

Bill Krause | Zero to a Million Ethernet Ports + The Epiphany

Derick: So Brandon, I think you'll agree with me that there aren't many people like Bill Krause who can coherently, but also in an entertaining way, tell their biography, right, totally off the cuff.

Brandon: Yeah, I totally agree, and it's always awesome to hear unique stories from back in the day.

We got to sit down with Bill to talk about his experiences as someone who was really there on the ground floor, bringing whole new categories of technology to market, in this case, first with personal computing, and then with networking.

So Bill was there when a computer was a thing that a company had, or maybe a company department head, and Bill helped make it a thing a *person* has as the first computer salesperson at HP.

Look for all I know when I ate lunch at HP in Palo Alto, as an intern in 2008, four decades earlier, Bill was eating at that same picnic table with Bill Hewlett.

Derick: "The first person to sell" in, in this category, personal computing. That is, that is kind of crazy to think about, like - how many billions of dollars is that category now.

Brandon: Uh, well searching Google here... it looks like the first search hit. It says \$688 billion. And it's growing.

Derick: So, so just a little bit of money.

Brandon: Little bit of money. Yeah. And then to be the CEO of a company that led Ethernet from approximately zero to the first million ports in under a decade, two years before their goal...

I don't know how much more "there when it's happening" you can be than that. 3Com needed business decisions and direction and that's what Bill did.

And I love all the little stories here because they connect to other episodes where each has a unique voice. So if you haven't checked them out yet, just real quick - Episode 2 and 3, we had Bob Metcalfe on, he invented Ethernet and he worked alongside Bill to bring it to market, as part of 3Com. Also, our Episode 4, we had Heidi Roizen on talking about how the effects of networking changed the way her business sold software and the way we all consume it. Check those out. If you haven't after this one.

Derick: Yeah, the, both the Bob and Heidi episodes were great. There's some of my favorite episodes that we've done so far.

Brandon: Those were fun ones.

Derick: So grab your favorite beverage, get into a listening headspace and let's get started.

Welcome [00:02:52]

Welcome to the podcast, Bill.

Bill: Thank you, Brandon, pleasure to be here.

Brandon: Very happy to have you. Before we get into 3Com and PC networking as we know it, maybe let's start with the beginning. Tell us your story. How does it begin - first day at HP even?

Bill: I went to college in Charleston, South Carolina at the Citadel, graduated with a BSEE. Because I had skipped a grade, I graduated early, I was 20 years old, and being somewhat anal in math, and this sounds more organized now than it was then - I'm 20 years old. I'm going to work till I'm 65. So you subtract 20 from 65.

That's 45. It's only divisible by three and 15. So why don't I organize my life's work in contributing to society in three phases of 15 years each, the first phase being sort of learning about business so that I go to the second phase of building a business. And then the third phase would be giving back both philanthropically and helping other entrepreneurs, and people building companies. So that was sort of the start of my early life. , Bringing me to Silicon Valley in 1967. I started at Hewlett Packard, HP, which is - it's a completely different company then as it is now. So, I mean, it's hard for people to even imagine what HP was like in 1967.

First day of work at HP [00:04:11]

Brandon: You're here at the birth of Silicon Valley, or the very early days before computers were the computers that we know them as.

Bill: Well, so I joined HP as their first computer salesperson. But everybody at HP in sales, well, everybody at HP was an engineer! Unless you were an accounting or

finance or, or HR or something. So I was a digital sales engineer. Yeah. And, uh, the first day I report to work, my buddy, I remember his name, his name was Ed White, and he's taking me around and introducing me to people that I'm going to be working with. We come to lunch and at lunch, I come to, we go to the cafeteria at 1501 Page Mill road, and we sit down at a kind of like a picnic-like table. And my buddy Ed sits across the table. I sit down and he says, Bill Krause, meet Bill Hewlett, who was sitting to the left of me.

So my first day at work, I'm sitting there having lunch with Bill Hewlett, the president and founder of the company, uh, which by the way, is an example of a very famous management acronym called MBWA, Management By Walking Around, but it was something that I practiced as a matter of course before it became a famous acronym.

But at any rate, so Bill asked me what I was going to be doing. I told him, he says, wow, you're going to be our first Digital Sales Engineer, you're going to be selling this new product that we're inventing and I'm all excited. So, you know, after lunch, would you like to come up and meet the guys working in the lab and see the product?

The product was really, I would say it was one of the world's first desktop personal computers. But Bill Hewlett didn't want to call it a personal computer because, uh, people wouldn't believe that HP made computers. IBM made computers! So rather than calling it a computer, he called it a calculator.

But this device was the first device, that had - with a single keystroke, the ability to compute all the transcendental functions, transcendental functions like trigonometric functions, logarithms, exponentials, and so forth, and it also - you could program it through the use of the magnetic card by clicking on keys and programming 80 steps that you could do - write a program.

So one of the first programs I wrote was to be able to input, uh, my wife was a, uh, elementary school teacher and I'd be able to input all the grades of her students and then calculate their averages and then store it on this magnetic card. So the product that I'm talking about was called the HP 9100.

Brandon: So Bill at that time, what did you think of a computer as? How big was it? What did it do?

Bill: Well, it was the size of a big typewriter. It actually weighed, I think, something around 40 to 50 pounds, something like that. It had 16 registers. Uh, it actually had 196 program steps to be recorded on a magnetic card. I thought I had 80, but I guess it was a hundred, 196 program steps to be recorded on a magnetic card. It had a 32 kilobit ROM, and 64 instructions. And it had specific keys that could not only do arithmetic functions, but also could do all the transcendental functions of exponentials, logarithms,

and trigonometry. So, you know, that was sort of my first introduction to the world of HP and computers and Bill Hewlett and, I'd be sitting at my desk and the telephone would ring and - "Hi, Bill Krause". "Hey Bill - it's Bill Hewlett. I'd like to come to make a sales call." HP had a rule that you couldn't make a sales call, without the salesperson. So even though Bill Hewlett had all these friends, you want to show this fancy new device - uh, he always had to take the salesperson with him. So I must have made 20 sales calls with Bill Hewlett. So as you could tell, HP was a much different place in 1967, 68, than it is now.

Brandon: I think that's a good, a really great starting point. So you were the first computer sales person at HP?

Bill: Correct? Well, they were called digital sales engineers because everybody had to be engineer.

So we were digital sales engineers. But yes, in essence, a sales person. But if you want to continue the story, let's continue the story and sort of, you know, to go back to the what's the whole purpose of being at HP.

The whole purpose in my, in my life's plan was to learn about business so that I can in turn, become an entrepreneur to build a business. So let's fast forward. So here I am enjoying my career at HP and on a fast track. I was promoted to be the youngest district sales manager at the time.

And then I was promoted to be a regional sales manager . And then I got more into management and, we started, HP commercial computer division, which is really the HP 3000, the birth of a major mini computer called the HP 3000. And that was a business that I learned how to go about building. We started out, with that product line. When, When I became involved with it had negative revenue! The product had been introduced prematurely, uh, and we had to take the product back because it wasn't ready to be used by customers. That was very embarrassing for Hewlett and Packard, Bill Hewlett and Dave Packard.

And so, you know, I got dispatched to try to turn this thing around. So anyway, it had negative revenue , about 10 million. Fast forward, five years later, it was a billion dollar business! In five years, we went from negative 10, 10 million or so to a billion dollar business in five years.

Brandon: Who was buying computers at this time? What was the dominant use case to grow all this business?

Bill: Uh, What we call distributed data processing. And, you know, you had, you had the big IBM mainframe, uh, in the data center, and then the departments started having their own mini computers to do departmental, data processing. So you would have, the

accounting department would have their own accounting department in a business unit of the large company, or you'd have the marketing department have their own little mini-computer.

And so these mini - a key component of the HP 3000 was the first database software for a mini computer. And it used - I think it used a sequential file access method for this database. And I would never write this. You're really pressing my memory, but look, let's fast forward from that.

So that was a great experience and very successful. And so, you know, , my mentors, Bill Hewlett and others knew that I had already wanted to be an entrepreneur and start a business. So they looked to me to try to get involved in starting new businesses for HP. So they said, look Bill. we want to get into the personal computer business.

Starting the HP Personal Computer Division [00:11:00]

And so why don't you start our personal computer division? And at that time, we had started a division to build terminals. These would be terminals and some of them were smart terminals that had some intelligence in 'em that would be used to connect to our mini computers. And so why don't we take these terminals and make them real smart and turn them into personal computers and run a operating system called CP/M.

So I'm starting the HP personal computer division and, my challenge was how do I get the attention of the sales force?

Because the sales force is selling these hundred-thousand dollar mini computers, and I'm going to be asking them to pay attention to selling a \$2,500 personal computer. So I thought, well, what if I networked them together, tied together, maybe 10 or 15 of these at a time? You know, at least I could get the total sales opportunity, you know, up to \$25,000 or \$50,000 - at least, might get their attention to be willing to spend some of their time to sell these new personal computers.

Brandon: This was at a time when people didn't know why to network, right? There was maybe a little bit of academic networking between research labs, but maybe not too much else that was commonplace, right?

Bill: No, there was no network.

Brandon: No networking at all...

Bill: no, no. And the only networking was a network called SNA from IBM: System Network Architecture. And that was basically a host-to-terminal kind of an architecture

where you would have smart devices connected up to the IBM mainframe host. That was the only kind of networking that was being done.

Xerox PARC [00:12:36]

And so in the process of thinking about, well, how I would network these personal computers, I was doing some research and I ran across some research that was being done at Xerox PARC. And it was some research being done on a technology called Ethernet and Xerox PARC was using this technology called Ethernet to connect their desktop workstations together at PARC to be able to share expensive peripherals like printers and disc drives and so forth.

So, wow, well maybe I could adopt this Ethernet technology.

Brandon: That's right, Bill, PARC is Palo Alto Research center that's where a lot of the innovations of computing today - came out of that lab.

Bill: Exactly. Not only did you have Ethernet that came out of it, invented by my partner, Bob Metcalfe, you also had the GUI user interface that was actually stolen from PARC by a guy by the name of Steve Jobs to put into the Macintosh. Uh, you had, God, I'm drawing a mental block on it - the ... Postscript, the language that allowed you to print to laser printers and have all kinds of different fonts, came out of Xerox PARC.

So almost all of the seminal technology that went into personal computers and early networks came out of Xerox PARC, Palo Alto Research Center. And unfortunately, Xerox didn't get the benefit for it. Very much of it.

Um, so fast forward here - we're on the path now to migrating from the making of an entrepreneur and my time at HP - I get a call from a long time friend of mine who I'd worked with at HP, but he had left HP to become a venture capitalist.

Bob Metcalfe is Looking for a CEO [00:14:11]

And, his partner had heard, a person by the name of Bob Metcalfe, speak at Stanford and talk about his Ethernet technology, and that he was starting a company, and he was pretty well known because he was the inventor of this technology called Ethernet, and a lots of venture capitalists were interested in investing in them, but he told the venture capitalists the way I'm going to decide whose money I'm going to take, is the

venture capitalist can, that could bring me the best person to be the CEO of my company. So any rate, the partner comes back and tells his other partner about the story and he says, well, I know this guy at HP, Bill Krause.

He's always been interested in starting a company. Let's see if we can put these two guys together. So any rate, I get connected to Bob. We wound up having lunch together in Los Altos. Which is a town here in the heart of Silicon Valley at a place called Mac's Tea Room. I remember the restaurant name to this day.

Love at First Sight [00:15:06]

It's not there anymore, but at any rate. So Bob and I had lunch at Mac's Tea Room, and we talked about how we saw the world of, of personal computers and networking and life in general. And we were just so compatible in so many different ways. It was sort of, as they would say, love at first sight, and so off we go, but I have to tell a little bit more of the story.

So after a couple of meetings with Bob and actually to be clear, Bob had started 3Com in May of 1979. He had started 3Com primarily as a mechanism to shelter his consulting income, because Bob had left Xerox after he had invented and patented Ethernet. The Ethernet patent was held by Xerox.

But he left then to start consulting on how people could build computer networks. And he was consulting with people like Digital Equipment and IBM and others about - and General Electric and other people - about how they could network computers. And so he, uh, incorporated, 3Com to shelter his consulting income. Let me tell a story about how the name came about.

So Bob was consulting for Digital Equipment Corporation and he's having this discussion and they're talking about their VAX computers. And so Bob writes down the word computer, C O M P U T E R. And they, well, what they want us to do is to have these computers communicate. And so Bob writes down the word communicate C O M M U N I C A T E. And what they want us to do is to be, have these computers communicate compatibly between each other.

So he writes down the word compatibility and in classic Bob Metcalfe format, they were lined up - computer communication compatibility, and he drew a line through the first syllable. Com, com, com. And he did a thing and wrote three. So that's how the name 3Com came about - computer communication compatibility.

So, anyway, I'm thinking about joining these guys and my wife and I used to run in the morning. And so we're out running, as I said, my wife, my wife's name is Gay. I said Gay, I'm thinking about joining these guys at 3Com. I would have been employee number six and really jump-starting the company.

What do you think? I look over and tears rolling down... "Why would you leave HP? You know, you can be president of HP", even another one, whatever. So I called Bob. I said, Bob, it didn't go too well with my wife. Would you and one of the other co-founders, Howard Charney, mind having dinner together with my wife and I. So we go to dinner and after dinner, I asked my wife, what'd you think?

It's just, well, Bob Metcalfe's the most charismatic guy I've ever met, Howard Charney is the smartest guy I ever met. What the hell do they need you for? I said, well, I guess that means it's okay. Just go for it. So the rest is history. So Bob and I joined together and we start 3Com. So, the other person whose name is on the Ethernet patent is David Boggs.

Interestingly, Bob could not get David to join him. The other two people that came with him from Xerox PARC was Ron Crane , and, and Greg Shaw and the fourth person, Howard Charney wasn't at Xerox PARC , but Howard was a fraternity brother of Bob's at MIT by coincidence. Ron also went to MIT and Greg Shaw also went to MIT.

And so it was sort of like an MIT fraternity reunion. When I got involved, I was the only non-MIT guy there. Uh, but yes, you're right. Dave Boggs was the other, the other person and Ron was a close colleague of Dave Boggs and Ron Crane's job was to work on the analog parts of Ethernet called the transceiver.

And Greg was a software engineer, and his job was to work on all the software parts of the drivers and so forth that were necessary of, of connecting, uh, you know, the Ethernet into the computer. And let me, let me stop there and see if you want to ask another question. I'll take it another direction.

Buy an HP 9100A today! [00:19:14]

Derick: I have one other thing. It's just, I, I Googled the HP 9100A and on a collector site last year, a working HP 9100 A with the card for programming, and a printer accessory went for \$2,200. Uh, last year this happened. That was the last known one wanted to go up for sale.

Bill: What was that? The 3C100 or the 9100.

Derick: That was the 9100A.

Bill: The 9100, well, when the 9100A was introduced, it sold for \$4,900. \$4,900 was the introductory price for the 9100 A. You know, 16 registers, 32, kilobit rom, 64 instructions sold for \$9,400.

Well, the listeners can't see this, but. You know, what I'm holding in my hand is today's iPhone. And I don't know how many gigabytes of memory it has and microprocessors and so forth. And so in that 50 some-odd year period of time, look at the progress we've made in tech, because that, that in itself, I think is a way to think about technology over long periods of time.

Here's this device, you know, it sold for \$4,900 and had 32 kilobits of ROM memory. Uh, and then you fast forward to today's smartphones.

Brandon: Now's the time to get an affordable piece of computing history. It's less than its original price.

Getting Ethernet Affordable [00:20:37]

Bill: Let's talk about now, sort of the early days of 3Com - so, one of the first, challenges that we had, was, you know, Bob and I saw that the computer world evolving through a series of eras. we called them millennials, uh, the three millennials of computing, but in our term, a millennial wasn't a thousand years. It was 10 years. And so you had the mainframes in 1960s. You had the mini computers in the 1970s and in the 1980s, was PC networks. Uh, okay. So we want it to connect these PCs into networks. Well, at the time, this is now circa 1981, uh, in 1981, the cost of Ethernet connection, you know, the, digital card, the transceiver and the cable that you plugged into to the Ethernet cable itself was \$3,500. Well, you're not going to spend \$3,500 to connect it to a \$2,000 personal computer. So we knew that we had to get this \$3,500 cost of an internet connection initially down to a thousand dollars and eventually down to a hundred dollars.

And so I drew on an XY axis, this exponential declining curve, uh, that went from \$3,500 to a hundred dollars. And that curve took place over a period of seven years, 1981 to 1988. And so Bob looks and me and says - what ? What are you thinking? How do you think that's going to happen? And I said, well, Bob, what do you think the price-performance has been of semiconductors for the last three or four years?

Semiconductors were doubling in performance or halving in price every two years. And so if we just take y'know normal, the semiconductor Moore's law and extrapolate that at

say 50% per year, over the next two years, that \$3,500 will go down to a thousand dollars. And over the next five years, that thousand dollars will go down to a hundred dollars.

So all we have to do is figure out how to follow Moore's law, to get the cost down. And sure enough, uh, we were able to work together with another company called Seek Technology, and we built the first VLSI Ethernet chip together with Seek Technology, uh, which then allowed us to get the cost of an Ethernet connection down to a single card that you could plug into a PC.

First Real Product: Software? [00:23:06]

Um, but let me, let me back up from that, because one of the little known secrets about 3Com is that while we're known for Ethernet... in 1981, our first real product was a software product. It was called UNET - U N E T - Unix for Networking. And it was the first implementation of the Unix operating system with the TCP/IP protocols and a driver to an Ethernet interface card in a VAX built by the Digital Equipment Corporation, DEC.

Our first customer, was this little company in Seattle called Microsoft... this is 1981. And so my job was, you know, Greg Shaw and we had hired at that time another software engineer, my job was to take a reel of tape, no, there's an actual reel of magnetic tape! And carry it up to Seattle and Bellevue and deliver it to Microsoft so they could install it. And what they were going to use the product for was they had these three VAXes - the VAX mini computer from Digital Equipment Corporation.

And they were using one VAX to create the code for a new operating system. The second VAX was being used use to debug and compile the code. Yeah. And the third VAX was used to sort of QA it and final assembly of the code. Now, we weren't supposed to know what this new operating system was, but it was MS- DOS, and it was a secret new project for IBM for the first IBM PC. At any rate, their office was on the second floor of this kind of like set of offices, I knock on the door and this young person comes to the door, opens the door and says, hi, I'm here to see Paul Allen because Paul Allen was really our customer.

And so Paul's over here. So he brings me here. Hi Paul. Here's Bill Krause. Oh, Hi Paul. I got the real estate. We can load it up and see if it works. And I said, by the way, Paul, who who's, whose young brother was that that answered the door. He says, Oh, that was Bill Gates. He's the founder and the CEO. So that was the first time I met Bill Gates.

I thought he was somebody's younger brother. Um, but any rate. So we install our Unix software and it helped, uh, Microsoft get MS-DOS out on time to launch the IBM PC. Uh, so that's a little known story about 3Com's first product being a software product.

Brandon: So Bill, you, you have this, this software product and it works with uh hardware Ethernet. Is that the case?

Bill: It ran on Unix and it had a driver that connected to an Ethernet card that plugged into what's called the Unibus bus of a VAX computer and the Ethernet card had been developed by Digital Equipment, themselves and , uh, using discrete components, and, actually a transceiver, uh, that we had built - a 3C 100 that Derick just looked up - and together that Unix card - I mean that, that Unibus card and the transceiver connected to a big thick yellow Ethernet cable and strung these VAXes together.

Brandon: And how fast was this Ethernet across all the devices - was this the era of vampire taps, the big thick cables?

Bill: There were two ways of connecting into this big thick yellow coaxial cable. One was vampire taps, and the other was - the 3C100, uh, actually broke the cable, and inserted the transceiver, uh, with connectors, put a little connector on each end of the broken cable and connected, and the transceiver would sit inline, in the cable, and the transceiver was taking the analog signals and converting them to digital signals through a cable that, that plugged into this card, uh, that plugged into the deck backs.

Brandon: So, if you wanted to get through this computer, it had to be on right? Every device had to be on to go through the network. Right?

Explaining How Ethernet Works [00:27:05]

Bill: Every device, every device was connected and it had to be on , and of course at that time, the key to the success of Ethernet was something called Carrier Sense, Multiple Access. The way Bob and I used to describe this to impress people as to why Ethernet was better than token IBM's token ring - IBM was introducing its own networking system called the Token Ring, and we did this little shtick where we'd say, okay, um, here's the way Ethernet works. Ethernet works just like the three of us talking together as we are now. So I'm speaking now, but however, if you, Mr. Press person want to say something, you'll insert yourself and there'll be a collision between what you started to say, and I started to say, and then the two of us will back off and then one of us will restart. And if I'm polite, I'll pause and let you say what you want to say. And when you're finished, then I'll say something. And so we have a conversation by being

polite with each other, that if we interrupt, we see a collision of our words and we both stop, and then one of us reinitiates to transmit whatever it is we want it to say. So Ethernet is communicating just like we as humans naturally communicate. Now, if you want to communicate with token ring,, and we'd take a spoon or a fork from the table and we're having lunch. And I say, I have the fork, and so that's the token so I can communicate. Now, if you want to communicate, I have to pass the token over to you, but you can't say anything until I give you the token, or until the token gets you, even though you're dying to say something, you can't say anything until you get the token. And so of course, you know, obviously Ethernet was a far better system than the Token Ring when you went through that little example, but that's a nice example of the early days of Ethernet.

Ethernet Cables (and Circuit Integration) [00:28:59]

Brandon: So did, did he Ethernet stay at the big thick coaxial cable? Maybe you can kind of tell us how, how it evolved to the Ethernet that we know, of ports you plug in.

Bill: That's good. That's a cause that's a good lead into, uh, another very interesting life experience. So as I mentioned, you know, our first customer, was Microsoft and Bill Gates and Paul Allen. Our second or third customer, I don't know whether it was second or third, but one of our early customers was for the, by now we had developed the transceiver, the 3C100, which would enable you to connect the Ethernet into a card that would plug into a computer.

And one of our early customers for that was a company called Apple.

And so we got to know Steve Jobs quite well during the early days. And Steve was a good friend. We used to get together frequently.

So fast forward, so now we're trying to figure out, how to design a card that's going to plug into the IBM PC and ergo, the partnership with Seek Technology, they developed the first VLSI Ethernet chip, which allowed us to shrink down - let's see if I can remember, right, if I can do the math. Remember I talked about, the card that plugged into the Unibus of the Ethernet VAX? That card was 13 by 13 or 169 square inches.

Plus you also had a separate transceiver - physically separate transceiver. So in order to get Ethernet to work on a PC, we had to take 169 square inches of component space, if you will, plus the transceiver and shrink it down to the size of a PC card, which was five inches by 13 inches, or 65 square inches.

The only way you're gonna be able to do that was with VLSI circuitry. So we were able to use the VLSI circuitry; not only did we get all the digital components of Ethernet onto the card, but we also through Ron crane and his brilliancy - got the transceiver onto the card so that the entire Ethernet connection was on this card and the way we were going to connect them is using a simple oscilloscope cable - today's audience would think of it as sort of like the cable you use to connect to your TV, you know, a TV cable - you know, a very thin cable and a little twist-to-lock connector that you plug into your TV. And so we would have these little twist-to-lock connectors, they were called BNC connectors, and we would string them together and connect the pieces together. And so this was really a huge breakthrough. You know, we had a card that plugged into the PC for \$995 PCs were selling for \$3,000 and you could connect them together.

You could connect them to a laser printer, which sold for \$6,000, and you could share the printer. And so you paid for the Ethernet just by being able to share the printer. So at any rate, we were all excited. Call Steve up. Steve, got to come over and see this demo. It's fine. I'll come over. And after the demo, we'll go have dinner afterwards.

More Steve Jobs... [00:31:54]

So Steve comes over and we do the demo and - classic Steve jobs fashion - pardon my language. Who's the brain dead idiot asshole that came up with this. This is shit. This is dreck. If you want to make the thing easier to use, just plug the fucking thing into the goddamn hole in the wall. End of the telephone wall, jack in the wall!

And so the Ethernet cable that we know today, the Twisted pair wire that plugs into the telephone Jack, uh, and the wall socket today, actually came about through an insight from Steve Jobs. Another very little known story of another one of his claims to fame. So that's how the Ethernet that we know today got created.

Brandon: Did Steve ever have any other, uh, unsolicited design advice that stuck with you? That's one helluva story.

Bill: Yeah, he, uh, we were having an offsite strategy meeting. I don't know. This is maybe say 1984, 85. We were a public company, I think then, and we invited Steve over to give us a talk and he said, you know, you guys ought to get out of this Ethernet hardware business and you oughta capitalize on this application software product that you've created called Ethermail. And you ought to concentrate 100% of your efforts on Ethermail and get into the electronic mail communication business. That was one of Steve's advice that we didn't take. It was probably wise that we didn't - is probably one of the few times that I know this team was wrong.

Huh.

The Big Hairy Audacious Goal: A Million Ports in under a Decade [00:33:19]

Brandon: So it's, it's the early eighties. You've, you've got Ethernet, you're showing it to all these companies, something that you said to me awhile back that really stuck with me was - this big audacious goal of getting Ethernet to a million deployed ports before the decade was out... it kind of brings to mind a certain famous speech by Kennedy. You have a very clear goal . How do you get there? What do you do?

Bill: Well, what you're referring to is... this is before the acronym was even known. It was called a BHAG, B H A G, big hairy audacious goal. And this was before that acronym was even known. You know, Bob and I had come up with this inspirational goal for the company. This would be like, I'm going to say probably 1982, something like that, just after we had introduced the, Etherlink card for the IBM PC, uh, as an inspirational goal, why don't we set for ourselves using a take off from John Kennedy's famous speech. Let's put a man on the moon by the end of the decade of the 1960s. Let's, you know, let's set a goal to Ethernet a million PCs by the end of this decade, the 1980s by 1989. And so we put that goal in place and throughout the company as an inspirational goal. And then from that, we backtracked to say, well, you know, what things have to happen? What decisions do we have to make in order to achieve that goal?

And we started working it back from, you know, 1989, 88, 87, 86, and so forth back to 1982 and 1983, and then put in place sort of a plan to get there.

A Self-Fulfilling, Positive Prophecy - A Plan [00:34:52]

You know, there's this old thing, plan your work and work your plan. And one of the great things about being an entrepreneur, is, you have an ability to create a self fulfilling, positive prophecy. And you know, in those days, a lot of the Silicon Valley entrepreneurs and us included were very idealistic.

You know, we were starting companies not to make money, but we were out to make a contribution to society and change the world and make it a better place. And, you know, computer networking enabled people to be just a heck of a lot more productive and effective in doing their work. And it basically changed the way we work, learn, and play.

And so, how did we go about, achieving this? And so we had to have a plan. So in 1982, we made a plan for 1983, keeping in mind that by 1989, we had to have a million PCs, Etherneted. So, uh, in 1983, we put together a plan. If I remember right, the plan was to achieve four and a half million in revenue in 1983. So that was our plan for the year. Then we broke that down into each of a three month quarter, and then we broke down each quarter into three months. And so every month we had a set of priorities and, uh, using our Ethermail product, I would publish the plan, for the year and then I'd publish the plan for that current quarter, let's say the first quarter of the fiscal year. And then I'd published a plan for the first month, and they all stacked together and connected together.

And then at the end of the month, We would have a monthly, all hands meeting and review the progress that we've made toward our monthly priorities. And of course the monthly all-hands meeting was on a Friday and it was, you know, the classic Silicon Valley beer bust. And we would celebrate, you know, we shipped so many, uh, 3C100s and so many Etherlinks, and so we're making progress toward our goal for the year. And so we'd celebrate with a beer bust.

Okay. So fast forward, uh, we made the goal 1983, we get to 1984. And I think we set the goal for 12 million, you know, a really substantial increase from four and a half. We actually wound up doing 16 million and that was the year we went public on \$16 million in revenue and a total capital raised of \$6 million.

So in order to start 3Com, we raised \$1 million in our first round, 2 million in our second round and 3 million in our third round, total of 6 million. We raised the first money in 1981, three years later in 1984, we went public, uh, with \$16.5 million of revenue, and we were profitable, and had a valuation of just under 80 million, uh, which enabled our original investors to get a 30 times return on their investment.

Brandon: Not bad. 30 X is pretty good today, three years from investment to IPO is ... it would be considered crazy.

Bill: It's a different world for sure. It was just. eating the elephant, a bite at a time, starting out, you know, with an annual operating plan, with the eye of how do we get to a million PCs by 1989, and then breaking that annual operating plan down into into four quarterly chunks of three months each and then breaking each one of those quarters down into three monthly chunks of one month each, and then reporting on our progress every month. A very, uh, disciplined approach to the management of our, of our company.

Brandon: So following this methodical plan, you continue to grow 3Com over the eighties. I'm curious about the next phase of networking. When did things change? So you keep growing the number of deployed ethernet ports. What happens next?

Bill: Well, so now we're pretty far along in the PC networking world, it's now sort of getting to the mid, say at 1986, 1987, 1988, somewhere in that - in that zip code and people are beginning to think, you know, God, we got all these PC networks connected together.. What happens if we start connecting these PC networks together? And start making networks of networks?

To give you some context for this next point, Bob and I and Howard would be sort of titurally called the three founders of 3Com. And we, we, the three of us agreed on two high level goals for ourselves and the company.

The first goal was that we wanted our company to become successful and become an icon in our own industry like others before us have become icons in their industry, like HP in computers, or Apple in personal computers, or Intel in semiconductors. And, you know, we want wanted 3Com to become an icon in our industry of networking. And we were successful with the first goal of having 3Com become an icon in its industry, and withstand the test of time, and live well beyond us as early founders - led to the second goal.

The second goal was that, even in our young age, we had seen other entrepreneurs overstay their time. And we had this kind of belief that entrepreneurs and executives had lifecycles just like products did. And the life cycle would be say about 10 years or so, because that would be the life cycle of a major cyclical change in technology.

You know, going back to our three millenniums of computers, you know, major technological changes every 10 years. And so if we were successful the first, of 3Com becoming an icon - then at the end of 10 years, we'd all retire and turn over 3Com to our successors.

An Intermission [00:40:28]

We just finished the first part of the episode. And we're now at a point where Ethernet has won. It's the way you connect computers. But tech advances rapidly and soon 3Com will have to figure out what to do as the definition of a network changes. Plus, Bill needs to figure out what exactly to do in the third phase of his life, now that his baby is all grown up.

But before we return to more stories with Bill, we're going to take a quick intermission. Derick's going to share a perspective as someone who's life was directly affected by Bill's work. Take it away, Derick.

Derick: So Brandon, I remember this recording really well because I was very nervous. I didn't really identify with Bill as the CEO that launched Ethernet and I, and I didn't know what to say, right?

Brandon: Yeah. I could tell you were a little cranky before that episode started.

Derick: Yeah. Yeah. I thought we were overshooting. I mean, you have to remember when I started networking in the 1994, the first network I worked on, it was the military network. It was all 3Com. 3Com switches, 3Com communication servers, and, uh, for routing, it was all Unix running GateD so 3Com was really the first network vendor that I got my hands on and it was a huge network, so I did a lot of it.

And here we are talking to the CEO of 3Com, from that timeframe. To be honest, I didn't know what to say or what to ask him. So, like during the show, for instance, I remember him mentioning the model of the first computer that he sold for HP. And so I Googled it and it's a collector's item now. Right. And it's worth a few thousand dollars, more or less the same as, in real dollars anyways, that it was being sold for back in the day when, when he was there.

Brandon: That stood out to me too, that this - arguably laughably obsolete piece of technology - is still worth something to people because it's, it's a historical item. It has meaning to people, someone sees value in that. And I love that Bill could remember all the model details, all the size of uh bytes and memory, the number of instructions, all that stuff right off-the-cuff.

Derick: Yeah. Yeah.

Brandon: He remembers that day as if it were yesterday. And it's so cool to hear that energy come out.

Look, we're not trying to make a "life advice" podcast here. But Bill's role now is to help people figure out what to do directionally, and day-to-day, and you've heard how sharp he is, so keep listening as Bill shares some high-value advice on what makes companies and people and places successful.

Part 2: Advice, and What Made the Valley Work [00:42:48]

Bill: So here we are. We're now thinking about networks of networks and Bob and I, you know, we're PC networking people. And, and, you know, for every network you're going to have 10 or more personal computers, plus some printers and some disk drives connected to the network. And you're only going to have one network connection to

connect it to another network. So if you only got one other network connection connected to another network, it seems like 10 times the PCs is better than that one network connection.

Transitioning Away from 3Com [00:43:16]

So Bob and I never really got the notion that networks of networks were going to become a really big deal. And, and fortunately we were coming to sort of the end of our time, and so in the early 90s we transitioned the company to a person by the name of Eric Benhamou , and Eric was a founder of a company called Bridge, which was an early pioneer in the, product category called bridges and routers.

And the early bridges and routers were how you would connect networks to networks. And so it was Eric's vision and insights of building products, such as routers and bridges and other kinds of devices that allowed you to connect networks of networks.

And that was a major transformation for 3Com, not only in its product capabilities, but also in its leadership. And so I became chairman, and then shortly after becoming chairman in 93 94, uh, retired , and gave it to Eric in total as CEO and chairman, and he did a great job of taking the company to its next leg of networks of networks.

Brandon: So, what did you then do with your time?

Bill: So now, okay. So going back to this hazy idea I had, when I graduated from college. Y'know, the first 15 years was about learning about business so that I could do the next 15 years, which was building a business, which is all about 3Com, and so now I'm about ready to go onto this third phase of giving back to society through philanthropy and mentoring other entrepreneurs and people who wanted to build companies. And so I began transitioning to be an advisor and serving on the boards of other companies, both young and immature public companies. And so that's how I've been spending my time, fortunately, for more than the last 15 years, actually for the last 25 years.

And hope that I've got another, maybe not 25, maybe 25, who knows that'd be great, Uh, but so that's where I'm spending, my time is serving on the boards of private and public companies and helping entrepreneurs and the executives of those companies achieve their aspirations and ambitions.

What To Look for in a Company [00:45:23]

Brandon: Bill, thank you for giving back. Y'know you have knowledge that not too many people have. So I'm curious, what do you look for when choosing a company to invest in or to mentor? What really gets you excited about a company these days?

Bill: Well, again, sort of to answer the question, let me give you some context. When I'm retiring from 3Com, I thought about actually becoming a venture capitalist. Unfortunately I realized I probably would never make a good venture capitalist, but I asked this friend of mine, the same friend who had introduced me to Bob Metcalfe back in 1981, 1980, actually, I said well Gibb - when you're looking at making investments in an early stage company, what are the criteria you look for? And so he says, well, Bill, the first criteria is the people. I said, okay, well that's good. What's the next criteria? He says, well, the second criteria is the people Okay, well, what's the third criteria? Well, Bill, it's the people. I said, well, c'mon Gibb, there must be something else as well. Okay. The fourth criteria is the technology and the fifth criteria is the market opportunity, but really it's all about the people. And that's sort of been my mantra, you know, I have a philosophy that starts with every person that I meet, I view that person as having a sincere interest of being a positive contributor to society until proven otherwise. I want that person to have every opportunity of the best advice and counsel that I can provide so that they can achieve their aspirations and ambitions, just like I was, just like, I was lucky to have run into Bill Hewlett on my first day, at Hewlett Packard, and have had him as a mentor through my entire career at HP.

Oh, I forgot to mention. I ran into Bill on an airplane and so we're chatting in the hallway there by the coffee pot and, and Bill said, well, Bill, in all the opportunities that we wanted to give you to start things at HP, why did you have to leave and go to this other company? Why didn't you just do what you were doing here at HP? And I said, Bill, I'm so grateful for everything that you did, and everything that I learned from you.

There was only one thing that that you couldn't do, HP was your company. And I wanted to have my company.

And he looked at me for a minute and he said, you're right. I'm so happy for you. And if there's ever anything I can do to help you, don't hesitate to ask. And so that kind of thing sticks with you for a long time and you remember those things and that's the way I always think of other people, if there's some small thing that I could do to help them achieve their goals and their ambitions, it would be a real treat for me.

So back to this notion of - what do I look for? It's the people. And so, for example, when I thought about Forward Networks - why did I want to promote that as an investment opportunity for Andreessen, uh, let me just, provide context there among the other things I do now, and in my third phase, I'm affiliated with Andreessen Horowitz, which is

a well-known venture capital firm here in Silicon Valley. I'm also a senior advisor to a private equity firm called the Carlyle group - kind of interesting. So, on the one hand with Andreessen Horowitz, I get to look at investment opportunities in the sort of the \$2 million range of initial investment.

And then with private equity - Carlyle. Uh, I get to look at investment opportunities in the \$2 billion range.

So it's kind of interesting spectrum of opportunities, but, going back to thinking about the opportunity to invest in, in Forward Networks, it was the same criteria. It was the people, the people, the people, and the technology behind it, and the market opportunity.

You know, when I, when I met you and I met David, and Nikhil and Peyman and, you know, I said to myself, these guys are rock stars. These are the rock stars of the next generation of networking. These people are the ones who are figuring out, you know, how the network is going to operate for the next 10 to 20 years.

And they're people with, a high degree of domain expertise, they're highly ethical, they have a goal. They want to make a contribution to the world. They're not doing it for the money. You had all those attributes that, uh, that I admire and look for.

And plus the fact that it was a great piece of technology, Peyman's algorithm, I forget the name of it.

Brandon: Header Space Analysis, yeah.

Bill: Header Space. Uh, Peyman's algorithm or the other technology.

And then, you know, there's no question in my mind, uh, that the network had to move beyond the archaic network management tools that people were still using. In fact, you know, to me, the BHAG for, Forward Networks is that, you know, just like we're thinking about in the world of autonomous everything, well, you ought to have autonomous-running networks, you know, the cars, you have a lot of these driver assisted kind of things, like we have automatic braking, we have lane change, speed control, you know, all of these driver-assisted tools to help us. Well that's where Forward Networks is. Today in terms of automating the network, all these network operator-assisted tools to help them and then making the network more resilient, more reliable, more easy to adapt and change to today's business environment, but the ultimate goal is to have it be completely completely autonomous and self operating, uh, to run itself. That's the ultimate goal, with a little bit of a sprinkling of artificial intelligence and a few more algorithms from the likes of Peyman and Nikhil - we'll get there.

Brandon: Bill, we could, uh, we could have a discussion about how soon that's going to happen, or even if complete autonomy is a good idea. And when I talk to people about

this, sometimes I say, how much confidence would you need to set foot in a car, if C3PO is doing the driving. Y'know you need to have a lot.

And I think there's a really interesting discussion to have maybe on a future episode, of what are the driver assists, versus what are the autonomous controls that we, know, that can help people in the right ways, because there's such a change needed to even get from where we are today to a lot of the exciting stuff that's on the horizon that isn't necessarily implementable, right? Where you deploy changes automatically. That's one example - or new kinds of boxes from new vendors that you want to pull into your network. All of these or open source as well, these are all examples of kinds of technology that network operators want to pull into their environments, but may not have an ability to do so, and all of these things will get them on the path towards autonomy, but I don't know that it's knocking on the door.

Bill: You know, it's, it's no different, in my mind, than as we did at 3Com by starting out with the uh, inspirational goal to Ethernet a million PCs by the end of this decade. As we talked about before, you know, looking at the change in technology from the 40, \$4,900, desktop calculator with 32 kilobits of ROM to today's smartphones - uh, you know, over the next 10 years, there's going to be on an enormous amount of technological change that will enable these things to happen. And as an entrepreneurial team, that's one of the great things - is that we get to have a self fulfilling, positive prophecy, and an impact on how those things turn out.

Factors For Success, and What Made Silicon Valley Work [00:52:34]

Brandon: Bill you're, you're an optimistic, you have an optimistic view of people and technology, and I'm curious, what advice would you have for other entrepreneurs who also have this same optimistic view of the potential for technology?

Bill: Well , that's sort of gets into a little bit of, you know, today's Silicon Valley and, maybe - let me just again, provide some context here. Y'know, what are, what are, if I were to sort of try to step back and say, what are the attributes that have made Silicon Valley so successful... there were six factors.

Let me try to enumerate them. Uh, the first factor was semiconductors in the actual geography that gave birth to the name Silicon Valley. I mean, Silicon Valley is located in a geographical location that's bounded by mountains on one side and the Bay on the other side. And semiconductors in the middle, if you will. So, you know, semiconductors and geographies is for the first factor.

Y'know, a second factor was just the culture and presence of a few large companies and in the early days there were large companies like HP, and Intel and Apple and, you know, they were sort of like icons of what you wanted to become like and their cultures - each of them had different cultures and different ways of conducting business, but they were models to emulate. Today of course we have the Googles, the Facebooks, the salesforce.com and so forth but the main point was there were these large companies that you could look to as a model.

A third factor was was the entrepreneurial example. When we were starting 3Com, you know, we had people like a long time friend of mine actually from HP days was a person by the name of Jimmy Treybig. He left HP and started a company called Tandem Computers.

Most of your listeners are probably not old enough to know who Tandem Computers was, but it was one of the early icons of a new startup in Silicon Valley. Uh, another example was Genentech, which was one of the first biotech companies as an example. And of course, then you had the Intels and the apples and the Ciscos and so forth and the 3Coms and so forth.

So the entrepreneurial example was another major factor.

Another factor was the, the influence of the network. And that was a huge factor. I mean, if you just used, if I were to just use Apple as an example in how the Silicon Valley network worked - you know, you have this guy Steve jobs who, gets together with his partner, Steve Wozniak, who, by the way, Steve Wozniak worked at HP, and he worked on the successor product to the HP 9100A, which was the very first calculator that fit into your pocket - the HP35, he worked on that project, and actually offered HP to build the Apple 1, but HP at that time, well, wasn't looking at personal computers was 1973 or 74 at any rate, but so Steve and Steve wind up meeting a guy by the name of Regis McKenna, who was in public relations.

And so Regis says, "Hey look, why don't you guys go meet this guy, Don Valentine, who is a venture capitalist at a venture firm called Sequoia." And Regis had worked with Don Valentine, both at Fairchild and National Semiconductor. So they go see Don Valentine and Don meets them and after he had met Steve and Steve, he called Regis back and he said, "Regis, what was your thinking about sending me these two renegades from the human race? It was his first description of, Steve and Steve, but anyway, he thought enough of their ideas, and said look, Why don't you go meet this guy, Mike Markkula? Mike Markkula had worked with Don and Regis at Fairchild and Intel, and had been a marketing guy, but he had retired.

So they go meet Mike Markkula. He puts together their first business plan, puts in the first hundred thousand dollars. And so Steve, Steve and Mike were the original founders

for Apple. Since Mike had worked at Intel, uh, he let some of the Intel people know about it. And that's where Arthur Rock came in, and he became an investor, and on and on and on, and so this goes on about how the network in Silicon Valley was so conducive to entrepreneurial activity.

The fifth factor was the competition for success in that, you know, you wanted to become the next HP or the next Intel or the next Apple, uh, or the next 3Com or the next, the next Cisco, the next whatever, and it was sort of that competitive drive for you to be better than the next one and to make a real contribution to the world and to society

And, and the very last, and that's the important element here. The last factor was the money. Most of the entrepreneurs during my era, weren't in it for the money they were in it to make the world a better place.

Advice For Entrepreneurs Today: The Epiphany [00:57:39]

And now, to answer your question about what advice would I give to entrepreneurs today?

The first piece of advice is that you just don't start a company for the notion of starting a company. In order to be successful, you have to have what I refer to is an epiphany. You have to have a secret that no one else seems to know yet, but you know, and so at 3Com, our secret was we knew that technology will enable us to take \$3,500 worth of cable and, and semiconductors, and boil it down to a hundred dollars, and connect millions and millions of devices together in networks.

That was an epiphany and a secret that we had because we knew that we needed to connect personal computers and that would lead to connecting other things. And that was our epiphany and our secret to success. So - the starting point is you have to have, through experience, some epiphany, that you know something that others people don't about some domain area where you're an expert.

And then the second thing is the motivation, the inspiration, uh, and, and doing it because you will, you want to make a contribution to society. You want to make the world a better place. You want to make a contribution to your customers.

You want your customers to be able to conduct their businesses better, and that becomes the driving force of doing something that enhances the ability of your customers, to conduct their business in a more effective way.

And the last thing is if you're successful in the first part of it - is you might be lucky to make some money along the way, but it's the money that's secondary, and the thing I worry about the most in today's world of Silicon Valley is people are too enamored by doing it for the money. They look at the Facebooks of the world, and the Googles, the world, and they just see how wealthy the founders of those companies have become. And they think about, well, I want to go start a company so that I could become wealthy as well.

What they don't hear about is the rest of the story about what Mark had to do to get Facebook started and what Larry and Sergey had to do to get Google started, and what Steve and Steve had to do to get Apple started and so forth and so on. It's hard work. You have to have an epiphany and you have to be willing to do it because you think you're making a difference in society.

Uh, so long winded answer to your question, but uh, , fortunately there are a lot of really, really great entrepreneurs in Silicon Valley today that are building companies along the lines of those kinds of, uh, ambitions and aspirations.

Brandon: Thanks Bill. I feel like we got to hear snippets from a bunch of chapters of a book that hasn't been written yet, but maybe should be someday. So I think we're going to bring this to a close. We don't get to talk every day to someone who begins their career next to Bill Hewlett, has Bill Gates as their product's first customer, or gets told you're doing it wrong by Steve Jobs.

And so I want to personally thank you for, for coming on and helping kick off this podcast with a bang.

Bill: Well, thank you, Brandon for doing it. And, uh, thank you all the team at Forward Networks for doing what you're doing. And hopefully your listeners will have an opportunity to benefit from all the great contributions that you and your team are making.

Good luck with it.

Brandon: Thank you so much, Bill.

The Hosts Reflect [01:00:53]

Look, not everyone has the discipline to divide up their life like bill. Most of us are a little more ad-hoc in how we do things, and maybe some of this is backronym'ing - where you go: yep. That's how things were going to happen - after they happen - but I

don't think any of that matters. And I remember thinking after the episode: "What phase of my life am I in?" "Derek? What phase of your life are you in?"

Derick: Yeah, God help me. I don't know.

Brandon: Yeah, plans never go according to plan, but Bill's did somehow.

So, my take is: Bill doesn't need to work. He hasn't needed to work for decades. He chooses to work. He chooses to mentor. He could hang out at a vineyard or on a beach in Hawaii, and he does each of those occasionally, but he stays active. You know, he's not a self-promoter, and when I mention his name, I tend to get one of two responses, either "Who is that?" "Oh, let me tell you about Bill!" Or "Wow. He's a legend in the Valley. You got to meet him. Cool." And it just - there's no in between. And I think it's because he's not spending his time posting on LinkedIn or tweeting. He's just out there contributing to what he believes in.

So on a personal note, that's why I was so interested to share his story more broadly with this audience and encourage everyone else to share it with others.

For over six years now, Bill and I have been on the board together at Forward Networks. And I'll just say that - Bill mentors with his full attention, and he won't hesitate to ask a hard question or call you out on what matters, no matter who's there. That's what you need. That guidance can't just be bought, and, you know it's coming from deep experience and knowledge and that's why you listen.

So we're at - what - 10 episodes now , and in the next weeks, we have more content coming, and as always, if you have any suggestions, especially guest leads, make sure to let us know on our website. And if you enjoy an episode, click to subscribe and do a friend or a coworker a solid, and send them a link.

Derick: Thanks for listening and we're out. See you on the next one.