# 200 Milliseconds To Owned: Walking Tour of a Drive By Exploit

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## Me

- Cal Poly Computer Science, BS
- Intuit
  - Software engineer, QuickBooks Online backend
- Qualys
  - Vulnerability Detection Engineer (now in research)
- InfoSec Community:
  - OWASP*, BlackHat/DefCon (speaker? We'll see…)
- CoffeeToCode.net

# Obligatory Ethics Slide

- Laws are new
  - Things we do can be viewed as good or bad
  - Want to set good precedent and win public opinion
- It's not just important to be doing the right thing
  - … you have to *look* like you're doing the right thing
- Toyota black box?
- Voting machines?
- Society should be able to trust hackers to tackle these
- Okay, on with the fun stuff…

# Some Terminology

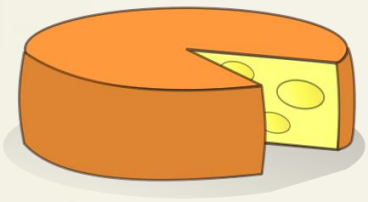
- Vulnerability (n.)
  - MS definition is pretty good
  - Essentially "a weakness in a computer system that allows something bad to happen"
  - Many have a CVE number, eg CVE-2010-0249
- Exploit (n., v.)
  - Often casually conflated with "vulnerability"
  - A specific technique or tool that makes something bad happen
  - Often used as proof of a vulnerability
- Payload (n.)
  - What an attacker actually does to a machine if an exploit attempt is successful
  - Usually bundled with, but distinct from, an exploit

# Attack Surface

- Useful concept -- internalize it
- What's the attack surface of a server just sitting there?
- When browsing the web, what's your attack surface?
- How do you find out?

# The Browser

- What browsers do you use?
- Swiss cheese, basically…



- Vulns in 2008 (Secunia):
  - IE: 31
  - Safari: 32
  - Opera: 30
  - Firefox: 115

  ActiveX: 366
  Java: 54
  Flash: 19
  PDF: 51 (2009)

## We Want Out…

- We want to run code in the context of the OS
- Can't do much with plain javascript or html
- Browser is a foothold; it has real power

## Breaking the Browser

- Programming errors everywhere
- Goal: Cross the line between data and code
- Lots of ways to do that

- Month of Browser Bugs
  - I <3 HD Moore

## Going Deeper (just for a moment)

- Don't let your eyes glaze over
  - This is where the magic happens
- Computers are simple, code is just bytes
- He who controls the next instruction to be run wins

## Going Deeper (just for a moment)

- Holy Grail: Get Instruction Pointer to point to something we control → Game Over.
  - Buffer Overflow, Format String, Heap Corruption
- Just as good: "Mother May I" vulns
  - These are stupid. Really, really dumb. Hopefully MS is past this. Adobe & Sun/Oracle, not so much.
  - MS06-014
    - var s = CreateO(a, 'WScript.Shell');
    - var o = CreateO(a, 'ADODB.Stream');
    - var e = s.Environment('Process');

## Going Deeper (just for a moment)

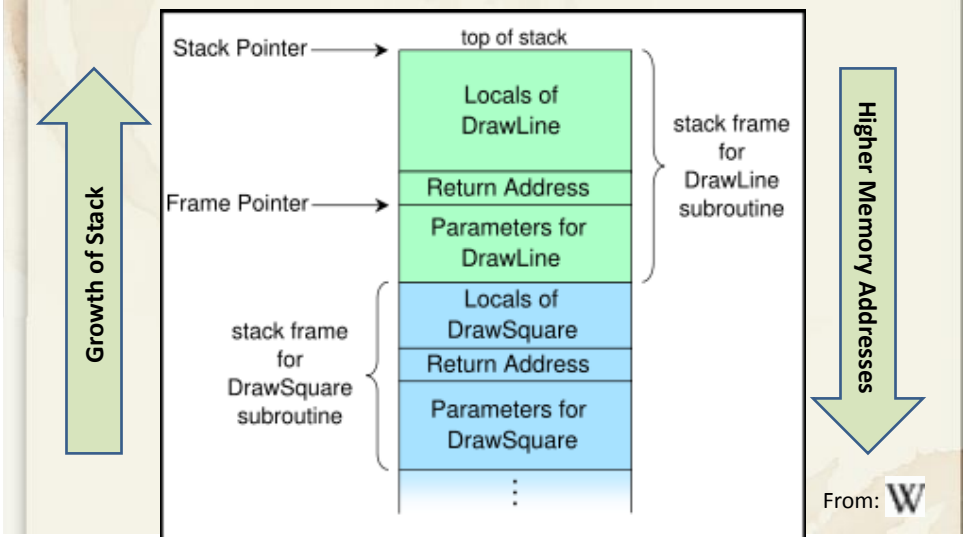
- The “stack” is working memory
- A “buffer overflow” is an attack against this working memory

```
DrawSquare(Point* a, Point* b, Point* c, Point* d)
{
  //use some locals here, then call to draw lines…
  DrawLine(a, b);
  DrawLine(b, c);
  DrawLine(c, d);
  DrawLine(d, a);
}
```

## Going Deeper (just for a moment)

```
Dump of assembler code for function DrawSquare:
0x080483c3 <DrawSquare+0>:     push   %ebp
0x080483c4 <DrawSquare+1>:     mov    %esp,%ebp
0x080483c6 <DrawSquare+3>:     sub    $0x8,%esp
0x080483c9 <DrawSquare+6>:     mov    0xc(%ebp),%eax
0x080483cc <DrawSquare+9>:     mov    %eax,0x4(%esp)
0x080483d0 <DrawSquare+13>:    mov    0x8(%ebp),%eax
0x080483d3 <DrawSquare+16>:    mov    %eax,(%esp)
0x080483d6 <DrawSquare+19>:    call   0x80483b9 <DrawLine>
…
0x0804840c <DrawSquare+73>:    call   0x80483b9 <DrawLine>
0x08048411 <DrawSquare+78>:    leave
0x08048412 <DrawSquare+79>:    ret
```

# Going Deeper (just for a moment)




# Going Deeper (just for a moment)

- The Schneier 7-11 Analogy
- Volunteers?

## Detecting Bad Stuff (1)

- Sure, just search for that in a page right?
  - Static Detection (aka signature-based)
- Right! (Once.) Now it's an arms race.
  - Alan Turing says the bad guys win in an obfuscation game
  - We don't have to play to the end though...
- End result: Bad stuff is almost always obfuscated

## Detecting Bad Stuff (2)

- Behavioral Detection
  - Let it do its thing, judge based on what it does
- Sweet, this is a powerful technique
- General lesson: Always whitelist

## Alright already, lets own something

- MS06-014 Demo
- MS10-002 “Aurora” Demo
- Disclaimer: Don’t expect fireworks… the cool stuff happens inside the machine.

## So, what happened? (1)

- Webpage made browser do something it shouldn't
- Attacker was on the net... now on your box
- He's not done yet…

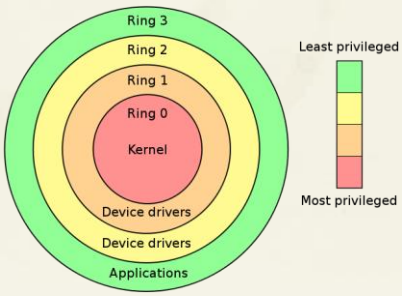
# So, what happened? (2)

| | | |
|---|---|---|
| 12:08:39.461 | | Click on Malicious URL |
| 12:08:40.128 | Owned | L1 Payload Process Start |
| 12:08:41.645 | Really Owned | L2 Payload Written |
| 12:08:41.663 | | L2 Payload System Hook Written |
| 12:08:41.668 | | L1 Payload Cleanup File Written |
| 12:08:41.851 | | L1 Payload Cleanup Process Start |
| 12:08:41.855 – .888 | | More System Hooks Written |
| 12:08:41.888 | Owned | L1 Payload Process End |
| ~12:08:42.000 | Really, Really | L1 Payload File Deleted |

<1 seconds to Ownage*, **

# More Terminology

- Ring0 - Ring3 (aka Kernel to User)
  - *nix/Windows differentiate, DOS didn't




- Ever wonder about CTRL-ALT-DELETE?

## Programs are just bytes

- How to defang malware
- Demo

- Though it's not always this easy…

## Some practical advice

- Run a modern, patched OS and browser
  - Take advantage of DEP, ASLR, SELinux
  - It's time for XP and IE 6 to die
- Run adblocker and scriptblocker
  - if you can stand it…
- Don't browse as admin
- Don't install random plugins in your browser
- Oh, and ditch Adobe Reader
  - Though Foxit just got egg in their face
- (A/V isn't on this list)

## Skills for InfoSec Industry

- Learn to speak and write well
- Politics is a skill
- Econ (depends who you ask; I think it's huge)

- Not so much about "*OMG H4xx0rs at teh gates!*"
  - More about "Hmm, that's funny" (P. Nico)

## Obligatory "Getting into InfoSec" Slides

- There's no one way
  - I'm biased toward getting a technical background
- Take a broad range of technical classes
  - You'll need approaches and techniques from many different fields
- Work with the smartest people you can find
- Mostly: "Be proactive"

## Obligatory "Getting into InfoSec" Slides

- Marissa Fagan's talk on ErrataSec
- Securiosis post
- SecureConsulting post

- Read blogs → Have a blog
- Get on Twitter (… I hate it as much as you do)

## Questions?

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Slides and more at
http://CoffeeToCode.net