Carnegie Mellon University
Software Engineering Institute

Insider Threat Metrics and Measures of Effectiveness

CERT National Insider Threat Center

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Approaches for Insider Threat Metrics

- Leverage multidisciplinary nature of Insider Threat and identify metrics from:
    - Human Resources
    - Legal
    - Physical Security
    - Information Technology
    - Information Security
- Contextualize Insider Threat Program activities within existing metrics frameworks – whether open source or proprietary

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ITIL Framework for Metrics – Insider Threat Examples

Technology

- Impact or lack thereof of employee monitoring programs on performance
- Availability of data sources for processing by Insider Threat program

Process

- Number of capability gaps identified or improved
- Average incident resolution time per month
- Number of inquiries completed per month

Service

- Management feedback or engagement with Insider Threat program
- Cost of inquiry
- Time to complete an inquiry

More information on ITIL can be found at: https://www.itlibrary.org/

Other Metrics to Consider

Coverage

- percentage of systems covered by a host-based user activity monitoring system
- process reviews
- gap assessments
  - Increasing data insights where there was previously no visibility.
  - Identifying gaps in administrative, physical and technical controls.

Latency

- average time between malicious activity and discovery by insider threat team
- risk avoidance and ability to proactively identify any issues where the risk can be mitigated

Compliance

- percentage of recommended / required (NIST SP 800-53, NITTF Minimum Standards) controls implemented
- pre-employment screening
- code of conduct
- Data Loss Prevention (DLP)
- mandatory vacation policies
- investigation teams

Impact

- number of incidents identified or prevented
- incidents that result in action
  - e.g., escalated to management or law enforcement, leads, inquiries, investigations, cases closed
- reduction in time to resolve allegations
- reduction in number of incidents over time
- value of any data targeted for exfiltration, or documents / IP recovered
  - aggregate of estimated value per incident in a reporting period
  - multiply average incident by value to estimate financial impact for future incidents
- policy changes and improved work behaviors that followed.
  - e.g., significant drop in non-work related internet activity when monitored staff were required to sign a User Activity Monitoring Acknowledgement

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Measures of Effectiveness

Qualitative

- Security culture

- Training and awareness leading to increased reporting

- Identification of broken processes

- Case study

- Incident severity / criticality

Quantitative

- Referrals and reports from staff

- Investigations

- Incidents detected

- Incidents referred to law enforcement

- Sites blocked

- Assets recovered

- Loss prevented

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Time Management Matrix

	Urgent	Not Urgent
Important	**Quadrant I - Manage** • Crisis • Pressing problems • Deadline-driven projects, meetings, preparations	**Quadrant II – Focus** • Preparation • Prevention • Values clarification • Planning • Relationship building
Not Important	**Quadrant III – Avoid** • Interruptions, some phone calls • Some mail, some reports • Many proximate pressing matters • Many popular activities	**Quadrant IV – Limit** • Trivia, busywork • Junk mail • Some phone calls • Time wasters • "Escape" activities

• Where is time being spent by analysts? At the program management level?
• Are you able to move from *Manage* to *Focus* activities?

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7 Metrics to Prove the Value of an Insider Threat Program

- **Cases opened:** Number and types of cases reviewed by the program

- **Internal requests for information:** Number and types of RFIs to organizational stakeholders

- **Internal escalation and triage:** Number and types of cases escalated and triaged within the organization

- **External escalation and triage:** Number and types of referrals to external law enforcement agencies

- **Risk mitigation actions:** Number and type of risk mitigating actions

- **Documents retrieved:** Number of document prevents from leaving a secure environment

- **Investigative productivity:** Average reduction in investigative timelines

From *Insider Threat: Prevention, Detection, Mitigation, and Deterrence* by Michael Gelles

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What's in a False Positive?

High false positive rates can potentially
- waste analyst / investigative resources
- alienate employees
- exacerbate threats
- reduce morale
- repel good employees
- increase claims of privacy violations and lawsuits
- erode support for the InTP across the organization and among senior leadership

Moore et al. "Effective Insider Threat Programs: Understanding and Avoiding Potential Pitfalls", available online at
http://resources.sei.cmu.edu/asset_files/WhitePaper/2015_019_001_446379.pdf

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Questions for Consideration

- What resources have you found valuable in developing metrics?
    - Were these resources internal or external to your organization?
    - Were the external resources open source or proprietary?
- What kinds of metrics has your organization used in the last 12 months?
    - What type of use case was it used for?
    - Was the metric reliable? Valuable? Useful?
- What metrics failed to make an impact on stakeholders?
- How are measures for Insider Threat success or value different from those used for a Security Operations Center (SOC)?
    - How could they be the same?
    - What lessons learned for developing SOC metrics can be used for Insider Threat?
- To what extent could (or should) other organizational units help to demonstrate the value of the Insider Threat program?

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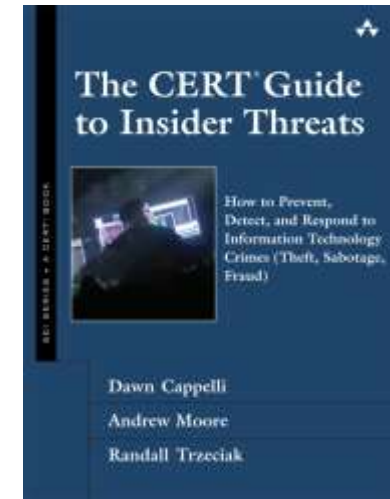
NITC Resource Highlights

- Building an Insider Threat Program
  - Insider Threat Program Manager Certificate (ITPM-C)

- Insider Threat Vulnerability Assessment
  - Insider Threat Vulnerability Assessor Certificate (ITVA-C)

- Evaluating an Insider Threat Program
  - Insider Threat Program Evaluator Certificate (ITPE-C)

- Insider Threat Control/Indicator Development / Deployment

- Insider Threat Data Analytics Hub Development / Deployment

- Insider Threat Training (1/2 day, 1 day, and 2 day interactive workshops)

- Customized Insider Threat Research
  - Ontology Development and Maintenance
  - Sentiment / Linguistic Analysis
  - Insider Threat Tool Evaluation Criteria Development

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

Moore, Andrew; Savinda, Jeff; Monaco, Elizabeth; Moyes, Jamie; Rousseau, Denise; Perl, Samuel; Cowley, Jennifer; Collins, Matthew; Cassidy, Tracy; VanHoudnos, Nathan; Buttles-Valdez, Palma; Bauer, Daniel; & Parshall, Allison. The Critical Role of Positive Incentives for Reducing Insider Threats. CMU/SEI-2016-TR-014. Software Engineering Institute, Carnegie Mellon University. 2016.

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For More Information

National Insider Threat Center   http://www.cert.org/insider-threat/

National Insider Threat Center Email   insider-threat-feedback@cert.org

National Insider Threat Center Blog   http://insights.sei.cmu.edu/insider-threat/

SEI Digital Library   https://resources.sei.cmu.edu/library/

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