2,000 Websites Later

Which Web Programming Languages are Most Secure?

Jeremiah Grossman
Founder & Chief Technology Officer

WhiteHat SECURITY

- WhiteHat Security Founder & Chief Technology Officer
- 2010 RSA Security Bloggers Award (Best Corporate Blog)
- InfoWorld's CTO Top 25 (2007)
- 5th most popular “Jeremiah” according to Google
- Brazilian Jiu-Jitsu Brown Belt
- Narcissistic Vulnerability Pimp
- Former Yahoo! information security officer

me.

WhiteHat Security

- 350+ enterprise customers
  - Start-ups to Fortune 500
- Flagship offering “WhiteHat Sentinel Service”
  - 1000’s of assessments performed annually
- Recognized leader in website security
  - Quoted thousands of times by the mainstream press

Inc.500

Deloitte. 2008 Technology Fast 50 Silicon Valley

SC MAGAZINE AWARDS 2009 FINALIST Honored in the U.S.

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WhiteHat Sentinel

Complete Website Vulnerability Management

Customer Controlled & Expert Managed

- Unique SaaS-based solution – Highly scalable delivery of service at a fixed cost
- Production Safe – No Performance Impact
- Full Coverage – On-going testing for business logic flaws and technical vulnerabilities – uses WASC 24 classes of attacks as reference point
- Unlimited Assessments – Anytime websites change
- Eliminates False Positives – Security Operations Team verifies all vulnerabilities
- Continuous Improvement & Refinement – Ongoing updates and enhancements to underlying technology and processes

Website Classes of Attacks

Technical: Automation Can Identify

Command Execution

- Buffer Overflow
- Format String Attack
- LDAP Injection
- OS Commanding
- SQL Injection
- SSI Injection
- XPath Injection

Information Disclosure

- Directory Indexing
- Information Leakage
- Path Traversal
- Predictable Resource Location

Client-Side

- Content Spoofing
- Cross-site Scripting
- HTTP Response Splitting*

Business Logic: Humans Required

Authentication

- Brute Force
- Insufficient Authentication
- Weak Password Recovery Validation
- CSRF*

Authorization

- Credential/Session Prediction
- Insufficient Authorization
- Insufficient Session Expiration
- Session Fixation

Logical Attacks

- Abuse of Functionality
- Denial of Service
- Insufficient Anti-automation
- Insufficient Process Validation

Attacker Targeting

Fully Targeted (APT?)

- Customize their own tools
- Focused on business logic
- Profit or goal driven ($$$)

WhiteHat Sentinel PREMIUM EDITION

Directed Opportunistic

- Commercial and Open Source Tools
- Authentication scans
- Multi-step processes (forms)

WhiteHat Sentinel STANDARD EDITION

Random Opportunistic

- Fully automated scripts
- Unauthenticated scans
- Targets chosen indiscriminately

WhiteHat Sentinel BASELINE EDITION

Evolution of Expectations

1. **Quantity phase** -- where more is more

2. **Quality phase** -- where less is more

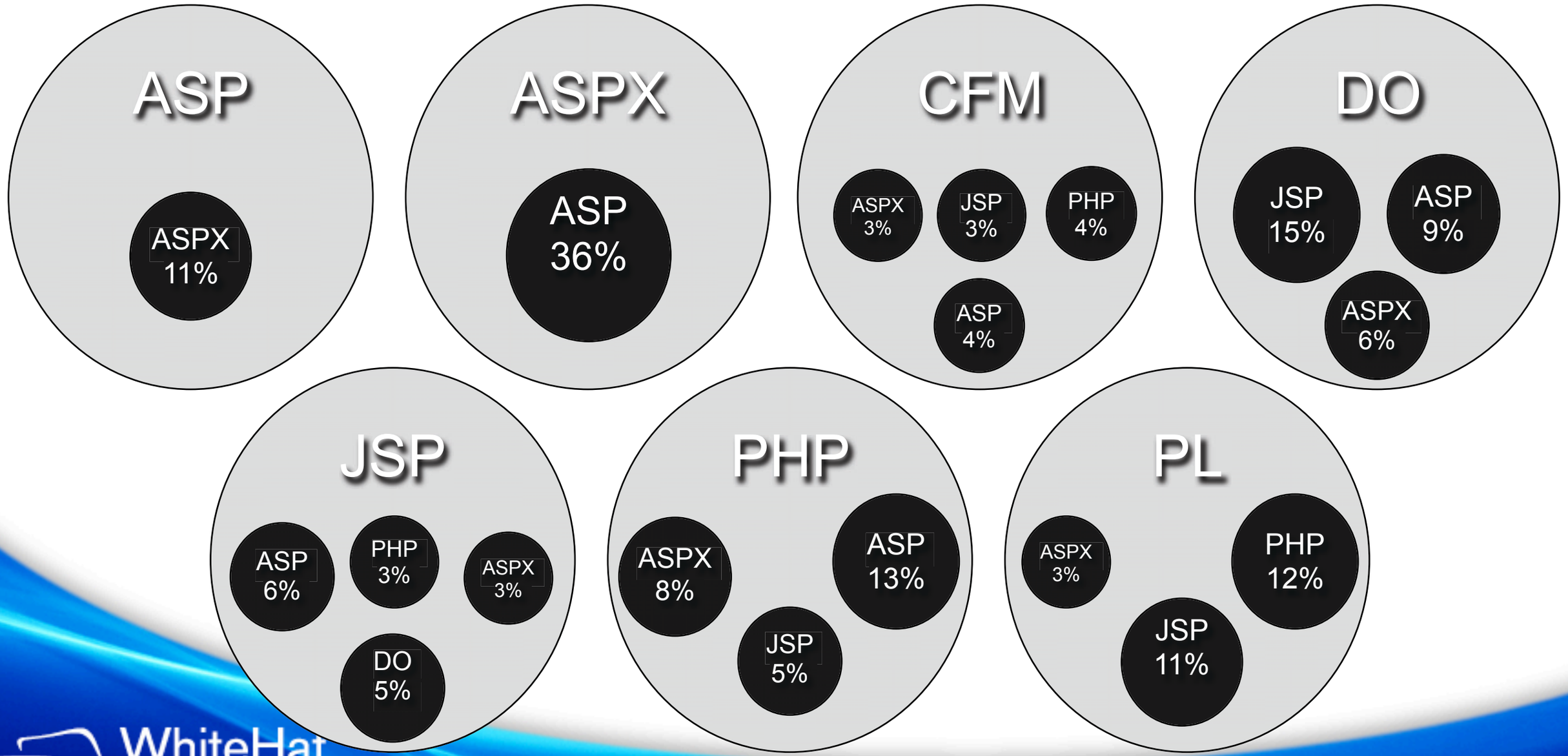
3. **Actionable phase** -- how do I fix/improve things going forward with this data?

4. **Consistency phase** -- how do I do this consistently across time, because my software is always changing, without spending a zillion hours doing it?

Vulnerability Overlap

What's a website?

Websites, which may be a collection of multiple web servers and hostnames, often utilize more than one programming language or framework. As such, a single website may contain vulnerabilities with multiple different extensions.



Data Overview

- **1,659 total websites**
- **24,286 verified custom web application vulnerabilities**
- Data collected from January 1, 2006 to March 25, 2010
- Vast majority of websites assessed for vulnerabilities weekly
- Vulnerabilities classified according to WASC Threat Classification, the most comprehensive listing of Web application vulnerabilities
- Vulnerability severity naming convention aligns with PCI-DSS
- Contrasted and compared ASP Classic, .NET, Cold Fusion, Struts, Java Server Pages, PHP, and Perl.

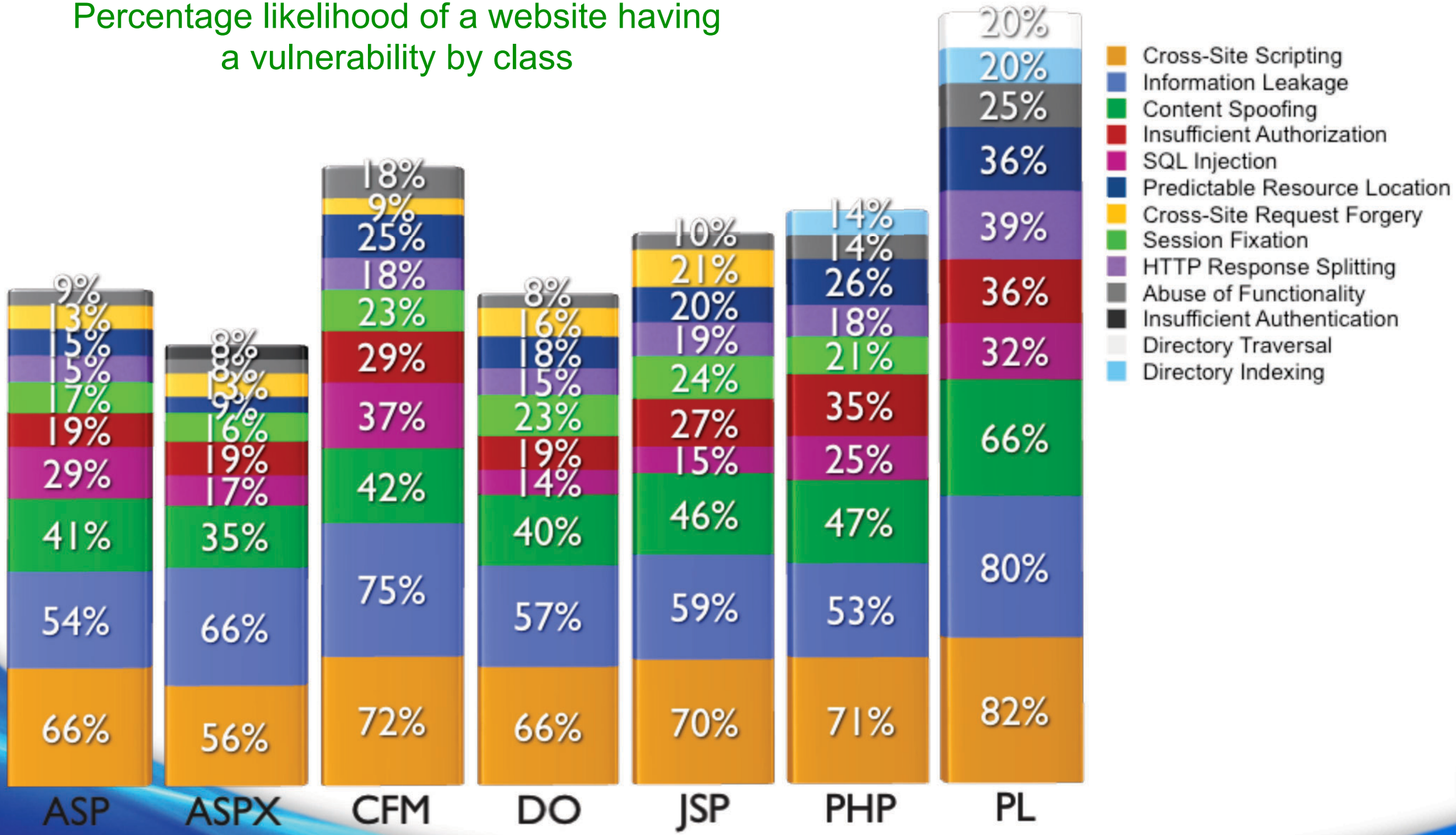
	ASP	ASPX	CFM	DO	JSP	PHP	PL
Average # of inputs (attack surface) per website	470	484	457	569	919	352	588
Average ratio of vulnerability count / number of inputs	8.7%	6.2%	8.4%	6.3%	9.8%	8.1%	11.6%

Key Findings

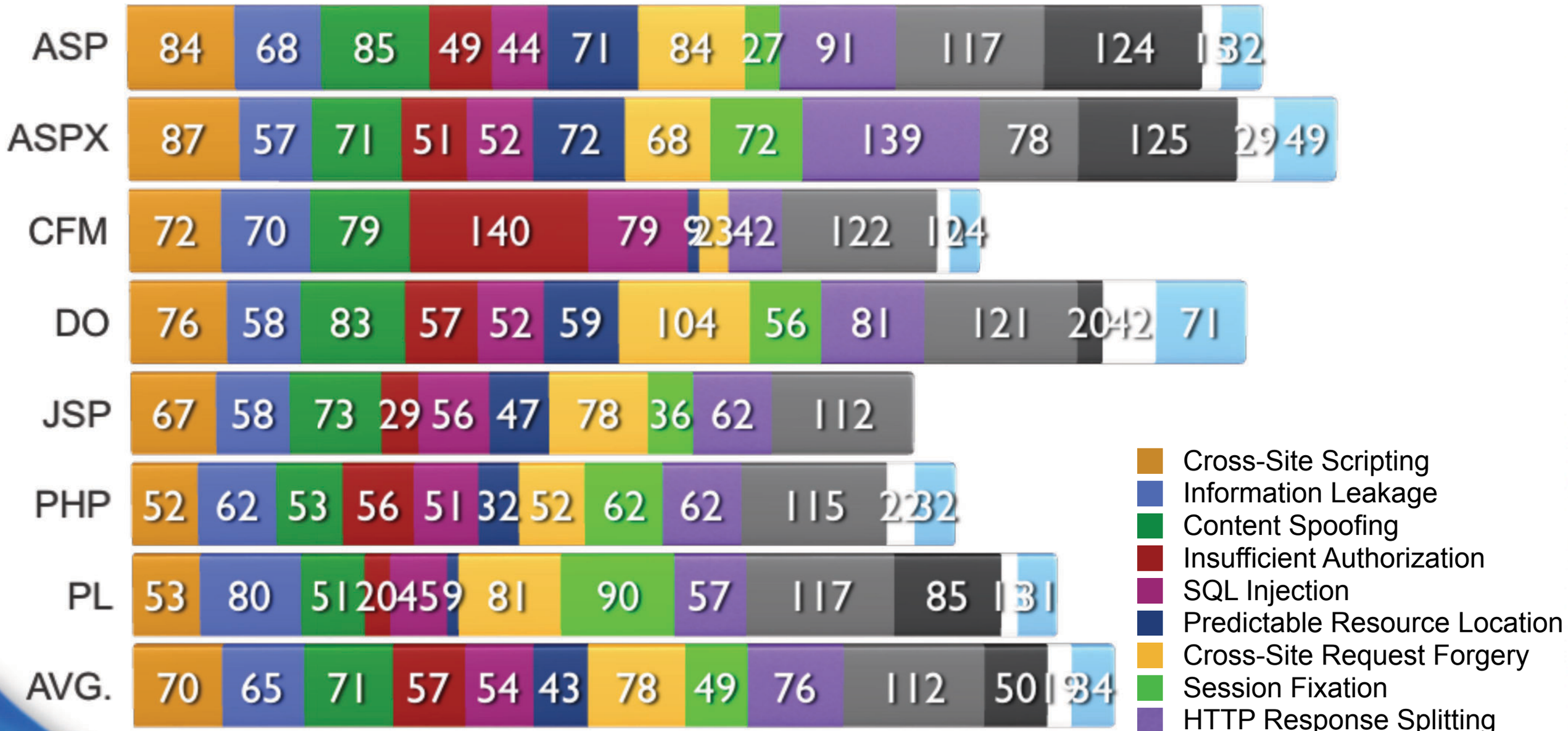
	ASP	ASPX	CFM	DO	JSP	PHP	PL
Websites having had at least one serious* vulnerability	74%	73%	86%	77%	80%	80%	88%
Websites currently with at least one serious* vulnerability	57%	58%	54%	56%	59%	63%	75%
Avg. # of serious* vulnerabilities per website during the WhiteHat Sentinel assessment lifetime	25	18.7	34.3	19.9	25.8	26.6	44.8
Avg. # of serious* severity unresolved vulnerabilities per website	8.9	6.2	8.6	5.5	9.6	8.3	11.8

Top Ten Classes of Attack

Percentage likelihood of a website having a vulnerability by class



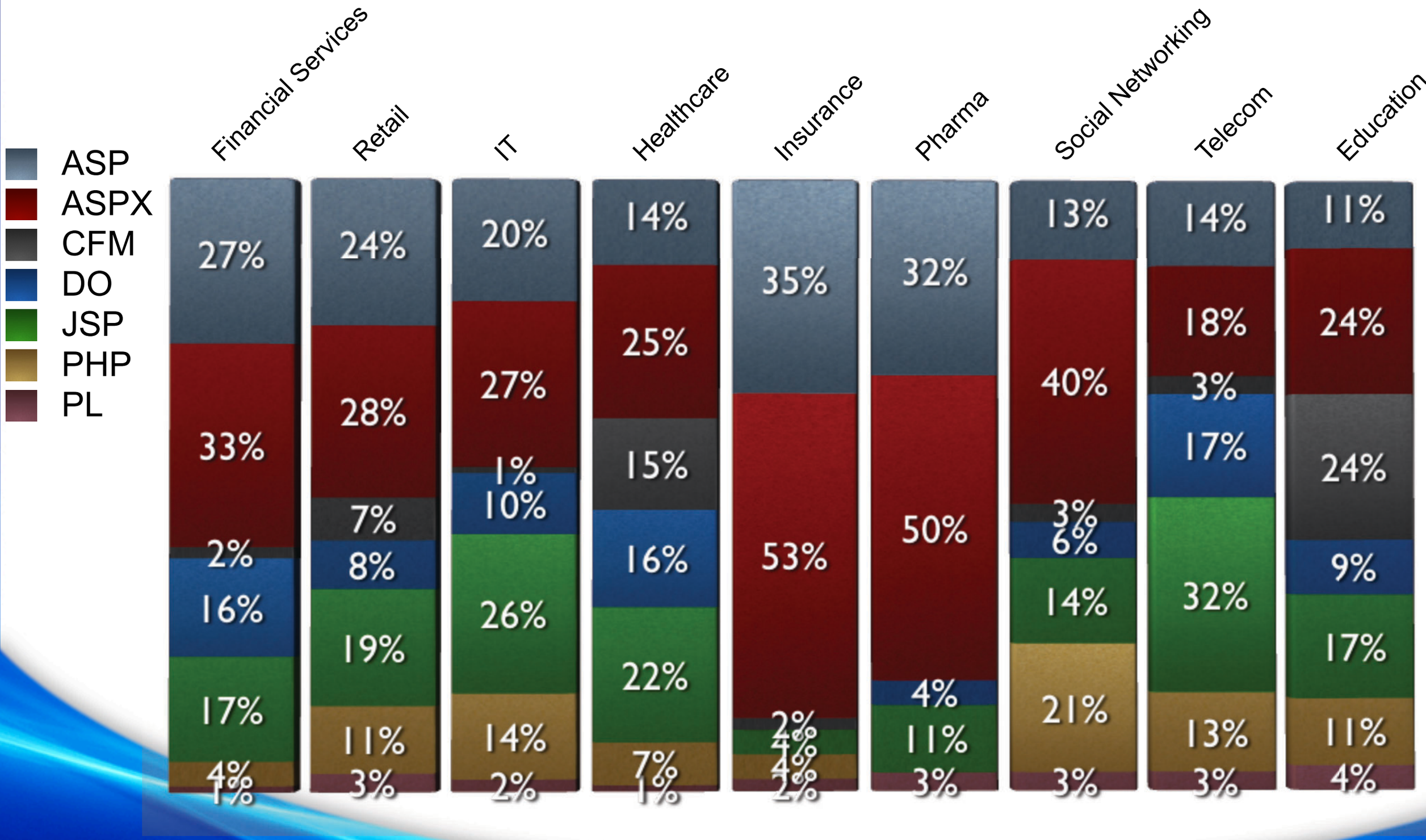
Time-to-Fix (Days)



Resolution Rates by Severity

Class of Attack	Severity	ASP	ASPX	CFM	DO	JSP	PHP	PL
SQL Injection	Urgent	70%	72%	66%	79%	58%	70%	71%
Insufficient Authorization	Urgent	21%	45%	46%	20%	25%	18%	10%
Directory Traversal	Urgent	43%	20%	67%	0%	33%	32%	16%
Cross Site Scripting	Urgent	100%	0%	100%	0%	0%	50%	0%
Cross-Site Scripting	Critical	51%	57%	50%	51%	52%	66%	54%
Cross-Site Request Forgery	Critical	18%	34%	17%	27%	39%	57%	27%
Session Fixation	Critical	19%	18%	0%	36%	50%	50%	100%
Abuse of Functionality	Critical	76%	23%	82%	38%	57%	59%	97%
Insufficient Authentication	Critical	55%	37%	0%	33%	71%	0%	100%
Information Leakage	High	32%	34%	57%	49%	45%	39%	29%
Content Spoofing	High	31%	30%	43%	37%	44%	46%	69%
Predictable Resource Loc.	High	29%	64%	85%	64%	53%	56%	29%
HTTP Response Splitting	High	28%	24%	33%	10%	36%	42%	35%
Directory Indexing	High	33%	56%	40%	25%	27%	33%	18%
TOTAL		65%	67%	75%	72%	63%	69%	74%

Technology in Use



Lessons & Observations

You can't secure what you don't know you own – Inventory Web applications to gain visibility into what data is at risk and where attackers can exploit the money or data transacted.

Assign a champion – Designate someone who can own and drive data security and is strongly empowered to direct numerous teams for support. Without accountability, security, and compliance, will suffer.

Don't wait for developers to take charge of security – Deploy shielding technologies to mitigate the risk of vulnerable Web applications.

Questions?

I was not in your threat model.

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jeremiahg
Jeremiah Grossman

Jeremiah Grossman
Founder & Chief Technology Officer

Blog: http://jeremiahgrossman.blogspot.com/
Twitter: http://twitter.com/jeremiahg
Email: jeremiah@whitehatsec.com

