Insider Threats in the Software Development Lifecycle

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Agenda

The Insider Threat Center at CERT

Types of Insider Incidents

Insider Threat Issues in the SDLC

Mitigation Strategies

CERT Insider Threat Resources

THE INSIDER THREAT CENTER AT CERT

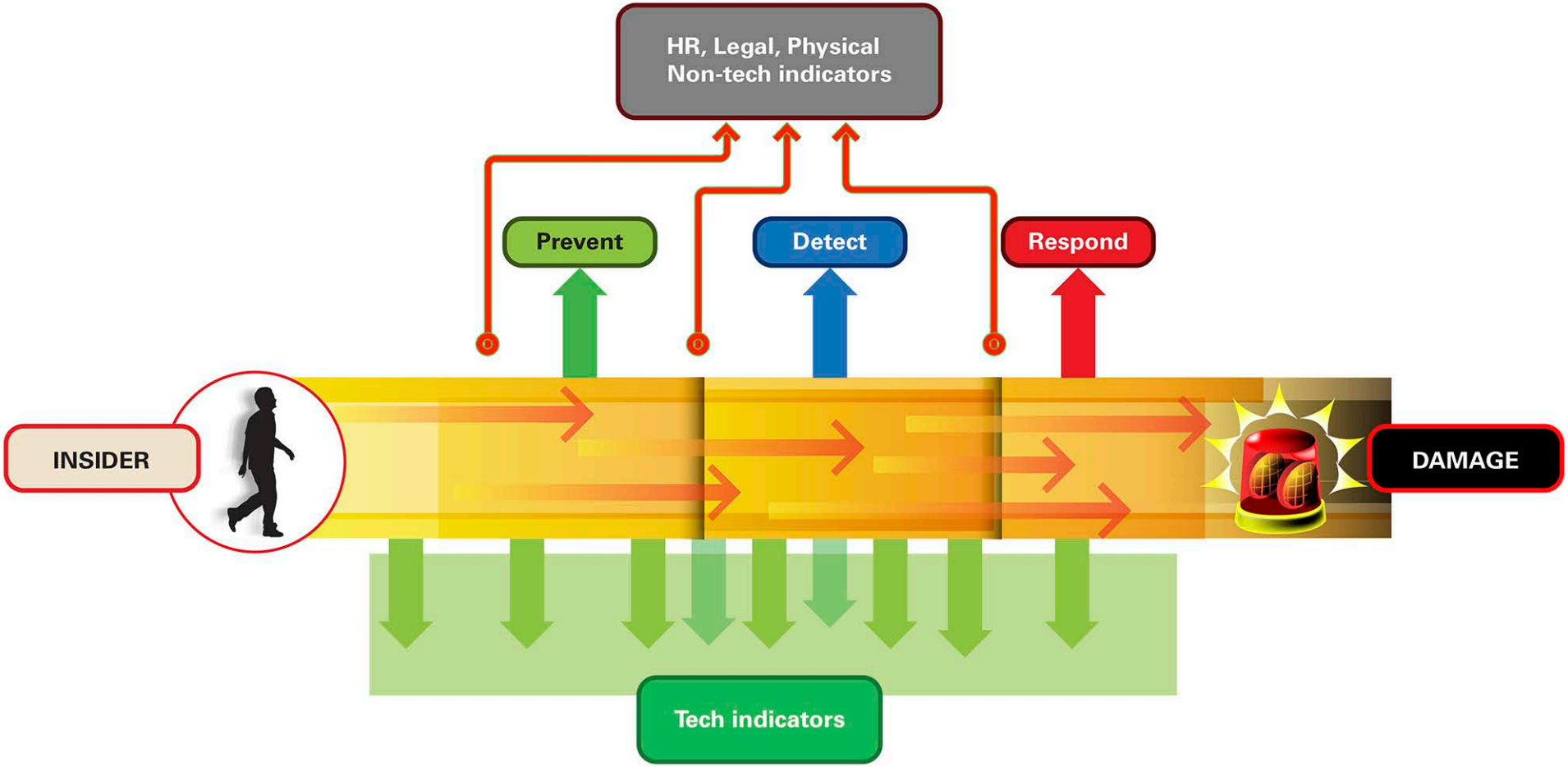
What is the CERT Insider Threat Center?

Center of insider threat expertise

Began working in this area in 2001 with the U.S. Secret Service

Our mission: *The CERT Insider Threat Center conducts empirical research and analysis to develop & transition socio-technical solutions to combat insider cyber threats.*

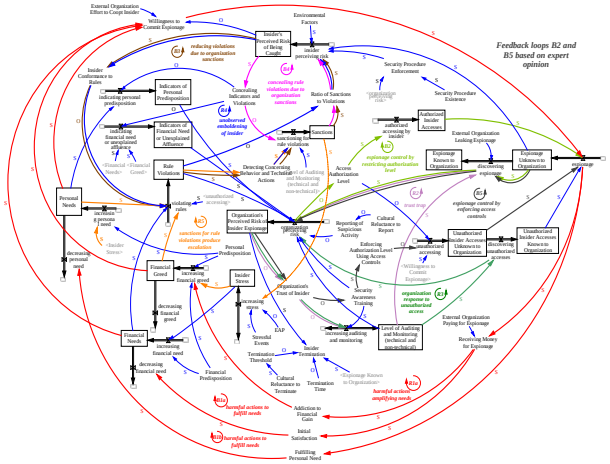
Goal for an Insider Threat Program



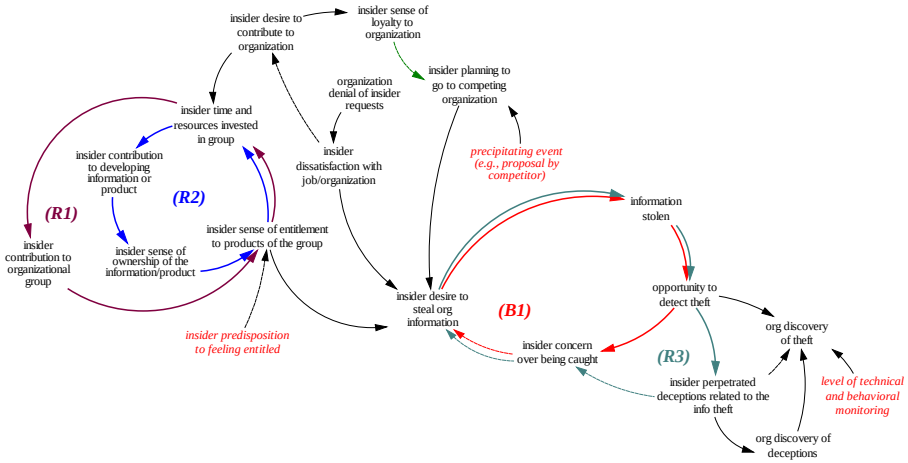
Opportunities for prevention, detection, and response for an insider incident

CERT's Unique Approach to the Problem

Research Models



Deriving Candidate Controls and Indicators



Our lab transforms that into this…

```
Splunk Query Name: Last 30 Days - Possible Theft of IP
Terms: 'host=HECTOR [search host="zeus.corp.merit.lab" Message="A user account was
disabled. *" | eval Account_Name=mvindex(Account_Name, -1) | fields Account_Name | strcat
Account_Name "@corp.merit.lab" sender_address | fields - Account_Name] total_bytes > 50000
AND recipient_address!="*corp.merit.lab" startdaysago=30 | fields client_ip,
sender_address, recipient_address, message_subject, total_bytes'
```

What is a Malicious Insider Threat?

Current or former employee, contractor, or other business partner who

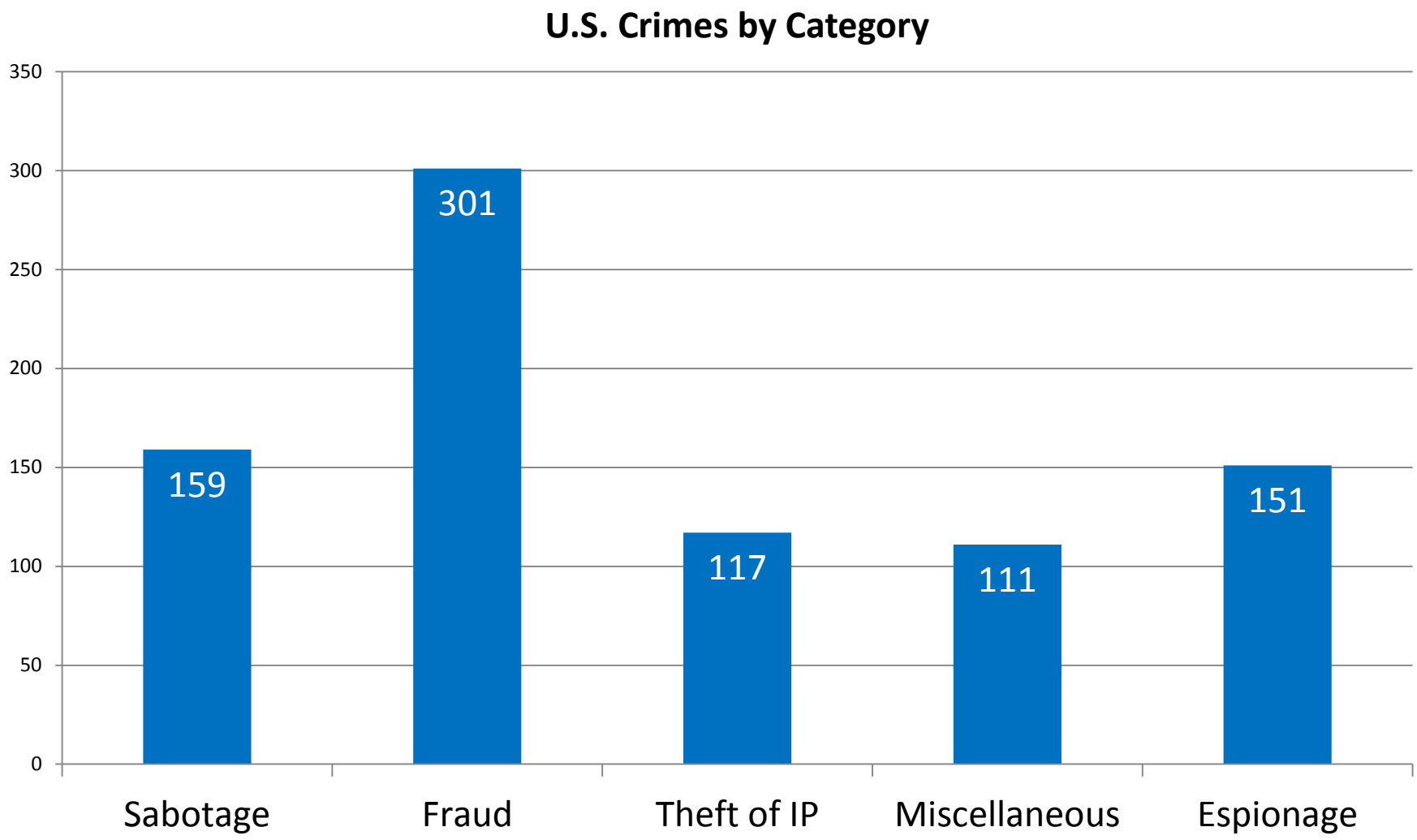
- has or had authorized access to an organization's network, system or data and
- intentionally exceeded or misused that access in a manner that
- negatively affected the confidentiality, integrity, or availability of the organization's information or information systems.

What is an Unintentional Insider Threat?

Current or former employee, contractor, or other business partner who

- has or had authorized access to an organization's network, system, or data and who, through
- their action/inaction without malicious intent
- cause harm or substantially increase the probability of future serious harm to the confidentiality, integrity, or availability of the organization's information or information systems.

CERT's Insider Threat Case Database



TYPES OF INSIDER INCIDENTS

The Insider Threat

There is not one “type” of insider threat

- Threat is to an organization’s critical assets
  - People
  - Information
  - Technology
  - Facilities
- Based on the motive(s) of the insider
- Impact is to Confidentiality, Availability, Integrity

There is not one solution for addressing the insider threat

- Technology alone may not be the most effective way to prevent and/or detect an incident perpetrated by a trusted insider

Separate the “Actor” from the “Target” from the “Impact”

Actor(s)	Target	Impact
Employees • Current • Former Contractors Subcontractors Suppliers Trusted Business Partners	Critical Assets • People • Technology • Information • Facilities	Confidentiality Availability Integrity
WHO	**WHAT**	**HOW**

Types of Insider Incidents

Insider IT sabotage
An insider’s use of IT to direct specific harm at an organization or an individual.
Insider theft of intellectual property (IP)
An insider’s use of IT to steal intellectual property from the organization. This category includes industrial espionage involving insiders.
Insider fraud
An insider’s use of IT for the unauthorized modification, addition, or deletion of an organization's data (not programs or systems) for personal gain, or theft of information which leads to fraud (identity theft, credit card fraud).
National Security Espionage
The act of stealing and delivering, or attempting to deliver, information pertaining to the national defense of the United States to agents or subjects of foreign countries, with intent or reason to believe that is to be used to the injury of the United States or to the advantage of a foreign nation.

Summary of Insider Incidents

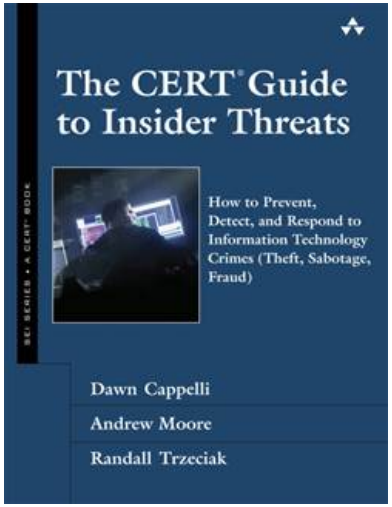
	IT Sabotage	Fraud	Theft of Intellectual Property
Current or former Employee?	Former	Current	Current (within 30 days of resignation)
Type of position	Technical (e.g. sys admins, programmers, DBAs)	Non-technical (e.g. data entry, customer service) or their managers	Technical (e.g. scientists, programmers, engineers) or sales
Gender	Male	Fairly equally split between male and female	Male
Target	Network, systems, or data	PII or Customer Information	IP (trade secrets) or Customer Information
Access Used	Unauthorized	Authorized	Authorized
When	Outside normal working hours	During normal working hours	During normal working hours
Where	Remote access	At work	At Work

INSIDER THREATS IN THE SDLC

Insider Threat Issues in the SDLC

"those aspects of an organization's software development or maintenance policies and processes that insiders exploited to carry out their attack"

- Cappelli, D., Moore, A. & Trzeciak, R. (2012). The CERT Guide to Insider Threats : How to Prevent, Detect, and Respond to Information Technology Crimes (Theft, Sabotage, Fraud). Addison-Wesley.



Phases of the Life Cycle Exploited

Requirements definition

System design

System implementation

System deployment

System maintenance

Requirements Definition Oversights

Neglecting to define **authentication** and **role-based access control** requirements simplified insider attacks.

Neglecting to define **security requirements/separation of duties** for **automated business processes** provided an easy method for insider attack.

Neglecting to define requirements for **automated data integrity checks** gave insiders the security of knowing their actions would not be detected.

System Design Oversights

Insufficient attention to security details in **automated workflow processes** enabled insiders to commit malicious activity.

Insufficient **separation of duties** facilitated insider crimes.

- not designed at all
- no one to “check the checker”

Neglecting to consider security vulnerabilities posed by “**authorized system overrides**” resulted in an easy method for insiders to ”get around the rules”.

System Implementation Exploits

Lack of **code reviews** allowed insertion of “backdoors” into source code.

Inability to **attribute actions** to a single user enabled a project leader to sabotage his own team’s development project.

System Deployment Oversights

Lack of enforcement of **documentation practices** and **backup procedures** prohibited recovery efforts when an insider deleted the only copy of source code for a production system.

Use of the same **password file** for development and the operational system enabled insiders to access and steal sensitive data from the operational system.

Unrestricted access to all customers' systems enabled a computer technician to plant a virus directly on customer networks.

Lack of **configuration control** and well-defined **business processes** enabled libelous material to be published to organization's website.

System Maintenance Issues

Lack of **code reviews** facilitated insertion of malicious code.

Ineffective **configuration control** practices enabled release of unauthorized code into production.

Ineffective or lack of **backup processes** amplified the impact of mass deletion of data.

End-user access to source code for systems they used enabled modification of security measures built into the source code.

Ignoring known **system vulnerabilities** provided an easy exploit method.

Summary – Most Prevalent SDLC Issues

IT Sabotage:

- System architecture that allows for efficient recovery or sustains the organization during disasters
- Configuration and access control of source code
- Formal code review/inspection to prevent malicious code from being inserted into production applications

Fraud:

- Existence and enforcement of authorization/approval steps in automated work flow to ensure proper approvals for critical business functions

Theft of Sensitive or Confidential Information:

- Configuration and access control of source code

http://www.sei.cmu.edu/library/abstracts/reports/12tr012.cfm

COMMON SENSE GUIDE TO MITIGATING INSIDER THREATS

CERT Common Sense Guide to Mitigating Insider Threats – Recommended Best Practices

Consider threats from insiders and business partners in enterprise-wide risk assessments.	Institutionalize system change controls.
Clearly document and consistently enforce policies and controls.	Use a log correlation engine or security information and event management (SIEM) system to log, monitor, and audit employee actions.
Incorporate insider threat awareness into periodic security training for all employees.	Monitor and control remote access from all end points, including mobile devices.
Beginning with the hiring process, monitor and respond to suspicious or disruptive behavior.	Develop a comprehensive employee termination procedure.
Anticipate and manage negative issues in the work environment.	Implement secure backup and recovery processes.
Know your assets.	Develop a formalized insider threat program.
Implement strict password and account management policies and practices.	Establish a baseline of normal network device behavior.
Enforce separation of duties and least privilege.	Be especially vigilant regarding social media.
Define explicit security agreements for any cloud services, especially access restrictions and monitoring capabilities.	Close the doors to unauthorized data exfiltration.
Institute stringent access controls and monitoring policies on privileged users.	

CERT INSIDER THREAT RESOURCES

CERT Insider Threat Resources

Insider threat awareness training

Insider threat certificate programs

- Insider Threat Program Manager
- Insider Threat Vulnerability Assessor
- Insider Threat Program Evaluator

Insider threat vulnerability assessments

Insider threat program evaluations

www.cert.org/insider-threat

- Technical reports
- Insider threat technical controls
- Insider threat blog

DISCUSSION

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