Pulse2011

New Techniques in Web 2.0 Security

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Accelerating Awareness and Progress: Secure by Design

Secure by Design is a **cost-effective** approach to constructing **safe and reliable systems** by applying IBM's experience with security technologies and best practices in all phases of system creation, from conception through system design, construction and deployment.

Being **Secure by Design** reduces the **cost**, **risk**, and **unpredictability** of integrating new technologies.

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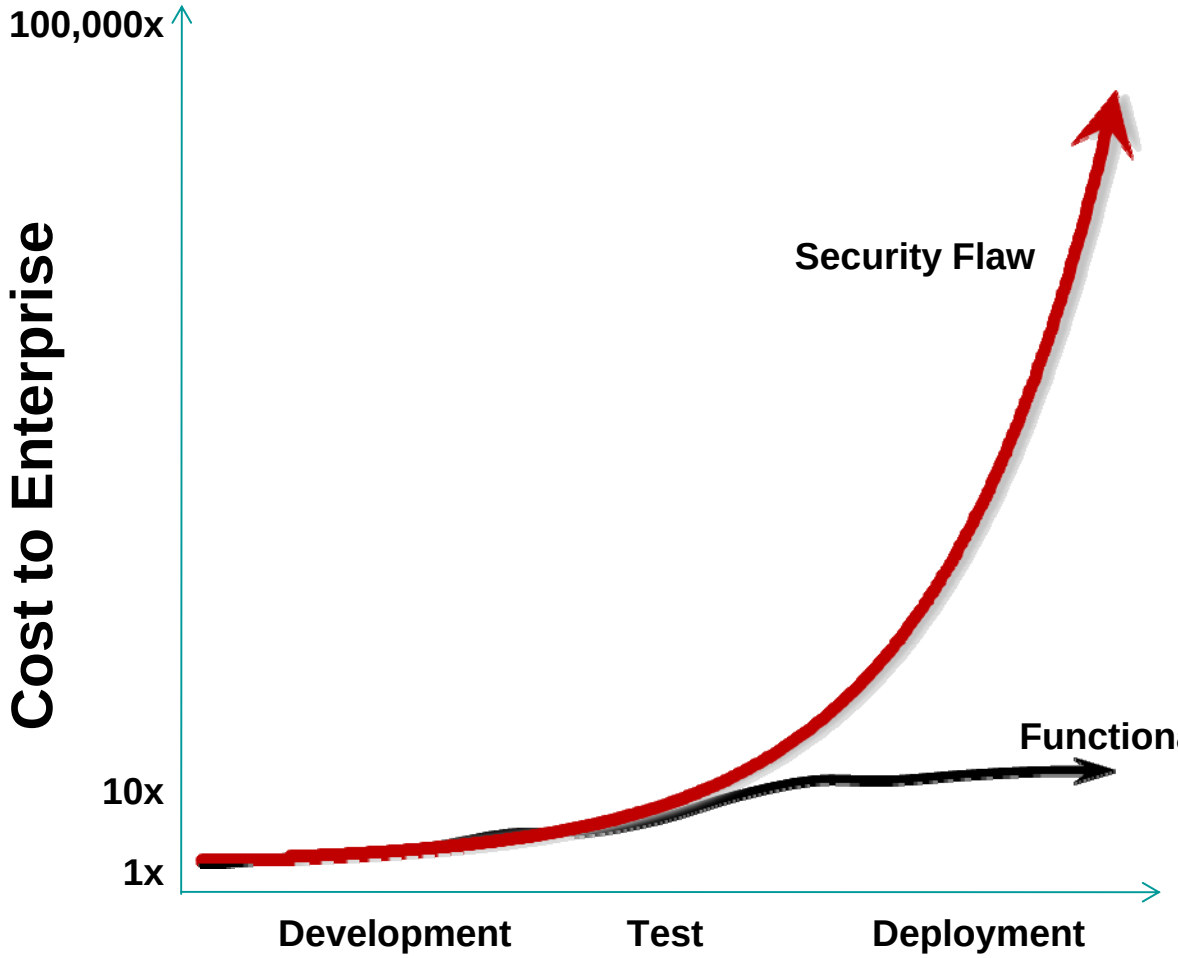
Incremental and Unbudgeted Costs of Critical Breaches



Unbudgeted Costs:

- Customer notification / care
- Government fines
- Litigation
- Reputational damage
- Brand erosion
- Cost to repair

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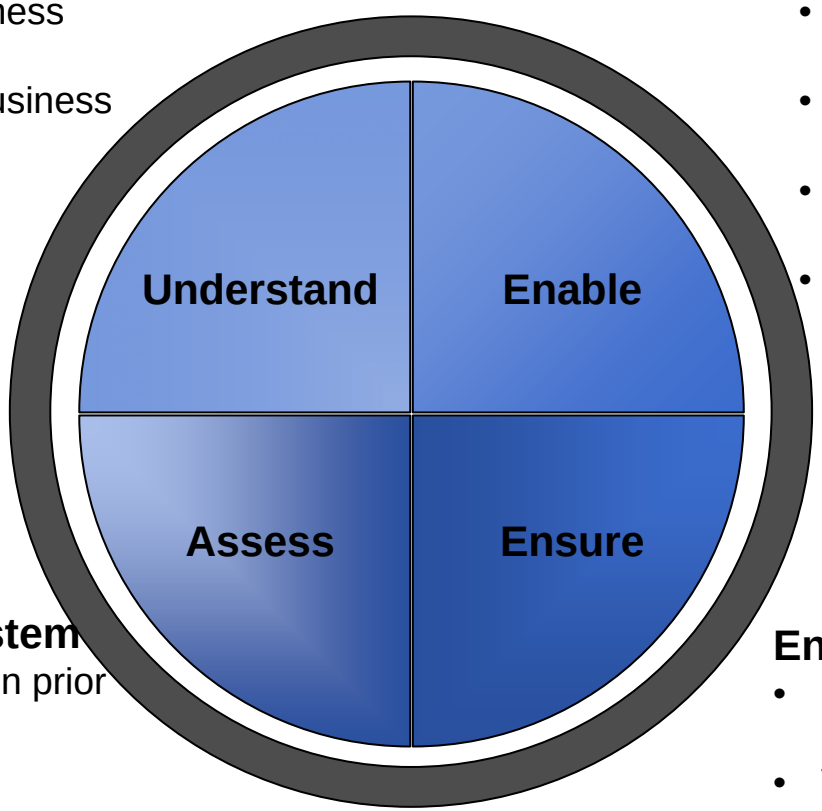
Components of a Successful Strategy to be Secure by Design

Understand Security Drivers

- Recognize specific business opportunity and priority
- Assess system risk to business
- Model likely threats and impacts



Enable System Security

- Mandate appropriate security controls within applications
- Implement system monitoring/logging
- Specify secure platform & configuration
- Document update management plan

Assess Production System

- Test composed application prior to deployment
- Verify security of platform configuration
- Establish process and schedule for regular checking

Ensure secure development

- Protect development infrastructure
- Verify safety of third-party software
- Check system for security during coding/build/integration stages

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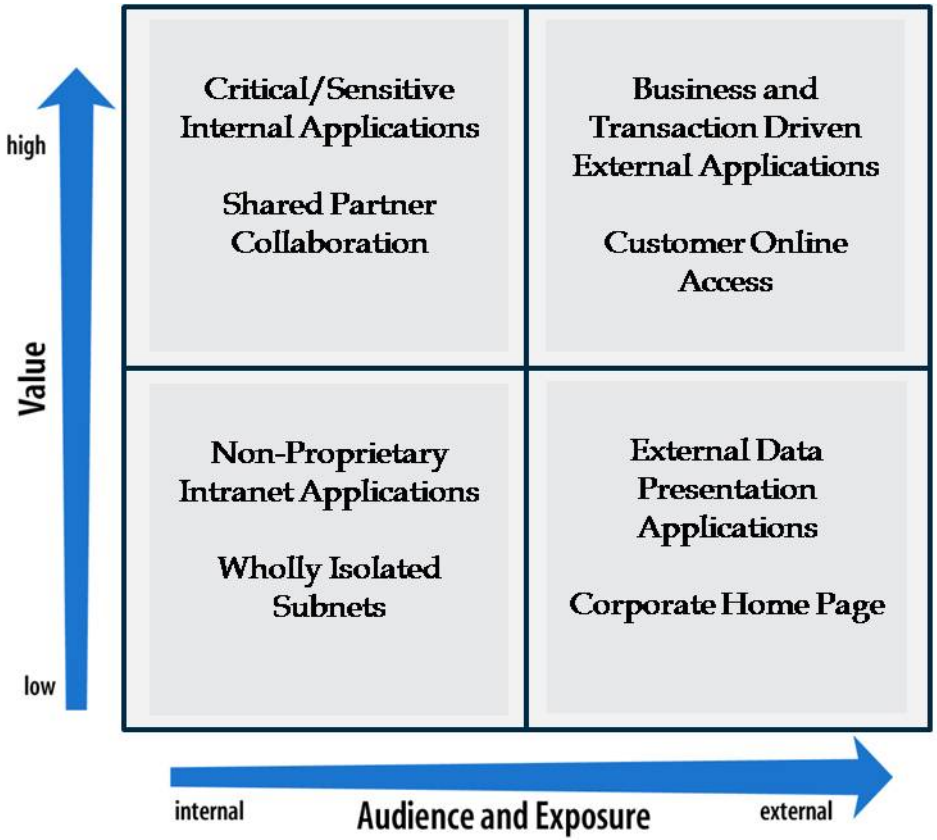
Scoping and Prioritizing Security Improvements : Inventory



Focus on actual needs:
- Confidentiality of data
- Reliability of systems
- Integrity of data and services

Understand where to focus:
- New Development
- Systems in Maintenance
- Legacy Systems

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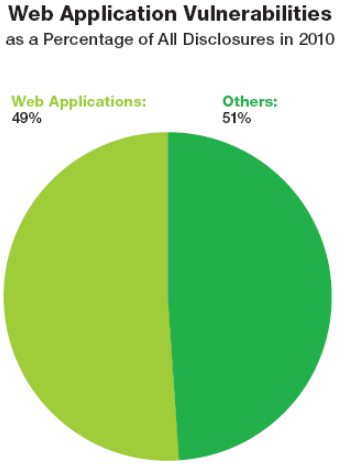
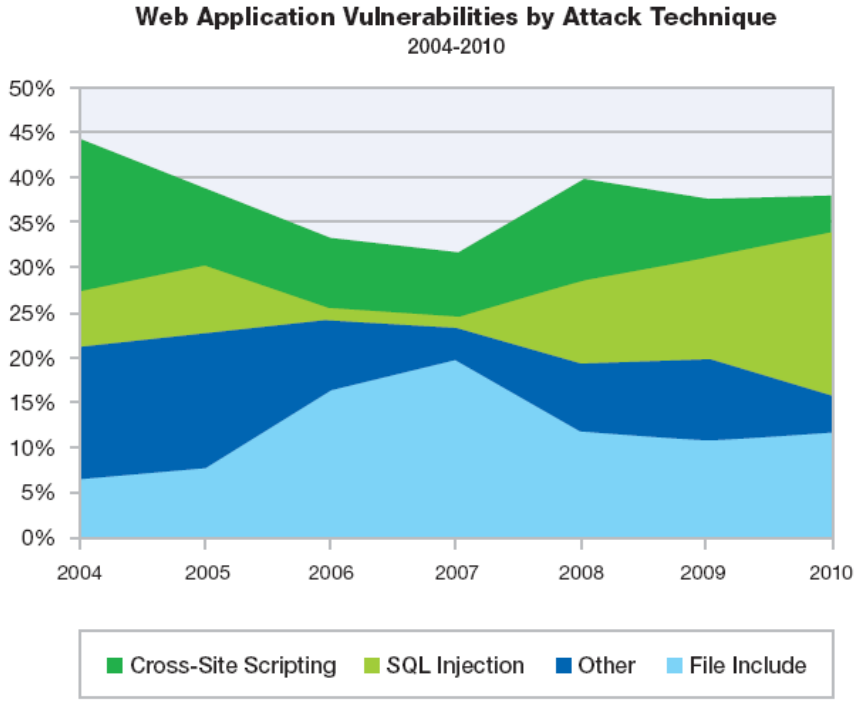
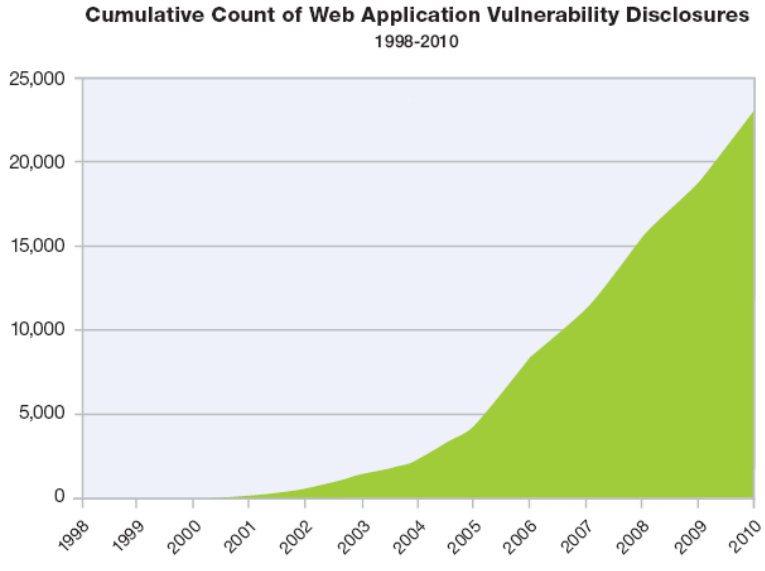
Web App Vulnerabilities Continue to Dominate

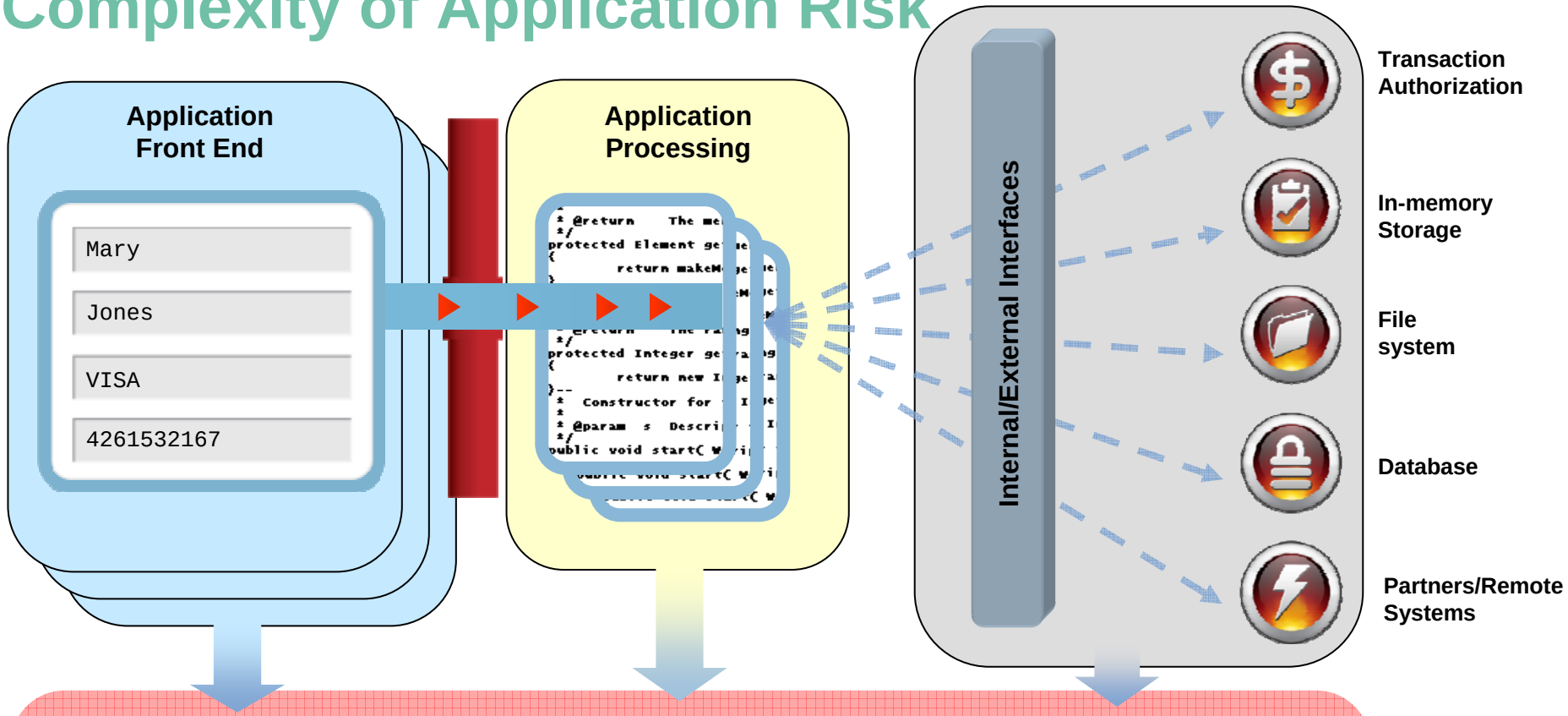
- Nearly half (**49%**) of all vulnerabilities are Web application vulnerabilities.
- Cross-Site Scripting & SQL injection vulnerabilities continue to dominate.







Complexity of Application Risk



External Vulnerabilities

- Web-based Attacks
- Misconfiguration
- Data Leakage
- Insufficient Input/Output Validation
- Number & Variety of access points/devices

Application Issues

- Programming Errors
  - Buffer Overflows
  - Race Conditions
- Insecure Data Handling
- Weak Access Control
- Malicious Code

Integrated Systems Risks

- Insecure Data Transmission
- Inappropriate Data Storage
- Incomplete Data Destruction
- Unmanaged Data Sharing

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New Techniques in Application Security

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Differences Between DAST and SAST Approaches

	Static Analysis	Dynamic Analysis
Scan input	Scans source code and bytecode for security and quality issues. Requires access to source or bytecode	Scans running web applications. Requires starting point URL, and login credentials where relevant
Assessment techniques	Uses "taint analysis" and pattern matching techniques to locate issues	Tampering of HTTP messages to locate application and infrastructure layer issues
Where does it fit in application development lifecycle	Fits best during application development	Fits best during build automation, QA and security verification of applications
Results & Output	Results are presented by line of code, source to sink functions flow	Results are presented as HTTP messages (exploit requests)

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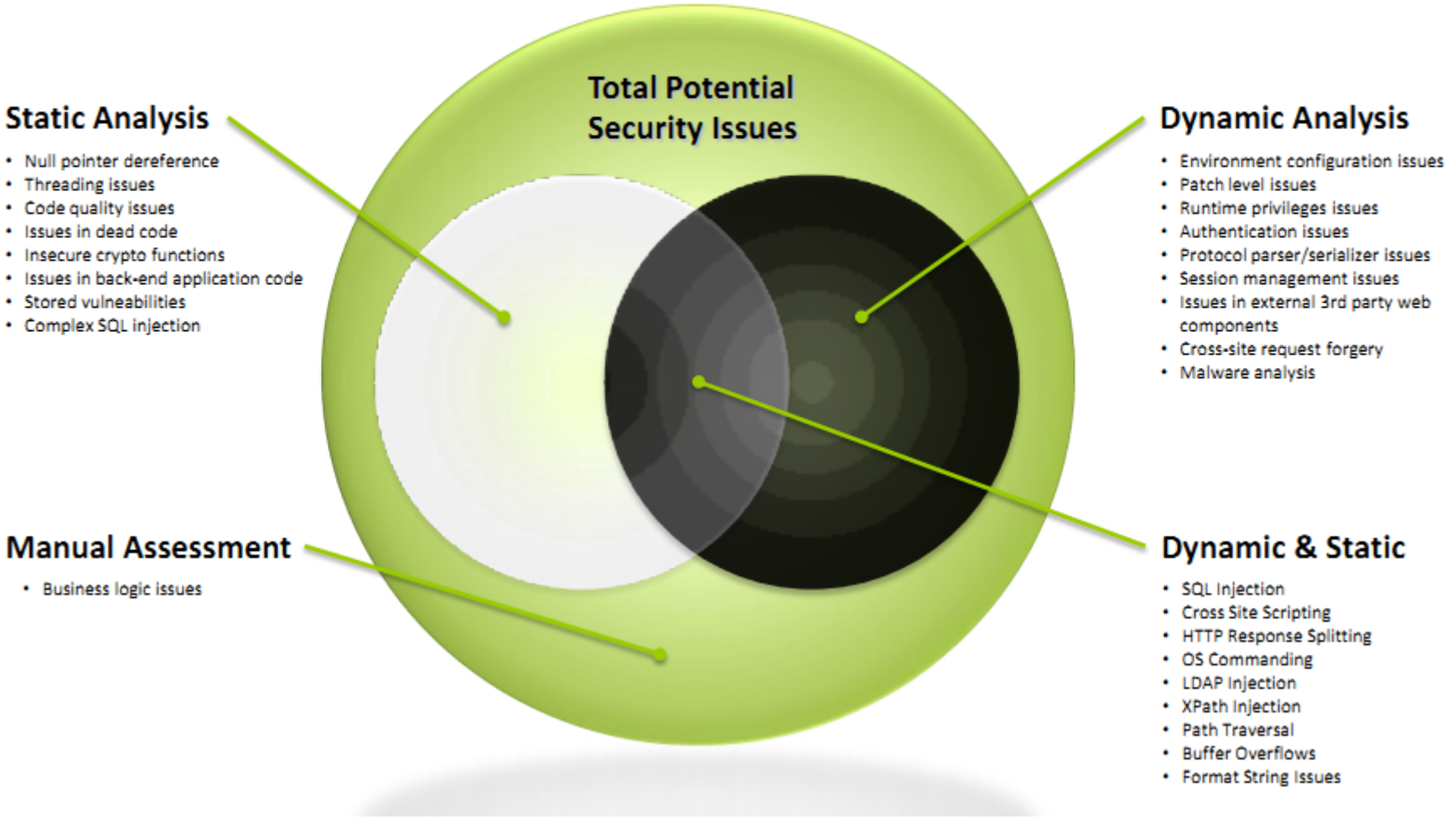
DAST and SAST – Issue Type Coverage



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Path to real hybrid analysis – how far are we?

- Definitions
  - Aggregation
    - Combining in a single report or repository the issues reported using both DAST and SAST techniques
  - Correlation
    - Associating issues that have similar key indicators as the same issue (more on this later)
  - Hybrid
    - Combining the analysis techniques of both SAST and DAST to provide new analysis capabilities that couldn't (or is hard) to do using only a single technique.

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JavaScript Security Analyzer (JSA) – Overview

- What is JSA?
  - An extension of AppScan Standard, developed in collaboration with IBM Research, that does static taint analysis of JavaScript, detecting a range of client-side security issues:
    - DOM-based XSS
    - Code Injection
    - Open Redirect
    - CSRF Bypass
    - Dual Session
    - Port Manipulation
    - Protocol Manipulation
- Why is this significant?
  - The role of JavaScript in modern web applications becomes greater as technologies such as AJAX, JS Frameworks and HTML5 become more common
  - It makes AppScan the first tool in the world capable of detecting a range of client-side security issues. These issues are thought to be very common but nobody knows for sure because no tools exist today that can find them
  - Additionally, it makes AppScan the first scanner that applies DAST and SAST in the same scan (hybrid analysis)

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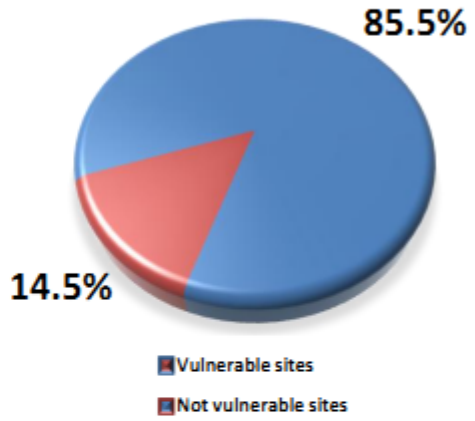
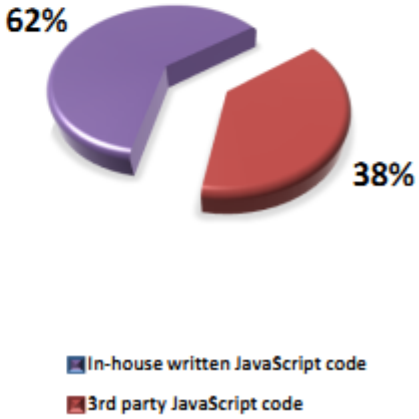
Statistics Gathered with JSA on Fortune500+ Sites

- 14.5% of the sites were found to be infested with severe client-side JavaScript issues
- These types of issues could not be automatically located up until now – JSA is the first automated tool capable of locating client-side JavaScript issues
- 38% of the issues were found in 3rd party JavaScript code such as:
  - Marketing campaign JavaScript snippets
  - Flash embedding JavaScript snippets
  - Deep linking libraries for Flash and AJAX
  - Social networking JavaScript snippets





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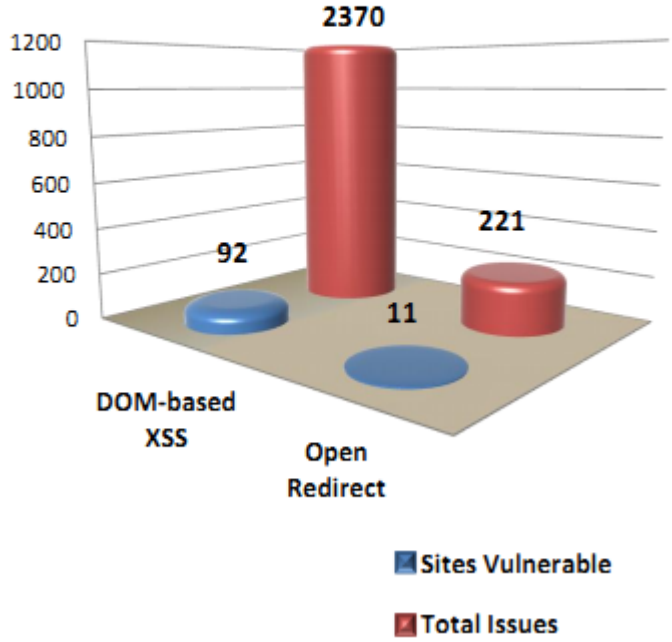
Statistics Gathered with JSA on Fortune500+ Sites

- We have run JSA looking for either DOM-based XSS or Open Redirects
  - 92 had DOM-based XSS (94% of vulnerable sites)
  - 11 sites had Open Redirects (11% of vulnerable sites)
  - In total, we have found 2370 DOM-based XSS vs. 221 Open Redirects



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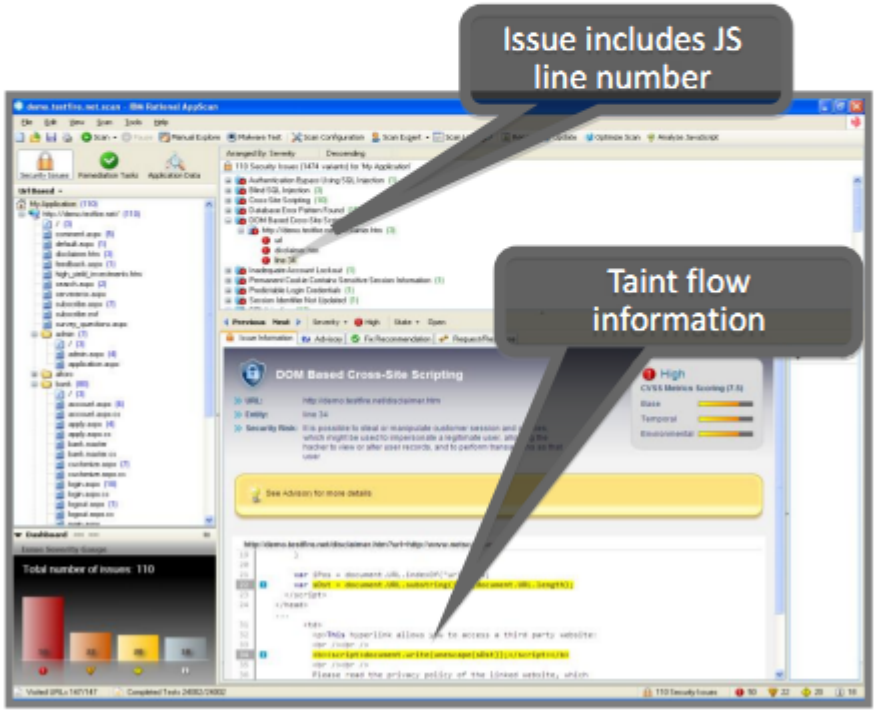
Hybrid Analysis - JavaScript Security Analyzer (JSA)

- **What is JSA?**
  - An example of real Hybrid Analysis
    - DOM-based XSS, Code Injection, Open Redirect, CSRF Bypass, Dual Session, Port Manipulation, Protocol Manipulation

- **Why JSA?**
  - These types of issues could not be automatically located up until now – JSA is the first automated tool capable of locating client-side JavaScript issues

- **Unique Ability to AppScan**
  - First scanner that applies dynamic and static analysis in the same scan (hybrid analysis)
  - This makes AppScan the first tool in the world capable of detecting a range of client-side security issues



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Adopting and Evangelizing a Practical Secure Development Lifecycle

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A Practical Cycle Described

Design Phase

- Consideration is given to security requirements of the application
- Issues such as required controls and best practices are documented on par with functional requirements

Development Phase

- Software is checked during coding for:
  - Implementation error vulnerabilities
  - Compliance with security requirements

Build & Test Phase

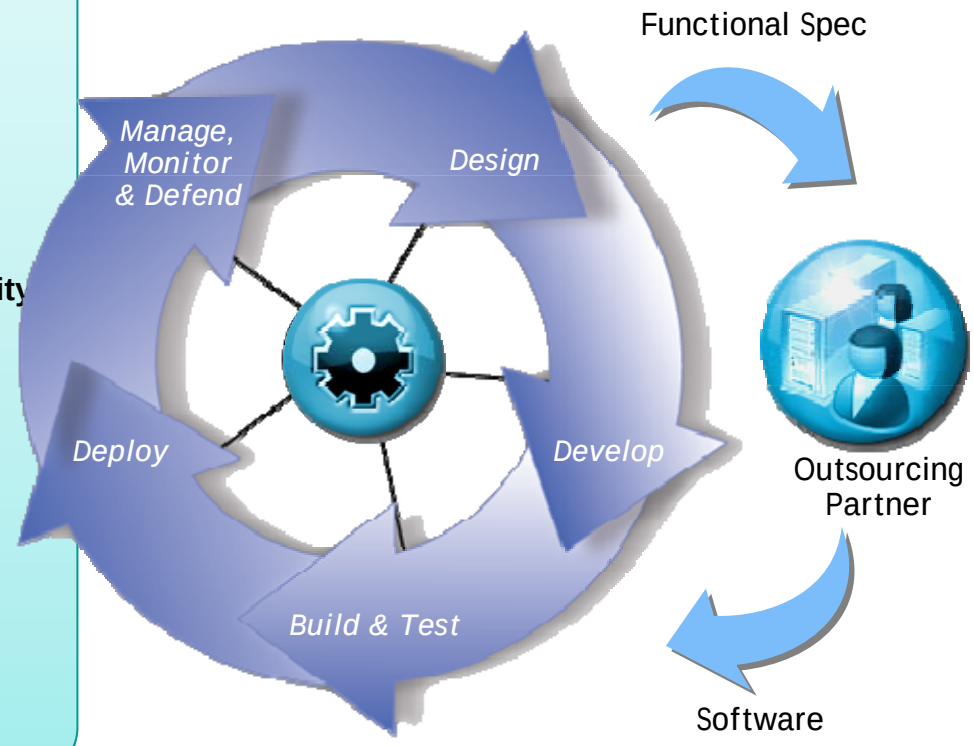
- Testing begins for errors and compliance with security requirements across the entire application
- Applications are also tested for exploitability in deployment scenario

Deployment Phase

- Configure infrastructure for application policies
- Deploy applications into production

Operational Phase

- Continuously monitor applications for appropriate application usage, vulnerabilities and defend against attacks



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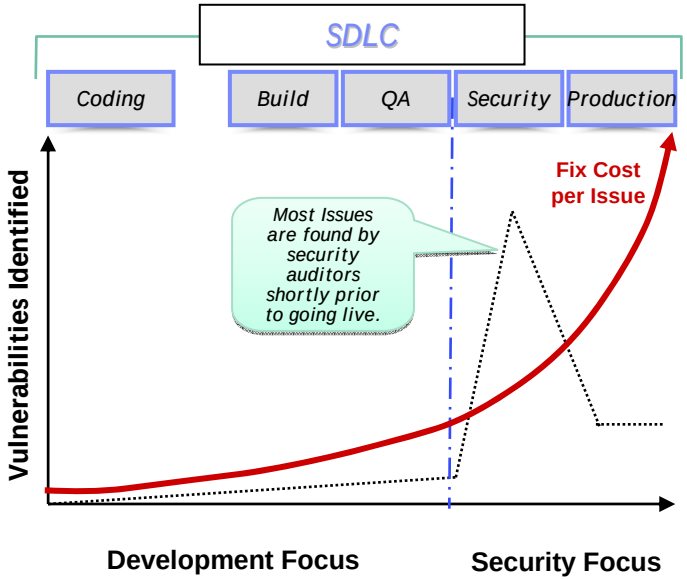
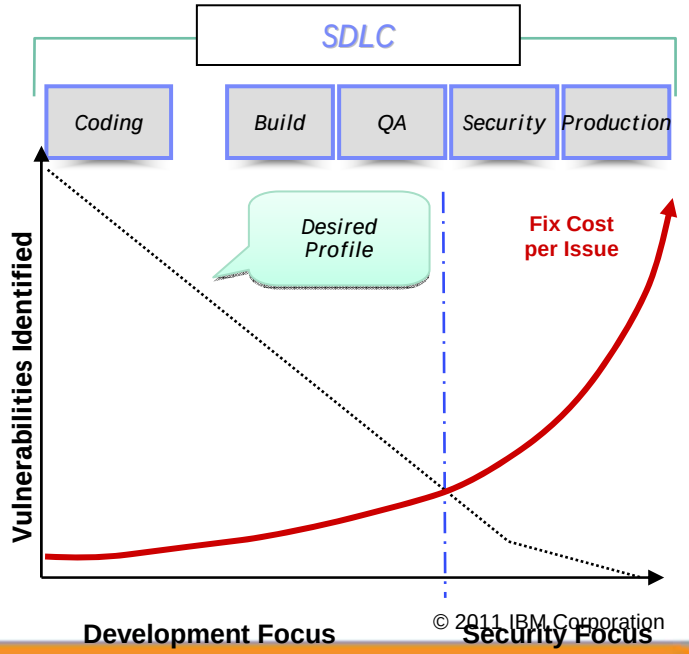
Moving to a Desirable End State



In early stages of adoption, security practitioners will assess applications during pre-deployment testing. **Costs are higher and window is shorter** to mitigate any issues found.



By integrating security into requirements, development and build/test/integration cycles, **identification occurs much earlier**, increasing find rate at a time when **fix costs are lowest**.

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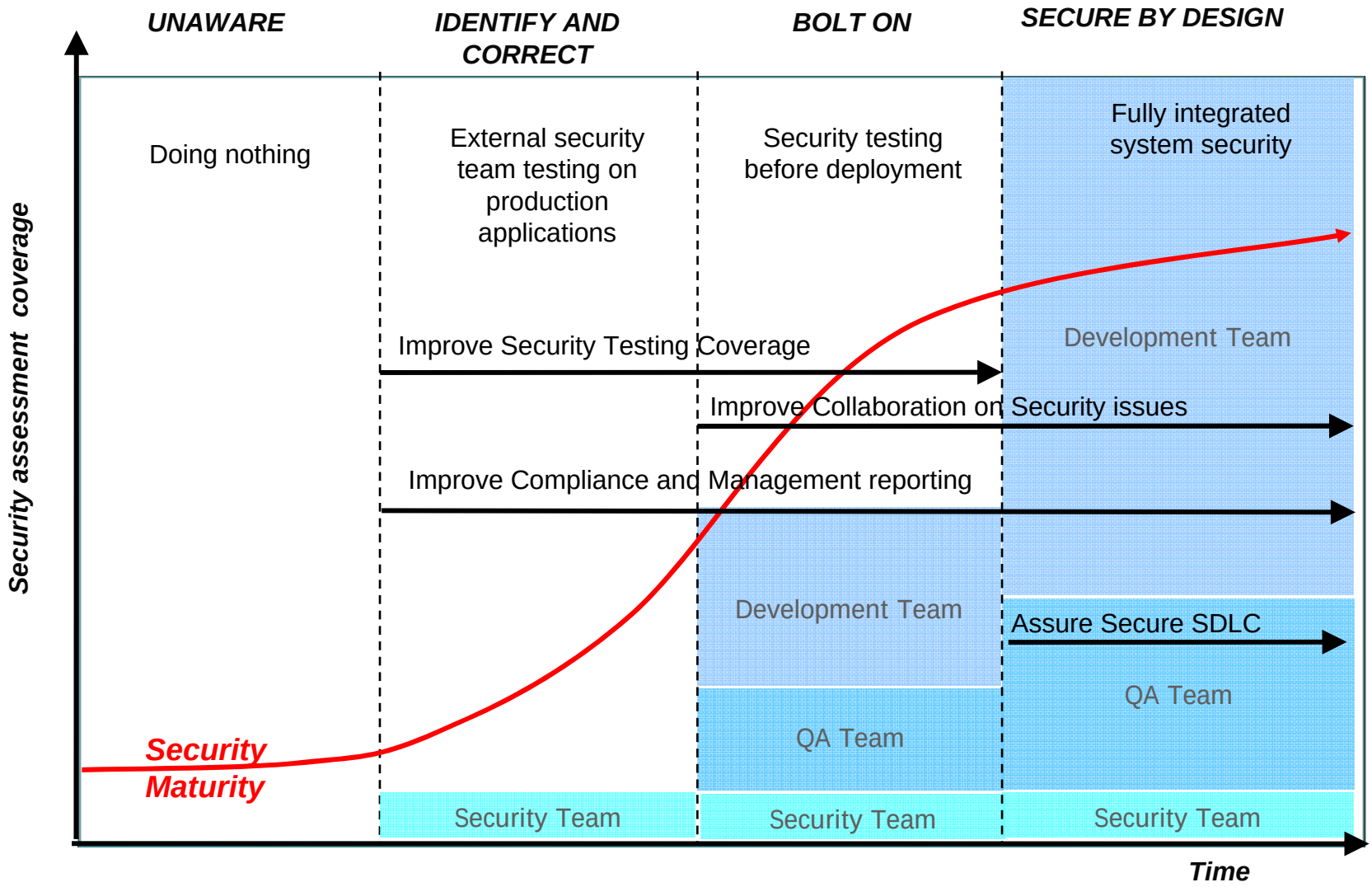
Evolution of Software Security Issue Mitigation



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Qualities of a Successful Application Security Program

1. **There is a Marketing Plan (*Really*)**
2. **Assessment begins with an organization, not an application**
3. **Initial goals are modest introductions**
4. **Initial projects are carefully chosen**
   - Impact
   - Exposure
   - Acceptance
5. **Outcomes are demonstrable results**
   - Justify focus
   - Refine budgets and timelines
   - Coalesce key metrics and reporting
6. **Implementations focus on automation and integration**
   - Decreases disruption to existing processes
   - Increases value and leverage of existing investments in personnel and systems
7. **Process is consistent and repeatable to scale**

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Questions?

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