Security Content Automation Protocol

presented by:

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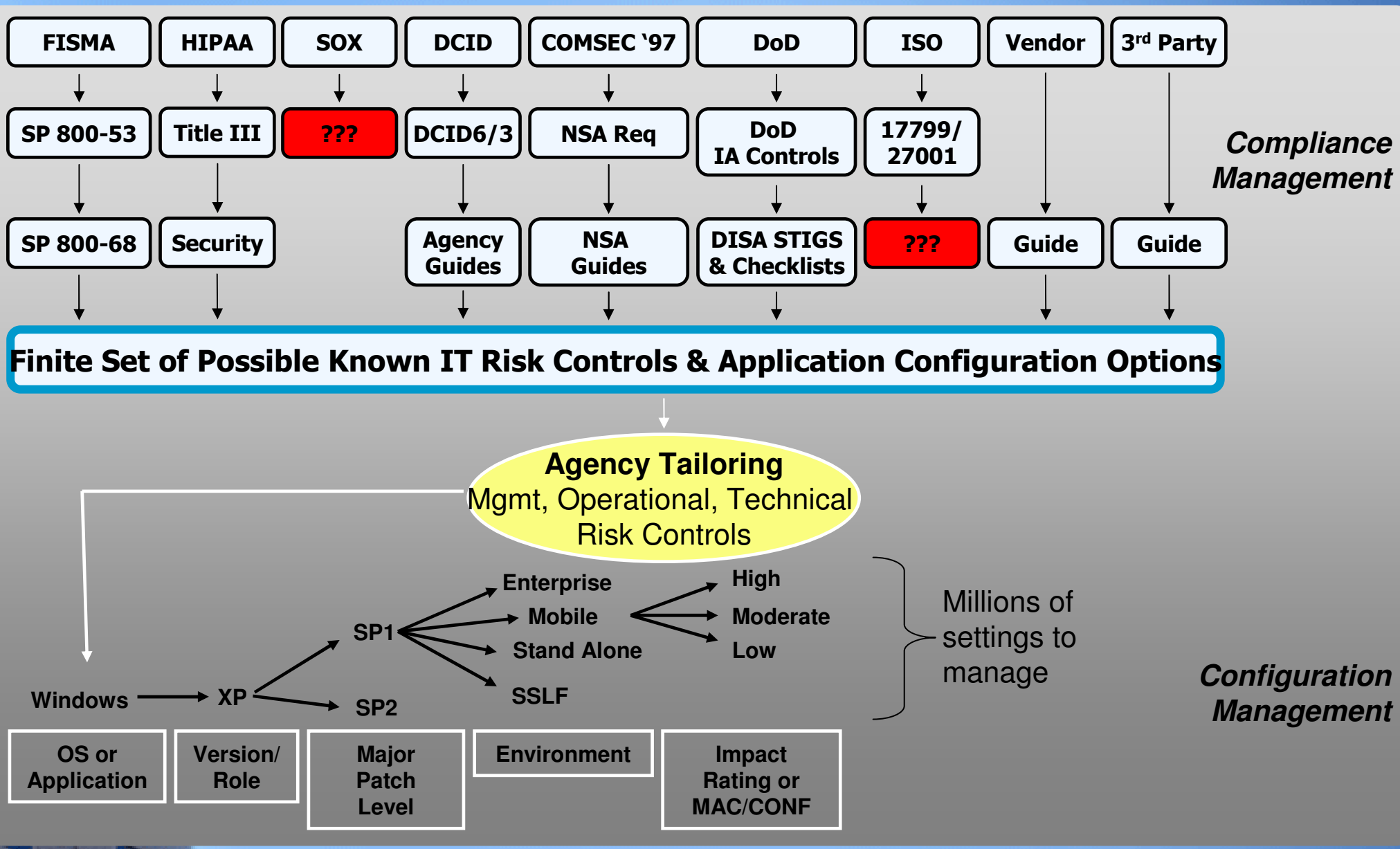
National Institute of Standards and Technology

Agenda

- Challenges with Current Security Approaches
- Introduction to Security Content Automation Protocol
- How Does SCAP Work
- Linking Configuration to Compliance with SCAP
- SCAP Stakeholders, Contributors, and Early Adopters
- SCAP Validation Program

Current State: Compliance and Configuration Management

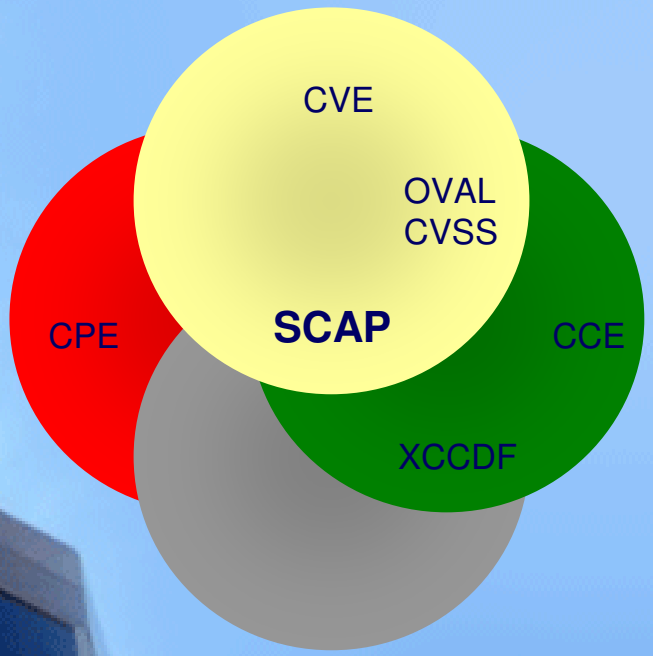


What is SCAP?

How

Standardizing the format by which we communicate

Protocol



What

Standardizing the information we communicate

Content

http://nvd.nist.gov

- 70 million hits per year
- 20 new vulnerabilities per day
- Mis-configuration cross references
- Reconciles software flaws from US CERT and MITRE repositories
- Produces XML feed for NVD content

Security Content Automation Protocol (SCAP)

Standardizing How We Communicate

CVE	Common Vulnerability Enumeration	Standard nomenclature and dictionary of security related software flaws
CCE	Common Configuration Enumeration	Standard nomenclature and dictionary of software misconfigurations
CPE	Common Platform Enumeration	Standard nomenclature and dictionary for product naming
XCCDF	eXtensible Checklist Configuration Description Format	Standard XML for specifying checklists and for reporting results of checklist evaluation
OVAL	Open Vulnerability and Assessment Language	Standard XML for test procedures
CVSS	Common Vulnerability Scoring System	Standard for measuring the impact of vulnerabilities

Cisco, Qualys, Symantec, Carnegie Mellon University

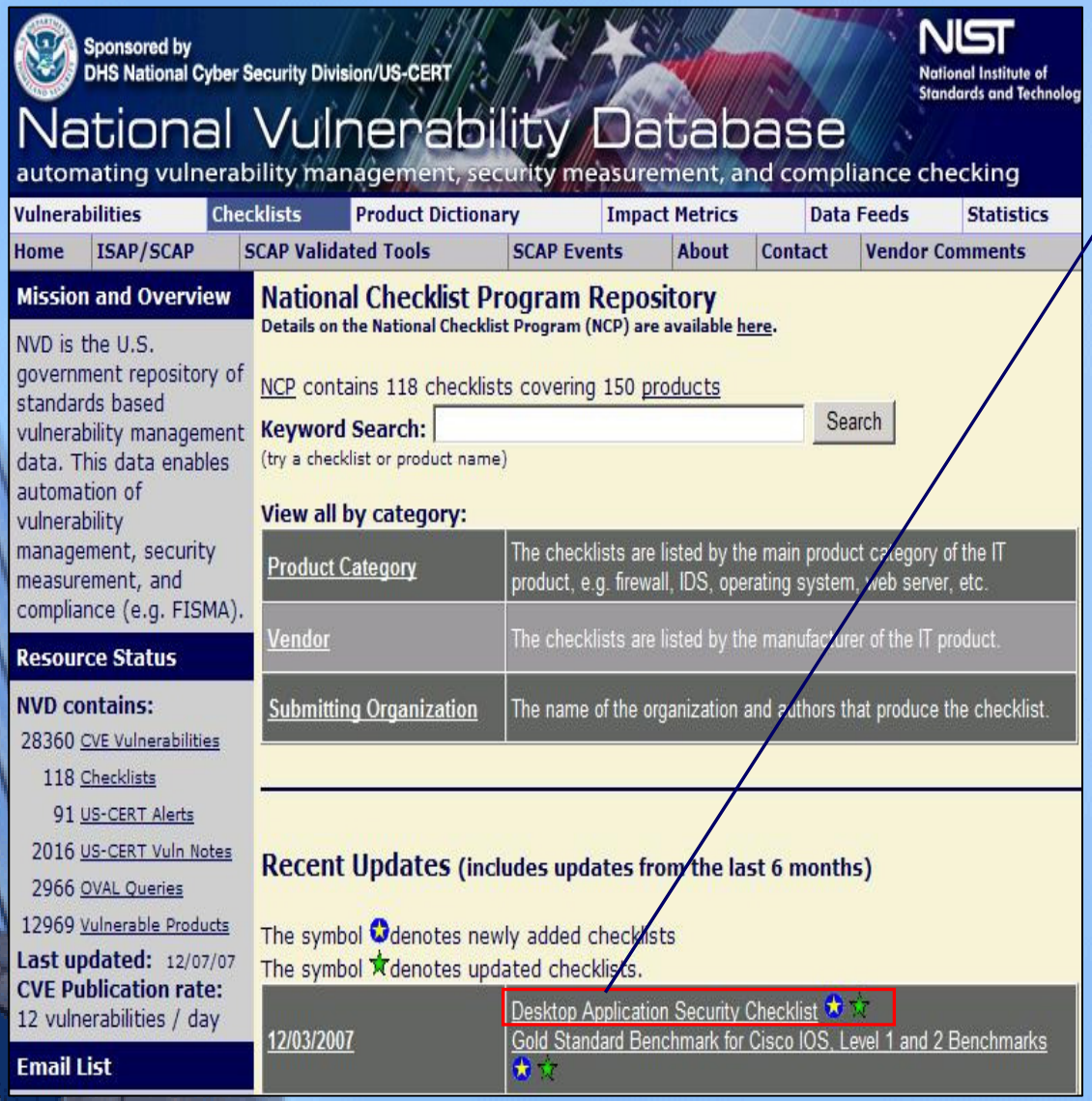
Existing Federal Content

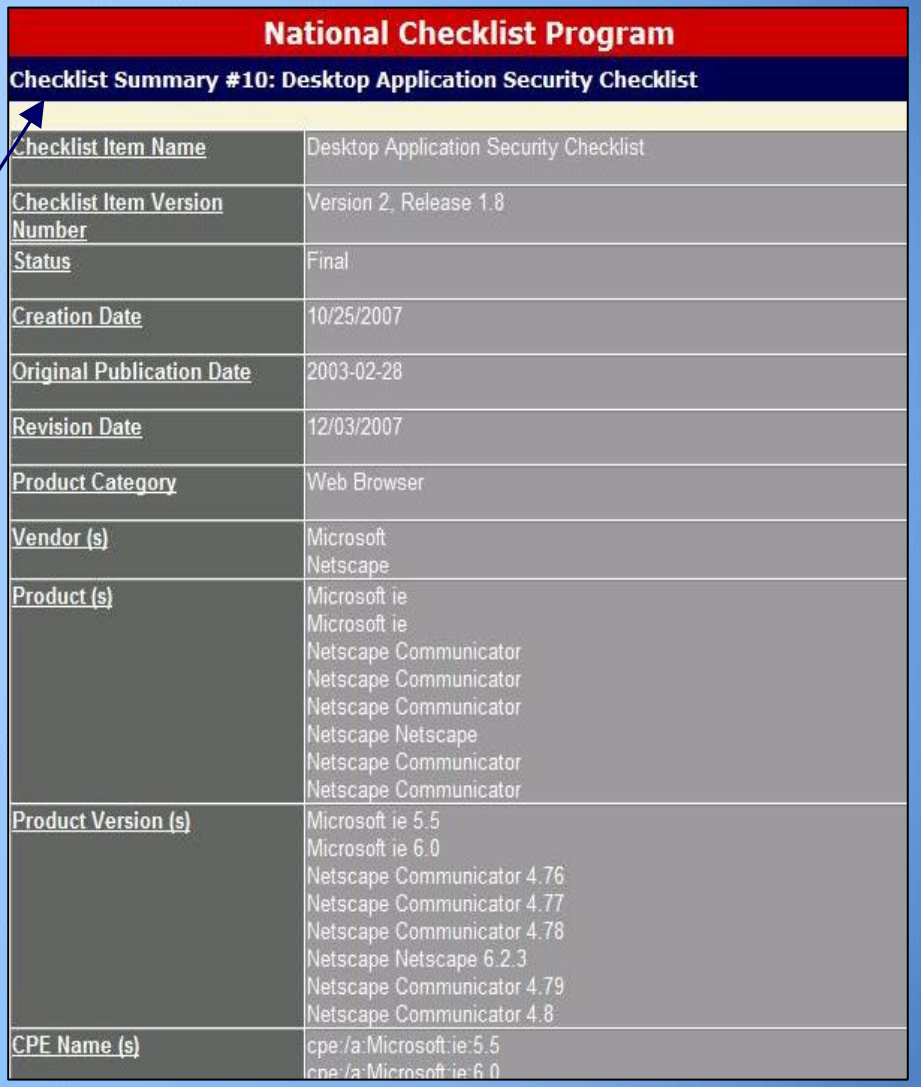
Standardizing What We Communicate

- In response to NIST being named in the Cyber Security R&D Act of 2002
- Encourages vendor development and maintenance of security guidance
- Currently hosts 114 separate guidance documents for over 141 IT products
- Translating this backlog of checklists into the Security Content Automating Protocol (SCAP)
- Participating organizations: DISA, NSA, NIST, Hewlett-Packard, CIS, ITAA, Oracle, Sun, Apple, Microsoft, Citadel, LJK, Secure Elements, ThreatGuard, MITRE Corporation, G2, Verisign, Verizon Federal, Kyocera, Hewlett-Packard, ConfigureSoft, McAfee, etc.

- Over 70 million hits per year
- 29,000 vulnerabilities
- About 20 new vulnerabilities per day
- Mis-configuration cross references to:
  - NIST SP 800-53 Security Controls (All 17 Families and 163 controls)
  - DoD IA Controls
  - DISA VMS Vulnerability IDs
  - Gold Disk VIDs
  - DISA VMS PDI IDs
  - NSA References
  - DCID
  - ISO 17799
- Reconciles software flaws from:
  - US CERT Technical Alerts
  - US CERT Vulnerability Alerts (CERTCC)
  - MITRE OVAL Software Flaw Checks
  - MITRE CVE Dictionary
- Produces XML feed for NVD content

National Checklist Program Hosted at National Vulnerability Database Website





Sponsored by DHS National Cyber Security Division/US-CERT
National Vulnerability Database
a comprehensive cyber vulnerability resource
NIST National Institute of Standards and Technology

How SCAP Works

Checklist **XCCDF**
Platform CPE
Misconfiguration CCE
General Impact CVSS
Software Flaw CVE
General Impact CVSS

Test Procedures **OVAL**

Patches **OVAL**

COTS/ GOTS Tools

Specific Impact CVSS Results

Specific Impact CVSS Results

Linking Configuration to Compliance

Keyed on SP800-53 Security Controls

```
<Group id="IA-5" hidden="true">
 <title>Authenticator Management</title>
  <reference>ISO/IEC 17799: 11.5.2, 11.5.3</reference>
  <reference>NIST 800-26: 15.1.6, 15.1.7, 15.1.9, 15.1.10,
    15.1.11, 15.1.12, 15.1.13, 16.1.3, 16.2.3</reference>
  <reference>GAO FISCAM: AC-3.2</reference>
  <reference>DOD 8500.2: IAKM-1, IATS-1</reference>
  <reference>DCID 6/3: 4.B.2.a(7), 4.B.3.a(11)</reference>
  <reference>HIPAA SR 164.308(a)(5)(ii)(D)
</reference></Group>
```

Traceability to Mandates

```
<Rule id="minimum-password-length" selected="false"
      weight="10.0">
  <reference>CCE-100</reference>
  <reference>DISA STIG Section 5.4.1.3</reference>
  <reference>DISA Gold Disk ID 7082</reference>
  <reference>PDI IAIA-12B</reference>
  <reference>800-68 Section 6.1 - Table A-1.4</reference>
  <reference>NSA Chapter 4 - Table 1 Row 4</reference>
  <requires idref="IA-5"/>
  [pointer to OVAL test procedure]
</Rule>
```

Traceability to Guidelines

Rationale for security configuration

Federal Risk Management Framework

Starting Point

FIPS 199 / SP 800-60

Categorize
Information System

Define criticality /sensitivity of information system according to potential impact of loss

FIPS 200 / SP 800-53

Select
Security Controls

Select baseline (minimum) security controls to protect the information system; apply tailoring guidance as appropriate

SP 800-53 / SP 800-30

Supplement
Security Controls

Use risk assessment results to supplement the tailored security control baseline as needed to ensure adequate security and due diligence

SP 800-18

Document
Security Controls

Document in the security plan, the security requirements for the information system and the security controls planned or in place

SP 800-70

Implement
Security Controls

Implement security controls; apply security configuration settings

SP 800-53A

Assess
Security Controls

Determine security control effectiveness (i.e., controls implemented correctly, operating as intended, meeting security requirements)

SP 800-37

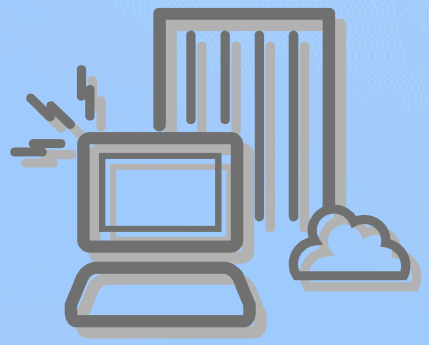
Authorize
Information System

Determine risk to agency operations, agency assets, or individuals and, if acceptable, authorize information system operation

SP 800-37 / SP 800-53A

Monitor
Security Controls

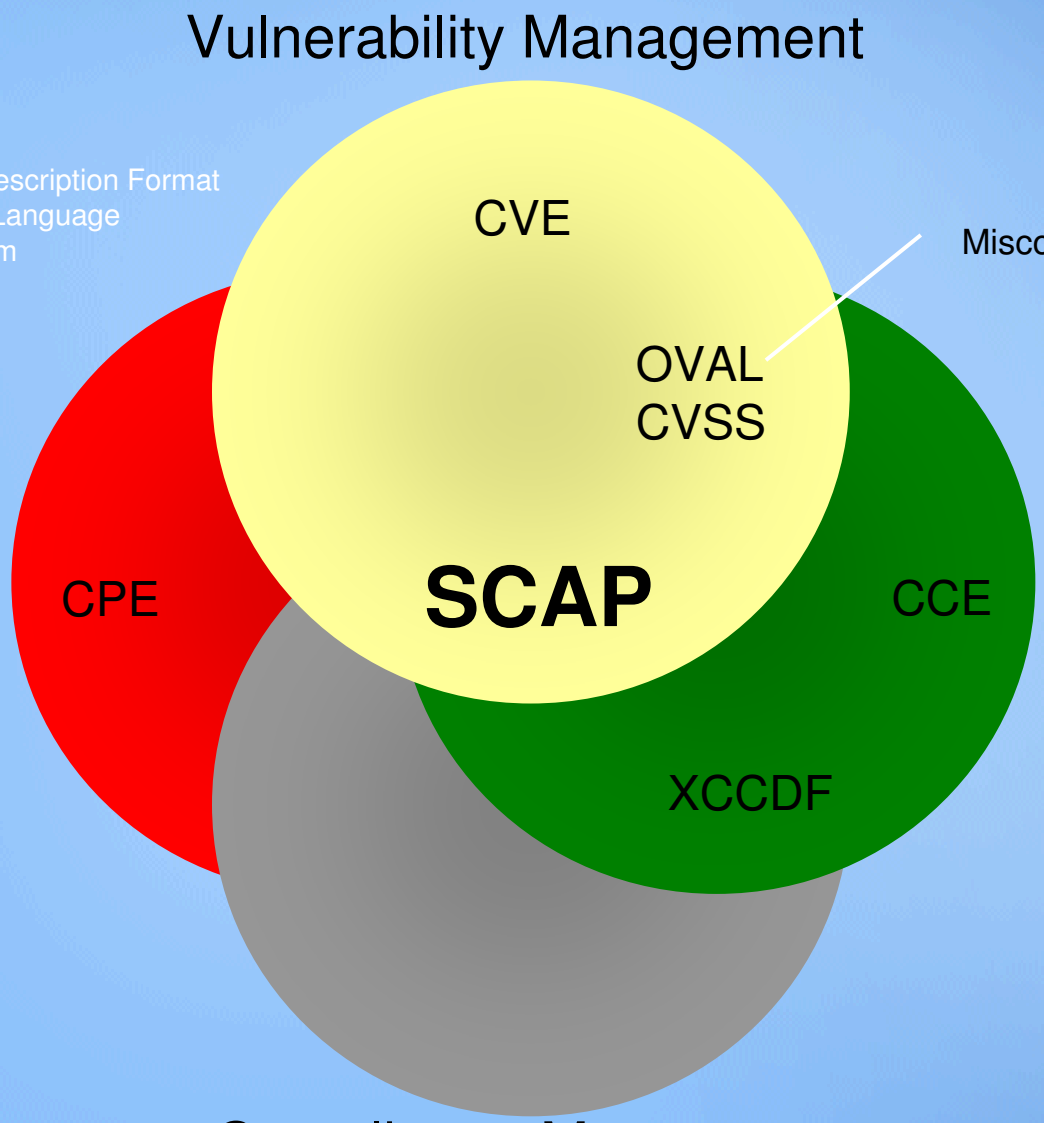
Continuously track changes to the information system that may affect security controls and reassess control effectiveness



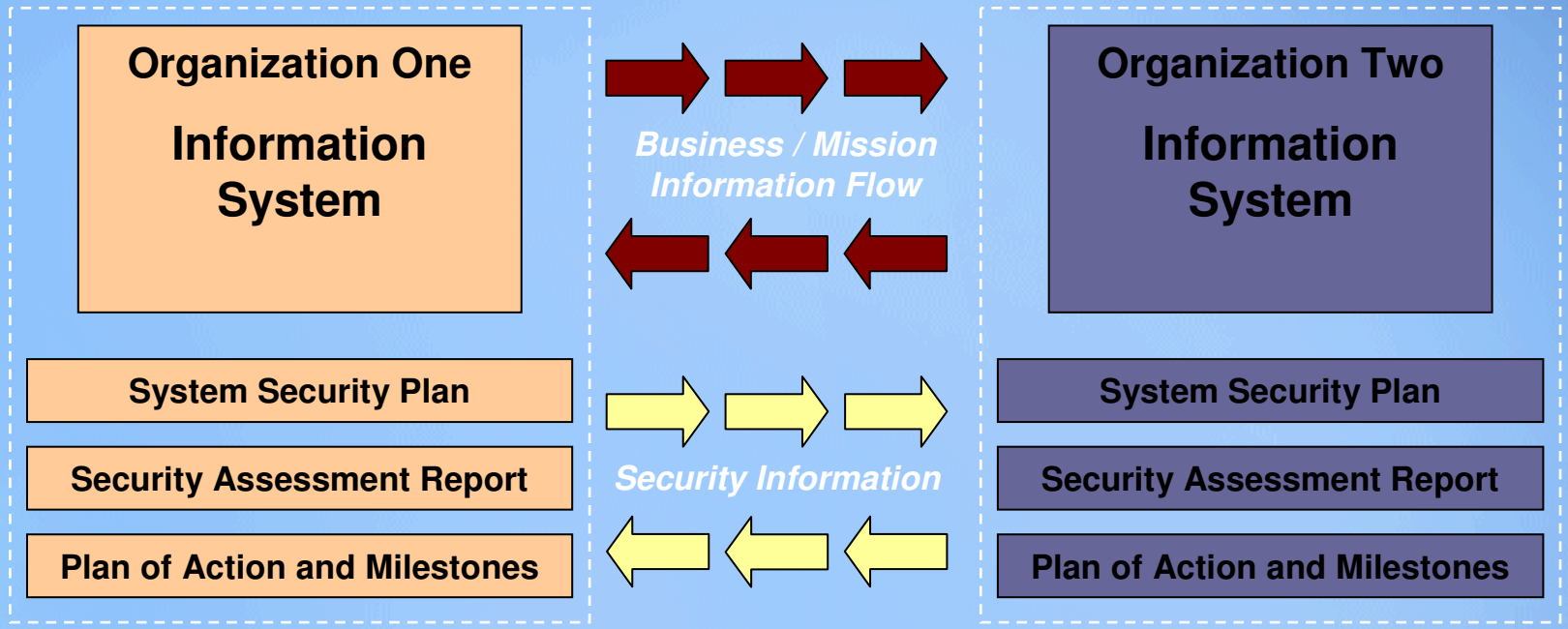
~ 19% of FISMA Security Controls are fully automated through SCAP
~ 24% of FISMA Security Controls are partially automated through SCAP

Integrating IT and IT Security Through SCAP

Common Vulnerability Enumeration
Common Platform Enumeration
Common Configuration Enumeration
eXtensible Checklist Configuration Description Format
Open Vulnerability and Assessment Language
Common Vulnerability Scoring System



Agility in a Digital World



Determining the risk to the first organization's operations and assets and the acceptability of such risk

Determining the risk to the second organization's operations and assets and the acceptability of such risk

The objective is to achieve *visibility* into prospective business/mission partners information security programs BEFORE critical/sensitive communications begin…establishing levels of security due diligence and trust.

Stakeholder and Contributor Landscape: Industry

Product Teams and Content Contributors

Stakeholder and Contributor Landscape: Federal Agencies

SCAP Infrastructure, Beta Tests, Use Cases, and Early Adopters

DHS		OMB	
NSA		IC	
OSD		DISA	
DOJ		EPA	
Army		NIST	
DOS			

OMB 31 July 2007 Memo to CIOs

Establishment of Windows XP and VISTA Virtual Machine and Procedures for Adopting the Federal Desktop Core Configurations

July 31, 2007

MEMORANDUM FOR CHIEF INFORMATION OFFICERS

FROM: Karen Evans
Administrator, Office of E-Government and Information Technology

SUBJECT: Establishment of Windows XP and VISTA Virtual Machine and Procedures for Adopting the Federal Desktop Core Configurations

The Office of Management and Budget recently issued policy memorandum M-07-11, "Implementation of Commonly Accepted Security Configurations for Windows Operating Systems," which stated: "agencies with these operating systems [Windows XP and VISTA] and/or plans to upgrade to these operating systems must adopt these standard security configurations by February 1, 2008."

As we noted in the June 1, 2007 follow-up policy memorandum M-07-18, "Ensuring New Acquisitions Include Common Security Configurations," a virtual machine would be established "to provide agencies and information technology providers' access to Windows XP and VISTA images." The National Institute of Standards and Technology (NIST), Microsoft, the Department of Defense, and the Department of Homeland Security have now established a website hosting the virtual machine images, which can be found at: http://csrc.nist.gov/fdcc. The website also includes frequently asked questions and other technical information for adopting the Federal Desktop Core Configurations (FDCC).

Your agency can now acquire information technology products that are self-asserted by information technology providers as compliant with the Windows XP & VISTA FDCC, and use NIST's Security Content Automation Protocol (S-CAP) to help evaluate providers' self-assertions. Information technology providers must use S-CAP validated tools, as they become available, to certify their products do not alter these configurations, and agencies must use these tools when monitoring use of these configurations. Related resources (e.g., group policy objects) are also provided to help facilitate agency adoption of the FDCC.

For additional information about this initiative, please call 1-800-FED-INFO. Additional information about the S-CAP can be found at: http://nvd.nist.gov/scap.cfm.

"As we noted in the June 1, 2007 follow-up policy memorandum M-07-18, "Ensuring New Acquisitions Include Common Security Configurations," **a virtual machine would be established "to provide agencies and information technology providers' access to Windows XP and VISTA images."** The National Institute of Standards and Technology (NIST), Microsoft, the Department of Defense, and the Department of Homeland Security have now established a website hosting the virtual machine images, which can be found at: http://csrc.nist.gov/fdcc."

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NVLAP®

National Voluntary Laboratory Accreditation Program

More Information

NIST FDCC Questions — fdcc@nist.gov

NIST FDCC Web Site — http://fdcc.nist.gov

- FDCC SCAP Checklists
- FDCC Settings
- Virtual Machine Images
- Group Policy Objects

National Checklist Program — http://checklists.nist.gov

National Vulnerability Database — http://nvd.nist.gov or http://scap.nist.gov

- SCAP Checklists
- SCAP Capable Products
- SCAP Events

NIST SCAP Mailing Lists — Scap-update@nist.gov

Scap-dev@nist.gov

Scap-content@nist.gov

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Information and Feedback
Web: http://fdcc.nist.gov
Comments: fdcc@nist.gov

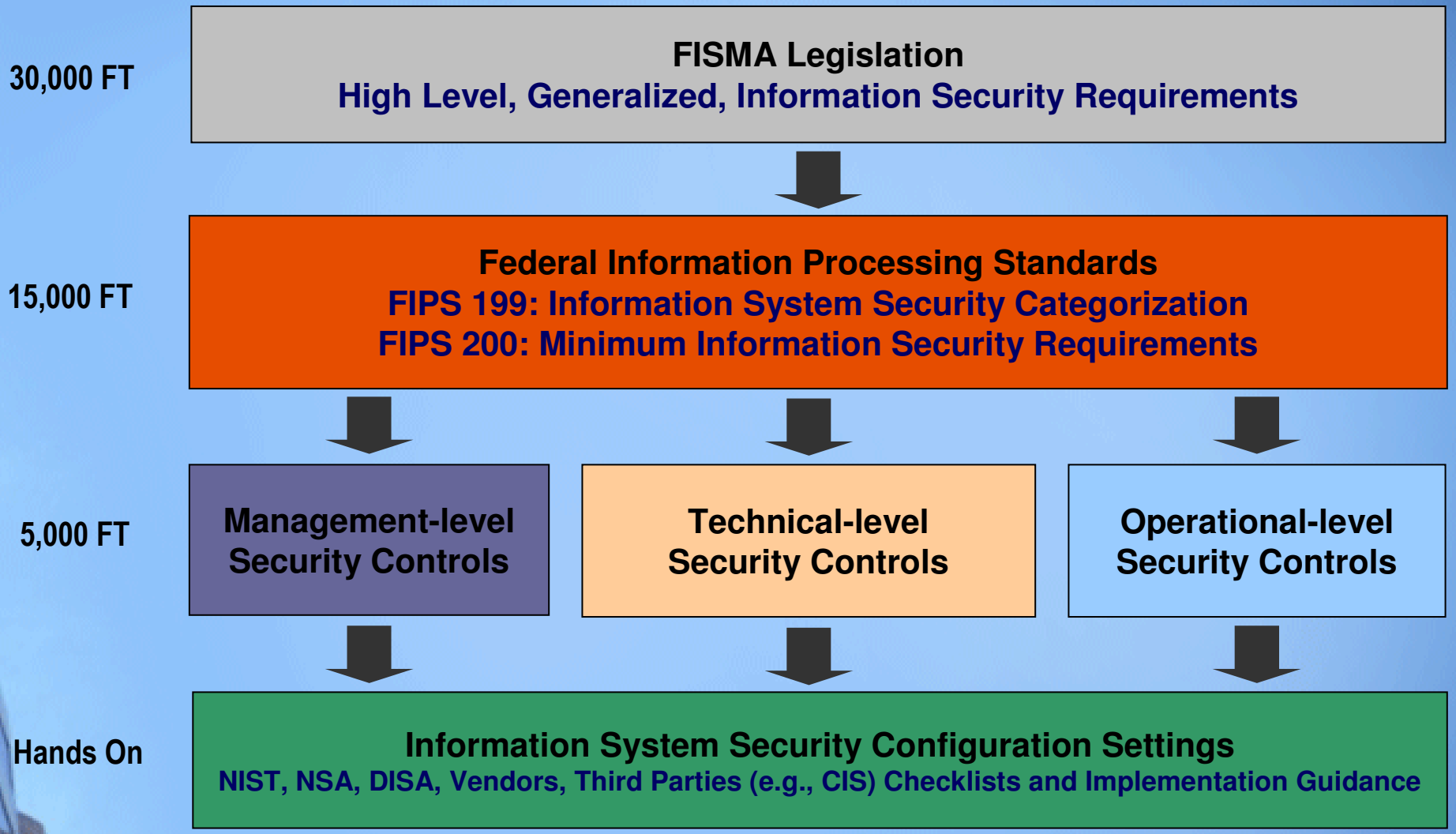
NIST FDCC Team Members

Questions

National Institute of Standards & Technology
Information Technology Laboratory
Computer Security Division

Current State of Information Security

FISMA Compliance Model



Current State Summary - Compliance

A Study in Cause and Effect

Governing Bodies

Recognize the need to improve security and mandate it in an increasing number of laws, directives, and policies

Standards Bodies

Try to keep pace with an increasing number of mandates by generating more frameworks and guidelines

Product Teams

Based on the increasing number of mandates, see the need for automation, many seek to enable it through proprietary methods

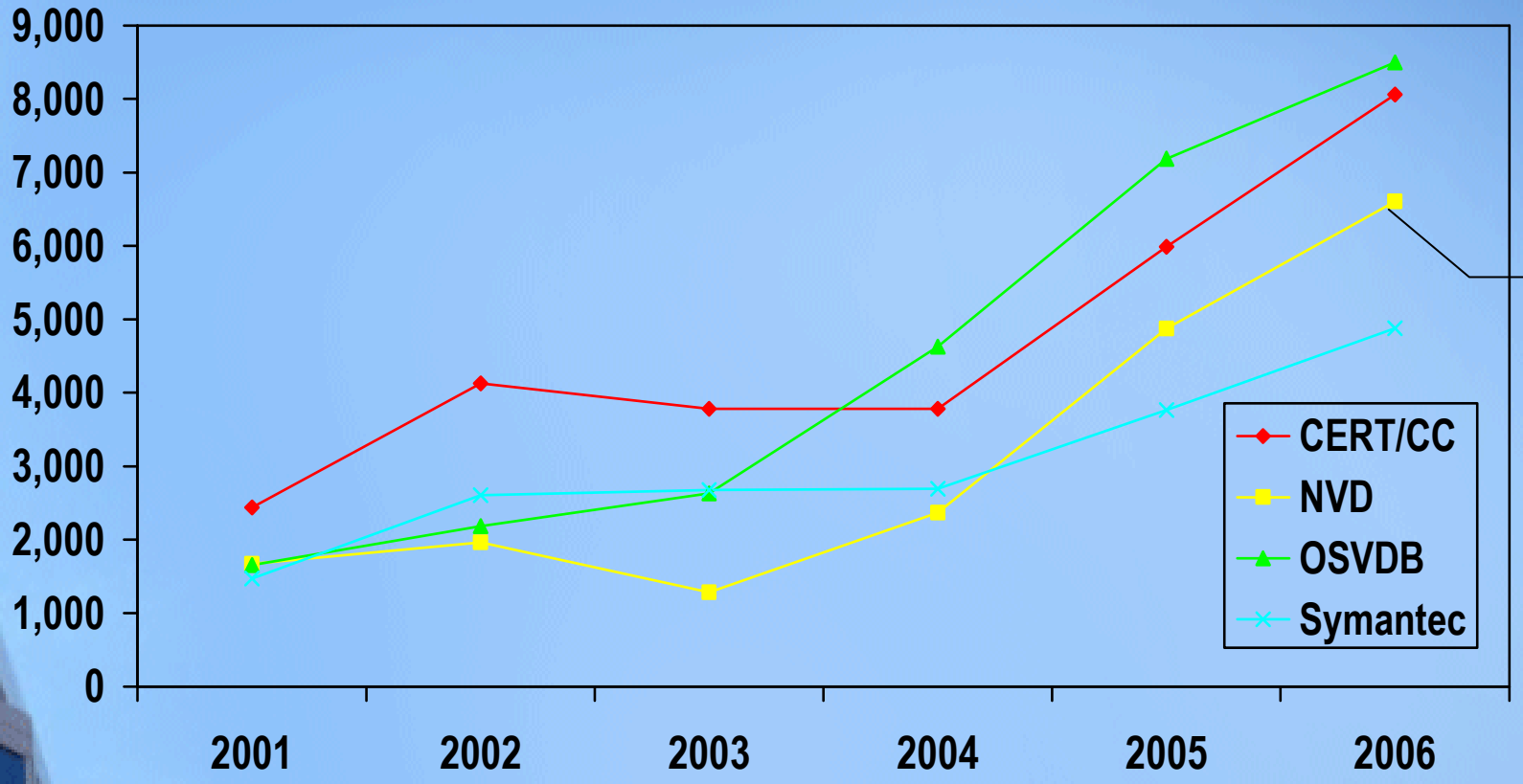
Service Providers

Based on the increasing number of mandates, see the need for automation and have responded by 1) learning a wide variety of both open and proprietary technologies and 2) implementing point solutions

Operations Teams

Lacking true automation, 1) have become overwhelmed by an increasing number of mandates, frameworks, and guidelines and 2) are spending a considerable amount of resources trying to keep pace

Current State: Vulnerability Trends



A 20-50% increase over previous years

- Decreased timeline in exploit development coupled with a decreased patch development timeline (highly variable across vendors)
- Increased prevalence of zero day exploits
- Three of the SANS Top 20 Internet Security Attack Targets 2006 were categorized as “configuration weaknesses.” Many of the remaining 17 can be partially mitigated via proper configuration.

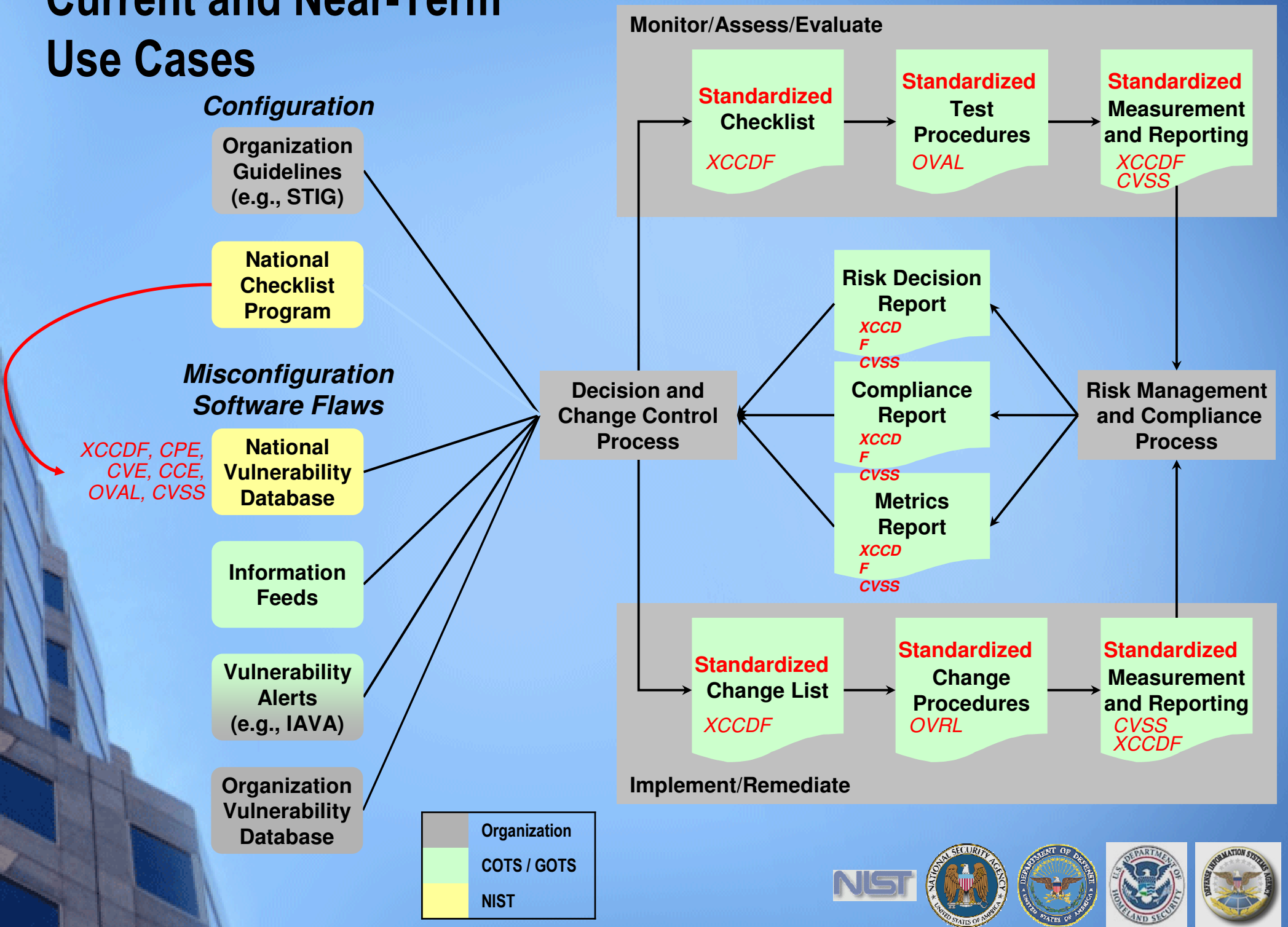
Current State: Vulnerability Management Industry

- Product functionality is becoming more hearty as vendors acknowledge connections between security operations and a wide variety of IT systems (e.g., asset management, change/configuration management)
- Some vendors understand the value of bringing together vulnerability management data across multiple vendors
- Vendors driving differentiation through:
  - enumeration, — Hinders information sharing and automation
  - evaluation, — Reduces reproducibility across vendors
  - content,
  - measurement, and
  - reporting

  } Drives broad differences in prioritization and remediation

Supplemental – SCAP Platform Evaluation Tutorial

Current and Near-Term Use Cases



Current Problems

Conceptual Analogy (Continued)

Before

After

CHECK ***Error Report***

Problem

Air Pressure Loss

Impact

Car Will Not Start (9/10)

Diagnosis Accuracy:

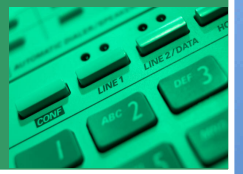
All Sensors Reporting

Diagnosis:

Replace Gas Cap

Expected Cost:

$25.00



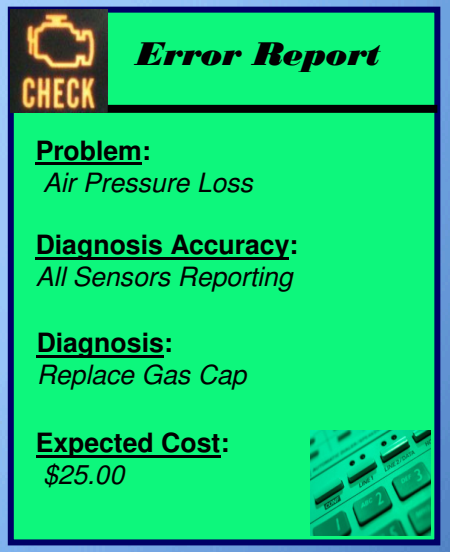
XML Made Simple

XCCDF - eXtensible Car Care Description Format

```
<Car>
  <Description>
    <Year> 1997 </Year>
    <Make> Ford </Make>
    <Model> Contour </Model>
  <Maintenance>
    <Check1> Gas Cap = On <>
    <Check2>Oil Level = Full <>
  </Maintenance>
 </Description>
</Car>
```

OVAL – Open Vehicle Assessment Language

```
<Checks>
  <Check1>
    <Location> Side of Car <>
    <Procedure> Turn <>
  </Check1>
  <Check2>
    <Location> Hood <>
    </Procedure> … <>
  </Check2>
</Checks>
```

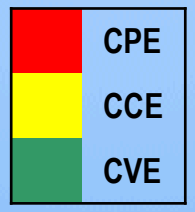


SCAP Content Made Simple

Standardized Checklist

XCCDF - eXtensible Checklist Configuration Description Format

```
<Document ID> NIST SP 800-68
  <Date> 04/22/06 </Date>
    <Version> 1 </Version>
    <Revision> 2 </Revision>
 <Platform> Windows XP <>
    <Check1> Password >= 8 <>
    <Check2> Win XP Vuln <>
  </Maintenance>
 </Description>
</Car>
```



OVAL – Open Vulnerability Assessment Language

Standardized Test Procedures

```
<Checks>
  <Check1>
    <Registry Check> … <>
    <Value> 8 </Value>
  </Check1>
  <Check2>
    <File Version> … <>
    <Value> 1.0.12.4 </Value>
  </Check2>
</Checks>
```

Standardized Measurement and Reporting

XCCDF security benchmark automation

CVSS

NIST

Application to Automated Compliance

The Connected Path

800-53 Security Control

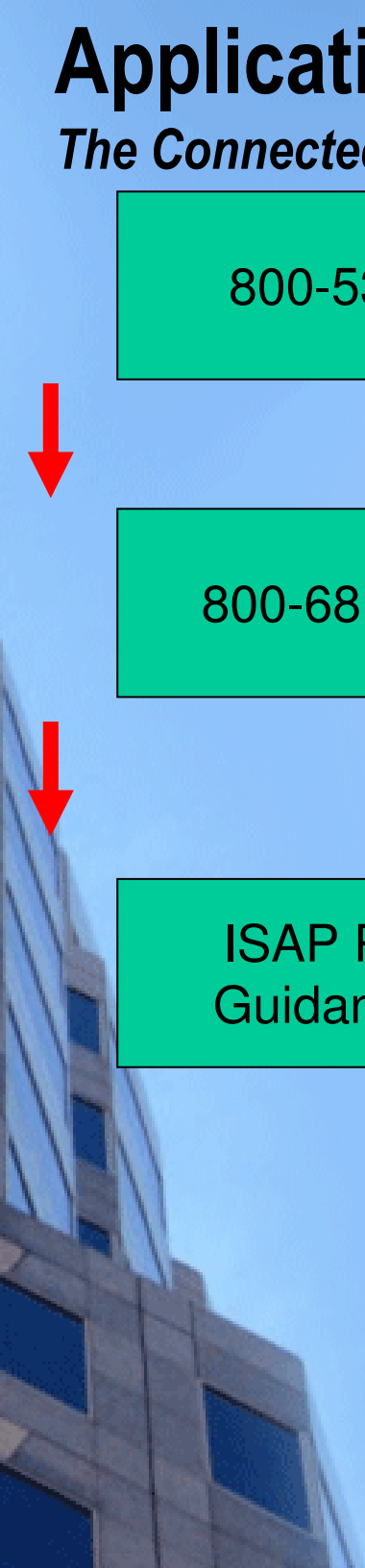
800-68 Security Guidance

ISAP Produced Security Guidance in XML Format

COTS Tool Ingest

API Call

Result



Application to Automated Compliance

The Connected Path

800-53 Security Control
DoD IA Control

AC-7 Unsuccessful Login Attempts

800-68 Security Guidance
DISA STIG/Checklist
NSA Guide

AC-7: Account Lockout Duration
AC-7: Account Lockout Threshold

ISAP Produced Security Guidance in XML Format

```
- <registry_test id="wrt-9999" comment="Account Lockout Duration Set to 5" check="at least 5">
- <object>
  <hive>HKEY_LOCAL_MACHINE</hive>
  <key>Software\Microsoft\Windows</key>
  <name>AccountLockoutDuration</name>
  </object>
- <data operation="AND">
  <value operator="greater than">5*</value>
```

Result

```
RegQueryValue (lpHKey, path, value, sKey, Value, Op);
If (Op == '>" )
if ((sKey < Value )
return (1); else
return (0);
```

API Call

lpHKey = "HKEY_LOCAL_MACHINE"
Path = "Software\Microsoft\Windows\"
Value = "5"
sKey = "AccountLockoutDuration"
Op = ">"

COTS Tool Ingest

Supplemental – SCAP Value Reference

SCAP Value

Feature	Benefit
Standardizes ***how*** computers communicate vulnerability information – the protocol	▪Enables interoperability for products and services of various manufacture
Standardizes ***what*** vulnerability information computers communicate – the content	▪Enables repeatability across products and services of various manufacture ▪Reduces content-based variance in operational decisions and actions
Based on open standards	▪Harnesses the collective brain power of the masses for creation and evolution ▪Adapts to a wide array of use cases
Uses configuration and asset management standards	▪Mobilizes asset inventory and configuration information for use in vulnerability and compliance management
Applicable to many different Risk Management Frameworks – Assess, Monitor, Implement	▪Reduces time, effort, and expense of risk management process
Detailed traceability to multiple security mandates and guidelines	▪Automates portions of compliance demonstration and reporting ▪Reduces chance of misinterpretation between Inspector General/auditors and operations teams
Keyed on NIST SP 800-53 security controls	▪Automates portions of FISMA compliance demonstration and reporting

Supplemental – FAQ for NIST FISMA Documents

Fundamental FISMA Questions

What are the NIST Technical Security Controls?

What are the *Specific* NIST recommended settings for individual technical controls?

How do I implement the recommended setting for technical controls? Can I use my COTS Product?

Am I compliant to NIST Recs & Can I use my COTS Product?

Will I be audited against the same criteria I used to secure my systems?

Fundamental FISMA Documents