SOPHOS

simple + secure

Fast fingerprinting of OLE2 files:

heuristics for detection of exploited OLE2 files based on specification non-conformance

Fast fingerprinting of OLE2 files

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Fast fingerprinting of OLE2 files

Menu

- What were we trying to achieve?
- How we went about it?
- What we found?
- What happened next?

Fast fingerprinting of OLE2 files

What were we trying to achieve?

- Troj/DocDrop-S
- Binary specification
- Prototyped a non-conformance scanner

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What were we trying to achieve?

- Fast method to hash on files that we wanted to spend time on.
- Differentiate different threats

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How we went about it?

- Read the Microsoft Specifications
- Initially we implemented the detection as an internal detection
- Implemented it in python

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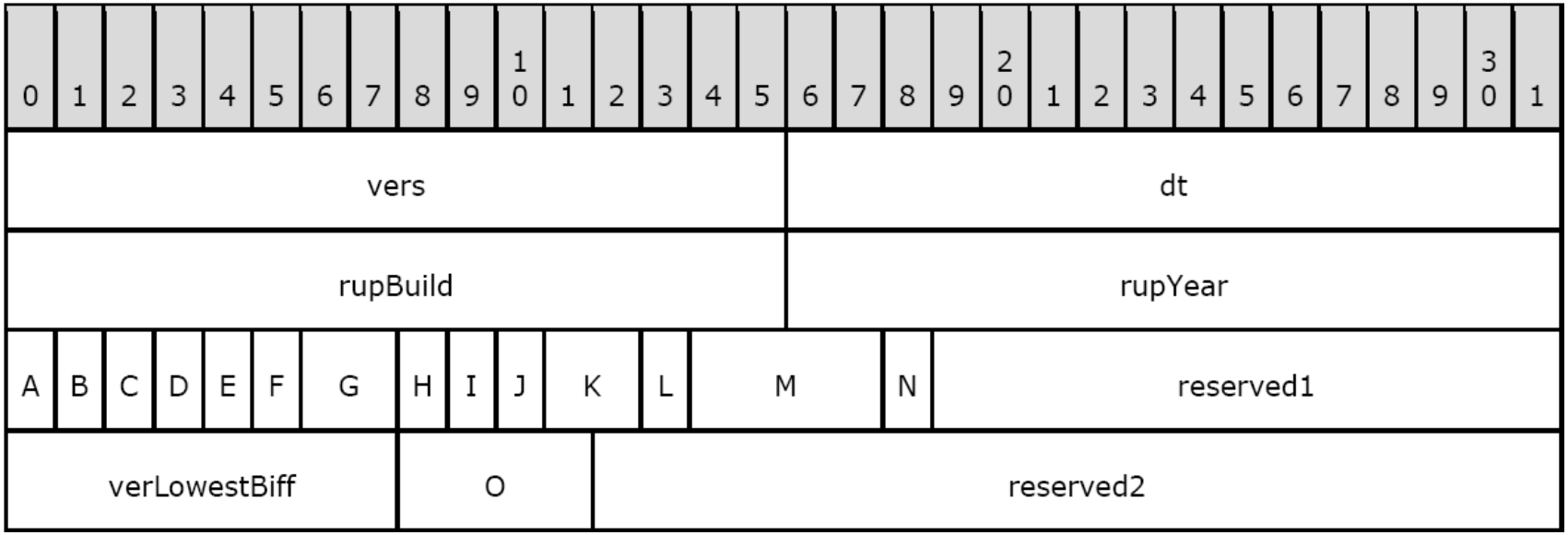
How we went about it?

BOF record – 128 bits



Source: http://msdn.microsoft.com/en-us/library/cc313154%28v=office.12%29.aspx

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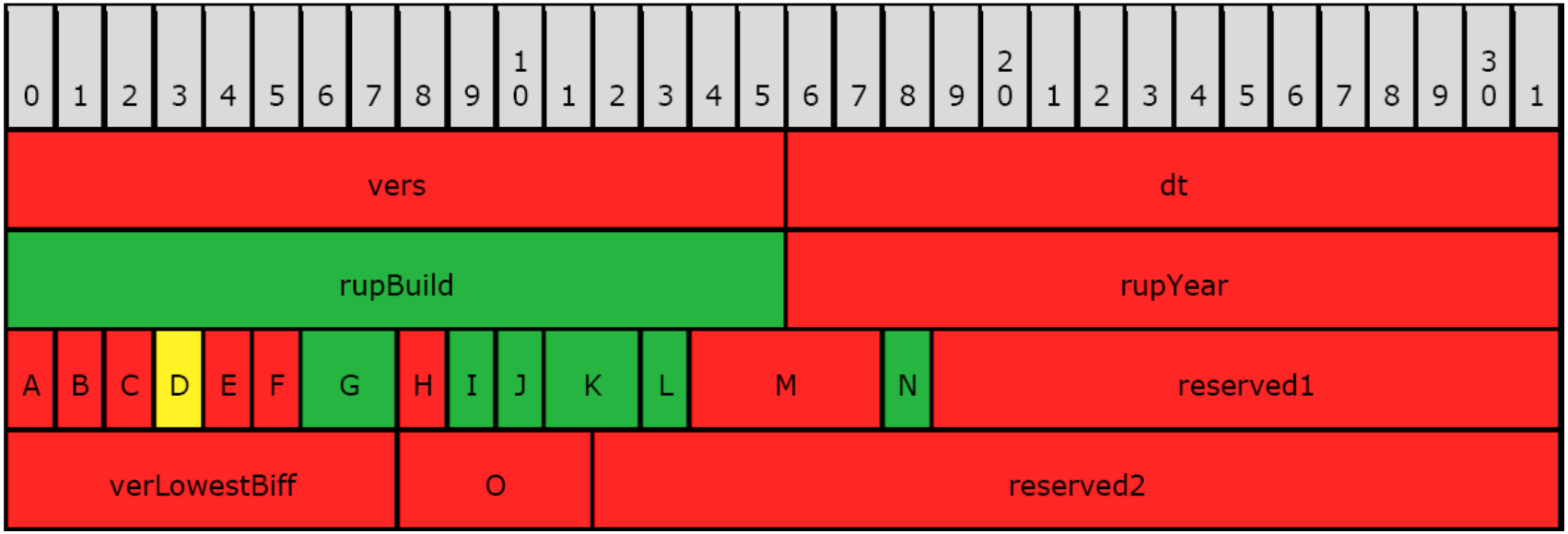
How we went about it?

BOF record – 128 bits : 104 can violate the specification



Source: http://msdn.microsoft.com/en-us/library/cc313154%28v=office.12%29.aspx

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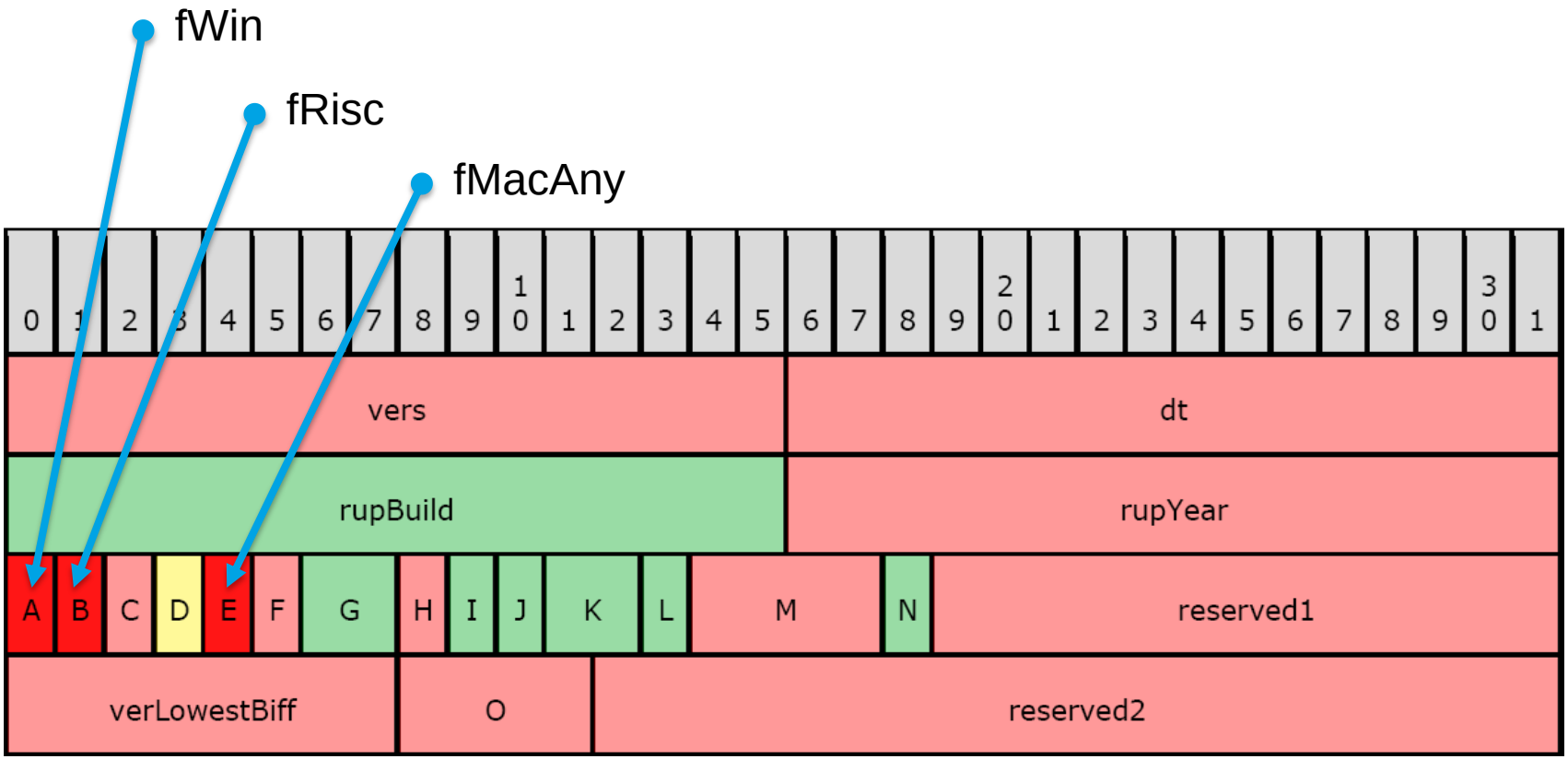
How we went about it?



Source: http://msdn.microsoft.com/en-us/library/cc313154%28v=office.12%29.aspx

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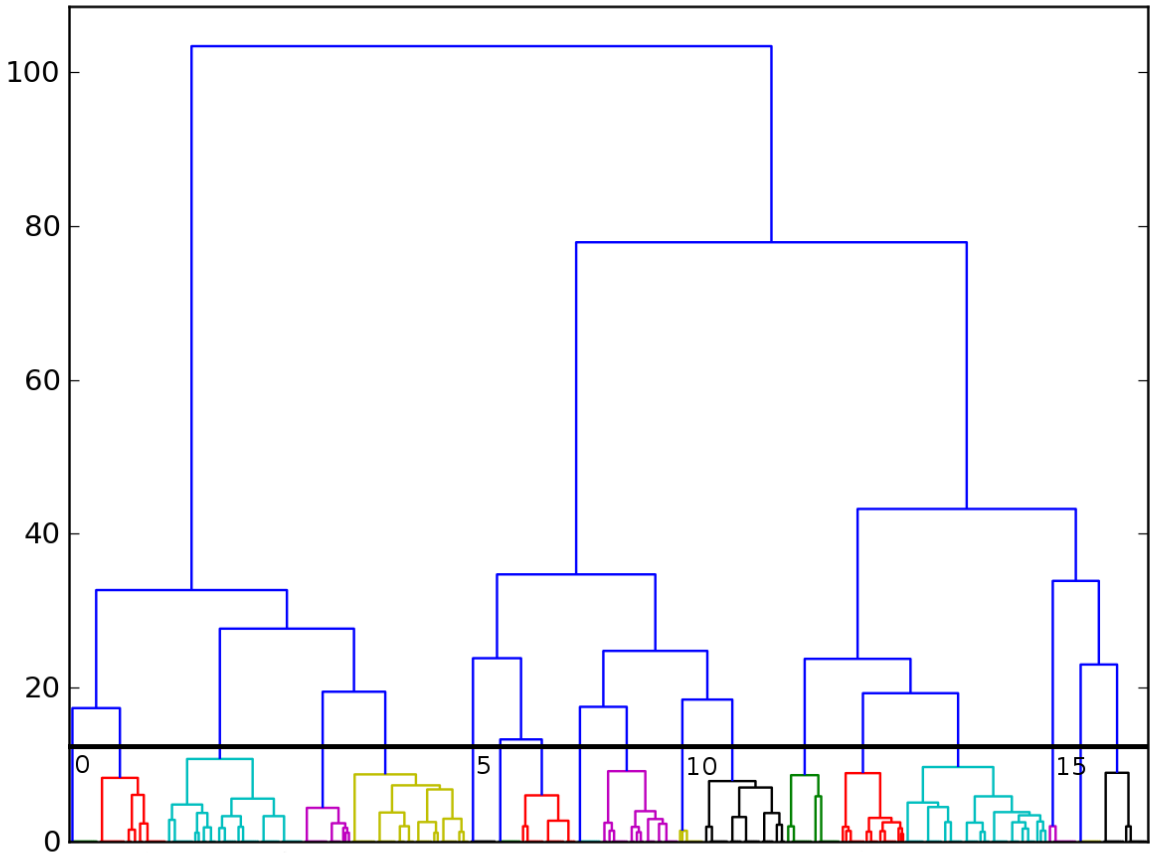
What we found? Clustering



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What we found?

- Troj/DocDrop-S grouped well
- XM97/Hidemod-A also grouped

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What we found? Troj/DocDrop-S

- CVE-2009-3129
- MS09-067
- Interesting sample names
- Some more on my blog

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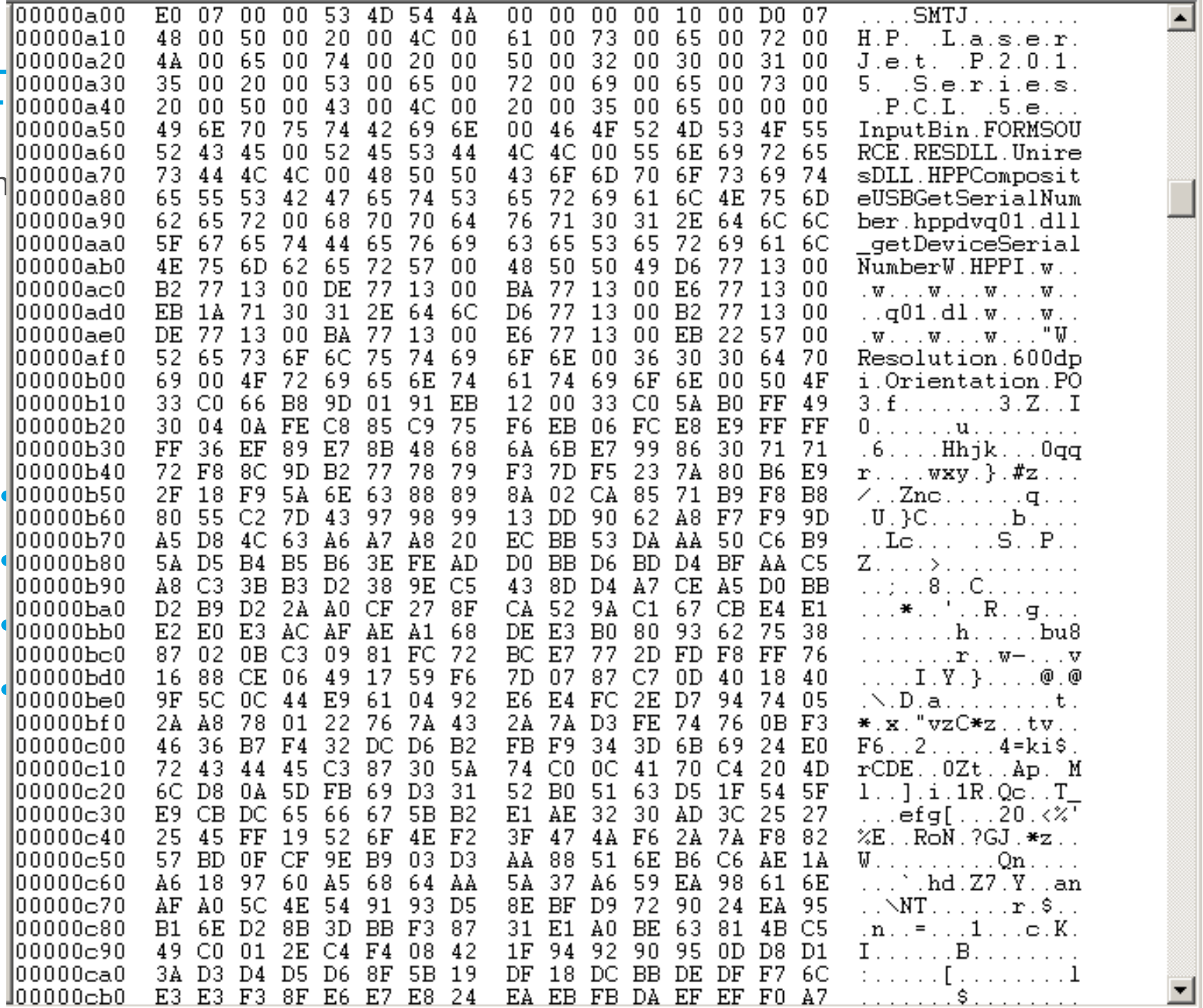

```
00000a00  E0 07 00 00 53 4D 54 4A  00 00 00 00 10 00 D0 07  ....SMTJ........
00000a10  48 00 50 00 20 00 4C 00  61 00 73 00 65 00 72 00  H.P. .L.a.s.e.r.
00000a20  4A 00 65 00 74 00 20 00  50 00 32 00 30 00 31 00  J.e.t. .P.2.0.1.
00000a30  35 00 20 00 53 00 65 00  72 00 69 00 65 00 73 00  5. .S.e.r.i.e.s.
00000a40  20 00 50 00 43 00 4C 00  20 00 35 00 65 00 00 00   .P.C.L. .5.e...
00000a50  49 6E 70 75 74 42 69 6E  00 46 4F 52 4D 53 4F 55  InputBin.FORMSOU
00000a60  52 43 45 00 52 45 53 44  4C 4C 00 55 6E 69 72 65  RCE.RESDLL.Unire
00000a70  73 44 4C 4C 00 48 50 50  43 6F 6D 70 6F 73 69 74  sDLL.HPPComposit
00000a80  65 55 53 42 47 65 74 53  65 72 69 61 6C 4E 75 6D  eUSBGetSerialNum
00000a90  62 65 72 00 68 70 70 64  76 71 30 31 2E 64 6C 6C  ber.hppdvq01.dll
00000aa0  5F 67 65 74 44 65 76 69  63 65 53 65 72 69 61 6C  _getDeviceSerial
00000ab0  4E 75 6D 62 65 72 57 00  48 50 50 49 D6 77 13 00  NumberW.HPPI.w..
00000ac0  B2 77 13 00 DE 77 13 00  BA 77 13 00 E6 77 13 00  .w...w...w...w..
00000ad0  EB 1A 71 30 31 2E 64 6C  D6 77 13 00 B2 77 13 00  ..q01.dl.w...w..
00000ae0  DE 77 13 00 BA 77 13 00  E6 77 13 00 EB 22 57 00  .w...w...w..."W.
00000af0  52 65 73 6F 6C 75 74 69  6F 6E 00 36 30 30 64 70  Resolution.600dp
00000b00  69 00 4F 72 69 65 6E 74  61 74 69 6F 6E 00 50 4F  i.Orientation.PO
00000b10  33 C0 66 B8 9D 01 91 EB  12 00 33 C0 5A B0 FF 49  3.f.......3.Z..I
00000b20  30 04 0A FE C8 85 C9 75  F6 EB 06 FC E8 E9 FF FF  0......u........
00000b30  FF 36 EF 89 E7 8B 48 68  6A 6B E7 99 86 30 71 71  .6....Hhjk...0qq
00000b40  72 F8 8C 9D B2 77 78 79  F3 7D F5 23 7A 80 B6 E9  r....wxy.}.#z...
00000b50  2F 18 F9 5A 6E 63 88 89  8A 02 CA 85 71 B9 F8 B8  /..Znc......q...
00000b60  80 55 C2 7D 43 97 98 99  13 DD 90 62 A8 F7 F9 9D  .U.}C......b....
00000b70  A5 D8 4C 63 A6 A7 A8 20  EC BB 53 DA AA 50 C6 B9  ..Lc... ..S..P..
00000b80  5A D5 B4 B5 B6 3E FE AD  D0 BB D6 BD D4 BF AA C5  Z....>..........
00000b90  A8 C3 3B B3 D2 38 9E C5  43 8D D4 A7 CE A5 D0 BB  ..;..8..C.......
00000ba0  D2 B9 D2 2A A0 CF 27 8F  CA 52 9A C1 67 CB E4 E1  ...*..'..R..g...
00000bb0  E2 E0 E3 AC AF AE A1 68  DE E3 B0 80 93 62 75 38  .......h.....bu8
00000bc0  87 02 0B C3 09 81 FC 72  BC E7 77 2D FD F8 FF 76  .......r..w-...v
00000bd0  16 88 CE 06 49 17 59 F6  7D 07 87 C7 0D 40 18 40  ....I.Y.}....@.@
00000be0  9F 5C 0C 44 E9 61 04 92  E6 E4 FC 2E D7 94 74 05  .\.D.a........t.
00000bf0  2A A8 78 01 22 76 7A 43  2A 7A D3 FE 74 76 0B F3  *.x."vzC*z..tv..
00000c00  46 36 B7 F4 32 DC D6 B2  FB F9 34 3D 6B 69 24 E0  F6..2.....4=ki$.
00000c10  72 43 44 45 C3 87 30 5A  74 C0 0C 41 70 C4 20 4D  rCDE..0Zt..Ap. M
00000c20  6C D8 0A 5D FB 69 D3 31  52 B0 51 63 D5 1F 54 5F  l..].i.1R.Qc..T_
00000c30  E9 CB DC 65 66 67 5B B2  E1 AE 32 30 AD 3C 25 27  ...efg[...20.<%'
00000c40  25 45 FF 19 52 6F 4E F2  3F 47 4A F6 2A 7A F8 82  %E..RoN.?GJ.*z..
00000c50  57 BD 0F CF 9E B9 03 D3  AA 88 51 6E B6 C6 AE 1A  W.........Qn....
00000c60  A6 18 97 60 A5 68 64 AA  5A 37 A6 59 EA 98 61 6E  ...`.hd.Z7.Y..an
00000c70  AF A0 5C 4E 54 91 93 D5  8E BF D9 72 90 24 EA 95  ..\NT......r.$..
00000c80  B1 6E D2 8B 3D BB F3 87  31 E1 A0 BE 63 81 4B C5  .n..=...1...c.K.
00000c90  49 C0 01 2E C4 F4 08 42  1F 94 92 90 95 0D D8 D1  I......B........
00000ca0  3A D3 D4 D5 D6 8F 5B 19  DF 18 DC BB DE DF F7 6C  :.....[........l
00000cb0  E3 E3 F3 8F E6 E7 E8 24  EA EB FB DA EF EF F0 A7  .......$........
```

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Wh

```
00000a00  E0 07 00 00 53 4D 54 4A  00 00 00 00 10 00 D0 07  ....SMTJ........
00000a10  48 00 50 00 20 00 4C 00  61 00 73 00 65 00 72 00  H.P. .L.a.s.e.r.
00000a20  4A 00 65 00 74 00 20 00  50 00 32 00 30 00 31 00  J.e.t. .P.2.0.1.
00000a30  35 00 20 00 53 00 65 00  72 00 69 00 65 00 73 00  5. .S.e.r.i.e.s.
seg000:00000B0E 50                      db  50h ; P
seg000:00000B0F 4F                      db  4Fh ; O
seg000:00000B10                 ; ---------------------------------------
seg000:00000B10 33 C0                   xor  eax, eax
seg000:00000B12 66 B8 9D 01             mov  ax, 19Dh
seg000:00000B16 91                      xchg eax, ecx
seg000:00000B17 EB 12                   jmp  short loc_B2B
seg000:00000B17                 ; ---------------------------------------
seg000:00000B19 00                      db    0
seg000:00000B1A                 ; ---------------------------------------
seg000:00000B1A
seg000:00000B1A                 loc_B1A:                                ;
seg000:00000B1A 33 C0                   xor  eax, eax
seg000:00000B1C 5A                      pop  edx
seg000:00000B1D B0 FF                   mov  al, 0FFh
seg000:00000B1F
seg000:00000B1F                 loc_B1F:                                ;
seg000:00000B1F 49                      dec  ecx
seg000:00000B20 30 04 0A                xor  [edx+ecx], al
seg000:00000B23 FE C8                   dec  al
seg000:00000B25 85 C9                   test ecx, ecx
seg000:00000B27 75 F6                   jnz  short loc_B1F
seg000:00000B29 EB 06                   jmp  short loc_B31
seg000:00000B2B                 ; ---------------------------------------
seg000:00000B2B
seg000:00000B2B                 loc_B2B:                                ;
seg000:00000B2B FC                      cld
seg000:00000B2C E8 E9 FF FF FF          call loc_B1A
seg000:00000B31
seg000:00000B31                 loc_B31:                                ;
00000c90  49 C0 01 2E C4 F4 08 42  1F 94 92 90 95 0D D8 D1  I......B........
00000ca0  3A D3 D4 D5 D6 8F 5B 19  DF 18 DC BB DE DF F7 6C  :.....[........l
00000cb0  E3 E3 F3 8F E6 E7 E8 24  EA EB FB DA EF EF F0 A7  .......$........
```

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What we found? Troj/DocDrop-S

Bit index	Property name	Spec notes	Probable meaning
3	rupYear	"The value MUST be 0x07cc or 0x07cd" "Excel97 writes 0x07cc for rupYear" (1996)	Maps to Excel spec version. Is set to 0x0700 in this instance; 1792!
5	fRisc	"MUST be 0" "last edited on RISC platform"	Unknown. This bit is so commonly set that the given meaning in the spec seems unlikely.
7	fWinAny	"SHOULD be 1"	Flag denoting if the file has ever been edited on Windows.
8	fMacAny	"MUST be 0"	Flag denoting if the file has ever been edited on Mac. Again, this violation is very common, and it would make little sense to have this bit, have Mac products, yet never set it!
11	2nd bit of unused1 field	"Undefined and MUST be ignored"	Unknown.
35	reserved2	20 bits, "MUST be zero"	Unknown. The 20 following bits often have a consistent pattern within a group it is likely these bits are in use and have an undocumented meaning.
38-39	Bits 2-3 of the reserved2 bits	As above	As above

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What we did next?

- Looked at a more robust directory chain parser
- Extended to WordDocument
- …

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What we did next? Extended to WordDocument

- File Information Block (Fib)
- Starts with FibBase
- 32 bytes 12 possible Must and 2 possible Should
- Going further in the docs looks promising

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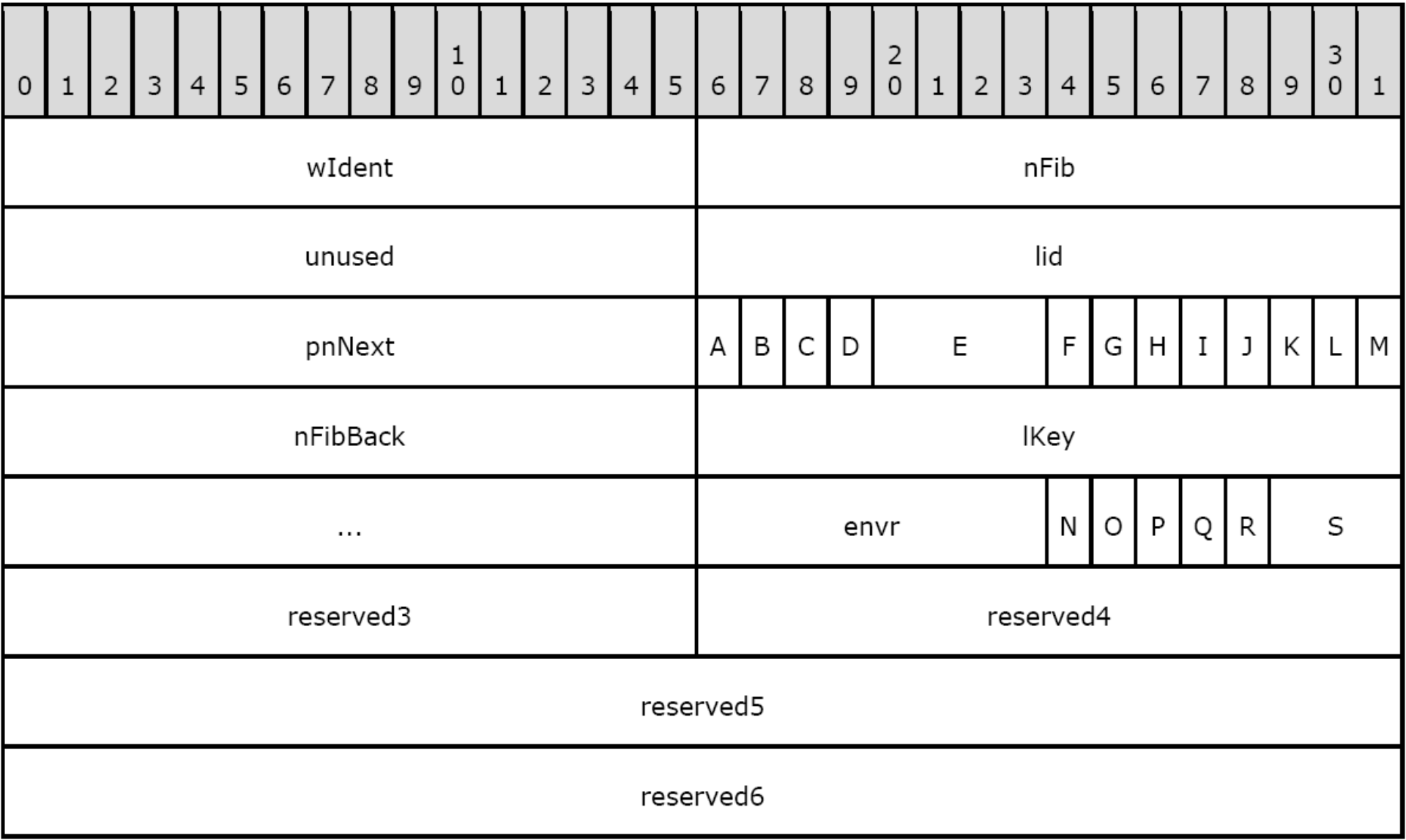
What we did next? Extended to WordDocument



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What we did next? Extended to WordDocument

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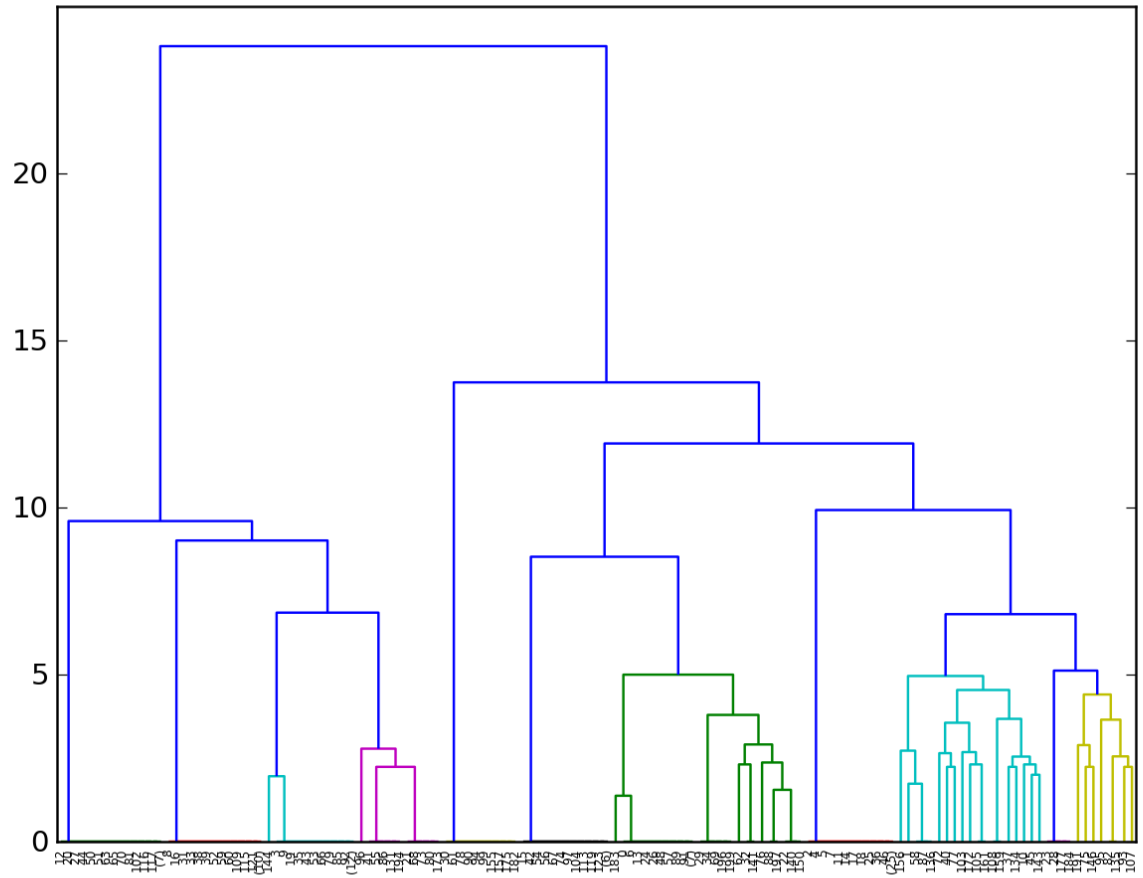
What we did next? WordDocument



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What we did next? WordDocument

- Group 7
- 36 files all same violation
- …

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Conclusion

- Spec violations can provide good grouping.
- Quick/cheap less than 4 loads
- The fingerprints are common over diverse campaigns

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Questions?

- …