Interview of Brigadier General (Ret.) H.R. “Johnny” Johnson

Interviewed by:
James Pelkey

Recorded: May 3, 1988
Cupertino, CA

CHM Reference number: X5761.2010

Brigadier General (Ret.) H.R. “Johnny” Johnson: The setting I would like to present for you is the relationship of data transmission, and its evolution, from the early 1950s, driven, I believe, by the Strategic Air Mission and the Continental Air Defense Mission of the US Air Force. These two national defense missions began to come together and to crystallize in the early 1950s. Before that time, SAC was struggling just to get some airplanes that could satisfy the mission, and they hadn't yet progressed to the point where command control on a worldwide basis was becoming crucial to them. Almost simultaneously, the early work in air defense that was going on in Boston at MIT began to create a capability to take more than one radar and consolidate the information on an automatic basis, or a semi-automatic basis, using very early IBM computers, very early ones. What developed from these two requirements was pressure for data transmission. Originally, most of the data transmission was done in VF telegraph equipment, so the speeds were at telegraph speeds, Teletype speeds. Stelma, for instance, was one of those who were active in the VF telegraph business even before they got into the modem business.

James Pelkey: I was led to believe by someone that the government contracted with AT&T after World War II to try to build a modem because of these formative applications, trying to get something close to real time. Given that you had these radar units, how did you get the information back?

Johnson: We did, and I'll come to that in just a minute here. In the 1950 - '55 timeframe, SAC was beginning to spread out into Puerto Rico and into North Africa, to a place called City Slamain. They put a base there and they still had the task of controlling, in a positive way, the bases that were in the US. Initially, those were done at telegraph speeds also, but they, by the mid '50s, were beginning to think of something a little bit faster. The Air Defense Mission, from the outset, was conceived to be computer controlled, to accept radar-generated information, and to process that information at, initially, seven centers that were installed on a lease basis by IBM. AT&T was the supplier of the communications links between those Continental Air Defense systems, so long as they were on the continent. The solution that was developed, and it was developed by Bell Labs, was a 600 bit per second modem that was considered to be monumentally fast, because, as far as I know, that was one of the first departures from the classical VF telegraph equipment, which was about 150 baud.

Pelkey: Do you know when that was?

Johnson: There was integration work done by MIT, under contract to the Air Force Systems Command, and we had a development center at Cambridge, and the commander of the center was Major General Ray Maud. I don't know if he's still living or not, but he spent a lot of time up there in that time frame.

Pelkey: Was this done in Shannon's area at MIT?

Johnson: I don't know.

Pelkey: What periods were these?

Johnson: These were 1954, 5, and 6.

Pelkey: Do you know when the first 600 baud modem was delivered?

Johnson: About 1956.

Pelkey: Must have been a big box.

Johnson: Yeah. That modem technology, as far as I know, came originally out of Bell Labs in response directly to the SAGE Mission, Semi-Automatic Ground Environment Mission. The SAGE operations, although they produced a product about 1955, '56, had been thought about for a couple of years earlier than that, and the people up in, particularly in the Boston area, were leading the way there. I was, at that time, in the '50 to '55 time frame, Captain and a Major and Director of Point to Point Planning for

Headquarters Airways and Air Communications Service. We were working on a worldwide mostly high-frequency network, single sideband high frequency network, with VFTG type speeds, as far as data transmission was concerned. In about 1954, I was pulled off the day to day planning and put in charge of developing a general operational requirement for Air Force communications for the Air Force Communications Service. I had a fellow who was a PhD from the military academy who was an engineer, a physics specialist and an engineer, who was working with me, and we drafted this paper, which was the Air Force pattern for the next five to ten years. We went up to Boston and saw what was being done with the 600 bit per second modem, and Bill Pugh said: "Well, you know," it looked to him as if a suitable goal would be 10,000 bits per second in a voice band, and he was able to make the case that such a thing was possible. So we established that in '55, '56, in the proposed General Operational Requirement that AACS sent to the Air Force, and subsequently, that General Operational Requirement was the research document that the Air Force Communications System 480-L, which was a very early major effort on the part of the Air Force to provide an integrated worldwide communications system. That GOR was the basis for that development effort.

Pelkey: I wonder how he came to the conclusion that 10,000 bps was possible after seeing this 600 bit modem.

Johnson: He was a very good physicist, and he had a lot of friends in the Boston area, and he had been a professor in -- he's still around. He's in Washington somewhere. I might have him call you to answer that question for you. He's retired, but, in any event, he was a very smart guy. He was the Chief Engineer for the Air Force Globe-Com Project, which our HF project, but he was interested in this longer-term stuff, so he was working with me. That's my view of what the driving force was behind these data transmissions. I don't have any doubt in my mind but what the Continental Air Defense Mission created the first modem. I'm sure of that.

Pelkey: I agree with that, from everything I've heard.

Johnson: Now, as far as the early modem manufacturers are concerned, the people who, at least it's my recollection that the people who later became somewhat active in the modem business, other than Western Electric, were coming from voice frequency telegraph manufacturing missions. There was a market there that they could sell into. Once Bell Labs began to come out with a modem that would do 600 bits per second for SAGE, some of these people who had been in the VFTG business began to look to see what could be done for general-purpose applications. It was still clear to them that the only market was the government, because AT&T and Western Electric was not buying from anybody else, they were building their own. Rixon was originally a VFTG manufacturer for the Air Force, and they were building a 16-channel telegraph multiplexer for use initially over ionospheric forward scatter circuits. Page Communications Engineers, that owned Rixon at that time, were the world wide experts in ionospheric forward scatter, and they put in a complex of systems between Goose Bay and Tooley and BW-8 and Iceland and the UK, and place up near Boston that would operate on what is nominally Sporadic E. About 70 kilometers above the earth there is enough ionization created by meteorites and solar wind that you could propagate on this E- layer regularly and very reliably if you used very high power. It would scatter off of that ionized layer. The system that was developed by Page provided these 16 telegraph channels and a voice channel that could be implemented over that relatively narrow band system. Rixon did the building of the VFTG equipment to start out with.

Pelkey: When you say VFTG, telegraphs were what 150 characters per second?

Johnson: Right, 150 baud.

Pelkey: What was the voice?

Johnson: What was done, originally, Western Union created some carrier equipment that would operate within a voice channel, wire lines, and originally four channels, which were frequency multiplexed. They had tones at various levels, and that was before 1940.

Pelkey: So they multiplexed four telegraph channels onto one voice channel.

Johnson: And that general technology was carried over to single sideband channel, single sideband radio, as one method of deriving telegraph channels.

Pelkey: So, were voice channels at this point in time 3000 hertz as they are today?

Johnson: Yeah.

Pelkey: So they would take a 3000 hertz channel, and they would do frequency multiplexing, to get 600 kilobits --

Johnson: They would get 16 150-baud channels.

Pelkey: Oh, so they'd get 16 150s.

Johnson: So this was pretty high technology stuff in those days.

Pelkey: So the thing that Page did was that they would take this 3000-hertz channel and bounce it off this E-layer, and they would be able to get --

Johnson: They'd carry two channels: one telegraph and one voice. They'd be two voice channels, really, but one of them would be used for --

Pelkey: Multiplexing the telegraph channels onto it. And the other one would be an analog voice channel.

Johnson: But the original technology came, really, out of Western Union, who was doing it on cable. It was four channels when they were doing it.

Pelkey: So Western Union had four, and Page was doing 16. That was a really big step-up. Did Page ever do it on cable, or did he just do this ionospheric scatter.

Johnson: They probably also did it on cable, because we were using the VFTG equipment on both microwave and cable to get it out to the transmitter sites from the communications centers on base.

Pelkey: And VFTG just refers to this frequency division multiplexing on the voice channel.

Johnson: Right.

Pelkey: Now, was Rixon a subsidiary of Page or was it a separate --

Johnson: No, they created it internally. It was headed by the Chief Engineer there, who was a guy named Jim Hollis.

Pelkey: Do you know how they came up with the name Rixon?

Johnson: I suspect that either P. X. Page, or Joe Walschmidt, who was the executive VP, probably came up with it. Walschmidt is still around. Maybe I can have him call you. He would know. So anyway, Rixon operated as a wholly owned equipment subsidiary for Page for quite a long time. Then, about 1960 -- '59 or '60, page decided that there was a conflict -- they were running into continuing conflicts only in this hardware company, and being fundamentally a systems engineering house, so they offered Jim Hollis, who was the Chief Engineer there, a chance to buy it and just separate it, which he did at that time, about late '59 or '60. The original products of Rixon were -- they continued with the 16-channel VFTG multiplexer equipment. Stelma was also building that same kind of equipment at that time.

Pelkey: Now, did Stelma go back further in time?

Johnson: Yes, I think they did. I think -- I'm not sure. I knew some of the people who were in -- Bernie Warren, for instance, is one of the guys who was part of the Stelma early group, and he was a Western Electric person. I don't know whether all the others were or not, but I think that they probably came out of Western Electric originally. ITT Federal was also -- they had some technology and they were trying to get into the business, although they weren't too active. By '62 or '63, somewhere in there, the military was generating requirements for modems, and Rixon and Codex and Milgo a little bit later, I think, began to respond and to bid, but the only thing they could really compete for were these government jobs, the military jobs.

Pelkey: Are you sure about Codex?

Johnson: I'm not quite sure when, but they were before '68, I know that.

Pelkey: They were?

Johnson: I knew they guys --

Pelkey: They were building coder/decoders. My understanding is that it wasn't until they bought Holsinger's outfit with the 9600-baud modem that they got into the modem business. Before that, they were just doing coders and decoders.

Johnson: I don't think so, but I could --

Pelkey: Were there people like Collins?

Johnson: Collins was definitely one of them. They were building a kenoplex kind of modem, 9600 bits. It was a real major step up?

Pelkey: Collins was?

Johnson: Collins was, by 1960, around that time. Yeah, in fact, you know the guy who was the designer of them. His name is Mel Doelz. Yes, they build the kenoplex modem.

Pelkey: Thank you. I will talk to Mel.

Johnson: He will remember it. I went out to see him.

Pelkey: That's complete news to me. I was led to believe that 9600 bit per second modems, that Holsinger built the first one, which would be '69.

Johnson: Well, I'm pretty sure that kenoplex was earlier than that. It was very expensive, but it was earlier than that.

Pelkey: Milgo was with NASA. They got a contract for the modems down at Cape Canaveral.

Johnson: Yeah, that's right. They were doing the extension out along the range there.

Pelkey: So the military at this point was starting to say: "We need modems." The state of technology at this point in time was largely 600 baud.

Johnson: I think that was the state, and maybe it was even -- maybe it really took the Bell Labs guys to do that, then there was really maybe 300 baud. It was certainly not over 600 baud.

Pelkey: And at this point in time there were no standard? There was no concept of 300, 600, or 1200?

Johnson: They were beginning to think in terms of that, though.

Pelkey: Paul's recollection is that it was a DCA action in the early '60s that (unintelligible) the 300, 600, which was the 75 X 2 to the nth power.

Johnson: It preceded that, because -- no, it was before DCA came on the scene, because even in --

Pelkey: DCA was '64, '65?

Johnson: Yeah. Even in the middle to late '50s, the Air Force Globe- Com Program was kind of standardizing on 75 x 2 to the nth.

Pelkey: Paul's recollection is that in the late '50s, early '60s, which got him involved in Rand, was this whole issue about wanting to put new communications networks in, that there was a major project going on to put new communications networks, and there was incompatibility among what the different services wanted to do, and that forced some standardization, and that's where they settle on the signal core eight bit per second, and the 75 x 2 to the nth, as being able to reconcile what the different military branches wanted to do.

Johnson: Yeah, but the reconciliation of the 75 x 2 to the nth was a little earlier than that. There were really two competing systems: the Army Unicom system, which was being supported very heavily by Bell Labs, and --

Pelkey: What was the Unicom system?

Johnson: That was a totally digital switch, which a lot of R&D money went into --

Pelkey: For voice?

Johnson: For voice and data. It was well ahead of its time.

Pelkey: I've never heard about it.

Johnson: It was, at that time, a guy named Jim O'Connell, whom I later worked for, was Chief Signal Officer. I was --

Pelkey: What was unique about this switch?

Johnson: It was the first digital switch that anybody had conceived of in those days?

Pelkey: Was there a protocol involved with it? This 75 x 2 to the nth.

Johnson: I don't think that was an issue. The 75 x 2 to the nth was earlier than that -- it was earlier, because I know we based the early Globe-Com design in '55 on 75 x 2 to the nth.

Pelkey: Now, was the Navy doing something different?

Johnson: Well, they were, but the Navy was -- they were not big in networking systems. They were weapons control oriented.

Pelkey: The Air Force is the one that drove the communications networks.

Johnson: They really did. So anyway, the Air Force, the government, the Army and the Navy, were fundamentally the only customers. At this point, I think it's worthwhile talking about the shifts in the regulatory action.

Pelkey: I agree, but let me finish up this area.

Johnson: My memory on these dates is not as precise as it should be. I knew Chuck Johnson, had known Chuck Johnson for 10 years before he started General Datacom. He was with the ITT switching company out in Chicago, and we were doing business with them. I remember when he decided that he was going to try to get some financing to start General Datacomm, and I think it was about this time that he came into the act. Still trying to get around some of the regulatory activities, some of the military guys were starting to use these AJ acoustic couplers, and I think --

Pelkey: That was a response to Carterphone and the DAA. What happened to Rixon that Rixon never became a factor?

Johnson: I'll tell you exactly what happened. They were one of the very early ones. They were acquired by United Telephone.

Pelkey: Do you recall what year?

Johnson: Yeah, it was about '69, because --

Pelkey: They were still a privately held company at this point?

Johnson: No, their shares were being offered on the local Washington stock exchange.

Pelkey: Oh, so Rixon was a public company?

Johnson: It was a public company, but Jim Hollis owned most of it. Hollis came out to -- I was by that time Commanding General of the Air Force Communication Center in Hawaii. Hollis came out to see me in either late '68 or early '69, and he told me he was going to sell the company to United Telephone. He did, and United Telephone didn't know what to do with this company, and it just floundered. Hollis had his money, and they didn't know how to use him, and then Jim died suddenly, so that was --

Pelkey: Early '70s?

Johnson: Yeah, about '70, '71, somewhere in there, very early. I could get those dates if you need them. So there was kind of a management vacuum there, and United Telephone didn't know what to do with it. Eventually, they sold it to -- I've forgotten who now -- they sold it, anyway, and it just never --

Pelkey: Do you have any views as to why the people at Collins and GE were in the business early in modems, why none of those companies were successful?

Johnson: Collins would not play if the market was not -- I mean, this market was not a very big market in those days, and Collins did the development work, but the market didn't -- there was no big market, so they just let it drift away, and put Mel Doelz to work on building a computer, which is exactly what he did out at Newport Beach with that group. So he quit working on kenoplexes and things of that nature. There just wasn't enough money in it.

Pelkey: What about people like GE?

Johnson: I didn't know the modem people at GE. I knew the heavy radar people and the big TROPO people, but I didn't know the modem people, and I don't know where they were. I presume that they must have been -- I'm not sure.

Pelkey: My understanding is that most of the technology came out of Bell Labs, and it was really the introduction of the low cost operational amplifier that started to make the cost structure of modems such that it started to get to the price point where there started to become a commercial market. Western Electric was a player in this period of time, and in fact, was early in the multiplexer game and finally, in the mid '70s, kind of collapsed, and part of it was sold to Halcyon, and part of the group left and became the engineering team at Timeplex. Do you know anything about Western Union during this period of time?

Tape Side Ends.

Johnson: The Air Force had Western Union as a prime contractor for two systems: one was called Plan 51, the other was called Plan 55. Both of these -- and we had Western Union engineers in residence at Andrews, which is where the communications service was at that time -- but they had VFTG people, but I didn't see any modem people.

Pelkey: When did you get involved with the White House?

Johnson: That was in 1965.

Pelkey: During this period of time, the White House, or the government, were the ones who at some level started to initiate the process of looking at the role of communications and computers, and AT&T, as to who could control what and where the lines of business were being drawn.

Johnson: Some people will tell you that the government did it. In fact, it was the FCC, and it was in fact Bernie Strassburg himself. He was the one that had enough vision to see what was coming, and he hired a guy named Manly Irwin for a year to do some very early policy study work for him, and that had to be in the early '60s. There was also, even before that, some work done in the Congress. If you talk to Manly -- I can give you his number -- there was some work done in the Congress on this general issue of competition and computers and communications, maybe about 1960, maybe one way or the other. I was in the government, and as far as I was concerned, I was doing as much advance thinking, probably more than anybody else, but the real guy who had the muscle to make something happen was Strassburg. He is a great man, in my opinion. He's an outstanding public servant and really, without him, the industry wouldn't be anywhere near where it is.

Pelkey: During that late '60s period, did you have any role that had any consequence in the data communications industry?

Johnson: I think the answer would be: "Only peripherally," and that -- I was doing a lot of policy work on domestic satellites in those days. That was five years of six years before the "Open Skies Decision" finally came. So, in that way, there was some minor contribution, and I had a consultant whose name was Dr. Pete Kelly, whom I asked to -- this was in '66, '67 -- I asked to take a look at the industry, because there were a lot of things going on there, and he came up with the conclusion that AT&T was in serious trouble. For someone to reach that conclusion at that time took a lot of insight into what was going on. So I would say that there was a recognition of the -- certainly a recognition in the executive branch of the government -- of a coming major shift in the domestic communications, but then, and even now, there is not a lot of concentrated policy power anywhere with respect to the communications industry. There has been a number of attempts made -- during the time I was there – and ours was one of them, in which they were trying to improve the focus at the executive branch, but it wasn't really successful.

Pelkey: During '67, '68, you had access to as good a communication system as existed. Can you describe, in comparison to today where you have a PC sitting on a desk and you can send documents around the world and you have 'store and forward' and 'voice annotation' and T1 systems and backbone systems -- these sorts of thing didn't exist then. The speed you get today, that wasn't the kind of environment that existed in '67.

Johnson: No, for the most part, what was going on was --

Pelkey: You didn't even have VTRs for the most part; it was all Teletype machines.

Johnson: Yeah. SAC was -- there were, as far as I know, two major systems that were leading the way. One had originally started out being called ComlogNet, which was the logistics system. That was pretty heavily automated -- they were one of the major purchasers of IBM products -- and SAC had a computer based command control system called SADN, that was being implemented by ITT Federal, and it was the first, as far as I know, on-line effort to begin to get real-time input of intelligence information into the database. Other than those two, it was pretty austere. Most everything else was still Teletype --

Pelkey: In a Teletype, could you send -- let me go back and explain why this is important to me.

Johnson: Ok, with respect to data communications in the 1967 time frame, the backbone that was being used by the Air Force, and really, by this time, by the Department of Defense, was the AutoDin Switching System. This was a computer-based switching system. The terminals were hard copy terminals. It had grown out of the Air Force ComlogNet, and had been essentially taken over by DCA. The switches were RCA computers, originally, and subsequently there were some Sigma V computers that were in the smaller nodes, and they were specifically designed as a data switcher.

Pelkey: Do you know who built those?

Johnson: Yeah, it was Scientific Data Systems, SDS. The AutoDin system was a store and forward system, so that the ability to go on-line end to end was restricted, for the most part, to a very few customers. What was put in was a Teletype printed page, and that's what you got delivered to you.

Pelkey: That was put in just by key-typing.

Johnson: Yeah these were Teletype machines. The AutoDin terminals were Teletype machines. Later, they progressed a little bit more, but to start out with, they were fundamentally Teletype machines. There were a few channels in that AutoDin system that were devoted to logistics traffic and a few other automated system kind of requirements. About the same time, SAC was doing the early work on this Automated Command Control System, but it was fundamentally a Teletype system too.

Pelkey: And they were 150 character per second transmissions?

Johnson: Right. All of them. In the Pacific, the Air Force was doing some work with 2400 bit per second modems, between places like Guam and Hawaii and Vietnam, where they were just getting started in '67.

Pelkey: Those modems were probably being supplied by Stelma?

Johnson: I don't know for sure. Perhaps Rixon, perhaps Stelma. One of those two I would think.

Pelkey: Before we go into the regulatory stuff, in the late sixties -- when did you retire from the Air Force?

Johnson: From 1965 to the beginning of '68, I was in the White House, so I was doing policy work on the satellite activities, primarily. In the beginning of '68, I was promoted to BG, and I went to the Pacific to become Commanding General of the Air Force Communications in the Pacific, so for '68, '69 and most of 1970, I was the Commanding General up there. During that time, in late '69 or early '70, Codex came out with their first 9600 bit per second modem, and we put it in between --

Pelkey: Right, in fact they won that contract over a lot of bidding.

Johnson: Yeah, but even before the contract, we --

Pelkey: You were one of the first buyers of (unintelligible) --

Johnson: We had them out there, and they modified it, as a result of that work, because the early one didn't work that well. Eventually, we had a four channel multiplexer that was carrying 9600 bits per second, four 2400 bit per second channels. That took about a year, to get the thing finally working.

Pelkey: That was really an important issue to you because in fact you just couldn't get channels?

Johnson: Yeah, that was THE important issue, because voice channels were what was needed, and we were gobbling up four of them for 2400 channels, each voice channel, so by getting this 9600 bit per second modem, we were able to recoup three voice channels, which was a godsend, because we needed it for airlift control and --

Pelkey: And the voice channels were 9600 bit per second channels as well?

Johnson: Well, they were if they -- no they weren't. At that time, they never were. If they were secure, they were 2400 bit per second, and they were very poor. Otherwise, they were just clear, used in the clear, analog voice channels. I can remember the guy’s first name who was the person -- Forney was the engineer back in Boston --

Pelkey: So this was 1970?

Johnson: Right, and I decided to retire from the Air Force, and at that point, I went to work for the Western Union Telegraph Company, and I was initially Assistant Vice-President of Government Systems here in Washington, and then later I was promoted to Vice-President, and later Group Vice-President, and almost all the time I was really working on the satellite system, until it was finally launched in '74, I guess. The Open Skies Decision came in -- it could have been late '73, because Western Union was the first to get one up. The Open Skies Decision came in '72, and I think -

Pelkey: Now you were a Group VP at this point?

Johnson: I was either a VP or a Group VP, I've forgotten which. I was probably a VP. What happened, I was promoted from VP to Group VP, Western Union found out they couldn't afford the group structure, and I became VP of Marketing. I left them in the end of '76.

Pelkey: Now, during that period of time, were you there when they sold their modem business off to Halcyon?

Johnson: I don't remember that transaction. I wasn't really involved in that part of the business.

Pelkey: Western Union could have been a pretty big player in data communications --

Johnson: Yeah, they could have been a player.

Pelkey: I wonder why they didn't.

Johnson: A major thrust was the satellite business at that time, and Mailgram. They were very heavily involved and they spend millions of dollars on these Mailgram centers, the voice input centers and the processing centers, and it never went anywhere, and the satellite business never really went anywhere either, for them.

Pelkey: Maybe they just made so many large commitments that maybe they didn't have the resources.

Johnson: I would say that's probably right.

Pelkey: In retrospect, they simple made the wrong bets.

Johnson: Yeah, I think that's right. Well, they certainly made the wrong bet, but at the time the satellite business looked pretty good.

Pelkey: So then in '76 --

Johnson: It was '77 that I went to work for Fairchild Industries, and I was one of the -- I was VP of Marketing there as they were doing the internal start-up of American Satellite, and I stayed with them until -- thought I would stay with them forever, until Al Horley called me up and said: "I'm going to start a satellite company, and KP wants us to have a marketing guy who knows something about on-premise satellite earth stations.

Pelkey: What year was this?

Johnson: This was September of 1980. That's when I went to VitaLink, and stayed there until '83 when I started working with Paul on TeleBit.

Pelkey: And then VitaLink, subsequent to your leaving, moved into this LAN bridge market.

Johnson: Yeah, that was after I left.

Pelkey: Because the satellite business, they struggled with that business --

Johnson: They struggles very hard, and -- actually, Paul Schaller, whom I had hired in Boston, was the one who recognized this LAN area as being an area that made sense. He had some contacts in Boston with DEC. He had started to work on it in a low-key way, but at the time I left, it was just an idea. Paul and -- I've forgotten the guys name, he's the VP of Engineering right now and was hired to do that job.

Pelkey: Let me ask you a question on standards. The modem standards process is CCITT, in working groups and in the plenary session that is every four years. Since you were actively involved in that process, can you describe that process a little bit? Do you recall when the CCITT process started for modems?

Johnson: Let's see. I believe it was in the late '60s. I was not active in it at that time. Just to answer quickly your question, within the United States, the standardization process goes through a couple of cycles. The first one used to be called the Modem Working Group. It was formed by manufacturers to serve as the base forum within the US. That modem working group was the advisor to the US CCITT structure, which deals with data transmission, which is called Study Group D. That Study Group D is operated by the State Department, and they nominate and designate the participants in the plenary that occurs every year. They also supervise the participation of the US representatives in the working study groups, which operate during the plenary period of the CCITT, and in that case, the study group that is responsible for data transmission is Study Group 17. Study Group 17, at the beginning of each plenary session, designates a number of questions that will be examined during that study period. You can introduce specific points -- the questions are generally rather broad, so you can introduce specific products under a particular question. When either a country -- or sometimes a manufacturer, but more usually a country -- comes forward with a specific task or project, the Study Group 17 chairman appoints a raperteur, a focal point for developing all of the inputs, all of the proposed characteristics, into a recommended standard for consideration by, initially, the Study Group 17 -- actually the three working parties of Study Group 17, since there are broad things covered. Working Party 1 handles the modem functions, 2 handles interfaces with ISDN and some other activities of that nature, and Working Party 3 handles largely maintenance standards.

Pelkey: Do you know when Study Group 17 was originally formed?

Johnson: I'm going to -- I know where you can find out.

Pelkey: Because I would like to know about the early formation of it and why the State Department (unintelligible) combination of modems, I guess it was IDCMA and the State Department, and those forces came together to put this process in place.

Johnson: I can get you to some people who can give you that answer.

Pelkey: It's not clear to me how that happened.

Johnson: It's not clear to me either, but there are several people in the US and certainly some in Europe--

Pelkey: There was some issue because of AT&T, and how it got to be a wider group than AT&T --

Johnson: I think that IDCMA is undoubtedly the source of that, and I believe that IDCMA was the original parent of the Modem Working Group, but I can't prove that.

Pelkey: I think that's right too but, (unintelligible) helpful.

Johnson: I will get you a contact, or a couple of them, in that area. In any event, as an example only, TeleBit was formed in early 1984, January, or December '83, whichever you like to select as the date. We certainly didn't get going until '84.

Pelkey: When was it first funded?

Johnson: The first funding was April of '84, although we had a commitment letter from Dick Kramlich, who in January, and using that, we were able to borrow $50,000, so we actually got started in January of '84. I felt that the standards matter was a matter of some importance at that time, so I joined and attended the first standards meeting that I knew of in '84, which was in April of May of '84. At that time, the V-33 recommendation was just being accepted. It had been worked on in the interregnum period and was being presented for verification -- it was presented for verification in either late '84 or '85 at the Munich meeting of Study Group 17, so it became a standard. "Interregnum," that's the period between the end of the 1980-84 study period and the '84-88 period. In between there, there's a period of about almost a year, in which, like now -- the last meeting for this current session was held just about a week ago or so. What comes next is the finally plenary now, which would be -- so it'll be essentially a year before any more meetings are held. V-32 had been accepted as a standard by that time.

Pelkey: In that regard, this issue of de facto versus du jour standards, are you a believer in du jour? That is, V-32?

Johnson: I'd say that I'm not. I think V-32 was too early a stage to create a standard, because the standard, in fact, was created on the basis of fundamentally dial back-up, which was the only requirement they could foresee at the time they were working on it. By the time they got the standard in place, dial back-up wasn't the function. It was straight dial up --

Pelkey: The argument some people make is that by creating standards in advance, (unintelligible).

Johnson: I don't believe it.

Pelkey: I think the standards committees ought to work with (unintelligible), but then you have this issue about Hayes and Microcom with (unintelligible) and MNP. At some point, market share might result in an inferior solution, and you have the problem of creating a standard that's not where the market is, then you might end up with (unintelligible) solution.

Johnson: Well, I think that in general, if you try to rush it, that's what will happen. You're much better off to let the market give you some pointers. Anyway, we started participating in an active way in '84. We actually were able to get a study question established in the beginning of '86 that covered -- so there was a lot of work, mainly in the Modem Working Group, and in Study Group D, to get something presented and put forward. In that entire four year period, we didn't get a standard, but we are now getting to the point where, my guess is, there will be a compromise next session, and -- incidentally, Jim McGill did a just absolutely beautiful job. He is good. What looks like it'll happen there is that the multi-carrier will be an option in the standard, which is fine from our point of view.

Pelkey: I think you've been incredibly helpful. I'm sure I'll get back to you, and if you can help me with the names --

Johnson: Yeah, I will, on modem standards.

END OF INTERVIEW

