Unit #12

Incident and Disaster Response

MIS 5214

Agenda

- Computer virus
- Malicious software
  - Proliferation of malware
  - Malware components
  - Anti-malware components
  - Best practices for protection
- Business Continuity and Disaster Contingency Planning
- Incident Response Planning
- Team Project Q&A

Virus

Virus: attached to a file

1986

Brain virus

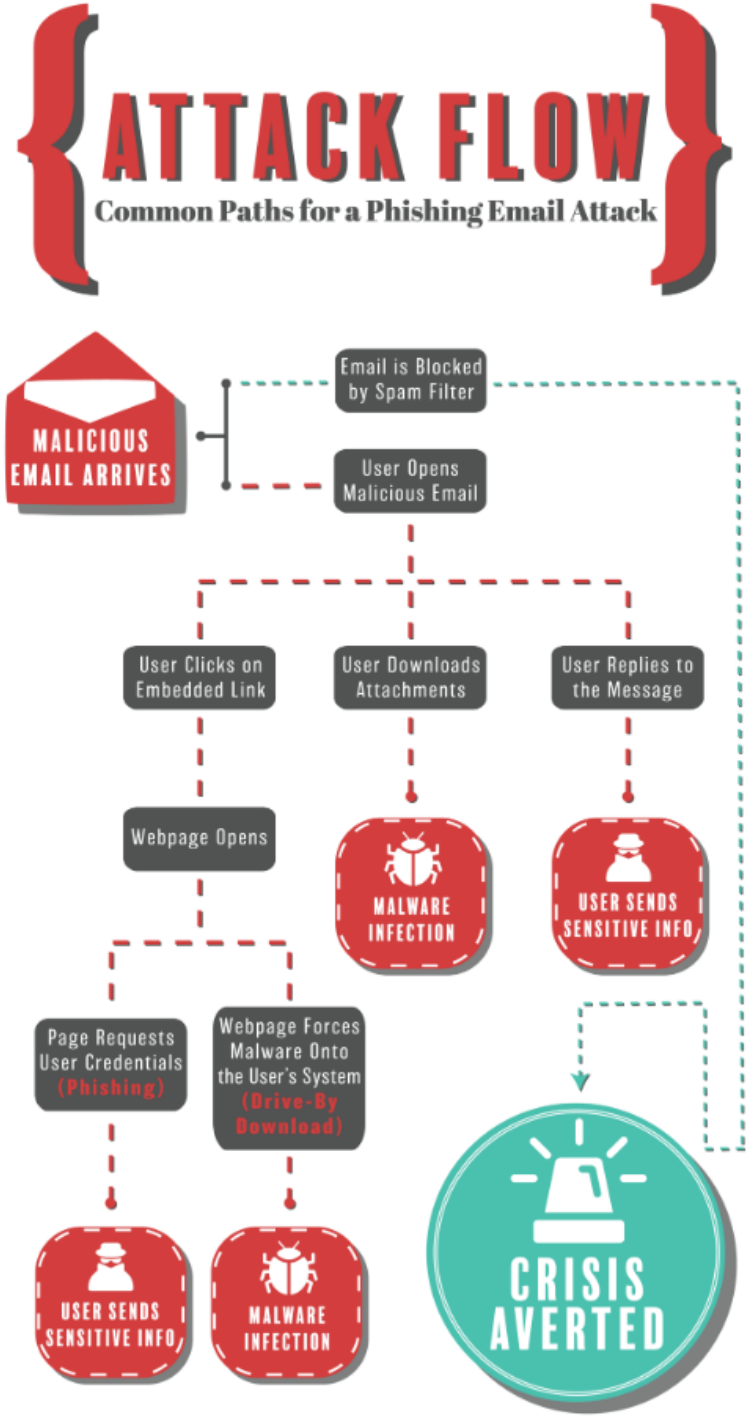
an F-Secure Production

Malicious Software (Malware)

Malware enables unauthorized access to networks for purposes of theft, sabotage, or espionage

- There are many types of malware, many cyberattacks use a combination of several types to achieve their goals
  - Obtain sensitive information (login credentials, credit card data, Social Security numbers, …)
  - Gain unauthorized access to systems
  - Carry out a profit-oriented scheme
- Usually introduced into a network through phishing, attachments, downloads, or may gain access through social engineering or flash drives
- Manual attacks on information systems are less common than the used to be

  >95% of all compromises use email as the main attack vector

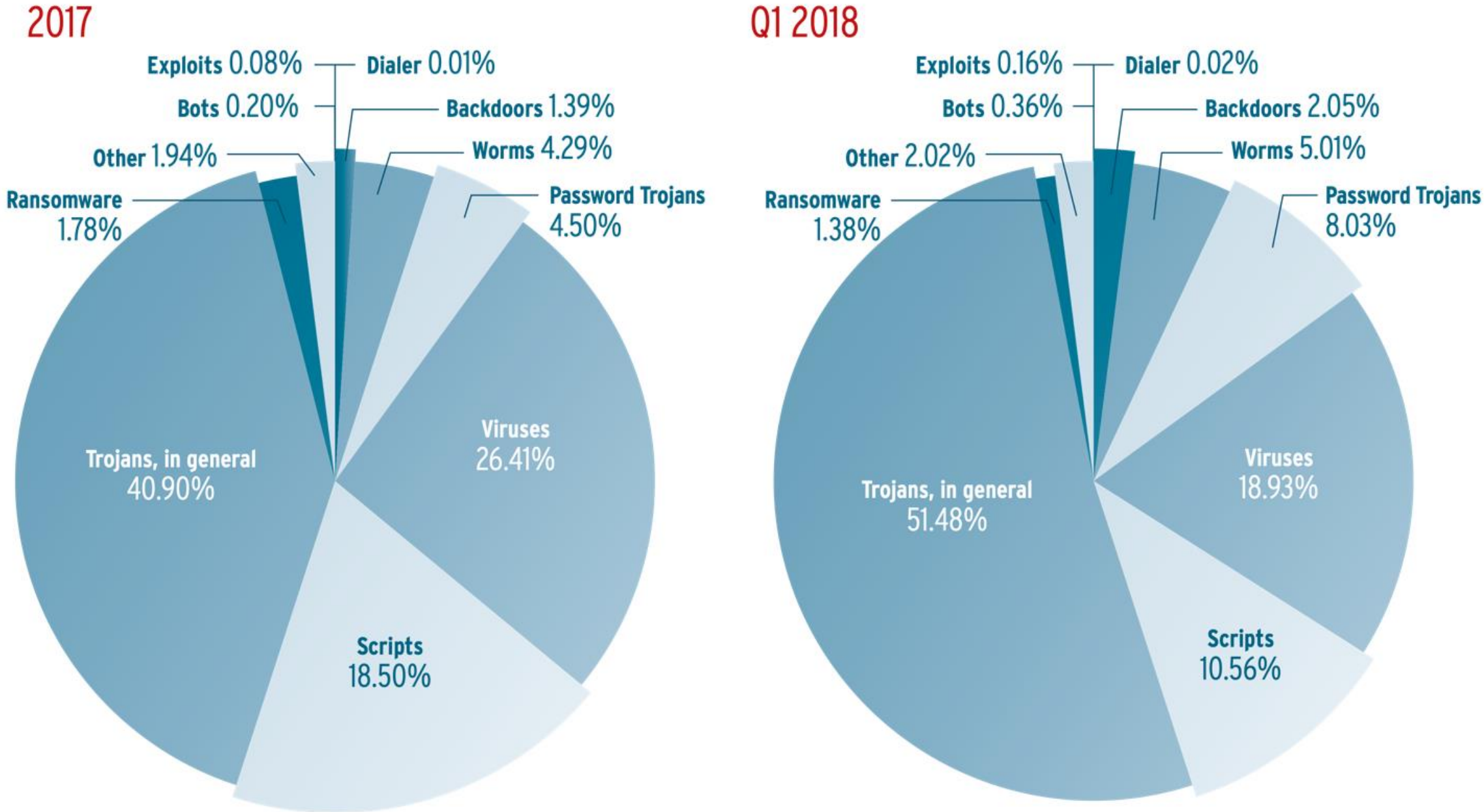


Types of malware

Type	What It Does	Real-World Example
Ransomware	disables victim's access to data until ransom is paid	RYUK
Fileless Malware	makes changes to files that are native to the OS	Astaroth
Spyware	collects user activity data without their knowledge	DarkHotel
Adware	serves unwanted advertisements	Fireball
Trojans	disguises itself as desirable code	Emotet
Worms	spreads through a network by replicating itself	Stuxnet
Rootkits	gives hackers remote control of a victim's device	Zacinlo
Keyloggers	monitors users' keystrokes	Olympic Vision
Bots	launches a broad flood of attacks	Echobot
Mobile Malware	infects mobile devices	Triada

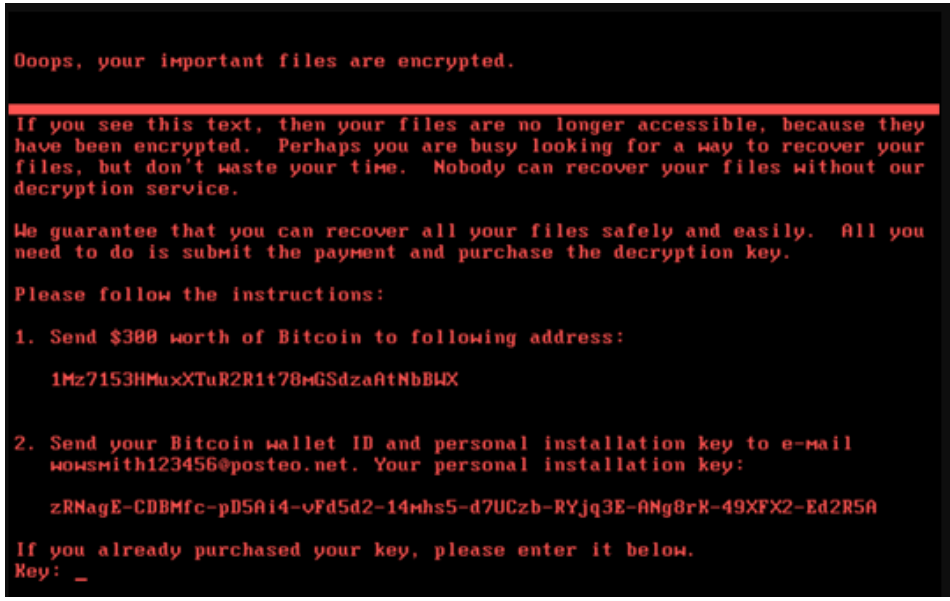
https://www.crowdstrike.com/epp-101/types-of-malware/

Distribution of malware under Windows



Ransomware

- Software that uses encryption to disable a target's access to its data until a ransom is paid
  - The victim organization is rendered partially or totally unable to operate until it pays
  - There is no guarantee that payment will result in the necessary decryption key or that the decryption key provided will function properly



In 2019 the city of Baltimore was hit by a type of ransomware named RobbinHood which was distributed using the National Security Agency's Eternal Blue hacking tool

- The attack halted all city activities, including tax collection, property transfers, and government email for weeks, and cost the city more than $18 million
- The same type of malware was used against the city of Atlanta in 2018, resulting in costs of $17 million

Fileless Malware

- Does not install anything initially, instead, it makes changes to files that are native to the operating system, such as PowerShell
  - Because the operating system recognizes the edited files as legitimate, a fileless attack is not caught by antivirus software
  - Because these attacks are stealthy, they are up to 10 times more successful than traditional malware attacks

Astaroth is a fileless malware

- When users downloaded the file, a Windows Management Instrumentation (WMI) tool was launched, along with other legitimate Windows tools
- These tools downloaded additional code that was executed only in memory, leaving no evidence that could be detected by vulnerability scanners
- Then the attacker downloaded and ran a Trojan that stole credentials and uploaded them to a remote server

Malware proliferation is directly related to profit hackers can make without being caught

Money making schemes include:

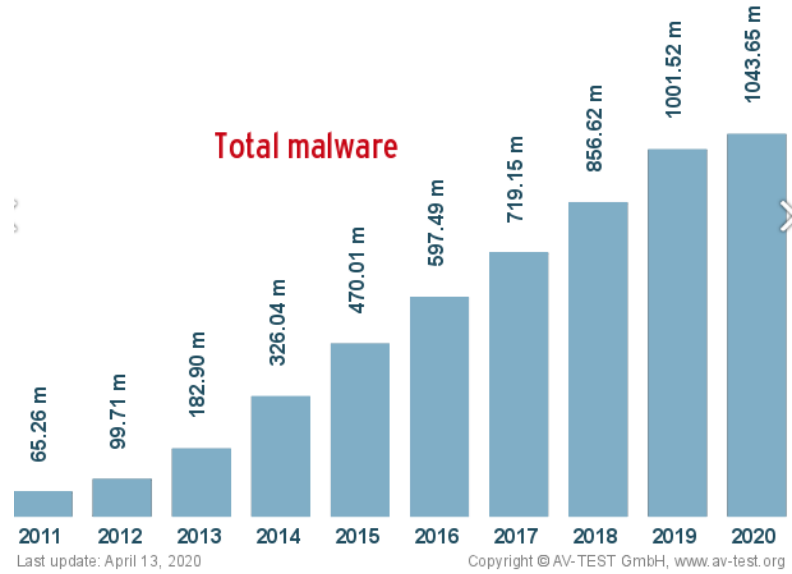
- Compromising systems with botnets for later use in:
  - Distributed denial of service (DDoS) attacks
  - Spam distribution
- Ransomware encrypting users' files with keys that are only given after users pay a ransom
- Spyware collects personal data for resale
- Redirecting web traffic pointing people to a specific product for purchase
- Installing key loggers, which collect financial information for reuse
- Carrying out phishing attacks, fraudulent activities, identity theft, and information warfare

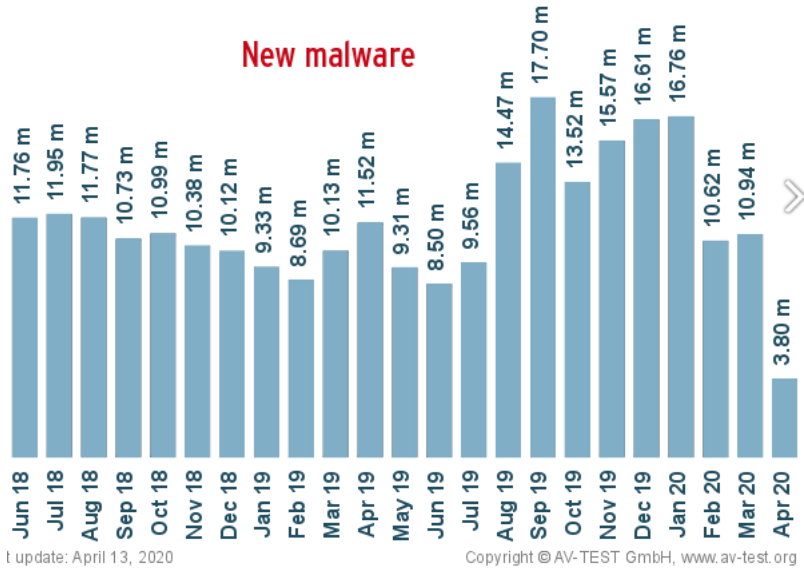
Malware is increasing

AVTest reports over 350,000 new malware and potentially unwanted applications identified each day

Main reasons types malware is increasing in quantity and potency:

- Homogenous computer environments (Windows, MacOS, Android, iOS) – 1 piece of malware will work on many/most devices
- Everything is becoming a computer capable of being compromised (phones, TVs, game consoles, power grids, medical devices,…)
- More people and companies store all their data in digital format
- Many accounts are configured with too much privilege (i.e. root/administrator access)
- More people who do not understand technology are using it for sensitive purposes (i.e. e-commerce, online banking, …)





https://www.av-test.org/en/statistics/malware/

Malware Components

Malware typically has 6 common elements

1. Insertion – Installs itself on the victim's computer
2. Replication – Copies itself and spreads to other victims
3. Avoidance – Uses methods to avoid being detected
4. Trigger – An event initiates its payload execution
5. Payload - Caries out its function (i.e. exploits a vulnerability to provide access, deletes files, encrypts files, installs a backdoor, …)
6. Eradication – Removes itself after its payload is executed

Anti-malware software components

Detection techniques

- Signature-based
- Integrity-based
- Heuristic-based
- Behavior-based

Protection techniques

- Quarantine the file
- Clean the file
- Roll-back to prior version of the file
- Warn the user
- Log the event

Signature-based malware detection

Anti-malware software scans files, e-mail, other data and **compares** them **to a database of signatures** created by the anti-malware vendor

- A malware signature is a sequence of code extracted from the virus that is used to identify the virus
- Can only identify previously identified malware
- Updates to the signatures must be downloaded and applied frequently
- Cannot detect 0-day attacks

Signature-based malware detection avoidance

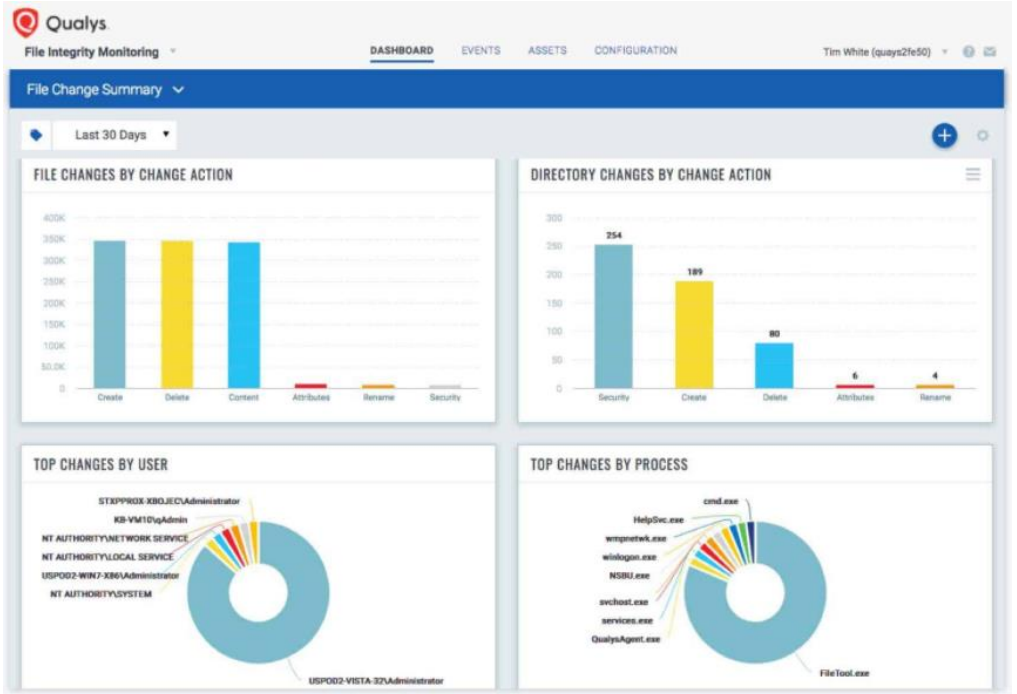
Polymorphic virus has the capability to change its own code to produce thousands of varied operational versions of itself

- Can use different encryption techniques
- Can vary the sequence of their instructions
  - Combining noise or bogus instructions with the useful instructions
  - Using a mutation engine and a random-number generator to change the sequence of their instructions

Multi-part virus distributes its components to different parts of the system

Integrity-based malware detection

- Calculates and stores a hash for each component of the system: operating system files, application files, configuration files, …
- Each new scan of the system calculates a hash for each component and compares it with the stored hash to detect differences
- Detected differences send alters and are flagged as suspect for further analysis



Heuristic-based malware detection

Analyzes the overall structure of the malicious code, evaluating

- Coded logic, instructions, functions and modules
- Data types and structures

Assesses likelihood that the code is malicious by accumulating a scored rating of “suspiciousness”

- Increases as it finds more potentially malicious attributes
- Compared to a threshold, which when crossed the detector identifies the software as malware and the protections are activated

2 types of heuristic malware detection methods

1. Static analysis – Reviewing code without running it
2. Dynamic analysis – Reviewing code as it is running

Behavior-based malware detection

Allows suspicious code to execute within the unprotected operating system, and watches its interaction with the operating system components looking for suspicious activities:

- Writing to Run keys in the Windows Registry or startup files
- Opening, deleting, or modifying files
- Modifying executable logic
- Creating or modifying macros and scripts
- Scripting e-mail messages to send executable code
- Connecting to network shares or resources
- Formatting a hard drive or writing to the boot sector

Anti-malware software components

Detection techniques

- Signature-based
- Integrity-based
- Heuristic-based
- Behavior-based

} ***Proactive techniques able to detect new malware (i.e. 0-day attacks)***

Protection techniques

- Quarantine the file
- Clean the file
- Roll-back to prior version of the file
- Warn the user
- Log the event

Best practices against malware attacks

User Education

Training users on best practices can go a long way in protecting an organization

- How to avoid malware
  - Don’t download and run unknown software
  - Don’t blindly insert “found media” into your computer
- How to identify potential malware
  - Phishing emails
  - Unexpected applications/processes running on a system

https://www.rapid7.com/fundamentals/malware-attacks/

Best practices against malware attacks

Use Reputable Anti-Virus (A/V) Software

- When installed, a suitable A/V solution will detect (and remove) any existing malware on a system, as well as monitor for and mitigate potential malware installation or activity while the system is running. It'll be important to keep it up-to-date with the vendor's latest definitions/signatures.

Ensure Your Network is Secure

- Control access to systems on the organization's network
- Use of proven technology and methodologies—such as using a firewall, IPS, IDS
- Remote access only through VPN—will help minimize the attack "surface" your organization exposes

Regular Website Security Audits

- Scan the organization's websites regularly for vulnerabilities
  - Software with known bugs and server/service/application misconfiguration
  - Detect if known malware has been installed

Create Regular, Verified Backups

- Have regular (i.e. current and automated) offline backup
- Make sure they are verified to be happening on the expected regular basis and are usable for restore operations
  - Old, outdated backups are less valuable than recent ones
  - Backups that don't restore properly are of no value

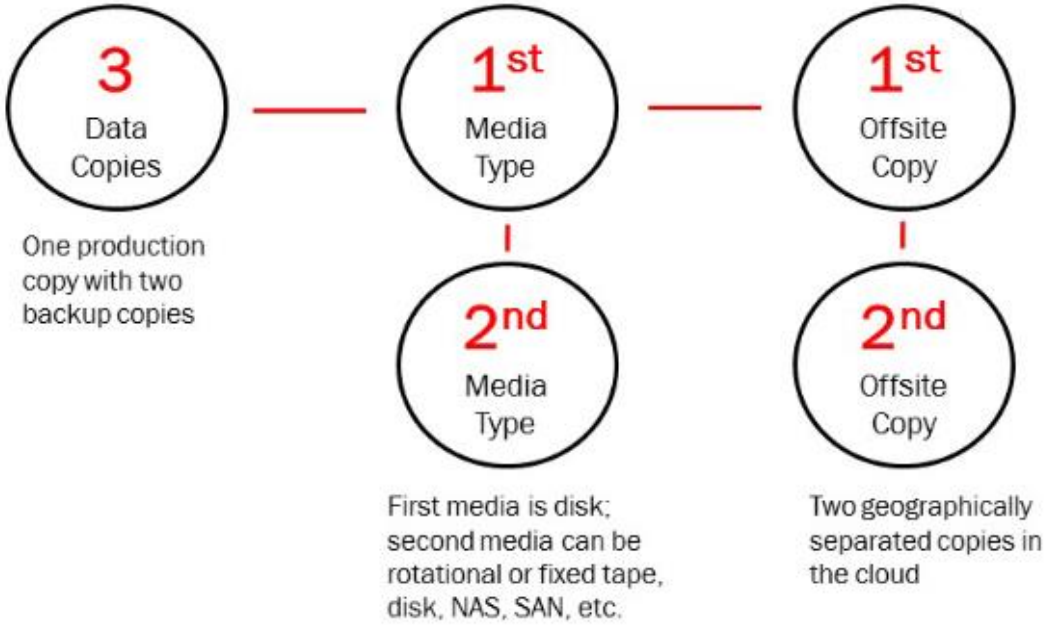
https://www.rapid7.com/fundamentals/malware-attacks/

Mitigation – Backup Best Practice

Three-Two-One rule

- Make 3 copies of all mission critical software and corresponding data in 2 different formats (to run on Linux and Windows machines), with 1 copy stored off-site not connected to any network

Maersk had 50 copies of their mission critical software and corresponding data – all in the same format, all on the network



Agenda

- ✓Computer virus
- ✓Malicious software
  - ✓Proliferation of malware
  - ✓Malware components
  - ✓Anti-malware components
  - ✓Best practices for protection
- Business Continuity and Disaster Contingency Planning
- Incident Response Planning
- Team Project Q&A

Business Continuity

Capability to continue service delivery at acceptable levels following” natural or human-induced disaster

Source: International Standards Organization 22300:2018

Security and resilience - Vocabulary

Resiliency

“Capacity to recover quickly from difficulties

…

Antonyms:

- Vulnerability, weakness…”

Source: https://www.lexico.com/en/synonym/resilience

Critical Infrastructure

"Critical infrastructures are those physical and cyber-based systems essential to the minimum operations of the economy and government. …As a result of advances in information technology and the necessity of improved efficiency, however, these infrastructures have become increasingly automated and interlinked. These same advances have created new vulnerabilities to equipment failure, human error, weather and other natural causes, and physical and cyber attacks."

Presidential Decision Directive/NSC 63, 1998

Critical Infrastructure Security and Resilience

"Critical infrastructure owners and operators are uniquely positioned to manage risks to their individual operations and assets, and to **determine effective strategies to make them more secure and <u>resilient</u>**"

Presidential Policy Directive/ PPD-21, 2013

America's Water Infrastructure Act of 2018

Defines 'resilience' as

> *"The ability of a community water system or an asset of a community water system to adapt to or withstand the effects of a malevolent act or natural hazard without interruption to the asset's or system's function, or if the function is interrupted, to rapidly return to a normal operating condition"*

To assure resilient response

Business Continuity Plan (BCP)

Documented procedures for recovering and resuming critical operational functions following significant disruption

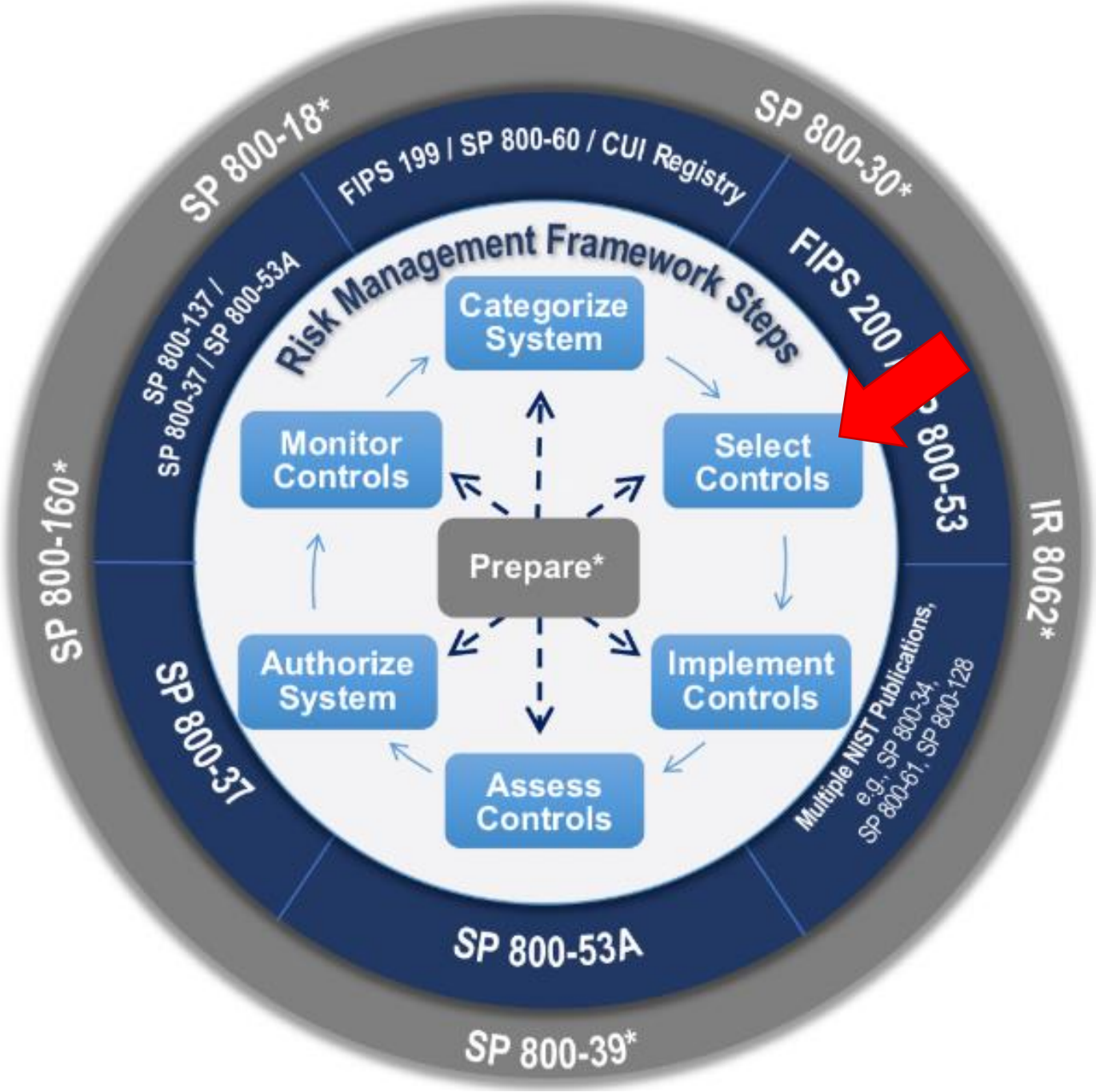
Source: ISO 22301:2012
Societal security – Business continuity management systems - Requirements

…includes a Disaster Recovery Plan (DRP)

Procedures for relocating critical information systems operations to an alternative site following significant disruption


Our Disaster Recovery Plan
Goes Something Like This...
HELP!
HELP!

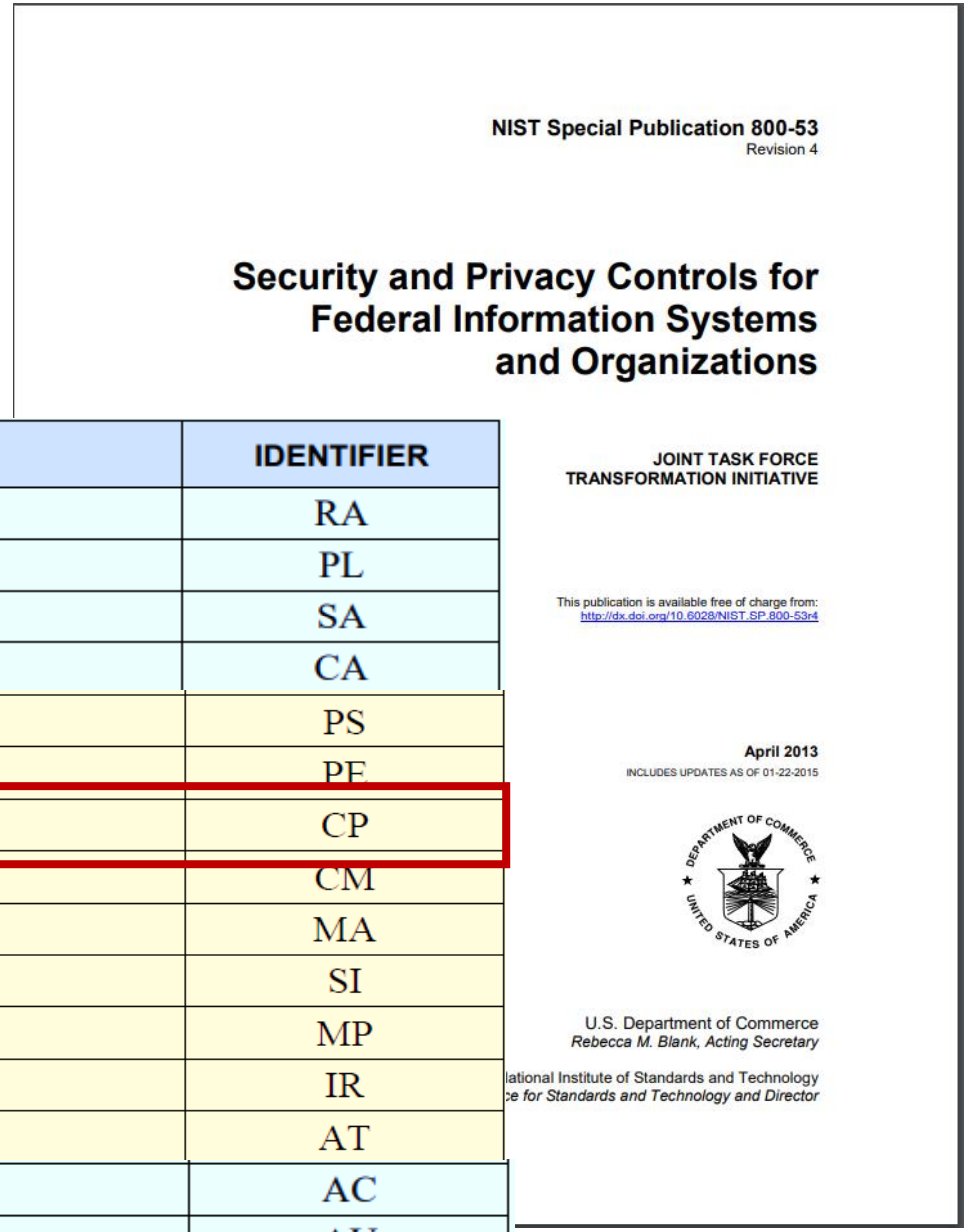
National Institute of Standards and Technology
U.S. Department of Commerce



Catalog of cyber-security controls

for Business Continuity and Resiliency planning focus on Contingency Planning controls

CLASS	FAMILY	IDENTIFIER
Management	Risk Assessment	RA
Management	Planning	PL
Management	System and Services Acquisition	SA
Management	Certification, Accreditation, and Security Assessments	CA
Operational	Personnel Security	PS
Operational	Physical and Environmental Protection	PE
Operational	Contingency Planning	CP
Operational	Configuration Management	CM
Operational	Maintenance	MA
Operational	System and Information Integrity	SI
Operational	Media Protection	MP
Operational	Incident Response	IR
Operational	Awareness and Training	AT
Technical	Access Control	AC
Technical	Audit and Accountability	AU
Technical	System and Communications Protection	SC



NIST Special Publication 800-53
Revision 4

Security and Privacy Controls for Federal Information Systems and Organizations

JOINT TASK FORCE TRANSFORMATION INITIATIVE

This publication is available free of charge from: http://dx.doi.org/10.6028/NIST.SP.800-53r4

April 2013

INCLUDES UPDATES AS OF 01-22-2015

U.S. Department of Commerce
Rebecca M. Blank, Acting Secretary

ational Institute of Standards and Technology
ce for Standards and Technology and Director

Contingency Planning Controls

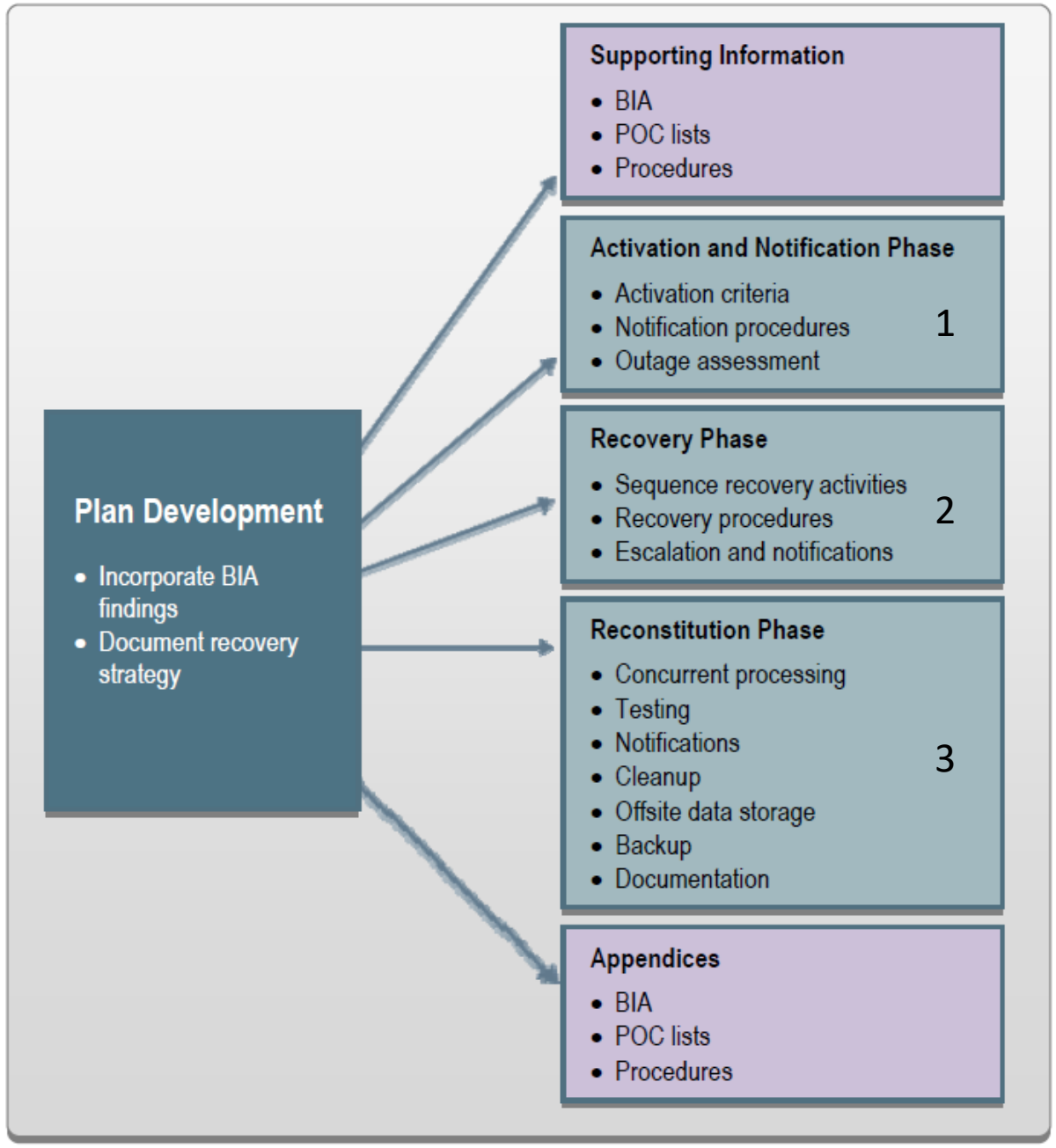
CONTROL NAME	BASELINES		
	LOW	MOD	HIGH
Contingency Planning Policy and Procedures	X	X	X
Contingency Plan	X	X	X
Contingency Training	X	X	X
Contingency Plan Testing	X	X	X
Alternative Storage Site		X	X
Alternative Processing Site		X	X
Telecommunications Services		X	X
Information System Backup	X	X	X
Information System Recovery and Reconstitution	X	X	X

NIST SP 800-53r4 "Security and Privacy Controls for Federal Information Systems and Organizations"

CNTL NO.	CONTROL NAME *Control Enhancement Name*	WITHDRAWN	ASSURANCE	CONTROL BASELINES		
				LOW	MOD	HIGH
CP-1	**Contingency Planning Policy and Procedures**		x	x	x	x
CP-2	**Contingency Plan**			x	x	x
CP-2(1)	*CONTINGENCY PLAN | COORDINATE WITH RELATED PLANS*				x	x
CP-2(2)	*CONTINGENCY PLAN | CAPACITY PLANNING*					x
CP-2(3)	*CONTINGENCY PLAN | RESUME ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*				x	x
CP-2(4)	*CONTINGENCY PLAN | RESUME ALL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(5)	*CONTINGENCY PLAN | CONTINUE ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(8)	*CONTINGENCY PLAN | IDENTIFY CRITICAL ASSETS*				x	x
CP-3	**Contingency Training**		x	x	x	x
CP-3(1)	*CONTINGENCY TRAINING | SIMULATED EVENTS*		x			x
CP-4	**Contingency Plan Testing**		x	x	x	x
CP-4(1)	*CONTINGENCY PLAN TESTING | COORDINATE WITH RELATED PLANS*		x		x	x
CP-4(2)	*CONTINGENCY PLAN TESTING | ALTERNATE PROCESSING SITE*		x			x
CP-5	**Contingency Plan Update**	x	Incorporated into CP-2.			
CP-6	**Alternate Storage Site**				x	x
CP-6(1)	*ALTERNATE STORAGE SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-6(2)	*ALTERNATE STORAGE SITE | RECOVERY TIME / POINT OBJECTIVES*					x
CP-6(3)	*ALTERNATE STORAGE SITE | ACCESSIBILITY*				x	x
CP-7	**Alternate Processing Site**				x	x
CP-7(1)	*ALTERNATE PROCESSING SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-7(2)	*ALTERNATE PROCESSING SITE | ACCESSIBILITY*				x	x
CP-7(3)	*ALTERNATE PROCESSING SITE | PRIORITY OF SERVICE*				x	x
CP-7(4)	*ALTERNATE PROCESSING SITE | PREPARATION FOR USE*					x
CP-7(5)	*ALTERNATE PROCESSING SITE | EQUIVALENT INFORMATION SECURITY SAFEGUARDS*	x	Incorporated into CP-7.			
CP-8	**Telecommunications Services**				x	x
CP-8(1)	*TELECOMMUNICATIONS SERVICES | PRIORITY OF SERVICE PROVISIONS*				x	x
CP-8(2)	*TELECOMMUNICATIONS SERVICES | SINGLE POINTS OF FAILURE*				x	x
CP-8(3)	*TELECOMMUNICATIONS SERVICES | SEPARATION OF PRIMARY / ALTERNATE PROVIDERS*					x
CP-8(4)	*TELECOMMUNICATIONS SERVICES | PROVIDER CONTINGENCY PLAN*					x
CP-9	**Information System Backup**			x	x	x
CP-9(1)	*INFORMATION SYSTEM BACKUP | TESTING FOR RELIABILITY / INTEGRITY*				x	x
CP-9(2)	*INFORMATION SYSTEM BACKUP | TEST RESTORATION USING SAMPLING*					x
CP-9(3)	*INFORMATION SYSTEM BACKUP | SEPARATE STORAGE FOR CRITICAL INFORMATION*					x
CP-9(4)	*INFORMATION SYSTEM BACKUP | PROTECTION FROM UNAUTHORIZED MODIFICATION*	x	Incorporated into CP-9.			
CP-9(5)	*INFORMATION SYSTEM BACKUP | TRANSFER TO ALTERNATE STORAGE SITE*					x
CP-10	**Information System Recovery and Reconstitution**			x	x	x
CP-10(1)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | CONTINGENCY PLAN TESTING*	x	Incorporated into CP-4.			
CP-10(2)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | TRANSACTION RECOVERY*				x	x
CP-10(3)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | COMPENSATING SECURITY CONTROLS*	x	Addressed by tailoring procedures.			
CP-10(4)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | RESTORE WITHIN TIME PERIOD*					x
CP-10(5)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | FAILOVER CAPABILITY*	x	Incorporated into SI-13.			

3-Phases in a Contingency Plan

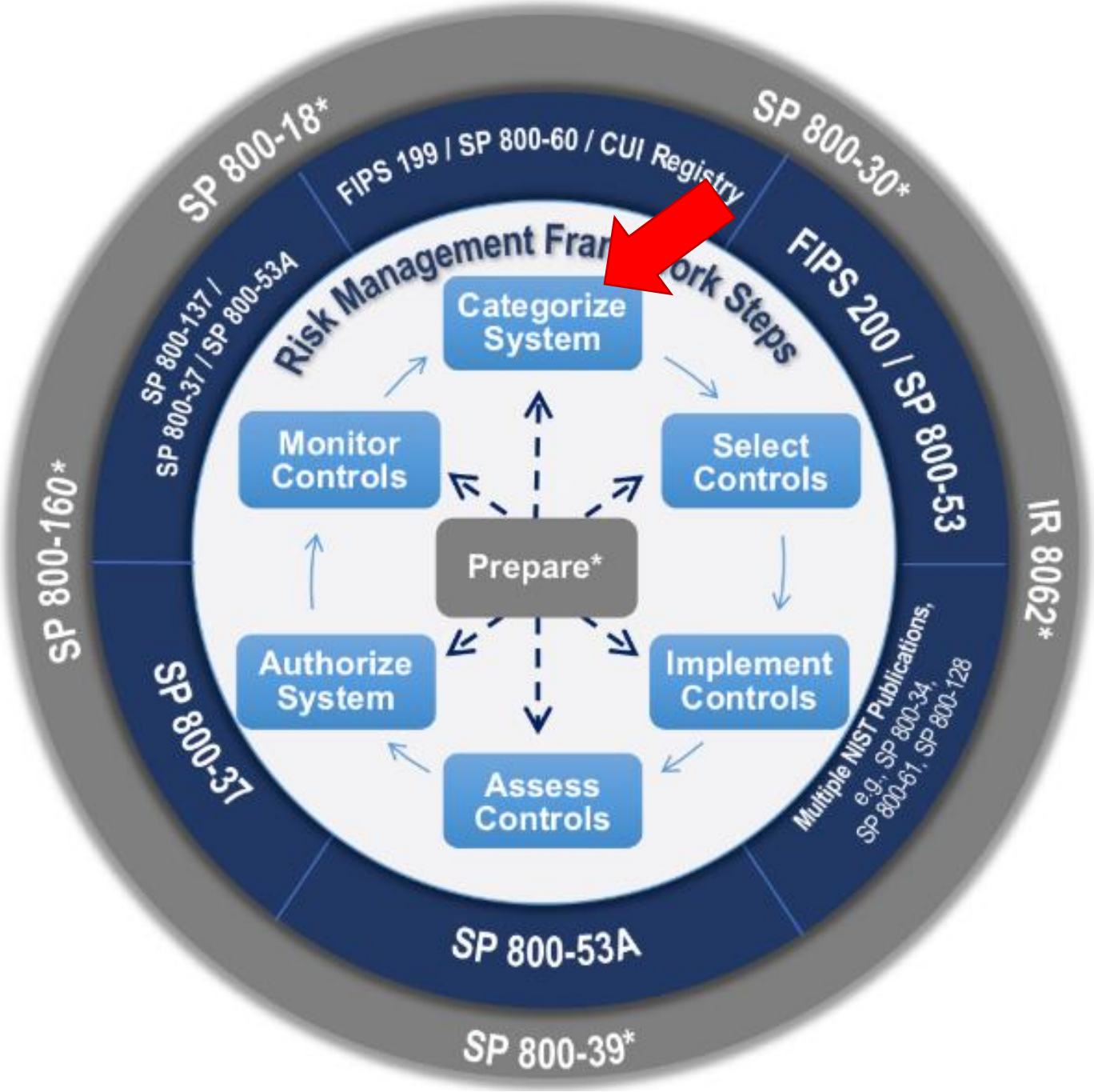
All dependent on a BIA “Business Impact Analysis”



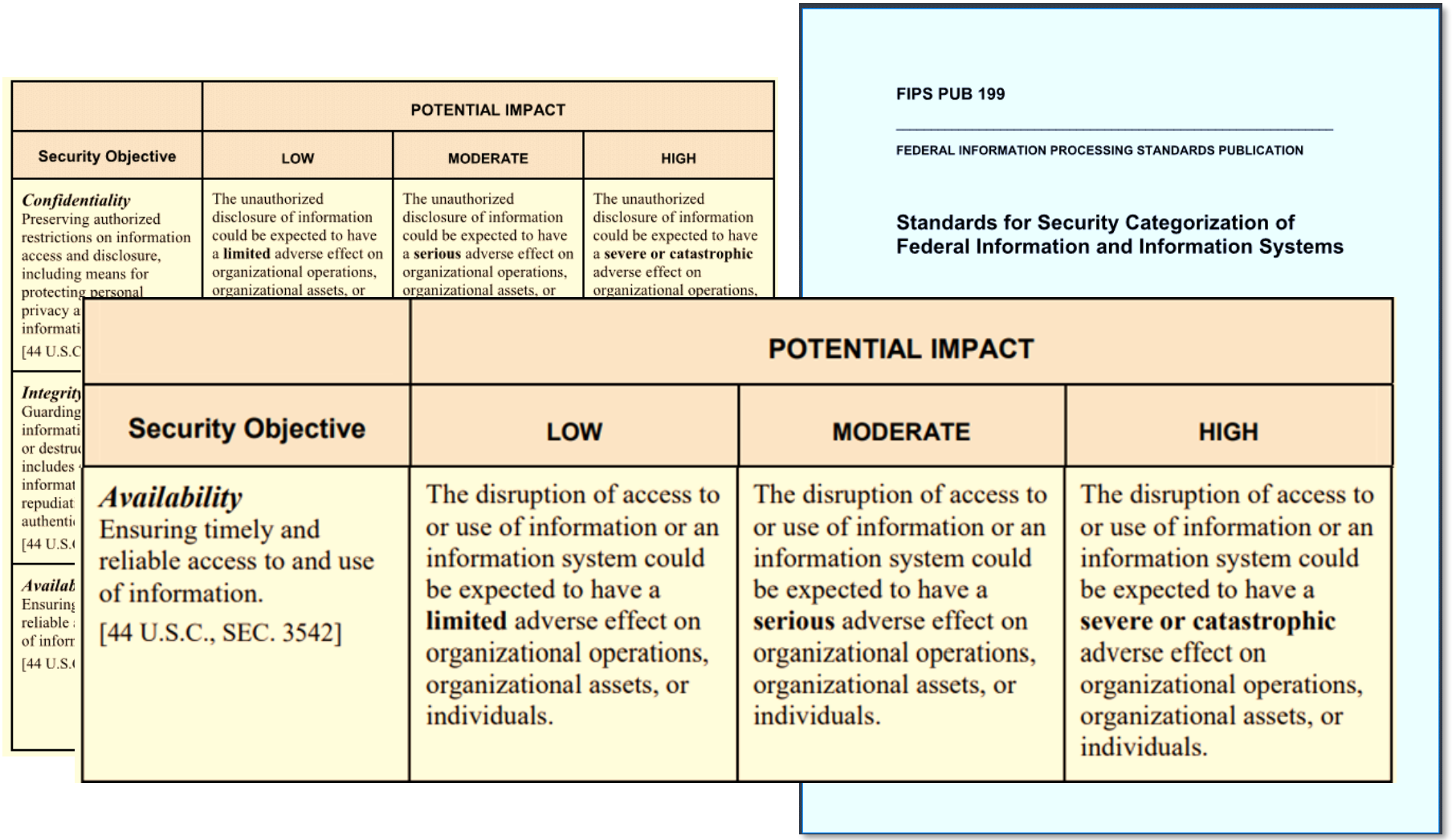
NIST SP 800-34 R1 – Contingency Planning Guide for Federal Information Systems

National Institute of Standards and Technology
U.S. Department of Commerce

Categorizing information systems enables us to understand the priority for recovery…



Impact on which security objective determines priorities for recovery?



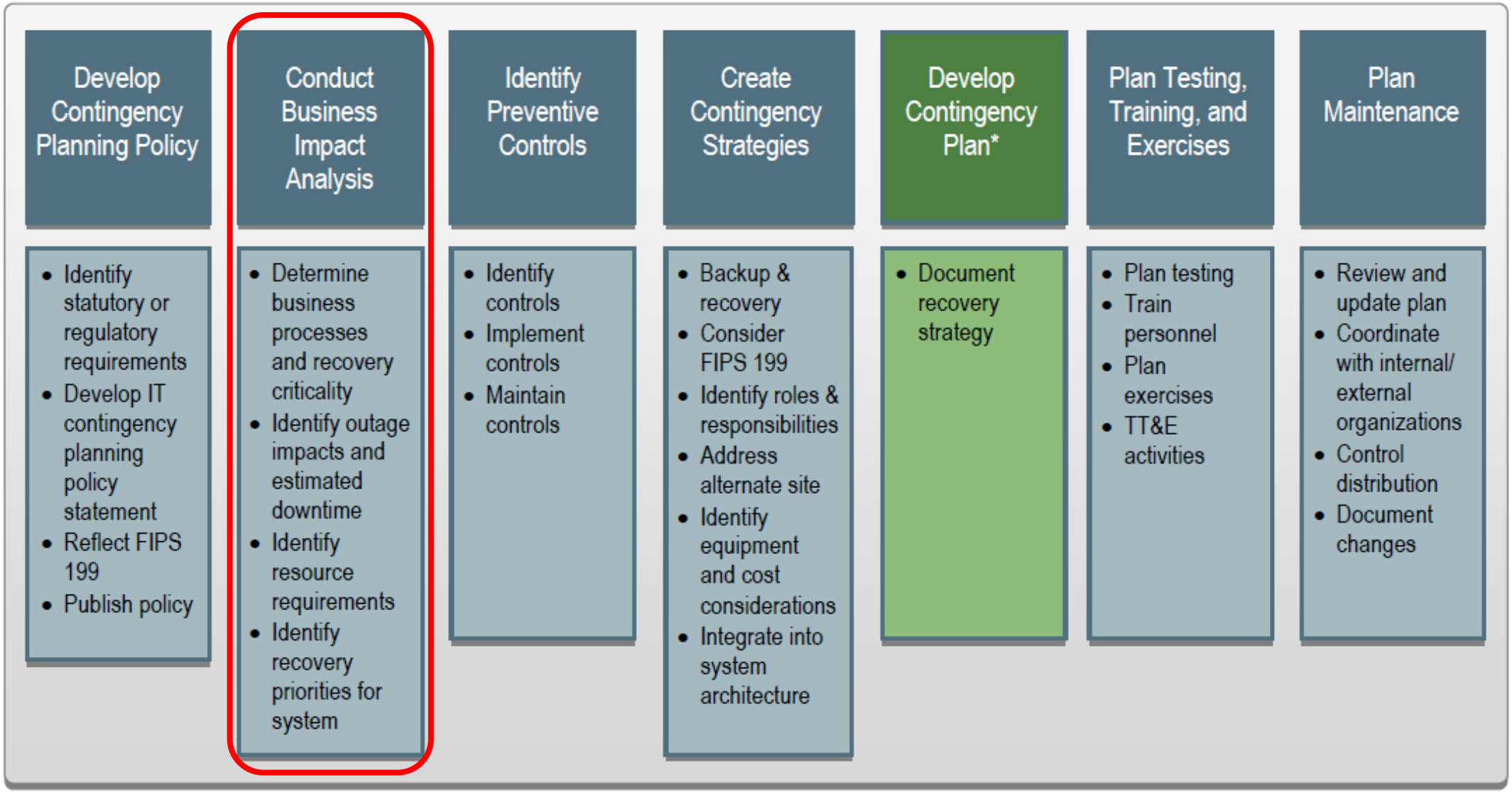
FIPS PUB 199

FEDERAL INFORMATION PROCESSING STANDARDS PUBLICATION

Standards for Security Categorization of Federal Information and Information Systems

Security Objective	POTENTIAL IMPACT		
	LOW	MODERATE	HIGH
Availability Ensuring timely and reliable access to and use of information. [44 U.S.C., SEC. 3542]	The disruption of access to or use of information or an information system could be expected to have a **limited** adverse effect on organizational operations, organizational assets, or individuals.	The disruption of access to or use of information or an information system could be expected to have a **serious** adverse effect on organizational operations, organizational assets, or individuals.	The disruption of access to or use of information or an information system could be expected to have a **severe or catastrophic** adverse effect on organizational operations, organizational assets, or individuals.

Plan is based on “recovery priorities”



NIST SP 800-34 R1 – Contingency Planning Guide for Federal Information Systems

Business Impact Analysis (BIA) Answers

1. What are the work processes ?
2. How critical is each ?
3. What data, applications, and people are needed to run each critical process ?
4. What are the priorities for recovering information systems after disruption ?

5. For each critical IT resource, what are:
   - **Recover time objective** (RTO):

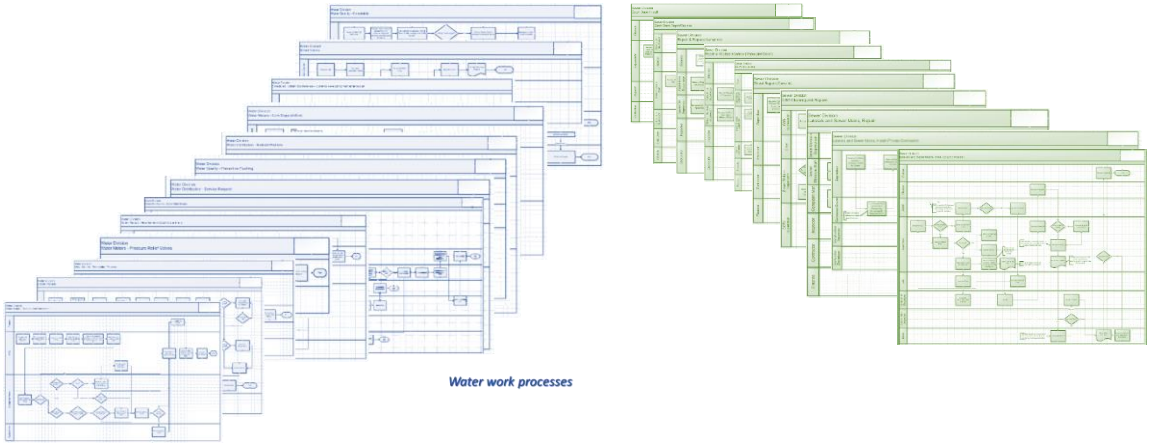
     Maximum acceptable downtime

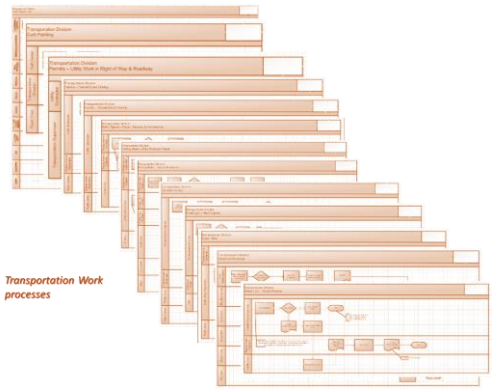
   - **Recovery point objective** (RPO):

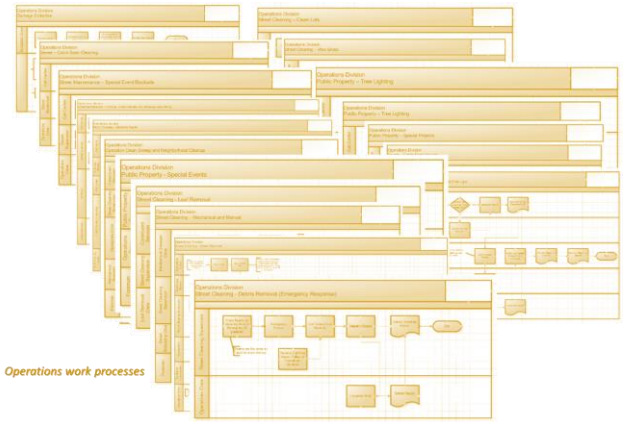
     Maximum acceptable data loss (measured in time, but implies # of data records)

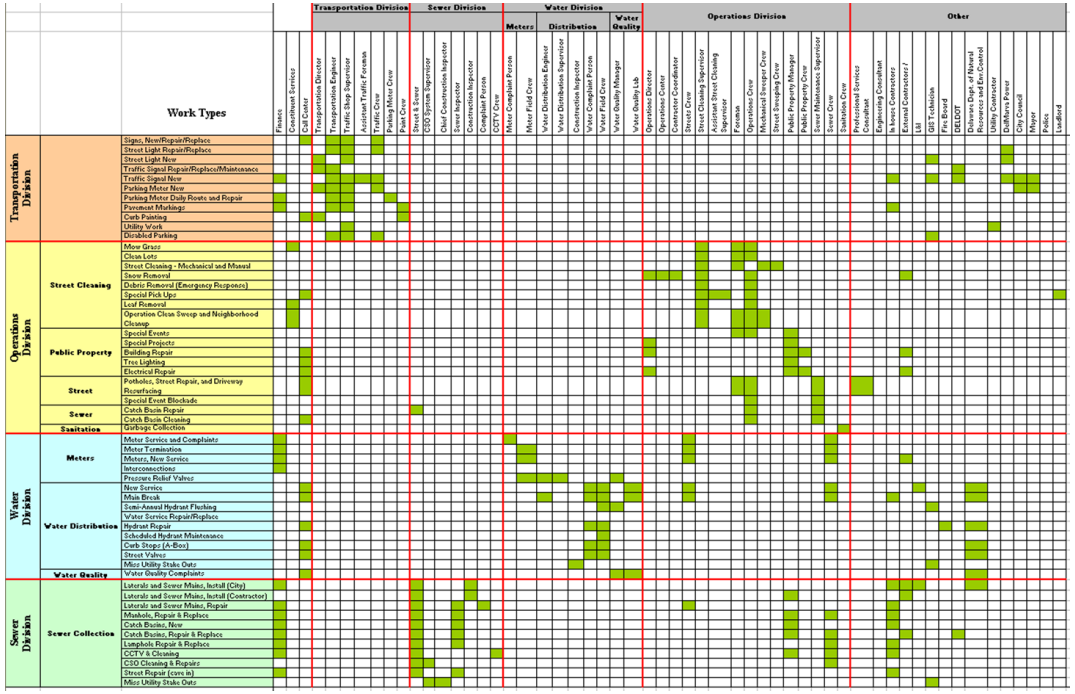
Prerequisite for BIA and contingency planning…

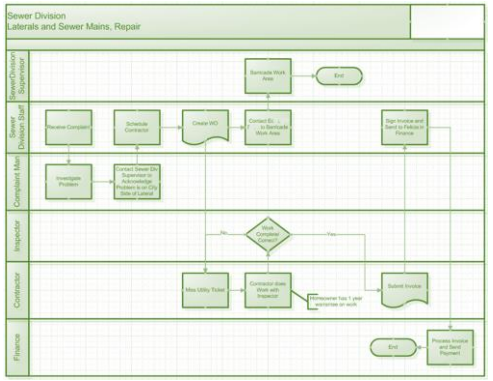
Good work process documentation identifies all people, data, applications, communications and information technologies needed to restore operations





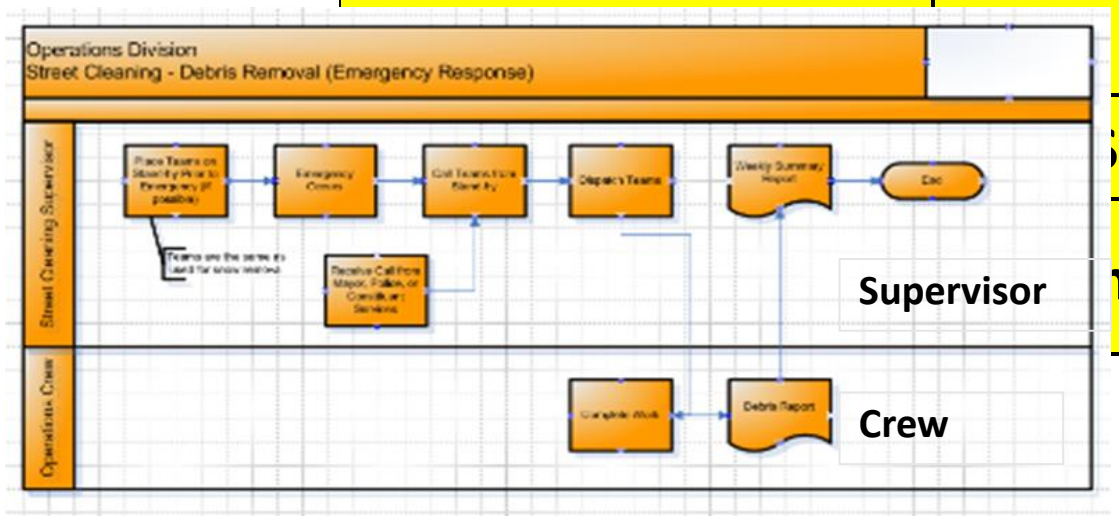






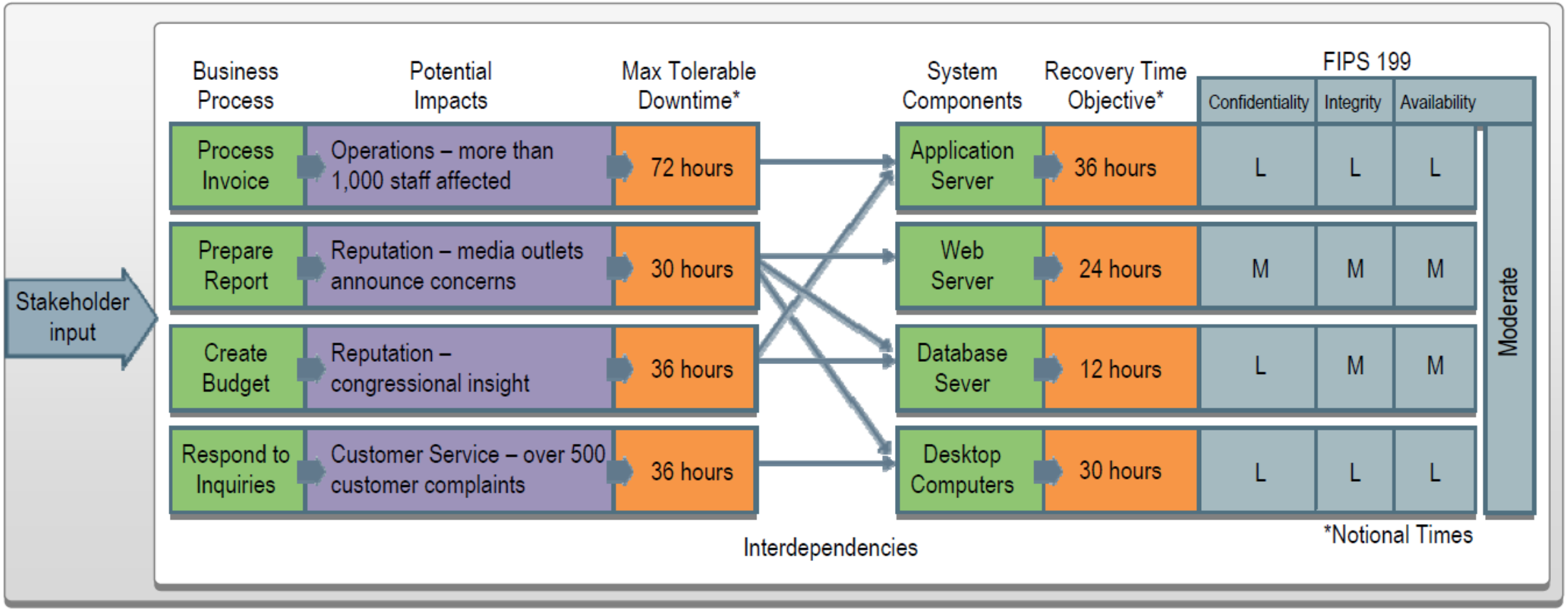
Priorities for recovery example

Public Works Dept Operations Division	**Street Cleaning**	**Mow Grass**
		Clean Lots
		Street Cleaning - Mechanical and Manual
		Snow Removal
		Debris Removal (Emergency Response)
		Special Pick Ups
		Leaf Removal
		Neighborhood Cleanup
	Public Property	**Special Events**
		Special Projects
		Building Repair
		Tree Lighting
		Electrical Repair
	treet	**Potholes, Street Repair, and Resurfacing**
		Special Event Blockade
	itation	**Catch Basin Repair**
		Catch Basin Cleaning
		Garbage Collection



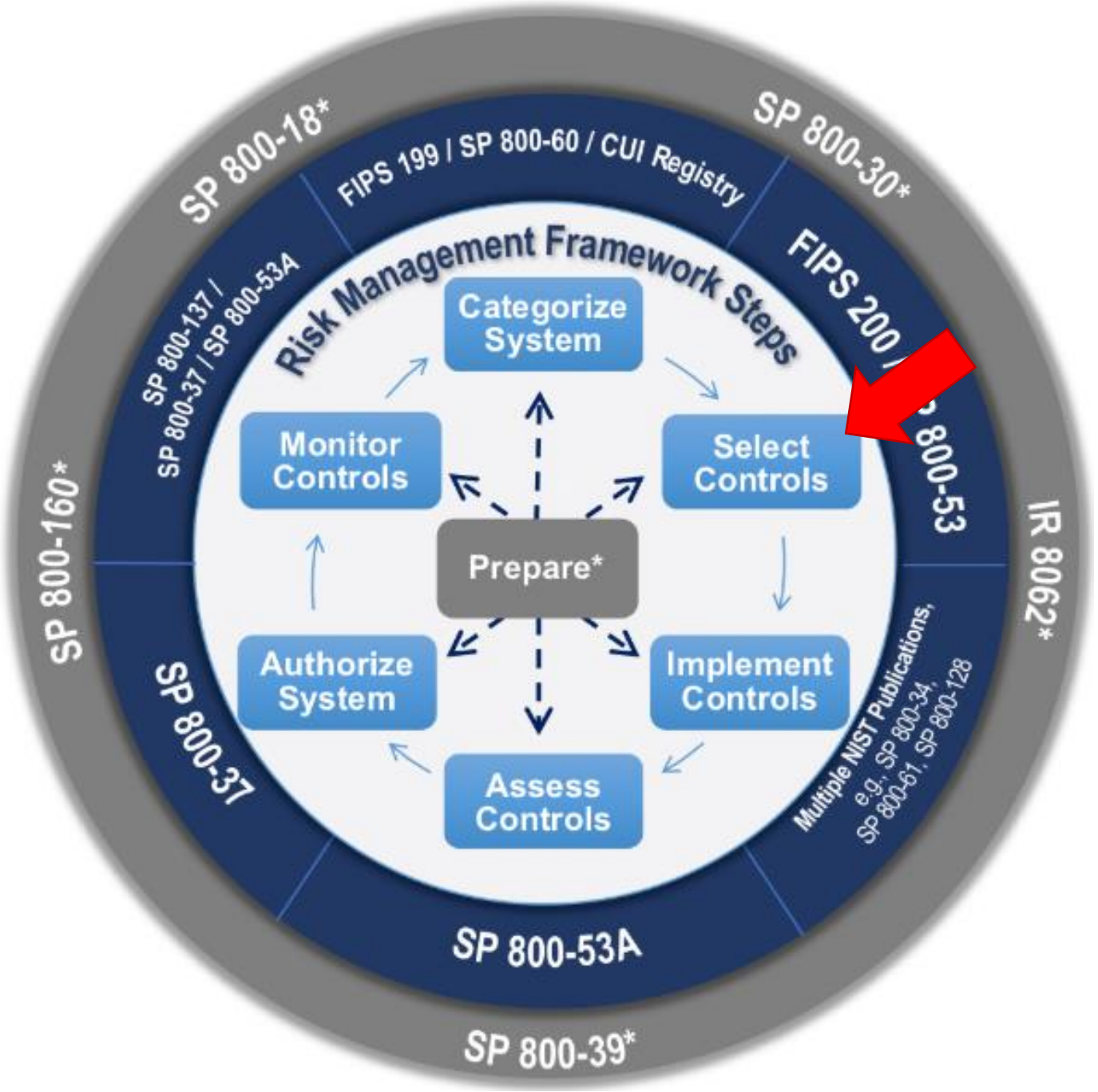
Business Impact Analysis (BIA) example…

- Determine Business Processes and Recovery Criticality
- Identify Information and IT Resource Requirements
- Identify Information System Resource Recovery Priorities



NIST SP 800-34 R1 – Contingency Planning Guide for Federal Information Systems

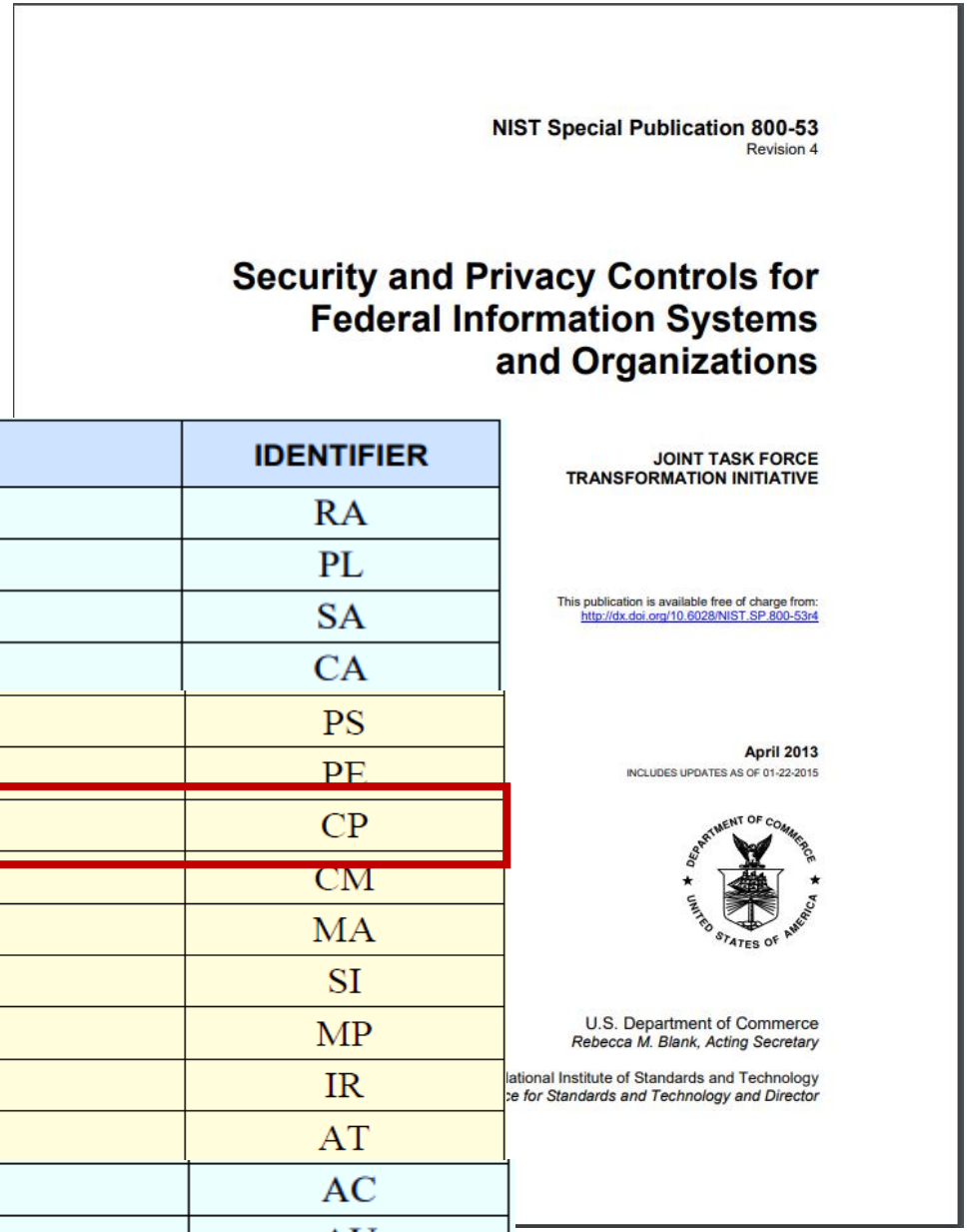
National Institute of Standards and Technology
U.S. Department of Commerce



Catalog of cyber-security controls

for Business Continuity and Resiliency planning focus on Contingency Planning controls

CLASS	FAMILY	IDENTIFIER
Management	Risk Assessment	RA
Management	Planning	PL
Management	System and Services Acquisition	SA
Management	Certification, Accreditation, and Security Assessments	CA
Operational	Personnel Security	PS
Operational	Physical and Environmental Protection	PE
Operational	Contingency Planning	CP
Operational	Configuration Management	CM
Operational	Maintenance	MA
Operational	System and Information Integrity	SI
Operational	Media Protection	MP
Operational	Incident Response	IR
Operational	Awareness and Training	AT
Technical	Access Control	AC
Technical	Audit and Accountability	AU
Technical	System and Communications Protection	SC



NIST Special Publication 800-53
Revision 4

Security and Privacy Controls for Federal Information Systems and Organizations

JOINT TASK FORCE TRANSFORMATION INITIATIVE

This publication is available free of charge from: http://dx.doi.org/10.6028/NIST.SP.800-53r4

April 2013

INCLUDES UPDATES AS OF 01-22-2015

U.S. Department of Commerce
Rebecca M. Blank, Acting Secretary

ational Institute of Standards and Technology
ce for Standards and Technology and Director

Contingency Planning Controls

CONTROL NAME	BASELINES		
	LOW	MOD	HIGH
Contingency Planning Policy and Procedures	X	X	X
Contingency Plan	X	X	X
Contingency Training	X	X	X
Contingency Plan Testing	X	X	X
Alternative Storage Site		X	X
Alternative Processing Site		X	X
Telecommunications Services		X	X
Information System Backup	X	X	X
Information System Recovery and Reconstitution	X	X	X

NIST SP 800-53r4 "Security and Privacy Controls for Federal Information Systems and Organizations"

CNTL NO.	CONTROL NAME *Control Enhancement Name*	WITHDRAWN	ASSURANCE	CONTROL BASELINES		
				LOW	MOD	HIGH
CP-1	**Contingency Planning Policy and Procedures**		x	x	x	x
CP-2	**Contingency Plan**			x	x	x
CP-2(1)	*CONTINGENCY PLAN | COORDINATE WITH RELATED PLANS*				x	x
CP-2(2)	*CONTINGENCY PLAN | CAPACITY PLANNING*					x
CP-2(3)	*CONTINGENCY PLAN | RESUME ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*				x	x
CP-2(4)	*CONTINGENCY PLAN | RESUME ALL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(5)	*CONTINGENCY PLAN | CONTINUE ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(8)	*CONTINGENCY PLAN | IDENTIFY CRITICAL ASSETS*				x	x
CP-3	**Contingency Training**		x	x	x	x
CP-3(1)	*CONTINGENCY TRAINING | SIMULATED EVENTS*		x			x
CP-4	**Contingency Plan Testing**		x	x	x	x
CP-4(1)	*CONTINGENCY PLAN TESTING | COORDINATE WITH RELATED PLANS*		x		x	x
CP-4(2)	*CONTINGENCY PLAN TESTING | ALTERNATE PROCESSING SITE*		x			x
CP-5	**Contingency Plan Update**	x	Incorporated into CP-2.			
CP-6	**Alternate Storage Site**				x	x
CP-6(1)	*ALTERNATE STORAGE SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-6(2)	*ALTERNATE STORAGE SITE | RECOVERY TIME / POINT OBJECTIVES*					x
CP-6(3)	*ALTERNATE STORAGE SITE | ACCESSIBILITY*				x	x
CP-7	**Alternate Processing Site**				x	x
CP-7(1)	*ALTERNATE PROCESSING SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-7(2)	*ALTERNATE PROCESSING SITE | ACCESSIBILITY*				x	x
CP-7(3)	*ALTERNATE PROCESSING SITE | PRIORITY OF SERVICE*				x	x
CP-7(4)	*ALTERNATE PROCESSING SITE | PREPARATION FOR USE*					x
CP-7(5)	*ALTERNATE PROCESSING SITE | EQUIVALENT INFORMATION SECURITY SAFEGUARDS*	x	Incorporated into CP-7.			
CP-8	**Telecommunications Services**				x	x
CP-8(1)	*TELECOMMUNICATIONS SERVICES | PRIORITY OF SERVICE PROVISIONS*				x	x
CP-8(2)	*TELECOMMUNICATIONS SERVICES | SINGLE POINTS OF FAILURE*				x	x
CP-8(3)	*TELECOMMUNICATIONS SERVICES | SEPARATION OF PRIMARY / ALTERNATE PROVIDERS*					x
CP-8(4)	*TELECOMMUNICATIONS SERVICES | PROVIDER CONTINGENCY PLAN*					x
CP-9	**Information System Backup**			x	x	x
CP-9(1)	*INFORMATION SYSTEM BACKUP | TESTING FOR RELIABILITY / INTEGRITY*				x	x
CP-9(2)	*INFORMATION SYSTEM BACKUP | TEST RESTORATION USING SAMPLING*					x
CP-9(3)	*INFORMATION SYSTEM BACKUP | SEPARATE STORAGE FOR CRITICAL INFORMATION*					x
CP-9(4)	*INFORMATION SYSTEM BACKUP | PROTECTION FROM UNAUTHORIZED MODIFICATION*	x	Incorporated into CP-9.			
CP-9(5)	*INFORMATION SYSTEM BACKUP | TRANSFER TO ALTERNATE STORAGE SITE*					x
CP-10	**Information System Recovery and Reconstitution**			x	x	x
CP-10(1)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | CONTINGENCY PLAN TESTING*	x	Incorporated into CP-4.			
CP-10(2)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | TRANSACTION RECOVERY*				x	x
CP-10(3)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | COMPENSATING SECURITY CONTROLS*	x	Addressed by tailoring procedures.			
CP-10(4)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | RESTORE WITHIN TIME PERIOD*					x
CP-10(5)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | FAILOVER CAPABILITY*	x	Incorporated into SI-13.			

Options for alternate Data Processing Site

Hot site: A geographically remote facility, fully equipped and ready to power up at a moments notice

Warm site: Includes communications components but computers are not installed – will need to be delivered and setup

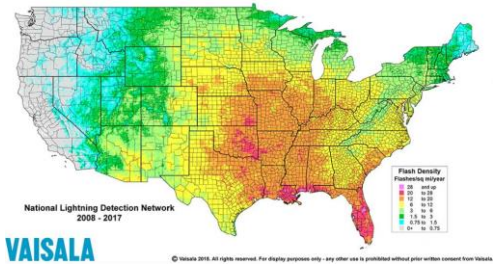
Cold site: Provides only the basic environment that can be outfitted with communication, utilities and computers

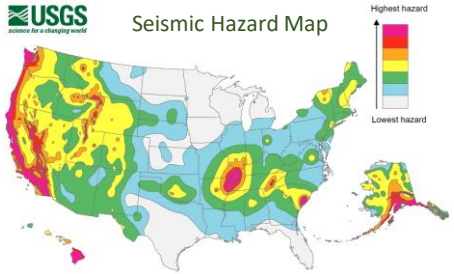
Site	Cost	Hardware Equipment	Telecommunications	Setup Time
Hot Site	High	Full	Full	Short
Warm Site	Medium	Partial	Full / Partial	Medium
Cold Site	Low	None	None	Long

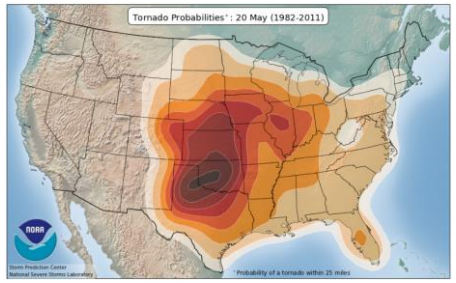
Location of Alternate site

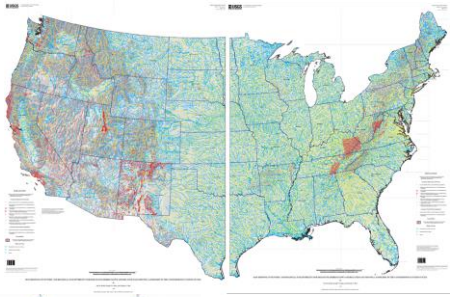
Disaster recovery site should be in a different geophysical area not susceptible to same disaster as the primary operations facility

Note: even the cloud is located somewhere…

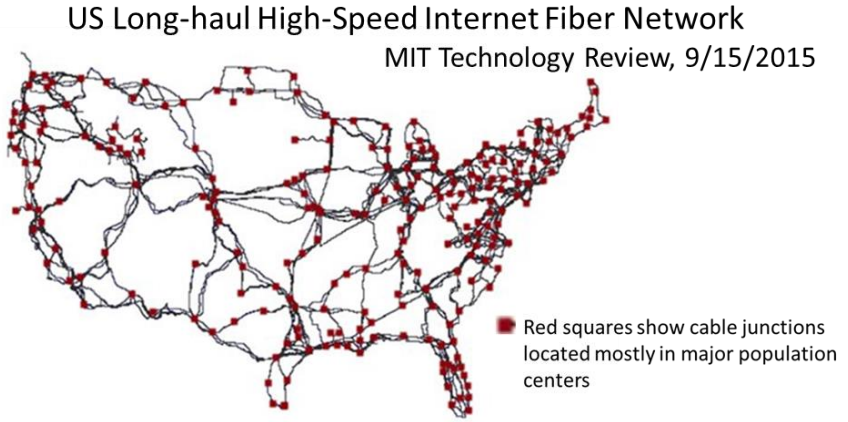








With multiple providers of:



- Telecommunications
- Stable power supply
- Redundant utilities

Multi-hazard mapping

Primer on Natural Hazard Management in Integrated Regional Development Planning

Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs Organization of American States

With support from the Office of Foreign Disaster Assistance United States Agency for International Development

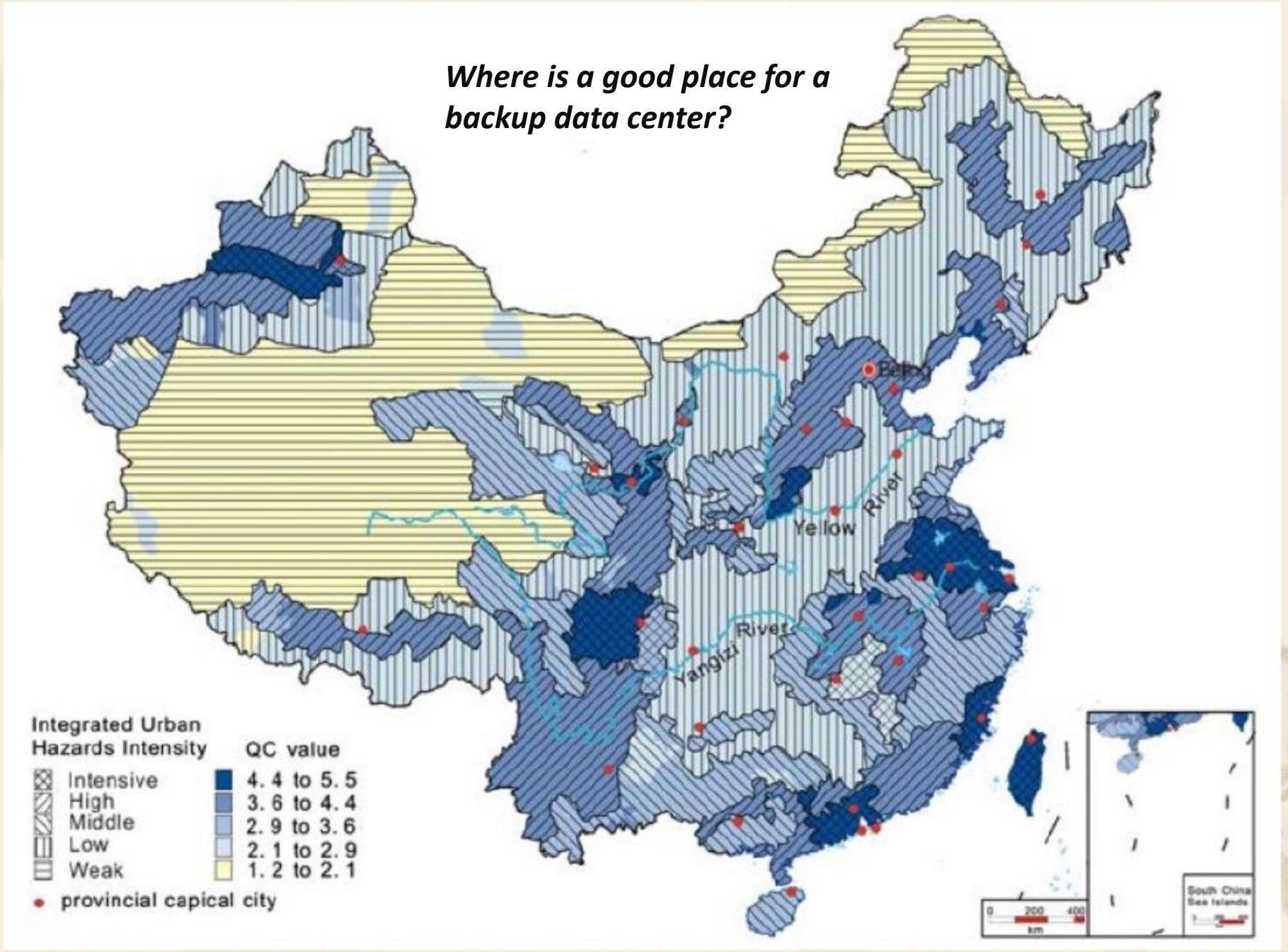
Washington, D.C. 1991

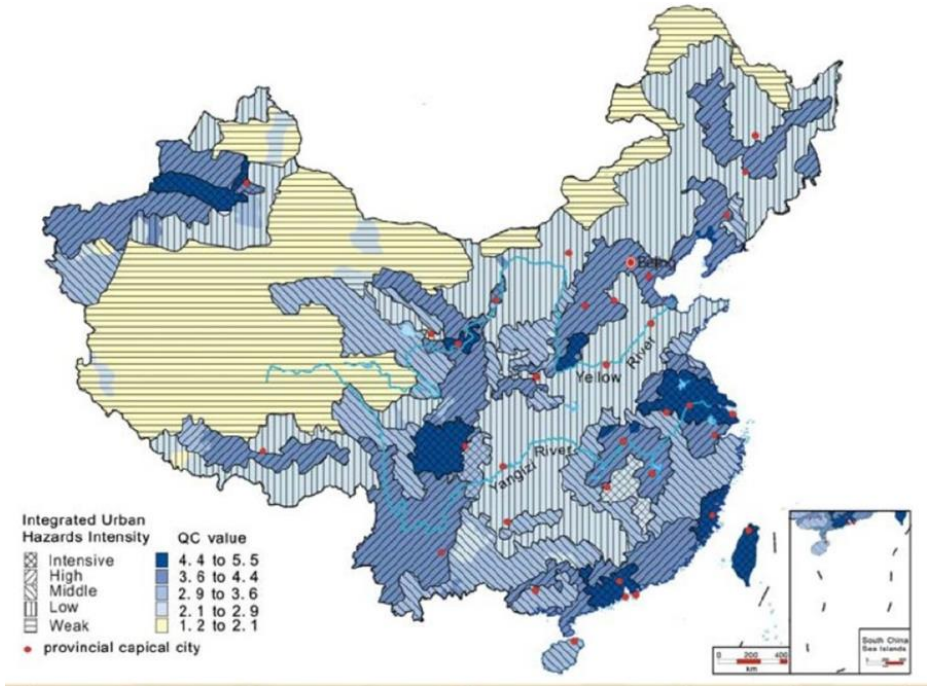
Figure 6-1 EXAMPLES OF NATURAL PHENOMENA WHICH MAY BE HAZARDOUS

Atmospheric	Volcanic	Hydrologic	Other Geologic	Seismic	Wildfire
Hailstorms	Ashfalls	Coastal flooding	Debris avalanches	Fault ruptures	Brush
Hurricanes	Gases	Desertification	Expansive soils	Ground shaking	Forest
Lightning	Lava flows	Drought	Rockfalls	Lateral spreading	Savannah
Thunderstorms	Projectiles and lateral blasts	Erosion	Submarine slides	Liquefaction	Urban conflagration
Tornadoes	Pyroclastic flows	River floods	Subsidence	Seiches	
Tropical storms	Tephra (ashes, cinders, lapilli)	Storm surges		Tsunamis	

CHAPTER 6 - MULTIPLE HAZARD MAPPING

Map of Comprehensive Urban Natural Disaster Intensity in China





中国教育和科研计算机网
China Education and Research Network

Example is an outdated internet infrastructure map intended to illustrate what is needed to plan data center disaster recovery site

Contingency Planning Controls

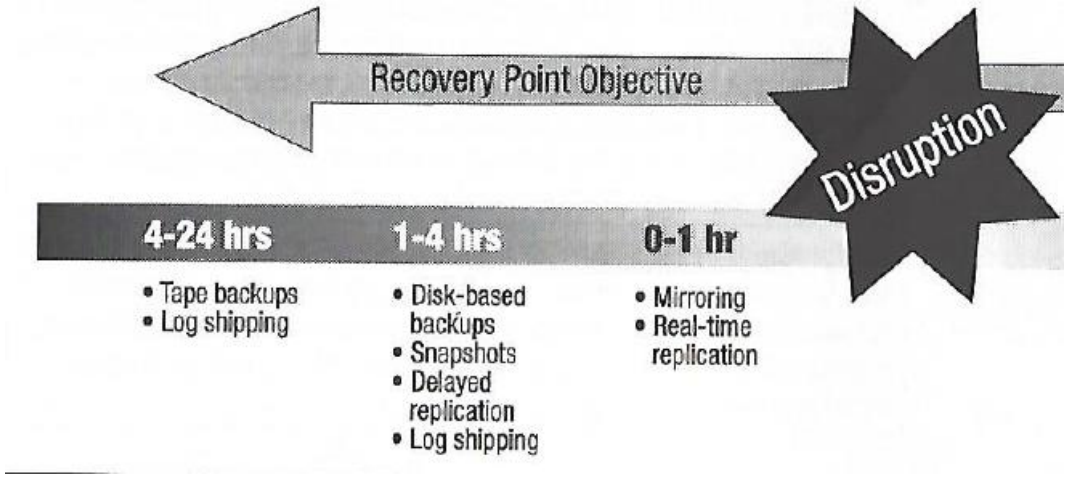
CONTROL NAME	BASELINES		
	LOW	MOD	HIGH
Contingency Planning Policy and Procedures	X	X	X
Contingency Plan	X	X	X
Contingency Training	X	X	X
Contingency Plan Testing	X	X	X
Alternative Storage Site		X	X
Alternative Processing Site		X	X
Telecommunications Services		X	X
Information System Backup	X	X	X
Information System Recovery and Reconstitution	X	X	X

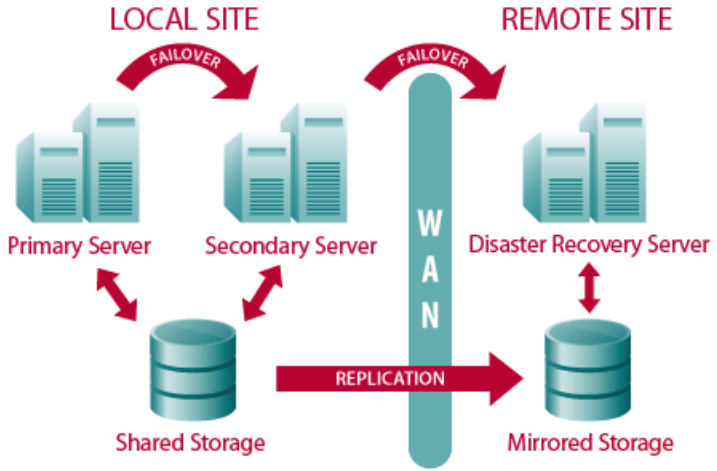
NIST SP 800-53r4 "Security and Privacy Controls for Federal Information Systems and Organizations"

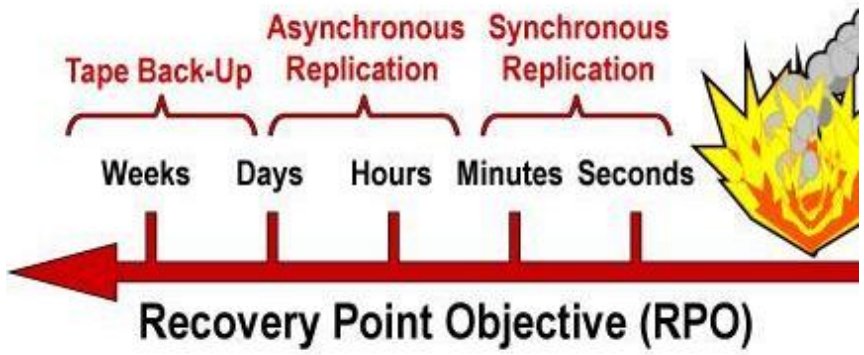
CNTL NO.	CONTROL NAME *Control Enhancement Name*	WITHDRAWN	ASSURANCE	CONTROL BASELINES		
				LOW	MOD	HIGH
CP-1	**Contingency Planning Policy and Procedures**		x	x	x	x
CP-2	**Contingency Plan**			x	x	x
CP-2(1)	*CONTINGENCY PLAN | COORDINATE WITH RELATED PLANS*				x	x
CP-2(2)	*CONTINGENCY PLAN | CAPACITY PLANNING*					x
CP-2(3)	*CONTINGENCY PLAN | RESUME ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*				x	x
CP-2(4)	*CONTINGENCY PLAN | RESUME ALL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(5)	*CONTINGENCY PLAN | CONTINUE ESSENTIAL MISSIONS / BUSINESS FUNCTIONS*					x
CP-2(8)	*CONTINGENCY PLAN | IDENTIFY CRITICAL ASSETS*				x	x
CP-3	**Contingency Training**		x	x	x	x
CP-3(1)	*CONTINGENCY TRAINING | SIMULATED EVENTS*		x			x
CP-4	**Contingency Plan Testing**		x	x	x	x
CP-4(1)	*CONTINGENCY PLAN TESTING | COORDINATE WITH RELATED PLANS*		x		x	x
CP-4(2)	*CONTINGENCY PLAN TESTING | ALTERNATE PROCESSING SITE*		x			x
CP-5	**Contingency Plan Update**	x	Incorporated into CP-2.			
CP-6	**Alternate Storage Site**				x	x
CP-6(1)	*ALTERNATE STORAGE SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-6(2)	*ALTERNATE STORAGE SITE | RECOVERY TIME / POINT OBJECTIVES*					x
CP-6(3)	*ALTERNATE STORAGE SITE | ACCESSIBILITY*				x	x
CP-7	**Alternate Processing Site**				x	x
CP-7(1)	*ALTERNATE PROCESSING SITE | SEPARATION FROM PRIMARY SITE*				x	x
CP-7(2)	*ALTERNATE PROCESSING SITE | ACCESSIBILITY*				x	x
CP-7(3)	*ALTERNATE PROCESSING SITE | PRIORITY OF SERVICE*				x	x
CP-7(4)	*ALTERNATE PROCESSING SITE | PREPARATION FOR USE*					x
CP-7(5)	*ALTERNATE PROCESSING SITE | EQUIVALENT INFORMATION SECURITY SAFEGUARDS*	x	Incorporated into CP-7.			
CP-8	**Telecommunications Services**				x	x
CP-8(1)	*TELECOMMUNICATIONS SERVICES | PRIORITY OF SERVICE PROVISIONS*				x	x
CP-8(2)	*TELECOMMUNICATIONS SERVICES | SINGLE POINTS OF FAILURE*				x	x
CP-8(3)	*TELECOMMUNICATIONS SERVICES | SEPARATION OF PRIMARY / ALTERNATE PROVIDERS*					x
CP-8(4)	*TELECOMMUNICATIONS SERVICES | PROVIDER CONTINGENCY PLAN*					x
CP-9	**Information System Backup**			x	x	x
CP-9(1)	*INFORMATION SYSTEM BACKUP | TESTING FOR RELIABILITY / INTEGRITY*				x	x
CP-9(2)	*INFORMATION SYSTEM BACKUP | TEST RESTORATION USING SAMPLING*					x
CP-9(3)	*INFORMATION SYSTEM BACKUP | SEPARATE STORAGE FOR CRITICAL INFORMATION*					x
CP-9(4)	*INFORMATION SYSTEM BACKUP | PROTECTION FROM UNAUTHORIZED MODIFICATION*	x	Incorporated into CP-9.			
CP-9(5)	*INFORMATION SYSTEM BACKUP | TRANSFER TO ALTERNATE STORAGE SITE*					x
CP-10	**Information System Recovery and Reconstitution**			x	x	x
CP-10(1)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | CONTINGENCY PLAN TESTING*	x	Incorporated into CP-4.			
CP-10(2)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | TRANSACTION RECOVERY*				x	x
CP-10(3)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | COMPENSATING SECURITY CONTROLS*	x	Addressed by tailoring procedures.			
CP-10(4)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | RESTORE WITHIN TIME PERIOD*					x
CP-10(5)	*INFORMATION SYSTEM RECOVERY AND RECONSTITUTION | FAILOVER CAPABILITY*	x	Incorporated into SI-13.			

Data backup systems and redundancies

- **Database shadowing**
- **Electronic vaulting**
- **Remote journaling**
- **Storage area network and hierarchical storage management**
- **Shared storage**
- **RAID**
- **Failover clustering**



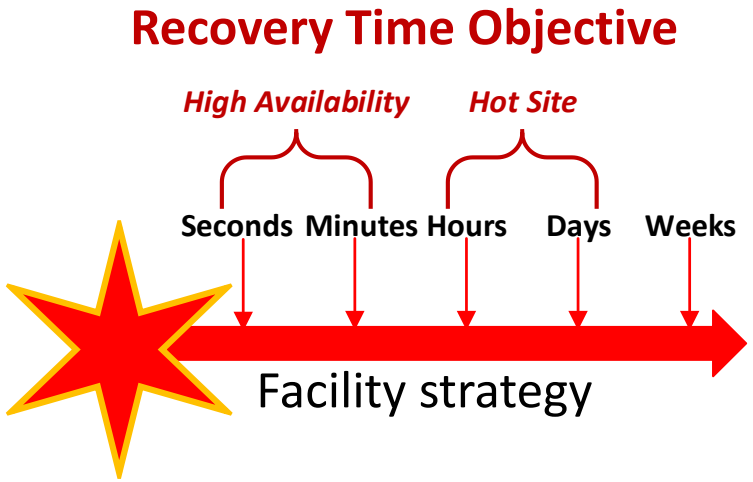


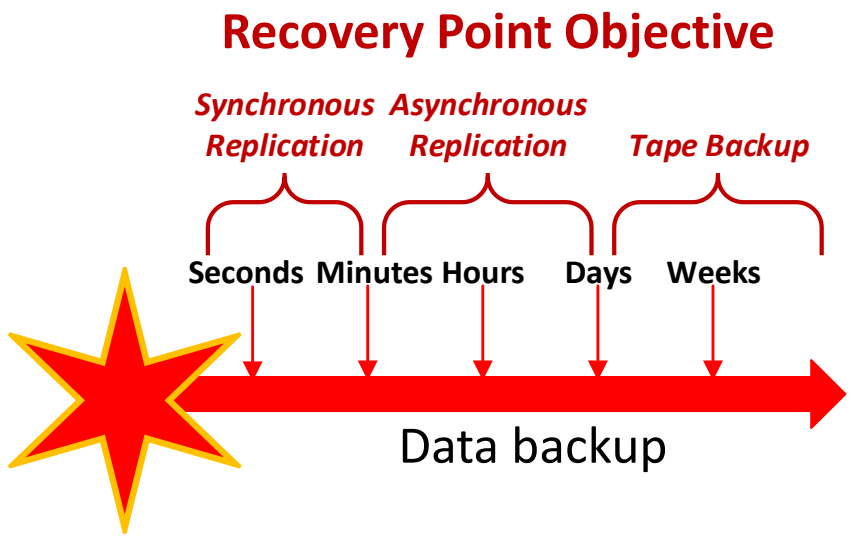


Recovery Options: Location & Backup

Information System Recovery Priority	Backup / Recovery Strategy
High priority	**Backup:** Mirrored systems and disc replication **Strategy:** Hot site $$$
Moderate priority	**Backup:** Optical backup and WAN/VLAN replication **Strategy:** Warm or Cold site $$
Low priority	**Backup:** Tape backup **Strategy:** Cold site $

[NIST SP 800-34 R1](#)
[Planning Guide for Federal Information Systems](#)

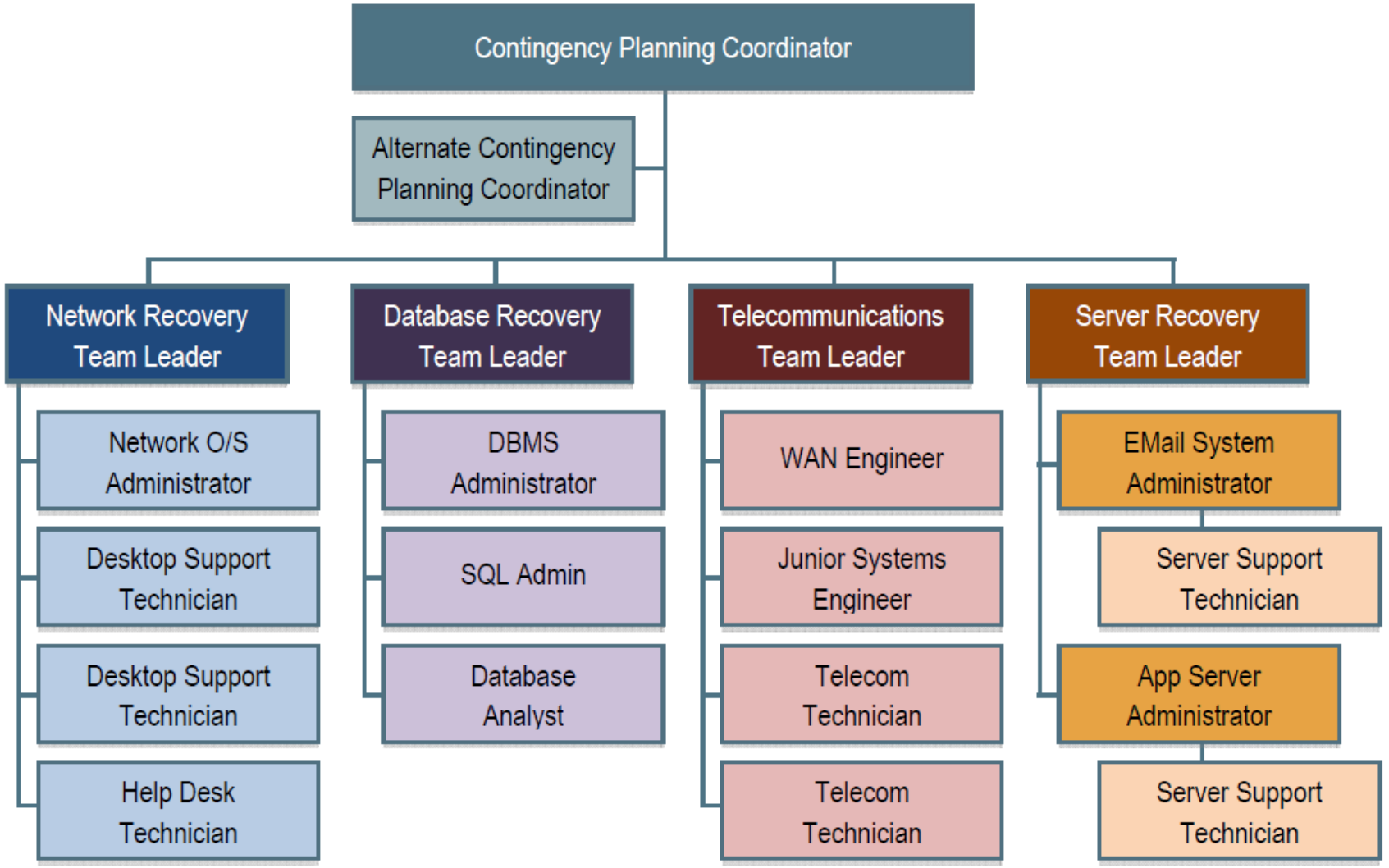




Considerations - Budget

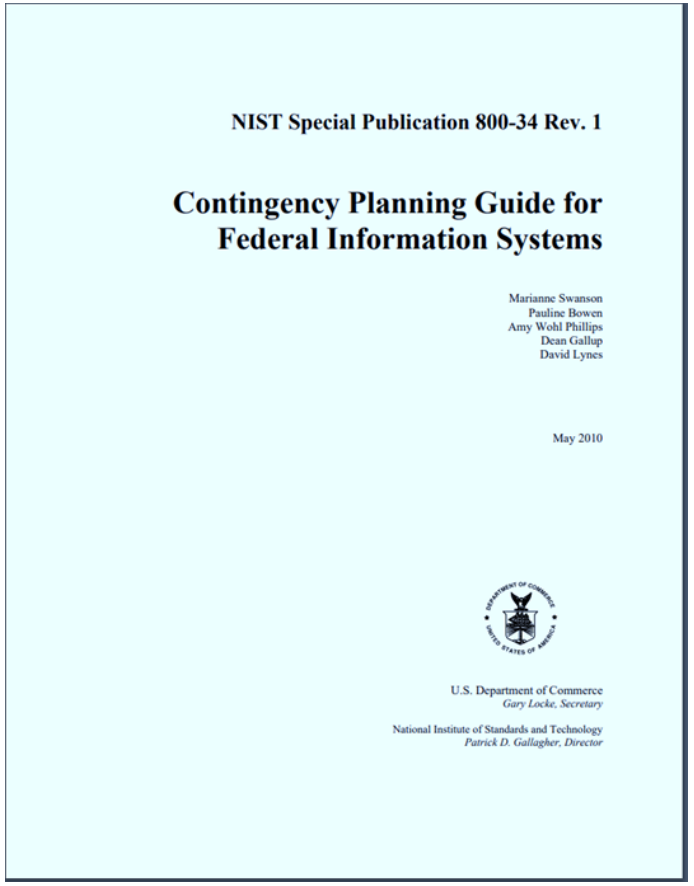
Contingency Resources	Strategies	Vendor Costs	Hardware Costs	Software Costs	Travel / Shipping Costs	Labor / Contractor Costs	Testing Costs	Supply Costs
Alternate Site	Cold Site							
	Warm Site							
	Hot Site							
Offsite Storage	Commercial							
	Internal							
Equipment Replace-ment	SLA							
	Storage							
	Existing Use							

Response Roles and Responsibilities example



NIST SP 800-34 R1 – Contingency Planning Guide for Federal Information Systems

Contingency Plan



NIST Special Publication 800-34 Rev. 1

Contingency Planning Guide for Federal Information Systems

Marianne Swanson
Pauline Bowen
Amy Wohl Phillips
Dean Gallup
David Lynes

May 2010

U.S. Department of Commerce
Gary Locke, Secretary

National Institute of Standards and Technology
Patrick D. Gallagher, Director

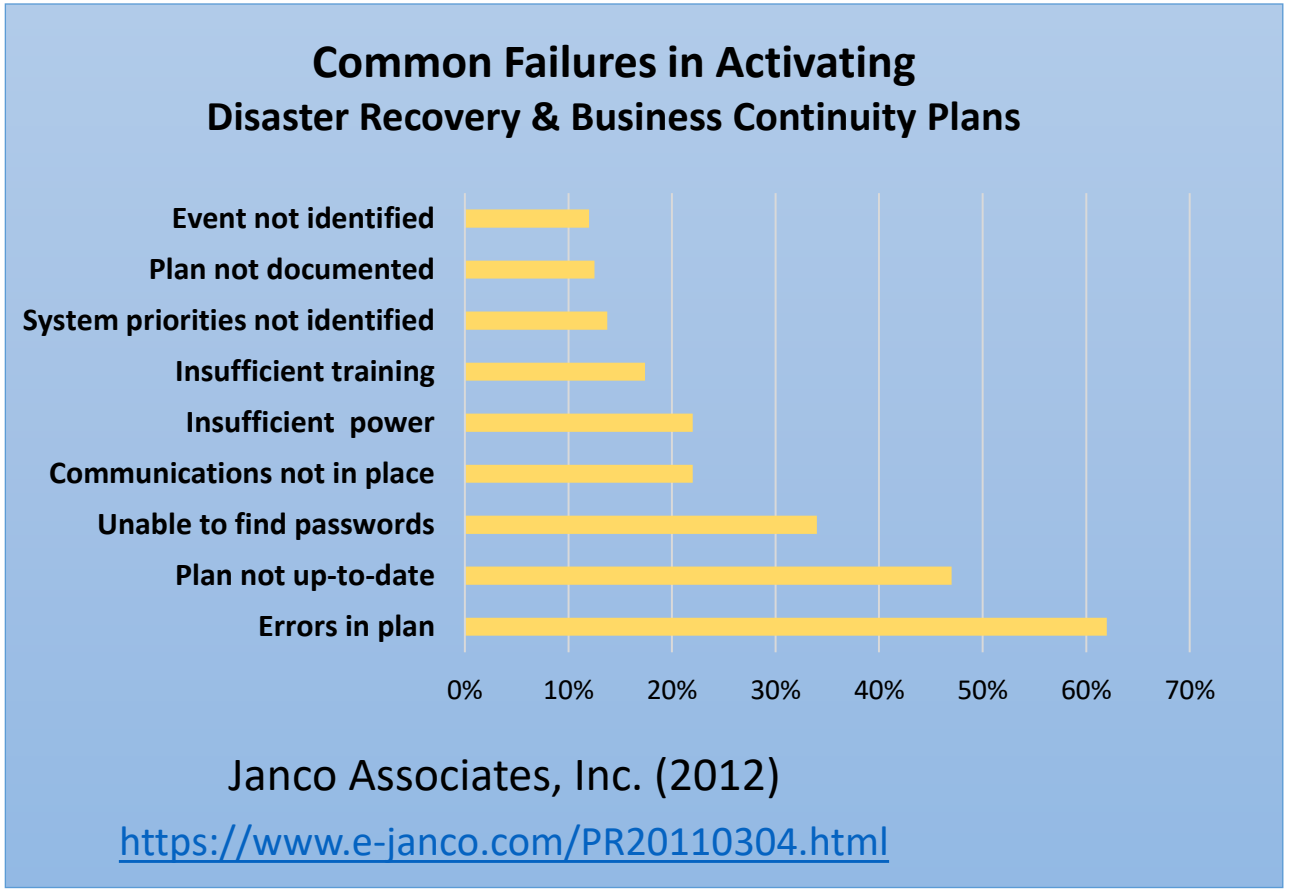
TABLE OF CONTENTS

Contingency plans must be practiced and tested

…to be sure the plan is good, everyone is prepared and knows what to do

Can range from:

- *Checklist review*
- *Tabletop exercise*
- *Structured walk-through*
- *Dry-Run tests*



Janco Associates, Inc. (2012)

https://www.e-janco.com/PR20110304.html

Agenda

- ✓Computer virus
- ✓Malicious software
  - ✓Proliferation of malware
  - ✓Malware components
  - ✓Anti-malware components
  - ✓Best practices for protection
- ✓Business Continuity and Disaster Contingency Planning
- Incident Response Planning
- Team Project Q&A

NIST Cybersecurity Framework

Framework for Improving Critical Infrastructure Cybersecurity

Version 1.1

National Institute of Standards and Technology

April 16, 2018

What assets need protection?

What safeguards are available ?

What techniques can identify incidents ?

What techniques can contain impacts of incidents ?

What techniques can restore capabilities?

Functions	Categories
IDENTIFY	
PROTECT	
DETECT	
RESPOND	
RECOVER	

NIST Cybersecurity Framework

What assets need protection?

What safeguards are available ?

What techniques can identify incidents ?

What techniques can contain impacts of incidents ?

What techniques can restore capabilities ?

Function Unique Identifier	Function	Category
ID	Identify	Asset Management
		Business Environment
		Governance
		Risk Assessment
		Risk Management Strategy
		Supply Chain Risk Management
PR	Protect	Identity Management and Access Control
		Awareness and Training
		Data Security
		Information Protection Processes and Procedures
		Maintenance
		Protective Technology
DE	Detect	Anomalies and Events
		Security Continuous Monitoring
		Detection Processes
RS	Respond	Response Planning
		Communications
		Analysis
		Mitigation
		Improvements
RC	Recover	Recovery Planning
		Improvements
		Communications

Computer security incident response - vocabulary

Event – any observable occurrence in a system or a network, e.g.

- User sending an email
- User connecting to a file share (i.e. file folder on another computer)
- Server receiving a request for a web page
- Firewall blocking a connection attempt

Adverse event – is an event with a negative consequence, e.g.

- System crash
- Execution of malware that destroys data
- Unauthorized use of system privileges

Computer security incident response - vocabulary

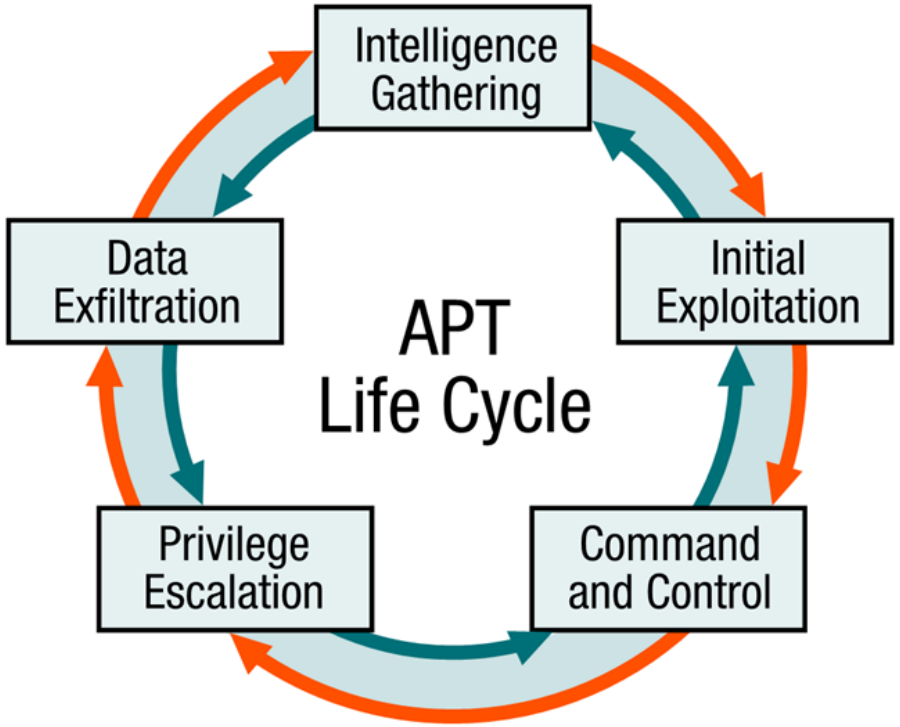
Computer security incident – is a violation (or imminent threat) of computer security policies, acceptable use policies, or standard practices, e.g.

- Users are tricked into opening a “quarterly report” sent via email that is actually malware; running the tool has infected their computers and established connections with an external host
- An attacker obtains sensitive data and threatens that the details will be released publicly if the organization does not pay a designated sum of money
- An attacker commands a botnet to send high volumes of connection requests to a web server, causing it to crash
- A user provides or exposes sensitive information to others by mistake or on purpose

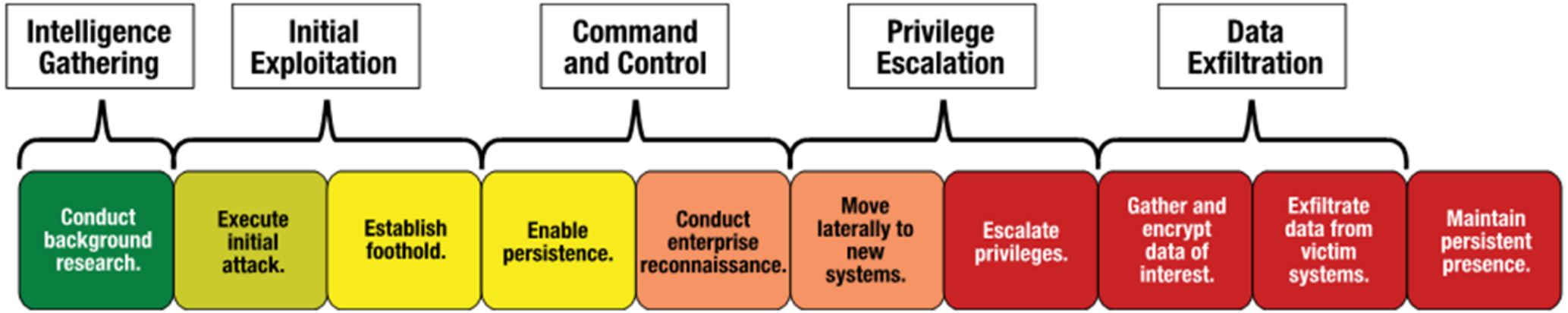
Computer security incident response

Is necessary because…

- Computer security controls, systems, and processes are not perfect
- Protections designed to protect information and information systems eventually fail
- Security breaches are inevitable



Anatomy of Advanced Persistent Threats

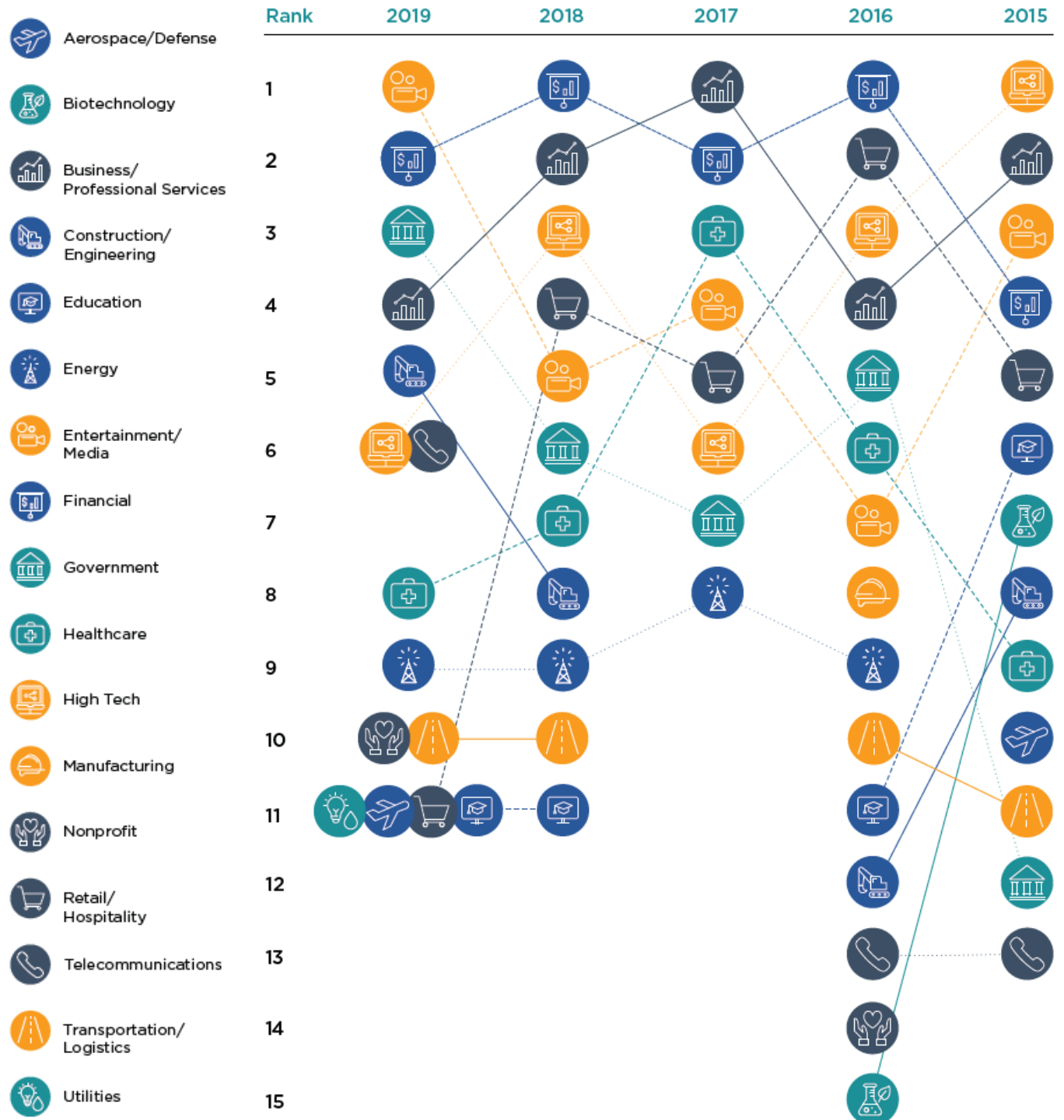


Attackers and their tactics

"Attackers continue to grow more adept at working across a range of operating systems and device types, as well as in both on-premises and cloud architectures

Traditional barriers to attacker success continue to lessen over time. Put simply, more attackers can do more things in more diverse environments"

Who is being attacked?



Who is detecting intrusions by attackers?

Compromise Notifications	2011	2012	2013	2014	2015	2016	2017	2018	2019
External	94%	63%	67%	69%	53%	47%	38%	41%	53%
Internal	6%	37%	33%	31%	47%	53%	62%	59%	47%

How long are attackers remaining in compromised systems?

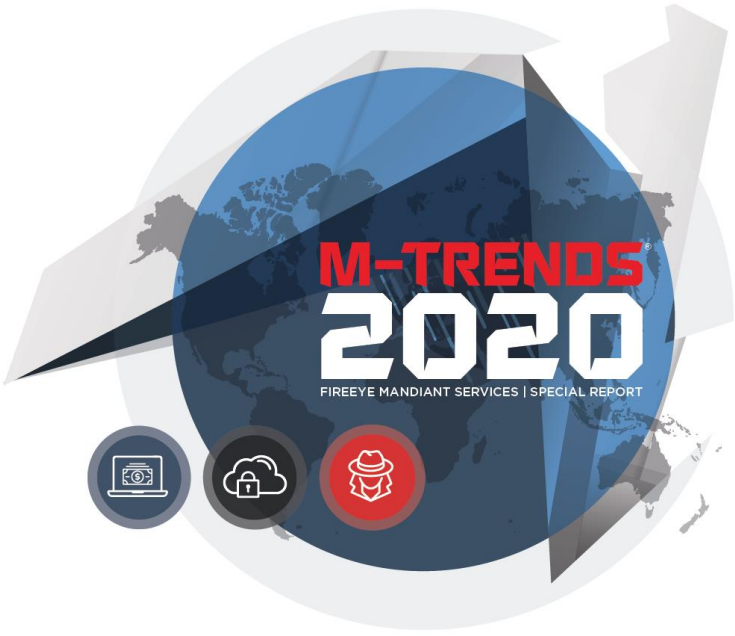
Compromise Notifications	2011	2012	2013	2014	2015	2016	2017	2018	2019
All	416	243	229	205	146	99	101	78	56
Internal Detection	—	—	—	—	56	80	57.5	50.5	30
External Notification	—	—	—	—	320	107	186	184	141

Median Dwell Time

416 > 56

DAYS IN 2011 **DAYS IN 2019**

"**Dwell time**" is "the number of days an attacker is present in a victim network before they are detected"

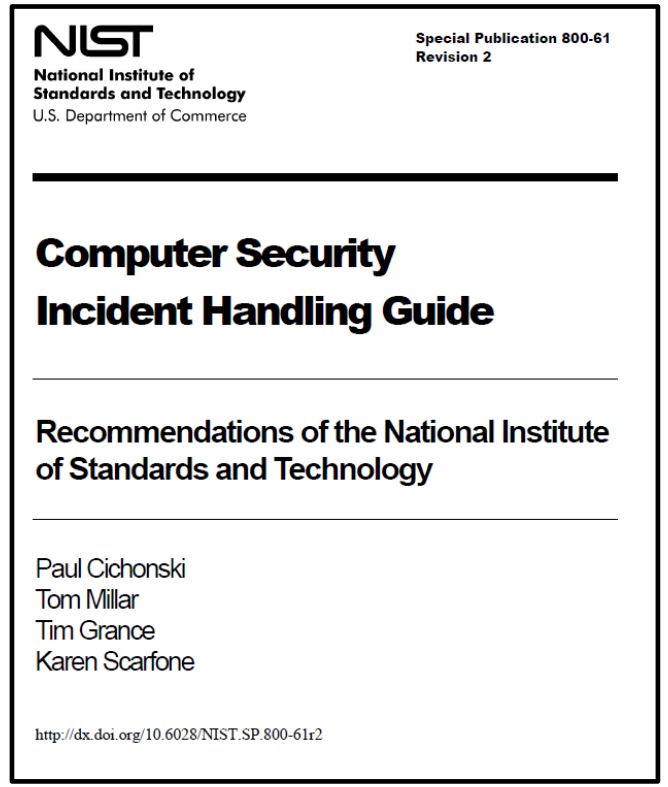


Handling an Incident

Incident response process has several phases:

1. **Preparation** - the business attempts to limit the number of incidents that will occur by selecting and implementing a set of controls based on the results of risk assessments
   - **Residual risk** will inevitably persist after controls are implemented

2. **Detection and analysis** - of security breaches is necessary to alert the organization when incidents occur


NIST
National Institute of Standards and Technology
U.S. Department of Commerce

Special Publication 800-61
Revision 2

Computer Security Incident Handling Guide

Recommendations of the National Institute of Standards and Technology

Paul Cichonski
Tom Millar
Tim Grance
Karen Scarfone

http://dx.doi.org/10.6028/NIST.SP.800-61r2

3. **Containment, Eradication & Recovery** - the organization works to mitigate the impact of the incident by containing it and ultimately recovering from it
   - Activity often cycles back to detection and analysis
     E.g., to see if additional hosts are infected by malware while eradicating malware

4. **Post-Incident Activity** - After the incident is adequately handled, the organization issues a report that details the cause and cost of the incident and the steps the organization should take to prevent future incidents

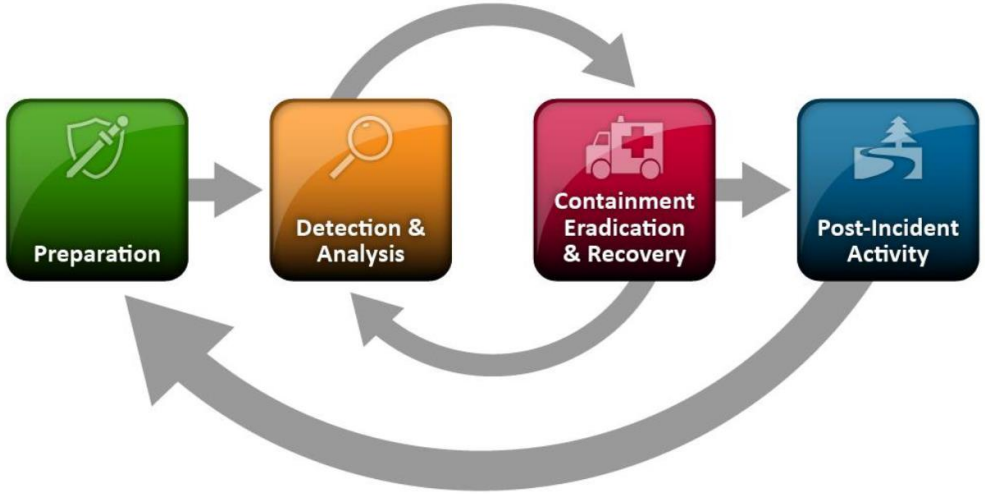
Handling an Incident - Preparation

Preventing Incidents – Keeping the number of incidents reasonably low is very important to protect the business processes of the organization

- If security controls are insufficient, higher volumes of incidents may occur, overwhelming the incident response team
- This can lead to slow and incomplete responses, which translate to a larger negative business impact (e.g., more extensive damage, longer periods of service and data unavailability)

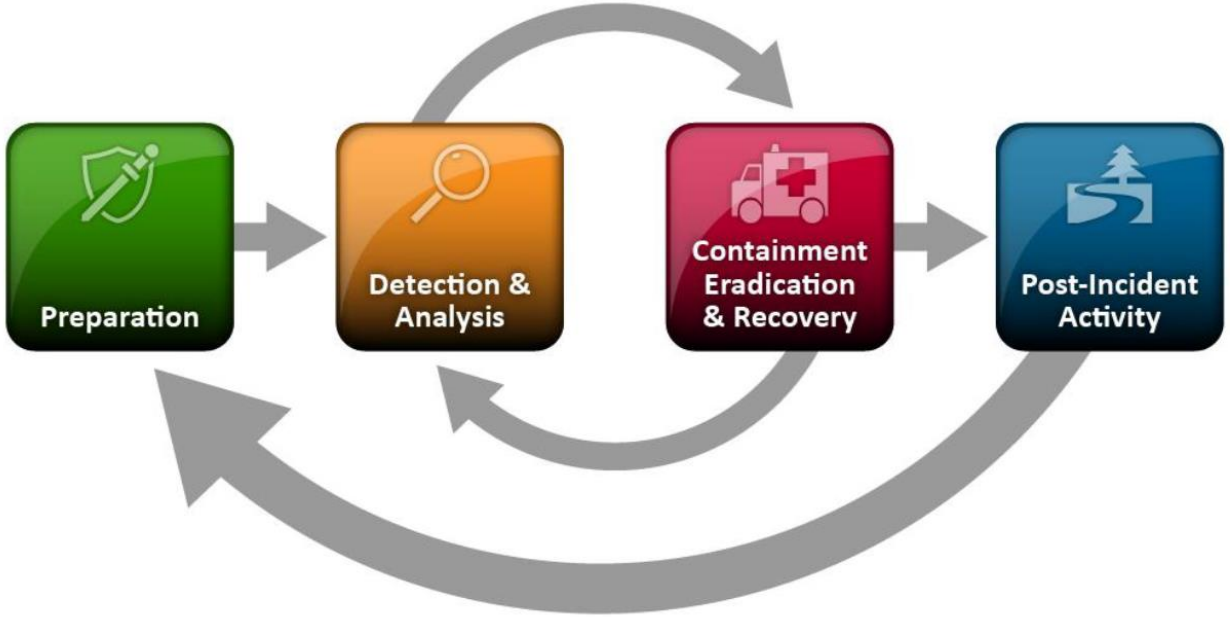
Incident response preparation includes preventing incidents by ensuring that systems, networks, and applications are sufficiently secure

- Risk Assessments
- Host Security
- Network Security
- Malware Prevention
- User Awareness and Training



Handling an Incident - Preparation

- Establishing and training an incident response team
- Acquiring the necessary tools and resources
  - Incident Handler Communication Facilities
  - Incident Analysis Hardware and Software
  - Incident Analysis Resources
  - Incident Mitigation Software



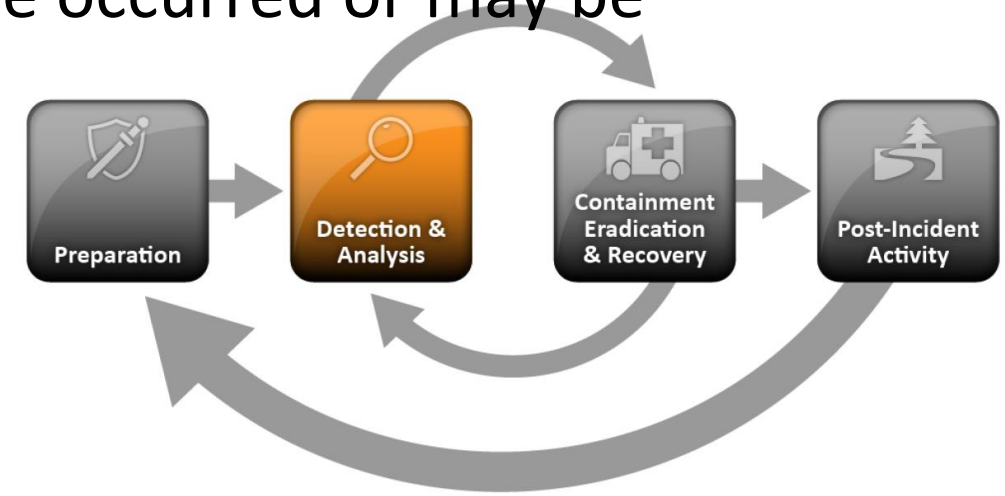
Handling an Incident – Detection and Analysis

Signs of an incident

For many organizations, the most challenging part of the incident response process is accurately detecting and assessing possible incidents—determining whether an incident has occurred and, if so, the type, extent, and magnitude of the problem

Signs of an incident fall into one of two categories:

1. **Precursors** – a sign that an incident may occur in the future
2. **Indicators** - a sign that an incident may have occurred or may be occurring now

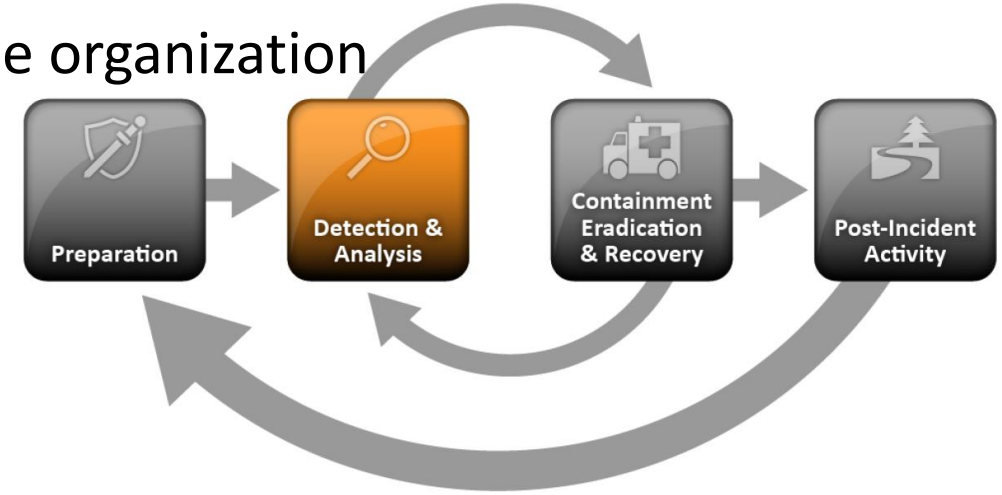


Handling an Incident – Detection and Analysis

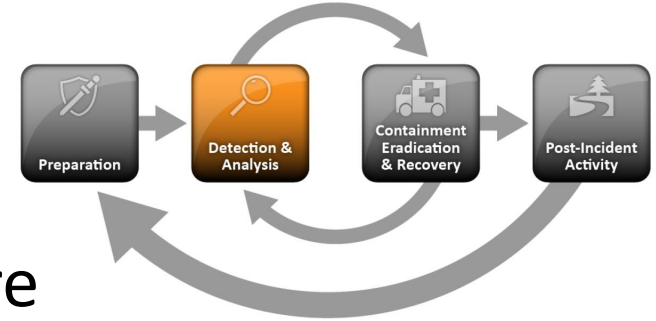
Precursors – While rare, if precursors are detected, the organization may have an opportunity to prevent the incident by altering its security posture to save a target from attack. At a minimum, the organization could monitor activity involving the target more closely.

Examples of precursors are:

- Web server log entries that show the usage of a vulnerability scanner
- NIST National Vulnerability Database (NVD) Announcement of a new exploit targeting a vulnerability of the organization's mail server
- A threat from a group stating the group will attack the organization



Detection and Analysis



Indicators - While precursors are relatively rare, indicators are all too common. Too many types of indicators exist to exhaustively list them, but some examples are listed below:

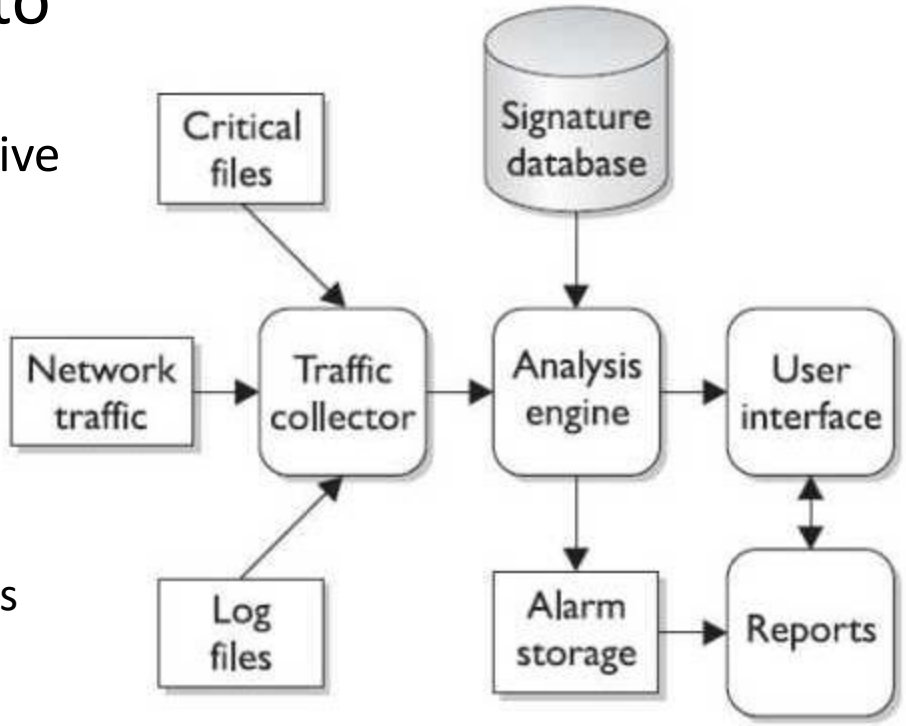
- An application logs multiple failed login attempts from an unfamiliar remote system
- A network intrusion detection sensor alerts when a buffer overflow attempt occurs against a database server
- A system administrator sees a filename with unusual characters
- Antivirus software alerts when it detects that a host is infected with malware
- A host records a configuration change in its log
- An email administrator sees a large number of bounced emails with suspicious content
- A network administrator notices an unusual deviation from typical network traffic flows

Intrusion Detection Systems (IDSs)

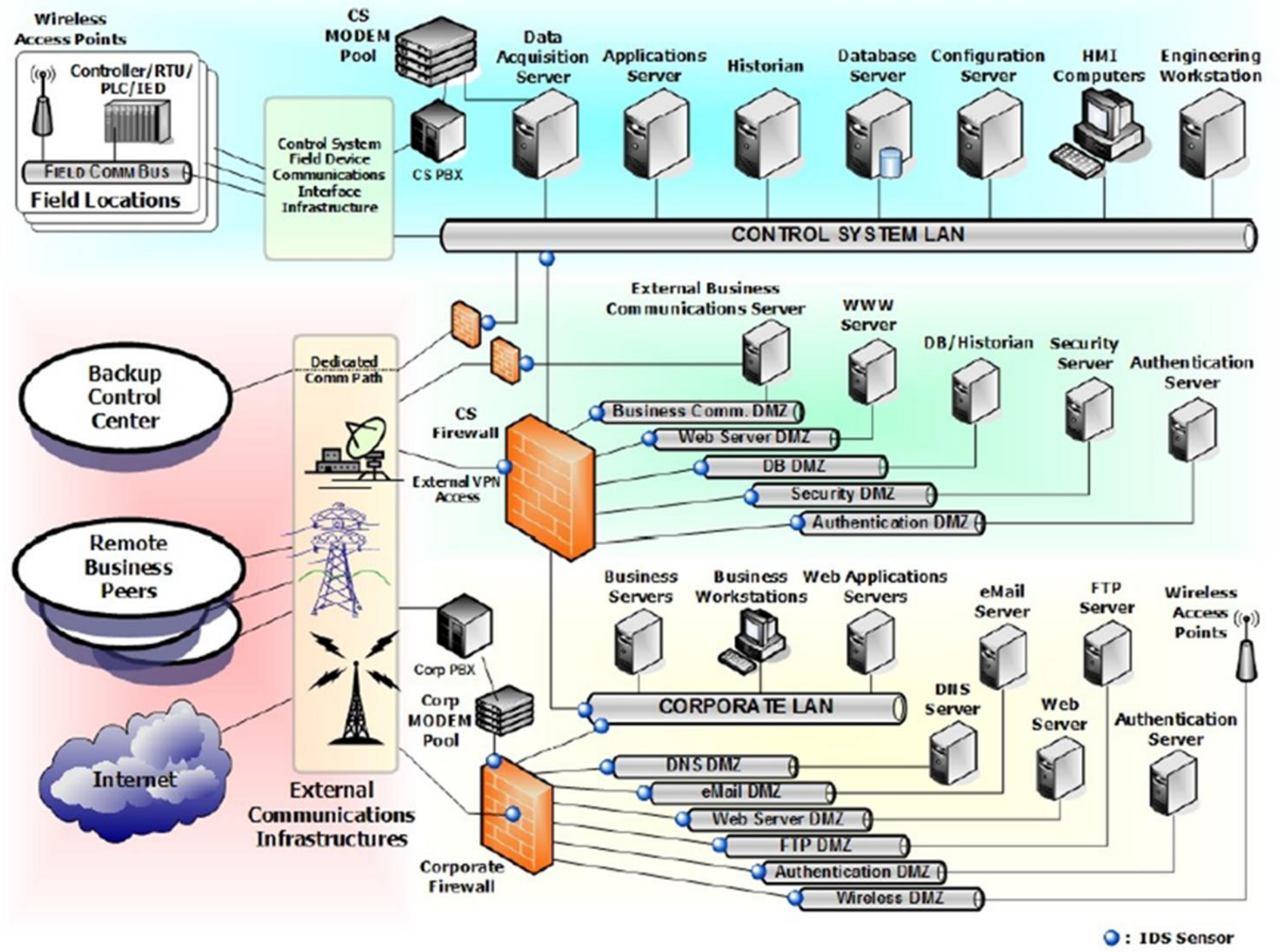
While firewalls and antivirus are preventive controls, IDS are access control monitoring devices designed to

1. Detect a security breach
2. Aid in mitigating damage caused by hackers breaking into sensitive computer and network systems

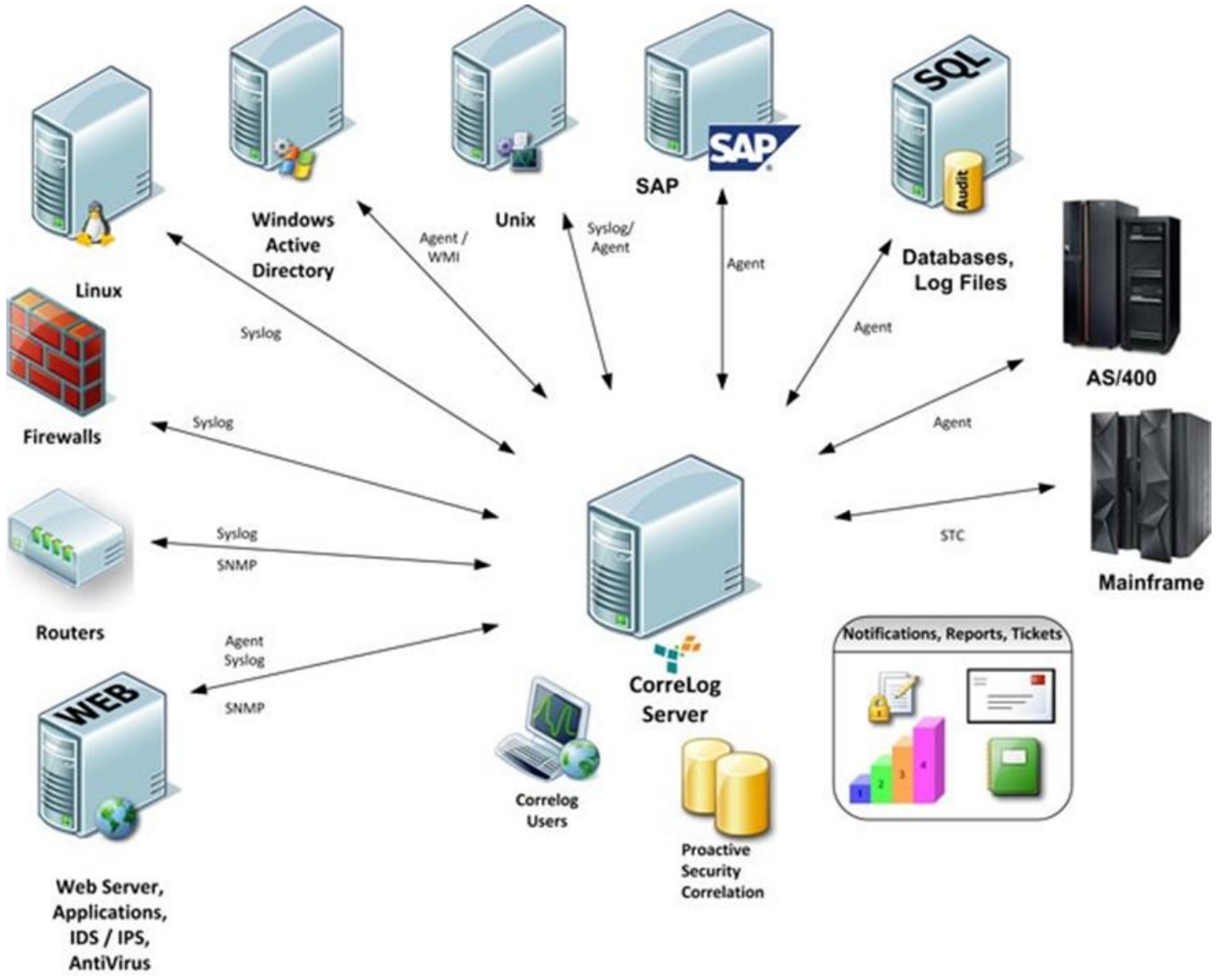
- IDS' components
  1. Sensors
     - Collect and send traffic and user activity data to analyzers
  2. Analyzers
     - Look for suspicious activity and if found sends alert to administrator's interface
  3. Administrative interfaces



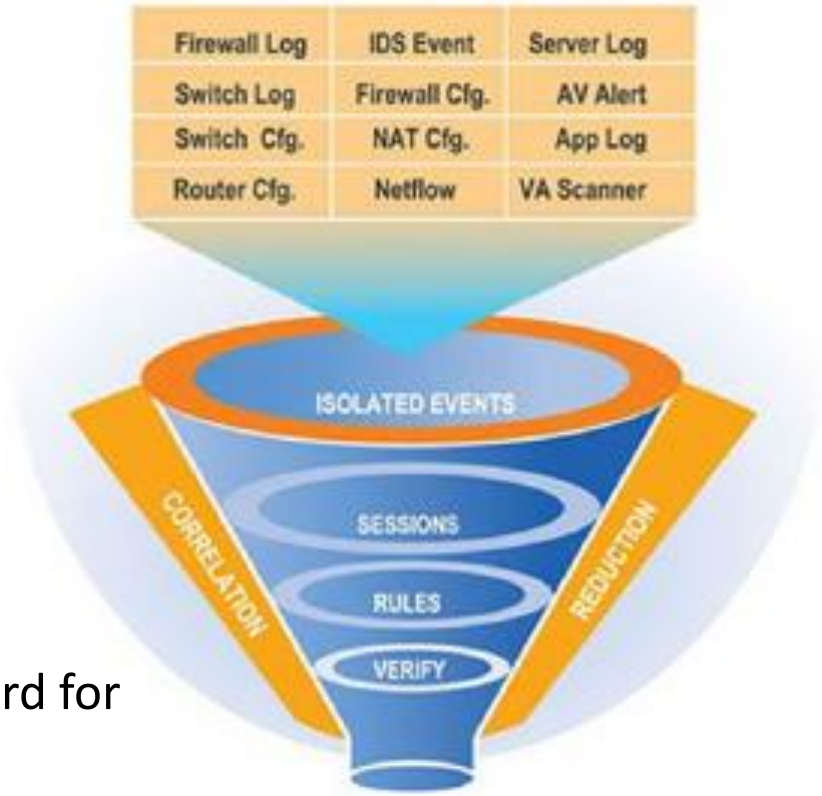
Example of IDS Locations



Continuous monitoring with a Security Information and Event Management (SIEM) system



SIEM's help with Data Analysis and Correlation



- Bring raw data events into one database
- Database software is programmed to look for "Notable events" or correlations
- Correlations will take seemingly isolated events and bring them forward for review/action:
  - **Windows Log:** Employee denied windows login (unknown user account)
  - **Identity Management System:** notes the user account was deleted because employee was terminated last month.
- Security Domains: Access, Endpoints, Networks, Identity

SIEM

- ***Security Information and Event Management (SIEM)*** market is defined by the customer's need to analyze event data in **real time.**
- Allows for the early detection of targeted attacks and data breaches
- Collect, store, investigate and report on log data for **incident response**, forensics and regulatory compliance.
- Aggregates event data produced by security devices, network infrastructure, systems and applications. The primary data source is log data.

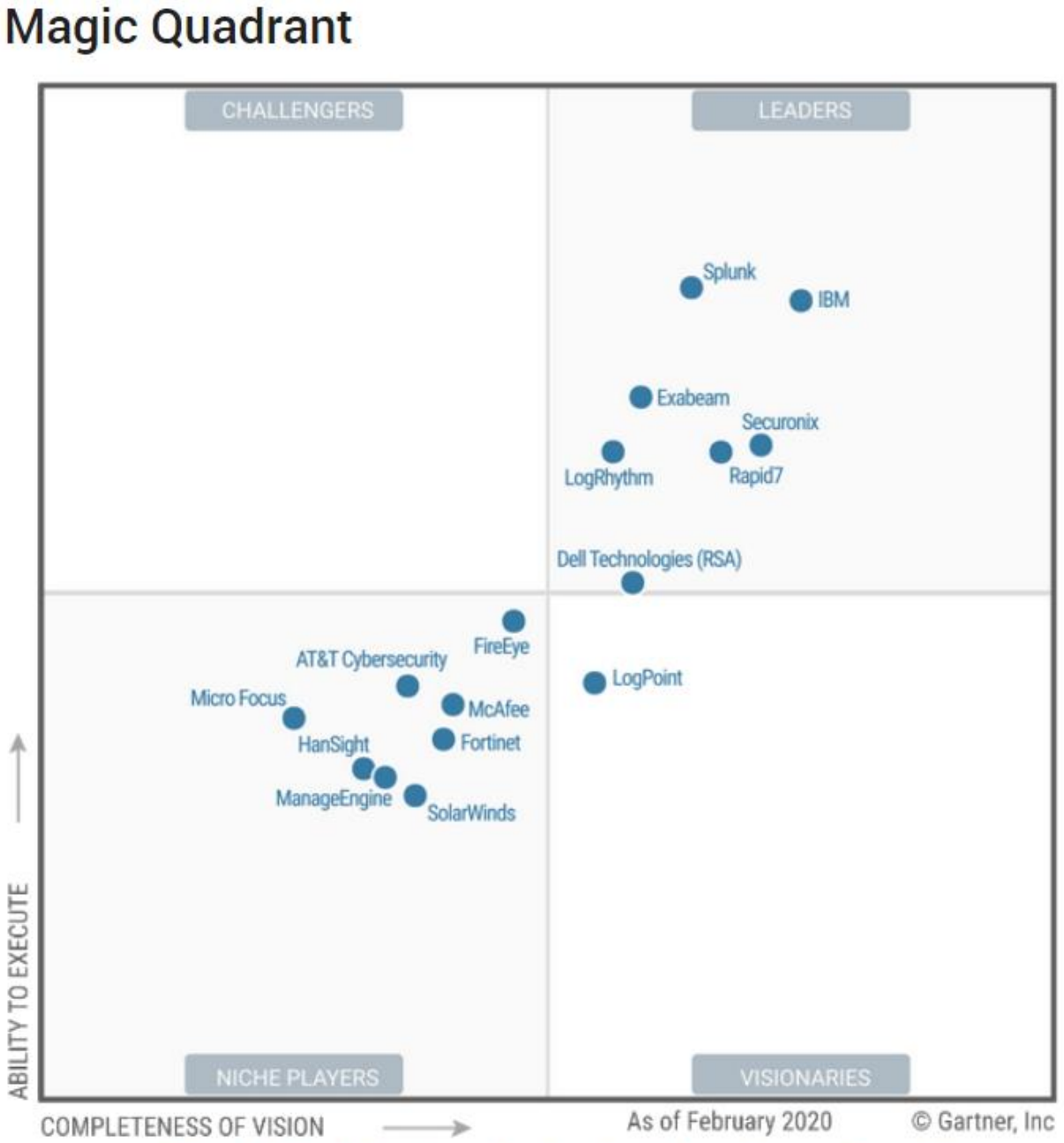
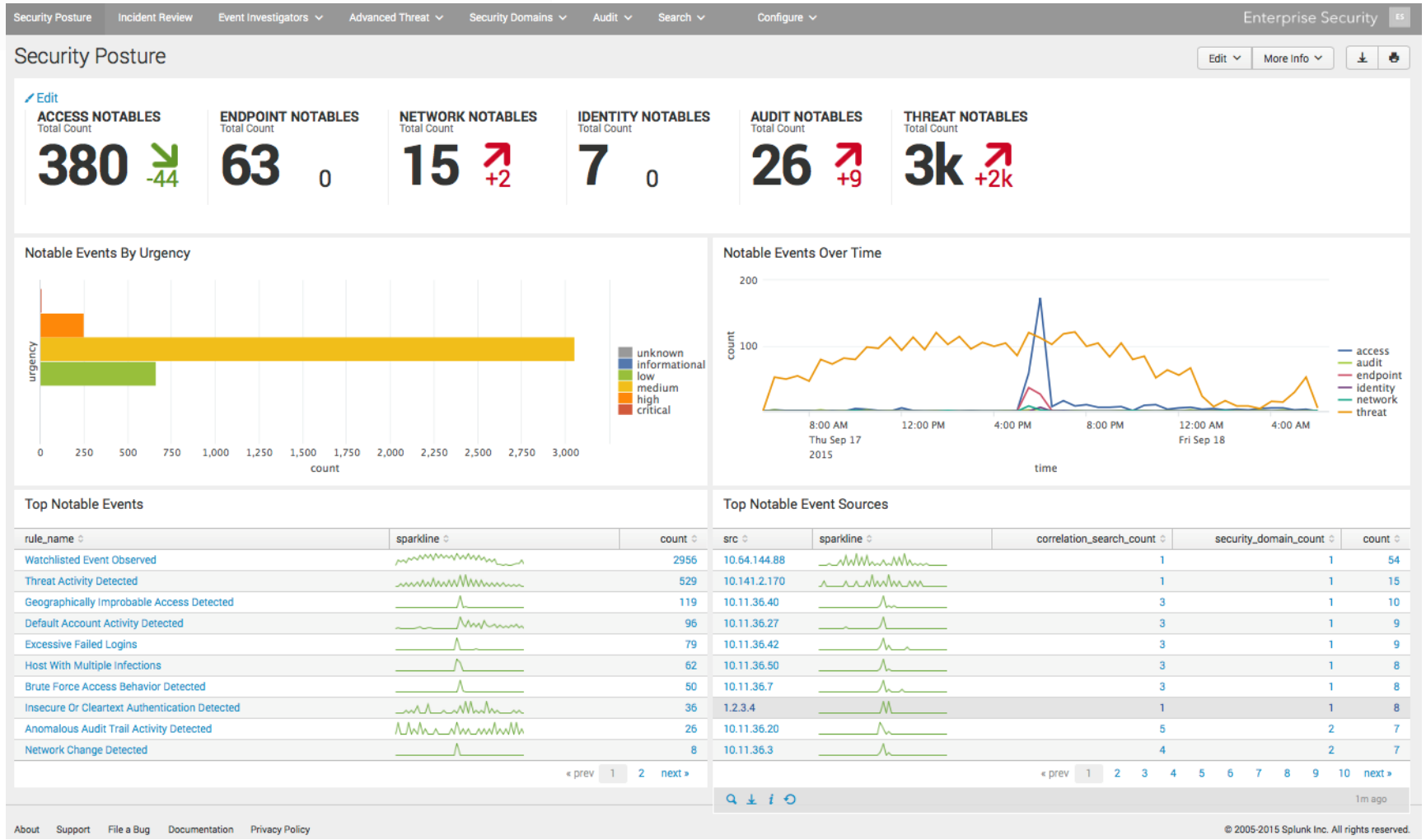
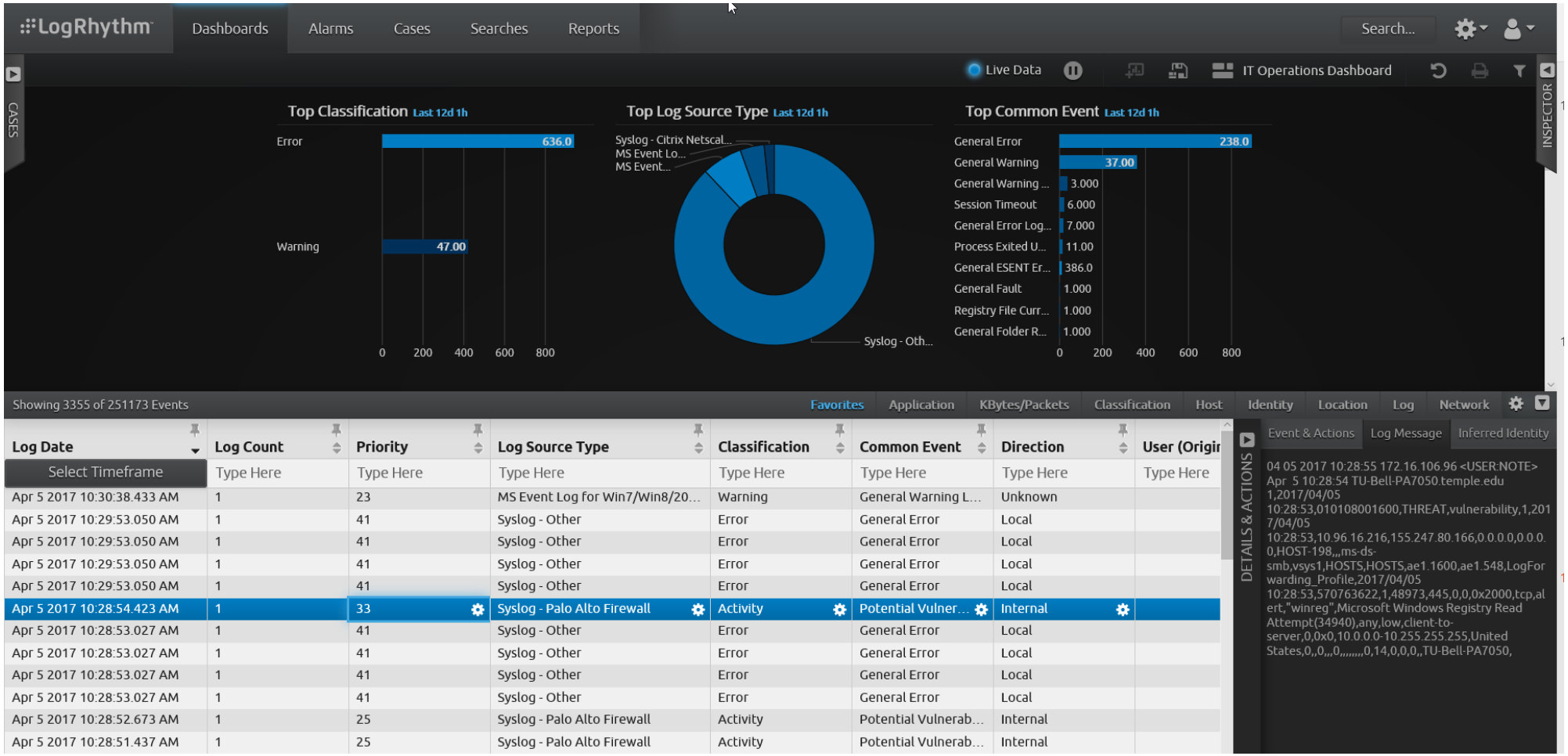


Figure 1. Magic Quadrant for Security Information and Event Management

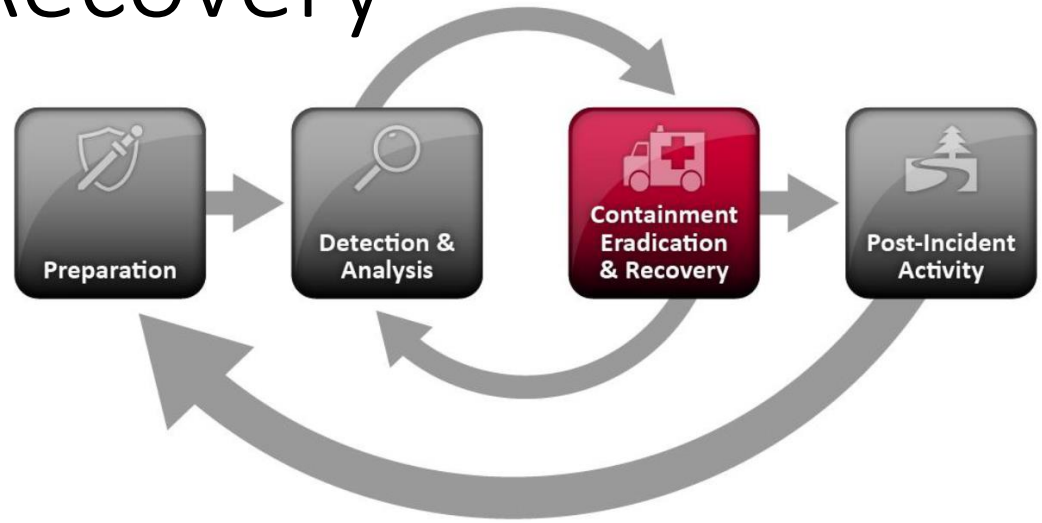
Source: Gartner (February 2020)


Security Posture
Incident Review
Event Investigators
Advanced Threat
Security Domains
Audit
Search
Configure
Enterprise Security
Security Posture
Edit
More Info
Edit
ACCESS NOTABLES
Total Count
380
-44
ENDPOINT NOTABLES
Total Count
63
0
NETWORK NOTABLES
Total Count
15
+2
IDENTITY NOTABLES
Total Count
7
0
AUDIT NOTABLES
Total Count
26
+9
THREAT NOTABLES
Total Count
3k
+2k
Notable Events By Urgency
urgency
unknown
informational
low
medium
high
critical
0
250
500
750
1,000
1,250
1,500
1,750
2,000
2,250
2,500
2,750
3,000
count
Notable Events Over Time
200
100
count
access
audit
endpoint
identity
network
threat
8:00 AM
Thu Sep 17
2015
12:00 PM
4:00 PM
8:00 PM
12:00 AM
Fri Sep 18
4:00 AM
time
Top Notable Events
rule_name
sparkline
count
Watchlisted Event Observed 2956
Threat Activity Detected 529
Geographically Improbable Access Detected 119
Default Account Activity Detected 96
Excessive Failed Logins 79
Host With Multiple Infections 62
Brute Force Access Behavior Detected 50
Insecure Or Cleartext Authentication Detected 36
Anomalous Audit Trail Activity Detected 26
Network Change Detected 8
« prev 1 2 next »
Top Notable Event Sources
src
sparkline
correlation_search_count
security_domain_count
count
10.64.144.88 1 1 54
10.141.2.170 1 1 15
10.11.36.40 3 1 10
10.11.36.27 3 1 9
10.11.36.42 3 1 9
10.11.36.50 3 1 8
10.11.36.7 3 1 8
1.2.3.4 1 1 8
10.11.36.20 5 2 7
10.11.36.3 4 2 7
« prev 1 2 3 4 5 6 7 8 9 10 next »
1m ago
About
Support
File a Bug
Documentation
Privacy Policy
© 2005-2015 Splunk Inc. All rights reserved.

LogRhythm™


LogRhythm
Dashboards
Alarms
Cases
Searches
Reports
Search...
Live Data
IT Operations Dashboard
CASES
INSPECTOR
Top Classification Last 12d 1h
Error
636.0
Warning
47.00
0
200
400
600
800
Top Log Source Type Last 12d 1h
Syslog - Citrix Netscal...
MS Event Lo...
MS Event...
Syslog - Oth...
Top Common Event Last 12d 1h
General Error 238.0
General Warning 37.00
General Warning ... 3.000
Session Timeout 6.000
General Error Log... 7.000
Process Exited U... 11.00
General ESENT Er... 386.0
General Fault 1.000
Registry File Curr... 1.000
General Folder R... 1.000
Showing 3355 of 251173 Events
Favorites
Application
KBytes/Packets
Classification
Host
Identity
Location
Log
Network
Log Date
Log Count
Priority
Log Source Type
Classification
Common Event
Direction
User (Origi
Select Timeframe
Type Here
Apr 5 2017 10:30:38.433 AM 1 23 MS Event Log for Win7/Win8/20... Warning General Warning L... Unknown
Apr 5 2017 10:29:53.050 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:29:53.050 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:29:53.050 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:29:53.050 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:28:54.423 AM 1 33 Syslog - Palo Alto Firewall Activity Potential Vulner... Internal
Apr 5 2017 10:28:53.027 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:28:53.027 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:28:53.027 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:28:53.027 AM 1 41 Syslog - Other Error General Error Local
Apr 5 2017 10:28:52.673 AM 1 25 Syslog - Palo Alto Firewall Activity Potential Vulnerab... Internal
Apr 5 2017 10:28:51.437 AM 1 25 Syslog - Palo Alto Firewall Activity Potential Vulnerab... Internal
DETAILS & ACTIONS
Event & Actions
Log Message
Inferred Identity
04 05 2017 10:28:55 172.16.106.96 <USER:NOTE> Apr 5 10:28:54 TU-Bell-PA7050.temple.edu 1,2017/04/05 10:28:53,010108001600,THREAT,vulnerability,1,2017/04/05 10:28:53,10.96.16.216,155.247.80.166,0.0.0.0,0.0.0.0,HOST-198,,,ms-ds-smb,vsys1,HOSTS,HOSTS,ae1.1600,ae1.548,LogForwarding_Profile,2017/04/05 10:28:53,570763622,1,48973,445,0,0,0x2000,tcp,alert,"winreg",Microsoft Windows Registry Read Attempt(34940),any,low,client-to-server,0,0x0,10.0.0.0-10.255.255.255,United States,0,,0,,,0,,,,,,,,0,14,0,0,0,,TU-Bell-PA7050,

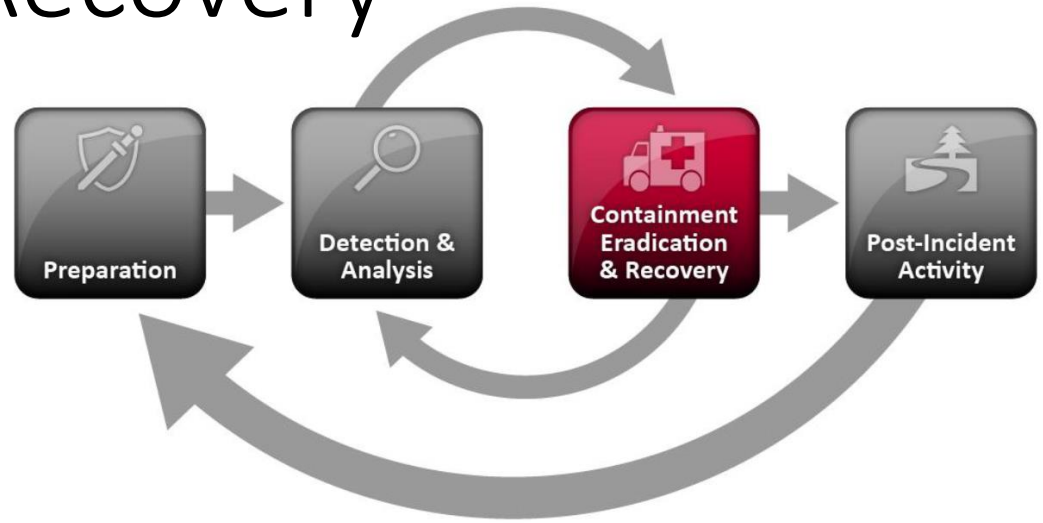
Containment, Eradication, and Recovery



Containment - is important before an incident overwhelms resources or increases damage

- Most incidents require containment, which provides time for developing a tailored remediation strategy
- An essential part of containment is decision-making (e.g., shut down a system, disconnect it from a network, disable certain functions)
- Criteria for selecting among containment strategies are based on type of incident:
  - Potential damage & theft of resources
  - Need for evidence preservation
  - Service availability requirements (e.g., network connectivity, services provided to external parties)
  - Time & resources needed to implement
  - Effectiveness (e.g., partial containment, full containment)

Containment, Eradication, and Recovery

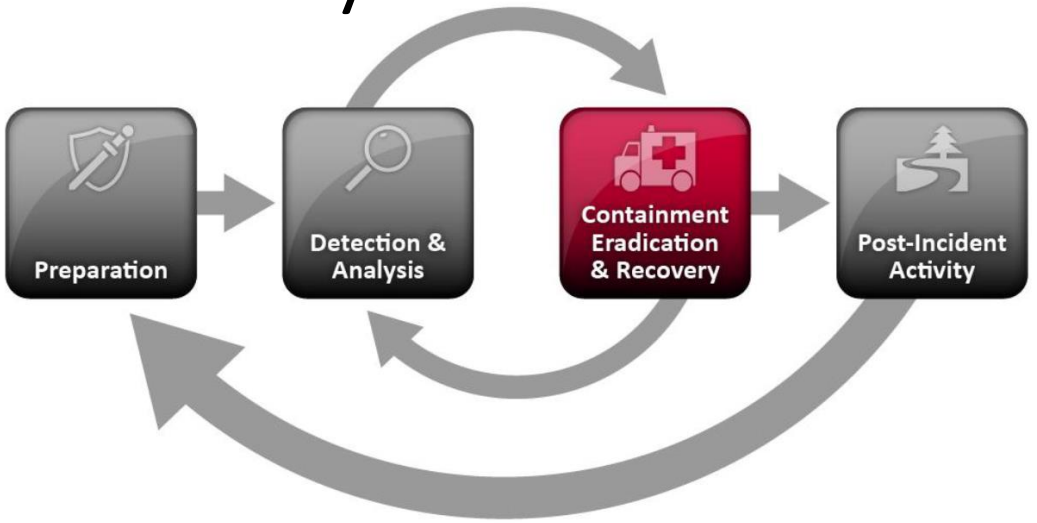


Eradication - After an incident has been contained, eradication may be necessary to eliminate components of the incident, such as:

- Deleting malware
- Disabling breached user accounts
- Identifying and mitigating all vulnerabilities that were exploited
  - *During eradication, it is important to identify all affected hosts within the organization so that they can be remediated*

Containment, Eradication, and Recovery

Recovery - In recovery, administrators restore systems to normal operation, confirm that the systems are functioning normally, and (if applicable) remediate vulnerabilities to prevent similar incidents



May involve such actions as:

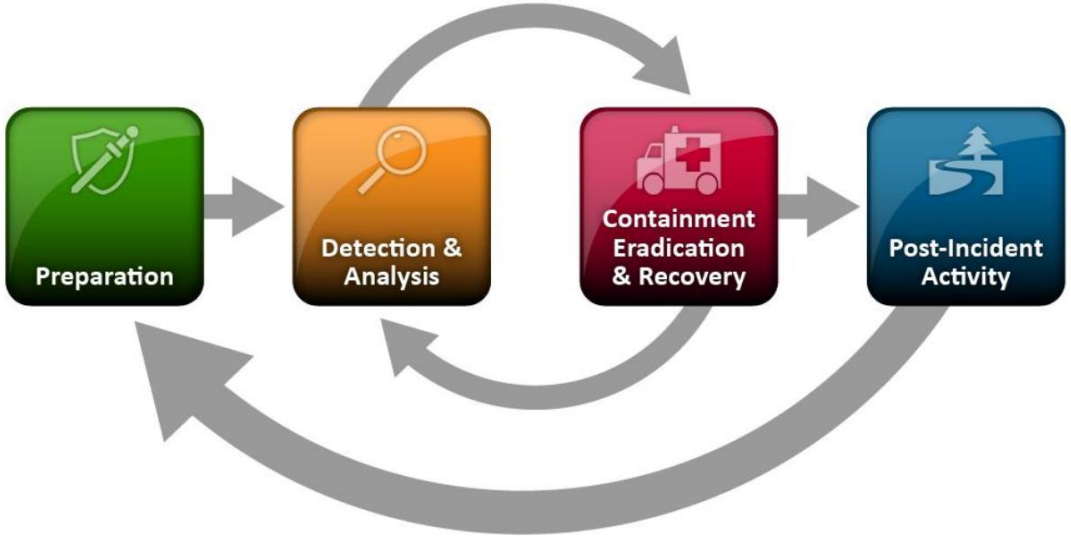
- Restoring systems from clean backups
- Rebuilding systems from scratch
- Replacing compromised files with clean versions
- Installing patches
- Changing passwords
- Tightening network perimeter security (e.g. firewall rules, boundary router access control lists, …)

Once a resource is successfully attacked, it is often attacked again, or other resources within the organization are attacked in a similar manner

- As a result, higher levels of system logging or network monitoring are often part of the recovery process

Incident Response Workflow

Detection and Analysis	
1.	Determine whether an incident has occurred
1.1	Analyze the precursors and indicators
1.2	Look for correlating information
1.3	Perform research (e.g., search engines, knowledge base)
1.4	As soon as the handler believes an incident has occurred, begin documenting the investigation and gathering evidence
2.	Prioritize handling the incident based on the relevant factors (functional impact, information impact, recoverability effort, etc.)
3.	Report the incident to the appropriate internal personnel and external organizations
Containment, Eradication, and Recovery	
4.	Acquire, preserve, secure, and document evidence
5.	Contain the incident
6.	Eradicate the incident
6.1	Identify and mitigate all vulnerabilities that were exploited
6.2	Remove malware, inappropriate materials, and other components
6.3	If more affected hosts are discovered (e.g., new malware infections), repeat the Detection and Analysis steps (1.1, 1.2) to identify all other affected hosts, then contain (5) and eradicate (6) the incident for them
7.	Recover from the incident
7.1	Return affected systems to an operationally ready state
7.2	Confirm that the affected systems are functioning normally
7.3	If necessary, implement additional monitoring to look for future related activity
Post-Incident Activity	
8.	Create a follow-up report
9.	Hold a lessons learned meeting (mandatory for major incidents, optional otherwise)



Team Project Q&A

Agenda

- ✓Computer virus
- ✓Malicious software
  - ✓Proliferation of malware
  - ✓Malware components
  - ✓Anti-malware components
  - ✓Best practices for protection
- ✓Business Continuity and Disaster Contingency Planning
- ✓Incident Response Planning
- ✓Team Project Q&A