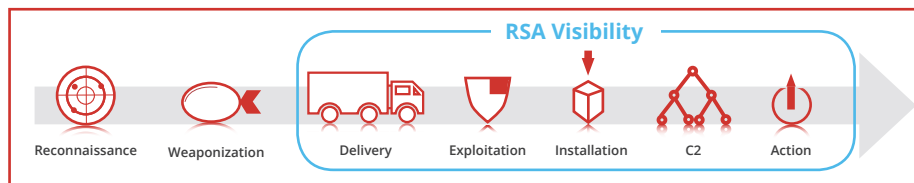


USE CASE

MALICIOUS PROTOCOLS: GHOST RAT

SEE EVERYTHING, FEAR NOTHING
THREAT SOLUTION SERIES



WHAT IS GHOST RAT?

Gh0st RAT is a popular example of a Remote Access Trojan used by attackers to control infected endpoints, originally attributed to threat actor groups in China. Gh0st RAT and its variants are still some of the most widely used RAT tools in existence due to their effectiveness. Once installed, Gh0st allows an attacker to take full control of the infected endpoint, log keystrokes, provide live webcam and microphone feeds, download and upload files, and other powerful features. Another feature of Gh0st RAT is the ability to obfuscate the client-server communication using a proprietary network protocol. This is wrapped up with a number of intuitive graphical user interfaces to make malicious remote control simple.

A TYPICAL ATTACK SCENARIO

The scenario for attacks using Gh0st RAT (or any RAT, really) follows a very typical targeted malware lifecycle. One example of how this might work is as follows:

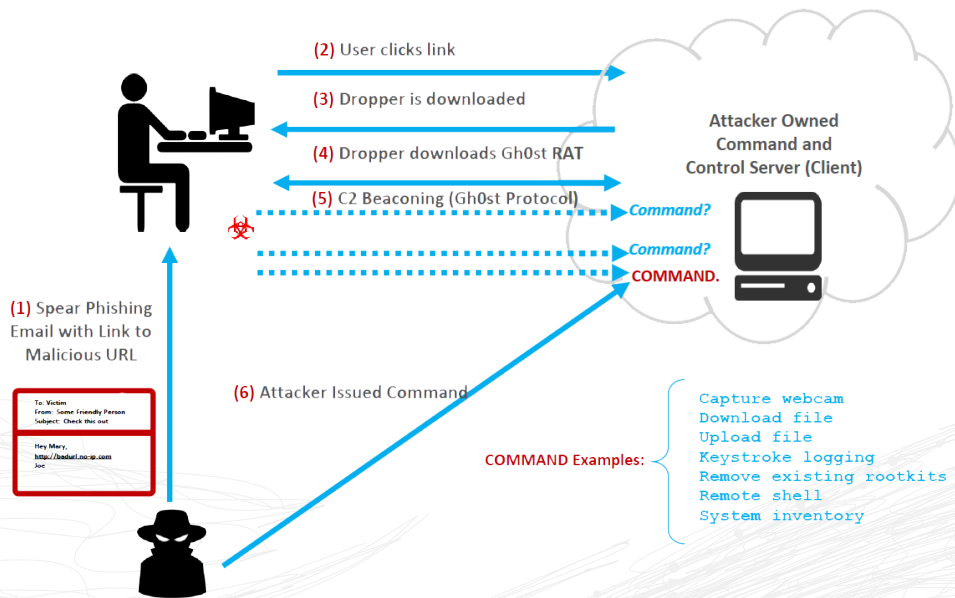


Figure 1 – Example Gh0st RAT Attack Scenario

DETECTION AND RESPONSE

Signature-based tools focused solely on log data lack the deep visibility into both the network and endpoint required to successfully track down attacks using Gh0st RAT. A motivated attacker can obfuscate or compile unique payloads to make detection of the delivery, exploit, and install phase extremely difficult. Visibility deep in the network is required to understand

and alert on network traffic exhibiting features of Gh0st RAT C2 traffic, and deep in-memory endpoint visibility is required to track down evidence of the malicious binaries. The following chart contrasts the **visibility** by attack stage into an attacker’s tools, tactics, and procedures (TTPs) provided by traditional tools with the RSA NetWitness® Platform:

	<u>Delivery</u>	<u>Exploit/Installation</u>	<u>C2</u>	<u>Action</u>
	Spear Phishing Drive By Others	Dropper + Payload Installation	Gh0st Protocol Beaconing	Varies/ Attacker’s Choice
AV/FW/IDS/IPS:				
Traditional SIEM:				
RSA NetWitness Platform:				

No VISIBILITY

Partial Visibility/Signature

Full Visibility

GH0ST RAT VISIBILITY WITH THE RSA NETWITNESS PLATFORM – DETAILS

KEY SOLUTION: RSA NETWITNESS PACKETS, RSA NETWITNESS ENDPOINT

Out of the box, via RSA Live, RSA NetWitness Logs and Packets contains a network parser that can understand the C2 traffic indicative of Gh0st RAT variants. This provides a very simple mechanism for alerting on potential infections and guiding the remainder of an investigation. In this example, the analyst sees the following risk indicators within RSA NetWitness Logs and Packets:

- ▲ **Risk: Warning** (3 values) ⌵
 escalation multiple suspicious (9) - xor encoded executable (1) - ghost-protocol-gh0st (2)
- ▲ **Risk: Suspicious** (7 values) ⌵
 escalation multiple informational (44) - dns extremely low ttl (28) - plaintext pop3 password (20) - direct to ip http request (11) - attachment overload (E
- ▲ **Risk: Informational** (16 values) ⌵
 outbound_traffic (120) - flags_ack (58) - flags_psh (48) - flags_syn (44) - watchlist_ports (40) - flags_fin (29) - http1.1 without referer header (15) - http dir
 - watchlist_file_extension (6) - high risk filetypes (6) - http1.1 low header count (4) - watchlist_file_fingerprint (2) - ua_not_good_mozilla (2) - http1.1 with

Figure 1 – RSA NetWitness Logs and Packets Detects Gh0st Protocol Network Traffic

Drilling further into the actual flagged events by reconstructing all relevant sessions, the analyst can see the string “Ghost” within the Hex view packet payload, which is the “magic word” for the default Ghost variant:

Event Reconstruction

service	id	type	source	destination	service
LAB-CONCENTRATOR-DEMO	190999	Network Session	192.168.1.136 : 49229	192.168.1.135 : 8080	0

Request & Response | Top To Bottom | View Hex | Actions | Open Event in New Tab

Request

```

00000000 : 47 68 30 73 74 ae 00 00 00 e0 00 00 00 78 9c 4b [ Gh0st... ..x.K ]
00000016 : 63 64 60 98 c3 c0 c0 c0 06 c4 40 26 c3 46 59 06 [ cd .....@&.FY. ]
00000032 : 06 26 20 1d 9c 5a 54 96 99 9c aa 10 90 98 9c ad [ .& .ZT. .... ]
00000048 : 60 c8 c0 c0 03 14 e3 28 d0 65 04 61 66 20 06 72 [ .....( .e.af .r ]
00000064 : 19 fe fd ff 0f 24 23 18 66 c4 aa 31 3e 89 56 63 [ .....$.f.>.Vc ]
00000080 : f4 96 e2 2d ce 00 b2 bf 16 26 94 2b c9 6b 80 e4 [ .....&.+k.. ]
00000096 : ff 5f b6 89 29 ff 07 c4 22 40 43 15 80 98 09 a4 [ .....)@C.... ]
00000112 : 17 aa 1f 24 06 02 ff eb f7 6b 94 c4 a8 31 82 f0 [ ..$.... .k...i.. ]
00000128 : c5 1f 51 e5 67 c5 79 8b 41 0a 84 18 99 19 5a b9 [ ..Q.g.y.A....Z. ]
00000144 : 18 18 0e ac 60 ec 70 2c 4a ce 48 2d d2 35 d5 35 [ .....p, J.H-.S.S ]
00000160 : d1 35 64 20 0e 94 0b 00 09 00 36 ee 2b 3d -- -- [ .5d .... .6.+ = ]
    
```

Response

```

00000000 : 47 68 30 73 74 16 00 00 00 01 00 00 00 78 9c 63 [ Gh0st... ..x.c ]
00000016 : 00 00 00 01 00 01 -- -- -- -- -- -- -- -- [ ..... ]
    
```

Figure 2 – Reconstruction of Ghost Payload in RSA NetWitness Logs and Packet

Highly suspicious in itself, the analyst then wants to confirm the infection and glean further details into the exploitation and installation phase of the attack. The first thing noticed is the relatively high score of the suspicious machine, ACER-PC:

Machine Sta...	Machine Name	Threat Level	Score	Admin Statu
	WIN-ASIACTS3685	●	303	
	ACER-PC	●	129	
	SHIBPC	●	47	
	WIN-ASIACTS3685	●	31	
	ARCHER-5-4-1	●	10	

Figure 3 – RSA NetWitness Endpoint Showing ACER with a High (Suspicious) Score

Drilling deeper, the analyst notices behavior very typical of Gh0st RAT installations. RSA NetWitness Endpoint quickly identifies three malicious binaries, one of which is highly suspicious (FastUserSwitchingCompatibilityex.dll):

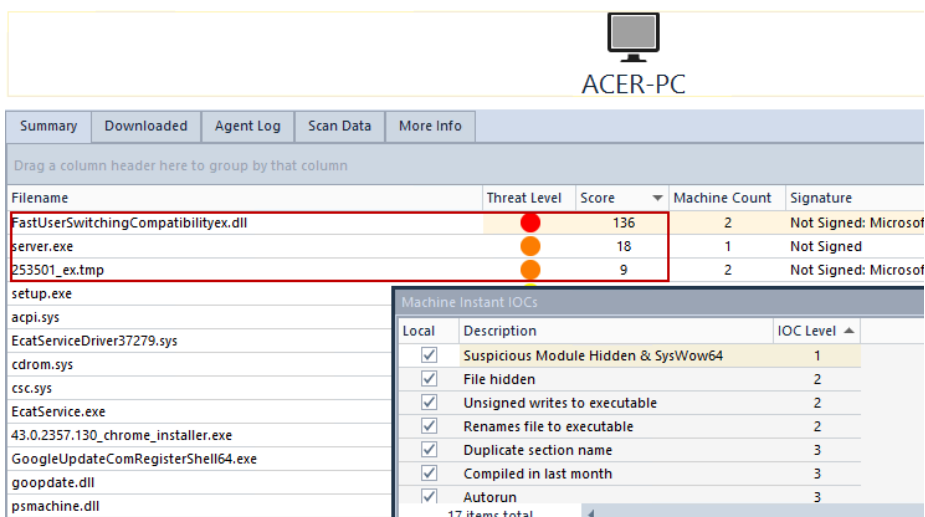


Figure 4 - Suspicious Modules Running on ACER-PC

RSA NetWitness Endpoint also provides the ability to search for these files on other machines in the organization’s network to determine whether other hosts have been impacted by the same type of attack. Here, the analyst was able to identify another machine with the same suspicious binary which warrants further investigation into that host to understand the footprint of this particular attack across the organization for potential lateral movement that took place:

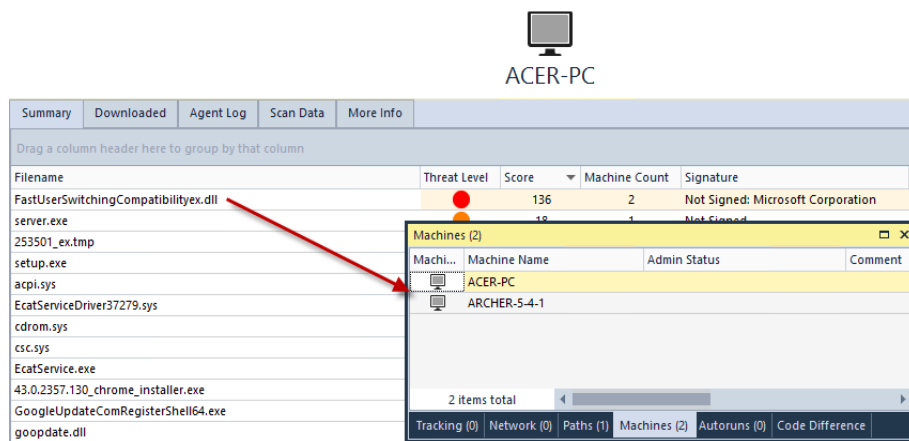


Figure 5 - Take Note of Other Computers with the Same Module

In addition to the two malicious binaries running on the system, RSA NetWitness Endpoint correlates the Gh0st protocol traffic seen within RSA NetWitness Logs and Packets destined to 192.168.1.135 (the attacker IP address and C2 server) on port 8080:

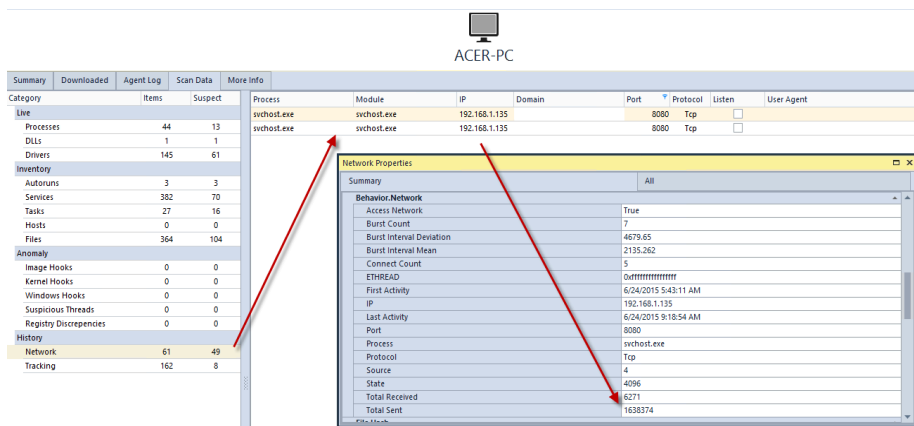


Figure 6 – Identify Process Responsible for GhOst C2 Traffic

The analyst can also see that svchost.exe is responsible for the offending traffic, and can also glean details into the properties of the network session, including the frequency, protocol, and ratio of bytes sent to bytes received. In this instance, the analyst notices a high ratio of bytes sent vs. received, which is typical of malicious traffic and potential data leakage.

The analyst can then pivot into the remaining scan data and look for any other confirmation of infection. Very quickly they can see svchost.exe is responsible for loading FastUserSwitchingCompatibilityex.dll, the most suspicious binary on this endpoint:

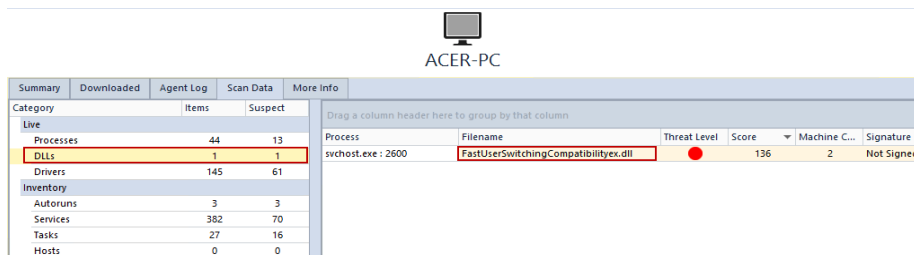


Figure 7 – Scan Data Showing svchost.exe Loading a Suspicious Module

Now that the infection is confirmed, the analyst must perform the rest of the investigation. This involves further analysis of network traffic, looking for lateral movement (investigating the second machine with the same DLL), and possibly trying to attain attribution for this attack. One of the first things the analyst does is rewind the tape for the infected host to see if the delivery mechanism can be pinpointed and used to move detection up the attack chain in future attacks. This is done within RSA NetWitness Logs and Packets by reconstructing network traffic to and from our victim machine for the time prior to the infection. Doing so reveals a few interesting details, including this email message that has been automatically reconstructed:

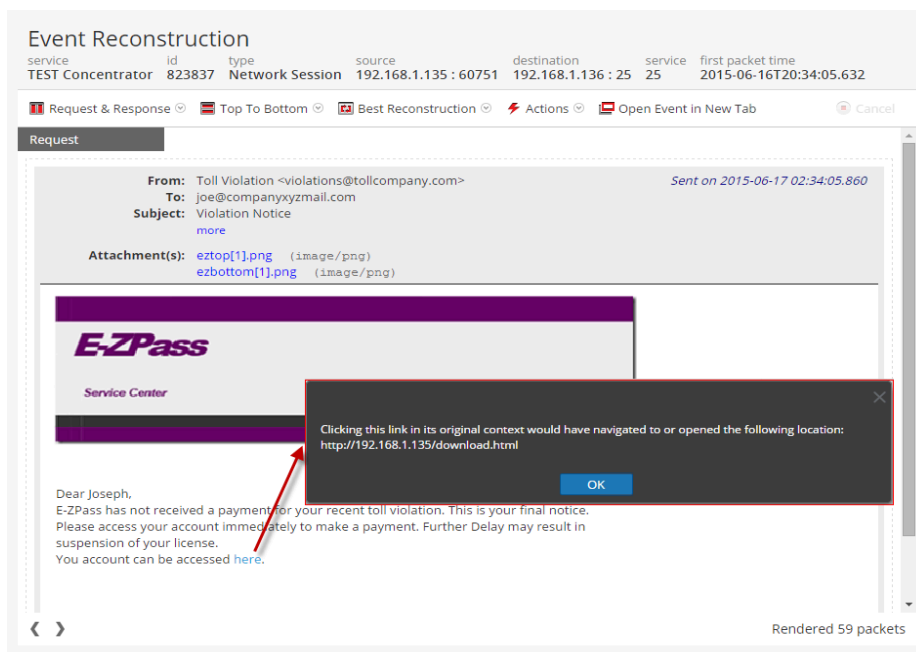


Figure 8 – Suspicious email received on the victim machine

To see whether the user clicked, the analyst can query for any HTTP sessions to <http://192.168.1.135/>. Doing so produces evidence of suspicious files being downloaded, which may indicate an initial infection vector:



Figure 9 – Evidence of Suspicious File Downloaded after Link Clicked

Now that the analyst has reasonable evidence that the endpoint was infected with Gh0st RAT, and evidence as to how it was infected, they can attempt to understand more about the impact to the victim machine(s). Reading up on Gh0st, the analyst determines that the traffic on port 8080 represents the

control commands being sent to the endpoint from the control server. This is accomplished by extracting the communications in a common pcap format and decoding it with the information learned in the investigation (in this case, the magic word “GhOst”). Here, the analyst is able to see the adversary launching a remote shell session and what commands were run:

```

1 fSOHNULNUL:-NULNULNULACKNULNULNULSOHNULNULNUL:-GSNULNULSTXNULNU
2 NULNULA"SOH"Archer-5-4-1NULNULNULNULNULNULNULNULNULNULNULNULNUL
3 Copyright (c) 2009 Microsoft Corporation. All rights reserved.
4
5 C:\Windows\system32>ipconfig
6 ipconfig
7
8 Windows IP Configuration
9
10
11 Ethernet adapter Local Area Connection 2:
12
13     Connection-specific DNS Suffix  . :
14     IPv4 Address. . . . . : 192.168.1.136
15     Subnet Mask . . . . . : 255.255.255.0
16     Default Gateway . . . . . : 192.168.1.2
17
18 Tunnel adapter isatap.{06EB1101-11D8-4F12-B921-D709145F2D0D}:
19
20     Media State . . . . . : Media disconnected
21     Connection-specific DNS Suffix  . :
22
23 Tunnel adapter Local Area Connection* 9:
24
25     Media State . . . . . : Media disconnected
26     Connection-specific DNS Suffix  . :
27
  
```

Figure 10 – Understanding What the Attacker Did on the Victim Machine

REFERENCES

McAfee GhOst analysis: <http://www.mcafee.com/ca/resources/white-papers/foundstone/wp-know-your-digital-enemy.pdf>

VOHO watering hole using GhOst: <http://blogs.rsa.com/will-gragido/lions-at-the-watering-hole-the-voho-affair/>

Cyber Kill Chain: <http://www.lockheedmartin.ca/us/what-we-do/information-technology/cyber-security/cyber-kill-chain.html>