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Web Application Attacks

What can an attacker do and just how hard is it?

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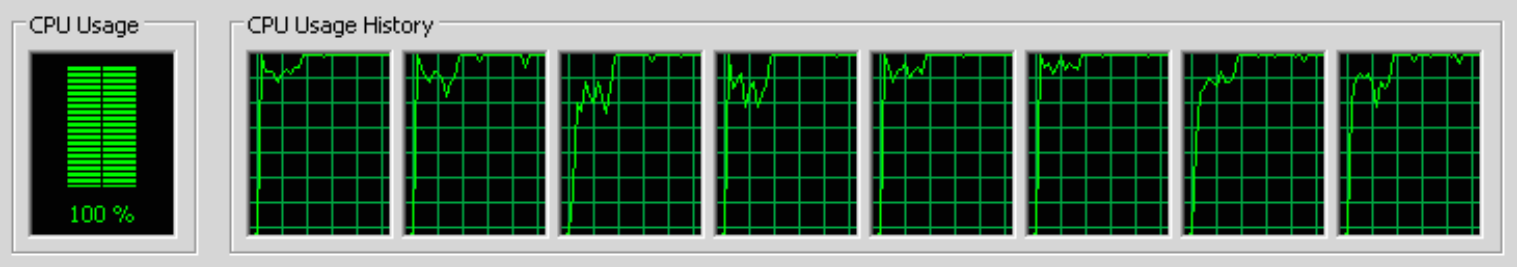
cortesi:~ damon$ whoami

- Systems and Security Administrator (Windows, Active Directory, Linux)
- Penetration Tester
- Source Code Reviewer
- PCI Assessor
- Breaker of Web Applications
- Destroyer of Quad Dual-Core Servers



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Web Application Attacks

- SQL Injection
- Blind SQL Injection
- Authorization Bypass (Parameter Manipulation)
- Cross-Site Scripting

- Overview and Live Demonstration
  - What exactly *can* a “hacker” do?

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SQL Injection

- Due to lack of input validation and string concatenation techniques:

```
strQuery = "SELECT username, password FROM users " & _
WHERE username = '" & Request.QueryString("user") & "'"
```

- Basic forms are easily identifiable and exploitable via ODBC driver error messages
  - I am sometimes known as Capt. "Just-a-Tick"
- Can be used to:
  - Enumerate or modify database contents
  - Compromise the database host operating system
- What's needed to exploit?
  - A web browser…but numerous tools exist to make life easy
- Exploits standard, required functionality
- Bypasses the network firewall

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DEMO!

- Basic error-based SQL Injection
- Demonstration of tools such as Absinthe and PRIAMOS

- Executive-level Impact – Which one sounds worse?
  - Your website is SQL-injectable…
  - Here's a list of your clients including social security numbers

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Blind SQL Injection

- Same root cause as regular SQL Injection, but data extraction methods are more advanced
  - No error-based extraction
  - Can only obtain a “True” or “False” result from SQL Queries
- Well that’s not so bad, right?

- `SELECT username, password FROM users WHERE username = 'user' and (SELECT SUBSTRING(@@SERVERNAME,1,1)) > 'M'—`
  - Programmatically determine a value based on comparisons of individual characters!

- Wow…that would take a while, wouldn’t it?
  - Yes, but that’s what automated tools are for!

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DEMO!

- Basic state-based Blind SQL Injection
- Demonstration of Absinthe in “blind” mode

- Beyond data extraction
  - Demonstration of system compromise via xp_cmdshell

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SQL Injection Mitigations

- Validate, Validate, Validate!
  - Front-end Validation – User Experience ONLY
  - Back-end Validation – Server-side validation of data
    - Strongly-typed variables
    - White-list techniques as opposed to black-listing “bad” characters
  - Database enforcement of the above validation
    - Typed columns, limits to field lengths
    - …everything is NOT an nvarchar with MAX length
  - Data encoding
- Stored procedures or Parameterized Queries
- Low-privileged accounts for database and web server
- Egress Filtering

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Authorization Bypass

- OK – so you've put generic error messages in place and you're using stored procedures…what can an attacker do now?
- Have you put an authorization layer in place?
  - http://hostname/creditinfo.asp?customerId=5637
  - Should I have access to customerId 5637?
  - What about 5638? Or 5639? Or 2567?
- Unfortunately, this is extremely common and again requires NO advanced techniques…just a simple modification of a predictable number
- Quick demo

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Cross-Site Scripting

- Root cause same as SQL Injection – Input Validation!
- HTML characters accepted as input and re-displayed to page without encoding:
  - Damon”><script>alert(‘IOA’)</script> is NOT a valid username!
    1. This shouldn’t be accepted in the first place
    2. If it *is* accepted, does it need to be re-displayed?
    3. Any HTML characters should be encoded in output
       - “ becomes "
       - > becomes >
- Can be used to:
  - Execute client-side code, such as arbitrary JavaScript
  - Steal cookies, credential information, alter any aspect of user experience

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DEMO!

- Basic Cross-Site Scripting (XSS)
- Persistent XSS

- Beyond alert dialogs
  - Escalation to administration using XSS
  - Using XSS to compromise a client system via browser exploits

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Current Threats

- Technology and Development Environments improving
  - Difficult to make this demo work in ASP.NET!

- Today's threats
  - Logic errors and authorization
  - Poor crypto implementation
    - SSL/TLS used only for transport security, not for other benefits
    - Web services using passwords instead of authenticating certs
  - File handling issues (arbitrary read/write)
  - Still…input validation!
  - In-depth manual review of complex web applications still required
    - Automated web app scanners have matured, but not enough
  - Applications still not designed with security ingrained in the process

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SQL Injection Tools

- Commercial
  - SPI Dynamics Toolkit
- Free/Open Source
  - Abinsthe - www.0x90.org/releases/absinthe/
  - Bsqlbf - http://www.unsec.net/download/bsqlbf.pl
  - BobCat - http://www.northern-monkee.co.uk/projects/bobcat/bobcat.html
  - PRIAMOS - www.priamos-project.com
  - SQLBrute - www.justinclarke.com/archives/2006/03/sqlbrute.html
  - SQLiX - www.owasp.org/index.php/Category:OWASP_SQLiX_Project
  - Sqlmap - sqlmap.sourceforge.net
  - Sqlninja - sqlninja.sourceforge.net
  - ISR-sqlget - http://www.infobyte.com.ar/down/ISR-sqlget-Readme.txt

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XSS in "Web 2.0"

- AJAX and Dynamic Applications require the use of JavaScript
- Greater functionality in applications = greater functionality for attackers!
- Expose API's - Again lack of authorization!

- Jikto - JavaScript port of Nikto for distributed web vulnerability scanning using cross-site scripting as a distribution method
  - Ie: XSS Bot-net
- JavaScript "Attack Toolkits" being released
  - BeEF - Browser Exploitation Framework
- New Classes of JavaScript attacks being revealed

- Unfortunately, also no legal avenues to report web application vulnerabilities to raise awareness
  - Unknown how many web applications in the wild are vulnerable

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Questions
Comments
Feedback

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