# Not so nice after all - Afrodita Ransomware

dissectingmalwa.re/not-so-nice-after-all-afrodita-ransomware.html

#### Thu 09 January 2020 in Ransomware

A new Ransomware strain spread by malicious Office documents targeted at Croatian systems - let's check it out



This strain was first discovered by Korben Dallas on Twitter on the 9th of January. As I already mentioned the Malware is delivered via a Malspam/Maldoc attack crafted for Users / Companies from Croatia. Researchers that were involved in the initial analysis: <u>@KorbenD\_Intel</u>, <u>@James\_inthe\_box</u>, <u>@Malwageddon</u>, <u>@pollo290987</u> and I (<u>@f0wlsec</u>). Thank you for your contributions!

<u>@James\_inthe\_box @malwrhunterteam @Malwageddon</u> 69450923d812f3696e8280508b636955 XLS 12/60 VT scan detections. Not nice.. upped to Malshare: <u>https://t.co/jXxXrJxcB9 pic.twitter.com/TPfP0BCZOB</u>

- Korben Dallas (@KorbenD\_Intel) January 9, 2020

A general disclaimer as always: downloading and running the samples linked below will lead to the encryption of your personal data, so be f\$cking careful. Also check with your local laws as owning malware binaries/ sources might be illegal depending on where you live.

Afrodita @ <u>AnyRun</u> | <u>VirusTotal</u> | <u>HybridAnalysis</u> --> sha256 9b6681103545432cd1373492297a6a12528f327d14a7416c2b71cfdcbdafc90b

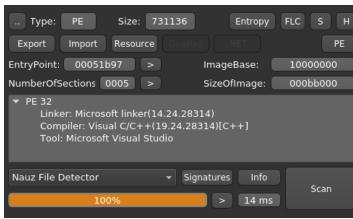
Here you can see three images extracted from the malicious Excel Docs. Funny how they didn't even bother to think of a fake company name for the second Logo :D



Afrodita uses a sleep routine for Sandbox evasion. In my Tests it took 30-60mins until the system was infected.



After unpacking the sample with UPX, *Detect it easy* returns the following:



It was likely build with a very new Version

of Visual Studio (2019)

Below you can see a screenshot of PEBear from the Imports-Tab.

C	Offset	Name	Func. Count	Bound?	OriginalFirs	tTł TimeDateSI	tar Forwarder	NameRVA	FirstThunk
		KERNEL32	110	FALSE		0	0		
		ADVAPI32.dll		FALSE					
sample.exe		RstrtMgr.DLL		FALSE					
e.e		SHELL32.dll		FALSE					
d A		SHLWAPI.dll		FALSE					
sar		USER32.dll		FALSE					
					ADVAPI32.dll	[ 3 entries ]			
c	all via	Name	Or	dinal	Original Thunl		Forwarder		
		CryptReleaseC	ontext -						
		CryptAcquireC	ontextA -						
		CryptGenRand	om -					0	

The extracted strings tell us quite a lot in this case. It looks like the internal name of the Project is *Afrodita* and it utilizes the CryptoPP Library. There are some references to .key files, but I haven't found a path or file on a infected machine yet. **README\_RECOVERY .txt** is will be the filename of the Ransomnote. It's contents are embedded in the binary's .data section with Base64 encoding. Lastly *Afrodita.dll* is the rewritten file that is downloaded as a payload (originally notnice.jpg or verynice.jpg). It's executed via **rundll32.exe Afrodita.dll,Sura**.



The following filetypes will be encrypted by Afrodita:

.TXT, .ZIP, .DAT, .JPE, .JPG, .PNG, .JPEG, .GIF, .BMP, .EXIF, .MP4, .RAR, .M4A, .WMA, .AVI, .WMV, .MKV, .CSV, .M3U, .FLV, .WALLET, .JAVA, .CLASS, .HTML, .HTM, .CSS, .LUA, .ASP, .PHP, .INCPAS, .ASM, .HPP, .CPP, .SLN, .ACCDB, .MDB, .PPTM, .PPTX, .PPT, .XLK, .XLSB, .XLSM, .XLSX, .XLS, .WPS, .DOCM, .DOCX, .DOC, .ODB, .ODC, .ODM, .ODP, .ODS, .ACCDR, .ACCDT, .ACCDE, .D3DBSP, .SIE, .SQL, .BACKUPDB, .BACKUP, .BAK, .SUM, .IBANK, .T13, .T12, .QDF, .GDB, .TAX, .PKPASS, .SLDM, .SLDX, .PPSM, .PPSX, .PPAM, .POTM, .POTX, .PPS, .POT, .XLW, .XLL, .XLAM, .XLA, .XLTM, .XLTX, .XLM, .XLT, .DOTM, .DOTX, .DOT, .BC6, .BC7, .BKP, .QIC, .BKF, .SIDN, .SIDD, .MDDATA, .ITL, .ITDB, .ICXS, .HVPL, .HPLG, .HKDB, .MDBACKUP, .SYNCDB, .GHO, .CAS, .SVG, .MAP, .WMO, .ITM, .FOS, .MOV, .VDF, .ZTMP, .SIS, .SID, .NCF, .MENU, .LAYOUT, .DMP, .BLOB, .ESM, .VCF, .VTF, .DAZIP, .FPK, .MLX, .IWD, .VPK, .TOR, .PSK, .RIM, .W3X, .FSH, .NTL, .ARCH00, .LVL, .SNX, .CFR, .VPP\_PC, .LRF, .MCMETA, .VFS0, .MPQGE, .KDB, .DB0, .DBA, .ROFL, .HKX, .BAR. .UPK, .DAS, .IWI, .LITEMOD, .ASSET, .FORGE, .LTX, .BSA, .APK, .RE4, .SAV, .LBF, .SLM, .BIK, .EPK, .RGSS3A, .PAK, .BIG, .WOTREPLAY, .XXX, .DESC, .P7C, .P7B, .P12, .PFX, .PEM, .CRT, .CER, .DER, .X3F, .SRW, .PEF, .PTX, .R3D, .RW2, .RWL, .RAW, .RAF, .ORF, .NRW, .MRWREF, .MEF, .ERF, .KDC, .DCR, .CR2, .CRW, .BAY, .SR2, .SRF, .ARW, .3FR, .DNG, .CDR, .INDD, .EPS, .PDF, .PDD, .PSD, .DBF, .MDF, .WB2, .RTF, .WPD, .DXG, .DWG, .PST, .ODT, .DXF, .MP3, .MRW, .NEF, .JFIF, .DRF, .BLEND, .APJ, .3DS, .SDA, .PAT, .FXG, .FHD, .DXB, .DRW, .DESIGN, .DDRW, .DDOC, .DCS, .CSL, .CSH, .CPI, .CGM, .CDX, .CDRW, .CDR6, .CDR5, .CDR4, .CDR3, .AWG, .AIT, .AGD1, .YCBCRA, .STX, .ST8, .ST7, .ST6, .ST5, .ST4, .SD1, .SD0, .RWZ, .RA2, .PCD, .NWB, .NOP, .NDD, .MOS, .MFW, .MDC, .KC2, .IIQ, .GRY, .GREY, .GRAY, .FPX, .FFF, .EXF, .DC2, .CRAW, .CMT, .CIB, .CE2, .CE1, .3PR, .MPG, .SQLITEDB, .SQLITE3, .SQLITE, .SDF, .SAS7BDAT, .S3DB, .RDB, .PSAFE3, .NYF, .NX2, .NX1, .NSH, .NSG, .NSF, .NSD, .NS4, .NS3, .NS2, .MYD, .KPDX, .KDBX, .IDX, .IBZ, .IBD, .FDB, .ERBSQL, .DB3, .DB-JOURNAL, .CLS, .BDB, .ADB, .MONEYWELL, .MMW, .HBK, .FFD, .DGC, .DDD, .DAC, .CFP, .CDF, .BPW, .BGT, .ACR, .AC2, .AB4, .DJVU, .SXM, .ODF, .MSG, .STD, .SXD, .OTG, .STI, .SXI, .OTP, .ODG, .STC, .SXC, .OTS, .SXG, .STW, .SXW, .OTH, .OTT

The Ransomware encrypts the first 512 Bytes of the File Header which will render most filetypes useless. It does not leave any Signature in the data of the files and neither does it append a custom extension to the filename.

Jellyfish.jpg 😵						
0000:0000	46 46 41	31 36 42 30	30 43 36 36	34 46 35 46	6FFA16B00C664F5F	
0000:0010 32 3	34 36 42	32 41 44 34	30 30 36 34	30 43 31 43	246B2AD400640C1C	
0000:0020 363	34 44 30	37 39 37 42	45 31 39 39	30 38 45 38	64D0797BE19908E8	
0000:0030 45 4	41 42 38	35 32 36 32	35 31 32 38	36 36 38 37	EAB8526251286687	
0000:0040 314	46 44 45	36 32 46 39	44 41 32 38	38 41 43 44	1FDE62F9DA288ACD	
0000:0050 414	42 37 35	34 46 45 43	41 35 36 42	45 32 30 41	AB754FECA56BE20A	
0000:0060 363	33 46 34	42 45 37 41	33 36 35 30	43 37 39 46	63F4BE7A3650C79F	
0000:0070 334	46 45 43	42 35 43 37	30 38 42 36	35 36 43 32	3FECB5C708B656C2	
0000:0080 393	35 37 33	42 44 46 33	36 45 41 45	41 37 41 38	9573BDF36EAEA7A8	
0000:0090 454	42 32 41	44 35 34 34	36 42 33 44	41 32 35 43	EB2AD5446B3DA25C	
0000:00A0 373	30 41 30	31 33 35 46	43 34 36 45	39 31 44 39	70A0135FC46E91D9	
0000:00B0 38	33 46 34	43 33 32 43	35 30 35 33	31 38 34 30	83F4C32C50531840	
0000:00C0 44	38 35 37	44 39 31 45	37 45 45 30	34 46 38 30	D857D91E7EE04F80	
0000:00D0 334	41 43 33	37 37 34 30	38 32 30 32	39 32 33 33	3AC3774082029233	
0000:00E0 374	42 41 42	37 38 31 37	36 42 36 43	30 42 46 39	7BAB78176B6C0BF9	
0000:00F0 433	30 41 41	33 43 32 30	44 45 36 43	41 32 45 46	C0AA3C20DE6CA2EF	
0000:0100 413	35 32 31	43 45 32 36	38 44 39 33	38 33 44 32	A521CE268D9383D2	
0000:0110 35 3	32 42 37	46 44 44 41	34 31 38 45	36 36 46 38	52B7FDDA418E66F8	
0000:0120 39	31 31 30	34 33 32 41	37 32 32 45	33 45 42 33	9110432A722E3EB3	
0000:0130 <mark>35</mark> 3	30 33 45	39 38 45 35	34 39 44 45	30 32 39 31	503E98E549DE0291	
0000:0140 314	43 41 36	31 38 42 34	36 36 38 37	37 31 34 43	1CA618B46687714C	
0000:0150 <mark>41</mark> 4	42 31 34	31 42 43 46	42 32 31 39	38 31 44 41	AB141BCFB21981DA	
0000:0160 <mark>30</mark> 3	39 33 37	36 44 33 43	42 30 41 35	31 43 30 44	09376D3CB0A51C0D	
0000:0170 43	34 35 44	43 30 46 38	34 42 33 33	30 43 34 46	C45DC0F84B330C4F	
0000:0180 <mark>36</mark> 4	46 39 35	38 33 42 45	46 43 45 41	42 46 31 38	6F9583BEFCEABF18	
0000:0190 384	41 42 32	41 38 39 39	45 38 41 45	31 37 34 36	8AB2A899E8AE1746	
0000:01A0 324	46 34 37	43 42 41 37	46 39 44 41	45 38 30 42	2F47CBA7F9DAE80B	
	31 31 35	33 37 44 31	31 37 37 44	30 37 32 39	F11537D1177D0729	
	45 31 42	46 42 30 41	38 44 37 31	38 37 34 31	4E1BFB0A8D718741	
	43 34 37	45 42 44 38	35 31 32 43	44 44 43 45	6C47EBD8512CDDCE	
	14 38 45	30 42 31 32	30 46 39 35	35 32 34 33	0D8E0B120F955243	
	38 42 44	30 30 32 37	37 30 37 33	36 37 44 30	A8BD0027707367D0	
0000:0200 253		DA BE C5 43	BE B1 33 A0		% <a6ú¾åc¾±3 td="" ß.ïá<=""><td></td></a6ú¾åc¾±3>	
0000:0210 FB	IE ES CE	24 84 9B 89	00 21 DD 87	<u>19 F7 F0 DA</u>	û.åÎ\$!ÝcðÚ	
Offset: 0000:00	00 Sel	ection: 0000	:0000 - 0000	):01FF (512 k	ytes)	OVR

## Another IOC: It creates the following Mutex: 835821AM3218SAZ

```
uint FUN_100151f0(void)
{
    DWORD DVar1;
    CreateMutexW((LPSECURITY_ATTRIBUTES)0x0,1,L"835821AM3218SAZ");
    DVar1 = GetLastError();
    return (uint)(DVar1 == 0xb7);
}
```

## Update 10.01.2020:

The criminals obviously failed to properly display the key / victim ID in the Ransomnote. This was also a problem because the screwed encoding killed this Blogs Atom RSS Feed :D To resolve this issue I removed the malformed section from this page. If you want to have a look at the original note plus a couple of encrypted jpegs, download the <u>zip</u> file.

Also this Malware family isn't as new as I originally thought. According to Michael Gillespie the MalwareHunterTeam found the first Maldoc in Late November. A few days later Checkpoint research found it as well:

<u>#Afrodita</u> Ransomware, appears to be a new strain.
Targeting businesses in Croatia via legitimate looking Excel spreadsheets.
Subject: "Poziv na placanje"
DZ: http://content-delivery[.]in/verynice.jpg
XLSM: 597ec6887f3bcdc5077939bdf1fb69f1
DLL: ebacbff99234887d9f27719e48bafe59 pic.twitter.com/IM0h4fHUDT

— Check Point Research (@CPResearch) December 3, 2019

Today Michael also asked if anyone was able to parse the *main-public.key* because the format seems off. I extracted it from the binary:

000A:9D80 70 63 68 61	72 4E 6F 64	65 40 40 00	24 D3 08 10	pcharNode@@.\$Ó
000A:9D90 00 00 00 00	2E 3F 41 56	70 44 4E 61	6D 65 4E 6F	?AVpDNameNo
000A:9DA0 64 65 40 40	00 00 00 00	24 D3 08 10	00 00 00 00	de@@\$Ó
000A:9DB0 2E 3F 41 56	44 4E 61 6D	65 53 74 61	74 75 73 4E	.?AVDNameStatusN
000A:9DC0 6F 64 65 40	40 00 00 00	24 D3 08 10	00 00 00 00	ode@@\$Ó
000A:9DD0 2E 3F 41 56	70 61 69 72	4E 6F 64 65	40 40 00 00	.?AVpairNode@@
000A:9DE0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9DF0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9E00 00 00 00 00	00 00 00 00	00 00 00 00	01 00 00 00	
000A:9E10 58 00 00 80	18 00 00 80	00 00 00 00	00 00 00 00	x
000A:9E20 00 00 00 00	00 00 01 00	6B 00 00 00	30 00 00 80	k0
000A:9E30 00 00 00 00	00 00 00 00	00 00 00 00	00 00 01 00	
000A:9E40 00 20 00 00	48 00 00 00	70 10 0B 00	24 01 00 00	Hp\$
000A:9E50 00 00 00 00	00 00 00 00	07 00 49 00	44 00 52 00	I.D.R.
000A:9E60 5F 00 52 00	53 00 41 00	00 00 00 00	00 00 00 00	.R.S.A
000A:9E70 30 82 01 20	30 0D 06 09	2A 86 48 86	F7 0D 01 01	0*.H.÷
000A:9E80 01 05 00 03	82 01 0D 00	30 82 01 08	02 82 01 01	
000A:9E90 00 C6 CD B1	91 E1 D1 CA	06 41 BA 91	5C DB E6 7F	.ÆÍ±.áÑÊ.Aº.∖Ûæ.
000A:9EA0 FD D2 E7 31	B5 91 FC D8	97 40 19 8F	D7 44 3B 9D	ýÒç1µ.üØ.@×D;.
000A:9EB0 B1 BF E6 36	83 72 29 3E	78 60 E1 DB	3C FA 5D 8A	±¿æ6.r)>x`áÛ<ú].
000A:9EC0 F6 52 BF AC	4B 5C 83 E3	FD 57 41 E2	19 FF 38 DC	öRį¬K∖.ãýWAâ.ÿ8Ü
000A:9ED0 8C 2E 37 1F	4F 74 <mark>9D</mark> 49	44 2D 3B 6A	F4 40 FC 2E	7.Ot.ID-;jô@ü.
000A:9EE0 A7 AF 9E B3	9A 31 01 72	50 <mark>88</mark> 50 53	EA 65 63 97	§ <sup>-</sup> . <sup>3</sup> .1.rP.PSêec.
000A:9EF0 89 77 A2 AE	5B 67 42 76	FF 27 D2 E0	43 <mark>03</mark> 30 50	.w¢®[gBvÿ'ÒàC.0P
000A:9F00 46 7A 63 26	BD 00 9A 79	04 CD 11 83	E5 70 A8 62	Fzc& <sup>1</sup> 2y.Íåp"b
000A:9F10 DA D1 D3 AD	64 04 07 AB	5D 08 C1 C6	14 12 9E C3	ÚÑÓ.d«].ÁÆÃ
000A:9F20 16 C4 4D 91	7B 17 2A DF	CB 60 7F FB	33 5C F6 A8	.ÄM.{.*ßË`.û3∖ö″
000A:9F30 48 3D 6F B1	29 <mark>88 C1 76</mark>	DC DE 74 E4	69 D6 <mark>0F</mark> 7E	H=o±).ÁvÜÞtäiÖ.∼
000A:9F40 32 EE E9 A5	96 62 68 A4	58 88 B7 CF	E4 68 50 E9	2îé¥.bh¤X.∙ÏähPé
000A:9F50 BB 3A 19 9A	3A EF <mark>9A</mark> CC	F0 8F 06 31	DC F7 77 01	»::ï.Ìð1Ü÷w.
000A:9F60 2A C2 E7 C7	34 87 88 A4	45 37 87 1D	D1 3B BE BA	*ÂçÇ4¤E7Ñ;¾º
000A:9F70 F7 A1 1A 5D	7E BF 70 8A	D1 98 FE 9E	BE 4E 7D E3	÷¡.]~¿p.Ñ.þ.¾N}ã
000A:9F80 63 30 66 10	8F CD 2D D3	E0 2A 9C 34	24 CF 07 40	c0fÍ-Óà*.4\$Ï.@
000A:9F90 FF 02 01 11	00 00 00 00	00 00 00 00	00 00 00 00	ÿ
000A:9FA0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9FB0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9FC0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9FD0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:9FE0 00 00 00 00		00 00 00 00	00 00 00 00	
000A:9FF0 00 00 00 00	00 00 00 00	00 00 00 00	00 00 00 00	
000A:A000 00 10 00 00	64 02 00 00	06 30 26 30	32 30 43 30	d0&020C0
000A:A010 48 30 59 30	5E 30 6C 30	71 30 <mark>7F</mark> 30	84 30 92 30	H0Y0^0l0q0.0.0.0
000A:A020 97 30 A5 30	AA 30 B8 30	BD 30 CB 30	D0 30 DE 30	.0¥0°0,0½0Ë0Đ0Þ0
000A:A030 E3 30 F1 30	F6 30 04 31	09 31 17 31	1C 31 2A 31	ã0ñ0ö0.1.1.1.1*1

A quick look into the <u>CryptoPP Wiki</u> revealed that the key was in raw (uncooked) ASN.1 format (you can identify it by hex 30 82). Using an online ASN.1 decoder (<u>Link</u>) yields us the public key:

# ASN.1 JavaScript decoder Sequence [2 alem] Sequen

#### -----BEGIN RSA PUBLIC KEY-----

MIIBIDANBgkqhkiG9w0BAQEFAAOCAQ0AMIIBCAKCAQEAxs2xkeHRygZBupFc2+Z//dLnMbWR/NiXQBmP 10Q7nbG/5jaDcik+eGDh2zz6XYr2Ur+sS1yD4/1XQeIZ/zjcjC43H090nUlELTtq9ED8Lqevnr0aMQFy UIhQU+plY5eJd6KuW2dCdv8n0uBDAzBQRnpjJr0AmnkEzRGD5XCoYtrR061kBAerXQjBxhQSnsMWxE2R excq38tgf/szXPaoSD1vsSmIwXbc3nTkadYPfjLu6aWWYmikWIi3z+RoU0m70hmaOu+azPCPBjHc93cB KsLnxzSHiKRFN4cd0Tu+uvehGl1+v3CK0Zj+nr50feNjMGYQj80t0+AqnDQkzwdA/wIBEQ== -----END RSA PUBLIC KEY-----

## **MITRE ATT&CK**

- T1179 --> Hooking --> Persistence
- T1179 --> Hooking --> Privilege Escalation
- T1045 --> Software Packing --> Defense Evasion
- T1179 --> Hooking --> Credential Access
- T1114 --> Email Collection --> Collection

## IOCs

#### Afrodita

notnice.jpg --> SHA256: 9b6681103545432cd1373492297a6a12528f327d14a7416c2b71cfdcbdafc90b SSDEEP: 6144:EXrm0zIiAhjC7Cqa5ZhiIJDQ13Xdksm1Cx2tJk:EbNQaCq6iIJcdksmJtJ

### **Payload Servers**

hxxp://riskpartner[.]hr/wp-content/notnice.jpg hxxp://content-delivery[.]in/verynice.jpg

#### E-Mail Addresses / Contact

#### Ransomnote

~~~ Greetings ~~~

```
[+] What has happened? [+]
```

Your files are encrypted, and currently unavailable. You are free to check. Every file is recoverable by following our instructions below.

Encryption algorithms used: AES256(CBC) + RSA2048 (military/government grade).

[+] Guarantees? [+]

This is our daily job. We are not here to lie to you - as you are 1 of 10000's. Our only interest is in us getting payed and you getting your files back.

If we were not able to decrypt the data, other people in same situation as you wouldn't trust us and that would be bad for our buissness --So it's not in our interest.

To prove our ability to decrypt your data you have 1 file free decryption.

If you don't want to pay the fee for bringing files back that's okey, but remeber that you will lose a lot of time - and time is money.

Don't waste your time and money trying to recover files using some file recovery "experts", we have your private key - only we can get the files back.

With our service you can go back to original state in less then 30 minutes.

[+] Service [+]

If you decided to use our service please follow instructions below.

Contact us:

Install Telegram(available for Windows, Android, iOS) and contact us on chat: Telegram contact: https://t.me/RecoverySupport

Also available at email afroditateam@tutanota.com cc: afroditasupport@mail2tor.com

Make sure you are talking with us and not impostor by requiring free 1 file decryption to make sure we CAN decrypt!!

[Removed victim ID because it breaks the RSS Feed :D]

Title Image by Robert Drózd, modified