

Raytheon Blackbird Technologies

Pony / Fareit PoC Report

For
SIRIUS Task Order PIQUE

Submitted to:
U.S. Government

Submitted by:
Raytheon Blackbird Technologies, Inc.
13900 Lincoln Park Drive
Suite 400
Herndon, VA 20171

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1.0 (U) Analysis Summary

(U) This report satisfies a Proof-of-Concept (PoC) deliverable for May 2015.

(U) The following binaries (labeled by SHA256 hash value) are believed to contain the Pony / Fareit malware.

- e011ffa7bd71d098a032059b10983193fb1df5788f61f317b0f694ee6963d5e4.bin
- f8b2b99e850dff3c838f6d9185e5f01d38dbbb3eade57d14a88357ce77a9da8.bin

(U) Both binaries were obtained from www.kernelmode.info for the purpose of reverse engineering. It is believed that one file contains version 1.9 while the other contains version 2.0. Research was conducted to aid in determining which file corresponded to what version. During this research, the only major difference between versions 1.9 and 2.0 was found to be the inclusion of a Bitcoin Wallet stealing module. Because the changes did not include or omit any functionality critical to the goals for this analysis, the second file was simply chosen at random for analysis.

(U) After reverse engineering the binary, Blackbird believes that the techniques used are not only well-known, but have been implemented in prior work. Additionally, Blackbird believes that the second file is Pony version 2.0 due to the presence of crypto-currency stealing subroutines.

2.0 (U) Detailed Analysis

(U) Pony was heavily obfuscated; the obfuscation was moderately sophisticated. For example, amongst other methods, `jmp` instructions to invalid addresses were inserted in such a way to trick a disassembler into taking all of them. As such, automated stack and function analysis was rendered ineffective. **Figure A** (below) illustrates the disassembly prior to manually correcting the calls while **Figure B** (below) shows the disassembly after correction.

```

.text:0040EFD4 ; 
.text:0040EFD4 ; 
.text:0040EFD4 loc_40EFD4:                                ; CODE XREF: .text:0040F37B4p
.text:0040EFD4                                         ; .text:0040F4E84p
    push    ebp
    mov     ebp, esp
    add     esp, 0FFFFFFE4h
    push    ebx
    push    edi
    xor     edx, eax
    xor     eax, edx
    xor     edx, eax
    push    offset loc_40EFEF
    nop
    clc
    nop
    jb     short near ptr byte_40EFEE
    nop
    retn

.text:0040EFE2 ; 
.text:0040EFE7 ; 
.text:0040EFE8 ; 
.text:0040EFE9 ; 
.text:0040EFEA ; 
.text:0040EFEA loc_40EFEF:                                ; DATA XREF: .text:0040EFE21o
    sub    ebx, ebx
    call   sub_403DF4
    mov    dword ptr [ebp-14h], 0
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-10h]

.text:0040EFEE byte_40EFEE db 0Fh                         ; CODE XREF: .text:0040EFA1j
.text:0040EFEF ; 
.text:0040EFFF ; 
.text:0040EFFF loc_40EFFF:                                ; DATA XREF: .text:0040EFE21o
    sub    ebx, ebx
    call   sub_403DF4
    mov    dword ptr [ebp-14h], 0
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-14h]
    push   eax
    call   loc_401000
    cmp    dword ptr [ebp-14h], 0
    jnz   short loc_40F024
    lea    eax, [ebp-10h]

```

(U) Figure 1: Prior to fixups

```

.text:0040F4A6 ; Attributes: bp-based frame
.text:0040F4A6
.text:0040F4A6 Pony_Main proc near                      ; CODE XREF: start:loc_40F5354p
.text:0040F4A6
.text:0040F4A6 var_8          = dword ptr -8
.text:0040F4A6 var_4          = dword ptr -4
.text:0040F4A6
    push    ebp
    mov     ebp, esp
    add     esp, 0FFFFFF8h
    xor     edx, eax
    xor     eax, edx
    xor     edx, eax
    push    offset loc_40F4BF
    nop
    clc
    nop
    jb     short near ptr byte_40F4BE
    nop
    retn

.text:0040F4BE byte_40F4BE db 0Fh                         ; CODE XREF: Pony_Main+141j
.text:0040F4BF ; 
.text:0040F4BF
    push    offset TopLevelExceptionFilter ; IplopLevelExceptionFilter
    call   SetUnhandledExceptionFilter
    mov    [ebp+var_4], 0
    lea    eax, [ebp+var_4]
    push   eax
    call   init_com_and_load_libs
    call   antiVm_maybe
    push   offset samantha ; "r`loui"
    call   Deobfuscate_String
    call   Begin_WSA_Exfil
    mov    [ebp+var_8], 1
    cmp    dword_41361E, 0
    jz     short loc_40F516
    cmp    dword_413411, 0
    jz     short loc_40F50C
    call   dword_413411

.text:0040F504
.text:0040F506
.text:0040F50C loc_40F50C:                                ; CODE XREF: Pony_Main+5E1j
    mov    hKey, HKEY_CURRENT_USER

```

(U) Figure 2: After fixups

(U) The malware makes use of Run-Time Dynamic Linking to resolve all external dependencies aside from NTDLL and Kernel32 dependencies. After being resolved, the addresses are stored in per module arrays. For example, **Table 1** (below) illustrates all of the functions found within the advapi.dll array.

AllocateAndInitializeSid
CheckTokenMembership
FreeSid
CredEnumerateA
CredFree
CryptGetUserKey
CryptExportKey
CryptDestroyKey
CryptReleaseContext
RevertToSelf
OpenProcessToken
ImpersonateLoggedOnUser
GetTokenInformation
ConvertSidToStringSidA
LogonUserA
LookupPrivilegeValueA
AdjustTokenPrivileges
CreateProcessAsUserA

(U) Table 1: advapi.dll functions

(U) Pony supports stealing the credentials / data of multiple applications. The credentials can be broken down into four distinct categories: web browser data, FTP credentials, crypto-currency wallets, and user certificate store.

(U) The user certificate store is the most important technique. It makes use of the crypt32.dll functions such as CertOpenSystemStore and CertEnumCertificatesInStore. This technique is well known, well understood, and has been implemented in a similar capacity in previous projects. As such, this technique is not recommended for further Proof of Concept (PoC) development.

(U) Based on previous discussions, crypto-currency stealing is not an area of interest and, as such, is not recommended for further investigation or PoC development.

(U) The techniques used for stealing web browser data (e.g., history), FTP credentials, and crypto-currency all appear to involve scanning the file system for specific files and scanning the 32-bit and 64-bit registry hives (when applicable). Due to the argument structure and indirect nature of the function calls, additional analysis is needed to determine the precise method. Despite this, the preponderance of evidence suggests that the techniques are no more complex than what is described above. As such, this technique should be noted for reference, but not pursued for further PoC development.

(U) This preliminary analysis did not conclusively determine whether or not Pony's included dictionary of passwords was used to attempt to crack the above credential stores. While most

dictionary terms are obfuscated with a single one-time pad XOR, a few other more complex obfuscation algorithms were identified.

3.0 (U) Recommendations

(U) Analysis into the Pony / Fareit binary suggests that the technique is well-known and has been implemented in prior work. As such, Blackbird does not recommend continuing with a Proof of Concept based on this credential stealing technique.