module 50251 and the "Qwerty" keylogger

By Costin Raiu, Igor Soumenkov on January 27, 2015. 11:00 am

On January 17 2015, Spiegel.de published an extensive article based on documents obtained from Edward Snowden. At the same time, they provided a copy of a malicious program codenamed "QWERTY" (http://www.spiegel.de/media/media-35668.pdf), supposedly used by several governments in their CNE operations.

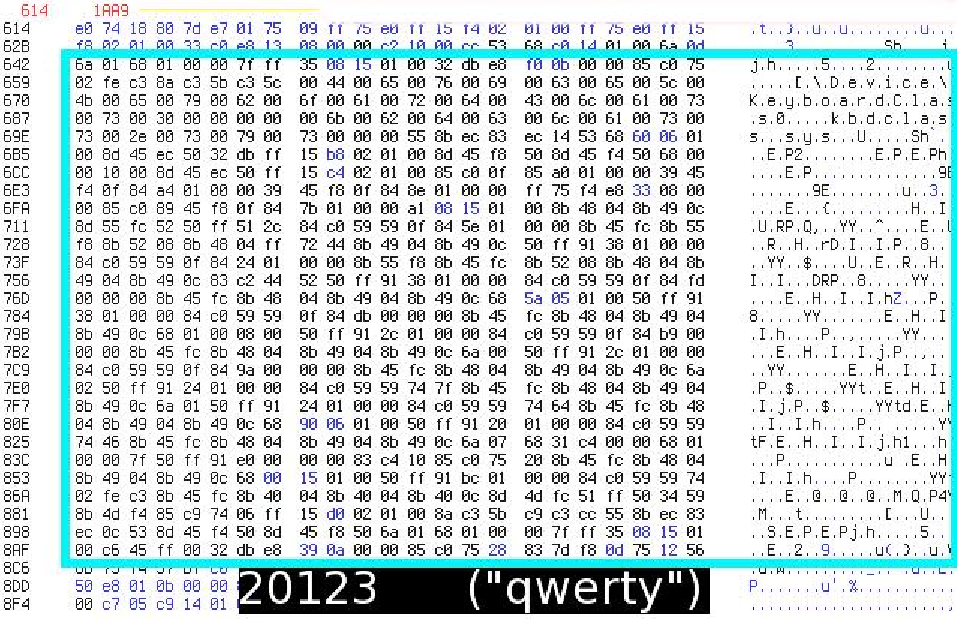
We've obtained a copy of the malicious files published by Der Spiegel and when we analyzed them, they immediately reminded us of Regin. Looking at the code closely, we conclude that the "QWERTY" malware is identical in functionality to the Regin 50251 plugin.

Analysis

The Qwerty module pack consists of three binaries and accompanying configuration files. One file from the package– 20123.sys – is particularly interesting.

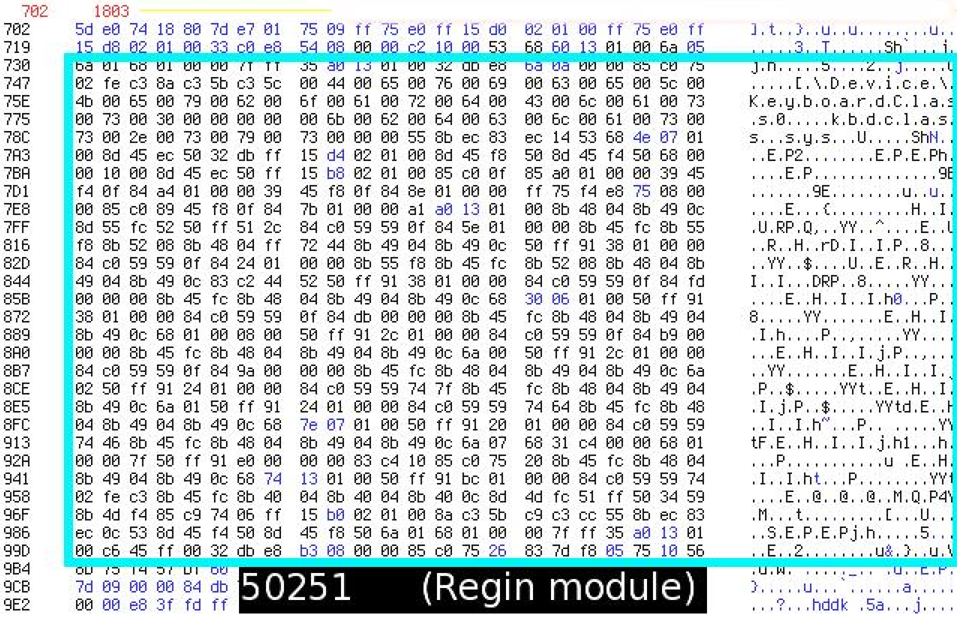
The "20123.sys" is a kernel mode part of the keylogger. As it turns out, it was built from source code that can also be found one Regin module, the "50251" plugin.

Using a binary diff it is easy to spot a significant part of code that is shared between both files:



```
 614     1AA9
614      e0 74 18 80 7d e7 01 75  09 ff 75 e0 ff 15 f4 02  01 00 ff 75 e0 ff 15    .t..}..u..u........u...
62B      f8 02 01 00 33 c0 e8 13  08 00 00 c2 10 00 cc 53  68 c0 14 01 00 6a 0d    .....3..........Sh....j
642      6a 01 68 01 00 00 7f ff  35 08 15 01 00 32 db e8  f0 0b 00 00 85 c0 75    j.h.....5....2........u
659      02 fe c3 8a c3 5b c3 5c  00 44 00 65 00 76 00 69  00 63 00 65 00 5c 00    .....[.\.D.e.v.i.c.e.\
670      4b 00 65 00 79 00 62 00  6f 00 61 00 72 00 64 00  43 00 6c 00 61 00 73    K.e.y.b.o.a.r.d.C.l.a.s
687      00 73 00 30 00 00 00 00  00 6b 00 62 00 64 00 63  00 6c 00 61 00 73 00    .s.0.....k.b.d.c.l.a.s
69E      73 00 2e 00 73 00 79 00  73 00 00 00 55 8b ec 83  ec 14 53 68 60 06 01    s...s.y.s...U.....Sh`.
6B5      00 8d 45 ec 50 32 db ff  15 b8 02 01 00 8d 45 f8  50 8d 45 f4 50 68 00    ..E.P2........E.P.E.Ph
6CC      00 10 00 8d 45 ec 50 ff  15 c4 02 01 00 85 c0 0f  85 a0 01 00 00 39 45    ....E.P..............9E
6E3      f4 0f 84 a4 01 00 00 39  45 f8 0f 84 8e 01 00 00  ff 75 f4 e8 33 08 00    .......9E........u..3.
6FA      00 85 c0 89 45 f8 0f 84  7b 01 00 00 a1 08 15 01  00 8b 48 04 8b 49 0c    ....E...{.........H..I
711      8d 55 fc 52 50 ff 51 2c  84 c0 59 59 0f 84 5e 01  00 00 8b 45 fc 8b 55    .U.RP.Q,..YY..^....E..U
728      f8 8b 52 08 8b 48 04 ff  72 44 8b 49 04 8b 49 0c  50 ff 91 38 01 00 00    ..R..H..rD.I..I.P..8..
73F      84 c0 59 59 0f 84 24 01  00 00 8b 55 f8 8b 45 fc  8b 52 08 8b 48 04 8b    ..YY..$....U..E..R..H.
756      49 04 8b 49 0c 83 c2 44  52 50 ff 91 38 01 00 00  84 c0 59 59 0f 84 fd    I..I...DRP..8.....YY..
76D      00 00 00 8b 45 fc 8b 48  04 8b 49 04 8b 49 0c 68  5a 05 01 00 50 ff 91    ....E..H..I..I.hZ...P.
784      38 01 00 00 84 c0 59 59  0f 84 db 00 00 00 8b 45  fc 8b 48 04 8b 49 04    8.....YY.......E..H..I
79B      8b 49 0c 68 01 00 08 00  50 ff 91 2c 01 00 00 84  c0 59 59 0f 84 b9 00    .I.h....P..,.....YY...
7B2      00 00 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a 00  50 ff 91 2c 01 00 00    ...E..H..I..I.j.P..,...
7C9      84 c0 59 59 0f 84 9a 00  00 00 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a    ..YY.......E..H..I..I.j
7E0      02 50 ff 91 24 01 00 00  84 c0 59 59 74 7f 8b 45  fc 8b 48 04 8b 49 04    .P..$.....YYt..E..H..I
7F7      8b 49 0c 6a 01 50 ff 91  24 01 00 00 84 c0 59 59  74 64 8b 45 fc 8b 48    .I.j.P..$.....YYtd.E..H
80E      04 8b 49 04 8b 49 0c 68  90 06 01 00 50 ff 91 20  01 00 00 84 c0 59 59    ..I..I.h....P.. .....YY
825      74 46 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a 07  68 31 c4 00 00 68 01    tF.E..H..I..I.j.h1...h.
83C      00 00 7f 50 ff 91 e0 00  00 00 83 c4 10 85 c0 75  20 8b 45 fc 8b 48 04    ...P...........u .E..H.
853      8b 49 04 8b 49 0c 68 00  15 01 00 50 ff 91 bc 01  00 00 84 c0 59 59 74    .I..I.h....P.........YYt
86A      02 fe c3 8b 45 fc 8b 40  04 8b 40 04 8b 40 0c 8d  4d fc 51 ff 50 34 59    ....E..@..@..@..M.Q.P4Y
881      8b 4d f4 85 c9 74 06 ff  15 d0 02 01 00 8a c3 5b  c9 c3 cc 55 8b ec 83    .M...t.........[...U..
898      ec 0c 53 8d 45 f4 50 8d  45 f8 50 6a 01 68 01 00  00 7f ff 35 08 15 01    ..S.E.P.E.Pj.h.....5..
8AF      00 c6 45 ff 00 32 db e8  39 0a 00 00 85 c0 75 28  83 7d f8 0d 75 12 56    ..E..2..9.....u(.}..u.V
8C6      8b 75 f4 57 01 c0                                                          .u.W..........._.. .u..E.
8DD      50 e8 01 0b 00 00                                                          P.......u'.%..........
8F4      00 c7 05 c9 14 01                                                          ......................,
```

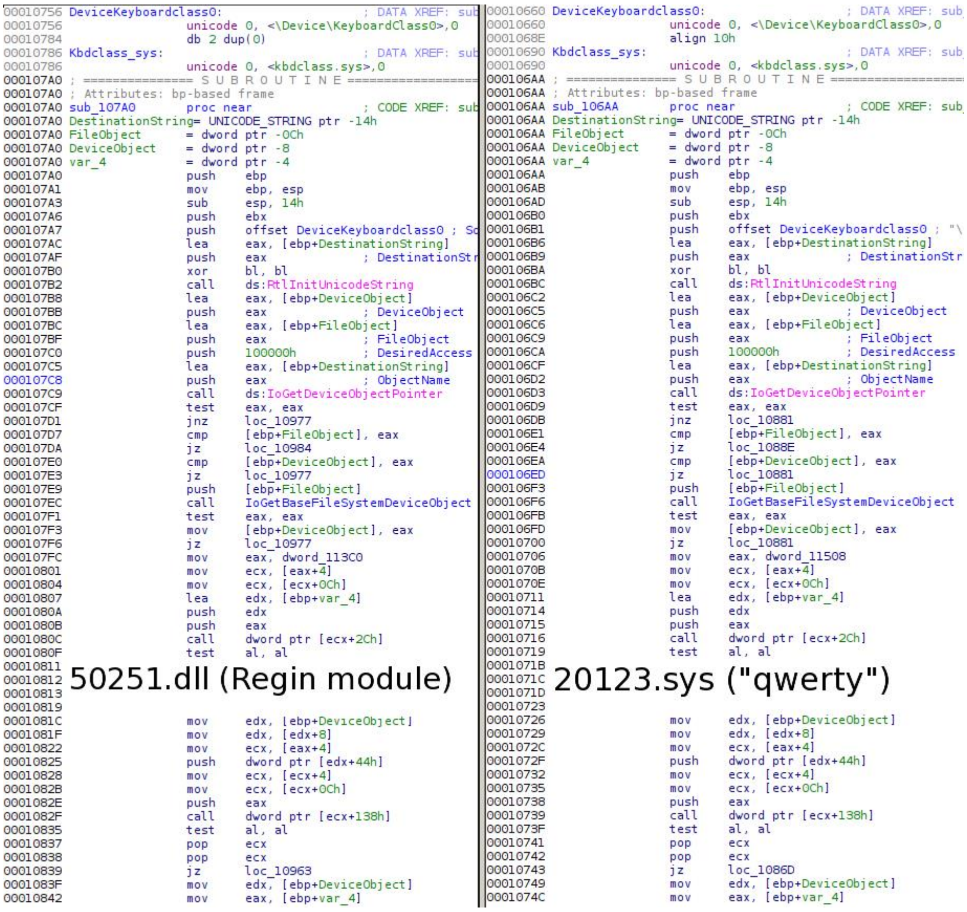
20123 ("qwerty")



```
 702     1803
702      5d e0 74 18 80 7d e7 01  75 09 ff 75 e0 ff 15 d0  02 01 00 ff 75 e0 ff    ].t..}..u..u........u..
719      15 d8 02 01 00 33 c0 e8  54 08 00 00 c2 10 00 53  68 60 13 01 00 6a 05    .....3..T.......Sh`...j.
730      6a 01 68 01 00 00 7f ff  35 a0 13 01 00 32 db e8  6a 0a 00 00 85 c0 75    j.h.....5....2..j.....u
747      02 fe c3 8a c3 5b c3 5c  00 44 00 65 00 76 00 69  00 63 00 65 00 5c 00    .....[.\.D.e.v.i.c.e.\.
75E      4b 00 65 00 79 00 62 00  6f 00 61 00 72 00 64 00  43 00 6c 00 61 00 73    K.e.y.b.o.a.r.d.C.l.a.s
775      00 73 00 30 00 00 00 00  00 6b 00 62 00 64 00 63  00 6c 00 61 00 73 00    .s.0.....k.b.d.c.l.a.s.
78C      73 00 2e 00 73 00 79 00  73 00 00 00 55 8b ec 83  ec 14 53 68 4e 07 01    s...s.y.s...U.....ShN..
7A3      00 8d 45 ec 50 32 db ff  15 d4 02 01 00 8d 45 f8  50 8d 45 f4 50 68 00    ..E.P2........E.P.E.Ph.
7BA      00 10 00 8d 45 ec 50 ff  15 b8 02 01 00 85 c0 0f  85 a0 01 00 00 39 45    ....E.P..............9E
7D1      f4 0f 84 a4 01 00 00 39  45 f8 0f 84 8e 01 00 00  ff 75 f4 e8 75 08 00    .......9E........u..u..
7E8      00 85 c0 89 45 f8 0f 84  7b 01 00 00 a1 a0 13 01  00 8b 48 04 8b 49 0c    ....E...{.........H..I.
7FF      8d 55 fc 52 50 ff 51 2c  84 c0 59 59 0f 84 5e 01  00 00 8b 45 fc 8b 55    .U.RP.Q,..YY..^....E..U
816      f8 8b 52 08 8b 48 04 ff  72 44 8b 49 04 8b 49 0c  50 ff 91 38 01 00 00    ..R..H..rD.I..I.P..8...
82D      84 c0 59 59 0f 84 24 01  00 00 8b 55 f8 8b 45 fc  8b 52 08 8b 48 04 8b    ..YY..$....U..E..R..H.
844      49 04 8b 49 0c 83 c2 44  52 50 ff 91 38 01 00 00  84 c0 59 59 0f 84 fd    I..I...DRP..8.....YY...
85B      00 00 00 8b 45 fc 8b 48  04 8b 49 04 8b 49 0c 68  30 06 01 00 50 ff 91    ....E..H..I..I.h0...P..
872      38 01 00 00 84 c0 59 59  0f 84 db 00 00 00 8b 45  fc 8b 48 04 8b 49 04    8.....YY.......E..H..I.
889      8b 49 0c 68 01 00 08 00  50 ff 91 2c 01 00 00 84  c0 59 59 0f 84 b9 00    .I.h....P..,.....YY....
8A0      00 00 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a 00  50 ff 91 2c 01 00 00    ...E..H..I..I.j.P..,....
8B7      84 c0 59 59 0f 84 9a 00  00 00 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a    ..YY.......E..H..I..I.j
8CE      02 50 ff 91 24 01 00 00  84 c0 59 59 74 7f 8b 45  fc 8b 48 04 8b 49 04    .P..$.....YYt..E..H..I.
8E5      8b 49 0c 6a 01 50 ff 91  24 01 00 00 84 c0 59 59  74 64 8b 45 fc 8b 48    .I.j.P..$.....YYtd.E..H
8FC      04 8b 49 04 8b 49 0c 68  7e 07 01 00 50 ff 91 20  01 00 00 84 c0 59 59    ..I..I.h~...P.. .....YY
913      74 46 8b 45 fc 8b 48 04  8b 49 04 8b 49 0c 6a 07  68 31 c4 00 00 68 01    tF.E..H..I..I.j.h1...h.
92A      00 00 7f 50 ff 91 e0 00  00 00 83 c4 10 85 c0 75  20 8b 45 fc 8b 48 04    ...P...........u .E..H.
941      8b 49 04 8b 49 0c 68 74  13 01 00 50 ff 91 bc 01  00 00 84 c0 59 59 74    .I..I.ht...P.........YYt
958      02 fe c3 8b 45 fc 8b 40  04 8b 40 04 8b 40 0c 8d  4d fc 51 ff 50 34 59    ....E..@..@..@..M.Q.P4Y
96F      8b 4d f4 85 c9 74 06 ff  15 b0 02 01 00 8a c3 5b  c9 c3 cc 55 8b ec 83    .M...t.........[...U...
986      ec 0c 53 8d 45 f4 50 8d  45 f8 50 6a 01 68 01 00  00 7f ff 35 a0 13 01    ..S.E.P.E.Pj.h.....5...
99D      00 c6 45 ff 00 32 db e8  b3 08 00 00 85 c0 75 26  83 7d f8 05 75 10 56    ..E..2........u&.}..u.V
9B4      8b 75 f4 57 01 60                                                          .u.W. .....;_.. .u..E.P.
9CB      7d 09 00 00 84 db                                                          }.....u...`......a.....
9E2      00 00 e8 3f fd ff                                                          ...?...hddk .5a...j....
```

50251 (Regin module)

Most of the shared code belongs to the function that accesses the system keyboard driver:



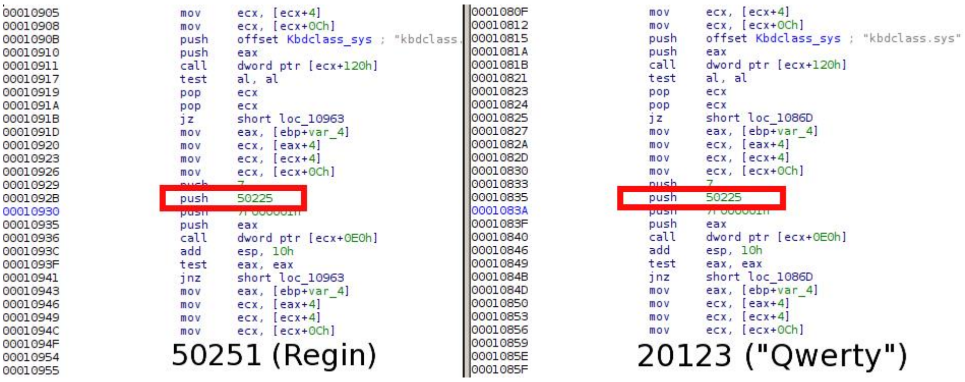
50251.dll (Regin module)

```
00010756 DeviceKeyboardclass0:                      ; DATA XREF: sub
00010756                 unicode 0, <\Device\KeyboardClass0>,0
00010784                 db 2 dup(0)
00010786 Kbdclass_sys:                              ; DATA XREF: sub
00010786                 unicode 0, <kbdclass.sys>,0
000107A0 ; =============== S U B R O U T I N E ===================
000107A0 ; Attributes: bp-based frame
000107A0 sub_107A0       proc near                  ; CODE XREF: sub
000107A0 DestinationString= UNICODE_STRING ptr -14h
000107A0 FileObject      = dword ptr -0Ch
000107A0 DeviceObject    = dword ptr -8
000107A0 var_4           = dword ptr -4
000107A0                 push    ebp
000107A1                 mov     ebp, esp
000107A3                 sub     esp, 14h
000107A6                 push    ebx
000107A7                 push    offset DeviceKeyboardclass0 ; Sc
000107AC                 lea     eax, [ebp+DestinationString]
000107AF                 push    eax                ; DestinationStr
000107B0                 xor     bl, bl
000107B2                 call    ds:RtlInitUnicodeString
000107B8                 lea     eax, [ebp+DeviceObject]
000107BB                 push    eax                ; DeviceObject
000107BC                 lea     eax, [ebp+FileObject]
000107BF                 push    eax                ; FileObject
000107C0                 push    100000h            ; DesiredAccess
000107C5                 lea     eax, [ebp+DestinationString]
000107C8                 push    eax                ; ObjectName
000107C9                 call    ds:IoGetDeviceObjectPointer
000107CF                 test    eax, eax
000107D1                 jnz     loc_10977
000107D7                 cmp     [ebp+FileObject], eax
000107DA                 jz      loc_10984
000107E0                 cmp     [ebp+DeviceObject], eax
000107E3                 jz      loc_10977
000107E9                 push    [ebp+FileObject]
000107EC                 call    IoGetBaseFileSystemDeviceObject
000107F1                 test    eax, eax
000107F3                 mov     [ebp+DeviceObject], eax
000107F6                 jz      loc_10977
000107FC                 mov     eax, dword_113C0
00010801                 mov     ecx, [eax+4]
00010804                 mov     ecx, [ecx+0Ch]
00010807                 lea     edx, [ebp+var_4]
0001080A                 push    edx
0001080B                 push    eax
0001080C                 call    dword ptr [ecx+2Ch]
0001080F                 test    al, al
00010811
00010812
00010813
00010819
0001081C                 mov     edx, [ebp+DeviceObject]
0001081F                 mov     edx, [edx+8]
00010822                 mov     ecx, [eax+4]
00010825                 push    dword ptr [edx+44h]
00010828                 mov     ecx, [ecx+4]
0001082B                 mov     ecx, [ecx+0Ch]
0001082E                 push    eax
0001082F                 call    dword ptr [ecx+138h]
00010835                 test    al, al
00010837                 pop     ecx
00010838                 pop     ecx
00010839                 jz      loc_10963
0001083F                 mov     edx, [ebp+DeviceObject]
00010842                 mov     eax, [ebp+var_4]
```

20123.sys ("qwerty")

```
00010660 DeviceKeyboardclass0:                      ; DATA XREF: sub
00010660                 unicode 0, <\Device\KeyboardClass0>,0
0001068E                 align 10h
00010690 Kbdclass_sys:                              ; DATA XREF: sub
00010690                 unicode 0, <kbdclass.sys>,0
000106AA ; =============== S U B R O U T I N E ===================
000106AA ; Attributes: bp-based frame
000106AA sub_106AA       proc near                  ; CODE XREF: sub
000106AA DestinationString= UNICODE_STRING ptr -14h
000106AA FileObject      = dword ptr -0Ch
000106AA DeviceObject    = dword ptr -8
000106AA var_4           = dword ptr -4
000106AA                 push    ebp
000106AB                 mov     ebp, esp
000106AD                 sub     esp, 14h
000106B0                 push    ebx
000106B1                 push    offset DeviceKeyboardclass0 ; "\
000106B6                 lea     eax, [ebp+DestinationString]
000106B9                 push    eax                ; DestinationStr
000106BA                 xor     bl, bl
000106BC                 call    ds:RtlInitUnicodeString
000106C2                 lea     eax, [ebp+DeviceObject]
000106C5                 push    eax                ; DeviceObject
000106C6                 lea     eax, [ebp+FileObject]
000106C9                 push    eax                ; FileObject
000106CA                 push    100000h            ; DesiredAccess
000106CF                 lea     eax, [ebp+DestinationString]
000106D2                 push    eax                ; ObjectName
000106D3                 call    ds:IoGetDeviceObjectPointer
000106D9                 test    eax, eax
000106DB                 jnz     loc_10881
000106E1                 cmp     [ebp+FileObject], eax
000106E4                 jz      loc_1088E
000106EA                 cmp     [ebp+DeviceObject], eax
000106ED                 jz      loc_10881
000106F3                 push    [ebp+FileObject]
000106F6                 call    IoGetBaseFileSystemDeviceObject
000106FB                 test    eax, eax
000106FD                 mov     [ebp+DeviceObject], eax
00010700                 jz      loc_10881
00010706                 mov     eax, dword_11508
0001070B                 mov     ecx, [eax+4]
0001070E                 mov     ecx, [ecx+0Ch]
00010711                 lea     edx, [ebp+var_4]
00010714                 push    edx
00010715                 push    eax
00010716                 call    dword ptr [ecx+2Ch]
00010719                 test    al, al
0001071B
0001071C
0001071D
00010723
00010726                 mov     edx, [ebp+DeviceObject]
00010729                 mov     edx, [edx+8]
0001072C                 mov     ecx, [eax+4]
0001072F                 push    dword ptr [edx+44h]
00010732                 mov     ecx, [ecx+4]
00010735                 mov     ecx, [ecx+0Ch]
00010738                 push    eax
00010739                 call    dword ptr [ecx+138h]
0001073F                 test    al, al
00010741                 pop     ecx
00010742                 pop     ecx
00010743                 jz      loc_1086D
00010749                 mov     edx, [ebp+DeviceObject]
0001074C                 mov     eax, [ebp+var_4]
```

Most of the “Qwerty” components call plugins from the same pack (with plugin numbers 20121 – 20123), however there is also one piece code that references plugins from the Regin platform. One particular part of code is used in both the “Qwerty” 20123 module and the Regin’s 50251 counterpart, and it addresses the plugin 50225 that can be found in the virtual filesystems of Regin. The Regin’s plugin 50225 is reponisble for kernel-mode hooking.



50251 (Regin)

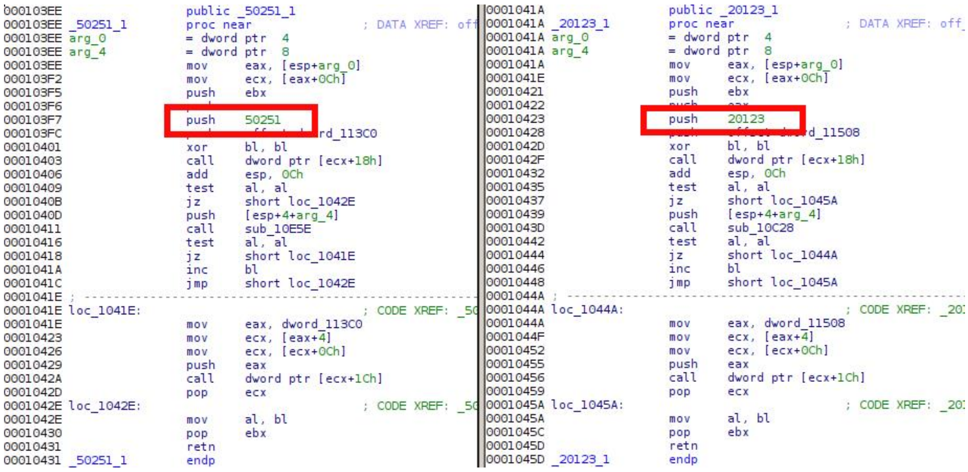
```
00010905                 mov     ecx, [ecx+4]
00010908                 mov     ecx, [ecx+0Ch]
0001090B                 push    offset Kbdclass_sys ; "kbdclass.
00010910                 push    eax
00010911                 call    dword ptr [ecx+120h]
00010917                 test    al, al
00010919                 pop     ecx
0001091A                 pop     ecx
0001091B                 jz      short loc_10963
0001091D                 mov     eax, [ebp+var_4]
00010920                 mov     ecx, [eax+4]
00010923                 mov     ecx, [ecx+4]
00010926                 mov     ecx, [ecx+0Ch]
00010929                 push    7
0001092B                 push    50225
00010930                 push    7F000001h
00010935                 push    eax
00010936                 call    dword ptr [ecx+0E0h]
0001093C                 add     esp, 10h
0001093F                 test    eax, eax
00010941                 jnz     short loc_10963
00010943                 mov     eax, [ebp+var_4]
00010946                 mov     ecx, [eax+4]
00010949                 mov     ecx, [ecx+4]
0001094C                 mov     ecx, [ecx+0Ch]
0001094F
00010954
00010955
```

20123 ("Qwerty")

```
0001080F                 mov     ecx, [ecx+4]
00010812                 mov     ecx, [ecx+0Ch]
00010815                 push    offset Kbdclass_sys ; "kbdclass.sys"
0001081A                 push    eax
0001081B                 call    dword ptr [ecx+120h]
00010821                 test    al, al
00010823                 pop     ecx
00010824                 pop     ecx
00010825                 jz      short loc_1086D
00010827                 mov     eax, [ebp+var_4]
0001082A                 mov     ecx, [eax+4]
0001082D                 mov     ecx, [ecx+4]
00010830                 mov     ecx, [ecx+0Ch]
00010833                 push    7
00010835                 push    50225
0001083A                 push    7F000001h
0001083F                 push    eax
00010840                 call    dword ptr [ecx+0E0h]
00010846                 add     esp, 10h
00010849                 test    eax, eax
0001084B                 jnz     short loc_1086D
0001084D                 mov     eax, [ebp+var_4]
00010850                 mov     ecx, [eax+4]
00010853                 mov     ecx, [ecx+4]
00010856                 mov     ecx, [ecx+0Ch]
00010859
0001085E
0001085F
```

This is a **solid proof that the Qwerty plugin can only operate as part of the Regin platform**, leveraging the kernel hooking functions from plugin 50225.

As an **additional proof that both modules use the same software platform**, we can take a look at functions exported by ordinal 1 of both modules. They contain the startup code that can be found in any other plugin of Regin, and include the actual plugin number that is registered within the platform to allow further addressing of the module. This only makes sense if the modules are used with the Regin platform orchestrator.



```
000103EE                 public _50251_1
000103EE _50251_1        proc near               ; DATA XREF: off
000103EE arg_0           = dword ptr  4
000103EE arg_4           = dword ptr  8
000103EE                 mov     eax, [esp+arg_0]
000103F2                 mov     ecx, [eax+0Ch]
000103F5                 push    ebx
000103F6
000103F7                 push    50251
000103FC                                rd_113C0
00010401                 xor     bl, bl
00010403                 call    dword ptr [ecx+18h]
00010406                 add     esp, 0Ch
00010409                 test    al, al
0001040B                 jz      short loc_1042E
0001040D                 push    [esp+4+arg_4]
00010411                 call    sub_10E5E
00010416                 test    al, al
00010418                 jz      short loc_1041E
0001041A                 inc     bl
0001041C                 jmp     short loc_1042E
0001041E ; ---------------------------------------------------------------
0001041E loc_1041E:                              ; CODE XREF: _50
0001041E                 mov     eax, dword_113C0
00010423                 mov     ecx, [eax+4]
00010426                 mov     ecx, [ecx+0Ch]
00010429                 push    eax
0001042A                 call    dword ptr [ecx+1Ch]
0001042D                 pop     ecx
0001042E loc_1042E:                              ; CODE XREF: _50
0001042E                 mov     al, bl
00010430                 pop     ebx
00010431                 retn
00010431 _50251_1        endp
```

```
0001041A                 public _20123_1
0001041A _20123_1        proc near               ; DATA XREF: off_
0001041A arg_0           = dword ptr  4
0001041A arg_4           = dword ptr  8
0001041A                 mov     eax, [esp+arg_0]
0001041E                 mov     ecx, [eax+0Ch]
00010421                 push    ebx
00010422
00010423                 push    20123
00010428                                d_11508
0001042D                 xor     bl, bl
0001042F                 call    dword ptr [ecx+18h]
00010432                 add     esp, 0Ch
00010435                 test    al, al
00010437                 jz      short loc_1045A
00010439                 push    [esp+4+arg_4]
0001043D                 call    sub_10C28
00010442                 test    al, al
00010444                 jz      short loc_1044A
00010446                 inc     bl
00010448                 jmp     short loc_1045A
0001044A ; ---------------------------------------------------------------
0001044A loc_1044A:                              ; CODE XREF: _20
0001044A                 mov     eax, dword_11508
0001044F                 mov     ecx, [eax+4]
00010452                 mov     ecx, [ecx+0Ch]
00010455                 push    eax
00010456                 call    dword ptr [ecx+1Ch]
00010459                 pop     ecx
0001045A loc_1045A:                              ; CODE XREF: _20
0001045A                 mov     al, bl
0001045C                 pop     ebx
0001045D                 retn
0001045D _20123_1        endp
```

The reason why the two modules have different plugin IDs is unknown. This is perhaps because they are leveraged by different actors, each one with its own allocated plugin ID ranges.

Conclusions

Our analysis of the QWERTY malware published by Der Spiegel indicates it is a plugin designed to work part of the Regin platform. The QWERTY keylogger doesn't function as a stand-alone module, it relies on kernel hooking functions which are provided by the Regin module 50225. Considering the extreme complexity of the Regin platform and little chance that it can be duplicated by somebody without having access to its sourcecodes, we conclude the QWERTY malware developers and the Regin developers are the same or working together.

Another important observation is that Regin plugins are stored inside an encrypted and compressed VFS, meaning they don't exist directly on the victim's machine in "native" format. The platform dispatcher loads and executes there plugins at startup. The only way to catch the keylogger is by scanning the system memory or decoding the VFSes.

Appendix (MD5 hashes):

QWERTY 20123.sys:

```
0ed11a73694999bc45d18b4189f41ac2
```

Regin 50251 plugins:

```
c0de81512a08bdf2ec18cb93b43bdc2d
e9a43ea2882ac63b7bc036d954c79aa1
```

APT KEYLOGGERS TARGETED ATTACKS

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Hausverwaltung Essen

Posted on January 27, 2015. 2:24 pm

Is it just as siple, as it seems???

REPLY

Lecaf@geocities.com

Posted on January 27, 2015. 2:38 pm

Any similarity with bugbear keylogger? Just curious.

REPLY

jashon

Posted on March 21, 2015. 10:19 pm

does this thing affect android 4.1?

REPLY

Erich Vansunn

Posted on May 2, 2017. 8:21 pm

This is astonishing information. It seems, if they put their collective minds to it, they could take over the planet. Reminds me of earlry James Bond and Spectre.

REPLY