Interview

Silver Bullet Talks with Jeremiah Grossman

Gary McGraw: Let’s start with clickjacking. Tell us about how the attack works and then, more importantly, tell us a little bit of the backstory behind the Adobe desktop thing.

Jeremiah Grossman: Sure. I think the latter part is more interesting, but clickjacking is when an attacker can force users to click on something they didn’t intend. Imagine all the different Web pages out there that have important buttons on them: some will send email, some will add friends, some will wire-transfer money. If you’re on an attacker-controlled Web page, they will iFrame in a button from another Web site and hover that iFrame just under your mouse transparently so you can’t see it. When you think you’re clicking on a link, you’re clicking on a button that the bad guy wanted you to click on.

One example we wanted to show was how you can hijack a user’s video camera and microphone using Flash. We used clickjacking on the permissions button when Flash asks to access your microphone, letting a Web page see and hear you, which is pretty scary.

Gary McGraw: The irony is that you didn’t really need that 0-day to have the real attack. That was just one of your vectors.

Grossman: Correct. We did the best we could with what we had and told people what we could about clickjacking. Later, as Adobe was in the process of patching Flash Player 10, somebody else figured out the issue and leaked the disclosure that you could do it with Flash Player, so we came out with the rest of it.

Gary McGraw: In that case, just to be clear, who’s at fault, the browser or the plug-in?

Grossman: We—Robert Hansen and myself—felt that clickjacking was more of a browser issue and not so much an Adobe issue. We just used Flash as an example. There was no real exploit to it that we knew of at the time.

We wanted to do a presentation on the subject—this has been an issue long-known by the browser vendors, but we felt it wasn’t given its due attention. Apparently, without really realizing it, we found a 0-day in the Adobe Flash player because you’re not supposed to be able to make the permissions dialogue transparent.

That’s when we had to pull the talk because Adobe asked for more time, which was fine because they weren’t given a whole lot of time. It caused a little bit of a media circus, and that’s not what we wanted, but it’s what happened anyway.

McGraw: Another critical and underappreciated Web problem is cross-site request forgery, which I think you’ve called “the sleeping giant of Web bugs.” I love that quote. How does the attack work?

Grossman: Cross-site request forgery is when an attacker can force
Ed Felten paper mentions that are worth looking into. At Fidelity Software Security Day, you said in your talk that roughly 50 percent of Web problems, or at least the ones that you had on your slide, couldn’t be automated. Why? What’s the nature of those problems that can’t be automatically tested?

Grossman: I was talking about classes of attacks overall. If you look at the OWASP Top Ten, about half of the classes you can automate with some degree of accuracy, like cross-site scripting, SQL injection, and a bunch of the other ones that we generally term technical vulnerabilities. But with the other half, you get these things that we loosely define as business logic flaws, which require knowledge of context. If I have a number in a URL with your bank account information, and I rotate it down from 100 to 99, I might see your account data. That could be good or bad. To an automated tool, it’s just data. Sometimes I might be allowed to see your data, sometimes not, but how’s the tool ever going to know?

McGraw: So you need to know more about what’s going on in the app?

Grossman: Yes. It’s more about users, what they’re supposed to be able to do or not supposed to be able to do. We’re inching the needle along, but by and large, scanners have a really tough
time—even humans have a tough
time in a lot of cases.

**McGraw:** I’m interested in the dif-
ference between a business logic flaw and an architectural flaw from a technical perspective. Are you just treating those as the same thing?

**Grossman:** What would you con-
sider an architectural flaw, just so I see where you’re going?

**McGraw:** This notion of, say, a
replay attack or maybe some way of overwriting a method that isn’t related to a particular bug and is higher level in nature but might be higher level from a technical per-
spective and not necessarily related
to the business application itself. See what I mean?

**Grossman:** Right. Most of the
time, if something can be auto-
mated, it tends to go into the technical vulnerability bucket. If it really can’t be, it tends to go in the business logic one. These are just loose terms; we shouldn’t take them all that seriously.

For instance, there are business logic flaws or architectural flaws that are by design, and that’s how the system is supposed to work. You might consider that an archi-
tectural flaw. Usually, insufficient authentication or authorization are defined as business logic flaws; they didn’t have a right check to see if a user was authorized or au-
thenticated to do a particular task. The amount of terminology in this industry is staggering.

**McGraw:** Yes. You know, 10 years
ago, I wrote this book called *Java
Security* [Wiley, 1996] with Ed Felten, and it was all about bugs in Java that had to do with applets. These days, I’m concerned about
an overemphasis on Web security. Am I getting old?

**Grossman:** All the same problems
exist; they’re just exacerbated. I
just looked at Netcraft today, and
there are 182 million Web sites out there. You and I can both guess how many of those were designed
with security in mind.

**McGraw:** In the early days, it was
a little bit easier to talk about the
browser being the problem, and
nobody was confused about that.

These days, with so many active
content systems, it’s hard to tell
whether it’s a browser problem, a
JavaScript plug-in problem, an ap-
lication written in Ajax, or whatever.
This leads to a little bit more confusion as to who’s at fault.

**Grossman:** Precisely. Books used
to say not to trust a client for se-
curity. You have that standard
mantra. I don’t know if we can do that anymore.

**McGraw:** I’m with you on that. To
some extent, early browsers—say, after Lynx to the Mosaic brows-
er—were really simple. They were
much more like a VT100 than
these almost platform operating system things today.

**Grossman:** I don’t think “almost.”
I think it is.

**McGraw:** That is what worried
Microsoft in the early ’90s, when it
didn’t even have a browser. It wor-
rried that the browser was going
to take the place of the operating system. To some extent, Microsoft
was just a little bit ahead of its time
in that worry.

**Grossman:** I think it’s still going
that way. I still use my desktop and
my OS, but I think for most peo-
ple out there who are connected,
most of their time is spent in the
browser and not their computer.

**McGraw:** In 1996, we knew this
browser problem existed. In fact, we
even knew that authentication—just
as we talked about with the cross-
site request forgery issue—was a
huge problem. Felten and his guys
at Princeton wrote a paper called,
“Web Spoofing: An Internet Con
edu/sip/pub/spoofing.html]. It was
just interposing between, say, a
user, or the user’s browser in this
case, and the rest of the Web. You
would just build a proxy server and
take control of somebody’s view of
the Web so he or she couldn’t really
trust anything at all. Hilariously,
that will still work.

**McGraw:** We discussed this notion
of how cross-site request forgery is
really kind of like an interposition
attack. I wanted to ask if you be-
lieve that many Web application
tack attacks have kind of wider coun-
terparts in software security.

**Grossman:** Such as?

**McGraw:** Well, just a way of say-
ing, “Yes, this is a particular version
of this way of thinking about an at-
tack when it comes to a browser or a
Web app, but if you look up the food
chain to more software, it’s suscept-
tible to the very same attacks.”

**Grossman:** It could be. I look at a
Web site and go, “What can I
make this do other than what was
intended?” Web security came way
later. I’m sure the same classes of
attack that we’re using on the Web
are applicable since the beginning
of software. I can only put it in a
Web security context.

**McGraw:** I think the Web secu-
rit y context is really important,
and I also think that perhaps you
guys are finding some interesting
new twists that haven’t been talked
about or looked for in the wider
software thing. If we did this map-
ning, there might be a way to learn
from each other.

**Grossman:** I think some of the
more interesting stuff we’re finding is where we’re double, triple encoding our attacks, going in and doing different styles of encoding and transcoding, whatever you want to call it.

And they’re working on a very small percentage of cases. Each test is like an edge case, but we’re actually finding a lot of edges out there now.

**McGraw:** That’s interesting. Some of the classic software exploitation techniques applied to Web attacks.

**Grossman:** Let’s say we take a SQL injection stream and we triple encode it with a bunch of different wacky stuff. It’ll only work on 1 percent of sites, if not less than .01 percent of sites, but it does work. Then, we stack 100 on those, and they start working a lot all over the place, so these are the kind of statistics we’re gathering these days.

**McGraw:** That’s interesting. I want to get to this notion of architecture a little bit more. You think that the Web browser now is kind of like an operating system. I also see on the other side of the world, these thicker clients getting built, some of which use Web protocols and many that don’t, but certainly thicker clients than they used to be.

What’s happening is these two worlds are colliding or coming together because of the kinds of distributed system applications that people are building.

**Grossman:** What happens is that developers want to do things in a Web page that the browser doesn’t readily support. If the browser vendors aren’t going to put it in, the plug-in vendors will.

**McGraw:** Right. That’s a helpful design feature these days.

**Grossman:** But they do suffer from massive architecture issues, like race conditions. They call it duping in the game, where you take an item, run across server lines, and get a duplicate item if you know what you’re doing. They actually have the most interesting logic laws I’ve ever seen.

**McGraw:** Some of these timing issues will probably be an interesting area to explore on the Web, too. I know that Dan Boneh [Stanford University] was thinking about that recently.

**Grossman:** Could be. Lots of different crazy attacks happen in massive multiplayer games that probably could happen in a Web context.

**McGraw:** I guess you’re not paranoid enough to use Lynx.

**Grossman:** Not yet.

**McGraw:** You’re coming around to that?

**Grossman:** You know, security guys, we always have to be careful not to confuse what’s possible with what’s probable.

**McGraw:** Right. The browser becomes thicker and it supports all that stuff, but I’m also thinking about, say, thick clients of the sort that the World of Warcraft guys use. They have a 9-Gbyte client: it isn’t little, and there’s lots of stuff in there. In terms of software security issues and exploits, it seems like these worlds are coming together.

**Grossman:** They could be. I think they deal with a slightly different set of problems. When I spawn cross-site request forgery using HTML inside the end game, I don’t know if I can force other users to make a request that they didn’t intend to make in that type of environment.

**McGraw:** It seems like a lot of people are saying, “Good lord, can’t we just rebuild a browser that isn’t a complete disaster?” Matt Bishop actually talked about that in an episode of Silver Bullet [November/December 2008].

**Grossman:** I actually just wrote a blog post [http://jeremiahgrossman.blogspot.com/2008/11/browser-security-bolt-it-on-then-build.html] on that, and my belief is, probably not. If a browser’s hoping to get used, it can’t and won’t be secure against the latest attacks because if we have these good defenses in there, no one would use the browser because the Web would feasibly break. What happens in browser security is that browser vendors make it as good as they can while trying to maintain their market share, and security plug-in vendors will say, “Okay, here’s how to protect against this style of attack,” and users adopt it. When the strategy is well vetted, then browser vendors build it into the main core of the browser.

We’ve seen this in phishing most recently, with the green toolbar and things like that. We see it, again, in IE 8 with the no-script features. Unfortunately, the browser will never be as secure as it needs to be.

**McGraw:** Right. One other issue I wanted to bring up, because your company specializes in it and does a great job with it, is this notion of penetration testing or automated penetration or security testing of a Web app.

I’m wondering how we can move penetration testing past this badness-ometer mode that it’s in now so that we can take the results and cycle them back into building better stuff.

**Grossman:** Here’s how I look at it. From WhiteHat’s point of view, my job is to measure the security...
of a Web site as it looks to an external attacker. There’s no way I’m going to get away from measuring badness in that way.

McGraw: No. I think it’s a good thing. I want to make that clear—that’s a good thing to do.

Grossman: From that point forward you go, “Okay, what is the causality?” When I find something that’s bad, I ask what led to that fact and start pushing it earlier into the SDL or wherever we choose to. Maybe it was a design issue. Maybe it was implementation. We can start to learn some of those things, but that’s just how I look at the world. I don’t want it to be a forever “find and fix” kind of thing, but I don’t think that’s going to stop anytime soon.

McGraw: I don’t either. I think actually there’s a pretty big distinction between the East Coast and the West Coast when it comes to that stuff, and the East Coast has been piling up bugs for maybe slightly longer because of the financial services industry. And the bug pile got really damn big.

You’d hire some guys to find some more bugs and throw them on the pile and go, “Geez, that’s going to collapse and kill us all.” They started thinking about making some of the results from these penetration tests more actionable, easier to fix, and easier to diagnose in terms of code and what needed to be done and what kind of training needed to happen.

I don’t see that same movement yet on the West Coast. I think it’s maybe about 18 months behind.

Grossman: If you want to put it in an East Coast–West Coast context, then we have at least on the West Coast two very large problems. One is that we have 180 million sites that are already vulnerable. What do we do about those? We have this rapid application cycle out there, which causes many problems. Even if we knew where the problems were, they’re not going to get fixed anytime soon. That’s why I’ve been doing the whole VA–WAF [vulnerability analysis–Web application firewall] integration thing.

But the other one that’s particularly concerning to me is that every year we have new and different attack classes and different variants on a theme. The problem is that even if we were to develop a code securely from the beginning state of the art, how do we revise our code and update it against the new latest and greatest attacks and all the old sites from that point forward?

McGraw: I hear you. There are even some old attacks that have code that’s been running since the ’70s. We have some customers who say, “Can you help us fix our Cobol application?” The answer can’t be, “no.”

Grossman: We have this whole software serviceability thing out there that’s going to be a really tough problem. When somebody comes up with a new Web security attack, are we going to have to go update 180 million Web sites out there?

McGraw: Of all the talks that you gave last year, which one was the most fun and why?

Grossman: That’s tough. I get something out of each conference I go to. Black Hat is definitely a cool conference: a lot of great speakers, a lot of great people there. I also like Hack in the Box in different countries. I just got back from Malaysia, and was definitely a cool conference, highly technical, completely different set of people. Very few Americans were there, so I got to interface with a lot of different people, but I’ve also been to CSI [Computer Security Institute] and different places like that, where you get to see more government and business-y people. It just depends on what you’re into.

McGraw: I asked you this question (close to the election) because I wanted you to pick one, not four.

Grossman: There’s no way. I’ve been going to Black Hat USA every year for four or five years, so that’s the one I don’t miss. I’ll take that one.

McGraw: That’s cool. It sounds like you have fun when you do these things anyway.

Grossman: Yes. Actually, it’s real easy. I guess I know something of value, and I put my slides together and create an interesting concept. People come and listen. They give good feedback. So it’s a good job.

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