Oral History of Richard Case

Interviewed by:
Burton Grad

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Table of Contents

Richard P. Case

Conducted by the Software Industry Special Interest Group —Oral History Project

Abstract: Richard Case had a long successful career at IBM and has continued his contributions to the computer field after retiring from IBM. In this interview Richard discussed his family background and growing up in Ohio along with his early computer experiences. Starting on the hardware side, he was able to contribute to the design of the 1410 computer and to the 7040 and 7044. While originally assigned to the engineering of the new S/360 product line, he was tapped by Fred Brooks to be his deputy in producing the OS/360 operating system. By far the largest such operating system effort at the time, the development team was able to overcome many technical and performance obstacles to release this program which became the standard for future mainframe computers. After Richard was responsible for the architecture of the S/370 he was assigned to head up the Future System Project, which was to be IBM's next major computer system. However, the size and complexity of this project led to its demise (along with a resurgence of demand for the existing IBM product line). Richard then had a series of other assignments in IBM Research, on the US Justice Department Anti Trust suit against IBM, as Director of SPD Technical Operations, and other technical leadership roles. He became a spokesperson for IBM to various US and international agencies, industry forums and standards committees and was selected to serve on certain US Government Commissions. His last IBM assignment was as Corporate Director of Technical Strategy Development providing technical support to Lou Gerstner, the new CEO of IBM. Richard continues to be in demand as a consultant and advisor in the computer field.

Burton Grad: I'm Burton Grad and I'm interviewing Richard P. (Dick) Case in Westport, Connecticut, on December 7, 2006. This is being done as part of the Oral Histories Project from the Computer History Museum. Dick, I'd like to start by asking you about your personal background, your education, those kinds of things. Do you want to start with your family and where you grew up and so forth?

Family History

Richard Case: Well, okay. I was born in Akron, Ohio. I went to grade school in Hyattsville, Maryland, which is a suburb of Washington, D.C. I went to high school in Gadsden, Alabama, and I went to college in Cleveland, Ohio. So where am I from?

Grad: Where you do you consider yourself from?

Case: Ohio.

Grad: Had your family been there for many years? Tell me a little bit about them.

Case: Okay. I can't trace my family back terribly far. On my father's side, my grandfather, George Case, was born and raised in northeastern Ohio in a small farming town called Randolph in Portage County. He was almost a man before electricity came to there- where he was. My father was born in the same town and he was almost a man before either the telephone or the automobile came to where he was. I was born in Akron, Ohio.

Grad: What did they do for a living?

Case: My grandfather, George, was proprietor of the local lumber mill. He had a factory; I guess you can call it that. It had major woodworking machinery including a facility that was big enough to saw logs and farmers would bring anywhere from 12 to 36 inch diameter trees that they'd cut down on their property. They'd get them hauled in and he would cut them up. He also sold building supplies and roofing materials and nails and stuff like that.

Grad: Did you ever see the sawmill?

Case: Oh, yes. I used to spend several weeks a year living with my grandmother and grandfather and that was delightful because I could participate. My earliest remembrance is I wasn't old enough to do anything. The only thing I could be trusted to do was to sit on the workbench on the far side of the room and watch things go on but that was fine. I did that. The same facility also had a cider press, a cider mill, and the farmers would bring apples and they would get dumped into a hopper at the bottom of the building and carried up by a conveyor and run through a grinder to grind them up and spread out on the canvases of the cider mill and press, and the farmer would take away the cider from the apples that he just brought.

Grad: How about your father? What did he do?

Case: He was trained at Ohio Northern University as a civil engineer. When he finished college in 1932 or 1933, jobs were hard to find and for a few months he worked pulling weeds in the celery swamp, the same thing he had done part time as a high school student to earn money. But not too long after that he got a job with Goodyear Tire and Rubber in Akron. His first job was what they called the Flying Squadron. You'd show up in the morning and the supervisor would tell you what department needed extra help that day. Then you'd go work in that department and the next day you'd be working someplace else. He fairly quickly got noticed and began to work in the tire design, the engineering department, and he spent, I don't know, 40 years or something like that rising through the ranks in the tire design business, which was engineering – it wasn't civil engineering but it was engineering – and he wound up at various times being in charge of all of the Goodyear International engineers. At the end of his career he was in charge the tire design for all of the tires except passenger car tires and the biggest thing that interested him and me were the big, off the road equipment with tires that were 12 feet in diameter on these big earth moving machines in strip mines and also in underground mines and aircraft tires and all of that kind of stuff.

Grad: When you were growing up did you visit at the plant, see him work there?

Case: Not much. When I was in grade school we were in Washington, D.C. That was because he was there. He was the rubber industry's technical representative to the War Production Board and his principal job was allocating natural rubber which was in limited supply during the war years. Everybody else had to make do with synthetic rubber and he was the technical person who was providing advice as to which of the various uses of rubber could be adequately served with synthetic rubber and which really had to have the limited supply of natural rubber.

Grad: You spent two or three years in Washington?

Case: Yes, and then we were in Gadsden, Alabama, where he was plant engineer, chief engineer at the Goodyear's tire plant in Gadsden which at the time was the biggest single tire making plant in the world and it was Goodyear's newest and sort of baseline plant. The variations in orders were all allocated to other plants up and down but they ran this plant sort of full out all the time.

Grad: This is in the late 1940s, early 1950s?

Case: Right. I was a teenager in high school.

Grad: Did you finish your high school education there?

Case: I finished my high school in Gadsden, Alabama.

Grad: Tell me also about the rest of your family. You had brothers and sisters?

Case: I have one brother and two sisters. I'm the oldest of four. The next two are girls. My oldest sister was a schoolteacher and then a homemaker, currently living in South Carolina, in the suburb of Charleston. My next oldest sister married an IBM'er. She's a musician. She's a church organist; and for several years in Wilton, Connecticut, she was chairman of the school board and then as a result of that became heavily involved in the state school board association kind of thing. She and her husband were volunteer election poll watchers and she was at some level in charge of that for the Wilton area for a while. They are currently retired in Sarasota, Florida.

Grad: Your younger brother?

Case: My younger brother, David, is 13 years younger than I am so I didn't really know him very much when he was growing up. He is the only one of us that ever got a Ph. D and he's working for one of the Scripps organizations in San Diego, not the oceanographic one, the health related one. I can't give you the exact title.

Grad: Was his Ph. D in the medical field?

Case: His Ph. D was in physical chemistry or something like that and his thesis was on the details of how the blood carries oxygen from one place to another in the body and he's still associated as a professor with some institution. I'm not sure which one but he has every year, at least until very recently, some Ph. D students that he's supervising.

Grad: Did the family end up back in Ohio or did you just go back because you went to school there?

Case: No. The family came back. I went to school first. The family was still in Alabama when I started school but during my college education the family came back to Ohio and lived there for quite a few years. I don't remember exactly how many. And then my parents moved to Connecticut, Heritage Village in Southbury.

Grad: One other question about your mother and grandmother. Do you have anything about that side of the family?

Case: Well, my mother was the third of five children. I knew three of my uncles. Only one of them is still with us. One died before he was a teenager and he was the one that had my name, Dick. Her father was an accountant. I think the best title for him probably is chief accountant at United Engineering and Foundry, which was the steel company in Youngstown, Ohio; he was definitely of German extraction.

Grad: Do you remember her maiden name?

Case: Ebinger, Grandpa Ebinger. I'm not sure whether he was born on this side or the other side of the Atlantic. I'm not sure. But his parents were surely born in Germany so they're that close to being immigrants.

Grad: Did your mother go to college? Did she have a degree?

Case: My mother, yes. Yes, my mother had a college degree from Wooster College in Ohio. It's not the English Worcester. They lived in Hubbard, Ohio, all the time that I knew them as I was growing up.

Grad: Did your mother have a professional career at any time or work?

Case: I think she did some teaching before there were any children, but her career was the home after she began to have children.

Grad: With that spread in ages of 13 years between you and your younger brother, it would give her a pretty full time occupation, being at home.

Case: And at the time it was a lot more usual than it is now.

Education

Grad: Were there special interests while you were a teenager or as you were growing up that tied you in to engineering, that made you interested in doing that?

Case: That's a really good question and I don't know how to answer it. It's come up before. All I can say is I never really thought of doing anything else even though at the time I didn't know much about it.

Grad: Was it because of your father being an engineer do you think?

Case: Maybe. Also my mother's brothers, my uncles. My father was an only child so I don't have any aunts and uncles on his side but, as I say, my mother was one of four that I knew and two of them were engineers and one of them was a Case graduate, the youngest one. My Uncle Phil, the youngest- my mother's younger brother, is 12 or 13 years younger than my mother and I'm 12 or 13 years younger than he is so he's sort of halfway between my mother and me in age.

Grad: In high school did you just take a regular college prep course? Were there any specific courses that you found that you really liked, that turned you on, that got you interested in math or science?

Case: I started out to be a chemical engineer and I was always good at science and math and attracted to physics and chemistry and those kinds of things.

Grad: Were you a good student?

Case: I was.

Grad: Straight A's?

Case: Well, almost.

Grad: Were you the valedictorian?

Case: No, I wasn't the valedictorian. As I remember, I was fifth in a class of 250 or something like that.

Grad: Pretty impressive.

Case: As far as those kind of numbers were concerned but I wasn't valedictorian. I did a lot of public speaking work and debate in High School. Both in Ohio in the eighth and ninth grades and then in Alabama when we were there- I was there for the last three years of my high school education.

Grad: After Washington you did go back to Ohio and then to Alabama?

Case: Yes, you got that right. Yes, we did go back to Ohio.

Grad: The junior high school years were in Ohio and then your high school years were in Alabama?

Case: That's right.

Grad: Did you find that change in schools made a big difference to you or not? Educational systems seem to be different.

Case: It happened several times.

Grad: You didn't have difficulty making friends or adjusting to a new environment?

Case: I would say no although during those years I didn't have a lot of friends. But that was all right.

Grad: What kind of things did you do on your own? What are the things that you spent time doing as a teenager? Did you build radio sets? Did you do things like that? Any kind of woodworking because you had exposure to that? Were there any of these mechanical or engineering things that you did?

Case: I built electronic equipment from kits. Heathkit did well by me in those years but they weren't my designs.

Grad: My point is you were using those things. We've often found in our interviews, that many of the people who go this way constructed things when they were younger and that was something that seemed to be appealing to them.

Case: That's right.

Grad: Why go to Case Western? What was your reason for going there?

Case: Well, at the time it wasn't Case Western.

Grad: What was it called?

Case: It was called Case Institute of Technology. I met my wife at college. She was a student at Western Reserve University. And it was eight years after we were married before we discovered we went to the same school because they weren't the same school when we were

there. We obviously knew what schools we were going to when we were married but it wasn't the same school at that time. It became the same school later.

Grad: That's a great story.

Case: I have several of those, but we'll get to them one at a time. I can't give you a good – I can tell you why I changed from chemical to electrical engineering. That's a very easy story.

Grad: Tell us that one.

Case: In freshman chemistry, the theoretical or book learning part of chemistry was not a problem. The laboratory part of freshman chemistry was a disaster. I couldn't even get the experiments on the knowns to come out right. The objective at the end of the semester was that you were supposed to develop your laboratory technique so you could be given a vial of who knows what in it and you were supposed to be able to figure out what it was and as a part of the learning of part of that process you'd be given a vial of something that you knew what it was and then you could do the procedure on that to make it come out. I couldn't get the knowns to come out right. Never mind the unknowns. I had no chance on the unknowns so that convinced me that I needed to make a change.

Grad: Why electrical engineering?

Case: I don't know. There was no specific history or reason that I can identify.

Grad: Hobbies when you were a teenager. Sports at all?

Case: No.

Grad: Books?

Case: Books, yes. When I was a teenager? Probably started that early. A lot of science fiction, which I've gotten away from now but a lot of years I was deeply involved in a lot of the science fiction stuff.

Grad: There were some wonderful science fiction writers during that period of time. That was just when it was really getting into shape.

Case: That's right. I did play some neighborhood pickup games and baseball; I don't remember ever playing football but I did play baseball or kickball.

Grad: Hiking, climbing, skiing? Any of those kinds of things?

Case: Yes, some hiking but nothing terribly active or consistent or driving force or really got to do that.

Grad: In many cases we find there was a very strong competitive spirit among some of these people who became entrepreneurs later on, but that doesn't seem to have been a part of your history.

Case: No, I don't think it was a part of my life at that time.

Grad: Did you continue the debating and speaking when you went to college?

Case: In college, yes. Yes, I did. I spent all four years on the debate team. At Case I was the only freshman who was on the varsity debate team since anybody then could remember.

Grad: That's a competitive activity and very strongly so.

Case: Yes. Oh, absolutely. That's right.

Grad: It means your articulateness, your use of words, must have been a very central part of you.

Case: Better than it is now. Yes. I think that's correct.

Grad: When you were at Case did you take any courses in English and literature or in speaking, any of those kinds of things?

Case: No.

Grad: It was basically the strict engineering curriculum that you followed.

Case: Yes. Right.

Grad: Your favorite courses while you were at Case? Do you remember? Anything special that sticks in your mind?

Case: Well, the one special course that sticks in my mind was an astronomy course which I chose because it was on the list of courses that would satisfy a required humanities elective taught by Dr. Jason Nassau who at that time was close to retirement, could even have retired before then, was the person for whom the then Nassau Astronomical Observatory that Case had was named; he had an international reputation, and all of us who took the course took it much for the same reason that I did. It sounded better than any of the other things that were on the list of things that we had to take as a humanities elective. I don't know whether to say I was inadequately advised, but I was inadequately attentive to the advice that I was given to get some broader humanities exposure. I would now recommend anybody who's in that place to do better or more than I did. But the course turned out to be not much astronomy except that was the background for a deep course in the philosophy of science and he managed to get all of us to do at least three times, sometimes five times as much work on that course as we did on any other course and he didn't require it. He motivated it somehow. You didn't have to do it in order to pass the course. You didn't even have to do it to get a good grade but after he explained, you wanted to go do it and do the reading and whatever and it was very good. That's the single course that stands out in my whole education.

Grad: In debate you have to be able to understand a great range of subject matter, political, economic, whatever the subject matter is, so that was in a sense maybe a way in which you got that broader background and experience that you didn't get through the classes.

Case: That could be.

Grad: I often think that's a way for many people to self-educate, if you will, as part of their development process.

Case: Yes. I am sure that's probably right.

Grad: Why did you go to Case?

Case: I guess principally because of my uncle. The "Where are you going to go to school" question was as I remember it not nearly the emotional problem that it is for people today. My high school chemistry teacher, which was also the school's guidance counselor (he spent I think two thirds of his time being guidance counselor and one third of his time being chemistry teacher) was interested in me a little bit and at one point he asked me, "Were you thinking about going to college?" And I told him well, I had applied to Case and had been accepted and he said it's the best undergraduate engineering school in the country. I don't know what he knew about it or how he knew about it and I don't think it ever was number one in some sense but I think it was then and pretty much still is a really good engineering school.

Grad: Did you apply to other schools?

Case: I don't remember applying to any other school.

Grad: This was 1952?

Case: This was 1952 and I had high enough SAT scores and grade point averages that I don't remember having any concern.

Grad: Were there particular people other than family that you looked to as models or idols when you were growing up prior to college?

Case: Not that I remember.

Grad: Were there any other professors there, or any other courses that had a particular memory for you?

Case: Well, I'm trying to remember one of the electrical engineering professor's name who taught, among other things, the senior course in electromagnetic transmission and he offered a option for people in that course for the final exam; it required four or five two hour preparatory sessions that were not part of the course material but the option was if you take the FCC examination for a radiotelephone license and if you get a class A radiotelephone license you get an A on the final exam and you don't have to take the final exam and if you get a class B license you get a B on the final exam and you don't have to take the final exam and if you don't get either of those you'll know by the time the final exam comes around and you can take the final. Not all of us by any means but quite a few of us opted for that more because we thought we'd like to do it or we thought we'd like to have the credential or something. We thought it would be interesting to study all the electromagnetic stuff and you had to know how to – at least you had to know on paper – run both shipboard and land based high power radio transmitters. But you had to pass an exam on that. I took the exam and I got a class A radiotelephone license and I never used it for anything and I stuck it in the drawer but I got an A on the final exam and I think I got an A on the course.

Grad: You took pretty much a straight electrical engineering curriculum?

Case: Yes.

Grad: Good grades again?

Case: Yes. I don't remember exactly what the numbers were but they were high. I was not valedictorian but I was high honors, magna cum laude, whatever, and received what the school called the Wickenden Prize, which was for the senior who had done best in public speaking.

Grad: That's an unusual combination of skills that you bring, both the technical skills and the speaking. That's not one of the things that we engineers are often noted for.

Case: I understand that. During my senior year at college, it was the quadrennial election year, 1956. And so the school, class, whatever, organized a mock political convention and I was general chairman for the mock political convention and that really required me to get around and meet and learn to know lots of people that I only knew casually. And I had to successfully get each of the fraternities to cooperate and to take a piece of the organization and to do that and try and get it all put together and I don't remember how I got selected for that job.

Grad: You sure did it.

Case: But I did it, and I had a great time doing it.

Grad: One of the things that's fascinating about your career, and we'll look at this when we look at the other areas, is that you combine both very intense technical innovation and creativity both in hardware and software – I hate to use the word 'political' because it has such negative connotations sometimes – but the ability to use the system to make things happen, to get things done, to organizing both within IBM and then in terms of the general political arena, working with various organizations. That's the things we want to explore later as we get there. It's different. When we interviewed Bob Patrick for example he's the quintessential technical person in many ways and he's superb at what he does but these other things he has no patience for and you apparently developed somewhere early on that kind of patience, which is very interesting. Did you have any exposure to computers either before or during college?

Early Computer Experience

Case: I had limited exposure during college and nothing prior to college. My first exposure to what I think you have to call pre computers during college was I got to be a student assistant in the math computing lab, which was mainly a bunch of tables and electromechanical calculating machines. The Marchant and Burroughs and I forget what else. There are several other names that were common but they were electromechanical turning wheels things and they would multiply – add, subtract, multiply and divide – somebody from the math department who was in charge of it, had installed a very primitive punch card installation to assist that kind of stuff. We had one 402 accounting machine and one 080 sorter and one 519 reproducing punch.

Grad: Did you get a 602A or a 604?

Case: Exactly, a 602A; not a 604.

Grad: You weren't up for that yet.

Case: It was before the 604's but there was the 602A. Right. And I got to be the evening attendant, which was the best student job you could ever have. First it was at the pay scale of twice any other student job on campus because it required competence or experience or knowledge or whatever that almost nobody had and the second thing was that I could do two things at once, walk in to work, put a deck of cards in each of the machines, sit down at the table while they "chunk-de- chunk-de chunked," do my homework in the other courses; and after 20 minutes of doing homework go off and get a cup of coffee, come back and refill the machines and do it again.

Those weren't really computers but pre computers if you want. Then I did have an opportunity, and I don't remember exactly how it was, to take a programming course on the 650.

Grad: This must have been 1955, 1956?

Case: It was 1956.

Grad: That's before you graduated?

Case: Right before I graduated. In my senior year, right before I graduated. It was I am sure a graduate course at the time. It wasn't on the undergraduate course level and there was nothing that was close to computer engineering as part of the regular curriculum but we used the Bell Labs Interpretive System for the 650, which was a simulator; it programmed the 650 to simulate another logical but not physically realized machine to do general purpose stored program calculations.

Grad: Do you remember the name of that? I don't remember that one.

Case: I remember it was basically a three address decimal—

Grad: That's when the very earliest SpeedCode had just come out at IBM and I was wondering if it was one of the things that had been done. These were all interpretive systems at that time.

Case: This was not anything like a high level language. You programmed it basically in machine language although the machine was not a physical machine. It was a machine that was simulated on the 650.

Grad: Dick, let me go back over a couple of things. What kind of jobs did you have while you were growing up in Alabama or before that in Ohio? Did you do any work as a teenager?

Case: Well there were a couple of jobs that I remember as a high school student – I don't remember any jobs before I was in high school. I was a go-fer at Dugger Books. I think it was the only bookstore in town and then later on he got some competition. Anyway, I worked for him and stocked shelves and unpacked books and took things to the post office and did mailings and stuff like that. When I was a junior in high school I worked for 25 cents an hour which at the time I knew was cheap, Dugger was cheap, but it fit my schedule and we got along well and so I did that.

Grad: During school, not summer times.

Case: Yes right after school and Saturdays. When I got to be a senior and my time was filling up so I told him I wasn't going to work for him the next year. H said, "We'll give you a raise if you'll stay and work for us, we'll pay you 35 cents an hour" I thought about that for about 2 seconds and I said, "No, don't think so." He said he'd have to talk to his wife who was sort of managing the family finances. They finally decided to offer me 37½ cents an hour and I still said no.

That was the same year that I did have evening jobs, sometimes as a neighborhood babysitter. We lived in a neighborhood that was 4 miles out of town; wrapped around the neighborhood was the country club golf course and this neighborhood was an upscale neighborhood for Gadsden and there were four or five families there who had children and they were delighted to have a local neighborhood guy as their babysitter because then they didn't have to transport them home after they got back from their evening out. In at least one case that was probably pretty good because they always came back under the influence. I had been charging 25 cents an hour and it was, of course easier, than working at the bookstore. But only one of the houses had television and we didn't have television at our house in those years. I decided in my senior year that I was going to increase my fee to 35 cents an hour and I went around with some trepidation as I told my clients. But the uniform reaction that I got was alright, we still want you.

Grad: Good vote of confidence towards you. Did you work summers as well or not?

Case: Not in high school, well I may have done some of the same kinds of things, I don't distinguish.

Grad: Did you go to camps or anything like that during the summer?

Case: I did do some summer time camps, but were they while I was in high school? I think those were while I was younger. But I can tell you about my summers when I was in college.

Grad: Tell me about the kind of things you did in the summers during college.

Case: Well between my freshman and sophomore year I was a ride operator at an amusement park; I ran The Bug which was a circular track with cars around it that go up and down hills and curves. Between my college sophomore and junior year I worked as an engineering intern at Goodyear.

Grad: Was that through your connection with your father?

Case: He knew about it but he didn't get me the job. I think I was open with them about the fact that I had a father there when I was applying and I think somebody asked him was that okay but no, he didn't get me the job. I probably got it somewhat through the college, I'm not sure I remember exactly how I got the job.

Grad: A lot of companies would hire summer interns with the hope that they would work there after they graduated.

Case: Right, they wanted me to do that too; they wanted me to do that pretty badly, but they didn't have a job that I was interested in, I could see what people, 2 or 3 years my senior were working on and what I had been working on and while it was interesting for the summer, it didn't look like it was the right career for me. But they wanted me and they reached the top of their salary scale at the time to try to get me to come after I had graduated but neither the salary nor the job experience matched what I wanted so I didn't do that.

Grad: Let me finish up with your undergraduate college stuff. In June of 1956 you got your degree as a Bachelor of Science in double E?

Case: Right.

Grad: Had you written any computer programs by that point in time? You said you had taken the course in 650 programming?

Case: Yes. I don't remember what the content of it was but did that as part of the course. I wrote a program, 2 or 3 maybe.

Grad: How did that hit you? Did you feel "Wow, this is great?" Was there anything of that sort going on as it did with your astronomy course, for example?

Case: I don't remember having that reaction, but I do remember having the reaction that computers were probably a good place to be. It certainly had some effect on my choosing to come with IBM.

Grad: When you were ready to graduate and started looking for a job, Goodyear was after you, but there must have been other companies that interviewed at Case too, weren't there?

Case: Yes, and 1956 was a great year for graduating engineers. There was lots of demand and anybody in our class could have as many offers as they were willing to have a serious interview with. I had offers from and interviewed with United Engineering in Hartford and I there were others but I don't remember where else.

Grad: Can you remember anything about the IBM interview there?

Case: Not really, the story I like to tell about IBM interviews is my son.

Grad: Go ahead.

Case: Well my son graduated in 1983 from Rensselaer. He wanted to go to MIT but he was not accepted. As far as I could tell, his qualifications were more than adequate but here are a lot of people who want to go to MIT and hey can only accept so many; he wasn't accepted. But he was accepted at Rensselaer and he went there with the intention of transferring to MIT after he demonstrated that he was capable of doing adequate college level work the first year there. But after he'd been at Rensselaer for one semester, any thought of transferring to MIT had gone; he'd found his home. He wound up graduating 4 years later with 2 degrees from two different schools. He graduated with an electrical engineering degree from the School of Engineering and with a computer science degree from the School of Arts and Letters or whatever computer science was in at that time. In spite of a significant overload of courses, including some that were advanced placement courses, he wound up 4 years later getting 2 degrees with roughly a straight A average. During at least the last 2 years, we would have occasional conversations about where he was going to go to work and his reaction always was: there are lots of opportunities, lots of places; I'll probably go into the computer field, but it won't be at IBM. When I asked why not, he said, "Because I don't want to be known as Dick Case's son."

I thought that was a reasonable evaluation. I had a very visible job. I wasn't vice president or something like that at the top of the ladder but lots of engineers at IBM knew my name. Not just

in one location but in a lot of locations because my job was to go around and give speeches at all the locations and evaluate projects and stuff like that. So I thought, “This guy least has his head on straight, he’s thinking carefully, I can leave it to him.

He called late in his senior year and said, “Well, I’ve decided where I’m going to go to work.” I asked where? One of the places he was thinking about was Pixar or Industrial Light and Magic or whatever that thing is. Is that the one? He said, “No. You won’t believe it but I’m going to work for IBM.” I said, “You’re going to go to work for IBM?” He said, “Yes I’m going to work for IBM in Poughkeepsie.” It was one of the places that I had been heavily involved with and I said, “Okay, I have no objection to that, but tell me why. Did they offer you the most money?” He said, “No they were third on the list of the money people were offering, but they’re the only company that offered me a job working in a department that I had interviewed in, working for a boss that I had interviewed and doing a job that I knew something about. They’re going to give me a 3080 full of disks and all I have to do is break it once a day and they’re going to be happy with me.” It was in final system test and his job was to run as many programs as he could and try and find something it wouldn’t do right. Every other company wanted him to come work for them but they would only assign him the job and the department after he actually got there.

Grad: IBM was different in that regard. How about for yourself?

Joining IBM

Case: When I joined IBM I was hired for the engineering training class and we spent the 2/3rds of the first 9 months at school in a classroom, learning about computers and algebra and digital circuits and stuff like that. There wasn’t a digital circuit around at college. And the other third of the time I spent on rotating assignments in different departments and only after that was done did they figure out where you could go. So I was acquainted with that kind of system and it hadn’t hurt me, but I could appreciate why he thought that it might be a good idea to know what job you would have beforehand.

Grad: That’s a great story. I also applied to MIT and got rejected and went to RPI instead. I never even considered leaving after that.

Case: I have two other MIT stories out of my family; two of my children did go to MIT.

Grad: You actually didn’t consider taking a masters degree after graduating from RPI?

Case: I did not.

Grad: Did you have any issues as far as going in the Army or going into service was concerned; was that an issue at that point?

Case: Yes. In 1959 the draft system pulled my number up. I don't remember the details but I had an option to either take the draft for a 3-year commitment or volunteer to join a reserve unit for an 8-year commitment. The reserve involved a 3-month full time assignment at Fort Dix for basic training and then I was put on a special list because of my professional capabilities. Being on the list meant I was available to be called, but I was never actually called. So my military experience involved 3 months of basic training at Fort Dix in 1959 and 8 years worth of service in a control group with the requirement to notify the military anytime my address changed.

Grad: So you didn't have to go to regular meetings or for summer training or any of those kinds of things?

Case: No I did not.

Grad: Where were you were living when you first went to work for IBM?

Case: Endicott, New York.

Grad: That was when your 1410 experience started?

Case: Yes my 1410 experience was there.

Grad: Were your engineering training and your rotating assignments all at Endicott or did you go to other locations as well?

Case: They were all at Endicott.

Grad: When you joined IBM, did they offer you the most money in 1956?

Case: I don't remember if it was the most, but my salary was certainly competitive at IBM.

Grad: One final thing about family. When did you get married?

Starting a Family

Case: I got married in September, 1956.

Grad: That was right after you graduated?

Case: Essentially right after I graduated.

Grad: And you've been married now quite a few years.

Case: Just over 50. And to the same girl

Grad: Wow. How many children do you have?

Case: 8. We had 4 children in the natural way and then we adopted 4; we essentially raised 2 families out of that.

Grad: Were there major time differences between the two families?

Case: Yes the oldest child was born in 1960 so he's 46 now and then the next one was born in 1961, the third in 1964 and the fourth one in 1968; the first three were boys and the fourth was a girl. By the time she got to be 5, she came around and said she really would like to have a sister. The boys weren't easy on her; she was holding her own but she really wanted to have a sister. We also thought would like her to have a sister but there were two problems. The first problem was if you roll the dice one more time you don't know if you're going to get a sister and the second thing is if you roll the dice one more time, the age difference was going to be marginally too big for close bonding. So we adopted Sarah.

She was a ward of the New York State Department of Social Services. She had been in a foster care facility many different times.

Grad: How old was she at the time?

Case: Well at the time we adopted her she was 5.

Grad: So she was almost the same age as your daughter.

Case: Ellen was seven by the time we got the job done and Sarah was 5; those five children were our first family. And by the time the last of them got to be in high school, my wife Virginia was – easy to say though I don't like all the connotations – facing the midlife crisis, trying to decide what to do now with her life. She has a degree in music and one in teaching and she did do public school music education before we had any children. She's a modestly capable artist in oils so she could have gone back to teaching or she could have done art; she

could easily have done something. But at that point she said, “What I like to do, and what I think I do best, is mother.”

So we thought about that and said there is no reason you can’t be a mother and we were thinking about adopting more children. But we realized there were two problems. First being in our 40s or 50s we were too old and the adoption agencies don’t want older parents to adopt small children. The second problem was that we already had children and they give preference to people who don’t yet have children.

We eventually solved those two problems by first agreeing to take a family group. That was to our advantage because a lot of people don’t want more than one child so that got us past a lot of the things. And the second thing we agreed to do was to take children who had some special need. In this case the special need was they had legal uncertainties due to the fact that although their mother had relinquished her rights but their father wasn’t ready to give them up. Initially two of the girls came to live with us and the youngest one stayed with her grandmother for a while. We took the older two girls as foster children when they were 6 and 4 with the intention to adopt. We got the younger one 4 years later when she was 5. So we adopted all 4 of the girls essentially at age 5.

Grad: How did that work out?

Case: It hasn’t all finished yet; it’s still working but it’s getting there.

Grad: It was a tremendous responsibility that you and your wife took on though, wasn’t it?

Case: Yes.

Grad: During that period, you were very busy with your work; you were involved deeply.

Case: That’s right. I spent more hours with IBM during many of those years and therefore less hours with the family than any of us would have thought optimum but it all seemed like it was what was needed at the time. Economically it has been a success.

Grad: But it’s interesting, that trade off, I’m sure you had the same experience, you get so deeply engrossed and involved in what you’re doing and how important it is and how it absorbs you that I’m sure it gets tougher to spend the time with your family that later on you say maybe you should have?

Case: Well I don't know. I haven't yet had the "holy smoke, I made the wrong decision" reaction and I don't anticipate having it at this point, but it was a decision I made and there certainly were trade offs that had to be made. You can't ever go back and find out what would have happened if you had done something else.

Initial IBM Experiences

Grad: I think it's time to shift now. I'd like to start with your experiences when you began at IBM. What was your first real assignment at IBM after you finished your initial training?

Case: My first real assignment was on a machine that we called the Print Edit Control Unit. It was a vacuum tube machine designed to read information off a magnetic tape which had been prepared on a mainframe computer to control the 720 wire printer which was then the high speed printer of the mechanical printer line. There was a 500 line a minute version and a thousand line a minute version. There were two electrical engineers on that project, Richard Lowenthal and me. Richard did the magnetic tape controls and I did the printer controls and the processing. There wasn't a lot of processing but it was a machine whose logical function was controlled by a plug board. Physically it was a 407 plug board but the wires and the connections didn't go where they went on a 407, they went on places that we had designed. It was a back up project in case the 1401 which was in development at the same time didn't work, or in case the 1403 chain printer didn't work.

Grad: That must have been difficult to work on a project that you thought had at least a 50/50 chance of not ever actually being announced or delivered, is that correct?

Case: Well, it was the first project I was ever on and I didn't have anything to compare it against. But we built the control unit and we built the printer and we got the engineering prototype all the way to the environmental chamber, testing it under conditions of temperature and pressure and humidity and all that kind of stuff as well as the normal environment kind of thing. Essentially we had it ready to announce when the 1401 and the 1403 worked so we didn't need it anymore.

Grad: Can you recall how you felt when the decision was made not to announce it? Do you have any recollection?

Case: No, not really. But I didn't have a big downer, maybe it's because it was obvious why and maybe it's because I don't know. But I didn't have a big downer.

Grad: You finished with that project, it was not going to get announced, now what did you work on next? Did you go right to the 1410?

The 1410

Case: Must have been the 1410.

Grad: You were part of a team on the 1410. Was this a successor to the 1401 or was it a separate pattern entirely?

Case: It wasn't entirely separate, but on the other hand it wasn't a direct successor to the 1401 either, although it might be considered that.

Grad: Was it a replacement for the 7010? I'm trying to remember what the pattern was on that.

Case: Well there was a 1410 that got quite a few copies made and a lot of customers used it so it was announced and delivered. In the 7000 series there was a 7090 and the 7080 which was a 705 or the 7070 which was basically upwards from the 650 and was there a 7010?

Grad: I may be just dead wrong; these series went from vacuum tube to transistors, didn't they?

Case: Right. All the 7000 series was solid state.

Grad: The 700 series was vacuum tube and the 7000 was solid state.

Case: The 701 and the 702 and the 704 and the 705 and the 709 were all vacuum tube machines. And in 1959 plus or minus a year we were all, I don't want to say, shocked but surprised at the edict from Tom Watson Jr. that all the future machines were going to be solid state.

Grad: You were at Endicott at that time?

Case: Yes.

Grad: Were any of the 700 series built in Endicott?

Case: No.

Grad: The 650 was built there?

Case: The 650 was designed and manufactured in Endicott.

Grad: And the 305 RAMAC was built there also?

Case: The 305 RAMAC was designed and most of it built in San Jose.

Grad: Now the 1401 was the new machine at Endicott at that time?

Case: There were two big projects connected with 1401 at Endicott, and it is arguable which one was eventually more significant to the company and the industry. One was the processor, the 1401 computer server, and the other was the 1403 line printer.

Grad: We've had a number of interviewers tell us how important the 1403 was to so many areas.

Case: It was arguably more important than the 1401.

Grad: The 1401 sold a hell of a lot of copies.

Case: I know that but how many of those were due to the 1403? We know a lot of them were but nobody has any good information on exactly how many were.

Grad: The 1403 was also an Endicott project?

Case: Yes right, Johnny Daeger was the Chief Engineer.

Grad: You were a young engineer, but were the conflicts between Endicott and Poughkeepsie, evident to you at that point in time?

Case: Oh yes, of course.

Grad: Can you give me some examples of how that showed up at that early stage?

Case: No, it's hard to give you an example.

Grad: Let me try it a different way – do you remember who was in charge of the Endicott lab, in that period of time?

Case: The Endicott lab director when I first got there, and for a lot of years after that, was Jim Troy. I don't remember exactly how long he stayed.

Grad: But he was there at Endicott.

Case: For the 1410 and maybe the 7070. The 7070 started out to be an Endicott project – that was one of the jobs I had afterwards but I think that was before the 1410. For the 7070 job I was like an ambassador or politician. There were two groups of engineers, one designing the mainframe logic for the 7070 and one putting together the transistor circuits. The project was in some kind of trouble – it wasn't meeting its development schedules, its cost objectives, its speed objectives – and there was a big fight between the logic designers and the circuit designers about which group didn't do what they were supposed to do.

Grad: This is all in Endicott?

Case: They were all in Endicott but one of the ways this was resolved was that the logic designers and the circuit designers were all put together in a big auditorium meeting and told, "You guys are wasting too much time talking and arguing with each other, we're going to stop that; none of the logic designers are allowed to talk to any of the circuit designers and none of the circuit designers are allowed to talk to any of the logic designers. If you have anything you need to know from the other side, you see Dick Case." And for my job I spent the first part of the morning wandering past every desk in the logic design area, had a cup of coffee, wandered past every desk in the circuit design area, went to lunch and did the same thing again in the afternoon and if anybody needed to know anything, they could go through me.

Grad: Weren't you a very young engineer to have that responsibility?

Case: A very young engineer.

Grad: Tell me a little bit about what you did on the 1410

Case: Okay. I was the chief logic designer for the central processing unit for the 1410.

Grad: You were 23 years old?

Case: Something like that. Projects like that in those years were done with a lot fewer people than similar kinds of projects would take in later years. Ron Smith and I, who shared an office for quite a while, did all the logic design. Then we had another group of two or three

people who converted the logic design to physical design, assigned the circuits to print circuit cards and put the cards in the frames and figured out the locations.

Grad: This is preparing an engineering prototype at this point in time?

Case: Yes. This was an engineering prototype and we had another engineer who spent most of her time on heat transfer and cooling to make sure the cooling part of the system worked but what we would now call architecture and the logic design was basically done by two of us on the 1410.

Grad: Did you start from the 1401 as your base? Did you have compatibility with the 1401 as an objective?

Case: Yes.

Grad: Tie that together if you would.

Case: I'm not sure I remember everything exactly right and if Emerson Pugh's books contradict it, they're right. I have a lot of respect for Emerson and he did his research very carefully. We actually had a 1401 mode in the 1410 that would run 1401 programs. The principal problem with the 1401 was it didn't have enough address space. Memories were getting bigger but you couldn't address more. When the 1401 was announced, 4000 bytes was the addressing limit. Eventually, they stole the zone bits from the 6 bit code. Four bits were the decimal number and they stole the zone bits from the units position to expand the memory addressing to 16,000 and after that all the bits were gone in a 3 byte address so the 1401 really couldn't get past 16,000. But problems were getting bigger and the need for more memory was growing by leaps and bounds and so instead of a 3 digit address the 1410 was built with a 5 digit address in the instruction and we figured that would be good forever. Ha, ha, ha. But anyway, we figured it would be good forever.

Grad: That need for that increase in address space was a primary motivator for the 1410?

Case: Yes, that's correct. And there was a desire to use the faster circuits that were now available to make the cycle time faster.

Grad: There were different silicon circuits at this point?

Case: Yes. I think so.

Grad: You were on this team working on the design.

Case: Right, and there was also a desire to make the standard configuration include a random access disc file.

Grad: The 1401 didn't have that?

Case: Well, the 1401 eventually attached a random access disc file but at the time we were designing it I don't think it did. The first engineering name for the 1410 project was 310, which was 5 more than 305, so it was the successor to the 305 although the programming style was never a follow-on to the 305. But we had "310" on the engineering drawings of the 1410, at least on the master data flow diagram, for a long time. On the master data flow diagram there's always a little box that says "clock." We had an image of a wall cuckoo clock on the diagram and the hands pointed to 310 long after the name had changed.

Grad: You said the 305 was done in San Jose?

Case: Yes. That's my remembrance.

Grad: But by this point in time the decision was made that San Jose would not be doing computers anymore and that Endicott and Poughkeepsie would be doing the computers

Case: Sounds right. I don't remember the decision but that's essentially what happened. San Jose did a lot of disc files and disc file control units and stuff like that but not any more computers that I remember.

Grad: How long did you work on the first project that you had, the 1410?

Case: The best numbers are either in my briefcase or on my resume. Roughly, on the Print Edit Control Unit it seemed a lot longer at the time but probably it was 12 months and the 1410 was maybe two years. I really don't know. I have to go back and look at the times.

Grad: We're up to around 1960 then when you're working on the 1410. That's what I was trying to get at.

Case: Right, and Bob Evans was in charge of systems development at Endicott.

Grad: I consider Bob in relation to Poughkeepsie primarily.

Case: He was and when he moved to Poughkeepsie from Endicott he took several of us with him and I was one. He was hired to run systems development in Poughkeepsie by somebody. You can read Bob Evans' history.

Grad: Was Jim Frame there about that time or maybe a little later?

Case: Jim Frame was certainly in Endicott.

Grad: When did you move to Poughkeepsie?

Case: I moved to Poughkeepsie in 1961.

Grad: Let's explore two more things and then we'll go to your Poughkeepsie days. As an aside, you said the 650 was the first machine that sold more than a thousand?

Case: Right.

Grad: How many did it get up to? Do you know?

Case: 1930 is the number that sticks in my head but I'm not sure that anybody has a number that's accurate enough but roughly 2,000.

Grad: The term 'biquinary,' 'quibinary' – what does this mean?

Case: Well, biquinary in the literature refers to a 7 bit representation of a decimal number, 1 out of 5 and 1 out of 2. And so 1 out of 5 and 1 out of 2 you get 10 possible combinations and the weights or the names of the bits were 0, 2, 4, 6, 8, and then the other bit was named 0 or 1 and when you add the two together that's the code. The 650 didn't use that system. They used 0, 1, 2, 3, 4 and 0, 5, so the binary part of it instead of being in the coding system 1 different was 5 different. It makes essentially no difference when you build the circuits. It's just a way of thinking about it.

Grad: It didn't make a fundamental difference in circuit design or efficiency or anything like that.

Case: No, it didn't. It doesn't make a fundamental difference in circuit design or efficiency or anything like that.

Grad: The 1410 was not a big seller if I remember correctly.

Case: I believe that's correct.

Grad: In contrast, the 1401 was an incredibly successful system. And you're saying a significant amount of it may have been because of the 1403.

Case: I used to have these numbers at the top of my head because I put them in a speech once but I think the 1401 was the first machine to sell 10,000 copies.

Grad: That's my recollection also.

Case: And if you run that number up, you get to the IBM personal computer which sold a million or something like that.

Grad: The AS/400 got to the 100,000 figure but I don't think it ever got to the million figure. Bob Patrick has a story on the 1401 about it being used as a controller on various machines and that must have increased the sales of the 1401 as well.

Case: If an external controller means a separate machine for some functions, principally printing, that's absolutely correct. A lot of 1401's were installed for the purpose of doing jobs related to what the mainframe was doing, but separate from it and not requiring the mainframe's attention; printing was chief among those.

Grad: Bob Patrick claims it made a major enhancement in the performance of the mainframe computers when they pulled that function off the mainframe.

Case: That is also true. If your mainframe was driving the printer, the printer was slowing the whole thing down and keeping the jobs per hour low. That's right. That's absolutely right.

Moving to Poughkeepsie

Grad: Now you move your family to Poughkeepsie. At this point you're married.

Case: Yes and have two children. When I came to visit my wife in the hospital after the second baby was born I said, "Guess what? Next week we're moving."

Grad: This was 1961?

Case: Right.

Grad: You now move to Poughkeepsie. Bob Evans apparently had seen you. Did he have anything to do with the assignment you got to be a coordinator? He offered you an assignment to go with him to the arch enemy in Poughkeepsie? Was there any of that feeling at that point?

Case: No. I didn't have any of that feeling. I was somewhat aware of some feelings in the other direction when we arrived at Poughkeepsie and started to try and make some new things happen. There was some level of feeling of who do these imports from the sticks think they are coming in and telling us everything that has to be done, but as far as I was concerned, you just dealt with that. My view was, "Look. I don't have anything against you. All I'm trying to do is I'm trying to optimize the output."

Grad: Had you been involved at Endicott in any business case decisions, any of those kinds of things, or were you strictly working as an engineer?

Case: No.

Grad: You were not in on the economics of the things particularly?

Case: That's right. Not in Endicott.

Grad: You said that you were strictly working on the logic design and with the hardware up to that point.

Case: Yes, that is correct.

Grad: What do you start doing when you got Poughkeepsie? What were your first assignments there?

Case: Logic design of the 7040. There was a little debate to begin with about what it should be called. 7040 is 10 times 704, which is not a reasonable description of what the machine was. 7040 is a downsized or cheapened 7090, which is a reasonable description of what the machine was.

Grad: Did the 7090 come out before the 7040?

Case: Oh, yes.

Grad: The 709 had become the 7090 when they put in solid state transistors?

Case: Yes. Right.

Grad: And now you're building a smaller 7090 in one sense.

Case: Exactly. As a matter of fact, I used to say to potential customers, "We're building the 7040 for people who always wanted a 7090 but couldn't afford one."

Grad: Were you starting to have contact with customers at this point, this early?

Case: Yes.

Grad: So this was a change in what you were doing?

Case: Yes. I don't remember having any real contact with customers when I was in Endicott, but shortly after I arrived at Poughkeepsie I began what was basically a career-long involvement with customers making mostly technical but also technical cum business lectures or presentations. There was everything from one on one with the chief executive of Daimler from Germany to keynote presentations at Share with 3,000 people.

Grad: Your debating skills paid off.

Grad: Did that start right away?

Case: Yes, and it continued year after year after year whether it was directly associated with my then current job assignment or not. I did a lot of that.

The 7040 and 7044

Grad: Talk about your engineering work on the 7040 and then the 7044.

Case: Yes. The 7040 and the 7044 were essentially the same machine with a different main memory. The 7044 had a faster memory technology and so therefore it was faster because those machines were timed to the memory cycle time. The instruction took two memory fetches, one to fetch the instruction and one to fetch the data, just like off the drum only this time out of memory. The logic unit was designed to keep up with the memory but it was locked to the memory and so if you had a faster memory, then you had a faster machine. Now obviously there was a limit to that because if the memory got too much faster, then your logic speed wouldn't keep up with it. But the circuit technologies and the logic speed were chosen to

go with the fastest memory you could imagine being available and then sometimes you would install a slower memory and get a cheaper but slower machine out of it.

Grad: What were your engineering responsibilities in relation to those machines?

Case: Well, on the 7040/44, I was either the engineering manager or second in command. I don't remember exactly the organizational structure at that point. Joe Brown was the project manager for the 7040/44 and he had, in addition to the engineering design responsibilities, some responsibilities for planning and project management and introduction to the customers.

Grad: Did he have any software responsibility, any operating systems responsibility, any of those kinds of things?

Case: No. He didn't have any software responsibility, except to negotiate or ask for it and make sure it was happening. But the software was built by the software department in Poughkeepsie.

Grad: At that point in time, IBM really had two completely separate product lines: business systems and scientific systems. The 7040/44s were in the scientific sequence. The 1401 and 1410 were clearly in the business, commercial sequence. Did you see any difference as a logic designer when you switched from one to the other?

Case: Technologically, there wasn't any difference as a logic designer. However, the instruction set of the machines were noticeably different. The scientific machines always had a built in floating point capability in the instruction set but none of the business machines did. The business machines sometimes had decimal, as in the 1401 and the 1410; they had pretty extensive variable word length decimals. On both the 1401 and the 1410, you could define a field with, just to pick a number, 30 decimal digits and then you could, in one instruction, multiply one by the other and it would sit there and crank until it cranked out the 60 digit product.

Grad: You could get very good precision even on those machines.

Case: Exactly, but it took forever. Nobody declared fields with 30 decimal digits unless they had some unusual reason to do so.

Grad: In the 7040/44 the floating point was the fundamental mathematical process rather than decimal?

Case: Yes, that's correct.

Grad: I have a story from someone who says they were doing accounting work using floating point and of course everything always ended up at 99.99 instead of 100.

Case: Not always but frequently that happens. Occasionally, you'll find that happen sometimes today when somebody isn't paying close enough attention to what's going on.

Grad: You were working as an engineer. You were working now for Brown who is the project manager for the 7040 and he in turn is working for Bob Evans?

Case: Yes, but here was at least one person, Max Paley, in between.

Grad: Evans had a pretty high level job already by that point in time.

Case: Yes, absolutely.

Grad: I remember Jim Frame on the software side, not on the hardware side.

Case: Yes. That's where I remember him and I remember Jim Frame from the early 360 days--

Grad: How long were you working on the 7040/40?

Case: It seems like a couple years, but probably it was somewhat less than that.

Grad: What was your next assignment?

Case: My next major assignment was as engineering manager for the 360 model 60. It didn't become model 65 until after I left. I think I have the 1962 architecture summary sheet in my briefcase.

Grad: You switched off the 7040/44 and then they said they were going to try and do something broader because the 360/60 was not supposed to be a scientific machine, was it?

Case: In order to get things right you have to find the date of the SPREAD Committee report. The SPREAD Committee report was a report from a group that I wasn't involved with. It met before I got into the 360 business, and had concluded that it was both possible and desirable to design one machine that would do acceptably well in both scientific and business applications.

Grad: That could do both floating point and decimal?

Case: And all the other control things.

Grad: My memory is that the report was available in around 1961, but I'm not certain. We can check on that.

Case: Well, that's roughly right. But at the time it was visionary. Everybody in the business thought that scientific machines had enough difference in application requirements that they had to be built differently in order to be maximally effective and that the business requirements were such that the machines had to be built differently in order to be maximally effective. I guess if anybody thought about it they would have said, "Well, I suppose you could do one that did both but you would lose too much and you wouldn't be competitive on either side with machines that had been designed to do exactly that." Nevertheless, the SPREAD Committee, which was partly organized by Don Spaulding and run by Bob Evans and who else? We'll have to dig out the names.

Grad: Was Jerry Haddad involved at that point?

Case: Maybe. Jerry Haddad decided that maybe it should be called the New Product Line.

Grad: That sounds familiar to me.

Case: Something like that. There could be the same architectural machine design across the range, across applications from scientific to commercial, across sizes from small to large, and it was supposed to be downward as well as upward compatible. They would all run the same programs, not at the same speed, but all run the same programs. And so you didn't have to replicate any of the program functions either in operating systems or in application programs for the purpose of getting them to run on a faster or a slower machine. Now it turned out that there were several operating systems built that were sometimes totally different from each other and sometimes derivatives of each other that were necessary in order to fit into memory or fit on disc space or something like that and there was a lot of details but the 360 compatibility idea was one machine line, not two, or maybe three depending on how you count them.

Grad: Historically, IBM at that point in time had something like I think six or seven machine lines, none of which had the same operating systems.

Case: That is correct.

Grad: But you could use FORTRAN across all of them because the compilers were built for all but there was no other real compatibility.

Case: That's right.

Grad: That was an incredible decision by the company.

Case: Well, yes, absolutely, that and the other similar decision, which probably had almost as much effect but I'm not sure people appreciated it, is that all of the peripherals would attach with a standard interface. They wouldn't have to be redesigned for each speed, each machine. The little machine attached the same discs as the big one and all three in between so everything would plug in place. Today that's almost taken for granted. Everything you get plugs into a USB port, but at the time that was a big deal and the importance of it I think is largely unappreciated. But it had at least as much to do with the economic success of the 360 line as the instruction set compatibility.

Grad: If they moved up the line they didn't have to replace anything; they didn't have to replace tapes or disc drives. It was a mammoth change. Do you remember whether that recommendation also came out of the SPREAD Committee or not?

Case: I think so. My remembrance is that it was part of the report.

The System/360

Grad: Pretty impressive. So you went off the 7040/44 and were asked to work on the 360/60, which was toward the upper end of the line, wasn't it?

Case: Yes, that's correct.

Grad: This is around 1962?

Case: Yes.

Grad: Who were you working for then and what was your assignment?

Case: I was working for Pete Fagg and I was the engineering manager on the model 60 or 60 and 62 because we had another one of these two different memories.

Grad: You're still less than 30 years old?

Case: Yes. And then I wrote the memo that caused my first big career change, which I have with me if you want to look at it.

Grad: I would like to. We'd love to have a copy if you're willing to give it to us.

Case: Yes, at this point I'm willing to give you a copy.

Grad: Tell us about that.

Case: I was three months on the job and I wrote a letter to my boss, Pete Fagg, telling him what I thought of those three months. Basically I wrote a catalog of problems, a catalog of things that weren't quite working right and that didn't quite fit and the difficulties we were having and all that kind of stuff. There was a paragraph in it that says basically some version of "But I think we'll get over all those things. Where the problem really is in this business is in software. Those guys are really fouled up and are getting nowhere."

Grad: Do you remember who some of the people in software were at that time?

Case: Bob Ruthrauff was in charge. And something like six weeks later, as I remember it, Fred Brooks, who was Pete Fagg's boss, walked in to my office and laid the memo on my table. I didn't even know he had a copy; I didn't send a copy to him. He laid the memo on my table and said, "Since you seem to know about this, how would you like to go work on it?" And I said some version of "I'm happy here, thank you," and I think he said, "Well, it's more important for you to go work over there." And I said, "What do you mean, it's more important? And he said, "Read your memo."

Grad: Brooks was a good salesman besides everything else.

Case: Yes, indeed. So I became, by appointment not by experience, a software engineer.

Grad: Were you working directly for Fred at that time?

Case: In 1962. No, not quite. At that point I don't remember who I was working for. Maybe Bob Ruthrauff was my second line manager at that point.

Grad: You did become part of the group?

Case: I became part of the group. They were under so much pressure to try and get the 7000 series operating systems and languages and compilers and so forth under control, hey

were spending most of their effort on that. But one problem was there was hardly anybody assigned to this New Product Line.

Grad: They were still enhancing and working with the 7000 series?

Case: Oh, absolutely. One of the things you can't do is stop the old train while you're getting the new train ready. And the balance of about how much you work on the old and how much you work on the new and where you put your efforts and all that kind of stuff is a problem that existed all the time and still exists in the business.

Grad: Here we have people, engineers, software people, who are working on both the support of the 7070, 7072, 7074 series.

Case: And on the 7080, 7090s, yes.

Grad: And they were also working on those new machines?

Case: Yes. Actually, there weren't very many people that had joint assignments.

Grad: Individuals were on one or the other?

Case: Yes. And one of the "gee whiz" stories is that one of the first things we had to do was to support the cost estimate for the business case for the 360. Gul Hira and I sat down to try to do an estimate of the cost of the programming systems. This was before there was any real design but similar programming systems had been done for the last five machine generations and we had some facts about that and we knew what the objectives were that were different from those so we didn't just start from scratch. We didn't think that we were just reaching into the air for a number but that's what we basically did. And the net result was we said the software for the 360 was going to cost $100 million.

Grad: That was a big number for the time, wasn't it?

Case: It was terribly big. Management massaged it and came back and said, "You're off by a factor of 3." So we put $33 million in as the cost estimate to justify the business case for the product. They were right. We were off by a factor of 3, but the other way. Fortunately, the revenue was also low by a factor of more than 3.

Grad: You mentioned being on the System/360 architecture committee. Did that start right away or was that at a later point in time?

Case: That was in process when I got there.

Grad: You then became a part of that?

Case: Well, I wasn't on the architecture committee after I got the software job.

Grad: My question was whether that was the first time they were trying to bring both the hardware and software together from an architectural standpoint.

Case: One of the things that I was able to do as a software manager was I was able to get several of the problems that had been plaguing the software guys about the machine design fixed to their satisfaction when they hadn't been able to get that done before.

Grad: We've now reached the point where you're now assigned working a couple of levels down for Fred Brooks on the software side of the 360.

Case: Well actually at the time I got to the software side, Fred was not in charge of the software side; that came slightly later.

Grad: But he had been the one who had approached you about working on it?

Case: Yes.

Grad: Did Fred come from the hardware side do you know?

Case: Yes, he did.

Grad: So you're working for the software people and in effect bringing over this hardware knowledge. Do you remember what your first assignments?

Case: Planning, organizing, estimating, and trying to deal with objectives.

Grad: You said that you had to help determine the cost factors that were going to be used in the business case.

Case: Right.

Grad: Were you involved in design issues on the system software side, discussions of what needed to be done for the systems software?

Case: Yes.

Grad: This is in the 1962 - 1963 time frame?

Case: Right.

Grad: Had the decisions been made then as to the nature and kinds of operating systems that were going to have to be built for the 360?

Case: They were made once a quarter.

Grad: Did the plans change once a quarter as well?

Case: Yes.

Grad: Was the basic idea of two levels of operating system already in the works at that point or did that come later?

Case: Two levels came fairly early. What resulted in maybe 3 or 4 levels didn't come until later.

Grad: My memory is there was a Tape Operating System that was delivered fairly early?

Case: Yes.

Grad: And there was one other one that was delivered fairly early, I've forgotten what that was, but they were long before OS and DOS got delivered if I remember correctly.

Case: You may be right and people had different names for different things and I'm not sure I remember all the details. There was certainly a Tape Operating System which was fairly early. DOS [Disk Operating System], as I remember it, was not too much later and it was largely a part of the same development effort and development group; both of them in Endicott and the OS versions were Poughkeepsie.

Grad: My memory is that there was a Compatibility Operating System; do you remember that one?

Case: No.

Grad: And then there were emulators of various kinds that were built.

Case: Yes there certainly were emulators of various kinds that were built for some but not all of the machine types.

Grad: At that time, those of us in the Data Processing Division were very concerned. We had a whole bunch of applications we had put together and we were concerned about how they were going to run; we had built them for other machines. There were lot of scientific applications, we'd done linear programming, we'd done a number of things and we said "How are these going to run on the 360 before we have time to build the new programs." Were you involved in any of those kinds of issues or did you focus differently

Case: Well, those were part of the motivation for studying and then later delivering several of the emulators of the prior machines because that was one way to get access for those applications or programs, but not just the ones that IBM had built but also the ones that many of the customers had built.

Grad: But that was not a specific area that you were working at that time?

Case: Not in the software business, that's right.

Grad: What I'm trying to get is that you obviously ended up getting involved heavily in the OS/360.

Case: Yes.

Grad: I'm trying to see how you transitioned from being part of the software team to being a major player in the OS/360. Can you describe that?

Case: I don't remember that much. During my very early time in the software business I was doing sort of total system planning, specification, objectives – whatever word you want to use. I was also doing cost estimates, figuring how many man years it was going to take for this and so forth. My first job when we got enough people to start writing some code was to be in charge of the language processors. I don't remember all the people, but Tom Ragland worked for me and was in charge of the assembler and somebody else who worked for me was in charge of the FORTRAN compiler and somebody else worked for me was in charge of SORT

Grad: And you had COBOL?

Case: COBOL and RPG; at least those.

Grad: Were those all being done in Poughkeepsie?

Case: Some of them were being done in other places; some of it was being done in Hursley, England and some of it was being done in Boeblingen, Germany. And some of it was being done in San Jose but I don't remember exactly at this point which was done where.

Grad: When was the actual announcement?

Case: I was in my new assignment before the April 1964 announcement. Maybe it was in the fall of 1963. I'm trying to match when Fred Brooks left the systems and hardware management business and came over to spend full time on software and I think maybe that was even after the announcement, although I'm not sure.

Grad: We'll find out when we interview Fred Brooks.

Case: Fred had planned and had agreed with the University of North Carolina executives to start a department of computer science there. I think they first called it Information Science at the University of North Carolina in Chapel Hill. He was scheduled to start in fall of 1963 or 1964 and I'm not sure I can pick which year is correct. And Tom Watson prevailed upon him to spend another year with IBM getting the 360 out in a reasonable way and Fred struck a bargain, said "I'm going to try and do both, I will work one week a month in Chapel Hill and I will work three weeks a month in Poughkeepsie and in order to make that work I need a deputy." The title of that position came to be known as assistant manager and he picked me so I got taken out of my language processor job and made assistant manager for all of 360 software.

Grad: And you're still not even 30 years old?

Case: That's about right. That would have been 1964; I was born in 1935 so I was about 29. We successfully made work something that had never been tried before as far as I know, but was tried a couple of times later and failed. But we successfully made it work. We had a two person, one job office and the appointments that we had for people to see us or for us to go see people never specified which one was going to show up. We didn't have a division of responsibility by task; we had a division of responsibility by who was available and what was most urgent and we made it work.

Grad: That took a lot of courage for Fred to try that.

Case: Yes it certainly did, it certainly did.

Grad: And it indicates the level of confidence you had built up in that relatively short time though.

Case: Yes.

Grad: That's quite a tribute to you.

Case: Well to Fred too because his successor did not want to continue that relationship.

Grad: Did Fred come out of a hardware background, primarily a systems background but not software?

Case: That's correct.

Grad: Nor did you.

Case: That's right.

Grad: And yet the two top people heading up the operating system development work were not software people; that fascinates me.

Case: But all the rest of the people had software experience.

Grad: Yes, but the two top people didn't. I think that the fact that the two of you made it work is a tribute to both of you.

Case: We spent an hour every day that he was in town, just the two of us in the office talking about whatever was on the agenda. Each of us kept an Action Log on yellow paper pads; we called it the A Log. On it we recorded everything each of us did every day. If I didn't know what Fred did the day before, I could go back and look at his A Log and see what he did and he could look at mine and see what I did. We got to the point where we thought alike and we did things alike. Fred will tell you the stories better than I can because it happened to him more than it happened to me. But somebody would walk up to Fred and ask a question about some technical deal and Fred would just off the top of his head say "Well blah, blah, blah, blah,

blah." And the reaction would be "that's almost exactly what Case told me five minutes ago and I know you haven't talked to him since then."

Grad: That's a wonderful story. It's amazing that you built up that kind of synergy so quickly.

Case: It worked and as a result Fred could spend a week a month in North Carolina and the organization basically didn't have to pay for him.

Grad: How long did this dual management continue?

Case: About a year.

Grad: And what happened at the end of that year?

Case: Fred left and went full time to North Carolina.

Grad: But OS/360 wasn't delivered until when?

Case: It was first delivered in 1965 but late 65, yes that's right.

Grad: Did he leave before that?

Case: Yes he did, I think he left before the delivery actually happened.

Grad: Were you then appointed as the Director?

Case: No, no.

Grad: What happened then?

Case: John Fairclough was appointed to replace Fred and John was not comfortable with the joint assignment so I went to Kingston and became programming center manager in Kingston.

Grad: So there was a discontinuity in that sense, that neither you nor Fred were still there?

Case: No more discontinuity than there ever is in a management change.

Grad: My recollection in reading Fred's book "The Mythical Man-Month" is that the time and the cost were far greater, certainly greater than what management had put down but even greater than what your original estimates were.

Case: Yes.

Grad: It was a much more complex task then anyone had ever tackled before as far as I remember.

Case: Yes that's certainly true.

Grad: And the total cost you've said was in the $300 million range?

Case: It depends on when you stop counting. I mean you can say the total cost is several billion dollars by now.

Grad: Because it has continued, of course. But at that time we were talking hundreds of millions?

Case: Yes.

Grad: So it was clearly the most expensive system software for a commercial machine that had ever been done?

Case: Yes.

Grad: How does it compare to SAGE or some of the things like that?

Case: It was more expensive than SAGE.

Grad: Did the fact that OS/360 was not available when the machines were first delivered have any significant effect on the acceptance of the 360?

Case: Sure it had big effects.

Grad: Weren't Fred and you under tremendous pressure because of that?

Case: Yes.

Grad: From whom and how did you respond?

Case: I don't want to answer that question. There was one incident that I remember. I don't know what the subject was anymore, but there was a letter to Fred from George Kennard who was then Division President in charge of this operation and he was attempting to deal with one of those problems. He said "Da da da da da da da, here's what you have to do." And Fred wrote a letter back that said your instructions are very clear but before I go do it, I have to ask you to reconfirm because the effect of doing that will be da da da da da and da which were a whole bunch of things that nobody wanted. We didn't hear back for two weeks and when we heard back Kennard said, "Go ahead and do what you think is right."

Grad: So Fred had the ability to challenge instructions. Was he directly hooked to Tom Watson or anybody? Did they have a rabbi or a mentor who was carrying the weight?

Case: I really don't know; you'll have to ask Fred that.

Grad: I think it is worth exploring with him because in his book he talks about the pressures on him to hire more people.

Case: Yes right.

Grad: And he resisted by saying "That won't get it done any faster; it'll actually get it done slower." And very few organizations, when you're spending this much money and it's your most critical product, will sit still for the current management continuing to run a thing like that; that's what I was trying to understand.

Case: Fred probably knows better about that than I do. My remembrance of those years is that I didn't feel myself pressured with all those kind of things, I was just coming to work every day and having fun or coming to work every day and fixing the next most important problem on the list that looked like it was fixable.

Grad: So you were very much operational in that sense?

Case: Yes.

Grad: And was he sort of handling the upward communication?

Case: Well yes, I think that's pretty true. It was later in my career on some other subjects that I had the job of dealing with the IBM Boardroom.

Grad: You've given us a document that was published in ACM in 1978 on the Architecture of the IBM System/370. Were there any similar documents that you ever published on the IBM 360 architecture?

Case: No.

Grad: So in 1965 the product is released, the OS/360 is released and people are ready to use it for regular applications.

Case: Yes.

Grad: And Fairclough comes in and you leave. Were you offered something else to stay in Poughkeepsie or did you choose to go to Kingston on purpose? How did that work out?

Case: I don't remember exactly how it worked out. It was quickly apparent to me, and probably was to John Fairclough before he came, that he wasn't going to run the office the way Fred and I had been. I don't think I had anything to do directly with the suggestion, but pretty soon somebody came around, it was probably John, and he said we want you to go to Kingston and run the Kingston Programming Center, and I said okay. That has been the way I got every job I ever had in IBM – I haven't tried to make a change; I had a lot of different jobs but I didn't go searching for any of them; they came to me.

Grad: Your family had moved with young kids and you had more children while you were there in Poughkeepsie. And then you were asked to move to Kingston. Did that require a physical move for the family?

Case: Yes it did; we stayed there for a short period of time, but we did move.

Grad: So you went to Kingston and what happened after that; what did you do at Kingston and what happened after that?

Case: Well, I ran the programming center in Kingston. We delivered, I forget all the major products, a couple of them were the 360/50 and the 360/65 emulators of the 7070 and 7090 and there was some kind of a teleprocessing monitor or teleprocessing subsystem.

Grad: Were they involved in communications already at that point in Kingston?

System/370 Architecture

Case: Yes. The next thing that happened wais that Hank Cooley, who was a division vice president, hired me to run the architecture job for the 370.

Grad: And where was that, in Poughkeepsie?

Case: That was back in Poughkeepsie.

Grad: Did you actually move back again then?

Case: Yes, oh yes.

Grad: Your wife Virginia must have really loved that, I would think.

Case: She was a trooper.

Grad: So you moved back within a year or so?

Case: Yes, something like that.

Grad: So you went back to Poughkeepsie and at that point I would guess it was 1967?

Case: Something like that.

Grad: Had they already decided that they needed a successor machine? Was this when there was the debate between the 8000 series and the 370?

Case: No, the 8000 series was the project that was cancelled in 1962 that Fred was in charge of. The SPREAD Committee report was the motivation for canceling the 8000 series and starting NPL which became the 360.

Grad: So that was a transition point. Had Fred had been involved with the 8000 before that?

Case: He had been in charge of it.

Grad: And that was cancelled and yet he was moved over to the 360?

Case: He'll tell you that story; he did tell it at the 40th anniversary of the 360 at the Computer History Museum and he told the story about the guy who defeated him, who then came to him and wanted him to run the project that won.

Grad: Well, that's one of the wonderful things in IBM that something like that could have happened; it was not unusual.

Case: Yes it happened in a lot of cases in those years, it may still happen, I don't know. I've been gone for 10 years now.

Grad: The loyalty was to the company and what the company needed to do to some extent.

Case: The phrase that I have used, I'm not sure it's mine, maybe it is – is to reward the winners and support the losers.

Grad: But the fact is that you then can work on the project which "beat" you. In many companies people would be so mad that it would not work.

Case: Well it was unusual at IBM too for it to happen that directly. Usually there was a period of penalty box jobs or something like that before you come back.

Grad: That's a term I remember, that you can be in the penalty box for some period of time.

Case: Right.

Grad: But I think in this case it wasn't that he was not doing a good job on the 8000.

Case: No it was not.

Grad: But it's just there was another concept that had different and new technology that made it possible. I think that was the difference to some extent.

Case: Yes, I think it's probably important to note that there was a technological component of the success of what Bob Evans used to call it his "unicameral machine." He was from Nebraska and they have a unicameral legislature in Nebraska which is the connection. But the emergence of several technically realizable and feasible implementations of the read only store was what made all the 360 line work.

Grad: Please explain that.

Case: Well the small machine, the model 30, had a data flow and control system of less than 10,000 gates – nobody thinks of building computers these days with less than 10 million – but it had less than 10,000 gates and a hundred thousand bits of microcode. It was the bits of microcode that enabled the rich instruction set of the system 360 to be implemented without a physical cost that would have made the model 30 uncompetitive. And the same thing was true all the way up to the model 75 which did not have a read only store with microcode. It was a conventional hardwired control section.

Grad: The model 20 which was considered part of the line was not a compatible machine?

Case: It was not. It was family related but it was not compatible until 3 years or 4 years later.

Grad: It was intended for smaller businesses?

Case: Right. It was intended to be something related that was even cheaper.

SDD Director of Architecture – System/370

Grad: When you went back now in Poughkeepsie, you were Director of Architecture in the System Development Division. Was your assignment the System 370 at that point in time?

Case: Yes.

Grad: Talk about what the nature of that job was, what you were doing. Were there a lot of people working for you?

Case: There were not a lot numerically. I was on Bob Evan's first team in those years and we would have division management meetings once a month, rotating around to the various different laboratories. So we got to every laboratory twice a year and were involved in essentially every technical debate and technical decision that was made, not just the architecture of the 370.

Grad: Others as well?

Case: Right. All the peripheral devices and the software components and the technology choices.

Grad: So at this point you really had brought together a wide range of experiences both in computer hardware, peripheral hardware, system software, languages. You had really done a lot of things.

Case: I didn't do a lot in peripheral hardware directly. As part of the division management team I was involved in a lot of those projects and from time to time I would be selected either as an individual or part of a team that would do project reviews at major checkpoints or major decision points on various projects, some of which were peripherals and some of which were technology. I don't remember the exact years, but I got involved in the technology review of what are we were going to do with the Josephson junction program and what were we going to do about magnetic bubbles and what were we going to do with the super high end machine, the ACS machines in San Jose and Menlo Park. And so I got an exposure to and an involvement in a lot of those kind of projects, even though I had no direct responsibility for them.

Grad: When you picked up that breadth of knowledge, you do gain an ability to balance and see things as a whole. On the software side at this point, was Jim Frame there in Poughkeepsie?

Case: I don't think so. I don't remember it that way; I remember Jim Frame in Endicott.

Grad: But I believe he ended up in Poughkeepsie because Earl Wheeler ended up working for him at some point in the 1969, 1970 time frame. Watts Humphries ended up in there somewhere along that line too.

Case: Well, I worked for Watts Humphrey for a while.

Grad: In Poughkeepsie?

Case: Yes, I was in Poughkeepsie; I think his office was in White Plains.

Grad: These were some of the players on the software side. When you were dealing with architecture, did it include both hardware and software?

Case: Yes.

Grad: And peripheral interfaces?

Case: Yes.

Grad: So it was the whole thing; the architecture was no longer separated there?

Case: Right.

Grad: Was there a particular motivation for the 370 other than IBM needed a follow on machine? Was there anything that triggered it particularly?

Case: Well there was the emerging technology change from hybrid individual components in the circuitry to integrated circuits where they're on the silicon chip and the 360 to 370 is that technology change.

Grad: One of the things that come in during the late 1960s was timesharing and Watts Humphrey took responsibility for selling the 360/67 into that market place.

Case: Right.

Grad: Were you involved in that in any way other than as part of the management team?

Case: No, only from the outside. The software chief was Scott Locken who had done the control program part of OS/360 and was ready to do the total job for timesharing.

Grad: I'd heard the story at one time and I don't know if it's accurate, that one of the motivations for the 370 was to provide a built in mechanism for timesharing with a DAT box. Is that a valid story?

Case: There was a dynamic address translation version of the 360/65 that was built, the 360/67, but on the 370, all the machines had that capability.

Grad: I've been told at least in one of the interviews we did that with the people at National CSS who picked up the VM/CMS capability that the DAT box was a very critical issue that they said was needed.

Case: If you're going to build that kind of an operating system you have to have the hardware underpinnings that does the dynamic address translation; otherwise you can simulate it if you want but you shouldn't.

Grad: Follow one more step. I'm trying to now discuss the economic factors. When you're looking at architecture, looking at a whole new line of machines, you had to be concerned about

the business case and the timing as to when it should be announced, because of what it would do to the 360. Was that a part of your assignment?

Case: Not directly.

Grad: Then you were just as part of management?

Case: Yes. I saw what was going on and I had comments about it and sometimes I was asked questions about it, but I didn't have any control over the conclusions that were being made.

Grad: One of the issues that had been raised was that the timing of the 370 was pushed up a bit because of some of the competitive issues, pricing issues and things like that. But that was not something that affected the schedule? You went ahead at your own pace?

Case: Well, the pace was always influenced by the viewpoint of what the competition was or was expected to be and what we needed to do in order to be successful against that.

Grad: But was there ever a point in time where all of a sudden you were told push it up because you had to get ready sooner?

Case: It happened frequently.

Grad: I see.

Case: And sometimes we would say alright, I think we know how, here's what we need, but at other times we would say sorry and let me tell you why that can't happen. If you had known that 6 months ago as you now say, you should have said it 6 months ago.

Grad: I'm looking now at the ACM article that I referred to which was published in 1978; you're a joint author on that Andris Padegs. What was his association with you?

Case: In 1962, when I think I first met him, he was working for Gene Amdahl and Gerry Blaauw on the details of the 360 architecture. When Gene Amdahl left the project and Blaauw left the project, Andris became chief architect and he reported to me during the 370 era as the person most responsible for actually writing the architecture document. Andris is one of the largely unsung heroes of the 360 and certainly of the 370 project. The system still has the reputation that the precision of its written specification, the architecture, is the best in IBM and

even the best in the industry. And to a large extent, Andris is personally responsible for making that happen and he was for 20 years.

Grad: Did he stay in STD all that period of time?

Case: Yes, whatever the organization's names were, he had that function.

Grad: I'm looking at this report and it's probably 30 pages at least and it describes in great detail what each of the individual elements were; it's very clearly written and we're going to make a copy of this available as a reference to your transcript.

Case: Fine.

Grad: So we won't need to go into that level of detail. But I would like to ask you what you consider some of the most important ideas in the 370 versus the 360. You worked for three or four years on the system 370 architecture?

Case: Yes.

Grad: Was there a major change in the operating systems with the 370, or were you pretty much able to use and upgrade the existing operating systems?

Case: Eventually there was a major change, but it didn't come all at once, as I remember it. But the 370 added dynamic address translation everyplace. Then the operating system could assume that it was going to have it. It wasn't a special TSS version of the operating system that assumed it had it. It was everything. There was an expansion in memory available on the models. Someplace in there, there's the beginnings of the address expansion beyond the 24-bit address the 360 had, that has continued for two or three different extensions until now, you can get a 64-bit address machine. There was modification and generalization of the I/O structure, so that the idea of a channel was less architecturally and more dealt directly with devices, although there really was a piece of channel hardware in between. And some protection improvements and a bunch of individual instruction improvements and I'm not sure what all else at this point.

Grad: Everything that had been done for the 360 was upward compatible to the 370?

Case: Yes.

Grad: That was a design criterion, I assume.

Case: Yes, that's right.

Grad: Not the other way around, though.

Case: No.

Grad: You didn't have downward compatibility. You couldn't go back to 360 with new 370 stuff.

Case: That's correct.

Grad: Did you ever get involved at this point with the PL-1 developments, things like that? The language area, or was that not a central point for you?

Case: I had a fair amount to do with the initial PL/I development, then sat in on the final language development committee debates before PL/1 was announced and before the first compiler was delivered.

Grad: Somewhere along the line, my memory is that some language was used to specify the architecture. Does this strike any responsive chord to you? It wasn't PL/I. There was something else that was done.

Case: There was a specification of the 360 architecture in what was called APL.

Grad: Ken Iverson's A Programming Language.

Case: Ken Iverson's APL. Done by Ken Iverson and Ed Sussengeth and published fairly early, but it wasn't used in the development process. It was an after-the-fact documentation or an after-the-fact simulation.

Grad: Did you use anything like that when you did the 370? A "mathematically precise specification"?

Case: No.

Grad: Is there anything else on the 370 that you think was particularly notable in terms of the changes?

Case: We've talked about the technology change from the hybrid circuits to the integrated circuits. We talked about memory size expansions.

Grad: You didn't have to use TSS or VM/CMS, but was there another timesharing-like capability that was used for the 370?

Case: Well, VM/CMS was the precursor to VM/370. Then there was a whole sequence of operating systems.

Grad: My memory was that IBM was sued by ADR for "giving away" some facility that was built into the operating system that they claim was preventing them from selling an independent timesharing capability. Marty Goetz was the one who was involved in that. Anyway, we won't pursue that at this point. TSO was IBM's timesharing option, isn't that what it was called?

Case: Yes, that's one of the things that those letters mean.

Grad: I don't remember if that was part of 370 or not. That's what I was trying to recall. It's not something that strikes you?

Case: It certainly was part of 370. It might have been started even earlier than that.

Grad: Obviously, IBM's TSS was a total disaster in many respects. It took forever and only 10 customers, I think, ended up using it, if my memory serves me correctly.

Case: Many more than used HyperTape.

Grad: In contrast, VM/CMS and its successors ended up becoming a primary tool for timesharing in IBM.

Case: Yes. Of course, the primary tool now on that class machine is just OS itself, or whatever the current name of it is.

Grad: At the end of 1971 you got a new assignment as Director of Advanced Systems?

Case: Right. It's the start the FS project.

Grad: You were still in SDD or whatever it was called at that point?

Case: Yes.

Future Systems (FS)

Grad: Now let's talk about FS [Future Systems] and where that came from and what were the objectives and so forth. That is not written up anywhere that I know of.

Case: No, it's not. No, it's not, although I brought along a retrospective presentation that I created in 1975.

Grad: Is that something we can have also?

Case: Yes, I might as well. Why not? Take it. What can they do to me anymore? They can't anymore claim that they have any economic harm to having that published.

Grad: I agree with you.

Case: And there's nothing in it that would disparage any individual, so we don't have that problem.

Grad: Talk about how this came about.

Case: Okay. FS comes about at the end of the 1960s, when the 370 had been announced. But it's apparent that acceptance was below expectations. The review of utilization of installed capacity around the users showed that the installed capacity was at record levels above the demand.

Grad: There was a gap.

Case: There was a large gap between what was being used and what was installed. Therefore, the projection for what was going to be sold in the future was low. It was typical economic analysis. The next piece of the environment was that Jerry Haddad had just finished doing a review of silicon technology and its future and concluded that the cost per circuit of logic and the cost per bit of memory, both in silicon and nonmagnetic storage devices, was going to zero faster than it could be measured. A quick, almost literally on the back of an old envelope, calculation said that if we designed and introduced a System/380 series with the characteristics that each of the machines in the System/380 line would use as much more logic gates and bits of memory and magnetic recording surface and so forth as the 370 was over the 360.

Grad: Normal progression.

Case: Straight line progression, 360, 370, now 380 and the utilization of the technology, which people generally believed we could do. We could design such a set of machines. If the customer acceptance of the 380s had been in the projected--not current--relationship from 360 to 370, which was supposed to be bigger, but wasn't yet, to 380, which nobody believed could possibly happen in those years. And if the markup from cost to price could be doubled from the 370 and nobody believed the competition would ever let you get away with that. The result of that was that there was still a declining revenue stream.

In 1970 or 1971, a declining revenue stream for IBM was nearly as bad a thing as you could imagine. IBM hadn't had a declining year in revenue that anybody could remember, probably since 1920 or something like that. Something had to be done. We needed to design a machine, a line of machines, that would use up all the bits and megabytes that were projected to come out of the technology engine and yet would make it so much easier for customers to use to put new applications on and new uses where they would not be constrained by what was available. And the usage would dramatically increase enough to cover all that extra power.

So we needed to figure out how to use all those bits and megabytes and figure out how to make it enough easier to use that the customer's programming staff would have five times more productivity. Those arguments were strong enough to start a major development program.

Grad: Were you involved in the reasoning to get to there, or were you brought in afterward?

Case: No, no. I was involved in the reasoning to get there.

Grad: Were you presenting to the board or where was this?

Case: I wasn't doing the presentations at that point. I was behind John Opel's desk. He was the outside man until it got started. Then I was the inside guy.

Grad: At this point in time, this was when Tom Watson, Junior, finished his term?

Case: He may have finished before then. It might have been Van Learson at that point.

Grad: It was probably Watson in the late 1960s and then Learson about this point in time?

Case: Yes, I think Learson was the chief executive when this thing started.

Grad: So there was top of the company support for this major new effort?

Case: There was more than top of the company support. There was top of the company motivation to figure out how to get it done. It wasn't something that started at the grassroots and said, "Help. Here, we know how to do this and we need support" kind of thing. It was, from my point of view, a top down requirement that something like this be done.

We were pretty confident we could build machines that used lots of MIPS and megabytes. We were not nearly so confident that we could make them easy enough to use that the programming productivity would be up by a factor of five or whatever it needed to be.

Grad: In 1969, IBM unbundles its software and separately prices it. Also in the beginning of 1969, IBM gets sued by the Federal government for monopoly practices. Did either of those things have any effect on the decision to start this Future Systems project?

Case: Not that I know of.

Grad: They were responses to a perceived gap in capacity versus demand?

Case: Right.

Grad: And a concept which you have stated, to fill that gap with a much more efficient way to program applications?

Case: Right.

Grad: Now, when did you first get the assignment? How were you given that? Was it another one that came into your lap without your trying for it or did you try for this one?

Case: No, I didn't try for it.

Grad: Did Opel ask you to do the job?

Case: I was going to say I don't remember him doing that, but as I remember the circumstances, he might well have. I don't know.

Grad: So you're asked to be Director of Advanced Systems and you're still part of STD.

Case: Yes.

Grad: Who did you effectively report to at that point in time?

Case: I reported to Ted Climis.

Grad: Ted wasn't at Corporate Staff at that point in time?

Case: No. Ted was head of the programming department in STD.

Grad: He must have been interesting to work for.

Case: He was.

Grad: He was what, 6'6"-6'7" or something like that.

Case: Something like that, right.

Grad: I worked with Ted on the unbundling task force for software and he would fill up chart after chart after chart and then start talking. I don't know how you coped with that. I had a great deal of difficulty doing that.

So you reported to Ted. Did you get to create your own staff?

Case: Yes.

Grad: How did you go about this? Tell me about it.

Case: I got to create my own architecture and systems planning staff and then the project got assigned engineering development staffs from Poughkeepsie and Endicott.

Grad: Was Raleigh in the picture by this point?

Case: Well, yes. I don't remember the details, but there were some Raleigh people and there were some from Europe and so forth.

Grad: So it was quite a mixed bag of people.

Case: Yes, yes it was quite a mixed bag. And it wasn't all about the CPUs. The project started or at least was the name under which several technological developments were started that turned out to be very successful. One was the 64 Kb memory chip out of Burlington in SAMOS technology.

People complained later should have been CFET. And later it was sort of accepted and proven it should have been CFET, but the 64 Kb memory chips built out of SAMOS were a generation ahead of where the rest of the industry was when they came out. When the 64 Kb chip was in full production in IBM, the industry standard was a 16 Kb chip. We also started magnetic recording activity in San Jose. I shouldn't say we started it. It was started under the banner that it was for FS. It would have been a good idea, even if FS hadn't been there, so I'm not trying to argue that FS caused it.

Grad: But FS gave cover to a lot of things that were important.

Case: Yes, right. FS Gave a name, at least a visible cohesiveness and connectedness to a lot of technology developments, principally in silicon and in silicon memory and in magnetic recording that turned out to be very valuable.

Grad: Independently.

Case: And all of which were used in the product line and made money, even well after FS was declared a disaster. There weren't any machines built to the FS specification.

Grad: Ever or at that time?

Case: Ever.

Grad: How about the later work on System/38 and AS/400?

Case: Yes, you can count that if you want to, but that was not so direct.

Grad: What was your work at that time? You were managing this fairly substantial team but where were you located?

Case: I was located in the 705 building in Poughkeepsie.

Grad: Where was the team doing the work on FS? Were they in one location?

Case: No, no.

Grad: Were they all over the country?

Case: They were all over the country. There was a processor development team in Poughkeepsie under Nick Donofrio, who is still senior VP for technology or whatever and must be getting ready to retire. He later went on to run the development and manufacturing organization in Burlington in semiconductors and now is a corporate executive, has been for years. There was a processor team in Endicott under Al Magdall. Jim Frame was in there someplace doing something.

Grad: Earl Wheeler was involved, I think, wasn't he? He was maybe at Endicott by that point or took over Jim's job in Poughkeepsie. One of the two. Somewhere there was a switchover that took place.

Case: Yes, yes. I remember.

Grad: My concern is do you think the fact that these people were not in a "skunk works," together in one place, had a negative effect upon the ability either to "solve the problem" or "solve the solution"?

Case: It would be nice to say yes, but I don't think so. At the time I felt that the distributed operation was essential, because there were too many people involved to have them in one place.

Grad: You weren't pushing to say, "Hey, for God's sake, let's bring the top ten people together and let's all work here quietly" or something? You weren't looking at it as a "skunk works" operation?

Case: No, no, no. That was not my model of how to get it done. It might have worked better. I can't tell you.

Grad: We'll never know.

Case: That's right.

Grad: You started by saying that the most important goal was the programming and productivity goal.

Case: Yes.

Grad: If you could get the programmers to be five times more productive, you could fill the capacity that you could produce. How did you address that issue?

Case: The words that we used at the time were more like ease of application development, rather than programmer productivity. But effectively, that's the same. That's two different ways of expressing the same goal.

Grad: One tends to be programmer methodology. The other tends to be the whole structure of the system.

Case: Yes, right. And we tackled that by having some of the same kinds of ideas that the System/38 introduced. That is, the database system was built into the operating system and even more uniform application, language, subroutine, interchangeable parts kind of idea and every part can be used in any environment or in any set of circumstance.

Grad: Did it have components or something like software components?

Case: Yes.

Grad: Was that part of the idea?

Case: Yes, right. That's part of everybody's way to do software. That's part of the way software's been done since software started, you can think of a subroutine.

Grad: Subroutine was the terminology, of course.

Case: Exactly, right. A lot of brand new programming methodology presentations amount, when you finally get down to it is, "Hey, you guys, you ought to write better subroutines."

Grad: Who was leading these software efforts? Who was working on that specifically? Did you have particular people who focused on those aspects?

Case: Yes, there was. The systems conceptual person that needs to be mentioned in George Radin , who was the intellectual giant at the detailed level who could put together a presentation or a memo or a design two levels below where it needed to be, just to demonstrate that the next two levels of detail were available. He could have put the three levels below it in there, too, except the pile of paper would have been too big for anybody to look at.

Grad: I guess what I'm trying to get at, was there a particular person who came up with the idea of integrating the database into the operating system, or is that just sort of obvious?

Case: I don't know that it was obvious. How did that go? We had at least a couple of significant group think sessions to create the system structure, where the structure of the dispatcher was going to be and where the database was going to be and where the languages were going to attach and stuff like that. We drew a couple of isometric views of a three-dimensional model of the system so we could attach everything to everything that it needed to attach to that we could see. There was a group effort of six or eight people that did that over two or three meetings or something like that. I don't remember who they all were.

Grad: This was a combined effort. Hardware and software people working together to reconceive this thing?

Case: Yes, yes, that's correct.

Grad: There's really no implementation of that concept, to my knowledge, until the System/38 came out, of that combined database.

Case: Yes.

Grad: That's considerably later. That was in the 1980s, I believe. The early 1980s before that gets realized, or very late 1970s.

Case: Before it's built, yes. Yes, that's right.

Grad: That's my recollection.

Case: The System/38 started, if I remember the numbers right, we can try and verify the numbers, the System/38 project started after FS was killed.

Grad: That is my understanding, also.

Case: And at the time, I don't remember anybody on the System/38 project saying that what they were doing was implementing FS ideas. They wouldn't have, politically, in any event because they didn't want to say they were picking up the failures.

Grad: It was done in Rochester, Minnesota, which is completely disconnected with the Endicott, Poughkeepsie or other facilities at all.

Case: That's right. So the observation that the System/38 had a lot of the FS ideas is probably correct as a historian views it, but I don't think it's correct as a part of the development

process. The people who were doing System/38 knew about the FS program, had heard about the FS ideas. It wasn't that they were in an isolated room or in a clean room and had never heard about this stuff. They had heard about the stuff. But I think they got to the place that they got by their own process of trying to make things good, rather than by trying to copy FS.

Grad: There is such a close resemblance on the integrated database structure, that it's hard for me to believe that it wasn't a direct relation. But again, I don't know that as a fact.

Case: I don't know either.

Grad: Let's finish up with your FS project. So you're moving ahead, you're making progress, you're getting some very interesting sideline things done that are very significant by other groups under the cover of this project. What happens then? How does it become a "failure"?

Case: By 1974, three years into the project, the acceptance of System 370 was now back on the original target, not below. The survey of installed capacity says it was full. There hadn't been any programmer productivity change involved as far as anybody could tell, but the business and the demand and whatever had made a projection that IBM was going to have to cover for a declining revenue stream; it was now very remote in everybody's thought.

Grad: Let me question you on that. My recollection, I was in IBM in the 1970s. My recollection is that sales volume on hardware was relatively flat during most of the 1970s, that this was a relatively poor period and that the impact of the government suit was very significant in terms of the whole morale and activity within the company

Case: Yes.

Grad: All these things were going on. One of my products was CICS at the time, which generated a hell of a lot of sales.

Case: Right.

Grad: The other, IMS, was generating some, but was not as dominant.

Case: They're still used by many more people than most people realize.

Grad: Yes, over 10,000 installations I'm told of CICS today still.

Case: Yes, right.

Grad: So this is what was moving along. VM/CMS had still, by the time you're talking, not been accepted by the product division as one of their products. They still hadn't taken on CICS or IMS although somewhere along there they start to pick them up. But that was a problem all along. My question is, I don't see how that financial conclusion could have been reached, given the fact that sales were very flat. But apparently that's what someone said, "Hey, we don't need it anymore." Is that what you're saying?

Case: What I'm saying is that my remembrance is that the dire predictions of the lack of success of the business with System 370 that had existed at the beginning of the decade had disappeared. The motivation went to zero.

Grad: What else?

Case: The predicted announce and delivery dates for FS were as far in front of us as they had ever been. In other words if you look at the predicted time from now to announcement or the time from now to delivery, it was as long as it had ever been. From which you can conclude zero progress has been made.

Grad: So you wouldn't be ready to announce in 1975 or 1976. It was still three more years out.

Case: You got it. You got it.

Grad: What was the reason for that?

Case: One reason is the original targets set at the beginning of the project were unrealistic. They were unrealistic when they were set by me and I knew it. And I can be faulted for that. I will tell you, in my defense, that I picked targets when we started the project that were designed not to be met, but to allow the project to get started on the theory that it was needed soon and if we didn't get started, it would be later. The dates that I set were just within the bounds of possibility, so that the implementers would not en masse say, "Forget about it." And just before the necessity so that the receivers, the salespeople and the executives, would not say "Forget it."

Grad: A narrow window that you had to try and fit through.

Case: The window was negative. But the project goals were set in the middle. I can tell you why I did it. I can't tell you what all the other reactions were to it, but I can tell you why I did it. I did it on the theory that we had to have some kind of a schedule that would allow us to get started, rather than have another three months worth of debate on what the schedules ought to be.

Grad: It makes a lot of sense to me. Did you feel that during those first three or four years that your technical progress was reasonable in terms of your expectations? Not in terms of what you had promised, but in terms of your own expectations?

Case: No.

Grad: You were disappointed?

Case: Yes.

Grad: Any particular areas that were disappointing to you?

Case: No.

Grad: Just across the board?

Case: It was a more ambitious thing than any of us expected.

Grad: That's what I understood at the time, that what you were trying to accomplish was generational. It wasn't evolutionary in any way. It was a totally generational change.

Case: That's right.

Grad: You worked with a very ambitious set of goals, and then the market was saying there was no urgency.

Case: Right.

Grad: Was there a parallel project going on for the successor to the 370 while you were working on FS; was there a 380 project?

Case: Well, there were people who were thinking about things like that, but as I remember it, nothing really got much done on it. For a while, for the first half or for the first third at least of

the FS project, we told ourselves that if we ever had to, we could take the hardware designs that were being done and make them S/380s. Because we had designed a layered architecture with a machine interface that was very similar to what a 380 would have been. In the middle of the project there was a big debate over whether that machine interface ought to be the place to do compatibility across the line or whether you ought to do compatibility across the line higher up in the structure. And the people who were recommending doing it higher up in the structure won. So that left us without a compatible machine interface. But I'm not sure what effect that had. All that's true, but I'm not sure what effect that had. But if I remember the dates right, the 3090s and similar what followed on the 370 didn't really get started in development until after FS was finished.

Grad: So 1975 is before that work starts.

Case: I think so.

Grad: So it wasn't some other project that said, "Okay, this one looks better than the FS."

Case: No, no.

Grad: Let me digress for just a minute from the discussion about the ending of FS. You seem to have had a number of jobs over the years and each one was sort of just given to you. You didn't go seek them, but they each seem to have been a very exciting experience, a very good experience for you. Is that how you feel?

Case: Yes, it is. I can tell you two things, if I can remember both long enough to say them at this point. One is that in almost all the jobs I had, probably all the ones I can remember, I was not independently wealthy. I needed the paycheck. But if I had been independently wealthy and didn't need the paycheck, that's the job I would've paid to get. The second thing is that of the – I used to remember the numbers a lot better than I do now – roughly 19 job assignments I had during my 41 years at IBM, 9 or 10 of them were jobs that didn't exist before I got them, or I wasn't replaced when I left.

Grad: They were unique.

Case: They were things that were created out of a need or out of an opportunity or out of a something and then disappeared.

Grad: We'll comment again before we finish up, but your combination of skills is very unusual and very unique and it appears that IBM recognized that: your ability to communicate, to talk with customers, to speak to small and large groups of people; your technical skills,

because you obviously knew what you were doing technically and could supervise and manage technical people at a very high level; your ability to write and communicate that way; your understanding of the business requirements and business needs; and your project management skills. It's not typical for someone to have the whole range of things that you do. You have the range of skills that would have made you a successful independent entrepreneur if you had your own business.

Case: My reaction to that is that while I could've been successful as an entrepreneur, I could not reasonably have expected to have had the impact on the industry and the world that I had by working at IBM.

Grad: IBM was this mammoth, big blackboard to write on. You had the chance to write on that blackboard; you couldn't get that anywhere else in the world, and that was very special, wasn't it?

Case: I think so.

Grad: I agree with you. When I left IBM, that's the thing I missed the most. There was no longer a large blackboard for me to write on and it bothered me.

Grad: Let's go back to FS. You didn't make the level of technical progress that you were happy with. You felt that it wasn't just one particular area. In general, you weren't accomplishing as much as you had hoped to do as soon as you had hoped to do it. Is that accurate?

Case: That's right.

Grad: Did you recognize this? What caused is the end of the project? Was it your recognition that you weren't going to get where you wanted to get soon enough, or was it company recognition?

Case: Some combination of both.

Grad: Can you talk about what happened in 1974-1975?

Case: Generally, what I remember is that I went to both Climis and Evans a couple of times and said, "Hey, this isn't getting there. We've got to figure out how to do something else. Let's make a graceful transition rather than an ungraceful transition to whatever it is we're going to do next. I've got two or three ideas that you could stick in your bonnet." They both listened carefully. Neither one of them argued that I was wrong, nor did they say yes, we think you're

right, and two weeks later they would come back and say, “Well, we’ve talked about it and we’ve talked about it upstairs and we think we still need to go ahead.” Now I don’t know for sure where “upstairs” was, whether it was Opel or Learson.

Grad: I would guess pretty high up.

Case: I think so. But then it came to the point where I think it was clear to everybody that something had to be done.

Grad: In the sense of not with FS, but the sense that they needed a follow-on product sooner?

Case: Well, yes and no. The FS project couldn’t continue. Exactly what brought on that conclusion after I had suggested it a couple of times, I have no idea. But what happened was that there was a committee put together to do a review and to make a set of recommendations. As far as I was concerned, the committee was two-thirds useless and one-third unnecessary, because the conclusion that we were going to go do something else had to be clear, But Climis convinced me that I ought to go before the committee and do my best to sell FS. He convinced me to take the advocate’s position for FS, and so I did. I probably got some kind of a reputation as being a, I don’t know, head in the sand or unwilling to see the truth or something out of that. But I did it. And then when we had the announcement meeting on St. Valentine’s Day 1975, the St. Valentine’s Day Massacre, the job that was offered to me was to go work for Ralph Gomory, who was then head of Research. It was an open-ended job; it didn’t have any content, it didn’t have any employees. I sat on aisle 14 at the Watson Research Center, along with Ralph in one of the offices across the hall and did the crisis du jour out of the Research Director’s office. But that was fine.

Grad: You were basically “in the penalty box?”

Case: Yes, that’s right.

Grad: Do you think if you had come to the committee and said, “Hey, despite what Climis said, this should be stopped. Here’s what you should do instead and we should draw the following information from it and we should close it off and say we won?” Would that have affected your career at that point in time or not?

Case: I have no idea. Probably it would have been the same. Whatever was next or whatever was going to replace FS, nobody was going to hire me to lead it.

Grad: That was my question. Why not? You're an outstanding architect, you're an outstanding designer, you've got a series of successes, you know all the current technology from the FS work. Why wouldn't you have been the logical person to work on that?

Case: Because I just had one chance.

Grad: Fred Brooks had a chance with the 8000, yet they invited him to come in on the 360.

Case: Yes.

Grad: How did you feel when the FS was ended and you were "put over into Research?"

Case: I thought I was being treated like a respected and valuable member of the team, and given a position which was rational. Nobody took any of my income away. I could essentially do whatever I wanted to and I did.

Grad: And your options weren't taken away at that point?

Case: That's right.

Grad: They weren't worth anything but they weren't taken away.

Case: <laughs> Turned out to be worth not bad.

Grad: That was a long time later.

Case: I don't remember exactly when.

Grad: During that period I had gotten some options and they weren't worth a hell of a lot for a period.

Case: Well that's true.

Grad: And then they turned around.

Case: That was also true. I had some days when I wondered if it would have made a difference if I had been more successful on the direct implementation debate or if I had not done what Climis said. You can't go back and replay those things.

Grad: I gather you don't spend a lot of time doing the "what if" kind of thing in your head. Is that fair?

Case: I do a lot of "what if" things in my head for what's going to happen in the future.

Grad: I mean going back.

Case: No, no. I don't spend a lot of time on "what ifs" in the past. But some things I do. I try to somehow convince myself what is the lesson that I need to learn out of this experience, and that has to involve some analysis of what if things had been different, especially what if I had done something different. But no, I don't spend a lot of time with that.

Grad: That still sounds like a constructive way of trying to examine how you can do better in the future rather than blame somebody for the past.

Case: I think that's right.

Grad: Interesting. To draw the FS discussion to a conclusion, you mentioned a couple of things that came out of that work that were then later used directly with other machines.

Case: Right.

Grad: Were there some other things of that ilk that are worth mentioning?

Case: The silicon technology and the magnetic recording technology are the two biggest ones.

Grad: Any architectural things?

Case: Not directly. The principal architectural thing that I think we were right on, probably a little bit ahead of our time, was addressing. We had concluded that both of the last two products, System/360 and System/370, had erred by making memory addresses not big enough and so we had a structure where you could have an 80 bit address.

Grad: You thought that might take care for a few years.

Case: We hoped so. Although people use up address space. If it's virtual, and there's a lot of it, address space tends to get used up like any other resource, Even though it doesn't have to, and if you were to conserve address space in today's machines like we used to conserve address space in machines, there'd be plenty. <laughs> But, you know, any resource where there's a lot of it, for one reason or another, gets used up. Even if people aren't trying to be sloppy.

Grad: But the database architecture, the integration of that, was certainly a significant thing, though it didn't get used until the System/38?

Case: Yes. But it hasn't been adopted by the industry yet.

Grad: That is a true statement, but I still don't understand why not.

Case: Well, maybe it's not as valuable as we thought.

Grad: It sure made the AS/400 easy to program. It dramatically changed the ballgame on the System/38 and then even more so on the AS/400.

Case: Yes.

Grad: I was just wondering if there were any of these other technical lessons that you have learned or architectural lessons that belong in here.

Case: Well the AS/400 was very successful and was more economically successful than its competitors in Data General or DEC or others. A) The industry doesn't recognize it, and B) it's not what you can go out and buy.

Grad: Well there's still a follow-on machine to that.

Case: Well of course, that's right. How significant is that in the hearts and minds of last year's graduate engineers?

Grad: But somewhere along there the PC comes in.

Case: Yes, in 1980-1981.

Grad: And it's a whole dynamic change is when that comes in.

Case: Right.

Grad: But still, it was 400,000 of those AS/400s sold or some such crazy number.

Case: Could well be.

Working at IBM Research

Grad: I think they did an AS/400 on a chip or in a Personal Computer frame. I won't go further because that was not where your career went, but I still think that was a brilliant contribution and made a hell of a difference. You were working for Ralph Gomory until 1978?

Case: Yes.

Grad: I was up in IBM Research in that same period of time, working for Joel Birnbaum. My job was to try and get some of the software out of the Lab and into the product divisions.

Case: Maybe that's where I ran into you to begin with.

Grad: It could certainly have been there. There was great stuff going on in Research during that period.

Case: Yes.

Grad: And I knew Ralph from many years back. He's a mathematician and I had worked with him at GE and then later at IBM. So what were you doing? What did you end up doing for Ralph?

Case: Mostly a different thing every day.

Grad: You used the phrase "crisis du jour" before.

Case: Maybe not crisis. Crisis is a little bit too strong a term but the miscellaneous task of the day. One that I remember, we had a guest lecturer from one of the government agencies, the Food and Drug Administration, and after his lecture, which was about red dye no. 2, if you remember red dye no. 2. The new procedures for checking for carcinogenic stuff were so much more sensitive than the previous procedures had been and one of the first results of that was that red dye no. 2 was stricken from the generally regarded as safe list, and hence no more red M&Ms for a while among several other serious things.

He had explained the tests and the procedures and what had happened and what they were studying and so forth in his lecture. I hadn't taken lunch, so we just went down to the cafeteria and I bought his lunch. We sat around with two or three other people, having a nice chat, and I said, "There is one question that I have after your lecture. I understand that the new procedures are more sensitive than the old ones had been and that you have not yet been able to apply those new procedures to the whole list of potential compounds that they might be applied to and so there are a lot of things that we might discover are carcinogens that we didn't think were carcinogens. But is there anything that the new procedures have been applied to that we've discovered are still not carcinogens?"

And he looked at me and he said, "Well, actually, not quite, but there are some substances that we are convinced will not be carcinogens under the new procedures even though we haven't applied the new procedures." And I said, "Oh, how are you convinced that they are not if you haven't applied the new procedures?" And he said, "Well they're all the substances that are toxic enough that the mice will die before the tumors get a chance to develop. Among them, arsenic and so forth, and so there are plenty of things we know of that are toxic enough that they will destroy the test animals before we'd get a chance to have it develop a tumor, even the new procedures.

Grad: Well that doesn't really help a hell of a lot, does it?

Case: <laughs>

Grad: That's funny. That's a great story.

Case: Another thing I did during that time was I wrote a paper on the architecture of the IBM System/370.

Grad: Well that's what I was going to ask about. Did you start doing more external work during that period of time?

Case: Well yes, a little bit. One of the things was that I don't have a lot of published papers. And I spent who knows what, probably three months, not full-time, on that paper.

Grad: It's a very polished piece of work.

Case: Yes, it went through a lot of drafts.

Grad: Did you use material that Andris had prepared earlier to do that paper or is it from your own knowledge?

Case: I don't remember exactly. He and I shared the paper back and forth frequently. So we were really co-authors, although I did the first draft, so all those are my keystrokes. One of the things that's not obvious is that that it is the first paper that ACM ever published for which the camera-ready copy was prepared by the author on a computing system.

Grad: Do you remember what you were using? Was it PROFS?

Case: No, it wasn't PROFS, but it was a text processing system that ran on the Research mainframe and I used the Research high density plotter and film processor to produce the final copy. If you get a copy of the actual magazine, there is an editor's comment on the first or second page saying the article was the first to be prepared by the author with such and such a system or something like that. It was the first one ACM ever published that way and they waived the author's charges because of that.

But that was 1978, not all that long ago. Today, every publication is done that way.

Grad: Yes. It's a big difference. Did you get involved in any of the Research activities themselves?

Case: Only to listen to presentations and comment on them.

Grad: You didn't personally conduct or work with anyone?

Case: That's right.

Grad: Harry Markowitz was there at the time. Harry's an old-time friend of mine from GE days. Part of my job there was to get him money and get him people so he could do what he wanted to do. I always enjoyed that part of it.

So you didn't continue to look in terms of applications, development languages, or any of these kinds of things during that period?

Case: No. I had modestly frequent meetings with John Cocke on whatever he was working on. He was a great guy to talk to.

Grad: Joel Birnbaum had one incredible staff of people there and it was a loss to IBM when Joel left and went to HP, I think.

Case: Yes.

Grad: Did you join any outside organizations and get active in IEEE or ACM or any of those kind of things at that period of time, or was that later?

Case: I think that was later. In the 1970s, maybe even before FS was finished, I began my association with IBM's outside lawyers on the anti-trust case and then lots of other suits that came after that.

The Anti-Trust Suit

Grad: Did you actually go on duty on the antitrust project for any period of time?

Case: I did for a while. I worked in the law department for one of my careers. I worked for Dan Evangelista when he was general counsel. I worked for him on the Fujitsu arbitration, but my beginnings were with Cravath, Swaine, and Moore, which was the New York law firm that we used then for a lot of things and that was our chief law firm during the U.S. anti-trust case. I started with them, when does it have to be?

It was related to U.S. vs. IBM and it was in the beginning of 1969, January 1969, when the suit was brought. It wasn't quite that early.

Grad: You were not involved in the Control Data suit then, were you? Or do you remember?

Case: No, I was not involved in the Control Data suit. I was involved in a post-trial hearing for Telex and I testified in the Memorex trial. My biggest testimony was in U.S. vs. IBM. That was a six-year trial, you know. Three years for the prosecution and three years for the defense. I was the defense's first witness in 1978, on the stand for 28 days. Not a record, but close to it. <laughs>

Grad: This was discussing the architectural decisions?

Case: Basically.

Grad: On the operating systems and so forth?

Case: It was describing technology and machines and functions and every piece in the system and software; sort of a crash course in computers.

Grad: What was the judge's name?

Case: Edelstein. David N. Edelstein, right.

Grad: I'm sure he understood everything you were talking about.

Case: Right. Oh, I do have one record in that trial. I have the record for the longest duration of an answer to a single question in Federal court history.

Grad: Two days or something?

Case: Yes, exactly right. Across three or four breaks in over two days, maybe into the third day.

Grad: So we can't exhaust you with what we're doing here, right?

Case: <laughs> That's right. You can't exhaust me. It was the craziest thing.

Grad: Was there extended cross-examination during your testimony or was it just more direct?

Case: There was some extended cross-examination. Mostly the cross-examination wasn't hard. I don't remember much about the cross-examination.

Grad: Well, it's not a comfortable thing, but you knew what you were saying, you were describing things accurately.

Case: I don't want to say it, but I was disappointed with the way I was treated by the judge.

Grad: He didn't treat any IBMer well, did he?

Case: Mostly not.

Grad: It was a whole strange situation. So you actually had just ended your FS work or were you still at Research when you were doing that testimony?

Case: Yes. Right.

Grad: That had to take a good bit of the time because you had to do preparations for other things.

Case: Oh, yes. For a while that was basically a full-time assignment. I had some other nominal job and I forget right now exactly what it was.

Grad: But effectively that was what you were supposed to be doing.

Case: Yes.

SPD Director of Technical Operations

Grad: Your next job was in 1979-1980 as Division Director of Tech Ops in SPD. What was SPD?

Case: System Products Division was the name for it.

Grad: Was that at Endicott at that point?

Case: No. The name for the Endicott division later was STD, the Systems Technology Division.

Grad: But the 4300 was a smaller machine and that's why I thought maybe there was an Endicott connection.

Case: Well there is. I mean, the site for the division was mostly in Endicott, but I was located in White Plains. Was Jack Kuehler president at that point?

Grad: Could have been.

Case: And then does GTD come next?

Grad: Yes. That comes in 1981, yes.

Case: That job I got because of Jack. He got appointed president of the General Technology Division and he brought me along as his headquarters technical guy.

Grad: This was after I left IBM in 1978, so the division names are no longer as familiar to me as they were earlier.

Case: They changed often enough that they're now no longer as familiar to me as they used to be yes.

Grad: A tremendous number of changes took place. The decade of the 1970s was not a strong decade for IBM, and there were a lot of changes – organizational changes and structural changes.

You became division director of Tech Ops. What were you doing there? What did that job involve?

Case: Supervision of the development programs, managing the product assurance or product test function, and let's see, this is the end of 1979 or something like that. I spent a large share of my time working on the CLARK board.

Grad: What is that?

Case: It was the printed circuit board on which the thermal conduction modules in the 3080s and 3090s were mounted.

Grad: Tell me about that. It's not something I know much about.

Case: Well, thermal conduction modules were a ceramic substrate that mounted 100 silicon chips with all their interconnected wiring and they plugged into a thousand pin receptacle. Nine of those modules were mounted on a 25-layer printed circuit board that was called a CLARK board. That whole system, the thermal conduction modules and the CLARK board and to some extent the chips and the other stuff after it, but those were the two main items, were the principal technological advances that characterized the 3080s.

Grad: And the 3080 was basically the successor to the 370? It was the 3081, the 3084, and then the 3090, so that was the sequence.

Case: The problem was that making a useful CLARK board was a complex process and it was at the state that our production rate of good ones out of the Endicott factory was one a day, and every 3080 needed four, and it was absolutely the gate on how many 3080s we could build, and that was absolutely the gate on what revenue we could have from 3080s and so the Executive Committee was interested and wanted feedback twice a week. And so I got the job of

spending two days in Endicott figuring out what the current status was, coming to the Executive Committee the third day, telling the bosses what the status was, going back to Endicott for two days figuring out what the status was, coming back for the sixth day. Then I got a day off, and then we'd go back over it again. <laughs>

Grad: So were you able to solve anything there or work something out?

Case: Well, they say I did but I really have no idea. Don Seraphim and all the other guys in Endicott busted their chops and actually did everything. What I did was get them together in a room twice a week and moderate the conversation. I tried to summarize what I just heard and draw whatever logical conclusion I could and ask them if they thought my conclusion was right. If they thought it was right they would act on it, and if they thought it was wrong they wouldn't act on it. That's what I did.

Grad: Did you feel you were engineering at that point in time?

Case: Yes. I felt that that's what I was doing. But I didn't have any nominal authority. Pat Toole was the plant manager and bless Pat, he once said in public, "Dick Case can steer the ship even without owning the crew."

Grad: Oooh, isn't that a nice comment.

Case: I thought it was, and he was apparently quite satisfied with what I was doing.

Grad: Sounds like you did a nice job.

Case: And the result turned out well.

Grad: Yes, they got the production up above one a day.

Case: <laughs> Right. We got the production up and started shipping 3081s and I got off the railroad track of going to the boardroom twice a week.

Grad: I'm going to move a little more quickly through some of these now.

Case: Yes, please do.

<u>General Technology Division – VP for Development Operations</u>

Grad: In 1981-1983 you went into the General Technology Division working for Jack Kuehler?

Case: Right.

Grad: And you were VP for Development Operations, working on integrated circuits, according to your notes.

Case: Yes, that's right.

Grad: What was that about?

Case: Well, that's microns and molecules and chemical vapor depositions, how you make silicon chips, how you make sand into silicon chips.

Grad: Were they were making the whole boards then or was they still doing silicon chips?

Case: No, the General Technology Division was making the silicon chips. The silicon chips eventually got mounted on the ceramic substrates and the substrates got plugged into the printed circuit boards, so you had to have all of it, but this was another section of the electronic technology chain.

Grad: Where was GTD?

Case: Burlington, Vermont.

Grad: Wasn't there a facility in Fishkill or something?

Case: Yes, there certainly was. And let me think now. Yes, when Kuehler had it they were the same division. They had been separate.

Grad: And they pooled them together.

Case: The two semiconductor things had been separately managed and they pooled them together under one division president and Kuehler was the boss.

Grad: IBM was a major producer of semiconductors.

Case: Yes. Oh, absolutely. Much more so than any of the industry reports recognized.

Grad: We have a Semiconductor Special Interest Group now starting at the Computer History Museum. I just wonder how much they are aware of and tied in with this.

Case: Well, I don't know because typically the Semiconductor Industry Association or the equivalent that was reporting what was happening every place else was leaving us out.

Grad: Interesting.

Case: That's not because they were interested in leaving us out or didn't even know in some sense what was going on, it's because we were close-mouthed.

Grad: You didn't tell people.

Case: That's right.

Grad: Because it would disclose volumes of other things to some extent.

Case: Who knows the reasons. Yes, among other things.

Grad: I think the sensitivity at IBM after the [antitrust] suit had been finally closed by Reagan led them still to keep things very close to the vest at that point in time.

Case: Yes. Well, it has been for a long time.

Grad: Yes. I agree. So you suddenly got to use your chemical engineering experience back then.

Case: <laughs> Yes. I could do it intellectually; I didn't have to do it in the lab. Other people got into the lab.

Grad: They found out what the knowns and unknowns were. You didn't have to do that anymore.

Case: <laughs> Other people got into the lab. I read the reports and came to the logical conclusions, yes.

Grad: Did these changes require family moves in each case?

Case: No.

Grad: So you didn't go up to Burlington then?

Case: No, I did not. My office was in White Plains. I traveled to Burlington frequently and traveled to Fishkill frequently. The only move in those years, let's see, it's a little bit later – I did move back to Endicott for a year-and-a-half.

Grad: One of the things that has been asked is to have you talk a little bit more about those printed board circuits, about some of the technical issues. How was it different from what had been done before?

Case: Well it was an advance in technology at all the levels of packaging; at the silicon level before the 3081, I should really check all these numbers but my remembrance is that there were of the order of 20 circuits per chip and with the 3081 it was up to 100 circuits per chip. The previous level, the number of chips per module was 6 or 8 and the 3081 it was a hundred and the number of modules per machine then was a lot less. With the 3081 you had 30 some modules per machine, when previously you had had 300, something like that. I don't have all the numbers right.

Grad: But you had orders of magnitude in each of these areas?

Case: Yes that's right.

Grad: And when you multiply those together, it makes a dramatic difference doesn't it?

Case: Well yes, although the total number of circuits wasn't all that many more.

Grad: Because you had a magnitude less.

Case: Right, and today 20 years later, all that would be on one chip.

Grad: Are circuits equivalent to logic elements?

Case: Yes, pretty much, or gates. They're all sort of like that, all within a factor of 2.

Grad: Let's go back now. We were talking about the General Technology Division and your work in integrated circuits. Is there anything special that comes to your mind from that period of time when you worked on or that you think would be of general interest?

Case: I don't think so.

Grad: But you were back now in a mainstream job, an operational job.

Case: Oh yes, absolutely.

System Technology Division – VP and Development Laboratory Director

Grad: Then the next job you talk about is going to the System Technology Division and that's in Endicott and you became VP and Development Laboratory Director?

Case: Right.

Grad: **Y**ou went back into a significant management position in a major operational area?

Case: Yes, that's correct and the principal products there were VM/SP release 4, I think, or something like that.

Grad: And that was on the 4381 processor and the 4248 printer you mentioned?

Case: Yes the last version of the mechanical printers, of the high speed mechanical printers. The next ones were laser photo page printers.

Grad: You also speak about packaging technology for the 9370 and the AS/400. What was that about?

Case: That was the development of the place to mount the chips and the cards and the boards that were used in the 9300's and that was used in the AS/400 products.

Grad: And this was built upon the same kind of technology you used before in the 4300 series?

Case: Well the same kind of technology but it was an improved level of technology and there were different sizes to match the processors that were going to be implemented with it.

Grad: Were these order of magnitude improvements then or just continuing gradual improvements?

Case: I don't remember the numbers.

Grad: Following Moore's law kind of thing?

Case: Yes.

Grad: So very much in that direction?

Case: Yes.

Grad: That was the first time you'd been a Development Lab Director, is that correct?

Case: Yes.

Grad: What was that like; what kind of job was that at IBM?

Case: In some sense it's one of the best jobs at IBM.

Grad: I'd always heard that.

Case: It's because to a large extent, at least when I was there, it's the level in the organization in IBM that has the most autonomy, the most ability to help your team specify and control what they do and the least amount of interference from on high. Since not every Lab Director has observed that, I assume it has to have something to do with either circumstance or personality and who your boss is, how much he or she wants to be hands on.

Grad: Do you remember who you were reporting to when you were there?

Case: When I was Lab Director, I was reporting to Pat Toole who was the Site General Manager and when I was Vice President I was reporting to Pat Toole who was the Site General Manager.

Grad: So you had worked for him on a couple of different jobs then?

Case: Yes.

Grad: Because you mentioned that he was involved when you were at SPD when you were doing stuff on the TCM and that he was supportive at that point in time as well.

Case: Yes that was a previous divisional organization and on that job I didn't report to Pat Toole but Pat Toole was still the Site General Manager at Endicott where CLARK board was being built and I was the headquarters guy who came in to look at the CLARK board and report down. If I hadn't been doing the reporting, Pat would have had to so he was delighted about that and that experience was what caused him to say he can steer the ship without owning the crew.

Grad: So you spent a couple of years there; many people say it's like being a Plant Manager at a manufacturing company, that you have a high degree of autonomy in most cases. As long as you do your job well, no one really bugs the heck out of you.

Case: I think that was true in my case; yes that's right.

Grad: Is that when you moved your family back up to Endicott?

Case: Yes we moved. I thought I was probably going to be there for 3 years, but it turned out I was only there for 15 months or something like that.

Grad: Those were commonly very long assignments. Was there some particular reason why it ended early?

Case: Good question. What happened next?

<u>Corporate Director of Technical Personnel</u>

Grad: Your next job you mention is becoming Director of Technical Personnel at the Corporate Level.

Case: Right. I think the best way to say it is that was because Eric Bloch, whose name you probably know, was just leaving IBM for the National Science Foundation; he had the Technical Personnel job. It was a job that didn't exist before he got it; was probably put together to some extent to support him and to make use of his capabilities or something like that. And I don't know why I was selected to replace him; maybe he suggested it, who knows.

Grad: There was a period of time when I thought Ted Climis was on corporate staff for programming personnel or something like that. Then Ted died in either the late 70's or early

80's – it was very premature; he was a young man at that time. But this a very different job that Eric Bloch had that you took over, wasn't it?

Case: Yes.

Grad: What were the principal responsibilities of position?

Case: Well, my principal responsibilities were to publish the IBM technical journals: the Journal of Research and Development and the Systems Journal; to supervise the technical libraries around the world in the all the different development labs; to run SRI, the Systems Research Institute, which was the Computer Engineering and Science College that IBM ran internally. Let's see, what else was in there? I think those are the main functions.

Grad: Awards and recognition programs – the Fellows Program probably was run through there?

Case: Right.

Grad: Education, relationship with universities, funding of university programs and so forth?

Case: Well let's see, I did all that stuff but did I do it then in that job? Yes, Yes, I think I did, I ran what would be the IBM education foundation, if there had been one; we didn't have a separately organized foundation, it was just a department.

Grad: I'm looking at the list that you've provided which lists the different areas in which you were involved. Starting in 1978 and up through 1980, 1982 you were involved as a keynote speaker, heavily involved in IEEE, advisory committees for Congress; you started to do a lot of these other broader things. Was that a very conscious thing on your part or something that IBM just asked if you would do this?

Case: I got involved in each one in some different way. I did not have a career plan to do that, although I was comfortable and felt useful in doing things like that and therefore I got asked more and more frequently to do things like that.

Grad: Were you asked by IBM or by the agencies or these other organizations?

Commission on Critical Infrastructure Protection

Case: Some of them were both. Sometimes the agency came to IBM at some other level and asked if they could have Dick Case for something and that was the trigger for IBM asking me. That's what happened when I retired. One of the commissioners of the President's Commission on Critical Infrastructure Protection came to IBM and said we need this kind of a person, can you suggest somebody like that who you might be able to make available. I don't know how it came down through the hierarchy, but it came to my boss who was Jeff Jaffey, who said, "How would you like to do this?" And I took one look at it and I said, "You know, that sounds like fun."

Grad: This is when you were preparing to leave IBM?

Case: Well, actually, it caused me to prepare to leave IBM.

Grad: Let us not move so quickly. When the job as Director of Technical Personnel was offered to you, was there any question of your taking it? You had this Lab Director job which was a wonderful job to have; I assume you were probably enjoying it.

Case: Yes.

Grad: And then they offer you this other change which means going to Armonk, I assume?

Case: Yes.

Grad: Did you have any doubts about making the change?

Case: No.

Grad: So whatever you got asked to do, you did?

Case: Pretty much.

Grad: I'm sure it was an honor to replace Eric Bloch as well.

Case: Yes it absolutely was. And as a result of that I got several things that I'm sort of still involved with. Eric Block was, among other things, a member of the Industrial Advisory Committee to the National Society of Professional Engineers. When Eric left his position at IBM he had to resign his appointment as well (it was not a paying job) because he was no longer employed by IBM and it would have been a potential conflict of interest with the National Science Foundation. The National Society of Professional Engineers said to him, "Who at IBM

can we get to be your replacement?" And he said, "Why don't you get my replacement at IBM?" They invited me and I served on that committee for, I don't know, maybe 12 years, the last 6 of which I was chairman. And that directly led to my involvement in MATHCOUNTS.

Grad: We'll come back to that one before we finish with your other activities. When you started working at IBM Corporate Headquarters as Director of Technical Personnel, was that the first time you had worked there?

Case: Yes.

Grad: And how did that feel, how was that different? You had been working together with the executive people and so forth but was it different being part of the corporate staff?

Case: Of course it has to be a little bit different, but I didn't notice any big difference. It was all the same group of people and we just had slightly different objectives or jobs that we were trying to accomplish.

Grad: You had gone from having quite a few people working for you as the Lab Director to having what, very few?

Case: Yes that's right. In Technical Personnel Development there actually were more than a very few when you count them all, but later, when the corporate staff assignment changed, it did get down to very few, yes.

Grad: It was a very different focus and role isn't it?

Case: Not all that much. As Endicott Lab Director, I had some level of responsibility for trying to make sure that 3,000 people were productive; they all reported to me on one level or another. On the corporate staff assignments I had some level of responsibility for 3,000 or maybe 30,000 people, to get them to work together, almost none of whom reported to me. But getting them all to work effectively together or towards similar goals was not all that much different a problem.

Grad: So whether you had the line or staff responsibility didn't matter to you?

Case: Right.

Grad: That was the point I was getting at.

Case: Well that's the way I felt. I didn't do things much differently whether it was line or staff responsibility and so I didn't notice a big difference.

Grad: I'm sure as you dealt with so many other people in the company – line versus staff was a major difference for most people. Line meant you had the people work for you, you could tell them what to do; staff meant you had to convince and persuade.

Case: But I felt like I was convincing and persuading even when they were line, so you're right, you have to convince and persuade. But I ran every job as though I had to convince and persuade.

Grad: That's your style of management; you apparently don't have a dictatorial style.

Case: Maybe that's right.

Grad: It's just different from some of descriptions I hear of some of the Lab Managers. So you stayed in that job for about 3 years until 1987 according to your notes here.

Case: Something like that.

Director of Systems Analysis – Fujitsu Arbitration

Grad: Then what happened? The next thing was you were Director of Systems Analysis; this was part of the corporate legal staff?

Case: The next thing that happened I think is the Fujitsu Arbitration.

Grad: This was in the late 1980s then?

Case: Yes, right.

Grad: What triggered the litigation, do you remember?

Case: Yes we discovered that Fujitsu had stolen MVS and marketed it to their customers as their own.

Grad: There's quite a story about how that theft took place.

Case: Yes, and Max Paley was involved. After he was no longer working with IBM, he helped set up the FBI sting that caught on camera the people having paid for it or transferred documents or whatever. The upshot of that was that there was an agreement that there would be a private arbitration about the issue and how much Fujitsu was going to pay IBM for this rather than a public trial. I was not involved in the discussions about the difference between a private arbitration and a public trial; I got into it after the private arbitration was already under way.

Grad: Who was the head of the legal staff on this one? Was it Evangelista or was it somebody else?

Case: Dan Evangelista was general counsel on the US versus IBM trial; actually Nick Katzenbach was general counsel and Dan Evangelista was his second. When Nick left, Dan Evangelista became general counsel and we had Cravath, Swaine and Moore led by Tom Barr who was the Chief Cravath attorney in US versus IBM; and Barr was still leading the legal team for the Fujitsu arbitration. Most of the other people who had been in US versus IBM weren't there anymore; there was a new set of next level partners and associates.

Grad: I think a lot of them were burnt out after 11 years.

Case: Many of them were; that's exactly right.

Grad: According to this record, you had a 3, 4 year assignment.

Case: Yes, it took about that long.

Grad: What were you doing; what was your actual role during this?

Case: Trying to put together the facts and produce an analysis of them that could be explained to a lawyer so the lawyer could explain it to the arbitrators. In some cases I explained it to the arbitrators; you could do things like that.

Grad: Were there 3 arbitrators involved?

Case: There were 3 to start with, but there wound up being just 2. Fujitsu picked one, IBM picked one and then the procedure was that the 2 were to pick the chairman or whatever and after not too long, everybody got unhappy with the chairman so there was a coup. I have no idea how it was organized but there was a coup and the chairman was out and the 2 sides agreed to go with 2 arbitrators. Now how you do an arbitration with 2, yours and mine, but they

made it work; they agreed often enough and when they didn't agree they figured out how to defer until they could agree and they made it work.

Grad: That took some very honest arbitrators.

Case: I think that's probably right.

Grad: So you continued to work on analysis, determining what the values were.

Case: Right and I wrote economic simulations out the kazoo, questioning what would happen if this happened, what would happen if that happened, blah, blah, blah, to try to establish the economic value of some of this kind of stuff.

Grad: Did you use spreadsheet programs?

Case: Oh yes, absolutely; lots of spreadsheets.

Grad: What would you have done without spreadsheet programs?

Case: I have no idea what we would have done without spreadsheet programs.

Grad: We're doing a special issue of the IEEE Annals [of the History of Computing] on spreadsheets and I'm trying to get a group of historians to write up their opinions as to what the effect of spreadsheets was on how business was conducted in the United States.

Case: Figure out what the effect typewriters had on how business was conducted, figure out the idea of what copying machines had on how business was conducted, figure out the effect of word processors and how business was conducted.

Grad: Yes we just did an issue on word processing.

Case: Nobody knows how to practice law anymore without a word processor and a copying machine.

Grad: Absolutely.

Case: You just can't do it, notwithstanding the fact it had been done for 500 years.

Grad: We couldn't go back to doing it the other way if we had to now; we really couldn't.

Case: That's right, we could not.

Grad: So the Fujitsu arbitration finally got settled and there is an agreement for how much they were going to pay IBM.

Case: Yes.

Grad: You were then finished with that assignment?

Case: Right.

Corporate Director of Technical Strategy Development

Grad: The record shows you then became Director of Technical Strategy Development on the corporate technical staff in 1991. Had Gerstner come in by that point?

Case: Not yet.

Grad: So you had that job before Lou got his job?

Case: Yes, let's see – how was that started and who did I work for? I don't remember. I think Pete Schneider was the boss at this point, but I'm not sure.

Grad: Do you remember what kinds of things you were working on – broad corporate issues, technical issues?

Case: Yes. One thing I remember is that somehow in this transition I either still had or got back the IBM Fellows program and the technical recognition functions and so forth. So I remember spending some time on that. I can give you a better story about what happened when Gerstner arrived.

Grad: Why don't we start there and if you remember some of the others we'll pick them up. But the Gerstner story is fascinating because bringing in an outsider to IBM, someone who did not have a technology background fundamentally and hadn't grown up at IBM, was an eye opener. How did you feel about that at the time?

Case: It was sort of: My god what are they doing now? But Lou turned out to be very helpful to IBM. The way I got directly involved with him was a little while after he showed up, I was high enough in the management tree to be invited to a luncheon meeting of 45 executives where he was first introduced to the crowd. So people knew who I was. I didn't have a lot of formal authority, I didn't have a lot of people reporting to me, but lots of people knew who I was and accepted me as a participant.

Anyway, I have a version of what happened that I've never reviewed with Lou so I don't know whether he would agree with it or not, but let me give you a version of what happened. He was talking to mostly his senior vice presidents, one on one, trying to get them to explain to him their business, what it was about, how to win and succeed, what the problems were and so forth. During those conversations he would hear from Joe or Bill stories that he felt were contradictory or at least based on inconsistent assumptions about which view of the world was right. After thinking about it for a while he would challenge them and he say, "Look, I heard this from Bill and I heard this from Jim and they sound to me like they're inconsistent in some way." And he would get back from both Bill and Jim "Oh no they're not inconsistent at all, blah, blah, blah, blah, blah." And there would be six paragraphs of words that he couldn't make sense out of. So he was wondering whether he could hire some kind of an outside consultant, a professor or an industry expert or someone to help him understand what the truth was on these things because he felt that some of the issues were significant and for some of some of them one of the stories had to be wrong. He felt that unless he could figure out which one it is or get the actions consistent with just one of them, we were going to be in trouble because we couldn't win by fighting ourselves.

I think it was Pat Toole who convinced him that he should try an inside version rather than an outside person first and basically said, "Why don't you let Dick Case put together a process?" And so I did. I started out by asking them what were the three things that were at the top of their list? And when I understood the technical part of all of the topics he was talking about, there must have been 2 dozen topics eventually; we put together a team of 4 to 6 people for each topic, selected mostly from inside IBM but with an occasional outsider. The teams were selected from the people who knew the most about the topic in IBM, no matter where they were – whether they were in research, whether they were in development, whether they were in sales, whether they were in support – no holds barred; the people on each team were the people who knew the most about the topic. We then got them to study the topic and write a report. There was always one person who was designated by a senior VPs that was on one side of this issue and another one by the other side.

Grad: Similar to the arbitrators.

Case: Yes. So the report that we were writing was always influenced by one person from each side of the issue. It turned out that we spent, from start to finish, about 3 months to get the

report written. That was the worst part of the whole problem: Lou wanted it done in 3 days, 3 weeks at the most. We took 3 months on almost all of them, and in most cases we wrote a report that both of the senior VPs signed onto and both said that the report was better than they could have done alone. And when that happened, the issue was finished right; when it didn't happen, I have no idea what happened. I don't know what Lou did with the reports where there was no agreement afterwards; we wrote the report, he read it, sometimes he would come in and ask us some questions about it, but you could never tell what was going to happen and in most cases I believe nothing happened. In these cases he just went onto something else, saying, if I can't solve this one, I'll work on another one that I can solve.

Grad: He sounds very hands on.

Case: Yes he was. But for at least 3 out of 4 of them, both of the participants said not only is it right, it's better than what I was proposing.

Grad: Gerstner was looking for advice from a variety of sources it looks like.

Case: Oh yes he was, absolutely. There was never any question that Lou was interested in listening to a wide variety of sources – which as far as I was concerned he should do; I mean that's what his job was.

Grad: I would also guess that the nature of the problems would require someone who could clearly explain something that had a strong technical basis but needed to be explained in a language that he would understand. Did you find that was one of your objectives?

Case: Yes.

Grad: John Landry commented that he thought Gerstner acted promptly on things; as soon as he felt he understood something, he was prepared to act on it and not dilly dally.

Case: Yes I believe that's true.

Grad: Did you have a lot of direct interaction with him?

Case: I would not say I had a lot of direct interaction with him, but I had some.

Grad: So it looks like that whatever came, up it could end up in your lap; you weren't defined in some narrow area?

Case: I don't think so. We did hardware stuff, we did software stuff, we did technology stuff, we did marketing approach stuff, we did strategic stuff in terms of suggesting should we be in this business or that business.

Grad: It was certainly a wide range of problems that you tackled.

Case: Yes, but we tackled them with different people. It wasn't always the same people.

Grad: But you were apparently involved in every one of these cases.

Case: That's true but I was more the facilitator rather than dictator.

Grad: That seems to be your style though, doesn't it?

Case: If you say so.

Grad: Well that's what you're saying as you describe each of these jobs. Your approach was not "Do it my way, my way or the highway." But it was a quite different, very collegial style, finding people or helping them work things out. The fact that you can say that 3 out of the 4 times, 15 out of 20 studies, ended up with both opposing sides agreeing and saying this is better than we could have done alone, that's an impressive track record.

The President's Commission on Critical Infrastructure Protection

Now we come up to 1997 when they offered you an opportunity of working on the President's Commission on Critical Infrastructure Protection. What does that mean and why did you take it?

Case: The task of the Commission was…let me think of the quickest way to explain it. If there is a local power plant that you'd like to take out of commission for whatever reason, you can put on a back pack filled with dynamite, figure out how to get across the fence, get into some modestly critical spot in the installation without being detected, leave the pack, run away and detonate it or, in the worst case, don't run away and detonate it. If you're successful in getting it in the right spot, the power plant will be out of commission for some time. In another scenario, you could hire a truck, fill it with fertilizer and diesel fuel and basically do the same thing except it's not quite as critical where you get and you have a mechanical help in getting there and you can cause the same kind of destruction.

In a third case, if you could get the right command sent to the control plant's control computer, you could cause it to self destruct. This would have the same result that the plant would be out

of commission but this time with zero chance of being physically harmed by the explosion and with much less chance of being caught and a very low chance of being punished if you were caught. This process of getting on the network and sending the right command to the control computer is called a “cyber attack.” And there are lots of other kinds of cyber attacks that can be identified.

The President’s Commission was to make sure that the US Government was protected against these kind things and to determine what can we do to be more protected and how to protect our critical infrastructure that’s not governmental. How about power generation to distribution, how about communications, how about transportation, how about banking and so forth, all of which are private sector functions that are important to everybody and subject to disruption in the same way.

The Boston Computer Museum

Grad: Dick, let me just take an aside here. I know you got involved with the Computer Museum when it was up in Boston.

Case: Right.

Grad: Can you describe how you got involved? What did you do with that?

Case: Well, from my point of view, I got involved because Jack Kuehler asked me to. At the time, Jack Kuehler was president of IBM. I think at the time he asked me to, Oliver Strimple was executive director, and, as I understood it, Oliver or somebody representing him had approached Jack and said, "We'd like IBM to be more involved." Jack said, "I looked into it, and I discovered that some number of years ago, I don't know how many, IBM had had some involvement at the Computer Museum and the museum had done something – an exhibit, a meeting, an article, something like that, that IBM thought was unnecessarily disparaging to IBM. And so IBM said, "Well, all right, if that's what you're going to do, then you’ll be on your own." And IBM withdrew whatever level of attention they had previously been giving to it.

But Jack said to me, "I had been assured that the Museum was not going to do that again, and one of your jobs is to make sure they don't, or at least tell me when they are; and otherwise, just do good things." So I went to meet Oliver and agreed to begin some level of involvement with the Museum. I probably helped get some level of contribution from IBM to the museum, never to the level that IBM should have been supporting that kind of a national institution in our industry, but I got a lot out of it and I was involved in various things. I was part of the volunteer management and I contributed at least some of my time; the time and travel expenses at least were all covered by IBM.

Grad: And this is when you were working as Director of Technical Strategy development?

Case: Yes, it probably was something like that.

Grad: So this would be in the 1990s primarily?

Case: My guess is my involvement with the Museum started earlier, but I don't remember exactly. It could have been in the mid 1980s.

Grad: Was Kuehler president when Gerstner was there or was he president before? Do you remember?

Case: Kuehler was president before Gerstner was there and he left when Gerstner arrived.

Grad: Do you remember anything unusual or specific that you worked on in conjunction with the Museum that you felt was very special?

Case: Well, the thing I was personally most interested in was the artificial intelligence prize, whatever the name of that was. Someone had created a prize for the machine that could best implement artificial intelligence. I think we had more than one competition, but one that I was really involved with was when we invited everybody with an artificial intelligence program to bring it and we staged a test. We ran several people past each of the stations to see who could decide which was a person and which was a machine. We had some people behind the screen and some machines behind the screen to see if the judges could distinguish.

Grad: I remember Joe Weizenbaum with his Eliza program which was a pseudo psychologist. A lot of people couldn't tell it was a machine; they thought there was a human being involved.

Case: Yes. In some restricted domains, some have been very effective.

Grad: They don't quite meet the Turing test?

Case: No. That's right.

Grad: But they're close.

Case: The story I have to tell about that is similar to language translation at the 1964 World's Fair. In the IBM pavilion there was a terminal attached to a mainframe computing

engine – physically it was in Kingston at the time – doing English to Russian translation. And being an international exhibition, it got a noticeable level of attention by some number of people. The Russian-English translators, the people who were in the business, both Russian native and American native, were favorably impressed. They were convinced that while it was not yet producing Russian-English translations that they would consider acceptable for their work output, it would surely be able to in a few years. The Russian-English translation capability has been considerably advanced in the last 40 years but the best Russian-English translators still have the same opinion. It's not yet to the point where it could represent what I would be willing to claim as my work, but it will get there. So, that measure hasn't changed in 40 years. But In fact, it has changed a lot in 40 years.

Grad: But it still doesn't do it at the level that a good translator can do.

Case: Right.

Grad: Let's go back to the Critical Infrastructure Protection Commission. Were you primarily focused then on the cyber attack issue?

Case: Yes.

Grad: Where did you work on this?

Case: I worked in Washington. Well, actually, our offices were right across the river in Roslyn, which is part of Washington as far as I'm concerned – but not politically.

Grad: So there was a whole headquarters operation?

Case: There was a headquarters operation. It wasn't all that big, but there was a total of 40 people, something like that, who were full-time employees.

Grad: Did you have a study group working on this cyber thing?

Case: No. The whole group was on that kind of issue in different industries.

Grad: So these were cyber attacks, not physical attacks that they were focusing on?

Case: That's correct.

Grad: Okay. But they were focusing on different industries with what you were trying to protect?

Case: Right.

Grad: Did you work on a particular area? You weren't chair of the Commission, were you?

Case: No, I wasn't chair. I was the next level down. The chairman was General Robert Marsh, who was a retired four-star from the Air Force, and there were unusually 16 commissioners. And because there were 16 commissioners, we had a process of negotiation and consensus development that in some sense is unusual in this kind of thing. Usually there are one or two leaders or chairmen or something like that who really control the thing, but somebody decided to set this one up differently. Each of eight major government departments was asked to nominate a pretty senior executive to be commissioner and to find an outside pretty senior executive that they could hire and appoint to be a nongovernmental commissioner. And I was found by the CIA. So, officially, I was an employee of the CIA.

Grad: Did you have to get security clearance?

Case: Oh yes, absolutely. We all did. Not only all the commissioners, but all the staff had top secret and what's the next level?

Grad: "If you talk about it we have to kill you" kind of thing?

Case: No, not quite that high, if that exists. You had to talk about that level of classification in a special room which was called a SCIF, Secured Classified Information Facility, something like that. Anyway, there was a level, a subset of top secret that is compartmentalized to particular subjects.

Grad: It was a need-to-know kind of thing?

Case: Yes, a need-to-know kind of thing. And we all had to get cleared up to that level, and a background check was done and my neighbors and relatives were all interviewed by the FBI or the CIA, or something like that.

Grad: That assignment lasted a couple of years. Was there a report at the end of it?

Case: Yes.

Grad: Did you find this exciting, along with every other job that you did?

Case: I did. Let me tell you, my experience with that revised my general impression of the competence of the Federal Government staff.

Grad: Up or down?

Case: Up. I dealt relatively high in the chain. In the military organizations, there wasn't anybody below a Bird Colonel that we were interacting with. And in the departments, one level below the assistant secretary or something like that

Grad: GS Sixteens or something like that?

Case: GS Eighteen, nineteen, yes, right. But I found in general, they were much more intelligent than I had expected, much more highly motivated than I had expected, and had what I'll call the interest of the country rather than their own interests at heart much more than I had expected. We were facing systematic – that is related to the system – problems that were beyond belief.

Grad: I have a question related to that. How would you compare the quality of those people you dealt with the people at IBM you had dealt with? Were they at the same level? Were they better, worse?

Case: I think generally the same.

Grad: Impressive.

Case: I didn't deal with people on purely technical topics like I did with IBM. I don't have a reading on their technical skills. But where technical and society meet and on the understanding of or appreciation for effects on the populace, I think they're good. The ones I ran into were good.

Grad: I remember when I left GE and went to IBM, that I was impressed at the quality of the IBM people. As good as GE was, the average person I came across at IBM was just a whole notch above, whereas there might be one or two people in a division in GE who were really sharp, I would find five or ten of people of that caliber just within a relatively small group. I found IBM an unusual organization that way when I joined in 1960.

When the study finished, you produced a report? This was Clinton Administration, right?

Case: Yes, this was the Clinton Administration.

Grad: And then what happened? You retired from IBM?

Case: Yes.

Grad: And what do you decide to do next? Tell us about a couple of those things.

Case: Accrediting engineering schools, involvement with the National MATHCOUNTS Foundation for the National MATHCOUNTS Program at the junior high school level. I'm a counselor and technical coordinator and instructor for the AARP functions for tax counseling doing income tax returns, generally for elderly and low-income people. It's a volunteer, no-charge to the customer kind of service. I am volunteer treasurer and volunteer – might as well call it – business manager for my church.

Grad: Are you involved with Case Reserve at this point?

Case: Not any more. I was on the visiting committee at the engineering school there. Two years ago, something like that, they dissolved the visiting committee and announced that they were going to restructure visiting committees throughout the university and they'd let us know. And I haven't heard anything since, and now the dean that I knew is no longer dean.

Grad: Did you ever try and do any consulting work on a commercial basis?

Case: Not except as asked for by the IBM's law firm in New York, Cravath, Swaine and Moore; I've been involved with them since 1975.

Grad: Really? So they continue to call on you since you left the company?

Case: Yes they have.

Grad: Are you allowed to talk about any of those assignments at this point?

Case: I can't tell you about a lot of the details, but I can tell you the topics.

Grad: Give me a few.

Case: Well, there was a fairly widely publicized Federal District Court trial in Detroit over Compuware's allegation that IBM had stolen some of their programs and was selling them

below their prices and trying to put them out of business. I was involved in the trial there. I was actually the person in the courtroom that IBM chose to represent IBM as the IBM executive, even though I wasn't, in fact, an IBM executive. But it turns out that the rules don't say you have to actually be an employee. You have to be appointed by the company to represent them in the case. So, I spent 12-hour days for 8 to 10 consecutive weeks in that trial two years ago, or a year and a half ago now, something like that. And there are a couple of other patent lawsuits that I've been involved in.

Grad: So, that one, you weren't testifying, you were just there?

Case: I was ready to testify. You know, the trial came to an end as a result of the fact that the parties finally negotiated a settlement while the prosecution was still presenting its case. But I was prepared and expecting to testify for IBM in the defense.

Grad: You started to mention another case.

Case: Well, yes, there was the patent case with Data General and the patent case with another company or two, and there are a couple that I'm still potentially working on, the SCO complaint about UNIX and so forth. I don't know a lot about the details, and what I do know I can't really discuss.

Grad: So, this actually requires a reasonable amount of time of yours?

Case: It's up and down -- 2006 almost nothing; 2005 probably a thousand hours.

Grad: That's basically half time.

Case: That's right. The year before that was 200 hours, and the year before that was 500. It bounces up and down.

Grad: It tends to cluster, though, I would guess.

Case: Yes, it tends to cluster at the important sections of the legal process.

Grad: The obvious question: Why do you do it? Do you do it for money? Do you do it for joy? Do you do it for loyalty? Why do you do it?

Case: I guess I do it because I like to do it. I mean, the money's fine, but at this point, I have enough that I can provide for me and my wife and whatever I want to provide for my children and still wonder what's going to happen to the rest of it.

Grad: But it's stimulating to you?

Case: Yes.

Grad: I find the same thing; when I get some consulting assignments, it really gets my brain going at a level that working for the church and other things like that doesn't have the same impact. Even working for the museum doesn't have the same effect.

Case: Sure.

Grad: You never published a lot of papers?

Case: No.

Grad: Why not? You're articulate. You have a lot of subjects that are interesting.

Case: I don't know a reason. It never seemed to be important to me.

Grad: There was no motivation to do much of that?

Case: But I recognize that of my whole set of professional qualifications, publication is way down on the list of things that I have done. I believe it may well be the singular reason that I was not elected to the National Academy. I was nominated – I don't know by whom – for the National Academy of Engineering, and I participated in the survey that they do collecting data. And I believe that the reason that I was not selected, which is the reason that I would not have selected me if I had been on the selection committee is: (A) This guy doesn't have a PhD, and (B) He hasn't published. And those are two fairly strong – not necessarily – fatal flaws, but strong preferential additional items to being elected to the National Academy.

Grad: That reminds me. We didn't talk about when you went back and got a master's degree, in 1985 at Syracuse University?

Case: Right. Let me tell you about the master's degree program. Starting in 1956, after I started to work for IBM, Syracuse ran, at IBM's behest and payment, an extension division at Endicott. You could take graduate courses, and for the next four years, part time, I did. I took

one course a semester, and wound up completing all of the required course work for a master's degree.

Grad: In Electrical Engineering?

Case: In double E, right. I did this within four years of when I graduated. There was, at the time, a requirement to write a master's thesis and I never wrote one. I got busy doing other things. Come the 1980s, how did it get started? I was back at Endicott working for Pat Toole and we were having one of our "how's your life" kind of conversations. And I said, "Well, one of the things that I had come to believe that I should have been more diligent at doing is finishing my master's degree." And I didn't think any more than that, but two months later, he came back and he said, "I've had a discussion with the dean at Syracuse, and we think maybe there's something that we can do." So the first thing that happened was that we found a glitch in Syracuse's student records. They were asked to produce a transcript for my graduate work in the 1950s and they produced an empty transcript; it had my name and address but nothing else. It didn't have anything on it. And I said, "Oh, gee, I don't think that can be." And he said, "Well do you have any documentation?" I said, "Well, yes, I think I've still got the course completion slips stuck in my file some place." He said, "With course numbers and grades and all that kind of stuff?" And I said "Absolutely." So I went home and I found it in the file and I produced a pile of 1956 through 1959 course completion slips. Then Syracuse found my real transcript. I was in the database twice, once empty and once with a full transcript that matched my records. And having my records in front of them gave them enough information that they could find it somehow, or enough motivation to find the second one. But the registrar agreed, "Yes, I really do have a record of him having passed all those courses." Now the current requirements for a master's degree don't require a thesis, but since that was a requirement when I did the work, there was something we had to do.

So I went through a process with Dean Straight's tutelage that got me in front of one faculty committee to talk about my work experience and what I was doing and basically a semi-technical interview the purpose of which was to decide whether or not I had forgotten it all since I took all those courses. I mean, because they're past the time, you can't automatically use them as justification for a degree. You have to pass a petition and get accepted there. So I did that. And then I gathered together a big pile of internal IBM stuff that I had written. But one of the things was the 360 architecture manual, which I had authored, and some other things which I'd been the only author of and so forth. I took a three or four inch binder of stuff up there and said, I think there must be a thesis in here some place. Would you like to look?" They shouldn't have to do that. The student should just present. But anyway, they agreed to look, and basically they said, "Yes, we think so." So, then I had another interview, which was basically a thesis defense issue. I passed the thesis defense issue and they issued a degree.

Grad: So you got your master's degree.

Case: So I got the master's degree 30, 29 years or something like that after I started

Grad: From 1956 to 1985

Case: Now, that's not a record. Some people have spent longer than that.

Grad: That's a great story. Let's try and bring this to a close now. You have not only tons of speeches in IBM and tons of presentations to customers, but you've given a lot of presentations to various professional organizations and so forth?

Case: Yes, that's true.

Grad: And you have a list of that. We will attach that as part of this transcript.

Case: Okay.

Grad: You've been active at various times in ACM but not in many of the other professional societies.

Case: I have helped many of those organizations at conventions or symposiums or something like that by giving a speech, usually on the technology of computers, but I've never been an officer.

Grad: You've not been into that kind of organizational thing?

Case: No.

Grad: You have a continuing connection with IEEE?

Case: I do have a connection with the committee on engineering accreditation activities, yes.

Grad: But that's your only connection with IEEE. You're not part of the overall governance or anything like that?

Case: No.

Grad: There are some final personal questions I'd like to ask. And this will wrap it up. We always ask each of the interviewees: Did I forget something I should have asked you?

Case: Oh, goodness. I don't think so.

Grad: When we send you the transcript to go over, if you think there are things that we should add, you may do that. We put in square brackets to indicate that it wasn't part of the interview, but you have an opportunity to enrich this interview or to clarify something that you feel in retrospect you would have said clearer or to add a name you left out, things of that sort.

Case: Okay.

Grad: As you look back over a very successful career, is there some particular thing that you look back and say, "That was really a defining moment; that was the best thing I ever did"?

Case: Not really. If I had to pick out a single thing, I guess I would say the thing that's probably the most significant to me involves the early 1960s work on the 360, and the job I had with Fred Brooks as joint manager and the contributions that I made toward getting the system announced.

Grad: That would seem a highlight for many people.

Case: Right.

Grad: And you were under 30 when you were doing that.

Case: We were trying to build a system, explicitly trying to build a system that we figured would last for 20 years.

Grad: And it has lasted.

Case: The previous systems had only lasted five years, so we were going to make a major increase in that.

Grad: That's a hell of a change. It totally changed the landscape in the computer field.

Case: Well, it was there when the landscape changed. It helped to change it, but it wasn't the only thing that changed the landscape.

Grad: Many of us believe that it provided a standard framework on which software could be developed on a massive basis.

Case: That's true.

Grad: And that the software industry would have developed much differently and more slowly if it hadn't been for that standard.

Case: Well, I think that's probably right.

Grad: And I feel the same way about the PC. The MS/DOS capability and later Windows provided the framework for the software development.

Case: Yes, I understand. I don't discount either of those. But I do say that the 40-year development of technology, both in silicon and magnetic recording and in printing and in some of the other things, were, at least collectively, close to being as important as that.

Grad: Interesting. That's why we're asking your opinion. As I say, I've always thought of that as a pivotal moment in the changing of the framework. That's my opinion, not yours.

Case: Okay. I'm not going to fight you on that because I think it was a pivotal moment. But the point that I was trying to make is that I think that the confluence of a lot of things in the last 50 years have made the computing industry the icon of the last half of the 20th century.

Grad: No question.

Case: At the end of World War II, Truman appointed Vannevar Bush and his committee to write the report on what did we learn during the war and what can we see for the future and all that kind of stuff. They wrote a tremendously insightful report about a lot of things that they expected to happen, many of them in the medical field as a result of the drugs and other developments that were occasioned by the war. Many have come absolutely true, but there was not a single mention of the computer.

Grad: Considering who he was, that's really surprising.

Case: There was not a mention of the computer. Not that the computer didn't exist. It did.

Grad: They didn't see it.

Case: I believe they saw it and did not appreciate the potential impact.

Grad: I think you're right. Were there any particular individuals in IBM or outside that you feel that you are particularly proud to have been associated with or became, I don't want to say role models so much, but people that you felt helped shape your life?

Case: Sure. First has to be Fred Brooks. Second but not very far behind him, maybe even not behind him, Bob Evans. Third, Jack Kuehler. Fourth, Pat Toole. I don't know whether I should continue to put numbers on them because I haven't really ranked them.

Grad: But they were all very significant to you.

Case: Jerry Haddad. Ralph Gomory.

Grad: It sounds to me, like, for example, with Lou Gerstner, you were more supportive of him rather than his affecting you in the same way?

Case: I think that's right. I don't see that Lou affected me very much. Maybe he should have.

Grad: That's an impressive list of people that you mention, though. They really are.

Case: Oh, also on that list should be Lou Branscomb.

Grad: Did you work much with Lou? You didn't mention him earlier.

Case: No, I didn't mention him earlier, but I always had a lot of respect for Lou.

Grad: Unless you have some more to say, we'll wrap this up and I want to express our appreciation for the time you spent and all your effort. It's been a very exciting interview for me, and I do appreciate the time.

Case: Okay. Well, thank you.

Professional Resume

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Computer Systems Specialist
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Educated as an Electrical Engineer, B.S. 1956 from Case Institute of Technology and M.S. 1985 from Syracuse University, Mr. Case is an independent consultant specializing in computer systems and their applications. His background includes forty-one years with International Business Machines in various technical and managerial capacities and one year as Commissioner with the President's Commission on Critical Infrastructure Protection.

Employment history

1998-Present **Self-Employed Computer Consultant**

1997-98 **President's Commission on Critical Infrastructure Protection**

Commissioner. The Commission was responsible to develop and recommend to the President of the United States a comprehensive national policy and implementation strategy for protecting critical infrastructures from physical and cyber threats and assuring their continued operation.

1991-97 **IBM**

Director of Technical Strategy Development, Corporate Technical Staff. Responsible for analysis, review, and audit of technical strategies for all sections of IBM in direct support of its CEO.

1987-91 **IBM**

IBM Director of Systems Analysis, Corporate Legal Staff. Involved in negotiation and litigation concerning intellectual, technical, and trade secret property protection with private parties and government regulatory bodies worldwide.

1984-87 **IBM**

IBM Director of Technical Personnel Development, Corporate Staff. Responsible for management of the corporate technical institutes, publication of the IBM technical journals, administration of the corporate technical awards and recognition programs, and programs for financial support to education (equivalent to an education foundation).

1983-84 IBM

Vice President and Development Laboratory Director, Systems Technology Division. Responsible for development of the IBM 4381, VM/SP Rel. 4, the IBM 4248 high-speed line printer, and the electronic packaging technology used in the IBM 9370 and the AS/400.

1981-83 IBM

Vice President for Development Operations, General Technology Division. Responsible for division headquarters technical staff and product assurance activities connected with the design and manufacture of logic and memory integrated circuit chips and ceramic substrates.

1979-80 IBM

Division Director of Technical Operations, System Products Division. Responsible for headquarters technical staff and product assurance activities connected with the development of the IBM 4300 series of computers and the development and manufacture of the TCM printed circuit board used in the IBM 3081, 3084, and 3090 systems.

1975-78 IBM

Consultant to the Director, Research Division. Responsible for review, analysis, and recommendations regarding scope and funding of research projects.

1971-75 IBM

Director of Advanced Systems, Systems Development Division. Responsible for planning, architecture, hardware design, and software design of a proposed new series of computer products.

1966-71 IBM

Director of Architecture, Systems Development Division. Responsible for the architecture of the IBM System/370.

1962-66 IBM

Assistant Manager, OS/360, Systems Development Division. Responsible for the initial development, announcement and early deliveries of system software for the IBM System/360.

1956-62 IBM

Various titles. Responsible for the logic design of the IBM 1410 CPU, the IBM 7040 and 7044 Systems, and for the first pass of the IBM System/360 Model 65. Member of the IBM System/360 architecture committee.

General and Personal

Mr. Case is a Fellow of the IEEE, a member of the ACM, and a member of the honorary societies of Tau Kappa Alpha, Tau Beta Pi, and Eta Kappa Nu. He was vice-chairman of the Trustees of the Computer Museum, Boston, Massachusetts. He is a Trustee of the MATHCOUNTS foundation and a MATHCOUNTS National Judge. He is a licensed professional engineer in the state of Connecticut.

Mr. Case married Virginia Quallich in 1956. They have eight children and make their home in Greenwich, Connecticut.

Publications

- D. Gifford and A. Spector, “Case Study: IBM System 360-370 Architecture, ”*Communications of ACM (USA)* Vol. 30 No 4 (April 1987) An Interview with R. P. Case and A. Padegs.
- R. P. Case, “Developments Affecting Computer Systems Organization,” *Datapro* March 1981.
- R. P. Case, “Computer Systems: Past, Present, and Future,” *Proceedings of the IEEE Stocker Symposium on Energy, Technology and Society, Computers and Electronics,* Athens, Ohio, 53-54.

- R. P. Case, “Computers: A View of the Future,” *The Black Collegian,* March-April 1979, 72-73.
- R. P. Case, H. Apfelbaum, J. E. Juliussen, B. Shriner, H. S. Stone, and J. E. Thornton; “Computer System Organization: Problems of the 1980’s,” *Computer (USA),* Vol. 11 No 9 (Sept 1978), 20-28.
- R. P. Case and A. Padegs; “Architecture of the IBM System/370,” *Communications of ACM (USA),* Vol. 21 No 1 (Jan 1978), 73-96.

Selected Professional Activities

- Member of *IEEE Committee on Engineering Accreditation Activities* (CEAA), 2004-Present.
- Program Evaluator for Electrical Engineering and Computer Engineering, *Accreditation Board for Engineering and Technology, Inc. (ABET),* 2001-Present.
- Member of the Visiting Committee, Case School of Engineering, Case Western Reserve University, Cleveland, Ohio, 2000-2004.
- Member of *National Society of Professional Engineers – Industry Advisory Group,* 1984-1997; Chairman, 1991-1997.
- Speaker on *Are the Mainframes Dying?* IEEE Computer Elements Workshop, Mesa, Arizona, January 12, 1993.
- Keynote speaker on *A View of the Future of Computing,* ASME International Computers in Engineering Conference, Santa Clara, California, August 21, 1991.
- Speaker in *Panel Presentation on New Technology,* Second National Conference on Court Management, Phoenix, Arizona, September 12, 1990.
- Speaker in *Panel Presentation on Computers and Personal Privacy,* Annual Judicial Conference, Second Judicial Circuit of the United States, Bolton Landing, New York, September 8, 1989.
- Speaker on *Emerging Trends in American Engineering Education,* ABET International Forum on Engineering Education, Washington, DC, November 30, 1988.
- Member and IEEE representative on *Engineering Foundation Board,* November 1987 to November 1991.
- Trustee of *National Technological University,* 1984-1988.
- Member ASEE Task Force on *A National Action Agenda for Engineering Education,* Ed David, Chairman, 1987-1988.
- Member of *NRC Committee to Study the Utility and Design of a National Research Network,* Chairman of *Subcommittee on Feasibility,* 1987-1988.
- Trustee of *Wagner College,* Staten Island, New York, 1982-1988.
- Panelist at the TECHWORLD symposium *Technology for Government in the 1990’s,* Washington, DC, December 9, 1987.
- Congressional testimony before the *Science, Research, and Technology Subcommittee, U.S. House of Representatives* about the National Science Foundation FY 1988 budget on behalf of NSPE and the Joint Society Engineering Education Task Force, February 25, 1987.
- Speaker at *24th Symposium on Advanced Research in Industrial Relations* sponsored by Industrial Relations Counselors, Inc., August 21, 1986.

- Speaker at *World Conference on Continuing Engineering Education* hosted by ASEE and IEEE, May 7, 1986.
- Member of *NRC Panel on Reliability, Integrity, and Privacy in Telecommunications,* 1985-1986.
- Session chairman of *Information Systems Technology Trends* at the National Computer Conference, Chicago, Illinois, July 17, 1985.
- Participant in *The Aspen Institute Executive Seminar,* Aspen, Colorado, July, 1985.
- Keynote speaker *CIMCON 1985 (Computer Integrated Manufacturing and Communications),* Anaheim, California, April 15, 1985.
- Keynote speaker at *AIESEC Symposium on Business and the Creative Process,* Providence, Rhode Island, March 8, 1985.
- Member of *Sponsors Advisory Committee* to the Center for Integrated Systems at Stanford University, 1980-1984.
- Program chairman of *IEEE Centennial Forum for Young Engineers,* San Jose, California, November 1984.
- Chairman of Editorial Board for *The Systems Programming Series,* Addison Wesley, 1975-1983.
- Keynote speaker at *Conference on Automation and Robotics,* Penn State University, University Park, Pennsylvania, October, 1983.
- Keynote speaker at *SHARE LX,* San Francisco, California, February 21, 1983.
- Member of Advisory Committee on *International Competitiveness in Electronics,* Office of Technology Assessment, Congress of the United States, 1983.
- Keynote speaker at *IEEE ICCD-82,* Rye, New York, October 4, 1982.
- Speaker at *Faculty Forum,* University of Virginia, Charlottesville, Virginia, February, 1982.
- Graduate of *The Stanford Executive Program in the Humanities,* Stanford University, July 1981.
- Graduate of *The Executive Program,* The Graduate School of Business Administration, University of Virginia, July 1978.
- Participant in *Workshop on Software Development and Procurement,* Air Force Studies Board, Woods Hole, Massachusetts, August, 1976.
- Panelist on *Making Computers Easier to Use,* COMP-CON, Washington, DC, September 9, 1975.
- Panelist on *Technology and Systems Architecture Interaction,* The National Computer Conference, Anaheim, California, May 22, 1975.

Honors and Awards

- IEEE Fellow, 1976, “For leadership in the design and development of large-scale computers and for contributions to systems architecture”.
- “Certificate in Data Processing” (CDP) and Award for Excellence in *Principles of Management* and *Quantitative Methods* from the Institute for Certification of Computer Professionals, 1976.
- Outstanding Invention Award for *System/360 Architecture* from IBM Corp. 1965.
- Undergraduate honor societies: Tau Beta Pi, Eta Kappa Nu, and Tau Kappa Alpha.

U.S. Patents

- 3,400,371 Data Processing System, September 3, 1968. This patent covers the IBM ystem/360 Data Processing System
- 3,264,615 Memory Protection System, August 2, 1966.
- 3,046,416 Phased Pulse Generator, July 24, 1962.

Community Activities

- Chairman, *Belle Haven Land Owners Association,* 2002-present
- Member of the Board of Directors**,** *MATHCOUNTS Foundation,* 1992-2006.
- Treasurer, *St. Paul’s Lutheran Church, Rye Brook, NY,* 1990-present
- Member of the Board of Directors, *Greenwich Symphony Orchestra,* 1989-present.
- Member of the Board of Directors, *Binghamton Symphony Orchestra,* 1983-1984.
- Member of the Board of Directors and Treasurer, *Mid-Hudson Philharmonic Orchestra,* 1974-1977.
- Chairman of Evaluation PFG Committee, *Metropolitan New York Synod, Lutheran Church in America,* 1973-1977.

