

# Visualization of Malware Behavior

DIMVA 2009  
- Rump Session -



PiL - Laboratory for Dependable Distributed Systems

UNIVERSITÄT  
**MANNHEIM**



# Motivation

- CWSandbox.org
- Detailed behavior report
- 2.500 - 4.000 binaries a day
- Each contains several hundred of api-calls

1265393.xml

```
<?xml version="1.0"?>
<!-- This analysis was created by CWSandbox (c) CWSE GmbH / Sunbelt Software--&gt;
&lt;analysis cwsversion="2.1.6" time="3/28/2009 10:06:45 PM" file="C:\1265393" md5="a9f6aa1649e6a0f1bfad8a576f0193a0"
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&lt;calltree&gt;
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filename_hash="6be7cccf384b1b05b08b7fc5ae5bc3bb3365cc55" starttime="00:01.547" startreason="CreateProcess"/&gt;
&lt;/calltree&gt;
&lt;/process_call&gt;
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&lt;/calltree&gt;
&lt;/processes&gt;
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terminationtime="00:01.172" startreason="AnalysisTarget" terminationreason="NormalTermination" executionstatus="OK" applicationtype="Win32Application"&gt;
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&lt;all_section&gt;
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```

1265393.xml

```
<open_key key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="DisableUNCCheck"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="EnableExtensions"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="DelayedExpansion"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="DefaultColor"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="CompletionChar"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="PathCompletionChar"/>
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<open_key key="HKEY_LOCAL_MACHINE\System\WPA\TabletPC"/>
<open_key key="HKEY_LOCAL_MACHINE\SYSTEM\WPA\MediaCenter"/>
<query_value key="HKEY_LOCAL_MACHINE\SYSTEM\WPA\MediaCenter" value="Installed"/>
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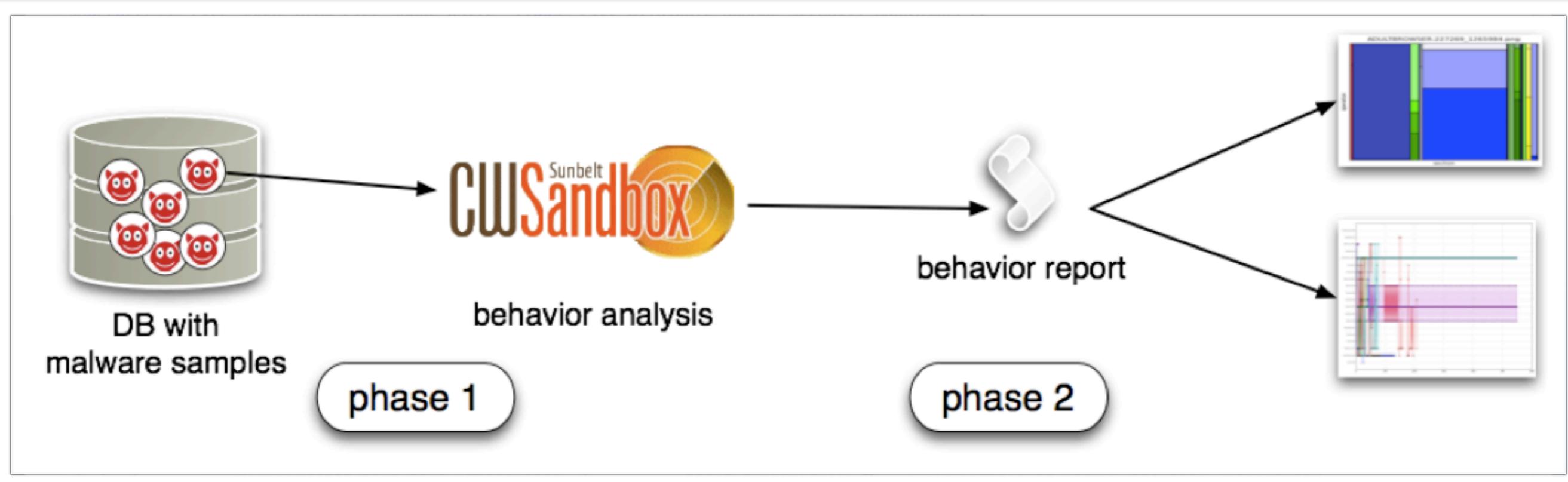


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<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="DisableUNCCheck"/>
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<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="DefaultColor"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="CompletionChar"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="PathCompletionChar"/>
<query_value key="HKEY_CURRENT_USER\Software\Microsoft\Command Processor" value="AutoRun"/>
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<get_file_attributes filetype="file" srcfile="C:\" srcfile_hash="hash_error" desiredaccess="FILE_ANY_ACCESS" flags="SECURITY_ANONYMOUS"/>
<find_file filetype="file" srcfile="C:\DeleteFileDos.bat" srcfile_hash="hash_error" desiredaccess="FILE_ANY_ACCESS" flags="SECURITY_ANONYMOUS"/>
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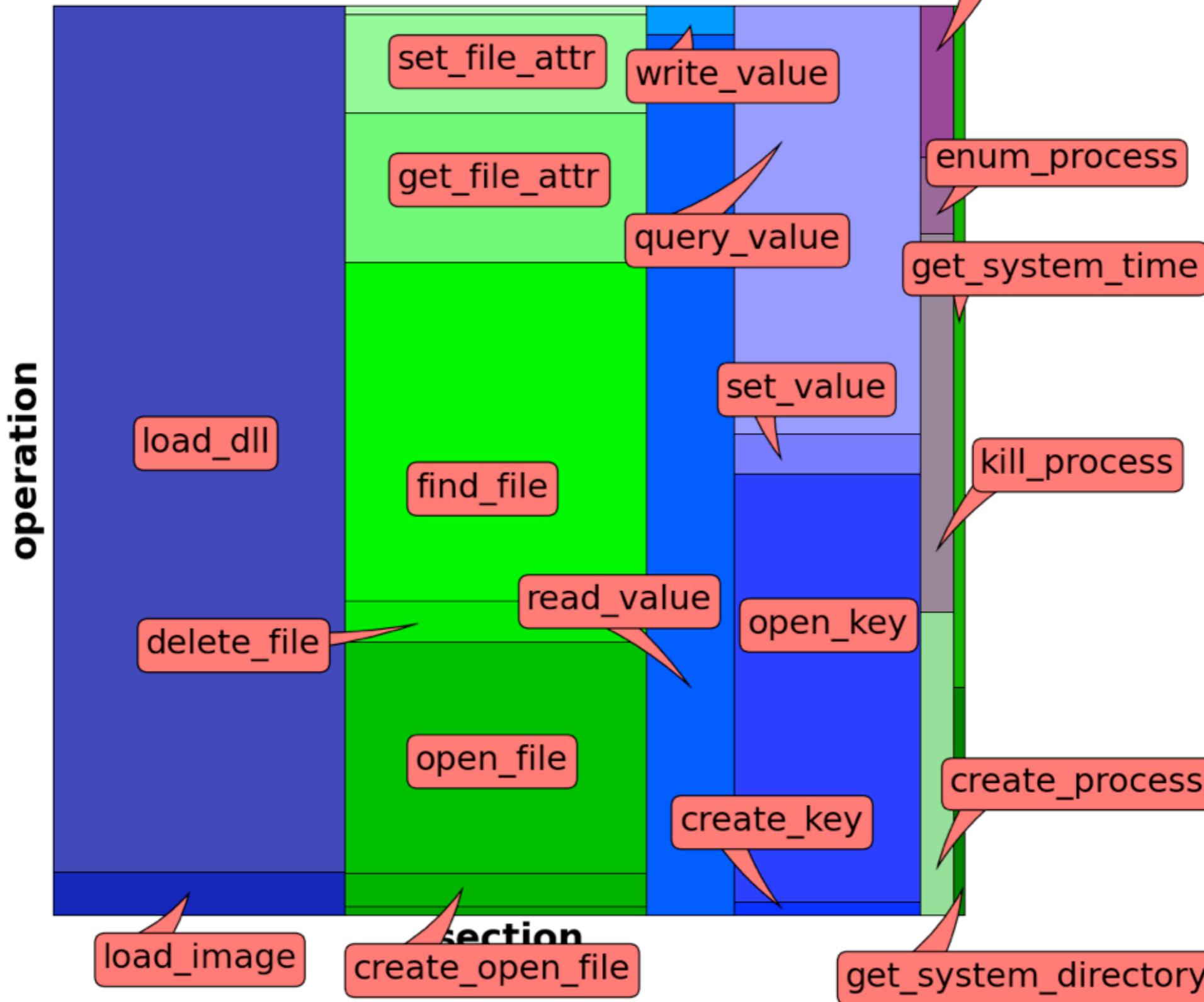


```

<open_key key="HKEY_LOCAL_MACHINE\System\WPA\TabletPC"/>
<open_key key="HKEY_LOCAL_MACHINE\SYSTEM\WPA\MediaCenter"/>
<query_value key="HKEY_LOCAL_MACHINE\SYSTEM\WPA\MediaCenter" value="Installed"/>
<open_file filetype="file" srcfile="\Device\NamedPipe\ShimViewer" srcfile_hash="hash_error" creationdistribution="OPEN_EXISTING"
· desiredaccess="FILE_ANY_ACCESS FILE_WRITE_ACCESS FILE_WRITE_DATA FILE_ADD_FILE FILE_ADD_SUBDIRECTORY FILE_APPEND_DATA FILE_CREATE_PIPE_INSTANCE
· FILE_WRITE_EA FILE_WRITE_ATTRIBUTES" flags="FILE_ATTRIBUTE_NORMAL SECURITY_ANONYMOUS"/>
<open_file filetype="file" srcfile="C:\WINDOWS\system32\" srcfile_hash="hash_error" desiredaccess="FILE_ANY_ACCESS FILE_READ_ACCESS FILE_READ_DATA
· FILE_LIST_DIRECTORY" shareaccess="FILE_SHARE_READ FILE_SHARE_WRITE" flags="SECURITY_ANONYMOUS"/>
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· desiredaccess="FILE_ANY_ACCESS" flags="SECURITY_ANONYMOUS"/>
<open_key key="HKEY_LOCAL_MACHINE\Software\Microsoft\Windows NT\CurrentVersion\AppCompatFlags\Layers"/>
<open_key key="HKEY_CURRENT_USER\Software\Microsoft\Windows NT\CurrentVersion\AppCompatFlags\Layers"/>
<open_key key="HKEY_LOCAL_MACHINE\Software\Microsoft\Windows NT\CurrentVersion\AppCompatFlags\Custom\attrib.exe"/>
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```

**HOOKSHELL-207706\_1265393**

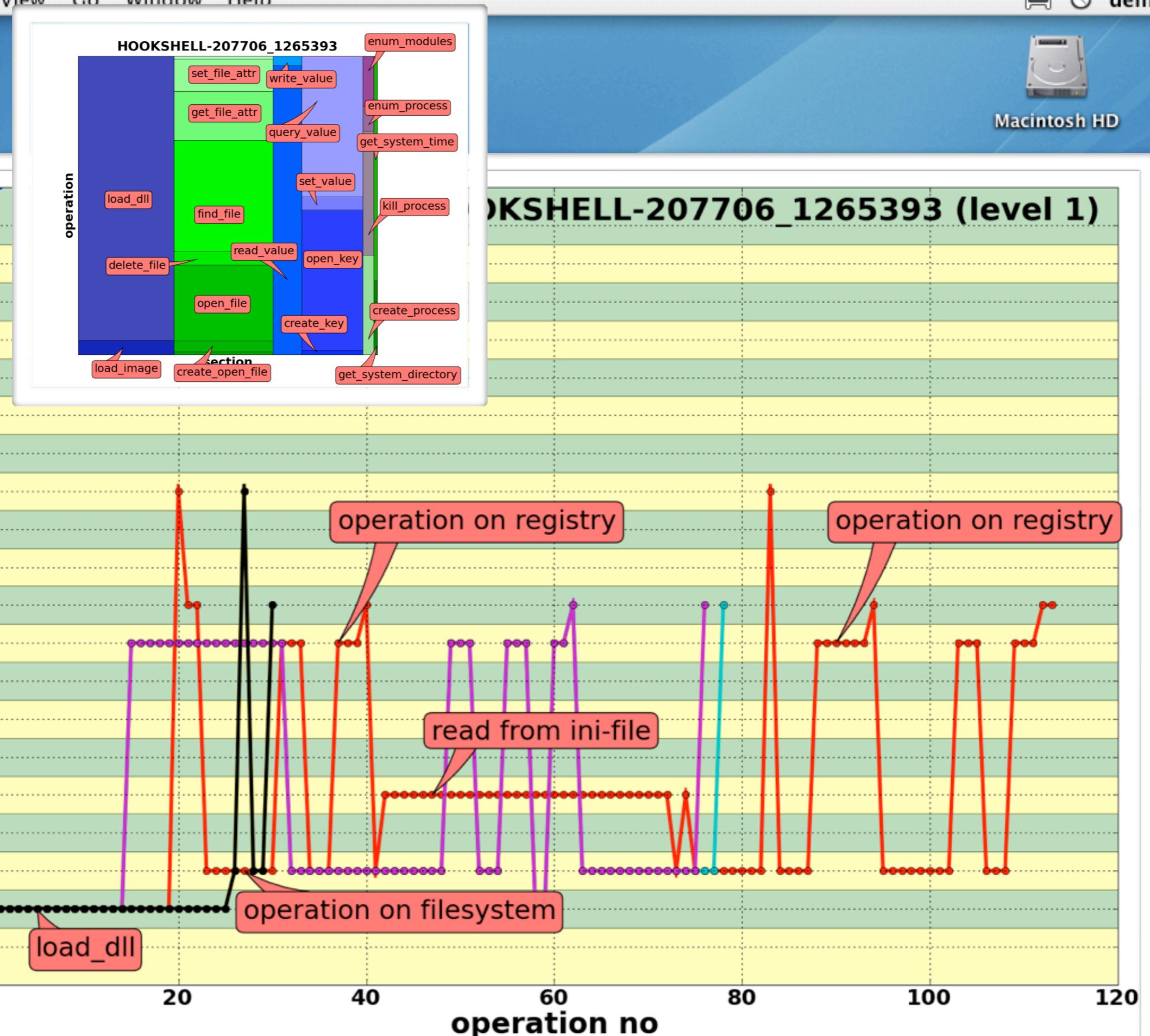


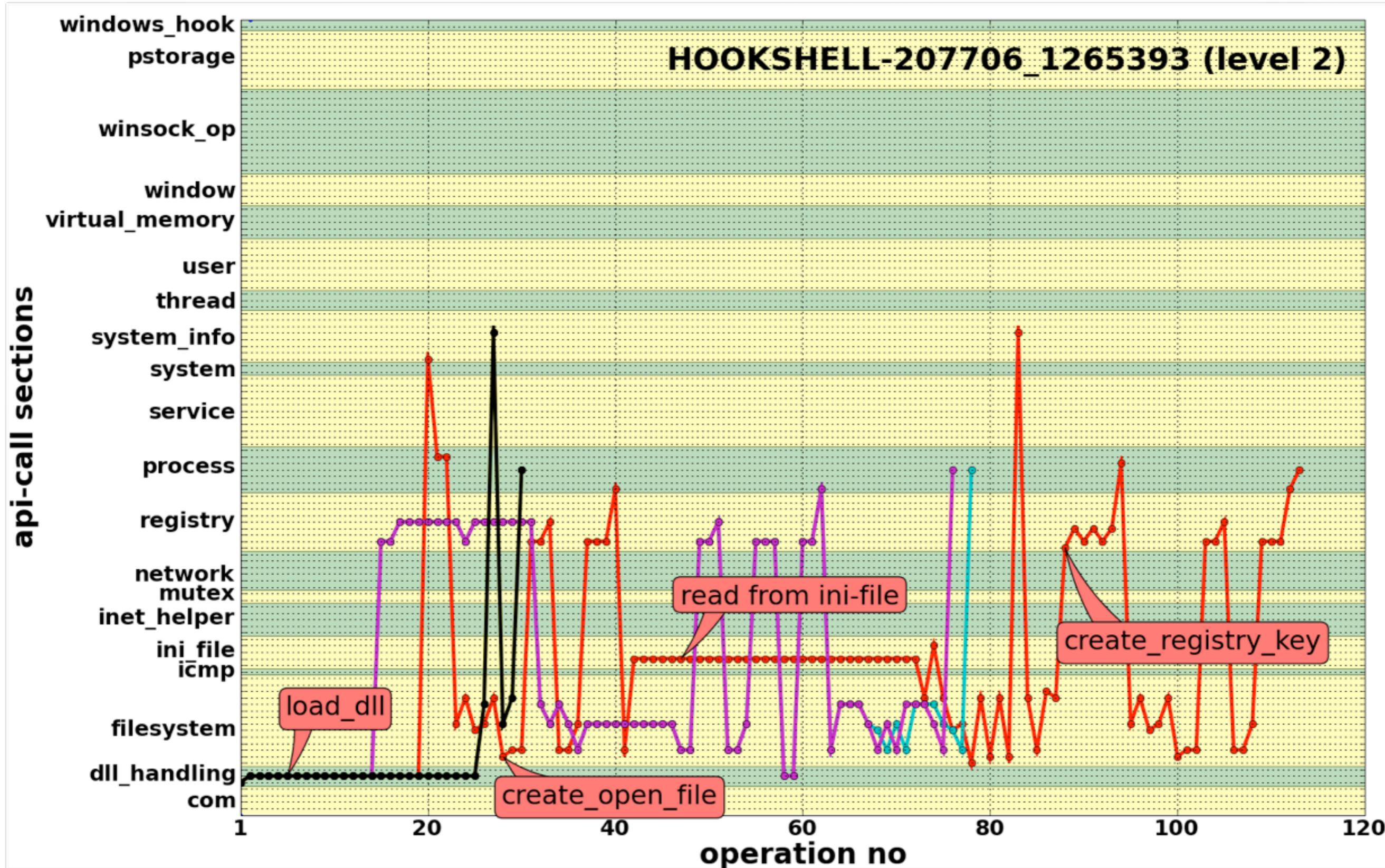


Macintosh HD

api-call sections

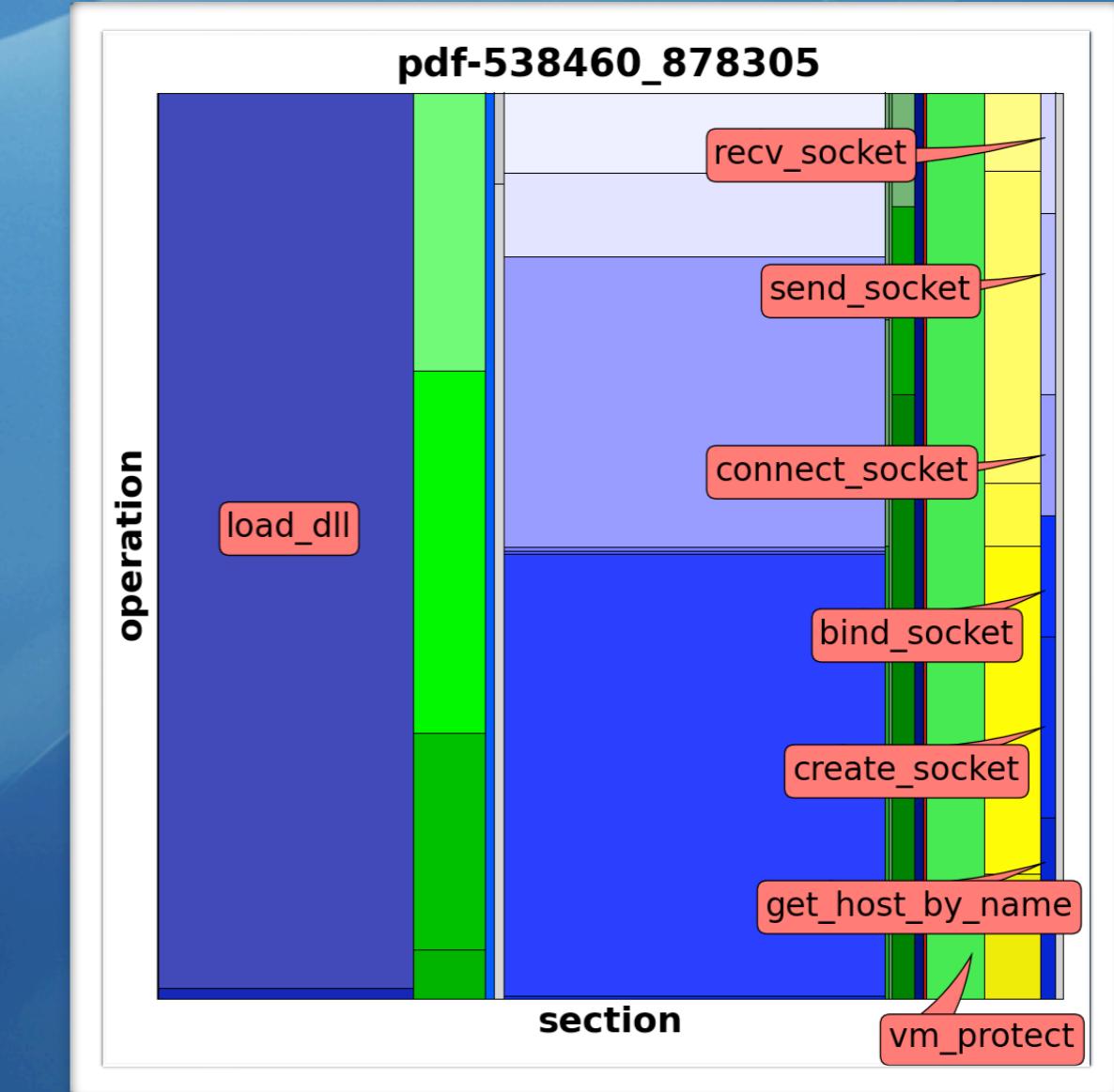
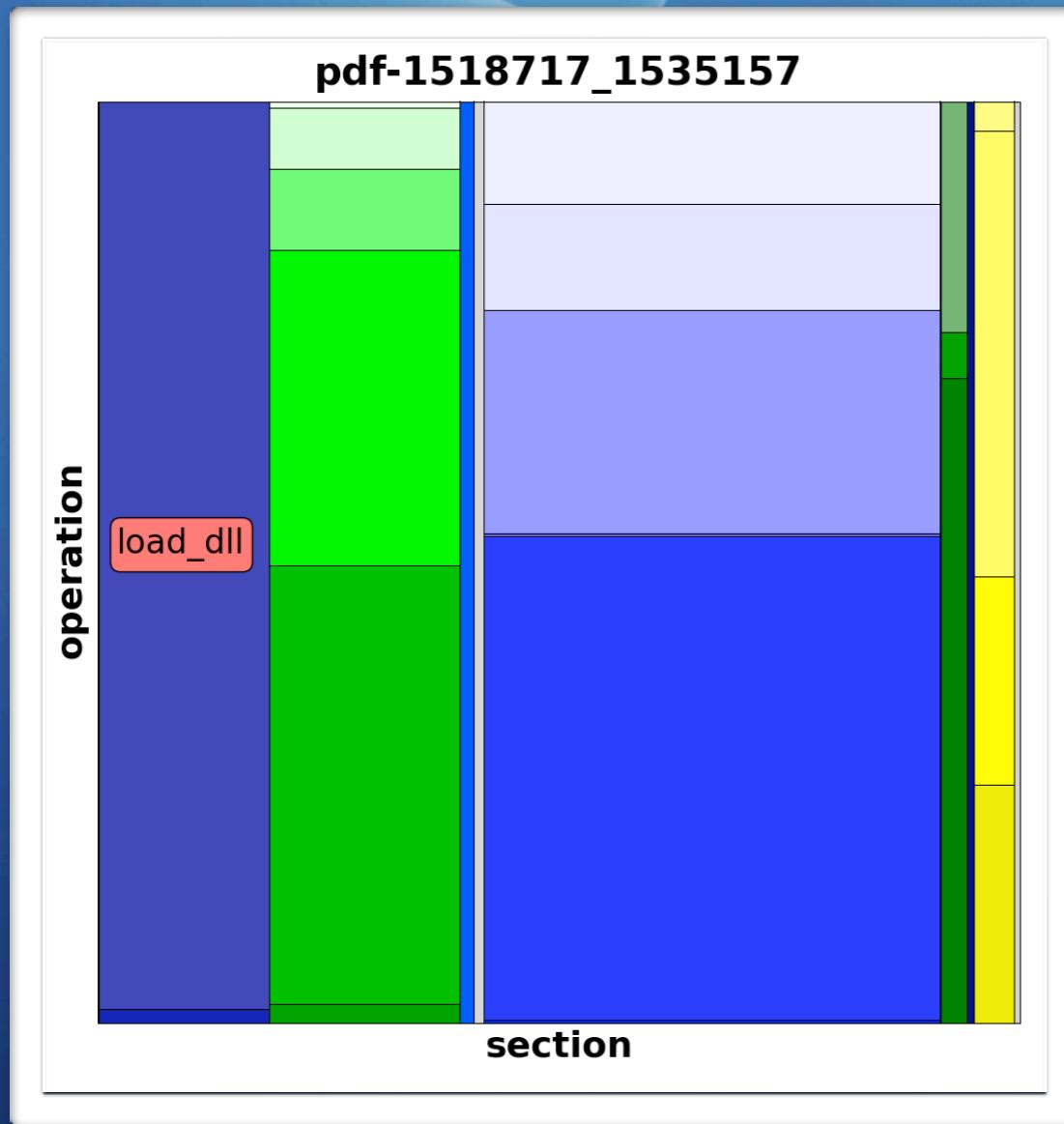
- windows\_hook
- pstorage
- winsock\_op
- window
- virtual\_memory
- user
- thread
- system\_info
- system
- service
- process
- registry
- network
- mutex
- inet\_helper
- ini\_file
- icmp
- filesystem
- dll\_handling
- com





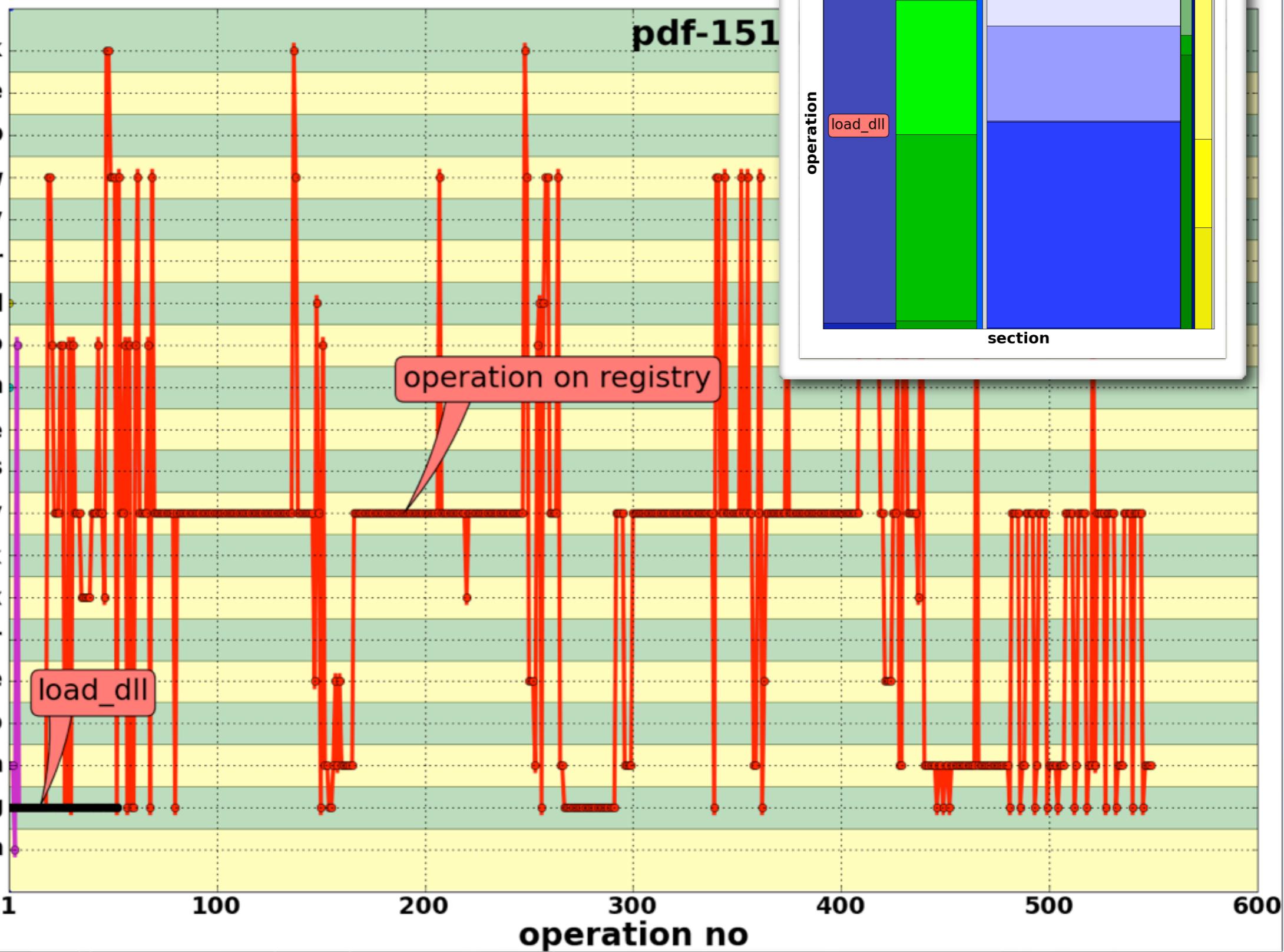


Macintosh HD



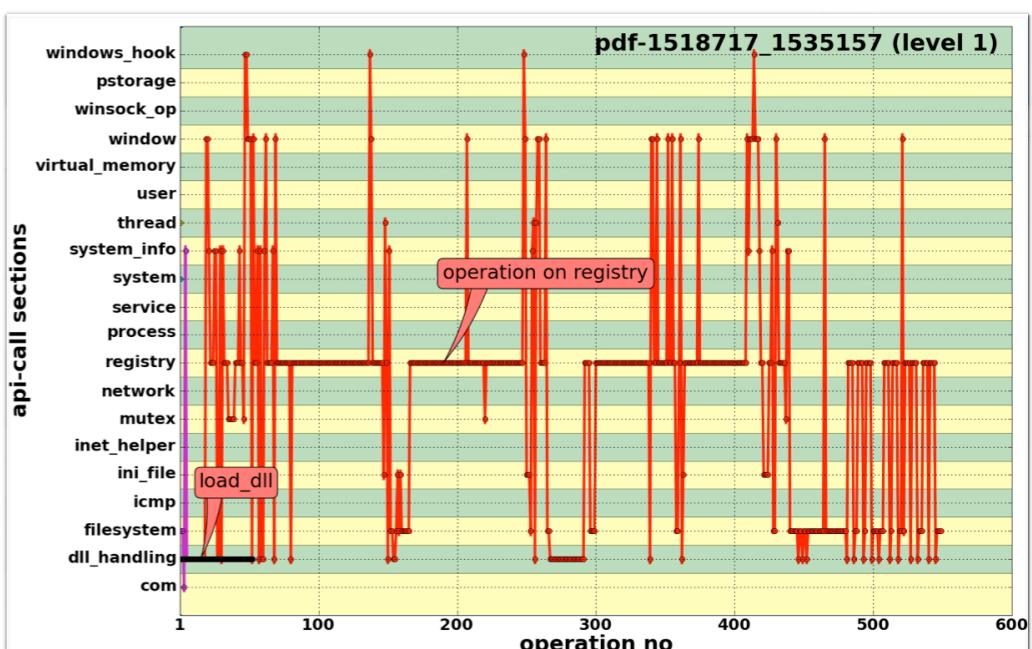
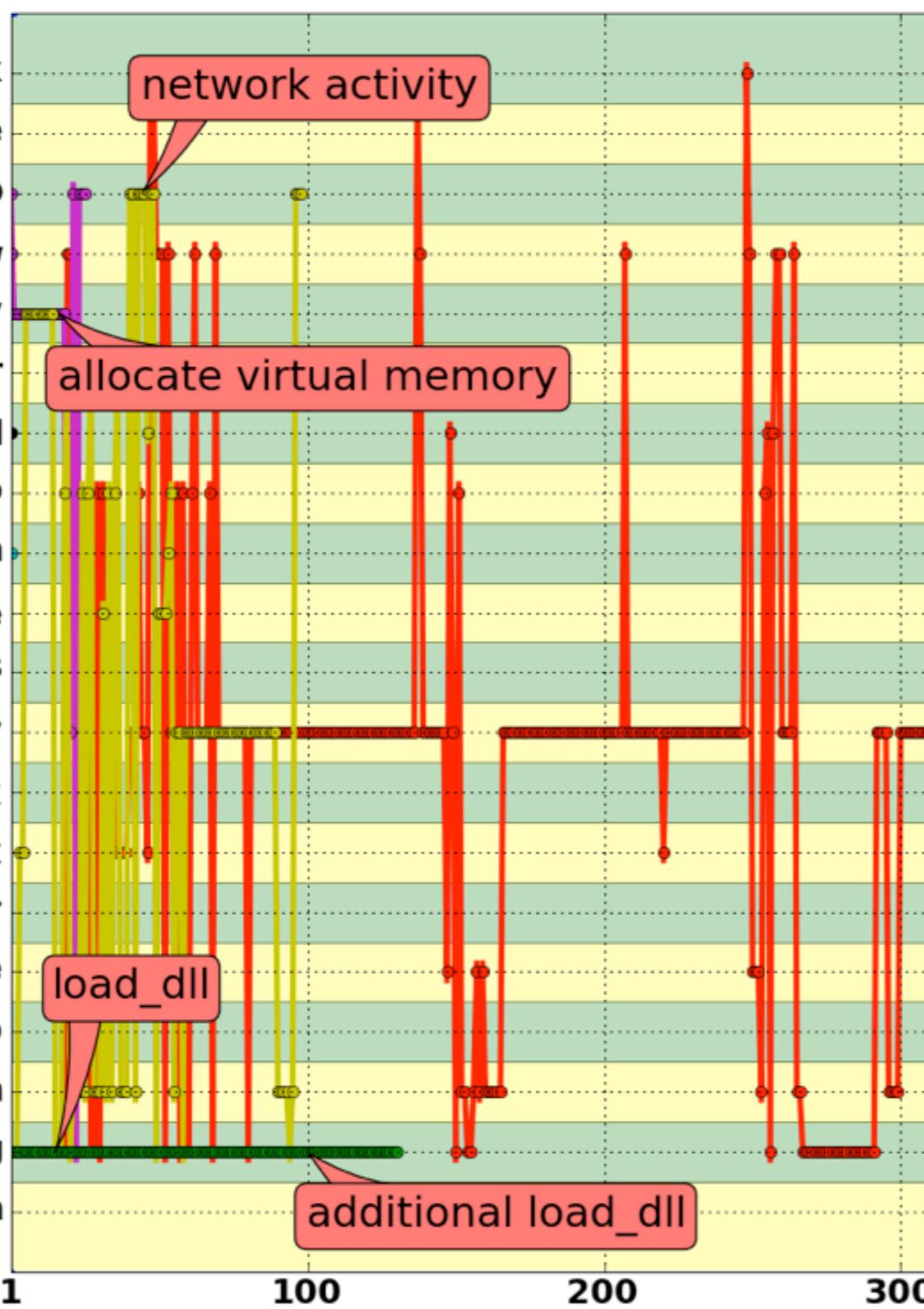
**api-call sections**

windows\_hook  
pstorage  
winsock\_op  
window  
virtual\_memory  
user  
thread  
system\_info  
system  
service  
process  
registry  
network  
mutex  
inet\_helper  
ini\_file  
icmp  
filesystem  
dll\_handling  
com



**api-call sections**

windows\_hook  
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system\_info  
system  
service  
process  
registry  
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mutex  
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filesystem  
dll\_handling  
com





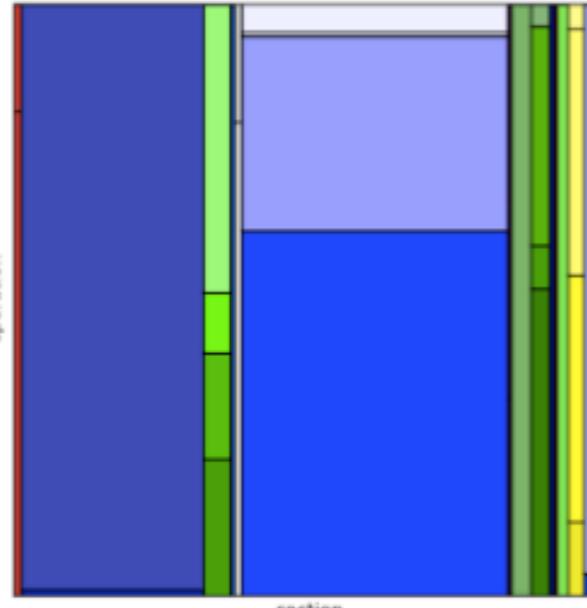
# Future Work

- More / More suitable visualization techniques
- Getting feedback of other analysts
  - Include the Pics into CW Sandbox.org
  - What do you think?
- Image clustering and classification

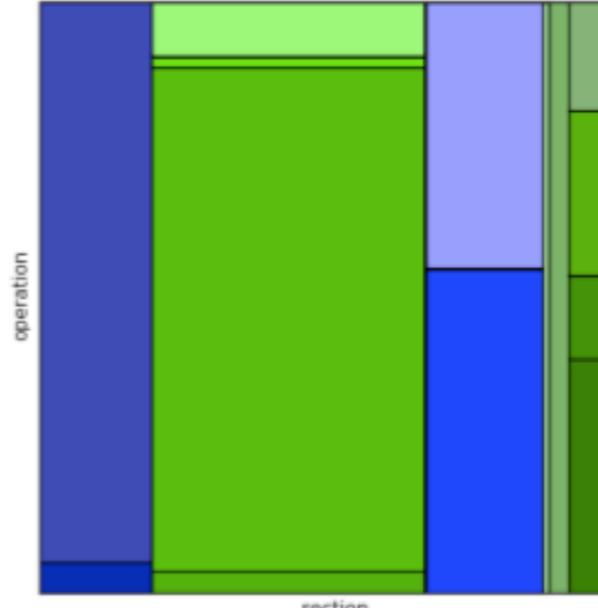


Macintosh HD

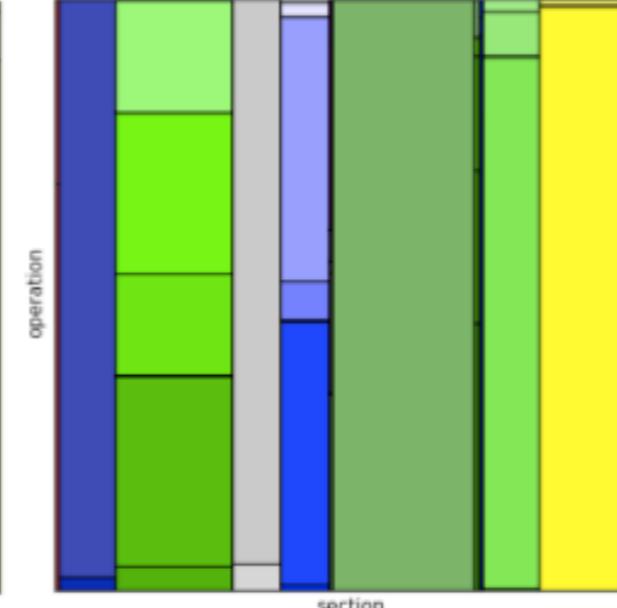
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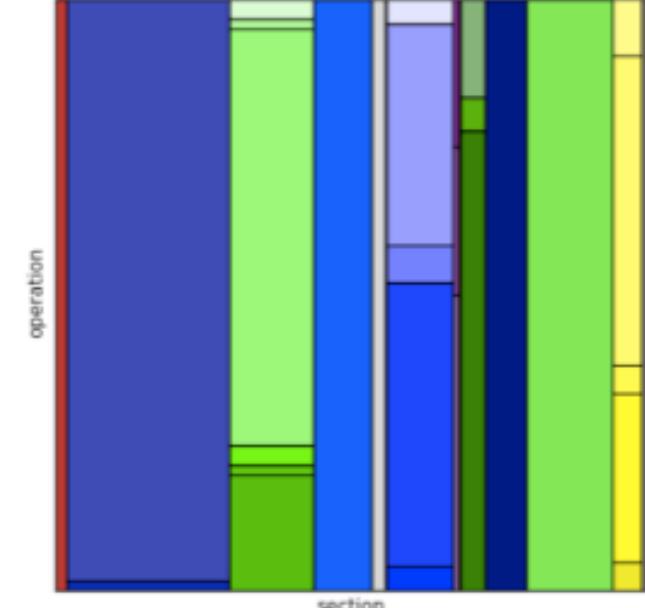
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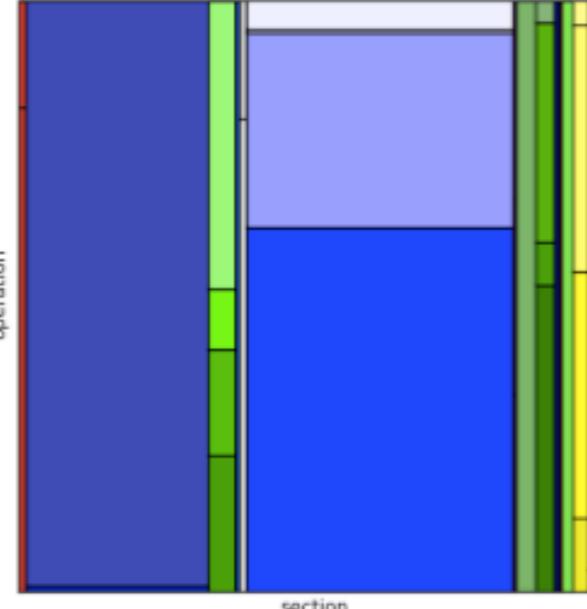
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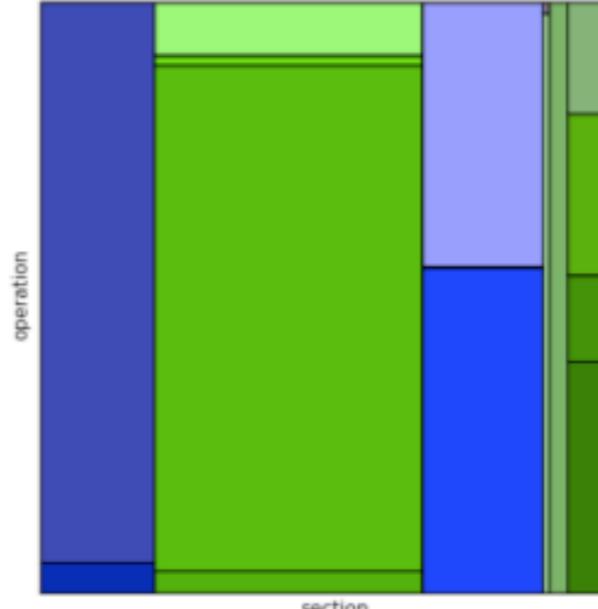
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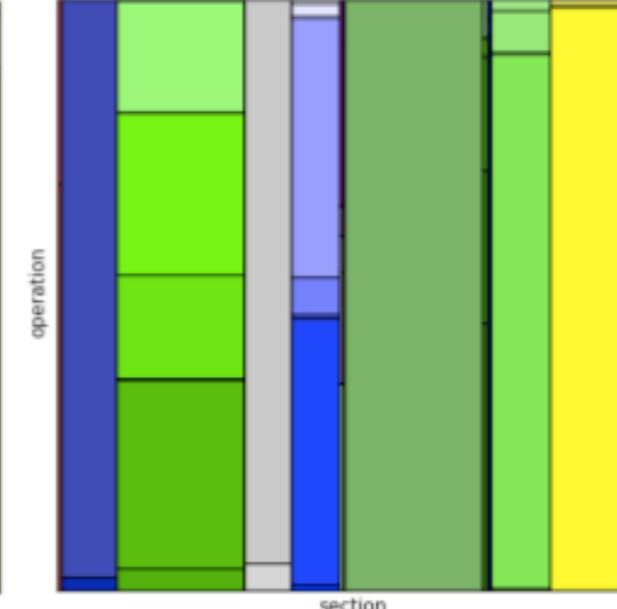
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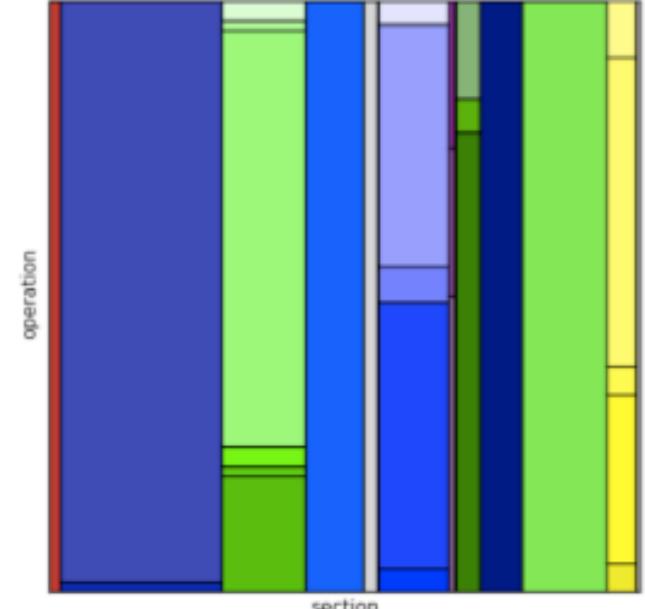
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SRAMLER.77768\_1264061.png



BAGLE.207223\_1265368.png



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## What do you think?



PiL - Laboratory for Dependable Distributed Systems

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