
THOR Cloud Microsoft Defender for Endpoint

Nextron Systems GmbH

Oct 09, 2023

CONTENTS:

- 1 Requirements 1**
 - 1.1 Supported Operating Systems 1
 - 1.2 Enable "Live Response" Feature 1
 - 1.3 Hardware Requirements 2
 - 1.4 Network Connections 2

- 2 Retrieve and Configure THOR Seed 3**
 - 2.1 Download THOR Seed using Voucher Trials 3
 - 2.2 Download THOR Seed in Customer Portal 3
 - 2.3 Configure THOR Seed (Optional) 3

- 3 Start a THOR Scan 9**
 - 3.1 Start a Live Response Session 9
 - 3.2 Upload THOR Seed 10
 - 3.3 Run THOR Seed 10
 - 3.4 Interrupted THOR Seed Sessions 10
 - 3.5 Retrieve the Results 13
 - 3.6 Cleanup 13

- 4 FAQs 17**
 - 4.1 Why does my scan suddenly terminate? 17
 - 4.2 Why can't I see a progress indicator? 17
 - 4.3 I cannot start a new THOR scan due to old log files? 17
 - 4.4 I can't start a scan and get the error "THOR already running", why? 19
 - 4.5 Does each scan use up one of my licenses? 19
 - 4.6 Can I use my own IOCs and YARA signatures with THOR Seed? 20

- 5 Links and References 21**

- 6 Indices and tables 23**

REQUIREMENTS

1.1 Supported Operating Systems

The operating systems are limited to the set that supports the Microsoft Defender for Endpoint "Live Response" feature.

Table 1: Table 1 - Supported Operating Systems

Operating System	Version
Windows 10 & 11	Version 1909 or later Version 1903 with KB4515384 Version 1809 (RS 5) with with KB4537818 Version 1803 (RS 4) with KB4537795 Version 1709 (RS 3) with KB4537816
macOS	Minimum required version: 101.43.84. Supported for Intel-based and ARM-based macOS devices.
Linux	Minimum required version: 101.45.13
Windows Server 2012	R2 with KB5005292
Windows Server 2016	with KB5005292
Windows Server 2019	Version 1903 or (with KB4515384) later Version 1809 (with KB4537818)
Windows Server 2022	

For a current version of the list of supported operating systems, check the [following page](#).

1.2 Enable "Live Response" Feature

You need to enable the [Live Response](#) capability in the "Advanced Features" settings page for Workstations and Servers.

Additionally, you need to change the [Live response unsigned script execution](#) option in the same page, which allows you to run unsigned¹ scripts in a live response session.

¹ thor-seed.ps1 is an unsigned powershell script

1.3 Hardware Requirements

The hardware requirements reflect the scan settings of a default scan.

Table 2: Table 2 - Hardware Requirements

Minimum	Recommended
1 CPU Core	2+ CPU Cores
1 GB of RAM	8+ GB of RAM
100 MB of temporary Disk Space	

Hint: THOR uses between 160 and 300 MB of main memory during the investigation, but there are conditions in which the memory usage can exceed this range for a short time. On very weak end systems, enable "soft" mode in THOR Seeds config section.

1.4 Network Connections

For a detailed and up to date list of our update and licensing servers, please visit <https://www.nextron-systems.com/hosts/>.

1.4.1 On Investigated Workstations

Table 3: Table 3 - Remote Hosts

Remote Host	Port
cloud.nextron-systems.com	443/tcp

Hint: this FQDN resolves to multiple IP addresses. See <https://www.nextron-systems.com/hosts/>.

1.4.2 Web Proxies

Web proxies are supported albeit not fully tested. THOR Seed, the script that retrieves a license and the temporary THOR scanner package is proxy aware and should use the local proxy configuration.

RETRIEVE AND CONFIGURE THOR SEED

2.1 Download THOR Seed using Voucher Trials

Trial users receive a link that leads to a web page, which lists the attributes of the voucher including start date, expiration date, the life time of each license and quota statistics.

You have to read and accept the EULA and check the box to enable the download links.

2.2 Download THOR Seed in Customer Portal

Every applicable contract in our customer portal shows a certain "Cloud" button in the Actions column, which leads you to a THOR Seed download page.

The THOR Seed download page lists all attributes of the contract including the total quota, used licenses and the lifetime of each license. (see the FAQ section at the end of this document for more details on the terms)

2.3 Configure THOR Seed (Optional)

THOR Seed is the PowerShell script that retrieves THOR packages with a valid license for the end system on which it was started, executes a THOR scan and cleans up afterwards.

You can find more information on Github:

<https://github.com/NextronSystems/nextron-helper-scripts/tree/master/thor-seed>

The version that you've retrieved from our customer portal already contains a token that is connected with you voucher trial or contract. It is also configured to use our cloud systems to retrieve THOR packages. (users of the ASGARD platform can also use an on-premise ASGARD server to retrieve package from that local system)

THOR Download

Contract Type	THOR Server & Workstation
Owner / Description	[REDACTED]
Begins On	2023-03-13
Expires On	2023-03-21
License Lifetime	30 days
Licenses Used	1 of 5

Enter one or more Hostnames to create Licenses for these Hosts.
Hostnames must be valid and unique within the Contract.

my-workstation
dc.example.corp
testserver
...
(separate by space, newline or comma)

[+ Add Hosts](#)

THOR requires a host-based license to run. Enter hostnames above to generate licenses. All licenses generated on this contract will be automatically added to the download packages.

I hereby agree with the terms and conditions stated in the [End User License Agreement \(EULA\)](#).

Do not upload the software to public platforms like [virustotal.com](#), [hybrid-analysis.com](#) or [malwr.com](#) as those platforms allow the download for registered users.

Please accept the EULA to show the download links.

Fig. 1: THOR Cloud Voucher Trial

Used	Total	Actions	Left
1	50	[Menu] [+] [Cloud] [Search] [Edit]	49
1	5	[Menu] [+] [Search] [Edit]	4
1	5	[Menu] [+] [Cloud] [Search] [Edit]	4
3	20	[Menu] [+] [Cloud] [Search] [Edit]	17
0	10	[Menu] [+] [Search] [Edit] [Delete]	10

1 - 5 of 5 Show 10 1

Fig. 2: Button that leads to the THOR Seed download page

2.3.1 Modify the Default Configuration

In the section “PRESET CONFIGS” you can modify or choose different scan options.

THOR Seed already includes good presets that can just be "selected" further below in the section.

A list of all options can be found here: <https://github.com/NextronSystems/nextron-helper-scripts/tree/master/thor-help>

The [THOR manual](#) contains a complete description of most of these features and can be downloaded from the “Downloads” section in the Nextron customer portal.

2.3.2 Define False Positive Filters

THOR Seed also includes a section in which you could include false positive statements (separated by new line) and defined as regular expressions.

It's important to use escaping as it is used in regular expressions to escape e.g., back slashes, periods, dollar and asterisk characters. The expression is applied to a full log line. The [THOR manual](#) has more information on these filters and a list of examples.

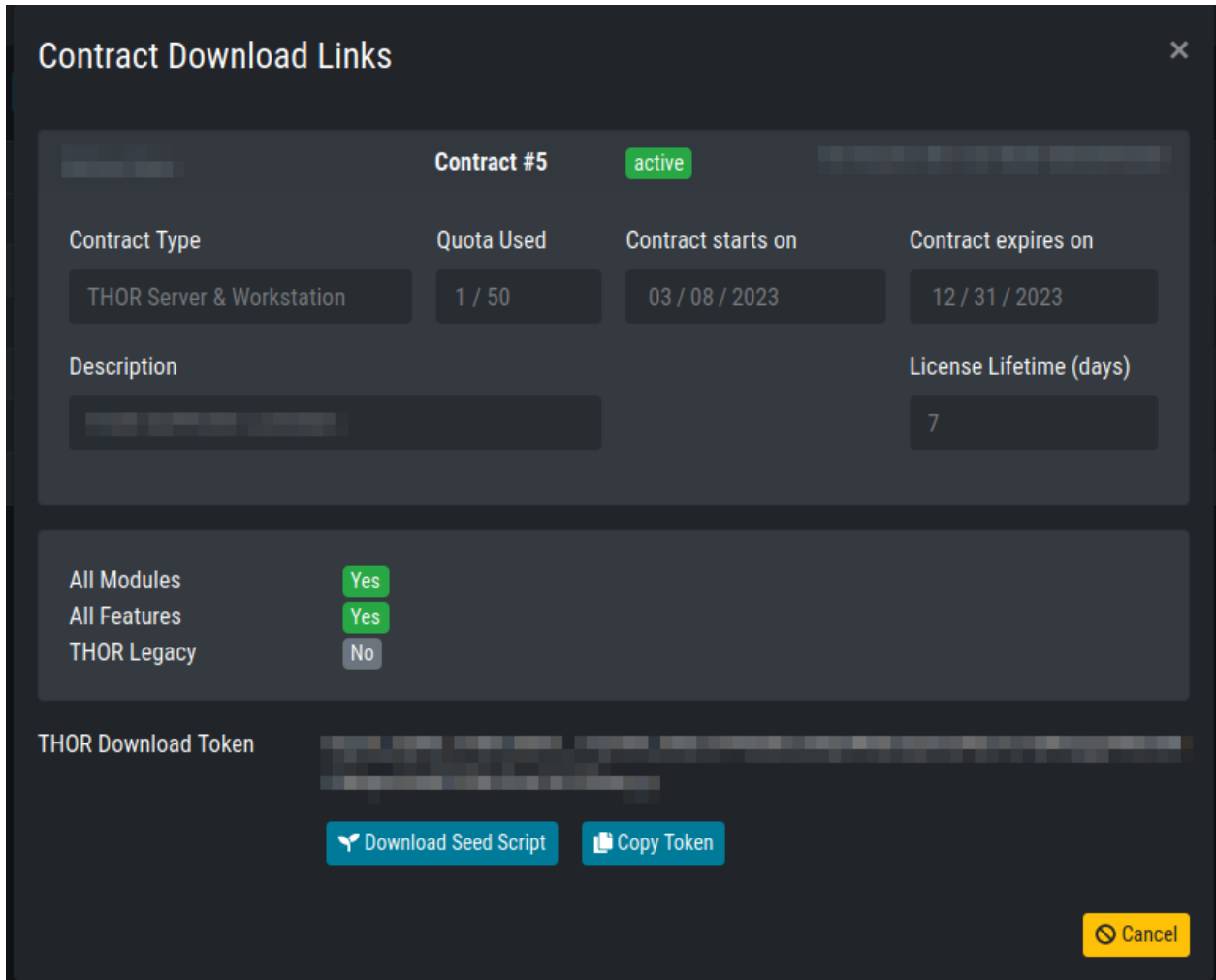


Fig. 3: THOR Seed Download Page

```

159
160 # PRESET CONFIGS
161
162 # FULL with Lookback
163 # Preset template for a complete scan with a lookback of 2 days
164 # Run time: 40 minutes to 6 hours
165 # Specifics:
166 # - runs all default modules
167 # - only scans elements that have been changed or created within the last 14 days
168 # - applies Sigma rules
169 # cloudconf: [!]PresetConfig_FullLookback [Full Scan with Lookback] Performs a full disk scan with all modules but
    only checks elements changed or created within the last 14 days - best for SOC response to suspicious events (5 to
    20 min)
170 $PresetConfig_FullLookback = @"
171 rebase-dir: $($OutputPath) # Path to store all output files (default: script location)
172 nosoft: true # Don't throttle the scan, even on single core systems
173 global-lookback: true # Apply lookback to all possible modules
174 lookback: 14 # Log and Eventlog look back time in days
175 # cpulimit: 70 # Limit the CPU usage of the scan
176 sigma: true # Activate Sigma scanning on Eventlogs
177 nofserrors: true # Don't print an error for non-existing directories selected in quick scan
178 nocsv: true # Don't create CSV output file with all suspicious files
179 noscanid: true # Don't print a scan ID at the end of each line (only useful in SIEM import use cases)
180 nothoradb: true # Don't create a local SQLite database for differential analysis of multiple scans
181 "@
182

```

Fig. 4: Configuration Presets

```

220
221 # SELECT YOUR CONFIG
222 # Select your preset config
223 # Choose between: $PresetConfig_Full, $PresetConfig_Quick, $PresetConfig_FullLookback
224 $PresetConfig = $PresetConfig_FullLookback
225

```

Fig. 5: Preset Selection

```

226 # False Positive Filters
227 $UseFalsePositiveFilters = $True
228 # The following new line separated false positive filters get
229 # applied to all log lines as regex values.
230 $PresetFalsePositiveFilters = @"
231 Could not get files of directory
232 Signature file is older than 60 days
233 \\Our-Custom-Software\\v1.[0-9]+\
234 "@

```

Fig. 6: False Positive filters

START A THOR SCAN

3.1 Start a Live Response Session

You find different locations in Microsoft Defender Security Center that allow you to initiate a Live Response session.

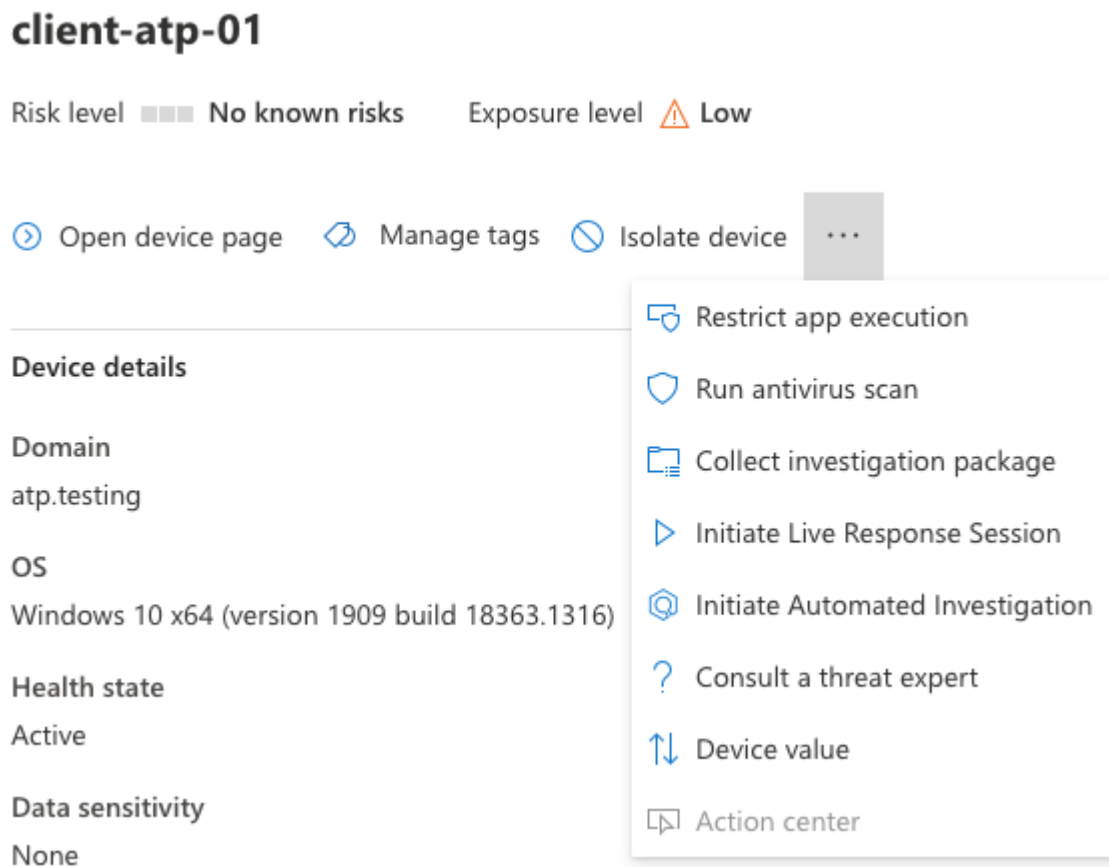


Fig. 1: Initiate Live Response Session

3.2 Upload THOR Seed

Use the button in the upper right corner of the window to upload "thor-seed.ps1" into the Live Response script library.

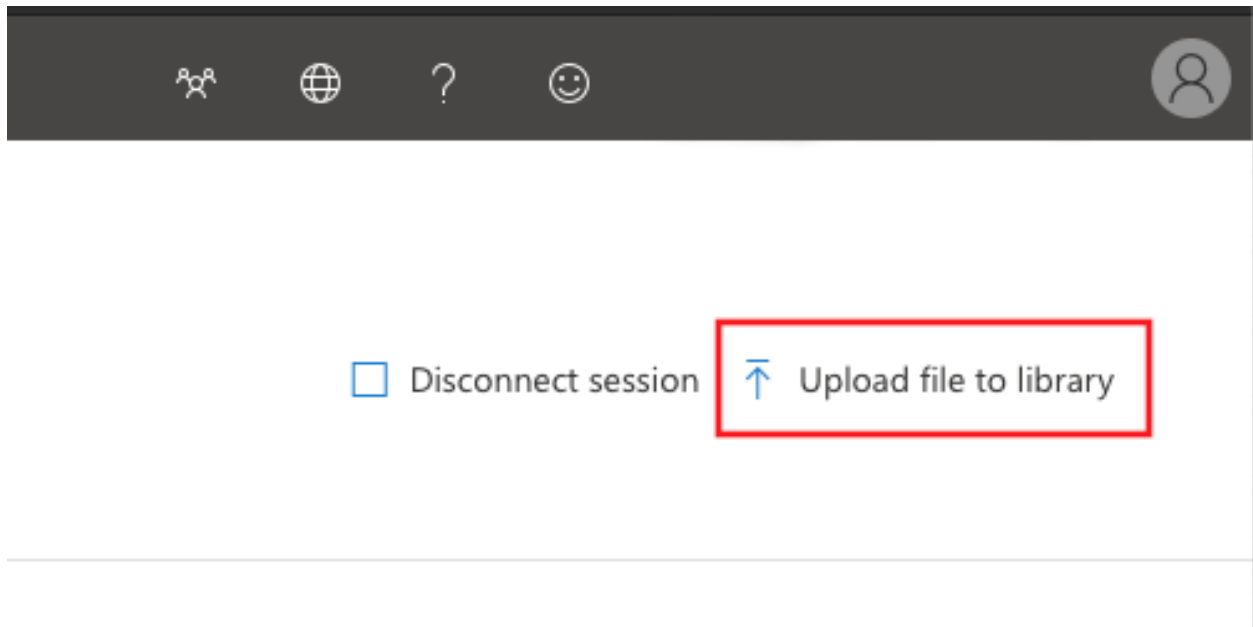


Fig. 2: Upload Button

Make sure to check "Overwrite file" to replace an older version of THOR Seed in your library.

3.3 Run THOR Seed

After uploading THOR Seed to the Live Response script library, you can start the script with the "run" command.

3.4 Interrupted THOR Seed Sessions

Microsoft Defender Security Center allows scripts a run time of a maximum of 30 minutes and then terminates the script. However, the sub process "thor64.exe" is still running.

3.4.1 Check the Scan Status

In THOR Seed versions before v0.18, it was difficult to get the scan status of THOR in the background or find the log files that THOR produces during the scan and the HTML report that is generated at the end of the scan.

Users can check if THOR is still running with

```
C:\> processes -name thor64.exe
```

Since THOR Seed version 0.18 you just run thor-seed.ps1 again and will see the information that THOR is still running, where to find the current log file and the last 3 log lines of that file.

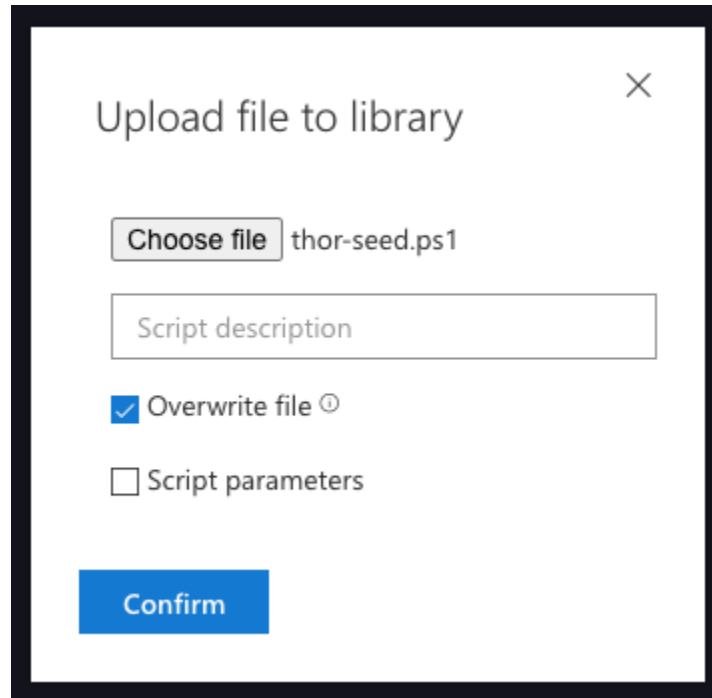


Fig. 3: Upload THOR Seed

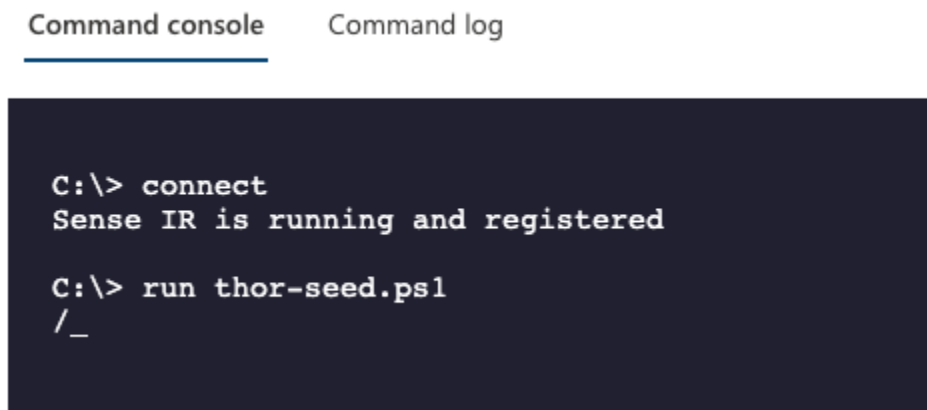


Fig. 4: Run thor-seed.ps1 in Live Response session

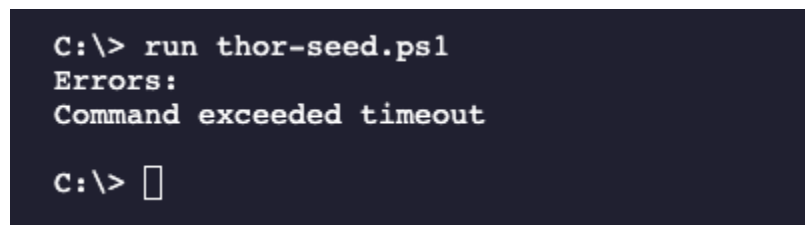


Fig. 5: Interrupted scan due to exceeded timeout

```
C:\> run thor-seed.ps1
Transcript started, output file is C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Temp
\PSScriptOutputs\PSScript_Transcript_{79E5B871-EFD9-45E3-AD2C-F69A38606B94}.txt
=====
THOR SEED
Nextron Systems, by Florian Roth
=====
[+] Started thor-seed with PowerShell v5.1.18362.1171
[+] Auto Detect Platform: MDATP
[+] Note: Some automatic changes have been applied
[E] A THOR process is still running.
[+] Detected Platform: Microsoft Defender ATP
[+] The scan hasn't produced any output files yet.
[+] Last written log file is: C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads
\client-atp-01_thor_2021-02-02_1428.txt
[.] Trying to get the last 3 log lines
[+] The last 3 log lines are:
Feb  2 13:58:14 client-atp-01/172.28.30.70 THOR: Info: MODULE: RegistryHive MESSAGE: Opened busy registry hi
ve directly via MFT PATH: C:\Windows\appcompat\Programs\Amcache.hve.LOG2
Feb  2 13:58:14 client-atp-01/172.28.30.70 THOR: Info: MODULE: RegistryHive MESSAGE: Scanning registry HIVE:
C:\Windows\appcompat\Programs\Amcache.hve.LOG2
Feb  2 13:58:14 client-atp-01/172.28.30.70 THOR: Info: MODULE: Amcache MESSAGE: Analyzing Amcache Hive FILE:
C:\Windows\appcompat\Programs\Amcache.hve.LOG2
```

Fig. 6: THOR Seed start while THOR is still running

You can run the script as often as you like to get an information on the current status of the scan. A normal scan takes between 20 and 180 minutes to complete.

3.4.2 Detect a Finished Scan

The moment that you run “thor-seed.ps1” while “thor64.exe” has finished its job in the background, you get a listing of all generated log files and HTML reports in the output directory and commands to download them and remove them from the end system.

It shows a list of three actions to proceed:

1. Retrieve the available log files and HTML reports

```
C:\> get file "C:\ProgramData\Microsoft\Windows Defender Advanced..."
```

2. Use the following command to clean-up the output directory

```
C:\> run thor-seed.ps1 -parameters "-Cleanup"
```

3. Start a new THOR scan with

```
C:\> run thor-seed.ps1
```



```

C:\> run thor-seed.ps1
Transcript started, output file is C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Temp\PSScriptOutputs\PSScript_Transcript_{8890739E-DC5D-4432-92BA-A5DAD211BE42}.txt
=====
THOR SEED
Nexttron Systems, by Florian Roth
=====
[+] Started thor-seed with PowerShell v5.1.18362.1171
[+] Auto Detect Platform: MDATP
[+] Note: Some automatic changes have been applied
[+] Detected Platform: Microsoft Defender ATP
[E] Cannot start new THOR scan as long as old report files are present
A.) Retrieve the logs and reports needed
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-02_1817.txt"
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-02_1817.html"
B.) Use the following command to cleanup the output directory and remove all previous reports
  run thor-seed.ps1 -parameters "-Cleanup"
C.) Run THOR Seed again
  run thor-seed.ps1

C:\> _

```

Fig. 7: THOR Seed run shows previously finished scan

3.5 Retrieve the Results

The output of THOR Seed already contains the right commands to download a report after the scan has finished. Simply copy and paste the full "getfile" command line to retrieve the HTML report.

```
C:\> getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\
Downloads\client-atp-01_thor_2021-02-02_1817.html"
```

3.6 Cleanup

In order to run another THOR scan, you have to remove all previous log files and HTML reports using the following command:

```
C:\> run thor-seed.ps1 -parameters "-Cleanup"
```

After removing the text logs and HTML reports you can start a new scan on this end system.

```
C:\> connect
Connection currently active. [last communication: 2021-02-03 09:27:12.230000+00:00]

C:\> run thor-seed.ps1
Transcript started, output file is C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Temp\PSScriptOutputs\PSScript_
Transcript_{3F52FF55-4485-4E9E-A443-C40E184FF4DF}.txt
=====
THOR SEED
Nexttron Systems, by Florian Roth
=====
[+] Started thor-seed with PowerShell v5.1.18362.1171
[+] Auto Detect Platform: MDATP
[+] Note: Some automatic changes have been applied
[+] Detected Platform: Microsoft Defender ATP
[E] Cannot start new THOR scan as long as old report files are present
A.) Retrieve the logs and reports needed
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-02_1817.txt"
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-02_1817.html"
B.) Use the following command to cleanup the output directory and remove all previous reports
  run thor-seed.ps1 -parameters "-Cleanup"
C.) Run THOR Seed again
  run thor-seed.ps1

C:\> _
```

Fig. 8: THOR Seed output on a system with finished scan

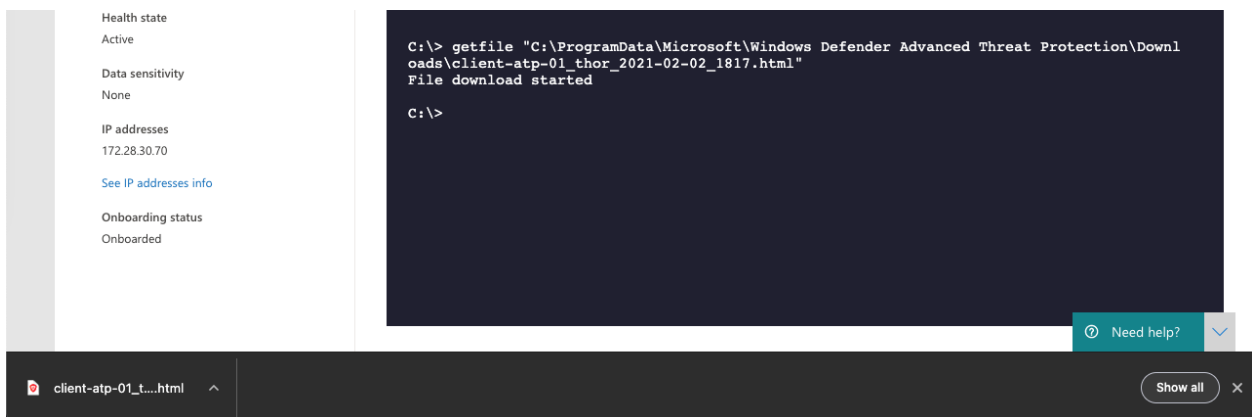


Fig. 9: HTML Report Download in Browser

THOR Scan Report					
Scan Information		Modules		Statistics	
Scanner	Thor	Rootkit	3	Alerts	9
Version	10.5.9	Filescan	18	Warnings	36
Run on System	client-atp-01	HotfixCheck	23	Notice	40
Argument list	-	WMIStartup	19	Info	858
Signature Database	2021/01/28-160332	AtJobs	9	Errors	0
Start Time	Tue Feb 2 18:17:25 2021	LSASessions	2	Help	
End Time	-	RegistryChecks	46	Shortcuts	Use Ctrl+↑ (Windows/Linux) or ⌘+↑ (macOS) to return to the t
IP Addresses	172.28.30.70	ServiceCheck	56	Filters	You can provide a file (-filter file) with regular expressions to sup
Run as user	NT	UserDir	2	Hint 1	Values contain links to search engines
Admin rights	yes	Firewall	76		
Platform	Windows 10 Enterprise	OpenFiles	3		
Log File Name	client-atp-01_thor_2021-02-02_1817.txt	Hosts	2		
Log Filters Applied	0	Users	7		
Scan ID	-	ProcessConnections	81		
		SHIMCache	3		
		Eventlog	75		

Fig. 10: THOR HTML Report

4.1 Why does my scan suddenly terminate?

Live response applies a rather disadvantages timeout for PowerShell scripts run within a Live Response session, which is 30 minutes by default. If a scan takes longer to complete, it gets terminated.

We recommend

- using scan settings that allow the scan to terminate within 30 minutes
- increasing the timeout to a higher value in future versions of Microsoft Defender ATP

Since version 0.18 of THOR Seed, this situation gets handled automatically. Just run `thor-seed.ps1` another time to get information on the `thor64.exe` process that still runs in the background. It will show you information on the log file and print commands that you can use to download the log file and HTML report once THOR finished its work.

If `thor64.exe` is still running when you start THOR seed, you will get information regarding the current scan.

If `thor64.exe` is finished, you will get some example commands to retrieve your files and clean up the reports of the previous scan.

4.2 Why can't I see a progress indicator?

The scripting environment doesn't give us the opportunity to report back any status information before the script terminates. All output written to `STDOUT` and `STDERR` will be returned at the end of the script execution although it appears earlier.

Unfortunately, it is not possible to return information before the scan terminates.

4.3 I cannot start a new THOR scan due to old log files?

Simply run a cleanup before starting a new scan.

```
C:\> run thor-seed.ps1 -parameters "-Cleanup"
```

Command console

Command log

```

C:\> run thor-seed.ps1
Transcript started, output file is C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Temp\PSScriptOutputs\PSScript_Transcript_{01ABB243-7779-4A7E-B9B2-9C70DD6B5759}.txt
=====
          THOR SEED
          Nextron Systems, by Florian Roth
          =====
[+] Started thor-seed with PowerShell v5.1.18362.1171
[+] Auto Detect Platform: MDATP
[+] Note: Some automatic changes have been applied
[E] A THOR process is still running.
[.] Checking output folder: C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads
[+] Output files that have been generated so far:
C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-01_1714.txt
[+] Detected Platform: Microsoft Defender ATP
[+] Hint: You can use the following commands to retrieve the scan logs
getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-01_1714.txt"
[+] Hint: Use the following command to cleanup the output directory and remove all previous reports
run thor-seed.ps1 -parameters "-Cleanup"
[+] Last written log file is: C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-atp-01_thor_2021-02-01_1714.txt
[.] Trying to get the last 3 log lines
[+] Last log lines are:
Feb  1 16:20:19 client-atp-01/172.28.30.70 THOR: Info: MODULE: ProcessCheck MESSAGE: Process info PID: 9240 PPID: 796 PARENT: C:\WINDOWS\system32\svchost.exe NAME: dllhost.exe OWNER: ATP\admin COMMAND: C:\WINDOWS\system32\DllHost.exe /Processid:{973D20D7-562D-44B9-B70B-5A0F49CCD

```

Fig. 1: THOR Seed after timeout

```

C:\> run thor-seed.ps1
Transcript started, output file is C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Temp\PSScriptOutputs\PSScript_Transcript_{8890739E-DC5D-4432-92BA-A5DAD211BE42}.txt
=====
THOR SEED
Nexttron Systems, by Florian Roth
=====
[+] Started thor-seed with PowerShell v5.1.18362.1171
[+] Auto Detect Platform: MDATP
[+] Note: Some automatic changes have been applied
[+] Detected Platform: Microsoft Defender ATP
[E] Cannot start new THOR scan as long as old report files are present
A.) Retrieve the logs and reports needed
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-at
p-01_thor_2021-02-02_1817.txt"
  getfile "C:\ProgramData\Microsoft\Windows Defender Advanced Threat Protection\Downloads\client-at
p-01_thor_2021-02-02_1817.html"
B.) Use the following command to cleanup the output directory and remove all previous reports
  run thor-seed.ps1 -parameters "-Cleanup"
C.) Run THOR Seed again
  run thor-seed.ps1

C:\> _

```

Fig. 2: THOR Seed after finished scan

4.4 I can't start a scan and get the error "THOR already running", why?

It is possible that you've interrupted a previous script run with CTRL+C and got back to the shell. In Live Response, sub processes started by scripts running from the script library don't get killed on CTRL+C.

It is highly likely that a THOR scan is still running in the background without you knowing.

Since version 0.18 of THOR Seed, this situation gets handled automatically. Just run `thor-seed.ps1` another time to get information on the `thor64.exe` process that still runs in the background. It will show you information on the log file and print commands that you can use to download the log file and HTML report once THOR finished its work.

4.5 Does each scan use up one of my licenses?

Once you generate a license for a system, this license has a certain lifetime (e.g. 48 hours). You can start as many scans within that lifetime without using a new license from your quota.

THOR doesn't stop if the scan takes longer than the license lifetime.

If you start a new scan on a system that has been scanned in the past and the old license is expired, a new license will be generated and count against the quota.

4.6 Can I use my own IOCs and YARA signatures with THOR Seed?

Not yet but we'll add an option to the THOR Seed PowerShell script to download and use a ZIP archive with custom IOCs and YARA signatures from a user defined location.

LINKS AND REFERENCES

- THOR Cloud Integration Into Microsoft Defender ATP Web Page
<https://www.nexttron-systems.com/thor-cloud/microsoft-defender-atp/>
- Webinar with Patriot Consulting
<https://www.nexttron-systems.com/2020/06/19/webinar-mitigating-persistent-threats-using-microsoft-defender-atp-and-thor/>
- First Complete PoC with Microsoft Defender ATP
<https://www.nexttron-systems.com/2020/01/07/thor-integration-into-windows-defender-atp/>
- THOR Seed Github Page
<https://github.com/NexttronSystems/nexttron-helper-scripts/tree/master/thor-seed>

INDICES AND TABLES

- search