Transcript
# Lecture 14: Exciting Conclusion

**Hour 1**

**(00:00:00)**

DAVID MALAN: Welcome to Computer Science E-1. My name is David Malan. And it was about seven years ago when I first uttered those words. It was February of 1999, when I took over this course.

And back then, there were no streaming videos, really, certainly not in the popularity that they are today. There was no podcast. There was no Distance Ed. There was VHS.

So back in the day, we used to film these lectures on VHS so that students, not abroad and so forth, could watch them, but so that our own students—if they missed a lecture or wanted to catch up—they could actually review the tape. And it was kept down the hallway in the library.

The funny thing back then is we didn't throw many resources into these VHS tapes, and we would have the teaching fellows rotate through each week. And each week film one of the lectures. And, back then, it was mostly my friends who were teaching fellows for the course, since I was an undergraduate at the time.

And we have a lot of videos where the camera is doing a really nice job during part of the lecture. And then, "zhump," when the TF, or cameraman, would fall asleep.

So, Chris Mehl has done a much better job in recent years of filming us. But I thought, if you'll indulge me down this walk down Memory Lane, I thought I'd give you a few seconds of what this class was like in 1999. Here we go.

(music plays on video, then stops)

DAVID MALAN (on video): All right, let's stop it repeating there. Let me just tweak this microphone for a moment. Can everyone in here in the back hear me all right?

Students in video: Yes.

DAVID MALAN (on video): Any need for more? Okay.

Welcome to Computer Science E-1, "Introduction to Personal Computers and the Internet." My name is David Malan, and I will be your instructor for this semester.

Some of you may recall a woman's name, Laura Knobel-Piehl, on the original course catalogue. She has since moved to Minnesota, and I've been asked to take over the course in her stead. But I promise this semester you will have a fantastic time. And by the semester's end will walk away with a firm grasp of both what computers are as well as what the Internet is.

Before we begin, let me take a quick survey of people. How many people here actually have a computer at home, if you could raise your hands?

That's fantastic because it will make our lives easier.

How many people—and it's okay to raise your hand to this one—have never actually used a computer before? There's no shame in this.

Okay, that's fantastic. This course will be...

(video stops)

DAVID MALAN: Everything was fantastic back then, apparently. And I don't think I was ever as nervous as I was that week. I probably didn't eat for days before that class. Because I was still... I was a senior at the time. And as that guy said, Laura Knobel-Piehl—who was the original architect of this course, a boss of mine at FAS Computer Services, whom I worked for as an undergrad—had invented this course, probably in 1997, or so.

And before this, at Harvard Extension, at least, there really was no introductory course, no survey course. There really was no entry point for folks who either wanted to pursue somewhat technical academic programs, or even just wanted to get some more savvy for their own personal edification.

So this course really is the result of her vision, way back when. And she moved, unexpectedly, partway through the year. And a gentleman took over for about a semester or so, Bill Barthelmy, who was the second instructor for this course.

And he too did a wonderful job bringing the course closer to what it now is today. And it was in the spring of 1999 that he decided to step down and focus on his full-time job at FAS Computer Services.

And they tapped me, this little old Harvard undergrad, who, uh... At the time, we kept it very quiet as to the fact that, not only was I the youngest kid in the room, I was also the only one without a degree, at the time.

That's why you see me dressing in suits, and I even had suspenders on under that suit, at the time. I wore glasses. I did everything I could to come across as something far older than I was. And I bought myself a few years.

And these days now, you know, this is... Dawne was surprised to see me tonight, because I think I've let myself go since, with jeans and t-shirts in class, and so forth. So I thought I'd spice it up a little bit tonight.

The point, though, is that this is the eleventh time that I've taught this course. And it's been wonderful.

This is the last time that I'll teach this course. So this is the final E-1 lecture that I will ever give. And for me, that's why I've probably not been nervous in this class since the first lecture of this year. I'm always nervous the first lecture, since I don't know anyone in the room, really. And that's kind of intimidating seeing all these fresh faces staring... literally staring down at you in this lecture hall. But then, fortunately, by Lecture 2, I realized that you all are pretty much okay.

But tonight what I'd like to do with us is, one, take a look back at where we, this semester, started the course; take a look forward as to where you might go academically, just with technology in the future; certainly say a few thank yous to those who have helped out in the class; and also just give you a sense of what you yourselves have been a part of, particularly with respect to the course's podcasts.

So, without further ado, we have over the years, tried a number of experiments in this class.

("Mission Impossible" theme music playing)

Oh, and there are a lot of little things tonight that I've tried to intersperse that really make sense only to me. This, for instance, was the very first song that was played in E-1 at that first lecture. So I thought it would be apropos for me, at least, to hear it again.

(music stops playing)

But, with that said, we've tried a number of experiments in this class. The one of which you are probably most familiar with is this guy, the Podcast that we've been dabbling in for the past year or two.

       Note, on screen: slide #2

And that's been one of the fun things about this course, is, over the past several years, we've tried a number of tools, techniques, ideas with which to familiarize our own students with technology and computers; make them more a part of the course, so that I'm not just some talking head at the front of the course. But rather, the students themselves and, beyond just Workshops and Sections, are actually engaging, either intellectually or hands-on with some of these technologies.

We tried, for instance, way back when, when the course had a different Website, a sort of... You know that the course Website now has that Resources page, with links. Those are, pretty much these days, links sanctioned by us.

Well, there was a time where students themselves could post to that Web page links that they liked to frequent; post a little description for them, so that their fellow students could see what kinds of links other people were making use of.

And you have to realize, too, back in 1999—though it would be cute to say that there was no Internet back then, and there were no computers—there certainly were. But certainly not to the extent that there are today.

And there were certainly several hands that first night in '99 that went up, that said, "I don't even own a computer." We had a couple of people who had never used a computer. And we had people certainly who'd never used the Internet. And it really was a different audience.

And the course has had to change over the years, such that these days, pretty much all of you came into this course with some savvy with computers; maybe a bit of a fear factor. Maybe you weren't quite the type who could problem-solve technical problems on your own. But odds are, you were using a computer nonetheless eight hours a day at work; or at night at home; or you had some basic skills. So the course has certainly adapted over the years.

Well, that one experiment, where students could post their own links to the Website: absolute failure. No one ever did it.

So we put it aside and we tried something else. We had a course listserv for a number of years. A listserv is just an email list. We put all the students on it and we invited them to talk with one another; post questions; post answers; discuss things on the listserv. That, too, a complete failure. Never really worked.

We tried using a listserv last year, in a last-ditch effort to breathe some life into it, requiring that students, for those movie reviews: If they wanted to get extra credit on a problem set, they'd have to share their thumbs-up or thumbs-down not only with us, but with the class, on the listserv. The only emails that ever went out on the listserv were movie reviews. So it didn't really speak to its academic value. So we scrapped that.

We, for several years, used a system called the Personal Response System, PRS, which essentially are these little infrared-based remote controls, which we fondly called "clickers." These were not so much a failure. We don't use them terribly much these days.

But imagine, if you will, an experiment in which all of you had these little remote controls in your hands. On these controls is a keypad, from one to nine, and zero, and a couple of other buttons. And we used these for a number of semesters to engage students in Q&A, sort of anonymous Q&A, such that if I posed a question in multiple-choice form, we could survey the students by way of these clickers, and they would buzz in with answer 1, or 2, or 3, or 4. And then we had some neat graphing software that would show us how many students guessed A, or 1; how many students guessed 2; how many students guessed 3. And it was always fun, of course, because though it was anonymized, we could always make fun of the students who, you know, were in the wrong bucket on the screen.

And that was sort of an attempt to get students to be a little less hesitant to answer questions, right? Raising your hand, especially if you feel like you know less than everyone else in the room, is kind of a scary thing, especially if you're wrong, and, you know, I make light of that, after the fact.

So we used these clickers. And those worked well. I am not convinced they have particularly pedagogical value, as much as they have entertainment and sort of fun value. But nonetheless, we used those for quite a while. And usually—we didn't do it this year—we used to, even that project,

we began to use just to vote for mousepads every year. So you would buzz in for your mousepad choice. But this year, we did it the old-fashioned way on paper-pencil.

So the short of it is, this class, not only in having students acquainted with a whole bunch of material, we've also tried to experiment with a lot of technologies. And the most current of which, and daresay the most successful of which for our own students and beyond, we think, has been this podcast.

So it was around Fall 2005, in September, when podcasts really were just starting to catch on. This is just over a year ago. They'd sort of existed under that name or others for quite some time, perhaps. I mean, at the end of the day, what's a podcast? It's just like a feed of MP3s; now movies, PDFs, right? It was just a marketing term, really. It was just a buzzword around something you could have been doing for years.

**(0:10:00)**

But it began to gain traction. And this term, "podcast," sort of came my way. And, you know, truth be told, I think said to Rei, in last August maybe, last September 2005, you know, "Hey, Rei, let's podcast E-1 this year."

Then I think, five minutes later, after I'd finished talking with Rei, I went on Google and looked up what a podcast was. And Wikipedia gave a very nice definition of what it was I had just committed us to.

At the time we were only podcasting in audio. So I had, in addition to these wires, yet another device, an MP3 recorder, that was recording everything I said. We used it in some sections and workshops. And we posted that material on the Web, and in iTunes, and the podcasts for students in the course to download.

And it was also just publicly accessible, if anyone else wanted to sort of see what this class was up to.

Well, around last October or November, Apple released the video iPod, and we quickly went back and redigitized all of our videos in QuickTime format, using an MPEG-4 codec, so that we could also distribute the videos of the course as well.

That landed me for a while in the Provost's Office, because we had a nice little discussion with the powers that be as to what it meant to be podcasting courses at Harvard Extension School, or at Harvard, in general. And everything certainly worked out for the best in the end.

But it certainly raised a whole bunch of issues that even other universities are continuing to consider and discuss, as to exactly, one, what the value of technology like this is, opening a university's doors—whether this one, or Harvard Extension or any other school—to the public at large, as well as to its own students. And also, two, just, you know, maybe they should be doing this in first place.

And I've sort of come around to thinking, with these kinds of technologies—especially when we have so much information being uttered in classrooms like this, and others, at this school and

others—that it perhaps could be one of the most significant things for universities to start doing: to start opening their doors virtually to the world; not only in the U.S., but other countries, and just making available, at relatively low cost, what is already being produced in some of this country's, certainly, dominant universities.

I think it's a powerful thing. And for that reason alone, I think it's been exciting to sort of be pushing the envelope, or getting ourselves in trouble at times, just to see exactly where something like this might go.

With that said, I thought it would be fun to reveal to you some of what you've been yourselves involved with, and what your past semesters' student body were involved with.

This podcast again was launched in September of 2005. To give you a sense of what logs suggest subscribership has been to this podcast—certainly not just among our own students, but in the world at large—this is a chart showing the number of downloads, so far as we can tell from logs that we've maintained, as to how many times each lecture or workshop was downloaded in either MP3 or QuickTime format.

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And you'll see that Lecture 1, for instance, last year, logs suggest was downloaded over a twelve-month period over 10,000 times. Things like Lectures 3 and 4, and Workshop 4 and 8, sort of average out, or, sort of reach equilibrium at about 8,000. So we actually suspect that last year's podcasts had, again, not just in our own walls, but a subscribership: 6,000 to 10,000 people who tuned into the class that you folks have been tuning in to, in this particular year, which was quite remarkable.

Because certainly at the time, we had no expectation as to really there being any benefits or any interest in the outside public. For us, for Rei and I, when we discussed this way back when, the value was just in letting students—if they missed a class or wanted to review a class—be able to review that class, or watch it, or listen to it for the first time without, honestly, the—you know, it's all relative—but the inconvenience of having to sit down at their computer and watch a streaming video, or listen to a streaming audiocast, right?

We've come a long way from VHS. And just putting this stuff online was a huge marginal gain, probably, for students, in terms of convenience.

Well, when you start to get used to things like iPods and wireless Internet access, it actually becomes, I think, a virtual tether if, to engage in this kind of material, you have to be physically online, or you have to be streaming on a relatively slow connection the data.

And so really what this podcast was for us was just a marginal change, a marginal improvement, perhaps, on the media that we were providing our own students with already, so that they could listen on the subway to their MP… I mean, frankly, it's a whole other question as to why you'd want to be listening to computer science on an iPod in the first place. So let me disclaim that, all right?

You know, I'm not sure I would watch myself on an iPod, or on iTunes, or whatnot, so that much I concede.

I think the value is in the technology, not so much the guy in the technology.

But with that said, it simply gives students options. And it gives them another angle, another means of access to courses' content like this.

Numbers we also looked at last year, between '05 and '06, were where people were coming from. Most subscribers appear to be coming from the United States—just over half.

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But we had folks from Germany, Australia, Japan, Canada, the United Kingdom, and then a whole bunch of other countries, who made up a smaller percentage. But there were over fifty countries represented in the logs, so far as we could tell.

This year, as we mentioned a few months ago, we had some serious bandwidth problems. Fall semester '06 began, and we crippled the Extension School's server, and were nicely asked to leave the Extension School's server.

So we turned to outside resources. And when we began looking at the logs—this is November '06, so just a few months ago; and December '06, just a month ago—we had experienced downloads on the order of just shy of 4 terabytes (4 TB) in November, and over 5 TB of data were downloaded from the podcast in December.

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Now, you have to consider that these videos themselves are large. So they're 200 MB to 300 MB. So these numbers, while big, you sort of have to divide by 10 or 100 to get a sense of the magnitude. But even so, when you consider how many individual people were downloading the content, it seems again to be in the thousands. And I'll show you a couple of numbers in just a moment.

This, I thought, is less related to the podcasts; more just fun with logs, as we suggested in our "Security" Lecture. I looked at the key phrases that people have apparently been typing in to Google, and Yahoo, and so forth, to find E-1, or find its podcast, or at least content like it.

> Note, on screen: slide #6

And apparently, and perhaps not surprising, if you type in "lecture" and "Internet," somewhere along the way E-1's podcast will come up in your favorite search engine. Also our log suggested that people had found us via "Harvard lecture." Seems reasonable as well.

So "police dog training" apparently leads to Computer Science E-1's podcasts. So go figure.

"Harvard Extension School Problem Set 4". I daresay that was one of you, looking for your Problem Set 4, given how specific it was.

"Upgrading a PC" similarly leads to us.

And, no joke—and mind you, this is the censored version of what I'm showing you—apparently for "great sex" you could come to Computer Science E-1. Apparently we've got some videos floating around that maybe I'm not aware of.

But those are among the search terms that apparently lead to E-1's podcast.

So what have the specific downloads been like?

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Well, here's a graph of just the last three weeks of November '06, so just a month or two ago. And Eugenia's Workshop 8 currently, according to logs, has the distinction of being the most popular content downloaded in November, with about 2,200 people downloading that particular content. And again, you have to take some of these numbers with a grain of salt, because we can only infer from the logs. But that seems to be a reasonable lower bound on the number of times these were downloaded.

Dan's Workshop 10 was clocked in around 1,600 or 1,700 downloads. And I hope these two are beaming that they completely trounced David Malan's lectures, which were the three least popular downloads in November of '06. But there we have Lectures 8, 7, and 9.

And to look in December, had similar results.

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Eugenia was hot in December as well, with her Workshop 11, with over 3,000 downloads. The TFs' Review… There's a pattern here, right? The TFs' Review 2 came in just shy of 3,000 downloads in December '06 alone. And then whoever it was doing Lectures 12, 11, 10, and 1 was in last place in December as well. So that's great.

And it's sort of... what's amazing, to be honest, is just these numbers—the fact that, as a side effect of our interest in just engaging our own students in, you know, tetherless iPods, and iTunes, and so forth, for the course's content—that it's had this sort of effect, or this fringe benefit of others tuning in as well, and finding their way not only to this class, and asking us, "Hey, how can I enroll next semester?" but also just to Extension, and some of the other courses that have begun this experiment as well.

Finally, just to make sure these guys are properly recognized for their popularity on YouTube, where some of these videos have been as well: Dan's Video of the Week, from Volume 4, "TCP/IP," has had over a thousand download on YouTube alone.

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Dan's Volume 2: "Browser Wars" has clocked in over 1,000 downloads, and then Rei's "Installing Windows XP" similarly popular on YouTube, as well.

So, it's remarkable. And we share these, not so much to... more out of, certainly... more out of amazement as to what has happened with this experiment, than certainly out of pride, or anything like that.

So we hope we offer these just as data to sort of offer you a sense of what you, yourselves have been involved with, or the project that you have involved with.

So none of this, certainly, would have been possible without these four folks today.

Note, on screen: slide #10

And what we're about to do is going to sound like we're winding down to a thank you and good night. But there's more to come, right? We clearly have something to do here tonight. And we've a retrospective as well.

**(0:20:00)**

But I wanted to take a moment, before we go on too long to recognize these four faces, who look much prettier in person, right? I blew up very small JPEGs. And you know, from your Multimedia Lecture, why they look so bad on the screen at this resolution, because it's only, like, 46 pixels across, and I blew it up.

But also listed here on the board are teaching fellows past, who have been involved with the course since February of 1999. And if you would indulge me with a round of applause for these four.

(applause)

If you would take a...

I'll say a quick word about each of them, if I may.

Rei Diaz has been involved with this course now for several years. And it was two years ago that, midsemester, Rei took on the gargantuan task of filling in for a few teaching fellows, who were no longer able to continue with the course. And so we had holes in the schedule of two sections. So Rei stepped up and literally began teaching three sections simultaneously. And I wish I hadn't used the moniker back then. But he was presented with, back then, a plastic Superman doll, which sort of captured the fact that he really was a Superman that semester. And he's certainly done an outstanding job since, as the continued Head Teaching Fellow.

Eugenia has been with us this year. And she is the result of several months... We started, honestly, recruiting for teaching fellows months ago, right? Because it's much easier to do this over a period

of time, and sort of ideally have your pick of folks. And we posted to various sites locally at Harvard, at MIT, craigslist; really anywhere we could think of where we might reach out to some technical folks. And Eugenia was the result of several months' search, and we've been thrilled, certainly, that she said yes to our offer. And has both been teaching and learning, we think, along the way with us. So thank you for that as well.

Dan Armendariz has been with the course for a couple of semesters now. Dan and I met at MIT, where we were both EMTs, emergency medical technicians, riding ambulances and such, though we never together rode the ambulance. That makes it sound much sexier than it really was. We met because, at the time of being EMTs, which is factually correct, I was also the Webmaster for MIT's Emergency Medical Services, and Dan was the guy who took over the Website for MIT-EMS. It's not nearly as cool when you say you met because of a Website. But we were officially at the time EMTs.

He's been with the course for two years now. And is certainly our unofficial and official Mac guy, and the guy, as you've seen during lecture, I'll turn to and ask questions of when I don't know the answer. And he too has been fantastic to have on the team for the past couple of years.

Finally, Chris Thayer hasn't officially been on the team, but has sort of become on the team over the past several months. Chris is a former student. So she was part of Fall 2005, and all of that. She has this semester volunteered way more hours than probably any of us have put into the course ourselves in helping with our video productions.

So the "Video of the Week" project that we took on—with the support of the University, producing some sixty Videos of the Week that will continue to remain available after the course's end, if you haven't even had time to dabble in that content—has certainly been furthered along with hours and hundreds of emails that I've gotten at 2 a.m. and 3 a.m., from Chris, who originally was just volunteering her own time, just to help out with this video project. And so much of the videos that you've seen this semester would not have been possible without her as well.

So if you'll indulge me once more. Just a round of applause for these four.

(applause)

Thank you so much.

This is going to sound like the Academy Awards, for just a moment.

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But Chris Mehl, who's the man you never see in front of the camera, but is always behind the camera, has been wonderful to work with, over the past few years, right? When we finally got rid of the sleeping teaching fellows and started using professionals to film the course, the videos have been fantastic. And of all the videographers we've worked with at Extension, Chris is awesome. Honestly, this man here, we personally request him via email each semester. Because, not only does he just film the lectures, which is one thing—and he doesn't fall asleep, which is also to his credit—he

really, if you watch the videos, and maybe I'm talking to the wrong crowd tonight, given that you're physically here, but he really gets into it. And does a really nice job, I think, of capturing what's going on down here, when Dawne is up volunteering some evening; capturing what's on the screen, and just really giving a good video experience. And we hope you've appreciated that as well.

Behind the scenes, Kriss Barnhart is the woman who does our post-production, who takes the videotapes that Chris makes each week; puts them into machines, and does her magic, and out comes some real videos, and the synchronization of slides, and so forth. So she too—and I'm hoping she actually watches these videos, and doesn't just fast-forward through us, because she'll too get this thank you from us.

A few other people, if I may, and then I got some juicy stuff for you here tonight.

      Note, on screen: slide #12

If you haven't seen *Wired* magazine, by way of author Jeff Howe was kind enough to make mention of E-1 and its podcast in its December issue. And we're very grateful, certainly, for the comments and the attention that he further brought to E-1's podcast.

Victor Cajiao, who was our guest lecturer, if you will, when we did that Skype demonstration.

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And he had that huge face beaming down at you on this twenty-foot screen via videoconference. Victor is a fellow who's had his own podcasts for a while. Currently most germane to the course is his "Typical Mac User Podcast," in which he takes questions and gives answers, and generally just talks about what it's like to be a Mac user, converting to be a Mac user. And early on, last year, he was wonderful in just drumming up attention for E-1's podcasts, and really helping us get the podcast out there. And for that we are certainly grateful.

Finally, in the commercial end, Jake Fisher, at Switchpod.com.

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Switchpod is a startup; started a couple of years ago. And I—don't quote me on this, but from my own research, Jake, I believe, is 16 or 17 years now. He was one of these crazy kids who starts a company in his parents' home, or dorm room; sells it to another company, and what you have here is Switchpod.com, which has been generous enough to host our podcast, gratis, for the past several months, and help us sort of deal with the thousands of downloads that you've seen. And it was Victor who referred us to Jake, so we too are grateful to Jake.

Here's where I'll wave my hand and not bore you with the Academy-type speech, but there's a whole bunch of people who have been instrumental in making this course possible, from 1999 until now.

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And thank you again for indulging me in this. Thank you to all of them. This is most of them. I'm sure I forgot one or more people. But the beauty of the Internet, and PDFs, and podcasts is that I'll just go change the document, when I realize I've forgotten someone, and put them back in retroactively.

Finally, literally, finally, Dr. Henry Leitner.

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So this effectively my boss. He was one of my CS professors, as an undergrad. Henry Leitner, he's one of the deans at Harvard Extension School. And is really one of those people—I don't know if you all have found one of these people in your life; I was sort of surprised that it happened to me already—that really influences you, and gives you your chance, and takes risks on you. And I'm sure it was kind of a crazy thing at the time, when he quietly had some kid filling in for Bill Barthelmy, when he stepped down, to take over E-1. But he took a chance on me. And for eleven semesters since, I've been lucky enough to continue to be brought on for this course.

And it is to Henry that I am eternally grateful. He's one of those guys, where… you know, I started off as an undergrad as a gov major—which maybe is fitting, if people who like to hear themselves talk, as we apparently are doing tonight—but eventually changed to computer science. And it was… the only reason, I think, that I ended up involved with E-1, or even teaching in general, was because I ran for student government, at Harvard, and lost, and lost really badly.

And I remember all too vividly the elections debate—one of these debates where it was me and a bunch of other sophomores or juniors, you know, all dressed up like this in some Harvardesque lecture hall, and debating each other over, like, the quality of food in the dining hall, and why there are no parties on campus, and these kinds of things—and I did horribly. Like, it was embarrassing how poorly I spoke, and how poorly I presented myself. And I don't know if this is the typical solution, but I decided to fix this by teaching!

So, I was an awful speaker, so I decided, if I started pursuing teaching fellows' roles—I was one of the TFs for E-1, when Bill taught it, in 1998, in the Fall thereof. And I sort of used that as the motivation to get in to all this.

So it's sort of funny, I think, just to look back on little incidents like that, where you make one relatively simple decision, or mistake, even, and it kind of influences things along the way. But none of this would have happened without Henry.

So thank you for indulging me in these past many minutes of retrospectives.

And now, welcome to Computer Science E-1.

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This is Lecture 14, "Exciting Conclusion." So, over the past several months, we have looked at a whole range of topics. And bear in mind, that one of the first pictures you saw, upon arriving at Lecture 1, or downloading Lecture 1, was a PDF containing a picture of a hack at MIT.

Does anyone remember what this picture of an MIT hack was? Yeah?

STUDENT: (inaudible response)

DAVID MALAN: "Water thingy"?

STUDENT: (inaudible response)

DAVID MALAN: Water fountain, yes! So, years ago, as MIT is popular for, one of their hacks was to have some clever kids connect a fire hose—working, as I understand it—to a water fountain. And then tacked on the wall just above this, recall, was a sign along the lines of "Getting an education at MIT is like drinking water from a fire hose."

And we've sort of usurped the idea, the spirit of that hack, and tried to warn you, on page 2 or so of the Syllabus, that there's just a huge amount of content in this particular course.

**(0:30:02)**

And it is certainly our expectation and our understanding that if some of that went this way, that was to be expected. And certainly, by course's end here—even if you didn't get 100 on Exam 1 or 2; even if you're thinking, "MIT hack: What was that?"—that's okay. It wasn't all supposed to go down.

But what hopefully you'll exit this course with is just—even if it's a marginal bit more confidence that, heck, if you don't know the answer to something; if you're not sure how something works— you know a half a dozen Websites you can go check; you know half a dozen people you can go ask; you know half a dozen tricks, Internet keyword searches, and so forth, that you can use to solve those problems or those questions on your own.

Among the things we did in Lecture 1 was focus on hardware.

     Note, on screen: slide #17

We didn't really talk about these, but these are sort of toys that I have in my apartment that are germane to hardware, including this newest, sexiest of telephones, the BlackBerry Pearl. And I offer this, one, as just a...

Originally, this slide contained binary numbers. And we were going to do a little exercise in what were these binary numbers. Do you remember the binary numbers we did with light bulbs, and there were five rows, and then we spelled out "9-0-2-1-0," and then I played the 90210... We've done that too many times. I think it wasn't funny the first time either, perhaps.

So, Hardware: What's the relevance of this stuff? It's the omnipresence of it. We talk in this course, early on, certainly, about hardware at its most basic level: bits. And we talk about registers, and CPUs. And ultimately we spend more time talking about laptops, and desktops.

But the fact of the matter is, and this is not a surprise, computers and technology, and the sort of stuff we explore in this course really is all around these days, such that the cell phones we all have, most likely in this lecture hall, are little computers. For years have your cars had computers in them. The TiVo is just a Linux box, with a sexy interface on top of it that let's you save TV shows as they're broadcast. The Slingbox, which we've used before lecture a lot, is just a little computer that uses some type of multimedia codec to take a video feed, quickly wrap it up in, like, some MPEG-like codec, and then stream it out on the Internet.

So already here we have the notion of an operating system, meaning Linux, and hardware. We have the notion of streaming. We have the notion of MPEG-like compression. We have the notion of—how can we tie this in—wireless Internet connectivity, and just the fact that it is a little computer.

And I won't ask that you indulge me in playing with this phone. But it really is the coolest thing. You can get Google maps on this. You can look up the Internet. I'll be sitting at dinner lately, and if some random question comes up, I'm the geek at the table who's like, "I'll answer this," and then type into Wikipedia, or Google, some question, and we get the answer immediately on demand.

But the point is that pretty much everything we talk about in this course still applies to all of this hardware. Inside of all of these devices are bits in some form; are registers; are pieces of memory: flash memory, ROM. All of that continues to be present in even today's most advanced devices.

Just released yesterday was the Apple iPhone.

      Note, on screen: slide #18

And if you didn't see the announcement already, go to apple.com after class, or pull up CNN, or MSNBC. Everybody's talking about this thing. This is a new cell phone that'll be out in June or so of this year. It is entirely touch-based. So there are very few buttons on this thing, and pretty much the whole menu interface that Steve Jobs demo'd yesterday at Macworld, is about showing you what you can do on this particular screen.

And there's some neat little effects. And what this really is, is sort of a nice marriage between good hardware, fast hardware, and increasingly well designed software, the aim of which is to just make these things easier to use.

The point Steve Jobs made yesterday in the keynote, that some of us were watching tonight before class, was that, you know, even just to call... it is hard... My mom hates it when I use her in examples. But this is the last time I'll do it.

For me to pick out a cell phone, even, for someone like my mother, who just wants a phone to make calls; doesn't need anything fancy; just wants to be able to make calls and receive calls, it's really hard to go into a place like Verizon, T-Mobile, any of these guys, and pick a simple phone. Even I

sometimes get frustrated, more so with my last phone—to do simple tasks is very hard. And I think this is largely a function, not so much of the fact that my mom's not a computer science major; the fact that you might not be a computer science major. It's because the computer science majors who designed the things did it poorly.

And so hopefully one of the takeaways you'll get from this course is that, if you are struggling with something technological, it is daresay as much if not more the fault of someone else, honestly, than it is of you. And hopefully you'll walk away with a sense that that is in fact true.

Testament to this notion of increasingly well designed software: Google Earth I think is a brilliant example of something that's pretty easy to use, it's certainly pretty to use, and it really seems to do a lot.

Note, on screen: slide #19

Even if right now it seems to be more of a novelty—sort of a fun way of taking a virtual vacation—already people are developing applications that use Google Earth. For instance, I think I saw something recently, like a "Where in the World is Carmen Sandiego"-like game running on top of Google Earth. And what better way to sort of allow a kid or an adult to explore the world than to literally make accessible all of that information in what's really a nice interface.

And so what Google is certainly good at, besides search, I think is presenting some really novel and really appreciated interfaces. Google Maps, right? We've had MapQuest, we've had Yahoo! Maps for years. Google Maps, I think, is the best. And it's the most recent one. You wouldn't have thought, perhaps, that this is a market that you should bother entering, since people already do this. But you can click and drag, and you can scroll, you can look at the satellite imagery.

And it's these marginal improvements that I think people are finally beginning to appreciate, as technology becomes the domain, not so much of geeks like us but of everybody, that you really have to appreciate that you don't need to be, or shouldn't need to be, a technophile to make a phone call, or to look something up on the Internet.

Well, Lecture 3, recall, was...

Note, on screen: slide #20

we call it "Software," but we really just put a DVD in the drive and hit Play, which is kind of a copout when it comes to talking about software. But software is sort of laced throughout the course, anyway, that it doesn't bother us so much.

What I did insert into this, "Our Conclusion," is some of the all-too-familiar indicators of what it means to use software. So this is the famed what?

STUDENT: (inaudible response)

DAVID MALAN: Blue Screen of Death, right? If you ever see this on your Windows PC, it doesn't mean that you messed up. It means that someone at Microsoft, or someone who wrote the software, or drivers that are installed on your computer messed up, and pretty much crashed the computer, and crashed it hard.

A few years ago, Exam 1—I forget if I said this already, in October. But Exam 1 fell on Halloween. And so we offered students five points of extra credit if you show up, however socially awkwardly, at your exam, dressed up in costume. So one of the winners that year dressed as a Blue Screen of Death. The man came in with a cardboard box on his head, painted blue, with some text on it, and he was a Blue Screen of Death. And he did very well, I think, on the exam.

Also familiar, or also funny, certainly, are error messages, like this.

> Note, on screen: slide #21

These are all real. These are not Photoshopped images. This, too, is when someone makes a mistake, and prompts you with, clearly, a complete lack of messages.

Here's an error.

> Note, on screen: slide #22

(audience laughter)

Again, this is an example of what we call a bug, right? Not so much your fault, but someone else's.

This is a classic.

> Note, on screen: slide #23

(audience laughter)

Right? This is one of those situations that maybe you stumbled across, when writing your Scratch programs, or PBJ programs. You know, if you don't think through all the scenarios, something's going to break. And this is an error in logic, certainly.

Blue Screen of Death: Not so good when your billboard is running Windows.

> Note, on screen: slide #24

All right, that is perhaps the biggest and saddest advertisement of Windows you might see on the side of a building: alt.tv had a computer clearly crash.

Perhaps a little more discomforting is when you see it in an airport, when those little Arrival/Departure computers are clearly running Windows at this particular airport.

Note, on screen: slide #25

It's not necessarily a good thing.

Those ticket machines you'll see at Greyhound or Amtrak. The machines, even...

ATM machines? Most likely not, hopefully not. But a lot of these terminals that don't look like Windows actually are Windows. Even Bloomberg has a version of Bloomberg that runs on Windows. It's just when it's full-screen, you don't know that it's Windows underneath the hood. Not saying it's good, not saying it's bad. Just saying that it's funny when things like that come your way.

And this.

Note, on screen: slide #26

This is doctored. Someone made this, to be cute. All right, PC users among you will know that Ctrl-Alt-Delete reboots your computer. What better peripheral to have than one that does so terribly easily?

Well, on "The Internet" was our Lecture 4.

Note, on screen: slide #27

This is a clip from Slashdot, from December of this year. I thought it was relevant, since the title was "Spam Volume Jumps 35% in November." This is a remarkable problem. We mentioned spam in 1999. And, yeah, you'd get spam once in a while. But spam did not constitute some eight or nine out of ten emails on the Internet, which is a gargantuan and scary problem; an expensive problem, certainly.

I mean, how many of you have ever just changed email addresses to avoid spam? Anyone? All right, so a few of you. So that's certainly not an ideal solution. And as the world moves toward relying on email ever more, hopefully we will soon see better technological solutions to this.

But does anyone know why this is such a problem in the first place? Like, what is the fundamental... If someone at the water cooler tomorrow said, "Hey, you just finished taking E-1. What's with spam? Why is it such a problem?"

STUDENT: (inaudible response)

DAVID MALAN: Excellent! So, one, it's a cheap form of communication. Sending a million emails doesn't really cost much more than sending one email, if you ignore bandwidth, and so forth, especially if these spams are being sent, not just from your own computer—which is very easy to shut you down, if you're sending spams from home.

**(0:40:10)**

Where is a lot of spam coming from these days?

STUDENT: (inaudible response)

DAVID MALAN: So bots and zombie machines. So some of you, if you have spyware installed on your computer, or just malicious software, among the things this software tends to do these days is not just pepper you with ads, and banner ads, and so forth. But it's to use your computer as a computing resource, and churn out spam.

In fact, if you ever run, like, the Netstat command at your command prompt, which we didn't do so much this semester. But it's one of those esoteric commands you can type and just see what's going on behind the scenes on your computer. If you see connections originating... If you see a lot of Internet connections, and you've got no Web browsers open, odds are it's because you have a little SMTP server running on your computer—SMTP referring, of course, to outgoing mail—then your computer, unbeknownst to you, is just churning out spam. And the beauty of that approach for spammers is what, if they're using you, or these so-called botnets, to deliver their spam?

STUDENT: It's free.

DAVID MALAN: It's free. They're not paying for the Internet access. They're not paying for the CPU cycles.

STUDENT: (inaudible response)

DAVID MALAN: Right, *they* won't get shut down, right? Imagine if you, the unsuspecting, fairly nontechnical person at home gets shut down by Comcast, as does everyone in your neighborhood, because, as Dell's survey a year or two indicated, that a huge percent, a majority of computers, according to their numbers, were infected with some form of spyware, the solution is not just to turn everyone's computer off. It's too large of a problem.

And it's a brilliant approach these spammers have taken to using fairly interesting algorithms, and distributed network-type approaches to just sending you junk mail: to random addresses, to specific addresses. And ultimately this is the result of the Internet really is being used these days—email, the Web—for stuff it wasn't intended for, right?

When email was invented, there was no notion of authenticating the origin. There was no protection against whose address you could put in the "From" line of an email. In fact, all of you could go home tonight, and type into the appropriate configuration screen of your email program that you are David Malan, at malan@post.harvard.edu, and send emails as though you were me, right? Sign it DJM. Who's going to know the difference, frankly? And that is testament to the fact that email just wasn't designed to sort of prevent this kind of problem that we're facing. And so a lot of the solutions that have been offered, including the software you might run on your computer, the stuff your ISP uses: it's patching the symptoms.

But it would really require some much more clever, or really a fundamental redesign of the way things tend to work right now to really get this right.

But we're sort of stuck with the way things are. And we can only make incremental improvements.

So this was just an article about how spam was increasing evermore. Just a few months ago, the numbers here is that, according to IronPort Systems, on average in October 2005, there were 31 billion spams sent a day.

In November… Oh, let's see. On average, yes. So there were 31 billion spams sent per day on average between October '05 and October '06. In November '06, though, according to these numbers, they saw 85 billion spams sent.

That is huge. It is a huge problem and, unfortunately the course is the over. We'll have to see how they figure that one out.

Also on "The Internet," we talked about this.

     Note, on screen: slide #28

And this image I did steal from our original lecture, because most of you have something set up like this at home. And hopefully, too, one of the takeaways from a course like is that, if nothing else, you at some point took our suggestion of unplugging all the cables from your computer, or maybe a coworker's computer, and then just plugging everything back together. That alone can be sort of empowering for some people.

This we offer, though, is just very representative of the type of stuff that hopefully, after this course, you'd be comfortable setting up. And turning on security with these routers, right?

Little pop quiz: What type of encryption, ideally, should you be using on your wireless router, if you care about the privacy of your data, and such?

STUDENT: (inaudible response)

DAVID MALAN: Yeah, so WPA. In contrast to WEP, which some routers still only come with, which simply is not secure; all too easily broken.

We had a little surprise in Lecture 6, where we had a few students pitted against a few teaching fellows.

     Note, on screen: slide #29

That was meant to just reinforce, recall, some of the material from that first exam.

"Multimedia," in Lecture 7.

     Note, on screen: slide #30

So what the heck is this? So this is a screen shot from a wonderful hardware site. If you've at all gotten a taste now for what cool hardware is like, and like to learn about this stuff, Engadget.com is a wonderful site that even I've just into this year. That, um… It will make sense in a moment.

This was a recent post. It's essentially a blog about the latest and greatest in computer hardware. And the Nintendo Wii, which you may have heard about just shy of Christmastime, was as talked about as the PlayStation 3. The Nintendo Wii, though, is cool because, rather than use those sort of old-school controllers that have Up, Down, Left, Right, A, B; and the newer controllers that have that plus sixteen other buttons, whose patterns you have to memorize to use.

So the Wii uses a controller that, ironically, has Up, Down, Left, Right, A, B, but at least I'm capable of remembering Up, Down, Left, Right, A, B.

But if you want to move something on the screen, you don't necessarily use Up, Down, Left, Right, A, B. You just point. And point here when you want to point here on the screen; point down when you want to point there on the screen. If you want to play tennis, you don't hold the keys and then hit the Left key, when you want the player to hit the ball to the left; or the Right key when you want the player to hit to the right.

With the Nintendo Wii, you go like this. And when the ball is coming to your backhand, you go like this. And when you want to serve, you throw the ball up and hit it like this because this controller has a bunch of accelerometers, as they're called, inside. And these things—Apple's iPhone has accelerometers. And if you saw the keynote, Apple's iPhone is able to detect, if you're looking at the phone—this is not an iPhone, this is a stand-in—it can detect if you're looking at your phone like this, or if you're holding it like this.

And if you're holding it like this, it shows the screen, or the photo, or the video as you would expect.

And if you turn it this way, it immediately rotates the image, too, so that you can watch, like, a wide-screen news clip, or a movie, even, or whatever you happen to have on your iPod.

So Nintendo uses the same type of hardware to detect if my hand is going up; if it's going left, right; if it's twisted this way, twisted that way, and the effect is remarkably powerful.

And one of the things we did promise tonight is that we would demonstrate this little toy.
This is Dan's Nintendo Wii. And I should fess up that, though in that solicitation last night, or that teaser email last night about how Dan stayed up for some ten hours in the parking lot of a Circuit City to get himself and his siblings one of these Wiis, so there was also someone else present that night for ten hours.

And I'm loathe to admit it, because, honestly, I never thought I would be, shall we say, "one of those people." But it was a fun experience nonetheless. We did footraces around 3 a.m. and 4 a.m. to stay warm, because this was in the midst of December. We became friendly with people we don't really know by name, because we knew them by "that guy's number one; that guy's number two." I think we were three and four in line. And number five was a cool guy. He was there overnight getting a

Wii for his kids. I think number ten was a woman with her two daughters, who were camped out on, like, a chair outside of Circuit City. Until finally, they, too, went into their cars for a bit.

But it was this wonderful, if nothing else, I mean, certainly a geek story. But a wonderful sociological experience, where you have a whole bunch of people going into this. And, mind you, this was coming on the heels of those stories where people are getting mugged, and attacked on line for PlayStation 3s, right? Sony's release of their hardware didn't go so well. Wii was much more civil.

But here were... We showed up at, what, 10 pm, and it was already dark, right? The employees, the manager said goodbye to us on her way out of the store. And there we were getting settled in for, like, a ten-hour nap outside of Circuit City. And what was funny was, this was one of these main, like, strip-mall type areas in New Hamp... We were in New Hampshire, of all places, too. Literally next door was a Best Buy, where there were twenty-four other "such people," waiting for Best Buy to open. Apparently down the road there was a Target, where you had people camped out there as well.

It was quite the place to be on Saturday night. But the result is that we did it for you. And we have this Nintendo Wii to demonstrate. And we thought, one, it's certainly fun. But, two, I think it really speaks in the spirit of a lot of the things Apple has been doing, and other companies; really where technology is going. And better user interfaces, and better experiences.

I mean, the fact of the matter is, these game consoles today—and I make myself sound old, when I say this—like, I can't deal with fourteen or some-odd buttons on these controllers. Because the game, then becomes a project of memorization—like, what keys do I have to hit if I want to punch the guy this way, as opposed to that way. Whereas something like this, the computer has become much more intuitive. And that's precisely in the spirit that this iPhone was released.

Now, what about this picture? So, I think these people should be embarrassed that they're bringing a lawsuit against Nintendo for having hurt themselves supposedly using the Nintendo Wii, for smacking people with these. I've seen pictures of these things lodged in people's expensive TVs, true or not. Frankly, I think it's great that Sony's getting all the more attention for these things.

We promise you a safe experience here. We thought we'd take a five-minute fun break. Pit a couple of people against each other, and hopefully it won't turn out quite like this.

But let me give you our little plug for the Nintendo Wii. And since it is Dan's, let me give controller number one to him.

(Nintendo Wii music playing)

And maybe we'll, uh... We won't ask you to...

**(0:50:07)**

If it might be of interest, allow me to challenge Dan to a match of tennis, a few points in tennis here? We're going to come up to the crowd. And notice, both he and I have these controllers in our hands.

You know, as with most things, though we like to spin this as... though we like to spin this as a bit academic, this is also a nice excuse for Dan and I to play this on a twenty-foot screen.

Okay, so I'm going to pick, uh... So, notice, as I move left, right, my right hand moves. So this is, uh, pun intended, wiijm.

I should probably go over there, then, huh?

All right, we're getting a bit of feedback for some reason. But we'll ignore that for now.

All right. All right, maybe I'll go up here.

All right. So you're number one.

(Dan says something inaudible)

What? Well, let's just do the one.

All right, so we have two players on a side. So, I'm officially… before we begin. Don't psyche me out here. So before we begin, I'm controlling the right-hand side of the screen; Dan, the left. But you're seeing the same image, just from different sides of the court.

Because I'm just one person, if I, for instance, move my arm, notice that both of my guys are swinging. So the idea is that, if the ball is closest to the guy at the net and I swing, he'll hit it. The computer figures out that I want him to hit it. Or if I wait, it'll come to the back of the court, and the back guy will hit it, as well.

So we've got our safety straps on. All right. Notice, Dan's going to swing. And you can't see this on film. But in a moment, Dan is literally going to throw his arm up, and then serve, and then I'm going to ace him back.

(Wii audio: crowd cheering, rackets hitting tennis balls)

Wii announcer: Fifteen, love.

DAVID MALAN: We will be editing the video at that point. All right.

(Wii crowd cheers)

Wii announcer: Fifteen all.

DAVID MALAN: Those of you watching the video, Dan just flailed his arms to the side and missed that shot.

(Wii crowd cheers)

Wii announcer: Fifteen, thirty.

DAVID MALAN: So at this point, Dan is losing by one point.

Wii announcer: Fifteen, forty.

DAVID MALAN: The funny thing is, Dan and I joked for a while that the wager for this would be: If I lose, I quit. But looks like I might be back in '07.

Wii announcer: Match point.

DAVID MALAN: Oh!

Wii announcer: The right team wins!

DAVID MALAN: Now since you've indulged us, let me yield my controller, and ask who in the crowd would like to take on Dan for a game.

(Wii music plays)

DAVID MALAN: Dawne, you've been volunteered. Would you like to come over? All right!

It's a good question: Have there been any experiments to compute how many calories people burn doing this. I did see an article recently which was... thank you... kind of funny that—it was on CNN, or something, too—where the article said that, like, these physical computer games help kids lose weight, which is sort of a nice rationalization, perhaps, but, I don't know. I will admit that when preparing for tonight's lecture, I broke a sweat several times playing tennis here.

(Dan talking with Dawne)

DAVID MALAN: So Dan has prepped Dawne. Dawne is filling in for wiijm, on the right.

Wii announcer: Fifteen, love.

DAVID MALAN: Dan hit it a little hard back, but...

Wii announcer: Thirty, love.

Wii crowd: Wow!

Wii announcer: Forty, love. Match point.

DAVID MALAN: Okay, comeback time for Dawne.

Wii announcer: The left team wins!

DAVID MALAN: I think I heard rematch? Rematch? One rematch? All right.

All right, so in this final rematch, we have Dawne versus Dangerous D.

Wii announcer: Fifteen, love.

Fifteen all.

DAVID MALAN: All right, it's tied. Fifteen all.

Wii announcer: Thirty, fifteen.

DAVID MALAN: Close. Thirty, fifteen. Dan slightly in the lead.

And, oh! Nice!

Wii announcer: Thirty all!

DAVID MALAN: Thirty all! Nice!

Wii announcer: Forty, thirty. Match point!

DAVID MALAN: For the game.

Wii announcer: The left team wins!

DAVID MALAN: So close! A round of applause, though, if we could for Dawne!

Dan has kindly offered to, when we conclude, which will be early tonight, that we'll leave it set up. We can have some more folks give it a shot.

So thank you to Dan. I'm going to get yelled at for having beaten him, because we did have sort of an unofficial wager. But ten thousand people just saw that, so… let's just leave it at that!

So in Lecture 8, after "Multimedia," we looked at "Security." This is a clip also from Slashdot, which is another one of these wonderful Websites, if you like to be up on everything current in technology and geekdom.

      Note, on screen: slide #31

This article is about a "Vista Zero-Day Exploit For Sale." So, one, Vista is referring to Microsoft's latest operating system, which you may or may not end up having on your computer soon, as well. A zero-day exploit: What does this mean? We didn't really spend time on this. But you see it a lot.

Zero-day exploit? It refers to the amount of time that… usually refers to the amount of time after a bug's discovery that it takes for someone else—a bad guy—to figure out how to take advantage of that bug, and wage havoc on a computer.

So, in other words, someone discovers, hey, there's this potential bug in Microsoft Vista, at 7 a.m. Well, if by 12 pm, someone's figured out how to use that bug to crash the system, or take it over, that's an exploit. And because it happens so fast, it's a zero-day exploit. That's pretty much the simplest explanation.

So perhaps unbeknownst to you, there is supposedly this whole black market, when it comes to bugs and software, especially software that's as omnipresent as Windows, such that, besides just there being opportunities for spam, there are opportunities in taking people's computers over to use them to just cover your tracks, and wage malicious attacks; or denial-of-service attacks against Websites; try to steal personal information by taking over people's computers.

So attacking the bugs in something like an operating system is perhaps the best way at getting at that. What this particular article is about is… it says the following:

"Underground hackers are hawking a zero-day exploit for Windows Vista at $50,000 a pop, according to computer security researchers at Trend Micro. The Vista exploit, which has not been independently verified, was just one of many zero-days available for sale at an auction-style marketplace, infiltrated by the antivirus vendor. Prices for exploits for unpatched code execution flaws are in the $20,000 to $30,000 range. Bots and Trojan downloads that typically hijack Windows machines for use in botnets were being sold for about $5,000."

So reportedly there is this underground market, such that, if you're going to make more than $50,000 off of spam; if you're going to make $50,000 or more off of some scam, getting… you know, emailing a million people and having just 0.01 percent of those people send you their life savings, some of these things can be worth it.

So just be aware, certainly, that these kinds of stories are all over the place today. But they're not so much cause, I think, for paranoia.

I mean, the fact of the matter is that practicing—and we sort of make light of it—"safe computing" is really the best you can do. And the measures that we've certainly proposed in our "Security" Lectures were things, like, you know, don't check your bank account in some Internet kiosk at an airport, or at some Internet café elsewhere. You know, anything that's particularly sensitive, at least just use your own computer. And even then, on your own computer, just be aware of the possible threats. Run some antivirus software, or run some antispyware software.

But at the end of the day, truth be told, you can only do so much these days. So you just have to be aware of what's going on with your computer.

And, for instance, if you notice all of a sudden your computer's gotten deathly slow. Well, maybe it's running something behind the scenes that you don't know about.

**(01:00:04)**
So maybe it's time to use that, not as cause for concern that, "I need more RAM," but maybe if this is a differential from the previous day, maybe something is on there that I don't know about. Investigate on your own by any of the techniques that we've discussed so far.

This is sort of in that same spirit.

> Note, on screen: slide #32

Professor Eugene Spafford, of Purdue: "The only truly secure system is one that is powered off, cast in a block of concrete, and sealed in a lead-lined room with armed guards—and even then I have my doubts."

This is a famous quote that's sort of been altered and butchered over the years, and taken up by other people. But it is pretty much fact, right? Say, only if the thing's not on the Internet, and not turned on, and not plugged in, and not accessible is it really secure. So it's all about relative risks. And hopefully in this course, and through some of the sections and workshops you'll walk away with some ideas as to at least what reasonable measures you can take for yourself.

CHRIS MEHL: David, I have to switch. Shall I just do it on the fly?

DAVID MALAN: Yeah, let's just proceed. So...

## Hour 2

**(01:01:02)**

DAVID MALAN: Wii gyms? I don't know. I mean, they already have ergonomic machines, right, where you can pretend to row, when you see, like, a guy, you know, going on water in front of you, right? I've seen something like that, but... I don't know.

The point, though, I suppose, is that it's possible now.

Apparently we're back. And, so "Website Development" was our Lecture 10.

> Note, on screen: slide #33

So, recall, we dabbled with this whole "Malan Rouge" idea. But really the takeaway, hopefully, from that lecture was, and in your ongoing Final Projects—if you don't mind being reminded—is relatively how easy it is and how cheap it is to get a Website up and running.

How pretty it looks really is a function of your own design abilities, or maybe how much you want to pay someone else to design it for you. But the fact of the matter is, it is relatively easy to do these days. And those Web hosts are sort of innumerable on the Internet. And DreamHost is the one we've been using. There are certainly others that we've recommended. But it's hard to go wrong to—certainly for relatively small sites that don't need to deal with a lot of traffic.

If you're thinking of launching some company whose Website will be its main focus, then you want to do a bit more background checks as to the quality of the service. And, honestly, if you're trying to run a major Internet company with a twenty-dollar Web-hosting account, that's probably not the right path to go down.

But certainly for the personal-type Websites—malanrouge—that we discussed in this class, more than sufficient. And you can pay even less than the twenty dollars a month that we're paying if it's really just for your own personal use, and for email and such.

Apparently it's "Peanut Butter Jelly Time," which means that we have one of these Internet forwards that I got a long time ago.

     Note, on screen: slide #34

Don't remember where it came from. But it's our introduction to this demonstration.

Oh, this is not... there we go.

(onscreen animation): There you go, there you go, there you go. Peanut butter jelly... peanut butter jelly...

DAVID MALAN: I don't know what this is or why someone made it, but it is "Peanut Butter Jelly Time." You'll recall that, for your Problem Set 8, one of the programs you had to write was that for making a peanut butter and jelly sandwich—something that could be passed to a robot, who could execute it, verbatim, literally making no assumptions.

So what we thought we would do is take a moment to just grade a couple of your Problem Sets right now. If the teaching fellows wouldn't mind coming down.

(animation): Peanut butter jelly... peanut butter jelly...

DAVID MALAN: I just so happen to have dropped by Star Market before class. And it appears, per that Problem Set, that we have some jelly, we even have some strawberry jelly. A couple more over there. We have some peanut butter.

(animation): Peanut butter jelly... peanut butter jelly...

DAVID MALAN: And, because we're going to do a nice tie-in with the class afterward, we got whole bunches of bread, so that after class you're all going to get a peanut butter and jelly sandwich, if you want.

We got split-top wheat bread, how about, for Rei. We've got country-style twelve-grain for Eugenia. We've got old-fashioned country 100 percent stone ground wheat for Dan. And we got white bread for Chris. Oh, white bread for Dan, all right!

So let me turn down the audio here.

What I did was took—and we apologize in advance, if you see your Problem Set on the board. It's anonymized. And we do this... we do this because we love and we care.

(audience laughter)

Don't assume you're going to get a good grade or bad grade just because we happen to pick, for instance, this one!

So, what I thought we'd do is, since the screen's behind you guys, I'll recite these lines, one at a time. And the task at hand for these guys is literally, while grading this in their minds, execute only what they are told to do, making no assumptions.

Let's see what happens!

Take one, from one of Computer Science E-1's Fall 2006 students.

> Note, on screen: slide #35

First step:
"Locate jars of peanut butter and jelly, a loaf of bread, and a knife."

Done. Excellent! One point so far.

"If customer orders a special sandwich

If only jelly is requested then

Dip knife into jelly and spread across bread."

So we're going to need, I guess, someone to play the roll of the customer. What kind of sandwich... Dawne, you're staff. What kind of sandwich would you like?

(Dawne's reply inaudible)

DAVID MALAN: Oh, split-top wheat, all right. So we'll take a specific request. So the request is for a regular sandwich. So let's skip down to the "Else" block. Sounds like only Rei is on the table right now.

"If customer orders a regular sandwich

Dip knife into peanut butter and spread across bread..."

(Rei bangs on jar lid)

(laughter)

DAVID MALAN: No, peanut butter.

(laughter)

Little bug.

Okay, "Dip knife into peanut butter and spread across bread..."

(Rei bangs on jar lid)

(laughter)

DAVID MALAN: You're glad this isn't your Problem Set, already, aren't you?!

All right, Step 2:
"Dip knife into jelly and spread across bread. "

REI DIAZ: We'll do this one nicely.

(jar pops open)

(laughter continues)

DAVID MALAN: And all that remains, apparently, is to

"Add another piece of bread..."

(laughter)

DAVID MALAN: "...and give it to server."

Okay, so not so good. Shall we try again? Uh, let's try again. How about, let's do another one?

Note, on screen: slide #36

So this one here was from another student. Take two. Yeah, so...

(laughter)

EUGENIA KIM: Whoa!

DAVID MALAN: Yeah, so this... let's just... this is an A-quality work, let's say. This was... perhaps has the distinction of being the longest program ever. It's a good two-pager. I think there are several hundred lines. It did well. So let's do another take.

      Note, on screen: slide #37

Take two. Hey, you know this'll be good. So take two... Well, let's involve all four of them now.

"Locate jars of peanut butter and jelly, a loaf of bread, and a knife, then"

"open bag of bread and remove two slices"

(laughter)

"remove lid from peanut butter jar and jelly jar"

(laughter)

"then if peanut butter or jelly are empty"...

They're not, so "else"...

Wait a minute.

"else give up"

(laughter)

I think that's a real bug!

Okay, let's debug. We're going to skip that line.

Step 7:
"using knife spread peanut butter on one slice of bread"...

(laughter)

You got ten thousand people wondering right now, "Why are... ? What?"

"place…"

"using knife spread jelly on top of peanut butter"...

CHRIS MEHL: Rei, the towel's are blocking your wizardry.

(banging, clanging)

(laughter)

DAVID MALAN: Maybe we'll go out after class!

(laughter)

"then place second slice of bread on top of first"...
(laughter)

This last one's mean.

"then..."

(laughter)

"eat"

(laughter)

EUGENIA KIM: Eat what?

(laughter)

DAVID MALAN: How many other... ? (to Dan) You brought prophylactic gloves tonight!

DAN ARMENDARIZ: What?

DAVID MALAN: It's the EMT thing.

(laughter)

Okay, excellent!

(applause)

All right, let's try... If our volunteers could restore things to their original state, as best as possible, let's try one final take. Right? Because if you all find this so funny, let's see how well you can do. Because, as I recall, the baby changing? Not so good!

So...

> Note, on screen: slide #38

**(01:10:06)**

Okay, so to the audience, Dawne, and team, Step 1 from you is

"Locate jars of peanut butter and jelly, a loaf of bread, and a knife."

Now, from someone in the audience, what's Step 2 going to be?

STUDENT: Unscrew the lid of the peanut butter and take off any cap.

DAVID MALAN: "Unscrew the lid of the peanut butter and take off any cap."

That's funny. We've made three sandwiches and we're still not at that point over here.

All right, Step 3?

STUDENT: (inaudible response)

DAVID MALAN: Ooo, riding her coattails. "Unscrew jelly lid and remove any cap."

All right, Step 4? Good job so far.

STUDENT: Open the bag of bread…

DAVID MALAN: "Open the bag of bread..."

STUDENT: …untwisting the tie…

DAVID MALAN: "…untwisting the tie..."

(laughter)

STUDENT: Take out two slices…

DAVID MALAN: "Take out two slices..."

STUDENT: …from the opening…

DAVID MALAN: "…from the opening..."

STUDENT: …of the bag.

DAVID MALAN: "…of the bag."

STUDENT: Place them on the plate.

DAVID MALAN: "Place them on the plate."

STUDENT: (inaudible response)

DAVID MALAN: "If it's a heel, discard it."

STUDENT: (inaudible response)

(laughter)

DAVID MALAN: That's fair. "And if it's flat..."

STUDENT: (inaudible response)

DAVID MALAN: "Place them flat on ... plate."

Okay, next step?

STUDENT: (inaudible response)

DAVID MALAN: "Take the knife..."

STUDENT: (inaudible response)

DAVID MALAN: "...blade-side first..."

STUDENT: (inaudible response)

DAVID MALAN: "…blade-side up..."

STUDENT: …and scoop out a teaspoon of peanut butter.

DAVID MALAN: "...and scoop out a..."

STUDENT: (inaudible response)

DAVID MALAN: "...teaspoon of peanut butter."

STUDENT: Put on one slice of bread…

DAVID MALAN: "Put on one slice of bread..."

STUDENT: (inaudible response)

DAVID MALAN: "...flat..."

STUDENT: (inaudible response)

DAVID MALAN: "Spread the peanut butter over the top of a..."

STUDENT: (inaudible response)

DAVID MALAN: "...evenly on the flat side of the bread. "

STUDENT: If it does not completely cover bread, scoop out more until covered…

DAVID MALAN: "If it does not completely cover bread, scoop out more until covered..."

STUDENT: Peanut butter.

DAVID MALAN: "Peanut butter."

STUDENT: (inaudible response)

DAVID MALAN: "...approximately one-eighth-inch thin . . ."

STUDENT: (inaudible response)

DAVID MALAN: "...evenly and pretty."

(laughter)

STUDENT: (inaudible response)

DAVID MALAN: What's that?

STUDENT: (inaudible response)

DAVID MALAN: "You can draw a design, if you wish."

Almost there. What's next?

STUDENT: With the other side of… with the other piece of bread…

DAVID MALAN: "With the other piece of bread..."

STUDENT: …do the same with jelly.

DAVID MALAN: "…do the..." You're punting. "...do the same with jelly."

(laughter)

STUDENT: (inaudible response)

DAVID MALAN: Sure!

STUDENT: One particular broken robot.

DAVID MALAN: Sure, uh…

(laughter)

(whispers) Eugenia!

Yes?

STUDENT: (inaudible response)

DAVID MALAN: "Take second piece of bread from underneath top piece..."

STUDENT: So there would have to be an if statement.

DAVID MALAN: Ah, so if what?

STUDENT: If bread is stacked on top of each other.

DAVID MALAN: "So if bread is stacked on top of each other..."

STUDENT: (inaudible response)

DAVID MALAN: Take what?

STUDENT: (inaudible response)

DAVID MALAN: "Naked piece"?! "Take the naked piece of bread..."

(laughter)

DAVID MALAN: This is why "great sex" and other such terms lead to E-1's Website.

(laughter)

DAVID MALAN: Okay, next?

STUDENT: Does that look like one-eighth-inch thin?

DAVID MALAN: Uh-oh, you're being reprimanded.

Next? Take us home. Almost there.

STUDENT: Scoop out more jelly.

DAVID MALAN: "Scoop out more jelly…"

STUDENT: Spread thinly…

DAVID MALAN: "Spread thinly..."

STUDENT: (inaudible response)

DAVID MALAN: "...on bread. And pretty..."

STUDENT: (inaudible response)

DAVID MALAN: "...evenly…"

STUDENT: Repeat the same as with the peanut butter…

DAVID MALAN: "Repeat the same as with the peanut butter..."

STUDENT: (inaudible response)

DAVID MALAN: "...on a different slice of bread..."

STUDENT: (inaudible response)

DAVID MALAN: "...join jelly side and peanut butter side flat together..."

STUDENT: (inaudible response)

DAVID MALAN: "...so that the pieces of the bread line up..."

STUDENT: (inaudible response)

DAVID MALAN: "...evenly and pretty..."

STUDENT: (inaudible response)

DAVID MALAN: "...lightly pushed together…"

STUDENT: (inaudible response)

DAVID MALAN: "Match edges…"

STUDENT: (inaudible response)

DAVID MALAN: So I need one more volunteer, clearly. No? What do you think?

STUDENT: (inaudible response)

DAVID MALAN: Oh, they got you. "Eat the sandwich, if you wish."

STUDENT: (inaudible response)

DAVID MALAN: Oh, you can... No, this'll be good. "Slice in half..."

(laughter)

STUDENT: (inaudible response)

DAVID MALAN: "...gently..."

STUDENT: (inaudible response)

DAVID MALAN: "...with knife."

STUDENT: (inaudible response)

DAVID MALAN: This guy's work's looking pretty good right now, isn't it?!

(laughter)

DAVID MALAN: All right! Well, that was great! All right! Whoo!

(applause)

Thank you to our volunteers.

PBJs and Wii at our conclusion here.

All right, so, um . . .

Oh, let's all stay down here.

All right, Lecture 12... That's fine.

> Note, on screen: slide #39

Lecture 12 was "Pictionary," recall, which was meant to just reinforce some of the topics from, of course, Exam 2. And it was our first attempt. Clearly it didn't work so well, since I was asking all of the terms that you'd been quizzed on. Made it a little easy. Didn't need that sixty-second timer. But it's an ongoing process here in E-1.

Lecture 13, just last week, was a film, for those of you who attended locally, on *Startup.com*.

> Note, on screen: slide #40

If you did not catch that, I would certainly recommend checking it out, from Netflix, your local store, or whatnot. It really is a fascinating documentary, at least in my opinion.

What I did offer here is not a screenshot of *Startup.com*. It was just to put the idea out there; maybe no particular claim.

But this is a news story from just October of '06. And you probably know that Google spent an enormous amount, $1.6 billion, to buy YouTube, which is, of course, this video file-sharing Website. And I offer this just as food for thought, if only because friends of mine and I certainly have discussions of late about a lot of the attention that companies like Google are getting—and YouTube, and Facebook, and a lot of these sites that are all the rage; you know, numbers one, two, three on the Internet, and so forth—and yet, other than Google, don't seem to make a whole ton of money.

YouTube, in particular: $1.6 billion for a site that effectively is free. It's got some ads, and so forth. But I offer this as food for thought as to whether what happened just five, six, seven years ago in the so-called "dot-com craze," if its lessons are sort of being quickly forgotten. And perhaps I'll be proved wrong, come a couple of years from now, if Google's investments and such do pay off.

But Google, in particular, is a company that, by all means, is printing money when it comes to "Search". But they have dozens of other projects—Google Maps, and Earth, and so forth—none of which has obvious or necessarily intentional revenue streams. And I think it'll be very interesting just to watch, as sort of a technological society, just how long, sort of, companies can keep that up. And just how long the world, the outsiders value companies like Google, at $500 a share, or more, or less.

It's sort of an interesting thing. And I think it'll be interesting to see what the sort of takeaways are in another five years' time—if we're sort of forgetting some of the lessons we learned a few years ago, when it comes to valuations of companies, and actual products, and revenue; or if, perhaps, this is something completely different altogether.

So, time will tell.

So, the "Exciting Conclusion" is where we're at, here at Lecture 14.

> Note, on screen: slide #41

So, Computer Science E-1, "Understanding Computers and the Internet," was all about this thing, ultimately.

> Note, on screen: slide #42

And again, do take away, if nothing else, reassurance that not all of this had to go down the first time. Know that the course's lectures, and workshops, and Videos of the Week, a lot of the handouts will remain online for a while—certainly on the course's Website, and in iTunes, but also, as you've seen, on Google Video, and on YouTube, as well.

So if you've missed anything, don't feel that tonight, or two weeks' time from now, was sort of your last chance. A lot of this content—especially the content that the teaching fellows have put so many hours into this year, to make possible; the Videos of the Week, in particular—will long outlive this course, we hope, and certainly outlive this semester.

**(01:20:01)**

So, Fall 2006's mousepad, right? After we announce this, do feel free to come down and mingle, say hello, grab a sandwich, make a... can we do that? Make a sandwich. All right, we have some things left over.

We'll turn back on the Wii, and perhaps Dan will take a rematch against anyone else here, as well as the other teaching fellows.

The winner of Fall 2006's mousepad, which we have in this box over here—one for each of you.

> Note, on screen: slide #43

And for distance students, we will mail these out to you. For the other ten thousand of you, um... not going to have enough. But that is okay.

The winner of this year's Fall 2006 mousepad, which rings in the end of this semester for us, is...

> Note, on screen: slide #44

(audience sighs)

That's some Photoshop work.

The winner is... this!

Note, on screen: slide #45

And how fitting that "I Survived E-1" is imprinted on it.

So congratulations to Danielle.

So thank you very much. Congratulations! You did indeed survive Computer Science E-1. We look forward to seeing your final projects, and certainly at some point in the future.

So farewell. Come on down for some snacks.

**(end)**

**(01:21:12)**