



# Developing Burp Suite Extensions

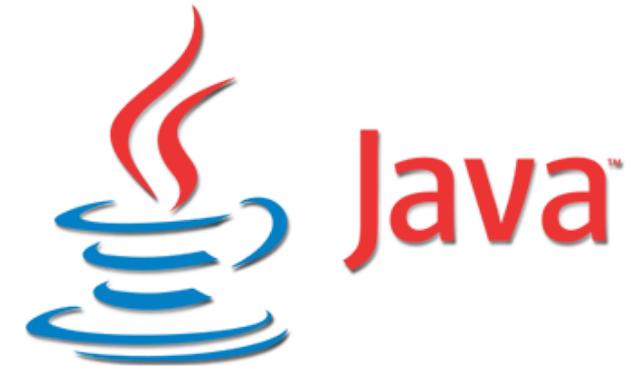
## From manual testing to security automation

Luca Carettoni - luca@doyensec.com

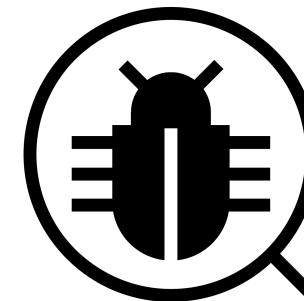
# Welcome

- This is a brand-new class!
- Hands-on and highly interactive
- We have 14 hours to go from manual testing to security automation

# Ingredients



# Jenkins



# Agenda - Day 1

1. Intro
2. A quick recap of Burp Suite's tools
3. Understanding Burp's Extensibility APIs
4. IDE setup and templates
5. *Hello Burp* extension
6. Customer logger

# Agenda - Day 2

7. Replay tool
8. Passive check for the scanner
  - Detect pages missing SRI attribute
9. Active check for the scanner
  - Detect EJL vulnerabilities
10. Security automation toolchain integrated in Jenkins
11. Intruder payload generator case study  
(Bradamsa)

# About me

- ❤️ AppSec since 2004
- Doyensec Co-founder
- Former AppSec  
@LinkedIn, Director of  
Security (Addepar),  
Senior Security  
Researcher (Matasano),  
....



# Relevant work

- First edition of **Instant Burp Suite Starter**
  - Packt Publishing, 70 pages, ISBN-10 1849695180
- Numerous extensions:
  - Bradamsa - <https://github.com/ikkisoft/bradamsa>
  - Blazer <https://github.com/ikkisoft/blazer>
  - ParrotNG <https://github.com/ikkisoft/ParrotNG>
  - etc..
- Burp Suite's anti-debugging patch me
  - <http://blog.nibblesec.org/2013/01/anti-debugging-techniques-and-burp-suite.html>

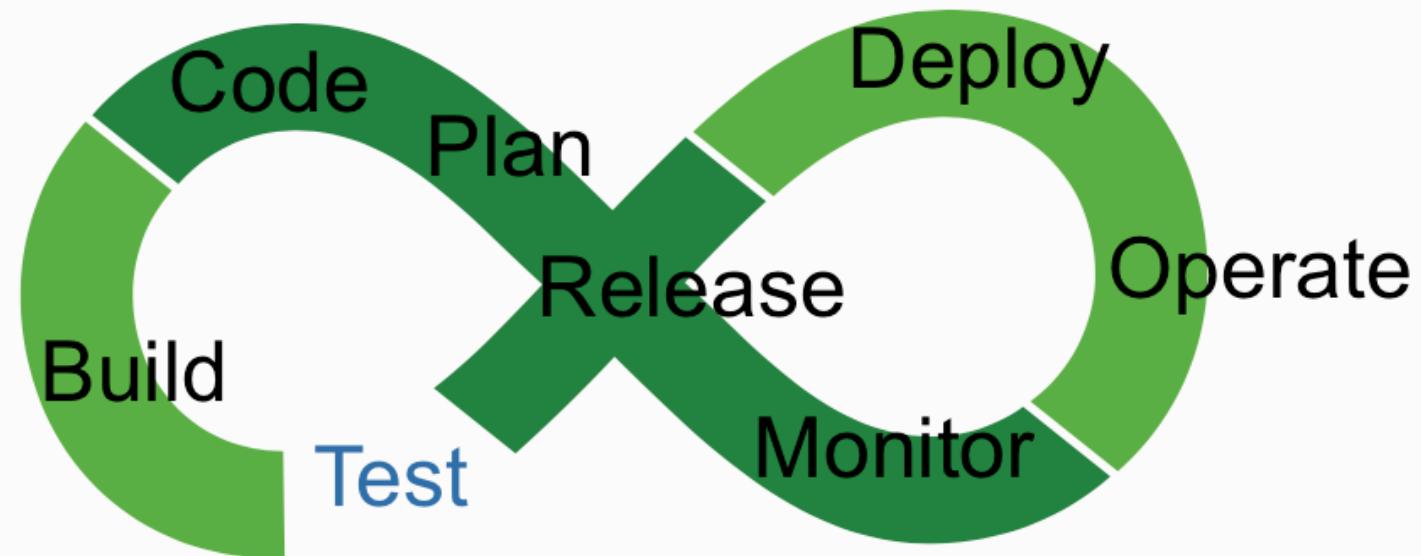
# Contact Details

- If you have questions, problems - even after the training:
  - Email: [luca@doyensec.com](mailto:luca@doyensec.com)
  - Twitter: [@lucacarettoni](https://twitter.com/lucacarettoni)

# Getting to know you

- Builder or Breaker
  - How many pentesters?
  - How many software engineers?
  - ...
- Have you ever used Burp? How often?
- Let's talk about coding in Java
  - *Hello World* or *Cocktail Shaker Sort* algorithm?

# Tactical Testing



# Setup

# Getting all ready...

# Java / Python / Ruby

- I will be coding in Java with Netbeans
- You can follow examples in any of the three languages
- For hands-on exercises, I would highly recommend coding in Java too!

# What you need

- Laptop :)
- Recent Java JDK installed
- Oracle Netbeans IDE installed
  - You can use Eclipse or IDEA (if you're very familiar with those)
- Git command line installed

# Burp Suite Professional

- Since we're building Scanner extensions,  
**this training requires a Pro license**
- You can either use your own license, or I  
can provide a temporary license kindly  
offered by



# Burp Setup

- Configure your browser to use the Burp Proxy listener as its HTTP proxy server
- *Firefox* is probably the best browser for security testing

# Setup Proxy in Internet Explorer

- Go to the Tools menu, select Internet Options, go to the Connections tab, and click on the "LAN settings" button. Make sure the "Automatically detect settings" box is unchecked. Make sure the "Use automatic configuration script" box is unchecked. Make sure the "Use a proxy server for your LAN" box is checked. Enter your Burp Proxy listener address in the "Address" field (by default, 127.0.0.1). Enter your Burp Proxy listener port in the "Port" field (by default, 8080). Make sure the "Bypass proxy server for local addresses" box is unchecked. Then click on the "Advanced" button. Make sure the "Use the same proxy server for all protocols" box is checked. Delete anything that appears in the "Exceptions" field. Then click "OK" to close all of the options dialogs.

# Setup Proxy in Chrome

- The Chrome browser picks up the HTTP proxy settings configured on the host computer. If you are using Chrome, you can open your computer's built-in browser and follow the instructions for configuring that. If you aren't sure where the built-in proxy settings are, open Chrome, go to the Customize menu, select Settings, click on "Show advanced settings", and click the "Change proxy settings ..." button. This will open the relevant configuration options for your host computer.

# Setup Proxy in Firefox

- Go to the Firefox menu, click on Options, click on Advanced, go to the Network tab, and click on the Settings button in the Connection section. Select the "Manual proxy configuration" radio button. Enter your Burp Proxy listener address in the "HTTP proxy" field (by default, 127.0.0.1). Enter your Burp Proxy listener port in the "Port" field (by default, 8080). Make sure the "Use this proxy server for all protocols" box is checked. Delete anything that appears in the "No proxy for" field. Then click "OK" to close all of the options dialogs.

# Setup Proxy in Safari

- Go the Safari menu, click on Preferences, click on Advanced, and by the Proxies label click the "Change Settings" button. This will open the Network configuration settings for your current network adapter. In the Proxies tab, check the "Web Proxy (HTTP)" box, and enter your Burp Proxy listener address in the "Web Proxy Server" field (by default, 127.0.0.1), and your Burp Proxy listener port in the (unlabeled) port field (by default, 8080). Ensure the "Bypass proxy settings for these Hosts & Domains" box is empty. Repeat these steps for the "Secure Web Proxy (HTTPS)" checkbox. Click "OK" and "Apply" and close the open dialogs.

# Clone the training repo

1. Open the terminal
2. From your working directory, clone using

```
$ git clone https://github.com/  
doyensec/burpdeveltraining.git
```

# Training Repo Structure

- ▶ BurpExtensionTemplate
  - ▶ Eclipse
  - ▶ IDEA
  - ▶ Netbeans
- ▶ Bradamsa
- ▶ DetectELJ
  - ▶ Java
  - ▶ Python
  - ▶ Ruby
- ▶ DetectSRI
  - ▶ Java
  - ▶ Python
  - ▶ Ruby
- ▶ HelloBurp
  - ▶ Java
  - ▶ Python
  - ▶ Ruby
- ▶ ReplayAndDiff
  - ▶ Java
  - ▶ Python
  - ▶ Ruby
- ▶ SiteLogger
  - ▶ Java
  - ▶ Python
  - ▶ Ruby

Each extension includes **Work In Progress** versions:

- /WIP1/
- /WIP2/
- /Final/

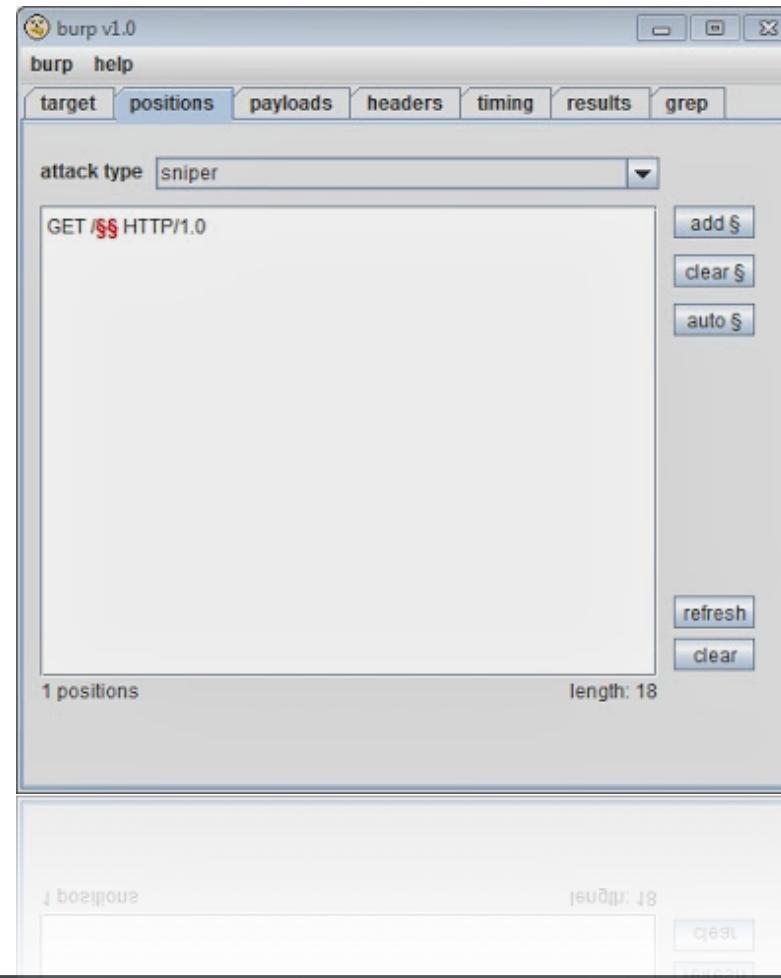
# Burp Suite Intro

## Overview



- Burp is the Swiss-army knife of Web Application Security
- Multiple tools, seamlessly integrated
  - Proxy
  - Spider
  - Scanner (Pro version only)
  - Intruder
  - Repeater
  - Sequencer
  - Decoder
  - Comparer

# From Burp v1.0 - June 2003



# To v1.7.17 and counting...

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Burp Intruder Repeater Window Help

Target Proxy Spider Scanner

Extensions BApp Store APIs

**Burp Extensions**

Extensions let you customize Burp's functionality.

Add Loaded Type

Remove Up Down

Details Output Errors

Extension loaded

Extension loaded

Details Output Errors

Report bug

Support Center

Release notes

Getting started

Using Burp Suite

Decoder Comparer Extender Project options User options Alerts

Diagnostics

License

Check for updates

Download other installers

Clean Burp from computer

# Proxy

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Burp Intruder Repeater Window Help

Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

Intercept HTTP history WebSockets history Options

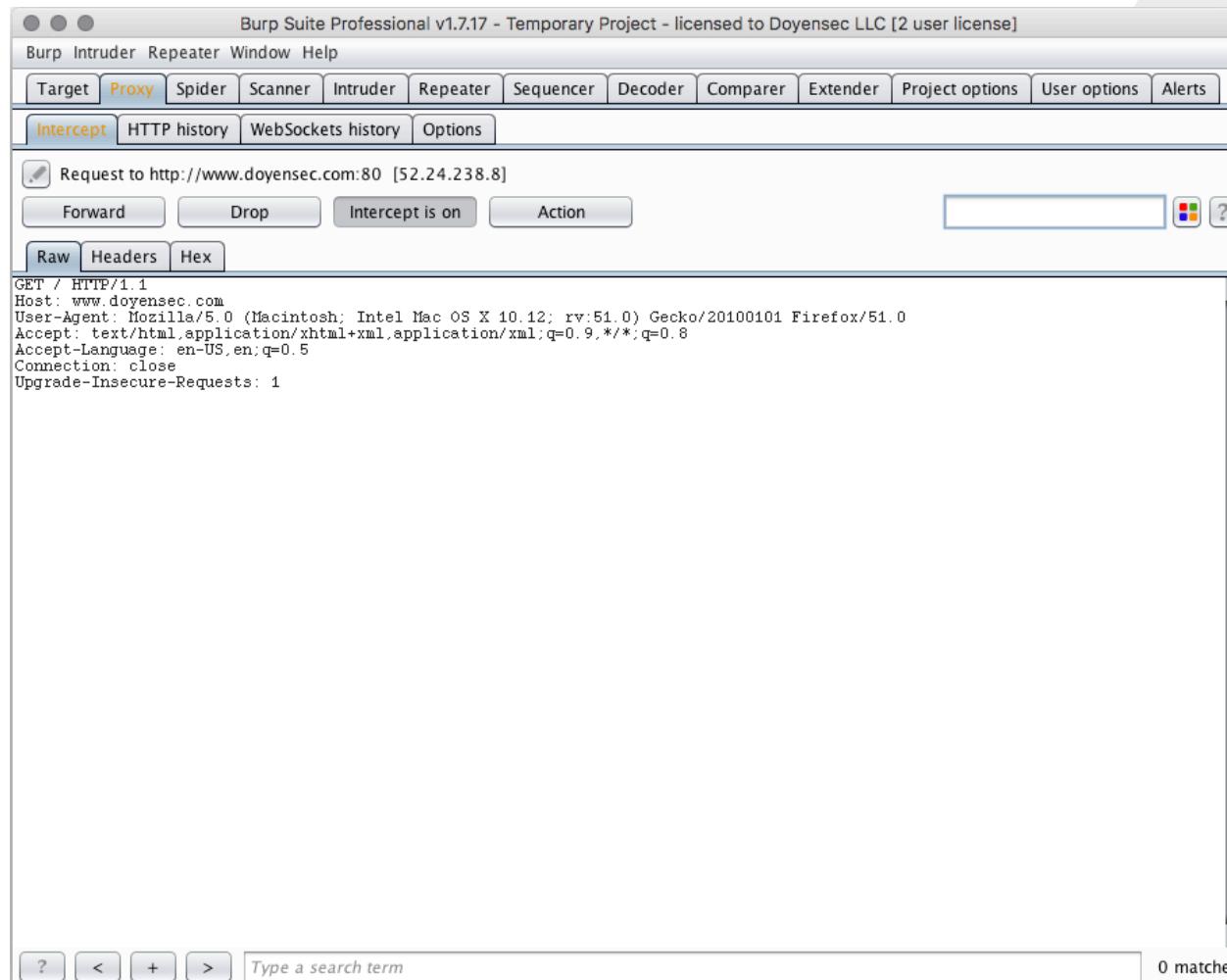
Request to http://www.doyensec.com:80 [52.24.238.8]

Forward Drop Intercept is on Action

Raw Headers Hex

```
GET / HTTP/1.1
Host: www.doyensec.com
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.12; rv:51.0) Gecko/20100101 Firefox/51.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Connection: close
Upgrade-Insecure-Requests: 1
```

Type a search term 0 matches



# Target

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Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

Site map Scope

Filter: Hiding not found items; hiding CSS, image and general binary content; hiding 4xx responses; hiding empty folders

Contents Issues

Host	Method	URL	Params	Status	Length	MIME type	Title	Comment	Time reques...
https://doyensec.com	GET	/index.html				HTML			

Request Response Raw

- https://blog.doyensec.com
- https://doyensec.com
  - /
  - auditing.html
  - automation.html
  - company.html
  - contact.html
  - engineering.html
  - images
    - index.html
    - js
      - research.html
- https://fonts.googleapis.com
- http://getbootstrap.com
- https://github.com
- http://kochinke.pl
- https://twitter.com
- http://www.doyensec.com
- https://www.linkedin.com

# Spider

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Control Options

**Spider Status**

Use these settings to monitor and control Burp Spider. To begin spidering, browse to the target application, then right-click one or more nodes in the target site map, and choose "Spider this

Spider is running    Clear queues

Requests made: 196  
Bytes transferred: 2,016,077  
Requests queued: 702  
Forms queued: 1

**Spider Scope**

Use suite scope [defined in Target tab]  
 Use custom scope

**Burp Spider - Submit Form**

Burp Spider needs your guidance to submit a login form. Please choose the value of each form field which should be used when submitting the form. You can control how Burp handles forms in the Spider options tab.

Action URL: <https://www.troopers.de/login/?next=/account/>  
Method: POST

Type	Name	Value
Hidden	csrfmiddlewaretoken	dRkyPfANtcMaVAJ3EXMevosOrVEbVHa8
Password	password	
Text	username	

Submit form    Ignore form

# Scanner

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Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

Issue activity Scan queue Live scanning Issue definitions Options

#	Time	Action	Issue type	Host	Path	Insertion point	Severity	Confid.
6	18:25:24 22 Feb 2017	Issue found	i Email addresses disclosed	https://doyensec.com	/		Information	Certa
7	18:25:24 22 Feb 2017	Issue found	i HTML uses unrecognized charset	https://doyensec.com	/		Information	Tenta
8	18:31:27 22 Feb 2017	Issue found	! SSL certificate	https://www.troopers.de	/		Medium	Certa
9	18:31:27 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/troopers17/		Information	Certa
10	18:31:27 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/troopers-logo.svg		Information	Certa
11	18:31:27 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/ernw-logo.svg		Information	Certa
12	18:31:28 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/icon_attack-and-research.svg		Information	Certa
13	18:31:28 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/icon_defense-and-management.svg		Information	Certa
14	18:31:28 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/icon_sap-security.svg		Information	Certa
15	18:31:29 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/images/conference-overview-2017.svg		Information	Certa
16	18:31:29 22 Feb 2017	Issue found	i Content type is not specified	https://www.troopers.de	/static/fonts/source-sans-pro-v9-latin-regular.woff2		Information	Certa
17	18:31:29 22 Feb 2017	Issue found	i Content type is not specified	https://www.troopers.de	/static/fonts/exo-2-v3-latin-regular.woff2		Information	Certa
18	18:31:29 22 Feb 2017	Issue found	i Content type is not specified	https://www.troopers.de	/static/fonts/source-sans-pro-v9-latin-700.woff2		Information	Certa
19	18:31:29 22 Feb 2017	Issue found	i Cacheable HTTPS response	https://www.troopers.de	/static/fonts/fontawesome-webfont.woff		Information	Certa
20	18:31:29 22 Feb 2017	Issue found	! Content type incorrectly stated	https://www.troopers.de	/static/fonts/fontawesome-webfont.woff		Low	Firm

Advisory Request Response

**i Cacheable HTTPS response**

Issue: Cacheable HTTPS response  
 Severity: Information  
 Confidence: Certain  
 Host: https://www.troopers.de  
 Path: /static/images/troopers-logo.svg

**Issue description**  
 Unless directed otherwise, browsers may store a local cached copy of content received from web servers. Some browsers, including Internet Explorer, cache content accessed via HTTPS. If sensitive information in application responses is stored in the local cache, then this may be retrieved by other users who have access to the same computer at a future time.

**Issue remediation**  
 Applications should return caching directives instructing browsers not to store local copies of any sensitive data. Often, this can be achieved by configuring the web server to prevent caching for relevant paths within the web root. Alternatively, most web development platforms allow you to control the server's caching directives from within individual scripts. Ideally, the web server should return the following HTTP headers in all responses containing sensitive content:

- Cache-control: no-store
- Pragma: no-cache

# Intruder

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Burp Intruder Repeater Window Help

Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

1 × ...

Target Positions Payloads Options

**Payload Positions**

Configure the positions where payloads will be inserted into the base request. The attack type determines the way in which payloads are assigned to payload positions – see help for full details.

Attack type: Battering ram

Start attack

POST /example?p1=\$p1&p2=\$p2vals HTTP/1.0  
Cookie: c=\$cvals  
Content-Length: 17  
p3=\$p3vals&p4=\$p4vals

Add § Clear § Auto § Refresh

# Repeater

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Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

1 ...

Go Cancel < | > | Target: https://doyensec.com

**Request**

Raw Headers Hex

```
GET /index.html HTTP/1.1
Host: doyensec.com
Accept: */*
Accept-Language: en
User-Agent: Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.1; Win64; x64;
Trident/5.0)
Connection: close
```

**Response**

Raw Headers Hex HTML Render

... Value  
... 200 OK  
... Wed, 22 Feb 2017 17:38:33 GMT  
... Apache/2.4.18 (Ubuntu)  
... Tue, 21 Feb 2017 22:33:46 GMT  
... "3861-54911f91c9ab6"  
... bytes  
... 14433  
... Accept-Encoding  
... close  
... text/html

```
<!DOCTYPE html>
<html lang="en">
<head>
    <meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
    <!--[if IE]><meta http-equiv="X-UA-Compatible" content="IE=edge, chrome=1" /><![endif]-->
    <meta name="viewport" content="width=device-width, initial-scale=1" />
    <meta name="description" content="Doyensec is an independent security research and development company focused on vulnerability discovery and remediation." />
    <meta name="keywords" content="doyensec, doyensecurity, security, infosec, vulnerability, exploit, offensive, pentest, pentester, hacking, auditing, reverse engineering, automation" />
    <meta name="robots" content="index, follow" />
    <meta name="robots" content="noodp" />
    <meta name="robots" content="noydir" />
    <title>Doyensec :: Build with Security</title>
    <link href="css/bootstrap.min.css" rel="stylesheet" type="text/css" />
```

# Sequencer

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Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

Live capture Manual load Analysis options

**Select Live Capture Request**  
Send requests here from other tools to configure a live capture. Select the request to use, configure the other options below, then click "Start live capture".

#	Host	Request
1	https://doyensec.com	GET /index.html HTTP/1.1 Host: doyensec...

Remove Clear Start live capture

**Token Location Within Response**  
Select the location in the response where the token appears.

Cookie:   
 Form field:   
 Custom location: From ["description" content=""] to [" />\n <meta"]

**Live Capture Options**  
These settings control the engine used for making HTTP requests and han

Number of threads:   
Throttle between requests (milliseconds):   
 Ignore tokens whose length deviates by  characters

**Burp Sequencer [live capture #1: https://doyensec.com]**

Live capture (paused)

Resume Copy tokens  Auto analyze (next: 200) Requests: 139  
Stop Save tokens Analyze now Errors: 0

Summary Character-level analysis Bit-level analysis Analysis Options

**Overall result**  
The overall quality of randomness within the sample is estimated to be: extremely poor.  
At a significance level of 1%, the amount of effective entropy is estimated to be: 0 bits.

*Note: Character-level analysis was not performed because the sample size is too small relative to the size of the character set used in the sampled tokens.*

**Effective Entropy**  
The chart shows the number of bits of effective entropy at each significance level, based on all tests. Each significance level defines a minimum probability of the observed results occurring if the sample is randomly generated. When the probability of the observed results occurring falls below this level, the hypothesis that the sample is randomly generated is rejected. Using a lower significance level means that stronger evidence is required to reject the hypothesis that the sample is random, and so increases the chance that non-random data will be treated as random.

# Decoder

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Burp Intruder Repeater Window Help

Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

Hello World!

%48%65%6c%6c%6f%20%57%6f%72%6c%64%21

JTQ4JTY1JTZjJTZjjTZmjtIwJTU3JTZmjTcyJTzjjTY0jTlx

Text  Hex [?](#)  
Decode as ...  
Encode as ...  
Hash ...  
Smart decode

Text  Hex [?](#)  
Decode as ...  
Encode as ...  
Hash ...  
Smart decode

Text  Hex [?](#)  
Decode as ...  
Encode as ...  
Hash ...  
Smart decode

# Comparer

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Burp Intruder Repeater Window Help

Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Project options User options Alerts

**Comparer** ?

This function lets you do a word- or byte-level comparison between different data. You can load, paste, or send data here from other tools and then select the comparison you want to perform.

Select item 1:

#	Length	Data	
1	35	https://www.troopers.de/troopers17/	<span style="float: right;">Paste</span>
2	35	https://www.troopers.de/troopers17/	<span style="float: right;">Load</span>

Remove Clear

Byte compare of #1 and #2 (0 differences)

Length: 35

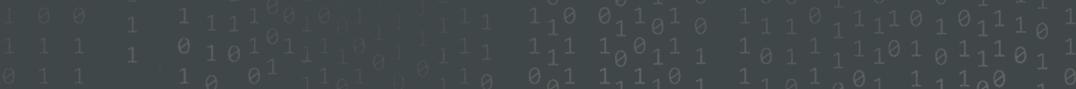
Text  Hex Length: 35

0	68	74	74	70	73	3a	2f	2f	77	77	77	2e	74	72	6f	6f	https://www.troo
1	70	65	72	73	2e	64	65	2f	74	72	6f	6f	70	65	72	73	pers.de/troopers
2	31	37	2f	--	--	--	--	--	--	--	--	--	--	--	--	--	17/

Select item #

# Burp Suite Trivia 1/2

- One question, twenty seconds and win Burp Suite merchandise!
- No Googling!

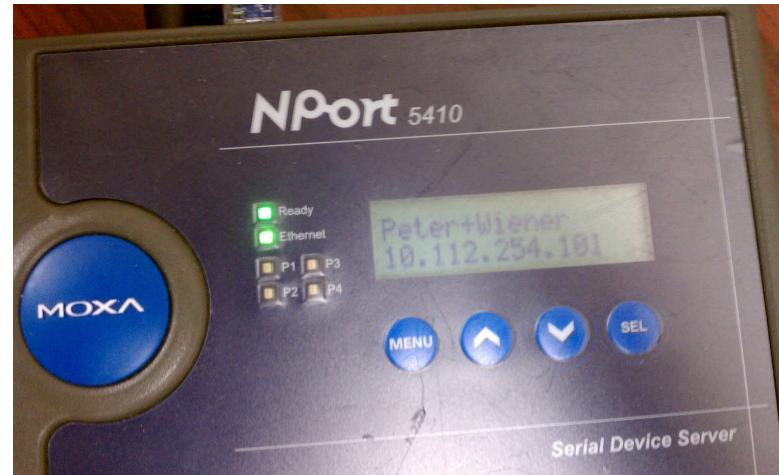


- What's the default name used by Burp for form submissions?



# and the two answers are...

- Peter Wiener
- Peter Winter
- Also, don't spider network devices!



# Burp Suite Extension APIs

## Overview

# Extender

- Lets you extend the functionalities of Burp in many ways
- Available since v1.1 (although radically different). Starting from v1.5.01, as known today
- Extensions can be written in *Java*, *Python* (*Jython*) or *Ruby* (*jRuby*)

# Free vs Pro

- Extensions are compatible for both Burp Suite Free and Professional versions

	Free Edition	Professional Edition \$349 per user per year
Burp Proxy	✓	✓
Burp Spider	✓	✓
Burp Repeater	✓	✓
Burp Sequencer	✓	✓
Burp Decoder	✓	✓
Burp Comparer	✓	✓
Burp Intruder	?	✓
Burp Scanner	?	✓
Save and Restore	?	✓
Search	?	✓
Target Analyzer	?	✓
Content Discovery	?	✓
Task Scheduler	?	✓
Release Schedule	?	✓
	Time-throttled demo	
	Major point releases	Frequent updates, earlier releases, beta versions

# Core Principles

- Allow multiple extensions to run simultaneously
- Support dynamic loading and unloading of extensions at runtime
- Support languages other than Java
- Provide a much, much richer API that allows extensions to really integrate with Burp's internals
- Use a more future-proof API design, to allow easier enhancements in future
- As far as possible, ensure backwards compatibility with legacy extensions

From <http://blog.portswigger.net/2012/12/new-burp-suite-extensibility.html>

# Extender GUI 1/4

- Load/Unload extensions
- StdIn and Stdout (Console, File, Show in UI)

The screenshot shows the 'Extensions' tab of the Burp Suite interface. At the top, there are tabs for 'Extensions', 'BApp Store', 'APIs', and 'Options'. Below the tabs, the title 'Burp Extensions' is displayed, followed by the sub-instruction: 'Extensions let you customize Burp's behavior using your own or third-party code.' On the left side, there is a vertical toolbar with buttons for 'Add', 'Remove', 'Up', and 'Down'. The main area contains a table with three columns: 'Loaded', 'Type', and 'Name'. A single row is visible, showing a checked checkbox under 'Loaded', 'Java' under 'Type', and 'Bradamsa' under 'Name'. Below the table, there are three buttons: 'Details', 'Output', and 'Errors'. Under the 'Details' tab, a message 'Extension loaded' is shown with a checked checkbox. A text input field contains the name 'Bradamsa'. At the bottom, there is a detailed table with two columns: 'Item' and 'Detail'. The items listed are 'Extension type' (Java), 'Filename' (bapps/cfba9ea9b11f4436a4303bca58b8ff06/bradamsa.jar), 'Method' (registerExtenderCallbacks), 'Suite tabs' (1), and 'Intruder payload generators' (1).

Item	Detail
Extension type	Java
Filename	bapps/cfba9ea9b11f4436a4303bca58b8ff06/bradamsa.jar
Method	registerExtenderCallbacks
Suite tabs	1
Intruder payload generators	1

# Extender GUI 2/4

- Burp App Store (BApp)
- Available since March 2014
- All BApp extensions source code is available on Github - see <https://portswigger.net/bappstore/>

The screenshot shows the Burp App Store interface. At the top, there are tabs for Extensions, BApp Store (which is selected), APIs, and Options. Below the tabs, a section titled "BApp Store" contains the message: "The BApp Store contains Burp extensions that have been written by users of Burp Suite, to extend Burp's capabilities." A table lists various extensions, including their names, whether they are installed, their rating, and a "Detail" column indicating if they are Pro extensions. The "Yara" extension is highlighted with a yellow background. Its details page includes a description, requirements, author information, a rating section, and download links.

Name	Installed	Rating	Detail
.NET Beautifier	<input type="checkbox"/>	★★★★★	
Active Scan++	<input type="checkbox"/>	★★★★★	
Additional Scanner Checks	<input type="checkbox"/>	★★★★★	
AES Payloads	<input type="checkbox"/>	★★★★★	
AuthMatrix	<input type="checkbox"/>	★★★★★	
Authz	<input type="checkbox"/>	★★★★★	
Autorize	<input type="checkbox"/>	★★★★★	
Backslash Powered Scanner	<input type="checkbox"/>	★★★★★	
Batch Scan Report Generator	<input type="checkbox"/>	★★★★★	
Blazer	<input type="checkbox"/>	★★★★★	
Bradamsa	<input checked="" type="checkbox"/>	★★★★★	
Browser Repeater	<input type="checkbox"/>	★★★★★	
Buby	<input type="checkbox"/>	★★★★★	
Burp Chat	<input type="checkbox"/>	★★★★★	
Burp CSJ	<input type="checkbox"/>	★★★★★	
Burp-hash	<input type="checkbox"/>	★★★★★	
BurpSmartBuster	<input type="checkbox"/>	★★★★★	
Bypass WAF	<input type="checkbox"/>	★★★★★	
Carbonator	<input type="checkbox"/>	★★★★★	
CO2	<input type="checkbox"/>	★★★★★	
Code Dx	<input type="checkbox"/>	★★★★★	
Commentator	<input type="checkbox"/>	★★★★★	
Content Type Converter	<input type="checkbox"/>	★★★★★	

**Yara**

This extension allows you to perform on-demand Yara scans of websites within the Burp interface based on custom Yara rules that you write or obtain. Example use cases include scanning spidered sites for obfuscated Javascript or any other specific string patterns of interest present in any part of a request or response. It has been tested with Yara 3.4 on Windows 7 and 10, and Kali 2.0.

Requires the latest version of the standalone Yara binary (3.4) for your OS. Instructions at: <https://github.com/plusvic/yara/releases/tag/v3.4.0>.

Requires Jython version 2.7 or later.

**Author:** Ian Duffy  
**Version:** 1.0

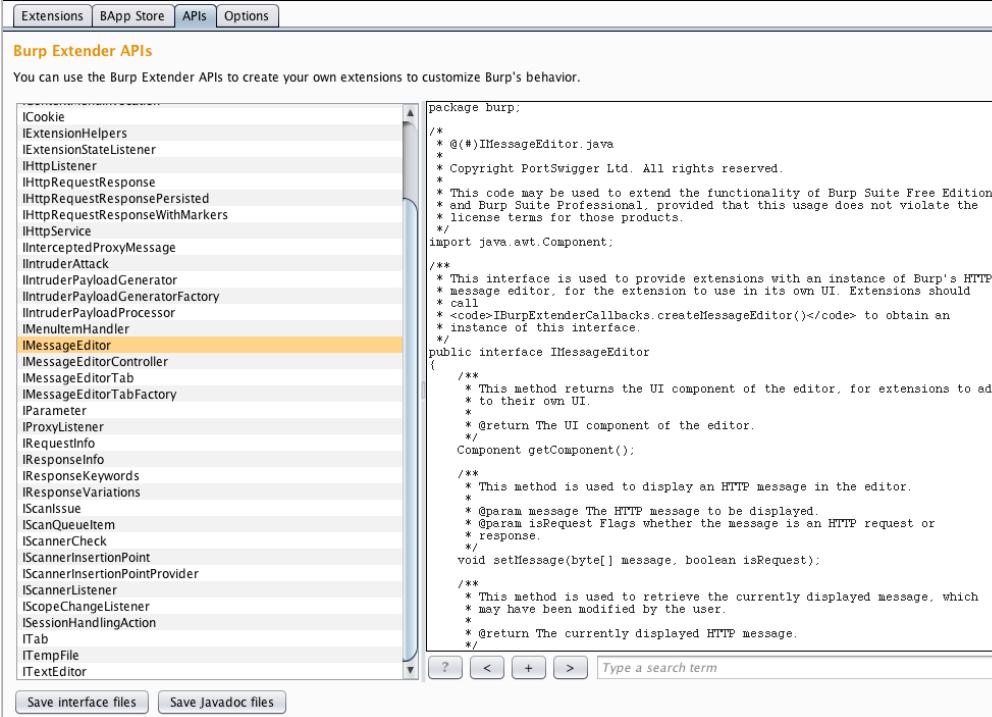
**Rating:** ★★★★★ [Submit rating](#)

[Install](#) [Download Jython](#)

To use Python extensions, you need to download Jython, and configure its location in Burp Extender options.

# Extender GUI 3/4

- Java APIs reference
- <https://portswigger.net/burp/extender/api/>



The screenshot shows a Java API reference interface for Burp Extender. At the top, there are tabs for 'Extensions', 'BApp Store', 'APIs' (which is selected), and 'Options'. Below the tabs, the title 'Burp Extender APIs' is displayed in orange. A sub-instruction reads: 'You can use the Burp Extender APIs to create your own extensions to customize Burp's behavior.' The main area contains a code editor showing the Java code for the `IMessageEditor` interface. The code includes imports, package declarations, and various methods and annotations. At the bottom of the code editor, there are buttons for 'Save interface files' and 'Save Javadoc files', along with a search bar labeled 'Type a search term'.

```
package burp;

/*
 * @(#)IMessageEditor.java
 *
 * Copyright PortSwigger Ltd. All rights reserved.
 *
 * This code may be used to extend the functionality of Burp Suite Free Edition
 * and Burp Suite Professional, provided that this usage does not violate the
 * license terms for those products.
 */
import java.awt.Component;

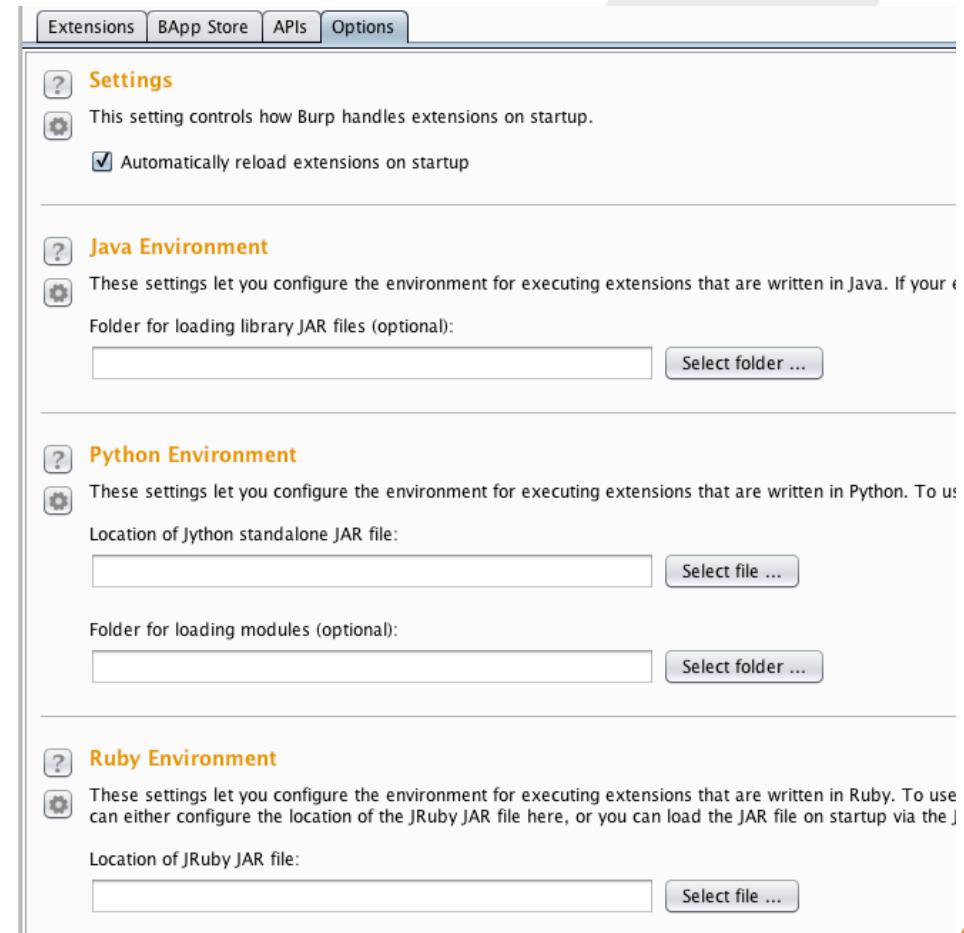
/**
 * This interface is used to provide extensions with an instance of Burp's HTTP
 * message editor, for the extension to use in its own UI. Extensions should
 * call
 * <code>IBurpExtenderCallbacks.createMessageEditor()</code> to obtain an
 * instance of this interface.
 */
public interface IMessageEditor
{
    /**
     * This method returns the UI component of the editor, for extensions to add
     * to their own UI.
     *
     * @return The UI component of the editor.
     */
    Component getComponent();

    /**
     * This method is used to display an HTTP message in the editor.
     *
     * @param message The HTTP message to be displayed.
     * @param isRequest Flags whether the message is an HTTP request or
     * response.
     */
    void setMessage(byte[] message, boolean isRequest);

    /**
     * This method is used to retrieve the currently displayed message, which
     * may have been modified by the user.
     *
     * @return The currently displayed HTTP message.
     */
}
```

# Extender GUI 4/4

- Runtime settings
  - Automatic reload
  - Execution environments, dependencies, etc.





# In a nutshell, we can write code to:

- Analyze, tamper and reply HTTP requests/ responses for all Burp tools
- Customize Intruder and Scanner payloads
- Modify Burp Suite's configuration
- Initiate actions like scanning and spidering
- Access runtime data
- Create custom UI tabs and context menu items



# Java Interfaces Summarized 1/2

## Core

- `IBurpExtender`
- `IBurpExtenderCallbacks`
- `IExtensionStateListener`
- `IHttpListener`
- `IScopeChangeListener`
- `ISessionHandlingAction`

## System-wide UI

- `IContextMenuFactory`
- `IContextMenuInvocation`
- `IMenuItemHandler`
- `IMessageEditor`
- `IMessageEditorController`
- `IMessageEditorTab`
- `IMessageEditorTabFactory`
- `ITab`
- `ITextEditor`

## Helpers

- `IExtensionHelpers`
- `ITempFile`

## HTTP objects

- `ICookie`
- `IHttpRequestResponse`
- `IHttpRequestResponsePersisted`
- `IHttpRequestResponseWithMarkers`
- `IHttpService`
- `IParameter`
- `IRequestInfo`
- `IResponseInfo`
- `IResponseKeywords`
- `IResponseVariations`



# Java Interfaces Summarized 2/2

## Collaborator

- IBurpCollaboratorClientContext
- IBurpCollaboratorInteraction

## Intruder

- IIIntruderAttack
- IIIntruderPayloadGenerator
- IIIntruderPayloadGeneratorFactory
- IIIntruderPayloadProcessor

## Scanner

- IScanIssue
- IScannerCheck
- IScannerInsertionPoint
- IScannerInsertionPointProvider
- IScannerListener
- IScanQueueItem

## Proxy

- IInterceptedProxyMessage
- IProxyListener

# Javadoc for the win

- <https://portswigger.net/burp/extender/api/>

## Package burp

Interface Summary

Interface
IBurpCollaboratorClientContext
IBurpCollaboratorInteraction
IBurpExtender
<b>IBurpExtenderCallbacks</b>
IContextMenuFactory
IContextMenuInvocation
ICookie
<b>IExtensionHelpers</b>
IEvolutionStateListener
IHttpListener
IHttpRequestResponse
IHttpRequestResponsePersisted
IHttpRequestResponseWithMarkers
IHttpService
IInterceptedProxyMessage
IIIntruderAttack
IIIntruderPayloadGenerator
IIIntruderPayloadGeneratorFactory
IIIntruderPayloadProcessor
IMenuItemHandler

# public interface *IBurpExtender*

- All extensions must implement this interface
- Implementations must be called **BurpExtender**, in the package **burp**, must be declared **public**, and must provide a **default (public, no-argument) constructor**
- The following method is invoked when the extension is loaded and provides callbacks

```
void registerExtenderCallbacks (IBurpExtenderCallbacks callbacks)
```

# Extension Templates

## Netbeans, Eclipse, IDEA

# Project Templates 1/2

- To facilitate development and debugging, you can use our empty extension template:
  - <https://github.com/doyensec/burpdeveltraining/tree/master/BurpExtensionTemplate>
  - Available for Netbeans, Eclipse and IDEA

# Project Templates 2/2

- The template includes:
  - *burp.BurpExtender* class
  - Setup for executing Burp's Main (*burp.StartBurp*) together with our extension - which makes debugging make better!
  - No need to import all *Interfaces*
    - Since we are referencing the original Burp's JAR

# Netbeans

1. Open NetBeans
2. *File* → *Open Project* and select the */BurpExtensionTemplate/Netbeans* folder from git repo. Click *Open*
3. Click *Resolve Problems*. Then *Resolve* and select your local copy of the Burp's JAR. Click *Close*.
4. You can now click *Run*

# Eclipse 1/2

1. Open Eclipse
2. *File → Open Project (or Import...)*
3. Choose “Select an import source:” *Existing Projects into Workspace*. Click *Next*
4. Click *Browse*, and select the /  
*BurpExtensionTemplate/Eclipse* folder from git  
repo. Click *Ok* and then *Finish*
5. On the project Name (top left), right click and  
select *Properties*. Go to *Java Build*

# Eclipse 2/2

6. In the *Libraries* tab, click on the Burp JAR reference and click on *Edit*. Then, select your local copy of the Burp's JAR and click *Ok*
7. **If you're NOT using JavaSE-1.8**, you may also need to fix the runtime environment. In the *Libraries* tab, remove the *JRE System Library [JavaSE-1.8]*. Then, click on *Add Library* → *JRE System Library* → *Workspace Default JRE*. Click *Ok* and *Finish*
8. You can now click *Run*

# IDEA

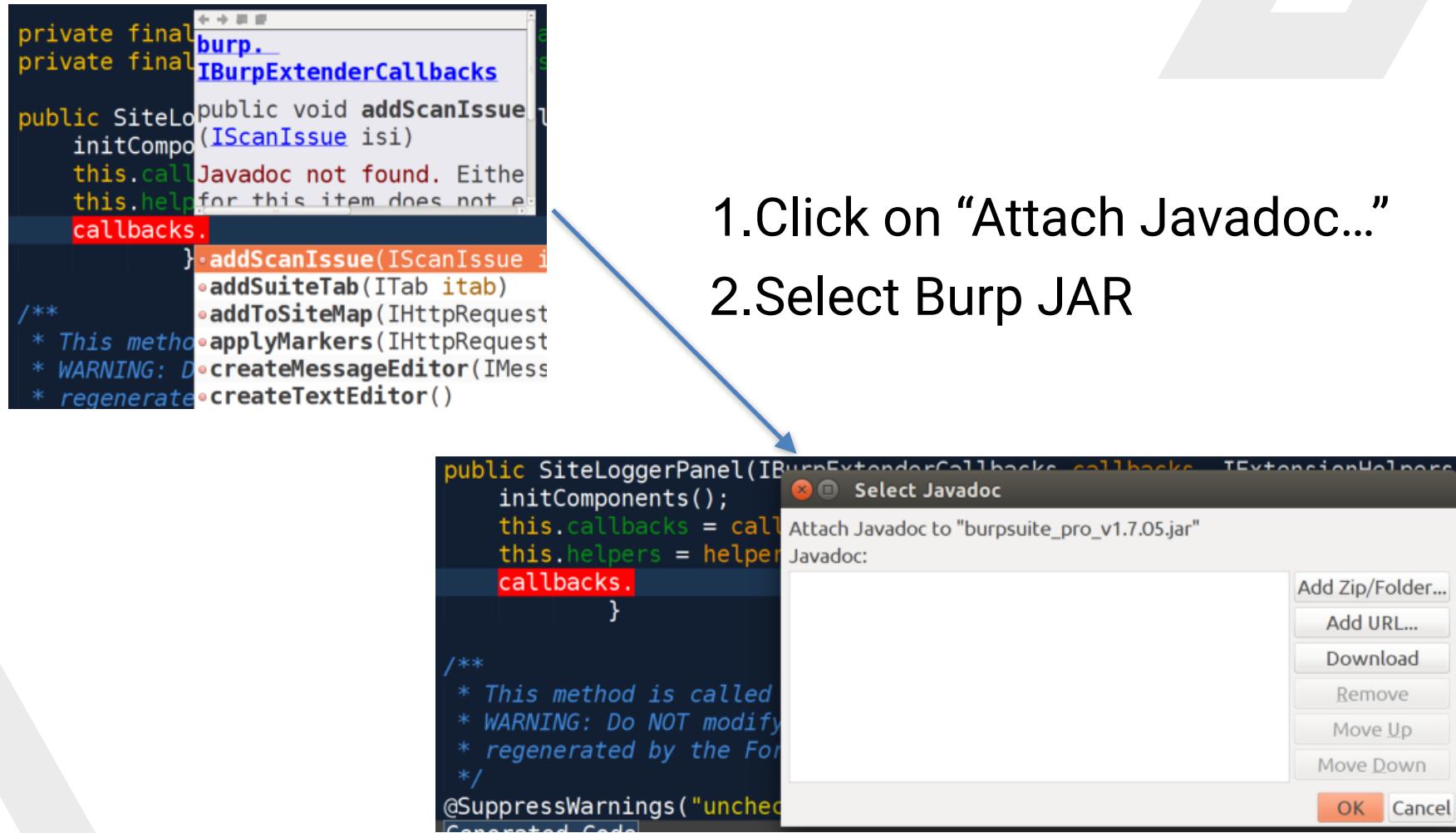
1. Open IntelliJ IDEA
2. Select *Open* and choose the /  
*BurpExtensionTemplate/IDEA* from git repo. Click  
*Open*
3. *File* → *Project Structure*. Select the Burp's JAR  
reference (in red). Right-Click and choose *Edit..*
4. Click + and select your local copy of the Burp's  
JAR. Click Ok. Select the old reference (in red) and  
Click - to remove the item
5. You can now click *Run*



# Pro Tip: Burp JavaDocs

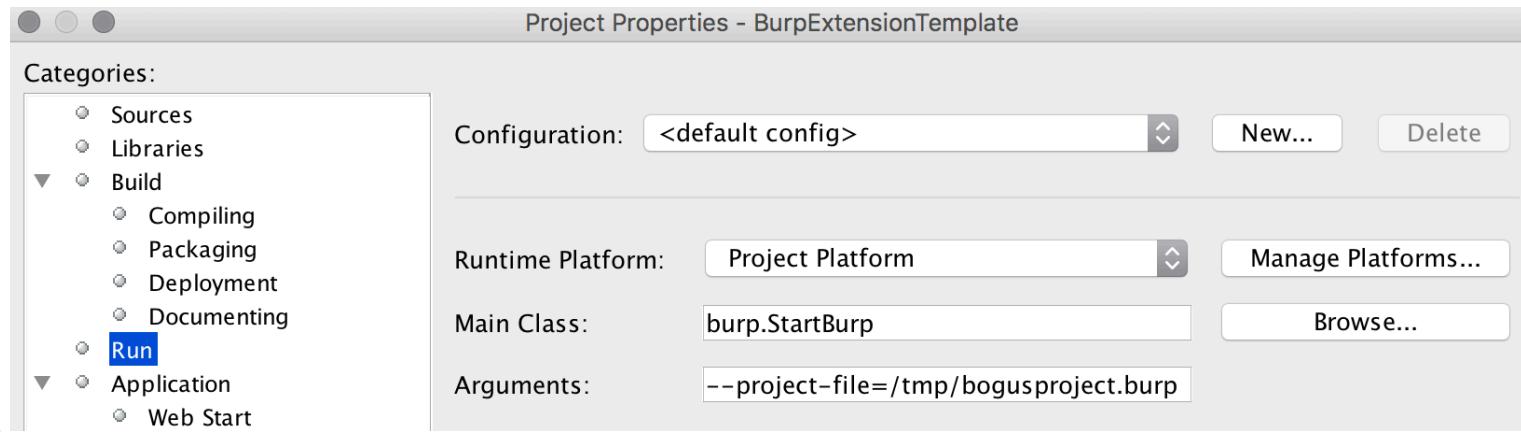
The screenshot shows a JavaDocs-style interface for the `burp.IBurpExtenderCallbacks` class. At the top, there are navigation icons for back, forward, search, and help. Below the title, the `addScanIssue` method is listed with its signature: `public void addScanIssue(IScanIssue issue)`. A detailed description follows: "This method is used to register a new Scanner issue. **Note:** Wherever possible, extensions should implement custom Scanner checks using `IScannerCheck` and report issues via those checks, so as to integrate with Burp's user-driven workflow, and ensure proper consolidation of duplicate reported issues. This method is only designed for tasks outside of the normal testing". Below the description, there is a link to `Helpers` and a note about callbacks. A blue bar at the bottom highlights the `addScanIssue` method with a red circular icon and the text "• addScanIssue(IScanIssue issue)".

# Add Burp JavaDocs to Netbeans



# Pro Tip: Avoiding Project Options At Startup

- If you're debugging your extension, Burp startup project options will slow you down
- You can disable it, by adding the —project-file argument. Burp will generate a new project file with default configs



# Our First Extension

## Hello Burp!

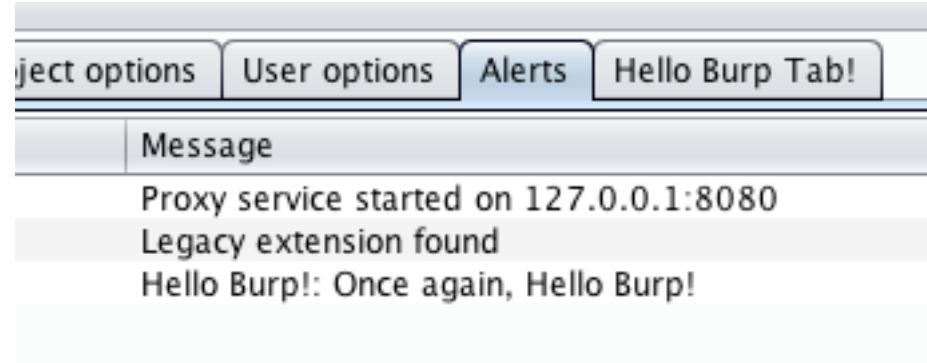
# Let's write some code...

- In *BurpExtender.java*, let's customize the *registerExtenderCallbacks* method to implement our **Hello Burp!** extension
- We want to:
  - Issue an alert
  - Write to StdIn and StdOut
  - Create a new UI component (Tab)

# Alerts

- Useful for info, error and other user notifications

```
callbacks.issueAlert ("Hello Burp!");
```



# Stdout and Stderr

- Stdout and Stderr can be customize from Burp's Extension UI, and it's transparent
- Simple use a *PrintWriter* on `callbacks.getStdout()`

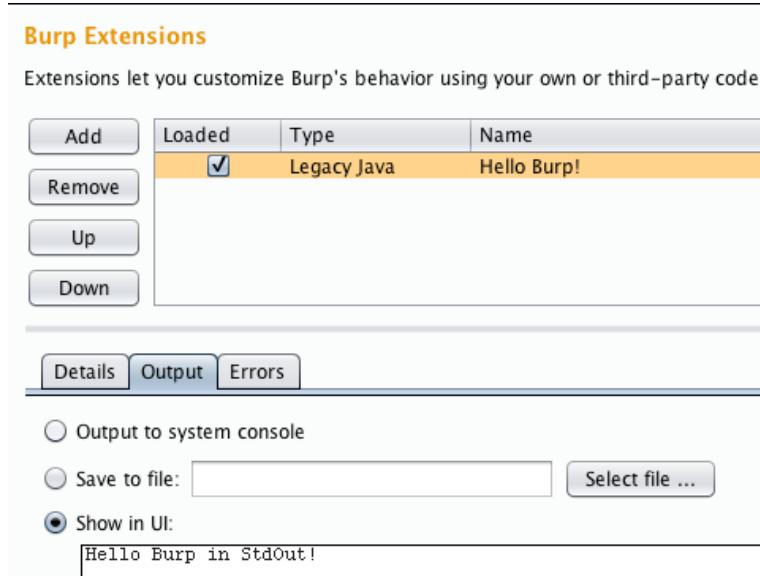
**Burp Extensions**

Extensions let you customize Burp's behavior using your own or third-party code.

Add	Loaded	Type	Name
	<input checked="" type="checkbox"/>	Legacy Java	Hello Burp!

**Output**

Output to system console  
 Save to file:    
 Show in UI:  
Hello Burp in StdOut!



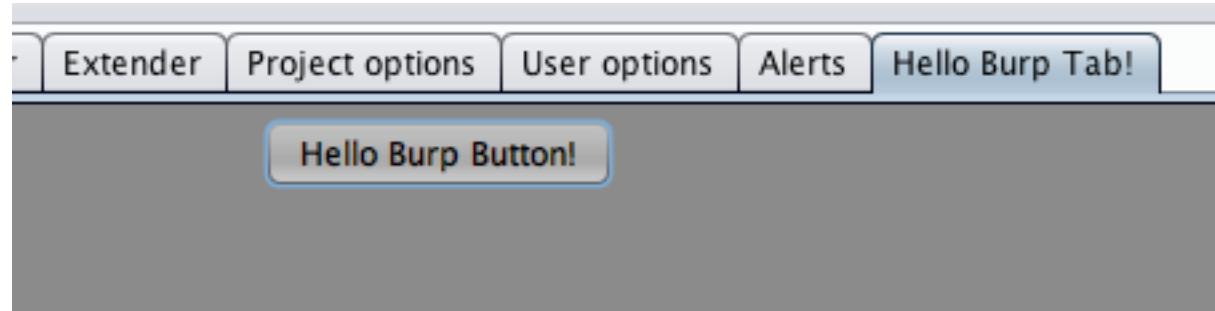
# Custom Tab and UI Components

- Create a class that *implements ITab* and implement the *getTabCaption()* and *getUiComponent()*
- *Pro Tip:* Use *callbacks.customizeUiComponent()* to adjust your custom UI with Burp's style, including font size, colors, table line spacing, etc.



# Our custom Hello Burp AWT Component

- AWT coding is fun!





# Coding Time!



- We will do this together!



# Code Complete Extension

- <https://github.com/doyensec/burpdeveltraining/tree/master>HelloBurp>
- To run this exercise in Python/Ruby, remember to set the *Environment* option

**Python Environment**  
 These settings let you configure the environment for executing extensions that are written in Python.  
Location of Jython standalone JAR file:

**Ruby Environment**  
 These settings let you configure the environment for executing extensions that are written in Ruby.  
Location of JRuby JAR file:

# Exercise

- Consult <https://portswigger.net/burp/extender/api/> and extend our HelloBurp extension:
  1. To issue an alert displaying Burp version number
  2. Unload the extension

# Building a custom logger

## SiteLogger

# Requirements

- Save all HTTP Requests and Responses for a specific site
- Save all scan results (active and passive) for the same site
- Persistent storage using MongoDB
- Easy to use tool. It should be possible to setup and save from a UI

# Plugin Structure

burp package

**BurpExtender**

`registerExtenderCallbacks()`

Your package

**SiteLoggerTab** implements `ITab`

`getTabCaption()`  
`getUiComponent()`

**SiteLoggerPanel**

**Note:**

For Python/Ruby, a single file  
with three public classes is used.



# getSiteMap and getScanIssues

- IHttpRequestResponse []  
getSiteMap (java.lang.String urlPrefix)
- IScanIssue []  
getScanIssues (java.lang.String urlPrefix)
- urlPrefix - This parameter can be used to specify a URL prefix, in order to extract a specific subset of the site map/findings

# MongoDB

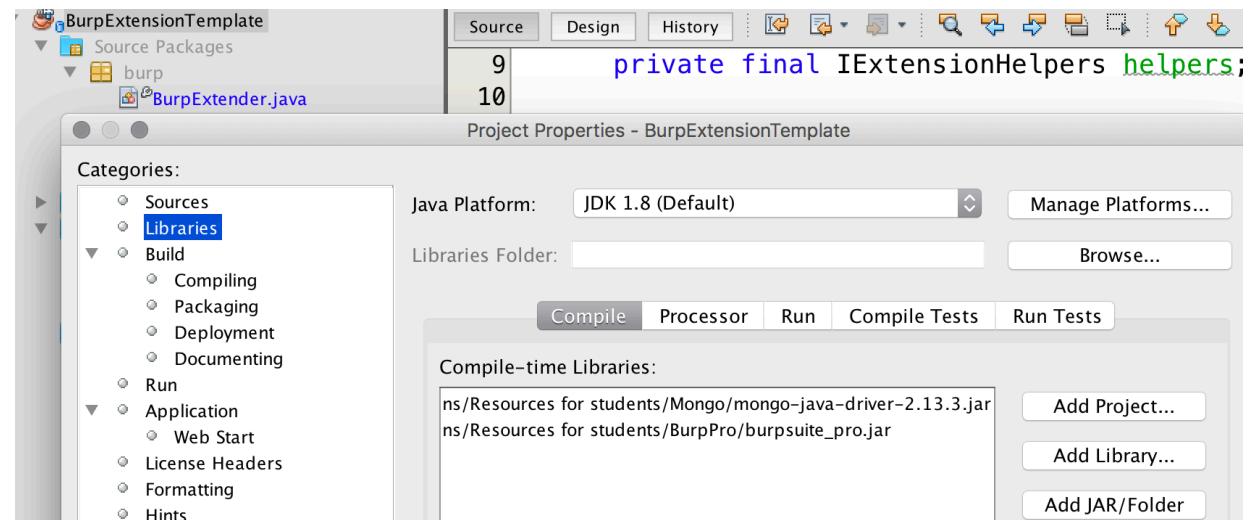
- There's a MongoDB instance running on **27017/tcp** (no authentication required)
- It's a shared environment - be nice!
- Please name your db **sitelogger\_<yourName>**
- For a quick intro to MongoDB with Java:
  - <http://www.mkyong.com/mongodb/java-mongodb-hello-world-example/>

# MongoDB Driver

- **[Java]** Download *mongo-java-driver-2.13.3.jar*
- **[Ruby]** Set *Extender->Options->JavaEnvironment* “Folder for loading library JAR files” to a folder containing *mongo-java-driver-2.13.3.jar*
- **[Python]** Set *Extender->Options->PythonEnvironment* “Folder for loading modules” to a folder containing *pymongo*

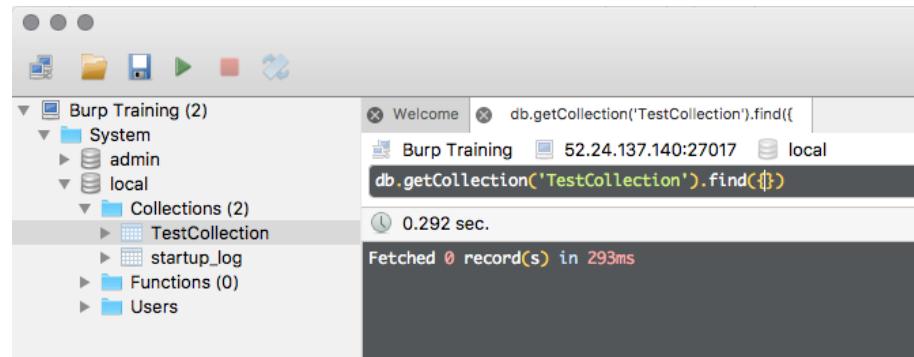
# Add MongoDB Driver to the IDE

1. Select Project Name
2. Right-click on ‘Properties’
3. Select ‘Libraries’
4. Add JAR/Folder

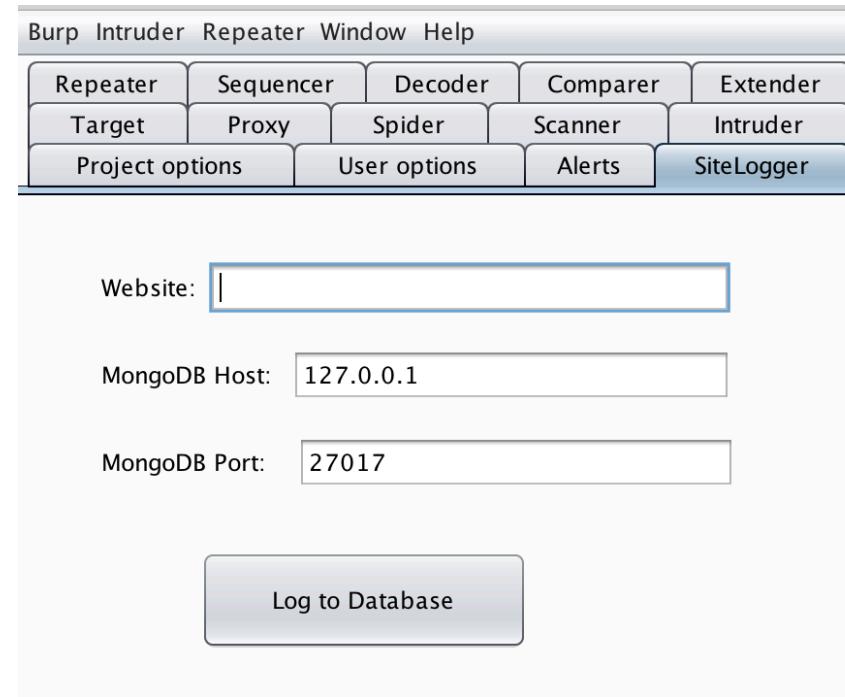


# MongoDB Client

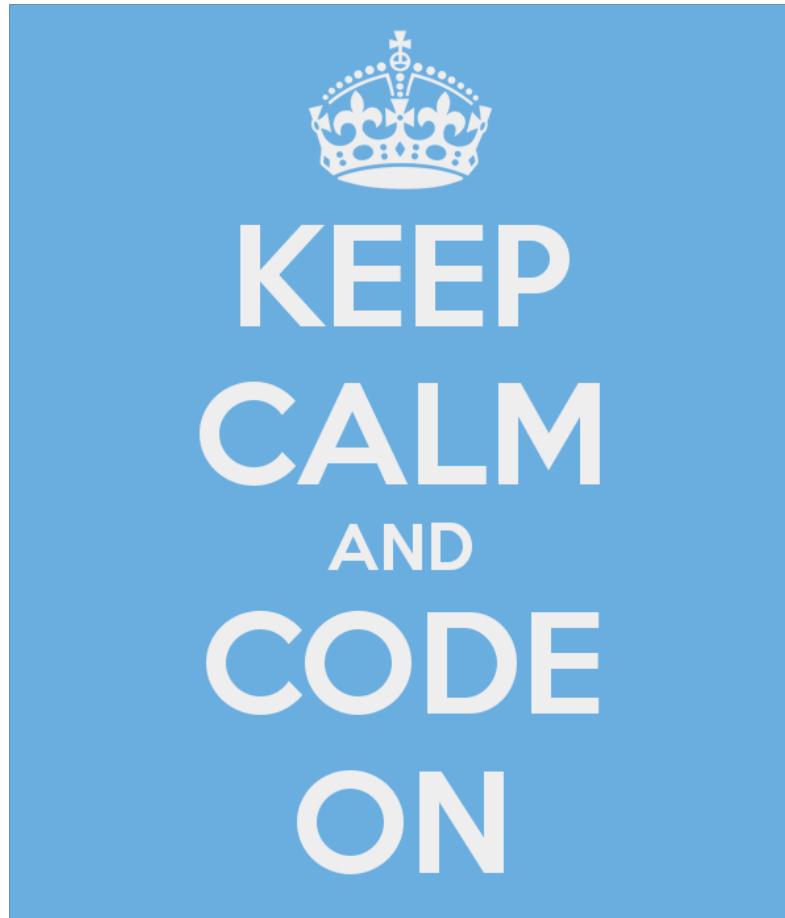
- You can use Robomongo



# SiteLogger UI



# Coding Time!



1. Let's review together the basic skeleton using WIP1 files
2. Let's build together the *swing.JPanel* using Netbeans WYSIWYG editor
3. Implement the remaining logic (~45 mins)
4. We will complete the exercise together

# Extension dependencies

```
java.lang.NoClassDefFoundError: com/mongodb/MongoClient
  at
com.doyensec.sitelogger.SiteLoggerPanel.logButtonActionPerformed(SiteLoggerPanel.java:121)
  at
com.doyensec.sitelogger.SiteLoggerPanel.access$000(SiteLoggerPanel.java:21)
...
...
```

- How can we import extension libs?
  - (a) Setup Burp Java Environment
  - (b) Embed libs within the extension JAR

# (a) Burp Java Environment

The screenshot shows the 'Extender' tab selected in the top navigation bar. Below it, the 'Options' tab is also highlighted. The main content area displays two sections: 'Settings' and 'Java Environment'. The 'Settings' section contains a checkbox for 'Automatically reload extensions on startup' which is checked. The 'Java Environment' section includes a text input field containing the path '/home/ikki/Desktop/libs' and a 'Select folder ...' button.

Sequencer   Decoder   Comparer   Extender   Project options

Extensions   BApp Store   APIs   Options

**Settings**

This setting controls how Burp handles extensions on startup.

Automatically reload extensions on startup

---

**Java Environment**

These settings let you configure the environment for executing extensions that are written. Specify a folder from which libraries will be loaded.

Folder for loading library JAR files (optional):

/home/ikki/Desktop/libs

Select folder ...

# (b) Embed libs within the extension JAR

- Build.xml for the rescue!

```
<target name="-post-jar">
    <copy file="resources/README.txt" flatten="true" todir="${dist.dir}"/>
    <jar jarfile="dist/${ant.project.name}_v0.3.1.jar">
        <zipfileset src="${dist.jar}" excludes="META-INF/*" />
        <zipfileset src="lib/mongo-java-driver-2.13.3.jar" excludes="META-INF/*" />
        <fileset dir="dist">
            <include name="README.txt"/>
        </fileset>
    </jar>
    <jar basedir="src" destfile="dist/${ant.project.name}_v0.3.1-sources.jar"/>
</target>
```



# Code Complete Extension

- [https://github.com/doyensec/  
burpdeveltraining/tree/master/SiteLogger](https://github.com/doyensec/burpdeveltraining/tree/master/SiteLogger)

# Building a replay tool

ReplayAndDiff

# Requirements

- From the database, retrieve a login HTTP request with credentials in order to obtain a fresh session
- Issue the login request and add the new cookie to Burp's Cookies Jar
- Replay a scan on the site previously saved by SiteLogger
- Compare results and generate scan report, if the new scan includes new findings

# Plugin Structure

burp package

BurpExtender

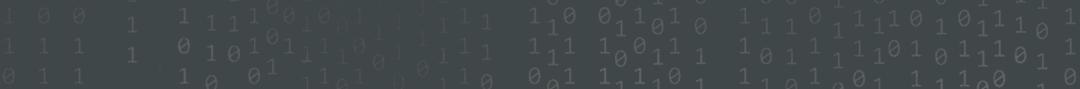
registerExtenderCallbacks()

- This extension should be executed in headless mode
- At startup, add the following JVM flag:  
-Djava.awt.headless=true

# Parse Command Line Args

- `java.lang.String[] getCommandLineArguments()`
- `String[]` can be parsed with an external library (e.g. JSAP, Apache Commons CLI, etc.). For now, let's use a simple loop:

```
String[] args = callbacks.getCommandLineArguments();  
for (String arg: args) {  
    if(arg.contains("-h=") || arg.contains("--host=")) {  
        MONGO_HOST = arg.substring(arg.indexOf('=') + 1);  
    }else if {  
        ...  
    }  
}
```

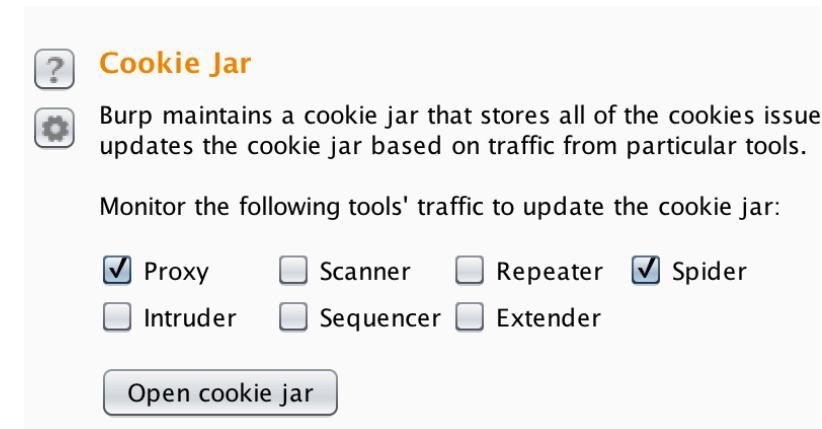


# makeHttpRequest and analyzeResponse

- byte[]  
makeHttpRequest (java.lang.String host, int port, boolean useHttps, byte[] request)
- IResponseInfo  
analyzeResponse (byte[] response)
- IResponseInfo contains key details about an **HTTP response** including cookies, using  
getCookies ()

# Burp's Cookie Jar

- Burp maintains a cookie jar that stores all of the cookies issued by sites you visit
- The cookie jar is shared between all of Burp's tools
- ```
void updateCookieJar(ICookie cookie)
```



# Run a scan

- Two types of scan:
  - `IScanQueueItem doActiveScan(java.lang.String host, int port, boolean useHttps, byte[] request)`
  - `void doPassiveScan(java.lang.String host, int port, boolean useHttps, byte[] request, byte[] response)`
  - **Passive checks are executed immediately on stored request/response pairs, while Active checks require live traffic**
  - **IScanQueueItem can be used to check the status of the queue items**

# Caveat

- When executing an active scan, Burp expects all target URLs to be in scope
- If the request is NOT within the current active scanning scope, the user will be asked if they wish to proceed with the scan
- Since we're running in headless mode, make sure to add:
- `void includeInScope(java.net.URL url)`

# Diffing

- For this plugin, let's adopt a simple heuristic

```
for (IScanIssue finding : allVulns) {  
    //Search in MongoDB for a finding with the  
    same type, name and URL  
    //If cursor.size() == 0, we have a new  
    finding!
```

- If there is at least one new finding in the new scan, generate the report

```
void generateScanReport(java.lang.String format,  
                      IScanIssue[] issues,  
                      java.io.File file)
```

# Login Request Setup 1/4

1. With Burp enabled, perform a login to the page
2. Go the request, and right-click to open the contextual menu. Select “Save Item”
3. Open the saved file, and copy the Base64 request

# Login Request Setup 2/4

```
POST /burp.php HTTP/1.1
Host: 52.24.137.140
User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X 10.
Accept: text/html,application/xhtml+xml,application/xml
Accept-Language: en-US,en;q=0.5
Referer: http://52.24.137.140/
Content-Type: application/x-www-form-urlencoded
Content-Length: 24
Cookie: sessionid=fac1323fee9252af2f
Connection: close
Upgrade-Insecure-Requests: 1

email=test&password=test
```

- Send to Spider
- Do an active scan
- Do a passive scan
- Send to Intruder
- Send to Repeater
- Send to Sequencer
- Send to Comparer
- Send to Decoder
- Show response in browser
- Request in browser
- Engagement tools
- Copy URL
- Copy as curl command
- Copy to file
- Save item



# Login Request Setup 3/4

- <request base64="true"><!

```
[CDATA[UE9TVCAvYnVycC5waHAgSFRUUC8xLjENKhvc3Q6IDUyLjI0LjEzNy4xNDANCIvzZXItQWdlbnQ6IE1vemIsbGEvNS4wIChNYWNpbnRvc2g7IEludGVsIE1hYyBPUyBYIDEwLjEyOyBydjo1My4wKSBHZWNrb8yMDEwMDEwMSBGaXJIZm94LzUzLjANCKfjY2VwdDogdGV4dC9odG1sLGFwcGxpY2F0aW9uL3hodG1sK3htbCxhcHBsaWNhdGlvbi94bWw7cT0wLjksKi8qO3E9MC44DQpBY2NlcHQtTGFuZ3VhZ2U6IGVuLVVTLGVuO3E9MC41DQpSZWZlcmVyOiBodHRwOi8vNTIuMjQuMTM3LjE0MC8NCkNvbnRlbnQtVHIwZTogYXBwbGljYXRpb24veC13d3ctZm9ybS11cmxlbmNvZGVkDQpDb250ZW50LUxlbd0aDogMjQNCKNvb2tpZTogc2Vzc2lvbmlkPWZhYzEzMjNmZWU5MjUyYWYyZg0KQ29ubmVjdGlvbjogY2xvc2UNCIvZ3JhZGUtSW5zZWN1cmUtUmVxdWVzdHM6IDENCg0KZW1haWw9dGVzdCZwYXNzd29yZD10ZXN0]]></request>
```



# Login Request Setup 4/4

- Using Robomongo, create a new collection named “login”
- Then, insert the following entry:

```
use sitelogger
db.login.insert({
  host: '52.24.137.140',
  port: NumberInt(80),
  protocol: 'http',
  request:
'UE9TVCAvYnVycC5waHAgSFRUUC8xLjENCkhvc3Q6IDUyLjI0LjEzNy4xNDANc1VzZXItQWdlbnQ6IE1vemlsbGEvNS4wIChNYWNpbnRvc2g7IEludGVsIE1hYyBPUyBYIDEwLjEy0yBydjo1My4wKSBHZWNrby8yMDEwMDEwMSBGaXJ1Zm94LzUzLjANCKfjY2VwdDogdGV4dC9odG1sLGFwcGxpY2F0aW9uL3hodG1sK3htbCxhcHBsaWNhdGlvbi94bWw7cT0wLjksKi8q03E9MC44DQpBY2NlcHQtTGFuZ3VhZ2U6IGVuLVVTLGVu03E9MC41DQpSZWZlcmVy0iBodHRw0i8vNTIuMjQuMTM3LjE0MC8NCKNvbnRlbnQtVHlwZTogYXBwbGljYXRpb24veC13d3ctZm9ybS11cmxlbmNvZGVkDQpDb250ZW50LUxlbd0aDogMjQNCKNvb2tpZTogc2Vzc2lvbmlkPWZhYzEzMjNmZWU5MjUyYWYyZg0KQ29ubmVjdGlvbjogY2xvc2UNc1VwZ3JhZGUtSW5zZWN1cmUtUmVxdWVzdHM6IDENCg0KZW1haWw9dGVzdC ZwYXNzd29yZD10ZXN0'
})
```

# Coding Time!



1. Let's review together the basic skeleton using WIP1 files
2. Implement the remaining logic (~1 hour)
3. We will complete the exercise together



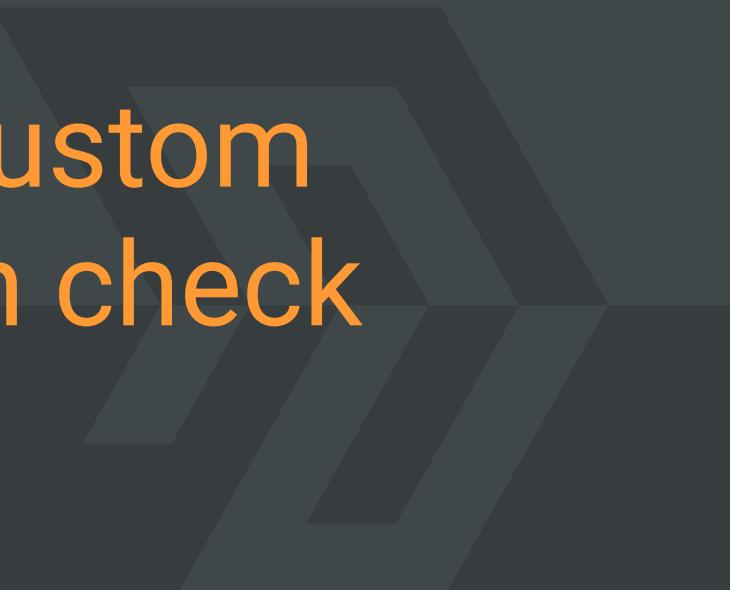
# Code Complete Extension

- [https://github.com/doyensec/  
burpdeveltraining/tree/master/ReplayAndDiff](https://github.com/doyensec/burpdeveltraining/tree/master/ReplayAndDiff)



# Building a custom Passive Scan check

## DetectSRI



# Requirements

- Create an extension that detects whether the specific HTTP response does not use SubResource Integrity (SRI)
  - “Subresource Integrity (SRI) is a security feature that enables browsers to verify that files they fetch (for example, from a CDN) are delivered without unexpected manipulation. It works by allowing you to provide a cryptographic hash that a fetched file must match”
  - [https://developer.mozilla.org/en-US/docs/Web/Security/Subresource\\_Integrity](https://developer.mozilla.org/en-US/docs/Web/Security/Subresource_Integrity)

# SubResource Integrity (SRI)

- Check the login page source



```
<!DOCTYPE html>
<html>
<head>
    <meta charset="utf-8" />
    <title>Burp Fake Login</title>
    <link href="assets/css/style.css" rel="stylesheet" integrity="sha384-M1jJIGbFlKmkFRh+jO8S0Yqr7EdK5pWff07FqQNsutJV/204RBfRd9AbyfHKvUf"/>
    ..

```

# Plugin Structure

burp package

BurpExtender

```
registerExtenderCallbacks()
```

```
callbacks.registerScannerCheck(this);
```

- In this simple passive check, we can include the heuristic code in the BurpExtender class itself

# doPassiveScan

- `java.util.List<IScanIssue>`  
`doPassiveScan(IHttpRequestResponse`  
`baseRequestResponse)`
- Extensions should only analyze the HTTP messages provided during passive scanning

# IScanIssue interface

- We will return our custom implementation
- getConfidence()
  - "Certain", "Firm" or "Tentative"
- getSeverity()
  - "High", "Medium", "Low", "Information" or "False positive"
- getIssueType()
  - 0x08000000



# consolidateDuplicateIssues

- int consolidateDuplicateIssues (IScanIssue existingIssue, IScanIssue newIssue)
- It's your responsibility to handle duplicates
- The Scanner will invoke this method if there are multiple issues for the same URL path

# HTML Ascii Art anyone?

**i Subresource Integrity (SRI) Missing**

- i Frameable response (potential Clickjacking)
- i Path-relative style sheet import
- i HTML uses unrecognized charset

[Advisory](#) [Request](#) [Response](#)

---

## **i Subresource Integrity (SRI) Missing**

---

**Issue:** Subresource Integrity (SRI) Missing  
**Severity:** Information  
**Confidence:** Certain  
**Host:** <https://doyensec.com>  
**Path:** /contact.html

---

**Note:** This issue was generated by the Burp extension: DetectSRI.

**Issue detail**

Burp Scanner has not identified Subresource Integrity (SRI) attributes in the following page: <https://doyensec.com:443/contact.html>

**Issue background**

Subresource Integrity (SRI) is a security feature that enables browsers to verify that files they fetch (for example, from a CDN) are delivered that a fetched file must match.

**Issue remediation**

This is an **informational** finding only.



# Coding Time!



- We will do this together!



# Code Complete Extension

- [https://github.com/doyensec/  
burpdeveltraining/tree/master/DetectSRI](https://github.com/doyensec/burpdeveltraining/tree/master/DetectSRI)

# Building a custom Active Scan check

DetectELJ

# Requirements

- Create an extension that detects **Expression Language** injection vulnerabilities
  - Type of injection that occurs when attackers control data that is evaluated by an Expression Language (EL) interpreter



# Expression Language (EL) injection

- Example:
  - $\$\{1336+1\} \rightarrow 1337$
- Think about Struts2 OGNL, Apache Jakarta, Spring's SPEL
- If interested, read <https://www.mindedsecurity.com/fileshare/ExpressionLanguageInjection.pdf>

# Plugin Structure

burp package

BurpExtender

registerExtenderCallbacks()

callbacks.registerScannerCheck(this);

- We can re-use the same passive scanner check skeleton, and instead implement doActiveScan ()



# Understanding Response Changes

- Burp Extender APIs provides a useful helper method to analyze variations between two or more HTTP Responses
- IResponseVariations  
analyzeResponseVariations (byte[] ... responses)
- IResponseVariations is a list of String representing the specific attributes that changed between those responses
  - content\_length
  - whole\_body\_content
  - and so many others

# IResponseVariations Attribute Types

- status\_code
- input\_image\_labels
- page\_title
- visible\_text
- button\_submit\_labels
- div\_ids
- word\_count
- content\_type
- outbound\_edge\_tag\_names
- whole\_body\_content
- etag\_header
- visible\_word\_count
- content\_length
- header\_tags
- tag\_ids
- comments
- line\_count
- set\_cookie\_names
- last\_modified\_header
- first\_header\_tag
- tag\_names
- input\_submit\_labels
- outbound\_edge\_count
- initial\_body\_content
- content\_location
- limited\_body\_content
- canonical\_link
- css\_classes
- location
- anchor\_labels

# Scan Issue

5 11:36:09 18 Mar 2017 Issue found ! Expression Language (EL) Injection Detected https://ikkisoft.com /elj.php par parameter High Firm

Advisory

## ! Expression Language (EL) Injection Detected

Issue: Expression Language (EL) Injection Detected  
Severity: High  
Confidence: Firm  
Host: https://ikkisoft.com  
Path: /elj.php

Note: This issue was generated by the Burp extension: DetectELJ.

### Issue detail

Burp Scanner has identified an Expression Language injection in: <https://ikkisoft.com:443/elj.php?par=aaa>

### Issue background

Expression Language injections occur when input data is evaluated by an expression language interpreter. An attacker can read server-side data, such as the content of server-side variables, and some other inner configuration details.

### Issue remediation

Apply input validation best practices, and reject \${, #{} and other variations.

# Coding Time!



1. Let's review together the basic skeleton using WIP1 files
2. Implement the remaining logic (~30mins)
3. We will complete the exercise together

# Pro Tip 1/2

- When creating a new issue, we can also specify markers to show specific strings within requests/responses
- This is done using the following callback method:

```
IHttpRequestResponseWithMarkers  
applyMarkers(IHttpRequestResponse  
httpRequestResponse,  
java.util.List<int[]> requestMarkers,  
java.util.List<int[]> responseMarkers)
```

# Pro Tip 2/2

- Within our implementation of `IScanIssue`, we can customize the object returned by `getHttpMessages()`

```
@Override  
public IHttPRequestResponse[] getHttpMessages() {  
    String strRes = helpers.bytesToString(reqres.getResponse());  
    int[] marks = new int[2];  
    marks[0] = strRes.indexOf("1337");  
    marks[1] = marks[0] + 4;  
    List<int[]> marksList = new ArrayList<>(1);  
    marksList.add(marks);  
    IHttPRequestResponseWithMarkers reqresMark = callbacks.applyMarkers(reqres, null, marksList);  
    IHttPRequestResponse[] rra = { reqresMark };  
    return rra;  
}
```

# Scan Issue Improved

The screenshot shows a Burp Suite interface with three tabs: Advisory, Request, and Response. A blue arrow points from the Response tab to the detected injection in the HTML source code.

```
<div id="protected-page">
    You are logged in</h1>

    <p>Dear Burp, I love you 1337 times!</p><a href="http://192.168.100.111/burp.php?logout=true">
        Logout
    </a>
</div>
```



## Expression Language (EL) Injection Detected

---

Issue: Expression Language (EL) Injection Detected  
Severity: High  
Confidence: Firm  
Host: http://192.168.100.111  
Path: /burp.php

---

**Note:** This issue was generated by the Burp extension: DetectELJ.

### Issue detail

Burp Scanner has identified an Expression Language injection in:[http://192.168.100.111:80/burp.php?elj=\\$%7b1336%2b1%7d](http://192.168.100.111:80/burp.php?elj=$%7b1336%2b1%7d)

### Issue background

Expression Language injections occur when input data is evaluated by an expression language interpreter. An attacker can read server-side data, such as the content of server-side variables, and some other inner configuration details.

### Issue remediation



# Code Complete Extension

- [https://github.com/doyensec/  
burpdeveltraining/tree/master/DetectELJ](https://github.com/doyensec/burpdeveltraining/tree/master/DetectELJ)

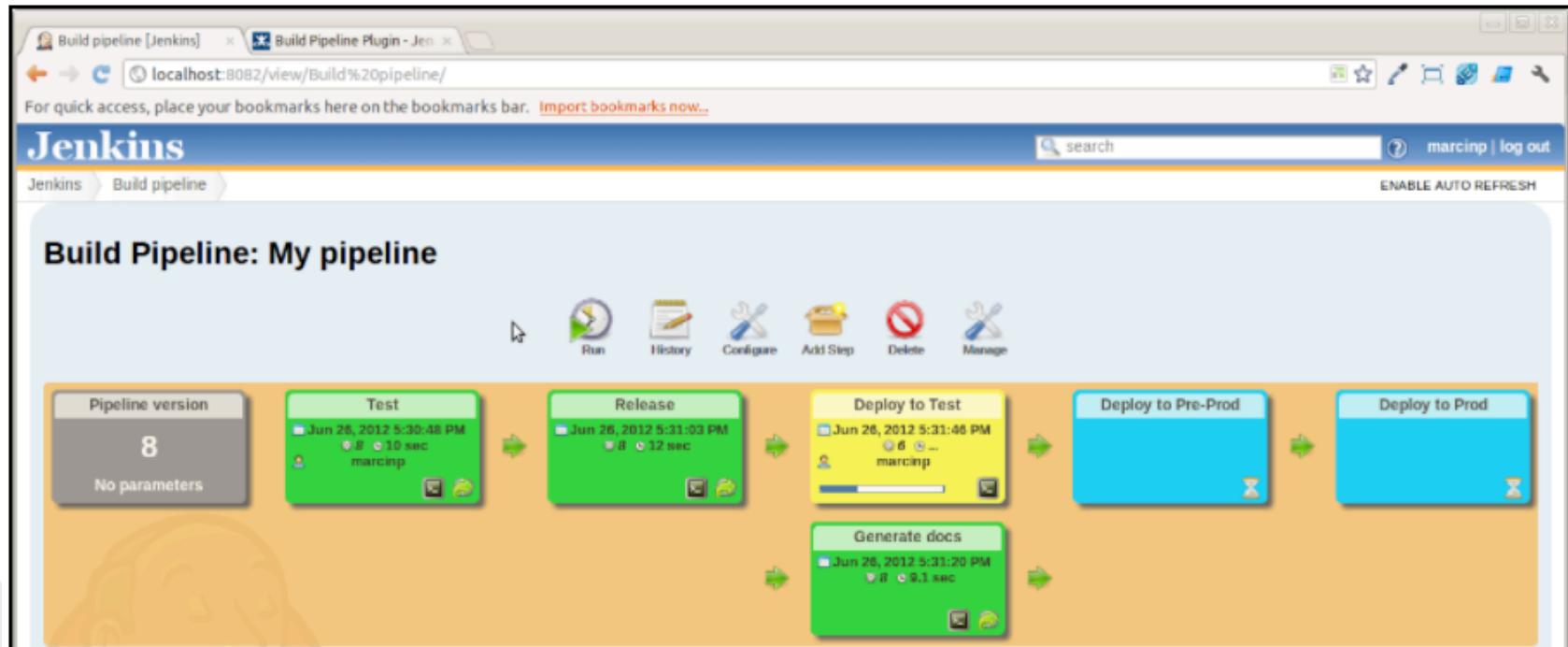


# Building a security automation toolchain

## Jenkins + Burp

# Typical CI Environment

- Continuous Integration has become a widely adopted practice



# Moving fast means testing fast

- We have a site logger
- We have an headless replay tool
- We have custom Scanner checks
- Let's integrate all components in a new *Build Step (SecTesting)* using **Jenkins** and the **Build Pipeline View** plugin

# Jenkins Setup 1/2

1. Download Jenkins - jenkins.war
2. Run it using `$java -jar jenkins.war`
3. Open the browser and visit  
<https://<HOST>:8080>
4. Type your auto-generated admin password
5. Select *Select Plugin to Install*
6. Search and install *Build Pipeline Plugin*

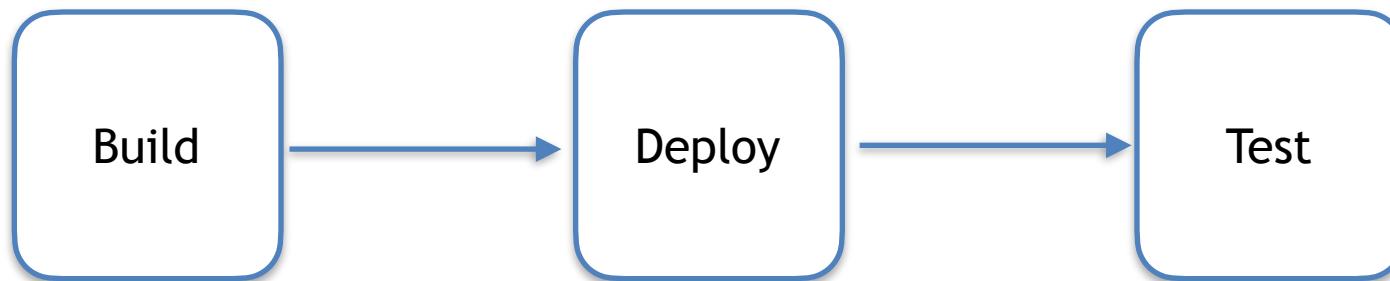
# Jenkins Setup 2/2

- 7. Coffee Break 
- 8. Create your admin user
- 9. It's time to create our build pipeline!

# Training Environment

- Multiple Jenkins instances already setup and ready to go
- Login with *admin:admin*

# Our pipeline plan



echo "Build"

echo "Deploy"  
curl http://target

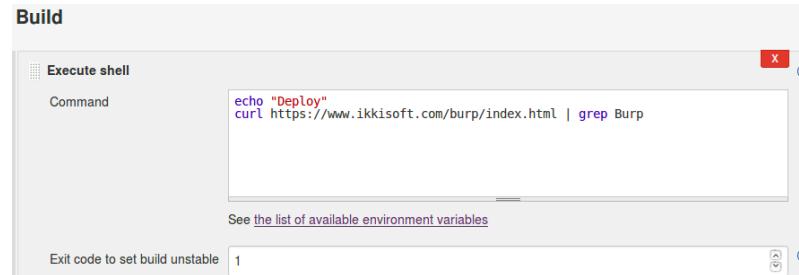
java -jar  
burp.jar ...

# (1) Build

- To simplify our setup, build is just simulated using a simple execute shell
- Click on “New Item”->“Freestyle Project” named “Build”
- In the Build section, select “Add Build Step” -> “Execute Shell”
- Type echo “Build”
- Save

# (2) Deploy

- To simplify our setup, deploy is also simulated
- Click on “New Item”->“Freestyle Project” named “Deploy”
- In the Build section, select “Add Build Step” -> “Execute Shell”
- Type echo “Deploy”; curl http://127.0.0.1/index.html | grep Burp
- Additionally, we can verify if the live endpoint is up and running with “Exit code to set build unstable”
  - If the exit code != 1 → *Build Unstable*



- Finally, in “Build Triggers” select “Build after other projects are built” and type “Build”
- Save

# Create New Build Pipeline View

- From the home, click on the +
- Select “Build Pipeline View” named “Security Pipeline” and then “Ok”
- (Optional) Type a description
- In the configuration “Select Initial Job”, pick “Build”
  - This is our first step for the overall execution

Upstream / downstream config

Select Initial Job



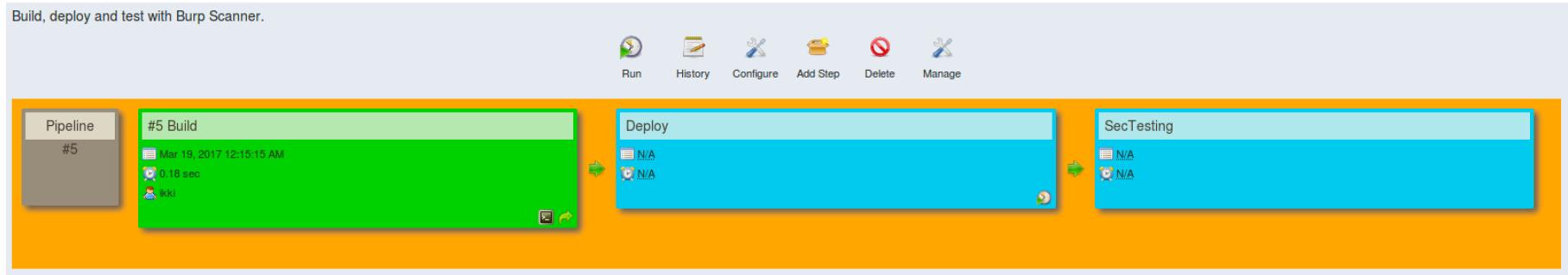
# Our Security Pipeline (so far)



- It's time to perform security testing on the “newly deployed code”

# (3) SecTesting

- A new task where we will execute Burp and our extensions



# SecTesting Plan 1/2

1. Using Burp and our *SiteLogger* plugin, we have already recorded the traffic to our deployed application
2. With *ReplayAndDiff*, we can run a scan in headless mode, performing diff and generating a new findings report
3. Using DetectELJ and DetectedSRI, we can enhance our scanners capabilities

# SecTesting Plan 2/2

- Let's just put all together so that our build step will execute Burp with our plugins
- Additionally, we want to fail the build if there're new findings



# SecTesting Setup 1/4

- First, let's start Burp with the GUI and load all extensions. Then, close it gracefully.
  - In this way, Burp will reload all previously-loaded extensions at startup
  - We can use **\$ ssh -X** for X11 forwarding
    - *This step was already done by me*



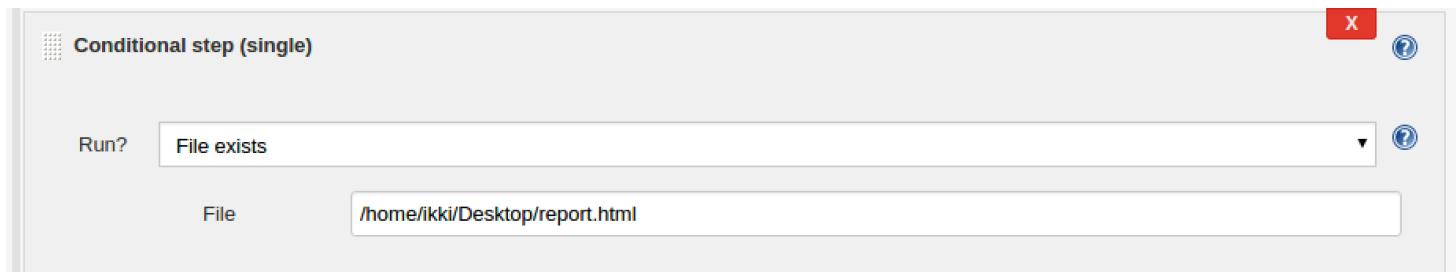
# SecTesting Setup 2/4

- Create a new Freestyle project named “SecTesting”
- In the newly create SecTesting task, create a new “Execute Shell” with the following code:

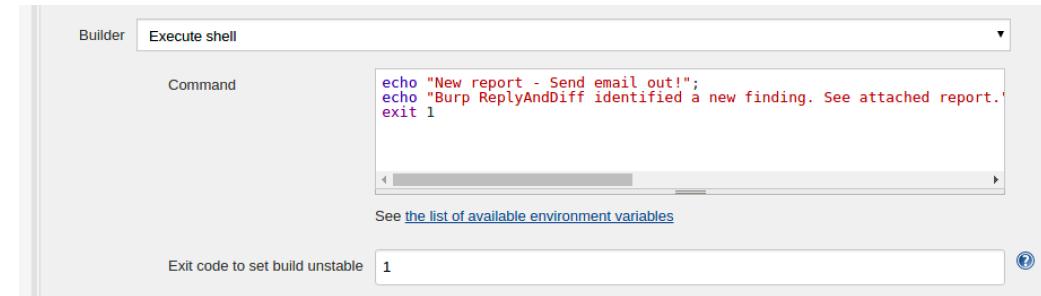
```
echo "Launching Burp Pro..."  
java -Xmx256m -Djava.awt.headless=true  
-jar /home/ubuntu/burpsuite_pro.jar  
-h=127.0.0.1 -p=27017 -o=/home/ubuntu/  
reports/ -r=report.html -t=40
```

# SecTesting Setup 3/4

- Click “Add Build Step” and select “Conditional Step (single)”
- File: */home/ubuntu/reports/report.html*



- Then, “Execute Shell” again



# SecTesting Setup 3/4

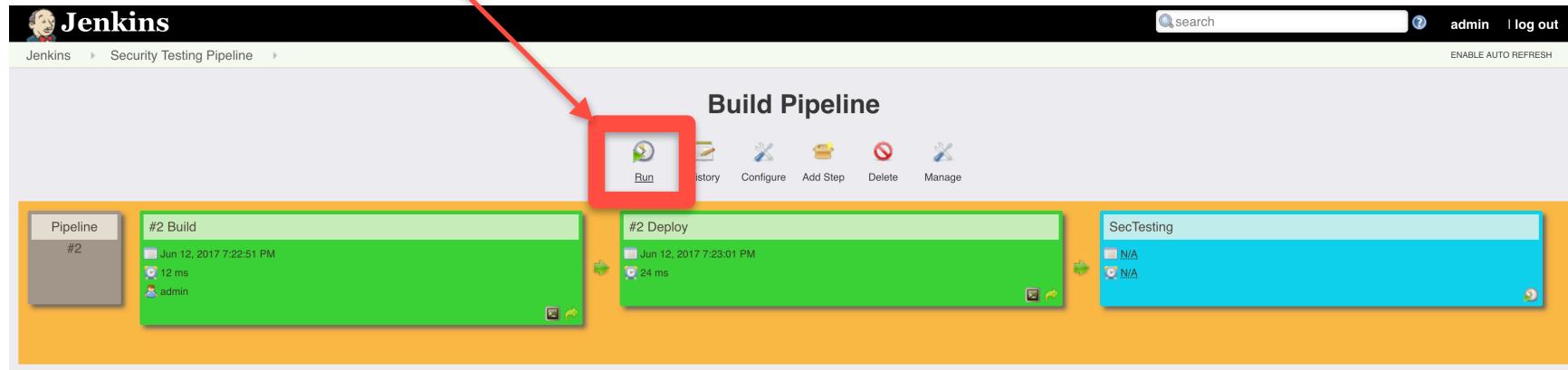
- As shell script use:

```
echo "New report - Send email out!";
echo "Burp ReplyAndDiff identified a new finding. See
attached report." | mail -A /home/ubuntu/reports/
report.html -s "Burp Scanner - New Finding" <email>
rm /home/ubuntu/reports/report.html
exit 1
```

- *Exit 1* will force the build as ‘unstable’
- In a real-world scenario, you could use Jenkins’ Email Notification to send a custom email to the developers
- In the configuration “Select Initial Job”, pick “Build”
- Save

# Ready To Go

- Click on Run to execute the entire pipeline



- Jenkins will display the progress. You can review the console output by clicking on the symbol

# SecTesting Console Output

 Jenkins

Jenkins > Security Testing Pipeline > SecTesting > #5

[Back to Project](#) [Status](#) [Changes](#) [Console Output](#) [View as plain text](#) [Edit Build Information](#) [Delete Build](#) [Previous Build](#)

## Console Output

```
Started by upstream project "Deploy" build number 5
originally caused by:
    Started by upstream project "Build" build number 5
originally caused by:
        Started by user admin
Building in workspace /home/ubuntu/jenkins/jenkins6/workspace/SecTesting
Run condition [File exists] enabling prebuild for step [Execute shell]
[SecTesting] $ /bin/sh -xe /tmp/hudson2616581029438597149.sh
+ echo Launching Burp Pro...
Launching Burp Pro...
+ java -Xmx256m -Djava.awt.headless=true -jar /home/ubuntu/burpsuite_pro.jar -h=127.0.0.1 -p=27017 -o=/home/ubuntu/reports/ -r=report.html -t=30
Proxy: Proxy service started on 127.0.0.1:8080

:: ReplayAndDiff Headless Extension ::

[*] Configuration {MONGO_HOST=127.0.0.1,MONGO_PORT=27017,OUTPUT_DIR=/home/ubuntu/reports/,REPORT_NAME=report.html,TIMEOUT=30}
Extender: DetectSRI: DetectSRI Passive Scanner check enabled
Extender: DetectELJ: DetectELJ Active Scanner check enabled
[*] Retrieving record for: 52.24.137.140
[*] Obtained cookie: sessionid=fac1323fee9252af2f
[!] Missing cookie attributes - e.g. domain not set
[*] Pausing extension...
[*] Resuming extension...
[*] Looking for: { "type" : 5245344 , "name" : "Frameable response (potential Clickjacking)" , "URL" : "http://52.24.137.140:80/" }
[*] Got a new finding!
[*] Looking for: { "type" : 3145984 , "name" : "Cleartext submission of password" , "URL" : "http://52.24.137.140:80/" }
[*] Got a new finding!
[*] Looking for: { "type" : 5244928 , "name" : "Password field with autocomplete enabled" , "URL" : "http://52.24.137.140:80/" }
[*] Got a new finding!
[*] Looking for: { "type" : 134217728 , "name" : "Subresource Integrity (SRI) Detected" , "URL" : "http://52.24.137.140:80/" }
[*] Got a new finding!
[*] Looking for: { "type" : 16777728 , "name" : "Unencrypted communications" , "URL" : "http://52.24.137.140:80/" }
[*] Looking for: { "type" : 2097960 , "name" : "Path-relative style sheet import" , "URL" : "http://52.24.137.140:80/" }
[*] Got a new finding!
```

# Moment of Truth

- Wait for the email :)

---

☆ ikki 🎵

Burp Scanner - New Finding

To: luca@doyensec.com

---

Burp ReplyAndDiff identified a new finding. See attached report.



[report.html](#)

**\*\* EXTRA MATERIAL \*\***

# Intruder Payloads Generator

Case Study: Bradamsa

# Intruder payloads

- Let's study the implementation of **Bradamsa**
- Radamsa for Burp
  - Original project:  
<https://github.com/ikkisoft/bradamsa>
  - Simplified code to study:  
<https://github.com/doyensec/burpdeveltraining/tree/master/Bradamsa>
- This extension provides a custom Intruder payload generator

# What is Radamsa

- Radamsa is a command-line test case generator for fuzzing
- It is scriptable and super easy to use

```
$ echo "aaa" | radamsa  
:aaa
```

# Install Radamsa

```
$ git clone https://github.com/aoh/radamsa.git  
$ cd radamsa  
$ make  
$ sudo make install  
$ radamsa --help
```

- You need *gcc/clang, make and git*
- On Mac OS, change the Makefile to install in */usr/local/bin/*



# What is a payload generator?

**Payload Sets**

You can define one or more payload sets. The number of payload sets depends on the attack type defined in the Positions tab. Va

Payload set:  Payload count: unknown  
Payload type:  Request count: unknown

**Payload Options [Extension-generated]**

This payload type invokes a Burp extension to generate payloads.  
Selected generator: [NOT SELECTED]

Select payload generator

Select the extension-provided payload generator that you want to use. Burp extensions can be loaded using the Extender tool.

Extension payload generator:



# Generator and Processor

- Extensions can register themselves as `registerIntruderPayloadGeneratorFactory` or `registerIntruderPayloadProcessor`
- For payload generators, Burp expects the extension to return an implementation of the `IIntruderPayloadGenerator` interface

# In pseudo-code

```
class myGenerator implements IIntruderPayloadGenerator{

    @Override
    public boolean hasMorePayloads ()
    { ... }

    @Override
    public byte[] getNextPayload(byte[] baseValue)
    { ... }

    @Override
    public void reset()
    { ... }

}
```

# Bradamsa Demo 1/2

Burp Intruder Repeater Window Help

Target Proxy Spider Scanner Intruder Repeater Sequencer Decoder Comparer Extender Options Alerts Bradamsa

**Radamsa command line options**

For more details, please refer to the official Radamsa homepage (<https://code.google.com/p/ouspg/>)

Binary:

Count:

Output:

Seed:

Mutations:

Patterns:

Meta:

Delete sample files after execution

**Resulting Command Line:**

```
/usr/bin/radamsa -n 10 -o /var/folders/d6/zjpxvxxs21x6c4fgr9j1mrt00000gp/t/radamsa2446258691559248640/%n.out
```

# Bradamsa Demo 2/2

Patterns:

Meta:

Delete sample files after execution

**Resulting Command Line:**

Invalid mutations pattern [od,nd,bu]



# Let's have a look at the code

- [https://github.com/doyensec/  
burpdeveltraining/tree/master/Bradamsa](https://github.com/doyensec/burpdeveltraining/tree/master/Bradamsa)
- Focus on *RadamsaPayloadGenerator.java* and *BradamsaPanel.java*



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# Conclusion



# Final Remarks

- Building extensions is **fun** and **useful** to improve efficacy and efficiency of security testing activities
- When analyzing custom protocols, Burp extensions make a big difference
- When Burp Scanner is integrated in the SDLC, creating custom check can ensure test coverage (regression, application-specific bugs, ...)

# What's next?

- Study the Burp API Javadoc
  - <https://portswigger.net/burp/extender/api/>
- Check the source code of BApp Store extensions on PortSwigger's Github
  - <https://github.com/PortSwigger>
- Build your extension!



# Thank you!

Please email your feedback at  
[info@doyensec.com](mailto:info@doyensec.com)

Luca Caretoni - [luca@doyensec.com](mailto:luca@doyensec.com)