



Anatomy of a Breach

How hackers break in—and how you
can fight back

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The Four Stages of a Breach

Security threats are relentless. A cyberattack can cause millions of dollars in damage—to both your company's bottom line and its reputation. Are you aware of the potential threats to your company? Do you have a plan in place to resist, mitigate, and recover after a breach?

01 Getting the Initial Foothold

03 Gaining Elevated Control (Local Escalation of Privilege)

Read on to explore what happens at each stage of a breach, and learn to how to formulate a defense strategy that will help you protect yourself and your company.

02 Expanding to the Network (Network Escalation of Privileges)

04 Staying for the Short- or Long-Term



STAGE 01

Getting the Initial Foothold

Attackers gain a foothold in your organization using a variety of tactics. From compromised workstations to unpatched internet-facing servers to badly configured third-party-managed devices, they will use anything available to breach defenses and gain network access. Once inside, they can perform the necessary reconnaissance to identify and target your organization's valuable information and resources.

Common Techniques

Exploit

Code that takes advantage of software vulnerabilities to access information on your server (or any other device) or install malware.

Password spraying

A more recent, novel tactic "sprays" several common passwords at tens of thousands of accounts at once to gain entry. Hackers cast a broad net at many organizations at once to better target where they wreak havoc.

Malware

Short for "malicious software," these programs can steal information, lock your PC until you pay a ransom, or use it to send spam. (e.g., viruses, worms, and Trojans.) This document focuses on what is often called "targeted malware," designed to infiltrate a specific industry or organization.

Phishing

Tricks users into giving out personal, financial, or company-specific information to gain unauthorized access to internal infrastructure. To entice users, attackers send emails with URL links that appear to be from trusted third-party vendors or internal employees.

Ransomware

This malware locks a user out of their computer or network without access to files, folders, or drives. Attackers then demand a financial ransom to regain access; however, they don't always return access after payment.

Supply chain vulnerabilities

Involves tampering with or manipulating an external vendor's products, IT systems, or processes during sourced components' development, manufacturing, or delivery.

Watering hole

Attackers identify specific websites as spot where their intended targets frequently visit. Attacker place malicious links to malware on the sites in hopes of infecting the when they visit.

Zero day

Exploitation of a vulnerability that the software vendor hasn't disclosed or patched.

SOLUTION

An Ounce of Prevention

Organizations across all industries are not immune to threats, especially those posed by weak or compromised user credentials. As employees use more apps and devices and create different identities across corporate and social accounts, it's easier than ever for hackers to breach corporate systems. Why? More often than not, an employee will use the same password to save time and increase their productivity.

Stopping hackers at the front door is the ounce of prevention you need to protect your company. Your first line of defense is a strong identity and access strategy.

Protect Identities, Control Access

We recommend the following preventive measures:

Find out how much control you have over access.

Ask critical questions:

- Who is accessing the network?
- Where are they based?
- Is their device healthy or managed?
- What apps and data are they accessing?
- What's the business impact?

And turn to solutions that protect against identity breaches:

Microsoft Enterprise Mobility + Security:

Use Azure Active Directory to employ a robust identity and access strategy to ensure users are who they say they are before you let them into your network. Conditional

access lets you manage user identities with access policies that control, secure, and restrict access to data. With multi-factor authentication, users must provide additional verification beyond just a username and password to confirm their identity.

Windows Hello

Try a password-free approach. Take away the hassle of remembering passwords, and replace it with more secure sign-ins using faces, fingerprints, or PINs.

Windows Credential Guard

Protect user credentials in the midst of an attack using a virtualization-based security solution that isolates sensitive identity data and protects it from theft attack techniques and tools.

Windows Defender SmartScreen

Help block phishing and exploit sites and occurrences of malicious app downloads using a phishing- and malware-filtering technology for Microsoft Edge and Internet Explorer 11 in Windows 10.

INDUSTRY PROFILE

Finance

Cyberattacks have increased in the financial services industry in recent years. Although many organizations are taking precautions, the ever-evolving digital landscape continues to create employee challenges.

If not properly set up, test environments without protections that validate endpoint request access can lead to breach. That's precisely what happened to a financial firm during tax season. Employees noticed unusual activity when a new file appeared on affected desktops, containing a webpage with ransom payment instructions to pay for the attacker to supply decryption keys needed to recover files. In all, hundreds of servers and workstations on the corporate network revealed targeted ransomware-encrypted documents.

A test server left exposed to the internet revealed the culprit. Hackers obtained both a public-facing IP address and access to the internal private IP address space. Upon further investigation, no Network Security Groups or firewall appliances were in place to protect any systems within the environment. And the test server operated with single-factor authentication, leading to further detrimental exposure.

Automated tools commonly search for open systems on the internet to gain access, but in this case, one tool led to brute-force logins. In less than a day, brute force successfully accessed a username and password for the test server. The culpable account's username and password were identical—these tools' typical first attempt to try to access. The compromised server account was a domain administrator, giving the attacker unfettered access within the network. The account was used to stage and deploy the ransomware that affected systems within the network, and the attacker also accessed a domain controller. As a result, the firm had to consider all account usernames and passwords compromised.

STAGE 02

Gaining Elevated Control

Whether infiltrating your company or one of your suppliers, local escalation of privilege is their next step. Attackers typically look for ways to consolidate control of the local system, or they look for another system that offers a higher chance of success in gaining administrative privileges or greater access to valuable data.

Wherever they end up, the attacker's goal is to identify the user accounts that are responsible for managing the system to impersonate the accounts' ability to manage, update, and access system resources. Then, using both built-in and downloaded tools, the attacker attempts to identify other systems of interest and network resources in order to capture usernames and password—since normal users typically can't accomplish these actions.

Don't ignore your company's supply chain as a potential entry point or place to gain elevated control. In fact, this is where an attacker can exploit a weakness at many parts of the chain, resulting in business disruption.

Common Techniques

Keyloggers

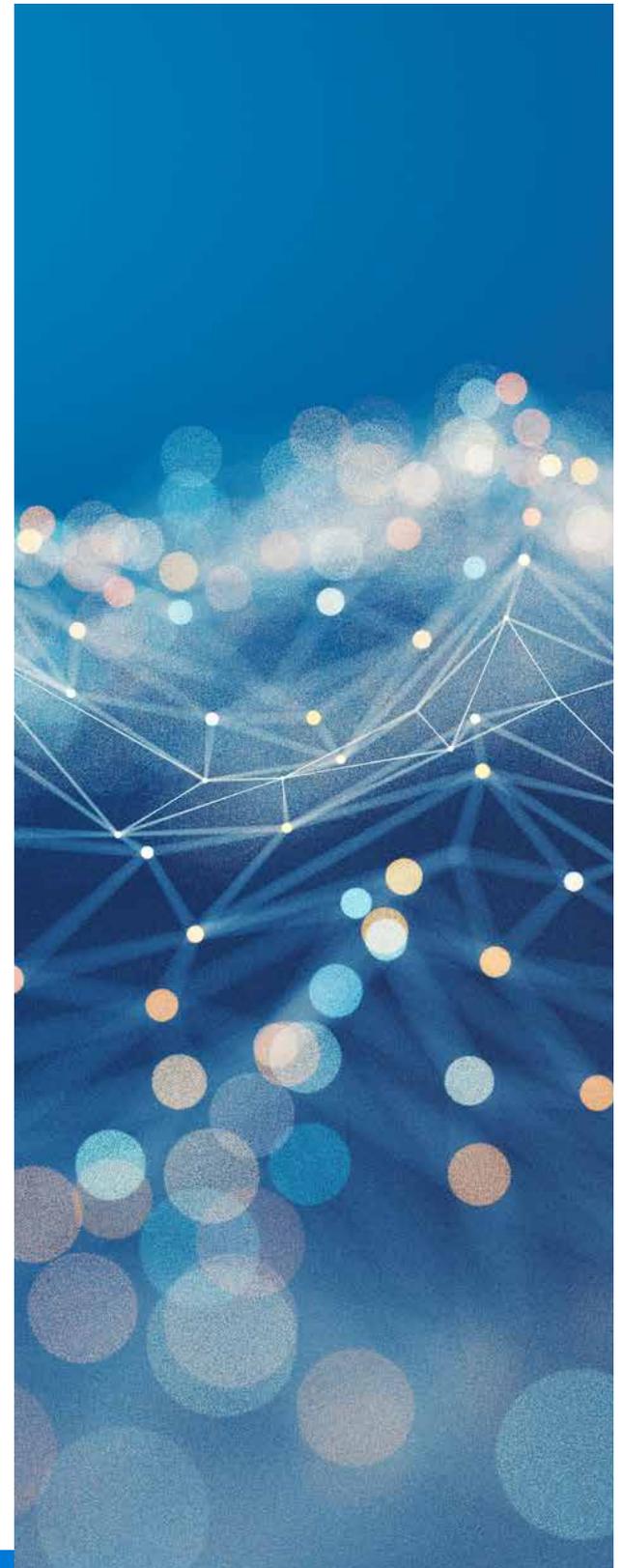
A type of malware that records which keys a user presses. Also known as keystroke logging, this software enables attackers to collect usernames and passwords to log into the target organization's network.

Network scanning

A reconnaissance technique that catalogues the systems that are currently accessible to them, such as the host machines, services, and resources that are active on a network. Attackers then create a target list of interesting systems that they will attempt to access with their newly acquired administrative credentials.

Pass the hash (PtH)

An attacker's technique to use a victim's password's underlying hash (code) to masquerade as that user. The attacker doesn't need to know the actual user credentials to authenticate to a remote server/service.





SOLUTION

A Winning Network Solution

As threats increase in sophistication, many organizations are unable to detect malicious activity and swiftly respond. The reality is, once attackers are in your network or supply chain, they can steal information, breach your corporate privacy policy, destroy your customers' trust, and cause major business disruption.

You can stay ahead with a solution that:

- Detects threats and attacks that have made it past other defenses.
- Provides key information about where and why the attack happened
- Gathers detailed footprints of attacker actions across the organization
- Supplies information about the attack and recommends a response

Comprehensive risk management is a key part of a stronger security strategy. This means understanding the assets you have, the potential risks to those assets, the cost to the company if those assets are leaked, and the controls you have in place to help protect them. You need to understand the vulnerabilities across your company's identity, apps, data, devices, and infrastructure in order to protect against threats and quickly recover. These approaches should be seen as part of the security lifecycle that evaluates risk on an ongoing basis and feeds lessons learned back into the system.

Build a Secure Framework

We recommend betting on these security measures:

Windows Defender Advanced Threat Protection

Collect and analyze behaviors observed on the device—whether in attachments or links included in incoming emails—to detect targeted advanced attacks. Questionable material is not allowed to reach your users, reducing threats to your network. With this rich cloud-based console, you get full visibility into your endpoint security.

Azure Advanced Threat Protection

Detect and investigate advanced attacks and insider threats across your organization and network. Azure Advanced Threat Protection can support the most demanding security analytics workloads for the modern enterprise.

Office 365 Advanced Threat Protection

Protect employee email inboxes in real time against unknown and sophisticated attacks through unsafe attachments and malicious links. All suspicious content goes through a real-time behavioral malware analysis that uses machine learning to detect suspicious activity. And if it detects an unsafe URL, it automatically blocks the site so users cannot access it.

Recipe for success

When choosing a vendor or service provider, ensure their policies and practices are worthy of your trust. First determine the types of services you should outsource, the appropriate level of access, and whether you can use the cloud (instead of a third party). If you determine that the best option is to go with an outside vendor or cloud service provider, diligently review, vet, and scrutinize the potential provider. Find out if they carry insurance in the event disaster strikes.

Ask your potential vendor these questions:

- Do you follow Enhanced Security Administrative Environment (ESAE) best practices?
- Do you enforce restrictions on where Domain Administrator (DA) and Enterprise Administrator (EA) accounts can login?
- Do you use privileged Identity Management for Azure Active Directory?

INDUSTRY PROFILE

Manufacturing

Securing networks and software against cyberattacks and data breaches is essential. But the supply chain is also vulnerable to security risks.

One manufacturer discovered an intrusion into a system the company used to make service-related announcements. Upon investigation, they found that only their customers' email addresses and company names were compromised.

But it gets worse. Since the data loss, several phishing campaigns have mimicked the company's legitimate communications format. Attackers are leveraging the knowledge that captured email accounts have used the service in the past and will be more likely to click links without proper inspection.

To gain an initial foothold, hackers send phishing emails to a small set of executives and their administrative assistants. The email contains a URL to a malicious Word document. Targets who follow the hyperlink, enabling macros, are considered malicious downloaders.

A malicious downloader allows the attacker to install anything on the infected computer. In this particular case, the downloader installed two applications: one that harvested user financial information and another that stole credentials (acting as a keystroke logger). Everything from corporate credentials to social media login information to remote access authorizations were targeted.

Then, the hackers took it a step further. They used a second malicious Word document to leave a backdoor on nearly a thousand systems, including many high-value servers and domain controllers. The attackers used the captured credentials to live off the land.

STAGE 03

Expanding to the Network

At this point, the attacker has gained widespread access to your network by spreading out from an individual workstation or server into as many systems as possible. The attacker may then install a permanent backdoor or alternate mechanism for long-term access to the systems.

The attacker will use tools, such as a type of malware called “implants,” while others may be automated. Some methods can appear more legitimate, such as creating fake accounts and gaining remote access. This lets the attacker get back into the network and live off the land (hide in plain sight in the environment to access various resources). Typically when using implants, attackers have a central command-and-control infrastructure for all the resources they control. They use this to ensure that their foothold throughout the network is up and running correctly. If they see any of their controlled access systematically go offline, they know someone is onto them and can try to reestablish their access and evade detection.

Common Techniques

Botnet

A network of private computers infected with malicious software controlled by a malicious hacker or group who can use it for large-scale attacks.

Command and control (C&C)

Servers and infrastructure are used to control many computers via centralized commands, such as a botnet. The black hat hacker running a botnet C&C is called a botnet controller or botmaster.

Implant

A small, hidden program that an attacker installs on your PC without your knowledge.

Living off the land

A phrase that refers to when attackers rely on native resources (as opposed to malware) to maintain a low profile and wreak havoc on a system.

SOLUTION

Comprehensive Defense Posture

As employees use more devices to get their work done, companies are increasingly more likely to store sensitive data in the cloud, on their devices, and in on-premise file shares. Sometimes, workers may accidentally or inadvertently share sensitive information with others. For this reason, a comprehensive approach to protecting your sensitive data is critical.

Here are four steps to take when considering a stronger defense posture:

- 1 Know where your data lives**
As data travels outside of your company's environment, you need to know where it's being created and shared—whether it's spread out on-premise, geographically, across devices, or in the cloud.
- 2 Determine your data's level of sensitivity**
Whether it happens automatically or manually, applying sensitivity labels and custom controls to data makes it easier for you to reinforce policies and restrict unauthorized user access.
- 3 Apply protective actions**
Once your data's been classified into categories, applying policy rules adds a higher level of protection. You can encrypt files, restrict access, block content sharing, provide end-user notifications, and control data usage across the cloud.
- 4 Regularly monitor data**
Gain visibility into how employees are using and sharing sensitive information so that you can drill into event details, identify high-risk events, and revoke access to documents, data, or apps as necessary.



Protect Sensitive Data

We recommend the following defense mechanisms.

Azure Information Protection

Control and secure email, documents, and sensitive information wherever it's stored or shared, whether across cloud services or in on-premises environments. With Azure Information Protection, you can classify data based on sensitivity, encrypt data and define usage rights, and apply protection without interrupting the workday.

Office 365 Data Loss Protection (DLP)

Keep sensitive information in Office 365 from landing in the wrong hands or being accidentally shared with others. With DLP, you can identify, monitor, and automatically prevent accidentally sharing sensitive information across many locations, help users learn how to stay compliant without interrupting their workflow, and view reports to ensure your organization maintains compliance.

Office 365 Advanced Data Governance

With proactive policy recommendations and automatic data classifications, you can take actions—such as retention and deletion—on data throughout its lifecycle. With Advanced Data Governance, you can apply compliance controls to on-premises data by intelligently filtering and migrating data to Office 365.

Microsoft Cloud App Security

Get deeper visibility, granular data controls, and enhanced threat protection with enterprise-grade security for your cloud apps. Microsoft Cloud App Security enables you to discover and assess risks, protect your information, control access in real time, and detect and protect against threats.

INDUSTRY PROFILE

Shipping

Companies in the shipping and transportation industry should keep a risk-based approach to cybersecurity top-of-mind. For some, it might start with addressing legacy applications and dated systems.

One shipping organization's data was compromised via an internet-accessible legacy web application running on a dated Linux operating system.

Hackers took advantage of the fact that the shipping organization didn't have a centralized monitoring software installed or enabled on their system. Once they gained an initial foothold, they discovered a jump system that wasn't part of the domain: an isolated Windows system in the DMZ. Here, they loaded variants of NBT scanning software and scanned for other Netbios-enabled targets, which eventually provided a pathway to the internal network. They also uploaded additional tools for backdoor persistence.

Once the first domain on the internal network was compromised, attackers harvested domain admin-level credentials and used them to connect to other systems, including a domain controller in two different domains. For one of the domains, anti-virus software blocked attempts to steal all user credentials. But the second domain was not so protected and credentials were stolen, and the attacker covered most of their tracks by modifying the system audit logs.

STAGE 04

Staying for the Short- or Long-Term

Bragging rights, revenge, amusement, money, political espionage, or a passionate commitment to the freedom of information—a hacker's motivation can influence whether they stay for the short- or long-term.

In an advanced persistent threat attack (APT), attackers want to stay on the network long-term, deploying stealthy and continuous processes, such as monitoring and extracting data while remaining undetected for the longest possible time. They'll create accounts for themselves to ensure that they stay on the network and change passwords to evade detection. For the short haul, attackers may take a smash-and-grab approach, breaching a system and taking whatever they can quickly get, with little interest in staying put.

As in stage three, hackers will use implants or bots to create and preserve several ways to get back into the network and hide in the environment. They use a command and control server to ensure their foothold, explore resources, and access channels throughout the network as they please. If they suspect they've been detected, they have the means and resources—like a backdoor—to slip away until the heat dies down and reconstruct their access later.

Common Techniques

Advanced persistent threat (APT)

A targeted attack against a specific entity that tries to avoid detection and steal information over a period of time.

Assume breach mindset

A strategic mindset that business leaders and CISOs adopt, requiring a shift in focus from purely preventive security measures to ongoing detection, response, and recovery from threat occurrences.

Backdoor

An entry point into a system or network that enables continued access.

Smash-and-grab technique

A carefully orchestrated hacking approach where an attacker exploits a system, steals data, then leaves.

SOLUTION

Building Better Security

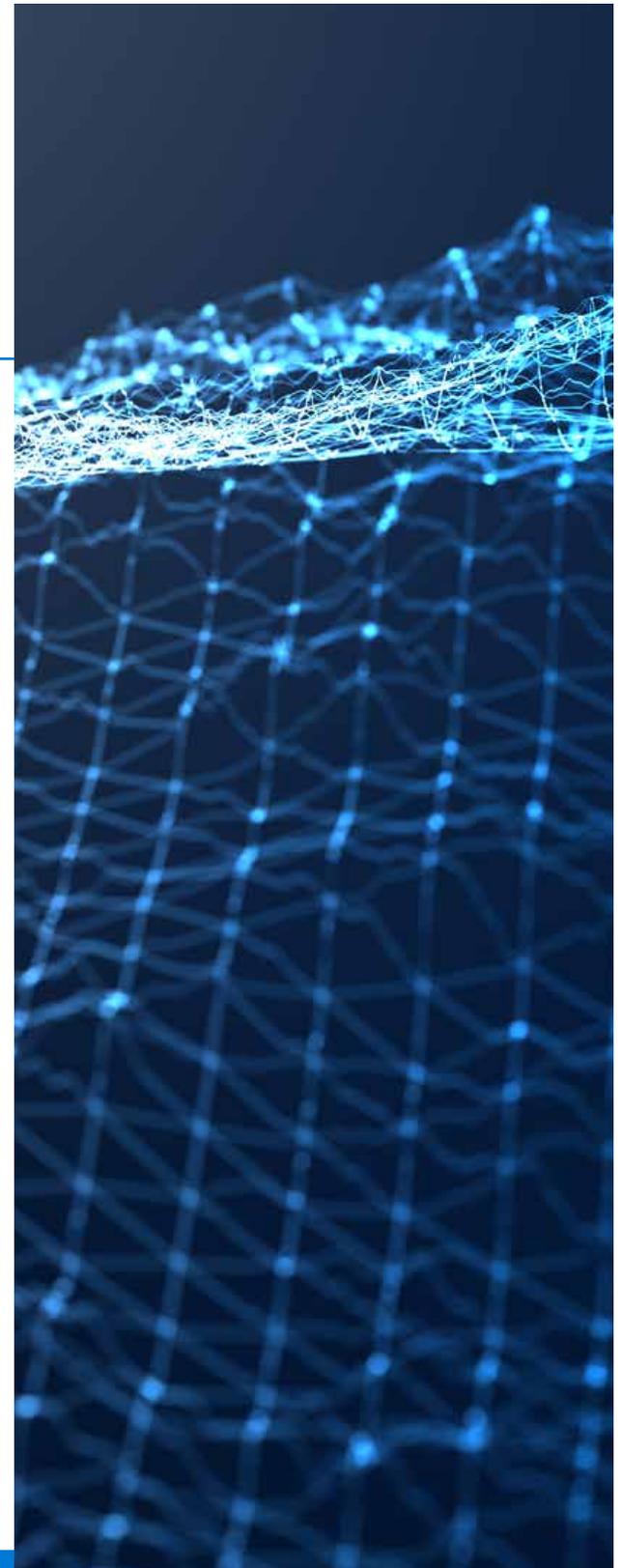
Managing security has never been more complex. Considering multiple point solutions to manage resources across so many environments may seem like a better option, but this often results in less visibility into your entire network's security posture and an inability to correlate incidents to see the bigger picture.

More often than not, maintaining scattered solutions can lead to the most dangerous of these challenges: ineffective responses to threats that grow both in number and sophistication, targeting your organization and your customers. It's a level of risk you need to be prepared for—and can be.

Whether your assets are deployed in the cloud, on-premises, or across a hybrid environment, you need to manage and secure your organization's security across four core components:

1. Identity
2. Devices or endpoints
3. Apps and data
4. Infrastructure

You need visibility, control, and guidance to understand your company's risks, define consistent security policies, and elevate your security strategy through actionable intelligence and recommendations.



We recommend using the following tools to mitigate a short- or long-term attack:**Azure Security Center**

Extend protection across clouds and on-premises datacenters, while empowering IT, ops, and security teams to easily understand your company's security posture and prevent, detect, and respond to threats. With Azure Security Center, you can monitor and assess Azure workloads' and resources' security state, identify vulnerabilities with continuous assessment, and investigate with advanced log analytics.

Azure Backup

Protect your company's data wherever it resides: in your enterprise datacenter, remote and branch offices, or in the public cloud. Get cost-efficiency and minimal maintenance, consistent tools for offsite backups and operational recovery, and unified application availability and data protection.

Windows Defender Security Center

Enable your devices' threat management by combining common Windows security features in one easy-to-use app. The Windows Defender Security Center is a single place to see the status of each of your Windows security features, customize notifications, and get help when a threat is detected.

Office 365 Security & Compliance Center

Manage compliance for all of your organization's data across Office 365. Grant permissions to people who perform compliance tasks like device management, data loss prevention, eDiscovery, retention, and more.

Purchase protection

The best way to prevent hackers from attacking through a remote access connection is to simply ban remote access, but this isn't realistic for many enterprises, including those in retail or online services.

Here are some safer ways to allow vendors to access your network:**Publish via Azure**

Move certain in-house workloads, such as web interface access and backend databases, to a trusted cloud platform as a service (PaaS). The cloud workload can be kept at a minimal level of access to only required data on the in-house network. This method limits the number of users that have direct access to a customer's network, and it reduces the privileges that a user within the network needs to have by limiting access to only required PaaS resources.

Multi-factor authorization (MFA)

Users are required to provide additional verification beyond just a username and password, such as using a phone call or text message to confirm their identity.

Migrate from a remote desktop connection (RDP) server to virtual machines (VMs) in Azure:

Using VMs lets you maintain unique passwords for network segments and control access to information.

INDUSTRY PROFILE

Service Automation

Service automation companies are increasingly becoming a hacker's target, particularly to cause reputational damage or to use as a stepping stone to other organizations.

When a professional service automation organization suspected a potential compromise, an investigation revealed three distinct sets of attack activity on the corporate network using several tools customized for the organization. The attacker leveraged their access along with evidence of potential exfiltration.

Hackers compromised a domain account with local admin privileges for 1,000 machines with the ability to gain access to an additional 50,000 machines. The attackers logged on, installed a remote access tool, and stole credentials— remaining undetected for three months.

Several user systems and domain controllers were controlled by the attacker using a legitimate account via an external VPN connection. Even though this organization didn't consider themselves a target, their lack of focus on secure design and detection allowed attackers to persist through the use of keyloggers to maintain current account access. With these credentials, attackers

used legitimate remote tools to access both the network infrastructure and critical data stores. The lack of detection was proven by the significant amount of commodity malware, ransomware and uncontrolled access. All of this allowed the attacker to easily blend into the environment.

CONCLUSION

Protect, Detect, Respond

Ready to improve your enterprise security posture? We recommend taking a holistic approach. Understand how targeted attacks typically succeed. Recognize that it's not a matter of if—but when—you'll be attacked. Both long-term compromises and short-term attacks to enterprise systems happen regularly, so actively look for them and take steps to mitigate your risk. Know how to quickly and effectively respond to a targeted attack with an incident response strategy.

Keep these four things in mind:

Preparation pays off

Planning for a major incident can reduce company damage, cost, and management difficulty.

Operationalize your incident management processes

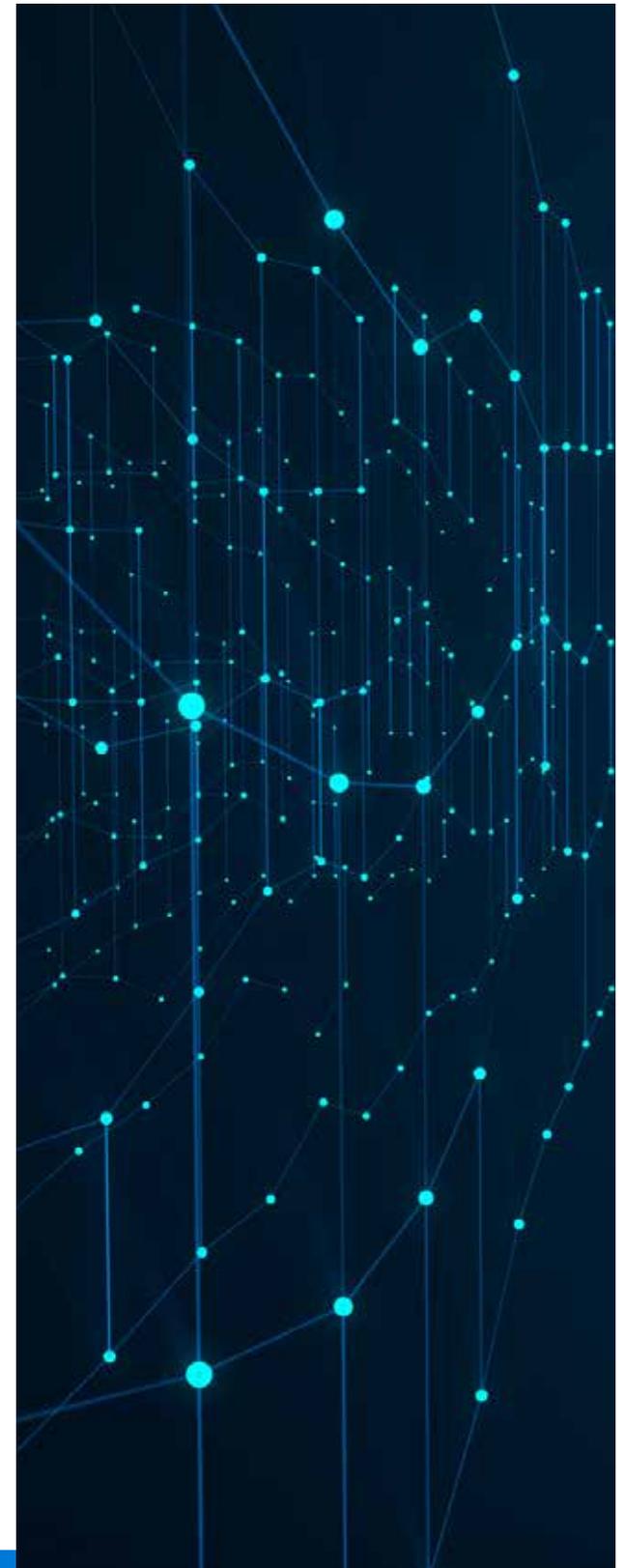
Include major cybersecurity incidents in your standard business risk management processes.

Coordination is critical

Effective cybersecurity incident management requires collaboration and coordination amongst technical, operations, communications, legal, and governance functions.

Stay calm, and do no harm during an incident

Overreacting can be as damaging as underreacting.



We've broken down the strategy into three steps:

01 Protect

Take a risk-management, least-privilege approach. Ask these questions:

- Does this person really need access to that resource?
- Do we know where our data is?
- Do we know who has access to it?
- Are we compliant where necessary?
- Is our software up to date?

02 Detect

Be suspicious, and assume you will be breached. Ask these questions:

- How will we know when a breach happens?
- Do we have the right tools in place to detect a breach?
- Do we have the right tools in place to analyze a breach?

03 Respond

Verify that you have a response process set up with appropriate triggers. Ask these questions:

- How will we respond to a breach?
 - How will we manage damage to assets and our reputation?
 - Do we have a customer communications plan in place?
 - How will we learn from this?
-

Microsoft is committed to supporting organizations that are looking to prevent, detect, and respond quickly to cybersecurity threats.

To learn more about Microsoft security solutions and services, visit www.microsoft.com/secure

For comprehensive guidance on how to reduce your organization's business and security risk during an incident, visit <https://aka.ms/IRRG>

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