

Haigh: So just something to bounce the signal off?

Belvin: Exactly. I was given the task of doing coverage studies to see what parts of the earth could be in touch with each other through this belt. That meant I had to do some, I guess, simulations you would call them or just do analysis. I was introduced to FORTRAN and to an orbital mechanics program that someone at Lincoln Laboratory had done, and I worked with him and developed a whole bunch of graphs showing visibility between locations, different parts of the earth at different times of day, assuming this belt did its normal thing. There was a lot of controversy about it because we would be polluting space deliberately so that it would come back down to the earth within, I think, a year or two. So it was not meant to be a permanent thing. I discovered I enjoyed the programming and got more interested in that than I did in my communications. There was another project that involved another group that I was assigned to support NASA with its manned spacecraft program and that's where I met Jack Arnow, with whom I ultimately formed Interactive Data Corporation [IDC]. He persuaded NASA [National Aeronautics and Space Administration] to have Lincoln support telemetry studies for manned spacecraft, and he proposed a computer system to the Laboratory. We got the okay to put a demo on for it and I fell in love with programming when we did that.

Haigh: So, during your master's degree at MIT, you hadn't come into contact with computers at all?

Belvin: There was something called TX-0 at MIT and I played with it but there was no course in it at the time for me and it was just fun and games.

Haigh: Yes. That's become a famous little part of computer history, the MIT hackers and the TX-0. So you were part of that community?

Belvin: Only peripherally. I was not deeply involved but I did spend some time on it. I was not of that mentality.

Haigh: Now, you mentioned the group had a visionary leader. Who was that?

Belvin: Herb Sherman. Well, visionary-- he reached out in many, many directions but I'm not sure he latched onto things as well. It ended up being a source of dissatisfaction for me so I transferred from Herb's group to Jack's and Jack was, at that time, coincidentally, responsible for the Laboratory computing facility, partly because he was one of the biggest critics of it. He complained about it and so the division head, who was responsible for both Jack's group and for the computer facility, just transferred the computer facility to Jack.

Haigh: Right. So on your resume, I'm seeing from 1964 to 1968 that you were a member of the computer group. So that was coincident with the transfer to Jack's group of the Computer Laboratory in 1968?

Belvin: That's it, yes.

Haigh: You mentioned you used FORTRAN for these programs. What kind of computer setup were you initially using at the lab?

Belvin: I first started with a FORTRAN program running on the lab's facility, the IBM 7094.

Haigh: And so that was a batch-type setup, was it? You dropped the cards off, you got the input back sometime later?

Belvin: Yes, exactly.

Haigh: What kind of turnaround time were you getting?

Belvin: Oh, it was miserable. <laughs> The laboratory did have a group of operators and key punch operators so that you didn't have to key punch your own cards, but you'd write the program out on a coding pad, and hand it in. A day later, you'd get the cards back and submit them for a run. If you were ordinary, I don't remember the turnaround but I'm guessing that you might get two shots a day and so it was very frustrating, especially when one makes silly errors, as I was prone to do.

Haigh: So was that batch mode operation part of the dissatisfaction of the computer facilities you had mentioned?

Belvin: Yes, it was.

Haigh: Okay. So then how did things change from 1964, when you became part of the computer group?

Belvin: Well, first of all, my FORTRAN career ended pretty much when I left Herb Sherman's group and the dipoles, and went into Jack's group and I started doing Assembly language programming and becoming a systems programmer. I'd joined Jack's group just about the time that the laboratory decided that the 7094 was not going to be good enough and that the batch service was not adequate to support the facility, and we put out a request for proposal, and got responses from CDC, GE, and IBM. I don't remember anything about the CDC proposal at all except that it was lowest on our list. The IBM proposal was for the System/360, model 64, which was not a standard product at the time. They were going to make it. It was in the 60 line, 60 and 62 were the standard products and they were going to make a 64 and a 66 that had dynamic address translation. IBM proposed that, and said that they were going to develop a time sharing system, which they ultimately called TSS 360. The General Electric proposal was pretty much equivalent to the MIT Multics proposal that they had made. There was a fair amount of pressure-- we were part of MIT, MIT had chosen the GE system for the MAC project and there was a fair amount of pressure on us to do the same thing, but in our proposal review, we decided that the System/360 had more to offer us. I don't have any of those records now and the history really fades. I can't be specific about what in particular attracted us, but we generally leaned strongly towards the IBM as opposed to the GE system and I wasn't the recipient of any pressure from MIT but Jack probably was. Jack was not a person that one could pressure. In fact, that was probably the wrong thing to do. Push on him, he's going to go in the opposite direction. So we chose the IBM proposal.

Haigh: What kind of ties were there between the work that your group was doing with operating systems and the project MAC and Multics work? Was there an interchange of ideas and people between them or were they completely separate?

Belvin: There was no direct interchange with us other than with project MAC. I guess maybe before it was called project MAC it was the CTSS, the Compatible Time Sharing System. I don't know who arranged for it but somebody either at CTSS or Lincoln arranged to have some terminals made available at Lincoln so that we had access to CTSS. Originally, it was a strange mix of people who did this. We had a psychology group that used it, but I got interested and I don't remember what I first started doing on it, but I soon discovered that they had a System/360 simulator and a System/360 assembly language assembler. By this time, we had chosen the IBM proposal and so I knew that I was going to have to learn System/360 so I used

project MAC as a means of learning the System/360. Aside from that, it didn't see much use within the laboratory.

Haigh: Now, this computer was ordered with the intention of using TSS?

Belvin: It was.

Haigh: I imagine that didn't work out?

Belvin: No, but it was a gradual transition. The first machine we got was a standard 60 or 62 running OS/360 because we weren't planning to make a complete upheaval in the system. People were used to batch, IBM was supporting batch as a standard mode of operation, and so the computer systems support group really divided into two groups. The old batch facility support, which had its own programming staff, was helping people convert from the 7094 IBSYS system to the IBM OS/360 with all of the arcane aspects of JCL in System/360.

Haigh: Did the System/360 provide hardware or software features to help give that kind of backward compatibility?

Belvin: No, I think it was all programming compatibility. It would support programs, FORTRAN and COBOL. I don't think there were any hardware features- I can't remember any hardware features that IBM did but, of course, IBM was making a huge change. It's a monumental shift where they're turning their backs on the old lines and everybody had them. Some people thought IBM was going to fall flat on its face doing this though it was incumbent on them to make sure that the transition could go smoothly and they put a lot of field engineers and system engineers on site. Our programming support staff had to do a lot of work but that was the batch side of it. My first task (we had gotten a small model System/360) was working with another fellow, Joel Winett, to develop a multi-programming system that we'd use on the small model 360 to replace all the 1401s that were in the batch shop. It was a typical batch shop, you come in with card decks, they get copied to tape, the tapes go over to the mainframe, you run the job, the mainframe produces output, either cards or on a tape, and then you take the tape back to the 1401 and do printout. We had three 1401s supporting this one 7094, and it was Jack's idea that we should cut our teeth on learning the 360 and do something useful by replacing all those 1401s; so Joel and I wrote a multi-programming operating system with the help of several people in our group who wrote various applications. We ended up replacing the 1401s and I remember a smooth running system.

Haigh: That was your personal shift you had mentioned from scientific application programming to systems programming?

Belvin: Yes.

Haigh: What drew you to systems programming?

Belvin: I don't know. I've never thought about that. What drew me to computing as opposed to communications was discrete mathematics as opposed to analogue mathematics. There's a certainty, a definiteness, that exists there and I guess doing systems programming carries on in that sense of being able to actually be in control of what's happening with the system. That appealed to my nature.

Haigh: Working with the machine itself.

Belvin: Yes. Also, because I was an electrical engineer, a hardware engineer, I found that I was better able to deal with things that seemed to be mysteries to some other people because I understood signals, and if we had interface questions and something happening with the device and the interface to the channel, I was able to understand better what was going on.

Haigh: All right. What did you do after that first project?

Belvin: It was about this time that the Cambridge Scientific Center was doing its work on CP-40 that you've heard a little bit about. There has been lots documented on this. I started working with the IBM Cambridge Scientific Center and I was also involved in working with IBM on TSS-360. We would have meetings. We'd work with them, design questions, specification questions, so Jack was hedging his bets. We had adopted IBM's proposal and so that meant we were going with TSS but, just in case TSS, which some of us thought was more than IBM could handle, the notion of CP-40 was a very nice backstop. So I was one of the people who worked both of those areas until that fateful day that IBM finally thought the TSS was ready and brought it up to Lincoln Laboratory and put the tape on and IPL'd [Initial Program Loaded] it and, after half an hour, nothing happened and Jack essentially told them, "Get out."

Haigh: Were you supposed to have been the first site to start using TSS?

Belvin: I'm not sure. Maybe they had Bell Labs or General Motors. I'm not sure. I don't remember. It would have been close to one of the first sites because TSS hadn't been finished and it clearly didn't work yet. So we would have been one of the first sites.

Haigh: How did that change your relationship with IBM and with the CP team?

Belvin: The IBM system engineers maintained cordial relationships with us. They were there to support the customer; they were not fighting IBM's Mohansic site's battles for TSS.

They wanted us to be happy. That must have rankled some IBM people but it didn't affect any kind of business relationship that I could sense. We still got full support for the hardware and whatever else we needed.

Haigh: How did collaboration then progress with the IBM Scientific Center?

Belvin: It was interesting. We had the first 67 in the area so the Scientific Center was eager to be able to test on our system when they made the conversion of CP-40 to CP-67. We were interested in getting the system to run ourselves as soon as we could. They didn't want to give us access until they were satisfied with it, but we managed to work through an arrangement where we would have it, and we started doing our own development of it fairly early on. It turned out that the Scientific Center, in its developments of CP-67, was really focused on having it do more things, adding features, and access methods and supporting more kinds of hardware.. They wanted to broaden it to support as wide a class of eventual customers as they could. We, at the Laboratory, were focused on reliability because the system was still in its early days and was quite frail. After all, the Scientific Center team members were not professional system programmers equivalent to those in IBM where they have such a focus on reliability. So, as time went on, we would make changes to the system, they would make changes to the system and, every few months, I would get together with one of their people and we'd go over their changes and our changes and we'd merge the two into a system that both of us could use. Ultimately, the diversions got to be great enough that the merger process was too hard for us, and that was about the time that Jack and I left to form Computer Communications Center.

Haigh: So that would have been about 1968?

Belvin: Yes, that's right.

Haigh: And your personal role, were you managing a team of system programmers? Were you working on your own? What were you doing?

Belvin: Working on my own in a team. Jack had a very flat organizational structure; there was only the group leader, Jack, then Jack Nolan, the associate group leader and then everyone else was staff. I tried to get some supervisory responsibility for this multi programming system that I was responsible for and even that was a problem in the organization. I remember I got help from several people in the programming organization to do parts of the multi-programming supervisor and some of the applications, I remember one time I went down to a young woman's office to check on her progress and I found out that she was on vacation and she hadn't told me about it and I realized, you know, it came as a shock to me that I was totally out of the loop. At one point, I was even so upset by this that I considered leaving the Laboratory and went out searching for jobs.

Haigh: So in that sense you think a more formal managerial structure would have worked better?

Belvin: Well, it would have satisfied my needs. I don't know if it would have worked any better, but it would have satisfied my needs more. But since it happened about the same time that we left to form Computer Communications Center, it was a natural fit for me because there was a structure that was set up at our company, at our new company, and I was in charge. Ultimately, I made the kind of structure there that I wish Jack had done at Lincoln Laboratory.

Haigh: There's already been quite a lot said about IDC in the round table, so we can focus more on your personal role and the aspects that didn't get covered already. So before we follow through that and talk more about your shift into the timesharing industry, one thing that people have said, talking about this era and the CP project, is that in some ways it's a precursor of later open source software development methods. Do you think that's a reasonable characterization?

Belvin: Well, there is this organization, SHARE, IBM's organization, which I think came close to having an open source sense, and when I was at the laboratory, we were heavily involved in SHARE. But IBM had not yet made CP even releasable, so there wasn't a lot going on there. Once we formed Computer Communications Center and IDC [Interactive Data Corporation] later on, we were not as magnanimous in our feelings about sharing things. We felt we had done things-- call them proprietary if you will. At least, we weren't happy to give them away. But there's a vast community of users who are not in it for proprietary reasons.

Haigh: Was IDC a member of SHARE?

Belvin: Oh yes. Yes, an active member of SHARE. And in fact, this little multi-programming supervisor I mentioned that Joel and I wrote, we contributed that to the SHARE library, and it apparently got heavy use, not only within IBM, but also the University of Michigan picked it up, and it was a little, tiny inside part of the University of Michigan Multi Programming System (UMMPS), which then became the Michigan Terminal System. So we were heavily involved. I had Mike Alexander come out and visit us. We were very open. But that was before we became our own separate commercial company. I think competitiveness at the university and laboratory level is very cooperative, whereas competitiveness outside is your bread and butter, and so you think more carefully about it.

Haigh: I've looked at some of the SHARE projects in the 1950s, in the early days, and a lot of the companies there were competitors. For example, the aerospace companies around L.A. were all members. It did seem that they would cooperate on things like system tools and mathematical software, areas where they didn't see the proprietary advantage. Of course, if you're a timesharing company and the operating system is not the plumbing that you can

cooperate on, it's the proprietary, competitive advantage. So I guess that would make a difference to the attitude.

Belvin: Yes. We did have interactions with National CSS, but I can't remember that we ever shared anything, or if we did, it was pretty superficial.

Haigh: Were you the SHARE representative for the company? Did you go to the meetings?

Belvin: I went to meetings, but I think it was a very loose structure. I guess they might have had resolutions and things where they involved voting. But I don't remember that. We would typically send several people to a SHARE meeting. They'd have multiple sub-groups, working groups. I don't think there was "a" particular representative, a target member. I don't remember that at all.

Haigh: As the company progressed, did you find SHARE a useful way of keeping in touch with customers?

Belvin: When I went to IDC, I lost interest in SHARE. I'd send people working for me to SHARE, but it was a difficult task for them, because they could be all ears and no mouth. That's a very uncomfortable position, and I realized that. So we just didn't push hard. Also, we weren't running VM/370 - well, in the early days, there was no VM/370. The only thing that IBM had to offer was this Type III program, and it wasn't until it became a product that you really had a group within SHARE, and we weren't running that product. So we wouldn't have gained a lot from interaction. So it was not a big part.

Haigh: So essentially you had a different fork of the operating system, which had moved in its own direction.

Belvin: Yes, and we maintained that all the time that I was there. It was independent. When we starting running out of capacity, one of our alternatives was to introduce a second processor to make it a duplex system. And there was no duplex. CP-67. It was not made for duplex operation, so we had to do that. My staff developed that. We had almost no incentive to pick up anything that IBM had to offer, other than possibly improvements that they might have made in CMS. We might have picked some of those up.

Haigh: Well let's backtrack now to your personal story. So 1968, you leave Lincoln Labs. Do you think that you would have left anyway, even if this particular opportunity hadn't come up?

Belvin: I was out shopping. I didn't find anything, so I stayed. But I don't know, I might have left anyway.

Haigh: What were you looking for?

Belvin: I was looking for an organization that would give me more responsibility, but I was happy with system programming, or computer facility management. So I was looking in that area.

Haigh: Was there a culture around Lincoln Lab at that point, of people leaving to make startups and spinoff companies?

Belvin: Not a large one, but there was. Ken Olsen of Digital Equipment, Larry Roberts left to go to ARPA, and Frank Heart went to Bolt, Beranek and Newman. Some were startups like Olsen. Some were joining existing companies. There was a little bit of an air, but it wasn't a major flow. Lincoln had a fairly stable workforce. It was a nice place to work.

Computer Communications Center and Interactive Data Corp 1968-1981

Haigh: Do you want to say a little bit now about how you came to be one of the founders of the company?

Belvin: I was lucky. And I think Jack was lucky. Jack and I didn't talk about starting a company and then go out looking for money. It was the other way around. Money came looking for Jack, because he had personal friends, and I talked a little bit about that yesterday. And Jack came to me, I think because I was the strongest member of his staff, and he knew he needed me if he was going to base a business on running CP-67. He needed somebody who could handle that. So he came to me. And it didn't take me long to say, "Yes, I want to do it." I met their board. The one thing I had to haggle a little bit about, which I think surprised Jack, was I wanted more stock than they were offering me. But he went to the board and he supported it, and once I got that, I was on board.

Haigh: By the time you started operations, how many people were there working on programming the operating system?

Belvin: Let me interrupt you to separate a little bit here. When Computer Communications Center got into operation-- I was there at the end of July of 1968, and Jack and I were the first two employees. We took Jack's secretary from Lincoln and we took the guy from operations. Our business plan, which I described as not even being on the back of an envelope, was to try to support local small companies, like the meatpacker, Colonial Provisions.

With that model I think that business would have failed. I don't think we had a good business plan. We even hired a marketing person to go out and try to find more businesses like that. But I don't think we could have made a business of it. It was only because Joe Gal, who was looking to relocate from New York to Boston, and found Jack by contacting IBM, asking IBM for a recommendation. It's only because of that, and the formation of IDC at the end of 1968, that we had a viable business. And it was interesting, in the sessions over the last two days to see that, of all those companies, only Interactive Data is still in existence, but of course not doing timesharing at all. It focuses on financial data. So I just wanted to fill in that little piece before getting to the beginning of 1969.

Haigh: So with the Computer Communications Center, there were the two of you, plus a secretary.

Belvin: And Frank Mahoney, the operations guy. And I think we hired a programmer from Lincoln Laboratory, hired this marketing guy to go out and look for business, and we were operating in an apartment in downtown Boston.

Haigh: Did you lease your own computer, or were you planning to buy time as you needed it?

Belvin: We were going to lease our own computer, and Jack and I went out looking for space. I mean, you couldn't locate a computer in the apartment. So we went out looking at space in downtown Boston and lots of places. Along came Joe Gal. He had already committed to a lease on this building in Waltham. So, that was perfect for us, and we got the system-- we committed to leasing the system from IBM. It was delivered probably at the beginning of 1969, I'm sure, and we started staffing up then.

Haigh: Did all those original employees you mentioned make the transition to IDC?

Belvin: Oh yes. There weren't that many and they all made the transition.

Haigh: Do you have a sense of how long it took between receiving delivery of the computer and being able to start running people's jobs on it?

Belvin: I don't know. I was looking at a memo that I wrote on and it was dated February of 1969. So we were already worrying about keeping the system in production, keeping it running reliably. But I think it was there servicing mostly our programmers. I don't think we had customers because the financial database was still running on the SDS940 down in New York, and we hadn't moved it up to Waltham yet. Once we did move it up to Waltham, our initial customers were running on the 940, not on the 67. I don't recall the transition period, how we

got people moved from the 940 to CP. But it had to have taken place over a period of half a year or so. I just don't remember that.

Haigh: That still sounds quite rapid.

Belvin: It was. When you're a young company and you're worried about where your next dollar is coming from, there is a lot of heat underneath to get going. We were lucky in hiring some good people. The fellow running operations ultimately was made an officer in the company. He probably should have been made one earlier. He could well have been a Marine drill sergeant. He was tough on his operators, but he ran a wonderful system and kept morale up in his operators.

Haigh: And his name was?

Belvin: Frank Mahoney. Francis X. Mahoney. He died of pancreatic cancer probably in 1980, after he had already been made a vice president.

Haigh: And what was his background, before joining the company?

Belvin: Before joining the company, he was the assistant manager of Lincoln's computer center, of the hardware facility. Not Jack's job, but the guy who dealt with IBM, dealt with the field engineers. And I don't know what it was before, but he was an ambitious young fellow, and he was going to Boston College at night I guess getting his MBA. He had five children. I never understood how he managed to do all of that and run the company. But he got his MBA. I don't know what he was like before. He was fairly young. That might have been his first job. I don't know.

Haigh: It sounds that you had, with the version of CP that you'd been using in Lincoln Lab, a fairly robust timesharing core operating system. What were the main things that you had to add to that to have something that was viable as a commercial timesharing system?

Belvin: Over time, we did things like add a debugger, and a simple database management system. We had to convert the First Financial Language [FFL] from the SDS/940 to the System/360, and we had to provide access to our financial data, which we got from Compustat. Compustat had started making tapes in the early 1960s of all of its financial data annually -- a whole host of stuff. That's what got Joe Gal originally interested in this as a business. And we had pricing data from the New York Stock Exchange, delayed by 15 minutes from real time. So there was a fair amount of programming involved in getting all that data onto the system and making it accessible to programmers. So in the first year, our efforts were on FFL and making the data available.

Haigh: So your efforts were really on getting the applications and data services that you needed over, rather than changes to the system software at that point.

Belvin: Yes. The system software changes that we might have made were to make things like the editor more user-friendly, to make provisions for people to be able to interact, to send information from one user to another-- fairly modest kinds of things.

Haigh: Did it have the billing and resource monitoring capabilities already that you would need to do the accounting for customer use?

Belvin: There was a very rudimentary facility that was already inherent in the system, or that we added. It didn't take much. Jack Arnow himself wrote the first billing system. I think he might have written it in FORTRAN. I can't remember. We actually punched cards when a user session ended that had the logon time, logoff time, total CPU time, and other stuff on it. So we were able to compute our bills, thanks to Jack. We didn't have to do much in addition to that.

Haigh: Were the capabilities in terms of security and keeping user data private between different people on the machine already strong enough?

Belvin: The virtual machine meant that users were isolated from each other. So that was easy. For disk, it was a matter of bookkeeping, because disk space was allocated per user. Disks were divided into segments of cylinders, and there we wrote programs to make sure that the operator who assigned disk space would not be able to assign overlapping disk space so that part of your disk space would reach someone else. So we were pretty confident in the security there, and did modest things to enhance that.

Haigh: Were there any changes in the balance of processes, input/output memory usage and so on, that were different with the timesharing users versus the internal users that you had to make any changes for?

Belvin: We did it administratively, in that if the load was too high, we would tell our internal users not to get on. We didn't establish a priority system early on. So if we allowed internal users on, they got the same kind of service as external users. I'm making it sound as though everything was a piece of cake coming from IBM. We did a lot of work. We added access method support. There were always things that needed to be done. We had very active program development things, but there were not crucial things that we had to wait on in order to be able to operate.

Haigh: By access methods, do you mean things like file indexing?

Belvin: Yes, right. IBM in OS/360 had sequential access methods, direct access methods, indexed sequential access methods-- all of that stuff. That wasn't always all supported in the original versions, and we had to add it. We also improved the file system itself, the original version. I think everybody who took early versions of CP/CMS ended up developing their own modifications to the file system, until IBM itself came up with that. So there was a never-ending fund of requests from people, but it didn't keep us from sending out bills, operating reliably, and separating users from each other.

Haigh: In terms of the users, what was the balance of people who just wanted powerful, reliable, generic timesharing resources versus those who were there for the value-added financial products?

Belvin: I wish I could remember enough of that. Early on, spurred by NCSS's success with their COBOL usage, and being in New York and other areas where there was a lot of COBOL programming going on, our sales force decided that that was a lucrative alternative, and would sometimes be an offshoot from their financial customers. They get into the door at some investment house with their financial stuff, and then they find out that there's an IT department over here doing a lot of programming development in COBOL, and they would go over and talk to them, and they'd find they'd want to use COBOL. So I think it was a strong selling tool, adjunctive selling tool, and we probably got a lot of usage. But I don't remember tracking, segregating our customer usage into those that are just doing vanilla timesharing or vanilla timesharing with program development timesharing as opposed to those using financial data.

Haigh: How about your personal role? By the time everything was operational and the applications were switched over, how big was the programming team?

Belvin: We probably had 40 people at the maximum, and at the layoff, I was probably down to 20, and then went back up again.

Haigh: And the layoffs would have been 1970-1971 era?

Belvin: 1971. April of 1971.

Haigh: With the general recession in the field.

Belvin: Well, we had been spending too much for what revenues we had. We had been trying to grow the company too fast. So this was a retrenchment with a renewed outlook of, "We're going to spend less money."

Haigh: My impression is that pretty much every software services timesharing company hit that kind of issue in 1970-1971.

Belvin: Yes, certainly NCSS.

Haigh: And many of them didn't survive.

Belvin: Yes. NCSS and IDC did, and both managed to pull through it.

Haigh: You mentioned one of the things that drew you to this was the chance to have more of a formal managerial role. Once you had that position, did you enjoy it?

Belvin: Mixed. I enjoyed being able to get more things done than I was able to do myself, because I could get people to do them, in a much shorter time. It required holding people's hands and listening to stories of problems between employees, problems between sections, problems that people had with their wives and others. I didn't realize how much of that was going to be on the manager's plate. Even though I got a certain amount of enjoyment if I could help solve some of these problems, they weren't something that I really looked forward to every day. But I organized the department so that I had a CMS group, CP group, Xport [a financial portfolio tracking system developed by IDC] group, data group, and an FFL group, and a communications group doing Comten, the front-end communications processing.

Haigh: Were there team leaders in each of those areas?

Belvin: There was a group leader in each of these. I depended on those people. Mike Wyman was one of those who then ended up taking my position when I got out of that department, i.e., out of being in charge of the computer systems.

Haigh: Were you personally responsible for making the layoffs?

Belvin: Yes, personally responsible. I selected the people. I was given the responsibility by Jack and Ed Greaves, the financial VP. We all got together and talked about it, but I was the one who, given the number that I was supposed to achieve, selected the people. I talked about it with my group leaders. I let them in on it before the layoff. And I was prepared to have them talk me out of it saying, "You made the wrong choice on this person or that person." I didn't lay off any of the group leaders. They were too valuable. I was prepared to make a change, and I might have. I can't remember if I made any changes at all, but I was prepared to do that, and I was the one who gave the word. They came in one at a time to find out whether they were laid off or not. I just had every member of the department come in in some order. I've forgotten whether it was alphabetical or what. And they found out either that they were laid off or not.

And one of them that was not laid off, one of the group leaders, said, "How about a raise?," which I laughed at at the time. But my hat was off to him.

Haigh: Were you hiring a lot of the people from MIT?

Belvin: No. We hired a few people from Lincoln Laboratory, but our source there pretty well had dried up. We had taken the cream of the crop, we thought, and the others were interested in staying. I think we might have hired one person from MIT itself, and that was just through either an ad or personnel shop. I can't remember. But the initial ones we got were pretty much all we got.

Haigh: So where were the other staff members coming from?

Belvin: People with résumés. We didn't get too many personal referrals. We picked up a few in the transition. The White-Weld group, all of the FFL group, had been located in New York. We moved them up to Waltham. Mike Wyman had been located in New York. We moved him to Waltham. There were a few operators, especially with the 940, that were in New York that we moved to Waltham, to Boston. Otherwise, we used the normal personnel shop. We didn't do a lot of advertising, but sometimes we would advertise. [I neglected to mention during the interview that we also hired a few people from the IBM Cambridge Scientific Center, as did CSS; we hired one or two, but they were key people.]

Haigh: Were you hiring college graduates or people with experience?

Belvin: I don't remember hiring any fresh college graduates, although we did have a few. We actually had undergraduates as interns. Mostly we were looking for people with some experience.

Haigh: At that point, the Boston area had a very vibrant, high-technology.

Belvin: Yes.

Haigh: Do you think being part of the so-called Route 128 high-tech miracle gave the company any advantages, changed anything about the way that you conducted business?

Belvin: Well, it's why Joe chose to come to Boston, to get the advantage of that, and we certainly had some benefits. I hired a couple of interns, undergraduates at MIT that proved to be-- well, I had mixed results. But I usually had very good results. Bob Frankston was hired originally by Joe Gal when he was still in high school to run the 940 for the Interactive Data Services division of White-Weld. We didn't move him. He coincidentally entered MIT about the

same time that IDC started. So I hired him at IDC, and he was a godsend for us for some things. So in that case, we wouldn't have had Bob if we hadn't been located in Boston, and we had some good people. But it was a good area for people at the time. I don't think we would have had trouble hiring. If we'd been in Wichita, Kansas we probably would have had more difficulty.

Haigh: So we've talked about the initial changes that had to be made and the things that had to be added onto the system to support the business. How did things develop after the first year or two? Were there changes in the culture and the kind of work that you were doing, and the kinds of things that needed to be done on a day-to-day basis?

Belvin: IDC tended to operate by entering some kind of business arrangements with people who had unique ideas. Typically those people would come in and have special requirements. We picked up clients for financial transaction services that wanted a whole different kind of interface to a virtual machine to enhance their services. So we would have people involved in making implementations to support those. The symbolic debugger was not on our original plate. So a couple years after we got going, we did the symbolic debugger. Originally Bob Frankston did it, and then Mike Wyman took over. It's a wonderful piece of work. As we picked up these arrangements with other people, we would find that there were things that they would look for that we needed to do. And we also got stimulus from our salespeople, who would say, "NCSS has this feature," or "Somebody has this feature. Can you do that for us?" So we had a never-ending progression of work that kept our people quite busy.

Haigh: Do you think you had enough resources to tackle everything that was thrown at you?

Belvin: After having been through the layoff of 1971, I was not going to complain too much, unless I would really have been strapped. I would defer something, or see who would scream the loudest.

Haigh: Now, the fact that you were running your own version of the operating system, did that make it more challenging when IBM came out with new machines and you had to accommodate new technologies?

Belvin: If we had switched machines, it would have been a problem, but we stayed with the model 67 all the time that I was in charge of the section. Maybe we got one smaller System/370 while I was there.

Haigh: It mentions on your résumé for this period that the computing equipment included a multiprocessor system System/360 model 67, and System/370 models 158 and 168.

Belvin: We might have gotten the model 158 in just to get started. There was not much change. We didn't have to do much to go to that. That was not a big problem. If IBM had come out with different disks you'd deal with it. It's not a horrendous thing.

Haigh: Was it a major challenge to switch to a multiprocessor operation?

Belvin: Very much a major challenge. We were limited in test time. The Cambridge Scientific Center had a multiprocessor, and I was able to schedule test time on Saturday nights, from midnight until 6 a.m. or something like that. And I got everyone involved. Mike, even though he was not involved in CP, I had him involved because he's such a creative person. And I had all of us get together to decide how we were going to support the multiprocessor, and then had the CP group do the programming for that, and we did the testing at the Cambridge Scientific Center. I don't remember how many weeks of testing it took, but I remember loading up a picnic basket of food to take in. Coming in at midnight or whatever on Saturday night and leaving Sunday morning, we needed a little bit of sustenance. It was a lot of work, but it was done in a short period of time.

Haigh: You said that manufacturing reliability was one of the big challenges.

Belvin: To me, it was the biggest challenge, because any crash and your customers are gone. You have too many crashes, and your customer's gone permanently. So we wanted to make sure that we found the sources of the problems and fixed them as quickly as we possibly could.

Haigh: Do you have a sense of how your "up" time compared with the major competitors?

Belvin: No. I think it was quite good, but I don't know. When I heard some of the figures that people were talking about in the last couple of days-- running for an hour without a failure is a success. I mean, that's appalling to me.

Haigh: I hope that they were able to rapidly improve as they commercialized it.

Belvin: I hope so too.

Haigh: And you were running on just one computer for most of this period, were you?

Belvin: When we first started, we were running one computer. When we actually absolutely first started, we were not running it 24 hours a day, because we did our testing on it in the mornings, typically. I don't remember when it switched to 24 hour a day operation.

Haigh: But you think through 1976 the production stuff was still being run off one IBM System/360?

Belvin: Right.

Haigh: Okay. So, unfortunately, with time constraints, we'll need to move onwards shortly. Is there any other aspect of this period of your career as vice-president of Computer Systems, 1968 to 1976, that you think we should cover before we do that?

Belvin: Following the layoff, one of the things that happened was a reorganization of the whole company and I inherited, from the marketing department, technical writing. Before, they had been responsible for all of the user documentation and I inherited all of that. It was an interesting additional thing. Even though I came to English a little later in life than most people and all those people who worked for me, I had a much better understanding of grammar and semantics than they did. I remember one time I even gave them a lecture <laughs> on diagramming a sentence so that we could understand why it was that a [particular] sentence didn't make sense. I was also responsible for the newsletter for a while, not my strong suit. The newsletter is a marketing thing and it was turned over to me. Fortunately, I don't think I had this technical writing responsibility for more than a couple of years after that.

Haigh: I think you mentioned that having that kind of contact with users also had some benefits.

Belvin: I mentioned that I sent programmers out. I would go out on marketing calls. The company made a strong effort to keep in touch with the customers. We had to be responsive to customers and that was a way of doing it.

Haigh: So your role changed within the company for your last five years there from 1976 to 1981?

Belvin: Right. I was getting a little burdened by some of the personnel aspects of managing my department and I was seeing what I thought was a problem in the organization as a whole. Jack tended to operate that company as a bunch of fiefdoms. He let the different department heads and others compete with each other. I thought that the company ought to have a somewhat more coherent role and so I became, with no staff, vice-president of strategic planning, I think that is what I was called. I was a member of the management committee and I tried to knit things together and, after a year of that, I realized that this psychology of the fiefdom was more than I could deal with and, in addition, Chase became a more encroaching presence. Jack was replaced, our next president was a Chase employee, and I decided that strategic planning was probably the wrong thing for me to deal with. This was an impossible thing. So I

went into something called new development, looking at possible new technological developments and I started working with mini and microcomputers in a very small operation. I hired one or two people, to try to see how we could fit microcomputing in with our business.

Haigh: So the years I'm seeing there are vice-president, corporate planning, 1976 to 1979 and then vice-president, new technology, 1979 to 1981.

Belvin: Okay.

Haigh: Which are the jobs you were just describing. When you joined the company originally, you had received an ownership stake. Did Chase finish up owning all of the company?

Belvin: Yes. It was a cash deal.

Haigh: And what year was that?

Belvin: I think it was 1975.

Haigh: Okay. So, at this point, 1979 to 1981, you were vice-president of new technology. You were looking into microcomputers and other kinds of things. This would have been the kind of area where distributed computing was becoming something of a buzz word, I think?

Belvin: Yes. I just didn't put enough energy into it. I didn't have enough background myself, I didn't hire enough, didn't get much support from the company as a whole. I'd say it was a relatively wasted effort for the company and for me. I don't have a pleasant memory of that period. I learned something about microcomputers and I may have planted some seeds for people because IDC certainly went into that after I left.

Haigh: Right. So the company as a whole didn't really embrace those technologies at that point?

Belvin: No.

Haigh: Did you personally develop a sense that this was something that was going to have profound implications for the timesharing business?

Belvin: Well, it seemed inevitable but I didn't have the vision to claim that I saw a profound shift, but it couldn't help but have done something. For instance, I was looking through my notebook I saw the names of Bob Frankston and Dan Bricklin, Bob being an employee that I knew well. Bob and Dan came to see me in 1979.

Haigh: And did they demonstrate VisiCalc or not?

Belvin: No, they just talked about it.

Haigh: I think it shipped in 1979.

Belvin: Oh, it did but I can't remember when they came to see me, whether they brought an Apple or not. It was certainly in existence. I remember writing a memo and sending it to the president of IDC then, not Jack any more, but John McElroy, saying, "Isn't it remarkable what you can do with a \$3,000 computer and a \$100 piece of software?" And even though I wrote that memo, I didn't have the vision then of what could happen with that.

Haigh: How did you come to leave IDC?

Belvin: Well, we had yet another new president from Chase, Don Hollis. I didn't get along with him very well. He wanted to put me in things that just didn't make sense. There was a venture in real estate that somebody had started and he wanted me to take it over and it was a lost cause. I was just going to do dirty work, wiping up a mess, and I said I don't want to. Why should he have me do that? We did not get along very well. Then Frank Mahoney, the then vice-president of operations, succumbed to pancreatic cancer and Don, for want of having any other bodies around, put me in charge. I didn't feel as though I was well suited for that. I did it as long as I could but I wasn't the right person for that so I decided it was time to leave. The company was very kind to me, and gave me half a year to get out of it.

Software Arts 1981-1994

Haigh: And then you finished up working for Software Arts.

Belvin: Right. During that half year period, I consulted, and the place I did most of my consulting for was Software Arts.

Haigh: How big was the company at that point?

Belvin: 30, 40 employees. Of course, I knew Bob. I knew Dan a bit. I got to meet Tracy Licklider, who was their executive V.P. or something like that and they had a programming

manager. After working with them for a while and getting really enthused about the spirit of a young company and very bright people, I asked Bob if he'd hire me as a programmer. I wanted to restart myself and I went back to a relatively low paying job as a programmer. I was working on advanced version of VisiCalc for the Apple III and their programming manager, who had not been terribly effective, maybe was told to leave, I don't know. He left. Tracy put me in as programming manager.

Haigh: It says in your resume you were a software engineer from 1981 to 1983 working on an advanced version of VisiCalc for the Apple III and for the IBM PC and a contact sensitive help system and some other features; you were then senior manager/vice-president of software developments from 1983 to 1984.

Belvin: That's when I took McElfresh's place.

Haigh: Yes. Now, how was the experience that you had had previously of managing Frankston? Was he an easy person to manage?

Belvin: He was impossible to manage and he was an impossible manager, too. I can only describe it as interesting. By saying that he's impossible to manage, I don't mean that you don't get a lot out of him. You get a lot out of him but it's on his terms and you have to be willing to work with that. I was perfectly happy with that at IDC because he was so productive and his ideas were so good. It didn't take too much to work with him. With him as a manager, it was much more difficult because he's not very articulate and he liked to do things himself. He's an active aimless programmer-- multiple hours a day. He gets up in the morning and, you know, has multiple things going on, always at the forefront of technology. It's hard to keep up with him. I found that much more trying.

Haigh: Now, Dan Fylstra, speaking of this period, has suggested that Software Art's attentions turned away from VisiCalc and that he felt that not enough was being done to keep the core product up to date and competitive with newer spreadsheets. Do you think that's fair?

Belvin: Yes. I think that's fair. Dan [Bricklin] was involved with TK!Solver and I've forgotten the guy, a professor, who brought it in. Dan was in love with TK!Solver and he put a lot of programming effort into that, and VisiCalc was not high on his list. I don't think Bob was even involved -- he was flitting around someplace else. It was Dan that pushed TK!Solver I think. Fylstra's observation is probably accurate.

Haigh: So when you were managing software development, what kinds of projects were receiving the most attention?

Belvin: TK!Solver and VisiCalc advanced version when we started seeing that VisiCalc sales were going down. Lotus 1-2-3 was already ready to eat our lunch. I had hired somebody who had the idea of something he called Spotlight Personal Organizer and he convinced Dan that that was worth putting some money into; so he worked on that. Those were the three things. Oh, and what was Ray Ozzie doing? Ray Ozzie was doing something. I can't remember now.

Haigh: So you had been attracted to the idea of a young, dynamic company.

Belvin: Yes.

Haigh: As things progressed, what did you find in terms of similarities and differences with the experience that you had previously had in the early days of IDC?

Belvin: Dan and Bob and Tracy and Julian Lange, the president that they brought in, were not very open in communications. They didn't share very much about what was going on; they were almost secretive, and it made for a somewhat hostile feeling. Those four, the upper level of management, were in their own world, and I didn't find that conducive to building company spirit.

Haigh: You left in 1994. Was the company falling apart at that time?

Belvin: Well, it was a layoff. They got rid of all of the middle managers, and they didn't last much longer after that.

Haigh: How did you decide what to do next?

The MITRE Corporation, 1994-2001

Belvin: I went on the job market and I was thinking that I was through with young startups for awhile. I was not quite 50, but old enough that I thought I better find something more suitable. I applied at a few places, one of which was the MITRE Corporation. I had a telephone screening interview with a fellow who was in charge of what was called the trusted product evaluation program run by NSA [National Security Agency]. He was in charge of the product evaluation work that MITRE did. We had a very interesting phone interview and I realized how much of my background in system programming might help in doing evaluation of computer systems for trusted use. We hit it off very well over the phone. I went in for an interview. I really liked the notion of it and I took the job. It turned out to be an ideal match for me because most of the people working on this, with a few exceptions, were relatively ignorant of hardware, of good architectural principles, and so I was a level above most of the people

working there. I ended up being able to follow a career path up the technical ladder. I did not want to get into management there and, at the time, MITRE did have a dual path that allowed me to progress. I think they've clamped down on that a little bit now but it doesn't matter to me, I'm gone. It was wonderful. I was introduced to all kinds of systems. I got to know UNIX. I got to work with some vendors to get into the internals of the system, did penetration testing, like a kid in the cookie jar. It was fine.

Haigh: You stayed there until 2001?

Belvin: Yes.

Haigh: Doing basically that same kind of work all the way through?

Belvin: Right. Yes. I was also a member of what they called the Technical Review Board. I looked at every product that came up for evaluation. A team of people from MITRE, Aerospace and NSA would have to present to the Technical Review Board why they recommended giving whatever classification they were giving to this, and I was on that. I was also in an international group that was working on a new set of criteria to be used by all the signatories, there were six countries, instead of just the Americans-- the Americans had what was called the Trusted Computer System Evaluation Criteria that just was used in America. This group was working on it for international use and I was on the group. We'd have meetings every three, four months to work on it. Aside from that, I was doing evaluation work.

Haigh: You enjoyed the culture more there than you had done?

Belvin: Oh, yes. I enjoyed being able to act as a mentor to younger, less experienced people. I got a lot of drop-in calls. That was nice; people coming to my office to talk about what they were evaluating and getting my opinion. That was a nice situation.

Haigh: More collegial?

Belvin: Yes. MITRE is a nice place for that.

Haigh: And where were you located physically?

Belvin: Bedford, Massachusetts, Route 128, sort of.

Haigh: Okay. So I think the time is running out. I have a couple of final questions. Is there anything else that you would like to talk about briefly before that?

Belvin: I don't think so.

Haigh: Okay. So I tend to finish the interviews with the same two questions. The first one would be, and they really go together, in terms of your whole career, the single thing that you're proudest of and your single biggest regret in terms of either something you did or just in terms of how something worked out. So we'll start with the regret first so that we can finish on a positive note.

Belvin: It's hard to say. Those were nearly impossible questions. I don't regret having gone to Software Arts, even though the experience ended up being somewhat painful, including a layoff. I don't regret it, but I'm not sure I would choose to do it again. I guess my regret is that I wasn't able to do something at Interactive Data Corporation in my role in charge of the computer systems department to have made my stay there more vibrant and effective so that I would not have chosen to leave. I think that was a path that led me downhill from IDC. The first years at IDC were glorious. They're on the other side of the ledger, you know? The most fun I've had other than writing LLMPS [Lincoln Laboratory Multi Programming Supervisor] at Lincoln Laboratory, were the first years [at IDC], even including going through the layoff process, which was a very painful one.

Haigh: Is there a particular aspect of the first years that you could single out?

Belvin: I think just the excitement of building an organization that would produce something you could be really proud of, which is what we did.

Haigh: That concludes things and thank you.