Oral History of Jonathan Schmidt

Interviewed by:
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Len Shustek: Today is June 2nd 2004 this is one of the Computer History Museum Oral interviews and we're interviewing today Jonathan Schmidt.

Jonathan Schmidt: Thank you.

Shustek: Behind the camera Len Shustek and Harry Saul. Why don't we start by having you tell us about your background - where you were born, what your family was like; siblings, parents - what did they do that sort of thing.

Schmidt: Born in Ann Arbor Michigan, my sister became a lawyer ended up serving republic of policy committee and thrown out by Senator Powell, the entire staff, and ended up in the Library of Congress congressional research. Brother's an artist, studied in Rome and has worked with Michael Graves and other architects and designers on wineries in California and he paints big murals and he's one of the founders of the New York Academy of Art and we're all different. I grew up in Ann Arbor and…

Shustek: What years?

Jonathan Schmidt: 1941 just before Pearl Harbor and ended up in an iron lung shortly after the war. My mother said from swimming in the public swimming pool in the park which she's probably right. Lying in the iron lung thinking you might not get out of it but not realizing what that meant probably subconscious turned my consciousness toward radio and dreaming about things outside. <laugh>

Shustek: How old were you?

Schmidt: Eight and that started me going., It wasn't long after I got out, one of the first things I started playing with was an old Zenith radio phonograph. The phonograph was on one of the end tables and the radio and the speaker was in the other and I didn't know how that happened. It broadcast into the am radio and it wasn't long before I took out the crystal card and plugged in a microphone and the phonograph didn't work anymore but I had a lot of fun and then got into ham radio.

Shustek: How old were you when you got your first license?

Schmidt: What was that 19 53…

Shustek: When you got your license?

Schmidt: Yes…

Shustek: When you got your license?

Schmidt: Yes - somewhere in there. I just missed because my best buddy got a W8Z on the first round and I got a reissue unfortunately - W8BCV and I remember building Johnson Viking am transmitters and huge transformers I couldn't lift. Heath Kits by the dozen single side band radios got interested in teletype.

Shustek: Did your parents have any technical background - like encourage you in doing this?

Schmidt: No not at all, they just hated it - they hated it because it was very destructive. I started to grow stronger and stronger but of course the only ways I could get stronger was build the biggest damn transmitter you ever saw so I had about a 4,000 watt transmitter four times the legal limit. When I turned it on, I swear even the incandescent lights in my neighbor's house would light up. Every fluorescent light within two or three houses around would light up and of course it was very irritating to them at 3 o'clock in the morning and no televisions would work, dishwashers would turn on by themselves. I caused a lot of problems in the neighborhood, but it was a lot of fun. I merged into teletype that got me into digital and then I joined the hospital ship Hope, went down to South America because I'd been helping them for a long time. My roommate Irv and I lived out north of Ann Arbor we put up a 180 foot tower, out of sections of rolled tower that probably should not have gone up over a 100 feet and I'm amazed we went up it and we had this huge 20 meter beam. We could always talk to the hospital ship when it was in Asia no matter where it was and the people in Washington in their fancy headquarters couldn't so we would relay it and I ended up making an automated relay; tape-to-tape and it would come it and it would automatically retransmit out to Washington DC and they loved that so much that they asked me if I'd come join them in Ecuador and Peru and then West Africa which I did.

Shustek: So let's place this in your education -

Schmidt: University of Michigan. I got a BA in mathematics and then I went off on this, came back and got an MA in mathematics, but meanwhile I was on this hospital ship and had a great time - I hooked up CB radios which we got donated from Hallicrafters to the old strober switch telephone system below deck what they called holds and so people could automatically dial any of the remote stations and they juggle by just a call number from anywhere in the ship. It was full of doctors and nurses and training and they were always talking, it was very important and it turned out to be very valuable. So I got a lot of involved in the designing radios, lot of RF design, digital design with teletypes, back before digital got designed, but that's what teletypes were. I was sitting down in Ecuador once on my radio, on the ship and I heard this call and I responded to it and the fellow said his name was Vic and he was in a travel trailer vacationing in Florida. I said 'you've got a terrific signal' he said 'Well, says, just a Collins radio it's one of the newer ones that I borrowed from my friend Irv in Michigan". I said, "where Ann Arbor?" He gave me a call sign and I said "that's my roommate and he doesn't have one of those, I have one of those left in Irv's care" Vic came back and said "are you telling me the first damn guy I talk to tells me I'm using his radio and he's in Ecuador". We became fast friends and even more than that I also was using a teletype demodulator of a design that he was involved in. It involved a page communications patent and was the basis for a product line for his company. I was doing a lot of interesting <tape breaking up> he kept asking me to come and work for him and I said "'Ehhhh, I want to see Africa, I hadn't seen Africa yet."

The next year I went to Africa and then after that I got pretty tired. It was the only communist country in French West Africa pretty desolate but I hope I was doing good work. I ended up going back to graduate

school doing a very quick turn round and I was surprised how much easier school is once you know how the school works, which happens long after unfortunately. My father used to say <inaudible> and so I obtained the Masters very quickly and I was working on my PhD in Michigan and-- my father died when I was 15, one of my memories is that I was there.

I ended up working for Vic Poor in Frederick Maryland and doing everything I dreamed would be the most fun thing in the world. We designed digital communications; digital implementations of facsimile machines. Digital implementations of facsimile to modulators rather that would go over the short-wave and I remember we did one using a linear discriminator, pulse counting discriminator, because before that all they did was pass the <making siren sound like noises> FM signals through a three stager Butterworth filter and get slope and then take that demodulator back to the amplitude and feed that into a crater lamp and burn the photographic print. UPI and AP users would get photographs from around the world on short wave and of course the signals were terrible on short wave; base shifting and amplitude shifting and noise. It was all Vic's idea and I just sat down night after night after night playing with digital analog circuits to come up with a pulse kind of discriminator and lots of delimiting and much more precise filtering and ended up with an amazing digital demodulation of facsimile signals. It was all touch soldered little spidery things put it in a beautiful case took it up to the United Press International to a fellow named Charlie Holm and Charlie put that in and it looked like it worked beautifully and I went back from the old UPI offices. They called me two days later and said "it couldn't be better, I mean except for one thing". I said, "What?" "The pictures are unbelievable compared to the overhead modulators, these pictures are spectacular, they look like they just came off the camera except every time you have a picture, where you could see the ends or the edges, offset by a certain amount is a ghost of the same thing" and we said, "that's impossible. There's no way for that to have stored that much information for that amount of time." It was Vic Poor who came up and said, "Wait a minute, uh, that's just the other path." I said "What do you mean that other path?"' "Short wave is coming from Hong Kong, the short way; it's also picking it up the long way". I said, "Well there's nothing we can do about that". Dickie Holmes was there and he said "Oh yes there is, dither out the least significant bit they'll never know the difference" <laugh>. So we put dither on the least significant bit, put noise generator on it and a little diode back biases, right, and the ghost disappeared and they are happy and we start shipping large quantities of these. The Teletype demodulator is a radio to use-- communicate digitally with all these wonderful machines.

Shustek: What was the name of the company?

Schmidt: Frederick Electronics, it was originally Frederick Electronics and Engineering which was run by John Houston - head of Roosevelt's War Products Board and we think really coming out of my so world here and by the way the hospital ship Hope was headed up by Jim Walsh who was Eisenhower's heart surgeon and also on that hospital ship was Nicholas W Crod who married General Norstead's daughter and I think they're divorced while we're on that. Anyway we had a great time with Vic; we ended up doing some of Vic's real dream work. That is getting into some real switching systems, message switching for tropical radio and we developed message switching systems which would take the messages in, look at the headers and from the headers vector them into holding states, memories…

Shustek: Queues of some sort…

Schmidt: Exactly made out of acoustic delay memories and then they would then when they had a path to the next one, it would be sucked out of that to the next one - so we'd make this massive switch, percolate the messages down and then out the proper channel to the next-- message switching…

Shustek: Were most people using paper tape at that time?

Schmidt: Well that was what it replaced - paper tape. Carrying it over sneaker net and we went to a lot of people. I remember this is an interesting story I wish I had them all. Harry Pyle whom you've got, he was seminal in virtually all of this we had a BRPE punch put in and a feed for Associated Press. A BRPE punch - do you know what that is?

Shustek: No.

Schmidt: It was BRPE it was the initials of the acronym I don't remember but it was a very high-speed punch - twelve hundred baud and it was punching six level teletypes intercode and when you turned it on it was <makes screeching sound> and the tape flew out oh about eight, ten inches in the air just because the velocity for it would fall down and of course fold up fast on the floor. This Bell guy in Frederick Maryland put this thing in hooked it all up, the line was there, the line tested was there, hooked it up - turned it on and Harry and I were watching and he says <makes screeching sound> stuff was coming out like crazy and the guy says, "Well I don't know how you're going to know it's going to work?" "I don't know" and Harry picks it up and he goes "Oh it's working great, here's the stock market, here are the ball scores. That Bell guy literally said, "You guys I'm leaving". He was out of there. He was crazy and I said "Hey that was amazing". He says, "Yes." He said, "Come here look they punch it in big letters <laugh> across it so you can find it right?" It was a 5 by 7 matrix of characters so you can find it, you know they had this <laughs>. It was a wonderful story.

<inaudible>

Schmidt: Right, that was wonderful. We did deals with Western Union and Western Union International - things that I never knew. Like how the separation of 'W' and 'WI' in their offices in New York they were forced to build a wall between them and the only connection between them was this 'u' shaped hole in the ceiling, you know about that?

Shustek: No…

Schmidt: And a clothesline and they clipped the messages on them and they do this <makes sound> and it was all through the hole to the other company and that was the law that they could not have any electrical connections, apparently - that's the only thing I can make out. Vic knew all about this but he was telling me about it, he says "'watch".

Shustek: What was your position in the company at this time?

Schmidt: Frederick Electronics in Engineering, Development Engineer - had no training in engineering, just built my own radios and teletype demodulators and stuff. We soon got into message switching and control and the controller for this message switching. I was a senior engineer at that point in Frederick Electronics, Vic's development group merged with John Houston's engineering group and became Frederick Electronics bought by Plantronics in 1969. We had these controllers getting more and more sophisticated using acoustic lead line memories. You know more and more shift registers and decoders for bit values, character values, bottom values and that controller really came out of a lot of Vic's experience; the Packard Bell PB250 from his navy days in the1950s; the PB250, as he would explain it, was a drum machine, . I did have experience with IBM was it 650?

Shustek: Yeah it was the drum machine?

Schmidt: … and IBM 701s, 705s - can't remember the numbers anymore but used to haul those dual triodes home and put them on hi-fis. I was a hi-fi repair man at night and those work very well in Fisher pre-amps and stuff. Didn't quite have the proper curves but they never failed, you know and they would take them out precautionary, the IBM. I was just a student, right, creating programs for the computer science teacher like write a compiler, here's what it does; write a macro and that's what I did in 1959. It was more profitable however taking the tubes out of the wastebasket and reselling them. But Vic had the Packard Bell 250 in his brain. Even the accumulator was on the drum, everything was on that drum; the entire state was in the drum. You had to wait for the accumulator to come around and also you had to write your programs so that the minimum number of phase shift or missed revs would occur in the process. We got experience in doing that with these acoustic delay lines and we always got more and more to the point where it was semi-programmable and in the meanwhile I developed electronic called Eltex which is a circuit switch…

Shustek: What was it called?

Schmidt: Eltex -- a telex exchange; it had a thousand line exchange and it was a cross bar, in my mind, switch with one dimension in time; time slots that weren't mentioned in many roving finders; every line in its own timeslot - one through a thousand - zero through nine ninety nine and the line would come off. There were several buses off line that buses and a card of finders made connections and when it kind of went off line the next finder would come and scan all thousand time slots; when it would find the one that was off hook rather than off-line would latch onto it except as valve pulses connected up to the relay the out of the other timeslot and just relay the data in and out - really cool, and Plantronics bought all that and decided they didn't want us anymore.

So we parted company and came down to visit some friends of Vic's who had come to visit us the year before - Gus Roach and Bill Ray. Gus was an old friend of Vic's and they came from General Dynamics Florida, we're out on our own, we're now in Texas. We're coming to raise some money for some technology and we had no idea what to do. Vic said, "Well". He introduced me to John McKiddrick, president of Plantronics. They had lots of money then and in your area of the world and it didn't go well because they had no products, no business plan. They came out of the space program and they thought that magic pixie dust was enough to raise money - it was in a lot of cases. Vic said, "You know, if I were you here's what I'd make. I'd make a glass version of Model 33 Teletype. Why? Because we can't even get them for our own projects. I was making this telex switching system and I had to wait six months to

get a couple, they were being bought up by Lease Co. for example." We took the Dartmouth basic interpreter, put it on HP2116s and it was a wonderful time sharing machine. They came out with a 16 or 32 and they'd sell-- you couldn't get enough of that plus the dial up time sharing was like the internet phenomenon today when you ran out of dial up lines for AOL and it was the same phenomenon they weren't enough teletypes and everybody discovered time-sharing. You take one of these things and buy it for three hundred bucks…

Shustek: What year's this?

Schmidt: 1968 I think.

Shustek: There's a worldwide shortage of teletypes?

Schmidt: Yes…

Shustek: Teletype Corp couldn't build them fast and no one else has anything…

Schmidt: Hi, 555 Touhy Avenue Chicago…

Shustek: And no one else has anything compatible?

Schmidt: Well no I mean everybody really liked the IBM Selectric Terminal 2114 or whatever that was…

Shustek: 2741…

Schmidt: 2741…

Shustek: But it didn't speak ASCI, didn't speak teletype?

Schmidt: No I mean the time sharing could have been built for ebcdic but they were built for teletypes because it was three thousand dollars for the IBM and three hundred dollars for the teletype so you buy these teletypes. We used to get teletypes by the dozen from Burt Prahl who's still here. Now his family lived up in Winnetka, Illinois, in a huge mansion and Burt would get teletypes from 555 Touhy Avenue in the junkyard and bring it back and sell the parts, or give the parts whatever it cost and I'd drive from Ann Arbor to Chicago and pick them up, drive them back and dip them into trichloethelyene and clean them out, benzene and clean them all out and fix them up and give them to the other hams and get teletypes going and those were the models 19s and the 28s…

Shustek: Right, it's a five level baud O machines in those days.

Schmidt: Right, 28s it was the version of the 28, it was ASCI 35 and 37 that's it but those were very expensive but the model 33 and 35 were dreamed for nothing you know and it-- there were future's being traded in teletype futures…

Shustek: So who was it who proposed building a glass teletype? <overtalking>

Schmidt: Vic Poor, because that was the major competitor to our progress in a lot of development selling teletype switches and message switches because they were all based on using these machines and these machines which were plentiful supply until Lease Co time sharing basic discovery took over just like the Internet. It smelled the same, it looked the same, had more nerds there were more radio people involved than you have now but it was the same kind of phenomenon; you couldn't get a dial line you couldn't get all in one modems 300 baud 110 baud, 110 baud modems I still have them some place - big racks and you pull out the circuit board there'd be one transistor, two resistors and a capacitor and that was it on the whole board. Bell made these modems, You would go pick them up surplus and you put them on a teletype and you get on line. I came to San Antonio, big guy here some months before we did by that time he had already had bought one of these from HP like the HP2116 it was called the HP3000 just about that time and it was there. Harry Pyle was from Case Western Reserve and he and I and Vic had been at Vic's house for Thanksgiving of 1969. They took all the controller architecture and Harry who had been in computer science in Case Western Reserve was from Maryland came back for Thanksgiving vacation and Vic who had the PB250 and me, I, was so allergic to cats that I sat in an open window sill on the other side of the room while Vic and Harry really came up with the architecture of the 8008 and the 8008 was Vic's experience with the PB250 and the controller architecture. I remember being part of the discussion like the parity flag and the accumulator because it wasn't fast enough to do a teletype emulator without it. <laugh> One of the very first programs that we ever wrote, I remember, shortly after we got San Antonio, I'll get to that in a moment. Harry Pyle's Morse code converter and I see even now on the internet, Harry Pyle programs involving Morse code conversions and Harry's still doing that.

Shustek: Now you described this as the 8008 but this was not a machine you were going to implement as a chip…

Schmidt: We were asked to come to San Antonio to design a computer architecture. Gus and Phil Roach built the glass Teletype.

Shustek: Where did the funding come from for the company?

Schmidt: San Antonio money-- all money local money with the proviso that the company stay there.

Shustek: How much money was invested do you know?

Schmidt: I don't remember.

Shustek: this was a business contact, friend or whatever of Vic's?

Schmidt: Vic and…

Shustek: You knew these people said San Antonio…

Schmidt: This is not going to-- presented to them they came back raised money, took Vic's glass teletype, got a guy from the space program - actually from Raymond Loewy a design engineer, industrial designer Jack Franscheco designed the 3300 with a beautiful glass teletype case. They found out the secretary's favorite typewriter was the IBM Selectric so they made it the same height and key feel as the IBM Selectric - roller shape and the contouring because that wasn't natural back then. They followed that as much as they could including something that nobody else had; a key rollover, all electronic keyboards at that time had end key lockout. That means if you had one key down, the others wouldn't work they were just dead. If you had 'the' and the 'h' wasn't there, either that or IBM Selectrics or teletypes where they had physical lockout where if you pushed one down it would force the other one up, it felt so good. Each of the keys had little pointers that went down to a tray of ball bearings when you pushed one down, a ball bearing expanded and squeezed the other one up so you could just feel…<typing>

Shustek: So let me get back…

Schmidt: … the keyboard. They made these devices so perfect for secretaries and so elegant the industrial design that everybody loved them.

Shustek: Let's talk a little bit about the location, San Antonio which is where we are today - 40 years later something like that.

Schmidt: Yes.

Shustek: So what you said was the reason it was here…

Schmidt: 45…

Shustek: 45 was because the funders were here…

Schmidt: The funders were here…

Shustek: …and they had this requirement that you start the company here, why did they have that requirement?

Schmidt: Local business people thought it would be good for San Antonio there wasn't much else here.

Shustek: Lower rent…

Schmidt: You want to know what is here, go rent -- what is that *Viva Max*? Peter Ustinov movie with Jonathan Winters and Harry Morgan and a host of other people you would love to watch. It took place here. A deranged isolated funny, endearing, Mexican general, forgotten about, wants to take over the Alamo again and you watch that movie and it's nothing but the Alamo here in San Antonio and it took place in '68.

Shustek: Did you have any thoughts at that time about the pros and cons of going from Fredericksburg where I guess there was some technology…

Schmidt: Frederick, Maryland…

Shustek: Frederick, Maryland where there was some technology…

Schmidt: There was…

Shustek: In the area right?

Schmidt: Just north of the National Bureau of Standards

Shustek: … of training people and so on going to the Alamo, what did you think about that?

Schmidt: I couldn't believe it, of course I'd lived in Africa <laugh> but it was pretty desolate but yes there was some wonderful people there, lot of them from the space program that came with Gus and Phil. But they had problems in their design-- electronic design in that what you see and offered for overflow phenomenon in Microsoft, then you say after ten years you'd think they'd know better the dynamic logic instead of static logic. A lot of you do this, you fire one shot and that triggers that and that fires the one shot and that triggers that, that's the way the design was but if the pulses missed, the system sits there hung to you until you turn it off and on again right. So we had cultural conflict where we had been designing stuff that works all the time, which these guys should've done from the space program but didn't. They wanted us to bring in computer technology because they said, when Vic talked to Gus and Phil, what they need now is not only the ASCII terminal but a Univac terminal and a UC100, this terminal and that terminal, they had ten different kinds of terminals they needed. Vic said, "Well you just need to put some more flexibility in your controller and you need to be able to program it". And they said, "What's that?" And that's when Vic was consulting with them and we came back to Maryland, it was Thanksgiving. He said, "Let's just build a controller that really does everything". And Harry said it had to be able to do teletype emulator and at this slow rate you need to put in an accumulator and I wanted to do a Morse code decoder so I'll need this and they came up with the architecture and the stack and registers and the way it worked and they did some sample programs and that architecture is un-changed since the 8080 and that original Datapoint 2200 programmer's manual.

Shustek: So the target was to have this flexible multi emulation capability, multi terminal emulation, that was the day terminal emulation, not just one but many and you went from that to a programmable logic device…

Schmidt: It had to be programmable. Once you had that spectrum of demand and the flexibility then everything was covered that had to do to be a computer.

Shustek: So who knew programming? So you had done some programming?

Schmidt: I'd done programming. Harry was the most sophisticated because he was at Case Western Reserve and really doing advanced stuff. Vic had this long rich history of successfully using programming and yes we came to San Antonio. Harry was remotely programming through a dial up connection. He wrote a compiler in BASIC, he wrote ninety percent of the compiler in BASIC; I had to finish it up…

Shustek: Compiler for this product which let's call it 2200.

Schmidt: I'm sorry, assembler

Shustek: …architecture…

Schmidt: Wrote the assembly in BASIC.

Shustek: Now which came first - the assembly language or you laid out the bits and opt codes and…

Schmidt: The architecture, the stack, the registers and the I/O bus being the accumulator all that was laid out Thanksgiving and I got there at the end of 1969 between Christmas and New Years and my first job was to finish up that assembler and to write a simulator for the machine on an HP2116. And as I said the first real job I had was to write a simulator so I sat down the 2114, cheaper. I'll tell you how advanced by the way Harry Pyle was. Back at Frederick Electronics we started bringing in for controllers, I forgot about that, Interdata core machines. Harry would start to program those and one day Harry spent all night, we just left him there shortly after we got it, he couldn't believe his good fortune being able to play with one of this being a teenager, this is maybe 1967 and we had racks because they were going to be shipped out as message switches. He took his portable radio and he noticed that he could hear the tones if he tuned it into somewhere around the upper end of the broadcast band and he could manipulate the tones and he wrote a program that played Anchors Away and broadcast it from there He took his radio and locked it in the rack. When we came in the morning into the lab and <humming Anchors Aweigh> over and over and over and over and there's nothing I can do and I didn't want to pull the plug because probably he was running something necessary, we had to wait all day long. Harry was brilliant. I mean he just found he could do that so he had…

Shustek: Was he in some sense a mentor to you, did he guide you or did you just admire him from a distance?

Schmidt: I worked with Harry and I worked closely together for years and years, he was much younger than I was. I mean this was like 1970 that Harry was in college. 1959 was when I was in college, but yes he did he's much smarter than I am but it was the synthesis of all of our very different backgrounds, we were all hams, amateur radio operators and we would all have projects together and very elaborate digital radio projects.

Shustek: So during the design of this instruction set for the computer which was the general purpose terminal, did anybody make an estimate of how much it would cost to build?

Schmidt: Oh yes we knew exactly how much it would cost to build and how much cost to build and using TTL and MSI we used and a lot of the architecture was specifically designed because back in late 1969, Vic was already in conversations with Intel and they were going over the architecture to make it as simple as possible so it could put on a chip.

Shustek: Now you have connections to Intel because they were selling you chip registers for the terminals.

Schmidt: Actually we were buying them from Mostek, but it didn't matter, I mean, Datapoint claimed to be the world's largest user of MOS memory in December 1969 because these terminals were shipping out with screens worth of display, and they were shipping thousands. HP bought them, and Westinghouse bought them, and Digital Equipment Terminals…

Shustek: Is the company still called CTC at this point?

<overtalking>

Shustek: Founded in San Antonio?

Schmidt: Yes CTC and the brand name for the product was Datapoint. They switched the name to Datapoint a couple of years later.

Shustek: So the company expanded very quickly, it grew.

Schmidt: It grew very quickly. It went public in October 1969; raised a lot of money and the stock went <making sound> and people were happy. Everybody was in a euphoric state for several months before the recession hit and there was a bubble very much like our dot com bubble. What are we going to do now? Money was running out, people stopped buying the terminals plus it was Beehive and everybody else in the world had figured out how to make lower cost not very economic but good enough alternatives. The project to build the 2200 came to a more or less a halt officially because of lack of funds and we only had built by April of 1970 we built four prototypes that looked and smelled and tasted like the original-- like the production units on the outside. I had to see them in running January with the I/O bus actually running peripherals and was running the assembler on it and everything worked, by April we had

four at the American Banker's Convention in San Francisco. I was running games. I had written some games for it, it was really fun.

Shustek: And this was using an MSI implementation of that instruction?

Schmidt: Yes a hundred percent exactly the same instructions.

Shustek: Was there a point at which it crossed people's minds and maybe it was always obvious from day one that this machine which was designed for this multi emulation terminal multi-terminal emulation capability actually could be used for other purposes - for games and so on or was that from day one clear?

Schmidt: There were more sophisticated programs. Some of the first programs I wrote for the American Banker's Show. I wrote all the programs for the applications for the American Banker's Show. There was a data collection program where you'd type the name, address and it'd say no you can't have numbers in the name field, I it was pretty remarkable back then and you know nothing over a hundred dollars was too much. It was an interesting demonstration of which you could do.

Shustek: Demonstration of the-- sounds like there's a demonstration of the technology that you recognized but it wasn't part of the product line; the product line was…

Schmidt: Terminals…

Shustek: …glass terminals…

Schmidt: Right…

Shustek: But somehow…

Schmidt: …the American Banker's Show concept of terminals embraced a little more of the validation of the data which was a new concept. 2260's had a…

Shustek: …field entry right, the IBM terminals at that time had the capability to field numeric field, alpha field, how many characters…

Schmidt: That was it…

Shustek: …and some simple…

Schmidt: …what you do is you had a couple of behind…

Shustek: …two levels…

Schmidt: …bits, which would characterize the fields and you fill those in and then the cursor would run around and sweep off the variables and send them out and back in the IBM.

Shustek: So that was kind of in the area in the marketplace?

Schmidt: It was just coming in the marketplace; we could do more than that you know.

Shustek: You could do anything in software as long as you had enough cycles; right there was performance value - question…

Schmidt: Barely had enough cycles. We could barely do 300 baud Teletype was about the limit. The process with Intel got kind of tough; they weren't sure and they kept saying you know money. Really from what Vic and the Intel people would come to report they were much more interested in the memory than selling computers and…

Shustek: Was that part of their business plan at that time?

Schmidt: <overtalking>

Shustek: Right, memory chips, RAMS, storage was their…

Schmidt: ,<name missing>…right his PhD thesis really has a very accurate chronology of events - mine's probably going to be mixed up but that by 1971 the 2200 was clearly under powered for what we wanted it to do.

Shustek: The hardwired version?

Schmidt: The hardwired version so…

Shustek: What you wanted to do? Because you saw the opportunity to go beyond terminal emulation in other words.…

Schmidt: Yes…

Shustek: But you said it kept up with terminal emulation.

Schmidt: But it's hard to tell. Terminal emulation and there was a cassette deck. There were two tapes, you could do a two tape edit so you had a real data base. You could do anything you wanted if you had enough time. I mean it was a Turing machine, you could add, delete records and by that time we had quite a bit of high level programming applications language. Vic came up with Data Bus with Harry. I was in the room…

Shustek: Just morphed into a real full computer…

Schmidt: Right, right

<overtalking>

Schmidt: Right and Intel was a year late with the chip and when they came up with it. Datapoint had created a parallel version of the serial 8008 which was almost exactly the 8080 and if you want to know where 8080 came from about that much MSI <puts fingers together> and an 8080 Dave Monroe was able to make Datapoint 2200 perfect version 2 it's parallel. By the time the parallel machine came out later in 1971 Pillsbury Farms and some other big customers at Datapoint came back 'hey you won't believe it but we can get rid of the computers in our remote offices because the terminal does everything and they had geeks who were writing incredible programs for this machine…

Shustek: When was that opened up to customers the 2200?

Schmidt: Oh everything was always open, always open.

Shustek: <inaudible>

Schmidt: That was all Vic Poor's doing. Vic said "if this is going to be a success it's got to be absolutely open and we've got to put as much effort into the program development for exterior use as anything"

Shustek: But the customer could develop the programs on that machine <overtalking>

Schmidt: It didn't mean anything else. I still think that was more Vic than anything else but once the rest of us realized we could take it home and develop programs on it and not have to come to work for a day or two around Sunday and Saturday and our wives would love us for not having to go to work 24 hours a day. I mean we were enamored with amazing possibilities of having a machine that you could pick up and actually develop programs on it and do fancy stuff. Harry wrote Pong you know there were lots of early, early games in 1972 that might not…

Shustek: But there were other applications like editors so tell us some of that business, let's call them applications or…

Schmidt: Oh yes, editors, and assembler and sub-routine libraries which were more and more extensive like string capture and data file writing and reading the kinds of things you sort of see in operating systems. For a permanent machine there was stream arithmetic package and floating point, and then my dream world Pascal compiler for it and things really roll along…

Shustek: This is very running of cassettes, dual cassette?

Schmidt: Dual cassettes and then we added…

Shustek: How much memory?

Schmidt: 4K and 16K, by the time we got to 16K the data bus compiler Harry had figured out how to make the interpreters so would support 16 users simultaneously and they thought it was fine, we put a disc out of it on course. Harry wrote a cassette tape operating system, a 9-track tape operating system and disc operating system. The disc operating system is very, very similar to Radio Shack's Trash DOS and Digital Research and so there's a heritage all way through and it's not a stretch, the Datapoint DOS we all know.

Shustek: How was all this funded?

Schmidt: Oh Datapoint, we're selling these terminals but we would have to turn on a dime, there's a couple of funny stories. When everything turned to pieces we went "wow all these terminals" and the executives at Datapoint were working with TRW to try to get funding and TRW said "yes, yes, yes one of our biggest problems are Credit Data Company and we just can't afford these IBM terminals, why can't you use small terminals on our stuff?" "Oh it's a different sort of a thing." So I came up with the idea of putting an extra bit of memory in the terminals so we could at least flag the fields and then using an HP2116 and just like the HP time sharing machine architecture, electronically the same but with 64 terminals and the terminal would keep you from typing anywhere but the fields and the computer would come in and suck up the data off the screen, just dump the screen memory and figure out which was the variables, format it into a proper IBM network message, it wasn't a selector channel, it was a network base and we had these controllers at Credit Data, they saved a lot of money they invested it…

Shustek: It was like emulating remote 2260s whatever cluster or…

Schmidt: 2260s…

Shustek: Cluster of 2260s…

Schmidt: 2260s cluster all came up with a selector channel interface with the Datapoint 2200. The cable was as big as the computer you know, the cable of the IBM it was, I mean it was unbelievable.

Shustek: But now you're doing all this stuff, I want to relate this back to being in San Antonio doing all this very advanced you know cutting edge development lot of software development operating systems, interfacing all this and all this I gather is drawing upon San Antonio labor pool or…

Schmidt: No…

Shustek: Did you have remote offices - what did you do?

Schmidt: I was the Vice President of by 1974 of advanced product development, and I brought in people I knew and people who knew people that I knew and we'd bring them into town they'd never seen anything like it. To bring in the fiesta, the ambiance, and the romance of the European culture it was different than anything they'd ever seen in any place else. We had some interesting things here. We had a full time 24-hour day classical music station and a symphony. I mean it wasn't as isolated as you thought. San Antonio is still probably the only city in the United States with 24-hour a day NPR station and a 24-hour classical music station.

Shustek: So it has those kinds of attractions and quality of life and so on I'm thinking of…

Schmidt: Right brought the man in…

Shustek: …the technology atmosphere or the company's to steal from, you had to bring everyone in from…

Schmidt: Everybody came-- whenever we would have a next project, for example, the reason we did ARCnet is we were getting clobbered by 16bit computers like computers you know Computer Automation, General Automation…

Shustek: …Data General…

Schmidt: Data General and they were doing these time-sharing systems and all we had was an 8-bit computer. We're getting faster and faster and we had a protected mode you know just before the 286 came out and we were all one step ahead of when we could use a chip even though the instruction sets were almost identical to Intel's. We were almost a year ahead with the actual MSI implementation. Vic again was the one who thought up "we'll cluster these things" and at first his concept was "'lets take computers and just boot them up off X25, there was no APB thing. We'll just remote download and we'll just program loads and everything" and created a model to do that and <making sounds>. People getting hungrier for speed and that didn't look like it was going to work.

Meanwhile Harry Pyle had hooked up one of our computers in my lab, Harry worked for me at that time, over something called a combus, it was a 1902 which was as fast in communications controller would go on a bus, a open collector shared bus that ran around and we could all transfer files, <sounds like hitting ruler on desk> that's my transistor that's my emitter, that's my collector and so this would go <making sounds> on the bus and they'd all talk to each other. He came up with a protocol where they would stay out of each other's hair and we could share the big printer; we had a data products line printer, we could transfer files back and forth and it was either that or the cassette. You know the cassette <makes kachunk sounds several times>. You know this was really terrific, we thought we'd died and went to heaven and it was Vic's idea remotely booting up remote offices over X25.

Shustek: For internal development at this point or…

Schmidt: And Harry's…

Shustek: This is a product, the Combus…

Schmidt: Yes, Vic's product was to be external. Harry's was an internal assistance in the lab because Harry in addition to thinking everything up and writing most of it. Well I mean there's a lot of my other programmers who would argue with it about half. He would also maintain the printer and the infrastructure so that he and the rest of the people could be productive and that was like help out. This <repeats bingo several times> is the way to compete with 16-bit computers. We'll just have a file server, print server, as many file servers as you want, as many printers as you want, as many computers as you want - one person, one computer, how about that and how fast do we have to go? And it pretty soon became quite clear that— and I remember us sitting at the top floor at one of the Datapoint buildings Harry was stringing around RG58 and using our ham radio technology. Harry was using transmitters and receivers and he was the first to try to do the same thing as the Combus that is, somehow share the cable. It became clear you can't share the cable because no matter what you do to the cable, it's a Heisenberg problem, you upset the impedance of the cable you're going to get reflections and you're going to have to paint circles every ten meters or something on there as to where you could puncture the cable or you could put in tabs. Oh what a nightmare and then we realized that if you had 30 computers it'd be like a 30 engine airplane that couldn't fly on 29 engines anybody could destroy the entire system from anywhere on the network. That meant we needed a hub, a hub where a gazatta would do all the gozatta and it's how the Ethernet ended up working too. And how fast can we go and how fast did we need to go. Basically how fast the computer probably needed to go in the next couple of years and 2-1/2 megabits was just about right; it smelled right, it tasted right and it felt real good. John Murphy an old RF engineer from-- he's not old, he's young, old time though that's an endearing phrase, Motorola RF engineer came down from Motorola and he'd been with Telex in Oklahoma. A first class Harvard engineer, learned the best software packets overnight I've ever seen in my life but he was the one who put the ARCnet and the protocol and the engineering.

Shustek: Did you recruit him? For this project-

Schmidt: Yes for this project and that was Harry and John working together creating the <uninteligible> air force base link-- acronym city. I called it 'Arc' before it was ARCnet and I remember I was on a 747 flight Air France curled up in four seats across because there weren't many people flying then, you could

always get four seats across and I would get up in the middle of the night and I was reading some computer books Datamation or something and there was an IBM announcement of an attached resource or attached computing, attached computing like two or three 360s do you remember that?

impedance Yes, right two way, three way, four way…

Schmidt: Yes and I said that's what we're doing we're not attaching computers we're attaching resources - print servers, file servers, communication servers; we're developing a whole heap of whatever you want to plug in so Attached Resource Computing Arc that sounds like that's cool. So I called it ARCnet, came back and it was rejected because you couldn't use the world 'network' because in those days IBM2260s on a network were very slow. IBM2260s on a selector channel interface were fast and the network was slow, anybody who had an office you didn't want to be on the network computer so we hid the word 'network' for a while. The computer became 'Arc' Attached Resource Computing and they finally let the network be called ARCnet. It was originally Gordon Peterson who wrote the software for it who called it the Internet. For years it was called the Internet before we actually productized it, Gordon is very important.

It was very quickly obvious that with many people sharing resources you had deadly embraces all over the place. I got ten tennis shoes to sell and there's 20 in stock you've got 12 to sell okay, I'm going to sell 10 you see there's 20 you sell 12 you've sold 22 but there's only 20. Okay I'm going to lock that record until I finish, subtracted 10 there will be 12 left or ten left rather and what if we both lock it, how do you unlock it, how do you get out of the deadly embrace or I lock A and I'm waiting for B that you have locked, you lock B in and you're waiting for A I have locked we'll wait for ever. Gordon Peterson constructed a very elaborate operating system out of our DOS that extended the resources out. Since there was no possible way to assign permanent fixed numbers because the only other way to do deadly embraces is to have everything enumerated. You always unlock and lock in the same direction - up to down or down to up in numerical-- in collating sequence. So Gordon figured out that if you took the ARCnet ID and the I/O bus address because you had multiple ARCnets on one computer. Everybody would see resources based on the combination of these things. It turned out that with Gordon's algorithm nobody would have the same number for the same resource but everybody would always agree to which was greater so the whole operating system was based on this resolution of deadly embrace. It never had a problem - you'd have a hundred computers and a thousand files opened with eight people on some of these huge systems like the Bank of Brussels, ten thousand people probably using it, file systems and no problem - it just went through perfectly. Gordon did a brilliant job, it was fast, it was clean and a cache order could be cached and deadly embrace problems were solved and as soon as people got a taste of this and realized there would be no limit to literally what they could build, they weren't limited by a 16-bit computer. Huge systems could be built, I think a thousand computers more than that, put together USA and San Antonio.

Shustek: Was one of Datapoints largest customer USA?

Schmidt: No I think the largest was Bank of Brussels.

Shustek: In designing the systems how aware were you of other work that other people had done - stuff that Xerox Park had done both on networks and on separate…

Schmidt: Virtually nothing, we didn't understand it. I remember Stuart Green and Mark Miller came in started talking about Windows and we didn't even understand what that meant so they created text Windows. We had graphic text symbols so they created text windows that you could move around and scale on your screen and the operating system fit right in with the word processing and office automation suites. Once people felt that, you had to move with your cursor, not the mouse then they understood what that meant. Those were the concepts that were brought in but we never heard of Ethernet, didn't make any sense, it was too unreliable for commercial use because you couldn't have three thousand computers and have anybody be able to take the system down.

Shustek: Can you talk about sort of was there what I call "customer based marketing" at Datapoint, how much were you driven by your customers or was it your vision or Vic's vision that led the customers into what they would need?

Schmidt: Lot of other people had visions. Dave Monroe was a real champion of the laser printer. We were thinking what can you connect to the network. He created this laser printer,, the thing was about fifteen feet long and was four feet high and three feet deep and it could pick from any one of half a dozen different papers and it had output bins you could bring up like file cases and extend them so you could have like maybe 48 output bins perhaps…

Shustek: And who built this?

Schmidt: Datapoint, and every output bin had a lock and key so you print from your office and you go up and you open it up so other people wouldn't get your printouts. Because it was so expensive the laser print mechanism had to be shared by lots and lots of people. How do you do that? By lock box output trays, output bins - it was a wonderful machine. It was fast. Paper picking and paper handling was all done by Stan Kline. Who should meet him down here. You go to Stan's house you go down to the driveway it's an 8^{th} of a mile into the woods where he has this huge electrical mechanical laboratory where he makes everything from blood testing curvets to army laser practice rifles and machines for everybody's exotic stuff. He did all Datapoint's cassette decks in 1969 through the laser printer; lot of laser printer stuff, Arclites. Laser printers by the way, we had a lot of big companies wanting them all over the world. There was a lack of communication at multi-megabit speeds. Arclite was developed --data had a lot to do with that.

Shustek: Why don't you describe that for us?

Schmidt: It relayed ARCnet through free space for two and a half miles. Because the word "laser" meant radiation people were afraid of it, there was law. The restrictions were virtually in every country from any kind of a laser so there are lots of other interesting restrictions too but we created this using plain infrared diodes, infrared light - spread it out with a Fresnel lens. It had a two foot beam so that only the largest birds would probably interfere with it and it was…

Shustek: Or rainy days, foggy days as I recall was the other catastrophe…

Schmidt: Worked relatively well, foggy days, believe it or not, it had to be pretty bad but I remember being in Australia years later and South Africa it was still running - over a mile or two of highways in the city-- line of sight.

Shustek: This was to extend Datapoint ARCnet environments between buildings and…

Schmidt: <overtalking>

Shustek: Wasn't genetic…

Schmidt: …connected up the other…

Shustek: Could be used for other products?

Schmidt: No and it had a telescope on it, you plug a telephone handset in the, PL1 whatever it is, and you kind of talk as you got it and you optimized it and in Belgium we had to proxy over the phone jack because it was against the law to have telecommunications over a telephone that was not controlled by the government so you couldn't even have an alignment telephone - you had to bring up a telephone line and ring up the other guy, they were very funny days.

Shustek: Were many of any of these devices sold for use in other systems like the Light Lens or the laser printer they could have been applied to other systems but they were only for Datapoint systems?

Schmidt: Yes well there weren't any LANs for years in commercial use for creating demand for Arclite, so it was a Datapoint only.

Shustek: What about the printer?

Schmidt: It was so rapid change in the printing industry that it became a Datapoint only phenomenon; there weren't that many large scale office companies, Wang and Datapoint basically.

Shustek: From what I'm hearing is Datapoint saw itself as a system's company, it was building components for its own information systems and it was not selling sort of modules…

Schmidt: …no as a matter of fact the solutions almost every problem was new. How do you make a bigger computer, you make a multiputer which was my word. I used to the say it because it was so stupid I'd say "multiputer", people would laugh "that's the dumbest word I ever heard". It was a joke word for ARCnet. We had such grand time. There were twelve thousand people at Datapoint at the peak and the computers were used all over the world.

Shustek: That's consistent with your decision not to, at least in the early days to make ARCnet a standard because you considered it a component of the Datapoint system.

Schmidt: It was very proprietary and the senior executives were extremely against it. Vic was the one that wanted to open it up and thought that it would bring major benefits to us by virtue of other companies like Netstar providing, as he thought but didn't know at the time what they would be, components that would reduce the cost for us just in time for our meeting the competition which was brilliant bit of presence you know.

Shustek: But he didn't sell that _____?

Schmidt: No not until Netstar, little private deal with Netstar and then it started to go from that but…

Shustek: Right, then Tandy came…

Schmidt: Yes and I remember I was discussing this with some Ziff Davis PC Magazine Editor, Greenfield was his name, young fellow and I was talking about it and I said "yes there are two check makers that's MC and NCR" and he said "NCR" and I said "National Cash Register" and he said "that's a good one, that's a good one I'll have to remember that one. What National Cash Registers that'll get them" I said, "what do you mean get them?" He says, "What you mean?" I said "that's what NCR means" he says, "naa" and three or four times after that I sent an email to him saying, "have you checked it out yet?" It's like ADT American District Telegraphic - people wonderful, wonderful age and they're gone right now

<break for tape change with break in questioning>

Schmidt: Your point is very well taken. Datapoint was very isolated and we were very fortunate in having just the right new idea from maybe Xerox Parc ,like Windows and mice or PCs or whatever it happened to be at the moment. Whenever we needed it and we embraced it and made it a part of what we did. But it became very proprietary very quickly because we're pretty isolated down here. I was always able to get people to come in, to San Antonio, to enlarge the department to take on whatever project I had because the quality of life was so pleasant down here.

Shustek: And intellectually very stimulating to work on the cutting edge system design which must have been easy to attract people.

Schmidt: It was. Plus the people that they got to work with were so fascinating. It was a really fascinating group.

Shustek: How big was the group that you ran?

Schmidt: A group of forty or fifty.

Shustek: And you were doing the advanced product development?

Schmidt: Product development, hardware, software, operating systems. The company became pretty large, with a lot of competing groups in the early 1980s, who all thought they were doing hardware, software, operating systems, as a company gets very large.

Shustek: Well you were here in the very beginning so maybe you can tell about the evolution of the company sort of from a process point of view. You know, how did you go from kind of a bunch of guys in a garage to such a huge company? How did you go about making product specifications and development schedules and.

Schmidt: It was very seat of the pants. There were many periods where things would get so screwed up. Nobody knew what we were making or what schedule we were on. I remember a point, I think it was 1972, when we didn't even have product numbers for the products. I mean there was a Datapoint printer and a Datapoint communications controller, a Datapoint computer but pretty soon we had different models of computers and different models of printers and there was no way to differentiate. The orders were coming in like crazy and what were they selling? So Vic said, "Jonathan, come one, we're going to spend all weekend." And Vic and I spent all weekend at the conference room table. We came up with a modeling number, P001, modeling number for computers and printers and communication controllers. Because we had asynchronous controllers and synchronous controllers and all sorts of stuff. Thermal printers and Diablo printers and as soon as technology came out, Datapoint embraced it. In someway, and sometimes it was the standard eventually, like a synchronous printer, synchronous printer standard interfaces. In the back of the first synchronous printer were tootsie roll sized magnets for each of the pins. Sometimes they were an off-brand, it was a French disk drive or something, Honey-Bull, some things did worked, some things that didn't work but we were very isolated and we all did things. It was like going to Australia when you're from the United States. It kind of looks like the U.S. and it kind of act like the U.S. but they kind of talk different and a little different values and they developed their own way of doing things and but it all works, it's perfectly great.

Shustek: Where did that culture come from?

Schmidt: It's self-made.

Shustek: From certain individuals, founders? Were there some leaders that created it, like yourself?

Schmidt: Well, we were all very independent. Vic was always held in a great deal of suspicion amongst the other executives because he didn't play golf. He didn't go to the country club. He didn't care whether he was a member of the country club. He didn't have Gucci shoes. He wanted a sailboat for him and his wife. He wanted a little Moody plane so he could get the hell out of here when he wanted to. He was extremely straightforward and he said what he thought and he thought what he said and the others were all kissing each others egos. And one of the executives, I remember, it was so typical, once the company started donating to causes in San Antonio, he was elected to the chairman of the Chamber Music Society. And here I'd done everything I could to help start the classical music station back up in town after the old one sold it's license to a religious broadcasting company and I was a minor figure, but I was

out knocking on doors, raising money with the rest of the group. And this guy got elected to the head of the Chamber Music Society and he didn't know a viola from a violin. But that was the sort of executives and the company, I suspect, that part of the culture was isolated from us. So they alienated us more and more and more. We wouldn't get invited to the regular functions and so we stayed in our own building and we were called the ivory tower and, of course, the executives <laughs>

Shustek: But you guys still had the ability to push forward on the vision that you foresaw and build the products. They weren't that powerful that they could.

Schmidt: No, they'd just pull something out. I remember we came up with a 1500 based on the Z80. And Louis Donzis was brought in by his older brother Henry. Henry worked for us and he was coming in the afternoons after high school, recommended by his math teacher, Mr. Forrester, Alamo Heights High School. And Henry was just brilliant and Henry would start coming in with his little brother. And I said, "What's that?" And he said, "What do you mean what's that?" He got away from our computer and he said, "That's not that, that's my brother Louis." And Louis was sitting on the chair much like Lily Tomlin in the over-sized rocking chair, he couldn't even reach the ground and his chin barely got to the keyboard and Henry informed me he was writing biorhythm programs to generate biorhythm charts in BASIC and he was a good BASIC programmer. And I went over and I kind of looked over his shoulder and he had a blonde fro, all curly-haired, and he didn't pay any attention to me, too busy. He was always there and pretty soon he started writing more and more things. And about a year later, maybe two years, three years later, he wrote Arcstat, the statistics program with a cityscape moving graph and an analysis, but he was super on ARCnet. He had to figure out how to discard the petty problems we were bringing in and when the rim wasn't ready and how to really do it right. It was brilliant. I'd say that one program sold big companies like to Bank Brussels when they had confidence; they could see what was going on in the network. And it was all for fun. And Louis was a terrific resource. I remember I said, this is true, I said, "Louis this 1500 based on the Z80 is a cheap version of the Datapoint computer. Could you convert the BASIC compiler for it?" He said, "Sure." I said, "I'll tell you what, if you get the BASIC compiler done by this weekend, I will take you to Slip and Slide and we'll go as many times as you want." And I promised. Louis did it. And we went out to Slip and Slide and we went up and down Slip and Slide, it's a water park here, all Saturday because he wrote BASIC in a week. And that was- Louis was a wonderful resource.

There are resources like that who you could not quantify so the executives didn't know what they had. If they knew we could write like, COBOL in a week they would have made sure we did it, right? But that wouldn't have been any fun. And within a few years it was, "Louis, you get this done and we're going to go and have all the steak you can eat at Texas Tumbleweed." And I can drink the beer too, not too much because I got to drive and there was some exotic thing Louis did and we went to Tumbleweed and we both had a 72 ounce steak. We got it for free.

Shustek: At what point in time did he become an employee?

Schmidt: Whenever it was legal.

Shustek: So you guys are having a great time. I guess there's other sort of issues, maybe Vic is shielding you from some of them. When did it get to be not fun?

Schmidt: Well we always made it fun. Somewhere around 1982 I started, or in 1981, I started a development center in Sweden. Then the Bank Brussels wanted one in Belgium so John Cordell who was hired away from us in our last company, by Microsoft to do a new thing called the Explorer, and Louis and Steve Springmire, the fellow that took over the security for Bill Gates' house. I sent them over to Brussels to do a development center. And they lived in a hotbed of national socialist tendencies outside of Brussels. And they drank lots of beer and they went through six Ford Fiestas, all destroyed by Louis. And they took the very last one and said, "Well, what the hell. I mean we're about to close this down, let's go to Istanbul." And all the way to Istanbul and they had stories like the car ahead of them was machine gunned off the Bosporus Bridge. Or when they came back through Hungary they were not allowed out of Hungary before they cleaned the car out because this was back in those days and the official said, "We are not going to allow anything as filthy as this outside our country." Because the back was full of beer cans and orange peels and candy wrappers. They had also taken it down the Nile in Egypt. No, they had rented another car down there and they lost it. But these were the kind of adventures that they were on. They would come back and they'd work real hard for some months and they'd do these things.

So we had this kind of an R/D shop and it was only after Dan Dorfman revealed on Wall Street Week that Datapoint was pulling some accounting shenanigans, not so much like the Enron stuff, but it was a gray enough area I guess the executives could rationalize it but they were shipping more product than the customer had agreed to take into some warehouse in between so they said they shipped it to customers. They'd say, "Ah, they'll probably take it next month." And then that became a habit to the point where they couldn't sustain it and then the whole thing crashed. The stock crashed and then executives started blaming each other and then there was a lot of intrigue and then a corporate raider decided to come in and Datapoint had a hundred and some million dollars in cash, no doubt which was very tasty for him and apparently that was all it took to get his wheels in motion, to successfully get a hold of it. And as soon as that happened, everybody left. I took the entire...

Shustek: What year was that?

Schmidt: 1985. So we were all on the street and Datapoint's major customers were calling us because there was nobody at Datapoint. I mean these are major banks with three thousand computers and billions and billions of dollars running through it every day, I mean the City Banks and the Chase Manhattan Banks and the Milk Board in New Zealand. I mean everything you could imagine and there was nothing coming. And so we said, "Well, we could take a fast PC and a Maxtor disk which has got ten times as much storage as that washing machine size drive that Datapoint still sells and use some fast, fast software and make a replacement file server. We made a whole variety of things that would speed systems up so fast that it would make your head swim. We went over to Citron in Paris, Louis and I, and they had a batch processor. Their biggest problem was the batch processing took all night and often it was not done before the next shift came back to work in the morning. So they said, "Can you fix it?" And We made this file server. We took it over, it was a demo. They had the whole room full of file servers and we had a special program ready that would drain all the file servers, real time, onto our Maxtor [disk while they were running. And at one point we could then stop the system, turn all those off, turn ours on, the file server, and on the ARCnet and continue on as if nothing happened. And we did that and time after time, I can't remember the number of times that Louis and I would go in a room bigger than this, full of twenty or thirty machines, washing machine-sized, we'd turn them all off and the executive of the company would come in and say, "I heard you had this magic box," and I walked by all the women who were doing the, I'm not trying to be chauvinistic, who were doing the key entry, and they were

complaining because normally they type in their request and the guy's on the phone and they'd have a little bit of time to themselves before the answer would come up and there would be no more time delay. You had to come in and see what happens. And he'd turn this huge room, usually raised floors, the hum was gone, he always turned the lights off and left his one little green tube, it was a compact double unit, compact lunchbox, a little tube, sitting in there making no noise and replacing all this. And we were a million dollars a month in the next three months.

Shustek: Now who are we and what is the company?

Schmidt: We were Performance Technology and it was Louis and John Murphy and me and Henry and several other people, Gene Hughes.

Shustek: Did you start with the official sanction from the remnants of Datapoint?

Schmidt: Oh no, they didn't think we could possibly do it until we started getting all this business and they started threatening us.

Shustek: Did you license technology from them?

Schmidt: No. There was nothing to license. We started from scratch. We actually made sure we had a documented demonstration that everything was a clean start.

Shustek: A clean room. Clean room development...

Schmidt: We didn't have any books, we had nothing. We documented studying the Sniffer do you remember that company?

Shustek: So you reverse-engineered the Datapoint products on the ARCnet from scratch.

Schmidt: Right, just the file server.

Shustek: Just the file server.

Schmidt: Right. Just the read and write command. It was quite simple actually. Just like Samba does for Microsoft except it was like a tenth as complicated. But it was so fast in Citron, to get back to this, we brought in our system, they finished the day, they started doing the batch processing and the guy was putting on his coat and he says, "Let's go and we'll come back tomorrow and see how long it took, because we got the timer on it." And I said, "Oh. Well we don't have to. It's done." I mean it was done in a minute instead of twelve hours. It was that much faster. And of course the word spread around the world, we couldn't ship fast enough. We were the world's largest user, one of the distributors said, of

memory because each one of these things had 32 megs of memory. In 1985 that was a lot of memory. We had pallets of memory coming in. Yeah, it was wonderful days. We were up in Norway, a huge slaughterhouse was running on our file server and they were so happy and they asked Louis and I to come in and see it. Louis meant to hit something on the keyboard to show the stats and he hit the key to stop it and the guy says, "Oh my goodness. Do you realize what has happened? There are over one hundred pigs now we'll have to go throw away because once the system is stopped, you cannot restart. You have to take all the pigs and throw the pigs away and then clean everything up and start from scratch with a hundred new pigs." <in a Norwegian dialect> And Louis says, "Oh, did I do that?" "Oh, that's okay young fellow, it happens." So I'm going, "Jeez, a hundred pigs." But it was near that time that Datapoint decided that they wanted to stop us and Datapoint said, "Put encryption in the protocol." And included in that, the serial number of the unit so that they will be making some violation of our proprietary information. And plus they will have to have our code to be encrypted. So they went to this elaborate encryption scheme for a lot of the protocol and they were so smart that when they got done, just to be sure they actually ordered it again with the serial number and of course, that undid it. So what looked like encryption was something extremely simple. So we sent back a sniffer tape of the protocol, back to San Antonio, we were in Norway, and our super-genius programmer Gene Hughes looked at it and said, "Oh, I can do that with a," he's a mathematics expert. He came back and said, "Okay, it turns out they out-witted themselves. They did something and then they undid it, apparently." And they didn't know that. Somebody said, "Put it in there again just in case, just for extra sure." The next one undoes itself. So, we did that and they started screaming and yelling. They had put the word out all over the world that all of the people who use our products would have to get rid of them because the new version of the operating system wouldn't support them. And of course they did. Then they huffed and puffed and hemmed and hawed and they had destroyed their reputation with our customers, of course, who really needed what we had. And then we didn't say we fixed it. That's right. Because we had to do so little we just automatically worked with the encrypting key, it was a bad key. Because they outdid themselves and we just put a constant in there, that's how it worked. They were so thorough that they came back to constant so we put a constant in there and that did it. And that was just a streak of luck, a stroke of luck. A few funny days though. And this was like tens of millions of dollars a year.

Shustek: How did it feel to you, stepping out of this, what was then a very large company, Datapoint, thousands of employees, hundreds of millions of dollars of revenue, and going into a start-up.

Schmidt: It didn't make any difference. That sounds like my cell phone, which it sounds like an old model 300. <strange sound> It wasn't much different because we had managed to isolate ourselves on our own little island inside of Datapoint and lived life the way we wanted to.

Shustek: You were a very entrepreneurial group within Datapoint, even?

Schmidt: They needed us so bad that they really were afraid to undo what we had going. They saw us as aloof, arrogant, uncontrollable jerks. We said, "No we're not." And so we made a new group where it looked exactly like it used to, smelled exactly like it used to, because nobody could call us names, but since we didn't care what they did anyway, life just went on. As a matter of fact, it's been that way with me since 1966. All the people I've worked with have been- basically it's been a continuum of pretty pop in, pretty pop out, and nine of the ten pretties are always there.

Shustek: So let's carry the story forward, so this is Performance Technology, founded in which year?

Schmidt: 1985.

Shustek: 1985 and how long did this last before?

Schmidt: Well at Datapoint lasted for several years and then we came up and we said, "Let's do a LAN version of this." It was my idea, I said, "Hey, it's this IBM hi-tech NetBIOS LAN." Mike Planer raised his money here in San Antonio, did you know that?" The same broker that raised the first money for Datapoint. He's been my broker for thirty years. You know the Mike that went to Varity? The hi-tech went by us and it became clear with IBM behind it and Microsoft sniffing around the edge that it was going to become standard and it was clear that the Novell server network was going to become a dinosaur because it was asymmetric and it wasn't peer-to-peer. So we created a peer-to-peer network based on the IBM standard and thought that we would go out and sell the world's fastest file servers in IBM-land.

Shustek: This was met by ____

Schmidt: It was all met by us and…

Shustek: SMB on top of that.

Schmidt: SMB from scratch. And we won like every year, PC Magazine's LAN of the year, best LAN. Everybody loved it, it was fast, and it beat Novell in PC Magazine tests on peer-to-peer. But we couldn't sell it. Microsoft wasn't a factor; Novell was still king of the hill. And it was interesting, Novell was running the same way that IBM did and the same way Cisco does and you create certified network engineers whose whole worth to the company is based on their isolated knowledge of this strange protocol and the IOS doesn't matter. And to keep their jobs, they would do anything, and I don't blame them because it works. It worked for them, it worked for Novell. It was hard to break into that. And I went around the world, lectured in dozens of countries on peer-to-peer networking, SMB and how that was going to become the future and people laughed me out of the room, blah-blah-blah. We made these LANs, we made a small living on it and it actually worked up to Windows 95 when we stopped making the client part, we weren't compatible with it.

Shustek: Now PCP has started into the picture.

Schmidt: Right, yeah.

Shustek: That time frame.

Schmidt: And Trumpet Winsock and we started to join this star, what was it, Winsock group and it was all modeling. And as soon as Windows 98 came out it was all handwriting on the wall, you know, "This is not the place to be." And we knew it was coming and it was 1994 and we didn't know what to do. You know, we knew our business was going to go downhill; we had to do something else. Here we had a group of people who had all this expertise and we brought in Frank Durfler, network editor of PC Magazine. Vic Poor had brought in Kylie from NetSoft in Austin. Who was the guy who wrote pcAnywhere? What was his name? Main industry thinkers and we just sat around all weekend, "What are we going to do?" Drawing things and the PC Magazine, the front of every magazine was video servers. I was like, "That could be coming." And that was the hot thing. Second was the internet one, then the third was network analyzers at the higher level and protocol analyzers and security and we had all these things laid out and I was the most vocal for the internet. And I probably knew less about it than most of these guys, like Louis had already been Sprint's nineteenth customer on the internet and we had a 56k internet connection in the very early nineties and we had a bunch of IBM RS 6000s?

Shustek: Oh yeah, RS-6000 was their desktop computer.

Schmidt: 24" color tubes. He had these things, I said, "Where in the hell did you get those?" Well our LAN products were power LAN, power serve, and all copyrighted, trademarked and IBM brought out PowerServe. And so we wrote a note to them and they said, "Oh, all you have to do is just stop using it and there won't be any problem." We said, "No, you don't understand. We've been using it for like six years with a trademark." And they said, "Yeah, if you just stop using it everything will be alright." "But you don't understand, it's our whole life." "Well, if you change to something else, you'll have another life." And then so we had a local lawyer write a property confidential note to them and they said, "Come to New York and we will discuss it." And it was all orchestrated. Come to this huge IBM monolith, fifty, sixty, seventy stories, all pitch black, evil building and got into the elevator and they took us up to the top floor.

Shustek: Your lawyer's clock is ticking.

Schmidt: Yes.

Shustek: Very rapidly, going up this long elevator ride.

Schmidt: My clock is ticking. My digestive tract is ticking and this boardroom is something out of Clockwork Orange-type exaggeration. *Putney Swope*, did you ever see that movie? My favorite movie of all time, late 1960's. Boardroom was taken over by a minority, wanted to turn the company into a rock and roll company. Everything successful, like one of those caricature boardrooms, this table was so big that you really could have to squint to see who it was at the other end. And, you know, twenty five screens and they didn't tell us where to sit. It was part of the intimidation, "Where are you going to sit?" There's like four hundred chairs at this table, right. And we're going to sit together, that's one thing. So we all sat together and then the black suits or dark blue suits all came in and stood up in front, "Well, what have we here?" <loud heavy voice> "Yes, we're here," <low squeaky voice> and it was an intimidation session. And, "Well you know, all we have to do is squish you and you don't have a chance. But we don't want to set a precedent either and give you lots of money." So we had some sum of money, six thousand more_ than we could need. Which was cool? Here we are all set up, there's our six thousands, what are we going to do? Henry says, "You know, I could build a complete emulation of a

complete Datapoint network, hundreds of computers all talking to each other over a virtual ARCnet inside this computer and take a hundred computers and all the ARCnet and make it operate and run all the Datapoint software directly in this RS-6000, that's so fast. And then we'll make an ARCnet board for the back and you can put old computers and printers and things you can't make inside here that you have to feel touch. And then you can run cheap terminals on the RS-6000s over the network with the serial ports and you just mix them and match them." I said, "No way, Henry" "Sure." That's Louis' brother, that's what he said, "Yes, go ahead. Make a virtual every product Datapoint's ever made and just synthesize it inside the RS-6000 so you can't tell the difference." And he did it and we got nearly a million dollars from IBM. And in the UK, because every Ford dealer in the UK had our power serve on their Datapoint system and IBM had gotten the contract to go in and replace them with an RS-6000, but of course an RS-6000 could run any software like these guys knew. So then they could run an IBM terminal and then run a Datapoint software and IBM software intermixed. And they had old Datapoint communications controllers that talked point, what's the old Univac point something protocol. Some old...

Shustek: Univac.

Schmidt: Univac protocol. Back to the old Ford parts system in Cologne. And IBM had nothing like that so eventually all this stuff had to go back into the virtual ARCnet, through the virtual ARCnet server back out to real ARCnet and the hole in the ARCnet server to the communications. The only thing left that was ARCnet was the old communications controller because it was the only thing that could talk the old Univac protocol. We got a million dollars just when we needed it. We were thinking up what to do and then we thought, "Hey," I said, "We do business LANs better than anybody." So IBM, I mean, Microsoft executives said, "These guys know LANs better than anybody, LAN operating systems." We actually made a print server in like 8k, a file server in 12k bytes, Microsoft said, "You got a print server SMP that can run in DOS?" We said, "Yes." "We'll buy it. Let's see the code." We said, "Oh, you'll be the first." So they said, "Okay, no problem. Not at all." "Let's see code." "You guys are pretty good." All chips go down here, right. A bunch of Microsoft guys, "Well, what can you do?"

Shustek: What's this print server running on?

Schmidt: It was DOS, MS-DOS printer, like 8k, full SMB. We had a file server in 12 kilobytes, right, and they came down and said, "Oh, we'll buy it from you. We'll just buy it, just take the code." Nothing, it was twenty-five thousand dollars, nothing. No money stopped talking to us and after awhile we kind of started calling them up and they didn't answer and then the next month they came up with their own 8k byte print server. Same size, same functions, everything was the same. There are a lot of stories about Microsoft back then like that and, "Come get us." We knew business LANs and so I said, "Let's connect business LANs to the internet. And let's convert Novell LANs. I want to walk into a Novell user and say, 'Do you want to get on the internet? I can get you on the internet in one minute. You don't have to know anything or do anything or change anything in any way, but as soon as I plug this device in you can run Netscape and you will browse the internet. Period. "What about TCP/IP?" "Don't worry about it." "What about IPX?" "Don't worry about it. I plug this into your Ethernet or your ARCnet, immediately you'll be on the internet. You're on email, everything you want." And that's the box we made. It converted the IPX sessions, your Winsocks, you didn't have to do a thing. All they did was run Netscape and bingo. And we started selling them like crazy. I flew over to Sweden. I sold twenty-two the first day I was there. I knew we had a hit because we had five San Antonio businesses that I said this to and they said, "Sure, we'll try it, we'll beta-test it," and as soon as I plugged it in they said, "We'll buy it." And of course these gateways

like Linksys now, they didn't also convert the- we eventually ran on IPX and on TCP/IP and then Louis had to come in, terminate PPPoE instead of WinPoET and so he developed that and applied for a patent, passing IPSock through net boxes. Wonderful, wonderful techniques all made by us and we applied for many patents, including my patent that I did for controlling internet access through a LAN directory. Use the NDS directory or actually any of the directories, the LAN directories, and you could say who could get on the internet, when, where they could go, where they couldn't go. That actually was issued but I don't think anybody cares.

Shustek: So it was within the existing LAN it was IPX?

Schmidt: Yes.

Shustek: And then you were mapping that on to?

Schmidt: IP.

Shustek: IP, to the outside? Some particle converter functionality?

Schmidt: Right. And that just automatically loaded and bingo, you were on the internet. And it didn't interfere at all with the IPX. It was- it looked like a miracle to these people. I mean nobody wanted to spend the time and learn TCP/IP but if they didn't know to do anything or know anything to change anything or risk anything but they could be a hero, they'd spend a couple of grand. It was 2,500 bucks a pop.

Shustek: This was your next product line?

Schmidt: It was our next product line. It did work out, it was clear within a year we either had to get a lot of money to market it, to really make use of it or sell the company. So we started putting probes out. We had a number of companies in the running to bid for us and the best one was Bay Networks. Some of the others actually bid more, we didn't like the culture of the company. And some of them weren't as straightforward with us, "We'll take care of you guys, we'll give you this much money and your shareholders will get that much. And after we close we'll have these secret agreements where you guys will get a lot more." And we said, "Now that's not honest." "What the hell. You guys control the place, you run the place, you deserve it. You deserve it." "Now, if we live with you now, we going to live with you later with that kind of an attitude?" The big guys were very straightforward, very good, very clean, very honest.

Shustek: How big were you at the time in terms of people?

Schmidt: Forty or fifty people. Anyway, sold it to Bay Networks. We had benefited a lot of people who were very smart and told us things we didn't necessarily want to hear but they were right.

Shustek: Outside the company?

Schmidt: Yes. But they always stuck with us; I remember Frank Durfler had this thing, "I wouldn't count on Novell being the market in another year." "What are you crazy? Everything's Novell. I mean nobody's putting in LAN managers for commercial purposes." He says, "Okay, have it your way." And you know, if we did not have Louis, who really knew the internet and IP so well and could do that much magic, we would have probably not been able to survive inside of Bay Networks because that product, by 1997, the year after we were bought, there was no Novell It was all Win95 and MP and that was it. Amazing, Frank was right on. But we had these powerful people, and as a matter of fact, Henry with that magic ARCnet with an entire buildings worth of computer equipment synthesized in a virtual reality inside of an RS-6000, amazing. He was the one who did the Winsock thing. As a matter of fact, I said, "Geez, I would love to have one." I was on ARCnet, I had an old PS2, an ARCnet in my office and I'd love to be on the internet. And I'd kind of look in there with envy at the guys that were in this twenty-four inch tube running Mosiac, browsing through the Vatican. It was all magic back then. And all I had was CC Mail to connect me to the rest of the world and Henry said, "Well, we can just test this out." I think he spent a day or two, went back to his RS-6000 that was on ARCnet, it was also on the internet, Ethernet through a token ring actually and he created this thing. He says, "Just try running Mosiac on your machine." "Henry, how'd you do that?" "Oh, from just playing with the RS-6000." So he actually did the proof of concept of the product that actually the company used to sell itself to Bay Networks. We eventually went offshore, got Korean hardware...

<crew talk>

Schmidt: We got Korean hardware and learned how to make this little box. It was all a compatible chip. These are the kind of, "Let's have an idea; it would be more fun than you could imagine if anybody could do it "And it's always somebody in the group that can do it." And that's been the history of the product, it's been fun. And we all have enough experience that it's not done just for ourselves because we have a lot of connections and customers we keep in touch with. For example, the current product was brought to us by a Time Warner guy who came up and he said, "Our biggest problem is we have no way of communicating with our subscribers." He said, "Can you believe that? We have three megabits or two megabits to their house and we have no way to talk to them. They won't answer the phone. They don't read the flyers in their bill. We have no idea what their email address is because they don't use our email, the use HotMail or legacy mail or office mail so we have no way to communicate with them. The more likely they are to be sophisticated an infected with a code red virus, the more likely they don't have our email. We need to communicate with them. And that's how we came up with the current product, is a way for them- we put frames inside the subscribers browsing screen that's not a popup, okay, they actually go to CNN and inside of CNN is a frame, which is a bulletin, and they say, "You have a code red virus and you need to disinfect or we're going to disconnect you in twenty-four hours, but if you click right here you'll do everything all at once. You'll disinfect yourself and you'll be right back up and you'll be in good standing." And so we have people who come to us, usually like Frank Durfler who says, "Hey, I've been watching what you're doing and that's not going to last." Or the guy from Time Warner, he says, "This is what we need and you probably could figure out how to do it." So it's been that- I've been blessed. I've been blessed. You know, it's...

Shustek: When you look back, do you ever see some moments that you, in hindsight, said, "Gee, we should have done this," you know, "just think what might have happened if we had made a different decision?"

Schmidt: But then what are the unintended consequences. I don't see how to guess that. It would have been probably interesting to have ARCnet opened up, earlier up.

Shustek: These are the kinds of things I was thinking about, decisions to open up systems. Things, with ARCnet as opposed to supporting Ethernet….

Schmidt: I've thought a lot about ARCnet.

Shustek: You know, wiring decisions, some forks in the road that perhaps you might have chosen otherwise.

Schmidt: But you know we'll go through one more generation and other things appear. Like ARCnet really couldn't scale. It didn't have a protocol that really allowed TCP/IP. You had 256 users on a network. If it was opened earlier maybe it would have been competition to Datapoint. Maybe ARCnet would have gotten a foothold. It was still the most widely used LAN protocol up until the mid- late-eighties by virtue of all the Novell were on ARCnet.

Shustek: A lot of effort went in to creating a thing called ARCnet Plus what you might describe to us and why you think that didn't, in fact, accomplish what I presume was its goal of sort of being the next generation ARCnet.

Schmidt: It had to be compatible with ARCnet which meant it had to have all of the constraints which made it useless in the internet world. And there were some extensions to that that had to be backward compatible or else it didn't have any life in the install market and that would be its only hope. But it was so expensive and so big and Ethernet and ARCnet boards were down to a chip and ARCnetplus was a huge, full-size board. It was very expensive, it got you only twice as fast as Ethernet maybe, but it's probably the most widely-used MAC layered chip in the world right now because the guys who did that became part of Intersil and now it is used virtually every Wi-Fi card in the world, the ARCnetplus MAC layered chip. How about that? So it lived, like dinosaurs living as birds. We're still here.

Shustek: Very exciting. I didn't know that.

Schmidt: Isn't that cool? This has been wonderful. And they're still here in town, having a good time. They were bought by a Taiwanese company then they moved to a New Jersey company but they're still here and they're still a group and Bruce Hughes who worked for us at Performance Technology when we did a lot of our UNIX servers on power LAN and he has a wonderful old house up in town. We've been blessed. If it hadn't been for the iron lung there wouldn't be in that interest in radio technology. And if I

hadn't been in such miserable shape to make it upstairs in the mid-1970's, I wouldn't have promised myself that I would run every day because I got to the point where I couldn't type.

Shustek: We're you living abroad for some period of time or something in France on the Seine on a houseboat.

Schmidt: My friend Lenny lived on the Seine in a houseboat, used to work for Datapoint. I visited him a lot. And my son Edward started the first commercial internet company in Budapest and there's a lot of interesting stories on that. My son is quite an entrepreneur and interested in these things too. He's got like a whole branch of totally unrelated, even more interesting, stories. I promised I'd run every day, so from 1974 until 1982 I never missed a morning until I ran a marathon and six months ago I ran my twenty-first. I'm 62. So that's, these things happen. You're just robust, you don't know why. These are wonderful folks and you got the right people to poke your head around the corner at the right time and say, "Ah! Maybe this way would be better."

Shustek: How big is the group now and what are your plans for it?

Schmidt: Well we have Peter and John Murphy and Henry and Louis and me and Rod and Rhonda and Maria. And we are making a device for internet providers that let them install this device on their NOC while they're up and running like this Novell system. You know, you can put it in, you don't have to take your system down to put it in, just snap it in. Put this device in and then you can send anything you want inside HTML to anybody's browser targeting, you know who you're selling what to. So I can send to Harry Saul an announcement of a special event at The Computer Museum because I know he'd be interested in it. Now that is not something that is like instant messaging but they have a lot of messages they'd like to send themselves, maybe the Amber Alert, maybe security. Definitely, "You've got a code red virus." And a local dial-up ISP in San Antonio, they've been running it. They send out messages to their intractable, won't-renew-their-credit-card subscribers, like, "We've tried to call you. Your credit card is five days overdue and three more days your account will be suspended. Click here, type in your new expiration date." And it comes up in the middle of whatever they're browsing. They found they didn't respond much to email but they respond instantly to this. When the MyDoom virus came out somebody started sending out emails to the local internet provider's eight thousand users, an email saying, "To protect yourself against MyDoom," and signed it the internet company. And the internet company wanted to send an email out to everybody saying, "Don't pay attention to that email behind the curtain, pay attention to this email behind the curtain." And then somebody said, "We've got the bulletin server." So they put out an email, and by the way, they're getting telephone calls saturating their call center. They just couldn't answer them fast enough. Everybody's getting busy signals. Within twenty minutes of putting this bulletin out, all calls stopped. They even got people who said, "Thank you so much, I was going to open that email thinking it was from you." But as soon as people got home and got on the internet, the first thing they saw was that so they didn't have any more questions and a worried subscriber is not a calling subscriber. So that's what we make. And it's got a lot of opportunities and promotion, Wi-Fi, hot spot where minors could find a new business model for advertising. There's just endless- this communication channel is heretofore unused and unabused.

Shustek: You want to try to grow the company to take advantage of this opportunity or do you like being small?

Schmidt: Yes. It's interesting. I've never been this small before because there's only five paying customers, Cox, Charter, Time Warner, Comcast, Cable News, you know, and they all have divided the country up so they all have this unholy alliance, well it's not unholy and they all have one big laboratory called Cable Labs in Denver where they develop the product that they're going to go up and bid for and Cable Labs certifies it so they have the 'no competitive buying' just competitive selling. So they have control of their sources, they control their customers, divide it up and they're all very, very happy. So any of those would probably get solved and it would be very, very interesting. We have a technology that is actually rather unique. We can control where you go, so we have parental controls coming out, but likely are four switches where we you have a switch that was $250,000 and runs sixteen thousand subscribers and does QOS and where you can go with the list and blah-blah-blah. And a lot of small routers can take ten thousand subscribers at an enterprise and we can do a million. We can do a half a million in one small box, all simultaneously in OC192 and control where you go, whether you can do instant messaging, whether you can read newsgroups, check your browsing against surf controls, categories that you manually select, you know, yourself and send you bulletins. Then it's a whole new technology.

Shustek: So it sounds like you're very positive and excited about the future.

Schmidt: Yeah! It's wonderful. It's a fantastic idea. But here it's another complete internet layered on top of the existing one at the disposal of the provider, whereas the current one's at the disposal of the destination sites. You don't see anything on your screen unless it comes from the destination. Now the provider can now use this to talk to you. Yeah, it could be fun to see what people do with it. So that's what we're doing. Any more questions?

Shustek: How about you? What didn't we ask about?

Schmidt: I don't know.

Shustek: Okay. Well you think about it.

Schmidt: I'll tell you what we used to do is like a two-tier distribution, we had distributors and customers and trying to get yourself written up in magazines, where you advertise and how often you get seen. When we were selling LANs to small businesses, you spend much more time marketing and much more time sales and much more time defending yourself and much more time trying to make people understand what you really are selling than trying to get rid of the misinformation from your competitors. People labeling you with something and you're not. That's the closest thing that comes to mind and that destroys the credibility, the real value of your product.

Shustek: So you're enjoying having just a few customers you can work directly with them.

Schmidt: Nobody else, nobody in the middle. We applied for a patent in 2001 and we haven't seen anybody like this at all. I don't think anybody thinks about this. As a matter of fact, it's such an enigma that the TCP/IP experts, the IT guys, would never in their life think about it.

Shustek: Yeah, you're tampering with someone's confidence.

Schmidt: Yes or destroying the elegant architecture of IP. But it's all within, there's no violation whatsoever. I mean a QOS device is doing more probably than we're doing. It's perfectly okay. It's just that people don't think of that. People hate pop-ups, people don't want anything on their screen that they didn't ask for so you've got to be able to come in there nice and subtle, in a way nobody else could. Like in a frame, inside the real frame you got from CNN. "How'd they do that? If they can do that, they must be pretty powerful."

Shustek: Well we wish you luck and we'll have to come back in a few years and hear the next chapter.

Schmidt: Well it's a big difference; sixteen years I was on top of that big green glass high-rise skyscraper across the street. Now we're in a one story industrial park again.

Shustek: But having fun.

Schmidt: More than fun, dignity too.

END OF INTERVIEW

