

## Deactivate the Rootkit

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## History:

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2004: The BIOS size of 60% of all notebooks suffered an increase of 25Kb

- Fast forward 5 years, 2009:
  - We were trying to install our own BIOS rootkit (Persistent BIOS Infection Talk, CanSecWest / Syscan)
  - We found that there was something already there!





## What is the rootkit?

- Absolute Corp. Computrace, Anti-theft agent
- Option ROM Embedded in Phoenix BIOS
- Agreements with law enforcement agencies.
- Inside notebooks from HP, Dell, Lenovo, Toshiba, Gateway, Asus, Panasonic, and more.

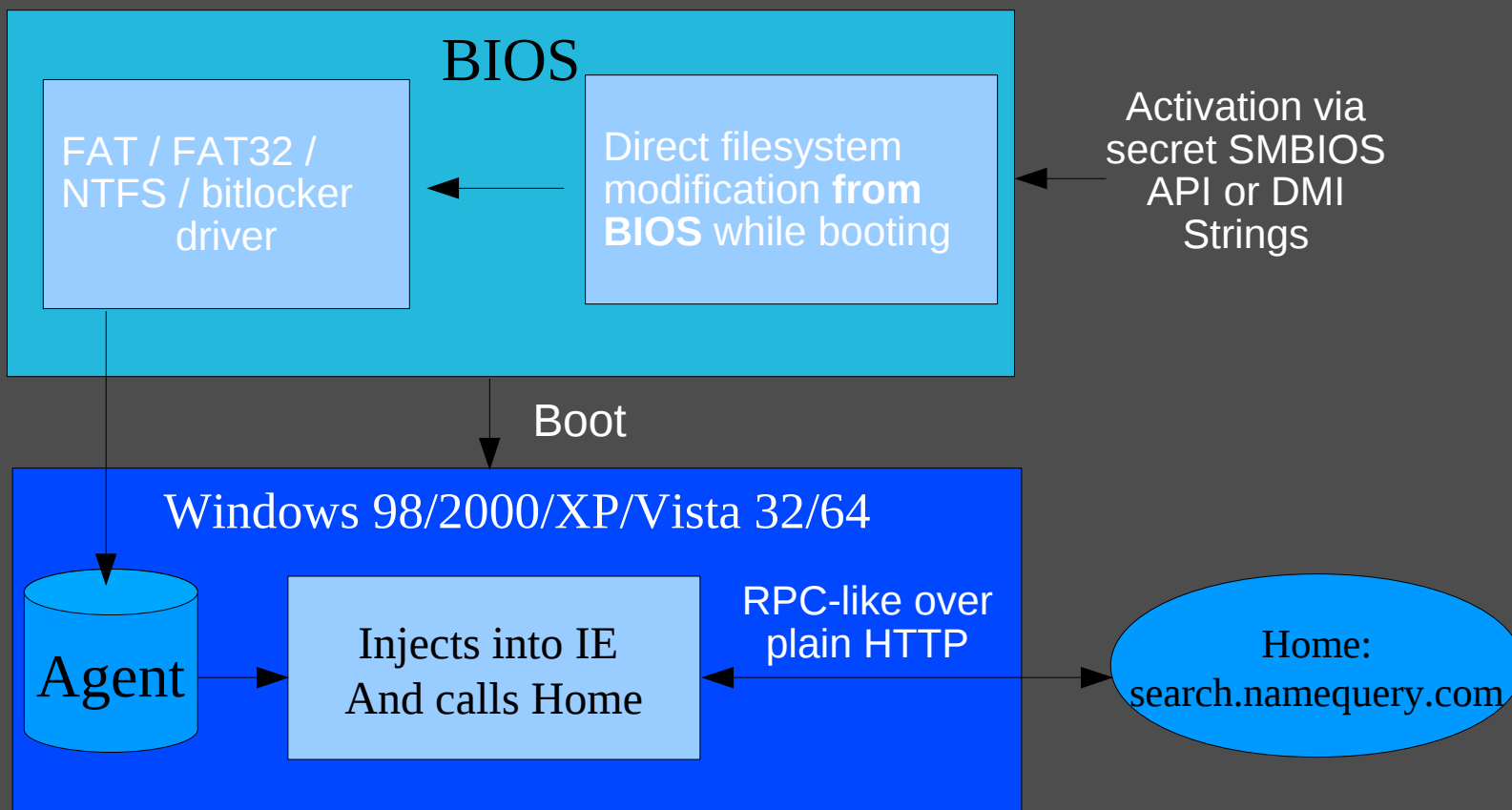
Option ROM header:

```
00000000  55 aa 2a eb 15 43 6f 6d 70 75 54 72 61 63 65 20 |U.*..CompuTrace|
00000010  56 38 30 2e 38 36 36 78 1d 00 e9 5c 01 50 43 49 |V80.866x...\PCI|
00000020  52 17 19 34 12 00 00 18 00 00 06 00 00 2a 00 00 |R..4.....*..|
```



## Basic Inner workings:

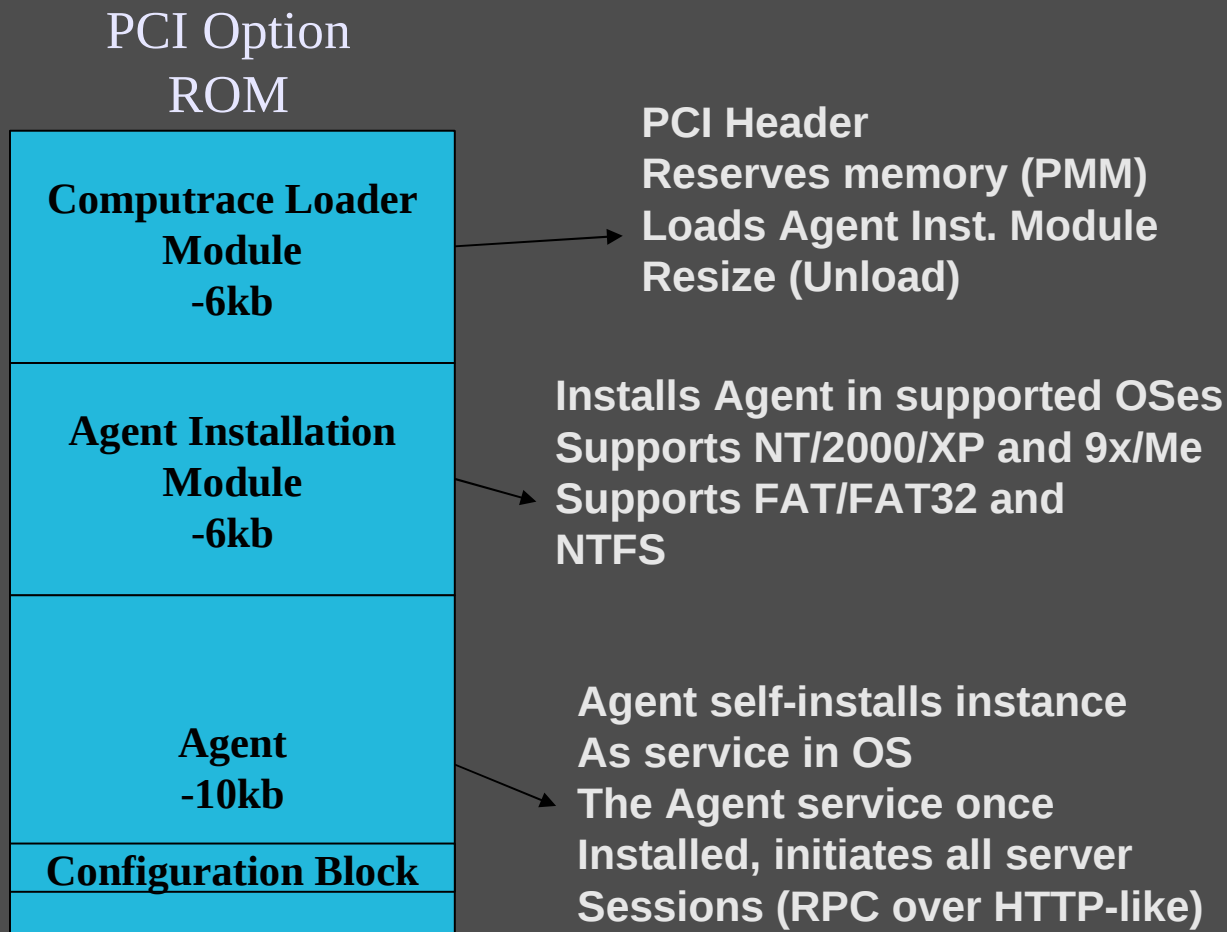
- See patent application US 2006/0272020 A1





## Basic Inner workings:

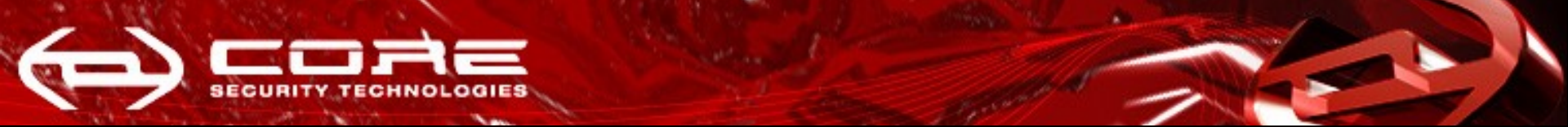
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## Problems found:

- Huge privacy risk (bad/no authentication)
- Anyone could activate it with enough privileges
- Anyone can change the configuration
- Anyone can de-activate it (at least in certain known cases)
- Whitelisted by AV (potentially undetectable)



## More problems found:

- Use of URL instead of IP (hosts redirection)
- Configuration block modification:  
Demo if there is time...

Configuration block XOR 0xB5:

00000000	b1 b7 b5 b5 35 ab b1 b4	b5 f5 b4 aa b1 b5 b5 b5	.....5.....
00000010	b5 a5 bf 41 41 30 49 4e	30 30 30 30 30 95 b1 1f	...AA0IN00000...
00000020	ee 30 86 a0 b1 8b b5 35	b5 ac ae 4a 4a 4a 4a 4a	.0.....5...JJJJJ
00000030	4a 4a 4a 4a 4a 4a 4a 4a	4a 4a 4a 4a 4a 4a 4a 4a	JJJJJJJJJJJJJJJJJ
00000040	4a 4a 4a 4a 4a 4a af b4	35 ae b3 b5 b5 b5 b5 b5	JJJJJJ..5.....
00000050	b5 a8 b7 b5 b5 f3 b3 b5	b5 b5 b5 b5 b5 f2 b3 b5	.....
00000060	b5 b5 b5 b5 b5 fd af 00	50 d1 35 71 17 73 65 61	.....P.5q.sea
00000070	72 63 68 2e 6e 61 6d 65	71 75 65 72 79 2e 63 6f	rch.namequery.co
00000080	6d bf b7 b2 a5 b3 b3 ac	35 b4 b4 b5 b5 b2 b3 b5	m.....5.....
00000090	b5 b5 b5 b5 4a 98 b4 0d	98 b4 0d 9e b1 41 54 44	....J.....ATD
000000a0	54 81 b7 38 2c 80 b7 39	2c 82 b2 39 2c 39 31 38	T..8,..9,..9,918

Stub agent: Unauthenticated BIOS code execution



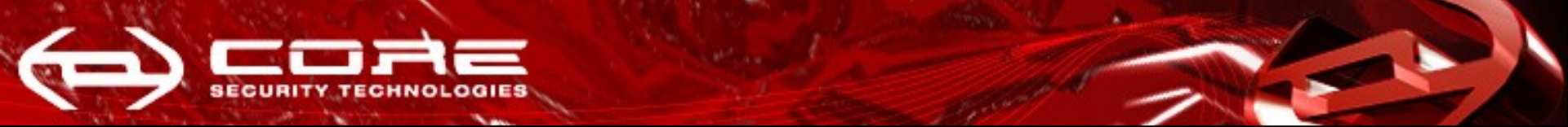
## Second Stage (AIM) loader, Stub Agent (DELL Vostro 1510 Computrace V 70.785)

```

seg000:01CF sub_1CF      proc near          ; CODE XREF: sub_27F+20↓p
seg000:01CF      push  cx
seg000:01D0      pop   es
seg000:01D1      assume es:nothing
seg000:01D1      mov   si, 0BFh ; '+'
seg000:01D4      mov   [si+6], cx
seg000:01D7      mov   dl, 80h ; 'Q'
seg000:01D9      mov   ah, 42h ; 'B'
seg000:01DB      int   13h          ; DISK -
seg000:01DD      push  es
seg000:01DE      pop   ds
seg000:01DF      jnb  short loc_1E2
seg000:01E1      locret_1E1:       ; CODE XREF: sub_1CF+1B↓j
seg000:01E1      ; sub_1CF+72↓j
seg000:01E1      retn
seg000:01E2      ; -----
seg000:01E2      loc_1E2:          ; CODE XREF: sub_1CF+10↑j
seg000:01E2      xor   ecx, ecx
seg000:01E5      loc_1E5:          ; CODE XREF: sub_1CF+2D↓j
seg000:01E5      ; sub_1CF+33↓j ...
seg000:01E5      inc   cl
seg000:01E7      cmp   cl, 3Eh ; '>'
seg000:01EA      ja   short locret_1E1
seg000:01EC      mov   ebx, ecx
seg000:01EF      shl   bx, 9
seg000:01F2      lea  bx, [bx+7E00h]
seg000:01F6      movzx eax, byte ptr [bx]
seg000:01FA      cmp   al, 3Eh ; '>'
seg000:01FC      ja   short loc_1E5
seg000:01FE      loc_1FE:          ; CODE XREF: sub_27F+33↓j
seg000:01FE      ; DATA XREF: sub_27F+30↓o
seg000:01FE      cmp   eax, [bx+4]
seg000:0202      jbe  short loc_1E5
seg000:0204      cmp   ecx, [ebx+eax*4]
seg000:0209      jnz  short loc_1E5
seg000:020B      cmp   eax, [ebx+eax*4+4]
seg000:0211      jnz  short loc_1E5
seg000:0213      mov   dx, [bx+2]
seg000:0216      movzx ebp, byte ptr [bx+1]
seg000:0218      mov   si, bp
seg000:021D      lea  bp, [ebx+ebp*4+4]
seg000:0222      lea  bx, [ebx+eax*4-4]
seg000:0227      mov   di, bx
seg000:0229      sub   di, bp
seg000:022B      shr   di, 2
seg000:022E      add   di, si
seg000:0230      inc   di
seg000:0231      inc   di
seg000:0232      cmp   di, ax
seg000:0234      jnz  short loc_1E5
seg000:0236      shl   edx, 10h
seg000:023A      loc_23A:         ; CODE XREF: sub_1CF+A6↓j
seg000:023A      mov   esi, [bx]
seg000:023D      cmp   esi, 3Eh ; '>'
seg000:0241      ja   short locret_1E1
seg000:0243      shl   si, 9
seg000:0246      lea  si, [si+7E00h]
seg000:024A      mov   di, bx
seg000:024C      sub   di, bp
seg000:024E      shr   di, 2
seg000:0251      dec   di
seg000:0252      shl   di, 9
seg000:0255      lea  di, [di+100h]
seg000:0259      mov   cx, 200h
seg000:025C      loc_25C:         ; CODE XREF: sub_1CF+9F↓j
seg000:025C      lodsb
seg000:025D      xor   dh, al
seg000:025F      mov   ah, 8
seg000:0261      loc_261:         ; CODE XREF: sub_1CF+9C↓j
seg000:0261      shl   dx, 1
seg000:0263      jnb  short loc_269
seg000:0265      xor   dx, 1021h
seg000:0269      loc_269:         ; CODE XREF: sub_1CF+94↑j
seg000:0269      dec   ah
seg000:026B      jnz  short loc_261
seg000:026D      stosb
seg000:026E      loop loc_25C
seg000:0270      sub   bx, 4
seg000:0273      cmp   bx, bp
seg000:0275      jnz  short loc_23A
seg000:0277      shld  eax, edx, 10h
seg000:027C      sub   ax, dx
seg000:027E      retn
seg000:027E      sub_1CF      endp

```





## Detecting the Rootkit Agent

- A single file to look for:
  - system32\rpcnet.exe (Normal Agent)
  - system32\rpcnetp.exe (BIOS Persistent Agent)
- A service called "Remote Procedure Call (RPC) Net" with no description
- Outgoing connections to search.namequery.com (209.53.113.223)
- Our Computrace Option Rom Dumper tool



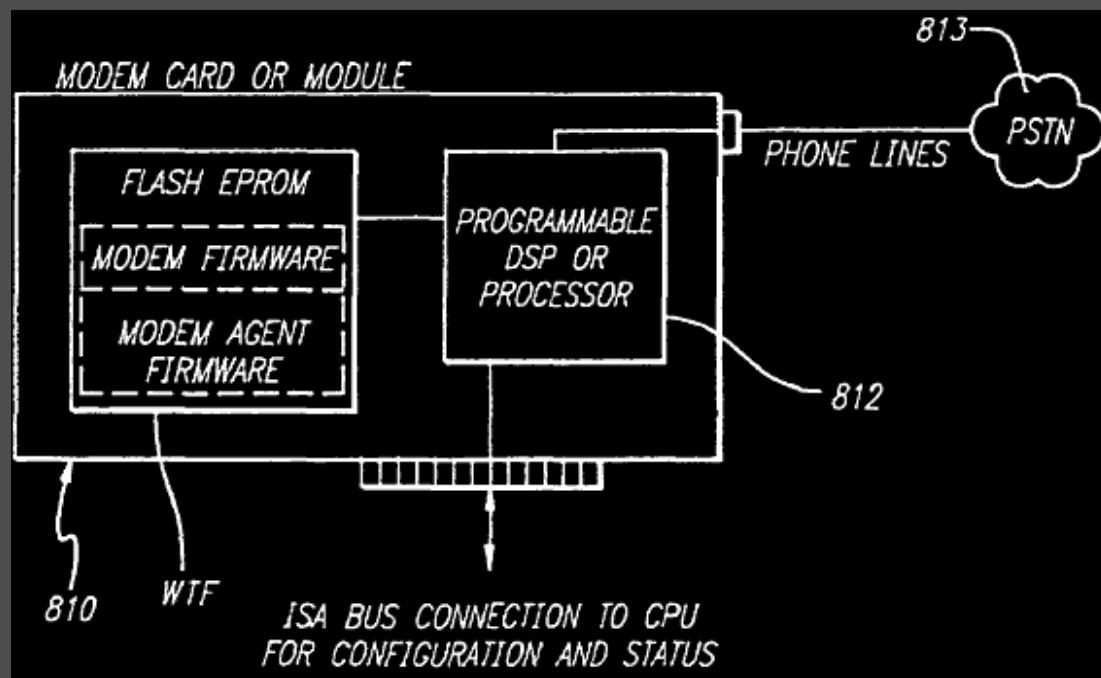
## Deactivating:

- Easiest way: hosts file redirection
- Modifying BIOS (only **unsigned BIOS!**)
- Modifying configuration block (Registry, hard-disk, etc.)
- Modifying nvram, then full HD Wipe.

## The Past:

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- US 6,300,863 B1 Pat. Figure 8A
- Filed Mar 24 **1998**, Absolute Corporation
- Agent inside modem Option ROM
- Support for DOS Backdooring



See "Implementing and Detecting a PCI Rootkit", Heasman, BlackHat **2007**

## The Future:

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- Phoenix Failsafe:
  - Inside SMM, sounds familiar?
  - Always-on OS-independent, Wifi and GPS tracking
  - It has “safe” in the name instead of “trace”
- Intel Anti-theft technology:
  - vPro technology
  - Using AMT secondary processor
  - Works even with the notebook turned off!
- Other security applications residing in BIOS

**Strong authentication:** *“Trust us, is for your own protection”.*

## This is only the beginning

- More research is needed in this area!
- CoreBoot (LinuxBIOS) project, is computrace-free
- Questions?
- Thanks! Now if you'll just look into the light:

