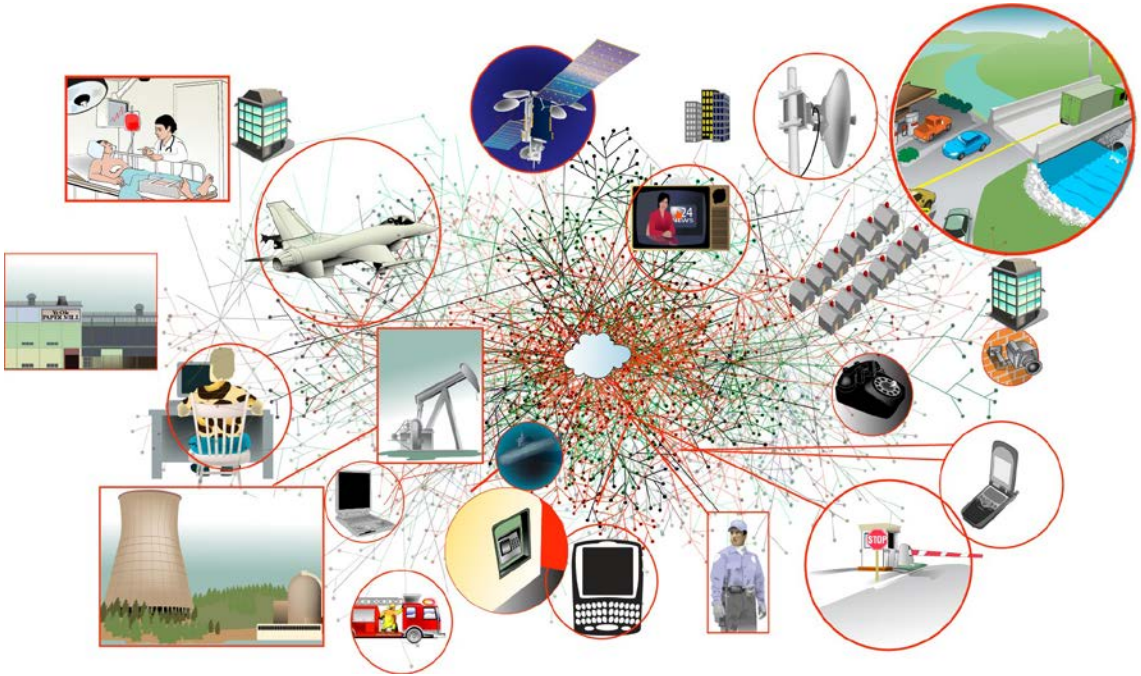


Lessons in External Dependency and Supply Chain Risk Management

October 14th, 2014

Disclaimer

This material is based upon work funded and supported by the Department of Defense under Contract No. FA8721-05-C-0003 with Carnegie Mellon University for the operation of the Software Engineering Institute, a federally funded research and development center.

Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the United States Department of Defense.

NO WARRANTY. THIS CARNEGIE MELLON UNIVERSITY AND SOFTWARE ENGINEERING INSTITUTE MATERIAL IS FURNISHED ON AN "AS-IS" BASIS. CARNEGIE MELLON UNIVERSITY MAKES NO WARRANTIES OF ANY KIND, EITHER EXPRESSED OR IMPLIED, AS TO ANY MATTER INCLUDING, BUT NOT LIMITED TO, WARRANTY OF FITNESS FOR PURPOSE OR MERCHANTABILITY, EXCLUSIVITY, OR RESULTS OBTAINED FROM USE OF THE MATERIAL. CARNEGIE MELLON UNIVERSITY DOES NOT MAKE ANY WARRANTY OF ANY KIND WITH RESPECT TO FREEDOM FROM PATENT, TRADEMARK, OR COPYRIGHT INFRINGEMENT.

This material has been approved for public release and unlimited distribution except as restricted below.

This material may be reproduced in its entirety, without modification, and freely distributed in written or electronic form without requesting formal permission. Permission is required for any other use. Requests for permission should be directed to the Software Engineering Institute at permission@sei.cmu.edu.

Carnegie Mellon® is registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

DM-0001524

Agenda

Introduction and structure

Planning for External Dependencies Management

The Role and limitations of SLAs and agreements

Managing ongoing relationships

Identifying dependencies in complex systems

Monitoring and improving the program

Improving incident management with external entities

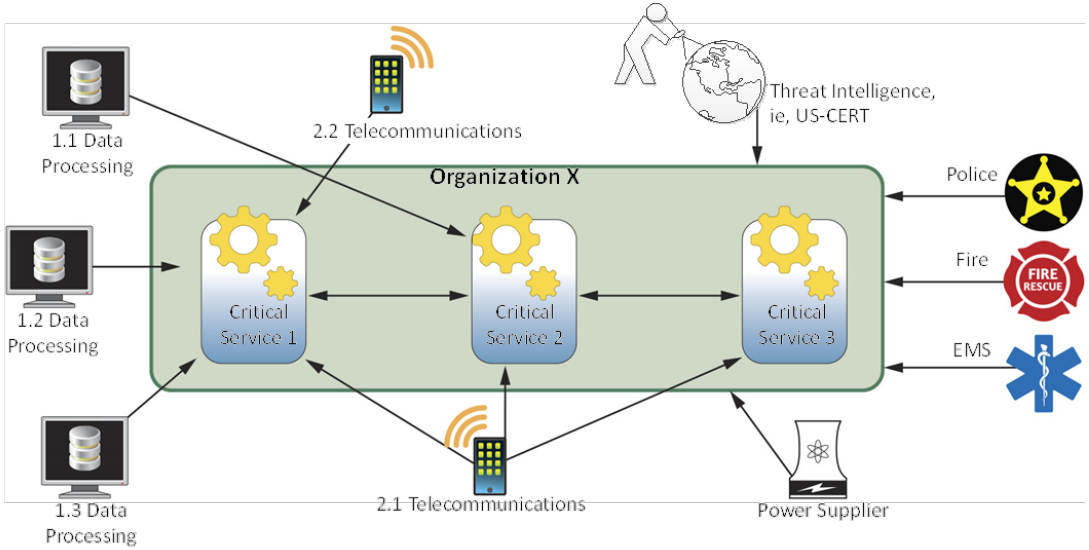
Conclusion – a resilience approach

Introduction and structure

What do we mean by external dependencies management?

Managing the risk of depending on external entities to support your organization's high value services.

External Dependency Management focuses on external entities that provide, sustain, or operate Information and Communications Technology (ICT) to support your organization.



Example incidents

- Heartland Payment Systems (2009)
- Silverpop (2010)
- Epsilon (2011)
- New York State Electric and Gas (2012)
- California Department of Child Support Services (2012)
- Thrift Savings Plan (2012)
- Target (2013)
- Lowes (2014)
- AT&T(2014)
- Goodwill Industries International (2014)
- HAVEX / Dragonfly attacks on energy industry
- DOD TRANSCOM contractor breaches

Case study: HAVEX malware / Dragonfly

Case study: TRANSCOM

113TH CONGRESS
2nd Session

SENATE

REPORT

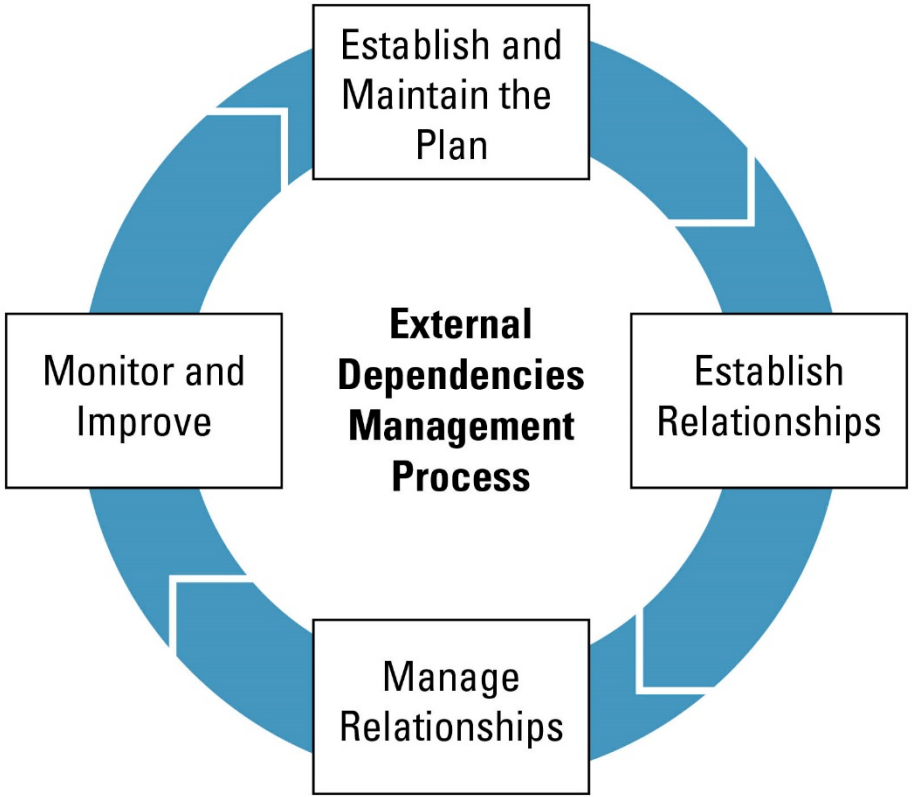
INQUIRY INTO CYBER INTRUSIONS AFFECTING U.S. TRANSPORTATION COMMAND CONTRACTORS

REPORT

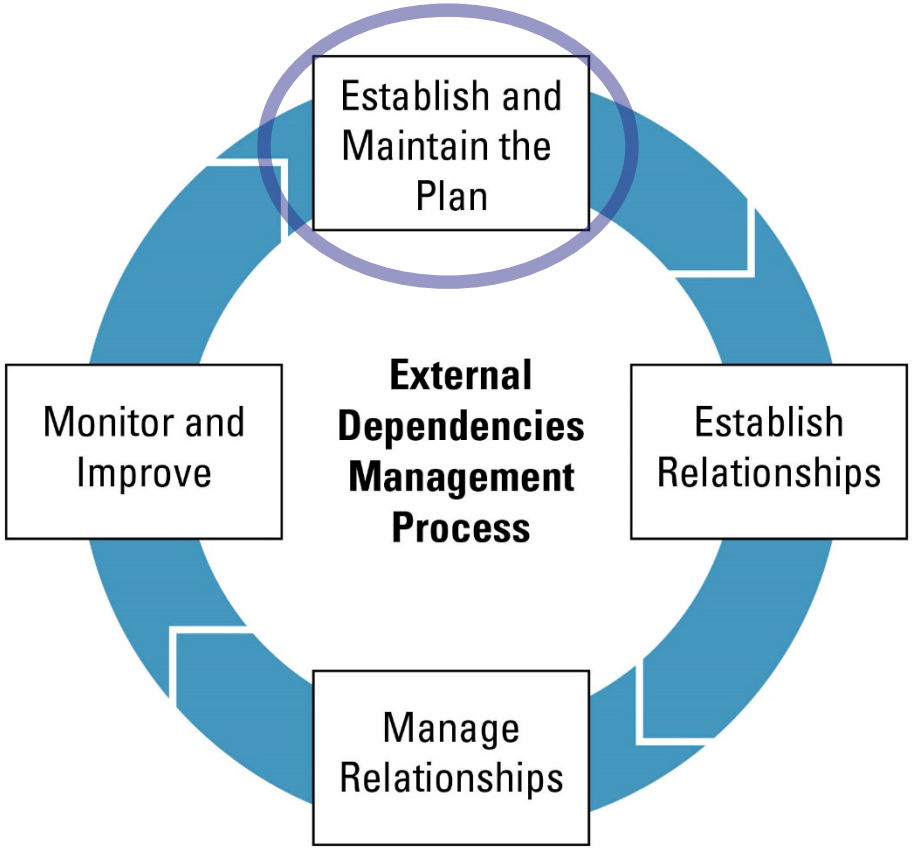
OF THE

COMMITTEE ON ARMED SERVICES
UNITED STATES SENATE

External Dependency Management



External Dependency Management



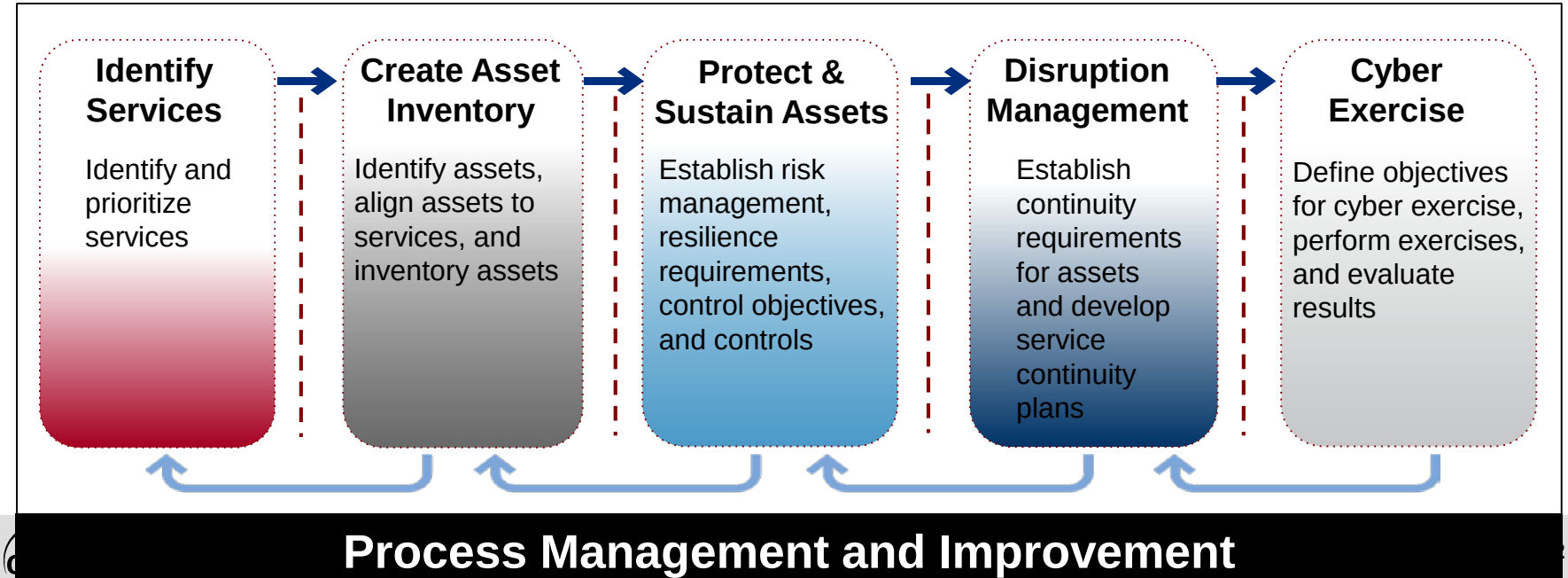
Planning for External Dependencies Management

Key goals:

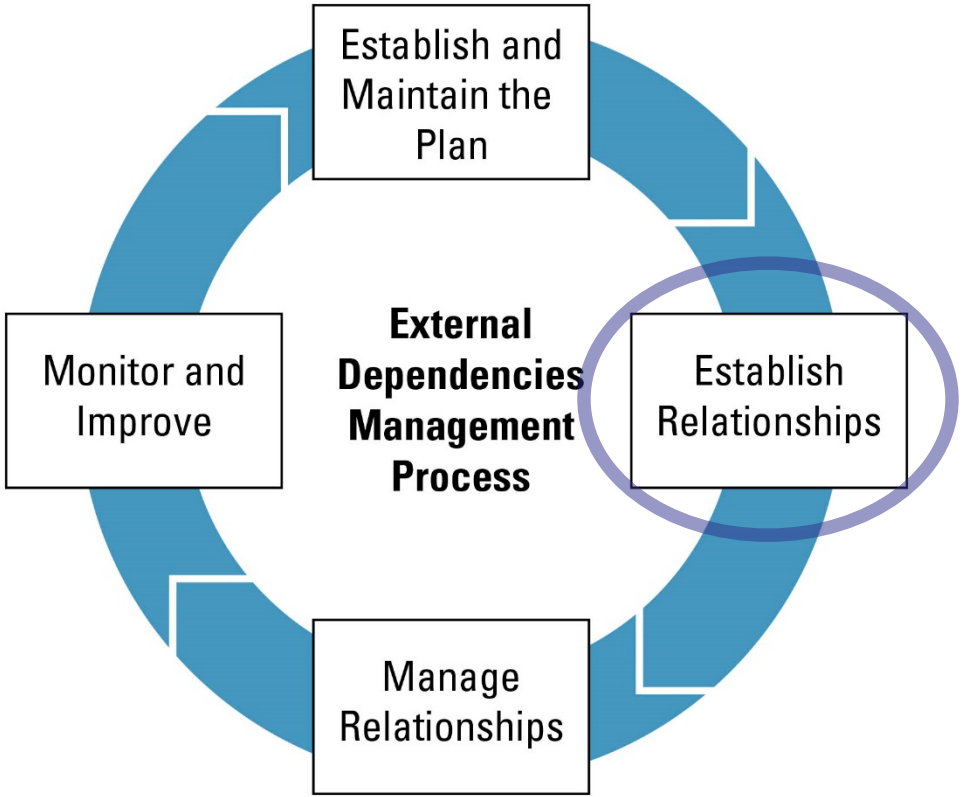
- Identify program management objectives
- Identify services
- Prioritize services
- Identify service requirements
- Identify enterprise requirements
- Plan relationship formation
- Plan relationship management

Basic activities already a part of cyber resilience

- Identify services
- Prioritize services
- Identify service requirements
- Identify enterprise requirements



External Dependency Management



Question

Do the legal and contracting departments in your organization work closely with the operational staff to make sure contracts really serve their needs?

Closer look: the role and limitations of formal agreements and SLAs

Organizations should:

- Establish and maintain requirements for external entities
- Include requirements in SLAs and other agreements
- Monitor performance against these agreements

Key point: Managers should understand the role and limitations of contracts and formal agreements

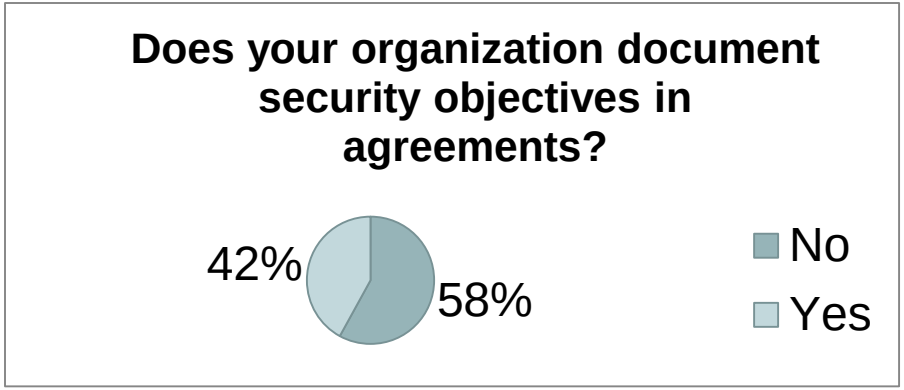
Polling Question 1

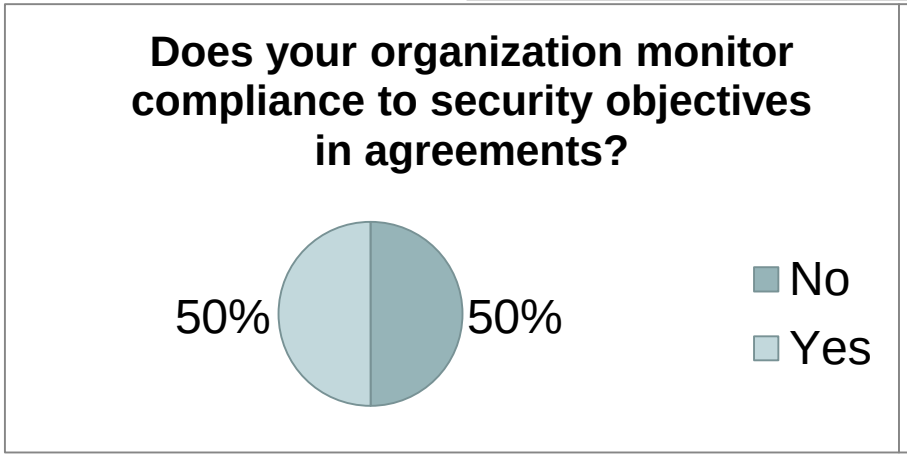
Does your organization consider the cybersecurity capability of third parties before forming relationships with them?

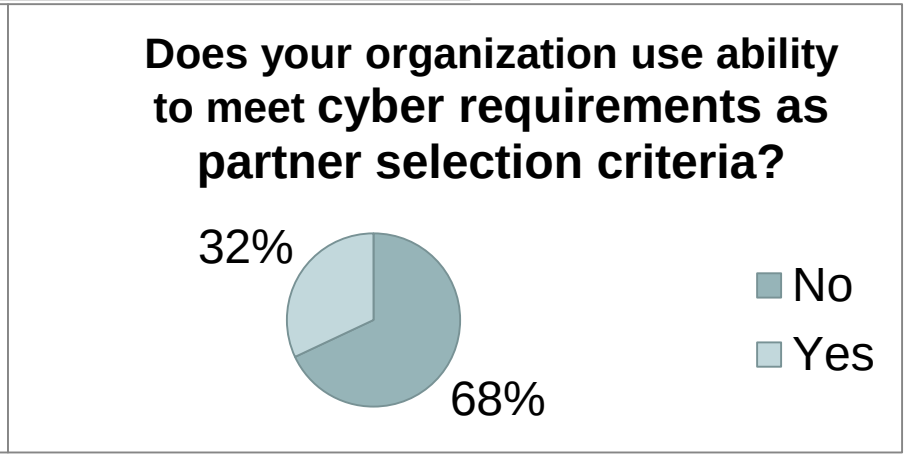
Polling Question 2

Does your organization always document security objectives in agreements with third parties that are critical to your business?

State of Cyber SLAs – field research







Standard SLAs and Contracts . . .

Basic reasons to have a contract (partial list):

Risk allocation	Recovering damages
Defining breach	Drive behavior

However in practice Cyber SLAs can be:

…unidirectional (they are written by the vendor, and smaller customers have trouble changing them)

…lacking specific measures, apart from availability metrics

…frequently indemnify the provider to the greatest extent possible, limiting the provider's exposure.

Examples of Cloud SLAs - Amazon

"Reasonable and appropriate measures"

- no specifics
  (cannot use to hold accountable)

""You are responsible for properly configuring and using the Service Offerings and taking your own steps to maintain appropriate security…"

"Limitations of Liability"

- Amazon not responsible for damages

-http://aws.amazon.com/s3-sla/

3. Security and Data Privacy.

3.1 AWS Security. Without limiting Section 10 or your obligations under Section 4.2, we will implement reasonable and appropriate measures designed to help you secure Your Content against accidental or unlawful loss, access or disclosure.

3.2 Data Privacy. We participate in the safe harbor programs described in the Privacy Policy. You may specify the AWS regions in which Your Content will be stored and accessible by End Users. We will not move Your Content from your selected AWS regions without notifying you, unless required to comply with the law or requests of governmental entities. You consent to our collection, use and disclosure of information associated with the Service Offerings in accordance with our Privacy Policy, and to the processing of Your Content in, and the transfer of Your Content into, the AWS regions you select.

4. Your Responsibilities

4.1 Your Content. You are solely responsible for the development, content, operation, maintenance, and use of Your Content. For example, you are solely responsible for:

(a) the technical operation of Your Content, including ensuring that calls you make to any Service are compatible with then-current APIs for that Service;

(b) compliance of Your Content with the Acceptable Use Policy, the other Policies, and the law;

(c) any claims relating to Your Content; and

(d) properly handling and processing notices sent to you (or any of your affiliates) by any person claiming that Your Content violate such person's rights, including notices pursuant to the Digital Millennium Copyright Act.

4.2 Other Security and Backup. You are responsible for properly configuring and using the Service Offerings and taking your own steps to maintain appropriate security, protection and backup of Your Content, which may include the use of encryption technology to protect Your Content from unauthorized access and routine archiving Your Content. AWS log-in credentials and private keys generated by the Services are for your internal use only and you may not sell, transfer or sublicense them to any other entity or person, except that you may disclose your private key to your agents and subcontractors performing work on your behalf.

4.3 End User Violations. You will be deemed to have taken any action that you permit, assist or facilitate any person or entity to take related to this Agreement, Your Content or use of the Service Offerings. You are responsible for End Users' use of Your Content and the Service Offerings. You will ensure that all End Users comply with your obligations under this Agreement and that the terms of your agreement with each End User are consistent with this Agreement. If you become aware of any violation of your obligations under this Agreement by an End User, you will immediately terminate such End User's access to Your Content and the Service Offerings.

4.4 End User Support. You are responsible for providing customer service (if any) to End Users. We do not provide any support or services to End Users unless we have a separate agreement with you or an End User obligating us to provide support or services.

Question

When there are proposed changes to SLAs or third party contracts in your organization, are the operational staff promptly informed and asked for comment?

Examples of Cloud SLAs - Google Apps

"Each party will protect the other party's confidential information with the same standard of care it uses for its own information."

6. **Confidential Information.**

6.1 **Obligations.** Each party will: (a) protect the other party's Confidential Information with the same standard of care it uses to protect its own Confidential Information; and (b) not disclose the Confidential Information, except to Affiliates, employees and agents who need to know it and who have agreed in writing to keep it confidential. Each party (and any Affiliates' employees and agents to whom it has disclosed Confidential Information) may use Confidential Information only to exercise rights and fulfill its obligations under this Agreement, while using reasonable care to protect it. Each party is responsible for any actions of its Affiliates' employees and agents in violation of this Section.

6.2 **Exceptions.** Confidential Information does not include information that: (a) the recipient of the Confidential Information already knew; (b) becomes public through no fault of the recipient; (c) was independently developed by the recipient; or (d) was rightfully given to the recipient by another party.

6.3 **Required Disclosure.** Each party may disclose the other party's Confidential Information when required by law but only after it, if legally permissible: (a) uses commercially reasonable efforts to notify the other party; and (b) gives the other party the chance to challenge the disclosure.

Best Practices in Cyber SLAs

SLA management practices auditors expect to find

- “Specific and enforceable stipulations in the outsourcing agreement that activities performed by the service provider are subject to controls and audits as if they were performed by the service user itself”
- “Inclusion of provisions requiring the service provider to monitor compliance with the SLA and proactively report any incidents or failures of controls”
- “Adherence to the service user’s security policies”

Source: ISACA IS Auditing Guide G4*:* Outsourcing of IS Activities to Other Organizations

Identifying Cyber Requirements

Confidentiality

- Who has authorized access?

Integrity

- Who is authorized to make changes to the data?

Availability

- When is the data needed to be accessed?

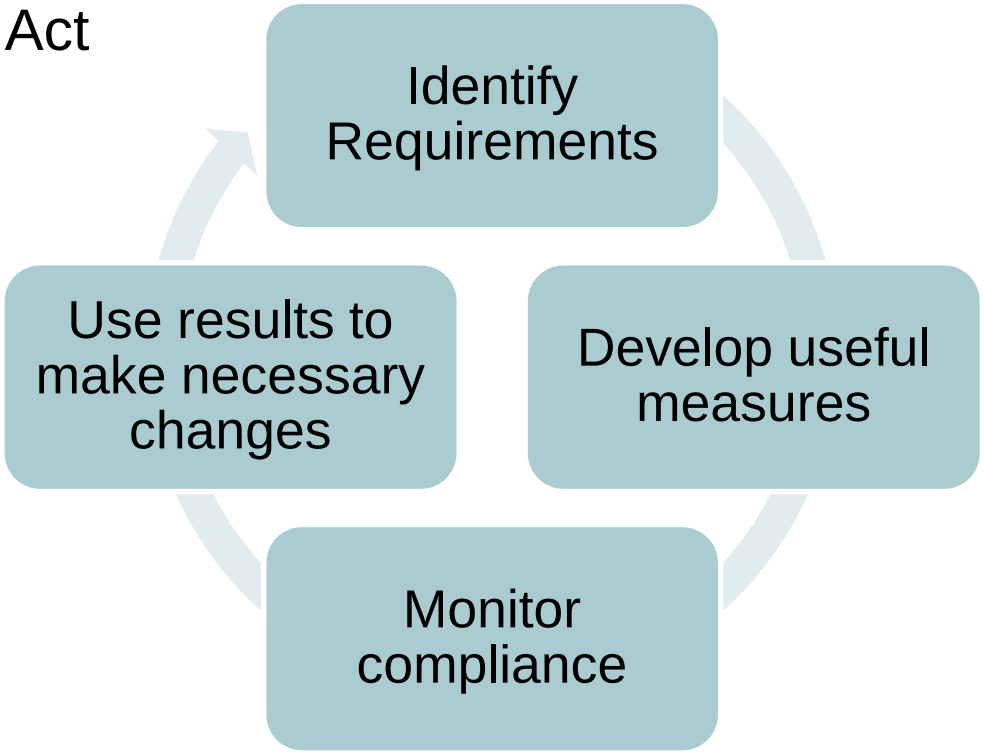
Using the Service to Develop Requirements

Use service requirements to develop requirements for information confidentiality and integrity

- Good:
  - Aligns with needs of the business
  - Is a check against too much investment/expense
- Bad:
  - Expensive to develop

A better SLA management process . . .

Plan, Do, Check, Act



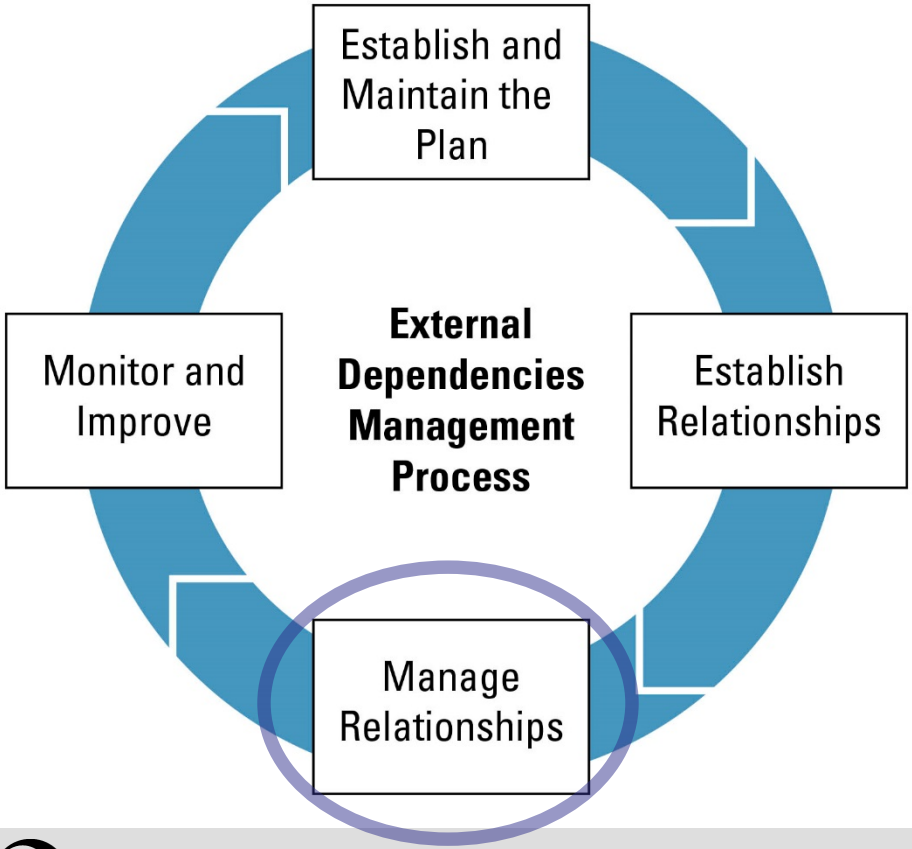
Limitations of formal agreements

Question: What are the limitations of formal agreements in this case?

How do I prove breach?

What are my damages (in monetary terms)?

External Dependency Management



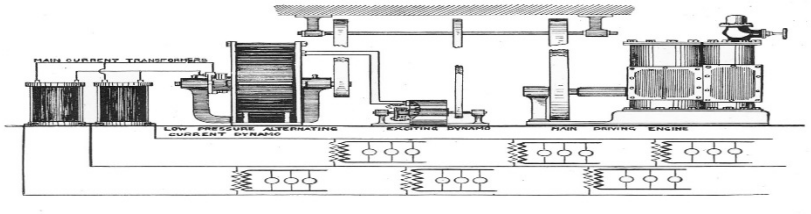
Managing relationships: HAVEX malware / Dragonfly

A closer look: Havex incident and identifying ongoing dependencies

Procurement

Deployment

Operation



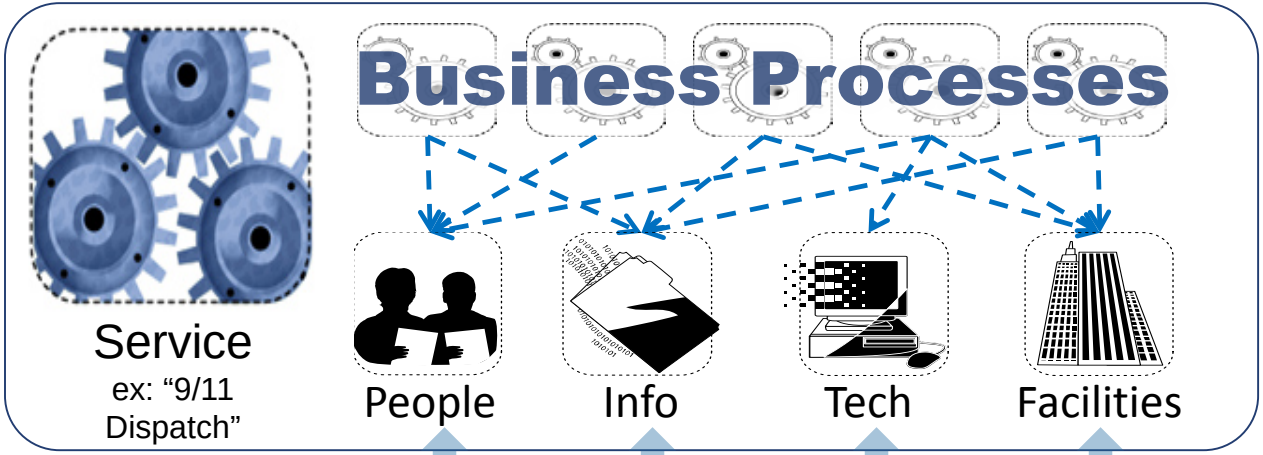
Who is managing this relationship?

Periodic software downloads from manufacturerwebsite
Requirement: 100% integrity of downloaded software installers

Question

Does your organization have an established process to recognize external cyber dependencies?

Identifying dependencies: one possible approach



Standard relationships, assets to third parties

People	Info	Tech	Facilities
Employs	Stores	Owns	Owns
Protects	Transmits	Operates	Sustains
Sustains	Processes	Protects	Protects
Transports	Protects	Maintains	
Vets	. . .	Updates	. . .
. . .		Monitors	
		. . .	

After identification: prioritization and tiering
















Where do we start?

After identification: prioritization and tiering












By prioritizing:

For global transportation of material:

The critical external entities are . . .

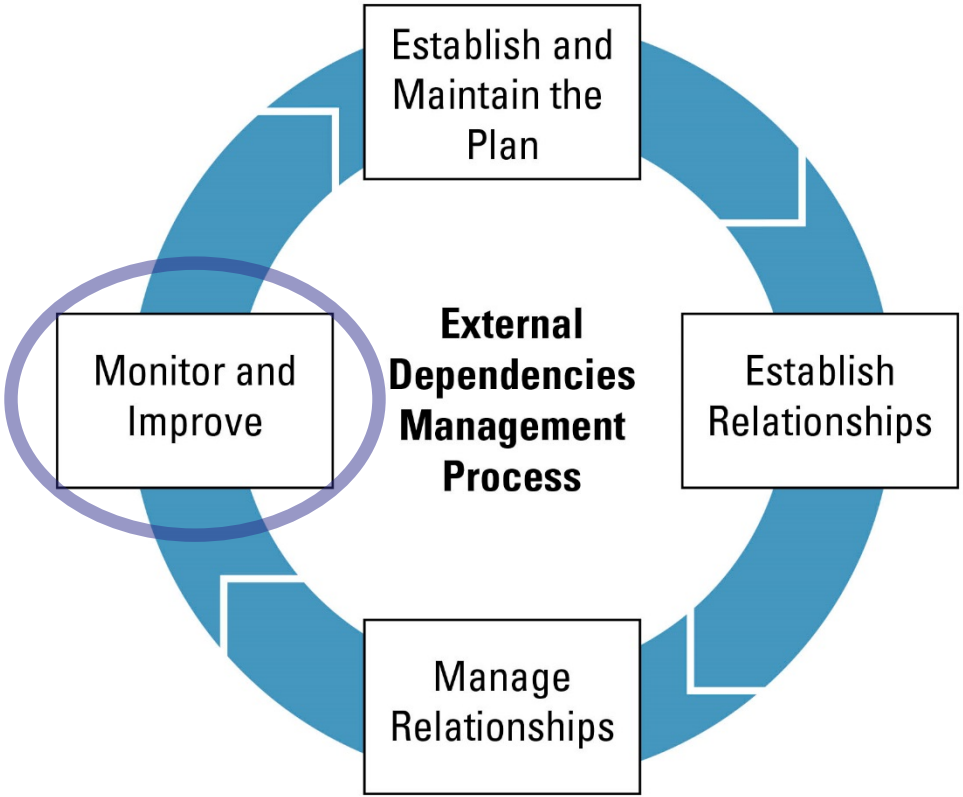
The high impact external entities are . . .

The low impact external entities are . . .

Question

How does your organization prioritize vendors and other third parties for governance?

External Dependency Management



For external dependencies management:

Are we actually implementing the program?

Are we detecting and correcting process exceptions?

Is the external dependency management activity effective?

Do we review the program with our stakeholders?

Are we improving the plan as needed?

For external dependencies management:

Are we actually implementing the program?

Are we detecting and correcting process exceptions?

Is the external dependency management activity effective?

Do we review the program with our stakeholders?

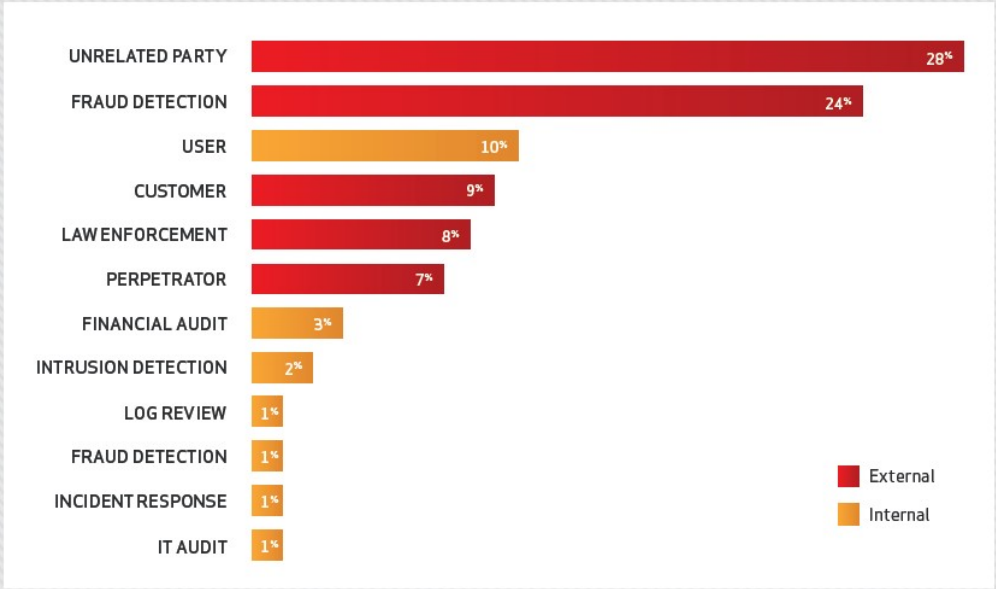
Are we improving the plan as needed?

List of possible effectiveness measures

- external dependencies risks or potential risks that remain unresolved
- open or unresolved high-risk supplier issues
- aging statement for corrective action reporting
- count of external entity relationships formed outside of the process
- emerging threats or risks that may affect key dependencies or suppliers
- number and frequency of critical service outages traceable to external entities
- percentage of external entities that have successfully passed third-party audits
- percentage of missed deliveries or shipping delays from external entities
- contracts or agreements that did not follow established procedures or policy
- percentage of SLAs across key external entities (e.g., tier 1 and tier 2 suppliers) that include resilience requirements in their agreements
- response times and other metrics relating to business continuity or cybersecurity drills conducted with external entities

Example area: Integrating service continuity and incident management

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.

External entity questions . . .

1. Does organizational incident management and service continuity planning account for dependence on external entities?

2. Do external entities participate in the organization's incident management and service continuity planning?

3. Does the organization verify that external entities have service continuity and incident management plans that are consistent with the critical service?

4. Have criteria for the declaration of an incident been established and communicated?

Incident declaration criteria:

Report incidents that "affect organizational information resident or in transit on vendor systems"

How do we assess the effectiveness of this control?

Very challenging, some possibilities:

- Event reporting?
- Reporting on technical detection?
- Situational awareness and collaboration?

Question

How would you evaluate whether or not the external entities your organization depends on are doing effective incident management?

Conclusion – a resilience approach

Cyber Resilience Value Proposition

Resilience management provides support to *simplify* the management of complex cybersecurity challenges.

Efficiency: not too much and not too little; resilience equilibrium

- balancing risk and cost
- getting the most bang for your buck
- achieving compliance as a by-product of resilience management

Roadmap: what to do to manage cybersecurity; flexibility and scalability

- using an overarching approach - which standard is best
- deciding what versus how to manage cybersecurity risk

Cybersecurity ecosystem: addressing the interconnectedness challenge

- managing dependencies
- addressing both internal and external organizational challenges and silos

Process Maturity for Cyber Resilience

The degree of process maturity can help to answer several important questions when managing cyber resilience:

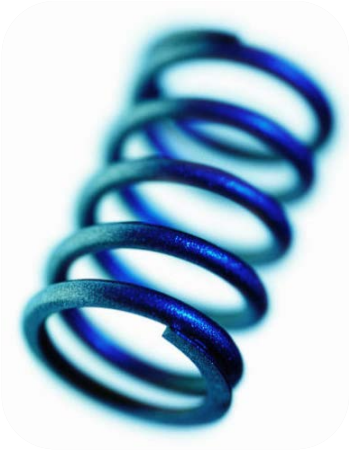
- How well are we performing today?
- Can we repeat our successes?
- Do we consistently produce expected results?
- Can we adapt seamlessly to changing risk environments?
- Are our processes stable enough to depend on them during times of stress?
- Can we predict how we will perform during times of stress?

Process maturity helps avoid the pitfalls of a project (set and forget) approach to cyber resilience and helps "make it stick."

What Is Cyber Resilience?

"… 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…"

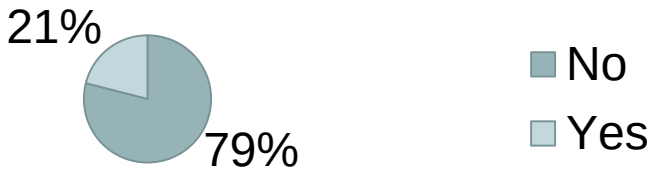
- Presidential Policy Directive – PPD 21
February 12, 2013



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

Key practices based on recent field work

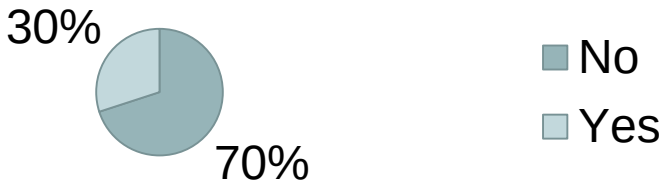
Does your organization have a plan for managing external dependencies?



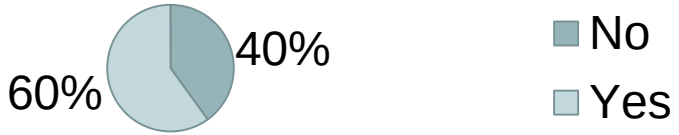
Relating to implementation of external dependency management practices, three activities seem to drive behavior*:

Planning
Measuring
Reporting

Does your organization periodically measure external dependency activities to ensure they are effective?



Is there management oversight of the performance of external dependency management activities?



*171 critical infrastructure organizations

External Dependency Management – Work Underway at Carnegie Mellon CERT

Two key components:

1. An organizational assessment for external dependencies management
2. Exploring better ways for organizations to identify and prioritize cyber dependencies

"The Information and Communications Technology (ICT) services used by operators of critical infrastructure, on which the delivery of a critical infrastructure service depends."

External Dependency Risk Management Assessment

Purpose: To understand the organization's ability to manage the risks of dependence on external entities for information and communications technology related services. A focused examination of practices and capabilities for managing external entity risk.

Based on the ***DHS Cyber Resilience Review*** and the ***CERT® Resilience Management Model (CERT® RMM)***, a process improvement model for managing operational resilience

- Developed by Carnegie Mellon University's Software Engineering Institute
- More information: http://www.cert.org/resilience/rmm.html

Piloting of the approach is underway with critical infrastructure organizations

In Closing…….

- External dependency management is one of today's key business challenges
- Dependencies extend well beyond just your vendors
- Relationships and partnerships are key – organizations cannot effectively manage dependency risks on their own
- The complexities of the today's cyber and physical disruption landscape requires new tools
- Taking a converged approach to the challenge is key
- Resilience management can help provide a roadmap to simplify the management of operational and dependency risks

CMU – CERT *Supply Chain Risk Management Symposium*, January 15th 2015 in the DC area. For information contact info@sei.cmu.edu

Contact Information:

John Haller – jhaller@cert.org

Matthew Butkovic – mjb101@cert.org