Finding Targeted SUNBURST Victims with pDNS

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Our SunburstDomainDecoder tool can now be used to identify SUNBURST victims that have been explicitly targeted by the attackers. The only input needed is passive DNS (pDNS) data for avsvmcloud.com subdomains.

Companies and organizations that have installed trojanized a SolarWinds Orion update containing the SUBURST backdoor will send DNS queries for seemingly random subdomains of avsvmcloud.com. Some of these DNS queries actually contain the victim's internal AD domain encoded into the subdomain, as explained in our blog post Reassembling Victim Domain Fragments from SUNBURST DNS.

Three Stages of SUNBURST Backdoor Operation

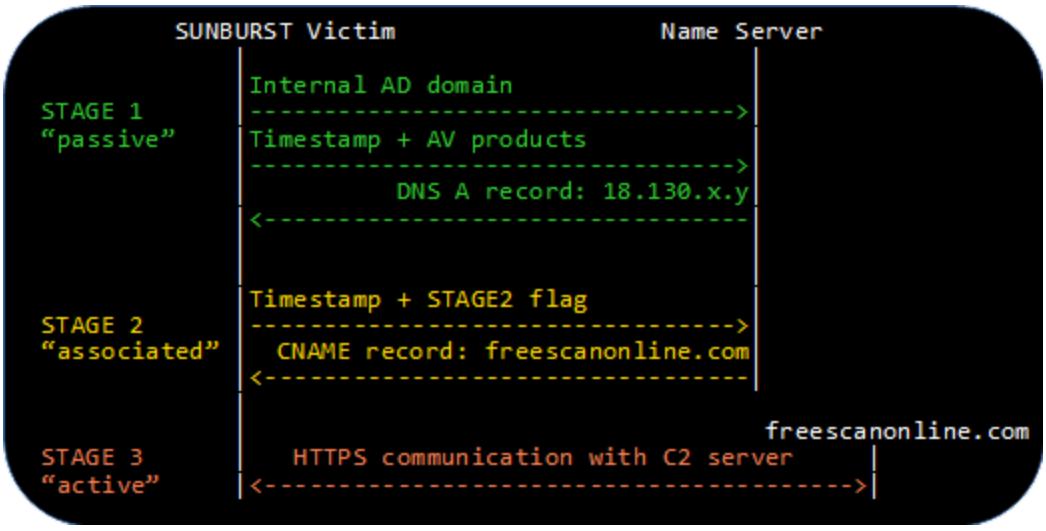
Most SUNBURST victims were luckily not targeted by the attackers. This means that the backdoor never made it past "STAGE1" of the infection process. Nevertheless, the attackers did choose to proceed to "STAGE2" with some victims. As explained in FireEye's blog post SUNBURST Additional Technical Details, the "C2 coordinator" can proceed to the next stage by responding with a DNS A record pointing to an IP address within any of these three ranges:

- 18.130.0.0/16
- 99.79.0.0/16
- 184.72.0.0/15

According to FireEye's "Diagram of actor operations and usage of SUNBURST", the decision to proceed to the next stage is based upon whether or not the victim's internal AD domain is "interesting to attack".

Note: "STAGE2" is referred to as "associated mode" in FireEye's blog post.

SUNBURST backdoors that have entered STAGE2 will allow CNAME records in DNS responses to be used as new C2 domains.



We have discovered that the SUNBURST backdoor actually uses a single bit in the queried avsvmcloud.com subdomain in order to flag that it has entered STAGE2 and is accepting new C2 domains in CNAME records. This bit is called flag, ext or dnssec in the malicious SUNBURST implant and can be extracted from DNS queries that have an encoded timestamp, such as those indicating which security products that are installed.

Detecting STAGE2 DNS Requests

Our SunburstDomainDecoder tool has now been updated to include a "STAGE2" tag in the output for DNS queries containing this stage 2 flag. This means that organizations like national CERTs, who perform incident response coordination and victim notification, can now use SunburstDomainDecoder in order to identify and notify **targeted** SUNBURST victims that have entered STAGE2.

Here's the output we get when feeding SunburstDomainDecoder with Bambenek's uniq-hostnames.txt passive DNS data and only displaying lines containing "STAGE2":

SunburstDomainDecoder.exe < uniq-hostnames.txt | findstr STAGE2
22334A7227544B1E 2020-09-29T04:00:00.0000000Z,STAGE2 5qbtj04rcbp3tiq8bo6t
FC07EB59E028D3EE 2020-06-13T09:00:00.0000000Z,STAGE2 6a57jk2ba1d9keg15cbg
1D71011E992C3D68 2020-06-11T22:30:00.0000000Z,STAGE2 7sbvaemscs0mc925tb99
F90BDDB47E495629 2020-06-13T08:30:00.0000000Z,STAGE2 gq1h856599gqh538acqn
DB7DE5B93573A3F7 2020-06-20T02:30:00.0000000Z,STAGE2 ihvpgv9psvq02ffo77et
3C327147876E6EA4 2020-07-22T17:00:00.0000000Z,STAGE2 k5kcubuassl3alrf7gm3
3C327147876E6EA4 2020-07-23T18:30:00.0000000Z,STAGE2 mhdosoksaccf9sni9icp
1D71011E992C3D68 central.pima.gov,STAGE2
DB7DE5B93573A3F7 coxnet.cox.com,STAGE2,WindowsDefender
F90BDDB47E495629 central.pima.gov,STAGE2

Most of these subdomains are listed in FireEye's Indicator_Release_NBIs.csv file as having CNAME pointers to other SUNBURST C2 domains like: freescanonline[.]com, deftsecurity[.]com and thedoccloud[.]com. But the first domain, with GUID

22334A7227544B1E, was actually not part of FireEye's IOC data.

Even more STAGE2 domains and GUID values can be found by analyzing other passive DNS resources, such as this passive DNS dump on pastebin by Rohit Bansal.

curl -s https://pastebin.com/raw/6EDgCKxd | SunburstDomainDecoder.exe | findstr STAGE2
E258332529826721 2020-07-18T05:00:00.0000000Z,STAGE2 1dbecfd99ku6fi2e5fjb
2039AFE13E5307A1 2020-05-30T14:30:00.0000000Z,STAGE2 4n4vte5gmor7j9lpegsf
22334A7227544B1E 2020-09-29T04:00:00.0000000Z,STAGE2 5qbtj04rcbp3tiq8bo6t
FC07EB59E028D3EE 2020-06-13T09:00:00.0000000Z,STAGE2 6a57jk2ba1d9keg15cbg
1D71011E992C3D68 2020-06-11T22:30:00.0000000Z,STAGE2 7sbvaemscs0mc925tb99
1D71011E992C3D68 2020-06-11T22:30:00.0000000Z,STAGE2 7sbvaemscs0mc925tb99
F90BDDB47E495629 2020-06-13T08:30:00.0000000Z,STAGE2 gq1h856599gqh538acqn
F90BDDB47E495629 2020-06-13T08:30:00.0000000Z,STAGE2 gq1h856599gqh538acqn
DB7DE5B93573A3F7 2020-06-20T02:30:00.0000000Z,STAGE2 ihvpgv9psvq02ffo77et
DB7DE5B93573A3F7 2020-06-20T02:30:00.0000000Z,STAGE2 ihvpgv9psvq02ffo77et
3C327147876E6EA4 2020-07-23T18:30:00.0000000Z,STAGE2 mhdosoksaccf9sni9icp

After removing the domains already present in FireEye's IOC we're left with the following FQDN's that have been requested by SUNBURST backdoors in STAGE2:

- 1dbecfd99ku6fi2e5fjb.appsync-api.us-east-1.avsvmcloud.com
- 4n4vte5gmor7j9lpegsf.appsync-api.eu-west-1.avsvmcloud.com
- 5qbtj04rcbp3tiq8bo6t.appsync-api.us-east-1.avsvmcloud.com

Update January 7, 2021

Paul Vixie kindly shared his SunburstDomainDecoder output on Twitter yesterday. Paul's results show that the victim with GUID FC07EB59E028D3EE, which corresponds to the "6a57jk2ba1d9keg15cbg.appsync-api.eu-west-1.avsvmcloud[.]com" CNAME entry in FireEye's IOC, was Pima County. This means that 3C327147876E6EA4 is the only GUID among the CNAME records published by FireEye that cannot yet be tied to a victim organization. Paul's data also reveals two new STAGE2 victim GUIDs (65A28A36F24D379D and 8D2267C5A00796DA).

Update January 12, 2021

With help of SunburstDomainDecoder 1.9 and passive DNS data from Dancho Danchev we've been able to verify that Palo Alto have installed the maliocous SUNBURST backdoor and that it entered into STAGE2 opreration on September 29, 2020. Palo Alto's CEO Nikesh Arora has confirmed that they were hit by SUNBURST (or "SolarStorm" as they call it).

Update January 25, 2021

On December 17 VriesHd tweeted a link to a Google Docs spreatsheet containing aggregated SUNBURST DNS request data.

One month later VriesHd made some substatial additions to the "SB2" spreadsheet, which by then contained several new STAGE2 victims. We have since then actively been trying to reach out to the targeted organizations, either directly or through CERT organizations, who perform incident response coordination and help with the victim notification process. VriesHd's passive DNS collection has now been incorporated into the SUNBURST STAGE2 Victim Table below.

Targeted SUNBURST Victims

Here's a summary of the STAGE2 beacons from SUNBURST victims that can be extracted from publicly available data:

GUID	avsvmcloud.com Subdomain	Timestamp (UTC)	AD Domain
FF1E34A864BCE106	dh1usc8287hr46bia74a	2020-05-14 14:30	nsanet.local
E5E2AD2B6DE697D6	70fov85qclvubqhf9vlh	2020-05-16 19:30	cisco.com
FF1E34A864BCE106	2die0g7i5kgkki628gaj	2020-05-18 11:30	nsanet.local
3E8DF7FF13FC8D38	7hpaqi751fqoei2fdv8m	2020-05-18 16:30	HQ.FIDELIS
FF1E34A864BCE106	tsem12v1rn620hatfol2	2020-05-20 14:30	nsanet.local

FF1E34A864BCE106	a0hmuoveln2400sfvf6n	2020-05-20 16:30	nsanet.local
0C1A5A27B297FE46	k0biaol9fc84ummfn7vi	2020-05-26 11:30	vgn.viasatgsd.com
A887B592B7E5B550	m4apr0vu9qnomtun3b9t	2020-05-26 20:00	WincoreWindows.local
2039AFE13E5307A1	4n4vte5gmor7j9lpegsf	2020-05-30 14:30	suk.sas.com
06A4EA63C80EE24A	9q5jifedn8aflr4ge3nu	2020-05-31 12:00	scc.state.va.us
9850F550BD1010F2	gth7uravpvaapoi86834	2020-05-31 20:00	lagnr.chevrontexaco.net
E5E2AD2B6DE697D6	8k56mm0b876uvf5e7rd3	2020-06-01 19:00	cisco.com
2039AFE13E5307A1	laog1ushfp80e3f18cjg	2020-06-03 01:30	suk.sas.com
06A4EA63C80EE24A	ntlcvjpqc57t9kb8ac75	2020-06-03 23:30	scc.state.va.us
1D71011E992C3D68	7sbvaemscs0mc925tb99	2020-06-11 22:30	central.pima.gov
F90BDDB47E495629	gq1h856599gqh538acqn	2020-06-13 08:30	central.pima.gov
FC07EB59E028D3EE	6a57jk2ba1d9keg15cbg	2020-06-13 09:00	central.pima.gov
583141933D242B0D	f25k66k5hu68fneu7ocd	2020-06-16 06:00	logitech.local
52CE2BAFD69B2D0E	f2co92njkm9od5eu7btg	2020-06-16 18:30	fc.gov
FACC72E2207CD69F	rkspr9a19fl8r5ipggi1	2020-06-17 01:00	fox.local
3256C1BCAF74B5FC	p0a7jjdp4eq9o2vok1mt	2020-06-18 07:00	ng.ds.army.mil
92DC5436D54898CD	lusq9mg6j1e3jii5f66o	2020-06-18 17:30	ddsn.gov

DB7DE5B93573A3F7	ihvpgv9psvq02ffo77et	2020-06-20 02:30	coxnet.cox.com
59956D687A42F160	o49qi0qbfm37o6jul639	2020-06-23 06:00	wctc.msft
123EDA14721C3602	p5iokg3v9tntqcbo77p2	2020-06-29 08:30	scc.state.va.us
123EDA14721C3602	84v0j8kkbvqf8ntt4o9f	2020-06-30 10:30	scc.state.va.us
2F52CFFCD8993B63	0tvuasje2vc2i2413m6i	2020-07-01 16:30	mgt.srb.europa*
65A28A36F24D379D	7u32o0m6ureci8h5eo6k	2020-07-02 01:00	
2F52CFFCD8993B63	en1clufg22h2uca27ro3	2020-07-03 06:00	mgt.srb.europa*
2F52CFFCD8993B63	s2r15kp335mnlq65i6ce	2020-07-03 09:00	mgt.srb.europa*
DB4013DDA16F6A40	up1vj67jjj9tpvceu7ak	2020-07-08 01:00	los.local
123EDA14721C3602	l0vos8o9m5p3m8of7g96	2020-07-10 22:00	scc.state.va.us
E5E2AD2B6DE697D6	8kr7r16da442u75egv1s	2020-07-15 14:00	cisco.com
A13731B17632C726	ttj6cro8jm6cfma8noo7	2020-07-17 12:30	phpds.org
E5E2AD2B6DE697D6	gh1so69rl1sgrgf38gr5	2020-07-17 15:00	cisco.com
E258332529826721	1dbecfd99ku6fi2e5fjb	2020-07-18 05:00	
123EDA14721C3602	epm95unblvj984s2ovqh	2020-07-22 11:00	scc.state.va.us
3C327147876E6EA4	k5kcubuassl3alrf7gm3	2020-07-22 17:00	corp.qualys.com
3C327147876E6EA4	mhdosoksaccf9sni9icp	2020-07-23 18:30	corp.qualys.com

F2C9AC93206ABF47	onpqb88oq440lq82p7lb	2020-07-24 05:00	jpso.gov
123EDA14721C3602	0qthjq50jbdvnjq16o8f	2020-07-27 17:00	scc.state.va.us
123EDA14721C3602	gu6r7k260p6afq3ticso	2020-07-28 17:30	scc.state.va.us
936F78AB73AA3022	i4d2krbn2f92jo3uj8r9	2020-08-04 05:00	ggsg-us.cisco.com
936F78AB73AA3022	et2gu9tg5ckrsvaj5bom	2020-08-05 06:00	ggsg-us.cisco.com
22334A7227544B1E	5qbtj04rcbp3tiq8bo6t	2020-09-29 04:00	paloaltonetworks*

SUNBURST STAGE2 Victim Table
Sources: John Bambenek, Joe Słowik, Rohit Bansal, Dancho Danchev , Paul Vixie, FireEye and VriesHd.

Identifying More SUNBURST STAGE2 Victims

Companies and organizations with access to more passive DNS resources will hopefully be able to use SunburstDomainDecoder to identify additional targeted SUNBURST victims that have progressed to STAGE2.

Download SunburstDomainDecoder

Our tool SunburstDomainDecoder is released under a Creative Commons CC-BY license, and can be downloaded here:

https://www.netresec.com/files/SunburstDomainDecoder.zip
You can also read more about SunburstDomainDecoder in our blog post Reassembling Victim Domain Fragments from SUNBURST DNS.

Posted by Erik Hjelmvik on Monday, 04 January 2021 21:11:00 (UTC/GMT)

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