External Dependencies and Supply Chain Risk Management

AFCEA Defensive Cyber Operations Symposium

John Haller – Software Engineering Institute
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Notices

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Session Topics

- Foundations and background
- Threats to cyber-dependent supply chains
- Examples and case study
- Limitations of “outsourcing cyber risk” and management by contractual agreement
- Methods for managing resilient supply chains (focus on Covered Defense Information)

Learning Objectives

- Understand the fundamental concepts of managing risks to cyber-dependent supply chains

- Explore sources of risk in cyber-dependent supply chains

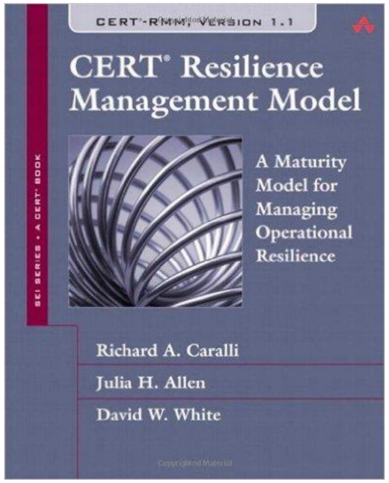
- Understand limitations of third party contracts

- Identify practical tools, technique, and methods for managing external dependencies and supply chain risk.

- Differentiate between operational resilience and traditional third-party performance requirements

Foundations

Foundation: CERT Resilience Management Model



CERT®-RMM, VERSION 1.1

CERT® Resilience Management Model

A Maturity Model for Managing Operational Resilience

SEI SERIES • A CERT® BOOK

Richard A. Caralli

Julia H. Allen

David W. White

"… the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions. Resilience includes the ability to withstand and recover from deliberate attacks, accidents, or naturally occurring threats or incidents…"

- Presidential Policy Directive – PPD 21
February 12, 2013

Protect (Security)	Sustain (Continuity)
Perform (Capability)	Repeat (Maturity)

Cyber Resilience Review (CRR)

- Department of Homeland Security initiative to help critical infrastructure providers understand their operational resilience and ability to manage cyber risk
- Derived from the CERT Resilience Management Model (CERT-RMM)
- A review of the overall practice, integration, and health of an organization’s cyber security program
- The CRR allows an organization to
  - develop an understanding of process-based cyber security capabilities
  - develop meaningful indicators of operational resilience
  - improve its ability to manage cyber risk to its critical services and related assets
- 252 Assessments performed to date on version 2

CRR Overview

A structured assessment available as:

- a one day, facilitated assessment
- a self-assessment utilizing a freely available online version

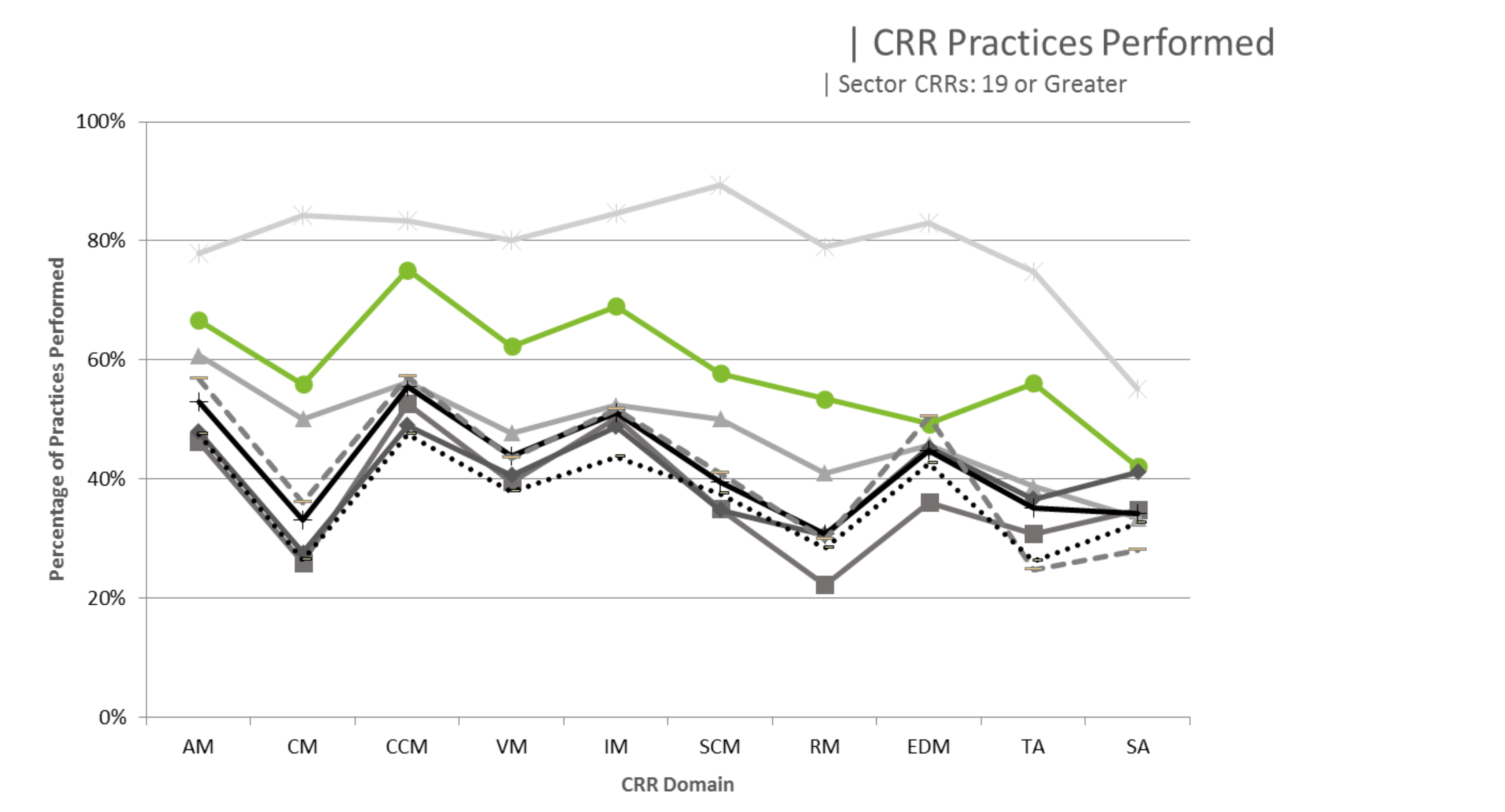
Data is protected as PCII – Protected Critical Infrastructure Information

Data analysis is done anonymously, for example:

- Performance of an entire sector
- Relationships between practices and questions

CRR Domains	
AM	Asset Management
CM	Controls Management
CCM	Configuration and Change Management
VM	Vulnerability Management
IM	Incident Management
SCM	Service Continuity Management
RM	Risk Management
EDM	External Dependencies Management
TA	Training and Awareness
SA	Situational Awareness

Sector Level Analysis



NIST Cybersecurity Framework for Critical Infrastructure

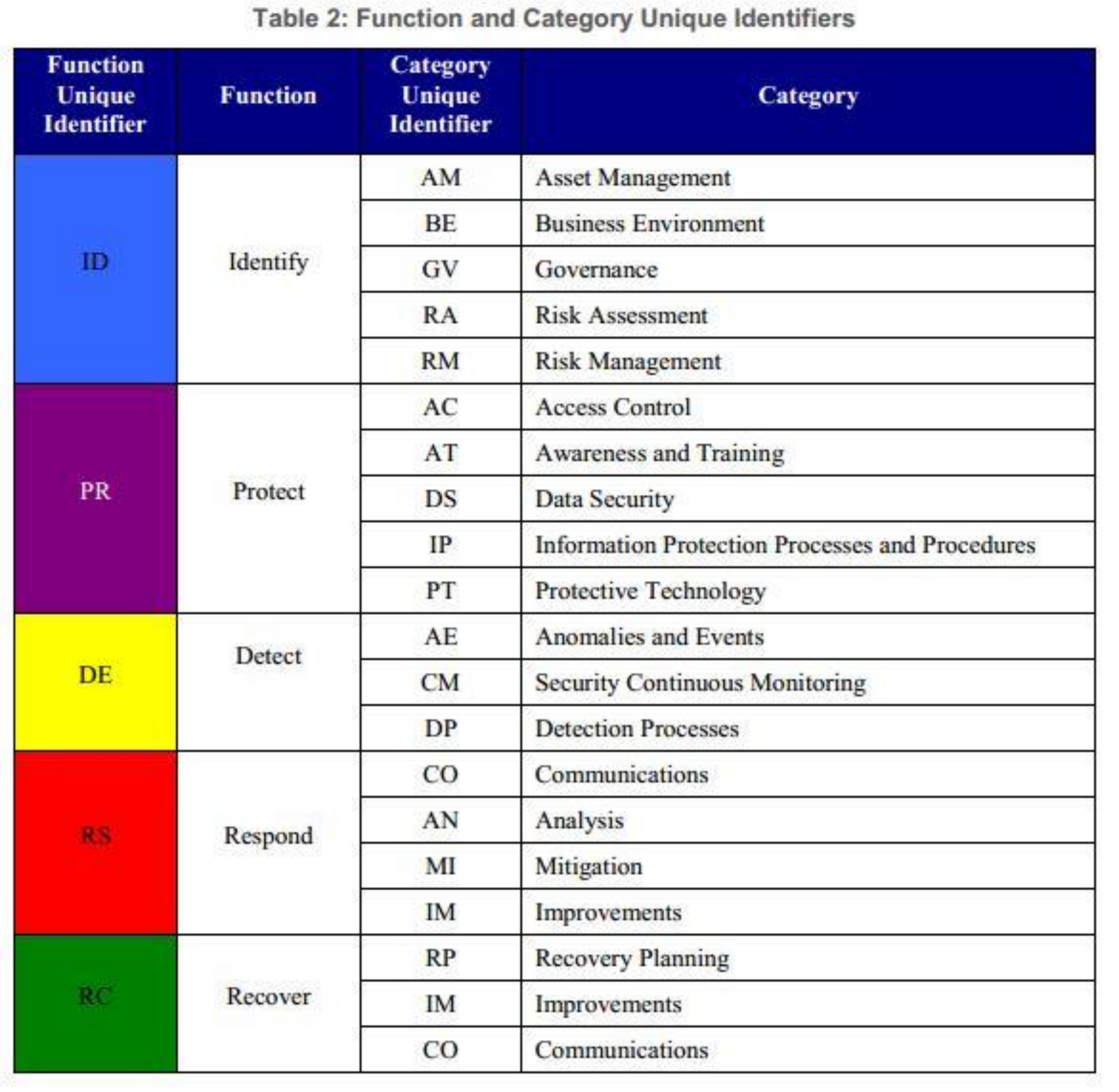
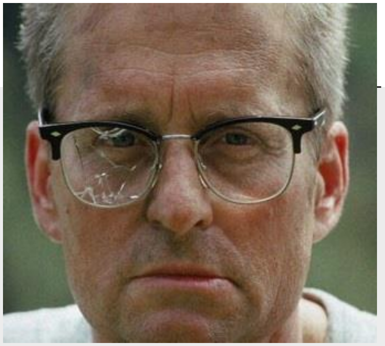


Table 2: Function and Category Unique Identifiers

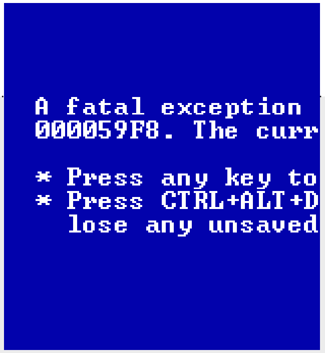
Function Unique Identifier	Function	Category Unique Identifier	Category
ID	Identify	AM	Asset Management
		BE	Business Environment
		GV	Governance
		RA	Risk Assessment
		RM	Risk Management
PR	Protect	AC	Access Control
		AT	Awareness and Training
		DS	Data Security
		IP	Information Protection Processes and Procedures
		PT	Protective Technology
DE	Detect	AE	Anomalies and Events
		CM	Security Continuous Monitoring
		DP	Detection Processes
RS	Respond	CO	Communications
		AN	Analysis
		MI	Mitigation
		IM	Improvements
RC	Recover	RP	Recovery Planning
		IM	Improvements
		CO	Communications

Sources and examples of supply chain risk

Actions of people



Systems & technology failures



```
A fatal exception
000059F8. The curr

* Press any key to
* Press CTRL+ALT+D
  lose any unsaved
```

Failed internal processes

External events

Specific examples:

Breach of covered defense information (CUI) or other sensitive information

Tainted or counterfeit technology

Unintended or unknown functionality

Process failures – for example failure to identify or track sensitive information

Examples and short case study

Recent commercial sector third party data breaches

- Why you should care about granting control of your data to service providers
  - Selected breach incidents

    -Lowes (2014)

    -DoD TRANSCOM (2014)

    -HAVEX (2014)

    -AT&T(2014)

    -Target (2013)

    -New York State Electric and Gas (2012)

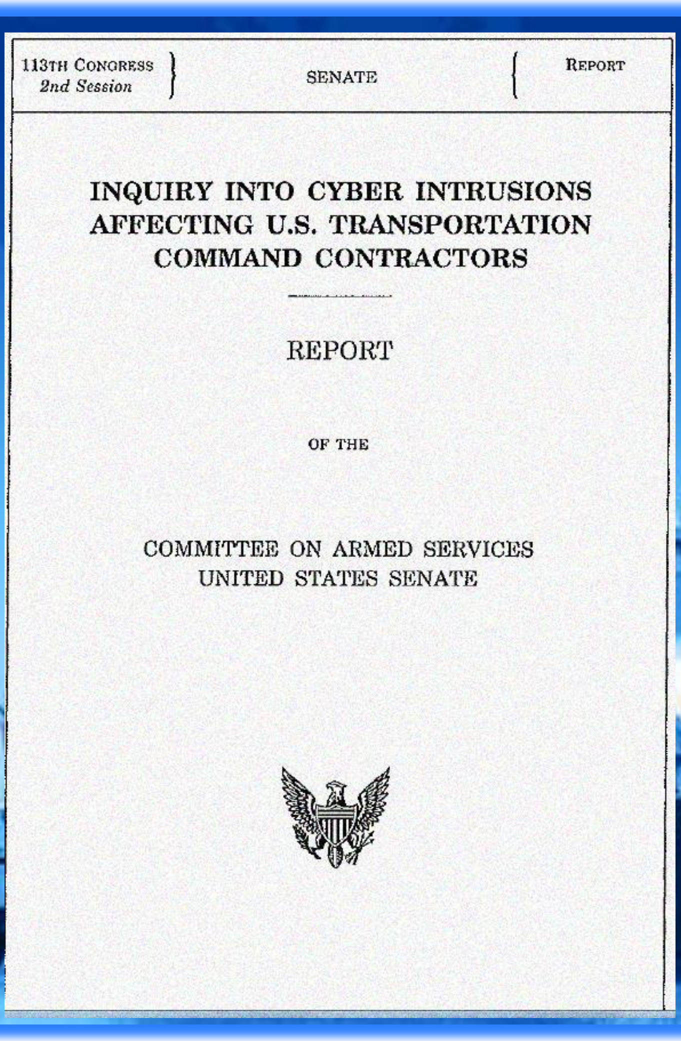
    -California Department of Child Support Services (2012)

    -Thrift Savings Plan (2012)

    -Epsilon (2011)

    -Silverpop (2010)

Case study: TRANSCOM



113TH CONGRESS
2nd Session

SENATE

REPORT

INQUIRY INTO CYBER INTRUSIONS AFFECTING U.S. TRANSPORTATION COMMAND CONTRACTORS

REPORT

OF THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

TRANSCOM target – military logistics capability

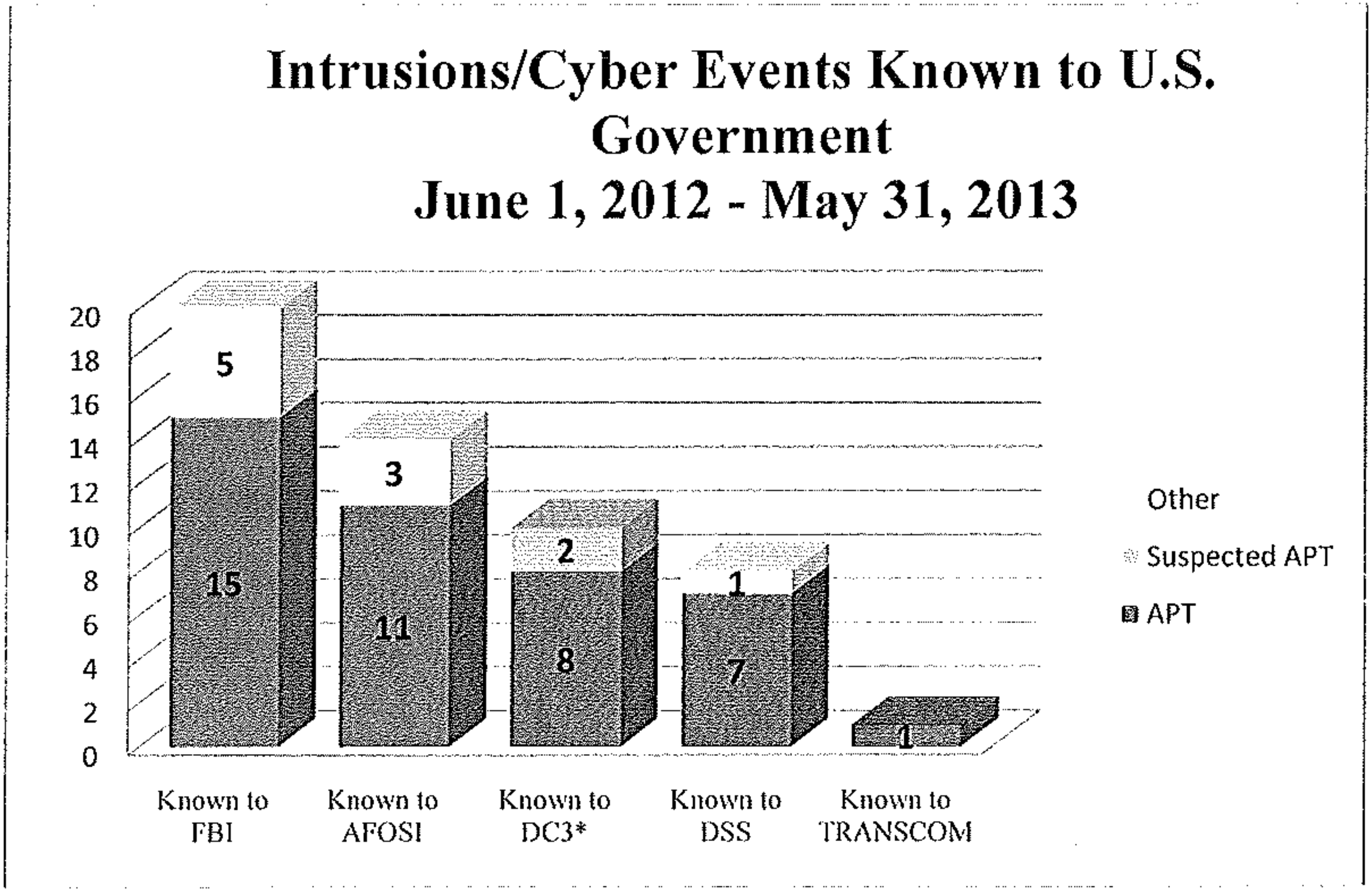
SASC identified fifty successful intrusions targeting TRANSCOM contractors between June 1, 2012 and May 30, 2013

Twenty intrusions attributed to “Advanced Persistent Threat”

Contractor targets:

- CRAF – Civil Reserve Air Fleet
- VISA – Voluntary Intermodal Sealift Agreement Program

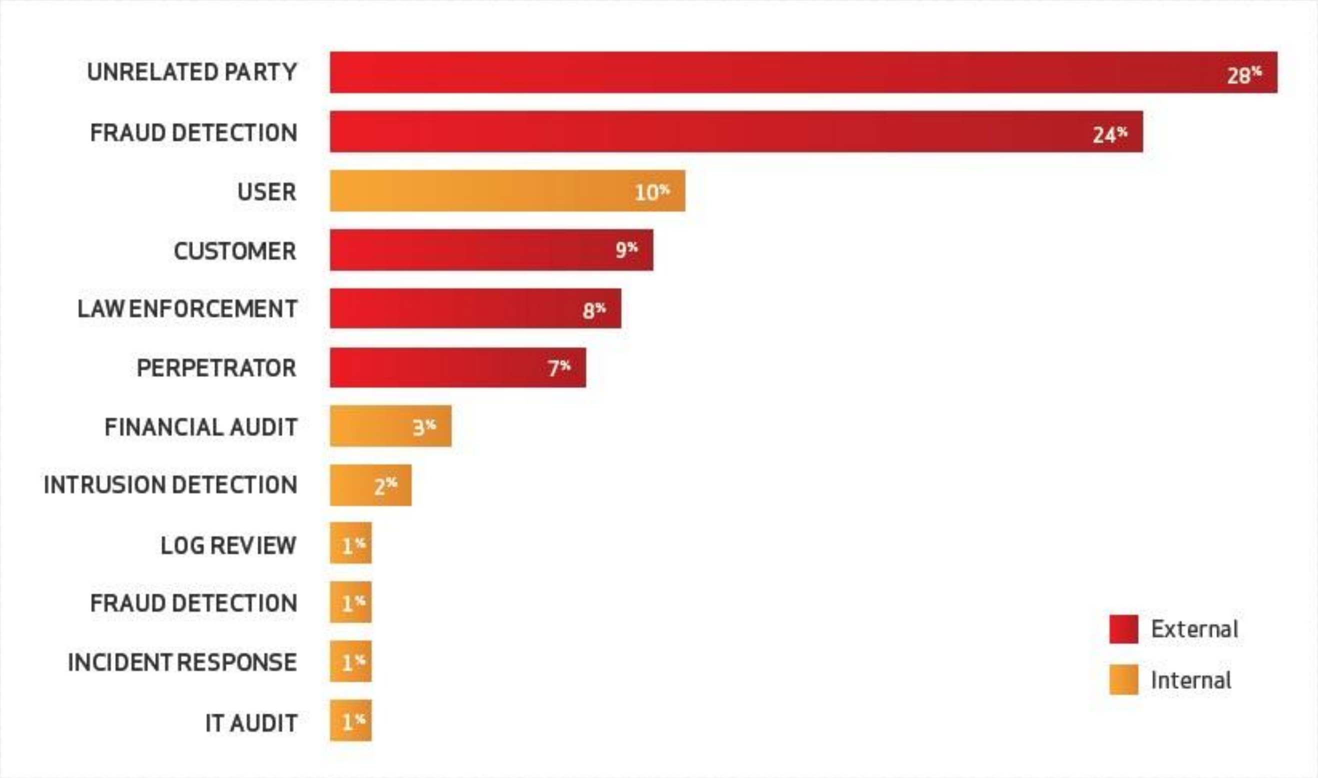
Information sharing in TRANSCOM case



Intrusions/Cyber Events Known to U.S. Government
June 1, 2012 - May 31, 2013

Importance of cooperation and managing the supplier set

Figure 6: Who identifies data breaches



Many organizations devote a disproportionate amount of time and money to detection methods that fall below the 1% mark.

Limitations to managing through contract requirements

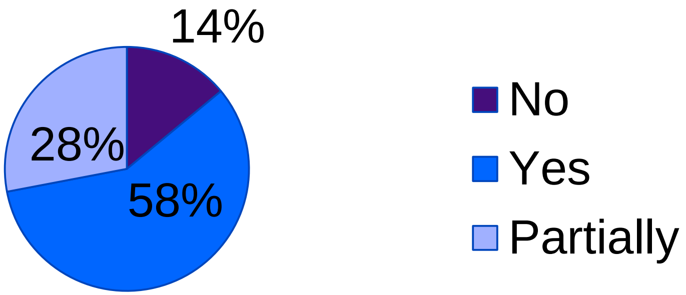
Risk in external dependencies

- *"One caveat of outsourcing is that you can outsource business functions, but you cannot outsource the risk and responsibility to a third party. These must be borne by the organization that asks the population to trust they will do the right thing with their data."*

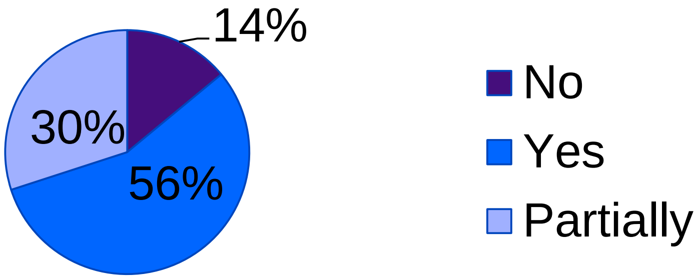
-Verizon 2012 Data Breach Investigations Report

State of cyber SLAs – field research

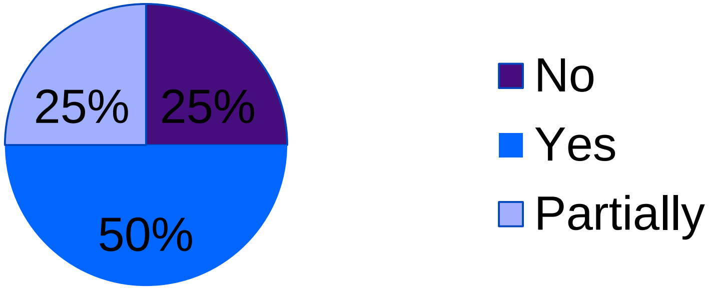
Does your organization document security objectives in agreements with third parties?



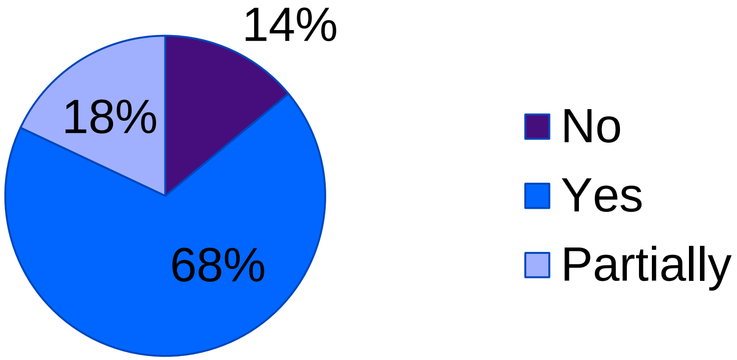
Does your organization include measures of security performance in agreements?



Does your organization monitor compliance to security objectives in agreements?



Is cybersecurity performance considered when selecting third parties?



Senate Armed Services Committee Report

TRANSCOM incident reporting contract language was:

- Interpreted differently by contractors, for example to mean system intrusions where exfiltration or corruption of DOD information had been confirmed
- Required contractors to know which systems contain DOD information
- Requires contractors to recognize APT attacks
- Focused ONLY on the information asset (DOD information)

KEY POINTS: - Contract language is “in the eye of the beholder”

- Important contractor relationships require “care and feeding”

Limitations of contract requirements

Contracts *can* do the following:

Allocate risk

Drive behavior

Define breach

Basic questions on contract clauses involving confidentiality or data integrity:

- How do we prove breach?
- How do we prove damages (in monetary terms)?
- If contract non-renewal is a remedy, is it realistic?

An approach to protection of Covered Defense Information

DFARS 252.204-7XXX (Revised December 20, 2015):

- Defense contractors have until December 2017 to provide adequate security for all covered defense information on covered contractor information systems.

- Covered defense information is:
  - Provided to the contractor by DoD or developed by the contractor, and is

  - Controlled Technical Information
  - Critical information (OPSEC related)
  - Export control related
  - Any other information identified in the contract.

DFARS Adequate Security

The implementation of controls in NIST Special Publication 800-171 “Protecting Controlled Unclassified Information in Nonfederal Information Systems and Organizations”

- 109 security controls, selected by evaluating NIST 800-53 controls against tailoring criteria

- Or alternate but equally effective security measures used to compensate for the inability to satisfy a particular requirement

An offeror may propose to vary from NIST 800-171 by submitting a written explanation of why a requirement is not applicable or how an alternative but equally effective measure is used to compensate. Deviations from NIST 800-171 become part of the contract

Application of NIST 800-171 Controls

- The control list is a highly relevant, useful set of controls to protect CDI

- Technology implementations may differ and change, meaning that not all controls will be applicable.

- Does not evaluate certain practices across the enterprise to sustain and institutionalize the controls

-

- A “point in time” assessment of control implementation may have a limited relevant period

- It does not address the contractors’ supply chain processes, other than flow down requirements

Elements of a Resilience Based Approach to Protecting Covered Defense Information

Focus on:

- Understanding and improving relevant organizational processes and capabilities
- Controls management for the protection of CDI
- Enterprise governance

Processes to protect CDI

Access Management

- Is CDI identified and tracked in an asset inventory?
- Are there policies and procedures for the proper marking of CDI?

Training and Awareness

- Is there insider threat training in place?
- Is the training evaluated for effectiveness?

Configuration and Change Management

- Are technology assets that store, process, or transmit CDI identified and inventoried?
- Is a change management process used to manage modifications to technology assets that store, process, or transmit CDI?

Sample practices to protect CDI

Incident Management

- Does the organization have a plan for managing incidents involving CDI?

Risk Management

- Are operational risks that could affect the confidentiality and integrity of CDI identified?
- Are risks tracked and a formal disposition (accept, transfer, mitigate, etc.) assigned?

Vulnerability Management

- Does the organization actively discover vulnerabilities affecting CDI?

Controls Management to Protect CDI

The purpose of Controls Management is to identify, analyze, and manage controls in an organization’s operating environment. Controls management helps an organization to build, analyze, and continuously update security controls.

- Do the organization's control objectives support the confidentiality of CDI?
- Are controls periodically analyzed to identify gaps where control objectives are not adequately satisfied?

Proposed control objectives focused on CDI

- Covered defense information is identified, inventoried, and marked in all contractor information systems.

- Third party (or service supply chain) relationships are formed and managed consistently with the need to protect CDI.

- Personnel are properly vetted, monitored, and trained to understand the risks of CDI disclosure and to protect CDI.

- Access to CDI is limited and managed.

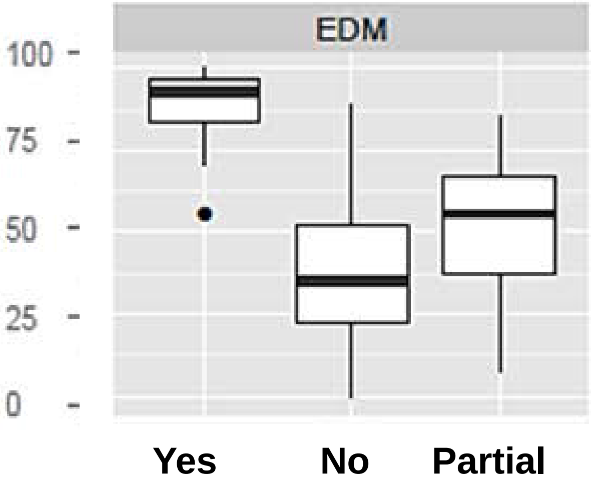
- Events and incidents that potentially affect the confidentiality or integrity of CDI are detected, managed, and tracked to resolution

Governance Focused on Protecting CDI

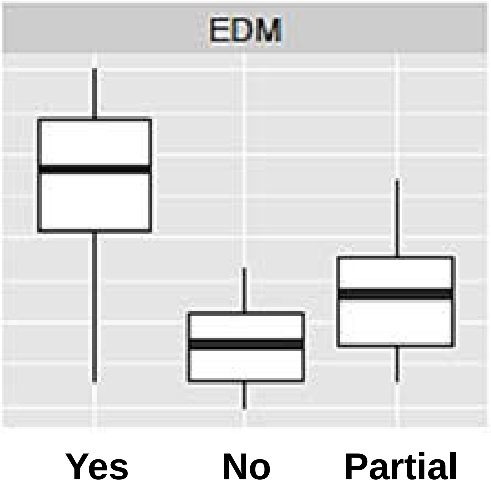
- Is there a policy for the protection of CDI?
- Is there management oversight focused on protecting CDI?
- Are activities to protect CDI periodically reviewed to ensure they effective and producing intended results?

Governance matters . . .

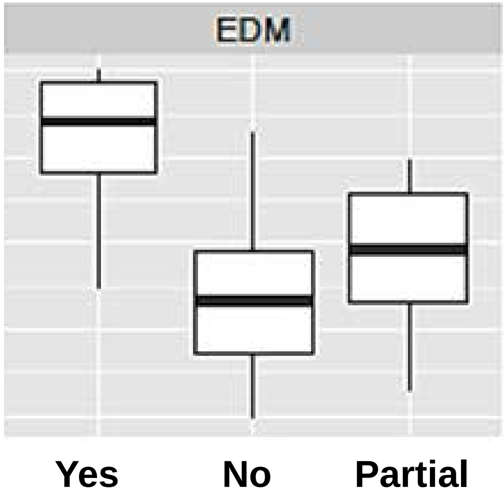
Percentage of “yes” responses to external dependency management practices, correlated to planning, oversight, and measurement



Planning



Management oversight



Measurement of effectiveness

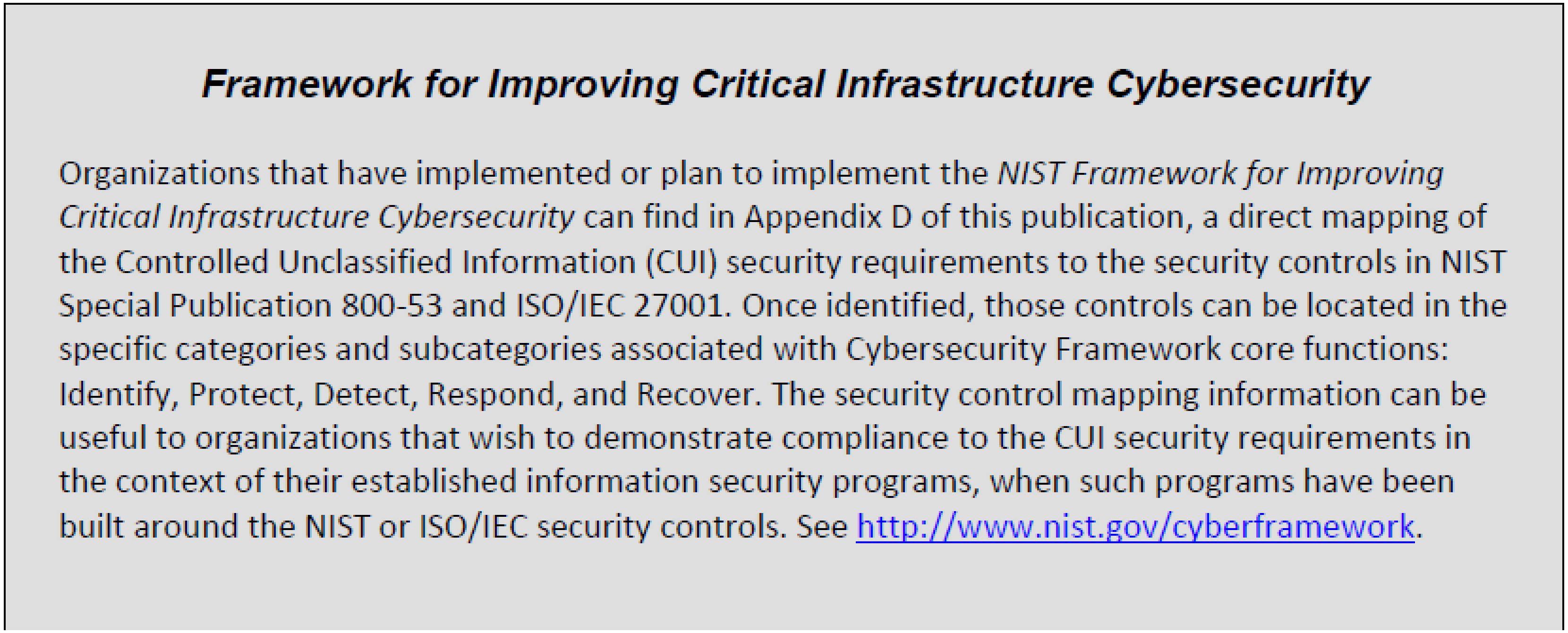
A capability assessment for CDI exists now

Access Management			
The purpose of Access Management is to ensure that access granted to CDI is commensurate with the requirement to protect its confidentiality. These questions also include access to the facilities or technology that may house, store, process, or transmit CDI. This domain includes questions relating to managing CDI as an asset, as well as questions concerning classification and marking.	1. Is CDI identified and documented in an asset inventory?		Question Intent: To determine if covered defense information is inventoried. • The organization should inventory the CDI that it is responsible for protecting. This is so that it knows which information to protect and apply controls against. Criteria for “Yes” Response: • The organization has a process to inventory CDI in a documented listing or inventory. Criteria for “Incomplete” Response: • The organization inventories some CDI.
	2. Are the physical locations of CDI (both within and outside the organization) documented in asset descriptions? [ADM:SG1.SP3]		Question Intent: To determine if the physical locations of CDI are documented in an asset inventory or similar repository. • Physical locations of information can be internal or external to the organization. • The location details should be sufficient enough to support the protection of the information. Criteria for “Yes” Response: • The organization documents the location of all identified CDI in the asset inventory or other documentation. Criteria for “Incomplete” Response: • The organization documents the location of some CDI.

NIST Cyber Security Framework

The framework of the NIST CSF would be very useful for organizations protecting the confidentiality of CDI.

- NIST 800-171 introductory note:



Framework for Improving Critical Infrastructure Cybersecurity

Organizations that have implemented or plan to implement the *NIST Framework for Improving Critical Infrastructure Cybersecurity* can find in Appendix D of this publication, a direct mapping of the Controlled Unclassified Information (CUI) security requirements to the security controls in NIST Special Publication 800-53 and ISO/IEC 27001. Once identified, those controls can be located in the specific categories and subcategories associated with Cybersecurity Framework core functions: Identify, Protect, Detect, Respond, and Recover. The security control mapping information can be useful to organizations that wish to demonstrate compliance to the CUI security requirements in the context of their established information security programs, when such programs have been built around the NIST or ISO/IEC security controls. See http://www.nist.gov/cyberframework.

Conclusions

Traditional Contractor Management vs. Supply Chain Resilience

Traditional Contractor Management	Supply Chain Resilience
Focus is on contract requirements and formal agreements	• Focus is on capabilities of acquirer and supplier • Contracts and requirements are part of the approach
One organizational silo handles vendors and contractors	The right stakeholders in the organization have input into the process
Contractor controls are assessed at a single point in time	• The risk is continuously managed • Assessments include the institutionalization of processes (policy, management, measurement)

Bottom line, what are we suggesting?

Contractual requirements are not enough for hard supply chain problems and critical relationships.

Specific controls and security technology are very important, but are one part of an organization’s overall capability to manage risk.

Enterprise governance practices are a good predictor of program completeness and “stickiness” . . . institutionalization.

Fostering a climate where information about capabilities and processes is shared - in addition to threat and incident information – would be helpful.

Questions?

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https://www.dhs.gov/topic/cybersecurity

www.cert.org/resilience