# EQL Analytics Library

endgame

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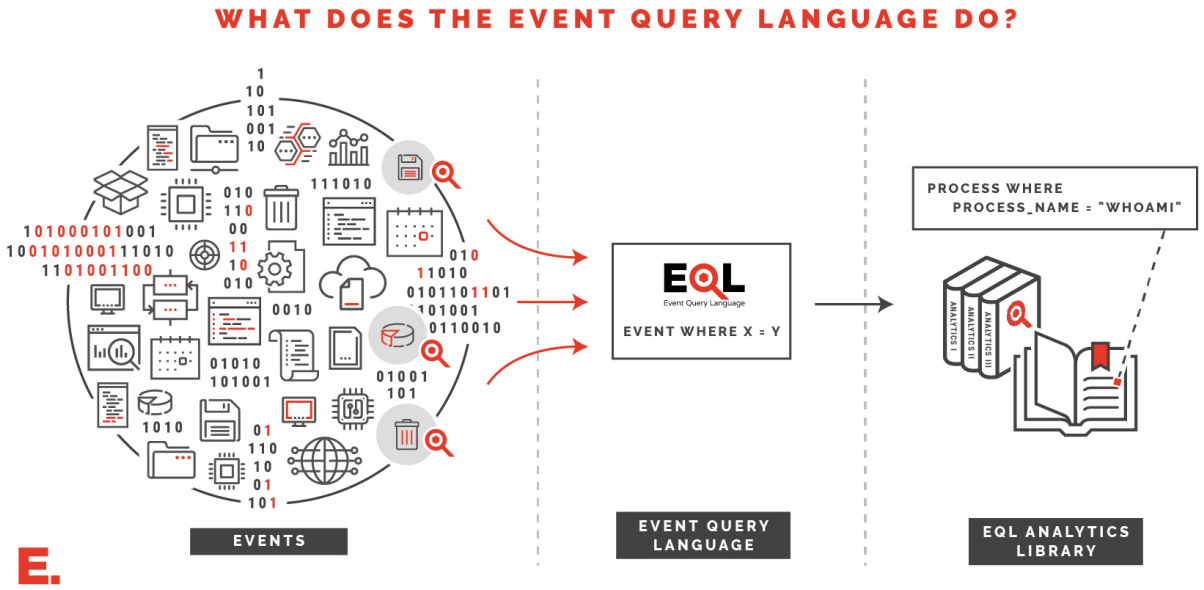


**eqllib** is a library of event based analytics, written in EQL to detect adversary behaviors identified in MITRE ATT&CK®.

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**Note:** Endgame has joined forces with Elastic, and EQL is now in the Detection Engine of Kibana! To find the latest rules written in EQL, KQL or Lucene for the Elastic Stack, please visit elastic/detection-rules on GitHub.

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# CHAPTER 1

# Next Steps

- *Get started* with EQL on your own computer
- Explore the *analytics* that map to ATT&CK.
- Learn how to write queries in EQL syntax
- Browse our *schemas* and existing normalizations
- View additional *resources*
- Check the *license* status

## 1.1 Getting Started

The EQL library current supports Python 2.7 and 3.5 - 3.7. Assuming a supported Python version is installed, run the command:

```
$ git clone https://github.com/endgameinc/eqllib
$ cd eqllib
$ python setup.py install
```

If Python is configured and already in the PATH, then `eqllib` will be readily available, and can be checked by running the command:

```
$ eqllib -h
usage: eqllib [-h] {convert-query,convert-data,query,survey} ...

EQL Analytics

positional arguments:
  {convert-query,convert-data,query,survey}
                        Sub Command Help
    convert-query       Convert a query to specific data source
    convert-data        Convert data from a specific data source
```

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```
    query               Query over a data source
    survey              Run multiple analytics over JSON data
```

### 1.1.1 `eqllib` Command-Line Interface

The EQL Analytics Library comes with a utility that can search, normalize, and survey JSON data. See *Getting Started* for instructions on installing `eqllib` locally.

#### convert-data

**eqllib** *convert-data* [*OPTIONS*] <*input-json-file*> <*output-json-file*>

The **`convert-data`** command normalizes data, generating a new JSON file that matches the schema.

#### Arguments

**`output-json-file`**
: Path to an output JSON file to store normalized events.

#### Options

**`-h`**
: Show the help message and exit

**`--file, -f`**
: Path to a JSON file of unnormalized events. Defaults to stdin if not specified

**`--format`**
: Format for the input file. One of `json`, `json.gz`, `jsonl`, `jsonl.gz`

**`-s`** `<data-source>`, **`--source`** `<data-source>`
: Required: the source schema for the events. (e.g. `"Microsoft Sysmon"`)

**`-e`** `<encoding>`
: Source file encoding. (e.g. `ascii`, `utf8`, `utf16`, etc.)

#### convert-query

**eqllib** *convert-query* [*OPTIONS*] <*eql-query*>

The **`convert-query`** command takes an EQL query that matches a normalized schema, and will print out the query converted to match a different schema.

#### Arguments

**`eql-query`**
: Input EQL query written for the normalization schema

### Options

**-h**
Show the help message and exit

**-s** <data-source>, **--source** <data-source>
Required: the source schema for the events. (e.g. "Microsoft Sysmon")

### query

The **query** command reads JSON events and print matching output events back as JSON. Unless specified with *-s*, data is assumed to already be normalized against the schema.

**eqllib** *query* [*OPTIONS*] <*input-query*> <*json-file*>

### Arguments

**input-query**
Query in EQL syntax that matches the common schema.

### Options

**-h**
Show the help message and exit

**--file, -f**
Path to a JSON file of unnormalized events. Defaults to stdin if not specified

**--format**
Format for the input file. One of `json`, `json.gz`, `jsonl`, `jsonl.gz`

**-s** <data-source>, **--source** <data-source>
Required: the source schema for the events. (e.g. "Microsoft Sysmon")

**-e** <encoding>
Source file encoding. (e.g. `ascii`, `utf8`, `utf16`, etc.)

### survey

**eqllib** *survey* [*OPTIONS*] <*json-file*> <*analytic-path*> [*analytic-path*, ...]

The **survey** command can be used to run multiple analytics against a single JSON file. Unless specified with *-s*, data is assumed to already be normalized against the schema.

### Arguments

**analytic-path** [analytic-path, ...]
Path(s) to analytic TOML files or a directory of analytics.

#### Options

**-h**
Show the help message and exit

**--file, -f**
Path to a JSON file of unnormalized events. Defaults to stdin if not specified

**--format**
Format for the input file. One of `json`, `json.gz`, `jsonl`, `jsonl.gz`

**-s** `<data-source>`**, --source** `<data-source>`
Required: the source schema for the events. (e.g. `"Microsoft Sysmon"`)

**-e** `<encoding>`
Source file encoding. (e.g. `ascii`, `utf8`, `utf16`, etc.)

**-c**
Output counts per analytic instead of the individual hits.

View usage for the related EQL utility.

### 1.1.2 Guide to Microsoft Sysmon

Microsoft Sysmon is a freely available tool provided by SysInternals for endpoint logging.

#### Installing Sysmon

`Download` Sysmon from SysInternals.

To install Sysmon, from a terminal, simply change to the directory where the unzipped binary is located, then run the following command as an Administrator

To capture all default event types, with all hashing algorithms, run

```
Sysmon.exe -AcceptEula -i -h * -n -l
```

To configure Sysmon with a specific XML configuration file, run

```
Sysmon.exe -AcceptEula -i myconfig.xml
```

Full details of what each flag does can be found on the Microsoft Sysmon page

**Warning:** Depending on the configuration, Sysmon can generate a significant amount of data. When deploying Sysmon to production or enterprise environments, it is usually best to tune it to your specific environment. There are several Sysmon configuration files in common use which can be used or referenced for this purpose.

- @SwiftOnSecurity's scalable config file.
- @olafhartong's more verbose config file.

#### Getting Sysmon logs with PowerShell

Helpful PowerShell functions for parsing Sysmon events from Windows Event Logs are found in the Github at utils/scrape-events.ps1

Getting logs into JSON format can be done by piping to PowerShell cmdlets within an elevated `powershell.exe` console.

```
# Import the functions provided within scrape-events
Import-Module .\utils\scrape-events.ps1

# Save the most recent 5000 Sysmon logs
Get-LatestLogs  | ConvertTo-Json | Out-File -Encoding ASCII -FilePath my-sysmon-data.
↪json

# Save the most recent 1000 Sysmon process creation events
Get-LatestProcesses | ConvertTo-Json | Out-File -Encoding ASCII -FilePath my-sysmon-
↪data.json
```

To get *all* Sysmon logs from Windows Event Logs, run the powershell command

```
Get-WinEvent -filterhashtable @{logname="Microsoft-Windows-Sysmon/Operational"} -
↪Oldest | Get-EventProps | ConvertTo-Json | Out-File -Encoding ASCII -FilePath my-
↪sysmon-data.json
```

**Warning:** Use this with caution as it will process all events, which may take time and likely generate a large file

#### Example searches with EQL

Once you have logs in JSON format, they can now be queried using EQL. To do so, either the *query* or the *data* will need to be converted (normalized). Because EQL is built to be able to be flexible across all data sources, it is necessary to translate the query to match the underlying data, or to change the data to match the query. The conversion functionality is described in more detail in the *eqllib Command-Line Interface* guide.

For example, to find suspicious reconnaissance commands over the generated data

```
eqllib query -f my-sysmon-data.json --source "Microsoft Sysmon" "process where␣
↪process_name in ('ipconfig.exe', 'netstat.exe', 'systeminfo.exe', 'route.exe')"
```

## 1.2 Analytics

### 1.2.1 Access of Outlook Email Archives

Collection of sensitive information via .ost and .pst outlook archive files.

**id** 15d87029-42c1-4992-a49b-aac74d451c06

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1114 Email Collection

#### Query

```
process where subtype.create and wildcard(command_line, "*.ost *", "*.pst *")
```

#### Contributors

- Endgame

### 1.2.2 Account Discovery via Built-In Tools

Adversaries may use built-in applications to get a listing of local system or domain accounts

**id** 56fdf859-b2a7-4009-88e0-69fec4c3deef

**categories** enrich

**confidence** low

**os** windows, macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1087 Account Discovery

#### Query

```
process where subtype.create and (
  process_name == "net.exe" and wildcard(command_line, "* user*", "*localgroup *",
↪"*group *") or
  process_name in ("groups", "id") or
  process_name == "dscl" and command_line == "*list /groups*" or
  process_name == "dscacheutil" and command_line == "*group*" or
  wildcard(command_line, "*/etc/passwd*", "*/etc/master.passwd*")
)
```

#### Contributors

- Endgame

### 1.2.3 AD Dumping via Ntdsutil.exe

Identifies usage of `ntdsutil.exe` to export an Active Directory database to disk.

**id** 19d59f40-12fc-11e9-8d76-4d6bb837cda4

**categories** detect

**confidence** medium

**os** windows

**created** 01/07/2019

**updated** 01/07/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

#### Query

```
file where file_name == "ntds.dit" and process_name == "ntdsutil.exe"
```

#### Detonation

Atomic Red Team: T1003

#### Contributors

- Tony Lambert

### 1.2.4 Adding the Hidden File Attribute with via attrib.exe

Adversaries can add the *hidden* attribute to files to hide them from the user in an attempt to evade detection

**id** 9051814c-a142-4b1c-965b-76a09dace760

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Persistence

**techniques** T1158 Hidden Files and Directories

#### Query

```
process where subtype.create and
  process_name == "attrib.exe" and
  command_line == "* +h*"
```

#### Contributors

- Endgame

### 1.2.5 AppCert DLLs Registry Modification

Dynamic-link libraries (DLLs) that are specified in the AppCertDLLs value in the Registry key can be abused to obtain persistence and privilege escalation by causing a malicious DLL to be loaded and run in the context of separate processes on the computer.

**id** 14f90406-10a0-4d36-a672-31cabe149f2f

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Persistence

**techniques** T1182 AppCert DLLs

#### Query

```
registry where registry_path == "*\\System\\ControlSet*\\Control\\Session␣
↪Manager\\AppCertDLLs\\*"
```

#### Contributors

- Endgame

### 1.2.6 Audio Capture via PowerShell

Detect attacker collecting audio via PowerShell Cmdlet.

**id** ab7a6ef4-0983-4275-a4f1-5c6bd3c31c23

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1123 Audio Capture

#### Query

```
process where subtype.create and
  process_name == "powershell.exe" and command_line == "* WindowsAudioDevice-
↪Powershell-Cmdlet *"
```

#### Detonation

Atomic Red Team: T1123

#### Contributors

- Endgame

### 1.2.7 Audio Capture via SoundRecorder

Detect audio collection via SoundRecorder application.

**id** f72a98cb-7b3d-4100-99c3-a138b6e9ff6e

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1123 Audio Capture

#### Query

```
process where subtype.create and
  process_name == "SoundRecorder.exe" and command_line == "* /FILE*"
```

### Detonation

Atomic Red Team: T1123

### Contributors

- Endgame

## 1.2.8 Bypass UAC via CMSTP

Detect child processes of automatically elevated instances of Microsoft Connection Manager Profile Installer (`cmstp.exe`).

**id** e584f1a1-c303-4885-8a66-21360c90995b

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1191 CMSTP, T1088 Bypass User Account Control

### Query

```
sequence
  [ process where subtype.create and
      process_name == "cmstp.exe" and command_line =="*/s*" and command_line =="*/au*
↪"] by unique_pid
  [ process where subtype.create ] by unique_ppid
```

### Detonation

Atomic Red Team: T1191

### Contributors

- Endgame

### 1.2.9 Bypass UAC via CompMgmtLauncher

Identifies use of CompMgmtLauncher.exe to bypass User Account Control. Adversaries use this technique to execute privileged processes.

**id** 7efc7afe-8396-4bf0-ac7d-1a860a401d22

**categories** detect

**confidence** medium

**os** windows

**created** 12/04/2019

**updated** 12/04/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1088 Bypass User Account Control

#### Query

```
sequence with maxspan=10s
 [registry where registry_path == "*\\mscfile\\shell\\open\\command*" and user_name !
↪= "SYSTEM"]
 [process where subtype.create and parent_process_path ==
↪"C:\\Windows\\System32\\CompMgmtLauncher.exe"]
```

#### Contributors

- Daniel Stepanic

#### References

- https://enigma0x3.net/2016/08/15/fileless-uac-bypass-using-eventvwr-exe-and-registry-hijacking
- https://www.elastic.co/blog/embracing-offensive-tooling-building-detections-against-koadic-using-eql

### 1.2.10 Bypass UAC via Fodhelper.exe

Identifies use of Fodhelper.exe to bypass User Account Control. Adversaries use this technique to execute privileged processes.

**id** e491ce22-792f-11e9-8f5c-d46d6d62a49e

**categories** detect

**confidence** high

**os** windows

**created** 05/17/2019

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1088 Bypass User Account Control

#### Query

```
process where subtype.create and
  parent_process_name == "fodhelper.exe"
```

#### Detonation

Atomic Red Team: T1088

#### Contributors

- Tony Lambert

### 1.2.11 Bypass UAC via WSReset.exe

Identifies use of WSReset.exe to bypass User Account Control. Adversaries use this technique to execute privileged processes.

**id** 532b5ed4-7930-11e9-8f5c-d46d6d62a49e

**categories** detect

**confidence** high

**os** windows

**created** 05/17/2019

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1088 Bypass User Account Control

#### Query

```
process where subtype.create and
  parent_process_name == "wsreset.exe" and process_name != "conhost.exe"
```

#### Detonation

Atomic Red Team: T1088

#### Contributors

- Tony Lambert

### 1.2.12 Change Default File Association

Detect changes to default File Association handlers.

**id** 26f0ebab-b315-492d-a5be-aa665fba2f35

**categories** hunt

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1042 Change Default File Association

#### Query

```
sequence by unique_pid with maxspan=1s
  [ registry where registry_path == "*\\SOFTWARE\\Classes\\*\\*"]
  [ registry where registry_path ==
↪"*\\SOFTWARE\\Microsoft\\Windows\\CurrentVersion\\Explorer\\GlobalAssocChangedCounter
↪"]
| unique_count process_name, registry_path
```

#### Detonation

Atomic Red Team: T1042

#### Contributors

- Endgame

### 1.2.13 Clearing Windows Event Logs with wevtutil

Identifies attempts to clear Windows event logs with the command `wevtutil`.

**id** 5b223758-07d6-4100-9e11-238cfdd0fe97

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1070 Indicator Removal on Host

#### Query

```
process where subtype.create and
  process_name == "wevtutil.exe" and command_line == "* cl *"
```

#### Detonation

Atomic Red Team: T1070

#### Contributors

- Endgame

### 1.2.14 COM Hijack via Script Object

Identifies COM hijacking using the script object host `scrobj.dll`, which allows for stealthy execution of scripts in legitimate processes.

**id** 9d556fd6-76a3-45d5-9d8d-cb8edf0282f2

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence, Defense Evasion

**techniques** T1122 Component Object Model Hijacking

#### Query

```
registry where
  registry_path == "*_Classes\\CLSID\\{*}\\InprocServer32*" and
  (registry_data == "scrobj*" or registry_data == "*\\scrobj*")
```

#### Detonation

Atomic Red Team: T1122

#### Contributors

- Endgame

### 1.2.15 Command-Line Creation of a RAR file

Detect compression of data into a RAR file using the `rar.exe` utility.

**id** 1ec33c93-3d0b-4a28-8014-dbdaae5c60ae

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Exfiltration

**techniques** T1002 Data Compressed

#### Query

```
process where subtype.create and process_name == "rar.exe" and
  command_line == "* a *"
```

#### Detonation

Atomic Red Team: T1002

#### Contributors

- Endgame

### 1.2.16 Control Panel Items

Windows Control Panel items are utilities that allow users to view and adjust computer settings. Adversaries can use Control Panel items as execution payloads to execute arbitrary commands.

**id** 3b9bbf6b-dde2-4f82-b1ad-b3b625f44a26

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1196 Control Panel Items

#### Query

```
process where subtype.create and
  process_name in ("control.exe", "rundll32.exe") and
  command_line == "*.cpl *"
```

#### Contributors

- Endgame

### 1.2.17 Creation of an Archive with Common Archivers

Adversaries may collect and stage data in a central location or directory in preparation of exfiltration

**id** f43f66f3-7e86-4cd1-9850-df7b4ac7822e

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1074 Data Staged

#### Query

```
sequence by unique_pid with maxspan=1m
  [ process where subtype.create and process_name in ("zip", "tar", "gzip", "hdiutil
↪") ]
  [ file where wildcard(file_name, "*.zip", "*.tar", "*.gzip", "*.gz") ]
```

#### Contributors

- Endgame

### 1.2.18 Creation of Kernel Module

Identify activity related to loading kernel modules on Linux via creation of new ko files in the LKM directory

**id** 9e711823-72f1-4c5c-843d-9afc90c4e6a1

**categories** enrich

**confidence** low

**os** linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1215 Kernel Modules and Extensions

#### Query

```
file where subtype.create and
  file_path == "/lib/modules/*" and file_name == "*.ko"
```

#### Contributors

- Endgame

### 1.2.19 Creation of Scheduled Task with schtasks.exe

A scheduled task can be used by an adversary to establish persistence, move laterally, and/or escalate privileges.

**id** 9583c2ff-508d-4ebb-8b89-712b0a4d3186

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Execution, Persistence

**techniques** T1053 Scheduled Task

#### Query

```
process where subtype.create and
  process_name = "schtasks.exe" and
  command_line = "*create*"
```

#### Contributors

- Endgame

### 1.2.20 Creation or Modification of Systemd Service

Systemd services can be used to establish persistence on a Linux system. The systemd service manager is commonly used for managing background daemon processes (also known as services) and other system resources.

**id** 1a568233-9ca1-4c2c-b2e7-b15b90e2c954

**categories** enrich

**confidence** low

**os** linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1501 Systemd Service

#### Query

```
file where not subtype.delete and
  file_name == "*.service*" and
  wildcard(file_path, "/etc/systemd/system/*","/usr/lib/systemd/system/*")
```

#### Contributors

- Endgame

### 1.2.21 Credential Enumeration via Credential Vault CLI

Identifies use of the Credential Vault command line interface to enumerate a user's saved credentials.

**id** 11968244-6db0-4e03-886c-e3983f9d9024

**categories** detect

**confidence** high

**os** windows

**created** 8/16/2019

**updated** 8/16/2019

### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

### Query

```
process where subtype.create and
  process_name == "vaultcmd.exe" and
  command_line == "* /list*"
```

### Contributors

- David French

### References

- https://rastamouse.me/2017/08/jumping-network-segregation-with-rdp/
- https://medium.com/threatpunter/detecting-adversary-tradecraft-with-image-load-event-logging-8de93338c16

## 1.2.22 Delete Volume USN Journal with fsutil

Identifies use of the fsutil command to delete the volume USNJRNL. This technique is used by attackers to eliminate evidence of files created during post-exploitation activities.

**id** c91f422a-5214-4b17-8664-c5fcf115c0a2

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1070 Indicator Removal on Host

### Query

```
process where subtype.create and
  process_name == "fsutil.exe" and command_line == "* usn *" and command_line == "*␣
↪deletejournal*"
```

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### Detonation

Atomic Red Team: T1070

### Contributors

- Endgame

## 1.2.23 Disconnecting from Network Shares with net.exe

Identifies attempts to remove network shares with the Windows built-in command net.exe

**id** 7d328c61-8f63-4411-9ae7-e5b502a80e7e

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1126 Network Share Connection Removal

### Query

```
process where subtype.create and
  process_name == "net.exe" and command_line == "* /d*"
```

### Contributors

- Endgame

## 1.2.24 Discovery and Enumeration of System Information via Rundll32

Identifies initial system enumeration and discovery commands tied to remote access tools that leverage ‘‘rundll32.exe‘.

**id** 35d27938-d13d-4bcd-9be7-3a69d208c63f

**categories** detect

**confidence** medium

**os** windows

**created** 12/04/2019

**updated** 12/04/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1087 Account Discovery, T1096 NTFS File Attributes, T1033 System Owner/User Discovery

#### Query

```
sequence with maxspan=1h
  [process where subtype.create and process_name == "rundll32.exe"] by unique_pid
  [network where subtype.outgoing and process_name == "rundll32.exe"] by unique_pid
  [process where subtype.create and parent_process_name == "rundll32.exe"] by unique_
↪ppid
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/embracing-offensive-tooling-building-detections-against-koadic-using-eql

### 1.2.25 Discovery of a Remote System's Time

Identifies use of various commands to query a remote system's time. This technique may be used before executing a scheduled task or to discover the time zone of a target system

**id** fcdb99c2-ac3c-4bde-b664-4b336329bed2

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1124 System Time Discovery

### Query

```
process where subtype.create and process_name == "net.exe" and
  command_line == "* time *" and command_line == "*\\\\*"
| unique parent_process_path, command_line
```

### Detonation

Atomic Red Team: T1124

### Contributors

- Endgame

## 1.2.26 Discovery of Domain Groups

Identify usage of known commands for discovery of local groups

**id** cd2124cb-718d-4ecf-bc96-5571f8e3dbce

**categories** enrich

**confidence** low

**os** linux, macos

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1069 Permission Groups Discovery

### Query

```
process where subtype.create and (
  process_name in ("ldapsearch", "dscacheutil") or
  process_name == "dscl" and command_line == "*-list*"
)
```

### Contributors

- Endgame

### 1.2.27 Discovery of Network Environment via Built-in Tools

Build-in tools can be used to enumerate and discover network environment on unix systems.

**id** fd7a0c56-60fa-4f14-8c8e-0e41ad955725

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1016 System Network Configuration Discovery

#### Query

```
process where subtype.create and (
  process_name in ("ifconfig", "arp", "networkctl", "netstat", "route", "ntop") or (
    process_name in ('cat', 'more', 'less', 'vim', 'vi', 'nano', 'gedit') and
    command_line =="* /etc/hosts*"
  )
)
```

#### Contributors

- Endgame

### 1.2.28 Discovery of Network Environment via Built-in Tools

Built-in tools can be used to enumerate and discover network environment on windows systems.

**id** 3a78a9fb-3714-43fa-90ca-7cf85da5a710

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1016 System Network Configuration Discovery

### Query

```
process where subtype.create and
  process_name in ("ipconfig.exe", "route.exe", "nbtstat.exe", "arp.exe")
| unique command_line
```

### Contributors

- Endgame

## 1.2.29 DLL Search Order Hijacking with known programs

Detects writing DLL files to known locations associated with Windows files vulnerable to DLL search order hijacking.

**id** afd1fba7-5301-4d5c-ae66-f8608bc98ae9

**categories** detect

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Defense Evasion, Persistence

**techniques** T1038 DLL Search Order Hijacking

### Query

```
file where not subtype.delete and
  not user_sid in ("S-1-5-18", "S-1-5-19", "S-1-5-20") and (
    file_path == "*\\windows\\ehome\\cryptbase.dll" or
    file_path == "*\\windows\\system32\\sysprep\\cryptbase.dll" or
    file_path == "*\\windows\\system32\\sysprep\\cryptsp.dll" or
    file_path == "*\\windows\\system32\\sysprep\\rpcrtremote.dll" or
    file_path == "*\\windows\\system32\\sysprep\\uxtheme.dll" or
    file_path == "*\\windows\\system32\\sysprep\\dwmapi.dll" or
    file_path == "*\\windows\\system32\\sysprep\\shcore.dll" or
    file_path == "*\\windows\\system32\\sysprep\\oleacc.dll" or
    file_path == "*\\windows\\system32\\ntwdblib.dll"
  )
| unique process_path, file_path
```

### Contributors

- Endgame

### 1.2.30 Domain Trust Discovery

Detect commands used to enumerate a list of trusted domains.

**id** bccb1c48-305c-4b1f-affb-a7a50bf4654b

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1482 Domain Trust Discovery

#### Query

```
process where subtype.create and (
  (process_name == "dsquery.exe") and command_line == "*(objectClass=trustedDomain)*"␣
↪or
  (process_name == "nltest.exe") and command_line == "*domain_trusts*"
)
```

#### Contributors

- Endgame

### 1.2.31 Domain Trust Discovery via Nltest.exe

Identifies execution of nltest.exe for domain trust discovery. This technique is used by attackers to enumerate Active Directory trusts.

**id** 03e231a6-74bc-467a-acb1-e5676b0fb55e

**categories** hunt

**confidence** low

**os** windows

**created** 05/17/2019

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1482 Domain Trust Discovery

#### Query

```
process where subtype.create and
  process_name == "nltest.exe" and command_line == "*domain_trusts*"
```

#### Detonation

Atomic Red Team: T1482

#### Contributors

- Tony Lambert

### 1.2.32 Encoding or Decoding Files via CertUtil

Find execution of the Windows tool certutil.exe to decode or encode files.

**id** c6facc54-4894-4722-b873-062baaae851f

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1140 Deobfuscate/Decode Files or Information

#### Query

```
process where subtype.create and
  process_name == "certutil.exe" and
  (command_line == "*encode *" or command_line == "*decode *")
```

#### Detonation

Atomic Red Team: T1140

#### Contributors

- Endgame

### 1.2.33 Enumeration of Local Shares

Identifies enumeration of local shares with the built-in Windows tool `net.exe`.

**id** bc1944cd-97fc-4b9a-b068-46203b6bbcde

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1135 Network Share Discovery

#### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  command_line == "* share*" and command_line != "* * *"
```

#### Contributors

- Endgame

### 1.2.34 Enumeration of Mounted Shares

Identifies enumeration of mounted shares with the built-in Windows tool `net.exe`.

**id** 4d2e7fc1-af0b-4915-89aa-03d25ba7805e

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1049 System Network Connections Discovery

### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  (command_line == "* use" or command_line == "* use *") and

  // since this command is looking for discovery only, we want to ignore mounting␣
↪shares
  command_line != "* \\\\*"
| unique parent_process_path, command_line, user_name
```

### Detonation

Atomic Red Team: T1049

### Contributors

- Endgame

## 1.2.35 Enumeration of Remote Shares

Identifies enumeration of remote shares with the built-in Windows tool `net.exe`.

**id** e61f557c-a9d0-4c25-ab5b-bbc46bb24deb

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1135 Network Share Discovery

### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  command_line == "* view*" and command_line == "*\\\\*"
```

### Detonation

Atomic Red Team: T1135

### Contributors

- Endgame

## 1.2.36 Enumeration of System Information

System information enumeration and discovery via built-in tools.

**id** 6a1247d5-8b8a-4a5c-8d35-dd9ef220e7d1

**categories** enrich

**confidence** low

**os** linux

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1082 System Information Discovery

### Query

```
process where subtype.create and (
  process_name == "uname" or (
  process_name in ("cat", "more", "less") and
    wildcard(command_line,
             "* /etc/issue*",    "* /proc/version*", "* /etc/profile*",
             "* /etc/services*", "* /proc/cpuinfo*",)
  ))
```

### Contributors

- Endgame

## 1.2.37 Enumeration of System Information

Windows contains several built-in commands to report system information. These may be used by an actor to gain detailed information about the target machine.

**id** 507f19c1-dfa9-475b-925e-61e417a10967

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1082 System Information Discovery

#### Query

```
process where subtype.create and (
  process_name in ("systeminfo.exe", "hostname.exe") or
  process_name == "cmd.exe" and wildcard(command_line, "* ver*", "*%COMPUTERNAME%*",
↪"*%PROCESSOR_*%")
)
```

#### Contributors

- Endgame

### 1.2.38 Executable Written and Executed by Microsoft Office Applications

Identifies an executable file written by a Microsoft Office application where that same executable is later ran as it's own process. This behavior can be indicative of suspicious activity possibly tied to macro objects or technologies used for command execution such as Dynamic Data Exchange (DDE).

**id** 2b512bec-b28d-4a84-9253-2c691bedb7bc

**categories** detect

**confidence** high

**os** windows

**created** 12/04/2019

**updated** 12/04/2019

#### MITRE ATT&CK™ Mapping

**tactics** Execution

**techniques** T1204 User Execution, T1173 Dynamic Data Exchange

#### Query

```
sequence with maxspan=3d
  [file where file_name == "*.exe" and process_name in ("winword.exe", "excel.exe",
↪"powerpnt.exe")] by file_path
  [process where true] by process_path
```

#### Contributors

- Daniel Stepanic

### References

- https://www.elastic.co/blog/embracing-offensive-tooling-building-detections-against-koadic-using-eql

## 1.2.39 Execution of a Command via a SYSTEM Service

Detect the usage of an intermediate service used to launch a SYSTEM-level command via `cmd.exe` or `powershell.exe`.

**id** dcb72010-c3f5-42bc-bc5e-f4f015aed1e8

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1035 Service Execution, T1050 New Service

### Query

```
registry where
    registry_path == "*\\System\\*ControlSet*\\Services\\*\\ImagePath"
    and wildcard(registry_data, "*%COMSPEC%*", "*cmd.exe*", "*powershell*", "*cmd *")
```

### Detonation

Atomic Red Team: T1035

### Contributors

- Endgame

## 1.2.40 Execution of Existing Service via Command

Identifies attempts to execute an existing service by running a built-in Windows command.

**id** 45861478-8ba3-4302-9600-1970d5d8b074

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Execution

**techniques** T1035 Service Execution

#### Query

```
process where subtype.create and (
  process_name == "sc.exe" and command_line == "* start *" or
  process_name == "net.exe" and match(command_line, ?".*? start *[\s].*") or
  process_name == "powershell.exe" and wildcard(command_line, "*Start-Service*") or
  process_name == "wmic.exe" and wildcard(command_line, "*service*call*startservice*")
)
```

#### Contributors

- Endgame

### 1.2.41 Execution via cmstp.exe

Identifies potentially stealthy execution via the Microsoft Connection Manager Profile Installer.

**id** 56c64a8c-a787-488a-a7f2-b992d332679d

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1191 CMSTP

#### Query

```
process where subtype.create and
  process_name == "cmstp.exe" and
  command_line == "* /s *"
```

#### Contributors

- Endgame

### 1.2.42 HH.exe execution

Identifies usage of hh.exe executing recently modified .chm files.

**id** b25aa548-7937-11e9-8f5c-d46d6d62a49e

**categories** detect

**confidence** medium

**os** windows

**created** 08/08/2019

**updated** 09/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1223 Compiled HTML File

#### Query

```
sequence with maxspan=1d
   [file where file_name == "*.chm"]
   [process where subtype.create and process_name == "hh.exe" and command_line == "*
↪*.chm*"]
```

#### Detonation

Atomic Red Team: T1223

#### Contributors

- Dan Beavin

### 1.2.43 Host Artifact Deletion

Adversaries may delete artifacts on a host system, including logs, browser history, or directories.

**id** 339d4a19-dfb8-4d86-89c8-6a3ac807a57f

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1070 Indicator Removal on Host

### Query

```
process where subtype.create and (
  (process_name == "rundll32.exe" and command_line == "*InetCpl.cpl,Clear*") or
  (process_name == "reg.exe" and command_line == "* delete *") or
  (process_name == "cmd.exe" and command_line == "* *rmdir *")
)
```

### Contributors

- Endgame

## 1.2.44 Image Debuggers for Accessibility Features

The Debugger registry key allows an attacker to launch intercept the execution of files, causing a different process to be executed. This functionality is used by attackers and often targets common programs to establish persistence.

**id** 279773ee-7c69-4043-870c-9ed731c7989a

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Persistence, Privilege Escalation, Defense Evasion

**techniques** T1015 Accessibility Features, T1183 Image File Execution Options Injection

### Query

```
registry where wildcard(registry_path,
  "*\\Software\\Microsoft\\Windows NT\\CurrentVersion\\Image File Execution␣
↪Options\\*\\Debugger",
  "*\\Software\\Wow6432Node\\Microsoft\\Windows NT\\CurrentVersion\\Image File␣
↪Execution Options\\*\\Debugger"
  )

  and wildcard(registry_path,
    // Accessibility Features
    "*\\sethc.exe\\*",
    "*\\utilman.exe\\*",
```

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```
    "*\\narrator.exe\\*",
    "*\\osk.exe\\*",
    "*\\magnify.exe\\*",
    "*\\displayswitch.exe\\*",
    "*\\atbroker.exe\\*",
  )
```

#### Detonation

Atomic Red Team: T1015

#### Contributors

- Endgame

### 1.2.45 Incoming Remote PowerShell Sessions

Incoming lateral movement via Windows Remote Management (WinRM)

**id** 3abf86e1-3ba3-4473-90ea-5fc37ff57d18

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement, Execution

**techniques** T1028 Windows Remote Management

#### Query

```
sequence with maxspan=2s
  [network where subtype.incoming and destination_port in (5985, 5986)]
  [process where subtype.create and
    process_name == "wsmprovhost.exe" and parent_process_name == "svchost.exe"]
```

#### Contributors

- Endgame

### 1.2.46 Indirect Command Execution

Detect indirect command execution via Program Compatibility Assistant `pcalua.exe` or `forfiles.exe`.

**id** 884a7ccd-7305-4130-82d0-d4f90bc118b6

**categories** hunt

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1202 Indirect Command Execution

---

**Note:** These processes can be used in legitimate scripts, so `| unique_count` and `| filter` are used to focus on outliers as opposed to commonly seen artifacts.

---

#### Query

```
process where subtype.create and
  parent_process_name in ("pcalua.exe", "forfiles.exe")
| unique_count command_line, process_name
| filter count < 10
```

#### Detonation

Atomic Red Team: T1202

#### Contributors

- Endgame

### 1.2.47 Installation of Port Monitor

A port monitors can be registered by calling the `AddMonitor` API with a path to a DLL. This functionality can be abused by attackers to establish persistence.

**id** dce405ba-0f30-4278-b6c6-80d57847ba6b

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Persistence

**techniques** T1013 Port Monitors

#### Query

```
registry where registry_path == "*ControlSet*\\Control\\Print\\Monitors*"
```

#### Contributors

- Endgame

### 1.2.48 Installation of Security Support Provider

Adversaries can establish persistence by modifying registry keys related to the Windows Security Support Provider (SSP) configuration

**id** 43cfcfb8-e52d-4c1a-a110-3aecc09e6206

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1101 Security Support Provider

#### Query

```
registry where
   wildcard(registry_path,
            "*\\SYSTEM\\CurrentControlSet\\Control\\Lsa\\Security Packages*",
            "*\\SYSTEM\\CurrentControlSet\\Control\\Lsa\\OSConfig\\Security Packages*
↪")
```

#### Contributors

- Endgame

### 1.2.49 Installation of Time Providers

Attackers may establish persistence by registering a DLL with Windows as a valid time provider.

**id** 3056a14a-59d9-43d3-84b5-738b4b8c3dd7

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1209 Time Providers

#### Query

```
registry where
  registry_path == "*\\System\\CurrentControlSet\\Services\\W32Time\\TimeProviders\\*"
```

#### Contributors

- Endgame

### 1.2.50 Installing Custom Shim Databases

Identifies the installation of custom Application Compatibility Shim databases.

**id** 0e9a0a32-acf4-4969-9828-215a692c436e

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence, Privilege Escalation

**techniques** T1138 Application Shimming

### Query

```
registry where registry_path == "*\\SOFTWARE\\Microsoft\\Windows␣
↪NT\\CurrentVersion\\AppCompatFlags\\Custom\\*.sdb"
  and not event of [process where subtype.create and

                      // Ignore legitimate usage of sdbinst.exe
                      not (process_name == "sdbinst.exe" and parent_process_name ==
↪"msiexec.exe")
                    ]
```

### Detonation

Atomic Red Team: T1138

### Contributors

- Endgame

## 1.2.51 InstallUtil Execution

InstallUtil may be abused to bypass process whitelisting or proxy the execution of code through a trusted Windows utility.

**id** b937f762-466f-4242-a461-d68e6e4bfc5a

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Execution, Defense Evasion

**techniques** T1118 InstallUtil

### Query

```
process where subtype.create and
  process_name == "installutil.exe" and
  command_line == "* *"
| unique parent_process_name, command_line
```

### Contributors

- Endgame

### 1.2.52 Interactive AT Job

Detect an interactive AT job, which may be used as a form of privilege escalation.

**id** d8db43cf-ed52-4f5c-9fb3-c9a4b95a0b56

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1053 Scheduled Task

---

**Note:**

**As of Windows 8, the `at.exe` command was deprecated and prints the error message** The AT command has been deprecated. Please use schtasks.exe instead.

---

#### Query

```
process where subtype.create and
  process_name == "at.exe" and command_line == "* interactive *"
```

#### Detonation

Atomic Red Team: T1053

#### Contributors

- Endgame

#### References

- https://blogs.technet.microsoft.com/supportingwindows/2013/07/05/whats-new-in-task-scheduler-for-windows-8-server-2012/

### 1.2.53 Launch Daemon Persistence

An adversary can maintain persistence by installing a new launch daemon that can be configured to execute upon startup

**id** 24cb8b7c-92fe-4d62-af0e-d3de993cd48b

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Persistence

**techniques** T1160 Launch Daemon

#### Query

```
process where subtype.create and
   parent_process_name == "launchd"
```

#### Contributors

- Endgame

### 1.2.54 Loading Kernel Modules with kextload

Identify activity related to loading kernel modules on MacOS via the kextload command

**id** deca3ab9-93f2-4e1e-b782-97863bc26089

**categories** hunt

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1215 Kernel Modules and Extensions

#### Query

```
process where subtype.create and
  process_name == "kextload"
```

#### Contributors

- Endgame

### 1.2.55 Local Job Scheduling Paths

On Linux and macOS systems, multiple methods are supported for creating pre-scheduled and periodic background jobs.

**id** 01fa72dc-5ce4-443b-96f9-703edfeefa5d

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Execution, Persistence

**techniques** T1168 Local Job Scheduling

#### Query

```
file where wildcard(file_path, "/etc/crontab", "/etc/cron.d", "*LaunchDaemons*")
```

#### Contributors

- Endgame

### 1.2.56 Local Job Scheduling Process

On Linux and macOS systems, multiple methods are supported for creating pre-scheduled and periodic background jobs.

**id** 7f490015-20b2-43e3-acf7-e2f2d098505d

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Execution, Persistence

**techniques** T1168 Local Job Scheduling

#### Query

```
process where subtype.create and
  process_name in ("cron", "at", "launchd")
```

#### Contributors

- Endgame

### 1.2.57 Logon Scripts with UserInitMprLogonScript

Detect modification of Windows logon scripts stored in `HKCU\Environment\UserInitMprLogonScript` and trigger when a user logs in.

**id** 54fff7e8-f81d-4169-b820-4cbff0133e2d

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1037 Logon Scripts

#### Query

```
registry where registry_path == "*\\Environment\\UserInitMprLogonScript"
```

#### Detonation

Atomic Red Team: T1037

#### Contributors

- Endgame

### 1.2.58 LSA Authentication Package

Adversaries can use the auto-start mechanism provided by LSA Authentication Packages for persistence.

**id** 077b1d1b-34ff-42d2-bd48-b0e6cdd1a359

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1131 Authentication Package

#### Query

```
registry where hive.hklm and
  registry_path == "*ControlSet*\\Control\\Lsa\\Authentication Packages*"
```

#### Contributors

- Endgame

### 1.2.59 LSASS Memory Dumping

Detect creation of dump files containing the memory space of lsass.exe, which contains sensitive credentials.

**id** 210b4ea4-12fc-11e9-8d76-4d6bb837cda4

**categories** detect

**confidence** high

**os** windows

**created** 01/07/2019

**updated** 01/07/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

#### Query

```
file where file_name == "lsass*.dmp" and process_name != "werfault.exe"
```

#### Detonation

Atomic Red Team: T1003

#### Contributors

- Tony Lambert

### 1.2.60 LSASS Memory Dumping via ProcDump.exe

Identifies usage of Sysinternals `procdump.exe` to export the memory space of lsass.exe which contains sensitive credentials.

**id** 1e1ef6be-12fc-11e9-8d76-4d6bb837cda4

**categories** detect

**confidence** high

**os** windows

**created** 01/07/2019

**updated** 01/07/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

#### Query

```
process where subtype.create and
  process_name == "procdump*.exe" and command_line == "*lsass*"
```

#### Detonation

Atomic Red Team: T1003

#### Contributors

- Tony Lambert

### 1.2.61 Modification of Boot Configuration

Identifies use of the bcdedit command to delete boot configuration data. This tactic is sometimes used as by malware or an attacker as a destructive technique.

**id** c4732632-9c1d-4980-9fa8-1d98c93f918e

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Impact

**techniques** T1490 Inhibit System Recovery

#### Query

```
process where subtype.create and
  process_name == "bcdedit.exe" and command_line == "*set *" and
  (command_line == "* bootstatuspolicy *ignoreallfailures*" or command_line == "*
↪recoveryenabled* no*")
```

#### Detonation

Atomic Red Team: T1490

#### Contributors

- Endgame

### 1.2.62 Modification of ld.so.preload

Identifies modification of ld.so.preload for shared object injection. This technique is used by attackers to load arbitrary code into processes.

**id** fd9b987a-1101-4ed3-bda6-a70300eaf57e

**categories** detect

**confidence** medium

**os** linux

**created** 05/17/2019

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1055 Process Injection

#### Query

```
file where file_path="/etc/ld.so.preload"
```

#### Detonation

Atomic Red Team: T1055

#### Contributors

- Tony Lambert

### 1.2.63 Modification of Logon Scripts from Registry

Windows allows logon scripts to be run whenever a specific user or group of users log into a system.

**id** af99d7ec-b1c7-4648-9188-063ca27544ac

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement, Persistence

**techniques** T1037 Logon Scripts

#### Query

```
registry where registry_path == "*\\Environment\\UserInitMprLogonScript"
```

#### Contributors

- Endgame

### 1.2.64 Modification of rc.common Script

During the boot process, macOS executes source /etc/rc.common, which is a shell script containing various utility functions. Adversaries can use the rc.common file as a way to hide code for persistence.

**id** 11db63f4-15eb-47f7-8e69-e4879bace2b0

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1163 Rc.common

#### Query

```
file where file_name == "rc.common"
```

#### Contributors

- Endgame

### 1.2.65 Modifications of .bash_profile and .bashrc

Detect modification of .bash_profile and .bashrc files for persistent commands

**id** 3567621a-1564-11e9-8e67-d46d6d62a49e

**categories** hunt

**confidence** low

**os** linux, macos

**created** 01/10/2019

**updated** 01/10/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1156 .bash_profile and .bashrc

#### Query

```
file where subtype.modify and
  (file_name == ".bash_profile" or file_name == ".bashrc")
```

#### Detonation

Atomic Red Team: T1156

#### Contributors

- Tony Lambert

### 1.2.66 Mounting Hidden Shares

Identifies enumeration of mounted shares with the built-in Windows tool `net.exe`.

**id** 9b3dd402-891c-4c4d-a662-28947168ce61

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement

**techniques** T1077 Windows Admin Shares

#### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  (command_line == "* use" or command_line == "* use *") and

  // since this command is looking for discovery only, we want to ignore mounting␣
↪shares
  command_line == "* \\\\*"
| unique parent_process_path, command_line, user_name
```

#### Detonation

Atomic Red Team: T1077

#### Contributors

- Endgame

### 1.2.67 Mounting Windows Hidden Shares with net.exe

Identifies hidden Windows Admin Network shares

**id** 8e7c9bce-565b-4ee1-bb70-37dc61afc8d0

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement

**techniques** T1077 Windows Admin Shares

### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  (command_line == "* use \\\\*\\*$*" or command_line == "* use \\\\*/*$*")
```

### Contributors

- Endgame

## 1.2.68 MS Office Template Injection

Microsoft's Open Office XML (OOXML) specification defines an XML-based format for Office documents. Adversaries may abuse this technology to initially conceal malicious code to be executed via documents.

**id** bba65411-cf61-4d7c-a9a8-a2021684e9ca

**categories** detect

**confidence** low

**os** windows

**created** 02/12/2020

**updated** 02/12/2020

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1221 Template Injection

### Query

```
sequence by unique_pid
  [process where process_name in ("winword.exe", "excel.exe", "powerpnt.exe")]
  [dns where not wildcard(query_name, "*.microsoft.com", "*.skype.com")]
  [network where true]
```

### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/playing-defense-against-gamaredon-group

### 1.2.69 Mshta Descendant of Microsoft Office

Identifies the execution of `mshta.exe` as a descendant of a Microsoft Office process.

**id** d49fc9fe-df80-416d-a861-0be02bef0df5

**categories** detect

**confidence** medium

**os** windows

**created** 12/04/2019

**updated** 12/04/2019

#### MITRE ATT&CK™ Mapping

**tactics** Execution, Defense Evasion, Command and Control

**techniques** T1170 Mshta

#### Query

```
process where subtype.create and process_name == "mshta.exe"
  and descendant of
    [process where process_name in ("outlook.exe", "winword.exe", "excel.exe",
↪"powerpnt.exe")]
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/embracing-offensive-tooling-building-detections-against-koadic-using-eql

### 1.2.70 Mshta Network Connections

Identifies suspicious `mshta.exe` commands that make outbound network connections.

**id** 6bc283c4-21f2-4aed-a05c-a9a3ffa95dd4

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Execution, Defense Evasion, Command and Control

**techniques** T1170 Mshta

#### Query

```
sequence by unique_pid
  [process where subtype.create and process_name == "mshta.exe" and command_line ==
↪"*javascript*"]
  [network where process_name == "mshta.exe"]
```

#### Detonation

Atomic Red Team: T1170

#### Contributors

- Endgame

### 1.2.71 Network Service Scanning via Port

Network Service Scanning via incoming network port scanning

**id** 4f64ef9e-ee9b-4245-a3f4-777e550ebb37

**categories** hunt

**confidence** low

**os** windows, macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1046 Network Service Scanning

#### Query

```
network where subtype.incoming
| unique unique_pid destination_port
| unique_count unique_pid
| filter count > 25
```

#### Contributors

- Endgame

### 1.2.72 Non-browser processes making DNS requests to Dynamic DNS Providers

Identifies non-browser processes making DNS requests to Dynamic DNS Providers used by GAMAREDON GROUP.

**id** de828f75-33bb-41ab-bc52-92dc2e0ef58b

**categories** detect

**confidence** low

**os** windows

**created** 02/12/2020

**updated** 02/12/2020

#### MITRE ATT&CK™ Mapping

**tactics** Command and Control

**techniques** T1071 Standard Application Layer Protocol

#### Query

```
dns where wildcard(query_name, "*.ddns.net", "*.hopto.org", "*.bounceme.net") and
  process_name not in ("chrome.exe","iexplore.exe", "firefox.exe")
| unique unique_pid
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/playing-defense-against-gamaredon-group

### 1.2.73 Office Application Startup via Template File Modification

Adversaries can modify default Microsoft Office templates in order to establish persistence

**id** d763c9bb-c0f7-4a4f-82b0-06105e178afa

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1137 Office Application Startup

#### Query

```
file where not subtype.delete and
  wildcard(file_path,
           "*:\\Users\\*\\AppData\\Roaming\\Microsoft\\Templates\\Normal.dotm",
           "*:\\Users\\AppData\\Roaming\\Microsoft\\Excel\\XLSTART\\PERSONAL.XLSB",
           )
```

#### Contributors

- Endgame

### 1.2.74 Office Application Startup via Template Registry Modification

Adversaries can modify Microsoft Office-related registry keys to establish persistence.

**id** 100e0ff0-fae0-4dc0-998d-c168d7e4dcb7

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1137 Office Application Startup

#### Query

```
registry where wildcard(registry_path,
  "*\\Software\\Microsoft\\Office\\*\\Outlook\\Today\\UserDefinedUrl",
  "*\\Software\\Microsoft\\Office\\*\\Excel\\Options\\Open",
  "*\\Software\\Microsoft\\Office\\*\\PowerPoint\\AddIns",
  "*\\Software\\Microsoft\\Office\\*\\Addins\\*",
  "*\\SOFTWARE\\Microsoft\\Office\\*\\Excel\\Options",
  "*\\Software\\Microsoft\\VBA\\VBE\\*\\Addins\\*")
```

#### Contributors

- Endgame

### 1.2.75 Password Policy Enumeration

Identifies enumeration of local or global password policies using built-in commands.

**id** 94a5cbe1-851a-4b8f-bd9c-04c62097ae5e

**categories** enrich

**confidence** low

**os** linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1201 Password Policy Discovery

#### Query

```
process where subtype.create and (
  process_name == "chage" and command_line == "* -l *" or
  process_name == "cat" and command_line == "*/etc/pam.d/common-password*"
)
```

#### Contributors

- Endgame

### 1.2.76 Persistence via AppInit DLL

Detect registry modifications of the AppInit_Dlls key, which is used by attackers to maintain persistence. AppInit DLLs are loaded into every process that users the common library `user32.dll`.

**id** 822dc4c5-b355-4df8-bd37-29c458997b8f

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence, Privilege Escalation

**techniques** T1103 AppInit DLLs

### Query

```
registry where wildcard(registry_path,
    "*\\SOFTWARE\\Microsoft\\Windows NT\\CurrentVersion\\Windows\\AppInit_Dlls",
    "*\\SOFTWARE\\Wow6432Node\\Microsoft\\Windows␣
↪NT\\CurrentVersion\\Windows\\AppInit_Dlls"
  )
  and not wildcard(process_path, "*\\system32\\msiexec.exe", "*\\syswow64\\msiexec.exe
↪")
| unique registry_data
```

### Detonation

Atomic Red Team: T1103

### Contributors

- Endgame

## 1.2.77 Persistence via NetSh Key

The tool NetShell allows for the creation of helper DLLs, which are loaded into `netsh.exe` every time it executes. This is used by attackers to establish persistence.

**id** 5f9a71f4-f5ef-4d35-aff8-f67d63d3c896

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1128 Netsh Helper DLL

### Query

```
registry where registry_path == "*\\Software\\Microsoft\\NetSh\\*"
```

### Detonation

Atomic Red Team: T1128

### Contributors

- Endgame

## 1.2.78 Persistence via Screensaver

Detect persistence via screensaver when attacker writes payload to registry within screensaver key path.

**id** dd2eee76-9b44-479e-9860-435357e82db8

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1180 Screensaver

### Query

```
registry where registry_path == "*\\Control Panel\\Desktop\\SCRNSAVE.EXE"

  // Ignore when the screensaver is legitimately set via the dialog
  and not event of [ process where subtype.create
                       and process_path == "*\\system32\\rundll32.exe"
                       and parent_process_path == "*\\explorer.exe"
                       and command_line == "* shell32.dll,Control_RunDLL desk.cpl,
↪ScreenSaver,*"
                     ]
```

### Detonation

Atomic Red Team: T1180

### Contributors

- Endgame

### References

- https://github.com/redcanaryco/atomic-red-team/blob/master/atomics/T1180/T1180.yaml

### 1.2.79 Persistent process via Launch Agent

An adversary can establish persistence by installing a new launch agent that executes at login by using launchd or launchctl to load a plist into the appropriate directories

**id** 8b3a3f3b-f4f0-4cd4-82f4-28f79a3cf95b

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1159 Launch Agent

#### Query

```
file where not subtype.delete and
  file_path == "*/library/launchagents/*"
```

#### Contributors

- Endgame

### 1.2.80 Plist Modification

Property list (plist) files contain all of the information that macOS and OS X uses to configure applications and services. Adversaries can modify these plist files to point to their own code, can use them to execute their code in the context of another user, bypass whitelisting procedures, or even use them as a persistence mechanism.

**id** 9424fa5e-466a-40df-bb69-7cf31b7bd398

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation, Defense Evasion, Persistence

**techniques** T1150 Plist Modification

#### Query

```
file where file_name == "*Library/Preferences/*.plist"
```

#### Contributors

- Endgame

### 1.2.81 Potential Gatekeeper Bypass

In macOS, when applications or programs are downloaded from the internet, there is a special attribute set on the file. This attribute is read by Apple's Gatekeeper defense program at execution time.

**id** a4fe6af5-bc33-4e72-8241-eea885b95c46

**categories** detect

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1144 Gatekeeper Bypass

#### Query

```
process where subtype.create and
  process_name == "xattr" and
  command_line == "*com.apple.quarantine*"
| unique command_line
```

#### Contributors

- Endgame

### 1.2.82 Process Discovery via Built-In Applications

Built-in tools can be used to discover running processes on an endpoint

**id** 737c7bed-364f-4b47-a0aa-763c80c8aa6c

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1057 Process Discovery, T1063 Security Software Discovery

#### Query

```
process where subtype.create and
  (process_name in ("ps", "pstree", "htop", "pgrep") or
  match(command_line, ?".*? /proc/\d+"))
```

#### Contributors

- Endgame

### 1.2.83 Process Discovery via Windows Tools

Attackers will enumerate running processes to gain further comprehension of the environment.

**id** 555a76e1-d5fe-44b9-a6bc-d275c4c446cc

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1057 Process Discovery, T1063 Security Software Discovery

#### Query

```
process where subtype.create and (
  process_name == "tasklist.exe" and not matchLite(?".* [-/]svc", command_line) or
  process_name == "quser.exe" or
  (process_name == "powershell.exe" and command_line == "*Get-Process*")
)
```

#### Contributors

- Endgame

### 1.2.84 Processes Running with Unusual Extensions

Processes should always be executing with PE extensions, such as `.exe`, so any execution from non-PE extensions, such as `.gif` are immediately suspicious.

**id** 251c26ff-658b-42d1-a808-bafcd4b52284

**categories** detect

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1036 Masquerading

#### Query

```
process where subtype.create
  and wildcard(process_name,
               "*.pif" ,  "*.pdf",    "*.docx",   "*.doc",
               "*.xlsx",  "*.xls",    "*.pptx",   "*.ppt",
               "*.txt",   "*.rtf",    "*.gif",    "*.jpg",
               "*.png",   "*.bmp",    "*.vbs",    "*.vbe",
               "*.bat",   "*.js",     "*.cmd",
               "*.wsh",   "*.ps1",    "* ",
              )
```

#### Contributors

- Endgame

### 1.2.85 Processes with Trailing Spaces

Identifies processes running with a trailing space, which can be used to look like an ordinary file while evading default file handlers.

**id** 391c27cf-68d5-4416-9315-cdfde096a33b

**categories** detect

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1151 Space after Filename

#### Query

```
process where subtype.create
  and process_name == "* "
```

#### Contributors

- Endgame

### 1.2.86 Proxied Execution via Signed Scripts

Signed script scripts such as PubPrn.vbs can be used to proxy execution from a remote site while bypassing signature validation restrictions and potentially application whitelisting.

**id** 0d62a884-1052-44d0-a76c-1f4845e348d2

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1216 Signed Script Proxy Execution

#### Query

```
process where subtype.create and
  process_name in ("cscript.exe", "wscript.exe") and
  command_line == "* *.vbs* *script:http*"
```

#### Contributors

- Endgame

### 1.2.87 Reading the Clipboard with pbpaste

Adversaries may collect data stored in the clipboard from users copying information within or between applications.

**id** 4e026838-f673-4a5b-b380-615d624fbd00

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1115 Clipboard Data

#### Query

```
process where subtype.create and process_name == "pbpaste"
```

#### Contributors

- Endgame

### 1.2.88 Registration of a Password Filter DLL

Identifies the installation of password filter DLLs which may be used to steal credentials from LSA.

**id** ae6ae50f-69f3-4e85-bfe2-2db9d1422517

**categories** detect

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1174 Password Filter DLL

#### Query

```
registry where hive.hklm and
  registry_path == "*SYSTEM\\ControlSet*\\Control\\Lsa\\Notification Packages*"
| unique registry_path, process_path
```

#### Contributors

- Endgame

### 1.2.89 Registration of Winlogon Helper DLL

A winlogon registry key was modified to establish persistence.

**id** 46de6f8f-e30e-45f7-a136-7ab140c9af08

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1004 Winlogon Helper DLL

#### Query

```
registry where
  wildcard(registry_path,
           "*\\Software[Wow6432Node]Microsoft\\Windows NT\\CurrentVersion\\Winlogon\\*
↪",
           "*\\Software\\Microsoft\\Windows NT\\CurrentVersion\\Winlogon\\*")
```

#### Contributors

- Endgame

### 1.2.90 Registry Persistence via Run Keys

Adversaries can establish persistence by adding an entry to the "run keys" in the registry or startup folder. The referenced program will be executed when a user logs in.

**id** c457d0c5-3ec8-4e9e-93f5-6ddcbfeec498

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1060 Registry Run Keys / Startup Folder

#### Query

```
registry where
  registry_path == "*\\Software\\Microsoft\\Windows\\CurrentVersion\\Run*"
```

#### Contributors

- Endgame

### 1.2.91 Registry Persistence via Shell Folders

Adversaries can establish persistence by adding an entry to the "run keys" in the registry or startup folder. The referenced program will be executed when a user logs in.

**id** f8b1720c-7116-4ec3-b38a-402f984e4972

**categories** detect

**confidence** low

**os** windows

**created** 7/22/2019

**updated** 7/22/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1060 Registry Run Keys / Startup Folder

#### Query

```
registry where
  registry_path == "\\Software\\Microsoft\\Windows\\CurrentVersion\\Explorer\\*Shell␣
↪Folders*"
```

#### Contributors

- Endgame

### 1.2.92 Registry Preparation of Event Viewer UAC Bypass

Identifies preparation for User Account Control (UAC) bypass via Event Viewer registry hijacking. Attackers bypass UAC to stealthily execute code with elevated permissions.

**id** f90dd84d-6aa1-4ffd-8f0e-933f51c20fbe

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Privilege Escalation

**techniques** T1088 Bypass User Account Control

#### Query

```
registry where
  registry_path == "*\\MSCFile\\shell\\open\\command\\" and

  // Ignore cases where the original avalue is restored
  registry_data != '*\\system32\\mmc.exe \"%1\"*'

  // SYSTEM will never need to bypass uac
  and not user_sid in ("S-1-5-18", "S-1-5-19", "S-1-5-20")
```

#### Detonation

Atomic Red Team: T1088

#### Contributors

- Endgame

### 1.2.93 RegSvr32 Scriptlet Execution

Detect regsvr32 loading a script object (scrobj).

**id** 82200c71-f3c3-4b6c-aead-9cafeab602f5

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Execution

**techniques** T1117 Regsvr32

#### Query

```
process where subtype.create and
  process_name == "regsvr32.exe" and
  wildcard(command_line, "*scrobj*", "*/i:*", "*-i:*", "*.sct*")
```

#### Detonation

Atomic Red Team: T1117

#### Contributors

- Endgame

### 1.2.94 Remote Desktop Protocol Hijack

Identifies possible Remote Desktop Protocol session hijacking

**id** 46ff4da0-2f55-4023-8de3-1709fbd33f1d

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement

**techniques** T1076 Remote Desktop Protocol

#### Query

```
process where subtype.create and
  process_name == "tscon.exe" and command_line == "* *"
```

#### Contributors

- Endgame

### 1.2.95 Remote Execution via WMIC

Identifies use of `wmic.exe` to run commands on remote hosts.

**id** 07b1481c-2a20-4274-a64e-effcd40941a5

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement, Execution

**techniques** T1047 Windows Management Instrumentation

#### Query

```
process where subtype.create and process_name == "wmic.exe" and
  (command_line == "* /node:*" or command_line == "* -node:*") and
  (command_line == "* *process* call *")
```

#### Contributors

- Endgame

### 1.2.96 Remote System Discovery Commands

Commands used to obtain information about the remote system.

**id** 9be90e44-c0f7-4fd2-9378-be00c25a02d7

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1018 Remote System Discovery

#### Query

```
process where subtype.create and (
  process_name == "nbtstat.exe" and wildcard(command_line, "* -n*", "* -s*") or
  process_name == "arp.exe" and command_line == "* -a*"
)
```

#### Contributors

- Endgame

### 1.2.97 Remote Terminal Sessions

An adversary may use Valid Accounts to log into a service specifically designed to accept remote connections.

**id** 5c310aff-d4a8-43fb-beed-b17dab1f1df0

**categories** enrich

**confidence** low

**os** windows, macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Lateral Movement

**techniques** T1021 Remote Services

#### Query

```
process where subtype.create and
  process_name in ("telnet.exe", "putty.exe", "ssh")
| unique_count parent_process_name, command_line
```

#### Contributors

- Endgame

### 1.2.98 Resumed Application on Reboot

Starting in Mac OS X 10.7 (Lion), users can specify certain applications to be re-opened when a user reboots their machine.

**id** 491db9c2-8b06-4076-8f9b-de44b9bae8d0

**categories** enrich

**confidence** low

**os** macos

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1164 Re-opened Applications

### Query

```
file where file_name == "*Library/Preferences/com.apple.loginwindow.*plist"
```

### Contributors

- Endgame

## 1.2.99 Root Certificate Install

Identifies modifications to the local trusted root certificates via known Windows tools. The install of a malicious root certificate would allow an attacker the ability to masquerade malicious files as valid signed components from any entity (e.g. Microsoft). It could also allow an attacker to decrypt SSL traffic on this machine. However, software may also install root certificates for the purpose of inspecting SSL traffic.

**id** 7a2efea5-42d9-4bb1-8e53-6e6d47167a96

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1130 Install Root Certificate

### Query

```
registry where wildcard(registry_path,
↪"*Software\\Microsoft\\SystemCertificates\\Root\\Certificates\\*\\Blob",
↪"*Software\\Microsoft\\SystemCertificates\\AuthRoot\\Certificates\\*\\Blob",
↪"*Software\\Policies\\Microsoft\\SystemCertificates\\Root\\Certificates\\*\\Blob",
```

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```
↪"*Software\\Policies\\Microsoft\\SystemCertificates\\AuthRoot\\Certificates\\*\\Blob
↪")
| unique process_path,registry_path
```

### Contributors

- Endgame

## 1.2.100 SAM Dumping via Reg.exe

Identifies usage of `reg.exe` to export registry hives which contain the SAM and LSA secrets.

**id** aed95fc6-5e3f-49dc-8b35-06508613f979

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

### Query

```
process where subtype.create and
  process_name == "reg.exe" and
  (command_line == "* save *" or command_line == "* export *") and
  (command_line == "*hklm*" or command_line == "*hkey_local_machine*" ) and
  (command_line == "*\\sam *" or command_line == "*\\security *" or command_line ==
↪"*\\system *")
```

### Detonation

Atomic Red Team: T1003

### Contributors

- Endgame

### 1.2.101 Scheduled Task Creation via Microsoft Office Application

Identifies the creation of a scheduled task via a Microsoft Office application to establish persistence.

**id** 8e98bf09-e662-4908-b68e-5c96ad5c6860

**categories** detect

**confidence** medium

**os** windows

**created** 8/16/2019

**updated** 8/16/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1053 Scheduled Task

#### Query

```
image_load where
  process_name in ("excel.exe", "winword.exe", "powerpnt.exe", "outlook.exe") and
  image_name == "taskschd.dll"
```

#### Contributors

- David French

#### References

- https://medium.com/threatpunter/detecting-adversary-tradecraft-with-image-load-event-logging-8de93338c16
- https://twitter.com/DanielStepanic/status/1161983008582393856?s=20
- https://twitter.com/SBousseaden/status/1161919993652662273?s=20

### 1.2.102 Searching for Passwords in Files

Adversaries may search local file systems and remote file shares for files containing passwords.

**id** 53de420f-7618-4330-87b1-1e57bafa7da5

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1081 Credentials in Files

#### Query

```
process where subtype.create
  and process_name in ("cat", "grep")
  and wildcard(command_line, "*.bash_history*", "*password*", "*passwd*")
```

#### Contributors

- Endgame

### 1.2.103 Searching for Passwords in Files

Adversaries may search local file systems and remote file shares for files containing passwords.

**id** 62b7273b-67b2-4698-95b5-f6fafabc3390

**categories** detect

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1081 Credentials in Files

#### Query

```
process where subtype.create and
  process_name == "findstr.exe" and command_line == "*password*"
| unique parent_process_name, command_line
```

#### Contributors

- Endgame

### 1.2.104 Service Path Modification with sc.exe

Identifies usage of the sc.exe command to modify existing services.

**id** 15c17f6b-29c5-43a4-8adc-d298f2c4c141

**categories** hunt

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1031 Modify Existing Service

#### Query

```
process where subtype.create and
  process_name == "sc.exe" and
  wildcard(command_line, "* config *", "*binPath*")
```

#### Contributors

- Endgame

### 1.2.105 Service Stop or Disable with sc.exe

Detects when running services are stopped with the sc.exe command

**id** 591da84a-0382-40e7-afc8-12bd58c40425

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Impact

**techniques** T1489 Service Stop

#### Query

```
process where subtype.create and
  process_name == "sc.exe" and
  wildcard(command_line, "* stop*", "* config *disabled*")
```

#### Contributors

- Endgame

### 1.2.106 Startup Folder Execution via VBScript

Adversaries abuse common persistence mechanisms such as placing their malware/implants into a compromised user's startup folder. This detection identifies the execution portion of GAMAREDON GROUP's technique of placing shortcut and VBScript files into this folder.

**id** 7b4bd51e-4165-43f8-b0c8-fb2d7cd9cf94

**categories** detect

**confidence** low

**os** windows

**created** 02/12/2020

**updated** 02/12/2020

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1060 Registry Run Keys / Startup Folder

#### Query

```
sequence by user_name with maxspan=90d
  [file where subtype.create and file_path == "*\\Programs\\Startup\\*.vbs"]
  [process where subtype.create and parent_process_name=="explorer.exe"
    and process_name == "wscript.exe" and command_line == "*\\Programs\\Startup\\*"]
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/playing-defense-against-gamaredon-group

### 1.2.107 Startup Folder Persistence with Shortcut/VBScript Files

Adversaries abuse common persistence mechanisms such as placing their malware/implants into a compromised user's startup folder. This detection identifies GAMAREDON GROUP's technique of placing shortcut and VBScript files into this folder.

**id** 5430be26-4019-4bc3-bb04-056019304dc9

**categories** detect

**confidence** low

**os** windows

**created** 02/12/2020

**updated** 02/12/2020

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1060 Registry Run Keys / Startup Folder

#### Query

```
file where subtype.create
  and process_name in ("powershell.exe", "wscript.exe", "cscript.exe", "cmd.exe",
↪"winword.exe", "excel.exe", "powerpnt.exe")
  and (file_path == "*\\Programs\\Startup\\*.lnk" or
       file_path == "*\\Programs\\Startup\\*.vbs")
| unique process_name, file_path, user_name
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/playing-defense-against-gamaredon-group

### 1.2.108 Stopping Services with net.exe

Detects when running services are stopped with the net.exe command.

**id** 0b2ea078-b2ef-4cf7-aef1-564a63662e3b

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Impact

**techniques** T1489 Service Stop

#### Query

```
process where subtype.create and
  process_name == "net.exe" and
  command_line == "* stop *"
```

#### Contributors

- Endgame

### 1.2.109 Suspicious ADS File Creation

Detect suspicious creation or modification of NTFS Alternate Data Streams.

**id** 6624038b-05e6-4f9b-9830-346af38de870

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1096 NTFS File Attributes

#### Query

```
file where
  file_name == "*:*" and file_name != "*:Zone.Identifier" and
  (file_name == "*.dll*" or file_name == "*.exe*")
```

#### Detonation

Atomic Red Team: T1096

#### Contributors

- Endgame

### 1.2.110 Suspicious Bitsadmin Job via bitsadmin.exe

Detect download of BITS jobs via bitsadmin.exe.

**id** ef9fe5c0-b16f-4384-bb61-95977799a84c

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Persistence

**techniques** T1197 BITS Jobs

#### Query

```
process where subtype.create
  and process_name == "bitsadmin.exe"
  and wildcard(command_line, "* /download *", "*transfer*")
```

#### Detonation

Atomic Red Team: T1197

#### Contributors

- Endgame

### 1.2.111 Suspicious Bitsadmin Job via PowerShell

Detect download of BITS jobs via PowerShell.

**id** ec5180c9-721a-460f-bddc-27539a284273

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Persistence

**techniques** T1197 BITS Jobs

#### Query

```
process where subtype.create and
  process_name == "powershell.exe" and command_line == "*Start-BitsTransfer*"
```

#### Detonation

Atomic Red Team: T1197

#### Contributors

- Endgame

### 1.2.112 Suspicious File Creation via Browser Extensions

Malicious browser extensions can be installed via app store downloads masquerading as legitimate extensions, social engineering, or by an adversary that has already compromised a system

**id** 7797d204-3205-4033-bac7-658fc203198d

**categories** enrich

**confidence** low

**os** macos, windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Persistence

**techniques** T1176 Browser Extensions

#### Query

```
file where not subtype.delete and
  wildcard(file_name, "*.exe", "*.dll", "*.ps1", "*.vbs", "*.bat") and
  wildcard(file_path,
       // windows
       "*\\AppData\\Local\\Google\\Chrome\\User Data\\Default\\Extensions",
       "*:\\Program Files\\Mozilla Firefox\\plugins\\*",
       "*:\\Program Files\\Internet Explorer\\Plugins\\*",
```

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```
        // macos
        "/Applications/Firefox.app/Contents/MacOS/firefox/plugins/*",
        "/Users/*/Library/Safari/Extensions/*",
        "/Users/*/Library/Application Support/Google/Chrome/Default/Extensions/*"
        )
```

### Contributors

- Endgame

## 1.2.113 Suspicious MS Office Registry Modifications

Adversaries may attempt to lower security controls around macro-enabled objects via malicious documents. By modifying these settings such as trusting future macros or disabling security warnings, adversaries increase their chances of success to re-gain access to machine.

**id** 53745477-dafc-43ba-8eaf-6578a6758794

**categories** detect

**confidence** low

**os** windows

**created** 02/12/2020

**updated** 02/12/2020

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1112 Modify Registry

### Query

```
sequence by unique_pid
  [process where process_name in ("winword.exe", "excel.exe", "powerpnt.exe")]
  [registry where wildcard(registry_path,
↪"*\\Software\\Microsoft\\Office\\*\\Word\\Security\\AccessVBOM",

↪"*\\Software\\Microsoft\\Office\\*\\Word\\Security\\VBAWarnings")]
| unique unique_pid
```

### Contributors

- Daniel Stepanic

### References

- https://www.elastic.co/blog/playing-defense-against-gamaredon-group

### 1.2.114 Suspicious Process Loading Credential Vault DLL

Identifies an unexpected process loading the Windows Credential Vault DLL in preparation of enumerating/stealing a user's saved credentials.

**id** 679560ee-0ea0-4358-bf83-e4c478d9d1c8

**categories** detect

**confidence** high

**os** windows

**created** 8/16/2019

**updated** 8/16/2019

#### MITRE ATT&CK™ Mapping

**tactics** Credential Access

**techniques** T1003 Credential Dumping

#### Query

```
image_load where process_name != "vaultcmd.exe" and
  image_name == "vaultcli.dll"
```

#### Contributors

- David French

#### References

- https://medium.com/threatpunter/detecting-adversary-tradecraft-with-image-load-event-logging-8de93338c16

### 1.2.115 Suspicious Script Object Execution

Identifies scrobj.dll loaded into unusual Microsoft processes, often indicating a *Squiblydoo* attack.

**id** a792cb37-fa56-43c2-9357-4b6a54b559c7

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1117 Regsvr32

### Query

```
image_load where image_name == "scrobj.dll" and
  process_name in ("regsvr32.exe", "rundll32.exe", "certutil.exe")
```

### Detonation

Atomic Red Team: T1117

### Contributors

- Endgame

### References

- https://web.archive.org/web/20170427203617/http://subt0x10.blogspot.com/2017/04/bypass-application-whitelisting-script.html
- https://gist.github.com/subTee/24c7d8e1ff0f5602092f58cbb3f7d302

## 1.2.116 System Information Discovery

Detect enumeration of Windows system information via `systeminfo.exe`

**id** 4b9c2df7-87e2-4bbc-9123-9779ecb2dbf2

**categories** hunt

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1082 System Information Discovery

### Query

```
process where subtype.create and process_name == "systeminfo.exe"
| unique user_name, command_line
```

#### Detonation

Atomic Red Team: T1082

#### Contributors

- Endgame

### 1.2.117 System Network Connections Discovery

Adversaries may attempt to get a listing of network connections to or from a compromised system.

**id** df696af0-8d3f-4557-8278-d10f40ba7c07

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1049 System Network Connections Discovery

#### Query

```
process where subtype.create and
  process_name in ("netstat", "lsof", "who", "w")
| unique command_line
```

#### Contributors

- Endgame

### 1.2.118 System Owner and User Discovery

Windows contains several built-in commands to report the active user. These may be used by an actor to learn privileges levels or determine if a session is active.

**id** 4d8563cb-f6cb-4758-9255-92479260031f

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1033 System Owner/User Discovery

### Query

```
process where subtype.create and (
  process_name in ("hostname.exe", "whoami.exe", "systeminfo.exe", "quser.exe") or
  process_name == "cmd.exe" and wildcard(command_line, "*echo *%USERNAME%*", "*echo *
↪%USERDOMAIN%*")
)
```

### Contributors

- Endgame

## 1.2.119 Trap Signals Usage

The trap command allows programs and shells to specify commands that will be executed upon receiving interrupt signals.

**id** 3ecbba23-0d1e-4870-8b9e-016b423aebee

**categories** enrich

**confidence** low

**os** macos, linux

**created** 7/26/2019

**updated** 7/26/2019

### MITRE ATT&CK™ Mapping

**tactics** Execution, Persistence

**techniques** T1154 Trap

### Query

```
process where subtype.create and
  process_name == "trap" and command_line == "* signals*"
```

### Contributors

- Endgame

### 1.2.120 Unload Sysmon Filter Driver with fltmc.exe

Detect the unloading of the Sysinternals Sysmon filter driver via the `unload` command line parameter.

**id** 1261d02a-ee99-4954-8404-8376a8d441b2

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1089 Disabling Security Tools

---

**Note:** The Sysmon driver can be installed with various service names. The analytic should be changed to reflect the installed service name if Sysmon is installed with a different name.

---

#### Query

```
process where subtype.create and
  process_name == "fltmc.exe" and command_line == "* unload *sysmon*"
```

#### Detonation

Atomic Red Team: T1089

#### Contributors

- Endgame

### 1.2.121 Unusual Child Process

Identifies processes launched with suspicious parents.

**id** 3b1b9720-179b-47e2-930e-d3757bbe345e

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion, Execution

**techniques** T1093 Process Hollowing, T1055 Process Injection

### Query

```
process where subtype.create and
(
  (process_name == "smss.exe" and not parent_process_name in ("System", "smss.exe"))␣
↪or
  (process_name == "csrss.exe" and not parent_process_name in ("smss.exe", "svchost.
↪exe")) or
  (process_name == "wininit.exe" and parent_process_name != "smss.exe") or
  (process_name == "winlogon.exe" and parent_process_name != "smss.exe") or
  (process_name == "lsass.exe" and parent_process_name != "wininit.exe") or
  (process_name == "LogonUI.exe" and not parent_process_name in ("winlogon.exe",
↪"wininit.exe")) or
  (process_name == "services.exe" and parent_process_name != "wininit.exe") or
  (process_name == "svchost.exe" and parent_process_name != "services.exe" and
      // When a 32-bit DLL is loaded, the syswow64\svchost.exe service will be called
      not (parent_process_path == "*\\system32\\svchost.exe" and process_path ==
↪"*\\syswow64\\svchost.exe")
  ) or
  (process_name == "spoolsv.exe" and parent_process_name != "services.exe") or
  (process_name == "taskhost.exe" and not parent_process_name in ("services.exe",
↪"svchost.exe")) or
  (process_name == "taskhostw.exe" and not parent_process_name in ("services.exe",
↪"svchost.exe")) or
  (process_name == "userinit.exe" and not parent_process_name in ("dwm.exe",
↪"winlogon.exe"))
)
```

### Contributors

- Endgame

### References

- https://web.archive.org/web/20140119132337/https://sysforensics.org/2014/01/know-your-windows-processes.html

## 1.2.122 User Account Creation

Identifies creation of local users via the `net.exe` command.

**id** 014c3f51-89c6-40f1-ac9c-5688f26090ab

**categories** detect, hunt

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Persistence, Credential Access

**techniques** T1136 Create Account

#### Query

```
process where subtype.create and
  (process_name == "net.exe" or (process_name == "net1.exe" and parent_process_name !
↪= "net.exe")) and
  command_line == "* user */ad*"
```

#### Detonation

Atomic Red Team: T1136

#### Contributors

- Endgame

### 1.2.123 Volume Shadow Copy Deletion via VssAdmin

Identifies suspicious use of vssadmin.exe to delete volume shadow copies.

**id** d3a327b6-c517-43f2-8e97-1f06b7370705

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Impact

**techniques** T1490 Inhibit System Recovery

#### Query

```
process where subtype.create and
    process_name == "vssadmin.exe" and command_line == "*delete* *shadows*"
```

#### Detonation

Atomic Red Team: T1490

#### Contributors

- Endgame

### 1.2.124 Volume Shadow Copy Deletion via WMIC

Identifies use of wmic for shadow copy deletion on endpoints. This commonly occurs in tandem with ransomware or other destructive attacks.

**id** 7163f069-a756-4edc-a9f2-28546dcb04b0

**categories** detect

**confidence** medium

**os** windows

**created** 11/30/2018

**updated** 05/17/2019

#### MITRE ATT&CK™ Mapping

**tactics** Impact

**techniques** T1490 Inhibit System Recovery

#### Query

```
process where subtype.create and
  process_name == "wmic.exe" and command_line == "* *shadowcopy* *delete*"
```

#### Detonation

Atomic Red Team: T1490

#### Contributors

- Endgame

### 1.2.125 Windows File Permissions Modification

File permissions are commonly managed by discretionary access control lists (DACLs) specified by the file owner. Adversaries may modify file permissions/attributes to evade intended DACLs.

**id** a099cb16-1a92-4503-9102-56cc84a51ad1

**categories** enrich

**confidence** low

**os** windows

**created** 7/26/2019

**updated** 7/26/2019

#### MITRE ATT&CK™ Mapping

**tactics** Defense Evasion

**techniques** T1222 File Permissions Modification

#### Query

```
process where subtype.create and (
  process_name == "attrib.exe" and command_line == "* +h*" or
  process_name == "takeown.exe" or
  process_name == "icacls.exe" and command_line == "*grant*"
)
```

#### Contributors

- Endgame

### 1.2.126 Windows Network Enumeration

Identifies attempts to enumerate hosts in a network using the built-in Windows `net.exe` tool.

**id** b8a94d2f-dc75-4630-9d73-1edc6bd26fff

**categories** detect

**confidence** low

**os** windows

**created** 11/30/2018

**updated** 11/30/2018

#### MITRE ATT&CK™ Mapping

**tactics** Discovery

**techniques** T1018 Remote System Discovery

#### Query

```
process where subtype.create and
    process_name == "net.exe" and command_line == "* view*" and command_line !=
↪"*\\\\*"
```

### Detonation

Atomic Red Team: T1018

### Contributors

- Endgame

## 1.2.127 WMI Execution via Microsoft Office Application

Identifies the execution of Windows Management Instrumentation (WMI) via a Microsoft Office application.

**id** e6be5ffe-c765-4e13-962d-7eaae07aeaec

**categories** detect

**confidence** medium

**os** windows

**created** 8/16/2019

**updated** 8/16/2019

### MITRE ATT&CK™ Mapping

**tactics** Execution

**techniques** T1047 Windows Management Instrumentation

### Query

```
image_load where
  process_name in ("excel.exe", "winword.exe",
                   "powerpnt.exe", "outlook.exe") and
  image_name in ("wbemdisp.dll", "wbemcomn.dll", "wbemprox.dll",
                 "wmiutils.dll", "wbemsvc.dll", "fastprox.dll")
```

### Contributors

- David French

### References

- https://medium.com/threatpunter/detecting-adversary-tradecraft-with-image-load-event-logging-8de93338c16

### 1.2.128 WMI Execution with Command Line Redirection

Identifies command execution via WMI with redirected output. WMI provides a method to execute a process on a local or remote host, but does not expose a way to read any console output. To get around this restriction, some administrators or attackers will execute `cmd.exe` with output redirection to a file. Then the file can be retrieved to read program output.

**id** 7c7f3114-7bdd-4477-a4e0-b5105b6babd8

**categories** detect

**confidence** medium

**os** windows

**created** 12/04/2019

**updated** 12/04/2019

#### MITRE ATT&CK™ Mapping

**tactics** Collection

**techniques** T1074 Data Staged

#### Query

```
sequence by unique_pid with maxspan=5s
  [process where subtype.create and process_name == "cmd.exe" and command_line == "*>*
↪" and
    descendant of [process where process_name == "wmiprvse.exe"]]
  [file where subtype.create and wildcard(file_name, "*.txt", "*.log")]
```

#### Contributors

- Daniel Stepanic

#### References

- https://www.elastic.co/blog/embracing-offensive-tooling-building-detections-against-koadic-using-eql

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Access of Outlook Email Archives* | Endgame | 7/26/2019 | Collection | T1114 Email Collection |
| *Account Discovery via Built-In Tools* | Endgame | 7/26/2019 | Discovery | T1087 Account Discovery |
| *AD Dumping via Ntdsutil.exe* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |
| *Adding the Hidden File Attribute with via attrib.exe* | Endgame | 7/26/2019 | Defense Evasion Persistence | T1158 Hidden Files and Directories |
| *AppCert DLLs Registry Modification* | Endgame | 7/26/2019 | Privilege Escalation Persistence | T1182 AppCert DLLs |

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Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Audio Capture via PowerShell* | Endgame | 11/30/2018 | Collection | T1123 Audio Capture |
| *Audio Capture via SoundRecorder* | Endgame | 11/30/2018 | Collection | T1123 Audio Capture |
| *Bypass UAC via CMSTP* | Endgame | 11/30/2018 | Defense Evasion Execution | T1191 CMSTP T1088 Bypass User Account Control |
| *Bypass UAC via CompMgmtLauncher* | Daniel Stepanic | 12/04/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Bypass UAC via Fodhelper.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Bypass UAC via Fodhelper.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Bypass UAC via WSReset.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Change Default File Association* | Endgame | 11/30/2018 | Persistence | T1042 Change Default File Association |
| *Clearing Windows Event Logs with wevtutil* | Endgame | 11/30/2018 | Defense Evasion | T1070 Indicator Removal on Host |
| *COM Hijack via Script Object* | Endgame | 11/30/2018 | Persistence Defense Evasion | T1122 Component Object Model Hijacking |
| *Command-Line Creation of a RAR file* | Endgame | 11/30/2018 | Exfiltration | T1002 Data Compressed |
| *Control Panel Items* | Endgame | 7/26/2019 | Defense Evasion Execution | T1196 Control Panel Items |
| *Creation of an Archive with Common Archivers* | Endgame | 7/26/2019 | Collection | T1074 Data Staged |
| *Creation of Kernel Module* | Endgame | 7/26/2019 | Persistence | T1215 Kernel Modules and Extensions |
| *Creation of Scheduled Task with schtasks.exe* | Endgame | 7/26/2019 | Privilege Escalation Execution Persistence | T1053 Scheduled Task |
| *Creation or Modification of Systemd Service* | Endgame | 7/26/2019 | Persistence | T1501 Systemd Service |
| *Credential Enumeration via Credential Vault CLI* | David French | 8/16/2019 | Credential Access | T1003 Credential Dumping |
| *Delete Volume USN Journal with fsutil* | Endgame | 11/30/2018 | Defense Evasion | T1070 Indicator Removal on Host |
| *Disconnecting from Network Shares with net.exe* | Endgame | 7/26/2019 | Defense Evasion | T1126 Network Share Connection Removal |

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Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Discovery and Enumeration of System Information via Rundll32* | Daniel Stepanic | 12/04/2019 | Discovery | T1087 Account Discovery<br>T1096 NTFS File Attributes<br>T1033 System Owner/User Discovery |
| *Discovery of a Remote System's Time* | Endgame | 11/30/2018 | Discovery | T1124 System Time Discovery |
| *Discovery of Domain Groups* | Endgame | 7/26/2019 | Discovery | T1069 Permission Groups Discovery |
| *Discovery of Network Environment via Built-in Tools* | Endgame | 7/26/2019 | Discovery | T1016 System Network Configuration Discovery |
| *Discovery of Network Environment via Built-in Tools* | Endgame | 7/26/2019 | Discovery | T1016 System Network Configuration Discovery |
| *DLL Search Order Hijacking with known programs* | Endgame | 7/26/2019 | Privilege Escalation<br>Defense Evasion<br>Persistence | T1038 DLL Search Order Hijacking |
| *Domain Trust Discovery* | Endgame | 7/26/2019 | Discovery | T1482 Domain Trust Discovery |
| *Domain Trust Discovery via Nltest.exe* | Tony Lambert | 05/17/2019 | Discovery | T1482 Domain Trust Discovery |
| *Encoding or Decoding Files via CertUtil* | Endgame | 11/30/2018 | Defense Evasion | T1140 Deobfuscate/Decode Files or Information |
| *Enumeration of Local Shares* | Endgame | 11/30/2018 | Discovery | T1135 Network Share Discovery |
| *Enumeration of Mounted Shares* | Endgame | 11/30/2018 | Discovery | T1049 System Network Connections Discovery |
| *Enumeration of Remote Shares* | Endgame | 11/30/2018 | Discovery | T1135 Network Share Discovery |
| *Enumeration of System Information* | Endgame | 7/26/2019 | Discovery | T1082 System Information Discovery |
| *Enumeration of System Information* | Endgame | 7/26/2019 | Discovery | T1082 System Information Discovery |
| *Executable Written and Executed by Microsoft Office Applications* | Daniel Stepanic | 12/04/2019 | Execution | T1204 User Execution<br>T1173 Dynamic Data Exchange |
| *Execution of a Command via a SYSTEM Service* | Endgame | 11/30/2018 | Privilege Escalation | T1035 Service Execution<br>T1050 New Service |

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Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Execution of Existing Service via Command* | Endgame | 7/26/2019 | Execution | T1035 Service Execution |
| *Execution via cmstp.exe* | Endgame | 7/26/2019 | Defense Evasion Execution | T1191 CMSTP |
| *HH.exe execution* | Dan Beavin | 09/26/2019 | Defense Evasion Execution | T1223 Compiled HTML File |
| *Host Artifact Deletion* | Endgame | 7/26/2019 | Defense Evasion | T1070 Indicator Removal on Host |
| *Image Debuggers for Accessibility Features* | Endgame | 11/30/2018 | Persistence Privilege Escalation Defense Evasion | T1015 Accessibility Features T1183 Image File Execution Options Injection |
| *Incoming Remote PowerShell Sessions* | Endgame | 7/26/2019 | Lateral Movement Execution | T1028 Windows Remote Management |
| *Indirect Command Execution* | Endgame | 11/30/2018 | Defense Evasion | T1202 Indirect Command Execution |
| *Installation of Port Monitor* | Endgame | 7/26/2019 | Privilege Escalation Persistence | T1013 Port Monitors |
| *Installation of Security Support Provider* | Endgame | 7/26/2019 | Persistence | T1101 Security Support Provider |
| *Installation of Time Providers* | Endgame | 7/26/2019 | Persistence | T1209 Time Providers |
| *Installing Custom Shim Databases* | Endgame | 11/30/2018 | Persistence Privilege Escalation | T1138 Application Shimming |
| *InstallUtil Execution* | Endgame | 7/26/2019 | Execution Defense Evasion | T1118 InstallUtil |
| *Interactive AT Job* | Endgame | 11/30/2018 | Privilege Escalation | T1053 Scheduled Task |
| *Launch Daemon Persistence* | Endgame | 7/26/2019 | Privilege Escalation Persistence | T1160 Launch Daemon |
| *Loading Kernel Modules with kextload* | Endgame | 7/26/2019 | Persistence | T1215 Kernel Modules and Extensions |
| *Local Job Scheduling Paths* | Endgame | 7/26/2019 | Execution Persistence | T1168 Local Job Scheduling |
| *Local Job Scheduling Process* | Endgame | 7/26/2019 | Execution Persistence | T1168 Local Job Scheduling |
| *Logon Scripts with UserInitMprLogonScript* | Endgame | 11/30/2018 | Persistence | T1037 Logon Scripts |
| *LSA Authentication Package* | Endgame | 7/26/2019 | Persistence | T1131 Authentication Package |
| *LSASS Memory Dumping* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |

Continued on next page

Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *LSASS Memory Dumping via ProcDump.exe* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |
| *Modification of Boot Configuration* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Modification of ld.so.preload* | Tony Lambert | 05/17/2019 | Defense Evasion | T1055 Process Injection |
| *Modification of Logon Scripts from Registry* | Endgame | 7/26/2019 | Lateral Movement Persistence | T1037 Logon Scripts |
| *Modification of rc.common Script* | Endgame | 7/26/2019 | Persistence | T1163 Rc.common |
| *Modifications of .bash_profile and .bashrc* | Tony Lambert | 01/10/2019 | Persistence | T1156 .bash_profile and .bashrc |
| *Mounting Hidden Shares* | Endgame | 11/30/2018 | Lateral Movement | T1077 Windows Admin Shares |
| *Mounting Windows Hidden Shares with net.exe* | Endgame | 7/26/2019 | Lateral Movement | T1077 Windows Admin Shares |
| *MS Office Template Injection* | Daniel Stepanic | 02/12/2020 | Defense Evasion | T1221 Template Injection |
| *Mshta Descendant of Microsoft Office* | Daniel Stepanic | 12/04/2019 | Execution Defense Evasion Command and Control | T1170 Mshta |
| *Mshta Network Connections* | Endgame | 11/30/2018 | Execution Defense Evasion Command and Control | T1170 Mshta |
| *Network Service Scanning via Port* | Endgame | 7/26/2019 | Discovery | T1046 Network Service Scanning |
| *Non-browser processes making DNS requests to Dynamic DNS Providers* | Daniel Stepanic | 02/12/2020 | Command and Control | T1071 Standard Application Layer Protocol |
| *Office Application Startup via Template File Modification* | Endgame | 7/26/2019 | Persistence | T1137 Office Application Startup |
| *Office Application Startup via Template Registry Modification* | Endgame | 7/26/2019 | Persistence | T1137 Office Application Startup |
| *Password Policy Enumeration* | Endgame | 7/26/2019 | Discovery | T1201 Password Policy Discovery |
| *Persistence via AppInit DLL* | Endgame | 11/30/2018 | Persistence Privilege Escalation | T1103 AppInit DLLs |
| *Persistence via NetSh Key* | Endgame | 11/30/2018 | Persistence | T1128 Netsh Helper DLL |

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Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Persistence via Screensaver* | Endgame | 11/30/2018 | Persistence | T1180 Screensaver |
| *Persistent process via Launch Agent* | Endgame | 7/26/2019 | Persistence | T1159 Launch Agent |
| *Plist Modification* | Endgame | 7/26/2019 | Privilege Escalation Defense Evasion Persistence | T1150 Plist Modification |
| *Potential Gatekeeper Bypass* | Endgame | 7/26/2019 | Defense Evasion | T1144 Gatekeeper Bypass |
| *Process Discovery via Built-In Applications* | Endgame | 7/26/2019 | Discovery | T1057 Process Discovery T1063 Security Software Discovery |
| *Process Discovery via Windows Tools* | Endgame | 7/26/2019 | Discovery | T1057 Process Discovery T1063 Security Software Discovery |
| *Processes Running with Unusual Extensions* | Endgame | 7/26/2019 | Defense Evasion | T1036 Masquerading |
| *Processes with Trailing Spaces* | Endgame | 7/26/2019 | Defense Evasion Execution | T1151 Space after Filename |
| *Proxied Execution via Signed Scripts* | Endgame | 7/26/2019 | Defense Evasion Execution | T1216 Signed Script Proxy Execution |
| *Reading the Clipboard with pbpaste* | Endgame | 7/26/2019 | Collection | T1115 Clipboard Data |
| *Registration of a Password Filter DLL* | Endgame | 7/26/2019 | Credential Access | T1174 Password Filter DLL |
| *Registration of Winlogon Helper DLL* | Endgame | 7/26/2019 | Persistence | T1004 Winlogon Helper DLL |
| *Registry Persistence via Run Keys* | Endgame | 7/26/2019 | Persistence | T1060 Registry Run Keys / Startup Folder |
| *Registry Persistence via Shell Folders* | Endgame | 7/22/2019 | Persistence | T1060 Registry Run Keys / Startup Folder |
| *Registry Preparation of Event Viewer UAC Bypass* | Endgame | 11/30/2018 | Privilege Escalation | T1088 Bypass User Account Control |
| *RegSvr32 Scriptlet Execution* | Endgame | 11/30/2018 | Execution | T1117 Regsvr32 |
| *Remote Desktop Protocol Hijack* | Endgame | 7/26/2019 | Lateral Movement | T1076 Remote Desktop Protocol |
| *Remote Execution via WMIC* | Endgame | 11/30/2018 | Lateral Movement Execution | T1047 Windows Management Instrumentation |
| *Remote System Discovery Commands* | Endgame | 7/26/2019 | Discovery | T1018 Remote System Discovery |

Continued on next page

Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Remote Terminal Sessions* | Endgame | 7/26/2019 | Lateral Movement | T1021 Remote Services |
| *Resumed Application on Reboot* | Endgame | 7/26/2019 | Persistence | T1164 Re-opened Applications |
| *Root Certificate Install* | Endgame | 7/26/2019 | Defense Evasion | T1130 Install Root Certificate |
| *SAM Dumping via Reg.exe* | Endgame | 11/30/2018 | Credential Access | T1003 Credential Dumping |
| *Scheduled Task Creation via Microsoft Office Application* | David French | 8/16/2019 | Persistence | T1053 Scheduled Task |
| *Searching for Passwords in Files* | Endgame | 7/26/2019 | Credential Access | T1081 Credentials in Files |
| *Searching for Passwords in Files* | Endgame | 7/26/2019 | Credential Access | T1081 Credentials in Files |
| *Service Path Modification with sc.exe* | Endgame | 7/26/2019 | Persistence | T1031 Modify Existing Service |
| *Service Stop or Disable with sc.exe* | Endgame | 7/26/2019 | Impact | T1489 Service Stop |
| *Startup Folder Execution via VBScript* | Daniel Stepanic | 02/12/2020 | Persistence | T1060 Registry Run Keys / Startup Folder |
| *Startup Folder Persistence with Shortcut/VBScript Files* | Daniel Stepanic | 02/12/2020 | Persistence | T1060 Registry Run Keys / Startup Folder |
| *Stopping Services with net.exe* | Endgame | 7/26/2019 | Impact | T1489 Service Stop |
| *Suspicious ADS File Creation* | Endgame | 11/30/2018 | Defense Evasion | T1096 NTFS File Attributes |
| *Suspicious Bitsadmin Job via bitsadmin.exe* | Endgame | 11/30/2018 | Defense Evasion Persistence | T1197 BITS Jobs |
| *Suspicious Bitsadmin Job via PowerShell* | Endgame | 11/30/2018 | Defense Evasion Persistence | T1197 BITS Jobs |
| *Suspicious File Creation via Browser Extensions* | Endgame | 7/26/2019 | Persistence | T1176 Browser Extensions |
| *Suspicious MS Office Registry Modifications* | Daniel Stepanic | 02/12/2020 | Defense Evasion | T1112 Modify Registry |
| *Suspicious Process Loading Credential Vault DLL* | David French | 8/16/2019 | Credential Access | T1003 Credential Dumping |
| *Suspicious Script Object Execution* | Endgame | 11/30/2018 | Defense Evasion Execution | T1117 Regsvr32 |
| *System Information Discovery* | Endgame | 11/30/2018 | Discovery | T1082 System Information Discovery |

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Table 1 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *System Network Connections Discovery* | Endgame | 7/26/2019 | Discovery | T1049 System Network Connections Discovery |
| *System Owner and User Discovery* | Endgame | 7/26/2019 | Discovery | T1033 System Owner/User Discovery |
| *Trap Signals Usage* | Endgame | 7/26/2019 | Execution Persistence | T1154 Trap |
| *Unload Sysmon Filter Driver with fltmc.exe* | Endgame | 11/30/2018 | Defense Evasion | T1089 Disabling Security Tools |
| *Unusual Child Process* | Endgame | 11/30/2018 | Defense Evasion Execution | T1093 Process Hollowing T1055 Process Injection |
| *User Account Creation* | Endgame | 11/30/2018 | Persistence Credential Access | T1136 Create Account |
| *Volume Shadow Copy Deletion via VssAdmin* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Volume Shadow Copy Deletion via WMIC* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Windows File Permissions Modification* | Endgame | 7/26/2019 | Defense Evasion | T1222 File Permissions Modification |
| *Windows Network Enumeration* | Endgame | 11/30/2018 | Discovery | T1018 Remote System Discovery |
| *WMI Execution via Microsoft Office Application* | David French | 8/16/2019 | Execution | T1047 Windows Management Instrumentation |
| *WMI Execution with Command Line Redirection* | Daniel Stepanic | 12/04/2019 | Collection | T1074 Data Staged |

## 1.3 Atomic Blue Detections

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *AD Dumping via Ntdsutil.exe* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |
| *Audio Capture via PowerShell* | Endgame | 11/30/2018 | Collection | T1123 Audio Capture |
| *Audio Capture via SoundRecorder* | Endgame | 11/30/2018 | Collection | T1123 Audio Capture |
| *Bypass UAC via CMSTP* | Endgame | 11/30/2018 | Defense Evasion Execution | T1191 CMSTP T1088 Bypass User Account Control |

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Table 2 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Bypass UAC via Fodhelper.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Bypass UAC via Fodhelper.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Bypass UAC via WSReset.exe* | Tony Lambert | 05/17/2019 | Privilege Escalation | T1088 Bypass User Account Control |
| *Change Default File Association* | Endgame | 11/30/2018 | Persistence | T1042 Change Default File Association |
| *Clearing Windows Event Logs with wevtutil* | Endgame | 11/30/2018 | Defense Evasion | T1070 Indicator Removal on Host |
| *COM Hijack via Script Object* | Endgame | 11/30/2018 | Persistence<br>Defense Evasion | T1122 Component Object Model Hijacking |
| *Command-Line Creation of a RAR file* | Endgame | 11/30/2018 | Exfiltration | T1002 Data Compressed |
| *Delete Volume USN Journal with fsutil* | Endgame | 11/30/2018 | Defense Evasion | T1070 Indicator Removal on Host |
| *Discovery of a Remote System's Time* | Endgame | 11/30/2018 | Discovery | T1124 System Time Discovery |
| *Domain Trust Discovery via Nltest.exe* | Tony Lambert | 05/17/2019 | Discovery | T1482 Domain Trust Discovery |
| *Encoding or Decoding Files via CertUtil* | Endgame | 11/30/2018 | Defense Evasion | T1140 Deobfuscate/Decode Files or Information |
| *Enumeration of Mounted Shares* | Endgame | 11/30/2018 | Discovery | T1049 System Network Connections Discovery |
| *Enumeration of Remote Shares* | Endgame | 11/30/2018 | Discovery | T1135 Network Share Discovery |
| *Execution of a Command via a SYSTEM Service* | Endgame | 11/30/2018 | Privilege Escalation | T1035 Service Execution<br>T1050 New Service |
| *HH.exe execution* | Dan Beavin | 09/26/2019 | Defense Evasion<br>Execution | T1223 Compiled HTML File |
| *Image Debuggers for Accessibility Features* | Endgame | 11/30/2018 | Persistence<br>Privilege Escalation<br>Defense Evasion | T1015 Accessibility Features<br>T1183 Image File Execution Options Injection |
| *Indirect Command Execution* | Endgame | 11/30/2018 | Defense Evasion | T1202 Indirect Command Execution |
| *Installing Custom Shim Databases* | Endgame | 11/30/2018 | Persistence<br>Privilege Escalation | T1138 Application Shimming |
| *Interactive AT Job* | Endgame | 11/30/2018 | Privilege Escalation | T1053 Scheduled Task |

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Table 2 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *Logon Scripts with UserInitMprLogonScript* | Endgame | 11/30/2018 | Persistence | T1037 Logon Scripts |
| *LSASS Memory Dumping* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |
| *LSASS Memory Dumping via ProcDump.exe* | Tony Lambert | 01/07/2019 | Credential Access | T1003 Credential Dumping |
| *Modification of Boot Configuration* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Modification of ld.so.preload* | Tony Lambert | 05/17/2019 | Defense Evasion | T1055 Process Injection |
| *Modifications of .bash_profile and .bashrc* | Tony Lambert | 01/10/2019 | Persistence | T1156 .bash_profile and .bashrc |
| *Mounting Hidden Shares* | Endgame | 11/30/2018 | Lateral Movement | T1077 Windows Admin Shares |
| *Mshta Network Connections* | Endgame | 11/30/2018 | Execution<br>Defense Evasion<br>Command and Control | T1170 Mshta |
| *Persistence via AppInit DLL* | Endgame | 11/30/2018 | Persistence<br>Privilege Escalation | T1103 AppInit DLLs |
| *Persistence via NetSh Key* | Endgame | 11/30/2018 | Persistence | T1128 Netsh Helper DLL |
| *Persistence via Screensaver* | Endgame | 11/30/2018 | Persistence | T1180 Screensaver |
| *Registry Preparation of Event Viewer UAC Bypass* | Endgame | 11/30/2018 | Privilege Escalation | T1088 Bypass User Account Control |
| *RegSvr32 Scriptlet Execution* | Endgame | 11/30/2018 | Execution | T1117 Regsvr32 |
| *SAM Dumping via Reg.exe* | Endgame | 11/30/2018 | Credential Access | T1003 Credential Dumping |
| *Suspicious ADS File Creation* | Endgame | 11/30/2018 | Defense Evasion | T1096 NTFS File Attributes |
| *Suspicious Bitsadmin Job via bitsadmin.exe* | Endgame | 11/30/2018 | Defense Evasion<br>Persistence | T1197 BITS Jobs |
| *Suspicious Bitsadmin Job via PowerShell* | Endgame | 11/30/2018 | Defense Evasion<br>Persistence | T1197 BITS Jobs |
| *Suspicious Script Object Execution* | Endgame | 11/30/2018 | Defense Evasion<br>Execution | T1117 Regsvr32 |
| *System Information Discovery* | Endgame | 11/30/2018 | Discovery | T1082 System Information Discovery |
| *Unload Sysmon Filter Driver with fltmc.exe* | Endgame | 11/30/2018 | Defense Evasion | T1089 Disabling Security Tools |

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Table 2 – continued from previous page

| Analytic | Contributors | Updated | Tactics | Techniques |
|---|---|---|---|---|
| *User Account Creation* | Endgame | 11/30/2018 | Persistence Credential Access | T1136 Create Account |
| *Volume Shadow Copy Deletion via VssAdmin* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Volume Shadow Copy Deletion via WMIC* | Endgame | 05/17/2019 | Impact | T1490 Inhibit System Recovery |
| *Windows Network Enumeration* | Endgame | 11/30/2018 | Discovery | T1018 Remote System Discovery |

## 1.4 Enterprise ATT&CK Matrix

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drive-by Compromise | AppleScript | .bash_profile and .bashrc<br>• *Modification of .bash_profile and .bashrc* (l, m) | Exploitation for Privilege Escalation | Access Token Manipulation | Account Manipulation | Account Discovery<br>• *Account Discovery via Built-In Tools* (l, m, w)<br>• *Discovery and Enumeration of System Information via Rundll32* (w) | Application Deployment Software | Audio Capture<br>• *Audio Capture via PowerShell* (w)<br>• *Audio Capture via SoundRecorder* (w) | Automated Exfiltration | Commonly Used Port | Data Destruction |

Continued on next page

Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exploit Public-Facing Application | Command Line Interface | Accessibility Features<br>• *Image Debuggers for Accessibility Features* (w) | Image File Execution Options Injection<br>• *Image Debuggers for Accessibility Features* (w) | BITS Jobs<br>• *Suspicious Bitsadmin Job via bitsadmin.exe* (w)<br>• *Suspicious Bitsadmin Job via PowerShell* (w) | Bash History | Application Window Discovery | Distributed Component Object Model | Automated Collection | Data Compressed<br>• *Command-Line Creation of a RAR file* (w) | Communication Through Removable Media | Data Encrypted for Impact |
| Hardware Additions | Dynamic Data Exchange<br>• *Executable Written and Executed by Microsoft Office Applications* (w) | AppCert DLLs<br>• *AppCert DLLs Registry Modification* (w) | SID-History Injection | Binary Padding | Brute Force | Browser Bookmark Discovery | Exploitation of Remote Services | Clipboard Data<br>• *Reading the Clipboard with pbpaste* (m) | Data Encrypted | Connection Proxy | Defacement |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spearphishing Attachment | Execution through API | AppInit DLLs • *Persistence via AppInit DLL* (w) | Setuid and Setgid | Bypass User Account Control • *Bypass UAC via CMSTP* (w) | Credential Dumping • *Suspicious Process Loading Credential Vault DLL* (w) • *Credential Enumeration via Credential Vault CLI* (w) • *LSASS Memory Dumping* (w) • *AD Dumping via Ntdsutil.exe* (w) • *LSASS Memory Dumping via ProcDump.exe* (w) • | Domain Trust Discovery • *Suspicious Domain Trust Discovery via Nltest.exe* (w) • *Domain Trust Discovery* (w) | Logon Scripts • *Modification of Logon Scripts from Registry* (w) | Data Staged • *WMI Execution with Command Line Redirection* (w) • *Creation of an Archive with Common Archivers* (l, m) | Data Transfer Size Limits | Custom Command and Control Protocol | Disk Content Wipe |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spearphishing Link | Execution through Module Load | Application Shimming<br>• *Installing Custom Shim Databases* (w) | Sudo | CMSTP<br>• *Execution via cmstp.exe* (w)<br>• *Bypass UAC via CMSTP* (w) | Credentials in Files<br>• *Search for Passwords in Files* (l, m)<br>• *Searching for Passwords in Files* (w) | File and Directory Discovery | Pass the Hash | Data from Information Repositories | Exfiltration Over Alternative Protocol | Custom Cryptographic Protocol | Disk Structure Wipe |
| Spearphishing via Service | Exploitation for Client Execution | Authentication Package<br>• *LSA Authentication Package* (w) | Sudo Caching | Clear Command History | Credentials in Registry | Network Service Scanning<br>• *Network Service Scanning via Port* (l, m, w) | Pass the Ticket | Data from Local System | Exfiltration Over Command and Control Channel | Data Encoding | Endpoint Denial of Service |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Supply Chain Compromise | Graphical User Interface | Bootkit | | Code Signing | Exploitation for Credential Access | Network Share Discovery<br>• *Enumeration of Local Shares* (w)<br>• *Enumeration of Remote Shares* (w) | Remote Desktop Protocol<br>• *Remote Desktop Protocol Hijack* (w) | Data from Network Shared Drive | Exfiltration Over Other Network Medium | Data Obfuscation | Firmware Corruption |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trusted Relationship | LSASS Driver | Browser Extensions<br>• *Suspicious File Creation via Browser Extensions* (m, w) | | Compile After Delivery | Forced Authentication | Password Policy Discovery<br>• *Password Policy Enumeration* (l) | Remote Services<br>• *Remote Terminal Sessions* (l, m, w) | Data from Removable Media | Exfiltration Over Physical Medium | Domain Fronting | Inhibit System Recovery<br>• *Modification of Boot Configuration* (w)<br>• *Volume Shadow Copy Deletion via VssAdmin* (w)<br>• *Volume Shadow Copy Deletion via WMIC* (w) |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | PowerShell | Change Default File Association<br>• *Change Default File Association* (w) | | Compiled HTML File<br>• *HH.exe execution* (w) | Input Prompt | Peripheral Device Discovery | Replication Through Removable Media | Email Collection<br>• *Access of Outlook Email Archives* (w) | Scheduled Transfer | Domain Generation Algorithms | Network Denial of Service |
| | Scheduled Task<br>• *Creation of Scheduled Task with schtasks.exe* (w) | Create Account<br>• *User Account Creation* (w) | | Component Firmware | Kerberoasting | Permission Groups Discovery<br>• *Discovery of Domain Groups* (l, m) | SSH Hijacking | Input Capture | | Fallback Channels | Resource Hijacking |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Service Execution<br>• *Execution of Existing Service via Command* (w) | DLL Search Order Hijacking<br>• *DLL Search Order Hijacking with known programs* (w) | | Component Object Model Hijacking<br>• *COM Hijack via Script Object* (w) | Keychain | Process Discovery<br>• *Process Discovery via Built-In Applications* (l, m)<br>• *Process Discovery via Windows Tools* (w) | Shared Webroot | Man in the Browser | | Multi-Stage Channels | Runtime Data Manipulation |
| | Source | Dylib Hijacking | | Control Panel Items<br>• *Control Panel Items* (w) | LLMNR/NBT-NS Poisoning and Relay | Query Registry | Taint Shared Content | Screen Capture | | Multi-hop Proxy | Service Stop<br>• *Service Stop or Disable with sc.exe* (w)<br>• *Stopping Services with net.exe* (w) |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Third-party Software | External Remote Services | | DCShadow | Network Sniffing | Remote System Discovery<br>• *Windows Network Enumeration* (w)<br>• *Remote System Discovery Commands* (w) | Windows Admin Shares<br>• *Mounting Hidden Shares* (w)<br>• *Mounting Windows Hidden Shares with net.exe* (w) | Video Capture | | Multiband Communication | Stored Data Manipulation |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Trap<br>• *Trap: Signals Usage* (l, m) | File System Permissions Weakness | | DLL Side-Loading | Password Filter DLL<br>• *Registration of a Password Filter DLL* (w) | Security Software Discovery<br>• *Process Discovery via Built-In Applications* (l, m)<br>• *Process Discovery via Windows Tools* (w) | | | | Multilayer Encryption | Transmitted Data Manipulation |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | User Execution<br>• *Executable Written and Executed by Microsoft Office Applications* (w) | Hooking | | Deobfuscate/Decode Files or Information<br>• *Encoding or Decoding Files via CertUtil* (w) | Private Keys | System Information Discovery<br>• *Enumeration of System Information* (l)<br>• *Enumeration of System Information* (w)<br>• *System Information Discovery* (w) | | | | Remote Access Tools | |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Windows Management Instrumentation<br>• *WMI Execution via Microsoft Office Application* (w)<br>• *Remote Execution via WMIC* (w) | Hypervisor | | Disabling Security Tools<br>• *Unload Sysmon Filter Driver with fltmc.exe* (w) | Security Memory | System Network Configuration Discovery<br>• *Discovery of Network Environment via Built-in Tools* (l, m)<br>• *Discovery of Network Environment via Built-in Tools* (w) | | | | Remote File Copy | |

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Table 3 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Windows Remote Management<br>• *Incoming Remote PowerShell Sessions* (w) | Kernel Modules and Extensions<br>• *Creation of Kernel Module* (l)<br>• *Loading Kernel Modules with kextload* (m) | | Execution Guardrails | Two-Factor Authentication Interception | System Network Connections Discovery<br>• *Enumeration of Mounted Shares* (w)<br>• *System Network Connections Discovery* (l, m) | | | | Standard Application Layer Protocol<br>• *Non-browser processes making DNS requests to Dynamic DNS Providers* (w) | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | LC_LOAD_DYLIB Addition | | Exploitation for Defense Evasion | | System Owner/User Discovery<br>• *System Owner and User Discovery* (w)<br>• *Discovery and Enumeration of System Information via Rundll32* (w) | | | | Standard Cryptographic Protocol | |
| | | Launch Agent<br>• *Persistent process via Launch Agent* (m) | | Extra Window Memory Injection | | System Service Discovery | | | | Standard Non-Application Layer Protocol | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Launch Daemon<br>• *Launch Daemon Persistence* (m) | | File Deletion | | System Time Discovery<br>• *Discovery of a Remote System's Time* (w) | | | | Uncommonly Used Port | |
| | | Local Job Scheduling<br>• *Local Job Scheduling Paths* (l, m)<br>• *Local Job Scheduling Process* (l, m) | | File Permissions Modification<br>• *Windows File Permissions Modification* (w) | | | | | | Web Service | |
| | | Login Item | | File System Logical Offsets | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Modify Existing Service<br>• *Service Path Modification with sc.exe* (w) | | Gatekeeper Bypass<br>• *Potential Gatekeeper Bypass* (m) | | | | | | | |
| | | Netsh Helper DLL<br>• *Persistence via NetSh Key* (w) | | Group Policy Modification | | | | | | | |
| | | New Service | | HISTCONTROL | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Office Application Startup<br>• *Office Application Startup via Template File Modification* (w)<br>• *Office Application Startup via Template Registry Modification* (w) | | Hidden Files and Directories<br>• *Adding the Hidden File Attribute with via attrib.exe* (w) | | | | | | | |
| | | Path Interception | | Hidden Users | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Monitors<br>• *Installation of Port Monitor* (w) | | Hidden Window | | | | | | | |
| | | Rc.common<br>• *Modification of rc.common Script* (m) | | Indicator Blocking | | | | | | | |
| | | Reopened Applications<br>• *Resumed Application on Reboot* (m) | | Indicator Removal from Tools | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Registry Run Keys / Startup Folder<br>• *Startup Folder Execution via VBScript* (w)<br>• *Startup Folder Persistence with Shortcut/VBScript Files* (w)<br>• *Registry Persistence via Run Keys* (w)<br>• *Registry Persistence via Shell Folders* (w) | | Indicator Removal on Host<br>• *Delete Volume USN Journal with fsutil* (w)<br>• *Host Artifact Deletion* (w)<br>• *Clearing Windows Event Logs with wevtutil* (w) | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Screensaver<br>• *Persistence via Screensaver* (w) | | Indirect Command Execution<br>• *Indirect Command Execution* (w) | | | | | | | |
| | | Security Support Provider<br>• *Installation of Security Support Provider* (w) | | Install Root Certificate<br>• *Root Certificate Install* (w) | | | | | | | |
| | | Service Registry Permissions Weakness | | InstallUtil<br>• *InstallUtil Execution* (w) | | | | | | | |
| | | Shortcut Modification | | LC_MAIN Hijacking | | | | | | | |
| | | Startup Items | | Launchctl | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | System Firmware | | Masquerading<br>• *Processes Running with Unusual Extensions* (w) | | | | | | | |
| | | Systemd Service<br>• *Creation or Modification of Systemd Service* (l) | | Modify Registry<br>• *Suspicious MS Office Registry Modifications* (w) | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Time Providers<br>• *Installation of Time Providers* (w) | | Mshta<br>• *Mshta Descendant of Microsoft Office* (w)<br>• *Mshta Network Connections* (w) | | | | | | | |
| | | Web Shell | | NTFS File Attributes<br>• *Suspicious ADS File Creation* (w) | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Windows Management Instrumentation Event Subscription | | Network Share Connection Removal<br>• *Disconnecting from Network Shares with net.exe* (w) | | | | | | | |
| | | Winlogon Helper DLL<br>• *Registration of Winlogon Helper DLL* (w) | | Obfuscated Files or Information | | | | | | | |
| | | | | Plist Modification<br>• *Plist Modification* (m) | | | | | | | |
| | | | | Port Knocking | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Process Doppelgänging | | | | | | | |
| | | | | Process Hollowing<br>• *Unusual Child Process* (w) | | | | | | | |
| | | | | Process Injection<br>• *Modification of ld.so.preload* (l)<br>• *Unusual Child Process* (w) | | | | | | | |
| | | | | Redundant Access | | | | | | | |
| | | | | Regsvcs/Regasm | | | | | | | |
| | | | | Regsvr32<br>• *Suspicious Script Object Execution* (w) | | | | | | | |
| | | | | Rootkit | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Rundll32 | | | | | | | |
| | | | | SIP and Trust Provider Hijacking | | | | | | | |
| | | | | Scripting | | | | | | | |
| | | | | Signed Binary Proxy Execution | | | | | | | |
| | | | | Signed Script Proxy Execution<br>• *Proxied Execution via Signed Scripts* (w) | | | | | | | |
| | | | | Software Packing | | | | | | | |
| | | | | Space after Filename<br>• *Processes with Trailing Spaces* (l, m) | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Template Injection<br>• *MS Office Template Injection* (w) | | | | | | | |
| | | | | Timestomp | | | | | | | |
| | | | | Trusted Developer Utilities | | | | | | | |
| | | | | Valid Accounts | | | | | | | |
| | | | | Virtualization/Sandbox Evasion | | | | | | | |
| | | | | XSL Script Processing | | | | | | | |

### 1.4.1 Linux

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drive-by Compromise | Command-Line Interface | .bash_profile and .bashrc<br>• *Modification of .bash_profile and .bashrc* | Exploitation for Privilege Escalation | Binary Padding<br>• *Indicator Removal from Tools* | Bash History | Account Discovery<br>• *Account Discovery via Built-In Tools* | Application Deployment Software | Audio Capture | Automated Exfiltration | Commonly Used Port | Data Destruction |
| Exploit Public-Facing Application | Exploitation for Client Execution | Bootkit | Setuid and Setgid | Clear Command History | Brute Force | Browser Bookmark Discovery | Exploitation of Remote Services | Automated Collection | Data Compressed | Communication Through Removable Media | Data Encrypted for Impact |
| Hardware Additions | Graphical User Interface | Browser Extensions | Sudo | Compile After Delivery | Credential Dumping | File and Directory Discovery | Remote Services<br>• *Remote Terminal Sessions* | Clipboard Data | Data Encrypted | Connection Proxy | Defacement |
| Spearphishing Attachment | Source | Create Account | Sudo Caching | Disabling Security Tools | Credentials in Files<br>• *Searching for Passwords in Files* | Network Service Scanning<br>• *Network Service Scanning via Port* | SSH Hijacking | Data Staged<br>• *Creation of an Archive with Common Archivers* | Data Transfer Size Limits | Custom Command and Control Protocol | Disk Content Wipe |
| Spearphishing Link | Third-party Software | Kernel Modules and Extensions<br>• *Creation* | | Execution Guardrails | Exploitation for Credential Access | Password Policy Discovery<br>• *Password Pol-* | | Data from Information Repositories | Exfiltration Over Alternative Protocol | Custom Cryptographic Protocol | Disk Structure Wipe |

### 1.4.2 macOS

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drive-by Compromise | AppleScript | .bash_profile and .bashrc<br>• *Modification of .bash_profile and .bashrc* | Exploitation for Privilege Escalation | Binary Padding<br>• *Modification of .bash_profile and .bashrc* | Bash History | Account Discovery<br>• *Account Discovery via Built-In Tools* | Application Deployment Software | Audio Capture | Automated Exfiltration | Commonly Used Port | Data Destruction |
| Exploit Public-Facing Application | Command-Line Interface | Browser Extensions<br>• *Suspicious File Creation via Browser Extensions* | Setuid and Setgid | Clear Command History | Brute Force | Application Window Discovery | Exploitation of Remote Services | Automated Collection | Data Compressed | Communication Through Removable Media | Data Encrypted for Impact |
| Hardware Additions | Exploitation for Client Execution | Create Account | Sudo | Code Signing | Credential Dumping | Browser Bookmark Discovery | Logon Scripts | Clipboard Data<br>• *Reading the Clipboard with pbpaste* | Data Encrypted | Connection Proxy | Defacement |
| Spearphishing Attachment | Graphical User Interface | Dylib Hijacking | Sudo Caching | Compile After Delivery | Credentials in Files<br>• *Searching for Passwords in Files* | File and Directory Discovery | Remote Services<br>• *Remote Terminal Sessions* | Data Staged<br>• *Creation of an Archive with Common Archivers* | Data Transfer Size Limits | Custom Command and Control Protocol | Disk Content Wipe |
| Spearphishing Link | Source | Kernel Mod- | | Disabling Secu- | Exploitation for | Network Ser- | SSH Hi- | Data from | Exfiltration Over | Custom Cryp- | Disk Struc- |

### 1.4.3 Windows

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Drive-by Compromise | Command Line Interface | Accessibility Features<br>• *Image Debuggers for Accessibility Features* | Exploitation for Privilege Escalation | Access Token Manipulation | Account Manipulation | Account Discovery<br>• *Account Discovery via Built-In Tools*<br>• *Discovery and Enumeration of System Information via Rundll32* | Application Deployment Software<br>• *wmic* | Audio Capture<br>• *Audio Capture via PowerShell*<br>• *Audio Capture via SoundRecorder* | Automated Exfiltration | Commonly Used Port | Data Destruction |

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Table 4 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Exploit Public-Facing Application | Dynamic Data Exchange<br>• *Executable Written and Executed by Microsoft Office Applications* | App DLLs<br>• *AppCert DLLs*<br>• *Application Shimming*<br>• *Image File Execution Options Injection*<br>• *Image Debuggers for Accessibility Features* | Cert<br>• *Control Panel Items*<br>• *Registry Modification* | BITS Jobs<br>• *Suspicious Bitsadmin Job via bitsadmin.exe*<br>• *Suspicious Bitsadmin Job via PowerShell* | Brute Force | Application Window Discovery | Distributed Component Object Model | Automated Collection | Data Compressed<br>• *Command-Line Creation of a RAR file* | Communication Through Removable Media | Data Encrypted for Impact |

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Table 4 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hardware Additions | Execution through API | AppInit DLLs<br>• *Persistence via AppInit DLL* | SID-History Injection<br>• *Persistence via AppInit DLL* | Binary Padding | Credential Dumping<br>• *Suspicious Process Loading Credential Vault DLL*<br>• *Credential Enumeration via Credential Vault CLI*<br>• *LSASS Memory Dumping*<br>• *AD Dumping via Ntdsutil.exe*<br>• *LSASS Memory Dumping via ProcDump.exe*<br>• *SAM Dumping via Reg.exe* | Browser Bookmark Discovery<br>• *Suspicious Process Loading Credential Vault DLL* | Exploitation of Remote Services | Clipboard Data | Data Encrypted | Connection Proxy | Defacement |

Table 4 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Spearphishing Attachment | Execution through Module Load | Application Shimming<br>• *Installing Custom Shim Databases* | | Bypass User Account Control<br>• *Bypass UAC via CMSTP* | Credentials in Files<br>• *Searching for Passwords in Files* | Domain Trust Discovery<br>• *Domain Trust Discovery via Nltest.exe*<br>• *Domain Trust Discovery* | Logon Scripts<br>• *Modification of Logon Scripts from Registry* | Data Staged<br>• *WMS Execution with Command Line Redirection* | Data Transfer Size Limits | Custom Command and Control Protocol | Disk Content Wipe |
| Spearphishing Link | Exploitation for Client Execution | Authentication Package<br>• *LSA Authentication Package* | | CMSTP<br>• *Execution via cmstp.exe*<br>• *Bypass UAC via CMSTP* | Credentials in Registry | File and Directory Discovery | Pass the Hash | Data from Information Repositories | Exfiltration Over Alternative Protocol | Custom Cryptographic Protocol | Disk Structure Wipe |
| Spearphishing via Service | Graphical User Interface | Bootkit | | Code Signing | Exploitation for Credential Access | Network Service Scanning<br>• *Network Service Scanning via Port* | Pass the Ticket | Data from Local System | Exfiltration Over Command and Control Channel | Data Encoding | Endpoint Denial of Service |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Supply Chain Compromise | LSASS Driver | Browser Extensions<br>• *Suspicious File Creation via Browser Extensions* | | Compile After Delivery | Forced Authentication | Network Share Discovery<br>• *Enumeration of Local Shares*<br>• *Enumeration of Remote Shares* | Remote Desktop Protocol<br>• *Remote Desktop Protocol Hijack* | Data from Network Shared Drive | Exfiltration Over Other Network Medium | Data Obfuscation | Firmware Corruption |

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Table 4 – continued from previous page

| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trusted Relationship | PowerShell | Change Default File Association<br>• *Change Default File Association* | | Compiled HTML File<br>• *HH.exe execution* | Input Prompt | Password Policy Discovery | Remote Services<br>• *Remote Terminal Sessions* | Data from Removable Media | Exfiltration Over Physical Medium | Domain Fronting | Inhibit System Recovery<br>• *Modification of Boot Configuration*<br>• *Volume Shadow Copy Deletion via VssAdmin*<br>• *Volume Shadow Copy Deletion via WMIC* |
| | Scheduled Task<br>• *Creation of Scheduled Task with schtasks.exe* | Create Account<br>• *User Account Creation* | | Component Firmware | Kerberoasting | Peripheral Device Discovery | Replication Through Removable Media | Email Collection<br>• *Access of Outlook Email Archives* | Scheduled Transfer | Domain Generation Algorithms | Network Denial of Service |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Service Execution<br>• *Execution of Existing Service via Command* | DLL Search Order Hijacking<br>• *DLL Search Order Hijacking with known programs* | | Component Object Model Hijacking<br>• *COM Hijack via Script Object* | LLMNR/NBT-NS Poisoning and Relay | Remote System Discovery | Shared Webroot | Input Capture | | Fallback Channels | Resource Hijacking |
| | Third-party Software | External Remote Services | | Control Panel Items<br>• *Control Panel Items* | Network Sniffing | Process Discovery<br>• *Process Discovery via Windows Tools* | Taint Shared Content | Man in the Browser | | Multi-Stage Channels | Runtime Data Manipulation |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | User Execution<br>• *Executable and Written and Executed by Microsoft Office Applications* | File System Permissions Weakness | | DCShadow | Password Filter DLL<br>• *Registration of a Password Filter DLL* | Query Registry | Windows Admin Shares<br>• *Mounting Hidden Shares*<br>• *Mounting Windows Hidden Shares with net.exe* | Screen Capture | | Multi-hop Proxy | Service Stop<br>• *Service Stop or Disable with sc.exe*<br>• *Stopping Services with net.exe* |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Windows Management Instrumentation<br>• *WMI Execution via Microsoft Office Application*<br>• *Remote Execution via WMIC* | Hooking | | DLL Side-Loading | Private Keys | Remote System Discovery<br>• *Windows Network Enumeration*<br>• *Remote System Discovery Commands* | | Video Capture | | Multiband Communication | Stored Data Manipulation |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Windows Remote Management<br>• *Incoming Remote PowerShell Sessions* | Hypervisor | | Deobfuscate/Decode Files or Information<br>• *Encoding or Decoding Files via CertUtil* | Two-Factor Authentication Interception<br>• *Modify Existing Service* | Security Software Discovery<br>• *Process Discovery via Windows Tools* | | | | Multilayer Encryption | Transmitted Data Manipulation |
| | | Modify Existing Service<br>• *Service Path Modification with sc.exe* | | Disabling Security Tools<br>• *Unload Sysmon Filter Driver with fltmc.exe* | | System Information Discovery<br>• *Enumeration of System Information*<br>• *System Information Discovery* | | | | Remote Access Tools | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Netsh Helper DLL<br>• *Persistence via NetSh Key* | | Execution Guardrails | | System Network Configuration Discovery<br>• *Discovery of Network Environment via Built-in Tools* | | | | Remote File Copy | |
| | | New Service | | Exploitation for Defense Evasion | | System Network Connections Discovery<br>• *Enumeration of Mounted Shares* | | | | Standard Application Layer Protocol<br>• *Non-browser processes making DNS requests to Dynamic DNS Providers* | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Office Application Startup<br>• *Office Application Startup via Template File Modification*<br>• *Office Application Startup via Template Registry Modification* | | Extra Window Memory Injection | | System Owner/User Discovery<br>• *System Owner and User Discovery*<br>• *Discovery and Enumeration of System Information via Rundll32* | | | | Standard Cryptographic Protocol | |
| | | Path Interception | | File Deletion | | System Service Discovery | | | | Standard Non-Application Layer Protocol | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Port Monitors<br>• *Installation of Port Monitor* | | File Permissions Modification<br>• *Windows File Permissions Modification* | | System Time Discovery<br>• *Discovery of a Remote System's Time* | | | | Uncommonly Used Port | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Registry Run Keys / Startup Folder<br>• *Startup Folder Execution via VBScript*<br>• *Startup Folder Persistence with Shortcut/VBScript Files*<br>• *Registry Persistence via Run Keys*<br>• *Registry Persistence via Shell Folders* | | File System Logical Offsets | | | | | | Web Service | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Screensaver<br>• *Persistence via Screensaver* | | Group Policy Modification | | | | | | | |
| | | Security Support Provider<br>• *Installation of Security Support Provider* | | Hidden Files and Directories<br>• *Adding the Hidden File Attribute with via attrib.exe* | | | | | | | |
| | | Service Registry Permissions Weakness | | Indicator Blocking | | | | | | | |
| | | Shortcut Modification | | Indicator Removal from Tools | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | System Firmware | | Indicator Removal on Host<br>• *Delete Volume USN Journal with fsutil*<br>• *Host Artifact Deletion*<br>• *Clearing Windows Event Logs with wevtutil* | | | | | | | |
| | | Time Providers<br>• *Installation of Time Providers* | | Indirect Command Execution<br>• *Indirect Command Execution* | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Web Shell | | Install Root Certificate<br>• *Root Certificate Install* | | | | | | | |
| | | Windows Management Instrumentation Event Subscription | | InstallUtil<br>• *InstallUtil Execution* | | | | | | | |
| | | Winlogon Helper DLL<br>• *Registration of Winlogon Helper DLL* | | Masquerading<br>• *Processes Running with Unusual Extensions* | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Modify Registry<br>• *Suspicious MS Office Registry Modifications* | | | | | | | |
| | | | | Mshta<br>• *Mshta Descendant of Microsoft Office*<br>• *Mshta Network Connections* | | | | | | | |
| | | | | NTFS File Attributes<br>• *Suspicious ADS File Creation* | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Network Share Connection Removal<br>• *Disconnecting from Network Shares with net.exe* | | | | | | | |
| | | | | Obfuscated Files or Information | | | | | | | |
| | | | | Process Doppelgänging | | | | | | | |
| | | | | Process Hollowing<br>• *Unusual Child Process* | | | | | | | |
| | | | | Process Injection<br>• *Unusual Child Process* | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Redundant Access | | | | | | | |
| | | | | Regsvcs/Regasm | | | | | | | |
| | | | | Regsvr32<br>• *Suspicious Script Object Execution* | | | | | | | |
| | | | | Rootkit | | | | | | | |
| | | | | Rundll32 | | | | | | | |
| | | | | SIP and Trust Provider Hijacking | | | | | | | |
| | | | | Scripting | | | | | | | |
| | | | | Signed Binary Proxy Execution | | | | | | | |
| | | | | Signed Script Proxy Execution<br>• *Proxied Execution via Signed Scripts* | | | | | | | |

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| Initial Access | Execution | Persistence | Privilege Escalation | Defense Evasion | Credential Access | Discovery | Lateral Movement | Collection | Exfiltration | Command and Control | Impact |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Software Packing | | | | | | | |
| | | | | Template Injection<br>• *MS Office Template Injection* | | | | | | | |
| | | | | Timestomp | | | | | | | |
| | | | | Trusted Developer Utilities | | | | | | | |
| | | | | Valid Accounts | | | | | | | |
| | | | | Virtualization/Sandbox Evasion | | | | | | | |
| | | | | XSL Script Processing | | | | | | | |

## 1.5 Schemas

### 1.5.1 Microsoft Sysmon

This is the mapping from Microsoft Sysmon native fields to the *security schema*.

#### Timestamp

**field** `UtcTime`

**format** `%Y-%m-%d %H:%M:%S.%f`

### Globally provided mapping

**hostname** `split(ComputerName, ".", 0)`

**pid** `number(ProcessId)`

**process_name** `baseName(Image)`

**process_path** `Image`

**unique_pid** `ProcessGuid`

**user** `User`

**user_domain** `split(User, "\\", 0)`

**user_name** `split(User, "\\", 1)`

### Event specific mappings

#### file

`EventId in (11, 15)`

**fields**

**file_name** `baseName(TargetFilename)`

**file_path** `TargetFilename`

#### image_load

`EventId == 7`

**fields**

**image_name** `baseName(ImageLoaded)`

**image_path** `ImageLoaded`

#### network

`EventId == 3`

**subtype** mapping

**incoming** `Initiated == 'false'`

**outgoing** `Initiated == 'true'`

**fields**

**destination_address** `DestinationIp`

**destination_port** `DestinationPort`

**protocol** `Protocol`

**source_address** `SourceIp`

**source_port** `SourcePort`

#### process

```
EventId in (1, 5)
```

**subtype** mapping

**create** `EventId == 1`

**terminate** `EventId == 5`

**fields**

**command_line** `CommandLine`

**logon_id** `number(LogonId)`

**original_file_name** `OriginalFileName`

**parent_process_name** `baseName(ParentImage)`

**parent_process_path** `ParentImage`

**ppid** `number(ParentProcessId)`

**unique_ppid** `ParentProcessGuid`

#### registry

```
EventId in (12, 13, 14)
```

**hive** mapping

**hklm** `TargetObject == "HKLM\\*"`

**hku** `TargetObject == "HKU\\*"`

**fields**

**registry_key** `dirName(TargetObject)`

**registry_path** `TargetObject`

**registry_value** `baseName(TargetObject)`

### 1.5.2 MITRE Cyber Analytics Repository

This is the mapping from MITRE Cyber Analytics Repository native fields to the *security schema*.

#### Timestamp

**field** `@timestamp`

**format** `%Y-%m-%dT%H:%M:%S.%fZ`

#### Globally provided mapping

**hostname** `hostname`

**pid** `pid`

**process_name** `exe`

**process_path** `image_path`

**unique_pid** `process_guid`

**user** `user`

**user_domain** `split(user, "\\", 0)`

**user_name** `split(user, "\\", 1)`

### Event specific mappings

#### file

`data_model.object = 'file'`

**subtype** mapping

**create** `arrayContains(data_model.actions, "create")`

**delete** `arrayContains(data_model.actions, "delete")`

**modify** `arrayContains(data_model.actions, "modify")`

**fields**

**file_name** `file_name`

**file_path** `file_path`

#### network

`data_model.object == 'flow'`

**subtype** mapping

**incoming** `not initiated`

**outgoing** `initiated`

**fields**

**destination_address** `dest_ip`

**destination_port** `dest_port`

**protocol** `transport`

**source_address** `src_ip`

**source_port** `src_port`

#### process

`data_model.object = 'process'`

**subtype** mapping

**create** `arrayContains(data_model.action, 'create')`

**terminate** `arrayContains(data_model.action, 'terminate')`

**fields**

**command_line** `command_line`

**parent_process_name** `parent_exe`

**parent_process_path** `parent_image_path`

**ppid** `ppid`

**unique_ppid** `parent_process_guid`

#### registry

```
data_model.object == "registry" and not arrayContains(data_model.actions,
"remove")
```

**registry_type** mapping

**binary** `type == "REG_BINARY"`

**dword** `type = "REG_DWORD"`

**expand_string** `type = "REG_EXPAND_SZ"`

**multi_string** `type = "REG_MULTI_SZ"`

**qword** `type = "REG_QWORD"`

**string** `type = "REG_SZ"`

**hive** mapping

**hklm** `hive == "HKEY_LOCAL_MACHINE"`

**hku** `hive == "HKEY_USERS"`

**fields**

**registry_data** `data`

**registry_key** `key`

**registry_path** `key`

**registry_value** `value`

### 1.5.3 Security Events

This is the primary schema used for normalizing across data sources. Queries are written to match this schema, and data sources are converted to this schema. This unifies sources to a unified by a common language and a common data model, so analytics can be written generically and are easy shareable.

**Globally provided fields**

- hostname
- pid
- process_name
- process_path
- unique_pid
- user
- user_domain

- user_name
- user_sid

### dns

**fields**

- query_name

### file

**subtype** options

- create
- modify
- delete

**fields**

- file_name
- file_path

### image_load

**fields**

- image_name
- image_path

### network

**subtype** options

- incoming
- outgoing
- disconnect

**fields**

- destination_address
- destination_port
- protocol
- source_address
- source_port
- total_in_bytes
- total_out_bytes

#### process

**subtype** options

- create
- terminate

**fields**

- command_line
- logon_id
- original_file_name
- parent_process_name
- parent_process_path
- ppid
- unique_ppid

#### registry

**hive** options

- hku
- hklm

**registry_type** options

- dword
- qword
- string
- expand_string
- multi_string
- binary

**fields**

- registry_data
- registry_key
- registry_path
- registry_value

## 1.6 Resources

### 1.6.1 Blogs

- EQL Threat Hunting
- Ransomware, interrupted: Sodinokibi and the supply chain

- Detecting Adversary Tradecraft with Image Load Event Logging and EQL
- EQL's Highway to Shell
- Getting Started with EQL
- EQL For the Masses
- Introducing EQL

### 1.6.2 Presentations

- BSides DFW 2019: ATT&CKing Koadic with EQL (slides)
- BlackHat 2019: Fantastic Red-Team Attacks and How to Find Them (slides, blog)
- BSides SATX 2019: The Hunter Games: How to Find the Adversary with EQL (slides)
- Circle City Con 2019: The Hunter Games: How to Find the Adversary with EQL (slides)
- Atomic Friday: Endgame on EQL (slides, notebook)
- MITRE ATT&CKcon: From Technique to Detection

### 1.6.3 Additional Resources

- Atomic Red Team
- Microsoft Sysmon
- MITRE ATT&CK™
- Event Query Language (docs, code, twitter)
- EQL Analytics Library (docs, code)

## 1.7 License



**Note:** The Event Query Language has an AGPL License

# Index

## Symbols



## A



## C



## E



## I



## O



## Q



## S