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Securely Enabling Business

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How to Develop a Comprehensive Application Security Program

INFORMATION ASSURANCE

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TRAINING

STAFF AUGMENTATION

SECURITY TECHNOLOGY

INFRASTRUCTURE

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Agenda

- Organizational Challenges and Trends
- Elements of the Application Security Program
- Developing the Program
- Application Program Strategic Roadmap

Organizational Challenges

- Executive-Level Support
- Limited Awareness of Application Security Risk
- Uniqueness & Complexity of Applications
- Control of Source Code
  - (COTS and outsourced development)
- Confusion of Ownership
  - (Security Group, IT Audit, QA, or Developer Group)
- Establishing Application Security Standards
  - Variety of Application Technologies & Platforms Utilized
- Traditional Controls Ineffective
  - (FW, IDS, etc.)
- Developing Prevention & Protection Strategies
- Consumerization
- Pressure for Speed to Market

Current Trends

- Unprecedented growth in mobile computing and mobile applications
- Shift to Agile programming development, creates more challenges integrating security into the SDLC
- Increasing need for more secure software, better quality, and faster time-to-deployment as market differentiators
- Business justification of investing in security throughout the System Development Life Cycle (SDLC)
- High cost and irreparable brand damage resulting from high-profile hacking incidents and data breaches
- Proactive compliance with applicable laws and regulatory requirements
  - *Twenty-five percent (25%) of the 150 companies surveyed by Forrester Consulting recently [2010] said that the most effective argument to obtain funding for software security was "to meet our compliance requirements".*
  - *Compliance-centric strategy often encourages a behavior of "implementing the bare minimum" to get by and does not support a business-driven approach to secure SDLC*

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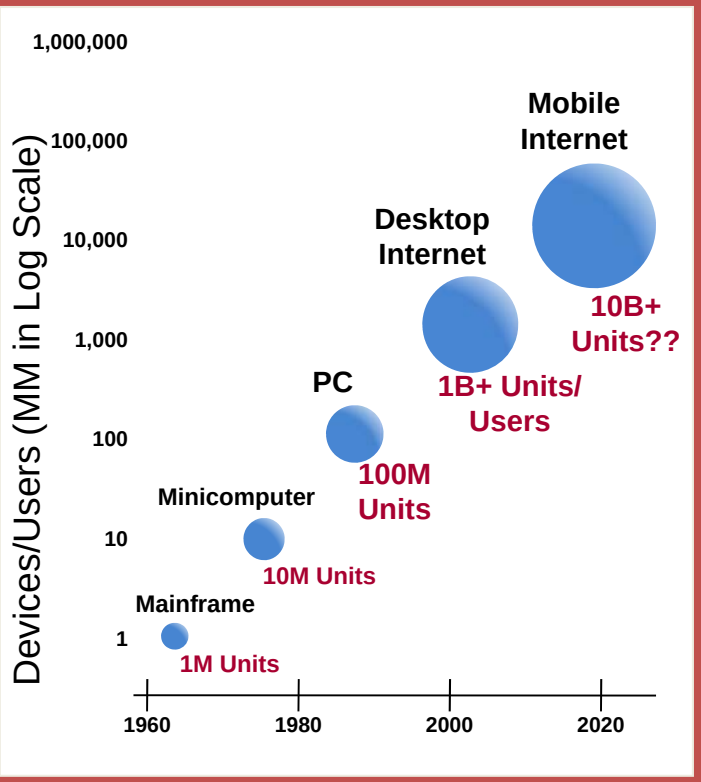
New Wave of Change: “Consumerization of IT”

Computing Cycles in Perspective
(from Morgan Stanley)



> “The desktop internet ramp was just a warm-up act for what we’re seeing happen on the mobile internet. The pace of mobile innovation is “unprecedented, I think, in world history.”

Mary Meeker, Morgan Stanley – April 2010

Mobile Enterprise Apps are Rapidly Evolving

*In House App Stores

Cost of Fixing Defects

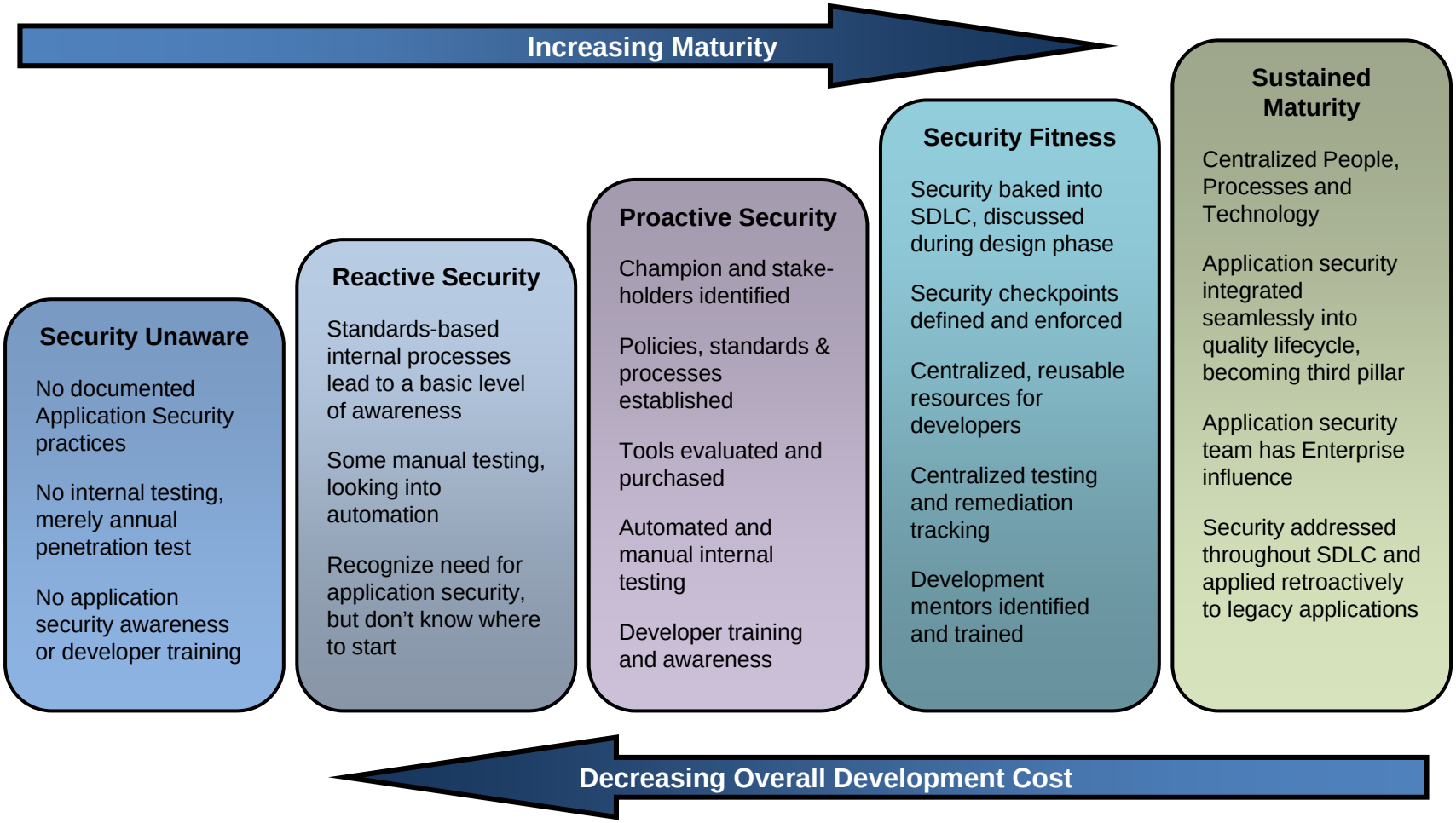
According to a study conducted by IBM Systems Sciences Institute on the relative cost of fixing defects, the cost increases exponentially the later it is addressed in the SDLC

Design	Implementation	Testing	Maintenance
1	Up to 6.5 times	Up to 15 times	Up to 100 times

Requirements*	Design	Coding	Testing	Maintenance
$139	$455	$977	$7,136	$14,102

*B. Boehm and V. Basili

Application Security Scale of Maturity



Application Security via SDLC

Design	Threat Modeling	Workshop session surrounding application risk, threat, attack, weakness, and vulnerabilities discussion
	Architecture Review	Analyze application tiered architecture based on design and implementation
	Best Practices Documentation	Design and customize BP specific to customer environment, language, policy, etc.
Development	Secure SDLC	Review existing security practices, procedures, and processes throughout the Software Development Life Cycle (SDLC) and recommend changes
	Secure Coding Training	The application security course brings awareness of common Web application vulnerabilities and the impact they have on businesses
	Automated Assessment Tools	Recommend and integrate 3rd- party assessment tools into the SDLC, provide developer/management training
	Remediation Planning	Take results of security assessments and develop a remediation plan. Work with business owners to prioritize and align remediation with business goals. Manage remediation process.
QA	Runtime Analysis	Standard black-box testing including the use of automated tools and manual analysis
	Static Analysis	Review source code for backdoors, logic bombs, and other vulnerabilities not identified by fault injection/black box testing. Static analysis must always be combined with runtime in order to verify results and increase overall efficiency of assessment. Use 3rd-party automated source scanner to obtain 100% code coverage. Augment with manual review.
	Security Due Diligence	Issue a client-facing or independent 3rd party letter to validate the application services provided by assessor for due diligence purposes. This could be just a letter describing what we tested all the way to a full-blown attestation process. Formal due diligence could be for a specific application or the development model as a whole.

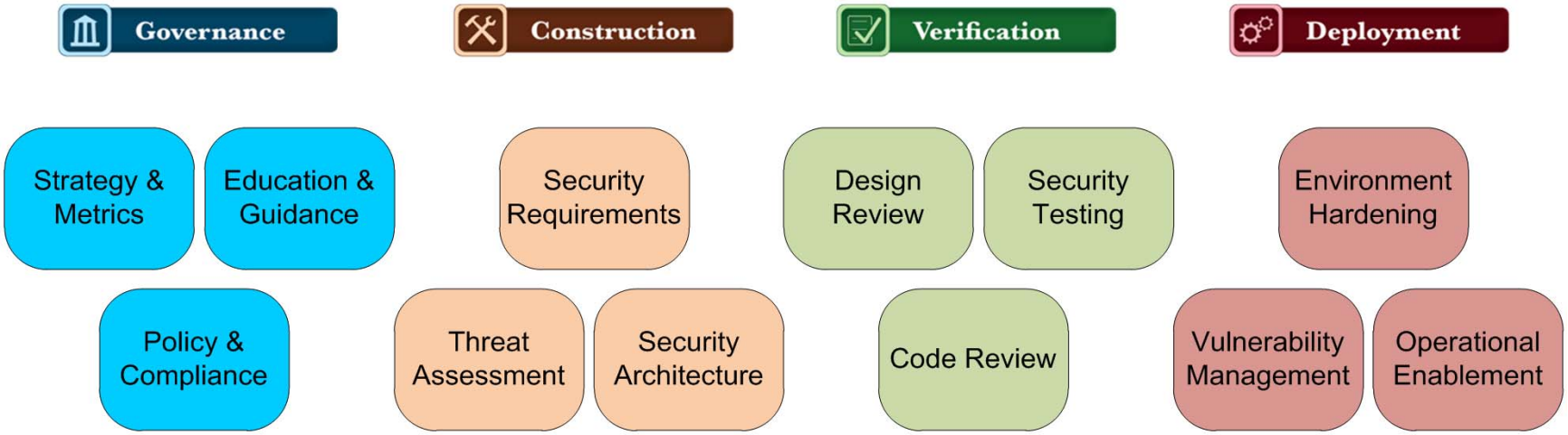
Developing an Application Security Program

- Build upon existing program, framework or methodology -customized form or any derivation of the traditional SDLC process is acceptable
- Reference established or common industry methodology, framework, or standard
  - Software Assurance Maturity Model (SAMM) – built upon four core business functions with twelve security practices tied to them
  - Microsoft Security Development Lifecycle (SDL) – consists of seven phases with seventeen security practices
  - Other models and standards (BSIMM, CMM, ISO27035)
- Evaluate and adopt commonly known secure software development control techniques
- Combine with Corporate Initiatives to support and expand AppSec framework

SAMM Framework

Example : Referencing SAMM

- The Software Assurance Maturity Model (SAMM) is an open framework that could be used to implement a secure application security program
- SAMM is built upon four core business functions with twelve security practices tied to them



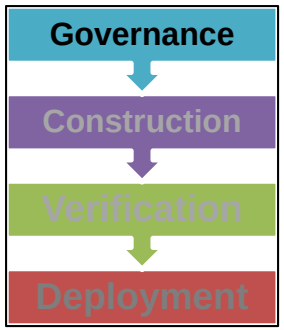
Elements of Application Security Program Initiative

1. Application & Information Inventory
2. Meeting and Maintaining Compliance Requirements
3. Developing Internal Application Security Standards
4. Establishing Initiative Sponsor & Owners
5. Internal IT Audit Function
6. Defining Methods of Application Security Due Diligence
7. Performing Due Diligence on Affiliates/Business Partner Applications
8. Outsourcing vs. In-House
9. Prioritization of Applications & Frequency of Testing
10. Training & Staffing Requirements
11. Application Solutions & Tools
12. Automated vs. Manual Review Process
13. Remediation Procedures
14. Metrics, Reporting & Documentation

*http://www.fishnetsecurity.com/6labs/resource-library/webinar/how-develop-application-security-program

Developing an Application Security Program - Governance

SAMM Deployment Security Practices	Program Elements for Consideration	Sample Decisions/Considerations
Strategy & Metrics	Meet/ Maintain Compliance	Overall Strategy – Secure at Source
Policy & Compliance	Establish Sponsors/Owners	Identify Metrics
Education & Guidance	Training & Staffing Reqs.	Identify Compliance Drivers
	Internal IT Audit Function	Role of IT Audit – Consult or Audit
	Developing Standards	Classroom /CBT
	Metrics, Reporting & Documentation	Develop Secure Coding Standards



Meeting and Maintaining Compliance Requirements

- What is my organization's responsibility to meet application related standards or compliance requirements?
- Example: Payment Card Industry (PCI) Data Security Standard (DSS) version 2.0
  - 6.5 -- Develop applications based on secure coding guidelines. Prevent coding vulnerabilities via SDLC
  - 6.6 -- For public-facing web applications, address new threats and vulnerabilities on an ongoing basis and ensure these applications are protected against known attacks…" via manual or automated assessment or WAF
  - 11.3.2 -- states companies must conduct annual "application-layer penetration tests" at minimum for 6.5 vulnerabilities
- Others: HIPAA Security Rules, Sox, Data Protection Act, FISMA, GLBA, EU Safe Harbor, NCUA, COPPA, NERC

Develop Internal Application Security Standards

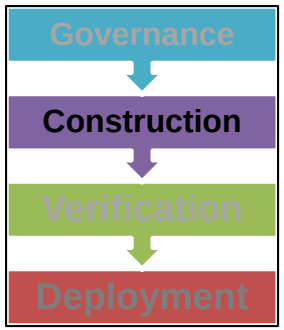
- Establish application specific security standards within the Software Development Lifecycle (SDLC)
- Develop mandatory application security requirement criteria for developers
- Provide security requirements surrounding development frameworks (i.e. .NET, Java)
- Ensure personnel involved understand these security requirements
- Code re-use repository (validation, encoding, encryption)

Training and Staffing Requirements

- Training internal security staff is critical and sometimes required for application security personnel (e.g. PCI 6.5a)
- High-level to specialized hands-on courses (focused on specific development language)
  - if hands on is not feasible initially because of size or disparity we have seen customized CBT to at least get the core concepts and examples out to developers
- Specialized requirements and skills for mobile apps
- Education is key

Developing an Application Security Program - Construction

SAMM Deployment Security Practices	Program Elements for Consideration	Sample Decisions/Considerations
☐ Threat Assessment	☐ Application and Information Inventory	☐ Risk Ranking of Apps & Data
☐ Security Assessment	☐ Define Methods for Security Due Diligence	☐ Threat Models and Analysis
☐ Security Architecture	☐ Perform Due Diligence on Affiliates/Business Partner Apps	☐ Authentication, Access Control, Encryption, etc.
		☐ Integration Requirements
		☐ Software Framework / Design Principles



Application and Information Inventory

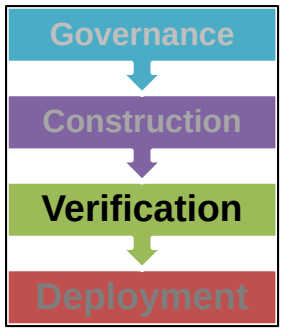
- Complete an inventory of all applications within the enterprise and the security controls / check points or each application
- Understand the business purposes of the application
- Identify the information/data that is flowing through these applications
- Start developing protection strategies and standards that will secure your organization's most critical data

Defining Methods of Application Due Diligence

- Define corporate standards for testing applications
- Decide methods or approaches on appropriate level of due diligence for applications
- Methods of Due Diligence include the following:
  - Threat Modeling
  - Run-Time Analysis / Fault Injection Testing
  - Architecture/Design/Implementation Analysis
  - Static Analysis / Source Code Reviews
  - Database Vulnerability Testing
  - Host Configuration Reviews
  - Access Control Reviews
  - Software Development Lifecycle Reviews
  - Performance Load Testing

Developing an Application Security Program - Verification

SAMM Deployment Security Practices	Program Elements for Consideration	Sample Decisions/Considerations
Design Analysis	Outsourcing vs In-House	Focus on Dev./ AppSec Resources
Code Review	Application Solutions & Tools	Periodic Testing/ Full App Assessment
Security Testing	Automated vs Manual Review Process	Continuous Scanning
	Remediation Procedures	Automated Tools/Managed Services
		Run-Time Analysis/Code Reviews/Peer Review
		Investment for In-house Tools



In-House vs. Outsourcing

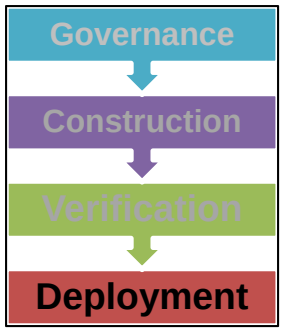
- Unique skill set is required to test applications
- Necessary application development background
- Evaluate in-house staff
- Outsourcing application security – Gain knowledge / offset internal cost
- Application Managed Security Services
- Conduct cost/benefit analysis
- Keep separate testing/development in-house for PCI compliance

Remediation Procedures

- Develop remediation plans based upon results of due diligence testing (workflow capability in eGRC solutions)
- Review all associated risks, threats, vulnerabilities, and weaknesses discovered
- Organizations must assign the appropriate level of risk to the business and prioritize findings
- Business owners to decide if organization mitigates, transfers, or accepts risk
- Accountability is key

Developing an Application Security Program - Deployment

SAMM Deployment Security Practices	Program Elements for Consideration	Sample Decisions/Considerations
Vulnerability Management	Prioritize Apps & Frequency of Testing	Ongoing Testing Strategy
Environment Hardening	Automated vs Manual Review	Roles & Responsibilities for Ongoing Maintenances
Operational Enablement	Reporting & Documentation	Additional Layers of Security & Controls Beyond App
		Change Management & Operational Controls
		Investment for In-house Tools



Prioritization of Application and Frequency of Testing

- Develop an evaluation process to determine which applications are most critical for testing
- Prioritize applications by setting a “risk” rating for each application
  - Not all applications are created equal!
- Assists in effective use of time, resources/staff, and budget
- Develop frequency standards on applications based on priority/criticality to business operations

Application Solutions and Tools

- Products and tools are NOT the “silver bullet”!
  - PCI suggests Security SDLC & Manual testing over dependence on WAF (info supplement)
- Solutions and tools by themselves cannot be relied upon
- Tools can bring tremendous value, but just do not forget people and processes
- Evaluate what, when, where, and how application security technologies can be utilized

Application Security Countermeasures

- Authentication
- Access Control
- Session Management
- Input Validation
- Error Handling
- Cryptography
- Cryptography
- Logging
- Monitoring & Alerting
- Change Management
- Incident Response
- Business Continuity

- Secure Data Storage & Transmission

OWASP 2010 Top 10

A1: Injection

A2: Cross-Site Scripting (XSS)

A3: Broken Authentication and Session Management

A4: Insecure Direct Object References

A5: Cross-Site Request Forgery (CSRF)

A6: Security Misconfiguration

A7: Insecure Cryptographic Storage

A8: Failure to Restrict URL Access

A9: Insufficient Transport Layer Protection

A10: Unvalidated Redirects and Forwards

OWASP Top 10: Mobile Risks

- Insecure Data Storage
- Weak Server Side Controls
- Insufficient Transport Layer Protection
- Client Side Injection
- Poor Authorization and Authentication
- Improper Session Handling
- Security Decisions Via Untrusted Inputs
- Side Channel Data Leakage
- Broken Cryptography
- Sensitive Information Disclosure

- **Top 10 mobile controls and design principles**
- **GoatDroid (same concept as WebGoat)**

Threat Modeling

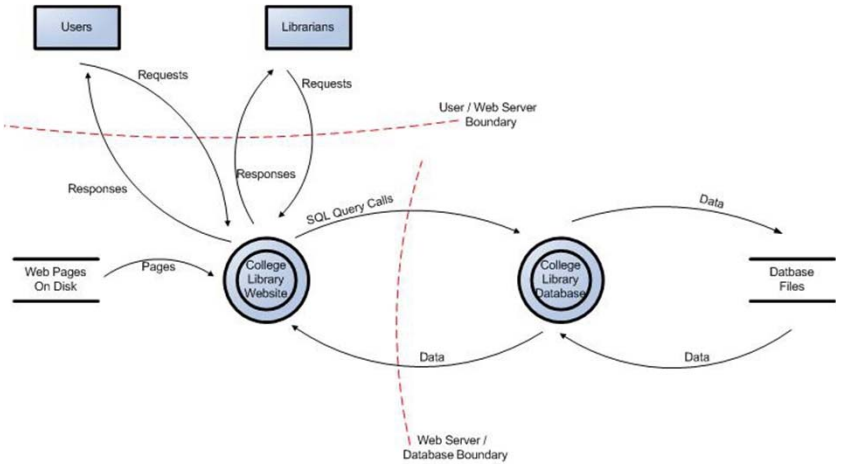
- An exercise performed to provide valuable insight into urgent and/or significant risks related to the enterprise business application.
- The outcome of these exercises include the level of business impact and potential exposure to the client related to our findings (i.e. loss of revenue, loss of availability, confidentially, integrity of data, and others).

Threat *(Risk)* Modeling:

STRIDE – Spoofing, Tampering Data, Repudiation, Information Disclosure, Denial of Service, Elevation of Privilege

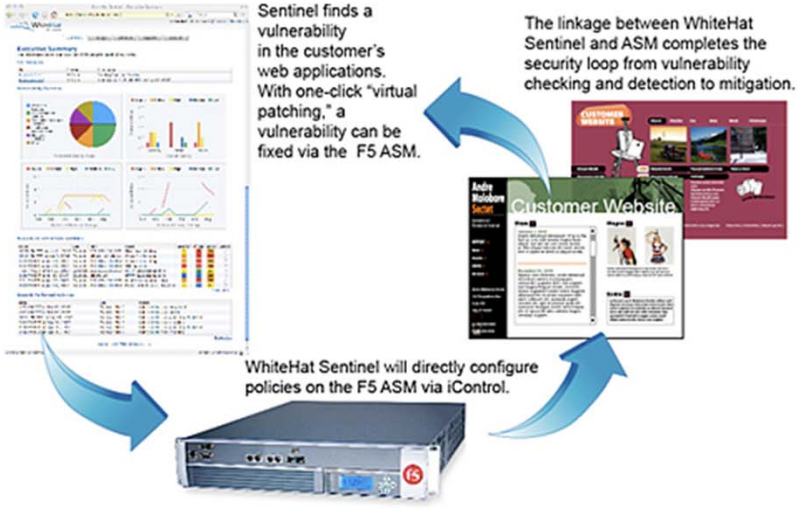
DREAD – Damage Potential, Reproducibility, Exploitability, Affected Users, Discoverability

*Mobile OWASP (under development)



Application Firewalls

- Imperva
- F5 Networks
- Barracuda
- Citrix Netscaler
- Fortify



Benefits:

- Positive Security Model/Dynamic Profiling
- Adaptive Learning Engine
- Decrypts and inspects SSL Traffic
- High Availability (Active-Passive or Active-Active)
- F5 iControl® API provides integration between WhiteHat Security & F5 ASM

Challenges:

- Management and Maintenance
- Development of Custom Rules
- Protection from new adaptations of web application vulnerabilities
- Developers still writing insecure code

What are businesses doing today?

	Client #1: Financial	Client #2: HealthCare	Client #3: Retail
Meeting & Maintaining Compliance	✓	✓	
Internal AppSec Standards	✓	✓	
Methods of AppSec Testing	✓	✓	
Establishing AppSec Owners/Sponsors	✓	✓	
Establishing IT Audit Involvement	n / a	✓	✓
Outsource vs. In-House	Outsource	Outsource	In-House
Testing Affiliate Applications	✓	✓	
Frequency of Testing	2 / year	1 / year	1 / year
Prioritizing Applications	✓	✓	
Training & Staffing Requirements	✓		
Application Solutions & Tools	YES	YES	NO
Validation & Remediation Procedures	✓		

Application Security Roadmap

- Establish Application Security Committee (include Development Leads/PMs)
- Develop Strategic Plan for Addressing AppSec Risk
- Share Budgeting Dollars to Accomplish Goals
- Conduct an Application Inventory & Prioritize
- Integrate Security within the Software Development Lifecycle (SDLC)
- Raise Awareness & Educate: Executives, Developers, QA, and IT Audit
  - Develop High-Level Management Reports
- Collaboration between Security and Developer Groups (Remediation)
- Track Remediation Progress through Metrics

Application Security Key Resources

- Open Web Application Security Project (OWASP)
  - OWASP Top 10
  - OWASP Guide (Reviews the 300+ appsec issues)
  - OWASP Tools Project
  - http://www.owasp.org
- Web Application Security Consortium (WASC)
  - Web Security Threat Classification is a cooperative effort to clarify and organize the threats to the security of a web site.
  - http://www.webappsec.org/

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