

Synapse Bootcamp - Module 16

Dynamic Malware Analysis - Exercises

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Objectives

In these exercises you will learn:

- How to use Synapse Power-Ups to retrieve dynamic analysis data for selected files
- How to model file behavior information using Synapse' data model
- Common queries and pivots to use when analyzing a file's behavior

Note: We are constantly updating Synapse and its Power-Ups! We do our best to make sure our course documents (slides, exercises, and answer keys) are up-to-date. However, you may notice small differences (such as between a screen capture in the documents and the appearance of your current instance of Synapse).

If something is unclear or if you identify an error, please reach out to us so we can assist!

Exercises

- All exercises use the **Research Tool** with the **Storm Mode Selector** set to **Storm mode**.
- Some example queries may wrap due to length.

The **Storm Jump Start** (included with the supplemental materials provided for this course) includes sample Storm queries / pivots for some common analysis tasks and may be useful for this module.

Dynamic Malware Analysis

Exercise 1

Objective:

- Use dynamic execution data to identify network activity and look for potential malware command and control (C2) communications.

You are researching a malware sample identified in a blog published by Italian security company Yoroi S.r.l.¹ You have already:

- Downloaded and parsed the file.
- Reviewed the static analysis data / VirusTotal file report.
- Determined the file is malicious and tagged it **cno.mal**.

Now you want to download and examine execution data.

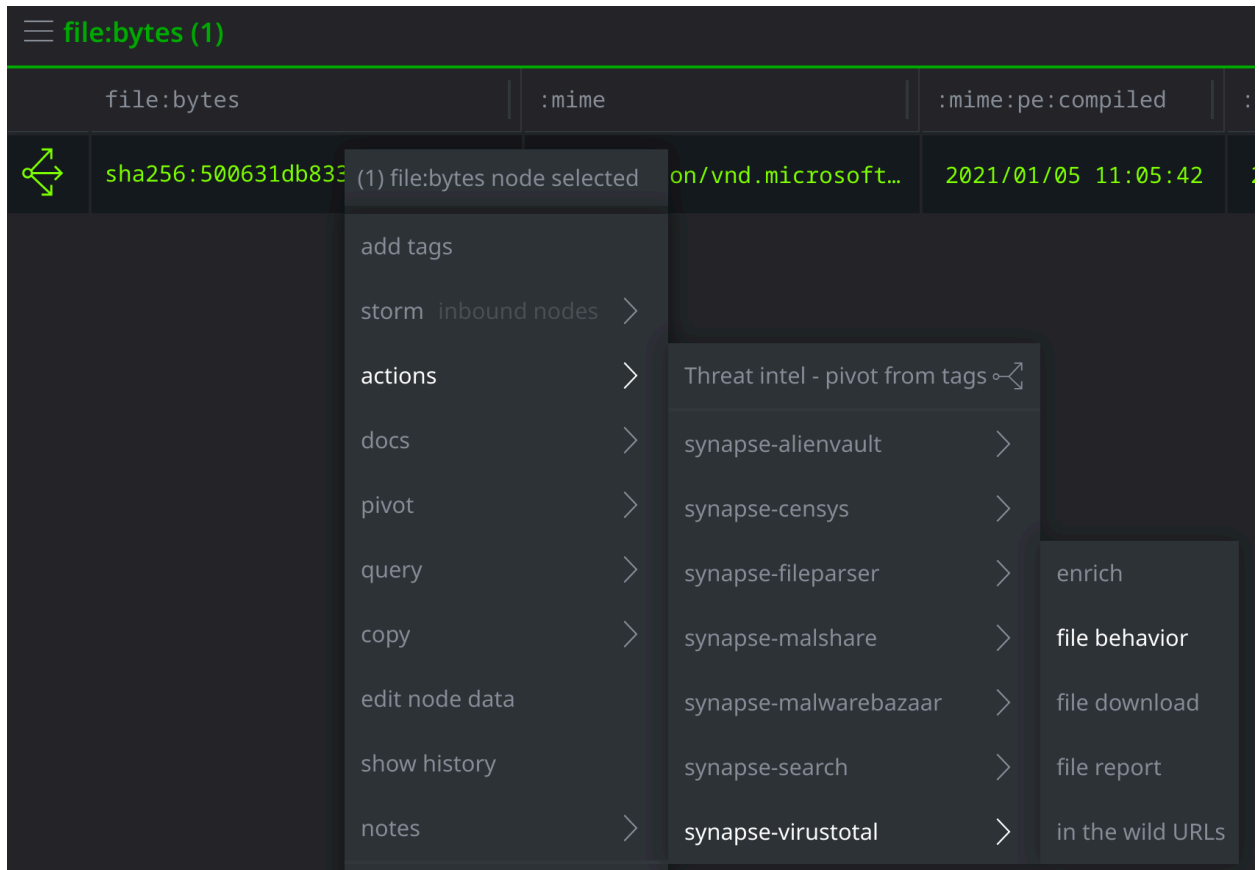
- In the **Research Tool**, enter the following into the **Storm Query Bar** and press **Enter** to view the file (**file:bytes**) associated with the hash:

```
file:bytes=sha256:500631db833b2729f784e233225621ddff411d7da49bd82cfd51a49b9600438f
```

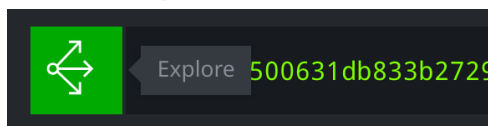
¹ "Connecting the dots inside the Italian APT Landscape", <https://yoroi.company/research/connecting-the-dots-inside-the-italian-apt-landscape/>. Published 2021/02/04, accessed 2022/05/02.

Note: The exercise PDFs may insert line breaks or spaces where values (such as the SHA256, above) are forced to wrap. If you copy the above into your Storm query bar and the query fails to run, you may need to manually remove the space / break.

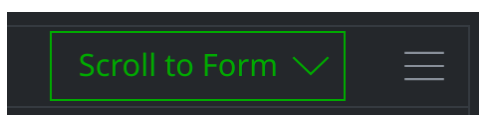
- **Right-click** the file and select **actions > synapse-virustotal > file behavior** to download execution data for the file:



- Click the **Explore** button next to the file to display adjacent nodes:

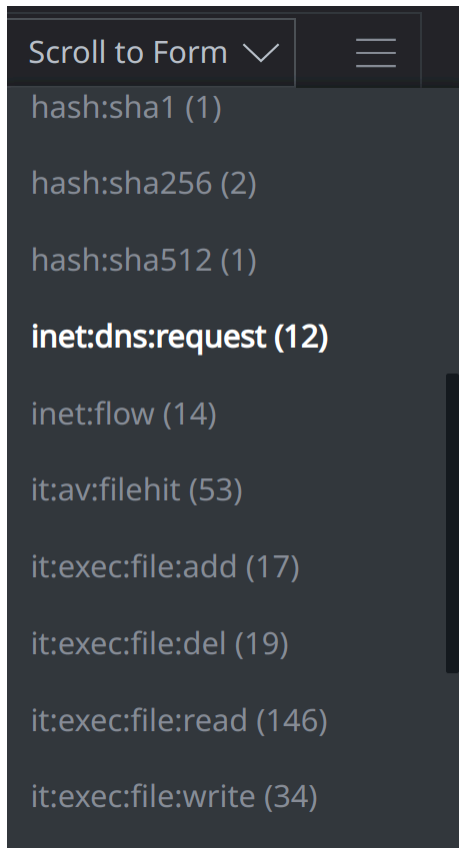


- Click the **Scroll to Form** button to browse the results:



Question 1: Are there any forms that might provide us with information about **network-based** communications or command and control (C2)?

- Use **Scroll to Form** to navigate to the **inet:dns:request** nodes:

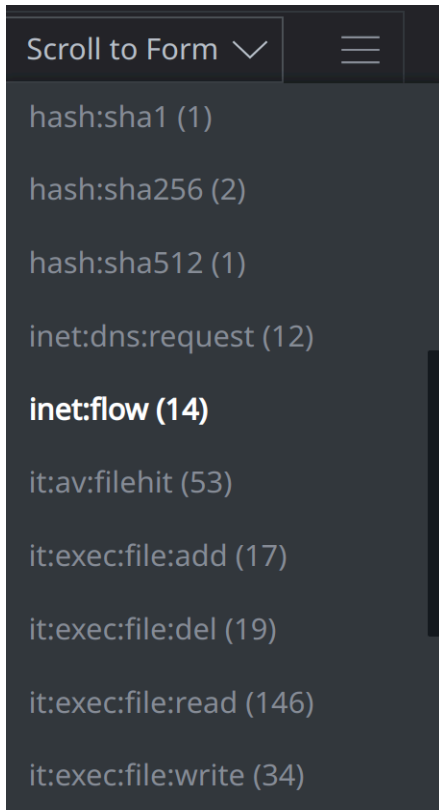


Question 2: When were the DNS queries made?

Question 3: How many unique FQDNs were queried?

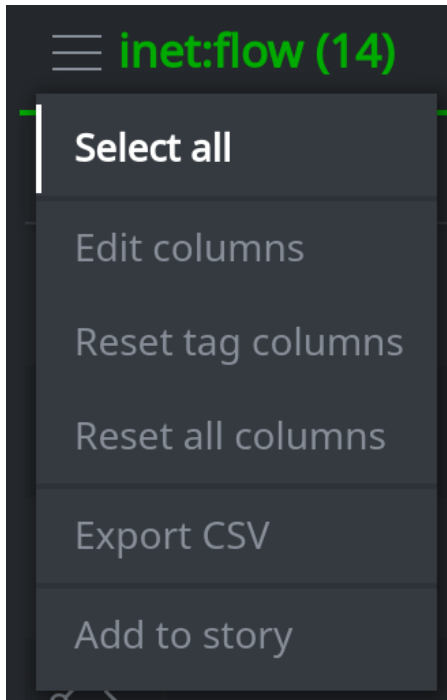
Question 4: Which FQDNs (if any) would you investigate?

- Use **Scroll to Form** to navigate to the **inet:flow** nodes:

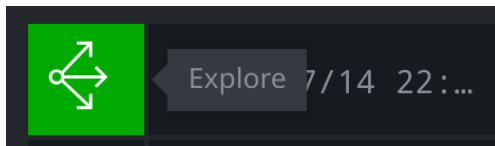


(If you navigated away from the previous results, use your **breadcrumbs** to return.)

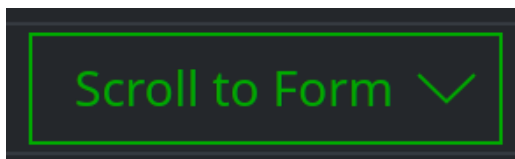
- Click the **hamburger menu** next to the **inet:flow** header and choose **Select all**:



- Click the **Explore** button next to any selected node to view adjacent nodes:



- Locate the **inet:ipv4** nodes (use **Scroll to Form** if necessary):



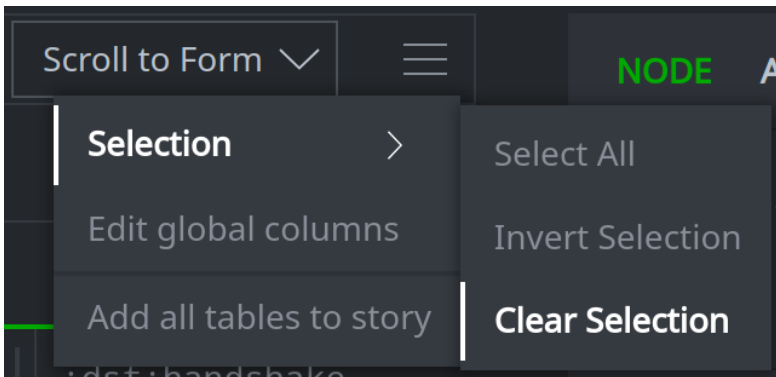
Question 5: How many unique IPv4s were contacted?

You want to see if any IPv4 addresses are the result of a DNS query.

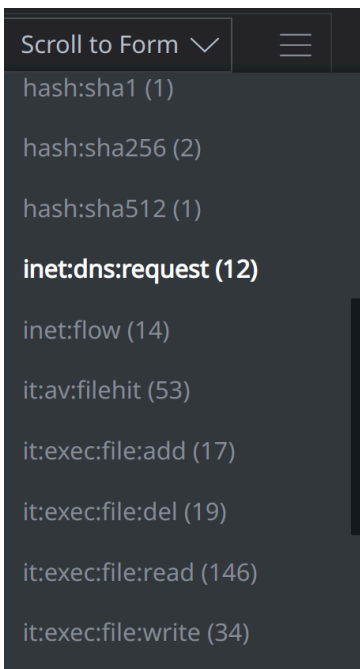
- Use your **breadcrumbs** to return to the prior query:



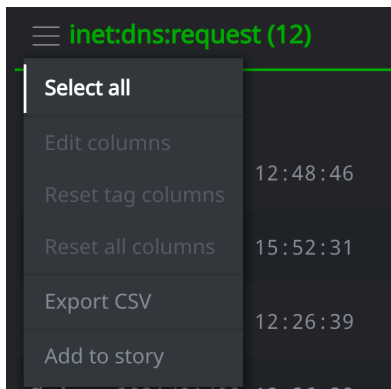
- Click the **main hamburger menu** and choose **Selection > Clear Selection** to de-select the **inet:flow** nodes:



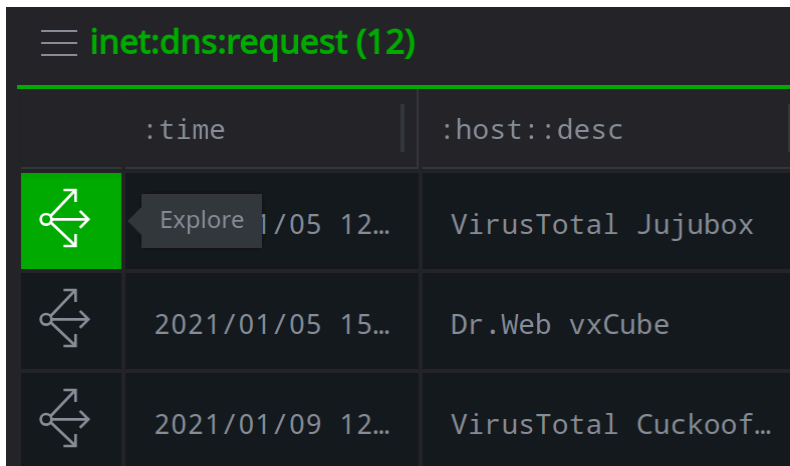
- Use **Scroll to Form** to return to the **inet:dns:request** nodes:



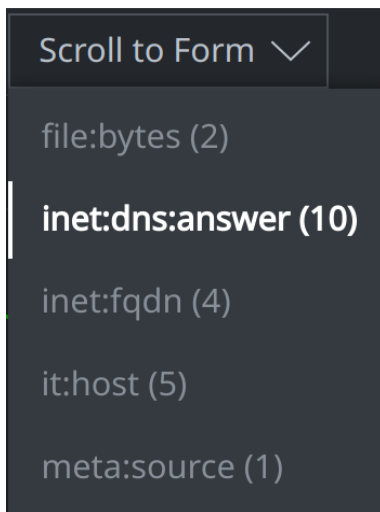
- Click the **hamburger menu** next to the **inet:dns:request** header and choose **Select all**:



- Use the **Explore** button next to any selected node to display adjacent nodes:



- Use **Scroll to Form** to navigate to the **inet:dns:answer** nodes:



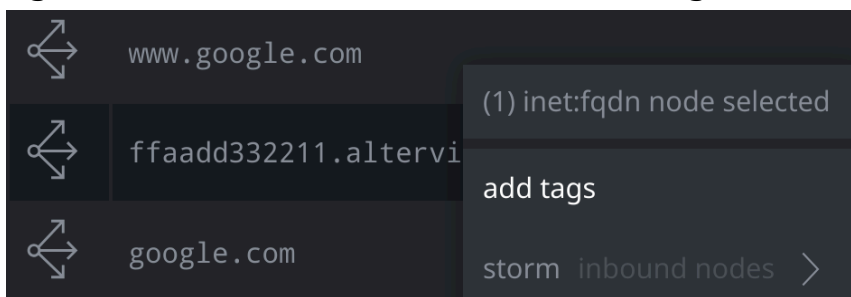
Question 6: Which IPv4 address (if any) is associated with FQDN **ffaadd332211.altervista.org**?

This FQDN may be malware C2, but you want to do more research. You can tag it for review so you do not forget to come back to it.

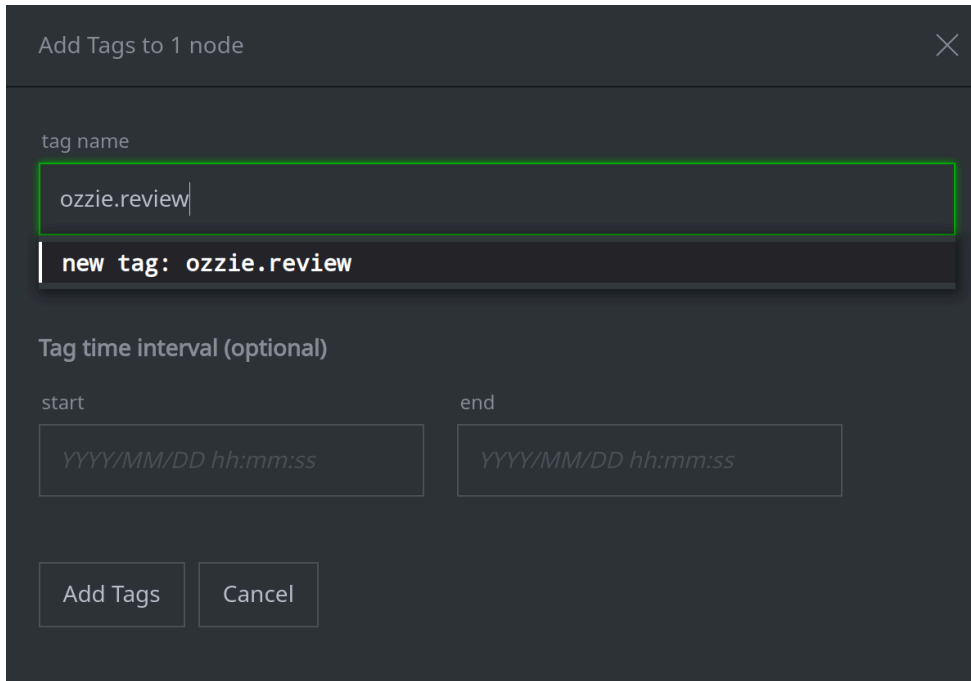
- Use **Scroll to Form** to navigate to the **inet:fqdn** nodes:



- **Right-click** the FQDN **ffaadd332211.altervista.org** and select **add tags**:



- Add the tag **<yourname>.review** to the FQDN to flag it for further analysis:



Add Tags to 1 node

tag name

ozzie.review

new tag: ozzie.review

Tag time interval (optional)

start

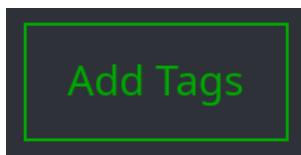
YYYY/MM/DD hh:mm:ss

end

YYYY/MM/DD hh:mm:ss

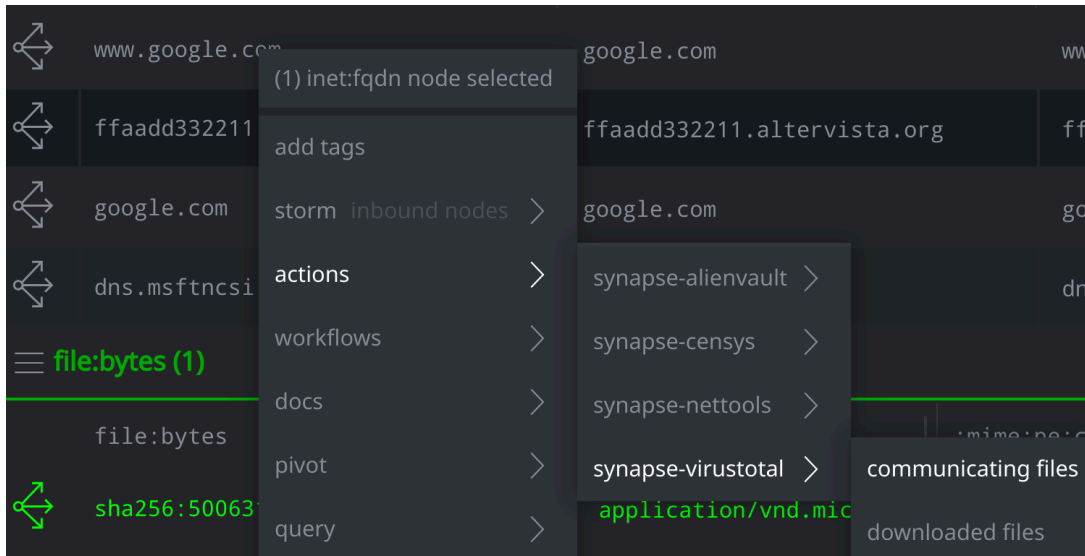
Add Tags Cancel

- Click the **Add Tags** button to apply the tag:

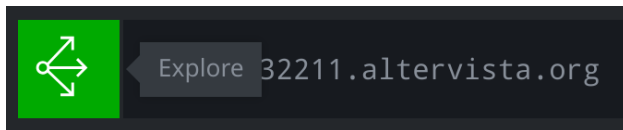


You want to see if you can identify any other files that communicate with FQDN **ffaadd332211.altervista.org**.

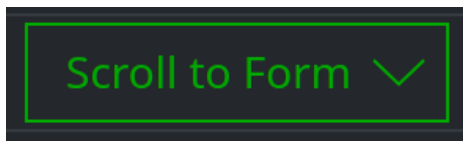
- **Right-click** the FQDN and select **actions > synapse-virustotal > communicating files** to check for other files that communicate with the FQDN:



- Click the **Explore** button next to the FQDN to display adjacent nodes:

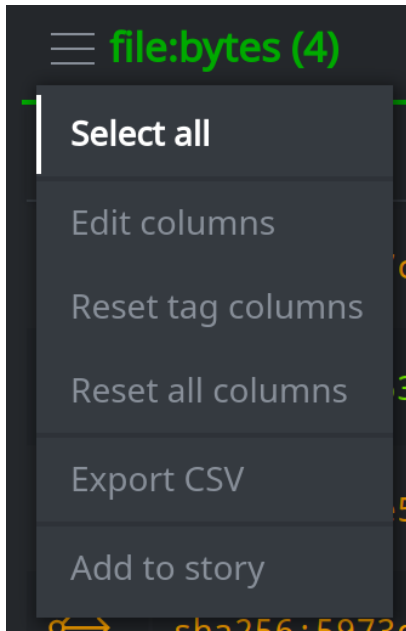


- Use **Scroll to Form** to navigate to the **file:bytes** nodes:

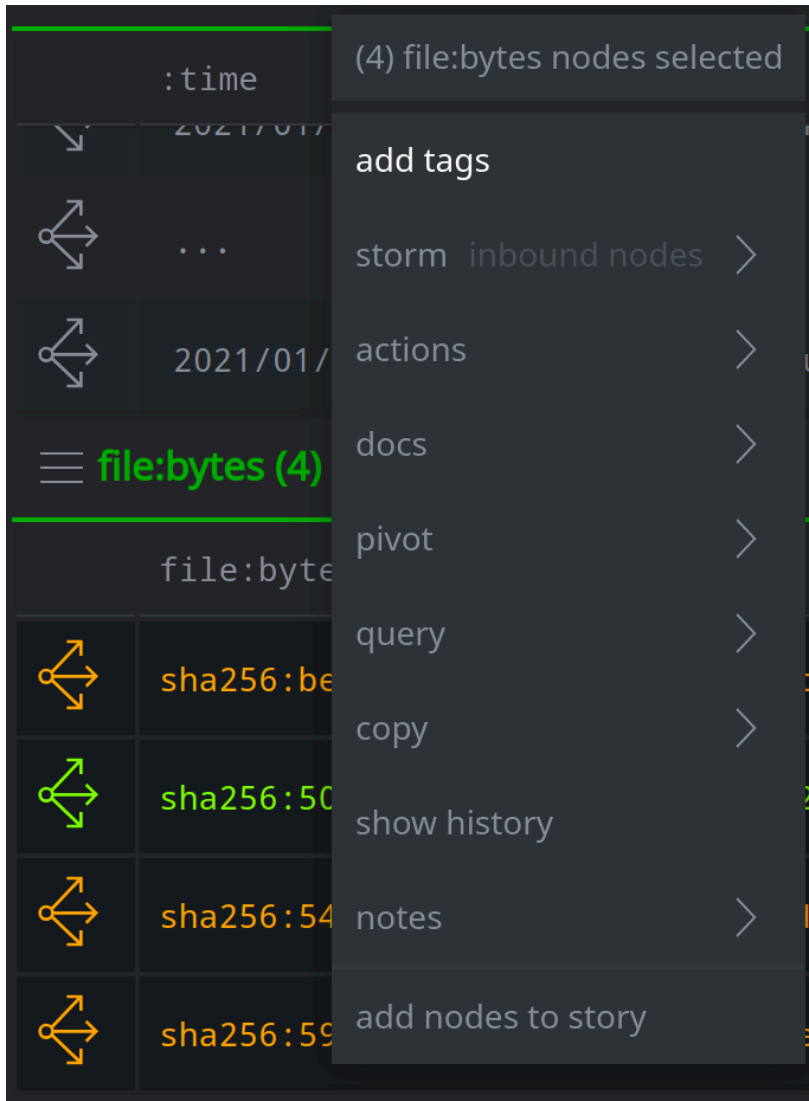


Question 7: How many files "communicate with" the FQDN?

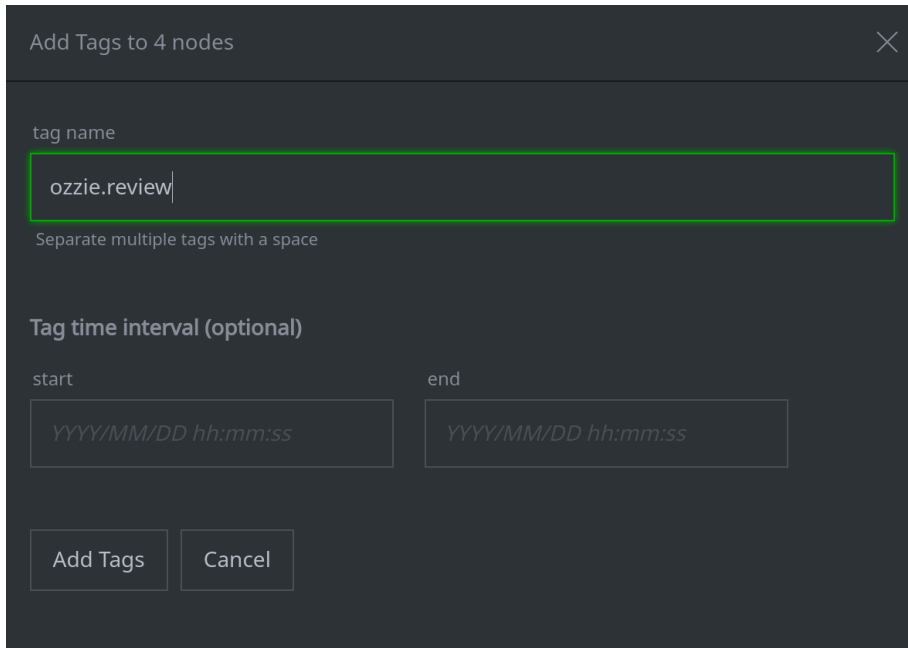
- Click the **hamburger menu** next to the **file:bytes** header and choose **Select all**:



- **Right-click** any selected node and select **add tags**:



- Add the tag **<yourname>.review** to the four files:



Add Tags to 4 nodes

tag name

ozzie.review

Separate multiple tags with a space

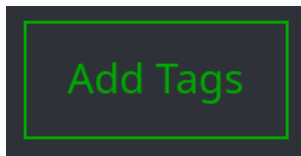
Tag time interval (optional)

start end

YYYY/MM/DD hh:mm:ss YYYY/MM/DD hh:mm:ss

Add Tags Cancel

- Click the **Add Tags** button to apply the tag:

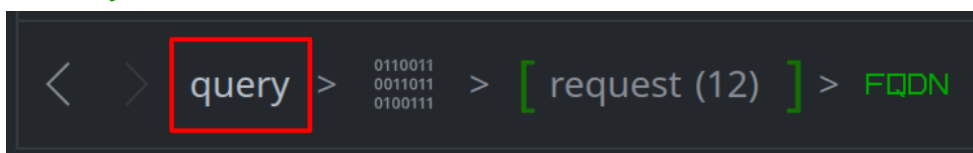


Tagging the files helps you to keep track of them. You can come back to these files and investigate them later.

Exercise 2

Objective:

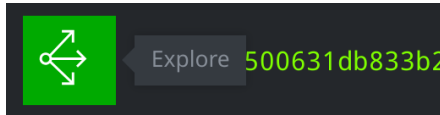
- Use dynamic execution data to identify changes made to the host and look for additional host-based IOCs.
- In your **breadcrumbs**, click **query** to return to your original query for the **file:bytes** node:



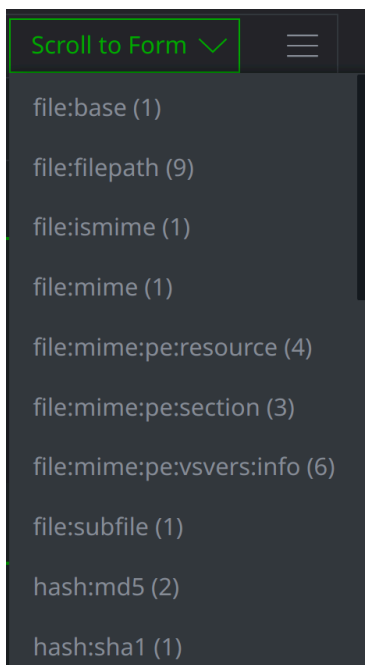
Alternatively, simply **re-run** the existing query in your **Query Bar**:

```
file:bytes=sha256:500631db833b2729f784e233225621ddff411d7da49bd82cfd51a49b9600438f
```

- Click the **Explore** button next to the file to display adjacent nodes:



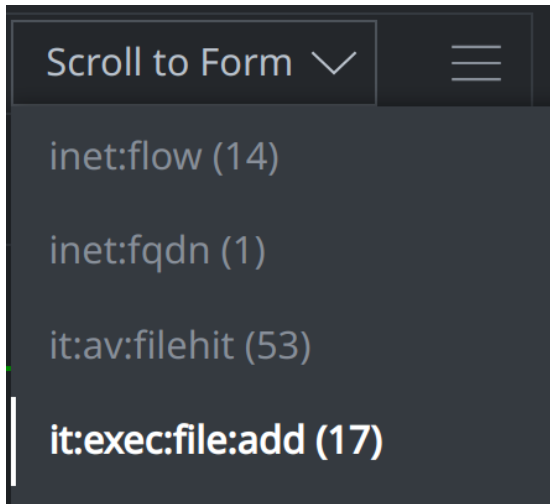
- Click the **Scroll to Form** button to browse the results:



Question 1: Are there any forms that might provide us with information about **host-based** activity for the file?

You want to see if the file adds any files to disk during execution.

- Use **Scroll to Form** to navigate to the **it:exec:file:add** nodes:



- **Sort** the nodes by the **:path:base** property (the file name):

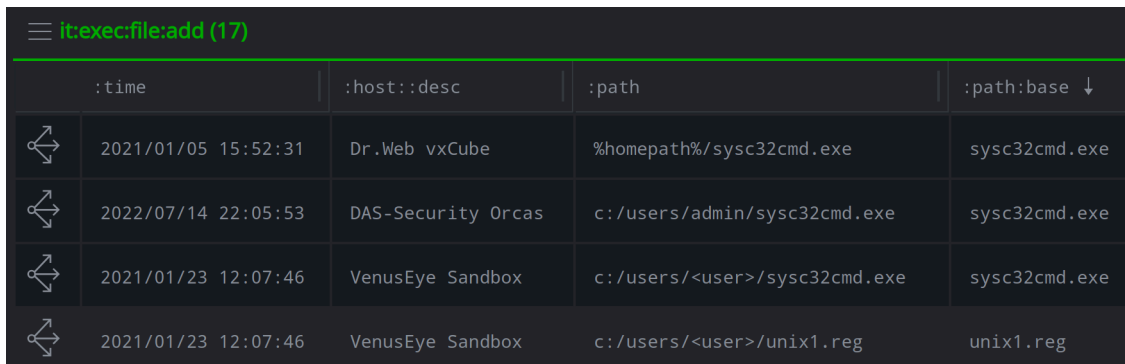


Question 2: Were any executable (**exe**) files added during any sandbox runs?

Question 3: How many sandboxes (hosts) observed the file? When was the activity captured?

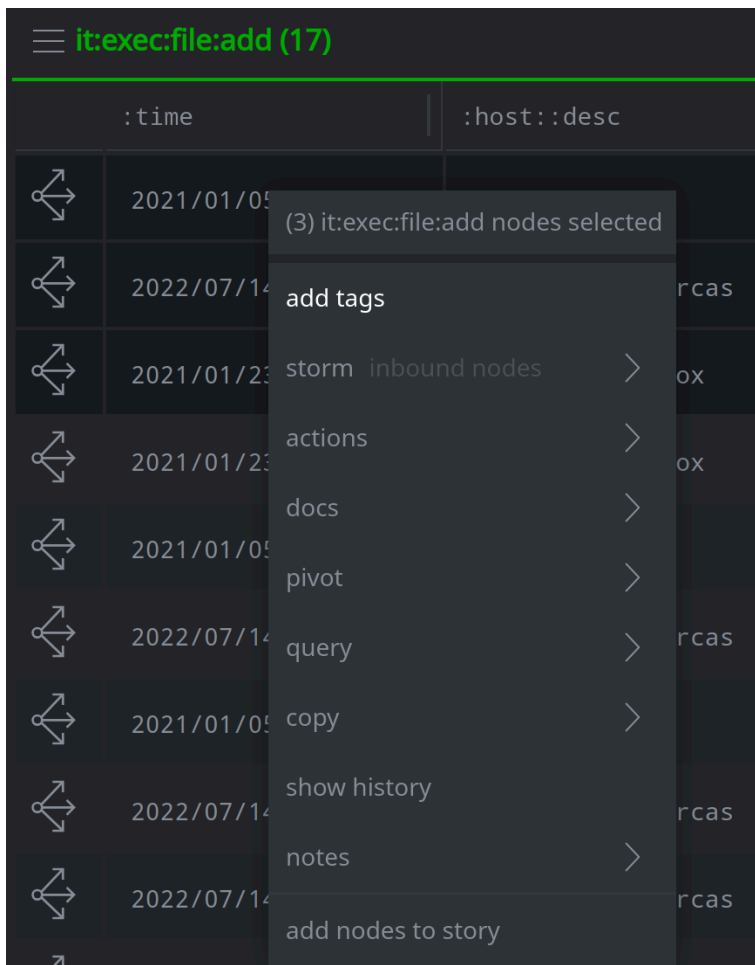
You decide that the **it:exec:file:add** activity is related to your malicious sample and want to tag it.

- Select the three **it:exec:file:add** nodes that create the **sysc32cmd.exe** file (use **Shift-click** or **Ctrl-click**):



it:exec:file:add (17)				
	:time	:host::desc	:path	:path:base ↓
↔	2021/01/05 15:52:31	Dr.Web_vxCube	%homepath%/sysc32cmd.exe	sysc32cmd.exe
↔	2022/07/14 22:05:53	DAS-Security_0rcas	c:/users/admin/sysc32cmd.exe	sysc32cmd.exe
↔	2021/01/23 12:07:46	VenusEye_Sandbox	c:/users/<user>/sysc32cmd.exe	sysc32cmd.exe
↔	2021/01/23 12:07:46	VenusEye_Sandbox	c:/users/<user>/unix1.reg	unix1.reg

- **Right-click** any of the selected nodes and choose **add tags**:

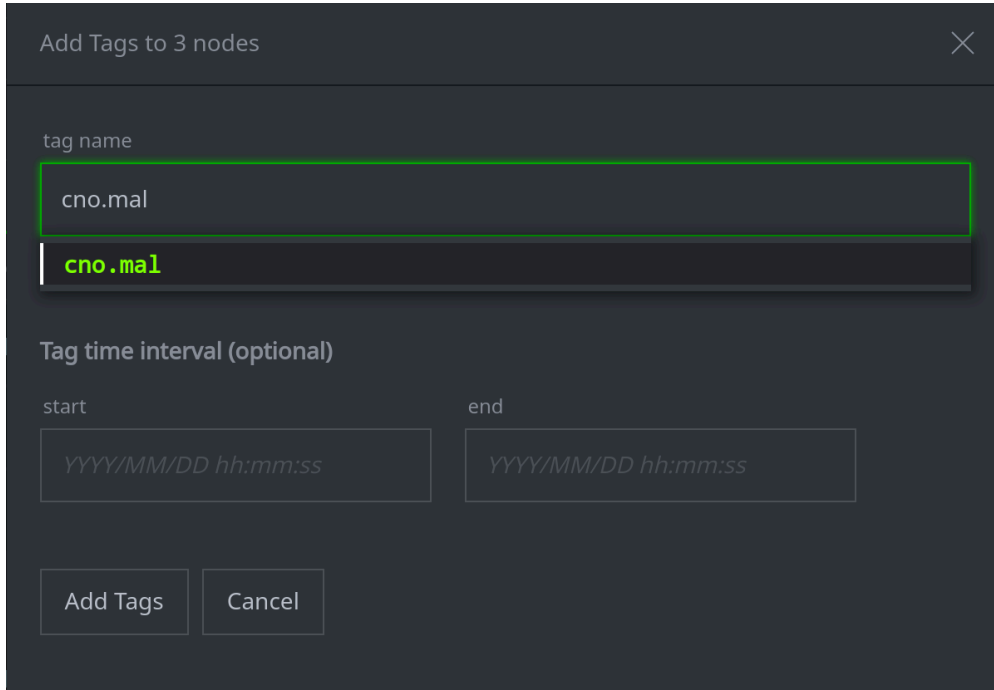


it:exec:file:add (17)				
	:time	:host::desc		
↔	2021/01/05			
↔	2022/07/14	rcas		
↔	2021/01/23	storm inbound nodes	>	ox
↔	2021/01/23		>	ox
↔	2021/01/05		>	
↔	2021/01/05		>	
↔	2022/07/14	rcas	>	
↔	2021/01/05		>	
↔	2022/07/14	rcas	>	
↔	2022/07/14	rcas	>	

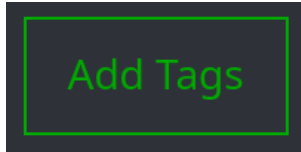
(3) it:exec:file:add nodes selected

- add tags
- storm inbound nodes >
- actions >
- docs >
- pivot >
- query >
- copy >
- show history
- notes >
- add nodes to story

- In the **Add Tags** dialog, enter the tag **cno.mal** in the *tag name* field:



- Click the **Add Tags** button to apply the tag:



You want to find out more information about the dropped (added) file.

- The **:sandbox:file** property is the file that ran in the sandbox - your original file.
 - The **:file** property is the **sysc32cmd.exe** file that was **added** during execution.
-
- For your three **it:exec:file:add** nodes, **compare** the **:sandbox:file** and **:file** properties

Question 4: Are the property values the same or different? What does this tell you?

You want to see if there are other files in Synapse that create a file named `sysc32cmd.exe`.

- In your `it:exec:file:add` nodes, locate the `:path:base` column:

```

:path:base

sysc32cmd.exe

sysc32cmd.exe

sysc32cmd.exe

```

- Right-click** one of the `sysc32cmd.exe` file names in this column and use the **pivot** `> :path:base -> it:exec:file:add:path:base` option to search for any `it:exec:file:add` nodes that create a file with this name:

<code>:path:base</code>	<code>:sandbox:file</code>	<code>:file</code>
<code>sysc32cmd.exe</code>	<code>6:500631db833...</code>	<code>sha256:500631db8...</code>
<code>sysc32cmd.exe</code>	<code>6:500631db833...</code>	<code>sha256:500631db8...</code>
<code>sysc32cmd.exe</code>	<code>6:500631db833...</code>	<code>sha256:500631db8...</code>
<code>~df899c...</code>	<code>6:500631db833...</code>	<code>sha256:c67a1eb99...</code>
<code>~dfa932...</code>	<code>6:500631db833...</code>	<code>sha256:126826bf3...</code>
<code>unix1.1...</code>		
<code>win1.ir...</code>		
<code>ccc4.d...</code>		
<code>pp</code>		
<code>ccc3.d...</code>		

Context Menu Item	Transformation
(1) it:exec:file:add node selected	
add tags	
storm inbound nodes	
actions	
workflows	
docs	
pivot	<code>:file -> file:bytes</code>
query	<code>:host -> it:host</code>
copy	<code>:path -> file:path</code>
download	<code>:path:base -> file:base</code>
edit node data	<code>:path:dir -> file:path</code>
show history	<code>:sandbox:file -> file:bytes</code>
notes	<code>:path:base -> it:exec:file:add:path:base</code>

Question 5: How many `it:exec:file:add` nodes are in your results?

Question 6: Did your query identify any **new** files that write to the same path?

Exercise 3

Objective:

- View host-specific (sandbox-specific) execution data associated with a file.

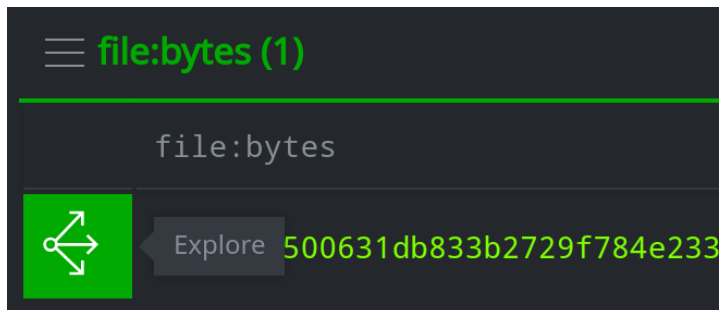
You want to look at the data captured by different sandboxes (hosts / `it:host` nodes) for this sample.

- In the **Research Tool**, either use the **breadcrumbs** tool or enter the following into the **Storm Query Bar** and press **Enter** to view our original file (`file:bytes`):

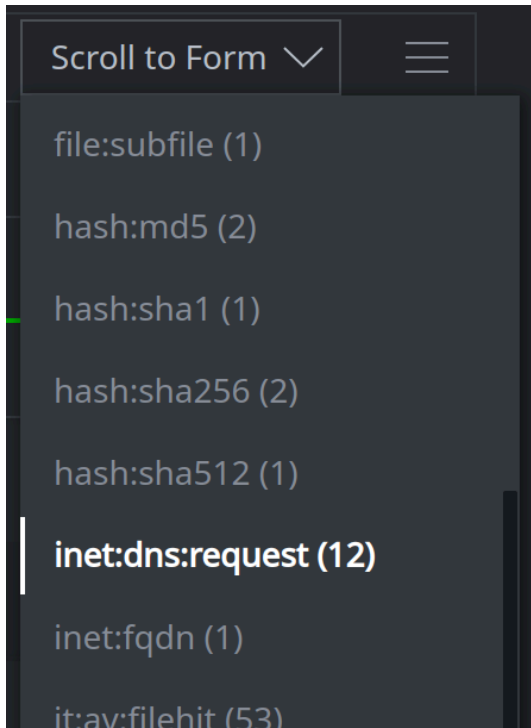
```
file:bytes=sha256:500631db833b2729f784e233225621ddff411d7da49bd82cfd51a49b9600438f
```

Note: The exercise PDFs may insert line breaks or spaces where values (such as the SHA256, above) are forced to wrap. If you copy the above into your Storm query bar and the query fails to run, you may need to manually remove the space / break.

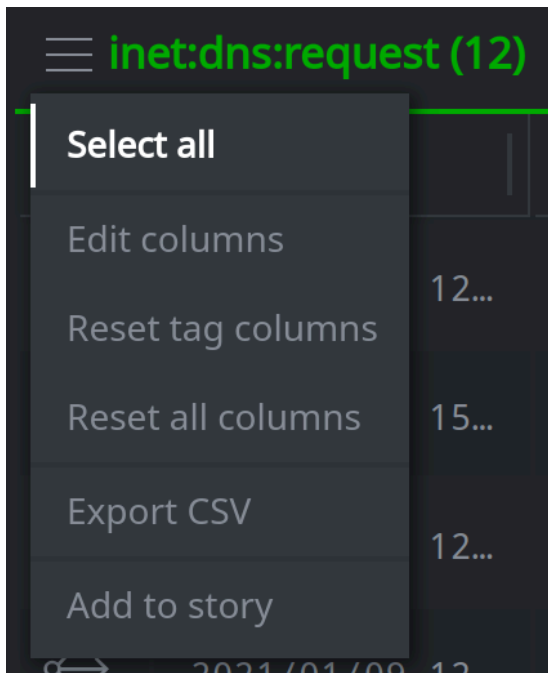
- Click the **Explore** button next to the file to display adjacent nodes:



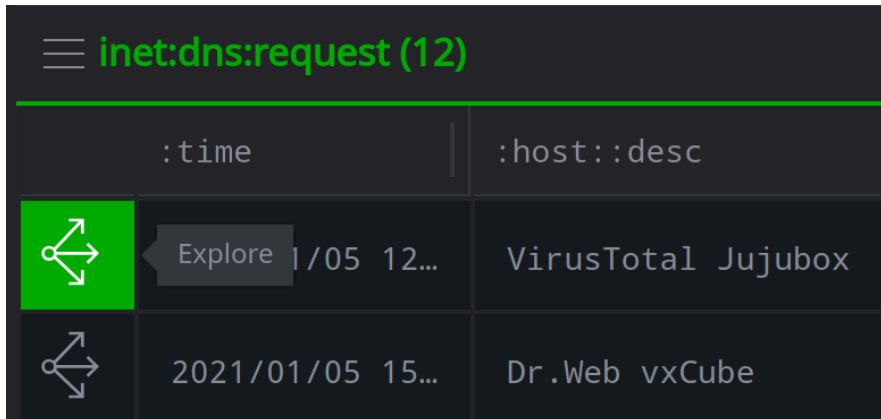
- Use **Scroll to Form** to navigate to the **inet:dns:request** nodes:





- Click the **hamburger menu** next to the **inet:dns:request** header and choose **Select All**:

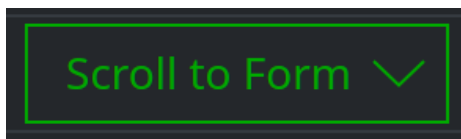


- Click the **Explore** button next to any selected node to display adjacent nodes:



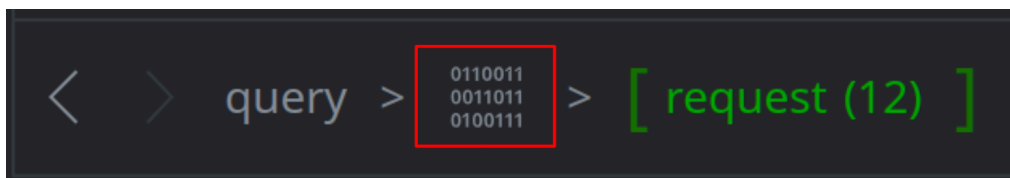
	:time	:host::desc
	1/05 12...	VirusTotal Jujubox
	2021/01/05 15...	Dr.Web vxCube

- Locate the **it:host** nodes (use **Scroll to Form** if necessary):

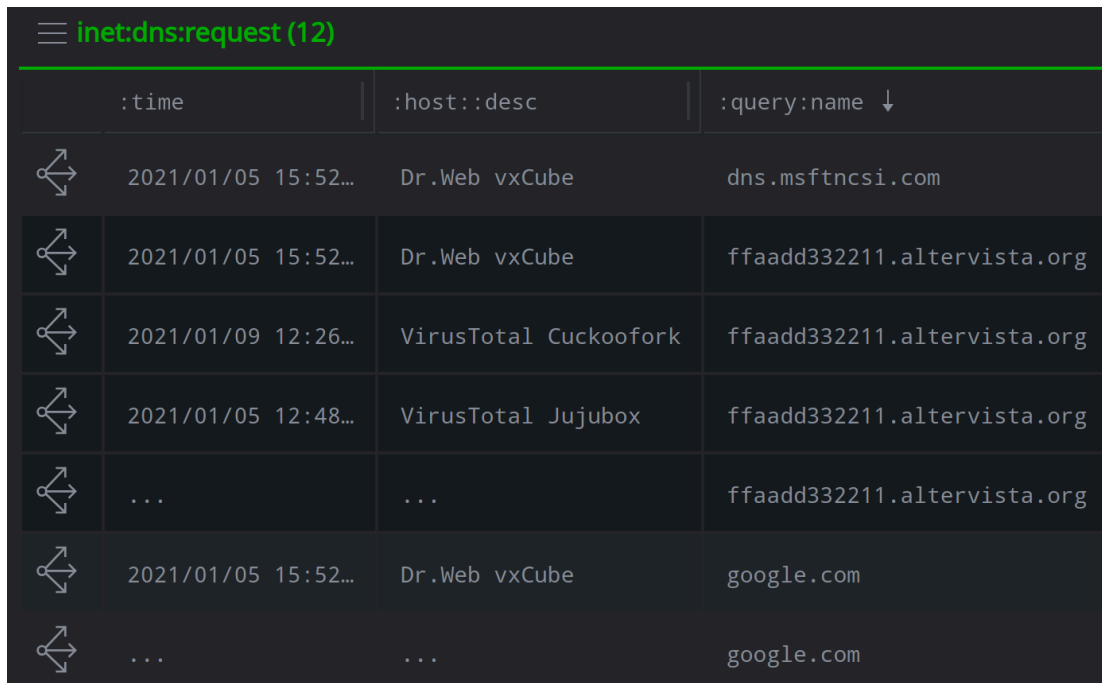


Question 1: How many hosts (sandboxes) recorded DNS queries during file execution?

- In your **breadcrumbs**, click the "ones and zeroes" icon to return to your previous results (i.e., the **inet:dns:request** nodes):

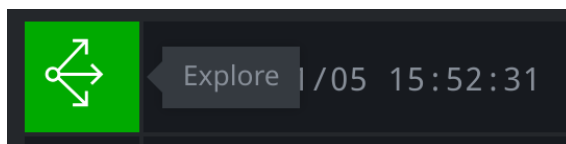


- From the **inet:dns:request** nodes, **select only** the nodes that query the FQDN **ffaadd332211.altervista.org** (use **Shift-click** or **Ctrl-click**):



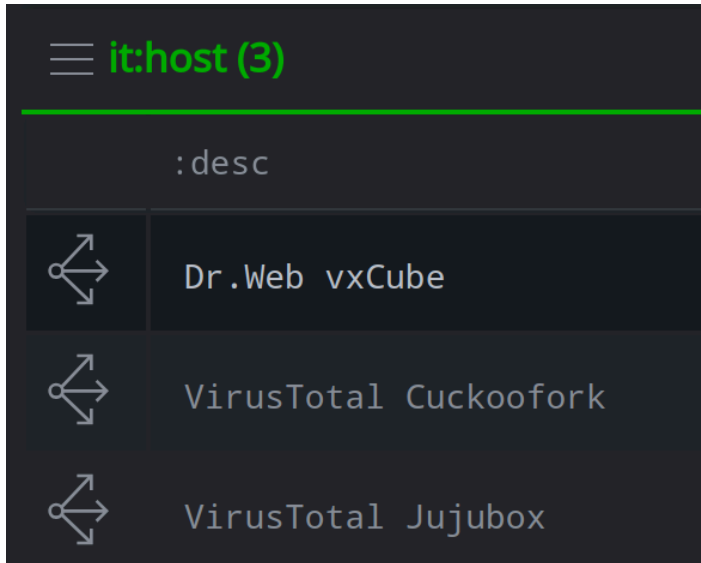
inet:dns:request (12)		
:time	:host::desc	:query:name ↓
2021/01/05 15:52...	Dr.Web vxCube	dns.msftncsi.com
2021/01/05 15:52...	Dr.Web vxCube	ffaadd332211.altervista.org
2021/01/09 12:26...	VirusTotal Cuckoofork	ffaadd332211.altervista.org
2021/01/05 12:48...	VirusTotal Jujubox	ffaadd332211.altervista.org
...	...	ffaadd332211.altervista.org
2021/01/05 15:52...	Dr.Web vxCube	google.com
...	...	google.com

- Click the **Explore** button next to any of the selected nodes to display adjacent nodes:

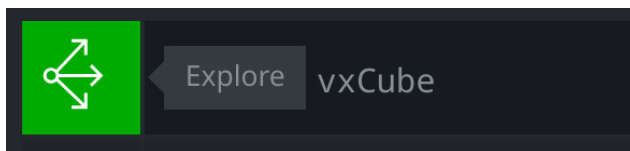


Question 2: How many hosts (sandboxes) recorded DNS queries for our C2 FQDN?

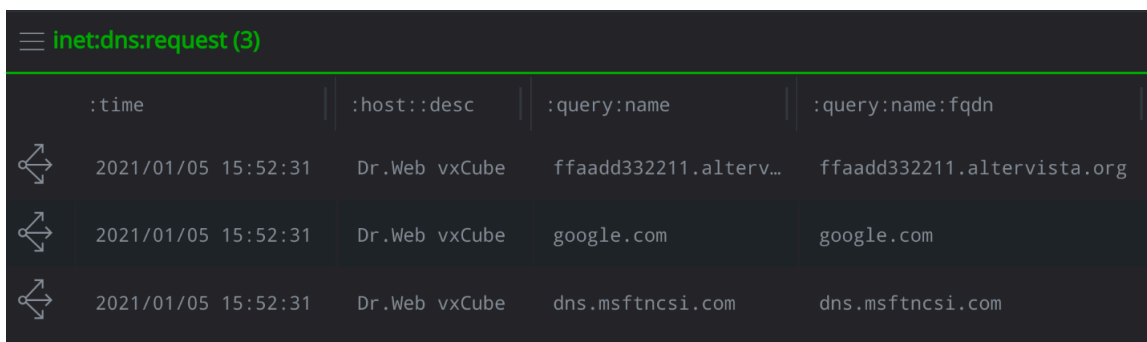
- Select the **it:host** node for **Dr.Web vxCube**:






- Click the **Explore** button next to the host to display adjacent nodes:

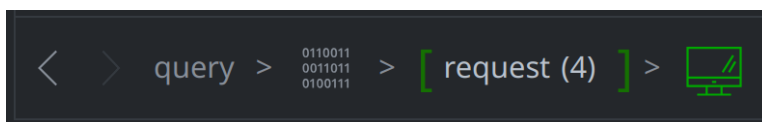


- **Review** the DNS requests (**inet:dns:request** nodes) recorded by the Dr.Web sandbox:

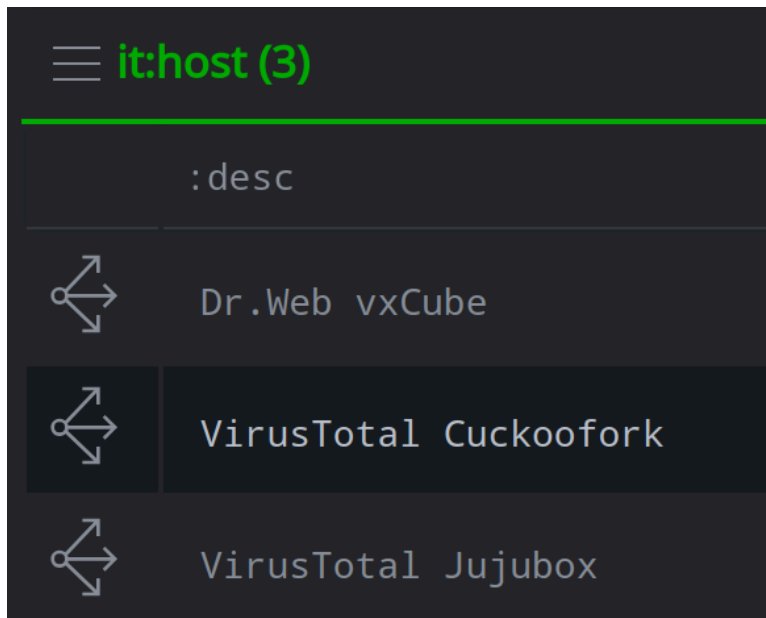


	:time	:host::desc	:query:name	:query:name:fqdn
	2021/01/05 15:52:31	Dr.Web vxCube	ffaadd332211.alterv...	ffaadd332211.altervista.org
	2021/01/05 15:52:31	Dr.Web vxCube	google.com	google.com
	2021/01/05 15:52:31	Dr.Web vxCube	dns.msftncsi.com	dns.msftncsi.com

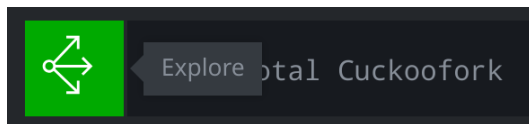
- In your **breadcrumbs**, click the [**request(4)**] icon to return to your previous results (i.e., the **it:host** nodes):



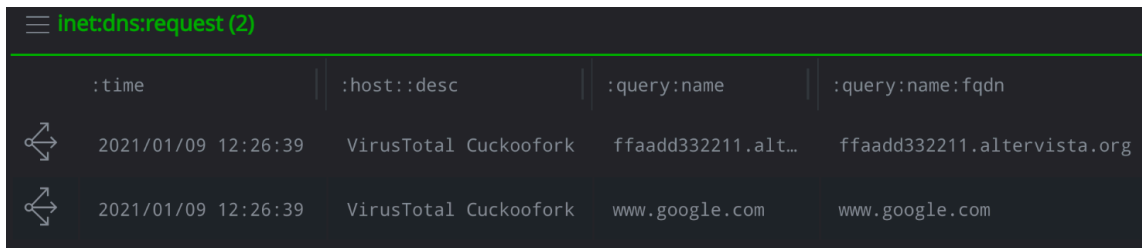
- Select the **it:host** node for **VirusTotal CuckooFork**:





- Click the **Explore** button next to the host to display adjacent nodes:



- **Review** the DNS requests (**inet:dns:request** nodes) recorded by the VirusTotal CuckooFork sandbox:



	:time	:host::desc	:query:name	:query:name:fqdn
	2021/01/09 12:26:39	VirusTotal Cuckoofork	ffaadd332211.alt...	ffaadd332211.altervista.org
	2021/01/09 12:26:39	VirusTotal Cuckoofork	www.google.com	www.google.com

Question 3: Was the DNS information captured by the sandboxes identical? If not, how do they differ?