Hands-on Security Tools

SecAppDev 2011

KRvW Associates, LLC

Caveats and Warnings

This is not a sales pitch for any product(s)

- If you want to talk to a sales person, tell me
- Otherwise, you will NOT get calls or spam

You are not authorized to "test" any systems other than your own

- If you do, then don't call me from prison
- I don't know you

Prerequisites

Computer (shared or solo)
- Windows, OS X, Linux
- Local admin access

Virtual machine environment (Vmware, Parallels, Virtual Box)

JDK (newer is better)

Development environment (for source analysis tool)
- C or Java
- Make, Ant, Eclipse (3 or 2), Visual Studio, Rational, Websphere

Objectives and Intros

We'll look at several tools described in my security tools class

Idea is to give everyone a glimpse of several tools
- NOT to turn anyone into an expert on any tool

Safe, sales-free env

Flow

- Describe each tool
- Demo (where applicable)
- Class tries tool with specific objectives
- Discuss results and applicability

Secondary Goals

Learn
Experiment with the tools
Judge for yourself
Have fun

Setup environment

We'll use a combination of stuff
- Live CDs
  - OWASP, Network Security Toolkit (NST) 1.8
- Desktop installations

For live CDs, virtual machine is highly recommended
- Copy CD image ISO into your VM folder
- Set up separate Linux VMs for each
  - Recommend "no hard drive" options

Infosec tools

Categories include
- Network port scanners
- Vulnerability scanners
- Application scanners
- Web application proxies
- Network sniffers

(For a great list, see http://sectools.org/)

Software security tools

Categories include
- Static code analysis tools
- Testing tools
  - Fuzzers
  - Interposition tools
  - System monitors
  - Process analyzers
  - Etc.

Network and vul scanners

Usage: determine open and potentially vulnerable network services

- Mainstay of "penetration testers"
- Useful for verifying deployment environment
- Validating on-going maintenance
- Rarely directly valuable to developers

Examples

- Nmap, nessus, Metasploit, ISS, Core Impact, Retina

NMAP

Http://nmap.org

Open source and free

Available on numerous OSes

Command line and GUI

Unix command-line folks will love this…

- nmap -h lists options
- Numerous !

Nessus

http://nessus.org

Free, but not open source

- Parent company is http://www.tenablesecurity.com
- Commercial

Supports several OSes

- Linux (RH, Suse, Debian, but not Ubuntu)
- Windows, OS X, Solaris, FreeBSD

Client/server model (but 3.0 can now run without server)

Metasploit

http://metasploit.org

WARNING!!!

Open source exploit/payload tool

Extensible with exploits written in Ruby

Runs on most OSes

CLI, menu, GUI, and WUI front-ends

Web application testing

First, the manual approach
- A lot of times, there's no substitute for this
- Kind of like a single-stepping debugger

Testing proxies are useful
- Man-in-the-middle between browser and app

Examples
- WebScarab, Paros Proxy

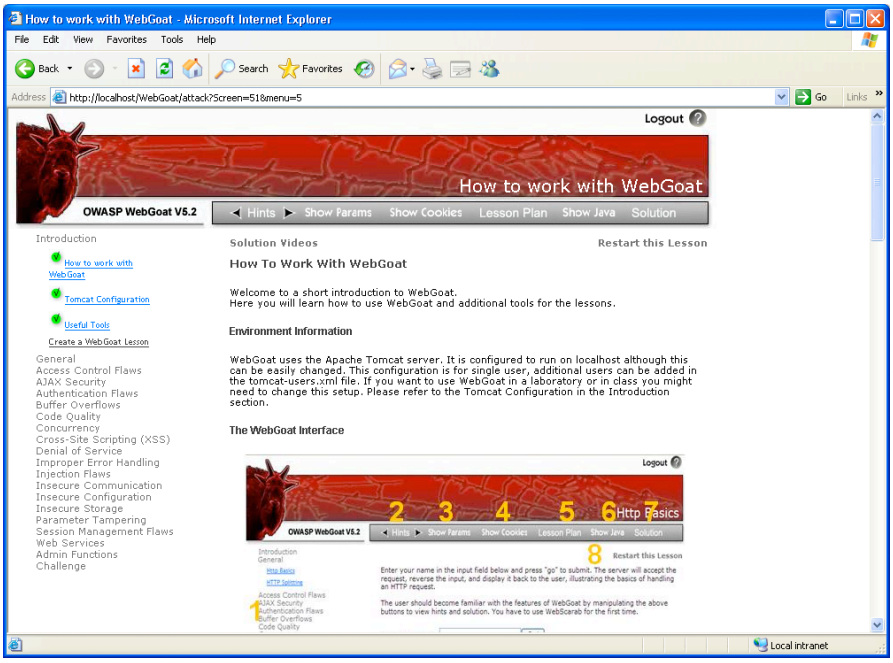
The tools we'll use

OWASP tools (freely available)
- Your web browser (IE or Firefox preferred)
- WebGoat -- a simple web application containing numerous flaws and exercises to exploit them
  - Runs on (included) Apache Tomcat J2EE server
- WebScarab -- a web application testing proxy

Instructor demo

Class installation of both tools

WebGoat



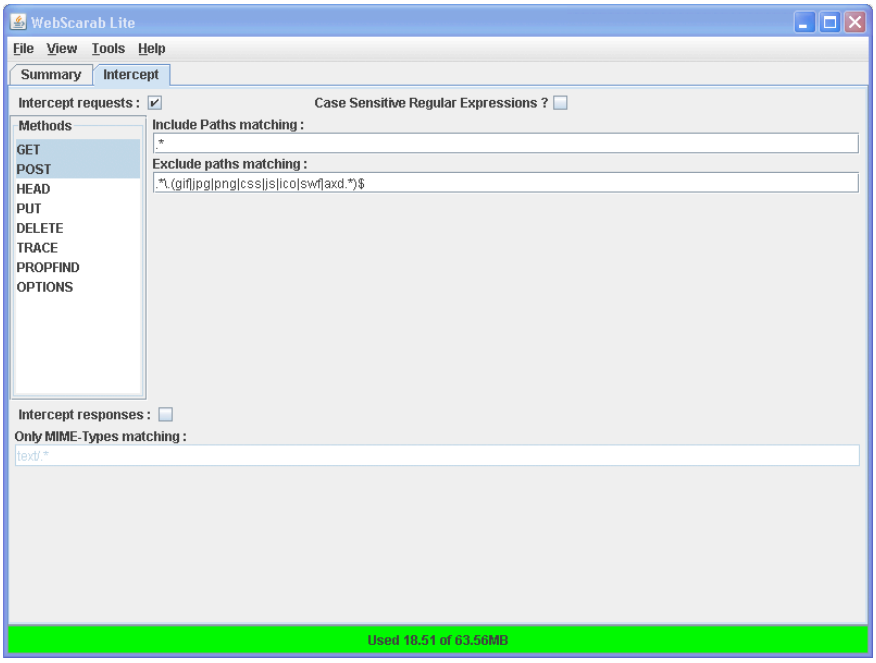
Setting up WebGoat

Run WebGoat on TCP port 8080

- From WebGoat folder (GUI or command line)
  - Windows: webgoat_8080.bat
  - OS X or Linux: ./webgoat.sh start8080
    - (Will need to chmod +x webgoat.sh first)
  - Verify in browser http://localhost:8080/WebGoat/attack

At this point, WebGoat is running, but you'll still need a testing proxy to perform some attacks

WebScarab



Next, set up WebScarab

Run WebScarab

- Default listener runs on TCP port 8008
- Ensure listener is running within WebScarab

Configure proxy

- Set web browser proxy point to TCP port 8008 on 127.0.0.1 (localhost)
- Include proxy for localhost
- Connect once again to http://localhost:8080/WebGoat/attack

Troubleshooting

Scarab not running
- Listener turned off or on wrong port

Browser proxy not configured or misconfigured
- IE behaves differently than Firefox
  - IE 7 often "misbehaves"
- Make sure proxy is set for localhost and 127.0.0.1
- Try using 127.0.0.1. (note the "." at end)
- Turn off anti-phishing or "safe browsing" features
- Ensure JavaScript is running
- Try Firefox if you are an IE user, and vice versa

WebGoat tips

Report card shows overall progress

Don't be afraid to use the "hints" button
- Show cookies and parameters can also help
- Show java also helpful
- None of these are typical on real apps…

Learn how to use it

Fabulous learning tool

Familiarizing Goat and Scarab

WebGoat

- Do “Web Basics” exercise
- Try Hints and other buttons
- Look at report card

#1 Cross site scripting (“XSS”)

Can occur whenever a user can enter data into a web app

- Consider all the ways a user can get data to the app

When data is represented in browser, “data” can be dangerous

- Consider this user input

```
<script>
alert(document.cookie)
</script>
```

Where can it happen?

- ANY data input

Two forms of XSS

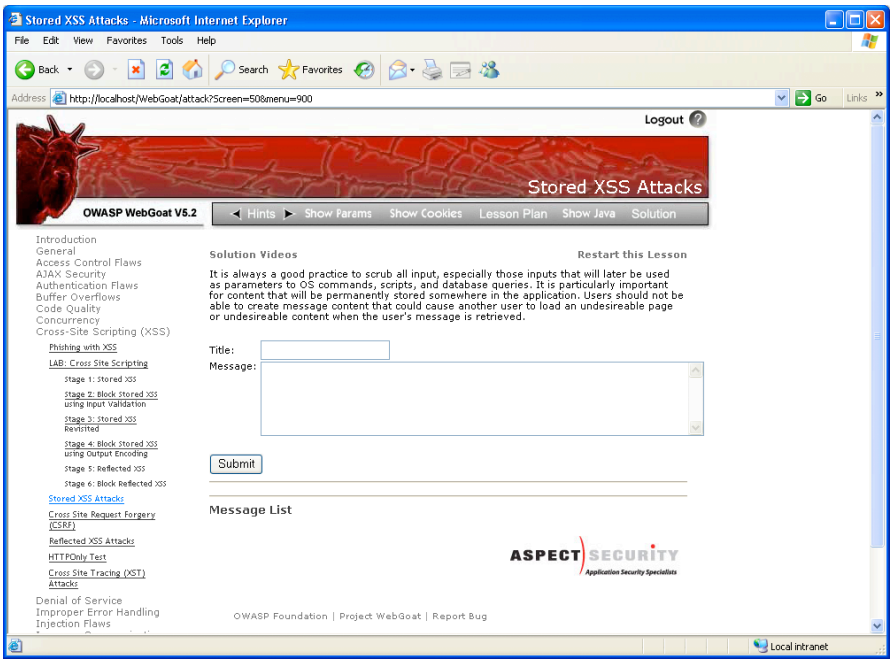
- Stored XSS
- Reflected XSS

Two WebGoat exercises to see for yourself

Stored XSS

- Attacker inputs script data on web app
  - Forums, “Contact Us” pages are prime examples
  - All data input must be considered
- Victim accidentally views data
  - Forum message, user profile, database field
- Can be years later
  - Malicious payload lies patiently in wait
  - Victim can be anywhere

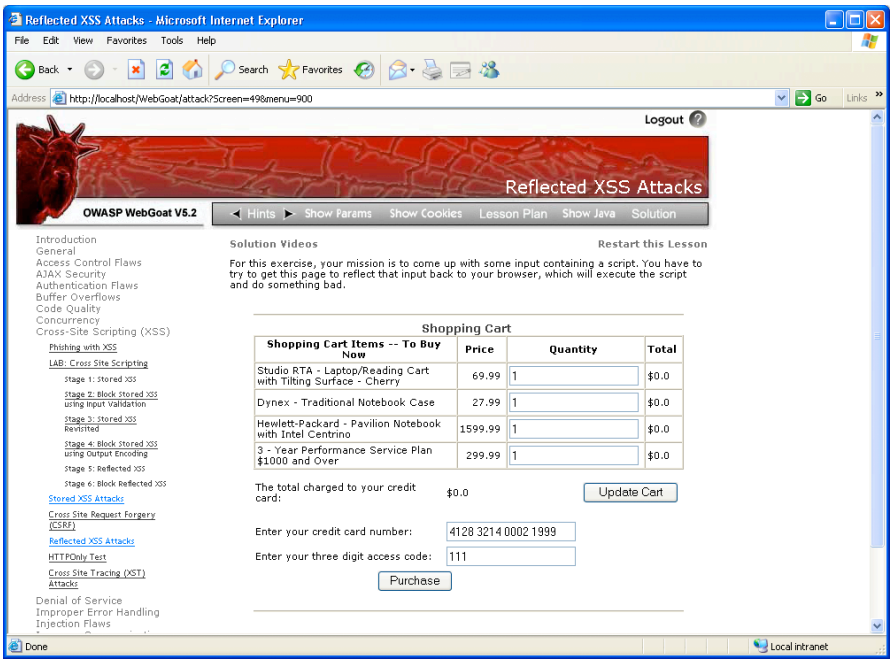
Stored XSS exercise



Reflected XSS

- Attacker inserts script data into web app
- App immediately "reflects" data back
  - Search engines prime example
  - "String not found"
  - Generally combined with other delivery mechanisms
    - HTML formatted spam most likely
    - Image tags containing search string as HTML parameter
      - Consider width=0 height=0 IMG SRC

Reflected XSS exercise



XSS issues

Why is this #1?

- Input validation problems are pervasive
- Focus on functional spec

Why is it such a big deal?

- Highly powerful attack
- Anything the user can do, the attacker can do
- Take over session
- Install malware
- Copy/steal sensitive data

Reflected (via spam email) attacks most common technique by phishers

How bad is XSS?

Perhaps the most (in)famous example is the MySpace Samy virus

- XSS content in author's page that added any viewer as a friend whenever viewed
- In less than 24 hours, Samy had > 1 million "friends"
- MySpace crashed and was down for 3+ days

JavaScript Obfuscation

Used to hide the real intent of a JS

Many (!) examples exist

Increasingly difficult to detect

Example

```
var a="Hello World!";
function MsgBox(msg)
{
    alert(msg+"\n"+a);
}
MsgBox("OK");
```

Becomes

```
//language=jscript.encode
#@~^1wAAAA==-mD~|!X FF XT']
Jw6W%wa+*-XZ'6v;wavw-X T-
aXF-avww6F wa+Z-aW-a
8EBJwX!zJ~r-X*s'6*ArTI-mDP|
T6yFGyaq'|!X qG+aZ
$T6ZDi6EU^DkWU~|!a 8{y6+v
{Z6 8Gya&*CVDOc|!
6yqGy6&3mT6yFF a!,TXFD_|
T6yF{+XF#IN,im!X+8G+X v{!X
8{ X!,!X Dbp5j4AAA==^#~@
```

(Source javascriptobfuscator.com)

Application vul scanners −1

Category of black box test tools that attempts additional “application level” vul probes

- E.g., SQL injection, buffer overflows, cookie manipulation, Javascript tampering
- Increasing in popularity among pen testers
- Useful at verifying (web) app is not vulnerable to the most common attacks
- Moderately useful to developers

Application vul scanners −3

Examples

– IBM/Watchfire's Appscan, HP/SPI Dynamics' WebInspect, Nikto

Nikto

http://nikto.org

Written in Perl

Simple and low-level app scans

AppScan

http://www.watchfire.com (acquired by IBM)
Windows only
Commercial application scanner
We'll look at eval copy
- Only able to scan http://demo.testfire.net

Fuzzers -1

Growing field of app testing that involves sending malformed data to/from app
- Tools, frameworks, and APIs are popping up
- "One size fits all" approach is highly problematic
  - Informed fuzzing vs. uninformed fuzzing
- Still early adoption among pen testers (arguably)
- Dev knowledge is necessary to get most of it

Fuzzers –2

- Fuzzing can and should be done from unit to entire app tests
- QA test team needs to acquire and learn

Examples

- OWASP's JBroFuzz, PEACH, SPI Fuzzer, GPF, Codenomicon, Mu Security, SPIKE, Sulley

"At Microsoft, about 20 to 25 percent of security bugs are found through fuzzing a product before it is shipped"

JBroFuzz

http://www.owasp.org/index.php/Category:OWASP_JBroFuzz

Open source from OWASP

Simplistic, but can fuzz

- Fields in any web app form
- URL guessing

Project is still alpha-stage

Static code analyzers −1

Review source code for common coding bugs

– A bit of history

- 1999: First examples appear from research projects
  - E.g., ITS4, RATS, Flawfinder
  - Tokenize input streams and perform rudimentary signature analysis
  - Accurate at finding strcpy() and the like, but lacking context to really be useful

Static code analyzers −2

- 2001: "2nd generation" tools arrive
  - E.g., Fortify, Ounce Labs, Coverity
  - Parse and build abstract syntax tree for analysis
  - Enables execution flow, data flow, etc., traces
  - Significant leap forward, but much work remains
  - Hundreds of common bugs in several languages
  - Management tools for overseeing, measuring, and policy enforcement
  - Integration into popular IDEs
- Still, many are shelfware

Static code analyzers −4

- Then do large scale analysis at project completion
- Possibly using more than one tool set

Examples

- Fortify SCA, Ounce Labs Ounce 5, Coverity Prevent, Klocwork

Fortify SCA

http://fortify.com

Commercial source code analyzer

Supports numerous platforms, languages, compilers, and IDEs

License caveats for this class

Other features: security manager, rule builder

The Challenge!

Rules of the game

- You may use WebScarab
- All access to the Challenge app must be via browser
- You may NOT use command-line or other OS interface
- Questions are ok, but I will answer to everyone

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