IBM Security
Intelligence. Integration. Expertise.

IBM

IBM Security – Application Security

Overview for Sarasota Software Engineering Group

Adrian Owens
Technical Specialist – IBM Security Channels Team
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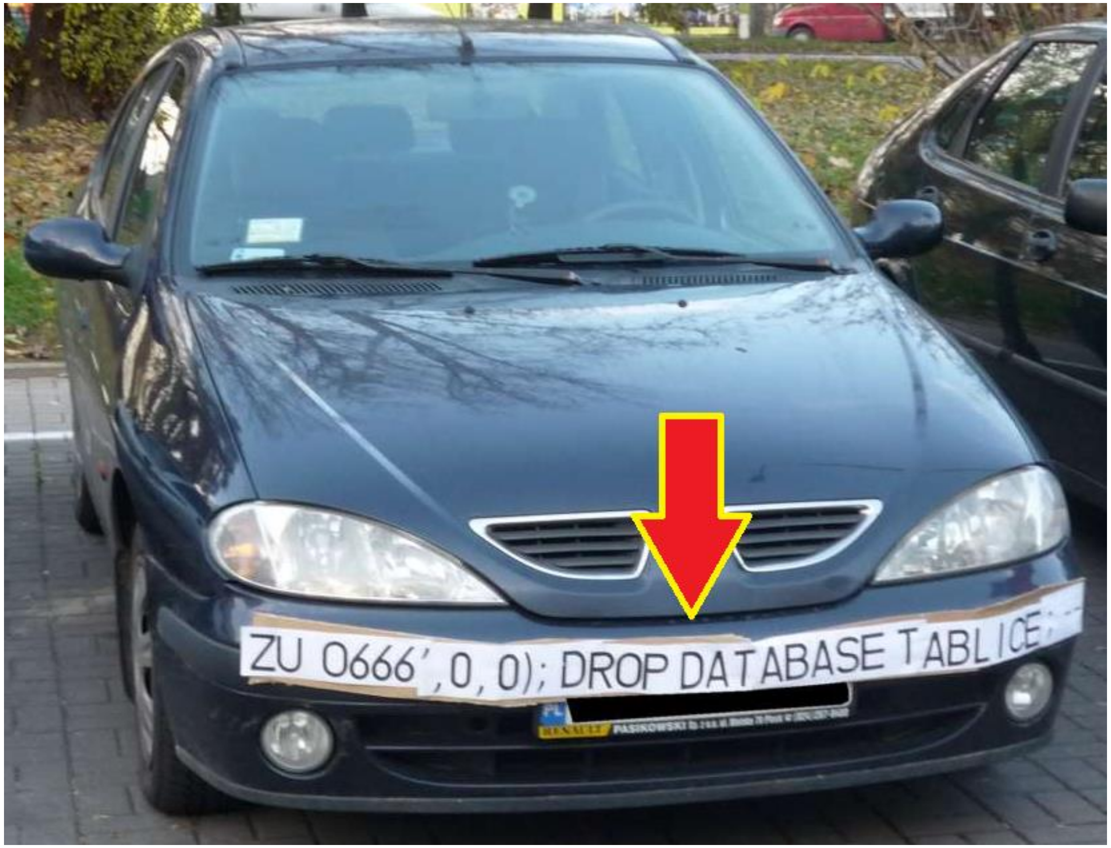
941-807-1357

Mobile SQL Injection?



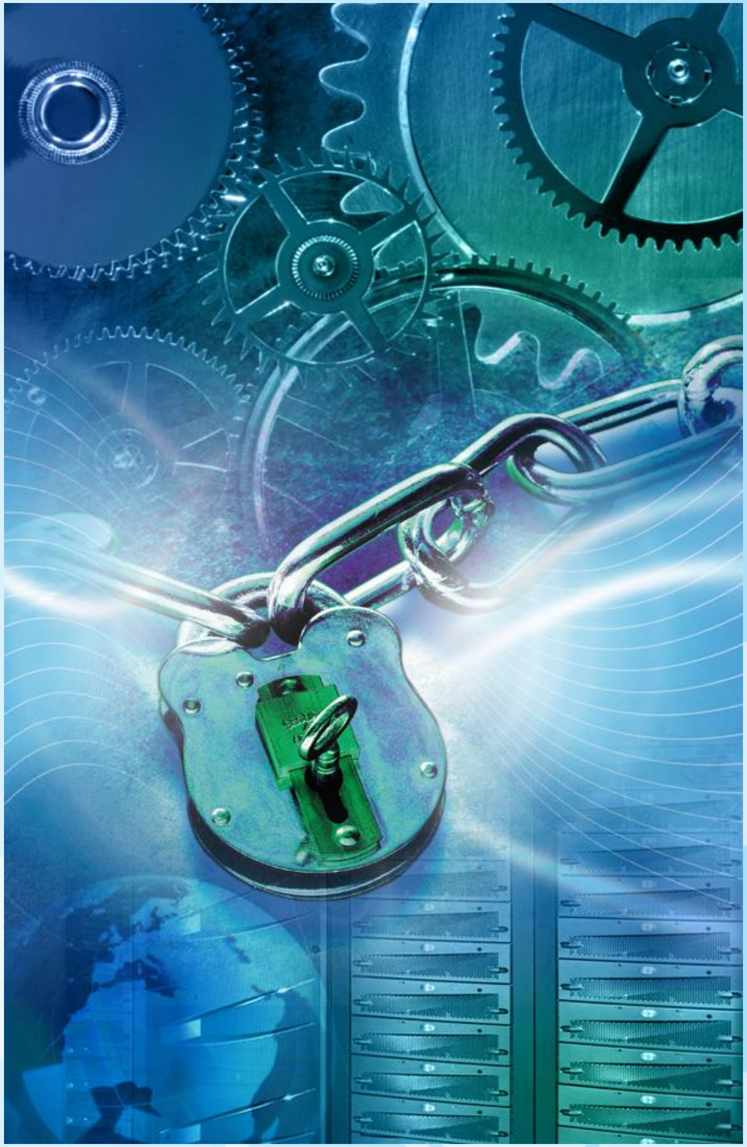
A Few Questions

- What is your name?
- What is your quest?
- What is the velocity of a unlaiden sparrow?
- https://www.youtube.com/watch?v=y2R3FvS4xr4

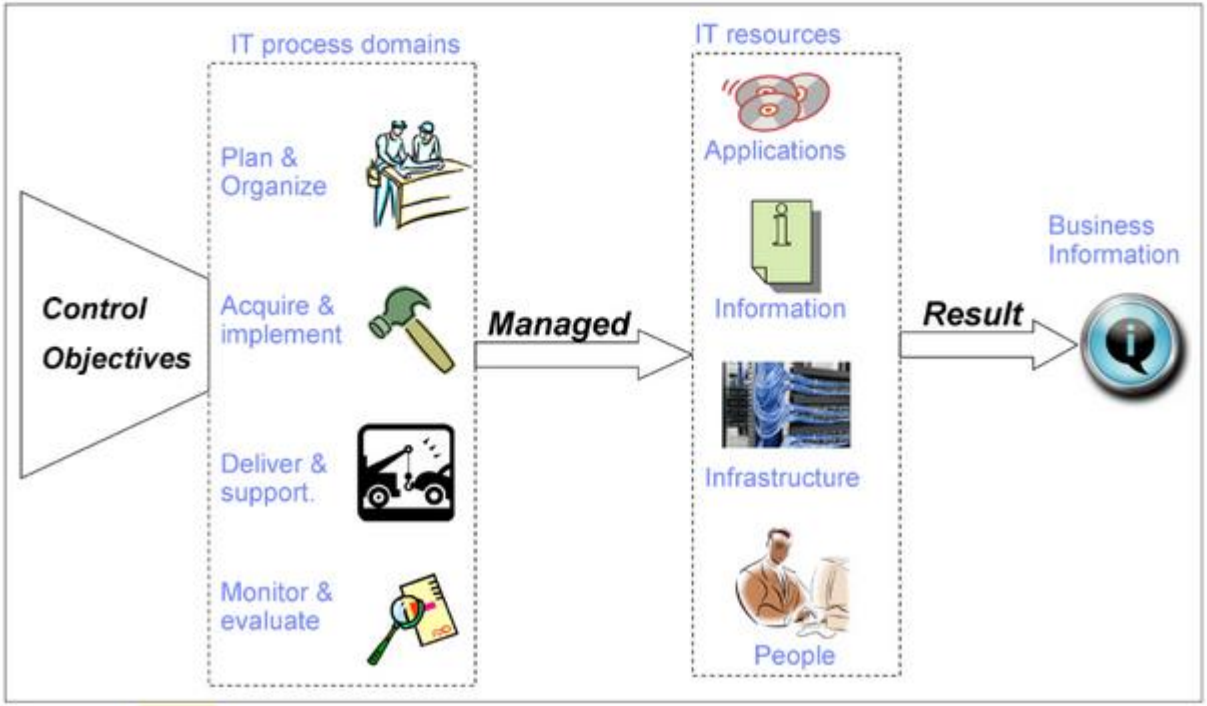
- What type of development do you do (web, mobile, client server, IoT)
- What is your is your industry (Financial, Health, Retail, Engineering…)
- What languages do you use
- What is your SDLC Process (traditional, agile, maintenance)
- Have you had an recent dealings with a security team (on your applications)

Agenda

- **IBM Security Framework**
- **Trends in Application Security**
- **Application Hacking Overview**
- **Consider Your Application**

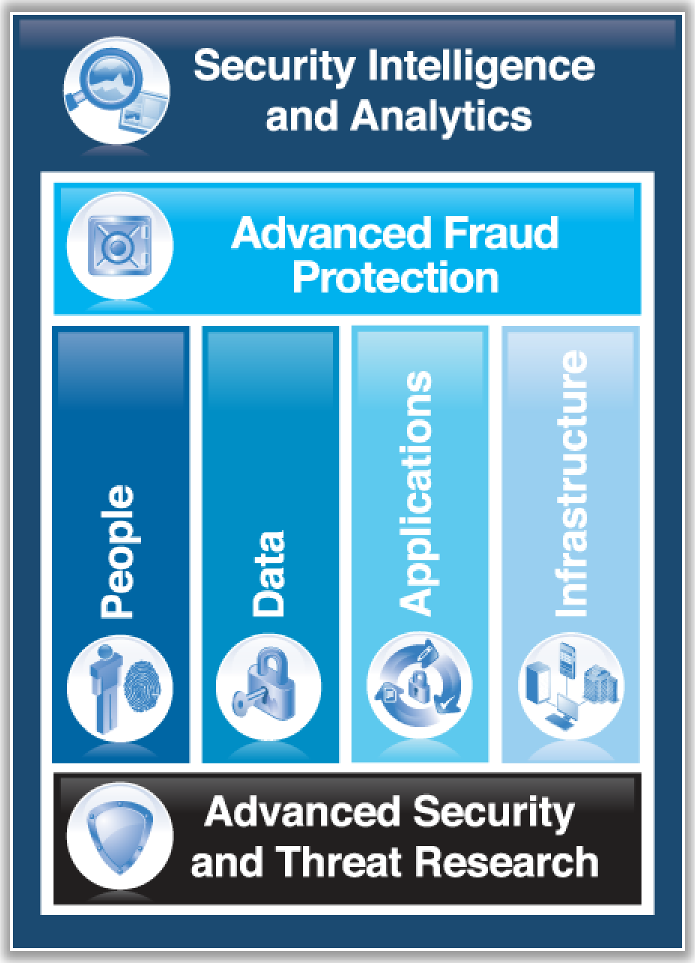


COBIT (nee Control Objectives for Information and Related Technology)



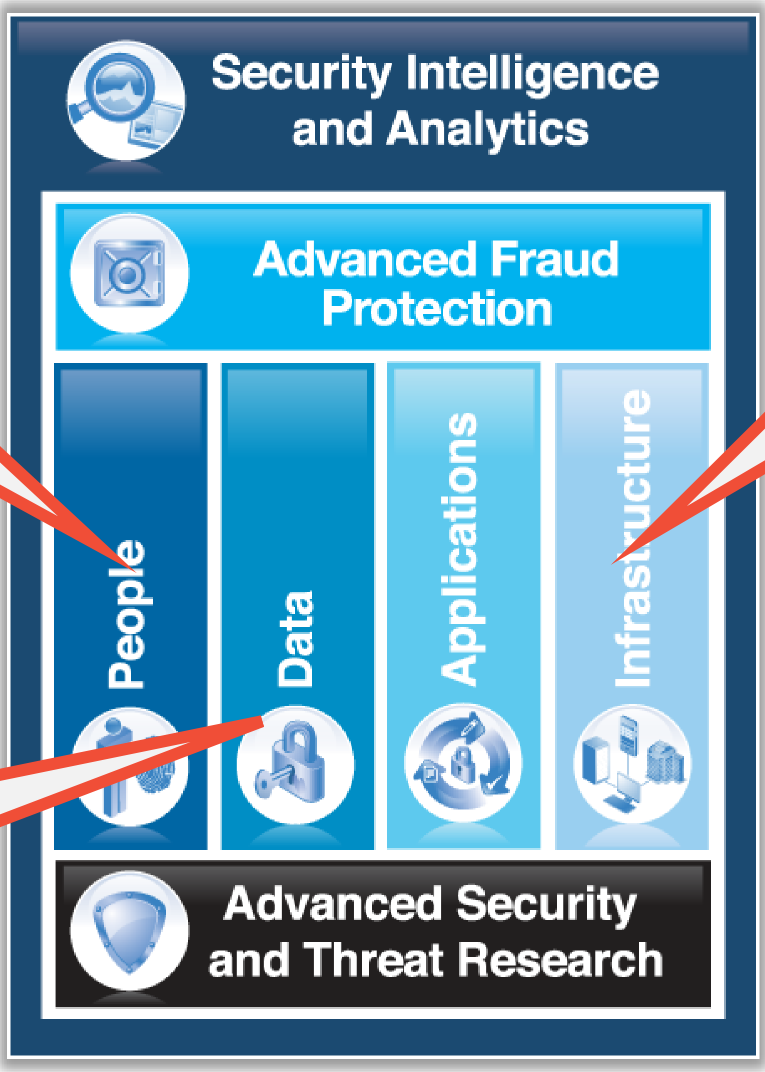
- ***Business information*** is the result of →
- IT Resources (applications, information, infrastructure, people) which are managed by →
- IT process domains
- frameworks are both
- focused on bridging the gap between business and IT technical points of view
- with regard to security.

IBM Security Framework.


Security Intelligence and Analytics
Advanced Fraud Protection
People
Data
Applications
Infrastructure
Advanced Security and Threat Research

- The IBM Security Framework is focused on bridging the gap between business and IT technical points of view with regard to security.

IBM Security Framework.

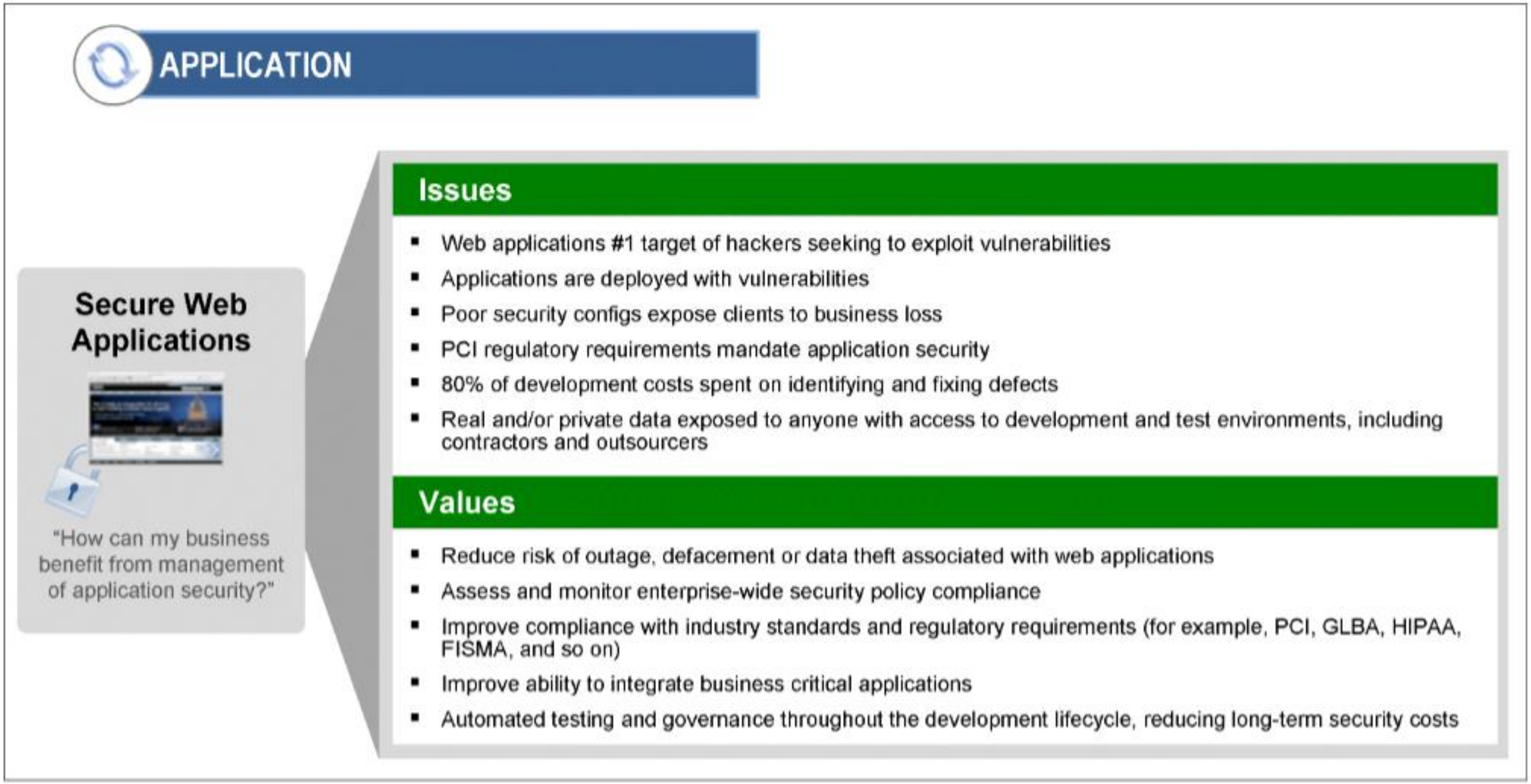

Security Intelligence and Analytics
Advanced Fraud Protection
People
Data
Applications
Infrastructure
Advanced Security and Threat Research

Houston Astros password is “guessed”. Former employee had to turn in laptop and password.

Panama Papers

Office of Personnel Management

Application Domain



APPLICATION

Secure Web Applications

"How can my business benefit from management of application security?"

Issues

- Web applications #1 target of hackers seeking to exploit vulnerabilities
- Applications are deployed with vulnerabilities
- Poor security configs expose clients to business loss
- PCI regulatory requirements mandate application security
- 80% of development costs spent on identifying and fixing defects
- Real and/or private data exposed to anyone with access to development and test environments, including contractors and outsourcers

Values

- Reduce risk of outage, defacement or data theft associated with web applications
- Assess and monitor enterprise-wide security policy compliance
- Improve compliance with industry standards and regulatory requirements (for example, PCI, GLBA, HIPAA, FISMA, and so on)
- Improve ability to integrate business critical applications
- Automated testing and governance throughout the development lifecycle, reducing long-term security costs

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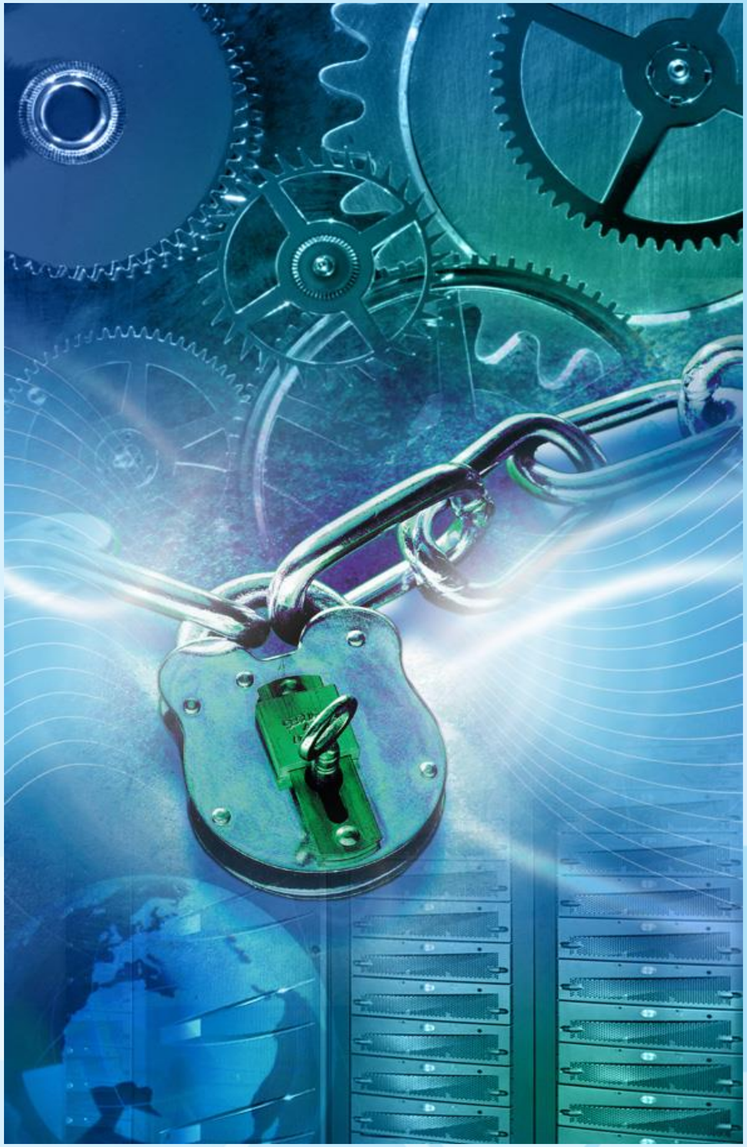
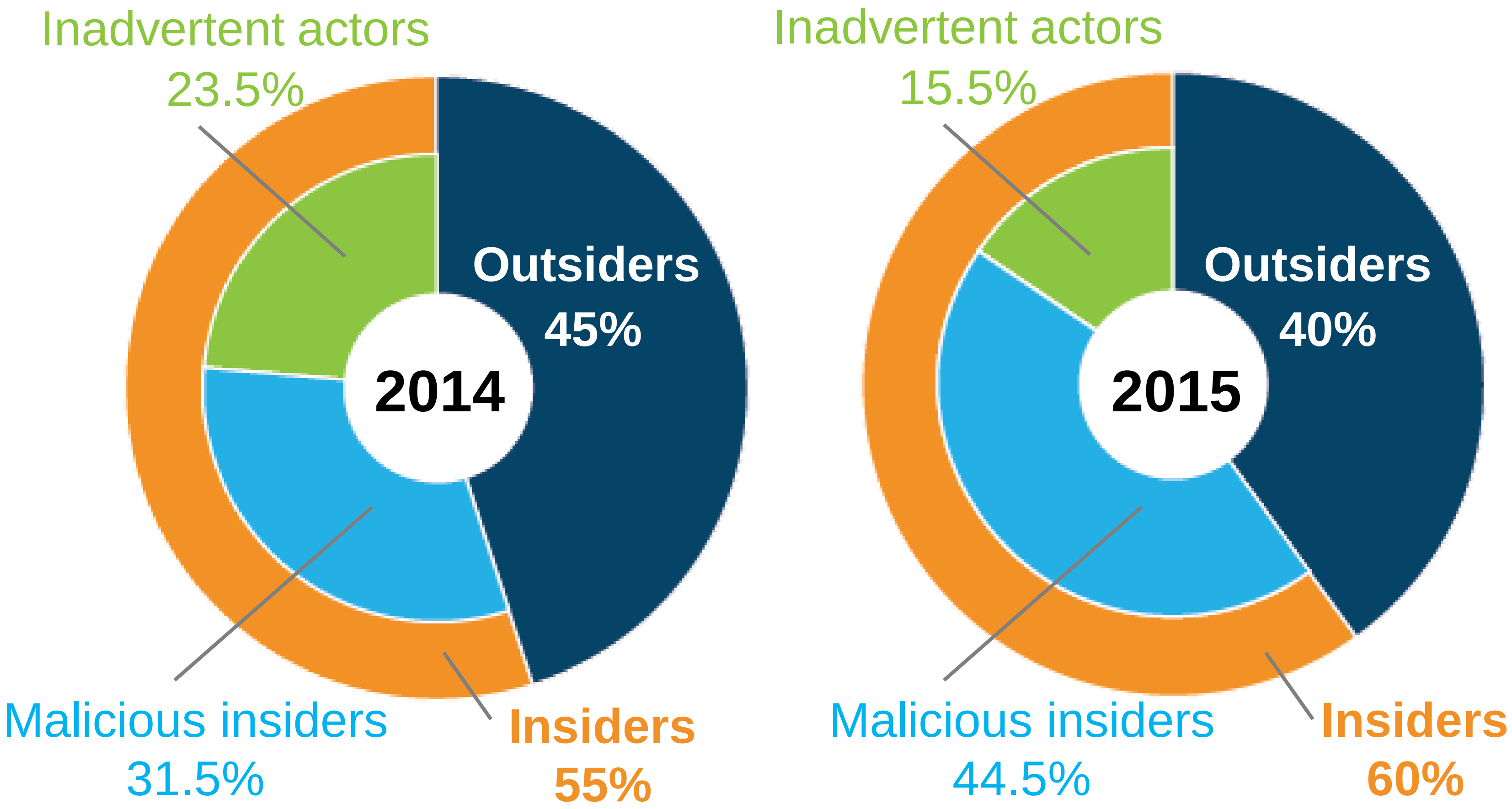


The growth of malicious insiders outpaced the reduction in inadvertent actors, pushing the insider total to 60%

Who are the bad guys?



2015 saw a major shift in the “top 5” industries according to incident rates, with healthcare moving into the top spot.

Industries experiencing the highest incident rates

	2014	2015
1	Financial services	Healthcare
2	Information and communication	Manufacturing
3	Manufacturing	Financial services
4	Retail and wholesale	Government
5	Energy and utilities	Transportation

According to Ponemon Institute, the cost of a data breach that compromises personally identifiable information is on the rise

up 12% over 2 years

up 23% over 2 years

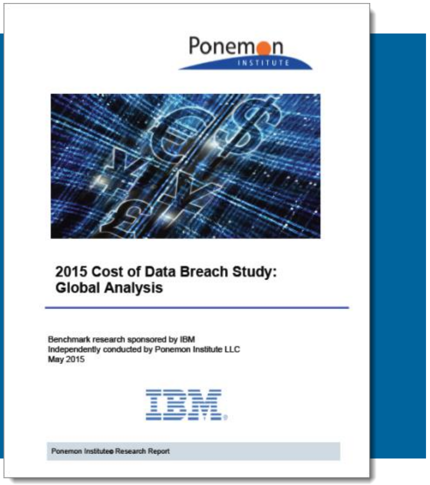
$154
Average global cost **per record compromised**

$3.8 million
Average global total cost **per data breach**

$1.57million
Average cost of **lost business** per data breach

2015 Cost of Data Breach Study: Global Analysis
Independently conducted by Ponemon Institute,
Sponsored by IBM

***Watch for 2016 study coming in Spring 2016**



Ponemon INSTITUTE

2015 Cost of Data Breach Study:
Global Analysis

Benchmark research sponsored by IBM
Independently conducted by Ponemon Institute LLC
May 2015

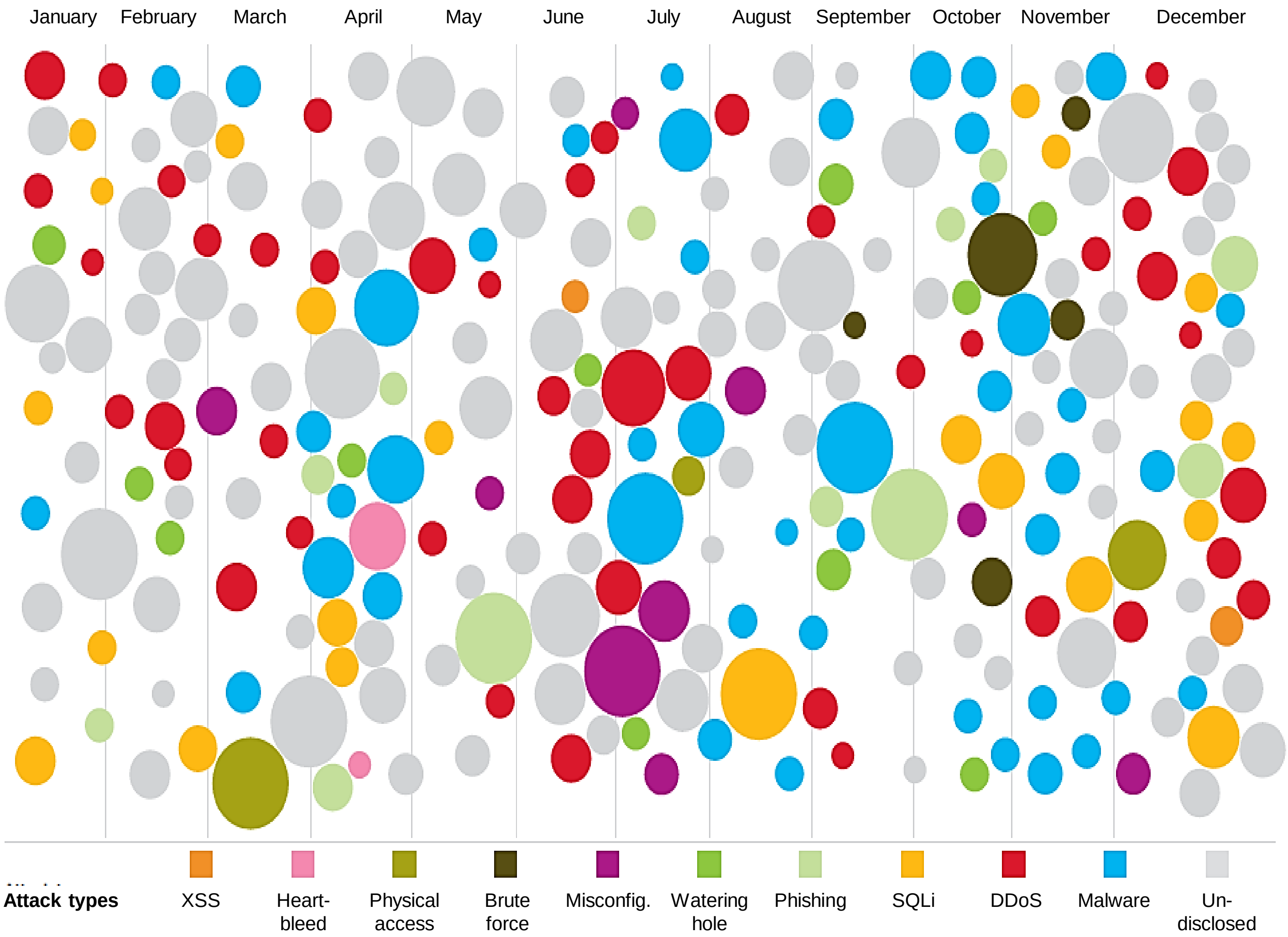
IBM

Ponemon Institute© Research Report

ibm.com/security/data-breach

SQL injection: Still reliable for breaching applications

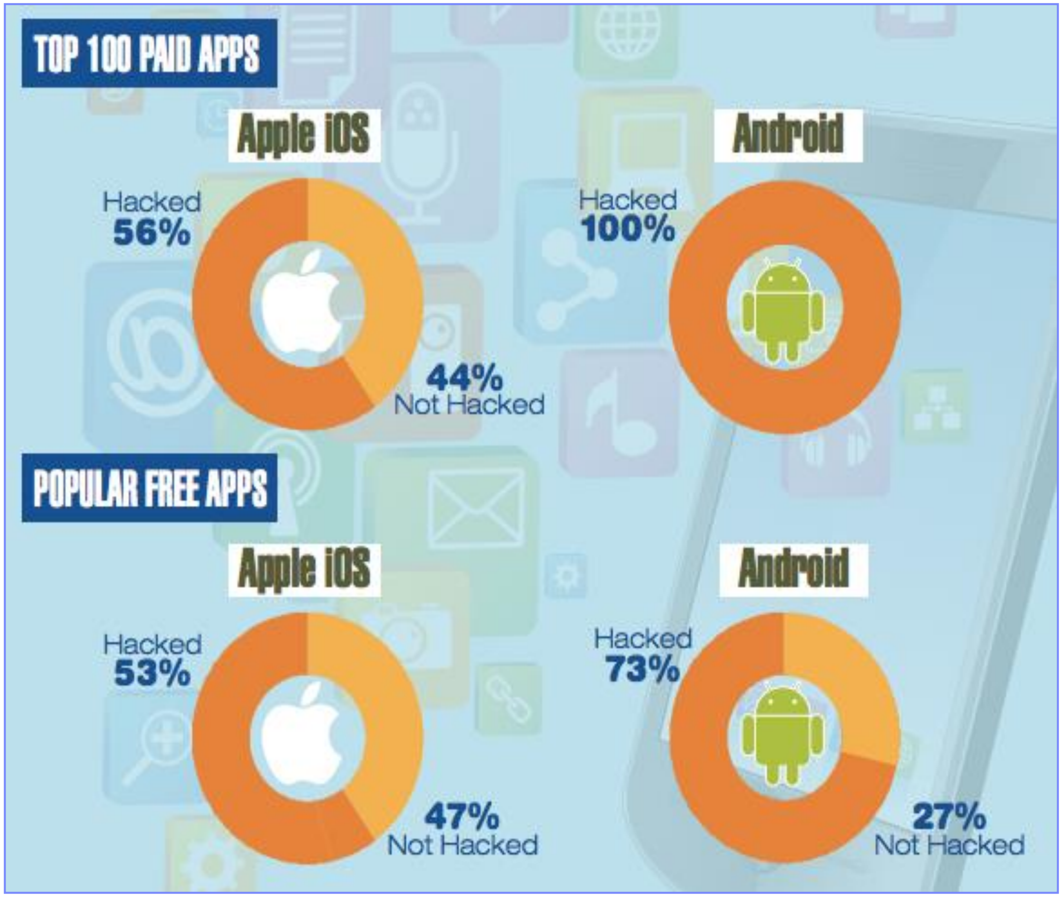
Sampling of 2014 security incidents by attack type, time and impact



SQL injection accounted for 8.4% of attacks in 2014

Source: IBM X-Force

Mobile Apps Under Attack



Source: State of Security in the App Economy
- “Mobile App Hacking Revealed” report (Dec 2013)

- “78 percent of top 100 paid Android and iOS Apps are available as hacked versions on third-party sites” (“State of Security in the App Economy”, Arxan, 2013)
- "Chinese App Store Offers Pirated iOS Apps Without the Need to Jailbreak” (Extreme Tech, 2013)
- “86% of Mobile Malware is legit apps repackaged with malicious payloads” (NC State University, 2012)

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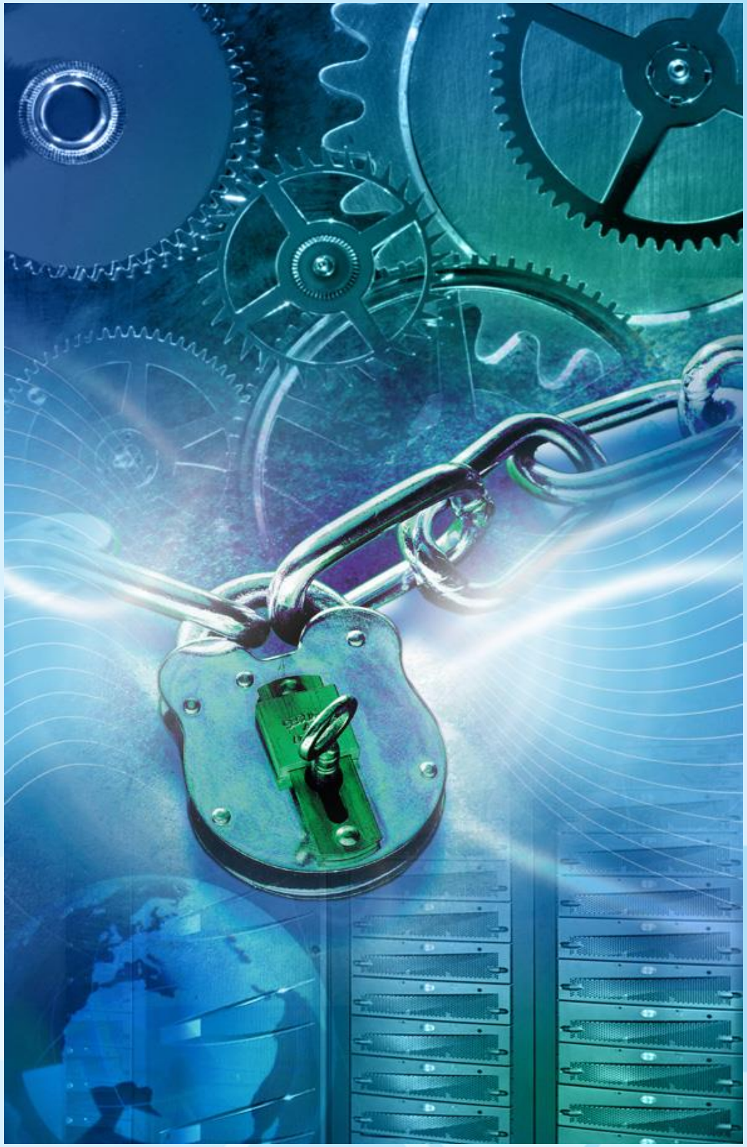


The Bad Guys Want In –
Right through Your Web Applications Front Door!

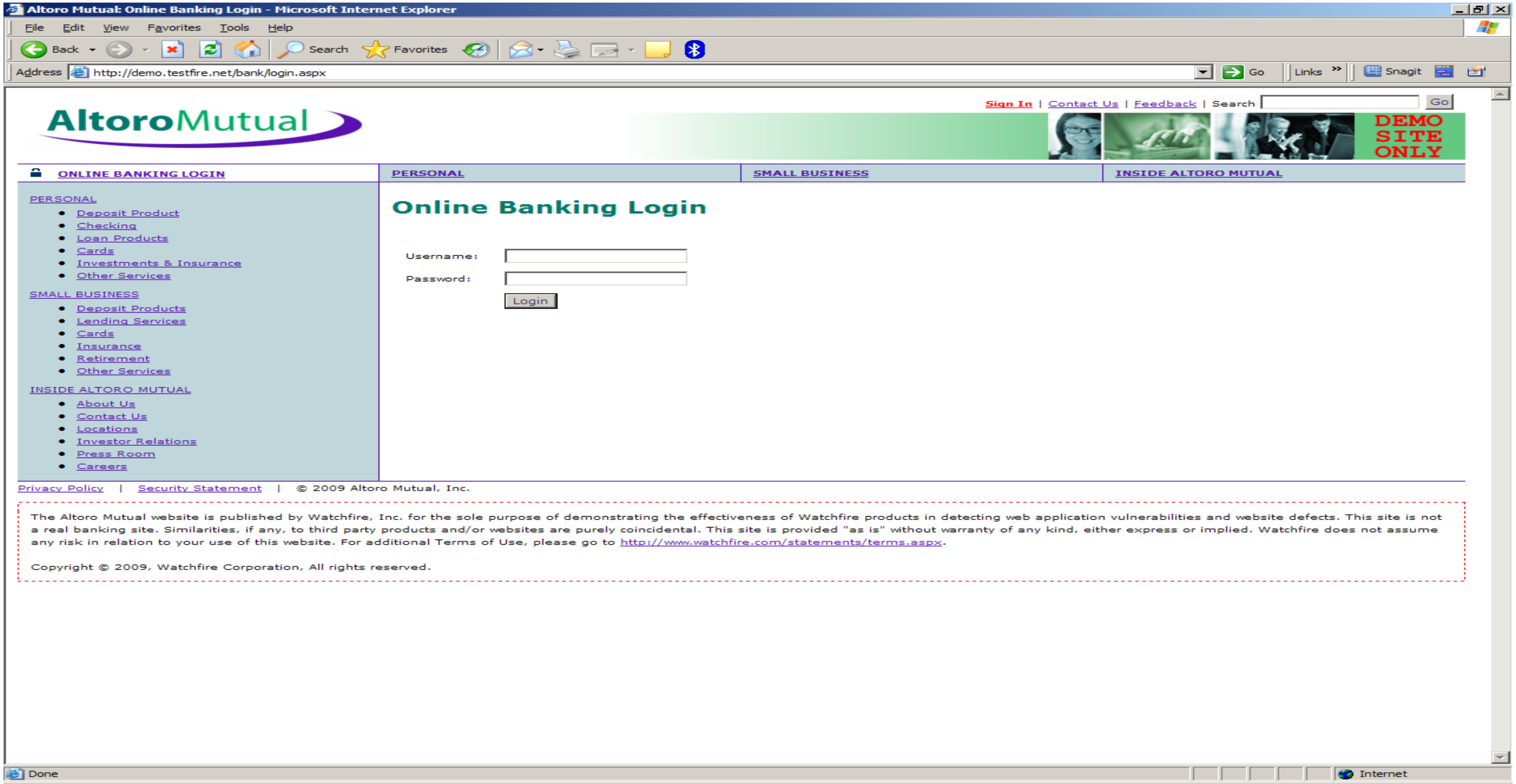
- Foreign Entities: Steal your important assets
- Black Hat Hacker: Wants to steal your important data, especially financial information, which they can sell for a gain.
- Hactivist: Take your website down. Could be motivated by politics, religion, may wish to expose wrongdoing, or exact revenge.

Common Attacks leveraging the web application:

- Injection (SQL, OS, LDAP, etc)
- Broken Session Management
- Cross-Site Scripting
- Insecure Direct Object References
- Using Components with Vulnerabilities

OWASP.org

Typical Web Application



Altoro Mutual: Online Banking Login - Microsoft Internet Explorer

http://demo.testfire.net/bank/login.aspx

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Username:

Password:

[Login]

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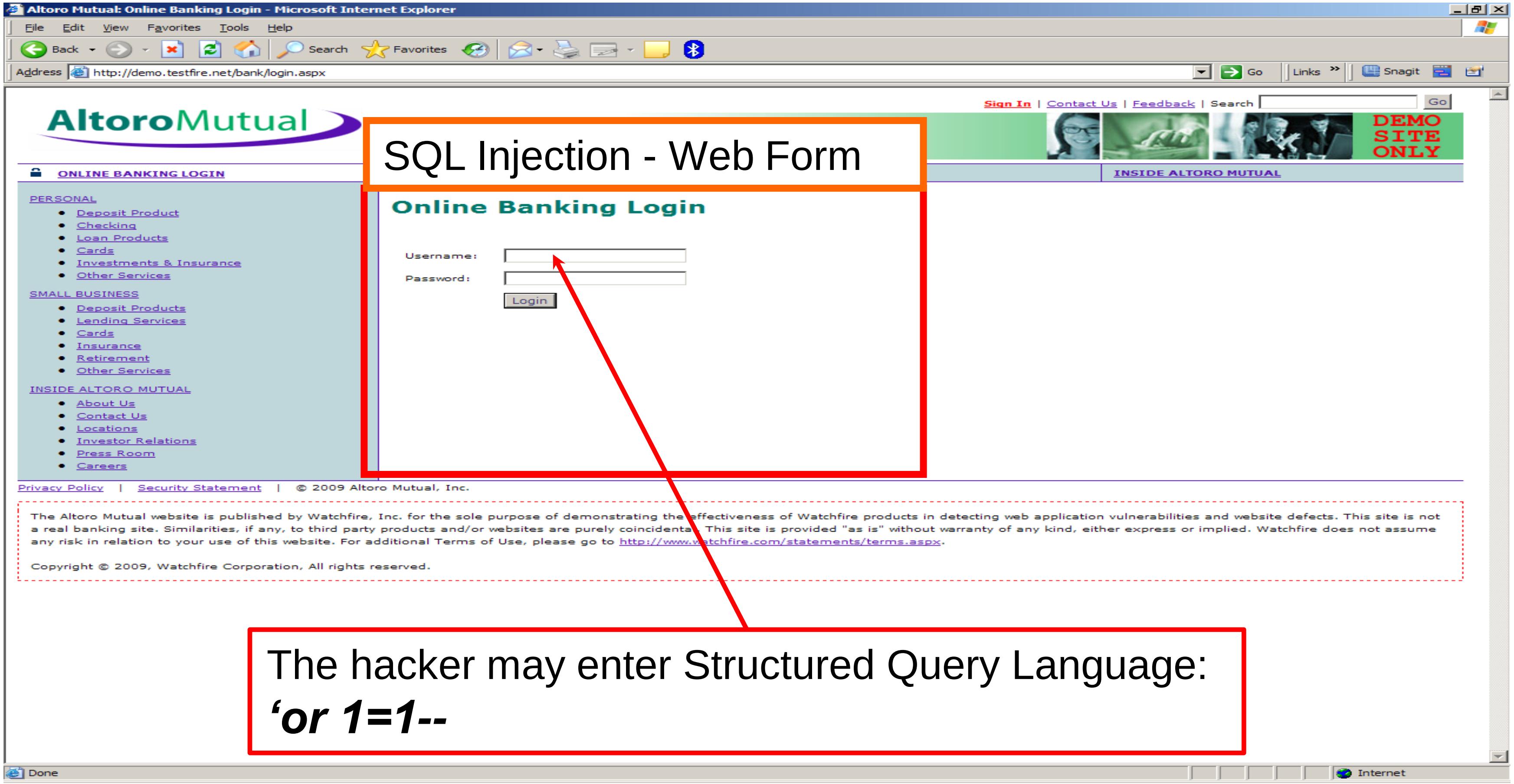
Attack Vector – Web Form and SQL Injection



SQL Injection - Web Form

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Password:

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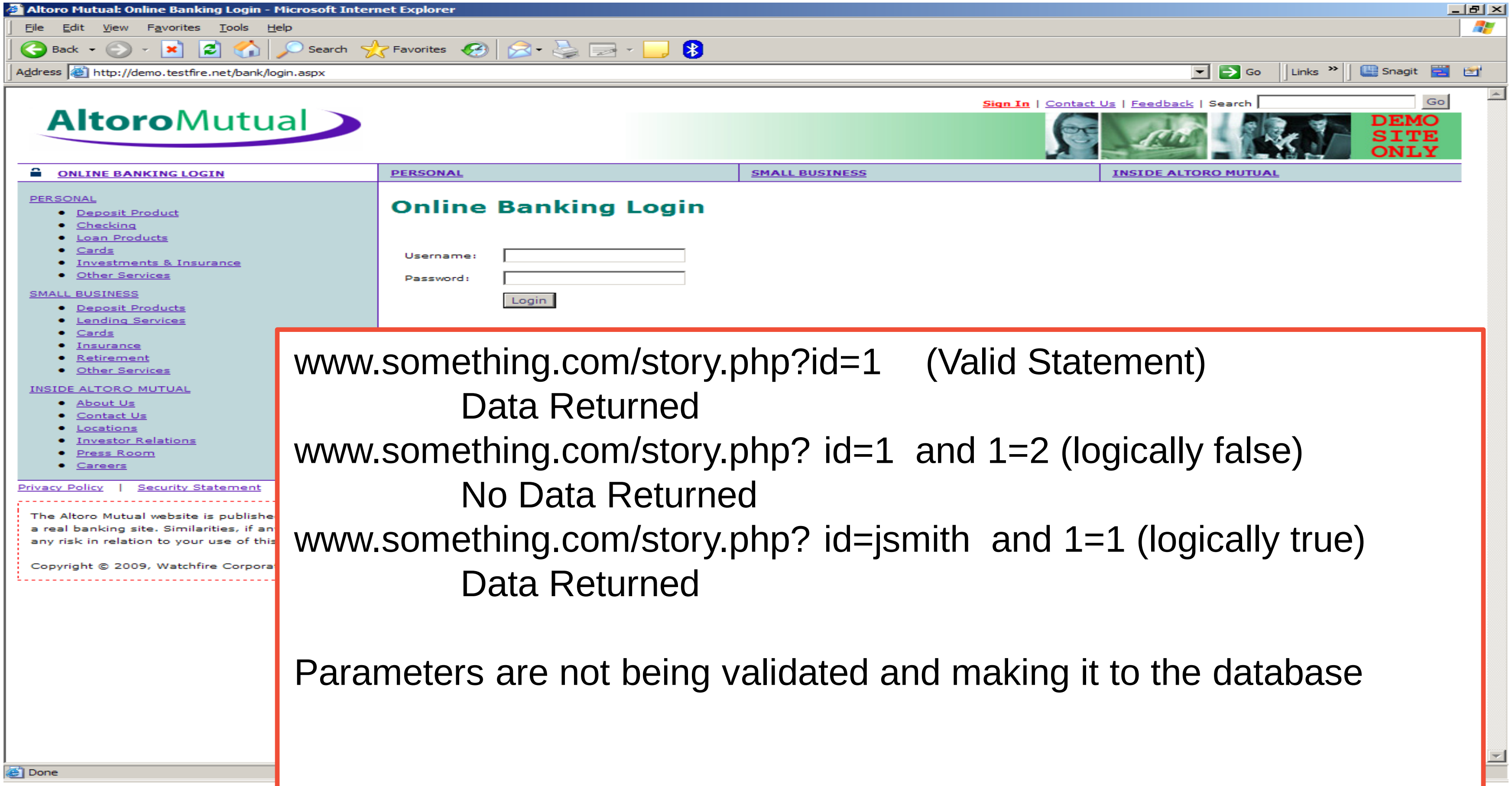
The hacker may enter Structured Query Language:
‘or 1=1--

Attack Vector – Blind SQL Injection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Username:

Password:

www.something.com/story.php?id=1 (Valid Statement)

Data Returned

www.something.com/story.php? id=1 and 1=2 (logically false)

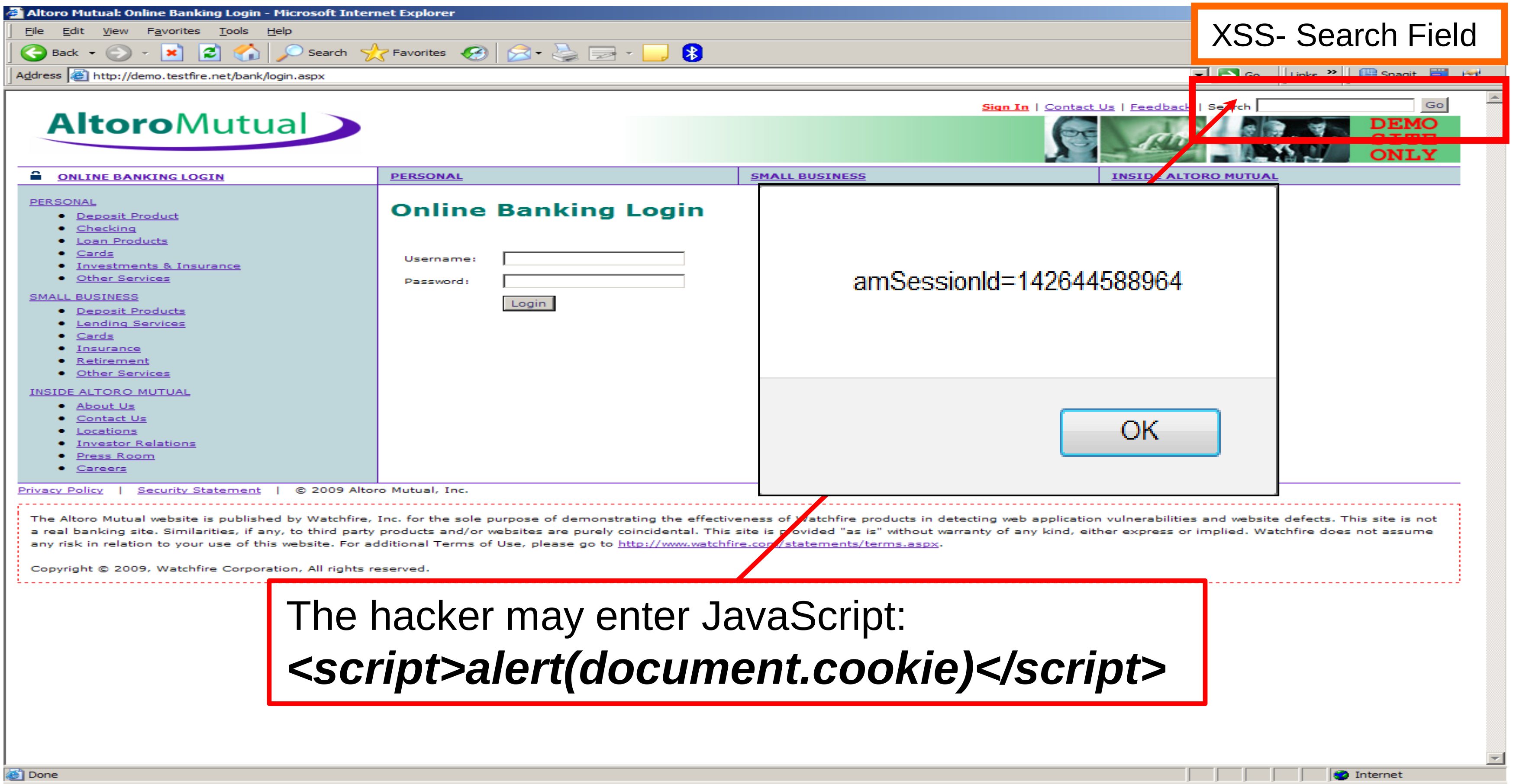
No Data Returned

www.something.com/story.php? id=jsmith and 1=1 (logically true)

Data Returned

Parameters are not being validated and making it to the database

Attack Vector – Search Field and JavaScript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File Edit View Favorites Tools Help
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Done
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Online Banking Login

Username: [ ]

Password: [ ]

Login

amSessionId=142644588964

OK

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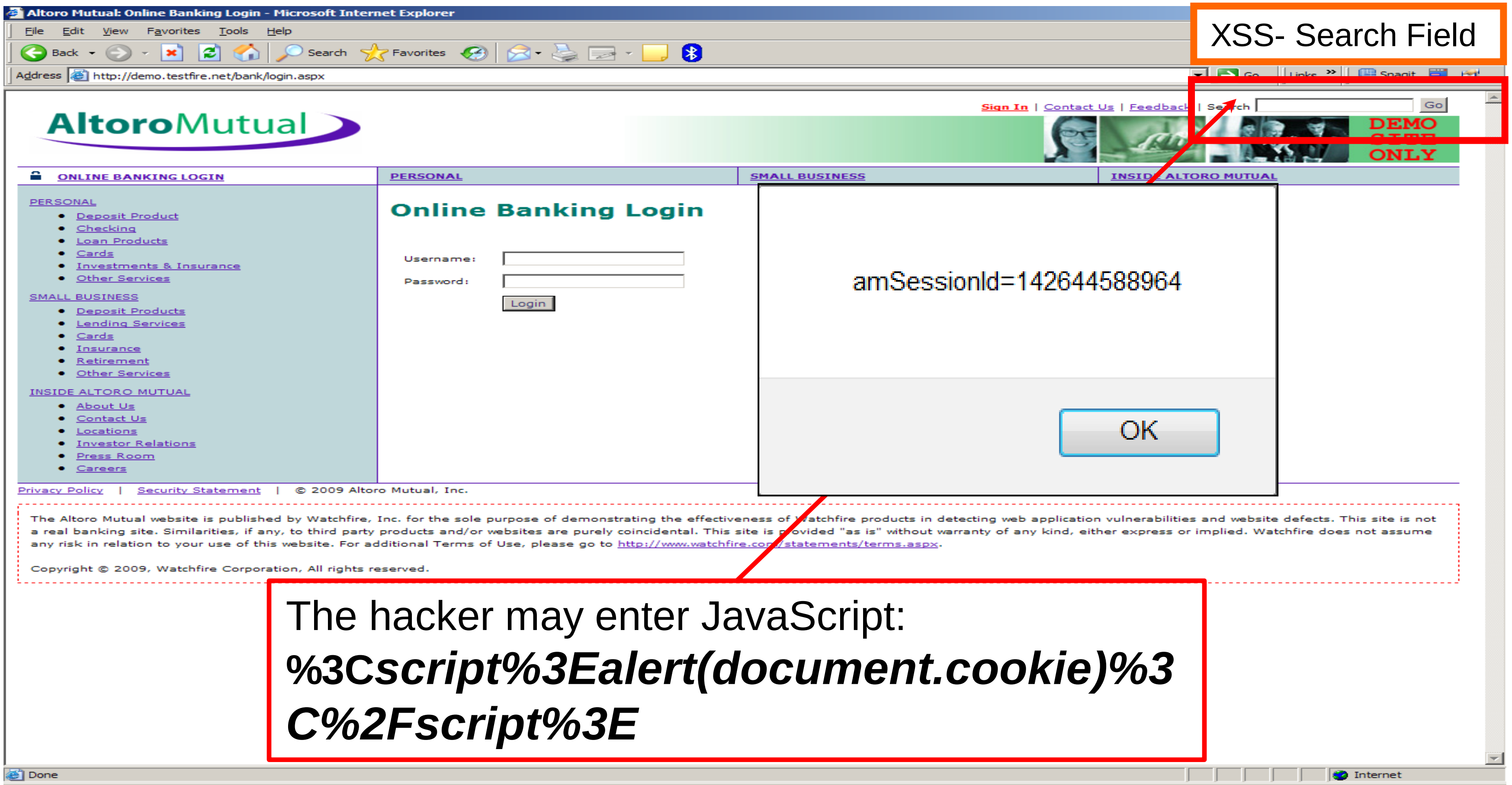
XSS- Search Field

The hacker may enter JavaScript:
<script>alert(document.cookie)</script>

Attack Vector – Search Field and JavaScript



amSessionId=142644588964

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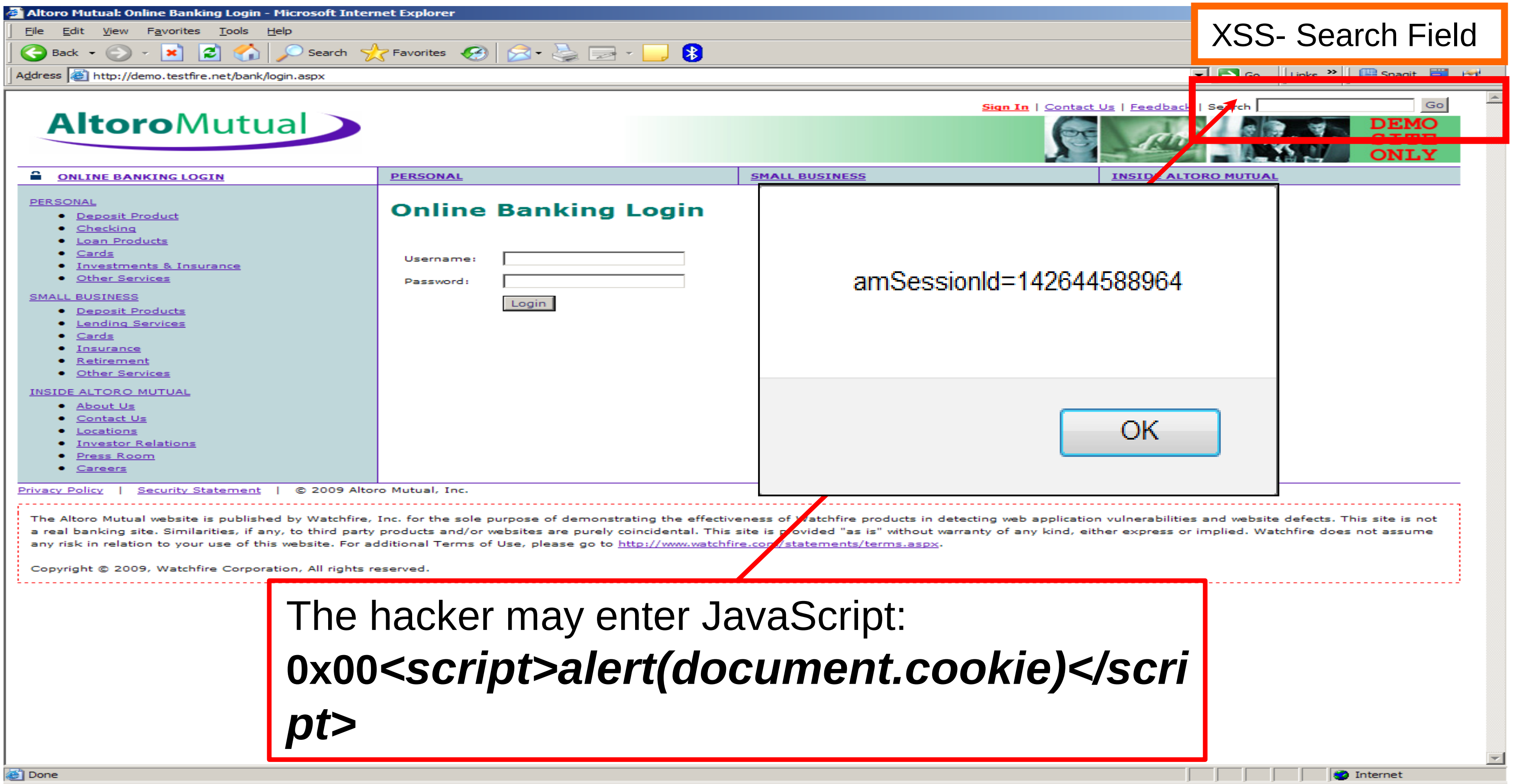
XSS- Search Field

The hacker may enter JavaScript:
%3Cscript%3Ealert(document.cookie)%3C%2Fscript%3E

Attack Vector – Search Field and JavaScript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Online Banking Login

Username:

Password:

Login

```
amSessionId=142644588964
```

OK

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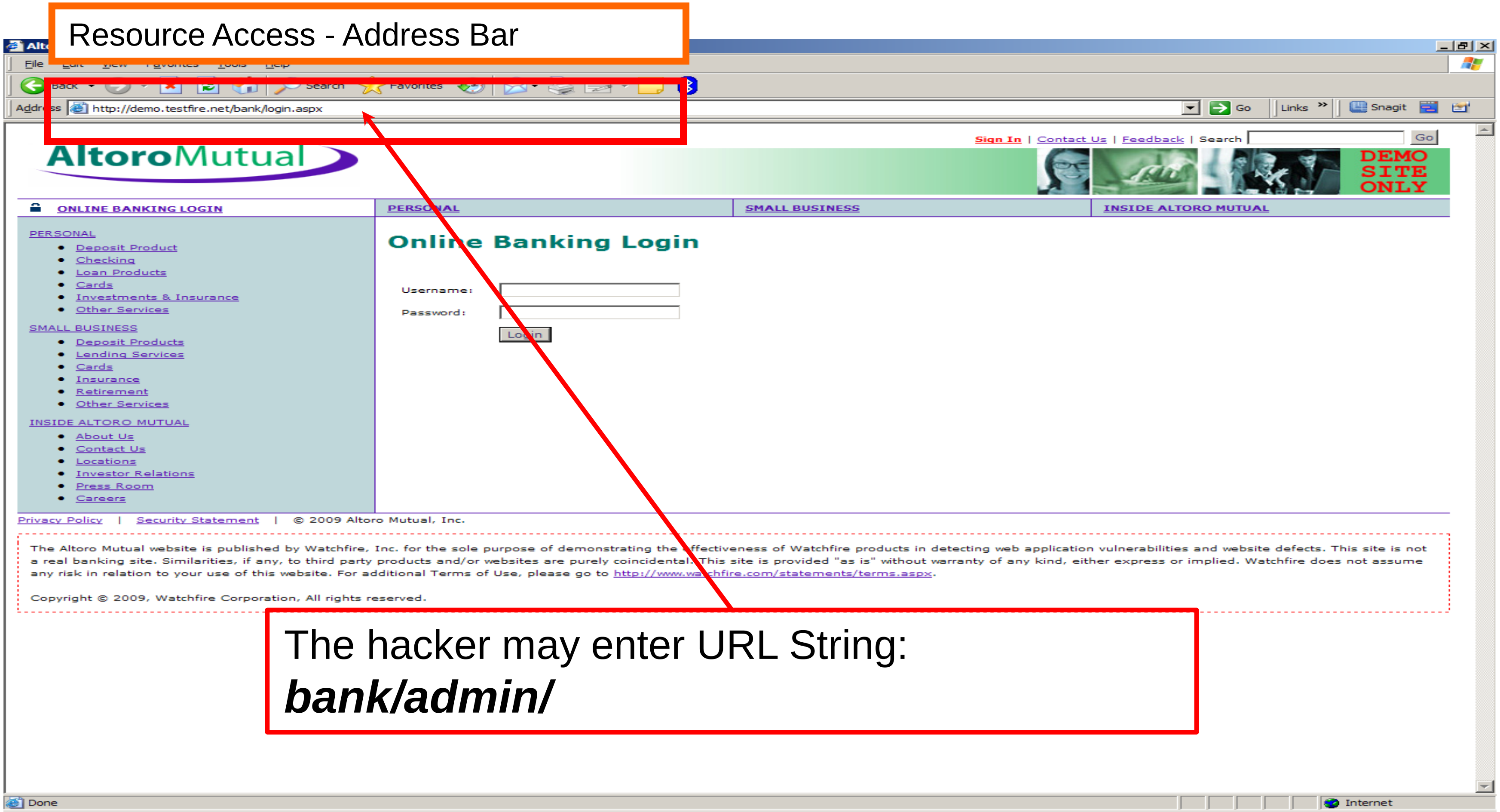
XSS- Search Field

The hacker may enter JavaScript:

0x00*<script>alert(document.cookie)</script>*

Attack Vector – Address Bar and Resource Access



Resource Access - Address Bar

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Password:

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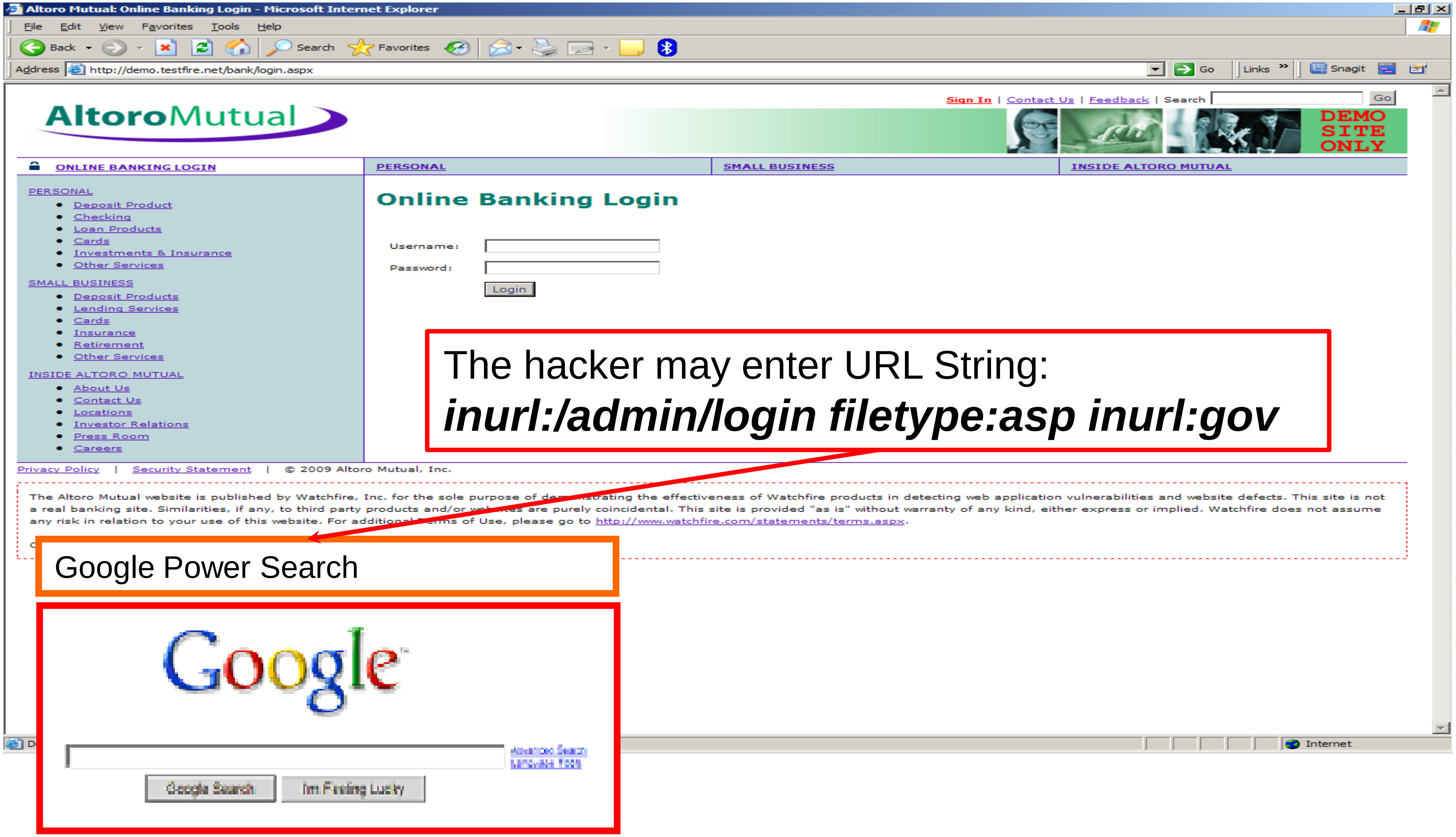
The hacker may enter URL String:
bank/admin/

Attack Vector – Google Search



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Password:

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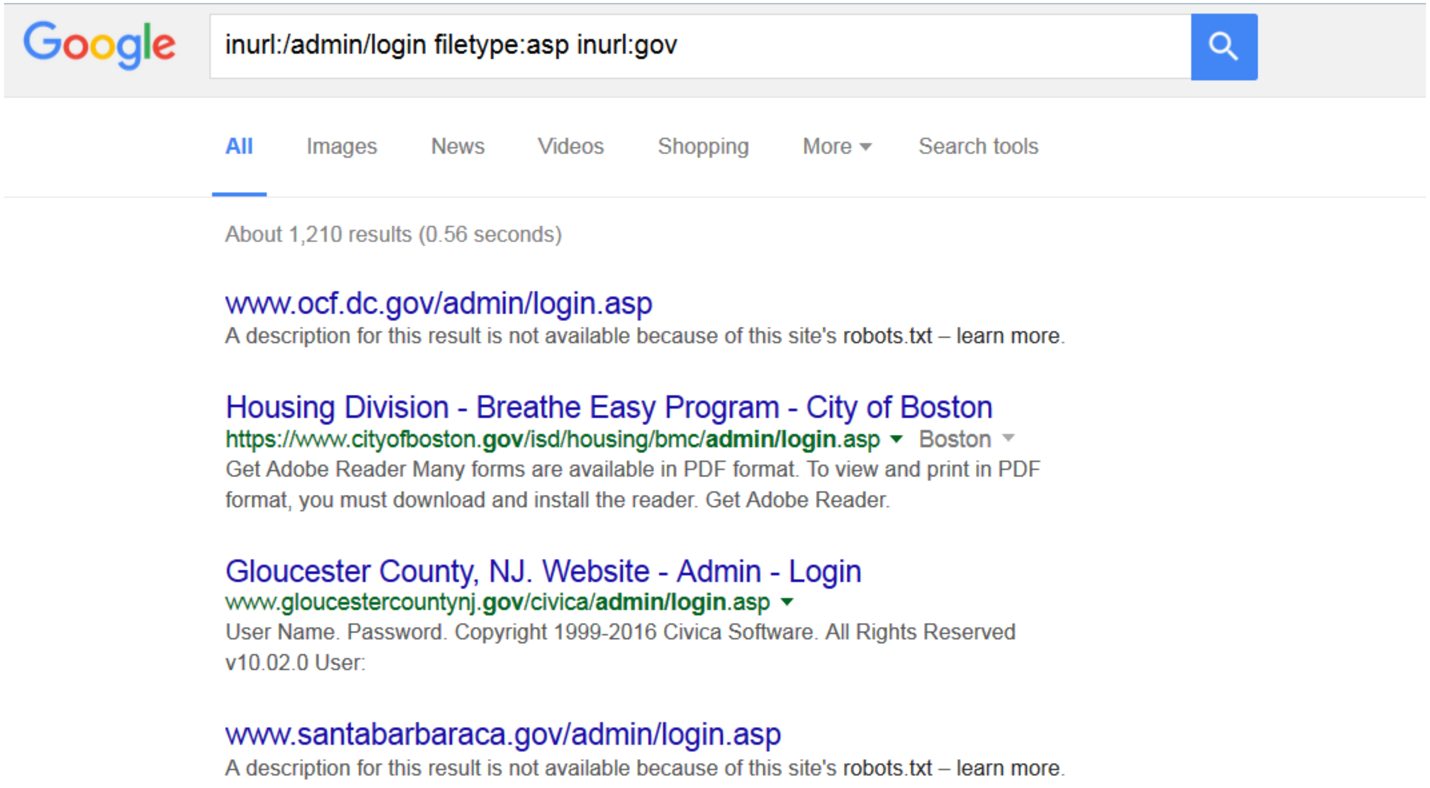
The hacker may enter URL String:
inurl:/admin/login filetype:asp inurl:gov

Google Power Search



inurl:/admin/login filetype:asp inurl:gov

About 1,210 results (0.56 seconds)

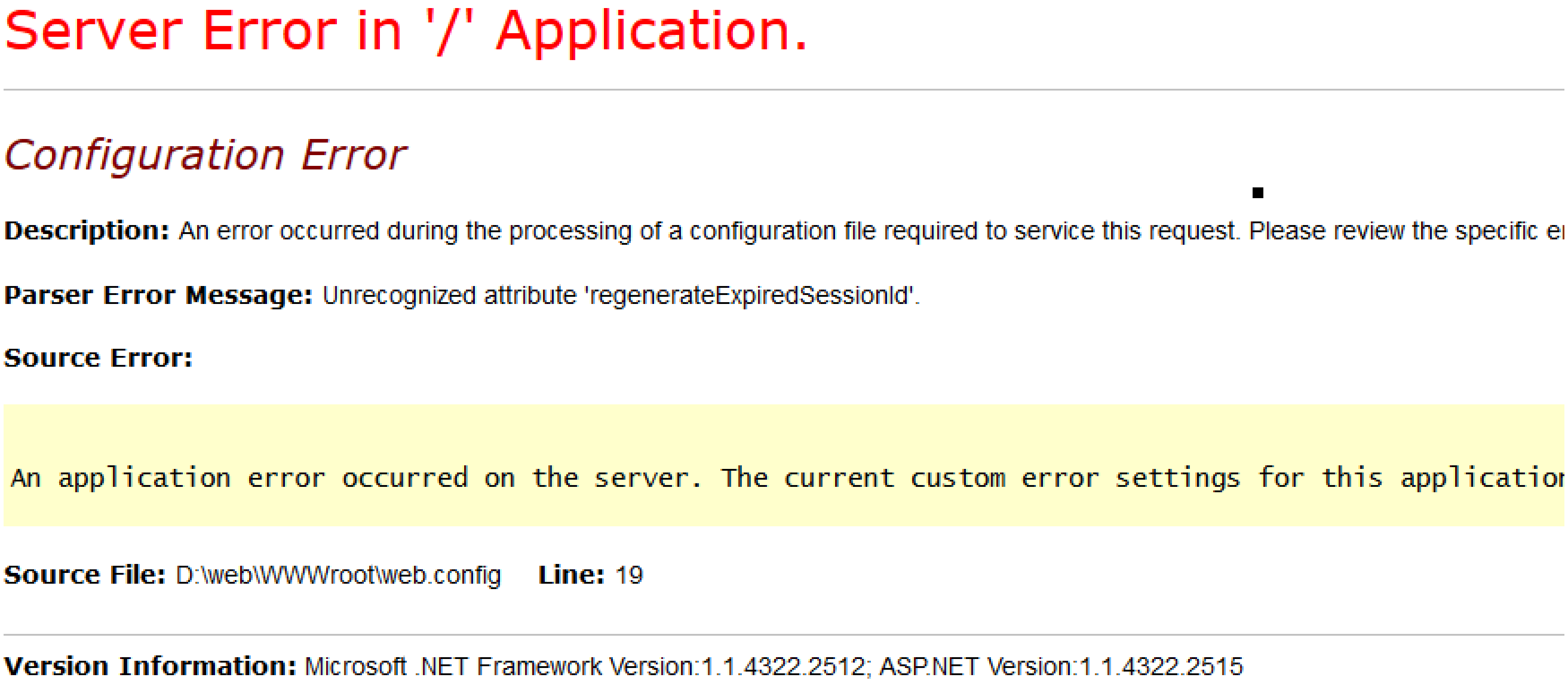
www.ocf.dc.gov/admin/login.asp
A description for this result is not available because of this site's robots.txt – learn more.

Housing Division - Breathe Easy Program - City of Boston
https://www.cityofboston.gov/isd/housing/bmc/admin/login.asp ▾ Boston ▾
Get Adobe Reader Many forms are available in PDF format. To view and print in PDF format, you must download and install the reader. Get Adobe Reader.

Gloucester County, NJ. Website - Admin - Login
www.gloucestercountynj.gov/civica/admin/login.asp ▾
User Name. Password. Copyright 1999-2016 Civica Software. All Rights Reserved v10.02.0 User:

www.santabarbaraca.gov/admin/login.asp
A description for this result is not available because of this site's robots.txt – learn more.

- Changed ASP to ASPX and some information was leaked



Server Error in '/' Application.

Configuration Error

Description: An error occurred during the processing of a configuration file required to service this request. Please review the specific e

Parser Error Message: Unrecognized attribute 'regenerateExpiredSessionId'.

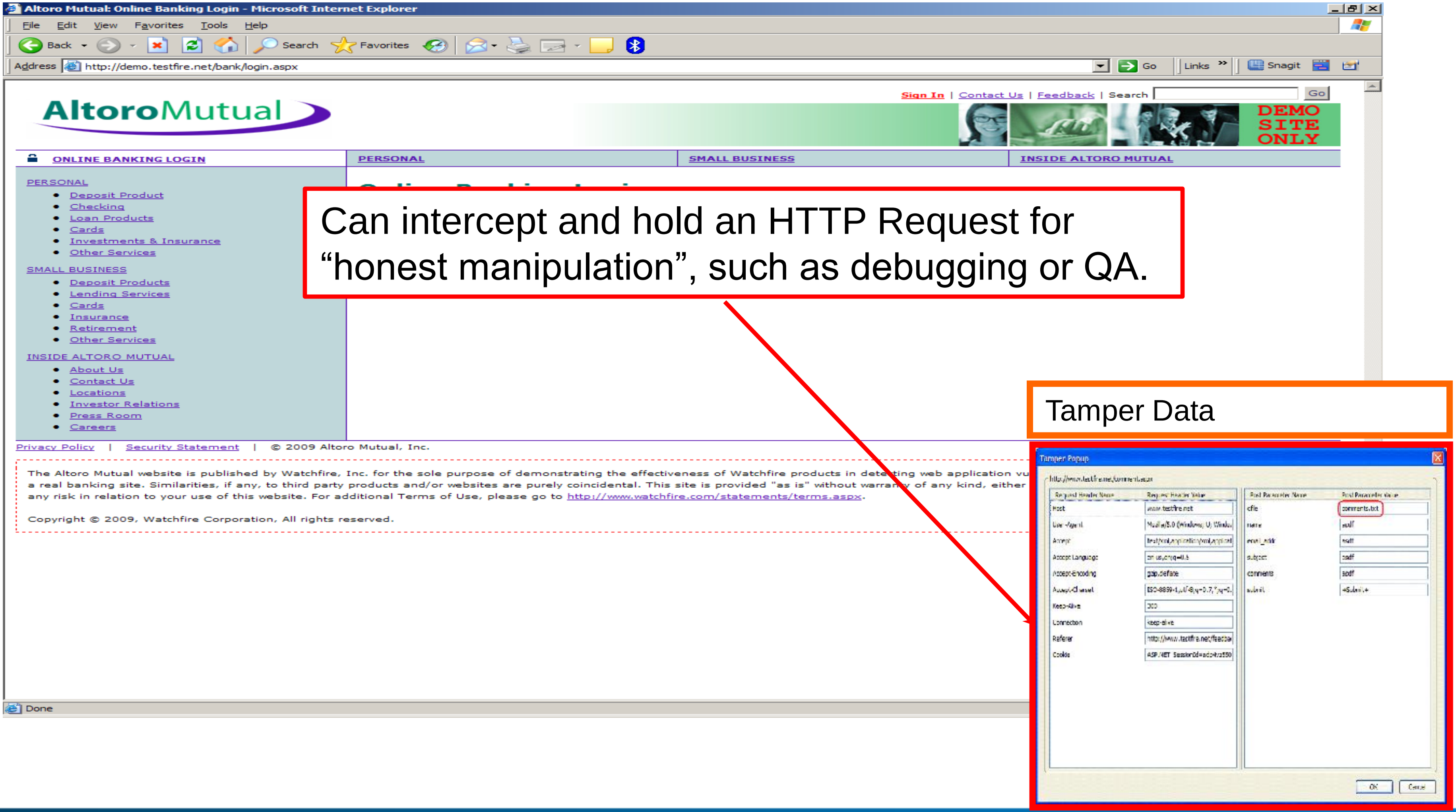
Source Error:

```
An application error occurred on the server. The current custom error settings for this applicatio
```

Source File: D:\web\WWWroot\web.config **Line:** 19

Version Information: Microsoft .NET Framework Version:1.1.4322.2512; ASP.NET Version:1.1.4322.2515

Attack Vector – Tamper Data HTTP Capture



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Can intercept and hold an HTTP Request for “honest manipulation”, such as debugging or QA.

Tamper Data

Tamper Popup

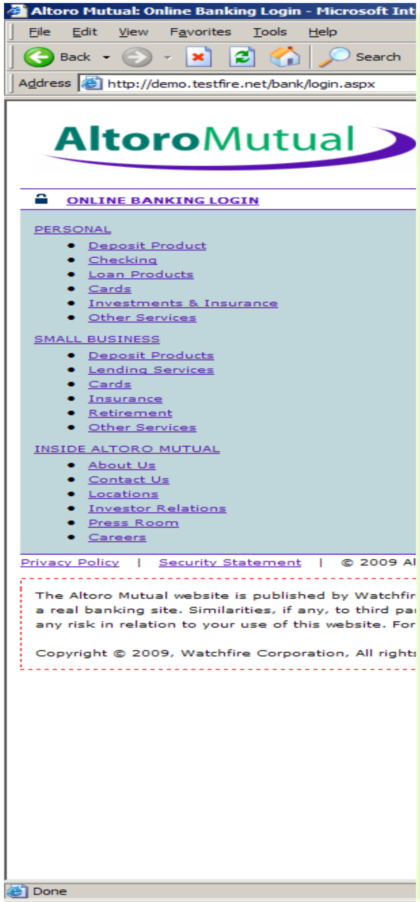
http://www.testfire.net/comment.aspx

Request Header Name	Request Header Value
Host	www.testfire.net
User-Agent	Mozilla/5.0 (Windows; U; Windo
Accept	text/xml,application/xml,applicat
Accept-Language	en-us,en;q=0.5
Accept-Encoding	gzip,deflate
Accept-Charset	ISO-8859-1,utf-8;q=0.7,*;q=0.
Keep-Alive	300
Connection	keep-alive
Referer	http://www.testfire.net/feedba
Cookie	ASP.NET_SessionId=adc4va550

Post Parameter Name	Post Parameter Value
cfile	comments.txt
name	asdf
email_addr	asdf
subject	asdf
comments	asdf
submit	+Submit+

OK Cancel

Attack Vector – Exploit Kits



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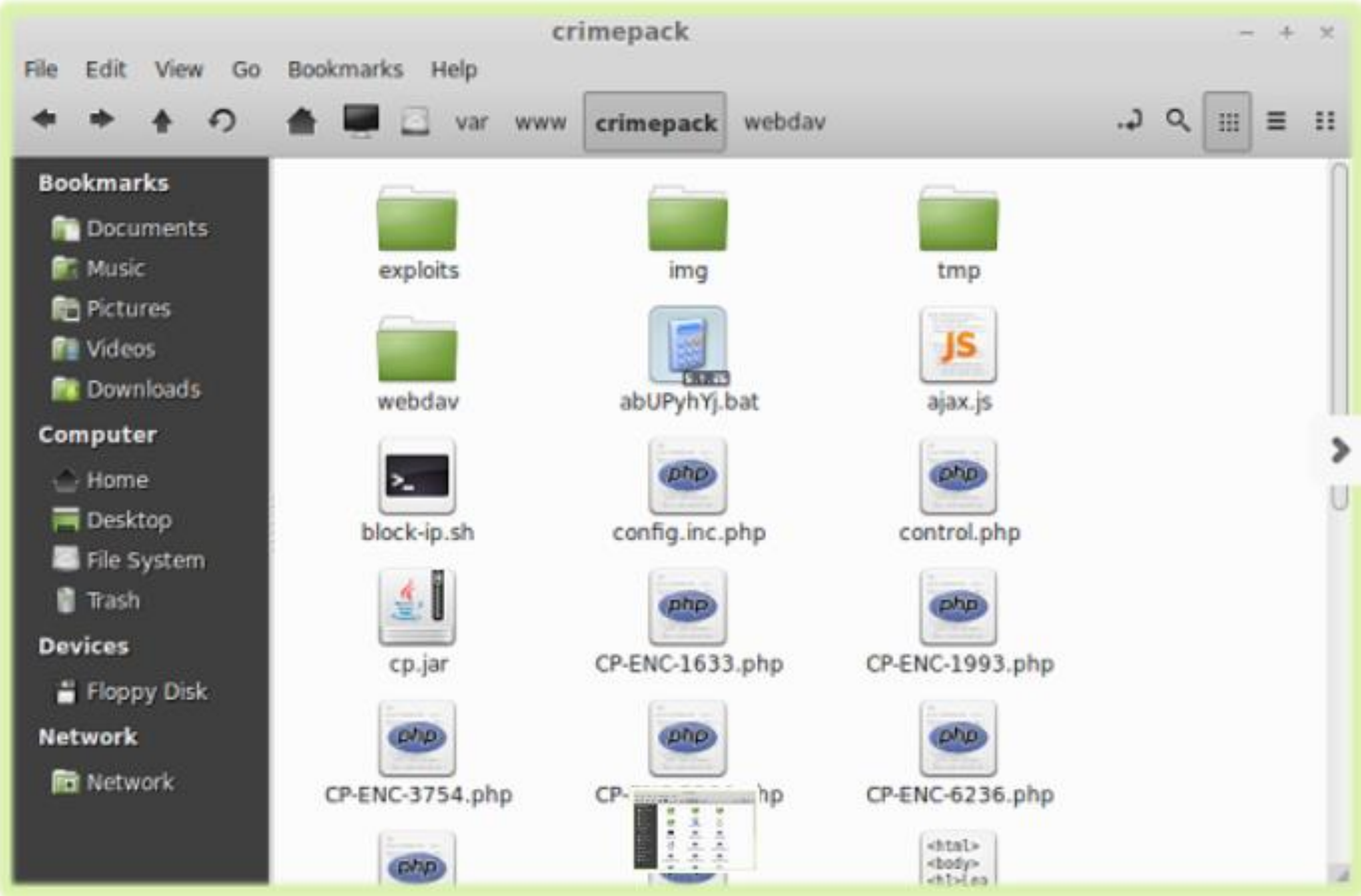

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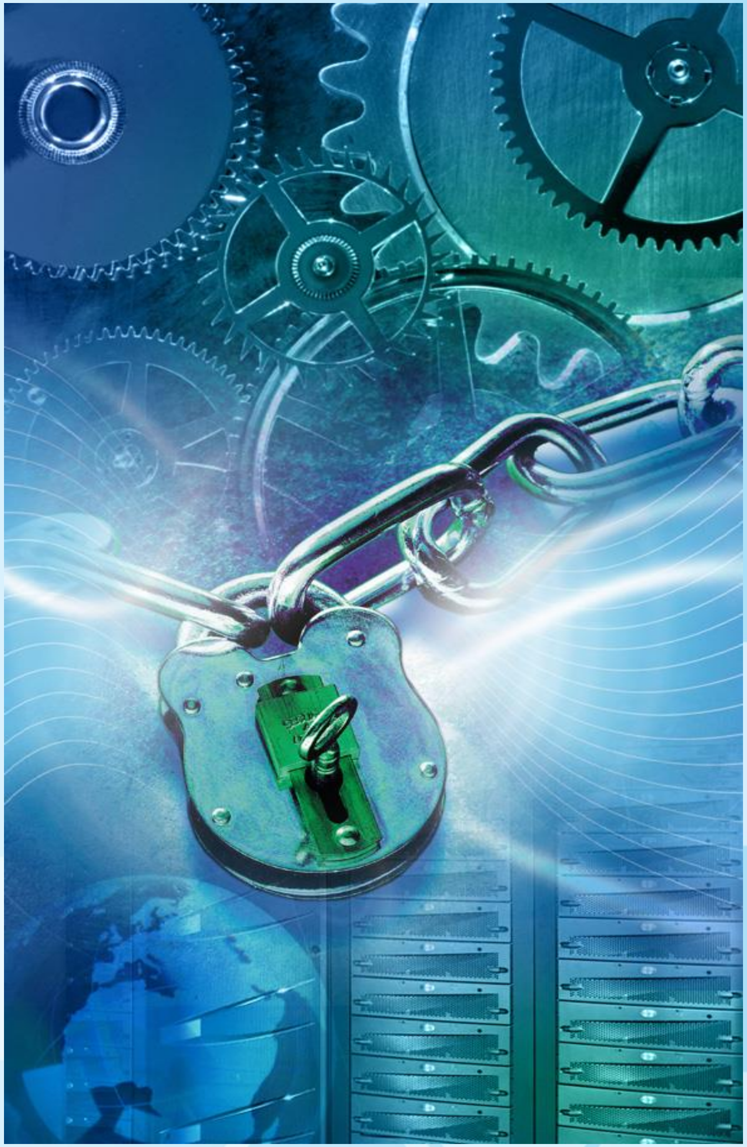


Why do you care about Application Security

Its your business to care

- Personal Reputation
- Company Reputation, Money
- Suppliers, Customers
- Regulations
  - GDPR (Failing to notify European users about breaches of personal data will soon be illegal under General Data Protection Regulation
  - Hippa
  - Sox
- Industry
  - Payment Card Industry

Consider your application(s)…

- Architecturally
- Software Development Process
- Application Development
- Validation and Testing

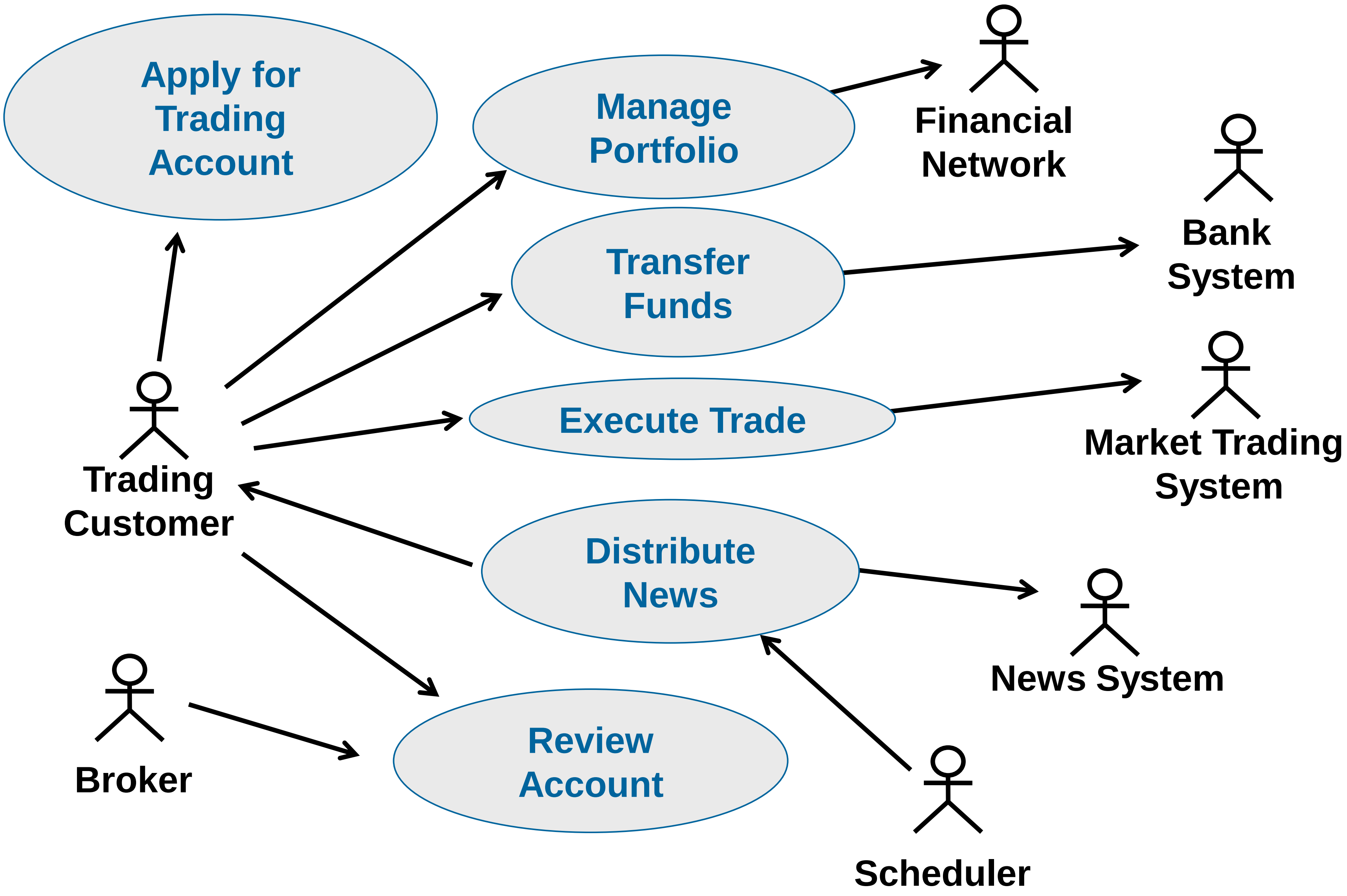
Consider your application(s)…

- Architecturally
  - Security Training
  - Working with Security Team
  - Environment
  - Components (Wordpress, Open SSL)
  - Libraries (Enterprise Secure API, encryption)
  - Security Requirements

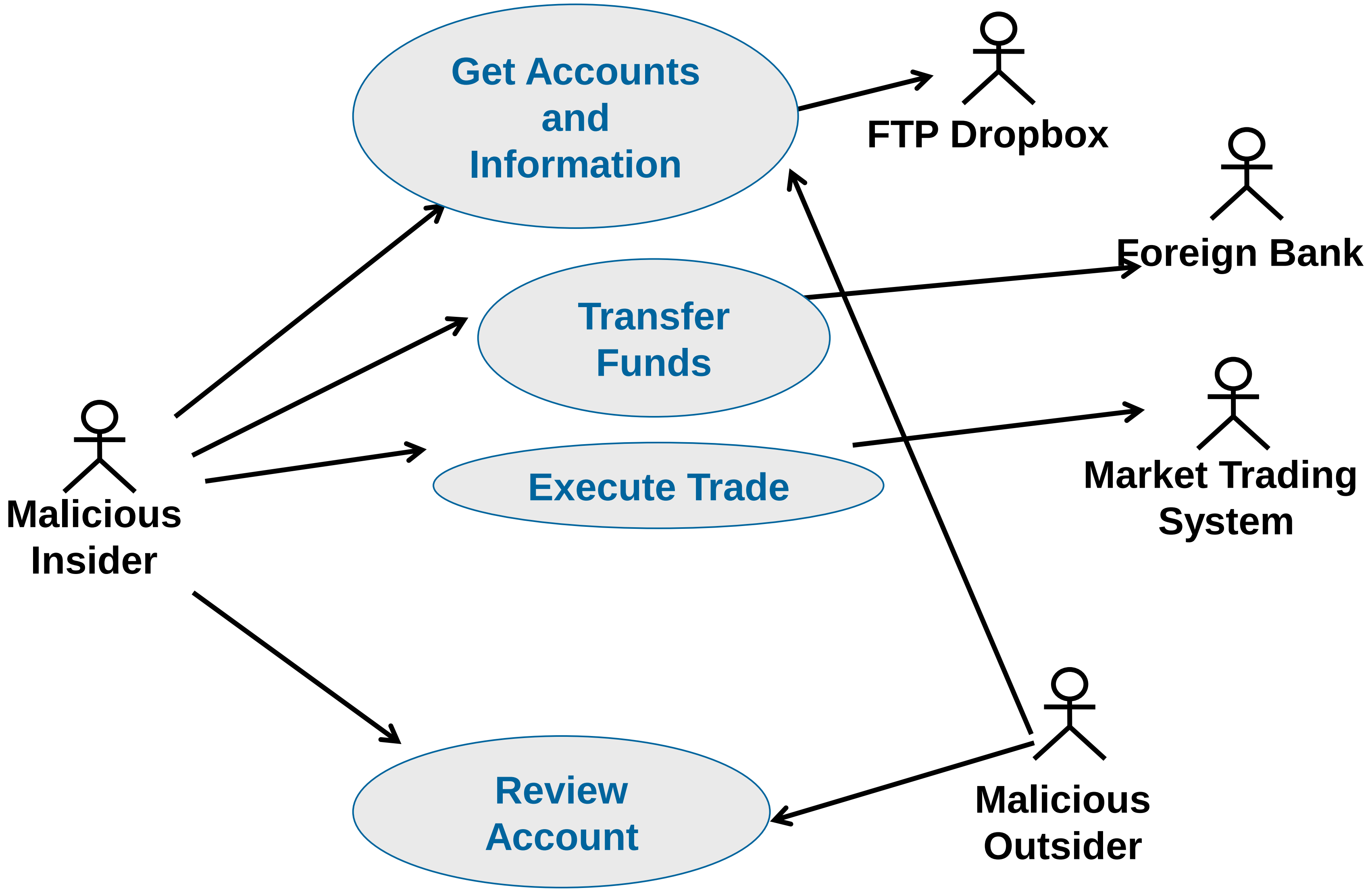
Consider your application(s)…

- Software Development Process
  - Agile processes present challenges because of “over-focus” on functional delivery in sprints and iterations
    - XP on unit testing:*”Trivial getter and setter methods are usually omitted.”*
  - When to introduce security requirements
  - When to introduce security training
  - When to introduce code reviews, security assessments
  - Review the Microsoft Secure Development Lifecycle

Sample Use-Case Diagram



Shadow Actors and Use-Cases



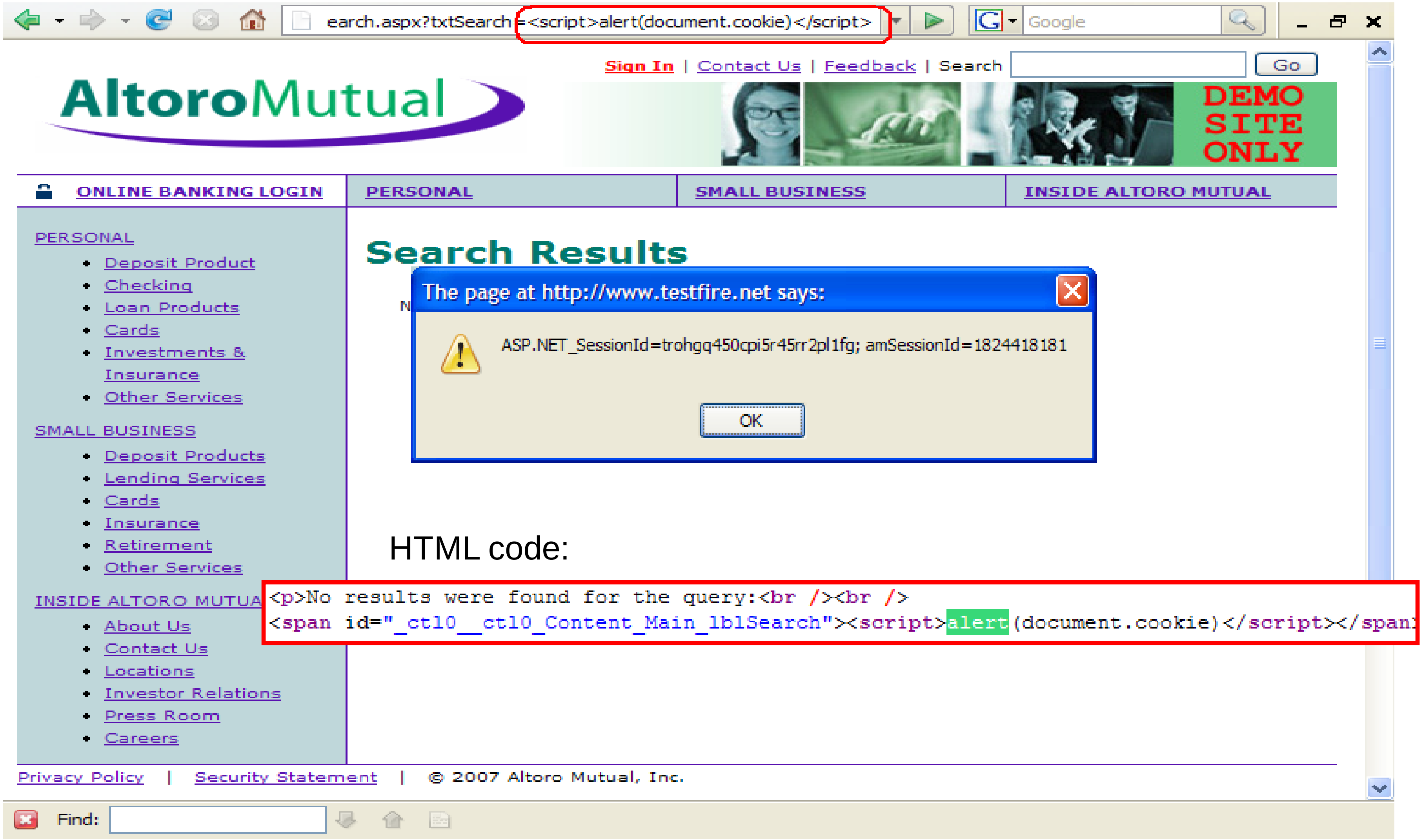
Consider your application(s)…

- Application Development
  - Security Training
  - Working with the security team
  - Sanitize your inputs, where is your data coming from
  - Where is your data going to (email, sockets, servlet)
  - API access
  - Consider walls to very sensitive areas
  - Security testing
  - Remediation process for security bugs

Consider your application(s)…

- Validation and Testing
  - Audits
  - Code reviews and checklists
  - Static Analysis Security Testing
  - Dynamic Analysis Security Testing

CrossSite Scripting Dynamic Analysis



```
earch.aspx?txtSearch=<script>alert(document.cookie)</script>
```

Search Results

The page at http://www.testfire.net says:

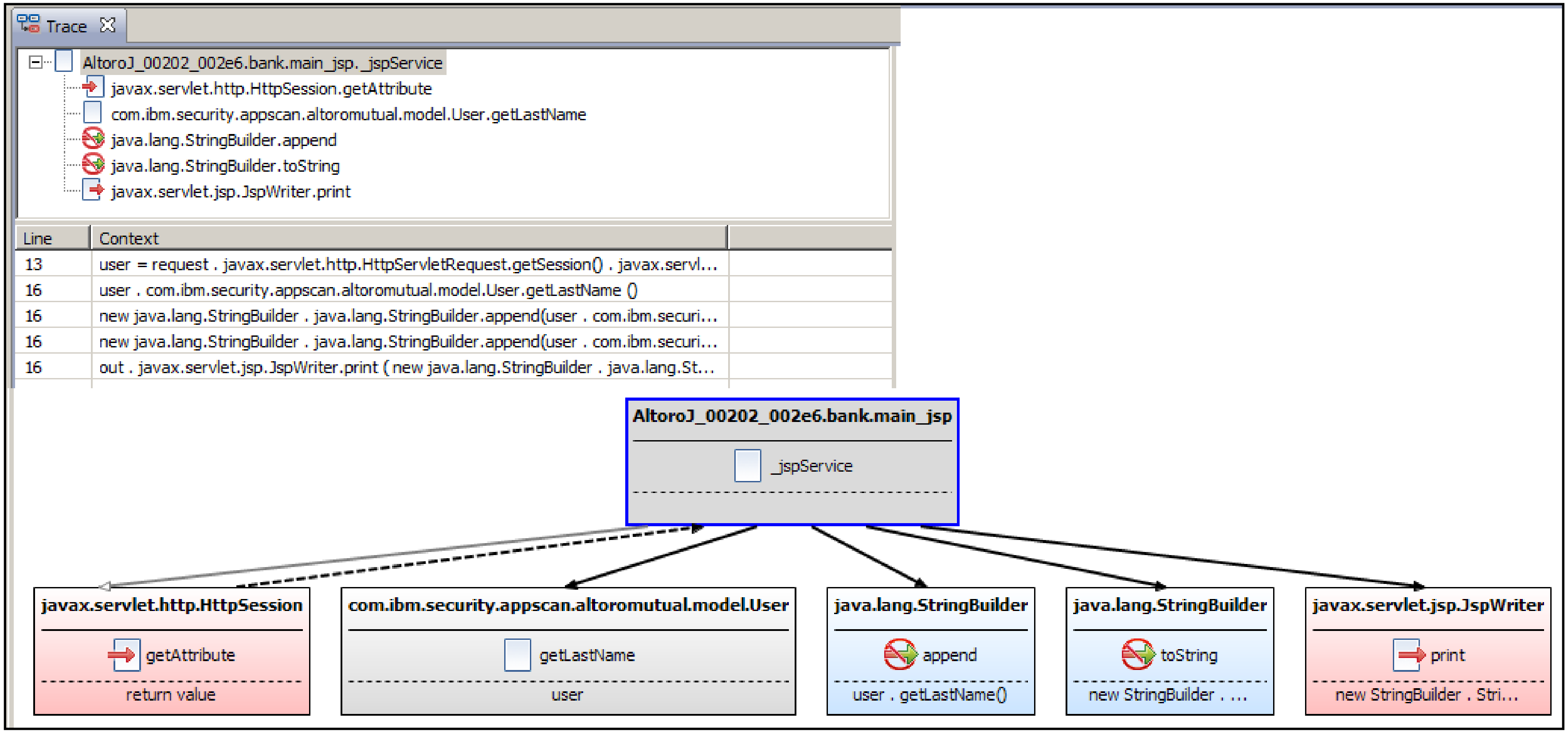
ASP.NET_SessionId=trohgq450cpi5r45rr2pl1fg; amSessionId=1824418181

OK

HTML code:

```
<p>No results were found for the query:<br /><br />
<span id="_ctl0__ctl0_Content_Main_lblSearch"><script>alert(document.cookie)</script></span
```

Cross-Site Scripting Pattern Static Analysis



Trace

- AltoroJ_00202_002e6.bank.main_jsp._jspService
  - javax.servlet.http.HttpSession.getAttribute
  - com.ibm.security.appscan.altoromutual.model.User.getLastName
  - java.lang.StringBuilder.append
  - java.lang.StringBuilder.toString
  - javax.servlet.jsp.JspWriter.print

Line	Context
13	user = request . javax.servlet.http.HttpServletRequest.getSession() . javax.servl…
16	user . com.ibm.security.appscan.altoromutual.model.User.getLastName ()
16	new java.lang.StringBuilder . java.lang.StringBuilder.append(user . com.ibm.securi…
16	new java.lang.StringBuilder . java.lang.StringBuilder.append(user . com.ibm.securi…
16	out . javax.servlet.jsp.JspWriter.print (new java.lang.StringBuilder . java.lang.St…

AltoroJ_00202_002e6.bank.main_jsp
_jspService

javax.servlet.http.HttpSession
getAttribute
return value

com.ibm.security.appscan.altoromutual.model.User
getLastName
user

java.lang.StringBuilder
append
user . getLastName()

java.lang.StringBuilder
toString
new StringBuilder . …

javax.servlet.jsp.JspWriter
print
new StringBuilder . Stri…

References

- ***OWASP Top 10 2013***
  - OWASP, https://www.owasp.org/index.php/Top_10_2013-Top_10
- ***Safeguard your code: 17 security tips for developers***
  - *InfoWorld, http://www.infoworld.com/article/2612858/application-development/safeguard-your-code--17-security-tips-for-developers.html*
- ***SQLi Hall-of-Shame***
  - http://codecurmudgeon.com/wp/sql-injection-hall-of-shame/
- ***OWASP Mobile Top 10 2016 (RC)***
  - https://www.owasp.org/index.php/Mobile_Top_10_2016-Top_10
- ***Using the IBM Security Framework***
  - http://www.redbooks.ibm.com/abstracts/sg248100.html?Open
- ***Microsoft Secure Development Lifecycle***
  - https://www.microsoft.com/en-us/sdl/

Statement of Good Security Practices: IT system security involves protecting systems and information through prevention, detection and response to improper access from within and outside your enterprise. Improper access can result in information being altered, destroyed, misappropriated or misused or can result in damage to or misuse of your systems, including for use in attacks on others. No IT system or product should be considered completely secure and no single product, service or security measure can be completely effective in preventing improper use or access. IBM systems, products and services are designed to be part of a lawful, comprehensive security approach, which will necessarily involve additional operational procedures, and may require other systems, products or services to be most effective. IBM DOES NOT WARRANT THAT ANY SYSTEMS, PRODUCTS OR SERVICES ARE IMMUNE FROM, OR WILL MAKE YOUR ENTERPRISE IMMUNE FROM, THE MALICIOUS OR ILLEGAL CONDUCT OF ANY PARTY.

Thank You

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