

## Chatting With Vint Cerf

(Ubiquity Interview with Vint Cerf)

**UBIQUITY:** What kind of advice would you offer to IT professionals? Are there any rules for making career decisions?

**CERF:** I'd advise them to be willing to take reasonable risks. People are often a little cautious about big career changes, but what I've learned is that sometimes the riskiest-sounding decision is the best one to make. Not just because it might turn out to be the most financially rewarding (assuming everything works out), but mainly because the challenges are almost certainly going to be educational.

**UBIQUITY:** And you're speaking from your personal experience?

**CERF:** Absolutely. Although I've had several major career changes, I was extremely hesitant about making some of them. I was very nervous about going up to teach at Stanford and very nervous even about going to ARPA. I was also nervous about coming to MCI the first time, worrying that if I screwed up it would be very visible. Yet in all those cases I finally steeled myself to seize the opportunity, and find a way to muddle through and eventually conclude that I had, in fact, chosen the right path, as risky as it seemed at the time. So, when people ask, "What should I do?", my answer is usually: "Take the risky path, because that will be the more interesting one."

**UBIQUITY:** What do you say to people who choose, or are forced to choose, between a technical career and a management career?

**CERF:** Well, that's an interesting choice to make. Personally, I've been very fortunate, because I've always managed to end up in jobs which, although they are very management-oriented, have allowed me a fair amount of latitude to keep my fingers a little bit dirty. And that's fun. But what we all have to learn is that we can't do everything ourselves. At some point, you can't lift this boulder with just your own strength. And if you find that you need to move bigger and bigger boulders up hills, you will need more and more help. And the way to get help is to move into management and organize larger and larger teams of people to do more and more interesting things.

Of course, you do have to get accustomed to being satisfied a little bit at second-hand by people who actually do some of the key work. But that shouldn't stop you from being able to spend time poking around in the dark corners of the technical end of things. And I'm well known for doing that.

So, from my point of view, going into management does not have to mean that you become utterly incompetent in your discipline. But it does mean you have to accept that you don't know what you would need to know if you were going to be an individual contributor and actually make something happen.

**UBIQUITY:** Do you read "Dilbert," by the way?

**CERF:** Oh, yes. Yes. "Dilbert" is painful to read. I often wonder how many Dilbert points I might have earned for having done X, Y or Z. And that's a common question for my staff — "How many Dilbert points did I just earn for that decision?"

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**UBIQUITY:** You mentioned Silicon Valley start-ups a moment ago. While we're still thinking of the Dilbert factor, do you see any important difference between, on the one hand, companies as big as the one you yourself work for, and, on the other, little start-ups? Is life significantly different in the two kinds of situations? How are they different, in terms of how risky they are, and how interesting they are?

**CERF:** Bert Roberts, the Chairman of MCI WorldCom, often observed, even before the merger of MCI with WorldCom, that one of his biggest challenges has always been keeping MCI small even while it's getting big. The crucial question becomes: How, in a large company, do you maintain a small-company "feel"? How do you propagate authority far enough out to the edges so that people feel like they can have a say in what happens to them? A large company can be a challenge in that regard because if you're trying to manage the entire organization for aggregate results — which sort of show up in very summarized form, like earnings per share or growth of revenue and so on — you tend to get — sometimes get — rather centralized. In the larger companies, you have this tendency to get top-down direction. Especially when it comes to things like budgeting and so on, just in order to try to keep some control over what happens to the company's basic business parameters. In a small company, you often see a lot more of what goes on in a broader range of things. And that's good. People need to be exposed to what the various problems are in various parts of the business. And you can become isolated from that in a large company.

On the other hand, if you have fairly ambitious things in mind to do, often a large company is the only place that has enough mass to do it. A good example of that is the huge network that MCI WorldCom has built across the Atlantic and the Pacific and in Europe and other parts of Asia, which simply would be impossible for a small company to do — to have enough capital, for example, or other available funding to make the investment.

So, for me, working with larger companies has often been very satisfying, precisely because of the ability of bringing critical mass to bear on a given effort.

Of course, I've done small company things, too, but most of them have been nonprofit organizations, such as the Internet Society, and I'm on the board of a number of small companies. And, of course, I see the other side of that coin, which is that everybody gets involved in coming to decisions. Sometimes that can lead to a difficult problem for the CEO when he's got everybody expecting to participate in making a decision. And there might come a time when the CEO has to decide and nobody else, and that often surprises people who were accustomed to the group decision-making style of a very small company.

**UBIQUITY:** Let's go from company size to company purpose. There used to be a lot of talk about converging technologies, but the talk seems to have faded away.

**CERF:** Well, that's interesting, because, for me, the word "convergence" still has significance. We're certainly seeing increasing instances of combined media showing up on the Internet, though not with uniform quality everywhere ... it certainly is not the case that sitting at your laptop you can expect to see a 30-frame-per-second-video, at least not very often. However, an enormous amount of both sound and video has been showing up within the World Wide

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Web framework ... and sometimes outside of that framework in a multicasting kind of implementation.

What I expect is that we will see more and more of that as the speed of access to the Net at the edges goes up. Once you get past a few hundred kilobits-per-second, it's possible to deliver pretty good quality video and sound. And that's well within the state of the art for cable modems and for digital subscriber lines. Over the next three to five years, we will see an increasing amount of real-time or on-demand delivery of both sound and video.

**UBIQUITY:** How will that be perceived from a consumer point of view?

**CERF:** Well, from the consumer point of view, go on the Net today and even if you're on a simple dial-up line of 56 kilobits, or even maybe 28.8, you can pull up a small video on demand. It's not necessarily terribly good quality, but have a look at ABCNews.com - and look at Sam Donaldson's stuff, and you can pull up the 15 or 20 minutes of television that he's done over the Internet. Although the imagery is not spectacular and it's a small screen, it actually works out very well for the kind of "talking-heads" things that Sam typically does.

I find it both amazing and also, on analysis, really not too surprising that it's very useful to be able to pull up 15 or 20 minutes worth of audio and video, because even if the video is so limited there's a great deal of information buried in the sound.

**UBIQUITY:** Where will it lead?

**CERF:** I'm beginning to believe that it won't be terribly long before it will be quite commonplace for people to use the Internet to pull up real-time video, or video-on-demand. I'm not arguing that that's somehow the holy grail of Internet services, but it's fair to say that when you can do that, it means that you've got to the point where there's enough capacity in the network and enough reliability that the quality is acceptable for wide-scale uses.

**UBIQUITY:** How do you see those developments affecting such things as education?

**CERF:** The impact of the Internet already is, and will continue to be, enormous. However, I am more and more convinced that the educational establishment is going to find itself not so much being totally "transformed" (which is what some people seem to feel) as being significantly enriched by an ability to augment and adapt its product. The product, of course, is education, and the augmentation and adaptation will be made through and by means of the different alternative media. It would not surprise me to see notable campuses, like Stanford University, putting up classes that are on the Net and are for regular credit and are accessible virtually anywhere. In fact, it's my understanding that this kind of thing is already being done to some extent at the Computer Science Department at Stanford.

**UBIQUITY:** Will the impact of technology on education result in an increasing partnership of academia and the private sector?

**CERF:** Well, only in the sense that, as we've known for a long time, if you're in the engineering discipline, you can't stop with your four-year Bachelor's degree or your two-year

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Master's degree. You have to continue to be exposed to new material and to be more educated because things are changing very, very quickly. And as a result, we in the business world will be looking to the academic world to package their educational goods in ways that are accessible to our engineers on a better basis than having to go full-time.

This was often referred to as "life-long learning" back in the '50s when television was first coming out and people thought television would be used to deliver a lot of educational material. Of course it sort of didn't work that way, although it's fair to say that there are, in fact, regularly scheduled lecture programs on television, though it has never been as big a thing as many people hoped it would be. However, I think the Internet is going to change that. The Internet is destined to make a very significant contribution to the expansion of educational opportunities and the improvement of information delivery.

**UBIQUITY:** How is life-long learning handled at MCI WorldCom? Is there a particularly aggressive educational program for employees?

**CERF:** We have a pretty broad educational program. The delivery vehicles vary. Some of them are videotapes that get distributed. Some of them are on the internal television system that we operate. And some of them are beginning to move over into a Web-based mode — less to take advantage of video than just to improve the distribution of canned presentations that are basically PowerPoint kinds of things with some audio associated with it. At some point, though, we'll also see more video conferencing for interactive kinds of learning.

Frankly, interactive video conferencing is still something of a challenge in the Internet world, because the delays for interaction occasioned by store-and-forward packet-switching are not always easy to overcome. And if you have too much delay, then the interaction becomes very awkward. You get into the "push-to-talk" and "over-and-out" kinds of modes, which are not at all natural. So, low delay is very important.

**UBIQUITY:** Let's switch to something else that's important, and ask you for an update on the Cerf family. You have two sons, right? Are they going to follow in your footsteps?

**CERF:** Yes, two sons, David and Bennett. Actually, they have both decided to go off in a somewhat different direction. However, I can report that genetics does seem to work. Both of them are involved in some form of video or film post-production work. The older of the two, David, is in San Francisco as a freelance video and audio post-production engineer. Bennett is just finishing his last year of college at The College of Santa Fe in New Mexico. Bennett's interests tend to be more towards film, rather than video, but we're all beginning to notice that HDTV is becoming increasingly the medium of preference for visual storytelling.

Both sons are photographers, and the older of the two is also a musician, who composes and also plays several instruments — piano, guitar and so on. My wife is an artist, and so it's pretty clear that the boys have inherited my own interest in computers and my wife's interest in arts. It's quite phenomenal. It's the sort of thing that you would predict, but never really quite expect.

**UBIQUITY:** What sort of general advice would you give to young people that you didn't know

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as well as you do your two sons? For example, would you be inclined to insist that they get a good general education? Or specialize on something technical? Or what?

**CERF:** Well, of course it would depend on the specific individuals who were being advised. I think the first thing I would say to them is that education is still, by far, the most important investment that anyone can make, and so time spent in the classroom will pay off in many dimensions, some of which are not always predictable.

Second, they need to take time to read. I don't care whether it's reading a book or reading on the Net, but reading is important. They need to get the reading habit. It's a marvelous way of ingesting new information.

The third point I would make is that they need to get to know the Net, which is already important, and will become ever more important; it will be an increasingly significant source of both information and communication as time goes on.

Of course, the good news is that most young people today are quite comfortable with the Internet. They expect to have e-mail; they expect to be able to surf the Web; they expect to hang out in chat rooms because that's just the way things are. These are all good developments, and they need to be encouraged. The Internet is simply going to be surrounding us and permeating everything. Not paying attention to it would be a bit like ignoring electricity, both of which would be silly things to do.

On the other hand, getting a liberal education, in my view, is tremendously valuable because you might not have time in the future, to read some of the things that you get to read if you were taking a liberal arts course. I remember taking History of Western Civilization at Stanford, and although I struggled with parts of that course, I look back on it now as a wonderful period of freedom it was. I had no other responsibilities. I could actually sit down and read Kierkegaard or I could read Alexis DeTocqueville, and today I would be hard-pressed to find the time to sit down and do that. So, I prize having had the time and the freedom to do that, and I feel that a liberal education has served me well...

On the other hand, I'd be lying to you if I didn't say that becoming an expert at something was pretty central to my career. The most important thing I did was to learn a lot about computers. That doesn't mean everybody needs to learn a lot about computers. It just means that everybody should learn a lot about something, and be expert at whatever it is that interests them most.

**UBIQUITY:** What do you think you'd say would be your greatest hope for the Internet, and your greatest fear?

**CERF:** My greatest hope is that the Internet will become affordable and accessible to essentially everyone on the planet... and my greatest fear is we won't figure out how to do that. I don't accept that we need to put up with a "digital divide" between those who have and those do not have access to the Net. One of the most determined efforts that I know about is the Internet Society's new task force that's looking at the economic and social impact of the Internet and trying to find ways to make sure that Internet, in fact, is for everyone.

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**UBIQUITY:** Your concerns are very much appreciated by the entire Internet community, and by everyone who wants not just a better Internet but a better planet.

**CERF:** Well, in that regard, I'm particularly fond of observing that the earth is not sufficient anymore. There's the universe beyond. And so some of us are working together with Jet Propulsion Lab engineers to design an interplanetary Internet to support space exploration and, perhaps, someday the commercialization, if not colonization of the other planets and bodies of the solar system.

It's one of the most exciting projects I can think of, because it's going to take a period of anywhere from 25 to 40 years to actually flesh out the interplanetary backbone communications system. It's a vital project, because as we move out further into space we'll need high-quality communications, especially if we have people out there. And, of course, it doesn't work the same as it works on earth because the delays are enormous. From here to Mars and back could be 40 minutes or more.

**UBIQUITY:** Do you have a URL where people can go for more?

**CERF:** Yes. If you want to look into that, I have a number of things about it at [http://global.mci.com/us/enterprise/insight/cerfs\\_up/](http://global.mci.com/us/enterprise/insight/cerfs_up/)

**UBIQUITY:** Great. We'll look forward to visiting with you there. Good luck with the project, and thank you very much for chatting with us.