Barry Wessler
Oral History
Interviewer: Leonard Kleinrock
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0:00:00:0 – 0:00:15:8

LK: So Barry what I will like to do today is to focus not too much on the particular work that was accomplished but on the environment which allowed the great work to take place in the period of the sixties and seventies of DARPA funding.

0:00:15:8 – 0:00:16:6

BW: Sure

0:00:16:6 – 0:00:24:4

LK: To begin with, why don't you introduce yourself? Give us a short bio what you have done, where you have been, where you are now?

0:00:25:8 – 0:01:47:7

BW: First of all of course my name is Barry Wessler, I have a PHD from the university of Utah that I got in ninety seventy three, I did my undergraduate working in MIT from ninety-sixty one to Ninety-sixty seven and left MIT in ninety-sixty seven and went to ARPA. Went to work for Bob Taylor in the IPTO office and stayed there for three years I was there from 1967 to 1970, after ARPA i went to university of Utah to get a PHD in an interesting area (( )) environment and then move back to Washington and started Telenet with Larry Roberts and others and I stayed till Larry once again paced me once again to work with (( )) and we were there for 10-11 years then Larry and I went up I did a number of other things mostly in the consulting project oriented activities.

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LK: Actually we will return to some of those transitions. But I will like to know how are you brought into ARPA, what was the history there?

0:02:03:1 – 0:07:06:5

BW: It's an interesting history, I and others as an undergraduate I had started to work for digital (( )) corporation and was working on a project called "the 338" which was a computer graphic display and it was in the process of been designed when I started working in 1965 but at DARC and worked on it through my tenure at DARC leading to a product the release of the product which was pretty well received certainly for those days (standard of those days) and one of the purchasers of that display was no other than Larry Roberts and the IPTO office at ARPA, the reason for having a display I guess one should differentiate between USA and the actuality which I don't know in this case because its pre-dates me but Larry had anxiety separation from Lincoln laboratory, he didn't arguable didn't feel super

comfortable been that far away from his TS2. The machine arrived at ARPA about the same time I think the summer of 67' but interestingly enough the summer before that Larry had organized to program the interface between that piece of equipment and the TS2 and he contracted with company whose name am not gonna remember but that company put a programmer on the project to write the software that programmer happened to be the Danny Cohen and so Danny walked into my office in typical Danny version and told me all the things we have done wrong in the equipment and the design and what he would have done differently and then had a series again in Danny's mimic able style about easy features to make it better and how to organize the software and what not, so Danny and I interacted on the programming of the 338 during that summer that will be the summer of 1966 and in the fall of 1966 I went back to MIT working as a research assistant at MIT and a teaching assistant and ran into Danny once again he said what course is it you taking and I told him about this fabulous course that I signed up for at Harvard and that was Ivan course on computer graphics and Danny immediately rushed out high to get into that class but couldn't get so he had to wait till the next term and he took the class the next term I don't know about that class but in my class with in Ivan class the names of world famous computer guys this days Ivan influence on that in that classroom and on the people that he taught was incredible just an amazing environment and what they were able to do by the time Alvin still had PDP1 that's the equipment they had and one can't really compare it to RPC's of this days because it was really slow and really small, but the things that were accomplished in that class the class projects or probably monumental probably all gone and difficult to reproduce but monumental success stories and led to people been interested in computer graphics and been interested in computer science.

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LK: So Alvin had already left ARPA by then?

0:07:09:9 – 0:08:43:6

BW: I think he left in sixty-six and so this would have been his first teaching assignment at Harvard, am not sure about that but I believe that was the case and this was the first class that he taken we were given that at Harvard I was lucky enough to be involved so I had an association with Alvin, an association with Danny who was working basically for Larry Roberts who is planning to go down to ARPA and so that all came together at some point in time I guess Larry got concern about how he will take care of the 338 and whether he will need some help and support and I was interested in doing something else at the time taking a break from my education and interviewed at ARPA, interviewed with Larry and Bob Taylor and I got an offer and went to work in the beginning of September 1967. So I was married in august 20th 1967, I had 10 days off and then was thrown into the path.

0:08:44:5 – 0:08:45:5

LK: You were hired as?

0:08:48:7 – 0:08:54:7

BW: Probably the title was research program manager but it hard to remember. That's difficult

0:08:56:4 – 0:09:06:9

LK: When you arrived what was the nature of the IPTO office; who were there, who is in charge etc

0:09:09:8 – 0:14:27:3

BW: It is interesting because the office consisted of two secretaries and Bob and Larry and that was the entire office, we had 1,2,3,4,5 days so and am sure you got the information we are at pentagon the office number as I recall is 3D169 there were some contention whether is 3D169 or 3D167 I can't resolve that problem but it was 5days and if you are interested in the details 3 is the third floor, D is the (( )), 169 was the office number of the door entering into a suite of rooms that consisted of you know it's easier to show it graphically but it consisted of one executive office, a secretarial station that was one of the base, the executive office was two base wide, then an office a small office maintained the space for safe for classified documents and a small office which was the lower level person office and then a mid-level office which consisted of the entire bay much more smaller than the two bay office that was the entire environment, when I got there Bob who occupied the two bay office had already agreed to move out of the two bay office into the one bay office so that the 338 could be housed in that lodge or space, never understood that completely but that was the agreement Larry was in this relatively small low level office both Bob and Larry where just (( )) and each one independently was dissolving of a two bay office and I think it is exemplary of their lack of following pentagon protocols because they couldn't stood up and demanded different space and they were happy and content in this low office, when I arrived they were thinking I will be able to go onto the 338 the room in the 338 turned out that the design of the 338 was power hungry, noisy, hard and so as it turned out I moved into the one bay office with Bob Taylor so Bob and I shared the one bay office, Larry had the lowly video office and the secretary had much space as we did and 338 had this enormous space double bay executive office in the pentagon and Bob was my supervisor and not Larry so I worked for the IPTO office. Larry had a different arrangement on I presume that you and Larry have discussed or its been recorded that Larry came down as a special assistant to the deputy director of ARPA and that happen to be Steve Lukasik who you said you will be interviewing that part of the story to Steve that pre-dated me all of the action about the relationship between Bob and Larry at the time and the relationship between Larry been the special assistant to Steve and that's an interesting story in itself when I got there in August there is an openly reserved their relationships were in place, I was 23years old, am not sure about how sensitive I would have been to any depth of the relationship that was going on in the office but everybody was working together and cooperating but again it was just three of us.

0:14:28:7 – 0:14:33:7

LK: So a couple of questions, 1. who actually asked you to come to ARPA?

0:14:34:8 - 0:14:34:8

BW: Bob

0:14:35:4 – 0:14:51:4

LK: And then you were interviewed by him. Secondly there is a story about all the terminals that Bob Taylor was plagued with reaching out with different sights would you've just describe the physical arrangement, where were all the terminals in the (( )) you have described?

0:14:53:8 – 0:15:48:4

BW: I don't know that, I question Bob about that myself and I don't know the answer to that, Bob reformed I talked to Bob at one point I said that was about four-three terminals and he said no they were actually three terminals and their wouldn't been a time in that before Larry arrived that Bob will have been in that big office, the two-bay office, the two secretaries there and nothing else and so the terminals could have been any place but it was before was before me so I can't really comment on that it may have been part of an experiment that Bob was involved in I just don't know.

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LK: So this raised the issue though, when was the concept of needing a network for the IPTO group conceived within ARPA?

0:16:05:1 – 0:18:10:1

BW: Again it pre-dates me but I have the background they are sort of at the time that it came about, it obviously dates back to work that (( )) was doing (( )) had a wonderful mind and was a stimulating individual and focus on machine interaction and so many of the programs that came out of the IPTO office that I arrived in were (( )) created (( )) started and we had in the IPTO office five areas that we focus on. One was operating system, one was computer languages, one was computer graphics, I think the next one was database activities and the last one was networking. So when I arrived there was in our portfolio of project areas I guess in today's terms may be BAA's where this 5 different project areas and even multiple contractors in each one.

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LK: But there were only three of you to cover what you have just describe as five areas, how wre those areas divided up?

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BW: They weren't, I would describe the activity as a team activity. I may not be the right one to address this but this is my perception of it, certainly in terms of the things that everybody worked on there was no segregation of even networking which obviously was a primary interest to Larry was actively followed, active interaction with Bob Taylor through the time that he was there when we overlapped.

0:19:11:4 – 0:19:21:0

LK: So even though there were multiple contractors per area, which of you may have been involved with some of those contractors across many areas?

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BW: Absolutely, my responsibility is "again I was 23yeras old when I went there". My responsibility were less well defined, the responsibilities I had in quote will probably be focused on administrative kind of things I was responsible for producing the weekly report that got send up from the IPTO office up to ARPA, and so I will make regular round calling the various contractors and trying to seek information that could be described in terms of the suitable for transmission up into DOD into the office of the secretary of defense, into congress. However, whoever that got pushed up I guess Steve Lukasik will be the best one who is the principle recipient of that weekly report what he did whether they then consolidated that into a single ARPA weekly report that got sent to (( )) or someplace that I don't know.

0:20:45:1 – 0:20:47:8

LK: But Steve was almost a deputy director or was he director at the time?

0:20:49:5 – 0:21:20:8
BW: Steve was deputy director as at the time that I arrived and was later promoted to be director after, so I can't remember the guy from Michigan who was there when I arrived -- he and I overlapped for a very shot of time (peter Franklin) then (( )) came in then I guess (( )) left Steve took his place.

0:21:20:8 – 0:21:25:8

LK: So by the time you left ARPA how large Is the office, the IPTO office?

0:21:28:0 – 0:23:14:3

BW: It was small so when I left it was Larry because Bob had left a year before me so for that year or half of that year it was just Larry and myself then a guy from Stanford wonderful guy am blacking on his name but he was brought in another post ARPA, PHD guy it was interesting because again that was 1970 and it was again the height of the (( )) movement and he was a Stanford guy with a scary bear, different look about him anyway great guy. Unfortunately we haven't really stayed in touch, so it was very small I think the office began to grow after Larry moved out of the Pentagon and that will be post my era when I started I was still in the pentagon I think the next person to come was Steve Crocker and I think by the time Steve Crocker got there they were already out of the pentagon.

0:23:17:1 – 0:23:26:6

LK: So what was your role in the ARPANET spec, the RFP and the whole process?

0:23:32:6 – 0:24:24:5

BW: Specifically in terms of responsibility I think I got saddled with ensuring the RFP was prepared that was a collaborative effort and of course Larry had his fingers in everything and that collaborative effort involved (( )) who actually was instrumental and had a lot of experience in government contract work much more than I did at the time. He was involved in the physical preparation of the document and I was responsible to making sure everything gets done and put together.

0:24:25:4 – 0:24:27:8

LK: He was the PI at the time

0:24:27:8 – 0:24:32:3

BW: Exactly

0:24:32:3 – 0:24:49:4

LK: So you said it was the distributor responsibility in terms of the program functions among the three of you. How much did you interact with the PI's or much did the office interact with the PI's?

0:24:52:3 – 0:29:42:0

BW: It was an extraordinarily collaborative activity again I can't go back before Bob Taylor, I don't know the dynamics or during the (( )) era I don't know what the dynamics were during the (( )) era but Bob is a communicator at heart so his desire was to interact and influence in ways that I have tried to emulate all my life, I don't know if it's successful or not but Bob had a neck of getting to the heart of matters and influencing them not in a directive way, the way I describe is Bob and (( )) started interaction and that interaction will go on and the guy would have an (( )) moment during that interaction and will walk away saying I have discovered this. I think there was an interesting consequence to that Bob therefore said he was been a part of the activity but if you look at Bob's track record he has a fabulous career in computer technology in computer science and as an influence of that whether that's put the teams together keeping the teams motivated, keeping them talking or arguing a lot of that you emulate in my experience and not having (( )) only when I arrived in September of 1967 had a tremendous influence on the interactions not only between the office and the contractors but between contractors. One of my proudest and sole responsibilities was managing something called the graduate student conference and the graduate student conference was an outcome of a principal investigators meeting (( )) at one point said "we are all guys(thirties and forties) and the real work is been done by 20year olds and why are we sitting here in the principal investigators meetings interacting with one another and the real work is been done at a lower level" and so Dan and Bob got together and said we should have a meeting like the principal investigators meeting but targeted at the graduate student level and I participated or ran that meeting for 3years we hold it at (( )) house at university of (( )) or outside the university of (( )). One of this mansion that some rich fellow donated to the university and we stayed at (( )) house everybody will be housed together and the interaction of the people that were there were are luminaries in computer science today and fabulous people in those meetings and I think if you talking to anybody who went to any of the three meetings I was involved in will say that it was a colossal influencer on their career, so am relatively proud of that environment that existed there at the interactions that went on.

0:29:43:2 – 0:30:23:1

LK: You have now described two kinds of meetings: PI meetings and the graduate student conferences and both had the potential and I believe the actuality of considerable cross institute (( )) cross university (( )). Can you talk about how well that worked certainly the graduate student conference because we

know the graduate students themselves were already nicely coupled across the university campuses but to the state you know about the PI meetings how well did they encourage and help realize such interaction?

0:30:26:6 –

BW: I am not sure I will agree with your assessment that part of the graduate student meeting that there was some interactions, then you will have to go back this is part of the network operations because I left in 1970, the graduate student meetings were 68,69 and 70 that I was responsible for so there was no ARPANET, there was no network email, we didn't have (( )) access, telephone calls was still relatively expensive compared to other media so I will argue that there was quite low interactions.

0:31:17:8 – 0:31:23:6

LK: I was thinking about the network working group for example did that occurred after the graduate student conference began?

0:31:24:9 – 0:34:28:0

BW: It did, so a lot of that grew out of the graduate student meeting, the introduction of Crocker and the guys at MIT and Stanford, now Crocker himself a communicator and so he was out there digging and talking to people before the graduate student meeting so as an individual I will say that the experience of Steve broadly a technique that he had already adopted which is communicating with other people. The rest of the people who he was mostly in production again this were graduate students so they were not published yet there was no documents (( )). I am famously embarrassed to tell my Alan Kay story one more time. Alan arrived at the graduate student conference and present (( )) which is what the (( )) was all about and I said to Alan that he must leave "Alan you talking about packaging something with a disc and a computer and people are gonna carry it around?" I said the disc today the standard drive weighs 250-300 pounds cost 25thousand dollars now they do hold 25megabites. What basis do you have to look at (( )) book as a reality and he wisely reminded everybody about the progress of (( )) of cost coming down and the likes and I think it was instructed for me to get caught in that discussion and the point of that discussion because it created a critical memory for me that influence me and how I judge and how time will influence the activity.

0:34:30:7 – 0:34:45:0

LK: During this period that you were there and holding these conferences did net did begin to emerge, what influence did it have on the collaborative relationship among this private bodies?

0:34:48:0 – 0:41:22:2

BW: Well I will say it was a threefold influence; there were the pro people and con people. The pro people this is over simplification of motivation but a primary motivation of any principal investigator is to maintain and hopefully grow is ARPA funding and to produce good work with that money. If you look at ARPA as a fixed pool then the principal investigators were competitive trying to get the dollars that

were available from ARPA, I don't remember exactly what the numbers were but the numbers that I use in my head went up and down each year but the number that I use to set up programs is 25million dollars a year some years less, some years more and that represented a fixed pool and that pool was under some scrutiny. I give you the pipe and I now remember that it was not probably databases but artificial intelligence that was in fifth area. Artificial intelligence was very large area of interest and there were interesting stories I don't know if you got the (( )) story about -- so this basically brings forward some of the things we have interactions in the office and how things worked. And (( )) came to ARPA as a director and he came as I will call from been a director from the massive beam space network so he's communications guy and he had his own view of what relevance meant I presume he come through defense relevance and the fact that ARPA was part of the defense department and when that carrier relevance become a strong and strong – so (( )) came in and we decided that we will participate in three things that will be given to (( )) from the contractors and one of the guys that we had coming in to help with that activity we had lunch meeting for (( )) and the guy came and was (( )). Melvin gave a fabulous (( )) when he saw the technology basin and how the evolution will go just terrific talk and then we sat down and had lunch with (( )) we were all sitting around with lots of people and Melvin decided to do a (( )) kind of thing,(( )) said to him I guess AI is really doing fabulously well and (( )) said we have never accomplished anything and (( )) said what do you mean whatever we do doesn't seems to be important, the point he was trying to make was that once the artificial intelligence solution emerge it was no longer a part of the artificial intelligence whether It was the (( )) or the game plan program or whatever it was will be absorbed into the general culture and will no longer be artificial intelligence and that was the point he was trying to make so (( )) took it a little bit more(( )) and went back into his office called Steve and said cancel AI and Steve said to Bob and Larry what happen and we then had an incredible useful exercise of trying to save the AI program which involve basically (( )) the key AI guys and saying here is where we are we now have to recover or you gonna lose your program I don't know the specifics that each one of the group; the Stanford group, the MIT group, Carnegie group what they got out of that activity but I believe the message that came out was we got to own our successes at least and perhaps the interactions created better programs within the AI community and as I said before my son is the AI guy he graduated had his doctor from MIT in 2000 and so he was beneficiary of that safe.

0:41:23:9 – 0:41:59:4

LK: You know that manifested itself in totally independent way, my experience I had a conversation with (( )) at one time and I was talking about the wonders of the internet and how powerful it was and he said he hates the internet and I asked him why and his answers was any money that goes in support of ARPANET is money taken away from AI to support your competitor but I haven't sensed any of that competitive feeling among the contractors early on from the PI side

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BW: You didn't sense that?

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LK: Couldn't see that at all, I was watching it

0:42:06:8 – 0:42:44:8

BW: Been a (( )) true capitalist I believe in free market personally I believe that competitiveness was one of the attributes of the success that having limited resources is detriment in many ways and benefits in some few ways and it brings up a much more competitive environment.

0:42:46:4 – 0:43:01:7

LK: Interesting, Danny kind of did say that there was the cooperative nature as supposed to the competitive nature which was one of the strong point of the ARPA funding environment so you are saying otherwise and I will like to elaborate on that a bit?

0:43:02:7 – 0:44:40:5

BW: I think it depends on the level you talking about I will argue that it's the success of the graduate student, graduate student conference where there was very little in the way of competitiveness and that because it was pre-ARPANET all the interactions if you got an idea from somebody at Stanford if you were in UCLA and got an idea from somebody at Stanford it's not likely that it could be absorbed and used in the same way that it could be today in the internet era because today for instance somebody put something on the internet its gonna be found by one thousand people, hundred thousand people and perhaps exploited by them prior to your been – suddenly my feeling was at the graduate student conference there was no holding back by the people there and at the PI meeting there was no holding back because you have to make your case that was the place to make your case if everybody shared your presentation it probably meant an expansion of the program and if it's a hold on thing it probably meant a contraction of the program.

0:44:43:6 – 0:44:58:1

LK: Talking about the research activity and the relationships, to what extent did ARPA, your office IPTO shape or determine the nature of the research or the objective of the deliverables?

0:45:03:1 – 0:46:02:2

BW: If you want to put aside the network project, I think it was all soft touch i.e. we work predominantly on unsolicited proposals basis even from existing contractors they were simply-- their contracts was up whether it was single year or multiyear contract they will work very hard to prepare a defense for the continuation of their program and much of that came from them and was selectively accepted or rejected by the office.

0:46:06:8 – 0:48:10:6

LK: The network which Larry influence in a tremendous way particularly the packet switching side of it as oppose my differentiation, my description of the ARPANET is that there were two key element that came together and created the environment the first was the (( ))/ Bob Taylor orientation and Larry of course but in a smaller way the orientation that the expansion of the things they were saying by bringing

people together in a time sharing environment could be expanded by bringing the same people together in a broader area/geographic area and through networking, that was the resource sharing that was available at the time and that attribute to the (( ))/ Bob Taylor duopoly and Bob recognize that he needed some help, UCLA contributed tremendously in that regard and in a pretty negative way by creating a project that was described as unsuccessful so there was the UCLA networking project which is to bring together the pre-systems.

0:48:10:6 – 0:48:16:0

LK: You talking about the one that (( )) tried to put together in 1964

0:48:16:0 – 0:48:49:5

BW: Precisely, and in some sense one can look at Taylors continued drive for resource sharing was quite interesting in light of the failure of that UCLA project to materialize anything of significant value

0:48:50:3 – 0:48:55:8

LK: Why don't you tell us about that project that Alvin came back and try to put together (the three groups)?

0:48:59:0 – 0:50:15:7

BW: You should talk to Steve Crocker about that he will be first hand information that comes more from Steve Crocker and Steve Lukasik actually in terms of the interactions that the three of us had about that era but the module that I build is that there was a serious and quite expensive setback in that project in the main time Larry and Tom were join other activities in terms of networking computers together but that particular project which was one of the (( )) networking was the description of resource sharing was resource sharing meant people working together, resource sharing meant machine working together as an example was a negative contribution.

0:50:17:4 – 0:50:44:4

LK: So just to clarify because I was there at the time, it has nothing to do with the (( )) project that I was funding, they just trying to put together 3 (( )) administrative group on campus and the failure as I recall was that there was a jealousy among this department a political jealousy that influence fighting had nothing to do with technology capability was all about nobody will cooperate as you said the people wouldn't work together on it.

0:50:49:4 – 0:51:30:0

BW: Once again if one takes that on to the ARPANERT, the Arpanet should have been even more dismal failure because the groups working within UCLA were under a the president office level was working on under a single administration a controllable administration it attempt that we did with the ARPANET in getting people to cooperate and work together. One could argue simply (( )) from the UCLA experience. We were attempting something much more difficult.

0:51:30:0 – 0:51:38:9

LK: So how successful were the early attempts to get people to join and participate in the emerging Arpanet?

0:51:38:9 – 0:55:48:1

BW: And so we come back to the point that I started out with which is one could identify two types of reactions; the first one was people saw it as an opportunity to get more of the (( )) of ARPA money and the other point said we have a lot of resources we have a (( )) of those resources as (( )) stated those resources will be dissipated number one by the networking project been successful drawing and absorbing useful whatever but in McCarthy's case Artificial intelligence and in the other group beside just the competition with that money there was the issues of the physical resources that existed at some of the (( )) the ARPA based campuses and whether connecting to the network will mean they will have less computer time and less resources to use and so that was another motivating factor in the less cooperative side of that argument but it was all less than cooperative and uncooperative because in fact ARPA held the (( )) so if the ARPA office was adamant about proceeding you could try and moderate that but ultimately the money was in ARPA's hand was in the IPTO office hands and there was absolutely clear enmity I will leave myself out of the formula but it was my believe that Bob had this notion that it will be colossal value and it's hard to tell whether he imagine the internet level value that we now see (48years later) but he saw this as been his contribution on the resource sharing side and he believed that Larry was the guy that execute the internal workings of that and make whatever technology platform was necessary to make that happen , the equivalent of the guy who built the first time sharing system that guy why would you wanna do something like that and of course the first time sharing brought PDP1 which had 7milisec cycle times but when you think about why you wanna share a platform like the PDP1 especially since they were design to be single user online systems so there was a big leap there, there was the same leap in creating the ARPANET and thinking about things that could be as a result of doing this technology platform.

0:55:49:5 – 0:56:07:8

LK: So given the general but firm persuasion on the part of ARPA, the ARPA office was expecting the PI's to join. What was the reaction when they did join, what was there view then?

0:56:13:0 – 0:58:38:4

BW: I think that will be highly speculative of me to try and get into the minds of the principal investigators, I think it took awhile for the principal investigators who were the less than enthusiastic group to get behind it but they were in control of their resources because it was from most of the universities and the graduate student got interested and whether MIT as a group on the AI project or project marc whether they had any strong interest in doing that rather than the MIT (( )) it was all submerge by the interest that the graduate had and whether that was because it was an interesting technology platform which was obviously or the graduate student conference had some role in that but I remember the first meeting of the graduate student somebody came up to me said is it true that this

meeting is only to get people interested in the network wasn't called the ARPANET then and I can't answer that because I was called to do what I was told to do and I did it and what motivated the (( )) or Bob or Larry to pay for this and really it really came from it didn't come out of the ARPA money it came out of the individual projects so u as a principal investigator has to cough out money to send Crocker and Cerf to that this meeting and off they went and one can argue the rest is history.

0:58:38:4 – 0:59:09:4

LK: Part of the delay gratification was after your time at ARPA because the initial host to host protocol wasn't developed until some years after the ARPANET came online so the ability to use the ARPANET was inhibited until the easy interface was presented and perhaps during that period you didn't see the attraction.

0:59:09:4 – 1:00:01:3

BW: I will use different vocabulary I will say it only took a year for host to host stuff to develop. Unbelievable what got done in the very short time frame from the first packet going and until we had something operating and a lot of that had to do with the 1972 meeting and the drive by Bob Kahn in particular have been put in charge of getting a credible presentation and something that looked like the network was real and that was 1972.

1:00:01:3 – 1:00:04:1

LK: October 1972 public demonstration

1:00:04:1 – 1:02:41:7

BW: Exactly, which is an incredibly short time for this things you look at how long we have been messing around with IP version 6 and how long that evolution to work or arguably how long it took from the creation of TCP/IP in the mid 70's (67/77) when Bob and Vint are comfortable with it until it emerge as TCP/IP or the basis of the Arpanet that was a 6,7, 8 years I don't know when you put the end date or the beginning date but it was a huge amount of time compared to the emergence of useful things coming out of the ARPANET and there were specific things that led to that and at one point there was this terrible criticism of the ARPANET that virtually all the traffic there wasn't (( )) itself was email and people were saying we build this thing we are paying for this thing and all that's going on is electronic mail. The interesting aspect of that is 1. People were under valuing it they value electronic mail that much in the first place an amazing change in how we do business but it is true that some of the early things that happen for the demonstration but Danny (( )) that work between machines over the network didn't re-emerge until years later as a critical thing but all of that created the platform environment that later became a colossal influencer in our daily life.

1:03:04:7 – 1:03:43:4

LK: I will like to return to a couple of the ideas that you raised for example you said you were preparing some of the report that went up to Lukasik to the ARPA hierarchy, what kinds of materials were you

putting out I am gonna address specifically the desire or need to have some military application, was that a present issue in your time there what you told the PI's how they work what you told the Darpa office etc?

1:03:49:1 – 1:04:33:6

BW: It did have an influence, it was crucial during that time frame that the weekly report be cast in a defense frame work in general we did not pass that down to the project itself so we got result and one of my principal activities was taking that result and casting it arguably from a marketing perspective and saying what is the utility of this in the department of defense.

1:04:35:3 – 1:04:41:2

LK: Would you seek advice from the PI's in formulating that (( ))

1:04:41:2 – 1:09:26:4

BW: Not to my memory, there may have been interactions where it appeared o be truly useless which means it could be did scared because we were trying to get as a I recall this was lots of years ago, as I recall we were trying to get 8-10 items out of 30 contractors and sometimes people have 2-3 items in the standard method you would pull back some good things in other to populate later report that seems otherwise weak but with respect to the weekly report one of my fondest memories and this goes to the dynamics of the people interaction at ARPA. I had just arrived some 2-3 weeks into the thing and that gave me responsibility for the weekly report and I went back to Bob again we are in the same office so going back to him was totally(( )) and said we need something from MIT, from project Marc but Bob (( )) was the principal investigator I didn't need to say his name, so X was the principal investigator on the project at the time and I told Bob somebody needs to come and its probably shouldn't be me because weeks before that he had been my graduate advisor at MIT and the relationship from my perspective wasn't the perfect relationship but it's one of the easy criticism of MIT in terms of the relationship between some of the faculty and some of the graduate student. And Bob said you got to learn Berry get on the phone and call him you know I was trying to talk to him just before and wasn't able to make contact he said it's your responsibility you do it. And you have to understand I said I tried to contact him I mean dozens of time I knew his secretary we go out drinking so that I could have some access to him and I place the call to his office and this same old secretary picked up the phone and I said this Berry Wessler he said I beery how you doing I said I need to talk to Prof.(( )) is he available I said hi this is Berry Wessler I just wanna let you know that am no longer your graduate student am now at ARPA she said "we know where you are" and I said can I see Doctor (( )) free and she said he's in a meeting right now and I said when can I call back she said call back in a second and the meeting was broken up and professor X got on the phone and said "hi Berry how are you doing there" and of course preceded to give me some of the information I was looking for, it's an interesting story because it speaks to the power that the people in the office had at the time, the power that existed from the prospects you know it's not that I had all of a sudden become a smarter, better more capable, more interesting person it was I had the money.

1:09:28:6 – 1:09:44:4

LK: So Berry were you given any guidelines as to how much influence, direction, and flexibility you should present to the PI's when you came in as a new PM, were you told what the approach should be?

1:09:46:7 – 1:11:20:2

BW: When you say coming in as a new PM it gives more structure than existed at the time, I think that in particular because of the relationship between Bob and Larry and they not been in direct alignment. Larry did not work for Bob we were all in the same office he was in IPTO but he was the special assistant to the deputy director that created an environment where – and this was a factor another factor is Bob Taylor (( )) establishment in the sense of former protocols and I will tell you a story about that later on but I will describe it as one of the single voice that came out of the office whether it came from me or whether it came from Larry or it came from Bob. Technically Bob was responsible for the budget were the money went who got what and when. Larry of course was colossal influence but if you look at it from a pentagon structure perspective it was Bob's office.

1:11:23:3 – 1:11:36:0

LK: That's really helpful, but am trying to get out what was the collective view on the funding culture that ARPA was presenting to the people they were funding?

1:11:40:5 – 1:12:19:0

BW: Am not sure that question is focus enough for me to answer -- my memory of the interaction was absolute collaboration. Larry was one of the guys he was PI, lesser PI I don't know that he was the principal investigator at Lincoln lab and he moved from not been a principal investigator to been the guy that made everybody report to him.

1:12:20:8 – 1:12:22:6

LK: How much reporting he was expected?

1:12:27:2 –1:12:32:4

BW: Aside from the weekly report

1:12:32:4 – 1:12:33:8

LK: I mean entirety organization I mean from the PI's to the office?

1:12:33:8 – 1:13:16:1

BW: Except from the weekly report that stuff that we will (( )) very little, it consisted mostly of site visits to Stanford to Utah to the university of (( )) to wherever and interactions and phone contact we didn't have email we didn't have all that we take for granted today to the best of my knowledge we had no fax machine, there may be a telex machine in the central we didn't have a telex.

1:13:16:9 – 1:13:27:2

LK: You were (( )) to weekly report are you saying you were in weekly contact with each of the PI's expecting a report from them or some information transfer?

1:13:30:4 – 1:14:12:0

BW: Personally I wasn't. The items for the weekly report could be self generated, could be stuff that we knew the contact with the PI's would be on regular-weekly basis it was more like we have run dry we needed to fill the well back, so it was more of that kind of thing it was not give me one thing for this weekly report it was translating the discussion into a two line grabbing defense related statement of progress.

1:14:15:0 – 1:14:29:7

LK: Explain in one of the questions earlier this defense related issue, was it or was not pierced down to the PI. Were the PI's aware of such an acquirement?

1:14:37:1 – 1:18:14:8

BW: It was, everybody knew it. They didn't know it from (( )), they knew it from been aware as part of the pentagon budget they entered the word (movement) or that sort of thing it was -- I doubt seriously there was a principal investigator that wasn't aware of the necessity or defense relevance but I don't think it was part of the daily conversation or the conversation in general. It wasn't you have to make this more relevant to the defense department it was you have to do good research and we have to make it relevant and if it's not relevant we need to close down the program. All the task if it was a risky task, so I am reminder fortunately it wasn't in our office the (( )) had put a request in because he was having a problem with the population of – a sub population (()) their reproductive numbers were not at the norm and the idea was to try and get an understanding of what that's all about we had a behavior office and the task got signed to the behavior office and as it evolved it turned out that part of the culture of this sub-group was to mix as I remember earth with some of their (( )) and they were (( )) back in the earth and was causing (( )) to swell and lower the reproductive (()) the head of the office made a tragic mistake calling it the swollen (( )) project and that got picked up in some congressional scheme of ARPA project and here was protest by a friendly government at the time to look into the public health issue and there was the unfortunate naming of the project but there was the general political appointment which was to bring down the defense budget to eliminate things that weren't relevant and this became a (( )). Fortunately not in IPTO Project because that will be on me and I will gone.

1:18:17:9 – 1:18:50:5

LK: So we got the issue of how contracts funding were decided or terminated, let's talk about the guidelines and what was the approach to mention the military issue could have been of course for cancellation. In any cancellation that you were aware of what was the motivating factor where the acceptance of funding or the decision making processes?

1:18:56:8 – 1:21:01:7

BW: This is a personal statement rather than an office statement, I will like to describe it as an extremely loose environment with respect to how we went about selecting projects to fund –my proudest moment for the most part I was a very small Gog in this bigger wheel of Larry and Bob doing their thing and then Larry doing his thing alone but a thinking across my desk from this guy name (( )) in Hawaii and it was funding of this crazy project that was dealt to me because this was a classic congressional (( )) project called project "Timus". Timus was directed to fund universities that met the criteria of government funding they had to have less government funding then some level and there were other qualifications basically it was probably I don't know in detail but it was probably thought to be (( )) for the environment not the high level universities(the secondary universities), naturally when we were told that we had to participate in project Timus there wasn't high expectation of any valuable thing coming out of it and so I had the stack of proposals and out of that proposal was the (( )) project.

1:21:01:7 – 1:21:04:4

LK: These proposals were solicited? How do they come in?

1:21:06:9 – 1:24:50:2

BW: The proposals were solicited under project Timus not solicited on—I can't even remember whether there was a technology limitation whether it was for computer technology or whatever that is cloudy in my mind but there were a number of less than stellar proposals and there was this one proposal that licked out and he said it was a highly credential guy who left Stanford and the group there turned out to be fabulous and they were looking for 200 thousand dollars for some research to look into the notion of common channel communications so they can communicate from the other(( )) back to computer centre at the university of Hawaii in (( )). And I write the proposals and went to Larry and i said this is the proposal he said "oh I want it "I said fine so I put in my (( )) they were (( )) rejected with a statement that any travel to Hawaii needs to be approved by the director of ARPA not Bob Taylor so I went to Bob Taylor and said I think this is the project can you take this to Lukasik or Rector and in Bob (( )) version he said you come with me make your presentation so my first one-one meeting with Steve Lukasik was preaching this thing which takes me to Hawaii and he looks me in the eye and said I want you in my office the day u come back and I want to hear back I said fine unfortunately as you can see I (( )) nicely with very little son and I got back from a 2or 3day visit with the guys from Hawaii and in for (()) and I walk into Steve office and he looked at me and said this better be good and you know on historic basis of course that was historic book in networking and common channel communication as we know it today it's what the cell phones were all about the whole technology of mobile communications it wouldn't have come out of something else but this was the earliest case that I know of that kind of humor environment and of course Larry then immediately picked it up and said this is really good stuffs and did the Larry Roberts thing which is not to say that its good work he jumped in with (( )) and all of his faculties and proceeded

1:25:05:2 – 1:25:20:2

LK: So Berry am curious at the time you receive the proposal (( )), just how developed was the technology at the time have they done any experiment, done any analysis, set up any protocols was it in the island or was it somewhere developed at the time

1:25:25:0 – 1:26:27:4

BW: I guess I will argue that's it is hard to remember I don't have the actual Timus proposal I wish I did I don't know that frank or anybody from that era would have it in their mind it will be useful document to have as a real foundation document knowing the individuals I will guess that if you read proposals they had a lot more done beyond the proposals and the best marketing style they produce enough to make the book and had more behind it to drag it in personally I was convinced I will not have stuck my head right this far if it wasn't true to me this was really interesting start.

1:26:39:9 – 1:26:49:2

LK: So you were talking about this selection criteria or lack thereof just went to provide the funding I will use the (( )) as example.

1:26:55:0 – 1:28:27:4

BW: What I will say is that It was a very soft criteria we had the five principal project areas that we are working on not that we wouldn't show on in interesting stuffs into another – into one of the project but in general we were looking for interesting people doing interesting work I have had some interaction with the (( )) capital community in (( )) life and I will say that there is a lot of similarity to the way the IPTO office worked and how good venture capitals works, they were looking for good people with good ideas and people who are not so dogmatic that they can't change but rather how they (( )) personally or as a group, if you look at the groups that were involved at the time basically they were all of that (( )) and the ones that weren't terminated.

1:28:29:4 – 1:29:09:7

LK: So you had a relatively small office you had a number of contractors in five major areas and each of this contractors at the universities for example were -- with good researchers and project that were bubbling up and imagine they will find themselves in your office and you will find your way to them and from there you might select—did you reach out all the universities or the research groups or did you like the major ones continue to feed you with the things for which you selected?

1:29:15:5 – 1:30:46:3

BW: I think we were always open, it was never a closed environment, many of the new ideas actually came up through the original set of contractors that were involved in IPTO but obviously there trying to (( )) there were closures there were openings sometime like (( )) incase you were(( )) they were the same universities but the project was close in a different project was open not intentionally they were uncorrelated in both cases they were uncorrelated activities with (( )) because we close the other case in other to keep communication with UCLA, we responded because it was a new project so to new

activity at UCLA I cannot as the continuation of UCLA but it is a brand new project and the same thing with Ivan project at Harvard that was completely independent of Tony Andrews project that proceeded Ivan coming to Harvard.

1:30:49:8 – 1:31:00:8

LK: During your tenure at ARPA (( )), so let's talk about what that meant, what impact did that have, what changes propagated getting up and down?

1:31:08:5 – 1:34:41:8

BW: I will characterize that we probably did an informal review to make sure we didn't have any swollen (( )) projects not that the project itself had a problem but how you characterize the project became a critical issue the relevance it was both defense relevance and general relevance we had an issue with (( )) with my recollection headed the deep space network and at one point he said why is the network project we know about international communications we know how to do international communication why do we do space network and we had that as a true relevance question, relevance not from a defense perspectives and arguable, we might have even use the defense card that said what you did at NASA. NASA were doing things that we open and look at things like the deep space network but we really focus on defense and hence we need the networking project to use all known technology/platforms and trying to answer the question of does (( )) which was the internal defense network that was carrying the message traffic did that represent the competitive alternative to what we were trying to do with networking with the BBN project and I remember personally going to the meeting with the defense communications agency preaching email as an important ingredient for military communications and I did get the response that one would expect and therefore in a (( )) years we will be saddled with the responsibility of going and getting the mail its absolutely imperative not only that they mail be (( )) delivered to us but that somebody in the (( )) look at the thing before it gets on some level of commands desk and use (( )) and modifying whatever and that this direct communication is an (( )) for the military environment, fortunately I don't remember who said that but I remember hearing it

1:34:43:5 – 1:34:55:5

LK: So when you were called selling the ARPANET were you selling the vision of (( )) or the vision of military apps or whatever?

1:34:57:9 – 1:36:53:4

BW: For the most part of the -- at the time we were selling the resource sharing part of the activity there was some work – one of the(( )) – you talk about relevance the other magic world (( )) is transfer and transfer means that in other to free your ARPA funds you take a project that is successful to some level and move it out of ARPA into a military command level and you transfer the project, and that was always critical so we are constantly talking to the military commands to the people that at the time/ in that era they were in the process of developing something called worldwide military command pro-system which turned out to be the largest procurement of information technology up to that point it

was an important project an important part of the military future and we try to sell them on the notion of using packet technology and so that really was an issue of resource sharing as we thought about it in terms of collaborative effort (( )) keep them working together again that was more of an (( )) to the military structure instead we were looking at the underline technology the packet technology and helping the military evaluate that as part of the winex procurement which was quite successful

1:37:05:0 – 1:37:16:3

LK: So after you left ARPA and you went back to get your PHD, did you continue to interact with ARPA office with Larry and the people there?

1:37:22:0 – 1:42:18:2

BW: One of my responsibilities at Utah was the network presence at Utah so I was at the 72 conference representing Utah, the demonstration we did which I had no idea what it was but the demonstration that we did there is my responsibility, so there was interaction at the variety of levels and we receive regular communications not frequent but regular communications with Larry because we are friends but I was always kind of sensitive about my presence as a graduate student I was sensitive about the transition from a very point of responsibility that I had at ARPA to (( )) graduate student am naturally successful in that to honor that transition but for example one of the things that I did at Utah was related to electronic mail, Larry had introduced electronic mail to the ARPANET electronic mail to Steve Lukasik and he did that within the context of Steve been an addressable person on the ARPANET and he did electronic mail and as to help him understand the importance of electronic mail at the time the facility that existed was re-mail and send mail the original Tenets commands that allow to send the message over the network and read messages that come in from the network. Two things had happen first is that Steve complained bitterly about the interfaces not been adequate and Larry proceeded to spend the night writing (( )) commands to produce a more user friendly version of email (( )) and that got to me I talk to Larry and said one can do better than ( )) commands and he said do it so I produce an email system that will do all the sending and receives (( )) I had spent some times trying to look for the source code my original source code because it had some question about the importance of the reply command the original send mail and receive mail had no reply and reply was the thing that need the traffic and made it much more user friendly and I had some recollection that I did it but I had proof and the next step that mattered was that my code got picked up USC and by the ISI project who made a real effort and they put the concept together and they did a more privatized version which evolve into (( )) email but there was interaction between Larry and myself over that routine and other things and then later on there were strong interaction while Larry was still in the office after I got my PHD I went to help begin the process with telenet communications corporation and there was strong interaction because I was trying to get Larry to come and be the president of telenet and so I had regular communication and Larry and Bob to make that transition.

1:42:21:6 – 1:42:25:4

LK: (( )) and was (( )) Paterson involved?

1:42:31:5 – 1:45:14:2

BW: Sorry that's the long story is that BBN looked at the technology and said we should try to find a way of capitalizing on the technology they hired a guy whose name currently skips me and he was biz development guy and he said this is the greatest thing since (( )) this is a real thing I need X dollars to put it together and he took it to the BBN board and the BBN board did not reject the proposal and they said we need more information before we made that noble commitment to the project and he decided probably correctly that BBN was not opposition to make that level of commitment that he thought was necessary and left BBN took a couple of key guys with him and started company called ((packet)) communication and corporation (PCI) – [inaudible] and PCI went out looking for funding to develop the biz prime now looking for funding and as soon as they do that BBN presumable said we made a (( )) we they should do something in the serial because otherwise its gonna be only by PCI (( )) and they hired (()) and (()) who biz development types and they later got (( )) from BBN and I think I was probably the first non-BBN person to join the group and I join the group because I had enough of an indication from Larry that he was ready to leave ARPA and do something else and I thought we had a good shot at that getting him to come to telenet which (( )) they didn't make that decision probably 3-4months later.

1:45:11:7 – 1:45:16:4

LK: How long did he stay at telenet by the way?

1:45:16:4 – 1:45:27:5

BW: He came in 73 and we both left in 82 to form (( ))

1:45:32:0 – 1:45:34:9

LK: And he did become a valuable carrier/ public carrier

1:45:34:9 – 1:46:28:8

BW: He did, we had the whole circle. we had initially funding one could call the indoor level funding from BBN, we then got in the private venture capital funding the real investor in that was trust personal securities, personal venture capital and they created a funding group and that happen in 1977 which took the company public and 1979 the company was sold to (()

1:46:33:4 – 1:46:40:1

LK: Interestingly AT&T was forcing around thinking about packet network at the time didn't come till 83 were there –

1:46:42:1 – 1:49:24:0

BW: They announced well before 1983 they talk the standard of course the company of that size will (( )) in getting to the right technology platform. The most interesting thing about telenet was ultimately we made wrong decisions, we did the keywords in the (())decision process at the time was virtual socket

versus data grams and it was my responsibility and my conclusion that virtual socket was a way to produce a carrier based servers which I still believe was still right decision at the time but I didn't follow the Alan kay principle of looking at the monitoring evolution of what happens I was still in aware of Larry's original (( )) which you must be very familiar with that says "a transport of bit is the cost (( )) with for the cord will look like this and therefore its gonna be all computer based and all we are doing is coping with slow sockets and making them better and more efficient and the best way to do that was with virtual socket and it was a process that we went on to creating internet version standard which was called s25 and went to other countries to promote the concepts and we had a meeting at telenet can't remember exactly but sometime in 1975 or 1976 when we had the Canadian and the French guys and we banged out an agreement that the universal virtual corp. interface will look like and that's what evolve to s25

1:49:25:6 – 1:49:47:0

LK: What's interesting is when you mention PCI they made a valid attempt to become a public packet network but as I recall they invested in not a small amount of effort to get something called a value (( )) carrier made official with the government and they put so much effort into that that they left to actually begin the implementation maybe you can fill in—

1:49:47:1 – 1:51:40:1

BW: I wasn't at PCI but that isn't how I will characterize it we got to venture capital funding the guy who made the decision to fund telenet the (( )) of telenet was a fellow by the name O'Neil (( )) who has been sniffing around talking to the PCI guys had come very close to funding when then was convinced that telenet was a better part and ultimately put money into telenet and that was the nail in PCI coffin, I think again I wasn't there to know the details of what went on but I can tell you based on the workers advise we did exactly the same thing we diligently look to the FCC and got a license had to be involved in computer communications (( )) all the FCC participated in that forum to shape it so that we could use the lines that AT&T had and re sell them on a packet by packet basis which was unclear at the time as long as it's the government and they want to (( ) in quote there was no issue but there was an issue from buying something at AT&T had and using it to resell basic communication what they will consider basic communications (())

1:51:41:2 – 1:51:54:6

LK: So let's backtrack a little bit because the issue that now comes up. what was the relationship with (( )) office and BBN was there a special interaction with them given the nature of what they were doing?

1:52:02:5 – 1:52:07:5

BW: Special word implied inappropriate

1:52:07:5 – 1:52:11:0

LK: No no (( )) research in universities

1:52:13:2 – 1:53:30:5

BW: I think the relationship with BBN was long term the relationship (( )) was hired into ARPA out of BBN so there was a very long relationship if you look at the individuals at BBN they were superstars, they were—if anything undervalued because we were simply university funding so there was the heatscrating,it was profit seeking organization and how much funding can you rush when you give them and if anything I think that was an un-special relationship was you know like you were hiring a sibling to work for you have to worry about –he /she really has to be good because otherwise there is the feeling that's its inappropriate higher, I think we were overly cautious

1:53:35:0 – 1:53:46:1

LK: I was not trying to play one way or the other about – but I was interested in the nature of the interaction between the office and the work they were doing. How much feedback there was how much direction, how much of specificity of goals and timing.

1:53:53:0 – 1:57:36:1

BW: Again while I was there, there was a tremendous amount of interaction, some of that interaction was difference of opinion and there was interaction of a different type then we will have a ARPA contractor it was for a specific project and again this was different from the research project that we had at BBN because it was a large research project that will supersede any of the ARPA project and Danny (()) &company were strong contributors to the AI area and that was funded in the normal ARPA fashion IPT fashion of the network was a very different thing they fixed price contract it had a schedule that (( )) it was really designed to when we started but we finally got the project funded. There was a document that I think you are in procession of, I think I sent it to you which is the program for resource sharing networks for me that is – the (( )) document is the founding document not the whole lots of stuffs occurred prior to that document but under that document is Larry Roberts and Bob Taylor signature saying we want this amount of money and we are going to produce this thing that was a very rare event in the any of the ARPA projects and perhaps unique in IPT and so there was a different sense of urgency a different sense of interaction required and yet we were working with extraordinary , guys who didn't necessary see the same picture that we saw all the time and so there were a lot of banging of heads in the interaction and to honor Frank Heart he is a very strong (( )) guy a (( )) guy as almost everybody else and would fight tooth and nail not for himself because I don't know how much the creativity or difference of opinion existed but to his guys I always thought frank will much happier considering and saying you walk that way and get it that way and his guys were saying here is how we want it done and so they were saying a bidding between Larry predominately Larry and the programmers of the imp activity and it was a lot of interaction much different than the rest of the IPT project.

1:57:37:7 – 1:57:57:9

LK: So if you had to characterize how explicit was the contract been received, expecting received as to what they should do and how change they made how much they contributed to the eventual product, maybe you can comment on that?

1:58:06:3 – 1:59:38:0

BW: I will characterize the RFP, the RFP was governing document along with their proposal and both of those were build on electronic programming and it's easy to go back and look at that there were a number of ideas that were present in the proposal that were not in the RFP the RFP basically said what the end result should be and not how it should be done not what the routing the specific routing mechanism was for saying here is why a packet should take that path a lot of that came out of BBN proposal which is probably the reason why they were selected ahead/over other people. Again it was probably some sensitivity about giving it to BBN because they were very close to IPT and so there were some concern that it will look like a ripped RFP for them fortunately the result and proposal was defensible in terms of selecting them instead of a close call.

1:59:40:0 – 1:59:43:5

LK: Where there any serious competitors to their proposal

1:59:45:3 – 2:02:16:4

BW: Yea my memory says there were 12submissions there were 3 that we went back to look, we went through the proposals, went back the second time and down selected to 3 of the zonal meeting and in the down selection the three were Adams associates,(()) and BBN and arguable the (( )) proposal was technically sound, was probably fundable had we not (( )) had the characteristics that the project were a project company so that they will understood the notion that here is a start and hers is the end and go through we may have gotten nickel and dime to that had we gone with (( )) because the nature of government funding then and government funding now is change orders and this change order is astronomical, I don't remember any change orders in the BBN that made there may been any change orders I don't remember them but some weren't significant and I think that the cost was probably a lot higher than what we were paying I don't know that for fact.BBN ultimately won of course, and when this project was funded the contract value was I can't remember nine hundred thousand dollars something like that and un-speculating that they put a whole lot more resources into it than they ask ARPA for in the proposal and decided not to nickel and dime us on change request. Am not sure how much change actually went on but of course the government contractors are masters at change orders and organizing change orders and increasing the value of the project to themselves.

2:02:18:7 – 2:02:45:6

LK: So setting back to my original opening for interview, thinking much about what I refer to the funding environment, the culture. Can you summarize what you have articulated was the culture and the environment that ARPA presented to its research groups

2:02:56:9 – 2:06:00:8

BW: I think the progression of ((())) who was a behaviorist, Ivan who is one of the smartest guys you ever wanna meet, Bob Taylor who is behaviorist, Larry Roberts who is one of the smartest guys you ever wanna meet and in particular the overlap of Bob and Larry in the office created a special environment but one of them we haven't talk about is what I was raised on as the model of ARPA original foundation part of this created in 58/59 so I got there approximately 9 years after the founding very short period of time and the only thing that I heard over and over again is you should be here in the old days [laughing] and in my era a guy couldn't walk into the office, have a great idea and walk out with the (( )) commitment of funding of a million bucks out of the 25million dollar program and there were some won't have to go through but I don't think there was ever case or something that we put forward at IPT got rejected by the ARPA office certainly not while I was there or not that I had sense of its not there wasn't strong interactions like (( )) say network is a done deal looking at the space network been told that there is no artificial intelligence they have never accomplish anything they were correcting that, there were also interactions that went on but I can't remember any interaction that didn't result in project been funded in much the same way that there probably very high expectation when one of the PI's came with a new idea to IPT that in all likelihood that we will find a way of funding some of the ideas that they have and we counted on them to do the down selecting for us there was literarily enough resources from there we were never far from leading the edge

2:06:03:1 – 2:06:16:5

LK: Talking about leading the edge, did you have an internal model of how to focus on (( )) funding or is that part of your vocabulary at the time?

2:06:17:8 – 2:13:27:4

BW: Oh it was, other than the network which I think was characterize to 6/3 I don't think we had any 6/3 project I can (( )) 6/1 and 6/2. Differencing between them I don't think was very careful thing but it make me done about my head and it make me very carefully done but I never saw that we were more interested in getting new ideas bringing them in but getting back to the ARPA history, the important thing that I got infused with is that one of the important things is the youth, the smart guys, young who want to do their thing at ARPA and get out of there. There was – I spent three years there because that's what I was told (three years) less than that you may not be returning all the – should be returning more than that you may be detrimental. I was somehow upset at the length of time that Larry spent there not that he got still not that he really got involved in communications it may in the post Ninety-seventy after I left his office (( )) really wanted to that aspect and of course it just continued with Ivan and others coming into the office but that turn over the early part of the career. So what I was told is the reason for ARPA was (( ))and the explanation of the word (( )) occurred by the Russians and not by us was that they had colossal advantage in pre-review research but there are short comings in pre-review research and that the natural science foundation which was the principle founder of all research in the United State government funding in the United State had missed the book in critical areas that maybe identifiable and that the (( )) decide to create an organization, an agency that did not have as a central mandate pre-review, that's what gave me at twenty—three enormous power because I want trying to go back to a pre-group or managing pre-group that was ultimately making the decision, I was making the decision to

the (( )) I was making decisions in the (( )) case it was a very positive decision the only one I was gonna tell you about is the other independent project that (( )) start to finish was that I went to the university of Illinois looked at the (( )) terminals and saw the plasma (( )) that was use in (( )) I said that's it, that has military use that has government use, it has commercial use. Its primitive but the underline technology make sense and the guy was supplying those terminals to (( )) was (( )) and I went to (( )) and said give me (( )) and they started the project ultimately wasn't successful I spent couple of hundred thousand dollars and they did the small (( )) but it was never a fundable follow up, unfortunately I told my wife we are not getting a new television set because am gonna get a flat panel and she said it's coming its coming and 30 years later [laughing] so then I was on the right side of the Alan Kay (( )) and saying am not gonna buy a new television set because something very useful later is gonna happen but that set of – that notion that this is not pre-review that we were different, we make our own judgment and do it and had enormous flexibility and the enormous flexibility that I saw was by the guys who were old timers at ARPA people like Al blue who were in the back office in the process management of the ARPA making sure the contracts got locked in the right way that those guys will talk about walking around with cash in your pockets and getting people to do new stuffs that it was a battle – it was undocumented perhaps, it was unaccounted for perhaps that it was probably easy to beat the system in terms of (( )) and whether that went on or not it was never evidence to me but it sounded like the perfect environment or if you are a bad guy you could really steal from ARPA. So there was some aspect in the early days but I didn't see any of that am not a bad (( )) [laughs] but I didn't see any of that going on, I did care about the old days.

2:13:29:5 – 2:13:42:9

LK: So you have expressed some interesting views as to what you did and during you period, could you describe what the (( )) ideal PM was in that era

2:13:49:0 – 2:14:47:3

BW: Sure but it is (( )) the ideal PM was a listener, the question is one of should the ideas come from the PM, how specific should the BAA be and should the PM be doing the – managing data research or can you trust the contractors that you have to do it like we did it in the old days and is it illegal. Under today's procurement procedures can you do the kind of things that we did – they were perfectly what we had we carefully managed to stay on the legal side

2:14:47:3 – 2:14:53:5

LK: Describe the PM of that period, the ideal PM of the period in which you served

2:15:02:1 – 2:23:17:5

BW: With respect to IPT, with respect to information. He's somebody who is a generalist, who has some of their own good ideas, is able to communicate within the ARPA's and externally (( )) in structure so I think if one has to look up to say what a good project manger would be. A good project manager is one who operate properly in the environment that (( )) that will level higher – than here she is and is able to

accomplish things within that structure, in order to ask what the right PM is you have to ask what the right office director is like IPT and you have to ask what the right person for the director of ARPA and what the right instructions are down from on high to ARPA. I happen to be a friend of Jack (( )) who was a deputy secretary of defense for information logistics and as it turns out at the time DARPA (( )) under him and he said he liked his job but if he were able to chose any job which is the job of been director of ARPA, I think ARPA/DARPA reported directly to him or make him maybe the (( ))level in-between (()) which he will rather be the head of DARPA because there is more things that you can do and that was twenty years after I was in the office so it's a very different office and I was there and (( )) will say it's a great place for me to be, it's a great place for Bob, it's a great place for Larry and at least for Steve Crocker, Bob Kahn and everybody else who followed but they were all the same (( )) that Larry and (( )) and rather than the Bob Taylor kind of individual, Vint in some sense is more of a communicator than Bob and had that dynamic between Bob and Vint has been something like the interaction with – between Bob and Larry. So it's a smart guy, listener you know number one is you got to listen to all the (( )) that gave you two ears and one mouth use it in that proportion and listening is a critical issue but I am not close enough to DARPA today to know whether it need help or not although my impression is that it does and whether the reflection of what existed forty five years ago marks to the culture that currently exist and the right thing is to swap out the current PM's for a 1970's like PM into the current culture it may be the worst thing one could possibly imagine and with that cultural change I go to meeting they still invite me to alumni things and so have been in the ARPA/DARPA offices and (( )) presentations, DARPA presentations and classified proper presentations and so I know a little about (( )) what's going on have been invited to the meetings and (( )) of office directors but one doesn't get enough to make the judgment. I am personally someone of a believer in the anarchy method I think if one looks at DARPA as a golden model of – look at what came out then one avenue to look out was the dissolving of ARPA were the transformation of ARPA to something else and the re-incarnation of something that is the new ARPA (( )) and make a new ARPA then (( )) can ask a question if you started a new ARPA what is the ideal program manager (( )) to me is a better question to ask than given the sake of DARPA today how would you advise the director at ARPA to set up his criteria for hiring new project managers. Yea I think we did very well back in the day, I don't know if that's appropriate or not and I don't that one can (( )) sufficiently to do the kinds of things to have the kind of (( ))cash sharing that we have with people not only new but today DARPA not only(( )) than the ARPA that I was in that you have to be in a very select group to know that ARPA in the first to think that you can get money from them to have the (( )) to go to them and get money to (( )) to the proposal and convince the likes of Bob and Larry to fund you. But I think that model still have some value so I think the thing you looking at is a good thing to look at but you have to ask a question do you wanna dissolve what's there, we built something that can potentially have the same energy and same impact than the ARPA of the late sixties, seventies and eighties.

2:23:23:9 – 2:23:32:6

LK: Okay Barry we have been at this for a bit, are there anything we have touched that you will to elaborate on further or anything we didn't touch that you will like to bring up?

2:23:40:4 – 2:24:03:9

BW: Let me think, this should be on the record or off the record one of things you didn't mention is an interview with Bob Taylor. Are you organizing or is he on the list?

2:24:03:9 – 2:24:06:2

LK: We trying to reach him on that

2:24:06:2 – 2:30:55:4

BW: If I can help let me know, he can still be – to have his own perspective on (( )) who has his vision on history and the value of looking at history and Bob has a different perspective (( )) regular communication with Bob and talk to him. There is a very different perspective that he will bring to the conversation and I think even more than Ivan will be a valuable contribution to the goal that you set out and how (( )) goes about getting on camera is perhaps a difficult question (( )) exactly how to get that organized but if I can help I would and I do think is important because in the ARPA evolution I think his presence is undervalued and he has a very strong case to make that the ambiance/environment that he worked in was tremendously influenced by Bob and his distinct personality. I guess there is a story about that, a wonderful story we walking through the walls of pentagon and I was relatively new in the process and so we are coming back from lunch and Bob said wanna have fun I said sure and he said lets go into the (( )) office and (( )) was in DBRA important for us for transfer and support at some level but the pentagon has its own set of how you go about doing things again this is pre email era so for example in our office not when I was serving Bob or Larry but when you are making a call within the pentagon, one did not never picked up the telephone, you ask your secretary to make the call and your secretary call the other secretary and that communication was established they were suppose to know who was higher and who was smaller and the lower person was put on the phone first so that the higher person had less than time that they had to wait to receive the line otherwise it was held back. So that's the environment, that's the picture that you have to understand Bob saying – Bob Taylor saying let's have fun, so we come to (( )) guys office he walks in and he ask one of this two bay offices his door is close to the secretary base or his defense against and Bob walks into the door and says is (( )) here and the secretary perhaps in appropriately said "Yes" and Bob said "thank you" and opens the door and she said "but,but,but"[laughing] and Bob walks into (( )) and he said I will like to introduce Berry Wessler is my new (( )) new guy on the block and he sits down at the guy conference table (( )) on his desk is working on something and this is the absolute (( )) I will guess that he was technically one or two runs higher than Bob in the absolute parking order of the pentagon this is the worst possible (( )) and the guy of course as to behave properly , secretary comes rushing in after us and he says No No that's okay and he lift himself up from his desk and comes to his conference table and Bob started chatting with him [inaudible]. This is by the way we have some interesting project going on, he starts getting the guy (( )) on some activity that were funded and the guy actually started to show some interest and Bob says "got to go" and immediately sitting at his desk you know no real goodbyes or anything and that was Bob Taylor he thought that the only value in that structural thing was that it was easy to make fun of and easy to mess around with and he did it all the time. And so his that kind of attitude, I came to be more formal than Bob and I will never ever in a million years do that but seeing that sort of activity it had an influence on the way you thought, the way you operated and so it's one of those things that corporate

culture—let's not say culture this is not corporate the culture of the environment his so critical and why you have to look out the levels before you can really say what a PM should be.

2:30:57:8 – 2:31:00:6

LK: Great. Berry that was wonderful, thank you very much.