Brief analysis of Redaman Banking Malware (v0.6.0.2) Sample

peppermalware.com/2019/11/brief-analysis-of-redaman-banking.html

Redaman is a well-known banking malware, discovered around 2015. Recently I have been analyzing a recent version of the malware (0.6.0.2, not sure if latest version, probably one of the newest). This malware uses some interesting tricks probably introduced in these recent versions. In this post I share some notes about the analysis.

- **Original Packed Sample:** 2b251483ed7705c60ee12b561280a1fc
- **Unpacked Sample (dll):** 2a298a650b50eb89041548e57d72f726
- **Virustotal First Submission:** 2019-10-11 10:35:13
- **Related links:**

Analysis

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1. Anti-analysis tricks

1.1. C2 encoded into bitcoin transactions

This trick, discovered by checkpoint and explained in this post, is really interesting. The malware gets the C2 addresses from the bitcoin blockchain. The malware doesn't carry C2 addresses into the binary. It carries (in the list of encrypted strings) some urls of some services offering APIs related to bitcoin blockchain:

- "**viabtc.com**"
  "/res/btc/transactions/addressv2?address="
- "**api.blockcypher.com**"
  - "/v1/btc/main/addrs/"
  - "?limit=10"
- "**blockchain.info**"
  "/rawaddr/"
- "**blockchain.coinmarketcap.com**"
  - "/api/address?address="
  - "&symbol=BTC&start=1&limit=10"

Additionally, it carries another encrypted string with the C2 schema, a bitcoin address and the C2 uri:

"http://**1N9ALZUgqYzFQGDXvMY5j1c7PGMMGYqUde**/index.php"

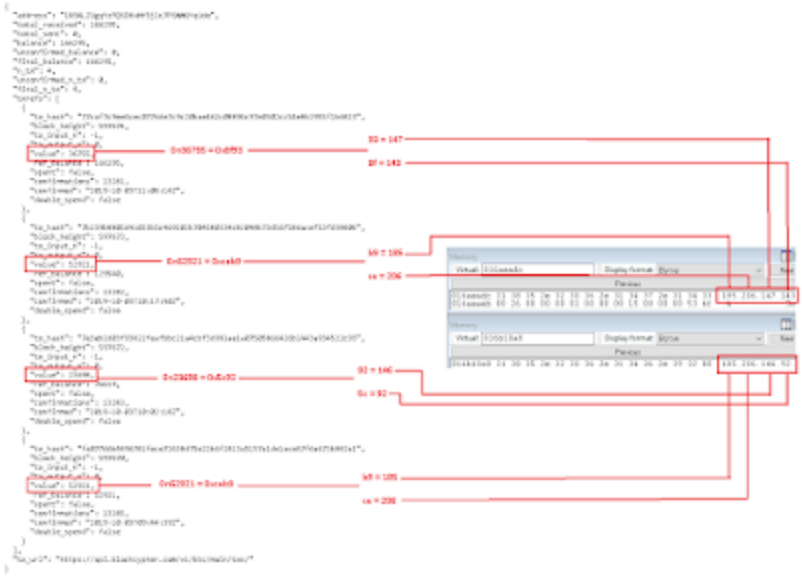
Then, the malware composes the blockchain API url, and queries the transactions for the given bitcoin address, for example:

https://api.blockcypher.com/v1/btc/main/addrs/1N9ALZUgqYzFQGDXvMY5j1c7PGMMGYqUde?limit=10

(Find a copy of the json response here: https://pastebin.com/rC9pF2F2)

The malware uses some fields of this json response (exactly the values of the transactions) to compose the C2 addresses, as explained in the following image (click on the image to

expand):



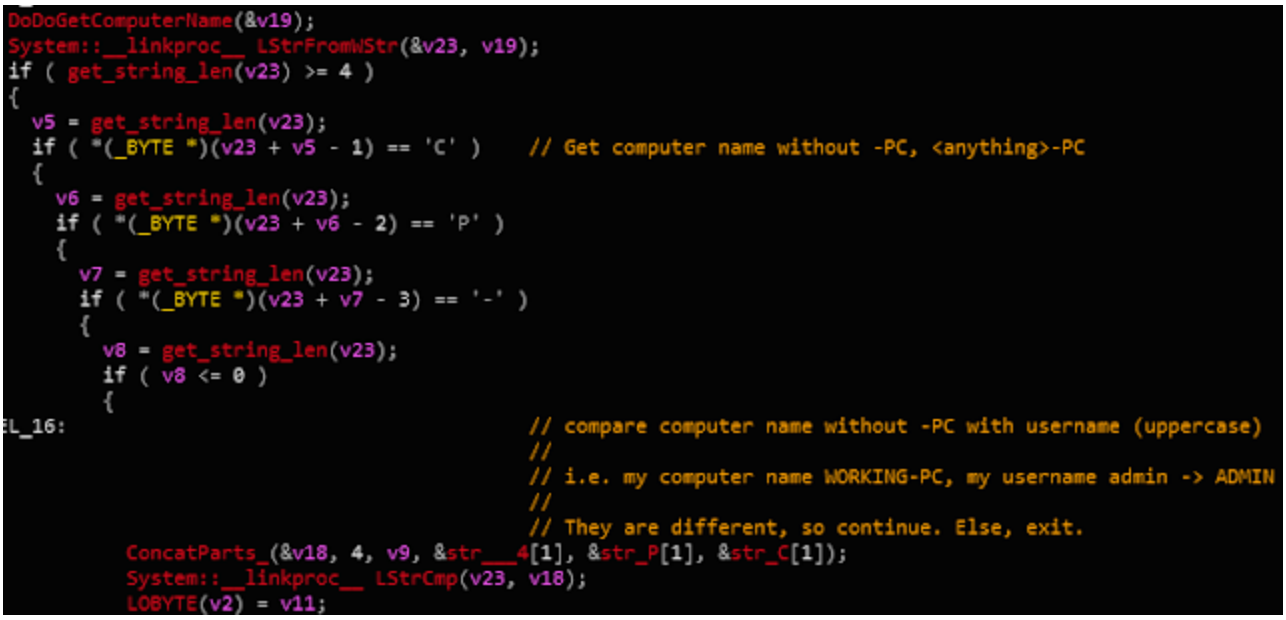
The threat actor only needs to perform some new transaction with the given bitcoin address to update the C2 list.

This is quite interesting. A malware could be keeping all kind of information and configs in the blockchain. It could use these APIs such as api.blockcypher.com, etc... or it could download the blockchain to get all the transactions directly from the blockchain and recover all the needed information.

A domain can be sinkholed, but, using this method, it would be hard to forbid the malware to get updates.

1.2. Checks machine name vs user name

This is another trick, quite aggresive, that I hadn't seen before. Basically, the malware gets tthe computer name and the user name. It removes the "-PC" suffix from the computer name, the in compares the computer name (without -PC) with the username (uppercase). If they are the same, exit.



Frequently, real usual users' machines have computer names like DESKTOP-JMP24OS, etc... I suppose with this aggresive trick the malware tries to avoid being executed in sandboxes, AV emulators, etc...

1.3. Encrypted strings

As explained at welivesecurity' article, the malware decrypts the strings that it is going to use by using a custom rc4 algorithm.

Here, Im just going to explain how I got the decrypted urls directly from memory and Im going to share the script that I used to add IDA comments automatically. I used the following Windbg commands to dump all the decrypted strings and their positions in the strings' table:

> bp <base_unpacked_mod> + 291F5 (at this point, strings were decrypted a moment ago)

Print decrypted ascii strings:

> .for ($t0=0;@$t0<0x18b;r $t0=@$t0+1){ .printf "%d ",4*@$t0; da poi (<base_unpacked_mod>+2C93C+4*@$t0); .printf "\r\n"; }

Print decrypted unicode strings:

> .for ($t0=0;@$t0<0xb6;r $t0=@$t0+1){ .printf "%d ",4*@$t0; du poi (<base_unpacked_mod>+2CF68+4*@$t0); .printf "\r\n"; }

With these commands, i got the list of strings (ascii and unicode), and I used the following IDA python script to set comments foreach part of the code where these strings are being used:

1.4. Unpacked module needs correct argument to work properly

Once the malware is unpacked, the real redaman dll is launched with rundll32 and DllGetClassObject method is called, and an argument is given:

> rundll32 <redaman dll path>, DllGetClassObject <password>

The given password needs to be correct, if it is not correct, the encrypted strings cant be decrypted and the malware exits.

1.5. Checks for typical sandboxes files, directories, processes...

It checks for the following files or directories at c:\ or d:\ : cuckoo, fake_drive, strawberry, tsl, targets.xls, perl, wget.exe

```
mov     byte ptr [eax], 'c'
lea     eax, [ebp+var_4]
call    sub_403570
mov     byte ptr [eax+1], ':'
lea     eax, [ebp+var_4]
call    sub_403570
mov     byte ptr [eax+2], '\'
lea     eax, [ebp+var_8]
mov     edx, 3
call    sub_403678
lea     eax, [ebp+var_8]
call    sub_403570
mov     byte ptr [eax], 'd'
lea     eax, [ebp+var_8]
call    sub_403570
mov     byte ptr [eax+1], ':'
lea     eax, [ebp+var_8]
call    sub_403570
mov     byte ptr [eax+2], '\'
mov     bl, 1
mov     dword ptr [esi], 'kcuc'
mov     dword ptr [esi+4], 'oo'
push    ebp
mov     eax, esi
call    sub_4149C8
pop     ecx
test    al, al
jnz     loc_414BC4
mov     dword ptr [esi], 'ekaf'
mov     dword ptr [esi+4], 'ird_'
mov     dword ptr [esi+8], 'ev'
push    ebp
mov     eax, esi
call    sub_4149C8
pop     ecx
test    al, al
jnz     loc_414BC4
mov     dword ptr [esi], 'arts'
mov     dword ptr [esi+4], 'rebw'
mov     dword ptr [esi+8], 'yr'
push    ebp
```

It checks for the following names in the own module name: myapp.exe, self.exe, t.exe

```
call    GetModuleHandleA_0
lea     edx, [ebp+var_4]
call    Wow64DisableWow64FsRedirection_GetModuleFileName_WowRevertWow6
test    al, al
jz      loc_414F19
lea     edx, [ebp+System::AnsiString]
mov     eax, [ebp+var_4]
call    sub_4262B8
mov     eax, [ebp+System::AnsiString] ; System::AnsiString
lea     edx, [ebp+var_14]
call    @Sysutils@LowerCase$qqrx17System@AnsiString ; Sysutils::LowerCa
mov     edx, [ebp+var_14]
lea     eax, [ebp+var_4]
call    @System@@LStrLAsg$qqrpvpxv ; System::__linkproc__ LStrLAsg(void
mov     [ebp+var_10], 78652E74h ; t.ex
mov     [ebp+var_C], 65h
lea     eax, [ebp+var_1C]
lea     edx, [ebp+var_10]
call    unknown_libname_41 ; BDS 2005-2007 and Delphi6-7 Visual Compone
mov     eax, [ebp+var_1C]
mov     edx, [ebp+var_4]
call    @System@@LStrCmp$qqrv ; System::__linkproc__ LStrCmp(void)
jz      short loc_414F19
mov     [ebp+var_10], 7061796Dh ; myap
mov     [ebp+var_C], 78652E70h ; p.ex
mov     [ebp+var_8], 65h
lea     eax, [ebp+var_20]
lea     edx, [ebp+var_10]
call    unknown_libname_41 ; BDS 2005-2007 and Delphi6-7 Visual Compone
mov     eax, [ebp+var_20]
mov     edx, [ebp+var_4]
call    @System@@LStrCmp$qqrv ; System::__linkproc__ LStrCmp(void)
jz      short loc_414F19
mov     [ebp+var_10], 666C6573h ; self
mov     [ebp+var_C], 6578652Eh ; .exe
xor     eax, eax
```

And for the following processes: vboxservice.exe, python.exe

```
call    unknown_libname_54 ; BDS 2005-2007 and Delphi6-7
test    eax, eax
jz      loc_414CE8
mov     [ebp+var_24], 786F6276h ; vbox
mov     [ebp+var_20], 76726573h ; serv
mov     [ebp+var_1C], 2E656369h ; ice.
mov     [ebp+var_18], 657865h
lea     eax, [ebp+var_10]
lea     edx, [ebp+var_24]
call    unknown_libname_41 ; BDS 2005-2007 and Delphi6-7
mov     [ebp+var_24], 68747970h ; pyth
mov     [ebp+var_20], 652E6E6Fh ; on.e
mov     [ebp+var_1C], 6578h
lea     eax, [ebp+var_14]
lea     edx, [ebp+var_24]
call    unknown_libname_41 ; BDS 2005-2007 and Delphi6-7
mov     eax, [ebp+var_4]
call    sub_404EE8
```

1.6. Checks for security products

Redaman uses the WbemScripting.SWbemLocator API to search for intalled security products:

```
mov     edx, ds:p_dest_decrypted_strings2
mov     edx, [edx+0C8h] ; decrypted string type 2: WbemScripting.SWbemLocator
call    @System@@LStrFromWStr$qqrr17System@AnsiStringx17System@WideString ; System
mov     eax, [ebp+System::AnsiString] ; System::AnsiString
lea     edx, [ebp+var_54]
call    @Comobj@CreateOleObject$qqrx17System@AnsiString ; Comobj::CreateOleObject(
mov     edx, [ebp+var_54]
lea     eax, [ebp+var_20]
call    sub_4047E4
lea     eax, [ebp+var_20]
call    unknown_libname_63 ; BDS 2005-2007 and Delphi6-7 Visual Component Library
test    al, al
jz      loc_4115A6
push    ebp
mov     eax, ds:p_dest_decrypted_strings2
mov     eax, [eax+0E0h] ; decrypted string type 2: root\SecurityCenter2
call    sub_411308
pop     ecx
test    al, al
jnz     short loc_411489
push    ebp
mov     eax, ds:p_dest_decrypted_strings2
mov     eax, [eax+0DCh] ; decrypted string type 2: root\SecurityCenter
call    sub_411308
pop     ecx
test    al, al
jz      loc_4115A6

                        ; CODE XREF: sub_4113F0+7D↑j
mov     eax, ds:p_dest_decrypted_strings2
add     eax, 0D8h       ; decrypted string type 2: WQL
push    eax
mov     eax, ds:p_dest_decrypted_strings2
add     eax, 0E4h       ; decrypted string type 2: SELECT * FROM AntiVirusProduct
push    eax
```

1.7. Disable Safeboot

The malware deletes the current safeboot value:

2. Bot commands and malware capabilities

I recommend to read the welivesecurity' article to learn about the protocol and encryption used by Redaman banking malware.

It looks in the newer versions of the malware they have introduced a much longer list of commands that the bot can receive from the C2 and execute. This is the complete list (each command and name is quite self-explanatory):

- keylogger.last-data
- keylogger.last-wnd-caption
- keylogger.last-exe-path
- botnet-prefix
- botnet-id
- cc.connect-interval
- scan-files
- post-install-report
- cc.url
- modules.
- modules-data.
- del-module
- unload
- uninstall
- uninstall-lock
- find-files
- download
- shutdown
- reboot
- cc
- get-cc
- botnet-id

- prefix
- connect-interval
- hosts-add
- hosts-clear
- dbo-scan
- cfg-set-str-a
- cfg-set-str-w
- cfg-set-dw
- cfg-get-str-a
- cfg-get-str-w
- cfg-get-dw
- cfg-del-param
- screenshot
- dns
- set-dns
- get-dns
- kill-process
- lpe-runas-flags
- scards.monitoring-interval
- auto-elevate
- reload
- scard-off
- modules-off
- dbo-detector-off
- multiinstance-off
- keylogger-off
- dns-servers-changed
- hosts-file-changed
- video.refresh-interval
- video-start
- video-stop
- del-files

Additionally, in the list of encrypted strings, the malware carries a list of strings to match against the browser window name. In case of match, it is a target site (most of them bank websites) to steal credentials from. This is the list of urls of the analyzed sample:

- online.payment.ru
- bankline.ru
- /ic/login.zhtml
- /servlets/ibc

- faktura.ru
- /iclient/
- ibank2
- bco.vtb24.
- bo.vtb24.
- dbo.vtb.
- elbrus.raiffeisen
- elba.raiffeisen
- handybank.
- wupos.westernunion
- online.sberbank.
- minbank.ru
- e-plat.mdmbank.
- link.alfabank
- click.alfabank
- ib.avangard
- ibc.vuzbank.
- ibc.ubrr.
- my.modulbank.
- online.centrinvest.
- cb.mtsbank.
- vbo.mkb.
- i.bspb.ru
- i.vtb.ru
- bc.rshb.
- /vpnkeylocal
- sci.interkassa
- ibank.mmbank.
- blockchain.info
- /wallet/
- cb.asb.by
- bps-sberbank.by
- dbo2.bveb.by
- ibank.bsb.by
- corporate.bgpb.by
- ibank.alfa-bank.by
- ibank.belinvestbank.by
- ib2.ideabank.by
- client.paritetbank.by
- ibank.priorbank.by
- client.mybank.by
- online.stbank.by

- client.belapb.by
- Unk
- SberBank_PC
- BSS
- BSS_PC
- iBank2_PC
- Faktura
- PCB
- InterPro
- RosBank
- SBBO
- INIST
- Inversion
- Interbank
- iBank2
- BiCrypt
- VTB24
- 1C
- SGB
- Raiffeisen
- HandyBank
- WU
- SB_Fiz
- CFT
- WinPost
- SBIS
- ClBank
- QiwiCashier
- ISCC
- WebMoney
- xTC
- iFOBS
- TRANSAQ
- OSMP
- MinBank
- SFT
- MDM
- ALBO
- Alfa_Fiz
- Avangard
- Intercassa
- Amikon

- Vuzbank
- UBRR
- ModulBank
- CentrInvest
- MTSBank
- MKB
- EL_CLI
- BSPB
- IVTB
- RSHB
- Infocrypt
- MMBank
- BlockchainInfo
- HBClient
- ASB
- BPS_SB
- BVEB
- BSB
- BGPB
- ALBO_BY
- BelInvest
- IdeaBank
- Paritet
- PriorBank
- MyBank
- StBank
- BelAPB
- scDBO
- AvestCSP

3. Yara rules

4. List of encrypted strings