



Interview of Bruce Smith

Interviewed by:
James Pelkey

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James Pelkey: We were just talking about where you came from and then I'd like to get into the forces that were driving consolidation of technology markets and companies that, specifically prior to that, had competed very differently for the same purchasing dollars.

Bruce Smith: Well, it's sort of off the pattern of a chronological layout of what you asked. You showed me your diagram, where you chronologically showed the progress of industries moving toward consolidation. With regard to that, I think the important intellectual point is that during the period up until '85, '84, those industry segments, LAN, WAN, and basically mainframe connections, progressed on their own with very little interaction and very little competition, because they were all built on, follow a technological stream to solve what was a fractionated market. With the proliferation of workstations and distributed computing in the '80s, by '84 or '85, customers began to seek more comprehensive and interconnected solutions to the overall problem which all of these various technologies were intended to address. Certainly by now, the pressure for market consolidation, both economically, and because the product-market mix had shifted from having been a new and thought a golden investment bonanza to nearly a late stage and no longer an investment opportunity, at least for the aggressive, for the private investor.

I think part of these solutions being so terribly different -- if you just take the LAN and the WAN business. In the local environment, particularly in Ethernet as it was employed in the mid '80s, bandwidth was effectively free, and indeed the Ethernet solution is one which is very inefficient in terms of its use of bandwidth, but in the wide area environment, bandwidth, prior to the divestiture of the Bell operating Companies, and largely until '86 or '87, was a very, very expensive good, particularly in wide-band chunks, so the technologies, and indeed the architectures that were appropriate in one environment versus the other, were very different, and I'll talk more about that later on. That separation is disappearing, both as processors and memory prices and speeds change, but also as bandwidth -- differential bandwidth costs, or dollars per bit -- changed very radically between '83 and '88 . . .

Interruption in the Interview

Pelkey: You were making the comment, in terms of the bandwidth --

Smith: Did that get picked up or not?

Pelkey: Yes.

Smith: We'll come back to this. Maybe, in fact, the best place to start on moving into the origins of NET and the intellectual framework that it came from was that the -- it's been a long standing proclivity of mine, whenever I see a change taking place in the economic system, to try to map it into something that's happened before, and I used to be, and to some degree still am -- times being what they are, less so -- a reasonable student of business history, and in the context of the time frame that I was at COMSAT -- come back and I'll walk through chronologically, but let's do it broad brush -- it became very obvious to me that the deregulation patterns in telecommunications would follow those that had taken place in other maturing connectivity or transportation businesses, and that in reality, what we were talking about, in terms of connectivity in a wide area, was in fact nothing in the world but a transportation business, and

indeed I would argue that is true for the local area, too. One may be over the road bands and the other package bands, but the analogy holds, and if you think about the problem from that perspective, in the wide area particularly, at a time when bandwidth was expensive, you can draw conclusions that the problem that needed to be solved, if in fact T1 lines were tarified, would follow very much the same pattern that the growth of the railroad network did, where first people would connect the largest locations in very thin ways, and that as bandwidth proliferated and costs came down -- which is also obvious because of the fiber lines going in, that those networks would become increasingly complex and more interconnected -- that the problem the user would face is how to install, adopt, manage, and control those networks, and that the problem you faced was the same problem that someone who was operating a railroad network faced, in terms of both the functions and also the economic model. The overwhelming thing that underlies the conceptual framework for NET was my perception that what had happened, or what would happen, would be a move from call/minute type economic thought to a fixed plant utilization type of thought, i.e. a fixed price, or cost, transportation plant that would be put in place for a variety of reasons and get increasingly close to the central production of business services in the company, but where the economic advantage, if you will, was in managing that fixed plant more effectively. The thing that the IDNX did that differentiated it both from the other companies that were started at the time, most dramatically from the PBX vendors and the datacom vendors, was it made that transition to fight the next war rather than the previous war, and that's the conceptual overlay. Once you make that step, the architecture of the product, the architecture of the network, the architecture of the software all fall out. It also leads you, very quickly, to the conclusion that you must mix voice and data, because there are nice things about voice; it's statistically very, very predictable, calls are very short in nature, they are random and there is the public switched network as a parallel path that you can off-load things on, so that if data is your most critical element, voice basically pays the freight, except when something goes wrong, and then you can keep the data applications up, and that's nothing different than the difference between fast freights and slow freights in the railroad network. Fast freights have priority. If a trestle goes down, slow freights get backed up in the queue somewhere, and you can do the same thing with voice, only you don't back it up in a queue, you put it out into the public switched network. So that was the conceptual leap. Now, several things; what led to that and what other things were going on in the market that made it possible for that perception to be so significant so fast? We need to go down those two paths. The first one is COMSAT/SBS and understanding the customers. The second one is regulatory in nature, because there's a lot of 'right time, right place' associated with this. Let's take the COMSAT/SBS perceptions, quickly. In late 1979 -- no early 1980 -- I was recruited as the chief strategic officer for Communications Satellite Corporation in Washington, DC. Their problem was that they were trying to take the business and diversify it into the commercial marketplace, out of the regulatory environment, and they had made a number of investments toward that end and wanted, basically, some new thought to try to lead parts of their foreign investment strategy and evaluate what had been done so far. For a lot of personal reasons, it made sense for me to do that, and among the first actions that I took was to look at, of all the stuff that they had done, what can go wrong and create a really major problem, because in fact, they had a major cash cow in the regulatory business. The only thing that would really derail the train is some massive debacle. That brought me to focus on the partnership with Aetna and IBM called Satellite Business Systems, into which, at that point in time, COMSAT had dumped well over \$100 million, and before they were finished, it would be more like \$250 to \$300 million. A second area of interest, which really doesn't relate

to what we're talking about here, was an emotional commitment to direct broadcast satellite to the home television, which wound up dumping another several hundred million dollars. Both turned out to be abortive ventures eventually, and satellite television is important only in so far as it is part of the background fabric in which some of the recommendations which I made, which, frankly, were ignored, were ignored in, which was basically: "Look, we've made a major public commitment to this. We're going to go ahead with it and see if it works," irrespective of the fact that there was cognitive evidence quickly building that it either wouldn't or couldn't work, or you couldn't afford to do it. With regard to SBS, there were several issues in 1980 which I thought related very directly to what happened. First of all, Satellite Business Systems was designed to provide wide-band connectivity to large communications or information intensive businesses who needed to communicate between, basically, host-to-host communications between major facilities. If you recall, at that point in time -- and indeed maybe some ancient history here is appropriate -- AT&T had steadfastly refused to tariff T1 lines. The rationale, to the degree that I understand it, is that the Bell operating companies were effectively the retailers of bandwidth, where AT&T was a wholesaler for the long lines to them, and in that process, the tariffs that they were able to justify -- remember this is still a rate-regulated environment -- provided much more cost coverage by breaking these lines up into smaller pieces and tariffing them only through the RBOCs as 56 kilobit data lines. There had been many attempts to cause AT&T to tariff those lines, including some suits by the government -- which I can't remember the exact nature of, but that were in the middle '70s -- which were not successful and references on that -- Phil Gevere, who ran the antitrust campaign against AT&T and is now a lawyer and a friend of mine in Washington with Willkie, Farr and Gallagher, probably could give you the endless details on that. Another guy named Alan Pearce, who was, at the time, the chief economist at the FCC -- in fact I may even be able to give you a third name -- he is now head of his own consulting operating known as Information Age Economics, and the third name that will pop up in this thing is a guy named Dick Wiley, who was the past chairman of the Federal Communications Commission, at that time starting his own law firm, which is now Wiley and Rhine, the biggest communications law firm in Washington. All three of those folks are now, and were then, good friends of mine, and they played a pivotal role in helping me to understand the governmental regulatory environment which we were dealing with at the time. In any event, in 1980, the Justice Department had indicated fairly clearly that it planned to pursue AT&T, in fact earlier than 1980, in an antitrust action. The question on that was, after the Reagan inauguration, would, in point of fact, that process continue, or would it be stopped? If it continued, what was the likely strategy that AT&T would take, in terms of dealing with it? If one could crack the answer to those things in advance, one would have a pretty good idea what the environment for SBS was going to be. With a lot of work, the conclusion that I came to, with the help of the three folks that I mentioned, particularly Wiley and Pearce at that point, because Gevere was really in another set of responsibility, was that yes, in point of fact, after the inauguration, the Republican administration would pursue AT&T and, through Pearce, the likely outcome was that they would try to divest their retail arm, meaning the RBOCs, and focus on their core digital backbone network. Well, if you believe that, and you look at the economics at the time -- there's a thing called 'Settlements and Separations,' which was basically a subsidy paid by AT&T Long Lines to the regional Bell operating companies, which if my memory serves me right was 35 or 37% of the long-haul tariff. If AT&T did, in fact, divest themselves, they would have that money to use in some form or another, and it was fairly obvious, politically, they wouldn't be able to drop it to the bottom line and suddenly become the most profitable

company in the world, so the net conclusion is that they would take their digital backbone, which was, at the time, the only digital backbone, and they would use that Settlements and Separations contribution margin to discount bulk bandwidth to the large users. That perception said two things: one, if they did that, the cost economics of the SBS system, which was designed in the mid '70s amid relatively low power transponders requiring very high economic investment in earth-station equipment to be able to handle those low power transponders, would on sort of a dollar per bit basis, be out of kilter by something like an order of magnitude. If that was true, then the SBS program was a bad one, and in point of fact, something else would have to grow up in its place. The something else that work led to was the existence of provider of things that connected those T1 lines into these complex networks and managed them to make the operation by the end-user a feasible thing. It's clear that, if the RBOCs are backing out, or being backed out, of these businesses, that cost, from a line standpoint, to the end-user will go down, but employee and personnel costs will go up, and in reality in 1983, the top 200 folks probably spent 70% of their budget on private line costs and it was about 35% in '88; and they probably spent 15% on people and that's pushing 40% in '88.

Pelkey: That's a profound change.

Smith: A fantastically profound change, and for that smaller percentage, they're going to get a whole lot more bandwidth, so you're looking at bandwidth cost that are a quarter or 20% of what they were pre-break-up for the large user in bulk. I had attempted to convince the folks at COMSAT of two things: one, SBS was going to be a disaster -- I made myself sufficiently unpopular on the partners' committee that I was asked to leave the partners' committee -- and that we should take the business into the direction of figuring out what it was that these users were going to need, that the trend to wide-band was correct, that SBS was the wrong vehicle, let's find another vehicle. Back to the comments I made earlier about direct broadcast to the home satellites, we were embarked in a partnership to do something. In fact, data might be generated that suggested that that was something that should at least be hedged as a bet. It not only was not met with enthusiasm or business logic, it was somehow suggested that it was almost morally inappropriate, and this went on for some period of time. I continued to work with Wiley and Pearce --

Pelkey: People must have loved to have you come to meetings.

Smith: I had two basic positions, one of which was that fiber is going to eat everything but the broadcast capability of satellites long-term, and two was that SBS was going to be a disaster. I couldn't be sure about, because of the broadcast nature of direct broadcast to the home, but there seemed to be some fundamental limitations to it. Those two were enough to make me a very unpopular fellow. I had a few positions that were wrong, also, but they were fortunately of a smaller nature. In any event, it became fairly obvious -- and we're now talking about a time frame post-election, we're well into '81 or early '82 when all of this is going on. By the middle of '82, it has become abundantly clear that I have not found my corporate home, that they're going to fall off a cliff in these programs, and that there was a huge opportunity here. Now, I decided to do two things -- well, with a lot of help from Suzanne, actually -- one was to contact the entire venture capital community as I knew it and say: "I am looking for interesting ventures," and the rationale behind this is that I had done a lot of work-ups, been a general manager for a long time,

been a group executive in this context, had no interest in being CEO of a huge company. So if that were true, I wanted to do something that I could really affect, where the quality of the way the business was operated was one of the things that was part of its value-added, and I was just going to go find one anyway. The second thing I did was continue to spend time with Pearce and Wiley trying to understand what was actually going to happen in the path of deregulation. Out of that, no totally new perceptions came, but an understanding of the speed of it did come. I had conceptualized a thing similar to a transmission resource manager in that time frame and maybe even earlier -- maybe as early '82 or late '81 -- to the point where some of the original notes are very similar to the kind of things that you would find in '83, '84 notebooks), not from an architectural or a technical standpoint but from an applications standpoint. In that series of venture capital contacts, one of the ones I made was with Jeff Pickard, who I had known out here ten years or so before. He put me in touch with Jim Anderson, who put me in touch with Walt, Roger and Robbie, I think, at the first meeting -- and what they described to me was a product that they wanted -- and they had come to it in different ways; Walt out of installing a lot of datacom product in the microwave business and believing that there was an opportunity for products that interconnected in complex ways, topologies that weren't point-to-point. At this point in time, nobody had a non-point-to-point product, so he came to it from an applications standpoint, where I came to it from a more broad environmental standpoint, and Roger and Robbie had come to the idea that a box could be made which would largely be a data engine, and that perception was driven primarily out of the Tymnet perception that a network can be built around nodal engines, and that's the reason that so many Tymnet people wound up doing these kinds of things, because the concept of a smart node, in a relatively small scale, was something that they presumed was the common wisdom. The rest of the world thought that, by the time you get smart, you had central office switches, or you had point products like PBXs which functioned independently -- same thing with multiplexers, in that time frame -- which basically functioned independently of all the other ones that might be someplace else. So the Tymnet people had this concept of interconnectivity which is not at all different than the perception I had because of the time division multiple access way you manage satellite communications, which is a very connected, very intelligent kind of thing, and indeed, what their end product does, one could argue, is an awful lot of what TDMA does, so there's a lot of similarity to that. We sat down and had lunch at the Captain's Table on April Fool's Day in 1983, and it was completely obvious we were talking about the same business, and that there were at least two, and probably three, different viewpoints around the table as to what it was, ranging from 'I think I understand what the customers want, or will want, and I know I understand the regulatory environment,' to Roger's 'if we're going to build a box, this is the way we ought to put the backbone together,' and NET, basically, was born there. It was then an implementation question. By the time that lunch was over, it was an implementation questions as to exactly what it was we were talking about, how to get it funded, for me to quit my job and move across the country. It took me the better part of two weeks to quit. They had corporate wives calling Suzanne wondering if I needed psychiatric help. It's really an incredible story.

Pelkey: You had become such a consolidating factor on the part of everybody else, and were this person that everybody else could easily be against because your views were so opposite everybody, they wanted you around.

Smith: Well, the real perception, which goes to the core of this, is that no vice president of that corporation ever left under anything but very significant circumstances, usually related to health or jail or something -- it wasn't one of those. In any event, I guess it was the end of May that we sold our house, packed up and moved to California. Walt quit his job, and by the end of May, there were six of us ensconced in an incubator over on Stevens Creek Blvd. in Cupertino with \$100,000, (maybe \$150,000) from Merrill, Pickard. What we did was we created a strategic statement of what it was the business was about, which was that the thousand largest companies worldwide, 600 in the US, were going, over time, as the world deregulated, to need a product which would allow them to interconnect this new, increasingly cheap, set of bandwidth; that, at the beginning, bandwidth wouldn't be cheap so the ability to interconnect it and use it efficiently was important, and using it efficiently meant voice and voice compression; that as bandwidth prices fell, efficiency of use would be less of an issue, but the ability to handle very complex topologies would become the issue -- all of this in the concept of what this thing was: a manager of a fixed plant. The IDNX today is still that best. Now, it is infinitely more complex and infinitely smarter than we ever conceived of at that time, because processors have gotten smarter and memory prices have fallen and the software guys generate ten times as much code as they think. We actually thought we could do this with 128K of code, and we're now shipping well over a megabyte.

Pelkey: Now, what was the first meeting with Audrey like? Audrey came back to have lunch with you in Washington --

Smith: Yes, that's true. That was --

Pelkey: That followed your first meeting?

Smith: I believe at the end of the first meeting, the deal was done, with the exception of the fact that some of the young people -- Audrey among them -- wanted to be sure that they were, in fact, getting in bed with somebody that was real, and by real I mean managerially real and conceptually real. So Audrey took it upon herself to come visit me in Washington, and I had an office you could play polo in overlooking the Potomac River, which I think sort of blew her doors off. We had a very good conversation, and Audrey, much to her surprise, I think felt that there was both a symbiosis and an ability to go ahead and function. I think we went to -- what's the Chinese joint on 19th Street, set up by the Chinese Embassy -- and talked over a very lengthy lunch. I had the chauffeur driven car and the whole nine yards, all the trappings. The car is the only thing I miss out of all of that, but I can't remember anything else of that meeting.

Pelkey: Now, the group of them had been working for some time, particularly Roger and Robbie and Audrey and Sarah, and --

Smith: Yes, but less coherently.

Pelkey: But from March on, they had -- Robbie had --

Smith: That's probably about right.

Pelkey: -- and knew that they didn't have a president, someone with that professional management, that getting funding was going to be difficult. They had gotten enough feedback, if I understand correctly, from the marketplace, that they needed a person like you to join the team to get the money.

Smith: I don't think that you will get universal agreement on this, but I believe it wasn't until Walt showed up that the trade-offs in the product started to be discussed, and it wasn't until I showed up that requirements, in a dynamic sense, were really addressed. An example of that is there was no question in my mind at all, whatsoever, that we needed to have voice and voice compression in the product. That started a chain of events which led to Walt taking the position, fairly hard against everybody, that we should use channel banks rather than design that stuff, because we'd really needed to put our design dollars someplace else, which, in retrospect, both those decisions were absolutely right, but that wasn't discussed. Roger and Sarah and Audrey and Robbie were running around with a business plan called Man I, and Man I was basically a non-voice Cohesive-like product, meaning it was a non-flat architecture, it had certain limitations --

Pelkey: Non-flat?

Smith: The IDNX architecture is a peer-to-peer architecture. It, in reality, outside the Bell System, was the first time you could buy a product that was intelligent enough to be connected in any arbitrary topology and would manage itself. It is, in fact, an expert system that manages the transportation network.

Pelkey: But Robbie came to that, really wanting to have a distributed, as opposed to hierarchical, architecture.

Smith: Yes.

Pelkey: Robbie was very much for having an incremental 'get in' cost that could build over time and become more complex over time, because it was of a distributed nature, if I understand correctly. That was his predisposition.

Smith: I think the reality is that the processing power that you need to do a peer-to-peer architecture has a higher 'get in' cost, in the final analysis. Be that as it may, the Man I business plan, and there's probably one floating around someplace, called out a non-voice, more hardware-oriented product. The only reason I'm going into this is that the IDNX emerged after everybody got together and met, and the business that Audrey and Robbie were working on was probably not only viable from a funding standpoint, it probably wasn't the same business, or it was as remote as the one I was working on, although it was much more tangible in the sense that there was hardware, it was as far away. It was only when all those ideas got together that something came out of it. I don't know how many times that venture capitalist contribute that sort of coalescing, but Jim Anderson certainly needs to be credited with that here.

Pelkey: Jumping ahead for a moment, there had been a lot of contact between the principals of NET, Cohesive and NSS prior to your arrival and prior to Walt's arrival. Art Caisse went off and

did Cohesive, and Al Zucchini went and did NSS, but they worked off this kind of agreed to common architecture, which was the one that got changed by your input of voice and voice compression and Walt's of "we're not going to deal with all this analog interface, we're going to deal with channel banks." Those two architectural considerations really changed --

Smith: Add the perception that what this thing had to do was manage the network.

Pelkey: Right, the bigger global issue that the economics are going to profoundly change over time. It was a move from bandwidth and was going to be moved to management.

Smith: That's correct. We need to talk about one foot in each camp. In reality, I think Chrisman was probably the creator of the idea that led to all three of those groups. He had worked for Caisse, I have seen the view foils that they used to try to talk Tymnet senior management into entering a business which, had they done it, would have been the Cohesive business, and I think Zucchini was more of an opportunist.

Pelkey: My sense of history is like that as well. By the way, it's interesting how while NET and the T1 companies at that point in time were getting into what was seen as a first generation product, your concept was really for the second generation product. That is, it was going to move to bandwidth management, and it was going to use management of these complex structures. This was where the business was going to end up, so you started to build that in from the very beginning.

Smith: I don't think we thought about it generationally. There were a lot of trust issues in all of this. In reality, certainly Walt and I and the rest had never worked together. Robbie and Roger and Sarah and Audrey had at least touched from time to time, but the two senior guys had not, and I can remember in the decision to go ahead with this thing, Walt and I had a number of conversations which went along the line of "I'm ready to do this if you're ready to do this. Are you ready to do this? Ok, let's go." That genesis of trust enabled me to work more as the conceptual strawman, or modeler. I was always drawing funny multicolored solids with various network densities and things on them, trying to articulate what it was the customers' problems would be, and it allowed Walt the freedom to try to first argue with those concepts, take from them ones that felt more correct, and try to apply or map that into common architectural thoughts and other things that were out there. That dialectic, which sort of got Walt, in the early year or so, Walt was the center of that, because it was all the engineering founders and then Walt with me in the other direction had some conversations around and about, but there was a lot of architectural 'what problem are we trying to solve?' 'how will that problem change over time?' kinds of things at the front end of this, which probably came more from the fact that the people did not work together before, did not have common wisdom. Therefore, these things had to be settled. Out of that came a much stronger idea.

Pelkey: Yet at the same time, there was enough bonding among the other people, and trust, that allowed for this dialectic at the high level, which enriched what you were doing, yet when it came to the implementing group, i.e. engineering, Roger and Robbie, who had worked together and known each other and had some common bonding from the past, at least through the experiences of having this Tymnet experience that they both shared in terms of architecture

problems -- things that worked and didn't work -- probably was very effective in terms of getting things done and not having to do a whole lot of team building at a lower level.

Smith: I think that's true. There certainly were rocky spots, little subjects like dividing up the equity and other things, a variety of issues, but I think, in general, that's true.

Pelkey: Now, the issue of getting that customer input into the organization, you all came to it with some view as to what the customer wanted, and what the marketplace was going to be.

Smith: And largely different customers.

Pelkey: How did that get resolved?

Smith: Well, there's a famous trip that was taken, probably in July, of 1983 -- I don't know if anybody ever told you this story, you may have heard about this -- I had just moved into a new house and had a contractor putting up a fence and he dropped an eight foot long 4x4 on my foot, so I was on a cane or a crutch. Audrey was about eight and a half months pregnant, and Walt carried the bags. Audrey, by some dint of magic, managed to set up a round robin trip for us, which included meeting with the telecom and information executives of some of the really major US companies, and we went out and we sat down with these people and just simply talked about their needs -- talked about where they thought their businesses were going, and by the time we finished that trip, not only had we heard every single one of them say: "I don't believe you can do it, but if you can do it I'll buy a truckload," we also began to comprehend the speed with which the applications environment was changing on these people. In '83, it was just starting to change. Today, it's a whirlwind. You didn't have smart workstations in '83 to complicate things, you didn't have distributed processing beginning to mature. We refined that. First of all, the IDNX was designed to be software configurable and largely software feature add-able -- even a hardware feature card. If we designed a processor, some sort of an attached processor today on a card that fits on the IDNX backbone, the original software can route applications through it, so we have not even begun to run out of the architectural capability that's in the machine. We did that because we didn't know. All we knew was that everything was changing very quickly, and we thought we knew what people thought the environment would be today, but we got a real clear sense of fear -- both fear of the break-up, fear of costs rising, and fear of this enormous growth in demand without any ability to predict it.

Pelkey: Now, you, shortly after you joined and got funding, got some management in from Ungermann-Bass?

Smith: It's a good bit later than that. Let's see, it's a year later than the first round, I think. We got first round funding in August, and I brought in the first group of management, which included Larry Markowitz and a guy named Roger Fetterman from Northern, who is back at Northern as marketing VP, in the very early part of the year, February, March time frame of '84, if my memory serves me correctly. I would have to go look and see, but I don't think Tony and Steve joined us until almost a year later.

Pelkey: One of the examples that people attribute to you as something that was very skillful, was having an insane schedule for development internally, and the commitment on the outside of a May, 1984 schedule for delivery of a product, or '85.

Smith: That's certainly true. We need to spend some time on that. We also financed business for the external schedule, which meant more dilution, and they may have not been so smart, but it certainly was safer. I think the issue on that was when we started -- remember, we never wrote a business plan for this company. We wrote a financial operating plan, and as a result, we had the whole credibility of the company riding on achieving the milestones and the results. To this day, we have never missed a quarter since the first one, either in major milestones or in dollar terms, and I think that credibility is a terribly important part of what a business must provide, whether it's to its marketplace or its investors. So that was a terrifically deliberate step.

Pelkey: You had these multiple plans internally, and you kept changing them -- this process of de-coupling, so there just wasn't one plan, i.e. there was an internal plan and an external plan, or that there were multiple internal plans that you would ration based upon how well you were doing, there was a whole system of how you allowed yourself to be measured, externally and internally, in order to be able to manage expectations and in order to be able to achieve credibility in the outside, it seems to me to have been a significant part of your culture.

Smith: Well, it's a philosophic issue. If you're going to get to some point, like that doorknob over there, faster than the other guy, you need to get going as soon as you perceive that to be true, and on the way there make mid-course corrections. The external world is not willing to spend enough time learning about you to deal with the changes on the track, so what you have to do, I believe, when there's that level of uncertainty, is to provide a tight control against the outside expectations, and a loose or flexible, willing to change and re-plan and adjust and everything else, against the internal goals. To separate the two, you have to be more conservative in the external one.

Pelkey: Did that cause problems for you within your organization.

Smith: I think it was confusing to some people.

Pelkey: Yeah, because having gotten that culture so it worked was a significant factor in your success.

Smith: In the beginning, of course, it only came together in a complete set at my level. Then later, at the CFO level and myself -- not that it was a secret, but there were engineering milestones, which obviously related to manpower loadings, which related to expenditures, which didn't necessarily relate to external expectations. Until we got to the point where there were choices that lower level management had to make, which was certainly in the '85 and subs time frame, there wasn't a lot of confusion. It was 'get the goddamn thing done on this schedule.'

Pelkey: Another example of that -- and I ask whether you had an impact on it -- was Banker's Trust, when they introduced compression. If I understand correctly, you said that: "In two weeks, we're going to introduce compression, and we'd like to have your feedback on it," and

then went ahead and implemented it right away, and then, of course, two weeks later the customer said: "Oh, yes, we can notice the quality differential," and "Oh, by the way, we did that two weeks ago and we'll look into why you think there was a problem with quality last night," effectively just dumping the whole issue. That's a great story. Did NET have anything, in terms of managing that process? There was an expectation creation process, or know how, on how to implement and everybody went on their own.

Smith: I was not as intimate with that decision. I can't give you a lot of feedback on it. There were a lot of things that were done at NET of that model; product announcements. We always announced -- until competition started to sell stuff that wasn't even on the drawing board yet -- we announced product we were ready to ship, which amazed the industry, but it was a very effective way of keeping exactly what it was that we were going to announce out of the competitor's hands until we actually had it. Roger Chrisman was great for saying: "Let's give them another head fake," which would be some completely deviant piece of work that we'd do for some customer --

Pelkey: Disinformation.

Smith: Exactly. We didn't spend a lot of time and energy on that, but there was a lot of creativeness that went into the process of managing the environment.

Pelkey: Another area that seems important, and maybe natural, based upon the conversation we just had, was the issue of going direct. The competition used the natural wisdom of 'you've got to go OEM because who can ever, as a small company, go and credibly sell direct?' Specifically, when you were trying to go in and sell this backbone, the core of the company business -- if it goes down, the company could be effectively out of business for some period of time -- and yet here you went right into it selling direct. That turned out to be very wise, but it wasn't obvious at that point in time.

Smith: It was terrifically obvious to me. I was responsible for that.

Pelkey: You certainly must have been challenged on that a lot.

Smith: How can you take a product of enormous complexity and push it through an intermediate.

Tape Side Ends

Smith: I think it was eminently demonstrated by our competitors that it didn't work.

Pelkey: It can't.

Smith: But, there were two stages of, I'm not sure 'resistance' in one is quite true, but let's use the term; two stages of resistance. First, the board of directors thought I was absolutely out of my mind; that the amount of money and dilution we'd have to tolerate was such that it was a whacko thing to do. My view of that was that "I'll settle for a smaller piece of a larger pie, thank

you very much, but I don't know how to do this any other way," and we got down to the point where, on that issue -- and there were a couple of others during the history of the business, but that was the first one -- where I basically said: "If you want to run the business, you can do that. This is the only way I know how to make it successful, and I'm prepared to step aside if you don't like that," and that solved that. It was a necessary step on this particular issue. The second problem --

Pelkey: How early on did that come?

Smith: It was pretty early.

Pelkey: Within a year of you being on board?

Smith: We had moved to Marsh Road, and we were in the first part of our space there. That would put it maybe a year, maybe a little later than that, in October of '84 sticks in my head, but we can validate that if that's important. The second part of the problem was, having driven that home, we now had the operational problem which goes along with that, which was 'how do you convince a big company -- a guy in a big company -- to take a potentially career-limiting risk and put the lifeblood of his business in the hands of some wacky group of people from California that had not been in business for a year?' Well the answer to that is, first of all, you start developing a larger-than-life image -- public relations and speaking. You convey the perception of credibility, you grab associated credibility wherever you can, you work with lots of customers, and you find one that's in such trouble that it's going to be career-limiting if he doesn't go with you, and then you build on that. Then you find two more that aren't quite so severe, and by the time you've got the first five, it's over. Now it's a question of a fair deal between your vastly superior product and somebody else's, and eventually it got to the point -- and I think it's close to that now -- that not buying from NET can be a career-limiting decision because of the reputation we have in the marketplace. However, if we were going to go direct, we had to do several things in addition to getting the first pieces of business. We all worked on that. I was handing out my home phone number. "If you have any problems, I'm your company rep and just call me any time of day or night," and I only had one such phone call and that wasn't because the product was in trouble, it was because they needed something in a hell of a hurry. The reality was that it was a reassuring sale. Customers were reassured because we were associating with people; we did our product announcement in New York at Morgan Stanley's corporate auditorium, with a seminar with the likes of Howard Anderson of the Yankee Group and Dixon Dahl and Alan Pearce and Dick Wiley, and -- I can't remember who all -- I guess RJ McGill, and all of that was to convey a sense of credibility. Once we did that, and we got the network, none of them could break, because it's a word of mouth business, so an enormous amount of energy went into the support side of the business. The good news about this segment of the market is that everybody buys in a few cities. Their buy locations are in a few cities, but they put this stuff in Dogs Falls, Idaho, so we had to build a system that would look like high-quality service personnel, on call everywhere, using third party people, and back it up with an enormous software program so that we could, in effect, push the state of the art remote diagnostics. We put in place an apparent -- and I emphasize apparent, because in the beginning it wasn't -- a 24 hour a day, seven day a week, 365 days a year technical assistance help, in which we put some of our better people and some very carefully crafted software tools to be able to reach out into these products in the field and find

out what's wrong before we sent somebody in there. Now, our thought in this was to keep service costs down, because it's really in the service side that you get creamed with that direct strategy. What we didn't realize was that 85% of the calls would be pilot error problem, which if we didn't have that facility, customers probably would have done dumb things; it would have misbehaved and we would have unquestionably been blamed for it. So that turned out to be, in retrospect, a stroke of genius without actually having been seen, and the service capability did, in fact, work. There's no question that our reach has been effective and that the position of NET's post-sale support capability is second to none. The level of expenditure that we spent to be sure that we caught infant mortality problems in the factory was also completely out of line with industry practice. So we were delivering a better product, and we were supporting it in ways that were beyond the state of the art that competitors had. In all of this, everywhere you look, whether it's the guys that designed the factory, Markowitz and company; the guys that set up the service operation, Jerry Davis; all these folks had done this kind of stuff a couple of times before successfully. So it was my job, not to do these things, but to point out the necessity, for focusing on the issues, for problem identification, and to be sure all that stuff hung together in some sort of an overall skeleton. This gets back to the internal/external budget. People had very specific packages of work that they had to get accomplished, and who cares what the external budget is.

Pelkey: I'm not sure that there's anything else internal to NET that I want to ask you. I'd like to talk about the competitive environment a little bit. I think the decisions that I understand were obviously the product architecture and recognizing the opportunity, managing the expectations, and going direct.

Smith: And the network architecture. One of the things that, up until very recently, has been an issue in the marketplace is "My product architecture is better than your product architecture" as a competitive argument. We've been saying since the get-go -- because we really believe it and customers are just beginning to understand -- that the product architecture isn't the issue, it's the network architecture, and it's the whole cost of ownership, the whole cost of operation.

Pelkey: And life-cycle cost.

Smith: But also that you take my product and you compare my box with the Cohesive box, I have some advantages. Take the networks that I can build and the certainty I can provide for critical applications and get a customer to think about his whole problem, I win hands down almost all the time. The company was designed that way, and the product was designed to fit into that sort of an architectural concept, and I think that credit needs to be shared among all of the early people, in terms of reaching up into that next level. You talked about the second generation; "What is this thing really, what's the layer beyond the layer I would think about?" Culturally, I think that's the thing that differentiated us from our competitors. I think it's the cultural limitation that meant that the General Datacoms didn't make it.

Pelkey: Because they were looking at solving today's problem using the technology they had?

Smith: They might have even been looking at solving the problem they understood from last year, and today's technology is relatively irrelevant here. At this point in time, the true technological base that was available to all players in the market was pretty level. It's different

than -- five years later, it's somewhat different, but there still is not a huge advantage, other than in memory and processor horsepower.

Pelkey: But you would have thought, for example, that General Datacom, where they had a customer like Texaco that forced them to build the first T1 --

Smith: The first Megamux.

Pelkey: The first Megamux, and with Tommy Thompson -- and they were a leader in the IDCMA, therefore, in terms of regulatory understanding and tariffing and all the deregulation changes, should have been at least as sophisticated as anyone else.

Smith: Sophistication I don't think is the issue. An example of that is, I think, that when Timeplex introduced its Link Series of products, even when it moved to Link II in the '85, '86 time frame, the engineers they had and the technology they had had to be at least equivalent to what we had, but we defined the problem differently. That's the issue. It is the attacker's advantage, but it's also something that we are struggling to keep in as part of the culture. It is rough. People prefer to deal with stuff that is more certain.

Pelkey: Yeah, and I just remember, early on, people thought you were big bullshit artists. I'm reminded of a story of you giving a speech and getting a question afterward to the effect of: "Mr. Smith, isn't what you're selling a T1 multiplexer?" and you would become irate and you would say: "Goddamn it, you haven't been listening to a word I've said. We are NOT a T1 multiplexer," and everybody would be befuddled and stunned in the audience, because clearly, in their concept of the world, that is what you were and all of the rest was PR bullshit marketing talk about networks and management and the future and so on, and they just thought you were a bunch of hot air, at some level, and they really knew you were, and had classified you, as a T1 mux, and therefore you competed with Link and 'why were you better than Link?' and you refused to be lowered to that. You just said: "Wait a minute, our playing ground is up here, and I'll keep telling you until you finally understand it."

Smith: Well, we effectively, by 1986, early '87, had driven Timeplex completely out of the upper end of the markets. Other than extensions of their installed base, they get no business, and that shows you how different it really is.

Pelkey: Did you, in those days, look at and analyze network systems, corporations, strategy in a company at all?

Smith: No.

Pelkey: Going back to competitive analysis for a second, it seems that, other than the fact that you brought this voice orientation, and the fact that it was really going to be voice driven economics for a period of time, which could have been a reason why the datacom guys kept thinking 'data.' They didn't understand voice, and therefore, they totally misunderstood the size of the market and the potential of the market because they were looking at the thin, 10% sliver, and not the 90%, which was the economics of the buying decision. Is there anything more

complex to it than that? You can say General Datacom was focusing on RBOCs, and for them to think about end-users, as opposed to thinking about their existing channel of distribution, was a limitation that was self-imposed.

Smith: I think an entrepreneur, to start one of these companies, at least to the point where he hasn't been successful with one before, and where he doesn't have a very fat bank account, has got to have a concept that he can believe in with almost a religious fervor. I believed that we had correctly identified the opportunity. An example would be my frustration in some of those early sessions, or the discussion I had when we tried to get Kleiner Perkins to fund us, and Tom Perkins basically said: "You're crazy, that's not the way the world is." You don't spend a lot of time looking at models of how other people build companies, because you've already got the problems identified that are going to take you two years or three years to solve. You have a huge problem with communicating that, and I'm sure the investment community has a terrible time telling the difference between promoter -- the difference between somebody who is religious and somebody who is a promoter, and in then in those who are religious, which ones are right and which ones are not. I believe that that fervor was broadly shared in the company. We thought we understood the business better than anybody else on earth, and probably we did.

Pelkey: Why is the market consolidating?

Smith: Because all of these things grew up differently, because of, in my view, differential bandwidth cost, and that distance is disappearing. Processing is becoming much more widespread with the advent of the super-intelligent workstations, and there's a greater demand for workstation-to-workstation connectivity, and I don't mean PC-to-PC connectivity, I mean serious applications. As such, the users want fewer vendors providing more of the solution that's more easily adoptable, and that allows them to control the people side of their budgets as well as they have recently been able to control the bandwidth cost side of their budgets. So I think it's a market driven phenomenon. It is definitely a maturation of the information industry. On the communications side, I would have to say that these changes are happening so fast -- basically '83 to date -- because they were pent up by poor regulatory policy, and when those floodgates opened, these changes, which might have taken 15 years, or 20 years -- they would have changed along the same time scale as the computer industry changed -- just sort of happened overnight.

Pelkey: From your perspective, the United States made a gigantic investment in information infrastructure in AT&T and left it under regulatory policy so that, in fact, there's universal phone service of high quality. The issue of how we take the next step in building our information infrastructure, which has to be higher speed and big signals, given that post '83 it has become a decentralized information infrastructure with links to these big islands of AT&T and the RBOCs and MCI and the like, but the major corporations where the major communication dollars are spent have at some level implemented their own communications infrastructure. I make the assumption that you accept the premise that our information infrastructure is a competitive weapon nationally and is a basis for companies to create new products and services and be able to compete, how, given that we have become very decentralized, is that going to impact our ability to put in place the gigabit networks of the future, in contrast to the kilobits that they've been in the past? Do you think this decentralized notion and the free marketplace will get there as efficiently as if we had a centrally controlled policy, which we had prior to deregulation?

Smith: I guess there are several different threads to the question. The first thing I'd like to say is that I believe, with an enormous degree of passion, that the most pressing piece of public policy, is the restraint on AT&T's ability to re-monopolize the industry, which they are trying to do today with tariff 1250, and that very use of their monopoly position must be constrained, because it is going to build back in time inertia. As they capture networks and defeat the ability of the user to make different decisions in two years, they make the market less responsive to new innovations. That's the first order of public policy in my view. The second issue is that the information, communications, and for that matter data processing infrastructure in the country, is pretty well established. The problem that industry in large measure faces is the applications to run on that infrastructure to make its production of goods and services more efficient than those in other countries. Federal policy, to the degree it is appropriate at all, should be focused on heightening the rate at which that happens. I would argue that things like major capital gains tax incentives with very long holding periods to encourage investment in those kinds of vehicles, certain kinds of tax incentives may also be appropriate. The government, in its infinite wisdom, prevented the American free market economy from moving the information industries ahead, and moving the advantage of the country ahead, through rate regulation and under structures. Having built that, and then released it, they have to be sure that the creature, i.e. AT&T, is controlled, but other than that, they should stay the hell out of it. Within the context of the world market, the break-up of AT&T, which basically allowed the users access to the wired country which does not exist yet in any other country in the world, although the Japanese are trying real hard to move quickly, has led to some very significant changes in the way goods and services are being produced, and we're pleased to be a part of that, but it's a very positive thing. There have been actions that tend to restrain that. Raising in corporate income taxes is another example. We've been doing it selectively. Those kinds of things tend to take the bloom off the rose at just the right time. Now, the Congress has a history of being 180 degrees out, and this is one of the areas where we have a major competitive advantage. I think that a broader issue is that until or unless this country develops a trade and industrial policy not dissimilar from the way MITI functions in Japan, we are going to continuously have confusion between regulation, tax incentives, and the international economic good of the country. I think it is probably the most pressing problem that we face, and nobody's paying any attention to it.

Pelkey: I have no other questions for the purposes of this conversation. This had been very helpful. If you can think of something that we haven't touched on --

Smith: Well yeah. I'll give you an anecdote. I was in California, in the San Francisco area, in the middle and late '70s, and I watched certain entrepreneurs, in industries that I understood, build businesses with incomprehensible market capitalizations, and very little in the way of true value-added, to the point that that system was so crazy, and to the point where I concluded that I couldn't possibly be an entrepreneur because I didn't understand how to do it -- the world re-corrected itself in the late '70 and early '80s. The reality is that NET has been constructed and successful on a very fundamental, step by step, business practice: the delivery of promised value to customers, charging for that value, the putting in place of quality direct sales and service activities, all of the steps formed a coherent whole, and none of it is magic. You sometimes think that people who come directly from a technological point of view, or directly from a sales

point of view, somehow miss that there's a whole business. I think that if you look in the histories of some of the people that haven't kept up with change, you'll see that.

Pelkey: Thank you very much for your time.

END OF THE INTERVIEW