Risk Mitigation Strategies: Lessons Learned from Actual Insider Attacks

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Agenda

• Background
• Exploration of each type of insider crime:
  – Theft/Modification of information for financial gain
  – Theft of information for business advantage
  – IT sabotage
• Best practices
• Summary
• Discussion
TRUE STORY:
Credit union customers lose all access to their money from Friday night through Monday...

Fired system administrator sabotages systems on his way out
TRUE STORY:
Financial institution discovers $691 million in losses ...

Covered up for 5 years by trusted employee
COULD THIS HAPPEN TO YOU?
What is CERT?

- Center of Internet security expertise
- Established in 1988 by the US Department of Defense on the heels of the Morris worm that created havoc on the ARPANET, the precursor to what is the Internet today
- Located in the Software Engineering Institute (SEI)
  - Federally Funded Research & Development Center (FFRDC)
  - Operated by Carnegie Mellon University (Pittsburgh, Pennsylvania)
Definition of Malicious Insider

From the CERT/US Secret Service *Insider Threat Study*

*Current or former employees or contractors who*

– intentionally exceeded or misused an authorized level of network, system or data access in a manner that

– affected the security of the organizations’ data, systems, or daily business operations.
How bad is the insider threat?
2007 e-Crime Watch Survey

- CSO Magazine, USSS, Microsoft & CERT
- 671 respondents

Percentage of Participants Who Experienced an Insider Incident

<table>
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<th>Year</th>
<th>Percentage</th>
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<tr>
<td>2004</td>
<td>41</td>
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<tr>
<td>2005</td>
<td>39</td>
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<td>2006</td>
<td>55</td>
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<td>2007</td>
<td>49</td>
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Most Common Insider Incidents

Percentage of Participants Who Experienced Specific Type of Insider Incident

- Unauthorized access: 27%
- Theft of IP: 24%
- Theft of other info: 23%
- Fraud: 19%
Source of CERT’s Insider Threat Case Data

- CERT/U.S. Secret Service *Insider Threat Study*
  - 150 actual insider threat cases
  - 1996-2002
- Carnegie Mellon CyLab *MERIT* Project
  - Approximately 100 insider threat cases
  - Cases not included in the CERT/US Secret Service study
  - Cases through 2007
- Case data includes both technical and behavioral information
CyLab Common Sense Guide Best Practices

- Institute periodic enterprise-wide risk assessments.
- Institute periodic security awareness training for all employees.
- Enforce separation of duties and least privilege.
- Implement strict password and account management policies and practices.
- Log, monitor, and audit employee online actions.
- Use extra caution with system administrators and privileged users.
- Actively defend against malicious code.
- Use layered defense against remote attacks.
- Monitor and respond to suspicious or disruptive behavior.
- Deactivate computer access following termination.
- Collect and save data for use in investigations.
- Implement secure backup and recovery processes.
- Clearly document insider threat controls.
CERT’s Insider Threat Case Breakdown

- Theft of Information: 87
- Modification of Information: 49
- IT Sabotage: 74
- Misc.: 17
Slightly Different Breakdown

- Theft/Modification for Financial Gain: 76
- Theft for Business Advantage: 24
- IT Sabotage: 74
- Misc: 17
Insider Scenarios

**Scenario 1:** Insider uses IT to steal or modify information for financial gain

**Scenario 2:** Insider uses IT to steal information for business advantage

**Scenario 3:** Insider uses IT in a way that is intended to cause harm to the organization or an individual

**Misc:** Cases that do not fall in to the above categories
Scenario 1:

Theft or Modification of Information for Financial Gain
Theft or Modification for Financial Gain

• Who did it?
  – Current employees
  – “Low level” positions
  – Gender: fairly equal split
  – Average age: 33

• What was stolen/modified?
  – Personally Identifiable Information (PII)
  – Customer Information (CI)
  – Very few cases involved trade secrets

• How did they steal/modify it?
  – During normal working hours
  – Using authorized access
Dynamics of the Crime

- Most attacks were *long, ongoing* schemes

<table>
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<th>At least 1 Insider Colluder</th>
<th>At least 1 Outsider Colluder</th>
<th>Outsider Induced</th>
<th>Acted Alone</th>
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<td>1/2</td>
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<td><strong>Modification</strong></td>
<td>almost 1/2</td>
<td>1/2</td>
<td>almost 1/3</td>
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Known Issues

- Family medical problems
- Substance abuse
- Physical threat of outsiders
- Financial difficulties
- Financial compensation issues
- Hostile work environment
- Problems with supervisor
- Layoffs
A Closer Look at THEFT for Financial Gain
Technical Aspects - Theft for Financial Gain

• Electronically
  • Downloaded to home
  • Looked up and used immediately
  • Copied
  • Phone/fax
  • Email
  • Malicious code

• Physically
  • Printouts
  • Handwritten

• Remaining unknown
Organizational Impacts - Theft for Financial Gain

- Unknown
- < $25K
- > $1M
- $100K to $1M
- $25K to $100K

[Diagram showing the distribution of financial impacts.]
Additional Countermeasures - Theft for Financial Gain

• Train managers on social networking issues
• Provide Employee Assistance Program or other recourse for employees experiencing personal problems
• Log, monitor, and audit for unusually large queries, downloads, print jobs, emails
• Do not overlook physical access controls
• Change passwords for all accounts upon termination, including EXTERNAL accounts!
A Closer Look at MODIFICATION for Financial Gain
Technical Aspects - Modification for Financial Gain

- Only Modified Data: 31
- Only Added Data: 13
- Only Deleted Data: 1
- Combination of Actions: 9
Organizational Impacts - Modification for Financial Gain

- $< 25K
- $25K to $100K
- $100K to $1M
- $> 1M
- Unk.
Additional Countermeasures - Modification for Financial Gain

- Audit/monitor for suspicious transactions
- Train managers on social networking issues
- Provide Employee Assistance Program or other recourse for employees experiencing personal problems
Scenario 2

Theft of Information for Business Advantage
Theft For Business Advantage

• Who did it?
  – Current employees
  – Technical or sales positions
  – All male
  – Average age: 37

• What was stolen?
  – Intellectual Property (IP)
  – Customer Information (CI)

• How did they steal it?
  – During normal working hours
  – Using authorized access
Dynamics of the Crime

• Most were *quick* theft upon resignation

• Stole information to
  – Take to a new job
  – Start a new business
  – Give to a foreign company or government organization

• Collusion
  – Collusion with at least one *insider* in almost 1/2 of cases
  – Outsider *recruited* insider in less than 1/4 of cases
  – Acted *alone* in 1/2 of cases
Known Issues

• Disagreement over ownership of intellectual property
• Financial compensation issues
• Relocation issues
• Hostile work environment
• Mergers & acquisitions
• Company attempting to obtain venture capital
• Problems with supervisor
• Passed over for promotion
• Layoffs
Technical Aspects - Theft for Business Advantage

• In order of prevalence:
  – Copied/downloaded information at work
  – Emailed information from work
  – Accessed former employer’s system
  – Compromised account

• Many other methods
Organizational Impacts - Theft for Business Advantage

- Unknown
- $100K to $1M
- < $25K
- > $1M

* Note: None in range $25K to $100K.

33
Additional Countermeasures - Theft for Business Advantage

• Log, monitor, and audit access to critical information
• Enforce “need to know” access controls, including encryption
• Protect software in development
• Prohibit use of personal computers for any work-related activity
Scenario 3:

IT Sabotage with the Intent to Harm Organization or Individual
Insider IT Sabotage

• Who did it?
  – Former employees
  – Male
  – Highly technical positions
  – Age: 17 – 60

• How did they attack?
  – No authorized access
  – Backdoor accounts, shared accounts, other employees’ accounts, insider’s own account
  – Many technically sophisticated
  – Remote access outside normal working hours
Dynamics of Insider IT Sabotage

• Most insiders were disgruntled due to unmet expectations
  – Period of heightened expectations, followed by a precipitating event triggering precursors

• Behavioral precursors were often observed but ignored by the organization
  – Significant behavioral precursors often came before technical precursors

• Technical precursors were observable, but not detected by the organization
Known Issues

• Unmet Expectations
  – Insufficient compensation
  – Lack of career advancement
  – Inflexible system policies
  – Coworker relations; supervisor demands

• Behavioral precursors
  – Drug use; absence/tardiness
  – Aggressive or violent behavior; mood swings
  – Used organization’s computers for personal business
  – Sexual harassment
  – Poor hygiene
Technical Aspects of Insider IT Sabotage

- Insiders created or used unknown access paths to set up their attack and conceal their identity or actions.

- The majority attacked after termination.

- Organizations failed to detect technical precursors

- Lack of physical or electronic access controls facilitated the attack
More About Access Paths

- Access path
  - A sequence of one or more access points that lead to a critical system

An organization may not know about all of the access paths to its critical systems.
Organizational Impacts of IT Sabotage

• Inability to conduct business, loss of customer records
• Inability to produce products
• Negative media attention
• Private information forwarded to customers, competitors, or employees
• Exposure of personal or confidential information
• Web site defacements
• Many individuals harmed
Additional Countermeasures - IT Sabotage

- Train management on the patterns of behavior that could indicate an IT sabotage attack
Miscellaneous:

Cases not in the above scenarios
Examples of Miscellaneous Cases

• Reading executive emails for entertainment
• Providing organizational information to lawyers in lawsuit against organization (ideological)
• Transmitting organization’s IP to hacker groups
• Unauthorized access to information to locate a person as accessory to murder
Summary

- Insider threat is a problem that impacts and requires understanding by everyone
  - Information Technology
  - Information Security
  - Human Resources
  - Management
  - Physical Security
  - Legal
- Use enterprise risk management for protection of critical assets from ALL threats, including insiders
- Incident response plans should include insider incidents
- Create a culture of security – all employees have responsibility for protection of organization’s information
Discussion
Points of Contact

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http://www.cert.org/insider_threat/