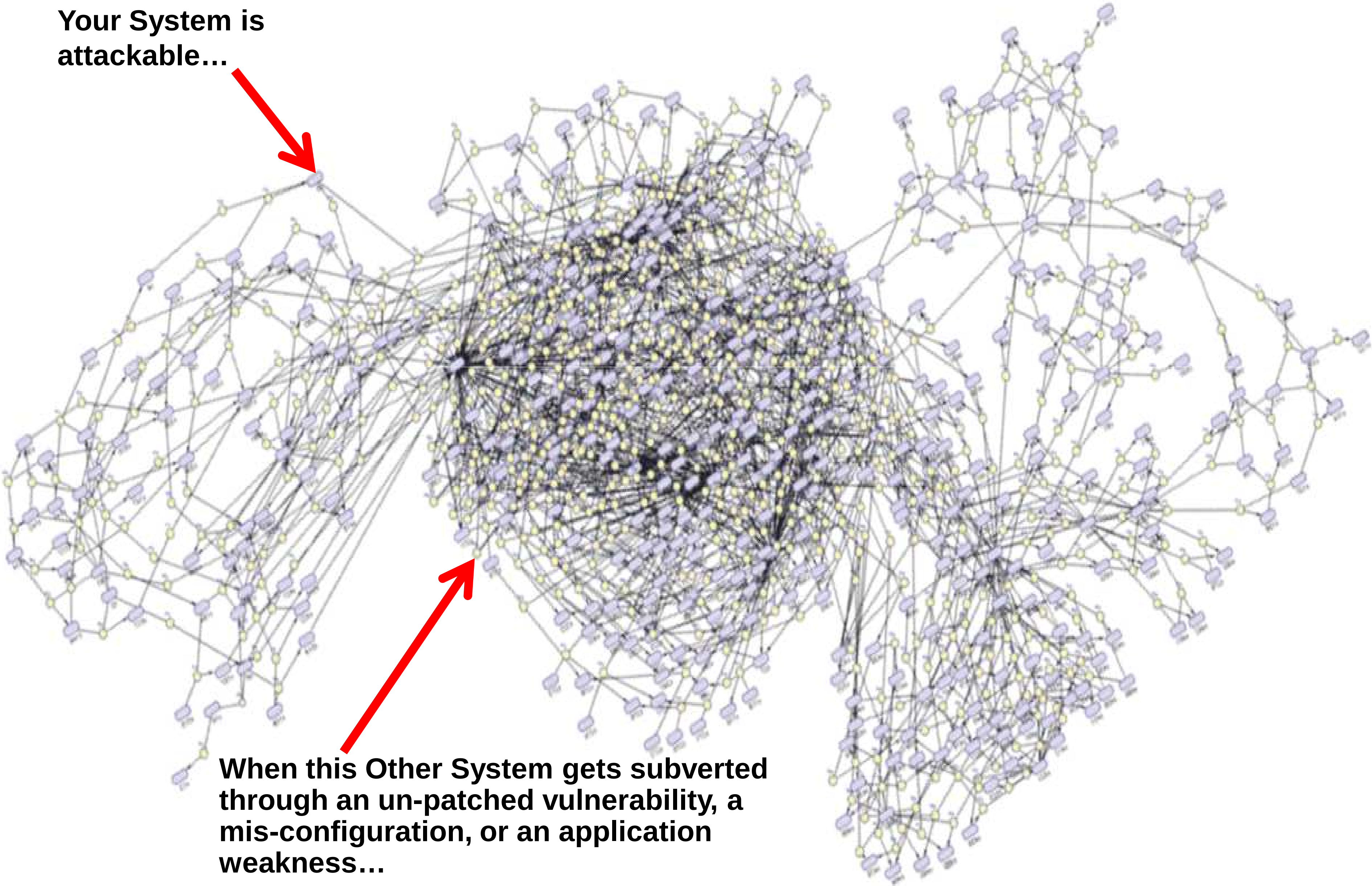
Training & Software Security Engineering: CWE

Knowing what could make software vulnerable to attack

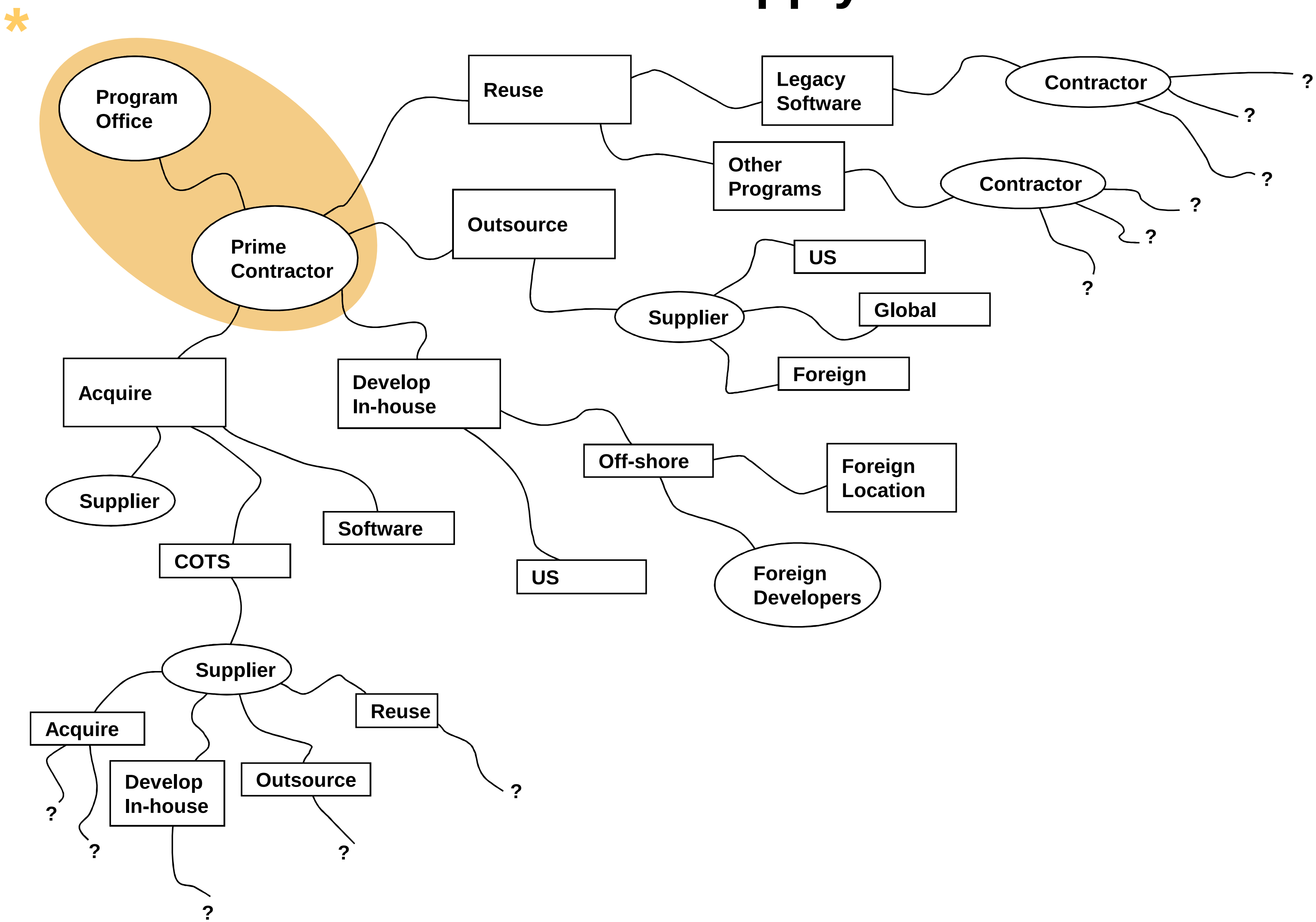
Robert A. Martin

28 February 2011

Today Everything's Connected



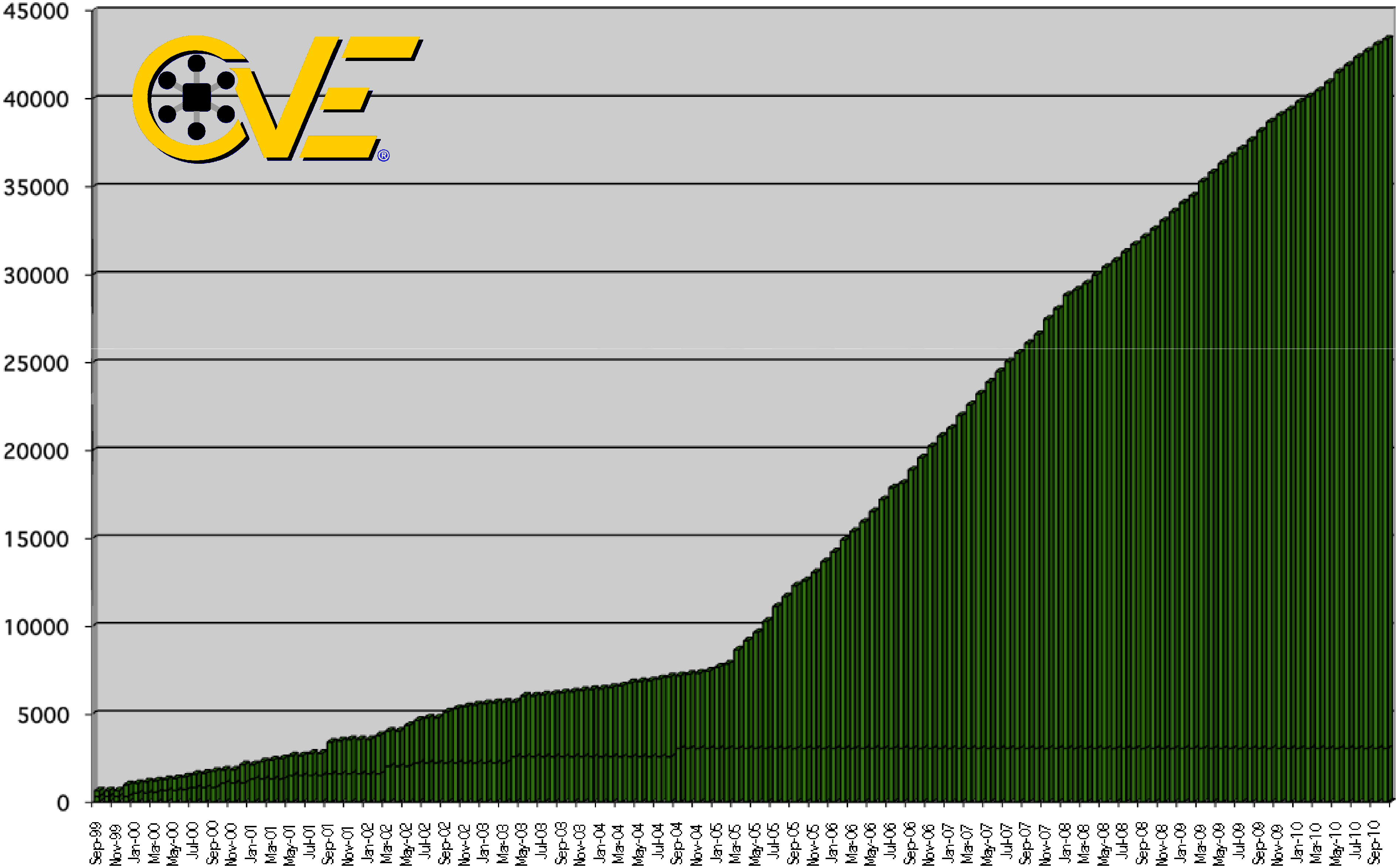
The Software Supply Chain



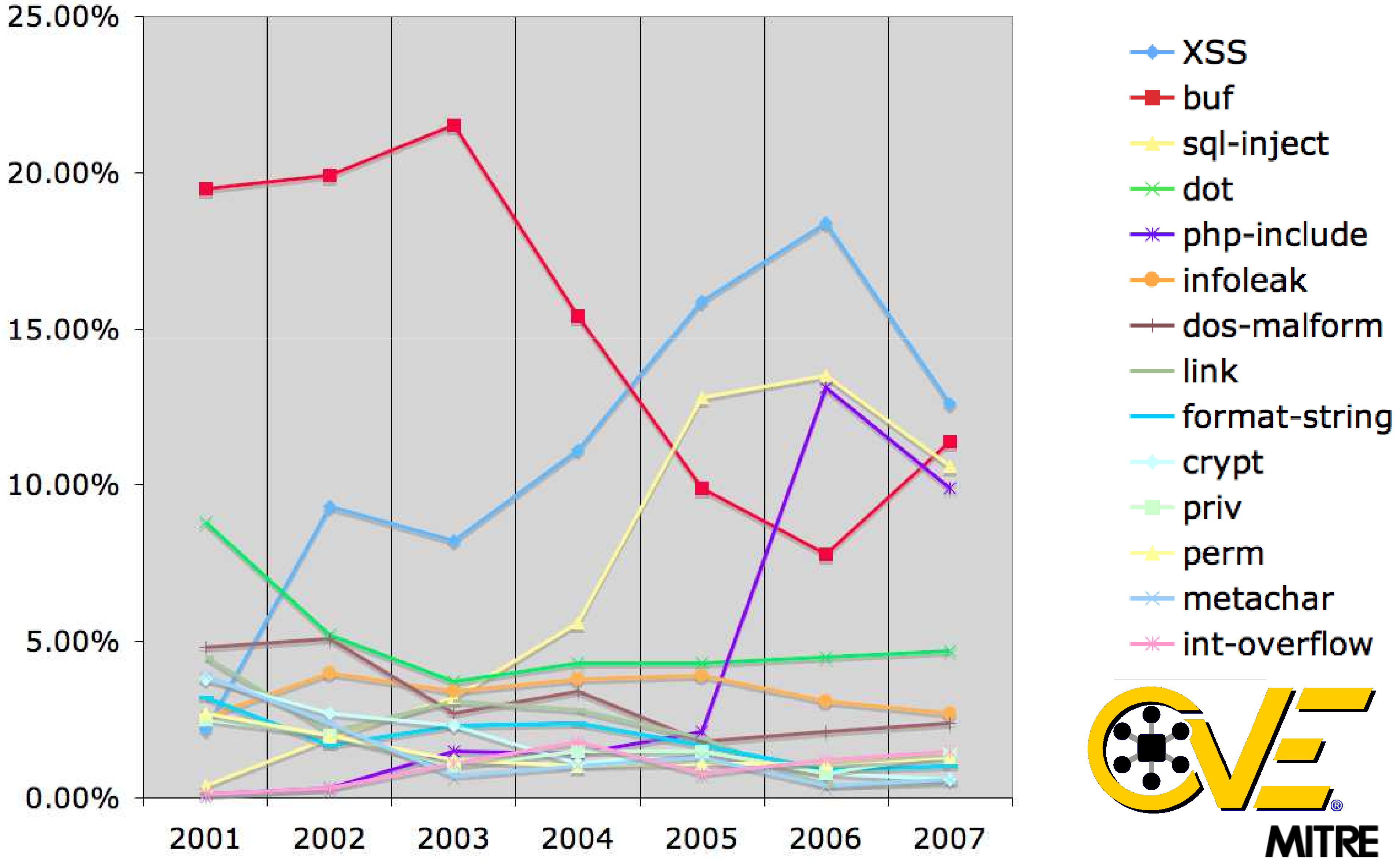
* "Scope of Supplier Expansion and Foreign Involvement" graphic in DACS www.softwaretechnews.com Secure Software Engineering, July 2005 article "Software Development Security: A Risk Management Perspective" synopsis of May 2004 GAO-04-678 report "Defense Acquisition: Knowledge of Software Suppliers Needed to Manage Risks"


If the weaknesses in software were as easy to spot and their impact as obvious as…

CVE 1999 to 2011



Vulnerability Type Trends: A Look at the CVE List (2001 - 2007)



MITRE

Removing and Preventing the Vulnerabilities Requires More Specific Definitions…CWEs

- XSS — 9
- buf — 14
- sql-inject
- dot — 19
- php-include
- infoleak
- dos-malform
- link
- format-string
- crypt
- priv
- perm
- metachar
- int-overflow

Improper Neutralization of Input During Web Page Generation ('Cross-site Scripting') (79)
- Improper Neutralization of Script-Related HTML Tags in a Web Page (Basic XSS) (80)
- Improper Neutralization of Script in an Error Message Web Page (81)
- Improper Neutralization of Script in Attributes of IMG Tags in a Web Page (82)
- Improper Neutralization of Script in Attributes in a Web Page (83)
- Improper Neutralization of Encoded URI Schemes in a Web Page (84)
- Doubled Character XSS Manipulations (85)
- Improper Neutralization of Invalid Characters in Identifiers in Web Pages (86)
- Improper Neutralization of Alternate XSS Syntax (87)

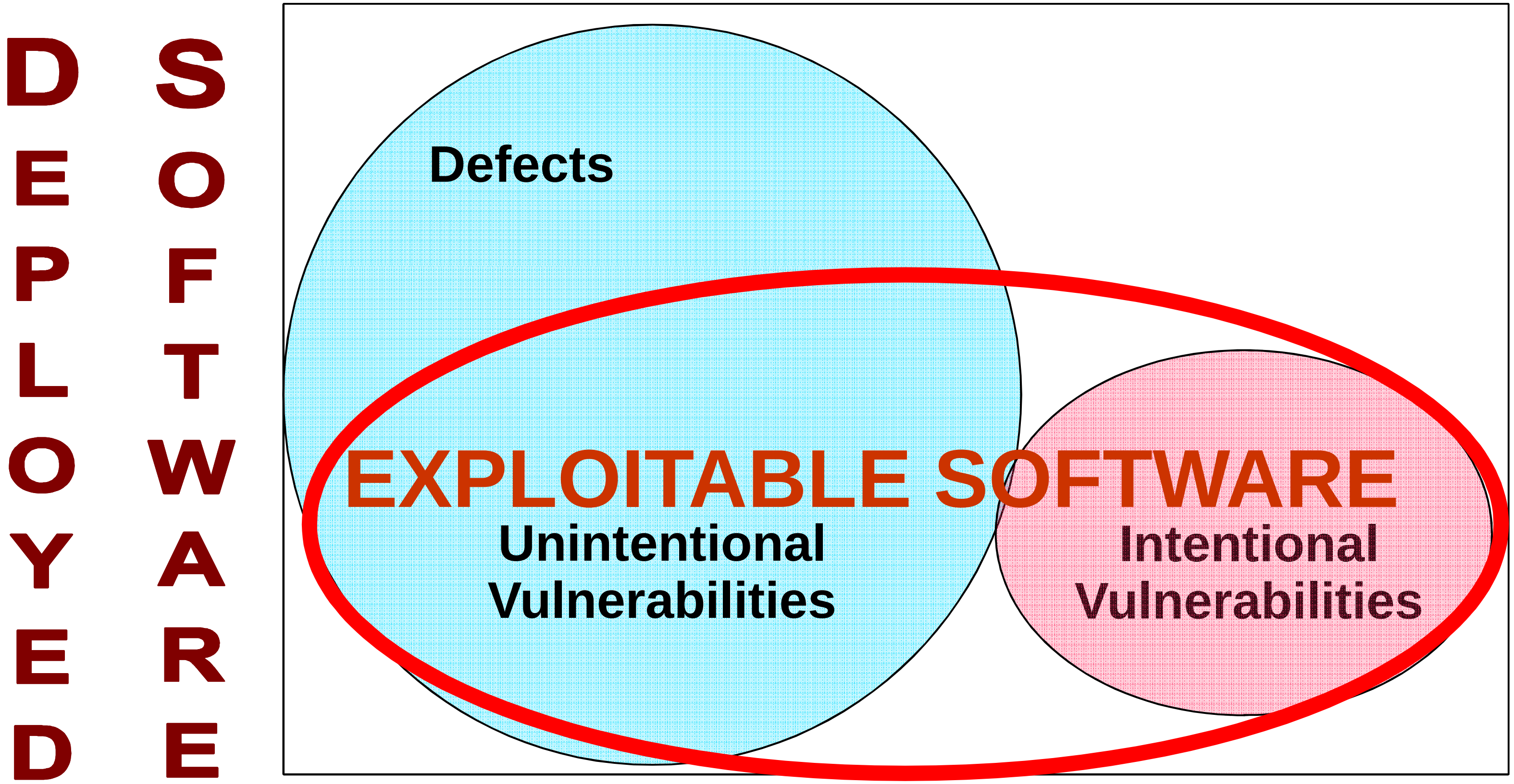
Improper Restriction of Operations within the Bounds of a Memory Buffer (119)
- Buffer Copy without Checking Size of Input ('Classic Buffer Overflow') (120)
- Write-what-where Condition (123)
- Out-of-bounds Read (125)
- Improper Handling of Length Parameter Inconsistency (130)
- Improper Validation of Array Index (129)
- Return of Pointer Value Outside of Expected Range (466)
- Access of Memory Location Before Start of Buffer (786)
- Access of Memory Location After End of Buffer (788)
- Buffer Access with Incorrect Length Value 805
- Untrusted Pointer Dereference (822)
- Use of Out-of-range Pointer Offset (823)
- Access of Uninitialized Pointer (824)
- Expired Pointer Dereference (825)

Path Traversal (22)
- Relative Path Traversal (23)
  - Path Traversal: '../filedir' (24)
  - Path Traversal: '/../filedir' (25)
  - <------------8 more here -------------->
  - Path Traversal: '....//' (34)
  - Path Traversal: '.../...//' (35)
- Absolute Path Traversal (36)
  - Path Traversal: '/absolute/pathname/here' (37)
  - Path Traversal: '\absolute\pathname\here' (38)
  - Path Traversal: 'C:dirname' (39)
  - Path Traversal: '\\UNC\share\name\' (Windows UNC Share) (40)

Exploitable Software Weaknesses (a.k.a. Vulnerabilities)

Vulnerabilities can be the outcome of non-secure practices and/or malicious intent of someone in the development/support lifecycle.

The exploitation potential of a vulnerability is independent of the "intent" behind how it was introduced.



Intentional vulnerabilities are spyware & malicious logic deliberately imbedded (and might not be considered defects but they can make use of the same weakness patterns as unintentional mistakes)

Note: Chart is not to scale – notional representation -- for discussions

Common Weakness Enumeration (CWE)

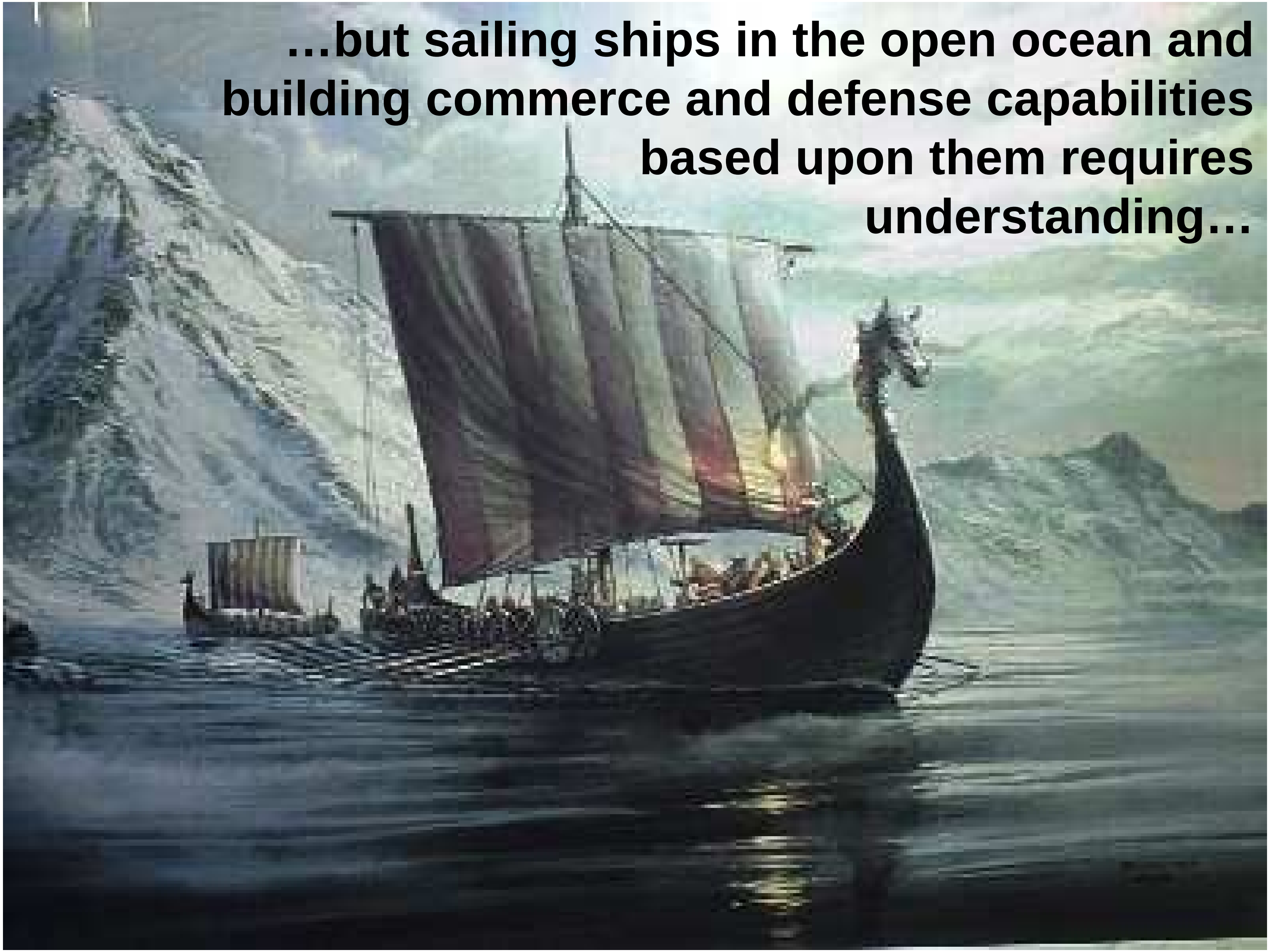
- dictionary of weaknesses
  - weaknesses that can lead to exploitable vulnerabilities (i.e. CVEs)
  - the things we don’t want in our code, design, or architecture
  - web site with XML of content, sources of content, and process used
- structured views
  - provides multiple views into CWE dictionary content
  - supports alternate views – developer/researcher/sub-views
- open community process
  - to facilitate common terms/ concepts/facts and understanding
  - allows for vendors, developers, system owners and acquirers to understand tool capabilities/ coverage and priorities
  - utilize community expertise

Foundation for other DHS, NSA, OSD, NIST, OWASP, SANS, and OMG SwA Efforts

Making Security Measurable™

© 2011 MITRE

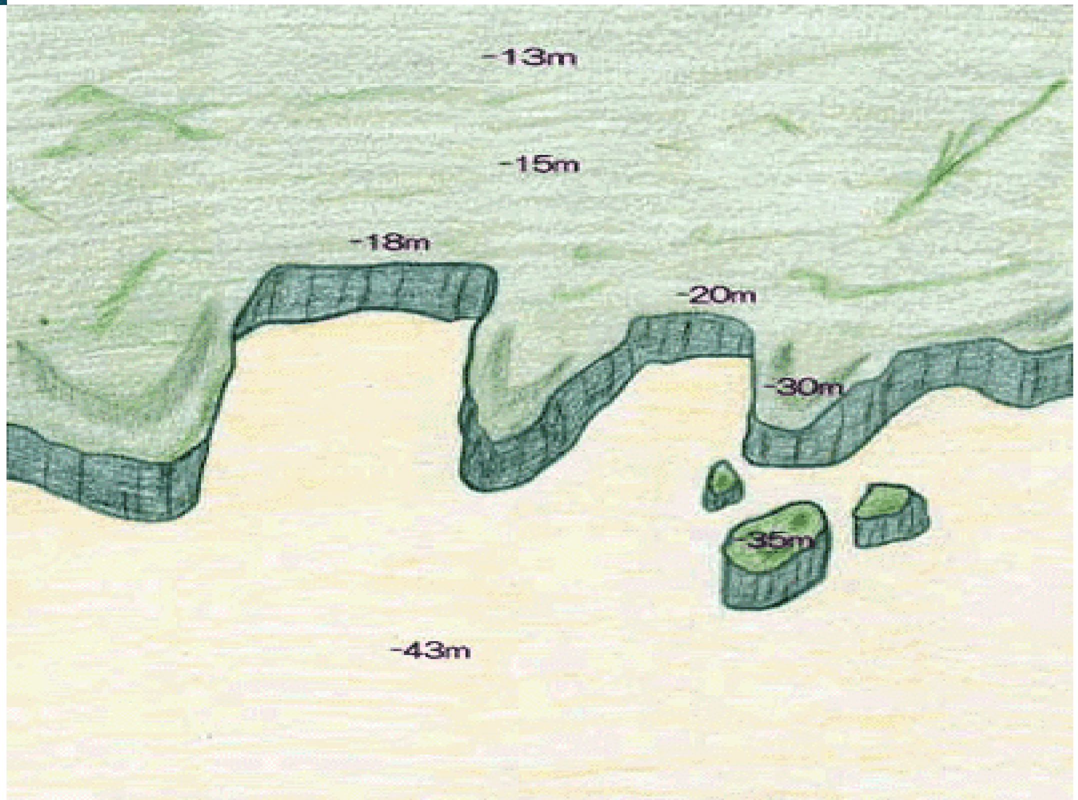

Building
Software
only require a few
skills and basic
understanding…

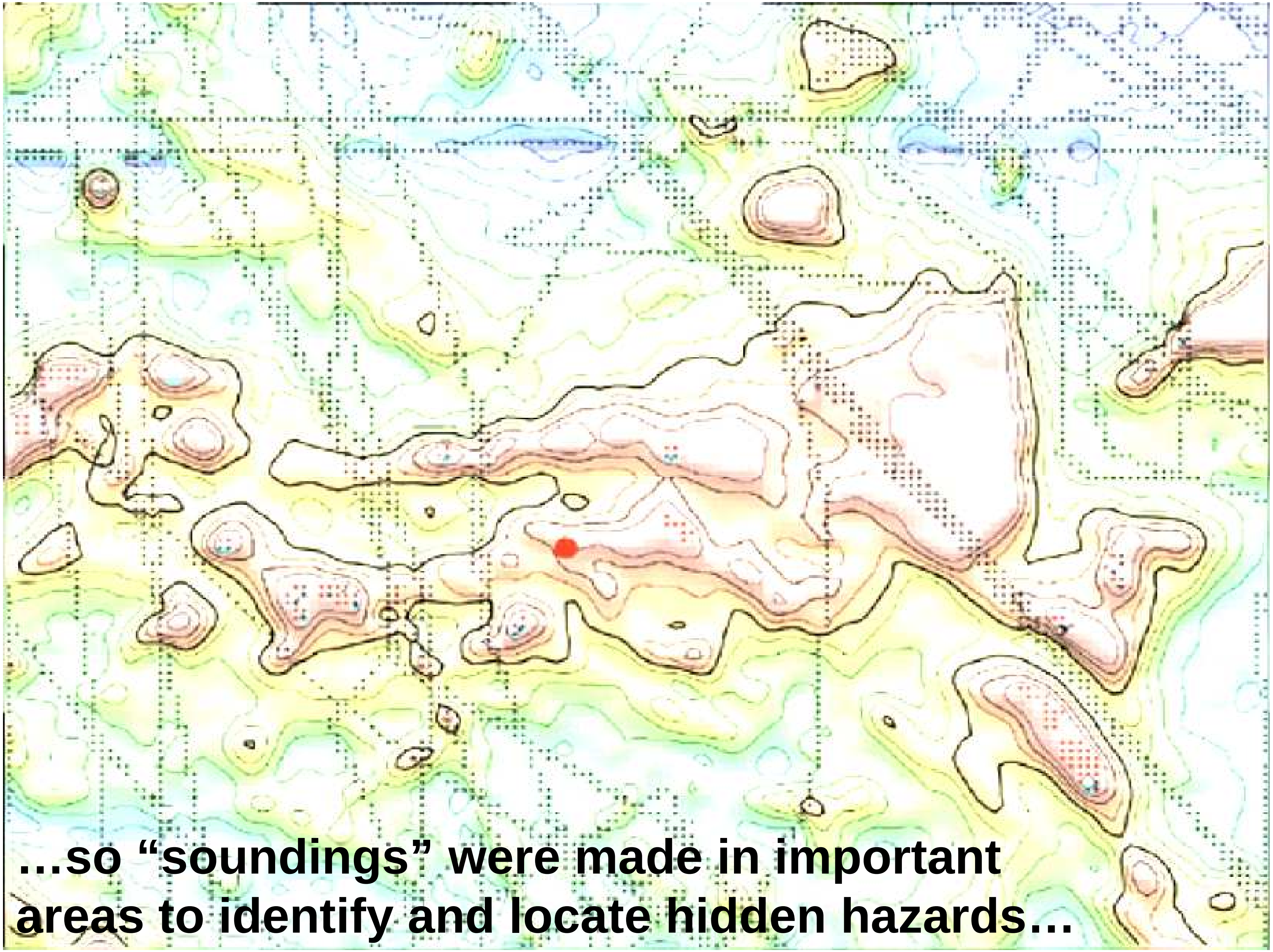

…but sailing ships in the open ocean and
building commerce and defense capabilities
based upon them requires
understanding…

…of navigation threats…

…surface maps didn't capture the full set of threats and hazards – i.e. what was really going on…

…a more insightful depiction – one that shows what was going on under the surface – was needed…



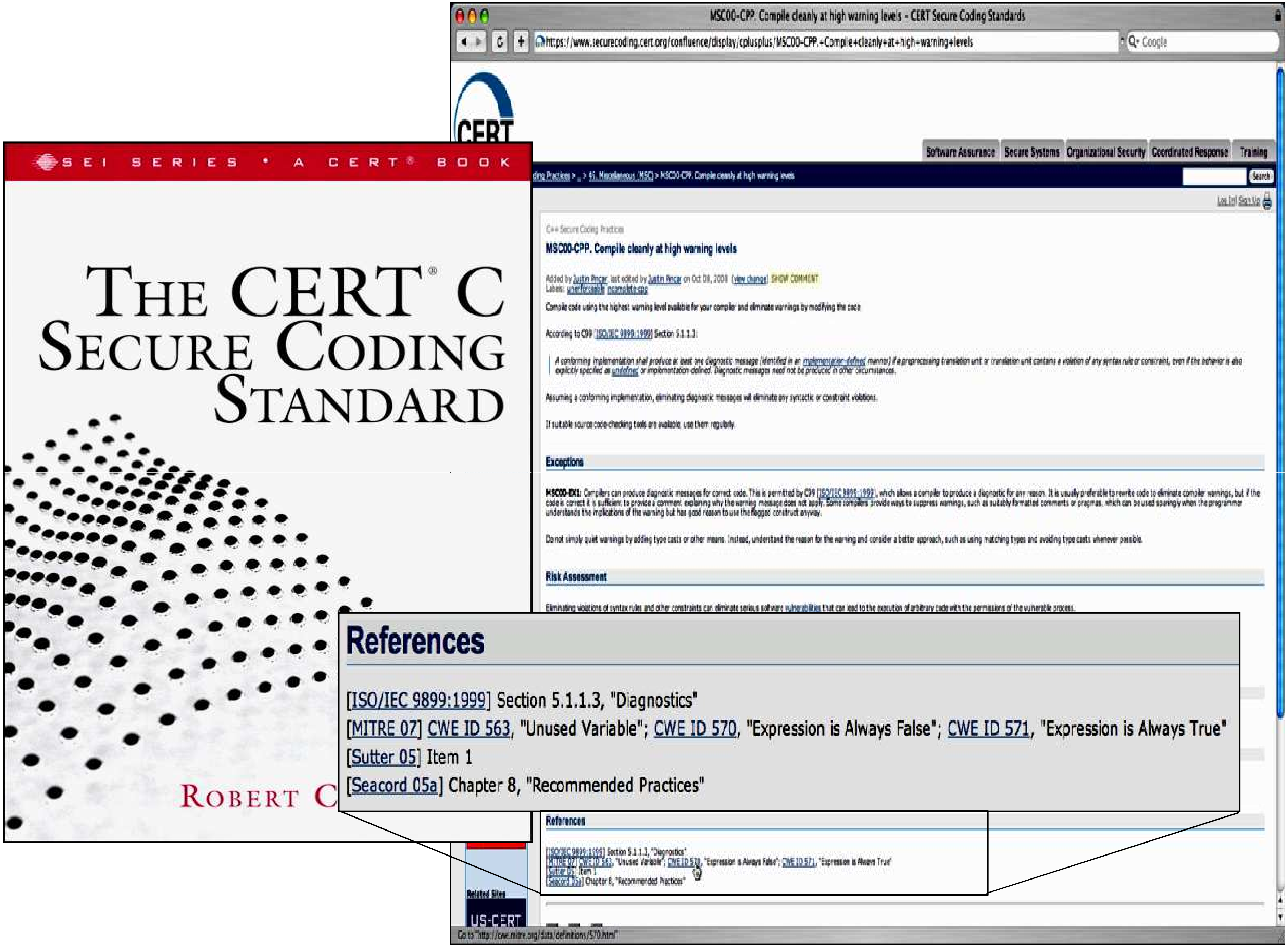


…so “soundings” were made in important areas to identify and locate hidden hazards…

…and warning signals to help others avoid known hazards were erected along with…

…indicators showing safe ways to avoid the known hazards…

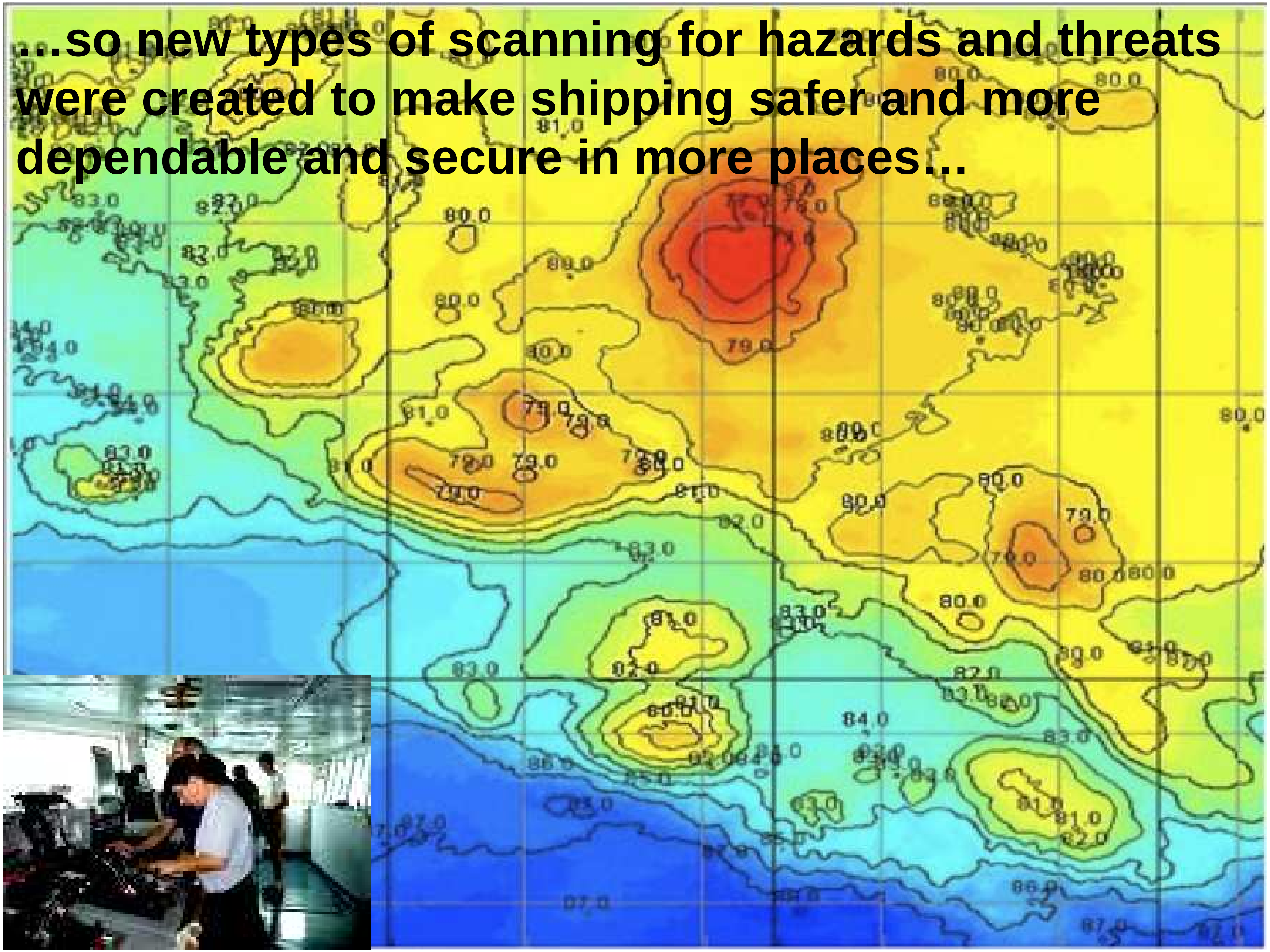

River
Know Security Weaknesses
Secure Coding Rules
Know Security Weaknesses
Know Security Weaknesses
Know Security Weaknesses


SEI SERIES • A CERT® BOOK
THE CERT® C SECURE CODING STANDARD
ROBERT C
MSC00-CPP. Compile cleanly at high warning levels - CERT Secure Coding Standards
https://www.securecoding.cert.org/confluence/display/cplusplus/MSC00-CPP.+Compile+cleanly+at+high+warning+levels
Google
CERT
Software Assurance
Secure Systems
Organizational Security
Coordinated Response
Training
Search
C++ Secure Coding Practices
MSC00-CPP. Compile cleanly at high warning levels
Compile code using the highest warning level available for your compiler and eliminate warnings by modifying the code.
According to C99 [ISO/IEC 9899:1999] Section 5.1.1.3:
Assuming a conforming implementation, eliminating diagnostic messages will eliminate any syntactic or constraint violations.
If suitable source code-checking tools are available, use them regularly.
Exceptions
Risk Assessment
References
[ISO/IEC 9899:1999] Section 5.1.1.3, "Diagnostics"
[MITRE 07] CWE ID 563, "Unused Variable"; CWE ID 570, "Expression is Always False"; CWE ID 571, "Expression is Always True"
[Sutter 05] Item 1
[Seacord 05a] Chapter 8, "Recommended Practices"
Related Sites
US-CERT

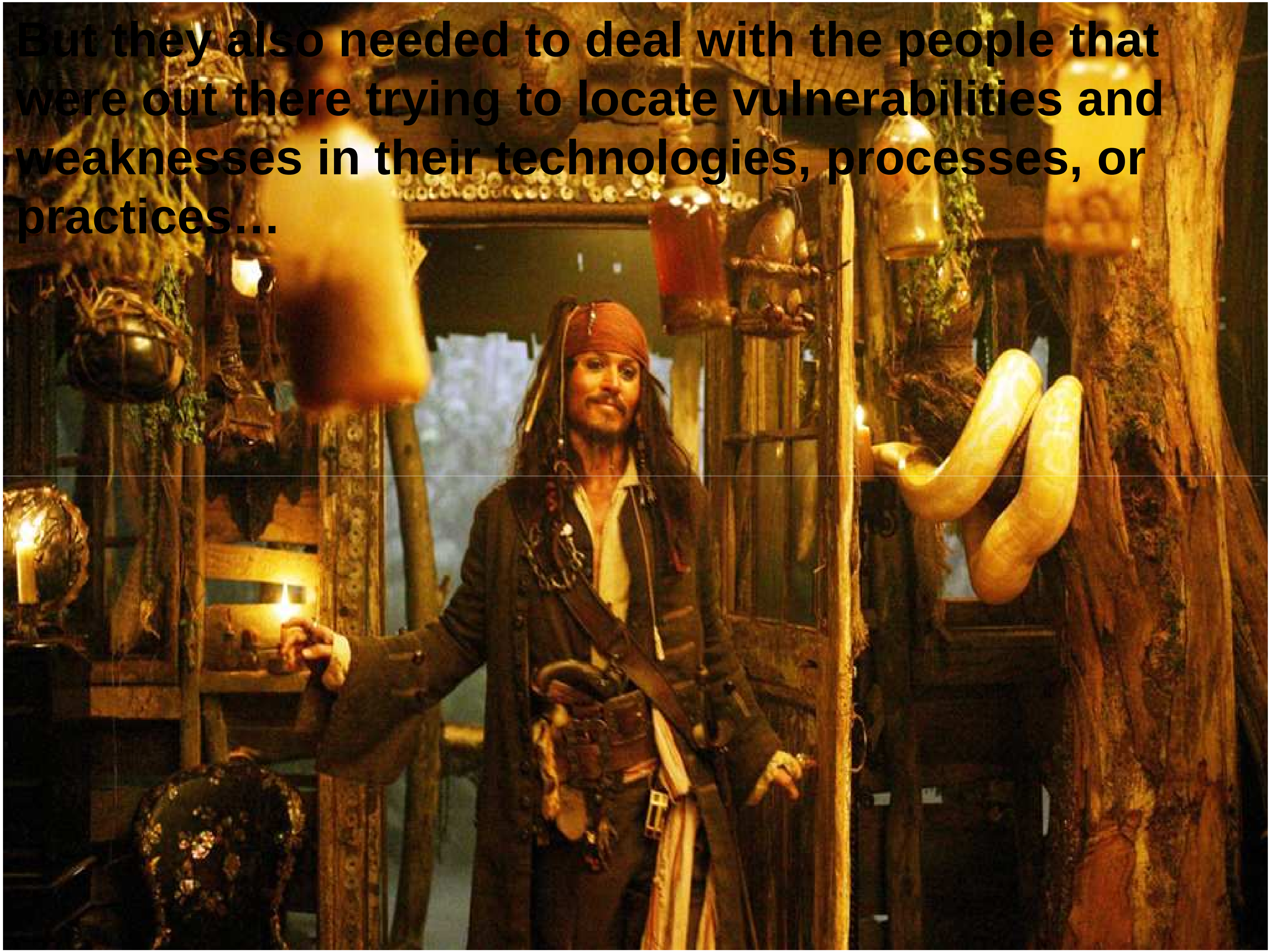
…but new types of threats and hazards can occur in unexpected places and in new ways and…


…some threats and hazards are unpredictable and dynamic…


…so new types of scanning for hazards and threats were created to make shipping safer and more dependable and secure in more places…

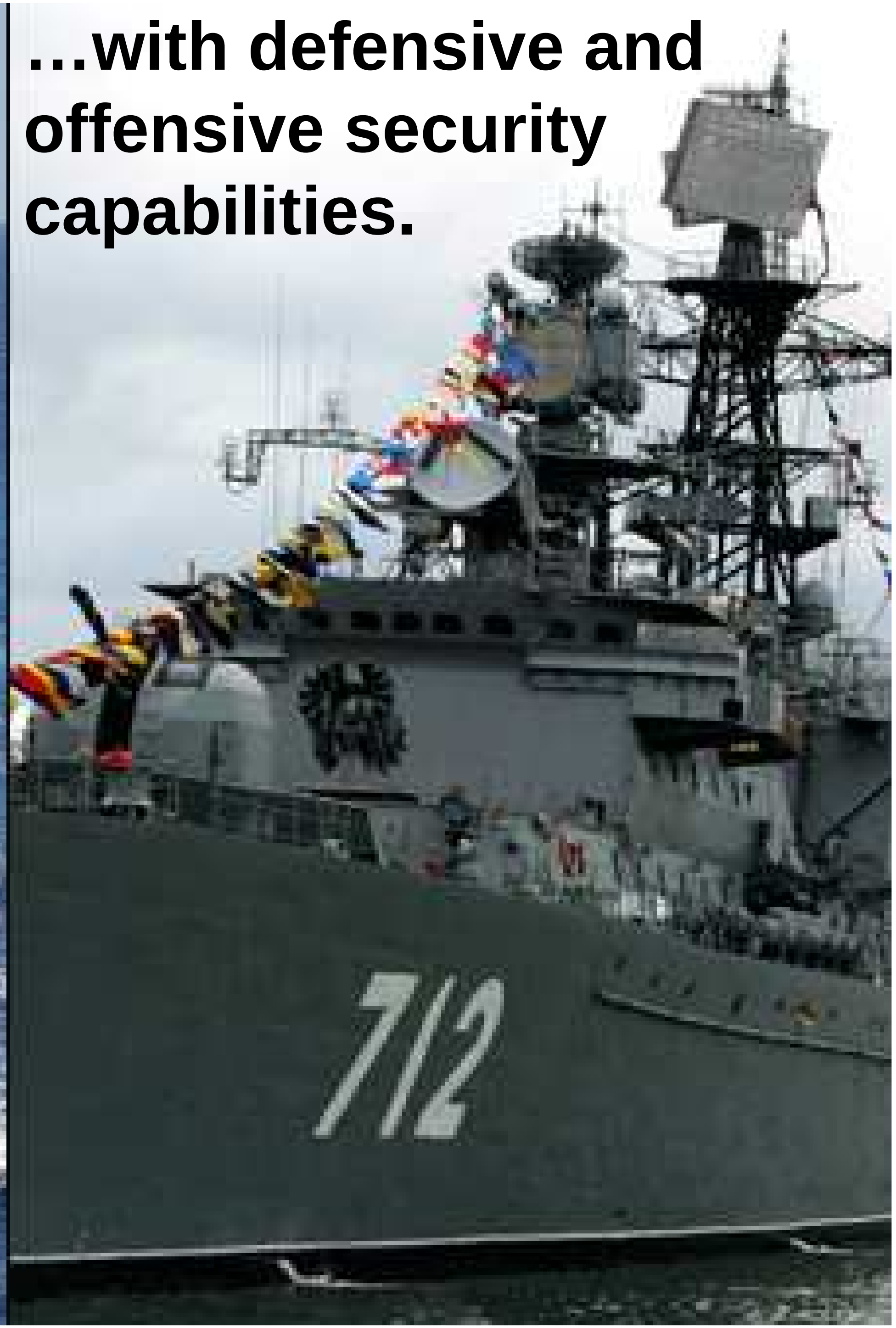


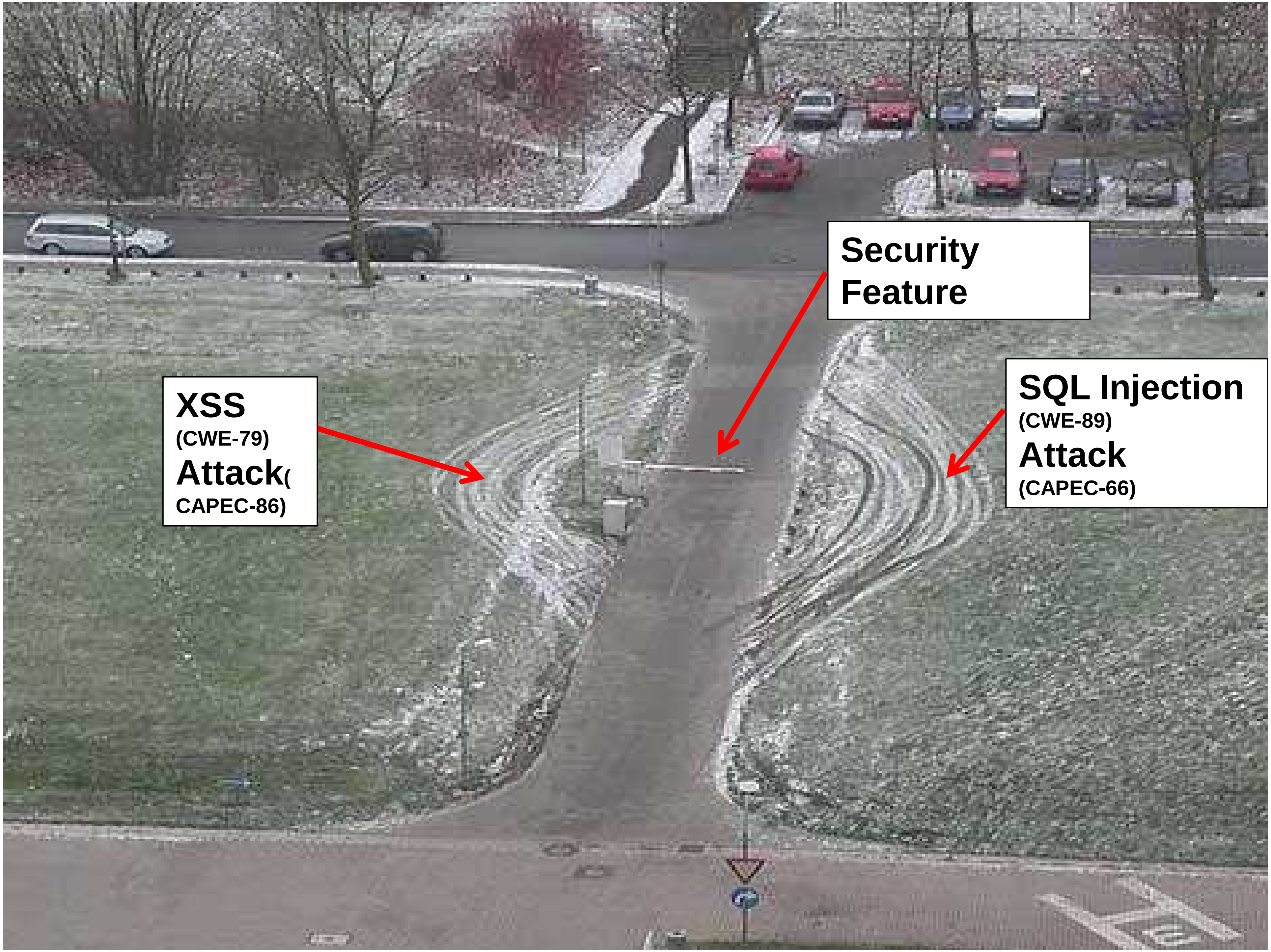
But they also needed to deal with the people that were out there trying to locate vulnerabilities and weaknesses in their technologies, processes, or practices…



…and so they also had to deal with active and intelligent threats…

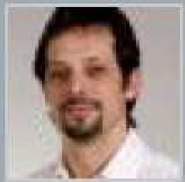
…with defensive and offensive security capabilities.





Security Feature
XSS
(CWE-79)
Attack(
CAPEC-86)
SQL Injection
(CWE-89)
Attack
(CAPEC-66)

Software [In]security: Cyber Warmongering and Influence Peddling

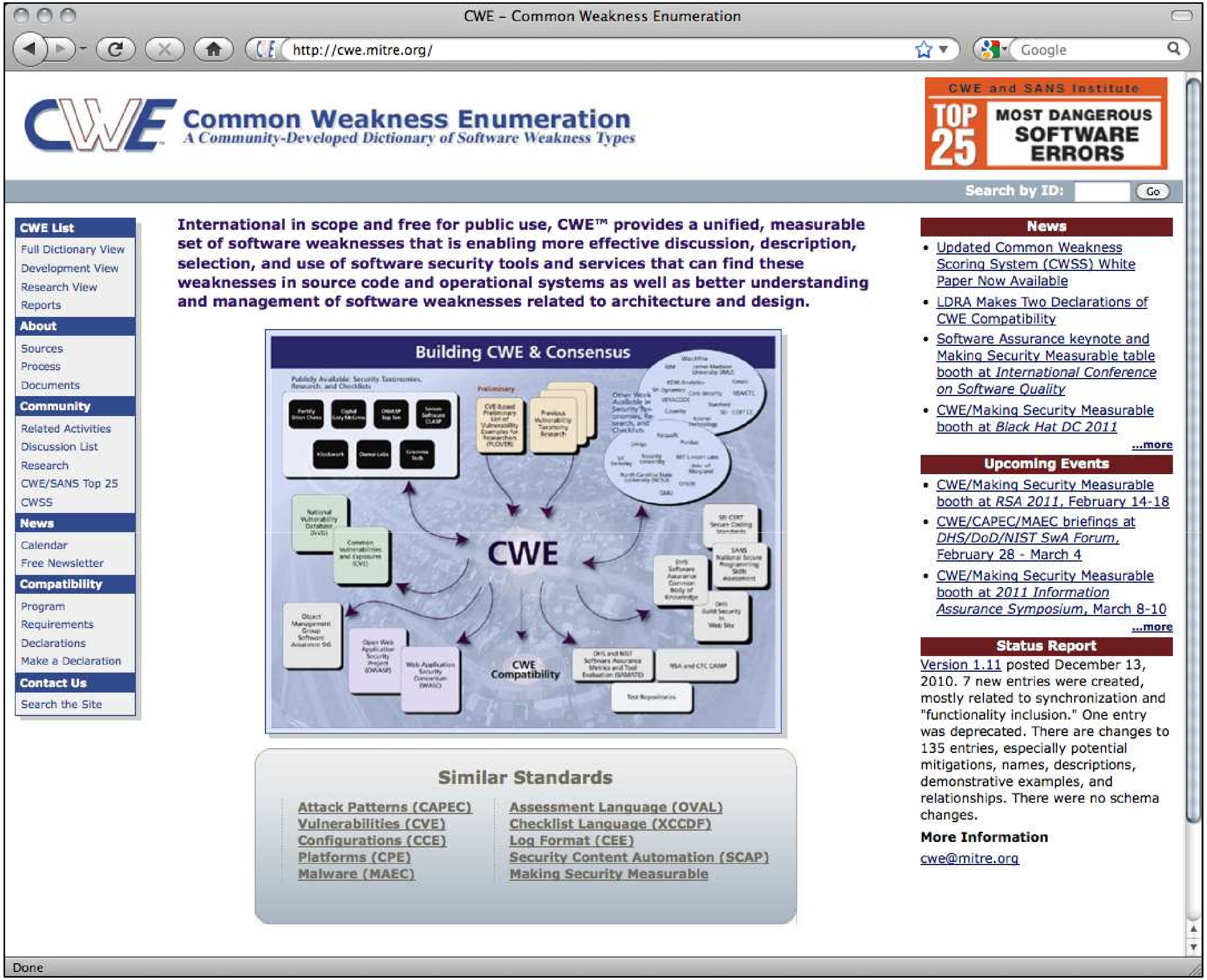



By Gary McGraw and Ivan Arce

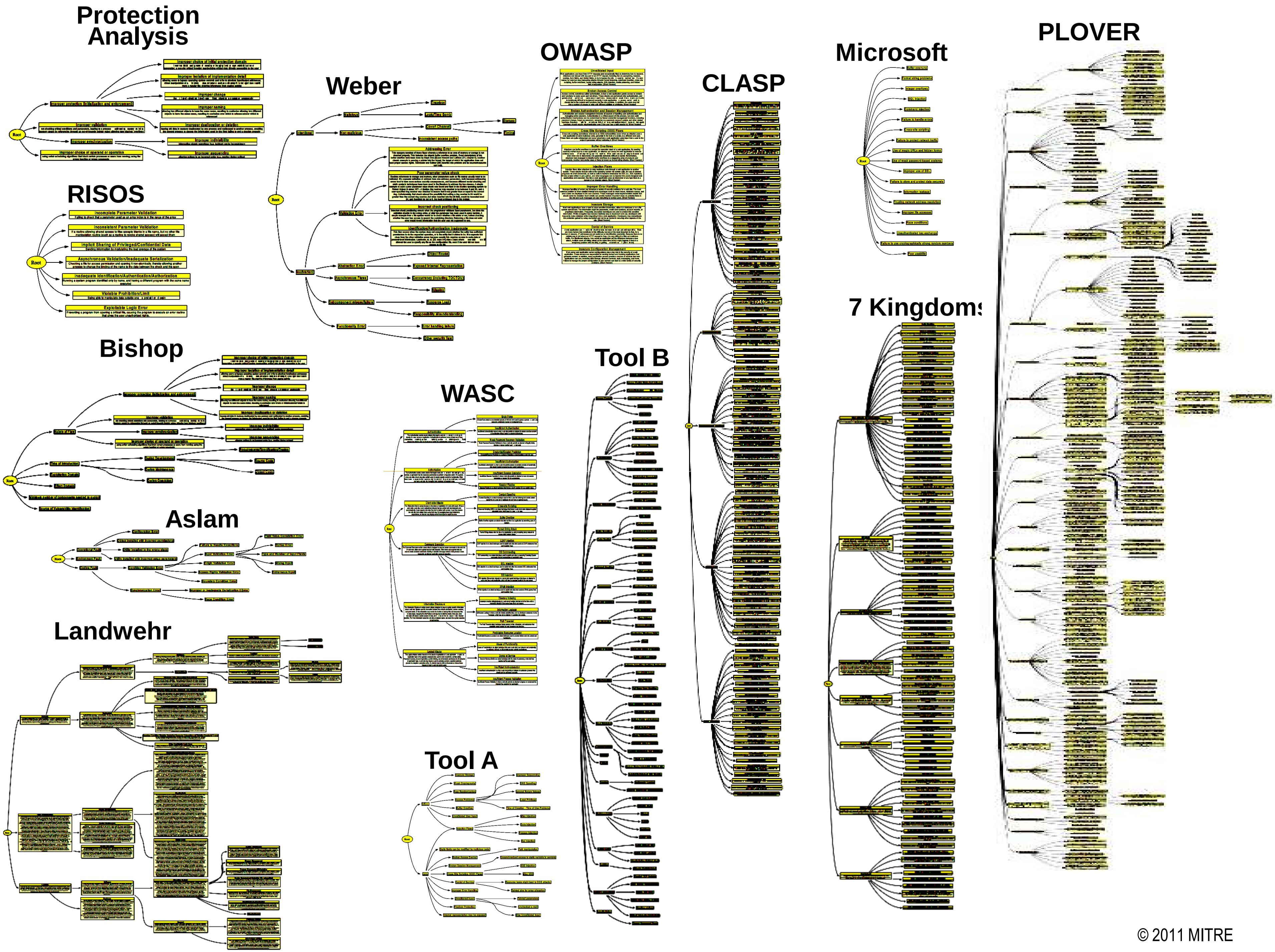
Nov 24, 2010

Article is provided courtesy of Addison-Wesley Professional

"For years in computer security, we have been attempting to protect the broken stuff from the bad people by placing a barrier between the bad people and the broken stuff. We have failed. Instead, we need to fix the broken stuff so that attacking it successfully takes far more resources and skill than is currently the case."

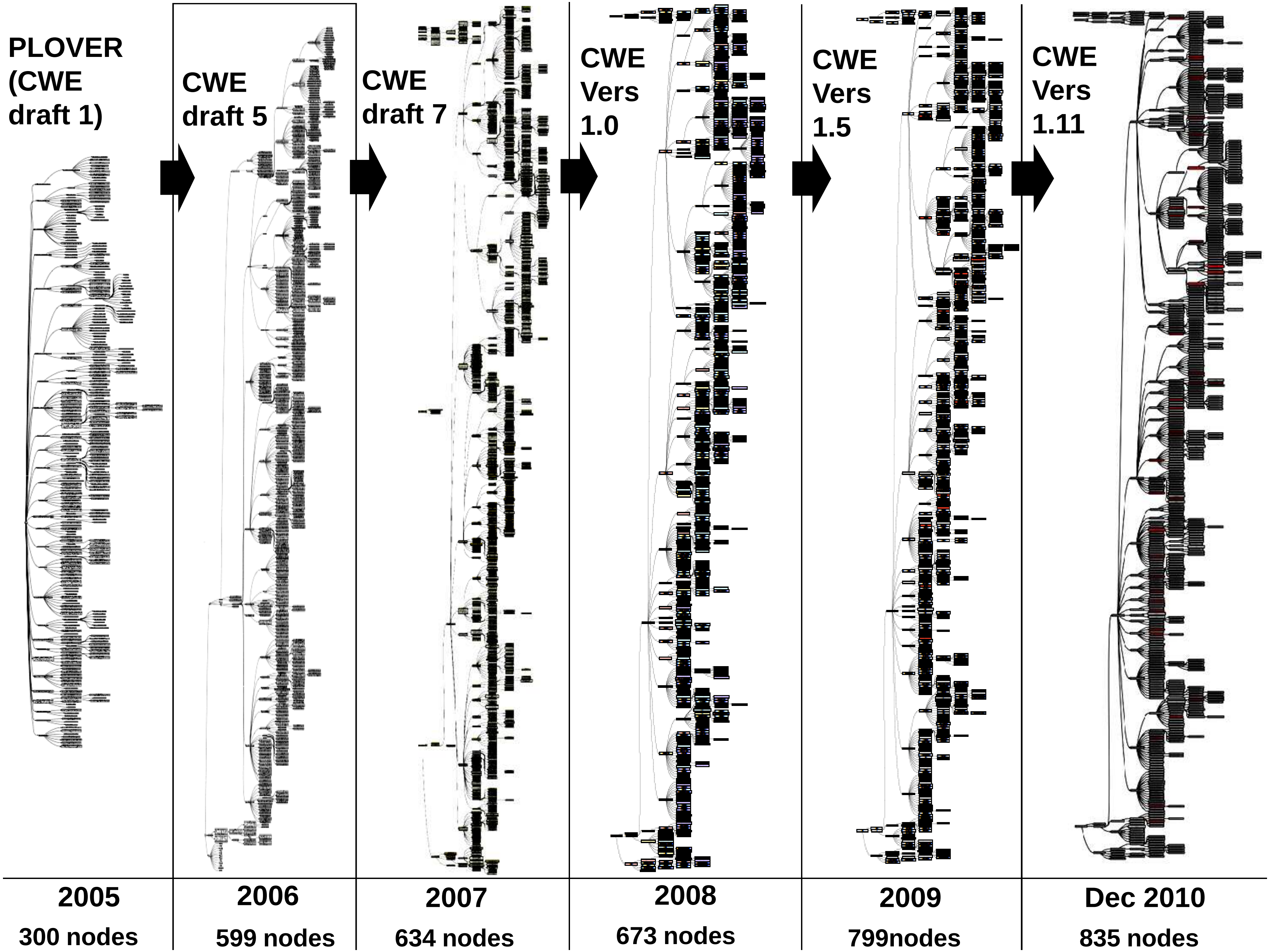

CWE - Common Weakness Enumeration
http://cwe.mitre.org/
Google
Common Weakness Enumeration
A Community-Developed Dictionary of Software Weakness Types
CWE and SANS Institute
TOP 25 MOST DANGEROUS SOFTWARE ERRORS
Search by ID:
Go
CWE List
Full Dictionary View
Development View
Research View
Reports
About
Sources
Process
Documents
Community
Related Activities
Discussion List
Research
CWE/SANS Top 25
CWSS
News
Calendar
Free Newsletter
Compatibility
Program
Requirements
Declarations
Make a Declaration
Contact Us
Search the Site
International in scope and free for public use, CWE™ provides a unified, measurable set of software weaknesses that is enabling more effective discussion, description, selection, and use of software security tools and services that can find these weaknesses in source code and operational systems as well as better understanding and management of software weaknesses related to architecture and design.
Building CWE & Consensus
CWE
CWE Compatibility
Similar Standards
Attack Patterns (CAPEC)
Vulnerabilities (CVE)
Configurations (CCE)
Platforms (CPE)
Malware (MAEC)
Assessment Language (OVAL)
Checklist Language (XCCDF)
Log Format (CEE)
Security Content Automation (SCAP)
Making Security Measurable
News
Updated Common Weakness Scoring System (CWSS) White Paper Now Available
LDRA Makes Two Declarations of CWE Compatibility
Software Assurance keynote and Making Security Measurable table booth at International Conference on Software Quality
CWE/Making Security Measurable booth at Black Hat DC 2011
...more
Upcoming Events
CWE/Making Security Measurable booth at RSA 2011, February 14-18
CWE/CAPEC/MAEC briefings at DHS/DoD/NIST SwA Forum, February 28 - March 4
CWE/Making Security Measurable booth at 2011 Information Assurance Symposium, March 8-10
...more
Status Report
Version 1.11 posted December 13, 2010. 7 new entries were created, mostly related to synchronization and "functionality inclusion." One entry was deprecated. There are changes to 135 entries, especially potential mitigations, names, descriptions, demonstrative examples, and relationships. There were no schema changes.
More Information
cwe@mitre.org
Done

© 2011 MITRE

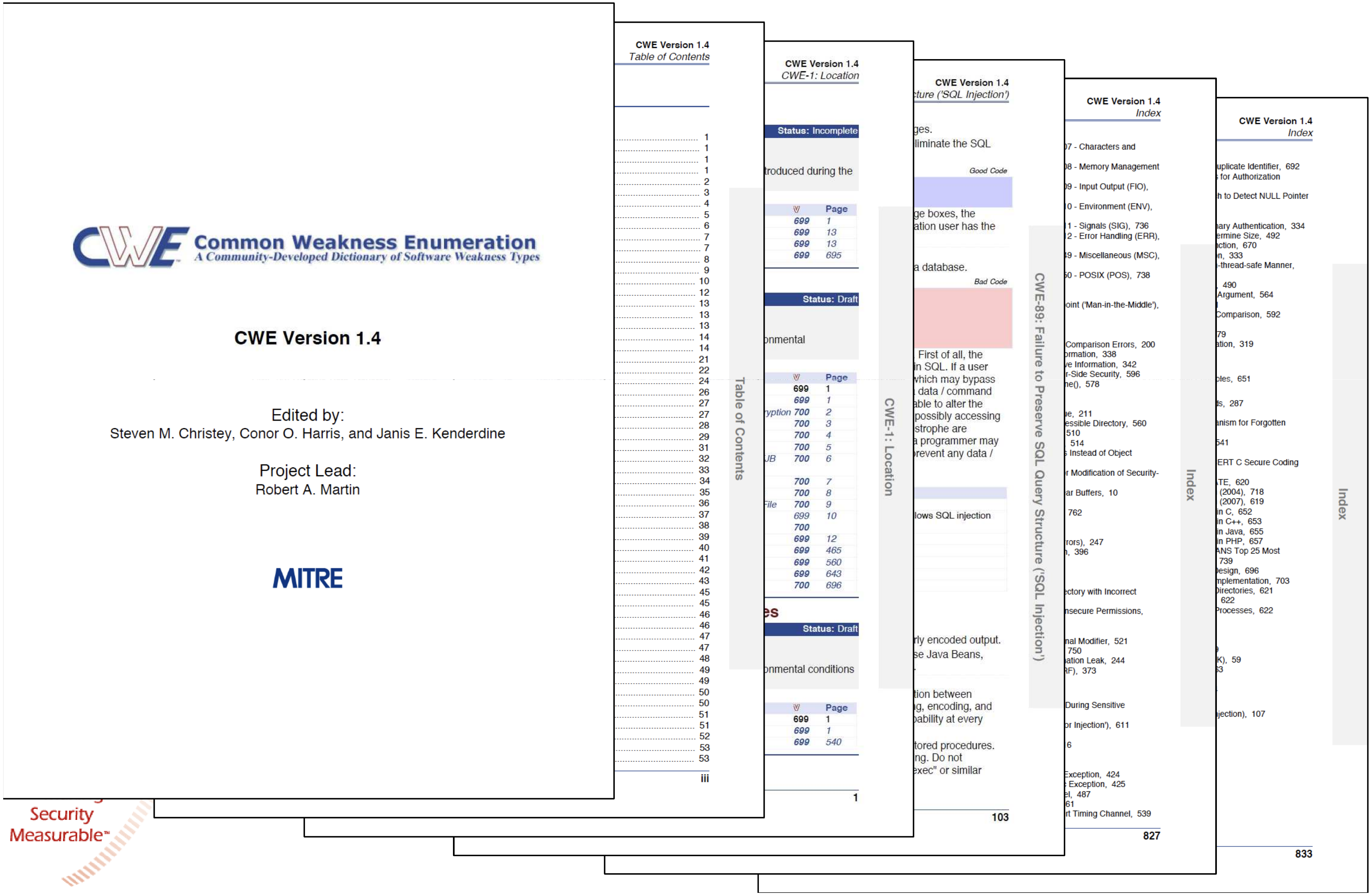


Protection Analysis
RISOS
Bishop
Aslam
Landwehr
Weber
OWASP
WASC
Tool A
CLASP
Tool B
Microsoft
7 Kingdoms
PLOVER

© 2011 MITRE

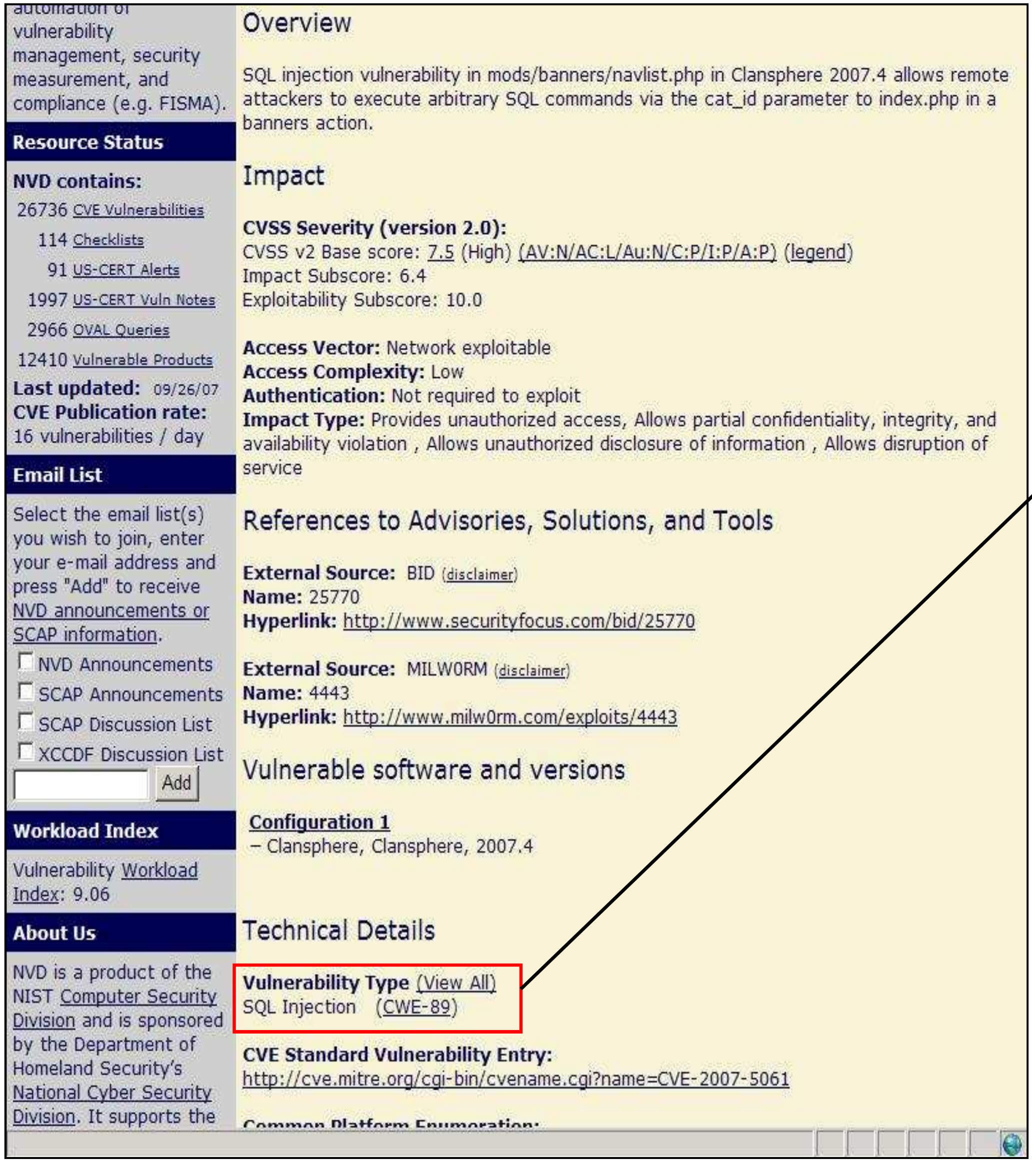

PLOVER (CWE draft 1)
CWE draft 5
CWE draft 7
CWE Vers 1.0
CWE Vers 1.5
CWE Vers 1.11
2005
300 nodes
2006
599 nodes
2007
634 nodes
2008
673 nodes
2009
799nodes
Dec 2010
835 nodes

CWE is Meant for People to Use

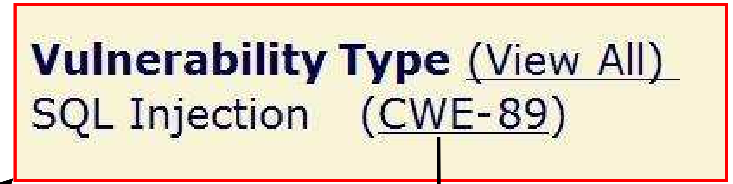


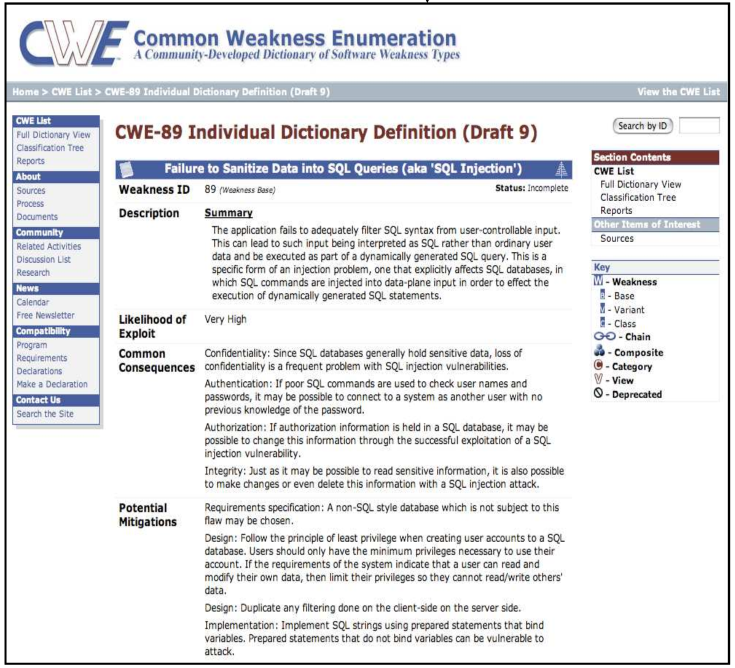
CWE web site visitors by City

Some High-Level CWEs Are Now Part of the NVD CVE Information



NVD XML feeds also include CWE





The Security Development Lifecycle : MS08-078 and the SDL

http://blogs.msdn.com/sdl/archive/2008/12/18/ms08-078-and-the-sdl.aspx

MS08-078 and the SDL

Hi, Michael here.

Every bug is an opportunity to learn, and the security update that fixed the data binding bug that affected Internet Explorer users is no exception.

The Common Vulnerabilities and Exposures (CVE) entry for this bug is CVE-2008-4844.

Before I get started, I want to explain the goals of the SDL and the security work here at Microsoft. The SDL is designed as a multi-layered process to help systemically reduce security vulnerabilities; if one component of the SDL process fails to prevent or catch a bug, then some other component should prevent or catch the bug. The SDL also mandates the use of security defenses whose impact will be reflected in the "mitigations" section of a security bulletin, because we know that no software development process will catch all security bugs. As we have said many times, the goal of the SDL is to "Reduce vulnerabilities, and reduce the severity of what's missed."

In this post, I want to focus on the SDL-required code analysis, code review, fuzzing and compiler and operating system defenses and how they fared.

Background

The bug was an invalid pointer dereference in MSHTML.DLL when the code handles data binding. It's important to point out that there is no heap corruption and there is no heap-based buffer overrun!

When data binding is used, IE creates an object which contains an array of data binding objects. In the code in question, when a data binding object is released, the array length is not correctly updated leading to a function call into freed memory.

The vulnerable code looks a little like this (by the way, the real array name is _aryPXfer, but I figured ArrayOfObjectsFromIE is a little more descriptive for people not in the Internet Explorer team.)

```
int MaxIdx = ArrayOfObjectsFromIE.Size()-1;
for (int i=0; i <= MaxIdx; i++) {
     if (!ArrayOfObjectsFromIE[i])
          continue;
   ArrayOfObjectsFromIE[i]->TransferFromSource();
   ...
}
```

Here's how the vulnerability manifests itself: if there are two data transfers with the same identifier (so MaxIdx is 2), and the first transfer updates the length of the ArrayOfObjectsFromIE array when its work was done and releases its data binding object, the loop count would still be whatever MaxIdx was at the start of the loop, 2.

This is a time-of-check-time-of-use (TOCTOU) bug that led to code calling into a freed memory block. The Common Weakness Enumeration (CWE) classification for this vulnerability is CWE-367.

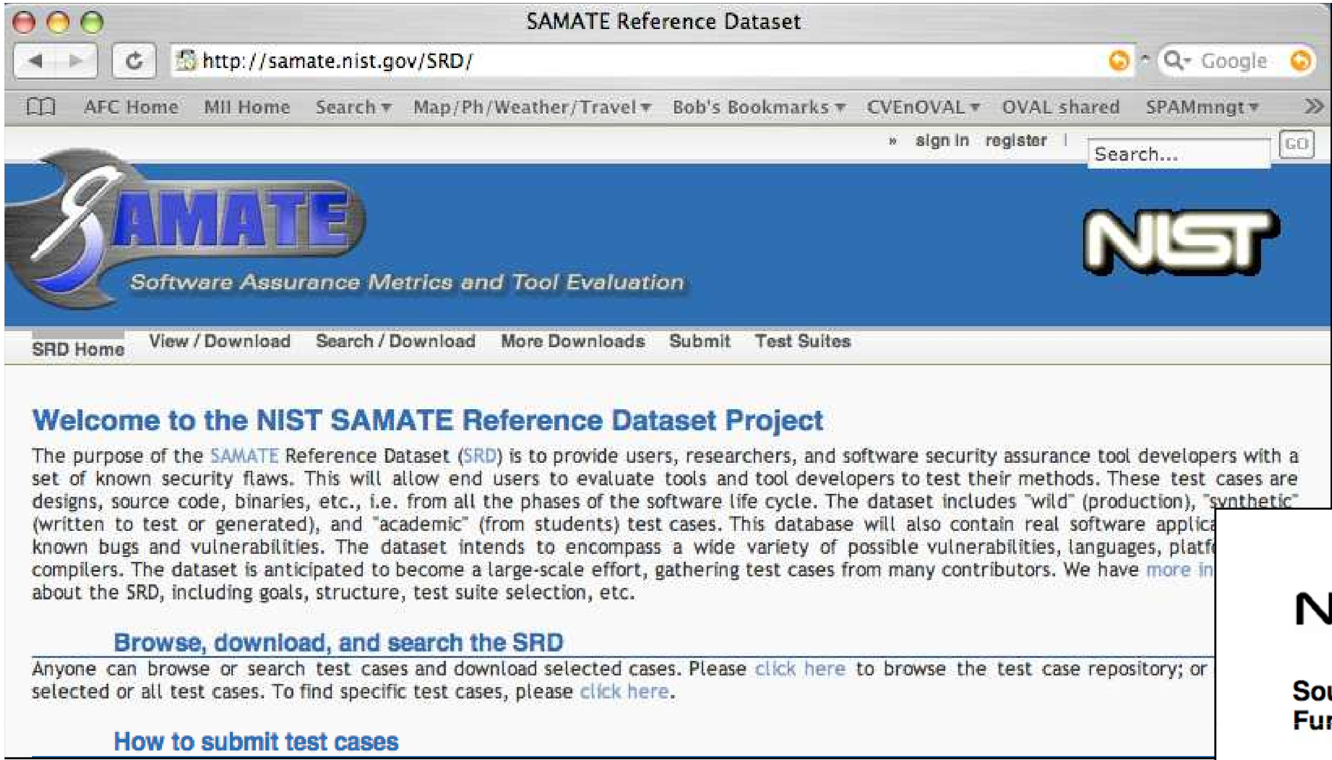
The fix was to check the maximum iteration count on each loop iteration rather than once before the loop starts; this is the correct fix for a TOCTOU bug – move the check as close as possible to the action because, in

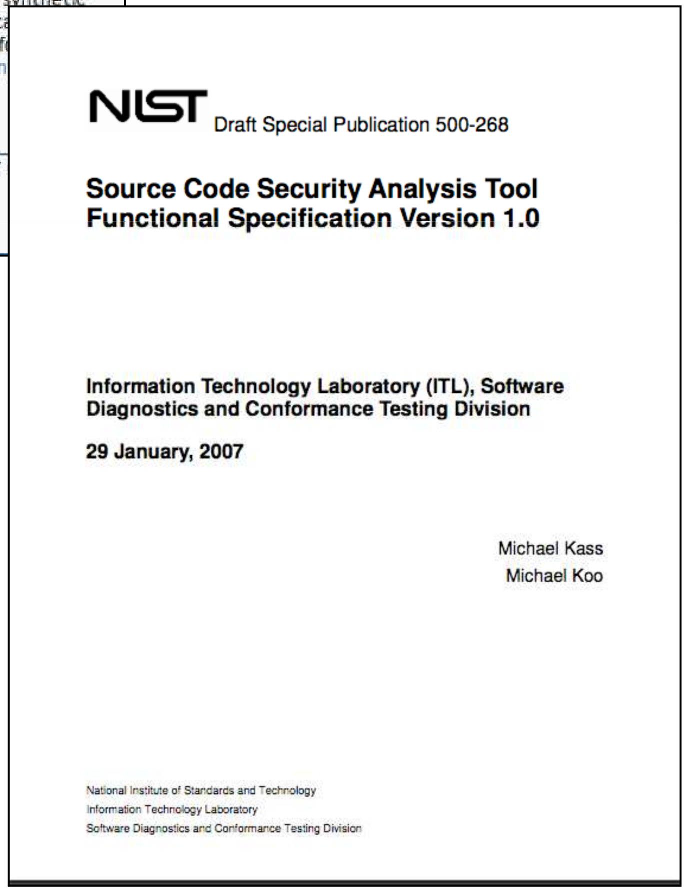
a time-of-check-time-of-use (TOCTOU) bug that led to code calling into a freed memory block. The
on Weakness Enumeration (CWE) classification for this vulnerability is CWE-367.

TOCTOU issues. We will update our training to address this.

Our static analysis tools don't find this because the tools would need to understand the re-entrant nature of the code.

Fuzz Testing




NIST Draft Special Publication 500-268

Source Code Security Analysis Tool Functional Specification Version 1.0

Information Technology Laboratory (ITL), Software Diagnostics and Conformance Testing Division

29 January, 2007

Michael Kass
Michael Koo

National Institute of Standards and Technology
Information Technology Laboratory
Software Diagnostics and Conformance Testing Division

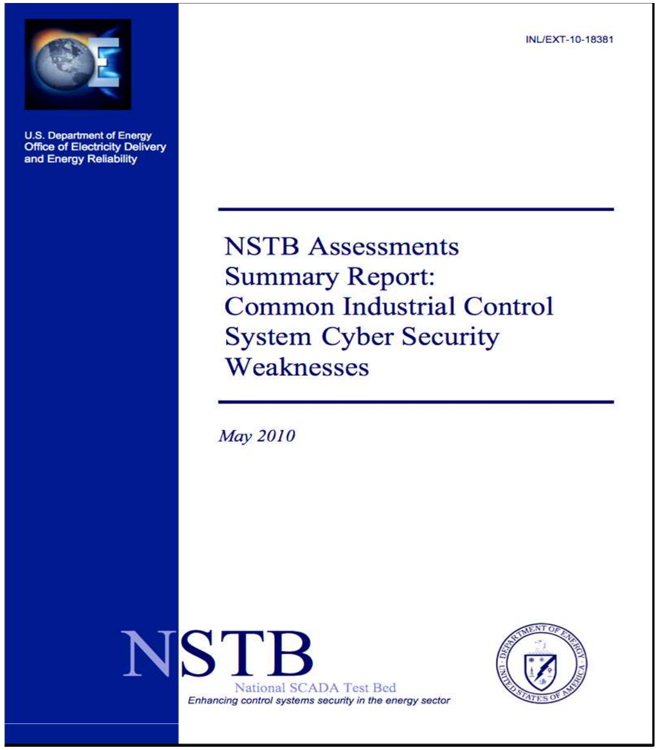
NIST Special Publications:

SP500-268	**CWE**
SP500-269	**CWE**
SP800-53a	**CVE, OVAL, CWE**
SP800-115	**CVE, CCE, CVSS, CWE**

NIST Interagency Reports:

NISTIR-7435	**CVE, CVSS, CWE**
NISTIR-7628	**CVE, CWE**

Idaho National Labs SCADA Report


INL/EXT-10-18381

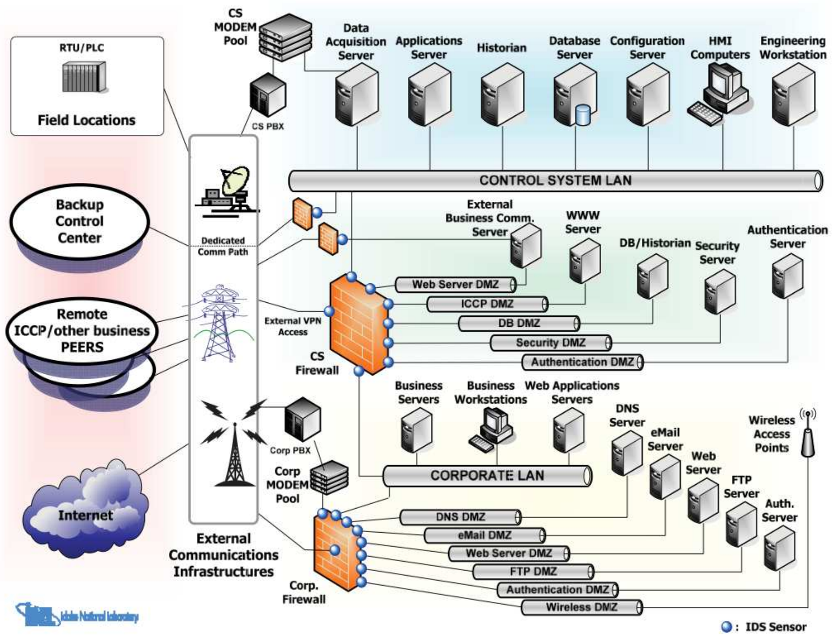
U.S. Department of Energy
Office of Electricity Delivery
and Energy Reliability

NSTB Assessments
Summary Report:
Common Industrial Control
System Cyber Security
Weaknesses

May 2010

NSTB
National SCADA Test Bed
Enhancing control systems security in the energy sector

SECURE CONTROL SYSTEM/ENTERPRISE ARCHITECTURE



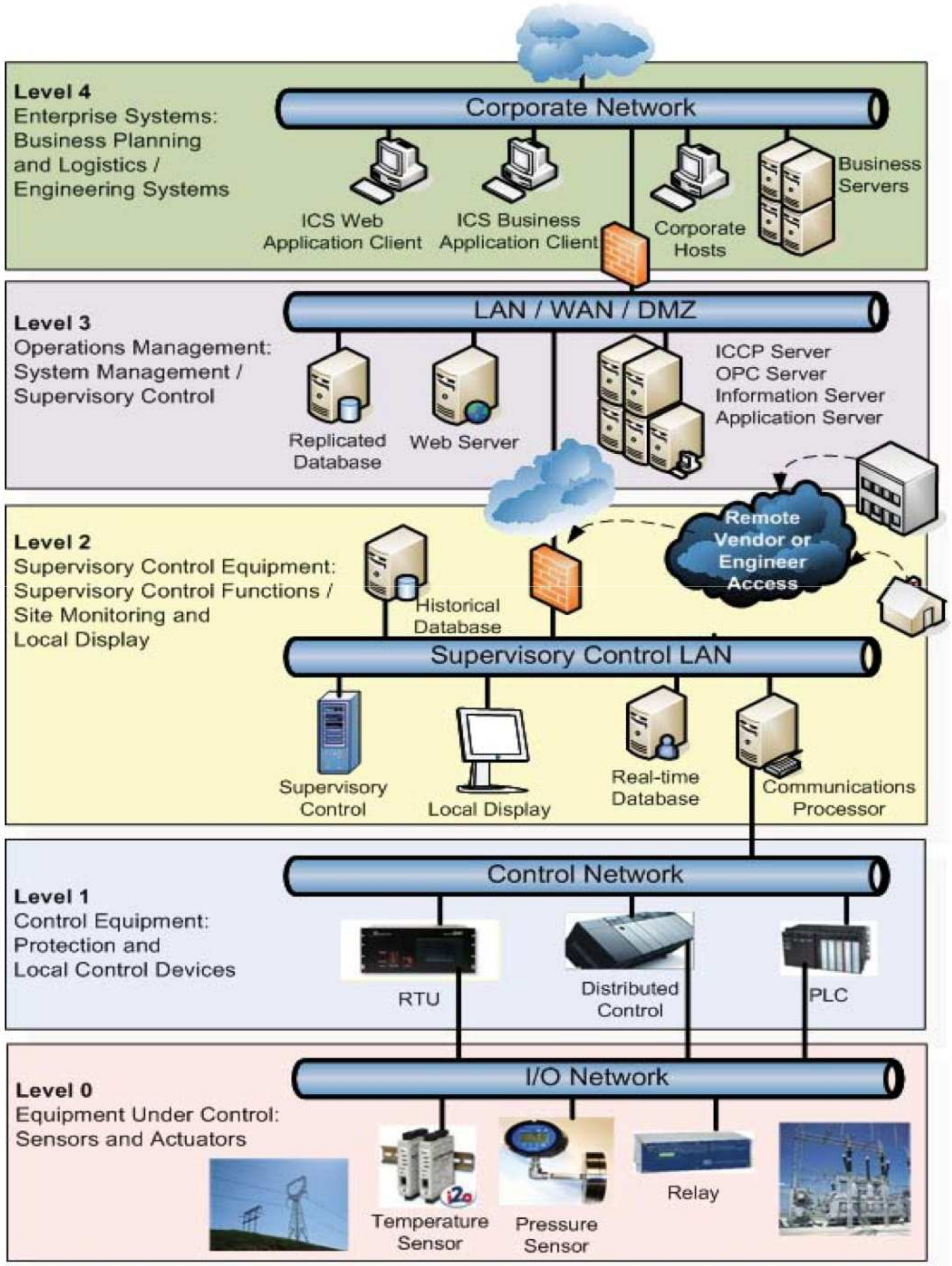


Table 27. Most common programming errors found in ICS code.

Weakness Classification	Vulnerability Type
CWE-19: Data Handling	CWE-228: Improper Handling of Syntactically Invalid Structure
	CWE-229: Improper Handling of Values
	CWE-230: Improper Handling of Missing Values
	CWE-20: Improper Input Validation
	CWE-116: Improper Encoding or Escaping of Output
	CWE-195: Signed to Unsigned Conversion Error
	CWE-198: Use of Incorrect Byte Ordering
CWE-119: Failure to Constrain Operations within the Bounds of a Memory Buffer	CWE-120: Buffer Copy without Checking Size of Input ("Classic Buffer Overflow")
	CWE-121: Stack-based Buffer Overflow
	CWE-122: Heap-based Buffer Overflow
	CWE-125: Out-of-bounds Read
	CWE-129: Improper Validation of Array Index
	CWE-131: Incorrect Calculation of Buffer Size
	CWE-170: Improper Null Termination
	CWE-190: Integer Overflow or Wraparound
	CWE-680: Integer Overflow to Buffer Overflow
CWE-398: Indicator of Poor Code Quality	CWE-454: External Initialization of Trusted Variables or Data Stores
	CWE-456: Missing Initialization
	CWE-457: Use of Uninitialized Variable
	CWE-476: NULL Pointer Dereference
	CWE-400: Uncontrolled Resource Consumption ("Resource Exhaustion")
	CWE-252: Unchecked Return Value
	CWE-690: Unchecked Return Value to NULL Pointer Dereference
	CWE-772: Missing Release of Resource after Effective Lifetime
CWE-442: Web Problems	CWE-22: Improper Limitation of a Pathname to a Restricted Directory ("Path Traversal")
	CWE-79: Failure to Preserve Web Page Structure ("Cross-site Scripting")
	CWE-89: Failure to Preserve SQL Query Structure ("SQL Injection")
CWE-703: Failure to Handle Exceptional Conditions	CWE-431: Missing Handler
	CWE-248: Uncaught Exception
	CWE-755: Improper Handling of Exceptional Conditions
	CWE-390: Detection of Error Condition Without Action

16 July 2010

A Human Capital Crisis in Cybersecurity

Technical Proficiency Matters

A White Paper of the
CSIS Commission on Cybersecurity for the 44th Presidency

COCHAIRS
Representative James R. Langevin
Representative Michael T. McCaul
Scott Charney
Lt. General Harry Raduege, USAF (ret.)

based on a body of knowledge that represents the complete set of concepts, terms and activities that make up a professional domain. And absent such a body of knowledge there is little basis for supporting a certification program. Indeed it would be dangerous and misleading.

A complete body of knowledge covering the entire field of software engineering may be years away. However, the body of knowledge needed by professionals to create software free of common and critical security flaws has been developed, vetted widely and kept up to date. That is the foundation for a certification program in software assurance that can gain wide adoption. It was created in late 2008 by a consortium of national experts, sponsored by DHS and NSA, and was updated in late 2009. It contains ranked lists of the most common errors, explanations of why the errors are dangerous, examples of those errors in multiple languages, and ways of eliminating those errors. It can be found at http://cwe.mitre.org/top25.

Any programmer who writes code without being aware of those problems and is not capable of writing code free of those errors is a threat to his or her employers and to others who use computers connected to systems running his or her software.

A complete body of knowledge covering the entire field of software engineering may be years away. However, the body of knowledge needed by professionals to create software free of common and critical security flaws has been developed, vetted widely and kept up to date. That is the foundation for a certification program in software assurance that can gain wide adoption. It was created in late 2008 by a consortium of national experts, sponsored by DHS and NSA, and was updated in late 2009. It contains ranked lists of the most common errors, explanations of why the errors are dangerous, examples of those errors in multiple languages, and ways of eliminating those errors. It can be found at http://cwe.mitre.org/top25.

Any programmer who writes code without being aware of those problems and is not capable of writing code free of those errors is a threat to his or her employers and to others who use computers connected to systems running his or her software.

© 2011 MITRE

Industry Uptake

Foreword

In 2008, the Software Assurance Forum for Excellence in Code (SAFECode) published the first version of this report in an effort to help others in the industry initiate or improve their own software assurance programs and encourage the industry-wide adoption of what we believe to be the most fundamental secure development methods. This work remains our most in-demand paper and has been downloaded more than 50,000 times since its original release.

However, secure software development is not only a goal, it is also a process. In the nearly two and a half years since we first released this paper, the process of building secure software has continued to evolve and improve alongside innovations and advancements in the information and communications technology industry. Much has been learned not only through increased community collaboration, but also through the ongoing internal efforts of SAFECode's member companies. This 2nd Edition aims to help disseminate that new knowledge.

Just as with the original paper, this paper is not meant to be a comprehensive guide to all possible secure development practices. Rather, it is meant to provide a foundational set of secure development practices that have been effective in improving software security in real-world implementations by SAFECode members across their diverse development environments.

It is important to note that these are the "practiced practices" employed by SAFECode members, which we identified through an ongoing analysis of our members' individual software security efforts. By

> The paper also contains two important, additional sections for each listed practice that will further increases its value to implementers—Common Weakness Enumeration (CWE) references and Verification guidance.
>
> SAFECode
> Software Assurance Forum for Excellence in Code
> Driving Security and Integrity

The paper also contains two important, additional sections for each listed practice that will further increases its value to implementers—Common Weakness Enumeration (CWE) references and Verification guidance.

CWE References

Much of CWE focuses on implementation issues, and Threat Modeling is a design-time event. There are, however, a number of CWEs that are applicable to the threat modeling process, including:

- CWE-287: Improper authentication is an example of weakness that could be exploited by a Spoofing threat
- CWE-264: Permissions, Privileges, and Access Controls is a parent weakness of many Tampering, Repudiation and Elevation of Privilege threats
- CWE-311: Missing Encryption of Sensitive Data is an example of an Information Disclosure threat
- CWE-400: (uncontrolled resource consumption) is one example of an unmitigated Denial of Service threat

CWE

An example of a portion of a test plan derived from a Threat Model could be:

Threat Identified	Design Element(s)	Mitigation	Verification
Session Hijacking	GUI	Ensure random session identifiers of appropriate length	Collect session identifiers over a number of sessions and examine distribution and length
Tampering with data in transit	Process A on server to Process B on client	Use SSL to ensure that data isn't modified in transit	Assert that communication cannot be established without the use of SSL

SAFECode — Driving Security and Integrity

Fundamental Practices for Secure Software Development
2ND EDITION

A Guide to the Most Effective Secure Development Practices in Use Today

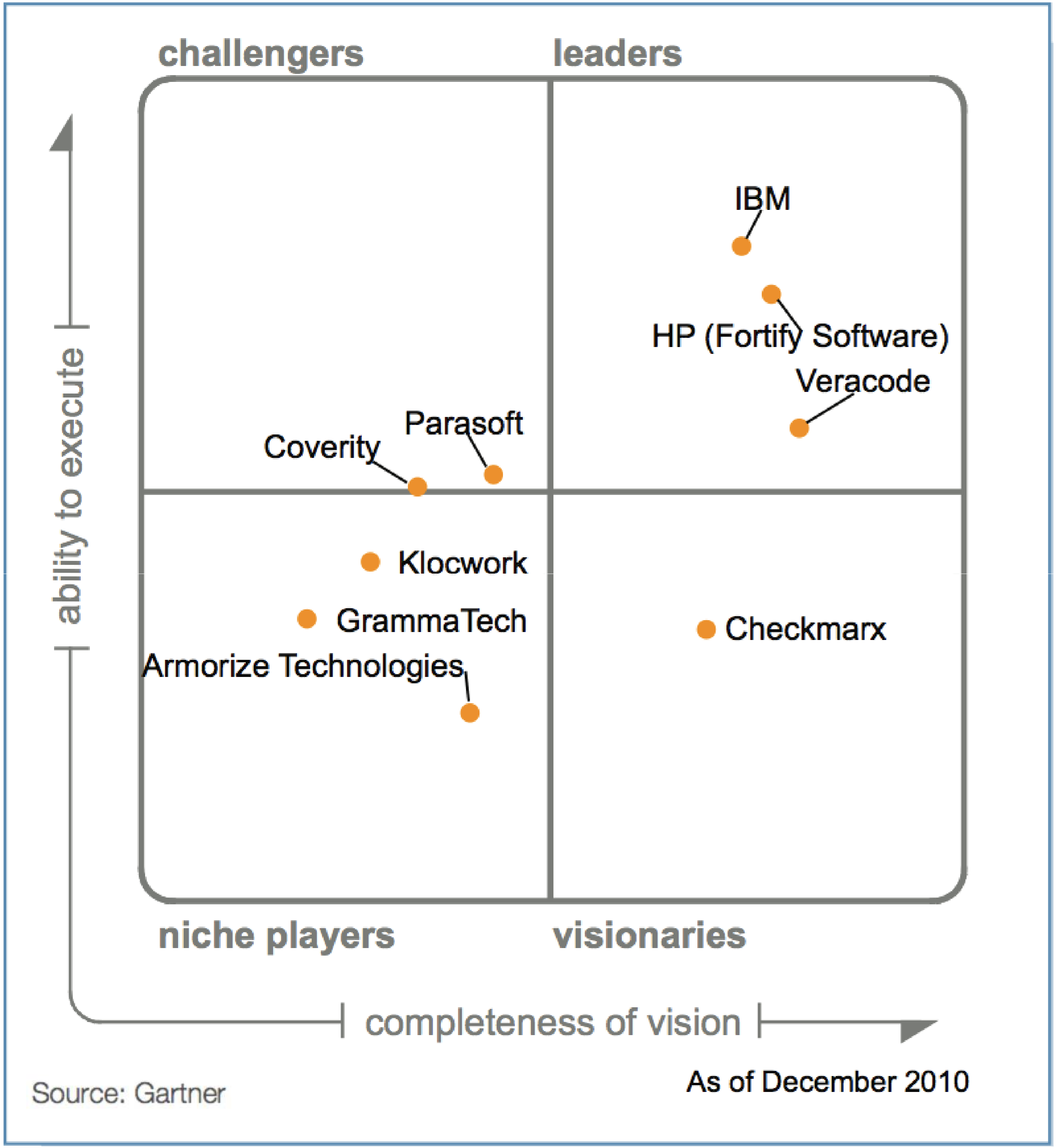
February 8, 2011

EDITOR Stacy Simpson, SAFECode

AUTHORS
Mark Belk, Juniper Networks
Matt Coles, EMC Corporation
Cassio Goldschmidt, Symantec Corp.
Michael Howard, Microsoft Corp.
Kyle Randolph, Adobe Systems Inc.
Mikko Saario, Nokia
Reeny Sondhi, EMC Corporation
Izar Tarandach, EMC Corporation
Antti Vähä-Sipilä, Nokia
Yonko Yonchev, SAP AG

Making Security Measurable™

© 2011 MITRE



Gartner Magic Quadrant for Static Application Security Testing Tools

Plus Some Other Important Tool Players…

Cenzic
CAST Software
Polyspace
Security Innovation
LDRA
KDM Analytics
SureLogic
Programming Research Inc
SofCheck

© 2011 MITRE

CWE Compatibility & Effectiveness Program

(launched Feb 2007)

CWE – CWE Compatibility

http://cwe.mitre.org/compatible/index.html

AFC Home MII Home Search Map/Ph/Weather/Travel Bob's Bookmarks CVEnOVAL OVAL shared SPAMmngt LogoutofSPAMmngt

Common Weakness Enumeration

A community-developed dictionary of common software weaknesses

Home > Compatibility View the CWE List

CWE List

Full Dictionary View

CWE Compatibility

Section Contents

Compatibility

SECURITY DATABASE KDM Analytics VERACODE FORTIFY SOFTWARE armorize technologies SecurityReason SkillBridge coverity Klocwork PARASOFT EMC² CODENOMICON defensics CENZIC GRAMMATECH symantec SANS (ISC)² CERIAS IPA SofCheck IBM watchfire checkmarx OUNCE LABS PRQA Programming Research CAST LDRA Software Technology cigital hp SPI DYNAMICS

INFORMATION-TECHNOLOGY PROMOTION AGENCY, JAPAN

Organizations Participating

All organizations participating in the CWE Compatibility and Effectiveness Program are listed below, including those with CWE-Compatible Products and Services and those with Declarations to Be CWE-Compatible.

Products are listed alphabetically by organization name:

TOTALS

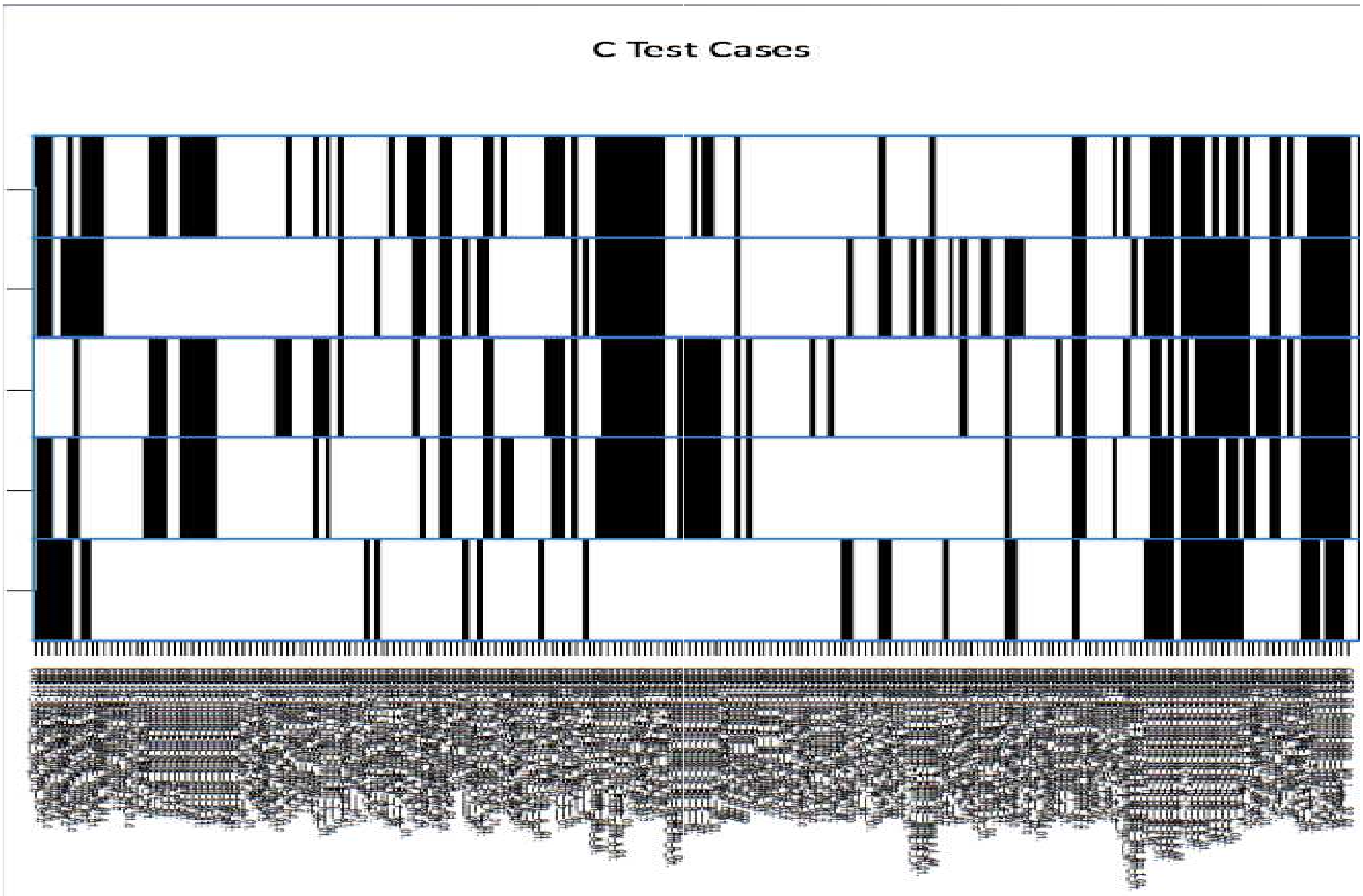
Organizations Participating: 29

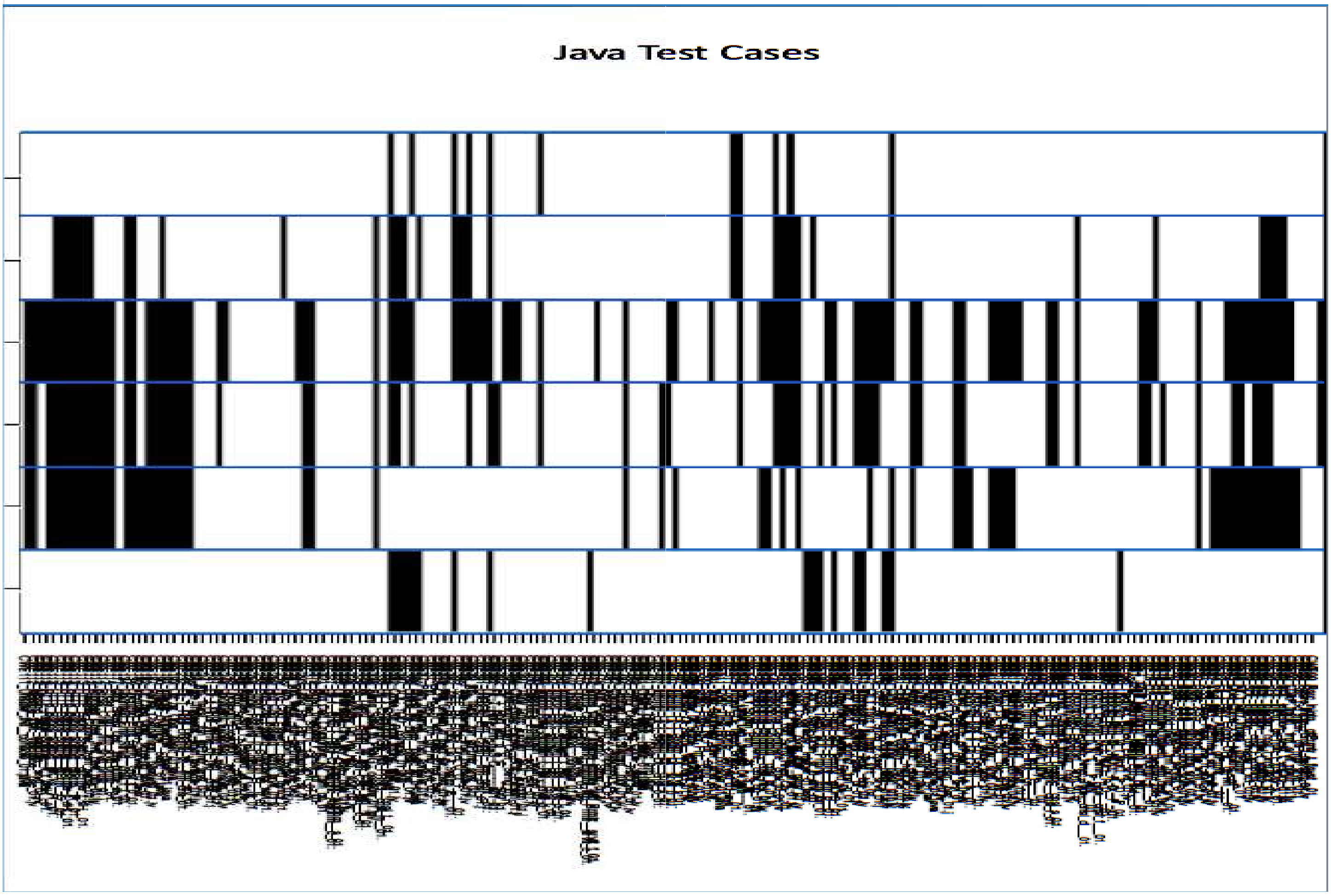
Products & Services: 48

December 29, 2006

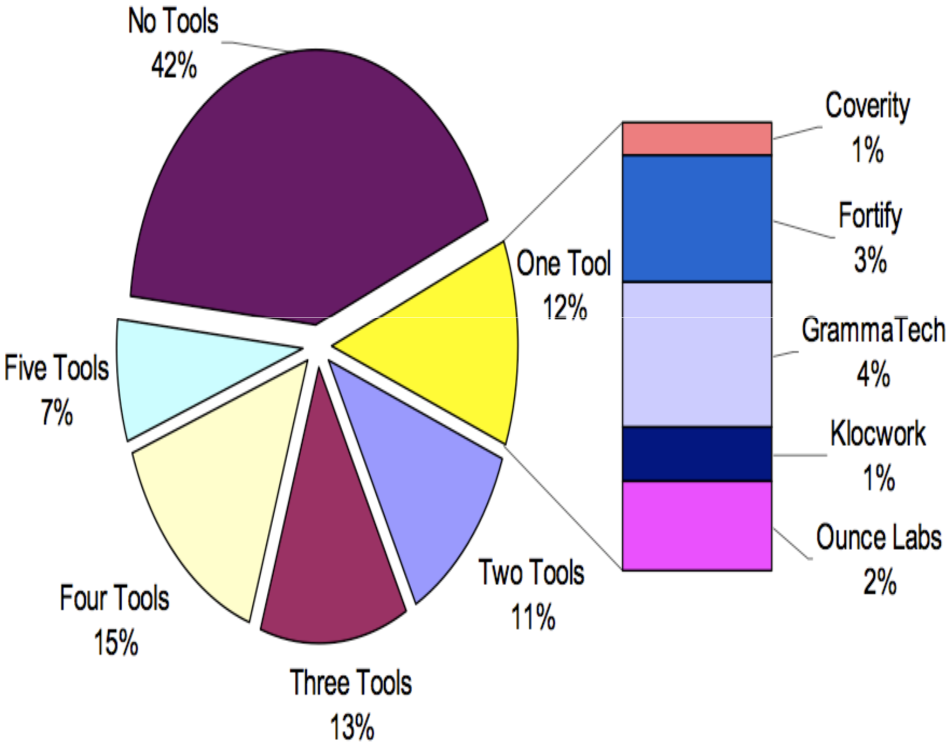
cwe.mitre.org/compatible/

© 2011 MITRE

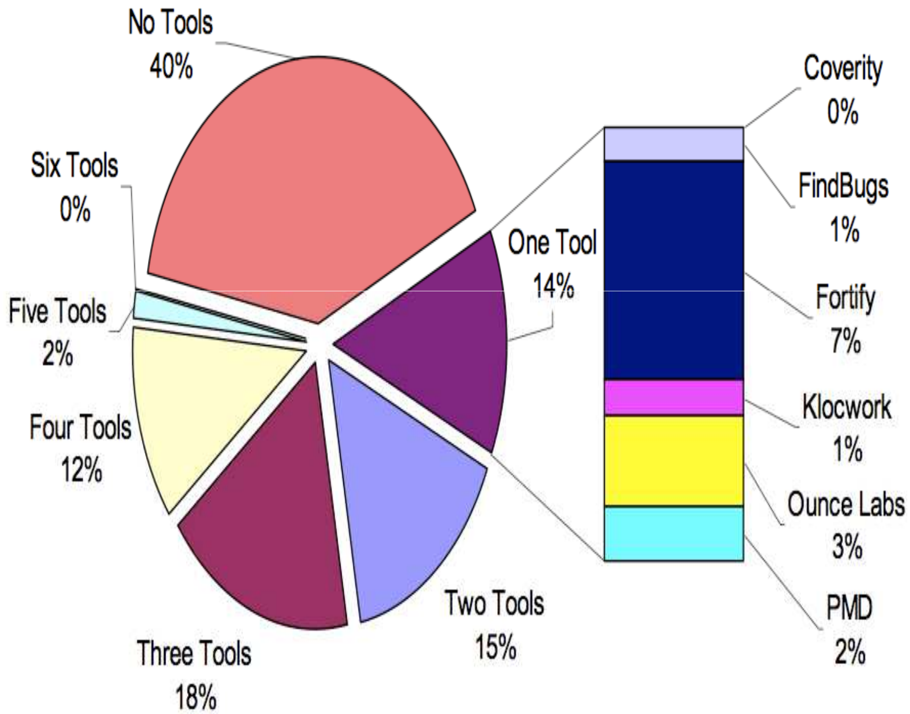

C Test Cases


Java Test Cases

C/C++ "Breadth" Test Case Coverage



Java "Breadth" Test Case Coverage



Making Security Measurable™

© 2011 MITRE

Code Analysis Effectiveness Assessment…

The Open Group

CWE Validation
Effectiveness Testing - ?

DHS

CWE Compatibility
and Effectiveness

CWEs with WhiteBox Definitions

DoD

Center For Assure SW
Tool Evaluation 2007
Tool Evaluation 2009

IARPA
STONESOUP- Securely Taking On New Executable Stuff Of Uncertain Provenance

OSD/NII
CWE Formalization

NIST

NIST SAMATE
SP 500-267
SP 500-269
SP 500-270

SAMATE Repository Dataset (SRD)

Automated Test Case Generator

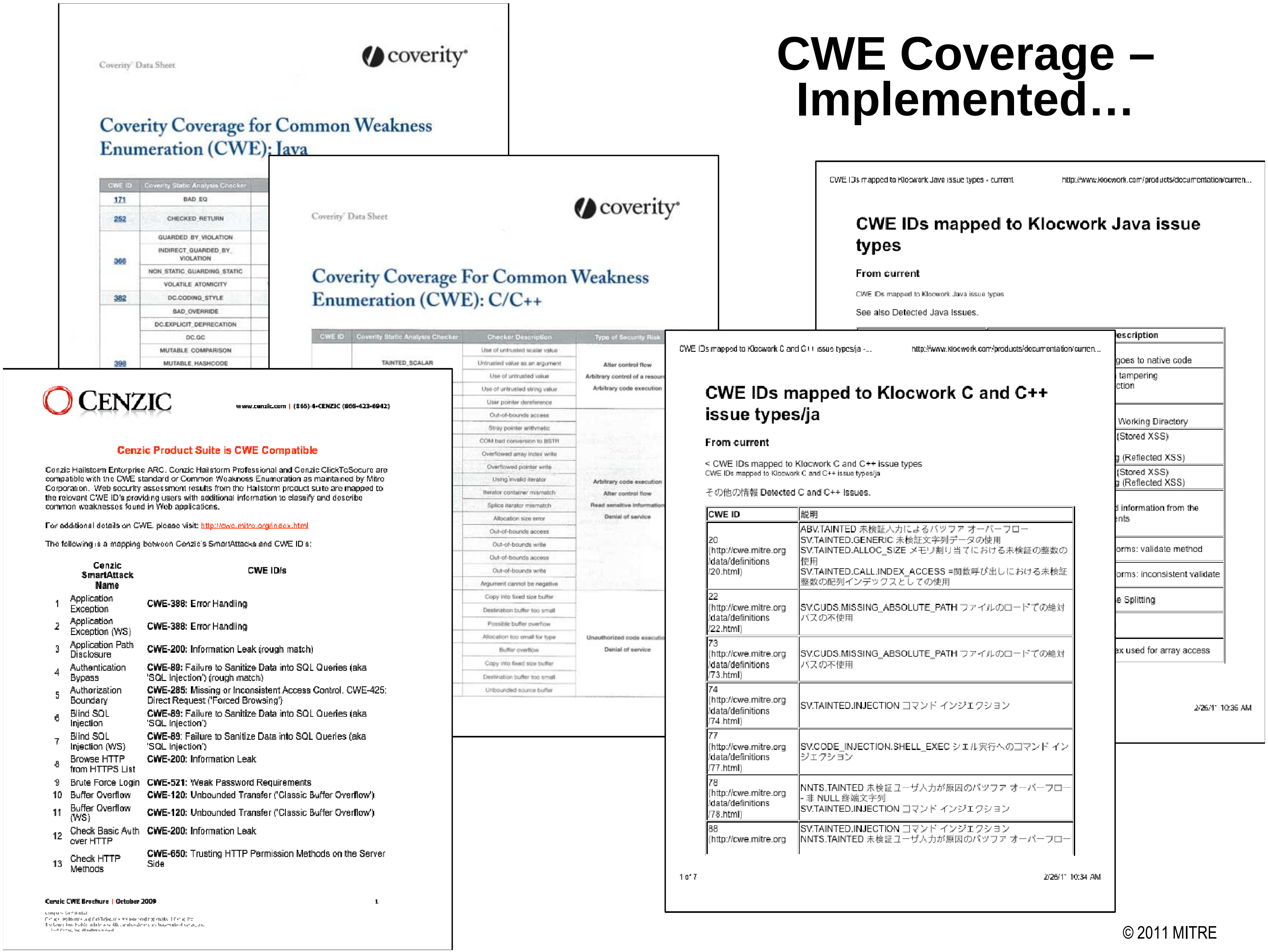
NIST SATE
SATE08
SATE09
SATE10

OMG

SySA Task Force
WhiteBox Definitions-to-SBVR-to-microKDM

All of these are aimed at different aspects of understanding how well tools find CWEs in software applications and what can be done to improve that and standardize the process for expressing a tools capabilities.

CWE Coverage – Implemented…



Coverity® Data Sheet

coverity®

Coverity Coverage for Common Weakness Enumeration (CWE): Java

CWE ID	Coverity Static Analysis Checker
171	BAD_EQ
252	CHECKED_RETURN
366	GUARDED_BY_VIOLATION
	INDIRECT_GUARDED_BY_VIOLATION
	NON_STATIC_GUARDING_STATIC
	VOLATILE_ATOMICITY
382	DC.CODING_STYLE
	BAD_OVERRIDE
	DC.EXPLICIT_DEPRECATION
	DC.GC
	MUTABLE_COMPARISON
398	MUTABLE_HASHCODE

Coverity® Data Sheet

coverity®

Coverity Coverage For Common Weakness Enumeration (CWE): C/C++

CWE IDs mapped to Klocwork Java issue types - current http://www.klocwork.com/products/documentation/curren...

CWE IDs mapped to Klocwork Java issue types

From current

CWE IDs mapped to Klocwork Java issue types

See also Detected Java Issues.

CENZIC www.cenzic.com | (866) 4-CENZIC (866-423-6942)

Cenzic Product Suite is CWE Compatible

Cenzic Hailstorm Enterprise ARC, Cenzic Hailstorm Professional and Cenzic ClickToSecure are compatible with the CWE standard or Common Weakness Enumeration as maintained by Mitre Corporation. Web security assessment results from the Hailstorm product suite are mapped to the relevant CWE ID's providing users with additional information to classify and describe common weaknesses found in Web applications.

For additional details on CWE, please visit: http://cwe.mitre.org/index.html

The following is a mapping between Cenzic's SmartAttacks and CWE ID's:

	Cenzic SmartAttack Name	CWE ID/s
1	Application Exception	CWE-388: Error Handling
2	Application Exception (WS)	CWE-388: Error Handling
3	Application Path Disclosure	CWE-200: Information Leak (rough match)
4	Authentication Bypass	CWE-89: Failure to Sanitize Data into SQL Queries (aka 'SQL Injection') (rough match)
5	Authorization Boundary	CWE-285: Missing or Inconsistent Access Control. CWE-425: Direct Request ('Forced Browsing')
6	Blind SQL Injection	CWE-89: Failure to Sanitize Data into SQL Queries (aka 'SQL Injection')
7	Blind SQL Injection (WS)	CWE-89: Failure to Sanitize Data into SQL Queries (aka 'SQL Injection')
8	Browse HTTP from HTTPS List	CWE-200: Information Leak
9	Brute Force Login	CWE-521: Weak Password Requirements
10	Buffer Overflow	CWE-120: Unbounded Transfer ('Classic Buffer Overflow')
11	Buffer Overflow (WS)	CWE-120: Unbounded Transfer ('Classic Buffer Overflow')
12	Check Basic Auth over HTTP	CWE-200: Information Leak
13	Check HTTP Methods	CWE-650: Trusting HTTP Permission Methods on the Server Side

Cenzic CWE Brochure | October 2009 1

CWE IDs mapped to Klocwork C and C++ issue types/ja -... http://www.klocwork.com/products/documentation/curren...

CWE IDs mapped to Klocwork C and C++ issue types/ja

From current

< CWE IDs mapped to Klocwork C and C++ issue types

CWE IDs mapped to Klocwork C and C++ issue types/ja

その他の情報 Detected C and C++ Issues.

CWE ID	説明
20 (http://cwe.mitre.org/data/definitions/20.html)	ABV.TAINTED 未検証入力によるバッファ オーバーフロー SV.TAINTED.GENERIC 未検証文字列データの使用 SV.TAINTED.ALLOC_SIZE メモリ割り当てにおける未検証の整数の使用 SV.TAINTED.CALL.INDEX_ACCESS =関数呼び出しにおける未検証整数の配列インデックスとしての使用
22 (http://cwe.mitre.org/data/definitions/22.html)	SV.CUDS.MISSING_ABSOLUTE_PATH ファイルのロードでの絶対パスの不使用
73 (http://cwe.mitre.org/data/definitions/73.html)	SV.CUDS.MISSING_ABSOLUTE_PATH ファイルのロードでの絶対パスの不使用
74 (http://cwe.mitre.org/data/definitions/74.html)	SV.TAINTED.INJECTION コマンド インジェクション
77 (http://cwe.mitre.org/data/definitions/77.html)	SV.CODE_INJECTION.SHELL_EXEC シェル実行へのコマンド インジェクション
78 (http://cwe.mitre.org/data/definitions/78.html)	NNTS.TAINTED 未検証ユーザ入力が原因のバッファ オーバーフロー - 非 NULL 終端文字列 SV.TAINTED.INJECTION コマンド インジェクション
88 (http://cwe.mitre.org	SV.TAINTED.INJECTION コマンド インジェクション NNTS.TAINTED 未検証ユーザ入力が原因のバッファ オーバーフロー

1 of 7 2/26/11 10:34 AM

© 2011 MITRE

SANS Common Security Errors in Programming

Special thanks to Robert A. Martin of MITRE Corporation.

The SANS Common Security Errors in Programming map illustrates the software weaknesses that are responsible for the majority of the publicly known vulnerabilities discovered in 2008. It is based on the CWE (Common Weakness Enumeration) that provides a unified, measurable set of software weaknesses that will enable more effective discussion and action to find these weaknesses in source code and eliminate them. The CWE was developed by MITRE and sponsored by the Department of Homeland Security. The numbers between parentheses represent the common weakness enumeration IDs for each weakness. Numbers between square brackets are direct children of the weakness listed. CWE IDs can be found at the MITRE CWE Website or accessed directly by putting the number in place of ### in the following URL:

http://cwe.mitre.org/data/definitions/###.html

SANS MITRE

Legend (orange): 2009's Top 25 CVE Causes and Important CWEs

Handler Errors

- Deployment of Wrong Handler
- Missing Handler
- Dangerous Handler not Disabled During Sensitive Operations
- Unparsed Raw Web Content Delivery
- Incomplete Identification of Uploaded File Variables (PHP)
- Unrestricted File Upload

User Interface Errors

- UI Discrepancy for Security Feature
- Multiple Interpretations of UI Input
- UI Misrepresentation of Critical Information

Behavioral Problems

- Behavioral Change in New Version or Environment
- Expected Behavior Violation

Initialization and Cleanup Errors

- Insecure Default Variable Initialization
- External Initialization of Trusted Variables
- Non-exit on Failed Initialization
- Missing Initialization
- Incomplete Cleanup
- Improper Cleanup on Thrown Exception
- Improper Initialization - (665)

Data Handling

- Numeric Errors
  - Use of Incorrect Byte Ordering
  - Unchecked Array Indexing
  - Incorrect Conversion between Numeric Types
    - Unexpected Sign Extension
    - Signed to Unsigned Conversion Error
    - Unsigned to Signed Conversion Error
    - Numeric Truncation Error
  - Incorrect Calculation - (682)
    - Incorrect Calculation of Buffer Size
    - Integer Overflow or Wraparound
    - Integer Underflow (Wrap or Wraparound)
    - Off-by-one Error
    - Divide By Zero
- Representation Errors
  - Cleansing, Canonicalization, and Comparison Errors
  - Reliance on Data/Memory Layout
- Information Management Errors
  - Information Leak (Information Disclosure)
    - Information Leak Through Sent Data
    - Privacy Leak through Data Queries
    - Discrepancy Information Leaks
    - Error Message Information Leak - (209)
    - Cross-boundary Cleansing Information Leak
    - Intended Information Leak
    - Process Environment Information Leak
    - Information Leak Through Debug Information
    - Sensitive Information Uncleared Before Release
    - Information Leak of System Data
    - Information Leak Through Caching
    - Information Leak Through Environmental Variables
    - File and Directory Information Leaks
    - Information Leak Through Query Strings in GET Request
    - Information Leak Through Indexing of Private Data
  - Information Loss or Omission
  - Containment Errors (Container Errors)
- Improper Access of Indexable Resource ('Range Error')
- Type Errors
- Improper Encoding or Escaping of Output - (116)
- String Errors
- Data Structure Issues
- Improper Handling of Syntactically Invalid Structure
- Modification of Assumed-Immutable Data (MAID)
- Improper Input Validation - (20)
  - Pathname Traversal and Equivalence Errors
  - Process Control
  - Missing XML Validation
  - Failure to Sanitize Data into a Different Plane ('Injection')
    - Improper Sanitization of Special Elements used in a Command ('Command Injection') - (77)
    - Failure to Preserve Web Page Structure ('Cross-site Scripting') - (79)
    - Improper Sanitization of Special Elements used in an SQL Command ('SQL Injection') - (89)
    - Failure to Sanitize Data into LDAP Queries ('LDAP Injection')
    - XML Injection (aka Blind XPath Injection)
    - Failure to Sanitize CRLF Sequences ('CRLF Injection')
    - Uncontrolled Format String
    - Failure to Sanitize Special Elements into a Different Plane
    - Argument Injection or Modification
    - Improper Control of Resource Identifiers ('Resource Injection')
    - Failure to Control Generation of Code ('Code Injection') - (94)
    - Improper Sanitization of Special Elements
  - Technology-Specific Input Validation Problems
  - Misinterpretation of Input
  - Unchecked Input for Loop Condition
  - Null Byte Interaction Error (Poison Null Byte)
  - Direct Use of Unsafe JNI
  - Improper Output Sanitization for Logs
  - Failure to Constrain Operations within the Bounds of a Memory Buffer - (119)
  - Use of Externally-Controlled Input to Select Classes or Code ('Unsafe Reflection')
  - ASP.NET Misconfiguration: Not Using Input Validation Framework
  - URL Redirection to Untrusted Site ('Open Redirect')
  - Variable Extraction Error
  - Unvalidated Function Hook Arguments
  - External Control of File Name or Path - (73)
  - Improper Address Validation in IOCTL with METHOD_NEITHER I/O Control Code
  - Use of Path Manipulation Function without Maximum-sized Buffer

Channel and Path Errors

- Channel Errors
- Failure to Protect Alternate Path
- Uncontrolled Search Path Element
- Unquoted Search Path or Element
- Untrusted Search Path

Error Handling

- Error Conditions, Return Values, Status Codes
- Failure to Use a Standardized Error Handling Mechanism
- Failure to Catch All Exceptions in Servlet
- Not Failing Securely ('Failing Open')
- Missing Custom Error Page

Pointer Issues

- Return of Pointer Value Outside of Expected Range
- Use of sizeof() on a Pointer Type
- Incorrect Pointer Scaling
- Use of Pointer Subtraction to Determine Size
- Assignment of a Fixed Address to a Pointer
- Attempt to Access Child of a Non-structure Pointer

Time and State

- State Issues
  - Incomplete Internal State Distinction
  - State Synchronization Error
  - Mutable Objects Passed by Reference
  - Passing Mutable Objects to an Untrusted Method
  - External Control of Critical State Data - (642)
- Race Condition - (362)
- Session Fixation
- Concurrency Issues
- Temporary File Issues
- Covert Timing Channel
- Technology-Specific Time and State Issues
- Symbolic Name not Mapping to Correct Object
- Signal Errors
- Unrestricted Externally Accessible Lock
- Double-Checked Locking
- Insufficient Session Expiration
- Insufficient Synchronization
- Use of a Non-reentrant Function in an Unsynchronized Context
- Improper Control of a Resource Through its Lifetime
- Exposure of Resource to Wrong Sphere
- Incorrect Resource Transfer Between Spheres
- Use of a Resource after Expiration or Release
- External Influence of Sphere Definition
- Uncontrolled Recursion
- Redirect Without Exit

Failure to Fulfill API Contract ('API Abuse')

- Failure to Clear Heap Memory Before Release ('Heap Inspection')
- Call to Non-ubiquitous API
- Use of Inherently Dangerous Function
- Multiple Binds to the Same Port
- J2EE Bad Practices: Direct Management of Connections
- Incorrect Check of Function Return Value
- Often Misused: Arguments and Parameters
- Uncaught Exception
- Execution with Unnecessary Privileges - (250)
- Often Misused: String Management
- J2EE Bad Practices: Direct Use of Sockets
- Unchecked Return Value
- Failure to Change Working Directory in chroot Jail
- Reliance on DNS Lookups in a Security Decision
- Failure to Follow Specification
- Failure to Provide Specified Functionality

Web Problems

- Failure to Sanitize CRLF Sequences in HTTP Headers ('HTTP Response Splitting')
- Inconsistent Interpretation of HTTP Requests ('HTTP Request Smuggling')
- Improper Sanitization of HTTP Headers for Scripting Syntax
- Use of Non-Canonical URL Paths for Authorization Decisions

Indicator of Poor Code Quality

- NULL Pointer Dereference
- Incorrect Block Delimitation
- Omitted Break Statement in Switch
- Undefined Behavior for Input to API
- Use of Hard-coded, Security-relevant Constants
- Unsafe Function Call from a Signal Handler
- Suspicious Comment
- Return of Stack Variable Address
- Missing Default Case in Switch Statement
- Expression Issues
- Use of Obsolete Functions
- Use of Function with Inconsistent Implementations
- Unused Variable
- Dead Code
- Resource Management Errors
- Improper Resource Shutdown or Release - (404)
- Empty Synchronized Block
- Explicit Call to Finalize()
- Reachable Assertion
- Use of Potentially Dangerous Function

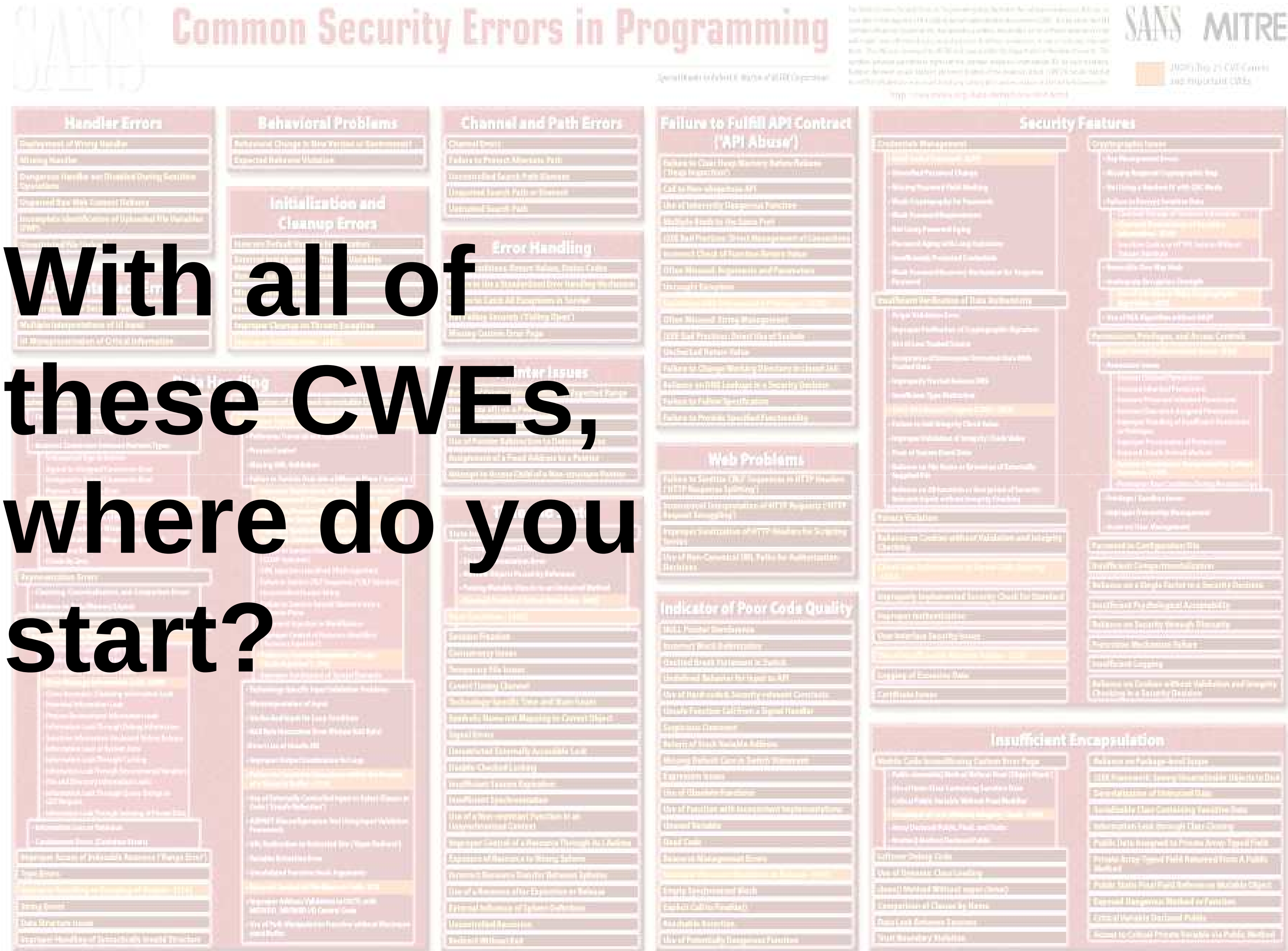
Security Features

- Credentials Management
  - Hard-Coded Password - (259)
  - Unverified Password Change
  - Missing Password Field Masking
  - Weak Cryptography for Passwords
  - Weak Password Requirements
  - Not Using Password Aging
  - Password Aging with Long Expiration
  - Insufficiently Protected Credentials
  - Weak Password Recovery Mechanism for Forgotten Password
- Insufficient Verification of Data Authenticity
  - Origin Validation Error
  - Improper Verification of Cryptographic Signature
  - Use of Less Trusted Source
  - Acceptance of Extraneous Untrusted Data With Trusted Data
  - Improperly Trusted Reverse DNS
  - Insufficient Type Distinction
  - Cross-Site Request Forgery (CSRF) - (352)
  - Failure to Add Integrity Check Value
  - Improper Validation of Integrity Check Value
  - Trust of System Event Data
  - Reliance on File Name or Extension of Externally-Supplied File
  - Reliance on Obfuscation or Encryption of Security-Relevant Inputs without Integrity Checking
- Privacy Violation
- Reliance on Cookies without Validation and Integrity Checking
- Client-Side Enforcement of Server-Side Security - (602)
- Improperly Implemented Security Check for Standard
- Improper Authentication
- User Interface Security Issues
- Use of Insufficiently Random Values - (330)
- Logging of Excessive Data
- Certificate Issues
- Cryptographic Issues
  - Key Management Errors
  - Missing Required Cryptographic Step
  - Not Using a Random IV with CBC Mode
  - Failure to Encrypt Sensitive Data
    - Cleartext Storage of Sensitive Information
    - Cleartext Transmission of Sensitive Information - (319)
    - Sensitive Cookie in HTTPS Session Without 'Secure' Attribute
  - Reversible One-Way Hash
  - Inadequate Encryption Strength
    - Use of a Broken or Risky Cryptographic Algorithm - (327)
  - Use of RSA Algorithm without OAEP
- Permissions, Privileges, and Access Controls
  - Access Control (Authorization) Issues - (285)
  - Permission Issues
    - Incorrect Default Permissions
    - Insecure Inherited Permissions
    - Insecure Preserved Inherited Permissions
    - Incorrect Execution-Assigned Permissions
    - Improper Handling of Insufficient Permissions or Privileges
    - Improper Preservation of Permissions
    - Exposed Unsafe ActiveX Method
    - Incorrect Permission Assignment for Critical Resource - (732)
    - Permission Race Condition During Resource Copy
  - Privilege / Sandbox Issues
  - Improper Ownership Management
  - Incorrect User Management
- Password in Configuration File
- Insufficient Compartmentalization
- Reliance on a Single Factor in a Security Decision
- Insufficient Psychological Acceptability
- Reliance on Security through Obscurity
- Protection Mechanism Failure
- Insufficient Logging
- Reliance on Cookies without Validation and Integrity Checking in a Security Decision

Insufficient Encapsulation

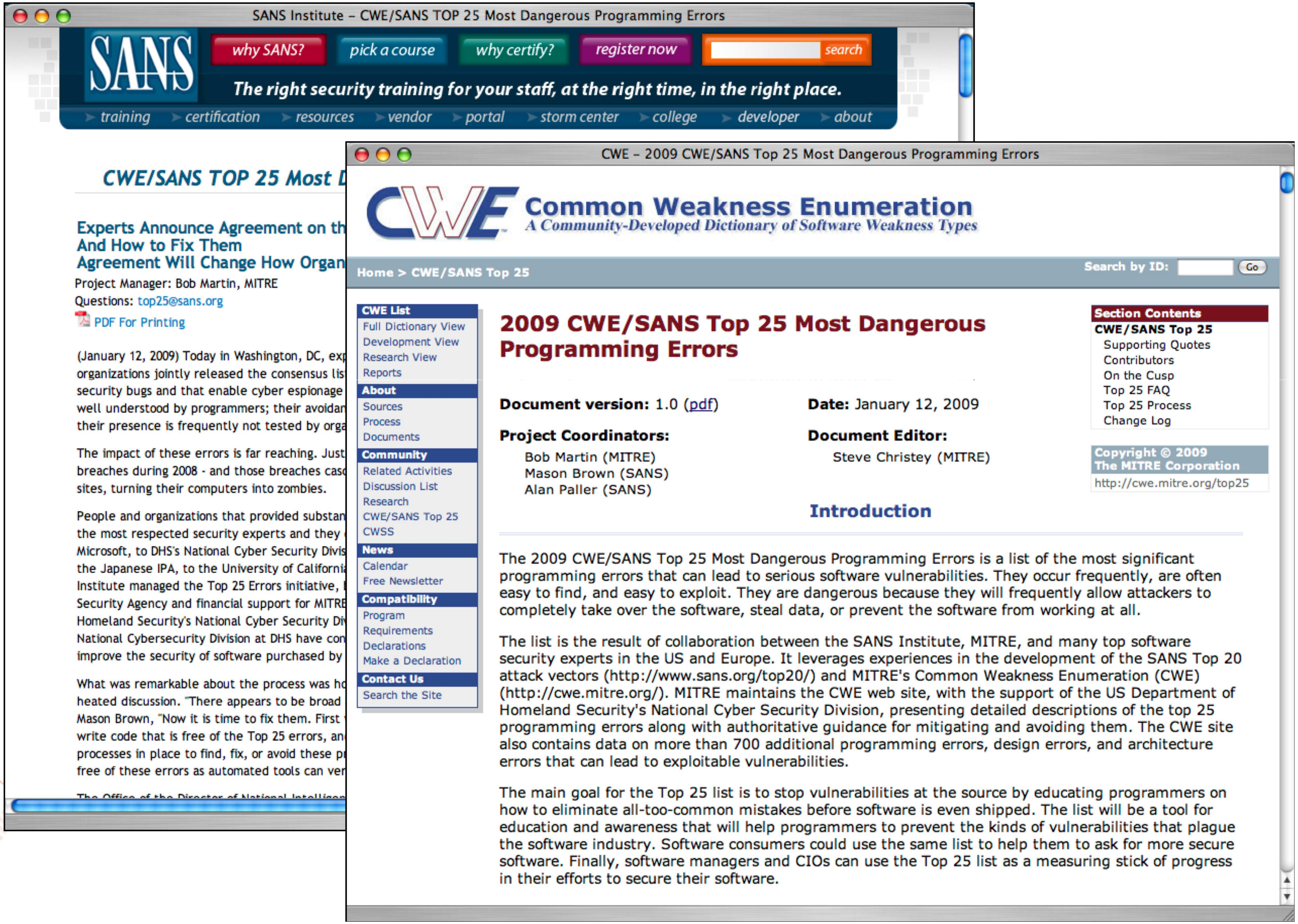
- Mobile Code Issues/Missing Custom Error Page
  - Public cloneable() Method Without Final ('Object Hijack')
  - Use of Inner Class Containing Sensitive Data
  - Critical Public Variable Without Final Modifier
  - Download of Code Without Integrity Check - (494)
  - Array Declared Public, Final, and Static
  - finalize() Method Declared Public
- Leftover Debug Code
- Use of Dynamic Class Loading
- clone() Method Without super.clone()
- Comparison of Classes by Name
- Data Leak Between Sessions
- Trust Boundary Violation
- Reliance on Package-level Scope
- J2EE Framework: Saving Unserializable Objects to Disk
- Deserialization of Untrusted Data
- Serializable Class Containing Sensitive Data
- Information Leak through Class Cloning
- Public Data Assigned to Private Array-Typed Field
- Private Array-Typed Field Returned From A Public Method
- Public Static Final Field References Mutable Object
- Exposed Dangerous Method or Function
- Critical Variable Declared Public
- Access to Critical Private Variable via Public Method

With all of these CWEs, where do you start?



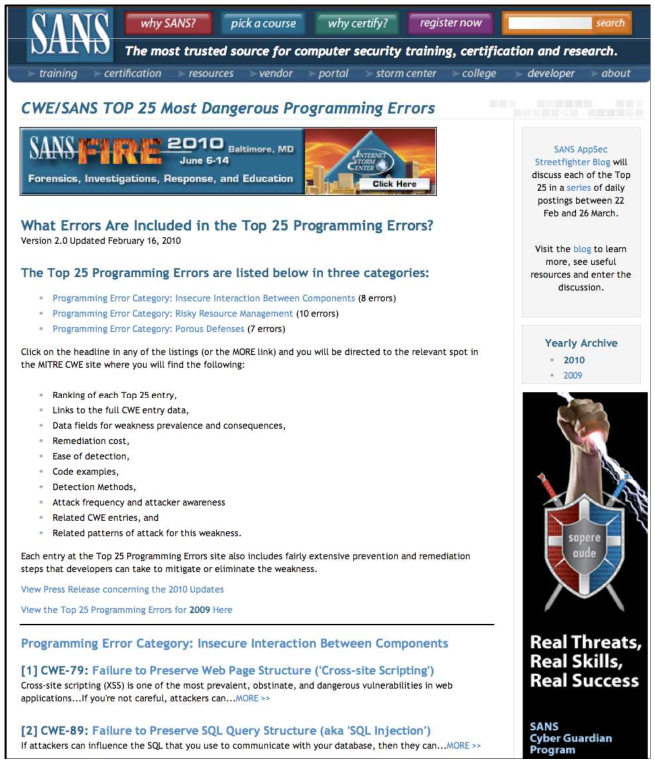
2009 SANS/CWE Top 25 Programming Errors

(released 12 Jan 2009) cwe.mitre.org/top25/



20010 CWE/SANS Top 25 Programming Errors
(released 16 Feb 2010) cwe.mitre.org/top25/

- Sponsored by:
  - National Cyber Security Division (DHS)
- List was selected by a group of security experts from 34 organizations including:
  - Academia: Purdue, Northern Kentucky University
  - Government: CERT, NSA, DHS
  - Software Vendors: Microsoft, Oracle, Red Hat, Apple, Juniper, McAfee, Symantec, Sun, RSA (of EMC)
  - Security Vendors: Veracode, Fortify, Mandiant, Cigital, SRI, Secunia, Breach, SAIC, Aspect,
  - Security Groups: OWASP, WASC



Making Security Measurable™

Main Goals

- Raise awareness for developers
- Help universities to teach secure coding
- Empower customers who want to ask for more secure software
- Provide a starting point for in-house software shops to measure their own progress

Making Security Measurable™

© 2011 MITRE

CWE – 2010 CWE/SANS Top 25 Most Dangerous Software Errors

http://cwe.mitre.org/top25/index.html

Common Weakness Enumeration
A Community-Developed Dictionary of Software Weakness Types

CWE and SANS Institute TOP 25 MOST DANGEROUS SOFTWARE ERRORS

Home > CWE/SANS Top 25 2010   Search by ID: Go

CWE List
- Full Dictionary View
- Development View
- Research View
- Reports

About
- Sources
- Process
- Documents

Community
- Related Activities
- Discussion List
- Research
- CWE/SANS Top 25
- CWSS

News
- Calendar
- Free Newsletter

Compatibility
- Program
- Requirements
- Declarations
- Make a Declaration

Contact Us
- Search the Site

2010 CWE/SANS Top 25 Most Dangerous Software Errors

Copyright © 2010 The MITRE Corporation
http://cwe.mitre.org/top25/

Document version: 1.06 (pdf)   **Date:** September 27, 2010

Project Coordinators:
Bob Martin (MITRE)
Mason Brown (SANS)
Alan Paller (SANS)
Dennis Kirby (SANS)

Document Editor:
Steve Christey (MITRE)

Introduction

The 2010 CWE/SANS Top 25 Most Dangerous Software Errors is a list of the most widespread and critical programming errors that can lead to serious software vulnerabilities. They are often easy to find, and easy to exploit. They are dangerous because they will frequently allow attackers to completely take over the software, steal data, or prevent the software from working at all.

The Top 25 list is a tool for education and awareness to help programmers to prevent the kinds of vulnerabilities that plague the software industry, by identifying and avoiding all-too-common mistakes that occur before software is even shipped. Software customers can use the same list to help them to ask for more secure software. Researchers in software security can use the Top 25 to

Done

Robert C. Seacord
CERT
Ryan Barnett
Pascal Meunier
CERIAS, Purdue University
Antonio Fontes
Matt Bishop
Kenneth van Wyk
Masato Terada
Sean Barnum
Mahesh Saptarshi
Cassio Goldschmidt
Adam Hahn
Jeff Williams
Carsten Eiram
Josh Drake
Chuck Willis
Michael Howard
Bruce Lowenthal
Mark J. Cox
Jacob West
Djenana Campara
James Walden
Frank Kim
Chris Eng
Chris Wysopal
Veracode, Inc.
2009
CWE - Top 25 Credited Contributors
http://cwe.mitre.org/top25/contributors.html
Common Weakness Enumeration
A Community-Developed Dictionary of Software Weakness Types
2010
Home > CWE/SANS Top 25 > Credited Contributors
Search by ID:
Section Contents
CWE/SANS Top 25
Contributors
Supporting Quotes
Monster Mitigations
Focus Profiles
On the Cusp
Documents & Podcasts
Training Materials
Top 25 FAQ
Top 25 Process
Change Log
SANS News Release
Section Archives
2009 CWE/SANS Top 25
Supporting Quotes
Contributors
On The Cusp
Change Log
CERIAS
Center for Education and Research in Information Assurance and Security
Microsoft
ORACLE
cigital
Sun microsystems
EMC²
redhat
Secunia
Stay Secure
SRI International
NSA
DHS
IPA
INFORMATION-TECHNOLOGY PROMOTION AGENCY, JAPAN
SANS
GRAMMATECH
SRA
FORTIFY SOFTWARE
symantec.
armorize technologies
Secure Your Web Code
VERACODE
McAfee
Juniper NETWORKS
Homeland Security
CWE is a Software Assurance strategic initiative sponsored by the National Cyber Security Division of the U.S. Department of Homeland Security.
This Web site is hosted by The MITRE Corporation.
Copyright 2010, The MITRE Corporation. CWE and the CWE logo are trademarks of The MITRE Corporation.
Contact cwe@mitre.org for more information.
Privacy policy
Terms of use
Contact us

Insecure Interaction Between Components

These weaknesses are related to insecure ways in which data is sent and received between separate components, modules, programs, processes, threads, or systems.

- CWE-20: Improper Input Validation
- CWE-116: Improper Encoding or Escaping of Output
- CWE-89: Failure to Preserve SQL Query Structure (aka 'SQL Injection')
- CWE-79: Failure to Preserve Web Page Structure (aka 'Cross-site Scripting')
- CWE-78: Failure to Preserve OS Command Structure (aka 'OS Command Injection')
- CWE-319: Cleartext Transmission of Sensitive Information
- CWE-352: Cross-Site Request Forgery (CSRF)
- CWE-362: Race Condition
- CWE-209: Error Message Information Leak

Risky Resource Management

The weaknesses in this category are related to ways in which software does not properly manage the creation, usage, transfer, or destruction of important system resources.

- CWE-119: Failure to Constrain Operations within the Bounds of a Memory Buffer
- CWE-642: External Control of Critical State Data
- CWE-73: External Control of File Name or Path
- CWE-426: Untrusted Search Path
- CWE-94: Failure to Control Generation of Code (aka 'Code Injection')
- CWE-494: Download of Code Without Integrity Check
- CWE-404: Improper Resource Shutdown or Release
- CWE-665: Improper Initialization
- CWE-682: Incorrect Calculation

Porous Defenses

The weaknesses in this category are related to defensive techniques that are often misused, abused, or just plain ignored.

- CWE-285: Improper Access Control (Authorization)
- CWE-327: Use of a Broken or Risky Cryptographic Algorithm
- CWE-259: Hard-Coded Password
- CWE-732: Insecure Permission Assignment for Critical Resource
- CWE-330: Use of Insufficiently Random Values
- CWE-250: Execution with Unnecessary Privileges
- CWE-602: Client-Side Enforcement of Server-Side Security

Insecure Interaction Between Components

These weaknesses are related to insecure ways in which data is sent and received between separate components, modules, programs, processes, threads, or systems.

For each weakness, its ranking in the general list is provided in square brackets.

Rank	CWE ID	Name
[1]	CWE-79	Failure to Preserve Web Page Structure ('Cross-site Scripting')
[2]	CWE-89	Improper Sanitization of Special Elements used in an SQL Command ('SQL Injection')
[4]	CWE-352	Cross-Site Request Forgery (CSRF)
[8]	CWE-434	Unrestricted Upload of File with Dangerous Type
[9]	CWE-78	Improper Sanitization of Special Elements used in an OS Command ('OS Command Injection')
[17]	CWE-209	Information Exposure Through an Error Message
[23]	CWE-601	URL Redirection to Untrusted Site ('Open Redirect')
[25]	CWE-362	Race Condition

Risky Resource Management

The weaknesses in this category are related to ways in which software does not properly manage the creation, usage, transfer, or destruction of important system resources.

Rank	CWE ID	Name
[3]	CWE-120	Buffer Copy without Checking Size of Input ('Classic Buffer Overflow')
[7]	CWE-22	Improper Limitation of a Pathname to a Restricted Directory ('Path Traversal')
[12]	CWE-805	Buffer Access with Incorrect Length Value
[13]	CWE-754	Improper Check for Unusual or Exceptional Conditions
[14]	CWE-98	Improper Control of Filename for Include/Require Statement in PHP Program ('PHP File Inclusion')
[15]	CWE-129	Improper Validation of Array Index
[16]	CWE-190	Integer Overflow or Wraparound
[18]	CWE-131	Incorrect Calculation of Buffer Size
[20]	CWE-494	Download of Code Without Integrity Check
[22]	CWE-770	Allocation of Resources Without Limits or Throttling

Porous Defenses

The weaknesses in this category are related to defensive techniques that are often misused, abused, or just plain ignored.

Rank	CWE ID	Name
[5]	CWE-285	Improper Access Control (Authorization)
[6]	CWE-807	Reliance on Untrusted Inputs in a Security Decision
[10]	CWE-311	Missing Encryption of Sensitive Data
[11]	CWE-798	Use of Hard-coded Credentials
[19]	CWE-306	Missing Authentication for Critical Function
[21]	CWE-732	Incorrect Permission Assignment for Critical Resource
[24]	CWE-327	Use of a Broken or Risky Cryptographic Algorithm

2 CWE-89: Improper Neutralization of Special Elements used in an SQL Command ('SQL Injection')

Summary

Weakness Prevalence	High	Consequences	Data loss, Security bypass
Remediation Cost	Low	Ease of Detection	Easy
Attack Frequency	Often	Attacker Awareness	High

Discussion

These days, it seems as if software is all about the data: getting it into the database, pulling it from the database, massaging it into information, and sending it elsewhere for fun and profit. If attackers can influence the SQL that you use to communicate with your database, then suddenly all your fun and profit belongs to them. If you use SQL queries in security controls such as authentication, attackers could alter the logic of those queries to bypass security. They could modify the queries to steal, corrupt, or otherwise change your underlying data. They'll even steal data one byte at a time if they have to, and they have the patience and know-how to do so.

Technical Details | *Code Examples* | *Detection Methods* | *References*

Prevention and Mitigations

Architecture and Design
Use a vetted library or framework that does not allow this weakness to occur or provides constructs that make this weakness easier to avoid.
For example, consider using persistence layers such as Hibernate or Enterprise Java Beans, which can provide significant protection against SQL injection if used properly.

Architecture and Design
If available, use structured mechanisms that automatically enforce the separation between data and code. These mechanisms may be able to provide the relevant quoting, encoding, and validation automatically, instead of relying on the developer to provide this capability at every point where output is generated.
Process SQL queries using prepared statements, parameterized queries, or stored procedures. These features should accept parameters or variables and support strong typing. Do not dynamically construct and execute query strings within these features using "exec" or similar functionality, since you may

Monster Mitigations

These mitigations will be effective in eliminating or reducing the severity of the Top 25. These mitigations will also address many weaknesses that are not even on the Top 25. If you adopt these mitigations, you are well on your way to making more secure software.

A Monster Mitigation Matrix is also available to show how these mitigations apply to weaknesses in the Top 25.

ID	Description
M1	Establish and maintain control over all of your inputs.
M2	Establish and maintain control over all of your outputs.
M3	Lock down your environment.
M4	Assume that external components can be subverted, and your code can be read by anyone.
M5	Use industry-accepted security features instead of inventing your own.
GP1	(general) Use libraries and frameworks that make it easier to avoid introducing weaknesses.
GP2	(general) Integrate security into the entire software development lifecycle.
GP3	(general) Use a broad mix of methods to comprehensively find and prevent weaknesses.
GP4	(general) Allow locked-down clients to interact with your software.

M1	M2	M3	M4	M5	CWE
High		DiD	Mod		CWE-22: Improper Limitation of a Pathname to a Restricted Directory ('Path Traversal')
Mod	High	DiD	Ltd		CWE-78: Improper Sanitization of Special Elements used in an OS Command ('OS Command Injection')
Mod	High		Ltd		CWE-79: Failure to Preserve Web Page Structure ('Cross-site Scripting')
Mod	High	DiD	Ltd		CWE-89: Improper Sanitization of Special Elements used in an SQL Command ('SQL Injection')
Mod		DiD	Ltd		CWE-98: Improper Control of Filename for Include/Require Statement in PHP Program ('PHP File Inclusion')
Mod		DiD	Ltd		CWE-120: Buffer Copy without Checking Size of Input ('Classic Buffer Overflow')
High		DiD	Ltd		CWE-129: Improper Validation of Array Index
Mod		DiD	Ltd		CWE-131: Incorrect Calculation of Buffer Size
Mod		DiD	Ltd		CWE-190: Integer Overflow or Wraparound
Ltd	High	DiD	Mod		CWE-209: Information Exposure Through an Error Message
		DiD	Mod	Mod	CWE-285: Improper Access Control (Authorization)
		Mod		Mod	CWE-306: Missing Authentication for Critical Function
		DiD			CWE-311: Missing Encryption of Sensitive Data
				High	CWE-327: Use of a Broken or Risky Cryptographic Algorithm
			Ltd		CWE-352: Cross-Site Request Forgery (CSRF)
		DiD			CWE-362: Race Condition
Mod		DiD	Mod		CWE-434: Unrestricted Upload of File with Dangerous Type
		DiD			CWE-494: Download of Code Without Integrity Check
Mod	Mod		Ltd		CWE-601: URL Redirection to Untrusted Site ('Open Redirect')
	Ltd	DiD		Mod	CWE-732: Incorrect Permission Assignment for Critical Resource
Mod	Ltd	DiD			CWE-754: Improper Check for Unusual or Exceptional Conditions
Ltd		DiD	Ltd		CWE-770: Allocation of Resources Without Limits or Throttling
		DiD	High	Mod	CWE-798: Use of Hard-coded Credentials
Mod		DiD	Ltd		CWE-805: Buffer Access with Incorrect Length Value
Mod		DiD	Mod	Mod	CWE-807: Reliance on Untrusted Inputs in a Security Decision

Focus Profiles

The prioritization of items in the general Top 25 list is just that - general. The rankings, and even the selection of which items should be included, can vary widely depending on context. Ideally, each organization can decide how to rank weaknesses based on its own criteria, instead of relying on a single general-purpose list.

A separate document provides several "focus profiles" with their own criteria for selection and ranking, which may be more useful than the general list.

Name	Description
On the Cusp: Weaknesses that Did Not Make the 2010 Top 25	From the original nominee list of 41 submitted CWE entries, the Top 25 was selected. This "On the Cusp" profile includes the remaining 16 weaknesses that did not make it into the final Top 25.
Educational Emphasis	This profile ranks weaknesses that are important from an educational perspective within a school or university context. It focuses on the CWE entries that graduating students should know, including historically important weaknesses.
Weaknesses by Language	This profile specifies which weaknesses appear in which programming languages. Notice that most weaknesses are actually language-independent, although they may be more prevalent in one language or another.
Weaknesses Typically Fixed in Design or Implementation	This profile lists weaknesses that are typically fixed in design or implementation.
Automated vs. Manual Analysis	This profile highlights which weaknesses can be detected using automated versus manual analysis. Currently, there is very little public, authoritative information about the efficacy of these methods and their utility. There are many competing opinions, even among experts. As a result, these ratings should only be treated as guidelines, not rules.
Weaknesses by Language	This profile specifies which weaknesses appear in which programming languages. Notice that most weaknesses are actually language-independent, although they may be more prevalent in one language or another.
For Developers with Established Software Security Practices	This profile is for developers who have already established security in their practice. It uses votes from the major developers who contributed to the Top 25.
Ranked by Importance - for Software Customers	This profile ranks weaknesses based primarily on their importance, as determined from the base voting data that was used to create the general list. Prevalence is included in the scores, but it has much less weighting than importance.
Weaknesses by Technical Impact	This profile lists weaknesses based on their technical impact, i.e., what an attacker can accomplish by exploiting each weakness.

Background Details to Check Out

cwe.mitre.org/top25

- Process description
- Changelog for each revision
- On the Cusp – weaknesses that almost made it
- Appendices
  - **Selection Criteria and Supporting Fields**
  - **Threat Model for the Skilled, Determined Attacker**

Making Security Measurable™

© 2011 MITRE

On the Cusp: Other Weaknesses to Consider

Table of Contents

Introduction

The CWE/SANS Top 25 is really just a starting point for developers. Many weaknesses were considered for inclusion on the Top 25, but some did not make it to the final list. Some were not considered to be severe enough; others were not considered to be prevalent enough. Sometimes, the Top 25 reviewers themselves had mixed opinions on whether a weakness should be added to the list or not.

With respect to severity, some Top 25 users may have a significantly different threat model. For example, software uptime may be critical to consumers who operate in critical infrastructure or e-commerce environments. However, in the threat model being used by the Top 25, availability is regarded as slightly less important than integrity and confidentiality.

With respect to prevalence, some Top 25 items may not be applicable to the class of software being developed. For example, cross-site scripting is specific to the Web, although analogs exist in other technologies. In other cases, developers may have already eliminated much of the Top 25 in past efforts, so they want to look for other weaknesses that may still be present in their software.

Some on-the-cusp items were omitted because they are already indirectly covered on the Top 25, usually by a more general entry. However, these would be important to consider as individual items.

For these reasons, users of the Top 25 should seriously consider including these weaknesses in their analyses.

BACK TO TOP

Weaknesses that did not have sufficient prevalence or severity

[26]	136	CWE-749: Exposed Dangerous Method or Function
		Just 2 points from the Top 25, possibly on the rise.
[27]	129	CWE-307: Improper Restriction of Excessive Authentication Attempts
		Possibly squeezed off the Top 25 by cousins such as missing authentication.
[28]	125	CWE-212: Improper Cross-boundary Removal of Sensitive Data
		Important when privacy is a main concern.
[29]	124	CWE-330: Use of Insufficiently Random Values
		Not always security-relevant, but still dangerous if it is.
[30]	120	CWE-59: Improper Link Resolution Before File Access ('Link Following')
		A burst in CVE statistics in 2008 shows that these can still be prevalent if focused attention is paid to them.
[31] *(tie)*	120	CWE-134: Uncontrolled Format String
		Usually easily findable, and code execution possibilities have been reduced due to compiler changes, e.g. removal of support for "%n" sequences.
[32]	119	CWE-476: NULL Pointer Dereference
		Typically cause a denial of service in C/C++ but, for certain Linux kernels and possibly other environments, exploitable for code execution.
[33] *(tie)*	119	CWE-681: Incorrect Conversion between Numeric Types
		May be on the rise in future years, especially in transitions from 32-bit to 64-bit architectures.
[34]	118	CWE-426: Untrusted Search Path
		Prevalence is uncertain.
[35]	116	CWE-454: External Initialization of Trusted Variables or Data Stores
		High prevalence in PHP environments with register_globals enabled, or by programmers who are not familiar with the effectiveness of reverse engineering, or the many ways that inputs can be modified.
[36]	114	CWE-416: Use After Free
		Likely on the rise in future years.
[37] *(tie)*	114	CWE-772: Missing Release of Resource after Effective Lifetime
		Important when prevention of denial of service is critical.
[38]	106	CWE-799: Improper Control of Interaction Frequency
		Important when prevention of denial of service is critical. Also a critical component of brute force attacks against security features.
[39]	100	CWE-456: Missing Initialization
		Not always security-relevant; also, easily findable and fixable with modern compilers and code scanners.
[40]	91	CWE-672: Operation on a Resource after Expiration or Release
		Sometimes catchable by the compiler, but may increase in future years.
[41]	77	CWE-804: Guessable CAPTCHA
		Not very prevalent since the use of CAPTCHA is not very prevalent, and importance is generally less than that of other security features such as encryption and authentication.

Frequently Asked Questions (FAQ)

How is this different from the OWASP Top Ten?

The short answer is that the OWASP Top Ten covers more general concepts and is focused on web applications. The CWE Top 25 covers a broader range of issues than what arise from the web-centric view of the OWASP Top Ten, such as buffer overflows. Also, one goal of the CWE Top 25 is to be at a level that is directly actionable to programmers, so it contains more detailed issues than the categories being used in the Top Ten. There is some overlap, however, since web applications are so prevalent, and some issues in the Top Ten have general applications to all classes of software.

How are the weaknesses prioritized on the list?

With the exception of Input Validation being listed as number 1 (partially for educational purposes), there is no concrete prioritization. Prioritization differs widely depending on the audience (e.g. web application developers versus OS developers) and the risk tolerance (whether code execution, data theft, or denial of service are more important). It was also believed that the use of categories would help the organization of the document, and prioritization would impose a different ordering.

Why are you including overlapping concepts like input validation and XSS, or incorrect calculation and buffer overflows? Why do you have mixed levels of abstraction?

While it would have been ideal to have a fixed level of abstraction and no overlap between weaknesses, there are several reasons why this was not achieved.

Contributors sometimes suggested different CWE identifiers that were closely related. In some cases, this difference was addressed by using a more abstract CWE identifier that covered the relevant cases.

In other situations, there was strong advocacy for including lower-level issues such as SQL injection and cross-site scripting, so these were added. The general trend, however, was to use more abstract weakness types.

While it might be desired to minimize overlap in the Top 25, many vulnerabilities actually deal with the interaction of 2 or more weaknesses. For example, external control of user state data (CWE-642) could be an important weakness that enables cross-site scripting (CWE-79) and SQL injection (CWE-89). To eliminate overlap in the Top 25 would lose some of this important subtlety.

Finally, it was a conscious decision that if there was enough prevalence and severity, design-related weaknesses would be included. These are often thought of as being more abstract than weaknesses that arise during implementation.

The Top 25 list tries to strike a delicate balance between usability and relevance, and we believe that it does so, even with this apparent imperfection.

Why don't you use hard statistics to back up your claims?

The appropriate statistics simply aren't publicly available. The publicly available statistics are either too high-level or not comprehensive enough. And none of them are comprehensive across all software types and environments.

People are Starved for Simplicity

© 2011 MITRE

Top25 | AppSec Street Fighter – SANS Institute

http://blogs.sans.org/appsecstreetfighter/category/top25/

Top 25 Series – Summary and Links

Posted by Frank Kim on April 6, 2010 – 3:41 pm
Filed under Top25

As requested here are the links to all the posts on the Top 25 Most Dangerous Programming Errors. Please let us know if you have any suggestions or comments.

1 – Cross-Site Scripting (XSS)
2 – SQL Injection
3 – Classic Buffer Overflow
4 – Cross-Site Request Forgery (CSRF)
5 – Improper Access Control (Authorization)
6 – Reliance on Untrusted Inputs in a Security Decision
7 – Path Traversal
8 – Unrestricted Upload of Dangerous File Type
9 – OS Command Injection
10 – Missing Encryption of Sensitive Data
11 – Hardcoded Credentials
12 – Buffer Access with Incorrect Length Value
13 – PHP File Inclusion
14 – Improper Validation of Array Index
15 – Improper Check for Unusual or Exceptional Conditions
16 – Information Exposure Through an Error Message
17 – Integer Overflow Or Wraparound
18 – Incorrect Calculation of Buffer Size
19 – Missing Authentication for Critical Function
20 – Download of Code Without Integrity Check
21 – Incorrect Permission Assignment for Critical Response
22 – Allocation of Resources Without Limits or Throttling
23 – Open Redirect
24 – Use of a Broken or Risky Cryptographic Algorithm
25 – Race Conditions

Pat on Some Thoughts About Passwords

Jim on Seven Security (Mis)Configurations in Java web.xml Files

Nick Owen on Some Thoughts About Passwords

ARCHIVES

Select Month

META

- Log in
- Entries RSS
- Comments RSS
- WordPress.org

Done

Welcome to MSDN Blogs **Sign in** | **Join** | **Help**

SEARCH

HOME · EMAIL · RSS 2.0 · ATOM 1.0

Recent Posts

SDL Threat Modeling Tool 3.1.4 ships!
Early Days of the SDL, Part Four
Early Days of the SDL, Part Three
Early Days of the SDL, Part Two
Early Days of the SDL, Part One

Tags

Common Criteria Crawl Walk Run Privacy SDL SDL Pro Network Security Assurance Security Blackhat SDL threat modeling

News

About Us

Adam Shostack
Bryan Sullivan
David Ladd
Jeremy Dallman
Michael Howard
Steve Lipner

Blogroll

BlueHat Security Briefings

SDL and the CWE/SANS Top 25

Bryan here. The security community has been buzzing since SANS and MITRE's joint announcement earlier this month of their list of the Top 25 Most Dangerous Programming Errors. Now, I don't want to get into a debate in this blog about whether this new list will become the new de facto standard for analyzing security vulnerabilities (or indeed, whether it already has become the new standard). Instead, I'd like to present an overview of how the Microsoft SDL maps to the CWE/SANS list, just
May.

Michael and I have writte
coverage of the Top 25 ar
believe that the results te
25 were developed indep
root them out of the softv
analysis white paper and
guidance around every m
made many of the same
for you to download and

Below is a summary of h
see the SDL covers every
them (race conditions an
by multiple SDL requirem
tools to prevent or detect

CWE	Title
20	Improper Input V
116	Improper Encodin Escaping of Outp

CWE	Title	Education?	Manual Process?	Tools?	Threat Model?
20	Improper Input Validation	Y	Y	Y	Y
116	Improper Encoding or Escaping of Output	Y	Y	Y	
89	Failure to Preserve SQL Query Structure (aka SQL Injection)	Y	Y	Y	
79	Failure to Preserve Web Page Structure (aka Cross-Site Scripting)	Y	Y	Y	
78	Failure to Preserve OS Command Structure (aka OS Command Injection)	Y		Y	
319	Cleartext Transmission of Sensitive Information	Y			Y
352	Cross-site Request Forgery (aka CSRF)	Y		Y	
362	Race Condition	Y			
209	Error Message Information Leak	Y	Y	Y	
119	Failure to Constrain Memory Operations within the Bounds of a Memory Buffer	Y	Y	Y	
642	External Control of Critical State Data	Y			Y
73	External Control of File Name or Path	Y	Y	Y	
426	Untrusted Search Path	Y		Y	
94	Failure to Control Generation of Code (aka 'Code Injection')	Y	Y		
494	Download of Code Without Integrity Check				Y
404	Improper Resource Shutdown or Release	Y		Y	
665	Improper Initialization	Y		Y	
682	Incorrect Calculation	Y		Y	
285	Improper Access Control (Authorization)	Y	Y		Y
327	Use of a Broken or Risky Cryptographic Algorithm	Y	Y	Y	
259	Hard-Coded Password	Y	Y	Y	Y
732	Insecure Permission Assignment for Critical Resource	Y	Y		
330	Use of Insufficiently Random Values	Y	Y	Y	
250	Execution with Unnecessary Privileges	Y	Y		Y
602	Client-Side Enforcement of Server-Side Security	Y			Y

CWE Outreach: A Team Sport

May/June Issue of IEEE Security & Privacy…

The Top 25 is not…

- A silver bullet
- A guarantee of software health
- A perfect match for your unique needs
- As simple as it seems
- The only thing to include in contract language
- Completely found by tools

Making Security Measurable™

© 2011 MITRE

The Top 25 is…

- A mechanism for awareness
- A trigger of questions
- A place for mitigations
- A conversation starter
- A first step on the long road to software assurance

Making Security Measurable™

© 2011 MITRE

CWE Top 25 2011

- Starting this week
- Utilizing the Common Weakness Scoring System (CWSS 0.2) as under-pinning
- Will have numerous “Top 25’s”
  - **Including one for Web Applications**
- Final "master" Top 25 list, will leverage combined score from multiple vignettes.
- No fixed date for release of the 2011 Top 25 at this point, may take 2 to 3 months.

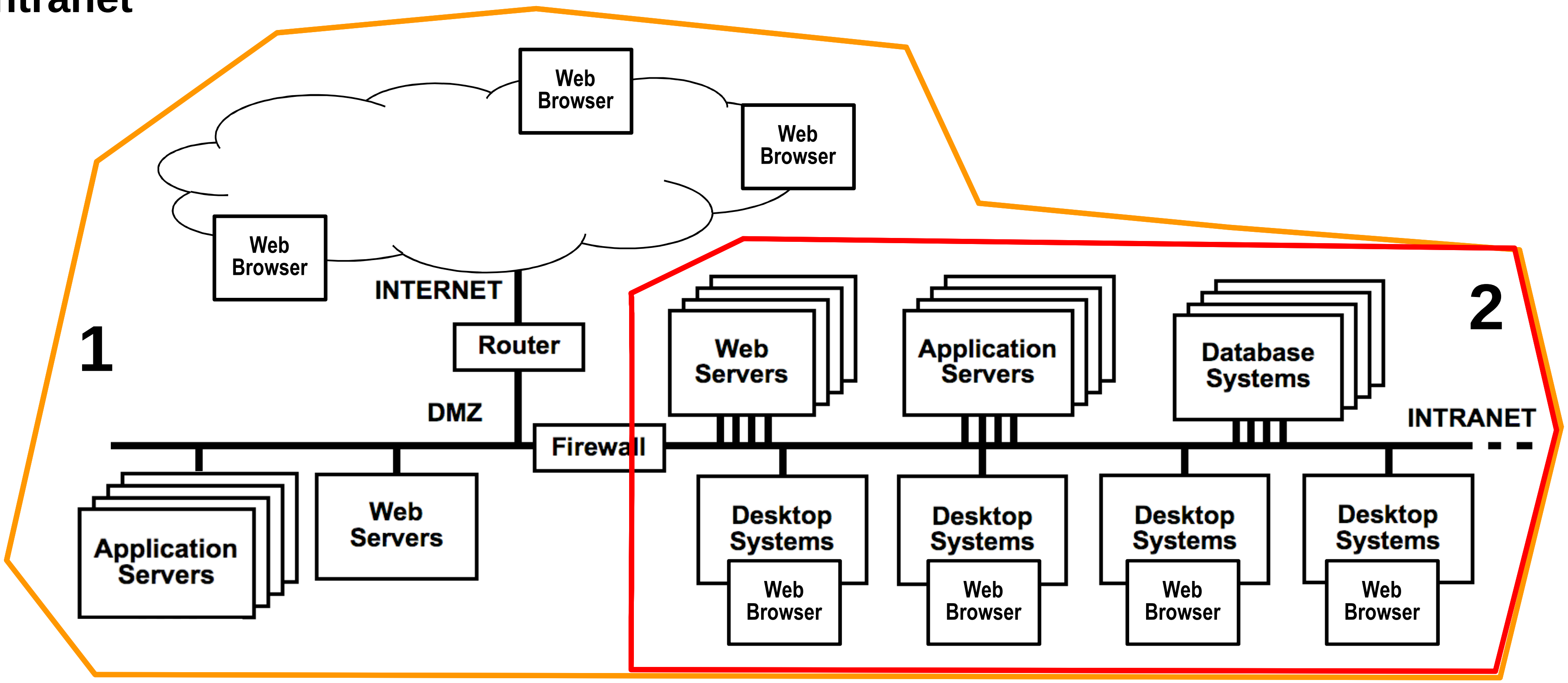
Making Security Measurable™

© 2011 MITRE

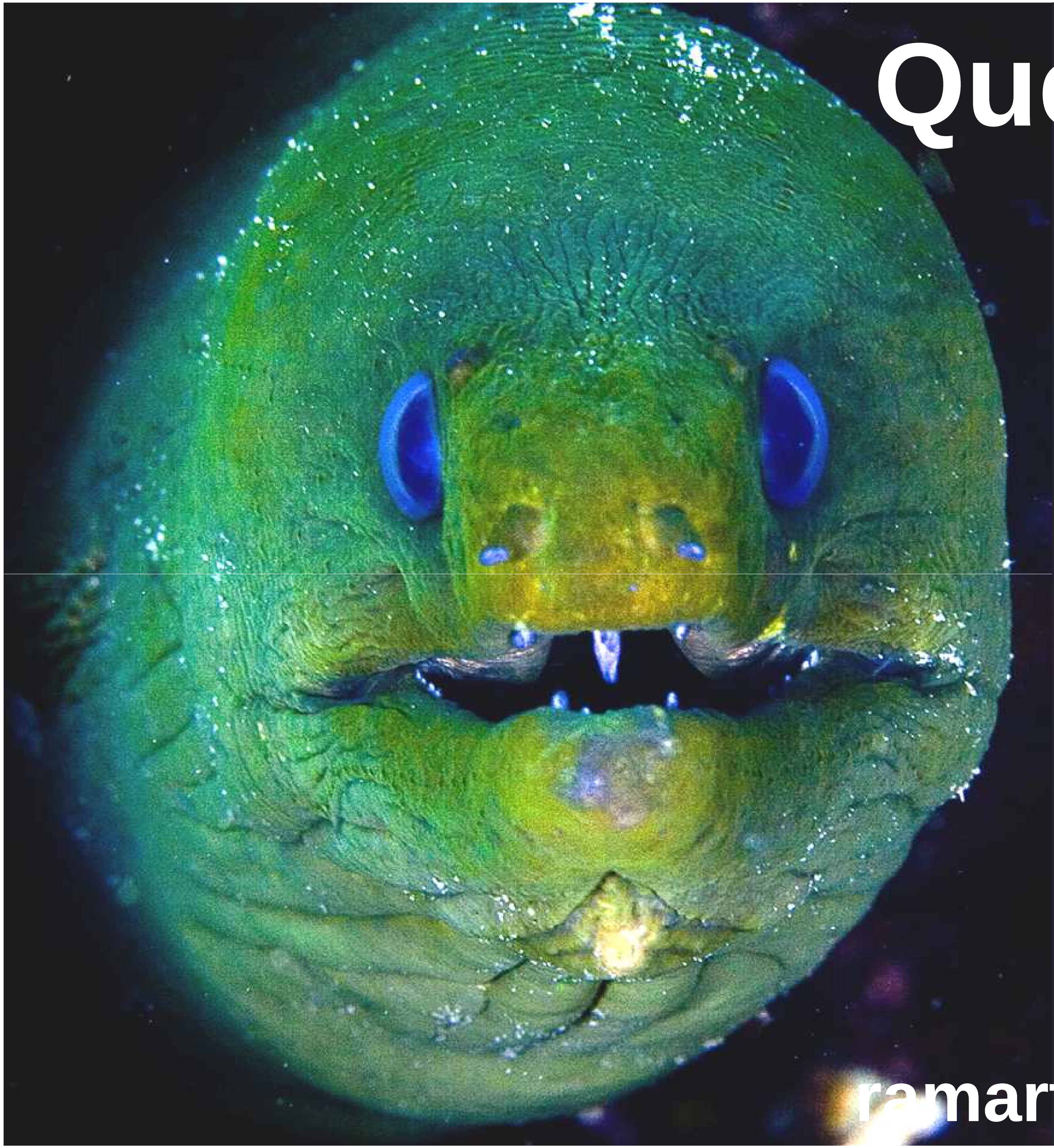
Common Weakness Scoring System (CWSS)

Archetypes:
- Web Browser User Interface
- Web Servers
- Application Servers
- Database Systems
- Desktop Systems
- SSL
- Internet
- DMZ
- Intranet

Vignettes:
1. Web-based Retail Provider
2. Intranet resident health records management system of hospital



Questions?



ramartin@mitre.org