SOPHOS

Sophos Incident Response Planning Guide

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Introduction

This document is designed to provide a comprehensive overview of incident response best practices, guiding the examination of cyberthreats in both technical and organizational aspects. This guide aims to assist companies in developing effective incident response processes.

Intended for information security professionals in technical or organizational roles, as well as for beginners without prior cybersecurity experience, this guide serves as an introduction to incident response. Please note that it does not offer an exhaustive reference to regulatory and legal information security management frameworks. It should be used as supplementary material alongside applicable breach disclosure and response guidelines specific to your organization. Additionally, the role of cyber insurance should be considered separately, as policies may contain guidelines that deviate from the recommendations presented in this incident response guide.

Effective preparation for cyber incidents enables organizations to rely on established protocols and procedures for faster reaction, assignment, and containment of risks. The goal of this document is to guide incident response processes within the preparation phase of an incident management lifecycle, ultimately minimizing financial and operational impact on organizations by facilitating faster containment of cyber incidents.

Security professionals are encouraged to incorporate these concepts and investigative methods into their own incident response plans and processes as appropriate. This guide can be read from beginning to end or selectively, focusing on the chapter(s) most relevant to the reader. While it does not provide a definitive step-by-step plan for dealing with cyber incidents, it is intended to help security teams prepare and establish their own processes.

The incident management phases described in this guide align with the SANS recommended Incident Response framework, which consists of six distinct phases. This framework is designed to emphasize each phase of the incident management lifecycle and assist security professionals in their preparation to effectively respond to incidents. However, it is not intended to be a playbook. Cyber incidents are dynamic, and while frameworks provide a necessary structure for a general approach, professional judgment from security professionals and security-minded employees is crucial in addressing these incidents.

Preparation

The first phase of the incident response cycle is the preparation phase. The activities and efforts undertaken during this phase significantly influence the efficiency and effectiveness of subsequent phases. As a result, the preparation phase is not only crucial but should also be revisited and updated regularly. The elements of the preparation phase encompass both non-technical aspects, such as processes and procedures, and technical components, including system hardening, telemetry collection, and training. By dedicating the necessary time and resources to preparation, organizations can create a solid foundation for a robust and resilient incident response strategy.

Processes and Procedures

Well-documented processes and procedures are essential for the effective functioning of an incident response team. By outlining and distributing these guidelines among personnel selected to participate in the incident handling process, you can ensure information integrity and alignment of objectives among stakeholders. Clearly defined processes and procedures help maintain consistency in the team's approach, facilitate communication, and contribute to a streamlined and coordinated response to cyber incidents.

Incident Handling Plan

An effective incident handling plan establishes clear procedures for managing cybersecurity incidents and provides the necessary guidance for all involved parties. The following elements should be incorporated into your incident handling plan to ensure a comprehensive approach to incident response:

- **Define Stakeholders:** Identify key stakeholders and assign roles in the incident handling process, such as incident leads, IT supplementary team, organization and leadership, and external parties like IT service providers, law enforcement, and incident response vendors.
- **Incident Classification and Severity Levels:** Establish criteria for classifying incidents based on factors such as potential impact, affected systems, and the type of threat. Define severity levels to prioritize and guide incident response efforts.
- **Escalation Procedures:** Develop clear escalation procedures for incidents that exceed the capabilities or authority of the initial responders, including involving higher levels of management or engaging external experts as needed.
- **Communications:** Ensure effective communication during a crisis by leveraging an incident response template with pre-defined communication templates for staff, customers, and partners. Consider incorporating practices from disaster recovery and business continuity plans to assess failover communication channels for email, messaging, and video conferencing.
- **Asset Inventory:** Maintain an up-to-date asset inventory to track and manage all hardware and software within the organization. This information is crucial for determining the spread, impact, and response to a threat.
- **Incident Response Timeline:** Create a timeline for each phase of the incident response process, outlining deadlines for key milestones to ensure a prompt and organized response.
- **Incident Documentation and Reporting:** Standardize the process for documenting all aspects of an incident, including actions taken, decisions made, and outcomes achieved. This documentation will be crucial for post-incident analysis and potential legal or regulatory inquiries.
- **After-Action Reviews and Continuous Improvement:** Implement a process for conducting after-action reviews following an incident to evaluate the effectiveness of the response and identify areas for improvement. Use these insights to update and enhance the incident handling plan as needed.

By incorporating these elements into your incident handling plan, your organization will be better equipped to manage and respond to cybersecurity incidents effectively and efficiently.

Legal Documentation

During the preparation phase, companies must address legal responsibilities related to disclosure, incident handling regulations, and other relevant aspects of cybersecurity. The following sections illustrate some common legal considerations, but each organization should conduct a comprehensive analysis of the regulatory requirements specific to their industry and location. Identify individuals responsible for reporting and legal compliance within the business and include them as stakeholders in the incident response plan with clearly defined roles.

- **Legal and Regulatory Disclosure Responsibilities:** Some organizations may be legally bound or encouraged to disclose incidents based on their industry or status.
  - Critical Infrastructure Sector Organizations
  - Government Agencies
  - Publicly Listed Companies
- **Data Privacy:** Adhere to data protection laws that mandate responsible disclosure to information commission agencies and affected customers or individuals whose data rights may be compromised.
- **Retention and Destruction of Data:** Establish policies and procedures for retaining, storing, and securely destroying data collected during incident response activities, in compliance with applicable laws and regulations.
- **Third-Party Agreements and Contracts:** Review contracts and agreements with vendors, suppliers, and partners to understand their incident response obligations and notification requirements in the event of a breach or incident.
- **Intellectual Property (IP) Protection:** Address the legal aspects of protecting your organization's intellectual property, including trade secrets, patents, copyrights, and trademarks, during and after a cyber incident.
- **Cross-Border Data Transfer and Reporting:** If your organization operates internationally, consider the legal implications and requirements of transferring and reporting data across different jurisdictions.
- **Employee Rights and Responsibilities:** Outline the legal rights and responsibilities of employees in the context of cybersecurity incidents, including their obligations to report incidents and protect sensitive information.
- **Insurance Policy Documentation:** Understand the process and requirements for making a cyber insurance claim.
  - Review policy terms and conditions to determine inclusions and exclusions.
  - Consult with internal policyholders to ensure a thorough understanding of the coverage.

Incident response playbooks

Incident response playbooks provide detailed, step-by-step guidelines on the actions to take when specific threats are identified. These playbooks should be developed based on a risk-based approach, considering the likelihood and potential impact of various attack scenarios. The following elements should be considered when developing your incident response playbooks:

- **Tailored to Your Organization:** Ensure that your playbooks are tailored to your organization's unique environment, resources, and capabilities. This includes considering the size, industry, and specific risks faced by your organization.
- **Specific Threats and Scenarios:** In more mature organizations, it is recommended to develop playbooks for specific threats, such as certain types of malware or targeted attacks. However, for organizations with limited resources, playbooks should be more encompassing and cover a variety of threats to remain useful in different scenarios.
- **Clear and Concise Instructions:** Playbooks should provide clear and concise instructions for each step in the response process. This enables responders to quickly understand and execute the necessary actions during an incident.
- **Roles and Responsibilities:** Clearly define the roles and responsibilities of each team member involved in the response process. This ensures that everyone knows what is expected of them and can collaborate effectively.
- **Communication and Escalation:** Include guidelines for communication and escalation during an incident, such as when to notify management or engage external support.
- **Integration with Incident handling plan:** Ensure that your playbooks are aligned with and support your overall incident handling plan. This helps maintain consistency and coherence across your incident response efforts.

- Regular Updates and Reviews: Playbooks should be reviewed and updated regularly to ensure that they remain relevant and effective in the face of evolving threats and changing organizational circumstances.

By incorporating these elements into your incident response playbooks, your organization will be better prepared to effectively respond to a variety of cybersecurity incidents and minimize potential impacts.

Backups

Backups are essential for ensuring business continuity and minimizing the impact of data loss due to accidents, system failures, or cyberattacks. Implementing a robust backup strategy involves creating and validating backups regularly, as well as choosing a variety of storage options to maximize data availability. The following elements should be considered when developing your backup strategy:

- **Backup Frequency:** Determine the appropriate frequency for creating backups based on the criticality of the data and the level of acceptable risk. Regular backups help minimize the potential impact of data loss.
- **Backup Types:** Utilize a combination of full, incremental, and differential backups to optimize storage space and facilitate efficient data recovery.
- **Storage Options:** Choose a variety of storage options, including local, cloud-based, and offline backups. This helps ensure data availability and mitigates the risk of data loss due to a single point of failure.
- **Prioritization of Business-Critical Data:** Focus on backing up business-critical data and systems that are essential for maintaining operations and supporting key business processes.
- **Backup Encryption:** Encrypt backups to protect sensitive data and prevent unauthorized access during storage and transmission.
- **Backup Validation:** Regularly validate your backups to ensure they are reliable and can be successfully restored when needed. This may include testing the restoration process and verifying the integrity of the backed-up data.
- **Retention Policies:** Implement data retention policies to manage the storage and disposal of backups in accordance with legal, regulatory, and business requirements.
- **Disaster Recovery Planning:** Integrate your backup strategy with your organization's overall disaster recovery plan to ensure a coordinated and effective response to data loss events.

By incorporating these elements into your backup strategy, your organization will be better prepared to recover.

System and Network Hardening

System and network hardening involves reducing the attack surface by minimizing unnecessary functionality, access to systems, and network connections. By implementing effective hardening practices, your organization can decrease the likelihood of a successful attack. Consider the following aspects when developing your system and network hardening strategy:

Patching

- **Patch Management Program:** Establish a program to ensure timely and consistent patching of assets in your network, leveraging automated or semi-automated patching tools.
- **Documentation:** Maintain records of applied patches and any necessary exclusions.
- **Prioritization:** Prioritize patches based on risk analysis, focusing on addressing vulnerabilities with the highest potential impact on your organization.

Configuration

- **Security Compliance Auditing:** Conduct continuous internal and external audits to verify the proper configuration and settings of security tools, identifying and addressing any misconfigurations or exclusions.
- **Application Control:** Implement application allow or block lists to limit the number and versions of applications that can run on hosts, reducing the risk of unauthorized or vulnerable software being exploited.
- **Network Access Control:** Configure network tools to restrict IP and port access to only necessary internal and external hosts, minimizing the potential for unauthorized access and data exfiltration.

- **Principle of Least Privilege:** Ensure users within your organization have access rights limited to the minimum level necessary to perform their job functions, reducing the potential for unauthorized access and data compromise.

Network Security

- **Network Segmentation:** Divide your network into smaller, isolated segments to limit the potential impact of a security breach and make it more difficult for attackers to move laterally within your network.
- **Firewall Configuration:** Configure firewalls to block all unnecessary incoming and outgoing traffic, and regularly review and update rules to maintain an optimal security posture.
- **Intrusion Detection and Prevention Systems (IDPS):** Deploy IDPS to monitor network traffic for signs of malicious activity and take appropriate action.

Monitoring and Telemetry

Monitoring and telemetry are crucial components of an effective incident response strategy, as they provide valuable insights into an organization's environment and allow for early detection of potential threats. By understanding your environment and implementing appropriate layers of detection and defense, you can enhance your organization's ability to respond to incidents efficiently.

Your Environment

Understanding your environment is the foundation for effective monitoring and telemetry. This includes:

- Asset inventory: Maintain an up-to-date record of endpoints, servers, and their coverage with relevant security platforms.
- Network topology: Develop a clear understanding of your network, including ingress/egress points, segmentation, and control points, preferably with an up-to-date diagram.

Layers of Detection and Defense

Establishing multiple layers of detection and defense is essential for a comprehensive security strategy. Consider the following sources of telemetry and ensure consistent timestamps across all sources, with UTC as the recommended standard:

- **Perimeter devices:** Firewalls, Intrusion Prevention Systems (IPS), Intrusion Detection Systems (IDS), VPNs, and proxies.
- **Endpoint protection:** Anti-Virus (AV), Next-Gen Anti-Virus (NGAV), Endpoint/Extended Detection and Response (E/XDR).
- **Centralized logging:** Security Information and Event Management (SIEM) tools, Syslog servers, and cloud-based data storage.
- **Authentication:** Multi-factor authentication services and Identity and Access Management (IAM) services.
- **Threat intelligence:** Tactical intelligence for correlation and brand monitoring to alert on external exposure.

Monitoring Tools and Techniques

Implementing the right monitoring tools and techniques is vital for effective incident identification and response. Consider the following approaches:

- **Continuous monitoring:** Deploy a combination of real-time and periodic monitoring to maintain a comprehensive view of your environment.
- **Anomaly detection:** Leverage advanced analytics and machine learning algorithms to identify unusual patterns or behaviors that may indicate a potential threat.
- **Log correlation:** Aggregate and correlate log data from multiple sources to identify patterns and trends that may be indicative of an attack.
- **Alert prioritization:** Develop a process to prioritize alerts based on factors such as criticality, potential impact, and threat level.

By focusing on your environment, establishing robust layers of detection and defense, and deploying effective monitoring tools and techniques, you can significantly enhance your organization's ability to identify and respond to security incidents in a timely and efficient manner.

Communication

Effective communication is critical during incident response, as it enables timely coordination and collaboration among all stakeholders. This section outlines the key considerations for both internal and external communication in the context of incident response, taking into account legal requirements.

Internal Communication

- **Communication Plan:** Establish a comprehensive communication plan that details escalation paths, communication channels, and key points of contact. This plan should be reviewed and updated periodically to ensure its effectiveness during an incident.
- **Incident Response Team:** Assemble an incident response team (IRT) and designate a team lead responsible for coordinating response efforts. Ensure that team members understand their roles and responsibilities, and maintain open lines of communication throughout the incident.
- **Secure Channels:** Utilize secure and reliable channels for communication to prevent unauthorized access to sensitive information. Consider implementing encrypted messaging applications, secure email, or dedicated communication platforms.
- **Response Templates:** Create a library of predefined incident response templates for various scenarios, enabling faster and more consistent communication. These templates should be easily accessible, customizable, and aligned with the organization's communication guidelines.
- **Stakeholder Updates:** Provide regular updates to stakeholders throughout the incident management process, including situation reports, actions taken, and anticipated outcomes. This transparency can help maintain trust and confidence in the organization's handling of the incident.

External Communication

- **Notification Strategy:** Develop a notification strategy for customers, vendors, partners, and law enforcement agencies in the event of a security breach or other incidents that may affect them. This strategy should outline the criteria for notification, appropriate channels, and designated communicators.
- **Legal and Regulatory Compliance:** Ensure that external communications adhere to legal and regulatory requirements, including data protection laws, responsible disclosure guidelines, and industry-specific regulations. Consult with legal counsel to confirm that communications comply with all relevant obligations.
- **Designated Spokesperson:** Appoint a designated spokesperson or public relations team to handle media inquiries and public statements, ensuring a consistent and accurate message is delivered. This individual or team should be trained in crisis communications and media relations.
- **Preparations for External Communications:** Prepare template communications for various incident scenarios to facilitate quick and clear notifications to external parties. Tailor these templates to address the specific needs of different stakeholders, such as customers, partners, and regulators.
- **Collaboration with Other Departments:** Work closely with legal, public relations, and other relevant departments to ensure that external communications are compliant with regulations, protect the organization's reputation, and maintain transparency with affected parties.

By implementing these communication strategies, your organization can ensure a coordinated and effective response to cybersecurity incidents, ultimately preserving trust and confidence in your organization's handling of such events.

Security Awareness and Training

Educating employees about cybersecurity threats and best practices is crucial for an organization's overall security posture. In this section, we discuss the key components of a comprehensive security awareness and training program, including security awareness initiatives, training content and frequency, and simulated incidents and exercises.

Security Awareness Programs

- **Program Objectives:** Establish clear objectives for your security awareness program, focusing on the knowledge and behaviors that employees need to adopt to protect organizational assets and information.
- **Targeted Training:** Develop tailored training materials for different roles and departments within the organization, taking into consideration their unique responsibilities and access to sensitive information.

- **Ongoing Updates:** Regularly update the security awareness program to reflect the evolving threat landscape, incorporating the latest trends and best practices.
- **Metrics and Evaluation:** Track and measure the effectiveness of the security awareness program, using key performance indicators (KPIs) such as employee engagement, training completion rates, and improvement in security behaviors.

Training Content and Frequency

- **Content Development:** Create engaging and informative training content that covers a wide range of topics, such as password management, phishing awareness, social engineering, and safe internet browsing.
- **Training Delivery:** Offer various training formats, including online courses, in-person workshops, and interactive webinars, to cater to different learning preferences and schedules.
- **Frequency:** Schedule regular training sessions throughout the year, with a recommended minimum frequency of once per quarter. In addition, provide timely training sessions in response to specific incidents or emerging threats.
- **Continuous Learning:** Promote a culture of continuous learning by providing employees with access to additional resources, such as articles, videos, and podcasts, that can help expand their cybersecurity knowledge.

Simulated Incidents and Exercises

- **Realistic Scenarios:** Design simulated incidents and exercises based on realistic scenarios that employees may encounter in their day-to-day work. These scenarios can help employees better understand the potential impact of a security breach and practice their response skills.
- **Cross-functional Collaboration:** Involve multiple departments in simulated exercises, encouraging collaboration and communication among teams with different areas of expertise.
- **Evaluation and Feedback:** Conduct a thorough evaluation of employees performance during simulated incidents and exercises, providing constructive feedback and identifying areas for improvement.
- **Lessons Learned:** Share the lessons learned from simulated exercises with the broader organization, reinforcing key concepts and best practices.

By implementing a robust security awareness and training program, organizations can empower employees with the knowledge and skills needed to identify and respond to cybersecurity threats, ultimately reducing the risk of successful attacks.

Incident Response Team

An effective incident response team is essential for a timely and coordinated response to cybersecurity incidents. In this section, we discuss the roles and responsibilities, team composition, and the importance of external support and expertise in incident response.

Roles and Responsibilities

- **Incident Response Manager:** Oversees the incident response process, coordinates team activities, and ensures effective communication among team members and with external stakeholders.
- **Security Analysts:** Investigate and analyze security incidents, providing technical expertise in identifying the root cause, scope, and impact of the incident.
- **Forensic Analysts:** Perform digital forensics tasks, including evidence collection, analysis, and preservation, to support investigations and legal proceedings.
- **IT Operations:** Assist in containment, eradication, and recovery efforts by managing system infrastructure and implementing necessary changes to prevent future incidents.
- **Legal and Compliance:** Provide guidance on legal and regulatory requirements related to incident response, ensuring proper disclosure and reporting.
- **Public Relations and Communications:** Manage internal and external communications, crafting appropriate messaging for affected parties, such as employees, customers, partners, and regulators.

Incident Response Team Composition

- **Cross-functional Representation:** Assemble a diverse team with representation from various departments, including IT, security, legal, HR, and communications, to address the multidisciplinary nature of incident response.
- **Skills and Expertise:** Ensure team members possess the necessary skills and expertise to perform their designated roles, providing them with ongoing training and development opportunities.
- **Availability and Rotation:** Establish a team that is available 24/7, using on-call rotations or dedicated shifts to maintain continuous coverage.

External Support and Expertise

- **Third-party Vendors:** Engage external experts, such as cybersecurity consultants or managed security service providers (MSSPs), to supplement your internal capabilities and provide specialized knowledge in areas such as digital forensics or threat intelligence.
- **Legal Counsel:** Retain external legal counsel with expertise in cybersecurity and data privacy laws to provide guidance on compliance and disclosure requirements, as well as to represent the organization in any legal proceedings related to a security incident.
- **Law Enforcement and Regulatory Agencies:** Establish relationships with relevant law enforcement agencies and regulatory bodies, facilitating cooperation and information sharing during incident investigations.
- **Industry Collaboration:** Participate in industry-specific cybersecurity forums and information sharing groups, exchanging threat intelligence and best practices with other organizations to stay abreast of emerging threats and trends.

By assembling a well-rounded incident response team and leveraging external support and expertise, organizations can better manage cybersecurity incidents and minimize their potential impact.

Identification

The identification phase is crucial in detecting the presence of an attacker within a network or system. Continuous monitoring of network telemetry is essential to minimize the time between intrusion and identification. The faster a team reacts, the lower the impact on the confidentiality, integrity, and availability of data, systems, and networks. Managed detection and response (MDR) solutions can provide valuable support in this process by offering expert threat detection and response capabilities.

Key Components of Identification

- **Network and Device Telemetry:** Comprehensive monitoring of various potential sources, as mentioned in the Telemetry section, is essential for real-time threat detection and response. Implementing an MDR solution can enhance this process.
- **External Notifications:** Collaboration with law enforcement and other external sources to gather and analyze threat intelligence enables faster identification of potential intrusions.
- **Threat Intelligence:** Monitoring dark web and underground websites to identify potential company compromises for sale further enhances detection capabilities.
- **User Reporting:** Encourage users to report suspicious emails or links and quickly respond to these potential threats, ensuring that critical context is passed on to incident handlers.

Solid processes should be established to categorize the severity level of an incident based on the following criteria:

- **Fidelity:** Refers to the trustworthiness of the source (e.g., IPS, FW, AV, XDR).
- **Criticality:** Considers the importance of the affected system.
- **Maliciousness:** Evaluates suspicious behavior, which can provide clues leading to the discovery of an otherwise unknown breach.
- **Incident Type:** Use frameworks such as the Cyber Kill Chain and MITRE ATT&CK to classify incidents.
- **Timestamp:** Ensure consistent timestamps using UTC, NTP, and common standards to normalize data.

Types of Incidents

NIST defines two incident categories:

- **Precursor:** Detect signs of reconnaissance, such as scanning activity aimed at identifying open ports and software vulnerabilities. MDR solutions can be particularly helpful in this context. Identify known exploits of remote-code vulnerabilities present on the organization's infrastructure.
- **Indicator:** Identify various indicator-type incidents, such as malware alerts, changes to files or Active Directory, or unusual user behavior like logins via RDP at odd times, and initiate an appropriate incident response. MDR can provide additional support in detecting and responding to such incidents.

By implementing a comprehensive monitoring strategy, leveraging external notifications and threat intelligence, encouraging user reporting, and utilizing well-defined criteria for incident categorization, organizations can enhance their overall security posture. Furthermore, incorporating MDR solutions can provide additional support in detecting and responding to incidents effectively. A strong identification phase not only reduces the impact of security incidents but also fosters a proactive security culture within the organization, ultimately promoting business continuity and protecting valuable assets.

Potentially Suspicious Files, Directories, Processes, and Persistence

Understanding and identifying potentially suspicious files, directories, processes, and persistence mechanisms can help in early detection of incidents.

- **Files and Directories:** Unusual or unexpected files and directories may indicate a security incident. Examples include:
  - Files with unusual extensions or names
  - Files in unexpected locations
  - Directories containing sensitive data that should not be accessible
- **Processes:** Suspicious processes may be a sign of malicious activity on a system. Examples include:

- Processes with high CPU or memory usage
- Processes that are running from unexpected locations
- Processes attempting to access sensitive data or resources

- **Persistence:** Attackers often establish persistence mechanisms to maintain access to a compromised system. Examples of persistence techniques include:
  - Scheduled tasks or cron jobs running malicious scripts
  - Malware that reinstalls itself upon removal or reboot
  - Registry keys or startup items that launch malicious processes
- **Credential Access:** Unauthorized access to credentials can lead to further compromise of systems and sensitive data. Examples include:
  - Brute force attacks on user accounts
  - Phishing campaigns targeting employee credentials
  - Credential dumping from compromised systems
- **Additional Footholds/Access:** Attackers may seek to establish additional footholds within an organization's environment to expand their access and control. Examples include:
  - Compromised user accounts with elevated privileges
  - Exploitation of unpatched vulnerabilities in systems or applications
  - Lateral movement within the network to access additional resources

By recognizing these types of incidents and their examples, organizations can more effectively identify potential threats and respond accordingly. Awareness of these various incident types is essential for an organization's ability to detect and mitigate security incidents promptly.

Forensic Analysis

Forensic analysis is a crucial aspect of the incident response process, as it helps organizations identify the root cause of an incident, understand its impact, and collect evidence to support further investigations or legal actions. The following are some key elements of forensic analysis:

Forensic Tools and Techniques

Various forensic tools and techniques are available to assist in the analysis of systems and networks during an incident response. These tools can help in data collection, analysis, and preservation. Examples of forensic tools and techniques include:

- Disk imaging and cloning tools for preserving the state of a compromised system
- Memory analysis tools to investigate volatile data and identify malicious processes
- Network traffic analysis tools to examine network activity and identify potential indicators of compromise
- Log analysis tools for reviewing system and application logs for signs of suspicious activity

Collecting and Preserving Evidence

The proper collection and preservation of evidence are essential in forensic analysis to ensure the integrity of the data and maintain its admissibility in legal proceedings. Some best practices for collecting and preserving evidence include:

- Documenting every step of the evidence collection process, including the tools and techniques used.
- Creating a detailed timeline of events related to the incident.
- Using write blockers and other forensic tools to prevent altering the evidence during collection.
- Securing collected data in tamper-evident containers or encrypted storage mediums.
- Ensuring that any collected data is stored in a secure and controlled environment.

Chain of Custody

Maintaining a proper chain of custody is critical for preserving the integrity of the evidence and ensuring its admissibility in legal proceedings. A chain of custody refers to the documentation and tracking of the handling, storage, and transfer of evidence throughout the investigation. To maintain a proper chain of custody, organizations should:

- Record the details of every individual who handles the evidence, including their name, role, and contact information.
- Document the date, time, and location of each transfer or handling of the evidence.
- Keep a record of any actions taken with the evidence, such as copying, analysis, or storage.
- Ensure that the evidence is always stored and transported securely, using tamper-evident seals or encrypted storage when necessary.

By incorporating forensic analysis into the incident response process, organizations can gain valuable insights into the nature and scope of security incidents, collect crucial evidence, and support further investigations or legal actions. Understanding and implementing proper forensic tools, techniques, and practices are essential for conducting a thorough and effective analysis.

Data Exfiltration

Data exfiltration refers to the unauthorized transfer of sensitive information or data from an organization's systems or network to an external location, typically controlled by an attacker. Detecting and preventing data exfiltration is crucial in minimizing the impact of a security breach and safeguarding valuable assets. To effectively address data exfiltration, organizations should consider the following aspects:

- **Monitoring and Alerting:** Implement a comprehensive monitoring system to detect unusual data transfers or network traffic patterns, such as large file transfers, communication with suspicious IP addresses, or multiple failed login attempts. Ensure that proper alerting mechanisms are in place to notify the appropriate personnel of potential data exfiltration incidents.
- **Data Loss Prevention (DLP) Solutions:** Deploy DLP solutions to identify and prevent sensitive data from being transferred outside the organization's network. DLP solutions can help detect and block the unauthorized transfer of sensitive information based on predefined policies and rules.
- **Encryption:** Encrypt sensitive data both at rest and in transit to reduce the value of the data to an attacker in case of a successful exfiltration attempt.
- **Employee Training and Awareness:** Educate employees about the risks of data exfiltration and the importance of adhering to security policies, such as not sharing sensitive information through unsecured channels or with unauthorized individuals.

Validation and Prioritization

Once a potential security incident has been identified, it is essential to validate the incident and prioritize the response based on the severity and potential impact on the organization. Validation and prioritization involve the following steps:

- **Incident Validation:** Verify that the identified incident is a genuine security event and not a false positive. This can be achieved by analyzing the available data, correlating it with known threat intelligence, and reviewing the context of the event.
- **Incident Prioritization:** Assess the potential impact of the incident on the organization's assets, operations, and reputation. Consider factors such as the type of data or systems involved, the extent of the compromise, and the potential consequences of the incident.
- **Severity Levels:** Assign a severity level to the incident based on the prioritization assessment. Severity levels can be defined using a predefined scale, such as low, medium, high, or critical, and should guide the incident response team in determining the appropriate resources and urgency for the response.
- **Response Plan:** Based on the severity level and the nature of the incident, select the appropriate response plan from the organization's incident response playbook. This plan should outline the necessary steps to contain, investigate, and remediate the incident, as well as any required communication and reporting procedures.

By effectively identifying, validating, and prioritizing security incidents, organizations can ensure that their resources are allocated efficiently, and the response efforts are focused on the most critical incidents, minimizing the overall impact on the organization.

Containment

The primary goal of containment is to mitigate any further damage by isolating systems that have been identified as compromised or are suspected to be compromised. This step helps prevent the spread of incidents, such as malware propagation or ongoing data exfiltration, and facilitates the preservation of a system in a state from which additional evidence may be gathered. Proper containment strategies can prove valuable for the investigation, such as gathering Indicators of Compromise (IOCs) that will be documented and used in further analysis.

Short-Term Containment

Short-term containment deals with immediate actions to limit the impact of the incident. These are typically conducted upon identification of the compromised machine to satisfy the primary goal of containing the current threat. Examples of short-term containment measures include:

- **Host-based isolation:** Use features from security platforms to isolate compromised hosts, such as Sophos Intercept X Advanced, while maintaining an active connection for further investigation.
- **Blocking SHA256 hashes:** Utilize Sophos Intercept X Advanced to block malicious files by their SHA256 hashes, preventing their execution.
- **Isolated network:** Change routing policies of the switch, router, or firewall to disallow the network segment that contains the identified machine to communicate with further machines and spread the threat.
- **Manual isolation:** Disconnect the network ethernet cable or disable the network (Wi-Fi) card on the machine in reaction to an identified compromise.
- **Account reset:** Reset any user accounts that are known or suspected to be compromised.

Long-Term Containment

Long-term containment focuses on preventing the spread of the same incident to other machines and assets in the network after initial investigations are concluded. Examples of long-term containment measures include:

- Blocking network connections to bad URLs and command and control (C2) servers identified within the investigation.
- Suspending compromised domain accounts, resetting/suspending domain/local admin account passwords, and conducting a domain-wide password reset if the full scale of the incident cannot be ascertained.
- Implementing automatic device isolation based on a minimum health status on the machine.
- Installing security agents on unprotected machines or machines that were wiped clean to ensure visibility and protection.

Best Practices

To ensure effective containment, consider these best practices:

Do

- Isolate the machine using one of the options above.
- Document the steps being taken, recording the time, action, and who's taken the action.
- Consider your incident response plans and containment strategy, especially if pursuing litigation. Consider taking forensic images and involving cyber insurance.
- Categorize the threat according to its threat level and notify management if it is a high-severity incident.
- Determine the IOCs to aid the investigation and collect evidence.
- Communicate with stakeholders, such as management, legal, and public relations, as appropriate for the severity and potential impact of the incident.

- Monitor for any signs of retaliation or escalation from the attacker during the containment process, as they may attempt to inflict further damage when they realize their activities have been discovered.
- Ensure that containment measures are reversible if necessary, in case of false positives or unintended consequences.
- Perform a thorough analysis of the incident to identify root causes and learn from the experience to improve your security posture and incident response process.

Don't

- Shut down or reboot the compromised machine.
- Rush into actions without consulting the incident manager according to your incident response plan.
- Install from a backup right away without concluding the initial IOC gathering and investigations.
- Publicize the incident or share sensitive information with unauthorized individuals, as it may alert the attacker and potentially compromise the containment process.
- Rely solely on automated tools or processes for containment; involve human expertise and judgment to make informed decisions.
- Forget to consider the potential business impact of containment actions, such as downtime or loss of functionality, and weigh these factors against the risks of not taking action.
- Neglect to update your incident response plan and procedures based on lessons learned from the containment process to better prepare for future incidents.

Remember that a one-size-fits-all approach may not be suitable, and the actions taken should consider the incident type, network landscape, and accessibility to the network. While containment stops the immediate threat and allows breathing room for further actions, it is often not the ultimate step in handling an incident. Companies should remain vigilant about the continuous risk posed by a cyber incident, as attackers may escalate their attack when they realize they have been caught.

Eradication

Eradication is the process of fully eliminating the threat or attacker from the environment. It often involves multiple stages, aiming to identify, document, and eradicate all threat actor activities, system changes, malware, and executions on the network and machines. As most high-impact cyber attacks leverage multiple footholds and hands-on-keyboard coordination, it's essential to identify any irregularities that scans may not detect. When eradicating a threat, it's crucial to consider all potential follow-on effects.

There are two primary strategies for eradication: rebuilding or reimaging machines and targeted removal. Each has its strengths and weaknesses and is often carried out in conjunction with the other for maximum effectiveness.

Rebuild or Reimage Machines

The most efficient way to eradicate compromised assets is to rebuild or reimage the hosts, ensuring a complete rollback to an uncompromised state. This process is simpler if organizations deploy standard software images on hosts and have access to the master image for recovery. The master image should be created before deployment to production to guarantee no prior compromise.

For critical servers, such as ERP systems, mail servers, and file servers, restoring from an old master image is uncommon due to potential data loss and associated costs. Instead, organizations can restore from a clean backup file (e.g., backup server, tape, cloud, or other media). This process requires verifying the availability and integrity of the backup files and choosing a recovery state that is not infected. To ensure the most effective rebuild and reimage strategy, organizations must investigate IOCs and Tactics, Techniques, and Procedures (TTPs) network-wide, with a particular focus on vulnerable machines.

Targeted Removal

The targeted removal strategy aims to identify all pieces of malware and artifacts, pinpoint the most significant system changes made by the adversary, and remove or revert them to their pre-compromise state. This approach is necessary for machines supporting production systems, industrial control systems, or other critical business functions where data loss or downtime would be damaging.

Targeted removal is often deployed using a combination of tools and skilled incident responders who hunt for threats based on initially observed IOCs, associated threat intelligence, and their experience with adversary TTPs. Organizations may use targeted removal to gain a deeper understanding of the attack, drawing lessons to implement long-term improvements and reduce the risk of future cyberattacks.

For instance, if an attacker successfully compromises a host based on existing vulnerabilities, misconfigurations, or prior dormant compromise, eradication should also include mitigating such weaknesses to prevent the host from becoming a vector for reinfection or a new attack. A root cause analysis can help organizations understand the steps an attacker took until the impact was perceived and find patient-zero to prevent future attacks.

It is recommended that companies continue to document their findings and use frameworks, such as the MITRE ATT&CK framework, to conceptualize the structure of an attack. This structured approach aids in identifying the root cause of an incident and allows organizations to improve their overall security posture.

Recovery

The goal of the recovery phase is to take a phased approach in returning affected machines and systems to normal business operations, restoring full functionality to the organization as it was before the breach. The recovery strategy depends on the incident, as some incidents may lead to the isolation of a few machines with minimal operational impact, while larger attacks like ransomware might target multiple machines, causing significant operational impact and business downtime. Therefore, recovery plans should be tailored to the attack.

- A single host affected by a phishing email with a detected and cleaned-up payload by the endpoint protection agent may warrant machine isolation while being investigated and cleaned up by a security analyst, with minimal overall operational impact.
- An early detection of a botnet in the network affecting two user machines with persistence mechanisms installed might lead to immediate isolation and rebuilding of the user machines, resulting in downtime for the employees but minimal operational impact on the business.
- A network-wide ransomware attack with a dwell time of multiple weeks and an identified root cause will lead to the isolation of not only endpoints and servers but also email, VPNs, Active Directory accounts, and other services. In this case, incident responders should keep containment measures in place until the attack is under control by identifying footholds, patching, and reimaging machines. Strategies can include creating an alternate "clean" network, reconstructing it without any affected machines, and reintegrating machines one by one. The decision to reintegrate isolated machines should be based on the risk of re-entry or reinfection being low enough, with incident responders communicating this risk to management to allow a business and risk-appropriate timeline and approach.

A Careful Approach

Recovering machines is a task that requires focus and attention to critical system details, as overconfidence in threat eradication and fatigue from working on the incident can be detrimental. It is essential to remain vigilant and pay attention to:

- Overall system health of any affected machine as it is reintegrated into the network by testing data integrity and system stability.
- Patching security vulnerabilities, especially after restoring a machine from a previous version that may be susceptible to a repeat attack.
- Verifying proper security policies and controls are applied to each machine:
  - The security agent should be deployed on all reintegrated machines.
  - Scanning exclusions should be minimal, with specific exclusions and applications tailored to the excluded item, machine, and user group.
- Scanning and hunting for the presence of identified IOCs from the attack and any footholds the threat actor might have left behind.

Additionally, incident responders and security analysts should continue monitoring the environment for further threat activity and proactively search for common threat actor activities to pre-emptively identify and respond to threats as they appear.

The recovery phase does not have to follow the complete eradication phase but should be conducted interchangeably, as machines restored to a healthy system state can be reintegrated into the production environment.

Post-Incident Review and Lessons Learned

After successfully recovering from a cybersecurity incident, it is crucial to conduct a post-incident review and identify lessons learned. This process will help your organization analyze the effectiveness of its incident response, identify areas for improvement, and implement changes to the incident response plan. By doing so, you can better prepare for future incidents and minimize the risk of similar breaches.

Post-Incident Review

Analyzing Incident Response Effectiveness

To assess the effectiveness of your organization's incident response, review the actions taken by the incident response team and measure their outcomes. Consider the following aspects:

- Time taken to detect, contain, and remediate the incident
- Communication and coordination among team members and with external parties (e.g., law enforcement, vendors)
- The appropriateness of the containment, eradication, and recovery strategies
- The accuracy and usefulness of the information provided by monitoring and detection tools

Identifying Areas for Improvement

Once you've analyzed the effectiveness of the incident response, identify areas where your organization can improve its processes and procedures. Some common areas for improvement may include:

- Staff training and awareness programs
- Incident detection and monitoring capabilities
- Incident response plan updates
- Technical controls and security measures
- Incident response team roles and responsibilities
- External communication and collaboration with stakeholders

Implementing Changes and Updates to the Incident Response Plan

After identifying areas for improvement, it's crucial to implement changes to your organization's incident response plan. Make sure to:

- Update the plan with new procedures, guidelines, or technical measures as necessary.
- Communicate changes to all relevant parties, including employees, management, and external stakeholders.
- Conduct regular training and exercises to ensure that the updated plan is understood and can be effectively executed.
- Monitor and evaluate the effectiveness of the changes over time and make further adjustments as needed.

By conducting a thorough post-incident review and identifying lessons learned, your organization can enhance its cybersecurity posture and better prepare for future incidents. Remember that the incident response process is continuous, and regularly reviewing and updating your plan will help ensure that your organization remains resilient in the face of evolving cyber threats.

Lessons Learned

Lessons learned will depend on the incident type and the incident handling process, and they represent identified areas for improvement. The lessons learned phase is a critical phase that is often overlooked once the high emergency state has passed, and executive sponsorship is removed as a "business-as-usual" state returns. Therefore, it is even more important for the Lessons Learned phase to occur immediately after the recovery phase and to include executive attention to understand the incident details and agree on improvements to mitigate future risks.

In common scenarios, this could be a written incident write-up that includes an executive summary that can be shared with and understood by non-technical stakeholders within the business. This write-up should be both collaborative, allowing comments and edits by multiple stakeholders, and should conclude in a consensus on the final report, including the technical details and lessons learned.

Given the broad spectrum of areas of improvement, a number of common areas have been listed below but should not be understood as a specific and exhaustive list.

Recommended Security Best Practices:

- Decommission outdated software, applications, and hardware within the corporate estate to minimize the risk of exploitation.
- Establish a robust patch management process for software and hardware that aligns with the organization's needs and ensures regular patch updates.
- Install cloud-based endpoint protection agents on all computers within the corporate estate to detect and neutralize malicious threats.
- Implement multi-factor authentication (MFA) for VPN, RDP, and other services that require authentication to enhance security.
- Secure the infrastructure by implementing core security control mechanisms and protecting internet-facing services against unauthorized access.
- Strengthen credential management by enforcing complexity requirements, using password managers, and regularly rotating credentials.
- Implement mail authentication protocols, such as DMARC, DKIM, and SPF, to protect against phishing emails and spoofing.

Network Set-up:

- Implement network access control (NAC) to add an additional layer of security and defend against rogue devices and malicious threats.
- Segregate networks using VLANs to protect critical systems and sensitive data and isolate internet-facing platforms and services within a DMZ.

Hardening:

- Implement GEO IP blocking on firewalls to prevent unwanted network traffic based on geographical origins.
- Deploy application control solutions like AppLocker to prevent unauthorized applications and files from being installed or executed within the corporate estate.
- Harden domain controllers by reviewing and removing unnecessary services, unsupported software, and legacy protocols that may pose security risks.

Proactive Management and Security Precautions:

- **Infrastructure Auditing:** Conduct regular audits of port configurations for all internet-facing infrastructure within the organization, ensuring that only necessary protocol services are allowed, and network flow ports are properly configured.
  - For example, eth0 is internet-facing, and eth1 is only reachable internally.
- **Web Control Auditing:** Regularly review web traffic configurations on proxy servers and similar web traffic flow platforms. Tighten security controls where applicable, adhering to the principle of least privilege. Implement a default deny or block policy. For example:
  - Block file types that pose unnecessary risks to the organization.
  - Review default categorization policies for uncategorized URLs and domains.
  - Export statistical data to identify anomalies, patterns, or recurring suspicious and malicious events.
  - Ensure security groups and policies are updated in line with the RBAC (role-based access control) principle.
- **Account Auditing:** Perform regular audits of non-standard and unapproved local administrator accounts or equivalents within the organization, aiming to remove such accounts.
- **Windows Event Logs:** Configure Windows event logs to preserve data, such as increasing the core Windows event logs' size through Group Policy or creating new event logs when size limits are reached. Windows event logs offer valuable forensic information.
- **Incident Response Plan:** Develop, implement, test, and maintain a cybersecurity incident response plan for the organization. Regularly review and test the plan, updating and refining its content as needed.
- **Hardware and Software Asset Management:** Implement asset management for both hardware and software across the organization. Incorporate prioritization/criticality ratings within the asset management solution to quickly identify high-value assets. Maintain an up-to-date inventory of hardware and software assets, which helps identify potential risks and enables the formulation of strategic plans to address these risks.

- **Network Topology:** Keep an up-to-date high-level network topology diagram for the organization, serving as a reference for reviewing existing configurations and infrastructure types and helping formulate strategic plans for network changes and implementations. During a cybersecurity attack, a network topology diagram can aid incident responders in understanding the organizational network structure, allowing targeted incident response actions to be executed more precisely and swiftly.

Data Integrity

Backups:

- Protect backup data by implementing a variety of backup solutions, storing backup data in completely segregated network locations/media types independent of the corporate estate, and managing access with appropriate security controls.
  - Begin formulating backup redundancy solutions by referencing the 3-2-1 rule and applying adequate encryption to backup data at rest: Create 3 copies of data, store the data on at least 2 different media types, store at least 1 copy of data offsite.

Encryption:

- Implement full disk encryption on computers, mobile devices, and USB drives to protect data from unauthorized access in cases of device loss or theft.
- Protect data at rest within the organization by implementing data at rest encryption (DARE), prioritizing highly sensitive data. Ensure adequate encryption mechanisms are in place for network data in transit, such as using the most current TLS (transport layer security) version for encrypted communication exchanges involving digital certification and preventing servers from downgrading cipher suites to accommodate unsupported browser types.

Security Investments

Use lessons learned from security incidents to advocate for funding and budget improvements in the organization's security posture.

- Invest in staff awareness and training. Since humans are often the initial attack vector, invest in:
  - Phishing awareness training or solutions that educate and test end users on common phishing techniques. Integrate this training into the company as an ongoing exercise through scheduled implementations or automated attack simulations and provide necessary reporting for the IT team to understand common victims and offer further guidance.
  - Staff upskilling in IT security, particularly in security analysis, threat hunting, and incident response.

Managed Cybersecurity Services

- Hire cybersecurity professionals specializing in security analysis, threat hunting, incident response, security tool detection engineering, etc. Implementing a cybersecurity operation center allows a company to monitor threats and respond to them 24/7.
- Invest in a managed cybersecurity solution, such as Sophos Managed Detection and Response (MDR). MDR services are outsourced security operations provided by a team of specialists, acting as an extension of a customer's security team.

Investment in Tools

- Sophos XDR – Extended Detection and Response - is a solution that stores and enables querying of critical information from endpoint, server, firewall, email, and other XDR-enabled products, streamlining threat detection and response workflows.
- Security Information and Event Management (SIEM) technology offers threat detection, compliance, and incident management capabilities by collecting events and information from various data sources in a centralized repository of threat data.

- Additional investments may be made based on lessons learned and should include enhancements to the security posture measured by closing gaps in protection/filtering, detection, and monitoring. Such tools can include AV, intrusion prevention/detection systems (IPS/IDS), firewalls, etc.

By addressing these common areas of improvement, your organization can significantly enhance its security posture and better protect itself against future cyber incidents. Remember that lessons learned are an ongoing process, and regularly reviewing and updating your security practices will help ensure your organization remains resilient in the face of evolving cyberthreats.

Incident Reporting

In the aftermath of a cybersecurity incident, it's vital to communicate the details, findings, and remediation steps to various stakeholders. Reporting the incident internally, to regulatory authorities, and to law enforcement is crucial for maintaining transparency, ensuring compliance, and supporting investigations.

Internal Reporting

To foster a culture of continuous improvement and learning, organizations should establish a clear process for internal reporting. This process should include:

- Documenting the incident, including the timeline of events, affected systems, and the nature of the attack.
- Summarizing the impact of the incident on the organization's operations, finances, and reputation.
- Outlining the steps taken to contain, eradicate, and recover from the incident.
- Identifying lessons learned and recommendations for future improvements to the organization's security posture.
- Communicating the incident report to relevant stakeholders, such as senior management, IT teams, and affected employees or departments.

Reporting to Regulatory Authorities

Depending on the jurisdiction and industry, organizations may be required to report cybersecurity incidents to regulatory authorities. Compliance with these requirements is essential to avoid fines, penalties, and damage to the organization's reputation. When reporting to regulatory authorities, organizations should:

- Determine the appropriate authority or authorities to notify, based on the nature of the incident and the organization's industry and location.
- Review the relevant reporting requirements, including the necessary information and the timeframe for reporting.
- Prepare a detailed report, adhering to the required format and content specified by the regulatory authority.
- Submit the report within the specified timeframe and maintain open communication with the regulatory authority throughout the investigation and resolution process.

Reporting to Law Enforcement

In cases of criminal activity or significant cyberattacks, organizations should consider reporting the incident to law enforcement. This can help support investigations and potentially lead to the apprehension of the attackers. When reporting to law enforcement, organizations should:

- Identify the appropriate law enforcement agency or agencies, such as local police, national cybercrime units, or specialized agencies (e.g., the FBI).
- Gather relevant evidence, including logs, system images, and network traffic captures, while preserving the chain of custody and adhering to any applicable legal requirements.
- Prepare a report detailing the incident, including the nature of the attack, the affected systems and data, the timeline of events, and any known information about the attacker(s).
- Cooperate with law enforcement throughout the investigation, providing additional information and assistance as needed.

By following these guidelines for incident reporting, organizations can ensure that they maintain transparency, comply with regulatory requirements and support the broader efforts to combat cybercrime.

Conclusion

In conclusion, this incident response planning guide provides a comprehensive framework for organizations to effectively prepare for, manage, and recover from cybersecurity incidents. By implementing proactive management and security precautions, ensuring data integrity, investing in staff training and security tools, and establishing clear reporting procedures, organizations can significantly enhance their resilience against cyberthreats.

Effective incident response planning not only helps organizations minimize the damage caused by cyberattacks but also fosters a culture of continuous improvement and learning. As the cyberthreat landscape continues to evolve, organizations must regularly review and update their incident response plans to stay ahead of emerging threats and vulnerabilities.

By diligently following the guidance provided in this guide, organizations can be better equipped to detect, contain, and remediate cybersecurity incidents, protect their valuable data and assets, maintain compliance with regulatory requirements, and preserve their reputation in an increasingly interconnected world.

For more information on the Sophos Incident Response service click here

Experiencing an Active Breach?

Call your regional number below at any time to speak with one of our Incident Advisors.

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Our Incident Advisors will respond to your request as quickly as possible.

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