Interview of Thomas (Tommy) L. Thompson and Robert Smith

Interviewed by:
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Thomas Thompson: General DataComm was founded in 1969. The founder and still chairman and chief executive officer is Charles P. Johnson. Chuck has had extensive experience in the industry, going back to working for Illinois Bell Telephone Company back in the late '40s and '50s. He then went with International Telephone and Telegraph Corp, a division of ITT, and his job there got him involved in dealing with large government contracts that had to do with air defense systems, early warning systems, those kind of things, and the reason that's significant is because those were the very first data communications systems. The state of the art at the time was, and it was really pushing it, was 2400 bits per second modems. The telephone companies, none of them offered anything like that. In fact, my recollection is the data sets, the modems, 2400 bit modems that were used in some of these initial systems were provided by independent suppliers. They were not Telephone & Telephone Inc. (AT&T), they were not Western Electric designed or manufactured equipment. Data communications, as far as what was available from AT&T at that time, and a little later, was primarily limited to 300 bits per second. That was about it. As far as multiplexing is concerned; there really wasn't any customer premises multiplexing. I think a good economic reason for that, and this was before Carterfone, was the equipment connected to the network had to be AT&T provided. I think we have to understand that they did not have any economic incentives to provide better utilization of a line, or to provide the ability for a user to transmit his data faster than a measured service, because either one of those things would cut down on the revenues. So they didn't have the incentive to do this. I wasn't directly involved in this part of it, but in about 1967 is when the first customer premises, customer provided, multiplexers were allowed to be provided on private line services, and those were in large part slow speed 75 bit per second teletype type channels. This is what they were using them for.

James Pelkey: Now these were time division multiplexers?

Thompson: No, these, probably the initial ones were frequency division and certainly time division came on right about the same time, a little after that but fairly close. Up to that time, users couldn't provide anything. At that point in time, users could begin to provide multiplexing equipment on private line services. It was then later, in '69 when the Carterfone decision was made, that was quite an involved, complex thing. It went back and forth between the Commission and the court and finally it was remanded to the Commission who made the decision. The Commission is credited for making the Carterfone decision. Actually, they were sort of forced into it by the Court, and that decision said the telephone company can not restrict customer connection to the network if it is beneficial to the customer and not harmful to others. So that was a major step.

Pelkey: Can I ask you to go back for a second? Why did AT&T and Bell Labs, or maybe even GTE Lenkurt, why weren't they suppliers of higher speed modems into the military applications or government applications where they were having to look to the small independents to get higher speeds?

Thompson: By smaller, I'm talking about independent distribution companies, not independent manufacturing companies. They really didn't have a client to provide those higher speed modems as part of their service because they had this disincentive.

Pelkey: Even though there were military application and so on, and the government really turned to AT&T after the war and said, for telemetry applications, for the FAA applications, someone, we need a modem. Give us a modem.

Thompson: There was work going on at Western Electric and Bell Labs in this area, but the people that had the equipment first were Lenkurt, which actually became a division of GTE. Whether it was at that point in time I'm not sure.

Pelkey: So you think they're the ones that first came out with the first 2400?

Thompson: They're the ones that first offered, had the first operating 2400 bit per second modem.

Pelkey: So there wasn't incentive, and the government didn't turn to them, they turned to these independents?

Thompson: Well, this is what they wanted. You have to understand that this particular application required data to be sent back from RADAR to control centers. The purpose was to be able to track incoming aircraft and plan action against that. The 300 bit per second, it just was too damned slow. The airplane would be gone before they could decide what they wanted to do. In fact, they couldn't even track the airplanes; it was so slow. The data was too slow, so they had to have this higher speed modem, and it just happened that while there had been work going on, they really didn't have this competitive push to get the equipment out of Western Electric or Bell Labs, these independent companies had been working in this field. By the way, that has been fairly typical of the data communications equipment field. It has been the independent companies, in a large part smaller independent companies, which have been the leaders in the marketplace. A couple reasons for that. It's a developing market, typically AT&T, for instance, does not want to design something unless they see a broad market for it, at least that's the way it used to be. They had this disincentive to do it in the first place, so it's been the smaller companies who have really pushed the state of the art in data communication.

Pelkey: Sure have. When did you say General DataComm was founded?

Thompson: 1969.

Pelkey: And was it -- do you remember the specific around why and how and the motivation for it?

Thompson: Chuck, our founder, was with ITT, and this was in the late '50s, this program that he was involved in where he used this Lenkurt equipment, I believe it Lenkurt data com equipment, I guess he sort of got the bug at that point in time. He's always felt from that time forward that data communications was the field he really wanted to be in. He went from there to two other companies. Did work, a large part of which was government contract work, but involving communication systems and data communication systems, and he decided it was time, in the late '60s, it was time to form his own company. So he got about six people together, wrote a business plan, went down and got some seed money, and General DataComm was kicked off in late '69.

Pelkey: Did he have money from friend that he knew in other industries?

Thompson: I wasn't involved at that time, but I believe Lowell Rhodes was the person that put up some of the original money.

Pelkey: So it was really from his knowledge and experience of ITT that caused him to go --

Thompson: Well, ITT, and he was with Lytton Industries, he was then with Stelma, which was a smaller company that was, in part, developing data com equipment, so it was all of those things, plus his background with the telephone company and his knowledge of the telephone industry and his background as an engineer is all part of it. All of that combined, giving him this desire to have his own company and to be in the Data Com field. That's the field he wanted to be in.

Pelkey: Now that experience of having been in the telephone industry per se, really had a profound influence, in terms of the channels of distribution and the perception of the how and where the market was going to develop for GDC, if I'm not mistaken, in terms of selling through the telephone companies and being a major equipment supplier to them has been part of the culture of GDC?

Thompson: Right, absolutely. The company was founded right after the Carterfone decision, but that decision wasn't implemented yet. The initial markets that GDC had planned to address were the independent telephone market, which is 20% of the telephone industry in this country, because the Bell System was closed to us. Also, directly to end user markets, the international market, and to a certain degree, to the government marketplace. But, you're right, selling to the telephone industry, the independent segment of that industry, was a significant part of the plan, and it was the knowledge that Chuck had and others had in dealing with the independent telephone industry over the years that was leading them to believe that they could be successful selling to that market.

Pelkey: And what was the first product?

Thompson: First product, I think, was a parallel modem. I really should get Bob Smith involved. In fact, he said he would try to join us if he's not in a meeting. Bob Smith was one of the founders, and is much more familiar with some of these details than I am. It was a parallel modem that was used with a tape reader. Have you seen this paper tape that has eight columns of the little wholes, it was to take that information and transmit it. I think it was probably for Western Union. We did a lot of business with Western Union also in the early days. In fact, I think they were our first customer and were our biggest customer for some period of time.

Pelkey: When did you actually join the company?

Thompson: I joined the company in about the middle of '70.

Pelkey: Somewhere early on, you got into the time division multiplexing business?

Thompson: We did multiplexing work, and again this was for Western Union. I believe our early units were for Western Union, and it was to multiplex telegraph channels for them. And we did both FDM and TDM equipment.

Pelkey: And you were one of the early leaders in that business?

Thompson: We were, and one of the things that we felt, and still feel sets us apart from some of the other companies in this field is that you had a lot of companies doing modems, or addressing that market. You had some doing FDM equipment, because that technology is a fairly old, mature technology. The applications that we were addressing were different. You had the TDM field in which some of it was older and some of it was new. We were addressing all of these things looking at it from a systems concept, and again, this was because of Chuck's background in the industry. He saw the need to address all these markets, to have products that could be integrated into a system, and provide the user from his computer center, the ability to analyze the health of his network, to maintain the network, if you will, rather than depending on the telephone company doing it. Data Com networks are different architectures than the telephone network. The telephone network centers around the central office, the switch, and everything is based on that architecture. The Data Com system typically is centered around the computer center, and it's like a neural network. The computer center being the brain and you've got to reach the fingers and you've got to be able to tell the fingers what to do, and you got to be able to determine if one of the fingers isn't working, why isn't it working? So this was the concept of diagnostics, and being able to remotely control diagnostics from the computer center so you could send out a signal, loop it back, get a response and determine whether or not there is a problem and try to isolate where the problem was. Our products have all been developed, since the beginning of the company, with that in mind. That has been the overriding philosophy of the company.

Pelkey: Was that an innovative approach at GDC in terms of the marketplace?

Thompson: Yes, we were the first company; I'm told, to introduce these diagnostic modems, the extent of diagnostics we were providing. We were also one of the first to utilize LSI technology, to the extent that we utilized it, so we were able to provide equipment with higher reliability, lower power requirements and a bunch of other things. We took -- while some of the work that we were doing was like work others were doing, we felt that we were taking a unique approach, and it was this overall systems approach that we were taking.

Pelkey: Maybe what we could do is switch for the moment from the company to the IDCM and leadership in the industry? Maybe if Bob joins us, we can come back.

Thompson: That's a good idea, because Bob is much more familiar with the company, and I'm more familiar with this stuff second hand.

Pelkey: How did IDCM ever come about?

Thompson: Let me just fill the gap in a little bit. We talked about the multiplexing was allowed to be done, then the Carterfone decision came along in '68, and the telephone industry's response was, when the FCC finally ruled you cannot restrict these devices if they are privately beneficial and not harmful to the public, the response from the telephone industry was: "Fine, we'll allow people to connect their own modems, but they got to connect through a protective device that we provide, because we're afraid that they're going to provide and connect all this stuff that's going to harm our network, or electrocute our service people," so their response to Carterfone initially, in the case of data, a data access arrangement.

Pelkey: Now a question, the DAA was only required to get access to the switched network, as opposed to the leased line market, right?

Thompson: Right.

Pelkey: Now, if I understand, at that point in time in the leased-line market, you had both dial-up leased lines and direct connect leased lines, in the sense that some of leased-line modems didn't require a DAA. You got the line terminated at your place and you just hooked a modem into the line

Pelkey: Yes, but with private line service, there were no restrictions, and about the time that multiplexing equipment was allowed to be connected, private line data sets were allowed to be connected too. And it was, I think, in large part the government's use of private line data sets that sort of precipitated that. But as far as switched network modems, you had to have a DAA. That was the response that Carterfone. Private line modems, I don't know the distinction you're drawing --

Pelkey: I guess there was FX --

Thompson: Oh, FX service, that's -- essentially an FX service is -- typically, you're connected to their central office, and when you pick up your phone, you get the dial tone from that office, and you can call this office. FX service is getting a private line from that office through another office, and it's hard wired through to your connection, so in effect, this instrument is getting it's dial tone from this office, and it's connected by an extended loop, if you will, which happens to be a private line. And this phone is just like that phone, as far as calling anyone in this area. This kind of connection would have required a DAA as well, because it was a switched network connection, even though it was a private line making the connection, you were connecting to the switched network.

Pelkey: Ok, was that a big part of the market at that point in time?

Thompson: I don't know that any one ever quantified that. Typically you use these in a business type application where this guy over here wants the people in this office to be able to call him --

Pelkey: Like a local call.

Thompson: On a local call basis.

Pelkey: Now multiplexers didn't require a DAA because you required a modem to sit in front of you, right?

Thompson: Right. This is why all of the private line modems and the DAA, I mean the Muxes and the private line modems, all of that sort of worked together. And that was, I believe 1967, when that type of equipment was allowed to be connected.

Pelkey: So why was the DAA a big issue for you then?

Thompson: Two reasons.

Pelkey: The dial-up modem guys it was a big problem for.

Thompson: Well, we were in the dial-up modem business too.

Pelkey: Oh you were?

Thompson: Oh, yes. We were making dial modems as well, and there were two reason why it was important to us, three I guess. One was just the restriction. Why should a user have to use that equipment? There were also technical and economic reasons why we were opposed to it. Let me just give you an example. We had developed and were selling to the telephone industry dial modems. Along comes Carterfone, or actually Carterfone was first, so we could sell these modems to the telephone company, and they could go out and directly connect them to the switched network. We couldn't, however, sell that exact same modem to an end user and let him directly connect to the network. If he wanted to connect to the network, he had to connect through this DAA, and the interface to the DAA was different. It was a multi-wire interface, depending on which DAA you used. There were different types. Our modems that were made, that we had developed and were selling through the telephone industry for direct connection could not be used with the DAA. And that didn't make any sense to us. It didn't make sense to a lot of people. Why is this modem ok if the telephone company provides it on the one hand, but it's not if the user wants to provide it directly. The argument the telephone industry used, quite successfully for a period of time, was: "If we provide it, we maintain it and we know it's going to work right. If the customer provides it, he might not maintain it, therefore he might get a short in the equipment and press a voltage out on the line and he might kill somebody." This is the type of horror stories they always raised. So that was what we were stuck with. We were stuck with the DAA. You asked about IDCMA. GDC had belonged to a couple of other organizations trying to get a meaningful Data Com industry association going. Those didn't work out.

Pelkey: You were instrumental in trying to make that happen at that point in time?

Thompson: Yes, Chuck and I were working on that.

Pelkey: And why weren't you being successful?

Thompson: One try was a group that was already sort of started that had to do with the manufacturers of acoustic couplers. You know what an acoustic coupler is? The reason they got started -- let me tell you, trade associations typically get started because there is a problem that people see as a mutual problem and it brings them together. In this case, AT&T was rumored to be soon to offer an acoustic coupler, and these guys saw it as knocking the hell out of their market, so they got together. You know: "What can we do to make sure that, if they do it, they do it in a way that doesn't kill our business." Well, AT&T then decided they weren't going to do that, and as a result this group that was starting dissolved. There was another group that we were involved in. Actually, it was the people, the attorneys, which were working with us on it that were the attorneys that worked with Carter on the Carterfone case. I don't recall the exact reason, but that dissolved as well. Then in late '70, early '71, there was rumor that AT&T, in order to justify what they were doing on the switched network, they almost had to do it, and that was they were going to require DAAs on private line services as well.

Pelkey: Ah ha!

Thompson: If they were going to defend their position, DAAs on a switched network, they pretty much had to do this.

Pelkey: Because it was logically inconsistent.

Thompson: It's running through the same facilities. If there's a real potential for harm, it's there whether it's a private line connection or a switched network connection. So that was the thing that brought the people together.

Pelkey: Do you remember anything more specific about that rumor?

Thompson: I think AT&T may have filed tariffs for it. No, I don't think they did. It was more than a rumor; there were technical references. These are the technical documents AT&T puts out that says what they are going to do, and again, like the switched network case, connecting through a DAA on a private line would have required a different interface, therefore a different design, therefore, you had to do something to your equipment. It was the threat of that that brought these people together.

Pelkey: I'm going to ask you to be more specific because I'm very interested in these moments in time, and that was a critical moment in time. Matt Kinney's recollection was that there was a trade conference/show in Atlanta or Atlantic City --

Thompson: I believe it was Atlanta. I was not at that -- did not happen to be at that meeting ---

Pelkey: Where Matt Kinney and Chuck and --

Thompson: Joseph Looney, who was the founder of Paradyne.

Pelkey: The president of Milgo at that point in time --

Thompson: Ed Bleckner who is now the chairman of Racal-Milgo. Met and decided hey, this is serious.

Pelkey: And these was a meeting in one of their hotel rooms --

Thompson: Yes. It took place, I believe, at an ICA convention in Atlanta. This would have been in, probably, ICA I believe has their conventions in May, so it would have probably been May of '71.

Pelkey: Matt got real fuzzy around the edges of this. Do you know someone who might remember the incidents or that more clearly? Was there anybody else there?

Thompson: Well, Chuck might, but I don't know. Sometimes you don't realize the significance of something until later, and then you get sort of fuzzy on the details.

Pelkey: Cause that was an important moment.

Thompson: Right.

Pelkey: Matt's recollection, also, is that AT&T was putting rumors out about a digital data service.

Thompson: That came a little later than that. The other rumor that was going around at this point in time also was that AT&T was going to drastically reduce the rates for their private line data sets. Two things that were happening. One that --

Pelkey: And that they're going to increase their rates for the DAA.

Thompson: Well, if they were going to provide a DAA, there would be a charge associated with it.

Pelkey: Someone somewhere along the line told me, at one point in time, that AT&T announced, maybe in '75 or '76, when they announced a drop in the rates of the modems and raised the rates on the DAA, which was just blatantly a problem, but I guess that came later.

Thompson: Yeah. This was one of the real problems with the DAAs was the economic one that I talked about. Some of the slower speed switched network modems that were coming out, ours included, could be leased for $12 to $15 a month, and the DAA, depending on the one you use, could cost $10 a month. So you can see the impact it would have. Also, the DAAs were experiencing some technical problems. Let me tell you something, the DAAs, unlike most Western Electric equipment, were rushed through.

They didn't go through the extensive testing and the QA and the QC, all that stuff that they typically go through with a telephone product. They didn't want a good product. They didn't have the incentive to have a good product. They didn't have the incentive to have a low price product. They could justify this because they designed it by putting a kluge together, and the more it costs the operating companies to buy it, the higher rate they could justify. So all of these things were in play here.

Pelkey: Let me ask you another question. During the early '70s you and all the other independent companies, you leased your modems as well did you not?

Thompson: Oh yes.

Pelkey: And where did you find the capital to be able to lease these? Must be gross margins, the profit margins were so high that you had the capital in order to be able to lease them, or did you lay that paper off to someone?

Thompson: Typically, and again this is an area I wasn't directly involved in, but typically in our leasing activities, we sell the paper off to a third party.

Pelkey: But the modem business must have been a very profitable business at that point? Even at the rates where you --

Thompson: You, have to understand we were, General DataComm for one was just getting it's business going, and in order to make money in the leasing or rental business, you have to get that base out there. You have to get it renewed. That's the idea, get that base and have the money keep coming in. But that was one of the reasons that the DAA was such as problem, and also there were these technical problems associated with it.

Pelkey: So there was this rumor that they were going to want the DAA on the leased-line, which was really just driving everyone berserk?

Thompson: Well, knowing that it caused us to have to redesign our switched network modems, we knew that we were going to have to do that for private line modems. Now, GDC was just really getting started at this point in time. Milgo and Codex -- Codex was involved in this by the way also.

Pelkey: Art Carr.

Thompson: Art Carr. Their long suit at that point in time was private line modems, and they were the companies doing work at the higher speeds on the private line, which is like pushing 4800 bit per second, they were really pushing it at that point in time. So the effect was going to be, initially, more on those folks than on ourselves. We were just coming out with our private line products. But that's what got it together. Then we --

Pelkey: What happened after that? How did those meetings go?

Thompson: Then Chuck and I went around and we talked to a couple of people who were involved with trade associations.

Pelkey: How did you and Chuck become the leaders at that point?

Thompson: I guess this is because Chuck has always been interested in this kind of thing, and it ended up that a guy from Ann Arbor, Michigan, who was in a timesharing business, recommended Herb Marx. Herb was with a firm called Wilkinson, Barker and Knauer down in Washington at the time. Herb was a young attorney that was specializing in communications work, and he was doing work for this firm and a group called ADAPSO, which you probably have heard of. So the recommendation was: "Hey, this is a guy that we think really, if you're seriously thing about putting an association together, maybe you should go talk to Herb." He's got a good background and he's a hard worker and smart, so we set up an

interview and went down and talked to Herb and everyone talked to him and liked him and so we wrote a charter and some by-laws --

Pelkey: Now, when were the charter and by-laws put together?

Thompson: In '71.

Pelkey: Summer, fall?

Thompson: This probably would have been summer. My recollection is that things moved fairly quickly at that point, because there was this pressure. AT&T then backed down on its plan to require DAAs on private lines --

Pelkey: On its own volition?

Thompson: On its own. I don't know that any of the things we were doing put pressure on them to do that.

Pelkey: Did you do press releases? Had it become knowledge that you had formed this association at this point in time?

Thompson: Yes.

Pelkey: So you were trying to go off and tell everybody that this was happening, to get your cause out there.

Thompson: The first action we became involved in as an association was the rate case that we were successful in getting the Commission to initiate concerning the reduction in private line data sets that AT&T filed. All data sets. It was all their data sets, significant reductions in them.

Pelkey: Now what was the basis of your argument?

Thompson: That the reductions in prices weren't cost justified, and what they did to get the price down is they were basing it -- what they have to do when they file a tariff, and these were all under tariff at the time, they come up with the investment, how much it costs them to install it, the initial equipment costs, and that's the investment that they have to recover. Then you have your maintenance and administration and taxes and depreciation, all this kind of stuff. The maintenance -- it was depreciation. They had depreciating this equipment over like five years.

Pelkey: That was short?

Thompson: Yes. Prior to this time. The way they were justifying the lower rates was they went out to about ten years. And we said: "What happened all of a sudden that makes this equipment, makes these people feel that this equipment is going to last twice as long as it did before?

Pelkey: Oh, that's great.

Thompson: So we got a rate case started, and I remember, it was 19419 was the docket number at the FCC. And that docket number was to consider the legitimacy of these rate reductions. That docket is still and open docket at the FCC. There has never been a final decision in that. What we did, though, we had been trying to find a way to get the DAA situation before the FCC. It was difficult to do this because DAAs were filed in local tariffs. We were concerned as to what a state Commission might do if we brought an action about the DAAs in a local Commission. Also, we were concerned that we didn't have the money to do this in every one of the states. So let's get it to the feds and maybe get a decision that is across the board. So what do we do? Well, General DataComm was in Norwalk, CT at the time, and we had a sales office in New York, so we ordered an FX line, private line -- no, we ordered, yeah an FX line

over into New York to our sales office with a DAA on it. That required AT&T to file a tariff for the DAA in an interstate tariff, an interstate private line tariff, because it was connected to this FX line.

Pelkey: So the FX originated in New York? It originated here in Norwalk and the dial-up connected it to New York, so local people in New York could call your home office?

Thompson: Yes. And we ordered this. And they said: "Well, in order to do this, we'll have to file a tariff, so it's take us a while." We said: "Fine." They filed the tariff, and as soon as we did that, we went into the FCC and filed a complaint, that this was an illegal device, and we then built arguments.

Pelkey: Illegal device, the DAA was illegal?

Thompson: Yes, on a number of grounds. Primarily, there was just no need for it. It could potentially cause problems with the customer equipment, it added an economic burden on the customer, but it was primarily the issue of need that was addressed. And the FCC found out that there was no need.

Pelkey: Now when was this? When did you take this to the FCC?

Thompson: This would have been in the 1971, early '72 time frame, and it was in this proceeding, which was primarily a rate case, but the DAA issue was brought into it, the record that was built in this case --

Pelkey: Why did you bring that case into this docket number?

Thompson: Well, we were already in there . . .

Interruption in the interview

Pelkey: So you got this, now you've got the DAA.

Thompson: Well, we got it in there -- there was a rate issue as well. It made sense to put it in that. We were already -- we were involved in it, from our perspective, it made a lot of sense to try to get it in the same proceeding if we could. It made management of it easier for us. There was a rate issue because there was a charge for it that increased the cost of service, and also we got the issue of need, whether it was needed. This thing went along and along. AT&T revised their tariff, so in effect it raised them back up again. So in effect, we won the case, the rate case for the data sets. As far as the issue for the DAAs, the FCC did find that they were illegal, and said that they weren't justified, and shouldn't be used, but the important thing that came out of this was that the record in this case, which is the only record the FCC had regarding protective couplers, was used by the staff, Mike Slomin was the guy that did it, because Mike was the technical -- Mike being a engineer and a lawyer, he was one of the FCC people involved in this proceeding. He knew the record. He used that record to justify the registration program. And the first equipment that was registrable under that program, were data modems. Because of the record and Mike's knowledge of that, and the fact that he wrote the 19528 decision that kicked off the registration program. We didn't realize this at the time, but all of this was leading to a much more competitive market for us.

Interruption

Robert Smith: This is Robert S. Smith, Vice President of General DataComm Industries, and we're talking about the beginnings of the data communication industry. Most people know about the Carterfone decision that opened up the network for the connection of privately owned equipment, but a year or two earlier there was an equally important decision, and that was the private line multiplexing case. In the 1966, '67 time frame, users were not allowed to buy multiplexers and connect them to the line and derive

their own channels. If you wanted a low speed data channel, 75 bits per second or 150 bits per second, you had to get those services under tariff from AT&T, or you could have a voice grade line and put a modem on it and use it as a private line data channel. But the rules didn't allow the subdivision of a voice channel. Tariffs were such that a 150 bit per second channel would cost about half the price of a voice channel, so for a 75 or 150 channel, there was almost a two to one trade off to the voice channel. Yet, if you used frequency division multiplexing techniques, you could derive 24 voice channels out of a voice grade. And with time division, you could get about 30 channels of Teletype, 75 bits per second. Now this service was widely used, for example Western Union private wire networks, the news networks were all 75 bit per second Teletype at the time. I'm not sure of the exact was that this ruling came about, but UPI, United Press International, was one of the proponents of this private line multiplexing. The FCC rules were changed. The year would either be '66 or '67. And right after that, for example, UPI went out and redid their whole nationwide network. They spent about $2 million with Lenkurt to buy their model 26 - - no 25 Carrier, which was the equivalent of the Western Electric FDM equipment, and they rebuild their whole nationwide network with Lenkurt FDM equipment, breaking down and feeding the Teletypes into the radio stations and newspapers and so on, and saved lots of money. A fellow named Jim Darr was communication manager at UPI at the time, and Jim may still be around and could give you a little background, but I know he's retired out of UPI. That decision in my mind was equally important to Carterfone because it opened up the network to the use of private multiplexers. So with those two things in place, by 1968, Carterfone was effective January 1, '69, the market was right for a company like General DataComm to be formed. Now, going back to GDC background, the real founding father of the company is Chuck Johnson, and his background was Illinois Bell early 1950s to about 1957 when he left and joined ITT/Kellogg in a systems group that was just being formed. I believe he was about the third employee. There was a president and a VP of Marketing named Tom Lutty, and Chuck was working for Tom Lutty, and they went out to sell major telephone switching systems to the independent telephone companies. One of the programs they got into was the SAGE program, Semi-Automatic Ground Environment, the distant early warning system that the Air Force was building all around the United States. One of the issues there is the Air Force was going to give the Bell System companies the contract to provide these services every place in the country, even in territories where independent companies had the franchise to provide telephone service. So this fight was taken to Washington, and it was battled through to the point where the Air Force, and specifically the Defense Communication Agency that was the group that was awarding the contracts, agreed that yes, in the areas where independents were providing the service, that --

Pelkey: The network would be supported in serviced areas.

Smith: Right, exactly --

Tape Side Ends

Smith: . . . but with that background, we had some exposure to large computer centered command control networks, between the Kellogg days and the Lytton days, the team that went trough there were involved in the early days of computer teleprocessing networks, these big military command and control systems were the first on-line real-time teleprocessing systems. So with that background, when the ' time frame came around, those thoughts were the ones that came into GDC. As it was bought by Lytton, in '66 Johnson left and went to Stelma in Stanford, CT, which was another house doing military work, but a lot more product rather than systems. In '68, they were sold out to Data Products Corp., at that time Chuck decided it was time to do his own thing, and he pulled a group of people together, myself, Tom Lehrman who was director of commercial sales at Stelma and had been at ITT Telecommunications and Illinois Bell before that. Johnson had known him for a long time. Jack Arcara who worked for Adler, Lytton and Stelma.

Pelkey: Where were you.

Smith: We were all at Stelma. I was at Stelma doing commercial sales, working for Don Lehrman. Jack was there in the customer service contracts group.

Pelkey: And how did it come about that -- was there a moment when you got together and Chuck said: "I think we ought to go -- "

Smith: Chuck approached each of us individually, the people I've mentioned here, and said let's start a company, and so the four of us began to skeletonize a company. Here's the organization that we need. We need a VP of Engineering. So we went back to Lytton and found Fred Cronin who had been a Lytton Director of Engineering, and was still at Lytton Industries, and we got him in as part of the team to run engineering. We went into our own production shop at Stelma, a fellow running production control who had been at Lytton and Stelma in production control, came in as our manufacturing manager, another sales guy, John Thompson came in with us as military sales.

Pelkey: Did you know what you were going to do at this point, or did you just want to start a company and you'd figure out what you're going to do?

Smith: We knew we wanted to be in this communication business, and over the winter of '68, '69, we wrote a business plan. The business plan was basically to create all the transmission products to work together in one of the big computer centered networks. At that time, in the commercial world, you basically had your telephone network and some private line Teletype nets that were supplied by Western Union or AT&T. The way you fixed things is that when something went wrong, you picked up the phone and called Western Union or AT&T and said: "My circuit's down. Fix it," and you waited for it to get fixed. For administrative Teletype nets, low speed stuff, that was probably ok, but now you've got this huge computer center, and there's going to be remote terminals -- timesharing was beginning to come into vogue by that time. There were a dozen different timesharing companies around. And you look at this big computer, and doing an economic analysis, 50% of the cost of the network was in the computer room, and 40% was in the data processing terminals at the remote end of the system, and 10% was in the communications in between. We wanted to provide all the products of the communications, have them work together on a system basis so the modems and multiplexers not only could pass data through, link to link, but also have some diagnostic capability. We wanted to provide the user with some information as to what was happening in his equipment, and the first echelon maintenance, swap cards and keep everything going. So there were some philosophies that came out of our background in the military systems and these big networks that were the foundation of the business plan.

Pelkey: And there was no independent company out there at this point in time that had this approach?

Smith: Right.

Pelkey: So this systems orientation, complete solution, plus the weirdness of what was happening in the marketplace in terms of --

Smith: Exactly. If you looked at the market in those days, AT&T had a huge amount of the market share in the modem business, and their modems had no indicators on them to tell you what was going on. There were lighted push-buttons, like your push button phone, that said data mode or talk mod or auto answer mode, but nothing to tell you what was happening in the course of transmission. Automatic Electric was building a few kludge data sets. General Electric was in the business; RCA was in the business --

Pelkey: They were all in it, but they weren't in it, at the same time, right?

Smith: Very small, very small part of the business.

Pelkey: And also, because they had been in the military and they were just trying to dabble in the commercial side?

Smith: Well, the other companies that were in it were Rixon, which today has been bought by Case; (unintelligible) Case, it was a military house. Milgo was in modems. They had been a military company and started building commercial, but only private line modems, not dial-up modems. Sangamo Electric

Company in Chicago was a licensee of Western Electric, and was building data sets for the independent telephone company market under license. Lynch Communications was also a licensee in that data set line.

Pelkey: Collins?

Smith: No, Collins didn't really have anything on the market. But none of these sets had any indicators on them. And one of the things we did was put indicators on the front panel of data sets to show what things were happening. Switching subjects here a minute, I mentioned the private line multiplexing decision; there was a company in California called Scantlin Electronics that was providing financial services, and they were using FDM techniques to broadcast their financial information to the brokers. A couple of guys there had an idea to build a time division multiplexer, and either Scantlin wasn't interested or they chose not to take the idea there, but they split out and started a company in 1968 named American Data Systems. (See Wilkes interview) ADS came out with a time division multiplexer that, by 1970, was the leading product on the market. They had tremendous market share. It was the best box round, and had lots of lights on it. In fact, the front of it looked like a pinball machine, with little squares that were red, yellow, blue and all sorts of colors with incandescent lamps in back of it. Now the only problem with that is that, when you went out and talked to the users, they basically said that this box was an excuse to create an annuity to sell light bulbs, because every time you turned the power on, 25% of the bulbs blew out. So many of the lights were out all the time that the indicators were terribly unreliable. Plus there was thermionic noise created by filaments and things like that which interfered with the electronic circuitry inside, all sorts of bad things. So we saw that this indicator thing was a real neat idea, wonderful, but you needed a reliable indicator. So we made a decision at that time that we would use these new gadgets called Light Emitting Diodes. They were expensive. You could buy a light bulb for 20 cents and an LED cost three dollars, but we made a decision anyway to go ahead, and so on our multiplexers on the front panel we started using LEDs. We were the first company in the data communications business to ever do that. Now, there were other multiplexers around, and for example, the Ultronics group, down in Mt. Laurel, NJ, GTE/Ultronics, had a multiplexer. Another company called TelTech had started up, and the multiplexers these folks made basically looked like a small refrigerator, about three feet high and two feet on the ground, and there was a white light that said power on and a red light that said "alarm" and the rest of it was blank. It was a blank front door, no idea. It's all ok or something's wrong, that's all you knew about it. Really very primitive. So we got the idea of putting all these indicators and really breaking it down into pretty fine detail, plus we put in a diagnostic capability, and our first products that we displayed at the ICA show in Houston, TX in 1970, Shamrock Hilton Hotel, and we had a display of a big lighted map of the United States, and a multiplexer in a computer room in New York City, and one all the way across in Chicago, and a modem connected to that and out through the dial network, to a far modem. And we could, from the computer room, by manipulating the switches on the front panel of the multiplexer, cause the channel card in Chicago to loop back so we could run an end to end loop back test or -- we patented a feature called Analog Loopback. We could take a two wire modem, like the 103s, and cause the transmit signal to loop back into the receive signal, and prove that the modem was working properly. That's a service mark called AnaLoop, which we have trademarked and patented the idea, and it's the first time that was ever done with a modem.

Pelkey: You must have been a smash at that show.

Smith: We were, we absolutely had everybody running over. There were companies around that don't exist today that -- all the engineers were over at our booth looking at the product line, and we had the communication manager from Shell Oil there, they were in New York City and were about to move down to Texas and redoing a teletype network, and they were looking at Muxes. They said: "Why don't you come on down and talk to us?" So we did, and we put in a couple of demo units, and they bought them. Over two years, we did over $2 million with Shell Oil, rebuilding their whole network from New York, homing it on Houston.

Pelkey: So those must have been fun days after that.

Smith: They were. There was a lot of fun in those days.

Pelkey: Now, go back for a second. You founded the company in '69?

Smith: Right. The company was chartered on January 29, 1969.

Pelkey: And where did you get your funding?

Smith: Well, we took this business plan, Chuck wrote it basically in his home, with the help of a fellow who had been in business planning at Lytton, and -- see, in the Lytton days, Chuck had worked for a fellow named George Sharfenberger, who became the president of City Investing. Chuck ran the Lytton communications group. Sharfenberger was a group executive that Johnson worked for. Sharfenberger introduced him to a bunch of people on Wall Street, and he took the plan around and presented it, talked to people, and he got a consortium together that put up $2 million for 30% of the company. That's how we got our funding.

Pelkey: When did you get your funding so you could start working?

Smith: June 19, 1969 we got our check.

Pelkey: So when did you introduce your first products?

Smith: May of 1970 at ICA.

Pelkey: That was a frantic period of time for you.

Smith: We introduced a time division multiplexer, model 1201 that is a character interleaf time division multiplexer, a 103 data set, a 202 data set, and a 402 data set.

Thompson: Wasn't the 402 the actual first product though?

Smith: Yes, the 402 -- the way we do our engineering drawing numbers, the first three digits of the number represent a product series. The 402 is product series 001, and the 103 was product series 002, and the 202 modem was product series 003.

Pelkey: And the time division multiplexing, frequency division had been the way it was done. You saw what ADS had done in terms of time division multiplexing and said: "Wait a minute, we can do this better, and this is the right way to solve it?"

Smith: Well, we had the idea for time division absent ADS, but they were selling a lot, they were advertising a lot, they were making a splash, so it was pretty visible in the marketplace that time division was needed, so we just jumped right into it. Then we later produced a frequency division product line that, in fact, we're still selling today.

Pelkey: So things were, after the introduction in May of 1970, for the next couple of years, it was just -- the process of building an organization and having fun and so forth.

Smith: Working like hell, seven days a week.

Pelkey: Then in 1971 at the May ICA show, Tom and I were talking about that AT&T had announced a drop in the data set rates that was of great concern to everybody, saying: "Wait a minute. They're trying to push us out of business here," and there was some effort to get together in a hotel room? That was the founding of IDCMA?

Smith: Right. The first group was called the Data Communications Association, and we started that group -- I guess you could say that Chuck Johnson and GDC were really the foundations of IDCMA,

because we started with a group called the Data Communications Association, and that lasted about a year, something like that. We changed it to IDCMA. Probably less than that.

Thompson: No, it wasn't changed from that to IDCMA. That group really didn't take off. There was an effort to get that DCA going. TelTech, Fred Utreck was one of the people. It didn't -- it wasn't going anywhere, and we saw it. And as we saw it at the ICA show in '71, Chuck and then Ed Bleckner and Matt Kinney and Art Carr and Joe Looney got together. They were all at the show, and they all got together, and it was the data set prices that AT&T was going to (unintelligible) out on, plus this threat that they were going to put DAAs on private lines that really got these guys to the point where: "We better do something."

Smith: Yes, you see, Joe Looney was running Paradyne at the time. He was the founder of Paradyne, Bleckner was the president of Milgo -- no he was the president of ICC, which was the sales arm. Milgo was a military house, and they had other things going.

Pelkey: I was going to correct you.

Smith: And Monroe Miller was the president of Milgo.

Pelkey: Right. That's where the Milgo comes from, Miller.

Smith: Yeah, he's the Mil in Milgo. But Bleckner and Kinney were the VP's of sales. ICC was in commercial, but those folks, Codex, Milgo, and Paradyne, all in the private line business, and so the data couplers on the switched network didn't really bother them. That was not an issue to them.

Pelkey: But the threat was that the DAA was going to be on the leased -- the private lines --

Smith: Right.

Thompson: Plus the fact that the reduction on AT&T's modem prices would have had a serious effect on all of us.

Smith: And that's how the IDCMA really got going.

Pelkey: Then we were talking earlier about how you get and came this one case, 19419?

Thompson: 19419 was the docket number.

Pelkey: The docket number that was before the FCC, that GDC took the initiative to try to get the DAA into that docket, as opposed to it being just a tariff issue, you wanted DAA into it, and then you put this FX line from --

Thompson: Actually, never put it in. Ordered it.

Pelkey: Ordered it.

Thompson: Asked for it. I don't think we even put it in writing to them. We just asked the local company, SNET, to do it, and they said: "Well, if we do it, there has to be an interstate tariff to do it. We'll have to work with AT&T," and AT&T filed the tariff, and once that happened, we challenged it at the FCC, and it was made part of this proceeding. Now as far as the need part of it, it was both a rate issue, but it was whether you needed it, and Bob was one of the principal witnesses for IDCMA, addressing the technical issues associated with the DAA and what it could do to the customer's performance, his equipment's performance.

Smith: I was on the witness stand about four days at the FCC.

Pelkey: Now, let me see if I can -- during this period in time in '72, '73, there was the IDCMA group, but there were also the PBX and keyset guys that had some kind of a body as well.

Smith: Was that the NATA group? Did they form NATA at that time?

Thompson: Certainly, NATA -- it's called the North American Telecommunications Association, represents the PBX key system vendors today. It seems to me they came into existence about that time frame, the early '70 time frame, they were called the North American Telephone Association. They were looking more at the voice interconnect -- they were called the interconnects.

Pelkey: But it got to the point where, what I'm trying to find out about is this issue about -- finally, the FCC, in order to deal with all this pressure about the need for the DAA and so on, formed a body, a committee. They asked the National Academy of Science to form a body to look into the technical issues related to whether or not the DAA was ever really --

Smith: Yes. That was in 1970. That was the National Academy of Science study. Unfortunately the people that were participating in that were from the telephone industry, and they came back -- Chuck, by the way, testified before that group, gave his views as to why you don't need it, but they did come back and say there was this potential for harm to the network if you indiscriminately allow people to connect anything they want. So that was a concern of the FCC, the serious concern that if they did away with the foreign attachment restrictions and let people attach to the network, how do you do that? One of the things that the National Academy study eluded to was that perhaps you could set up some kind of program, like the homolitisation (?) requirements in Europe, to make sure that the equipment is quality equipment and it's operated properly and so forth. The main finding of that study, which we weren't particularly happy about, was that there is this potential, and if you're going to do something, you really have to address how to handle that potential, to make sure that is doesn't damage the network.

Pelkey: And when did that committee at NAS come back with that conclusion?

Smith: Oh, it was early on, about 1970 or '71. I remember delivering our position paper to that hearing in Washington. That group was beating a broom off Constitution Avenue. In fact Bob Carwatt, who was with the New York Central at the time, was one of the members of the group.

Thompson: It had to be before may of 1970, because you folks had already testified when I joined the company in May of '70, so it must have been very early '70.

Smith: It was.

Pelkey: Did the FCC then take -- as I understand it, they said: "The DAA is one way of doing it, but there's another, which is certification with enforcement," and then the FCC took those results and created an advisory committee?

Thompson: Well, there was an advisory committee that was looking at this, and the findings of that advisory group ultimately got into the record in 19528, which was the proceeding that resulted in the adoption of a registration program.

Pelkey: So then the registration program was finally brought to fruition, in terms of having Part 68 Registration.

Thompson: Mike Slomin -- is Mike still at Belcorp by the way?

Pelkey: Yes. (See Slomin Interview)

Thompson: Mike was the FCC staff guy who was involved in the --

Smith: He was counsel for the Common Carrier Bureau in 19419.

Thompson: Right, and his involvement -- in fact, my recollection is that his involvement, primarily, went to the DAA issues, not the rate issues. And he took all that testimony; Bob's and the other people that testified, and he used that as justification for the rules he adopted initially, or proposed to be adopted in 19528 for the registration program, and those rules went to what kind of registration requirements do you impose on data modems.

Pelkey: Two specific questions. Do you remember, at that point in time that there was a clause in the rules requiring AT&T to also submit to the rules?

Thompson: That was one of the things that certainly got kicked around a lot. There were a number of industry meetings. The FCC got the industry together, and they were bogging down. It's obvious, looking back, why they started to bog down. The carriers --

Pelkey: Excuse me, this is pre '68 or post '68?

Thompson: This is in the process where they were trying to develop the rules, and it became very obvious, the reason it was bogging down was because the carriers were trying to impose onerous requirements, the reason being that they were not going to be held responsible to provide equipment that met those requirements. So the Commission, all of a sudden the light went on and they realized: "Hey, there's one way to solve this," and I think Mike was probably very instrumental in this, "whatever rules we adopt, guys, your equipment has to meet them too. You are now going to have to register your equipment, whether it's tariffed or not, we still require that you register your equipment the same as a non-affiliated company. (Snap) All of a sudden, everyone was cooperating and the rules became ones that everyone could live with and, of course there were some thing, some disagreements still, but the main roadblock was removed at that point.

Pelkey: Now after '68 there was also a set of meetings set up to create what became the modular jack?

Smith: The plugs and jacks program. The standard connection. That was sort of an ad hoc industry committee, of which Tom was one of the key players.

Thompson: Those also were held under the auspices of the FCC. They got the industry together and said -- one of the things they realized is that, if you're going to have a registration program, you really need a simple way to connect, and more importantly disconnect equipment if it's starting to cause harm, you have to have an easy way of disconnecting it. Therefore, it looks like the best way to do that is modular plugs and jacks, and there was a lot of discussion that some people had specific interests in mind, the people that make that kind of equipment, and after a number of meetings, open industry meetings, it was agreed that the mini modular jacks like this one on this telephone would be the ones that we would use.

Pelkey: Can I ask you a very specific question to test your memory? You may not have been there, but you might be able to recall it. Those meetings did get bogged down and kept going on and on. I've heard from other people that Mike, in fact, came into one of those meetings with some parts out of a Radio Shack and said: "This is what it's going to be." Do you remember something like that?

Thompson: Well, one of the things that caused it was this is a patented jack or General Electric's, and the reason they wanted to use it was because they were already, the Bell System was already implementing these things, and so they wanted those adopted as the standards, but they had a patent on it. The question was, are you going to let anybody else build that? And if so, we want you to do it royalty free. Well, AT&T said: "We'll let them do it under license, but not royalty free," and so there was a thing between AT&T and the commission for a while as to whether or not they would adopt as a standard a jack on which AT&T held the patent, and therefore would be getting revenue. But then AT&T offered, I guess what turned out, because the industry went along with it, a royalty arrangement, a licensing and royalty arrangement that evidently was reasonable, so that broke that. I do vaguely remember Mike coming in saying: "(Slam) This is what it's going to be." It's those kinds of things that got people off the

dime and got AT&T to back off. I think AT&T wanted 2% or maybe it was five, and it backed off, I think it's 1% or something like that, now.

Pelkey: That strikes me as an interesting things to write about, how these log jams got broken, to the extent that there was this hassle about the jack and if Mike did bring in -- I just want to cross correlate a couple of peoples remembrances.

Thompson: I didn't attend all of those meetings, but vaguely I remember Mike -- I know Mike was really one of the prime movers in this whole activity. I thing we were very fortunate to have Mike in the Commission, and the fact that he was both an engineer and a lawyer, and most of the people at the FCC are lawyers, and AT&T had come in with all this technical crap, and just snowed them. But they felt they couldn't challenge AT&T. "That's AT&T and Bell Labs. We can't challenge them on a technical issue." So it was Mike, with his technical background, he could take the testimony of Bob and Farrel Pelz, who happened to be the witness from Codex, the other IDCMA witness, and he could make some sense out of that, and he was willing to say: "Hey, this sounds right," so we were very fortunate to have Mike there. Had we not had Mike there, things might have turned out a great deal differently.

Smith: One of the issues underneath the coupler was the marketing aspects of it, and one of the things we were arguing about is that by controlling the supply of couplers, the Bell companies were actually controlling the interconnect data set business. We had customer situations where we were trying to put a system in for a customer, and they would go to the local Bell company and ask for data couplers, and the response was: "You can have a data coupler in four months, but by the way, if you want our 103 modems, you can have it next week."

Thompson: And they directly connect so --

Smith: Yeah, they were directly connected modems.

Pelkey: That was one of the real grievances.

Smith: Absolutely. In fact, that particular instance is one example that I used in my testimony at the FCC.

Pelkey: About the fact that AT&T didn't service -- put the DAAs in on a competitive basis and service them and so on.

Thompson: As I mentioned earlier, unlike most Western Electric products, these, because there was a series of them, were real kluges. They weren't intended to be cost effective. In fact, the more they cost, the better. They weren't intended to operate all that great. The telephone companies weren't required to stock them like they should have, and so they really controlled the data marketplace with this, and you can either go buy your own, if you want, and then connect to this very expensive DAA, but you have to wait for it, or we can give you our direct connect modem today.

Smith: I'll tell you a war story about the couplers. I told you about this trade show in May of 1970 down in Houston. We had a real live working set-up, and we had live telephones that we connected through data couplers. Well we couldn't get Southwestern Bell to come in and provide us data couplers. It's two days before, we're setting up and these guys couldn't get couplers for months, couldn't find them or whatever, so we called back here. It was a Saturday afternoon. We got John Thompson, phoned him up, said: "John, go up to the plant." The key guys all had keys to the plant. "Come up to the plant, rip out the data couplers we had installed in our lab, stick them in your suitcase, and come on down to Houston." Johnny shows up about 1:00 Sunday afternoon with the couplers. We have the telephone guys come in. "Here's the equipment. Hook it up."

Pelkey: Now how about that.

Smith: And that's how we got our demo to work for the May 1970 show.

Pelkey: Do you remember any other instances of people getting together around IDCMA and something unusually happening that would be of historical interest? Clearly, they must have been very heated and energized get-togethers, because you had a cause there. The industry was really at jeopardy at that point in time. If you hadn't been successful.

Smith: Well, it was the modem companies. IDCMA --

Thompson: Talking about the interconnect companies is something I was going to mention. They were stuck with what was called the voice connecting arrangement. You have to understand that these people were providing -- with a modem, it's a one on one thing, a DAA, so the costs of this, looking at just the economics, with something like a PBX, you've got all your stations off of it, maybe you've got 10 trunks with 100 lines, so you only have voice couplers on 10 trunks, shared by the 100. Economically, it was not as important. Also, the price of this PBX was well up there compared to a modem. As I said, in some of these cases the dial-up modems rented for not much more than the DAA, so the guy, if he wanted to get his own modems, he really was paying twice.

Smith: Then, when Bell wanted to drop the price of the modems, their direct connect modems would be cheaper than the interconnect modem with the coupler, with a double charge on it.

Pelkey: Nothing else comes to mind in terms of questions about that. After the universal jack came out, the IDCMA still existed and went on.

Smith: Well, it still exists today.

Pelkey: But there wasn't anything of the magnitude of these issues that

Thompson: Yeah, there was. Later on, we'll get a little later, there were a lot of things that had to be negotiated if you will to get -- before the registration program really got off and running. There were some challenges to it, court challenges. Fortunately, the good guys prevailed in all of that. Later on, General DataComm had developed a line of digital data sets to work with AT&T's Dataphone's digital service, and it was the same situation all over again. We can sell these to the telephone companies, and they can directly connect them, but if we sell them to the customer, the customer has to connect through a device that has to be provided by the telephone company in (unintelligible) which the tariffs called the CSU --

Smith: Channel Service Unit

Thompson: There's an article that Chuck wrote, I wrote for Chuck, but it got published, and I was trying to find a copy of that, I will send it to you. My secretary can find it. She's not here today. So we sat down, we had gotten the direct connections for analog modems. Now, let's get direct connection for digital services, primarily for equipment to connect to DDS. But DDS services were not under the Part 68 rules, so we couldn't register the equipment. There were not rules for the registration of equipment. How do you do this? So GDC filed. We went to one of the testing laboratories and we said: "How would you test this equipment? Here's the technical reference. How would you test this equipment so that you could certify that, in your judgment, that it would not cause harm to the network." So they prepared this application, which really was somewhat of a bogus application, since it wasn't in accordance with anything because there weren't any rules? We filed it with the FCC, and they didn't know what the hell to do with it. In fact, that application sat on a desk of one Jim Tallons, I don't know it you know Jim Tallons, for I guess four or five years. And every time I went in there, Jim would ask me: "Why don't you take those back?" And I said: "No, we'll leave them there a while." So this started the pressure building, and what had started out as a GDC cause initially, the IDCMA, I believe it was in 1978, late 1978, filed at petition with the FCC to provide for direct connection of digital equipment, equipment to digital services, in effect, extend Part 68 to include this, and we suggested they should develop rules and put them in, and there's no reason why the customers shouldn't have the right to directly connect to digital services like they have the right to directly connect to analog service. And again, there were a number of arguments you could make. They were very similar to the DAA arguments in the analog context, and that is that

there was a device -- a digital service provided by the telephone company required a CSU. And you paid for this access line. This was an access line to get into the DDS service. CSU. But, the tariff said there are some other functions that you need besides this function. These we'll call the DSU functions. Now you, the customer, can provide this yourself if you want. This part you have to get from us. Now we can provide this functionality for you. If we do that, we provide it all in one box, and that box costs ten dollars a month more than the service, so for an additional $10, or some small incremental dollars, you can get all the functionality from us, or you can buy it yourself. Now, that, again, you couldn't provide this functionality in a stand alone box and compete with that, the Delta that they charged. Also it presented some problems, because this device --

Smith: The Delta DSU --

Thompson: This device could affect the performance of this thing.

Smith: Of the CSU.

Thompson: Right. And you needed -- if you were going to have diagnostics, you need to have direct access to the facility, rather than a connection through a box. So we presented it in a way that was analogous to the analog case, and showed that really it's no different. This I'll give you (**handing JLP something**). This was a presentation GDC put together for IDCMA, and basically what it is, is this: The telephone companies, again, went in with this technical jargon and they said: "Digital is different than analog." Maybe you did it on analog, but you can't do it for digital. We need to have this terminating device. We need to control it. That's the only way digital services can be provided." We went in with this presentation and showed them essentially that really these devices, while they are digital devices, the signals that are being sent out on the line are really analog type signals. The bottom line of all of this was that the Commission, in a proceeding, docket number 81216, said: "We are deciding that users are going to have the right to directly connect to digital services, both present and future." They affirmed that decision in a case, a little later, that was specifically addressing ISDM services, and they said: "We're going to reconfirm what we did there. The new reference point," which is the facility interface, "is going to be the policy in this country for ISDN," and there had been a lot of pressure by the telephone industry, saying: "Look what they're doing in Europe." In Europe, you could make a similar case with DDS and ISDN. This would be, I don't know if your familiar with the terminology, the NT-2 and NT-1, and in Europe you've got to connect at this point or at this point." The Commission said: "No, here's where we're going to connect. We don't care what other countries are going to do. Here's where we're going to connect with it," and they've been pretty steady on this. There have been a lot of --

Pelkey: But the philosophy was all set from what came earlier. The battle had been fought earlier. It was an extension of the logic.

Thompson: Right, and a lot of the arguments the telephone companies raise -- and by the way, they're still raising these same issues. We just went through this with a device called Project Victoria, and we still don't have a decision on that, but I'm hoping that - - it appears, based on what they did in Computer Inquiry III, Reconsideration Decisions, that they're going to say: "Hey, Project Victoria is not unlike all these other things, and it's customer premises equipment." But the carriers continue to try, and it's understandable. This is their monopoly. Why not extend it to the extent you can?

Smith: Going out from the U and into the back of the CSU, back to the (unintelligible).

Thompson: It extended out to encompass the functionality of the customer's premises.

Pelkey: If I might, given the time constraint, if we could switch back to General DataComm? After it's 1971 going into '72, things are going very well. The company is broadening it's product line and selling, from the heritage, into the independent telephone companies is an important (unintelligible) and into the government and into these big systems providers, and the timesharing companies and so on are important parts of where you're selling your product. Who were you competing with at this point?

Smith: In the multiplexing world was ADS and Timeplex. Timeplex started shortly before we did. I think they made their first show appearance in January -- November of '69 at the fall Joint Computer Conference. I think that was their first trade show. So they were out there with Muxes. Infotron was around, but really very high priced, Cadillac type product, and we didn't see them that much in the marketplace. ADS and Timeplex were the two biggest competitor.

Thompson: Timeplex started going through some problems around '73 to '76, right? Did that reduce their effectiveness in the marketplace?

Smith: Yes. That's I think when Ed Botwinick came in was about '76, when he came in from the financial community.

Pelkey: Because they weren't doing a particularly good job?

Smith: We overlapped in some areas, but we also had unique customer bases, and there were a lot of areas where they didn't see us and we didn't see them.

Pelkey: Most of the time you didn't compete with each other? I mean, the markets were so big and the opportunities were so great, I imagine you had more to do --

Smith: Plus they also had this distribution agreement with Milgo, which really gave them the whole Milgo sales force to move Timeplex products. I think that lasted about two years or more.

Pelkey: Yes. Now, the next big innovation in the marketplace was the statistical multiplexer? I guess while DCA may have created it, Codex is the one who really made --

Smith: No, Micom is the one that created the StatMux. Micom was the company that really made it go.

Pelkey: I agree with that, and I'm going to come to Micom in a minute, but Codex was out there with one of these big boxes? In '74 or '75 with, as I've been told, they had to ship a couple of engineers with it in order to get it to work? Does that ring a bell?

Smith: No, I think it was later. They came out with that big 6000 series device in the late '70s. Before Motorola. '76, '77.

Thompson: Yeah, I would say in that time frame.

Smith: Well, DCA had a StatMux product that was based around a DEC PDP8 computer. And they had been in the business for quite a while, selling little switching systems based on the PDP8, but they really -- I'm not sure when they got into the StatMux business per se, but Micom was really the one.

Pelkey: When did you get into it?

Thompson: Well, it's interesting. We got into it around 1979 or '80, but the first thing we did, we were OEMing the Micom box.

Pelkey: When you first saw Micom's product, do you remember that?

Smith: Oh, yeah, it was a disaster. The northeast rep, and Roger Evans came in to visit. They were promoting the Micom product and they said: "Look. We are a distributor product company. We don't want to build a network that's more than 50 miles from one end to the other. We don't have the service force to handle it. We just want these little products and for big network and big distribution you fellows would be a natural distributor for us," so we took a couple of the boxes and said: "Ok, we'll try it. If we're going to put the GDC support behind it, we want a decent box," so we put it in the lab and the thing is a disaster. And, I think in 1978, we did a heck of a lot of engineering straightening out the Micom 800 multiplexer.

Pelkey: And you did that in '77, right?

Tape Side Ends

Pelkey: So you spend time --

Smith: Straightening out Micom.

Pelkey: During '77 --

Smith: '78. I think it was February of '78. I recall when Roger Evans and the rep, Rosenthal or Rosenberg, whatever his name was, came in here. It was about December before we got a product from them that was usable.

Pelkey: December of '78?

Smith: Yes. So that whole year we spent helping them straighten out their --

Pelkey: At this time, they're starting to sell the product pretty decently.

Smith: Yes.

Pelkey: Through the distributor organization.

Smith: But all the things we told them were wrong with it they went back and cranked in these design changes, and beefed up the product.

Pelkey: What they did in terms of their advertising campaign, their orange juice can and their stocking reps, what did you people think about that when you saw all of that?

Smith: It was a very clever ad.

Pelkey: That was unique and different at that point in time.

Smith: Yeah, but let me tell you the story of what we were chasing. We were really getting into the T1 business. Let me tell you how we got into the T1 business.

Smith: There's this little oil company down in Texas called Texaco. They had a couple of data centers in Houston that were about eight miles apart, and we had a product that we had introduced in 1972 called the 1251. It was a bit interleave synchronous multiplexer with synch and asynch channels and stuff like that. It ran up to 300 kilobits per second, and Texaco had some cross town lines. They were running 230.4, which was a standard channel offering of AT&T's at the time, and they were breaking down the data centers into low speed channels, and we had sold them a couple of 1251s, and they were really building up their business requirements quite a bit. And one of the guys at Texaco, thumbing through the tariffs, found that under the DDS tariff, your local access lines are designated as the DAL-1, DAL- 2, data access line. They had a thing called a DAL-3, which was 1.544 megabits, only available in the local metropolitan area. They found out that they could get a DAL-3 T1 pipe between their two data centers at some phenomenal saving over what they were paying for multiple 230.4s. And they said to us: "Look, we can buy lots of your 1251s to give us the low speed channels, but we'll only do it if you give us something that will allows us to put it into a T1 pipe." We had a --

Pelkey: Now this is when?

Smith: This is Texaco, 1977. '76, '76.

Pelkey: '76.

Smith: Our product 1251 was introduced in '72.
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Pelkey: Ok, so this is '76.

Smith: '76 now. So we had a small single shelf called our model 1253. It was a twelve channel Mux, and we kind of reengineered the back plane and the high speed common card and cranked it up, and we came up with a 6 channel multiplexer that would run at 1.5 meg. The channel speed was 256 kilobits, and that's all. It was a fixed frame 6 256s into a T1. We plugged that in front of our 1251s and ran them at 256 into the channels and Texaco built on this whole big thing, and they went with their T1 and that, as far as I know, was the first commercial T1 data application ever in the country.

Pelkey: I think you're right. A number of other people said that you were the first one. When did that go in?

Smith: 1976 or '77.

Pelkey: '76 or '77.

Smith: And we thought, well maybe we could sell a few more of these, so we built 20. Well, low and behold they sold, and they said: "Gee, we ought to crank up our build plan to about 80 units." And we did, and they went out pretty quick too. So we said: "Hey, maybe there's a market here," so we went out looking at this thing seriously, and we came up and developed our 1257 and 1258, which is basically the same hardware, which was the original MegaMux. The 1258 ran at 1.5 megabits and the 57 was a lower speed device, but it used the same common equipment sets except for the high speed front end and the high speed clocking, and that was what hit the market in 1981 as MegaMux, the original MegaMux.

Pelkey: Now, that was largely a data only --

Smith: that was data only, right. Then we began to put voice channels in. We found that there were people who had a lot of data channels, but couldn't quite justify a T1 line, because T1, you remember, long distance were only available on special assembly, and yet they had a few voice tie lines. If we could afford to put those in the same T-pipe, they could afford the T- pipe. So we came out with the CBSD voice channel card. It was the first voice card we came out with, and put voice in there.

Pelkey: And this was when?

Smith: '81, '82 time frame. About 1981 we had a voice channel.

Pelkey: Now at this point in time, in T1 there's yourself and there's Infotron --

Smith: Nobody.

Pelkey: Still nobody.

Smith: Nobody. The channel bank guys, the CoastComs and the Telco Systems were building channel banks. Nobody was really in T1.

Pelkey: So even into '81 --

Smith: '82.

Pelkey: '82, it was you?

Smith: Yes.

Pelkey: When did the first competition come on and who was it?

Smith: Timeplex with the link one, which they announced at an Interface show --

Pelkey: In '64.

Smith: (Laughter) Probably. I think it ran something like two years between announcement and delivery. 1985 or something like that.

Pelkey: Who was the first that came out with something, do you recall? Was it Link?

Smith: They were the first real competitor. Then, there was a guy named Tony Barbero who had been the vice president of engineering at Infotron, and he split out and started a company called DataTel down there in south Jersey, and developed at T1 box that was based on the channel bank architecture. Instead of 24 fixed channels, he could break those in half, so he got up to 48 channels at 32 kilobits per time slot and give you an RS-232 data interface, or a V-35 interface, and that's the box that Infotron started selling. Then Paradine picked it up. A couple of companies. But it never really sold a lot. It was not a big selling device.

Pelkey: Now somewhere along the line here there's a T1 tariff change.

Smith: Yes, I think it was in January of 1984. I think that was the time frame. Because we put in the first long distance circuit, from Hartford to Atlanta, Georgia, for Travelers Insurance. They had a megabit to megabit mainframe link, 1.024 megabits per channel, plus the low speed stuff, and it was the first long distance T1 circuit, and AT&T told us that, that we had the first long distance T1 circuit.

Pelkey: And that was in '84?

Smith: No, that was '83. I think that was December of '83, and it was March -- was it March of '84 the tariff went down?

Thompson: Yeah. Jack O'Neal says it was it happened on March 17, St. Patrick's day, and Jack O'Neal said that was because I'm Irish.

Smith: That's right, and the Travelers Insurance Company was paying 68 or $69,000 a month for their circuit under a special assembly. It went down to $29,000 a month.

Thompson: You see, the way it evolved, the only T1 services provided some time back were for the intelligence activities in the Washington. D.C. area, and they were special assembly tariffs. Then they put in T1 in the DDS tariff, and brought in the DAL-3, the digital access line 3, but the price went up from what the intelligence services were paying, and they had a rate case going for along time that they just fairly recently settled. But that was the first formalized offering of T1 type services. As Bob said, most of it was special assembly. Most of it was fairly short links. Most of it was intrastate. Then, in the '83 time frame, AT&T formalized it and it was in tariff 267 originally, no 270, tariff 270 --

Smith: It was the DDS tariff.

Thompson: Right, and then -- no, DDS was 267. T1 service was offered under tariff 270, and then they as a result of the divestiture and the restructuring of the tariffs, it is now offered under a combination of tariffs 9 and 11 on an interstate basis by AT&T and they now call it AcuNet T1.5 Service.

Pelkey: That changed the business dramatically when they dropped the rates. That really made it economical for people to do T1, plus you get it long distance at this point in time. It's no longer just this short (unintelligible). Now, you can build nationwide networks.

Smith: I have another subject about the growth of technology. I'm not sure how much of this could be substantiated in terms of the thread, but let me give you my scenario. I talked about diagnostics, and we, in the course of our 201 2400 bit per second modem, created a separate diagnostic card that plugged in the box with the modem stuff, and by sending certain codes downstream, you could do digital loopback of the remote modem, or loop the telephone line (unintelligible) back to your cell, or trigger a signal that would bring a telephone, like you would have an autowire phone that could be triggered on a ring down basis, and there was another thing, that on multi-point lines, occasionally a terminal would hang on the line and not come up for it's 30 seconds of transmission and drop off. It effectively got hung up and hogged the line and shut down the transmission. You could send a signal down to intercept that terminal signal and shut it down and free the line. We called it the request to send intercept. That was a 009P003-123 cord, and we started peddling that with our 201s. Now, at the same time, we had been working with Intertel, up in Massachusetts, Jerry Holsinger's company, and before we even had our own 201 we had been dealing with them and trying to OEM a 201 modem from them, but for various and sundry reasons the deal didn't work out, however, they were aware of and had access to our diagnostic card. You go down to the ICA show in New Orleans in 1974, Intertel was developing their first modem diagnostic system. You look at the front panel of their diagnostic card, it looked that same as the diagnostic card we had here. So Intertel's out there in the marketplace selling diagnostic systems, and the first one that they sold successfully was Manufacturers Hanover Trust Company, 1972 in New York City. We bid that job against them and lost by a big number of dollars and I was later told that they bought that job because they wanted the contract, to get in there. The history is that Intertel became very successful on Wall Street. They owned the Wall Street community in terms of data communications. So anyway, we then got into developing the side channel, the secondary channel diagnostics, the non-interfering stuff, and we introduced the NetCom 5 in 1977, the first side channel thing. Around '76 or so, there was a guy working here who left and went to Paradine, and he was a pretty smart, aggressive young fellow who loved these ideas. He took all of these diagnostic ideas to Paradine. One trade show, they show up and they've got a little tape playing in the back of the booth with all these crazy displays that come up on the screen, and that was the beginning of their analysis system. Now, some time later, I interviewed a guy who was working at Bell Laboratories. I forget his name, but he was a little Chinese guy with eyeglasses that looked like a couple of ash trays, and he was instrumental in developing the Dataphone II, the Bell 209 modem and then the 2096, the Dataphone II. We got into a discussion of why they moved the center frequency so the 209 and the 2096 were not compatible and things like that. The story as he tells it, is we were developing the 209, we got finished with that, and we were looking around for something to do, and we look out in the world and we see this company, Intertel, selling all these diagnostic systems, and we did a real study on that. We decided that the market really could use a good diagnostic modem type networking modem, so they proceeded to develop Dataphone II. It is my convention that the Paradine analysis, AT&T's Dataphone II, the Intertel DMS and then the competitors like Milgol and Codex, seeing this coming along, all started here at General DataComm.

Pelkey: Makes a lot of sense.

Smith: This is the Adam and Eve of the diagnostic community.

Pelkey: It's strange. I've been talking to Jerry, he's agreed to sit with me, but Intertel was perceived as the company that introduced network management.

Smith: Yeah, because they really exploited the network management in the modems, they did. I can't argue that point, that they exploited it, but we had the idea, they exploited it.

Pelkey: But there's also -- while Intertel was very hot, they ran an ad at one point right near a trade show about -- Does Milgol does this? Does Codex do this? Does AT&T do this? Do you remember this ad?

Smith: Yes. The Intertel challenge. They were very aggressive.

Pelkey: And somehow, that really validated that some people in fact had it. That ad was a major mistake and after that, Intertel -- that ad was a key point because it was such a mistake to put an ad out there --

Smith: Because it publicized the competitors' capability.

Pelkey: So you remember that ad?

Smith: Yeah.

Pelkey: Who was mentioned? Do you recall?

Smith: I think the ones you mentioned: ATT, Milgol and Codex.

Pelkey: Isn't that something. Let me ask you a question. You are widely recognized as having innovated T1, and yet the T1 marketplace got innovated additionally by NET, came out and is the darling of the T1 business today, and there's been lots of other refinements by potential start-up companies. While you're still a shareholder in the marketplace, that was all yours at one point in time. Now your just a --

Smith: I'm sure if you look at what happened there, Jim, when we got the MegaMux going, and it was very successful, we took our engineering talent and steered it toward the statistical mux market. I said we started with StatMuxs working with Micom. We were OEMing Micom for several years, and we decided we should do our own. There was a low-level StatMux program going. When we got done with MegaMux, we threw engineering resources to that, and didn't focus on the T1. Where Timeplex came along was the multi-aggregate, the fact that they could build a triangle network; three point network, interconnect with three muxs, and we had to take six because we had two per link to do it. So they got the real jump based on the networking marketplace. We're in that market today. We have our MegaSwitch today, but it's really been like two years late hitting the market. Meanwhile, if you take a look at the high end stuff, the NET and Cohesive and the group, Network Switching Systems that's been bought out by BBN, those folks all came out of TimeNet. The whole genesis of that group was TimeNet. What they did is go out and address the very high end of the market with a lot of voice communications. They're market rationale is really to bring a lot of voice channels into T1. And so they're approaching it from a voice world and adding data, whereas we have come from the data side and added voice. They've gotten a good market niche because that's a market niche that we had never planned to address.

Pelkey: Why did you not see the fact that voice was the dominant form of traffic out there and that, on T1 switches that can handle voice, it would (unintelligible) --

Smith: There's possibly all kinds of reasons. I think our focus has been in the data modems and data transmission and computer interfaces. We've never really had an orientation toward voice communication, and we have not hand an orientation toward integrating voice and data in a complete network. Not until the last, the recent past where we are doing it, but not with the orientation that those folks had five years ago when they really got themselves started.

Pelkey: Let me ask the two of you a question of a similar kind, because this is an area that fascinates me, and it goes back to this technology growth. Other than for Milgol's introduction of PlaNet, which wasn't very successful and was developed in England, the traditional data communication companies, yourself being one of them, none of you participated in the local area networking market either. Now, companies are going out -- Micom bought Interlan and so on, and the local area networking market, just like the T1 market have been the place where there's been a great growth rates in data communications in a broad sense. Why did the traditional guys miss the LAN market?

Smith: Because it's a different technology. Let's face it, when you're talking about an engineering department that knows how to do data modems and wire line transmission and things like that, then you get into 10 megabit coaxial cable, you have a different technology, a different marketplace, it's a different product line. Well, to say it's communication is sort of like, I suppose, trucks and cars. If you're really good at cars, do you want to get into trucks or vice versa.

Pelkey: But the fact is that now these companies are starting to conglomerate, if you will, to be able to offer more, going back to the early genesis of General DataComm, which was kind of a total solution with

diagnostics and end to end service and so on, that that's an important development in the marketplace, going back to the philosophical roots.

Smith: Part of the issue, though, would be that you can take -- the networking today. If you take a look at wide area networking, you're getting to the point where LAN clusters are becoming the terminals on wide area networks. The LAN server or interface becomes a terminal device on a wide area network, and that will be our entry point into the LAN market. We don't, at this point, strategically, we are not looking at going into the LAN business, per se.

Pelkey: But the gateway marketplace would be a marketplace would be a marketplace that would be obvious -- what Welfley's doing, as an example, would be an area I would think would have to be of interest.

Thompson: Who?

Pelkey: Welfley. It's Paul Severino's new company.

Smith: Don't know them.

Pelkey: They're doing gateways, T1 to EtherNet and so on. You were sellers to Western Union. Western Union was an early customer and a good customer to you. And Western Union eventually got out of the business and, if I understand correctly, sold their business to Halcyon?

Smith: Oh, no. Western Union. The thing that they sold to Halcyon was their multiplexer. Western Union had a group called Western Union Information System, WIS, that started doing their own manufacturing. They were developing their own product, and they had created their own multiplexer, that they ultimately sold to Halcyon, and as far as I know, the thing has died. We don't see it in the market anymore. It's gone, but it wasn't a good box to begin with, and it --it started off wrong and it never got patched up right.

Pelkey: Now Timeplex -- some of the people who founded Timeplex were people out of Western Union.

Smith: Right.

Pelkey: Those gentlemen being?

Smith: Those were Sidney Kaplan, Richard Schmall and John Ehlich. Ehlich was the engineering guy, he was VP of Engineering at Timeplex. Kaplan I think was president.

Thompson: Yes he was.

Smith: As far as I know, when the big shuffle, when Ed Botwenik went into Timeplex in '76 or '77, Schmall and Kaplan left, or they left soon after. Ehlich stayed on. Ehlich has been there all -- I think he's retired now from the company, but not terribly long ago that this happened.

Pelkey: My understanding is that when Western Union abandoned that project, that in fact Timeplex picked up some of the people that had been working on that StatMux project within Western Union and formed the nucleus of what became their StatMux line. Is that?

Smith: I couldn't comment and I don't know that for sure.

Pelkey: During this period of time, you had maintained a significant portion of your business going into RBOCs, to the channels that were your root. The fact that different companies in the marketplace focused on channel of distribution or customer type or, as an example, Racal-Milgol used manufacturers' reps and Codex going direct and your selling into the telephone companies also was a way that you all

grew your companies and didn't run into each other a lot, because you focused on different parts of the market, because the market was growing so rapidly.

Smith: That's fair. We started out with direct sales to end users, and we -- actually started with a log of reps. We hired manufacturer's reps right at the very beginning of the company. We also had ties to the telephone companies because Don Lehrman, our first VP of sales and marketing, had been vice president of marketing at ITT Telecommunications before he came to Stelma in 1967. He was at Stelma about two years and then came over with us, and even at Stelma we were selling equipment to the telephone industry, so we had -- we were known, we had good ties in the telephone industry, so it was a natural market because we knew people there, we knew where to go and were able to penetrate. Plus the fact that under the -- Tommy, comment on this. Is it under the '56 Consent Decree of Western Electric or was it just by policy that if there were --

Thompson: No, that was a policy. AT&T had an unwritten policy, I guess it was at least, that if -- they did not want to have to sell Western products to independent telephone companies, unless they were force to, really. There are probably a number of reasons for it. We think it's they didn't want to reveal the pricing, but they would only -- they would not sell if there were two other vendors that had a similar product, they would not sell the Western product to an independent.

Smith: So what we found out out there was that, in terms of the data set business, there was Western Electric, there was Sangamo who was a Western licensee, and then we got in that business developing direct connect data sets. And we went out to pursue that market, so it wound up that we and Sangamo were the two players in the independent telco supply of data sets. In fact, by 1980, the General Telephone Companies, GTE and its subsidiaries, represented 19.8% of our revenue. We also moved into Canada, selling to Bell of Canada and the provincial companies in Canada, and we've been very successful in Canada now, since 1970, in the telco market, so we had about a third of our business in the business systems or end user market, about a third to the telcos, and a third outside the US. We hit that third, third, third split in 1974 and it stayed that way up until 1980, and then the Second Computer Inquiry, which deregulated terminal equipment, basically drove the independents out of the equipment business. And we had, for example, General Tel of California found that about 60% of their use of GDC equipment was on joint service orders. A customer called AT&T and wanted a private line put in between some place and General territory, and General Tel got an order for a data set because there was a service order from AT&T, and they didn't have to sell, it was an over the transom type of bluebird order. Well, under the deregulation, under Computer II, they could no longer provide the data set at the end of the circuit, so they didn't need to buy them from us. They had to sell at an unregulated basis. American Bell could sell in their territory. GDC could see in their territory. The customer was open game, they basically never created a game plan to sell equipment, General didn't, at least for a couple of years. And people like Centel and Uniteds and so on effectively got out of the business, so our independent telco market dried up, and it wasn't until divestiture when the seven RBOCs were formed, became customers again.

Pelkey: You had a great marketplace open up to you at that point.

Smith: We did, and we --

Pelkey: You had the relationships with them, you had the experience selling to that kind of customer base --

Smith: Yeah, and we hired a lot of people and built up seven regional offices to sell to the seven RBOCs and hired people to do technical support and stuff like that.

Pelkey: One of the outside -- people in the industry hold GDC in high regard, and whenever GDC comes up, there's a limitation about the fact that your channels of distribution, you were always churning, going from direct to reps. You were always changing this around and it never became steady state for you, that you were ever able to exploit the innovation and technology and the leadership that you had.

Smith: I don't think that's a true statement, not the channels of distribution. We were selling to the telcos, the independents. That died on us in '81. There was a lull there for a couple of years until Bell broke up and we got back in that business real strong, but the market wasn't there, the telephone industry. We've always been in the business user market. Shell oil bought multiplexers number three and four in 1970, and we've had a presence there, but not a strong one until '81. When the telco went to hell, we had four regions, we had 32 people, the whole business system sales organization. Today we have ten regions and 285 people in business system sales.

Pelkey: One other question before I must leave, Hayes came out of nowhere, and became a significant factor in the modem business --

Smith: By addressing a very specific market niche, the PC, and a modem for the PC. I think it was a great strategy. They found essentially one application, and they made a modem for that one application, and they did it very well.

Pelkey: It's interesting how innovation happens. Both of you,I thank you so very much. I greatly appreciate your time.

Thompson: We'll look forward to looking at your transcript. If you're back out this way again and would like to sit down again, I'm sure Chuck would like, particularly after he reads your transcript, I think Chuck will probably want to meet you anyway. So let's keep in touch.

Pelkey: What we have talked about today is going to have a prominent position, so I look forward to it.

END OF THE INTERVIEW

