Blackboard

Accessing JVisualVM in Order to Take CPU Sample Screenshots

Date Published: Feb 17,2017 **Category:** Product:Application_and_Webserver_Learn; Version:Learn_9_1_Q4_2016_3100_0_0_rel_107_401e,Learn_April_2014_9_1_201404_160205,Learn_October_2014_9_1_201410_160373,Learn_9_1_Q4_2015_9_1_201510_1
Article No.: 000064203

Product: Blackboard Learn

Release: 9.1

Introduction: When troubleshooting Blackboard Learn issues where performance is in question, you may find jVisualVM gives you a much clearer picture of where your application time is going than normal thread dumps or monitoring software such as Nagios or NewRelic. Here is a quick guide for using jVisualVM when you have a Windows workstation, and you're connecting to a Unix-based app server.

Note:
If you have Windows application servers, you can simply run jvisualvm from Windows Explorer, and skip the PuTTY/VcXSrv. You can also skip the PuTTY/VcXSrv installation if you have another SSH client that supports X11 and another X Windows server for Windows (there are many free versions available).**Functionality:**

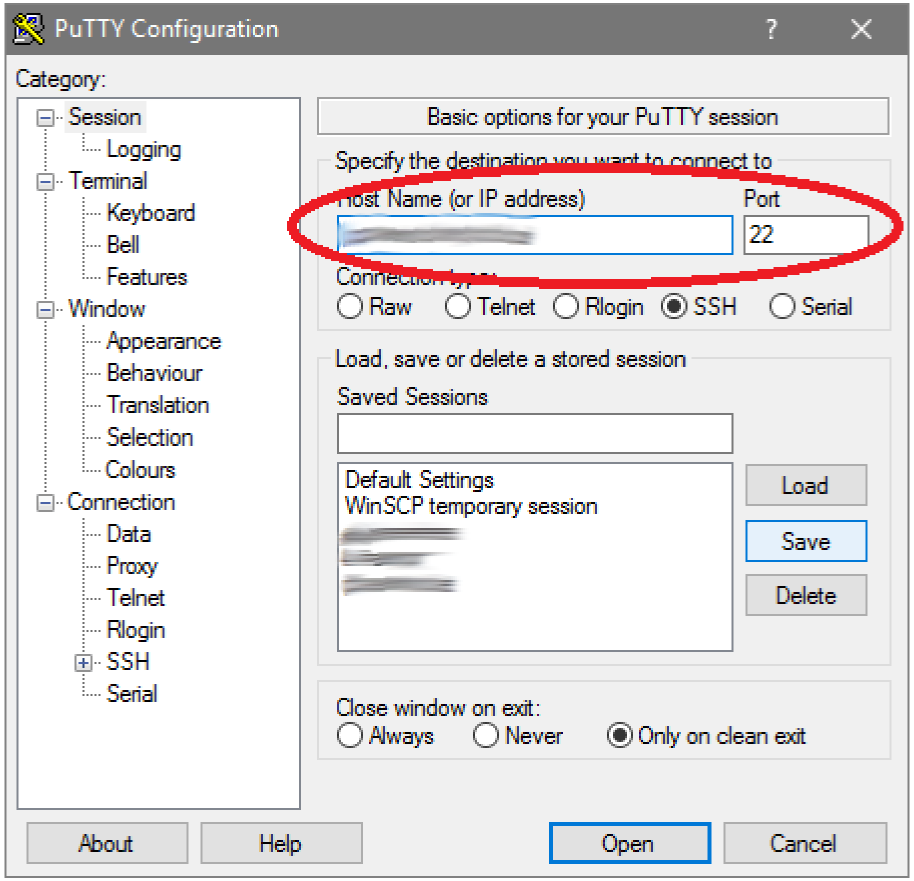
jVisualVM - The easy way

You need two software packages, which may or may not already be installed:

1. SSH client like PuTTY (or another PuTTY-based client, like SuperPuTTY)
2. X Server package for Windows.

If you don't already have both, and/or are not familiar with these packages, Blackboard Learn Client Support recommends using the links below to download and install PuTTY and VcXSrv, as they require very little configuration, and are both very small:

1. Install PuTTY client for your Windows workstation (http://www.putty.org/)
2. Install Visual C++ Redistributable 2015 (08 or newer works, if you already have it): (https://www.microsoft.com/en-us/download/details.aspx?id=48145)
    - If you have issues installing Visual C++ Redistributable on Win7, see the 'Common Issues' section below.
3. Install VCXSrv (Visual C X Server) for Windows (https://sourceforge.net/projects/vcxsrv/)
4. Restart your machine after installing both (VcXsrv needs to set system variables)
5. Open PuTTY and enter the app server host name you want to profile



Host Name (or IP address): [redacted]

Port: 22

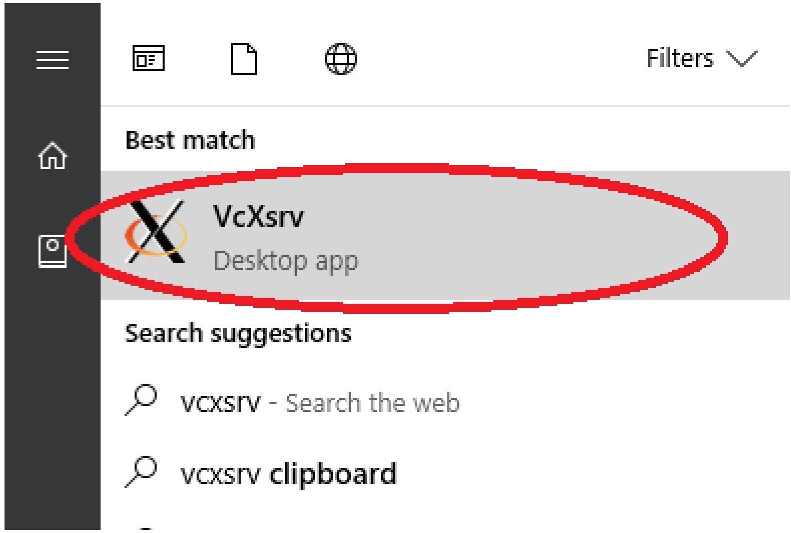
Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

Saved Sessions:

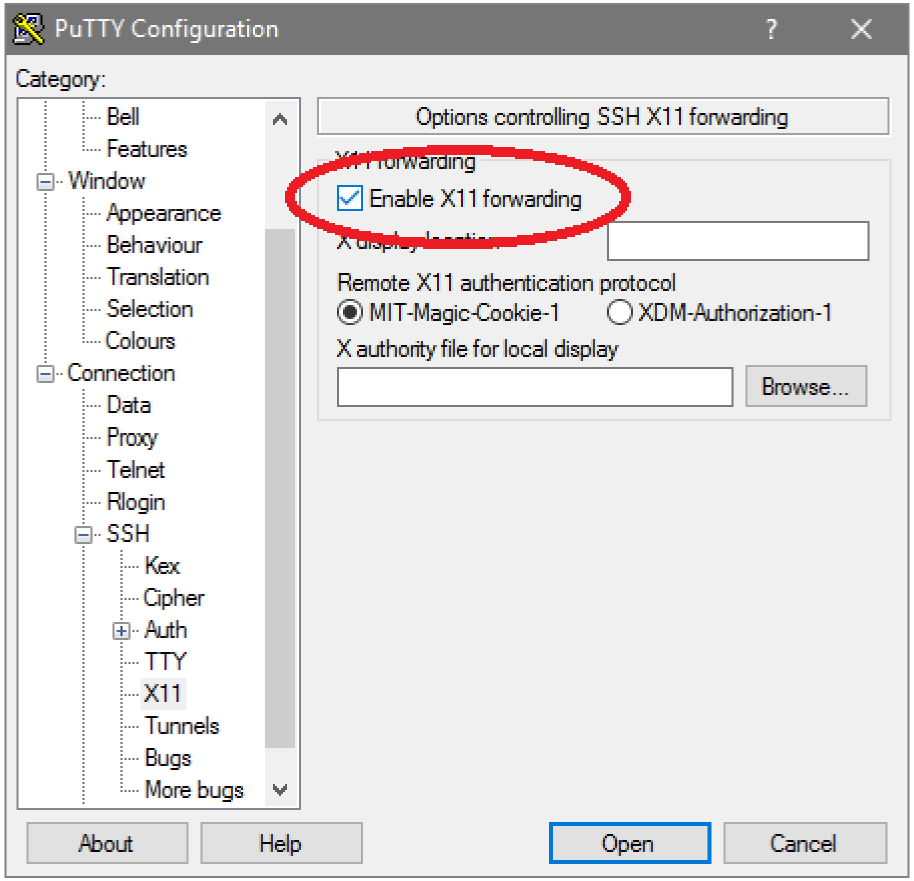
Default Settings
WinSCP temporary session
[redacted]

Close window on exit: ○ Always ○ Never ● Only on clean exit

6. Start the VcXServ server in the background (**Start** > **Search** > **VcCSrv** > **Enter**)



7. In PuTTY, click **Connection** > **SSH** > **X11** and check **Enable X11 Forwarding.** Under **Connection** > **SSH** click **Enable Compression**



Options controlling SSH X11 forwarding

X11 forwarding

☑ Enable X11 forwarding

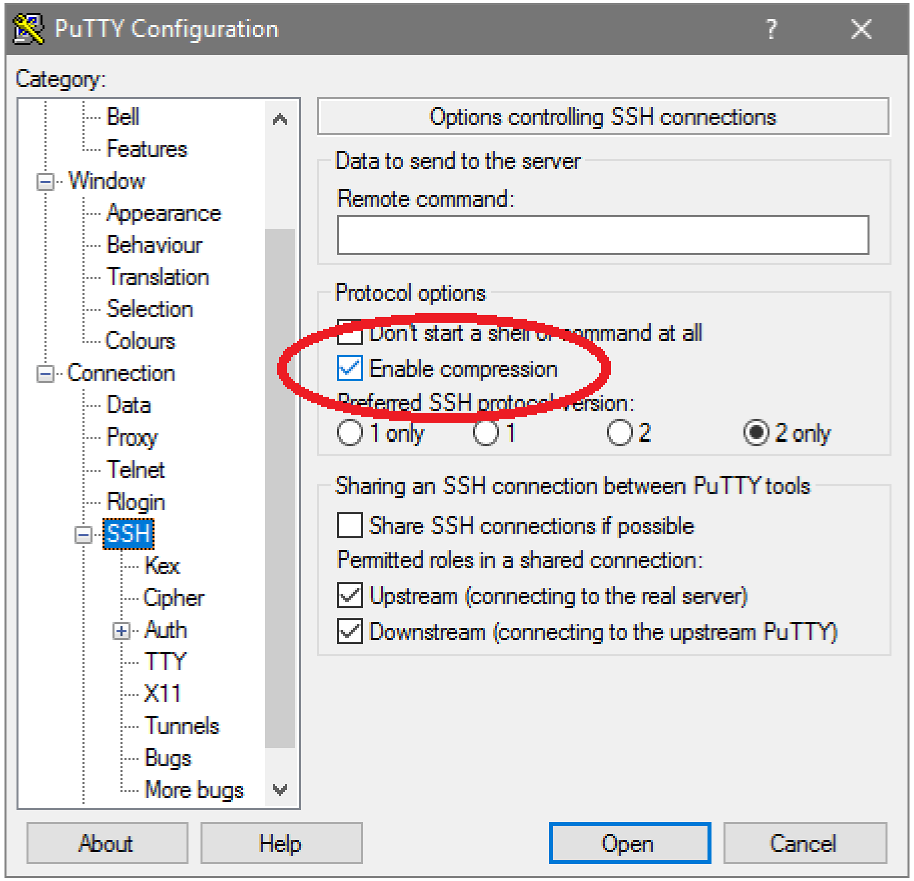
X display location

Remote X11 authentication protocol

● MIT-Magic-Cookie-1 ○ XDM-Authorization-1

X authority file for local display

Browse...



Options controlling SSH connections

Data to send to the server

Remote command:

Protocol options

□ Don't start a shell or command at all

☑ Enable compression

Preferred SSH protocol version:

○ 1 only ○ 1 ○ 2 ● 2 only

Sharing an SSH connection between PuTTY tools

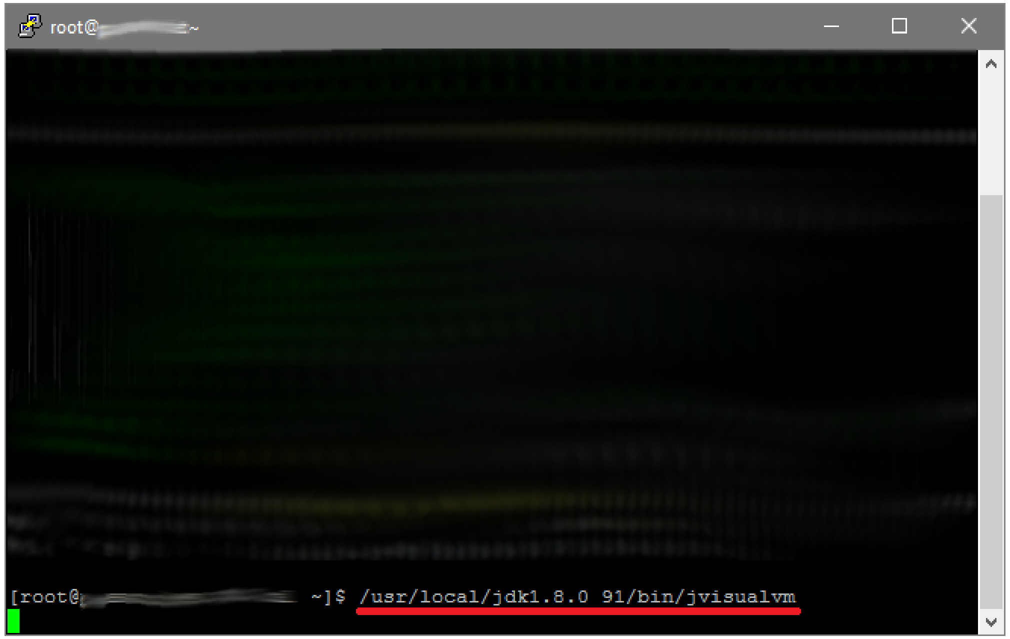
□ Share SSH connections if possible

Permitted roles in a shared connection:

☑ Upstream (connecting to the real server)

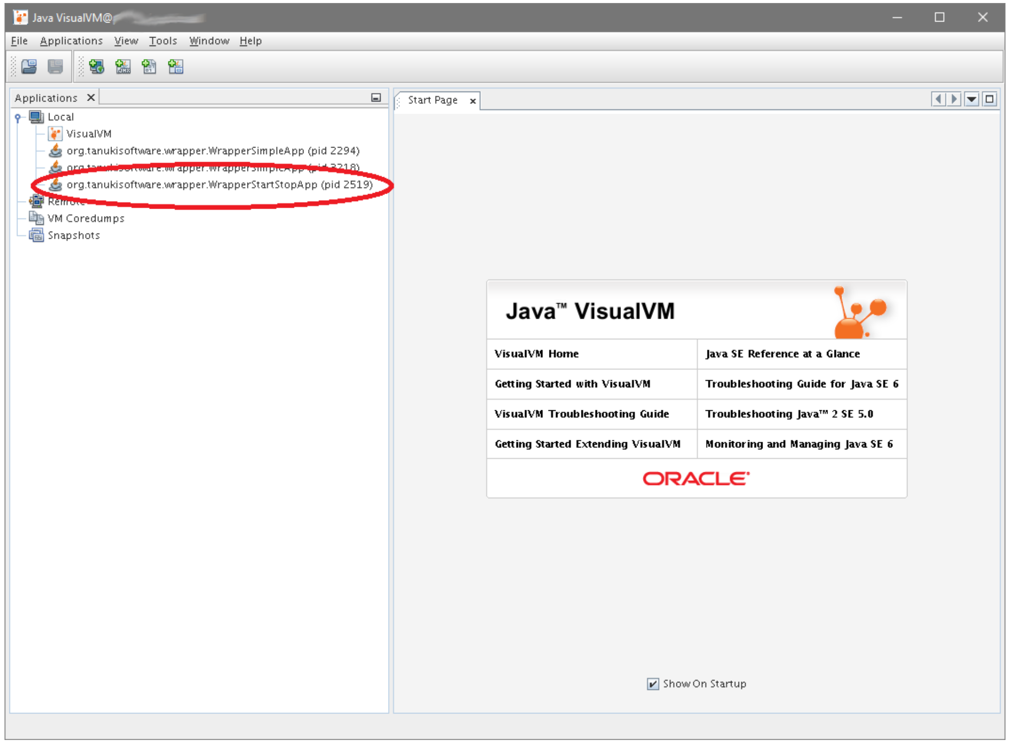
☑ Downstream (connecting to the upstream PuTTY)

8. Open your SSH session, then run /usr/local/jdk1.8_0_91/bin/jvisualvm (replace with whichever JDK Learn is using)



```
[root@[redacted] ~]$ /usr/local/jdk1.8.0_91/bin/jvisualvm
```

9. Since X11 is enabled, you should get a GUI window for jVisualVM. From here, find the main Tomcat JVM by looking for org.tanukisoftware.wrapper.WrapperStartStopApp:

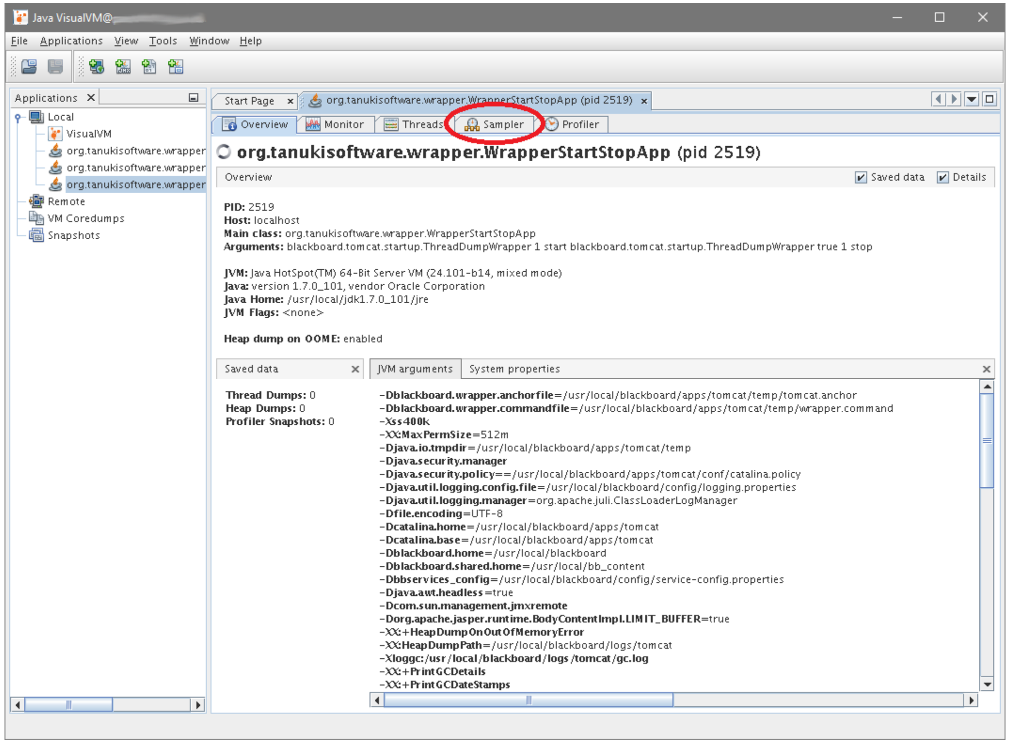


Java VisualVM@[redacted]
File Applications View Tools Window Help
Applications
Start Page

```
Local
  VisualVM
  org.tanukisoftware.wrapper.WrapperSimpleApp (pid 2294)
  org.tanukisoftware.wrapper.WrapperSimpleApp (pid 3218)
  org.tanukisoftware.wrapper.WrapperStartStopApp (pid 2519)
Remote
VM Coredumps
Snapshots
```

Java™ VisualVM
VisualVM Home
Java SE Reference at a Glance
Getting Started with VisualVM
Troubleshooting Guide for Java SE 6
VisualVM Troubleshooting Guide
Troubleshooting Java™ 2 SE 5.0
Getting Started Extending VisualVM
Monitoring and Managing Java SE 6
ORACLE
☑ Show On Startup

10. Double click the WrapperStartStopApp, and you're in! You can now take CPU samples, memory samples, observe the live heap, take thread dumps or heap dumps, or anything else you might need to do. For example, we often use CPU Sample Snapshots to find out what classes are taking up the most time in a specific action. To get a snapshot, click the "Sampler" tab:



org.tanukisoftware.wrapper.WrapperStartStopApp (pid 2519)

PID: 2519
Host: localhost
Main class: org.tanukisoftware.wrapper.WrapperStartStopApp
Arguments: blackboard.tomcat.startup.ThreadDumpWrapper 1 start blackboard.tomcat.startup.ThreadDumpWrapper true 1 stop

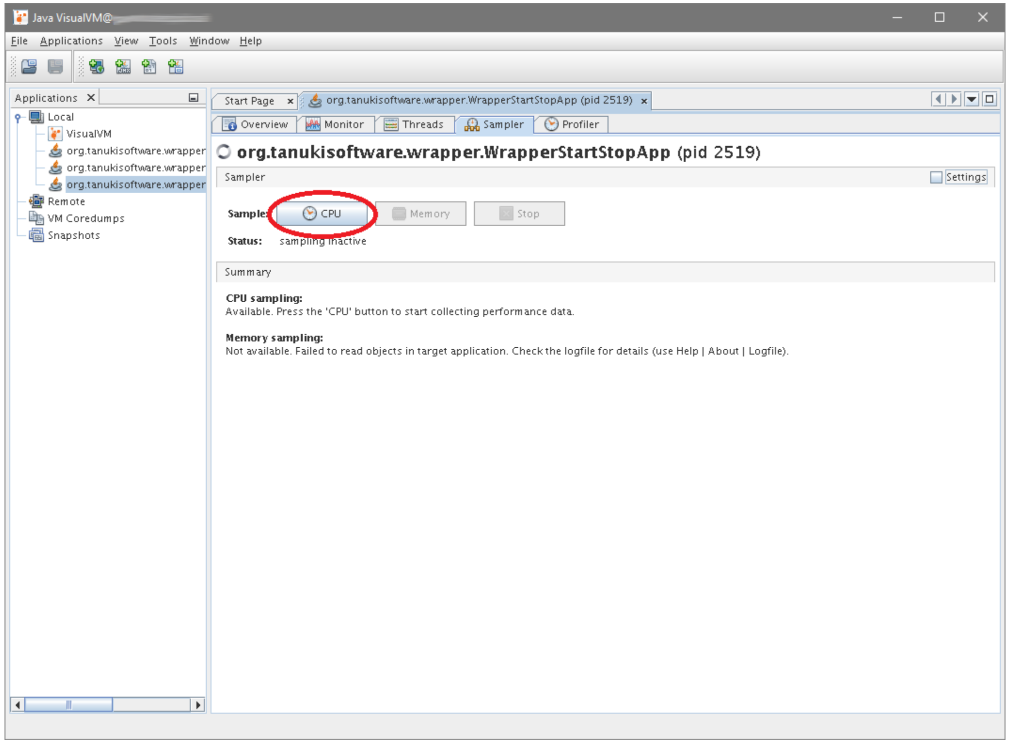
JVM: Java HotSpot(TM) 64-Bit Server VM (24.101-b14, mixed mode)
Java: version 1.7.0_101, vendor Oracle Corporation
Java Home: /usr/local/jdk1.7.0_101/jre
JVM Flags: <none>

Heap dump on OOME: enabled

Thread Dumps: 0
Heap Dumps: 0
Profiler Snapshots: 0

```
-Dblackboard.wrapper.anchorfile=/usr/local/blackboard/apps/tomcat/temp/tomcat.anchor
-Dblackboard.wrapper.commandfile=/usr/local/blackboard/apps/tomcat/temp/wrapper.command
-Xss400k
-XX:MaxPermSize=512m
-Djava.io.tmpdir=/usr/local/blackboard/apps/tomcat/temp
-Djava.security.manager
-Djava.security.policy==/usr/local/blackboard/apps/tomcat/conf/catalina.policy
-Djava.util.logging.config.file=/usr/local/blackboard/config/logging.properties
-Djava.util.logging.manager=org.apache.juli.ClassLoaderLogManager
-Dfile.encoding=UTF-8
-Dcatalina.home=/usr/local/blackboard/apps/tomcat
-Dcatalina.base=/usr/local/blackboard/apps/tomcat
-Dblackboard.home=/usr/local/blackboard
-Dblackboard.shared.home=/usr/local/bb_content
-Dbbservices_config=/usr/local/blackboard/config/service-config.properties
-Djava.awt.headless=true
-Dcom.sun.management.jmxremote
-Dorg.apache.jasper.runtime.BodyContentImpl.LIMIT_BUFFER=true
-XX:+HeapDumpOnOutOfMemoryError
-XX:HeapDumpPath=/usr/local/blackboard/logs/tomcat
-Xloggc:/usr/local/blackboard/logs/tomcat/gc.log
-XX:+PrintGCDetails
-XX:+PrintGCDateStamps
```

11. Then click "CPU" to start sampling (do this DURING an issue):


Java VisualVM@[redacted]
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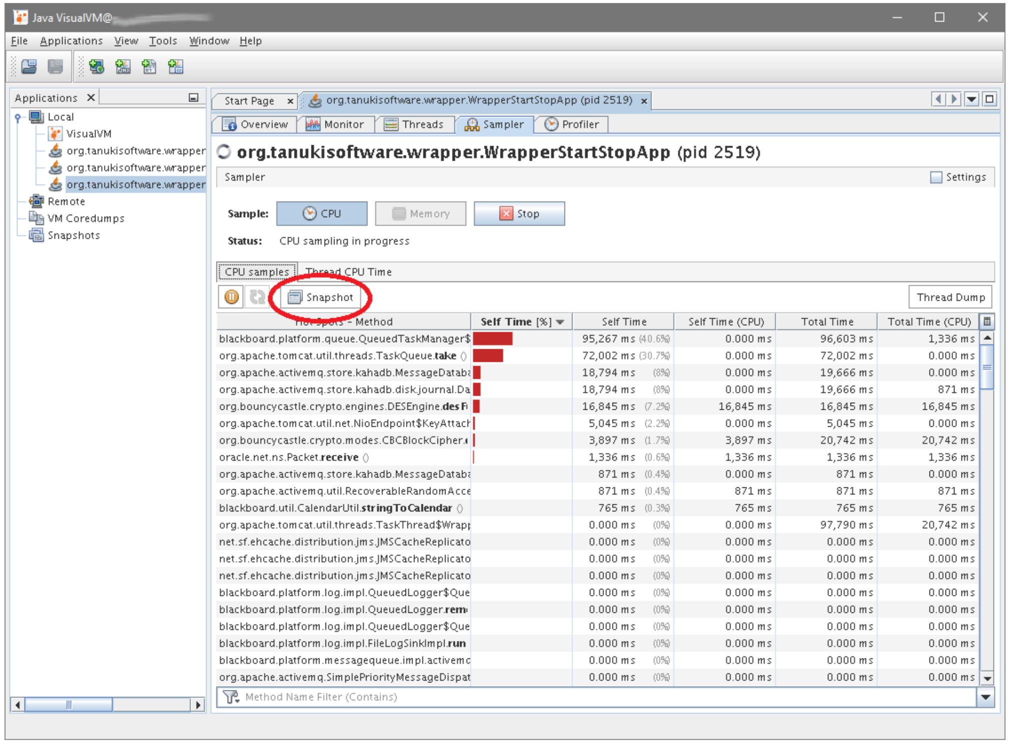
Summary

Status: sampling inactive

CPU sampling:
Available. Press the 'CPU' button to start collecting performance data.

Memory sampling:
Not available. Failed to read objects in target application. Check the logfile for details (use Help | About | Logfile).

12. After you've been sampling the issue for enough time and can see some items may be problematic, take a snapshot by clicking the Snapshot button:


Java VisualVM@[redacted]
File Applications View Tools Window Help
Applications
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VisualVM
org.tanukisoftware.wrapper
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Stop
CPU samples
Thread CPU Time
Snapshot
Thread Dump
Method Name Filter (Contains)

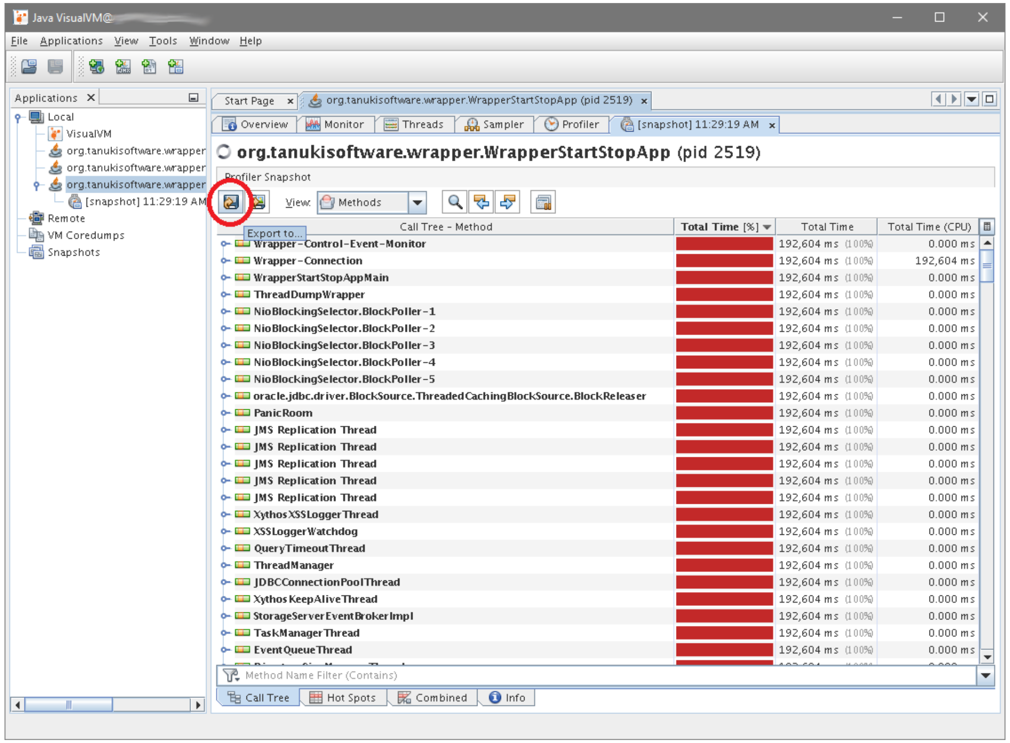
org.tanukisoftware.wrapper.WrapperStartStopApp (pid 2519)

Sample:

Status: CPU sampling in progress

Hot Spots - Method	Self Time [%]	Self Time	Self Time (CPU)	Total Time	Total Time (CPU)
blackboard.platform.queue.QueuedTaskManager$		95,267 ms (40.6%)	0.000 ms	96,603 ms	1,336 ms
org.apache.tomcat.util.threads.TaskQueue.**take** ()		72,002 ms (30.7%)	0.000 ms	72,002 ms	0.000 ms
org.apache.activemq.store.kahadb.MessageDataba		18,794 ms (8%)	0.000 ms	19,666 ms	0.000 ms
org.apache.activemq.store.kahadb.disk.journal.Da		18,794 ms (8%)	0.000 ms	19,666 ms	871 ms
org.bouncycastle.crypto.engines.DESEngine.**desF**		16,845 ms (7.2%)	16,845 ms	16,845 ms	16,845 ms
org.apache.tomcat.util.net.NioEndpoint$KeyAttach		5,045 ms (2.2%)	0.000 ms	5,045 ms	0.000 ms
org.bouncycastle.crypto.modes.CBCBlockCipher.		3,897 ms (1.7%)	3,897 ms	20,742 ms	20,742 ms
oracle.net.ns.Packet.**receive** ()		1,336 ms (0.6%)	1,336 ms	1,336 ms	1,336 ms
org.apache.activemq.store.kahadb.MessageDataba		871 ms (0.4%)	0.000 ms	871 ms	0.000 ms
org.apache.activemq.util.RecoverableRandomAcce		871 ms (0.4%)	871 ms	871 ms	871 ms
blackboard.util.CalendarUtil.**stringToCalendar** ()		765 ms (0.3%)	765 ms	765 ms	765 ms
org.apache.tomcat.util.threads.TaskThread$Wrapp		0.000 ms (0%)	0.000 ms	97,790 ms	20,742 ms
net.sf.ehcache.distribution.jms.JMSCacheReplicato		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
net.sf.ehcache.distribution.jms.JMSCacheReplicato		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
net.sf.ehcache.distribution.jms.JMSCacheReplicato		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
blackboard.platform.log.impl.QueuedLogger$Que		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
blackboard.platform.log.impl.QueuedLogger.**rem**		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
blackboard.platform.log.impl.QueuedLogger$Que		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
blackboard.platform.log.impl.FileLogSinkImpl.**run**		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
blackboard.platform.messagequeue.impl.activemc		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms
org.apache.activemq.SimplePriorityMessageDispat		0.000 ms (0%)	0.000 ms	0.000 ms	0.000 ms

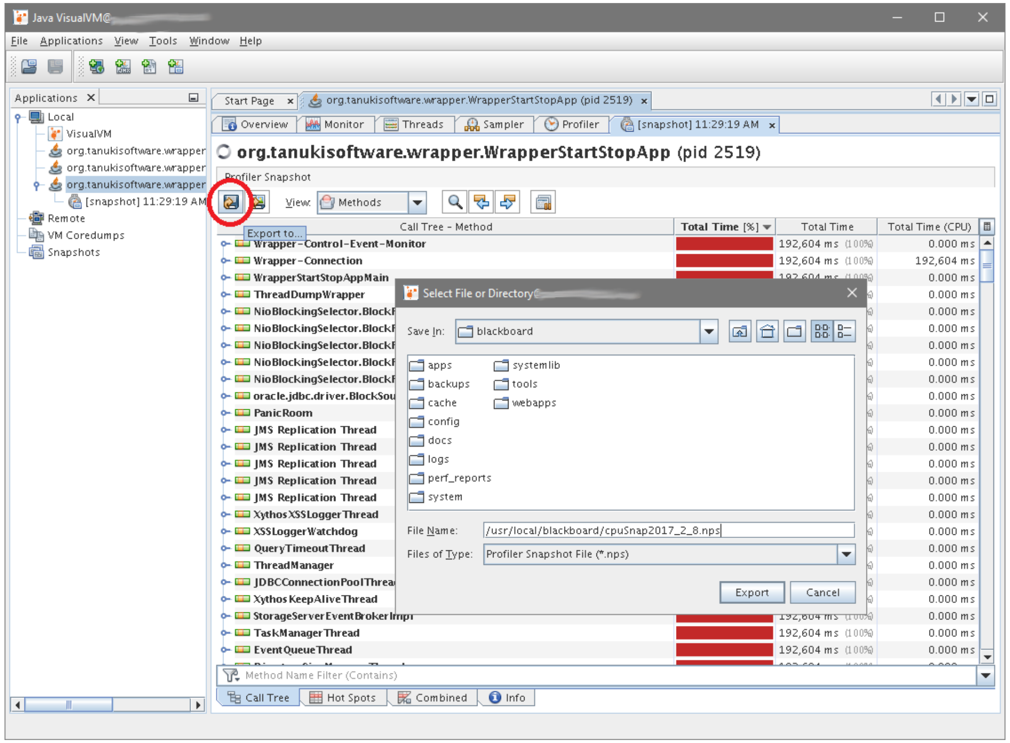
13. Save the snapshot by clicking the new snapshot-generated tab and selecting **Export to**:



org.tanukisoftware.wrapper.WrapperStartStopApp (pid 2519)

Call Tree - Method	Total Time [%]	Total Time	Total Time (CPU)
Wrapper-Control-Event-Monitor	🟥	192,604 ms (100%)	0.000 ms
Wrapper-Connection	🟥	192,604 ms (100%)	192,604 ms
WrapperStartStopAppMain	🟥	192,604 ms (100%)	0.000 ms
ThreadDumpWrapper	🟥	192,604 ms (100%)	0.000 ms
NioBlockingSelector.BlockPoller-1	🟥	192,604 ms (100%)	0.000 ms
NioBlockingSelector.BlockPoller-2	🟥	192,604 ms (100%)	0.000 ms
NioBlockingSelector.BlockPoller-3	🟥	192,604 ms (100%)	0.000 ms
NioBlockingSelector.BlockPoller-4	🟥	192,604 ms (100%)	0.000 ms
NioBlockingSelector.BlockPoller-5	🟥	192,604 ms (100%)	0.000 ms
oracle.jdbc.driver.BlockSource.ThreadedCachingBlockSource.BlockReleaser	🟥	192,604 ms (100%)	0.000 ms
PanicRoom	🟥	192,604 ms (100%)	0.000 ms
JMS Replication Thread	🟥	192,604 ms (100%)	0.000 ms
JMS Replication Thread	🟥	192,604 ms (100%)	0.000 ms
JMS Replication Thread	🟥	192,604 ms (100%)	0.000 ms
JMS Replication Thread	🟥	192,604 ms (100%)	0.000 ms
JMS Replication Thread	🟥	192,604 ms (100%)	0.000 ms
XythosXSSLoggerThread	🟥	192,604 ms (100%)	0.000 ms
XSSLoggerWatchdog	🟥	192,604 ms (100%)	0.000 ms
QueryTimeoutThread	🟥	192,604 ms (100%)	0.000 ms
ThreadManager	🟥	192,604 ms (100%)	0.000 ms
JDBCConnectionPoolThread	🟥	192,604 ms (100%)	0.000 ms
XythosKeepAliveThread	🟥	192,604 ms (100%)	0.000 ms
StorageServerEventBrokerImpl	🟥	192,604 ms (100%)	0.000 ms
TaskManagerThread	🟥	192,604 ms (100%)	0.000 ms
EventQueueThread	🟥	192,604 ms (100%)	0.000 ms

14. Save it to a location from which you can retrieve it, and use WinSCP or some other SFTP client of your choice to retrieve it:



org.tanukisoftware.wrapper.WrapperStartStopApp (pid 2519)

Profiler Snapshot

Select File or Directory

Save In: blackboard

File Name: /usr/local/blackboard/cpuSnap2017_2_8.nps

Files of Type: Profiler Snapshot File (*.nps)

15. Repeat as needed for further snapshots, thread dumps, etc. and submit the requested CPU Snapshots, App Snapshots, Heap dumps, or Thread dumps to support for investigation.

Common Issues:

If you have issues installing Visual C++ Redistributable on Windows 7, you may find the following resources useful:

- Visual C++ Stuck during install at Windows7_MSU_x64: http://stackoverflow.com/questions/41233672/installation-microsoft-visual-c-redistributable-stuck-at-processing-window
    - Install Update for Windows 7 for x64-based Systems (KB2999226)
    - Download the update KB2999226 for your OS edition from here: Update for Universal C Runtime in Windows
    - Manually install the KB2999226 as below:
    - o Find the path to the file Windows6.1-KB2999226-x64.msu from the folder C:\ProgramData\Package Cache\xxxxx\packages\Patch\x64, where xxxxx is the update ID, similar to "42D5BEC7DDFBD49E76467529CBC2868987BF8460"

      o Create a folder named ‘XXXX’ in that and execute following commands from **Admin** command prompt (start > cmd.exe > right click > run as admin)

      o wusa.exe Windows6.1-KB2999226-x64.msu /extract:XXXX

      o DISM.exe /Online /Add-Package /PackagePath:XXXX\ Windows6.1-KB2999226-x64.cab

      o Run the Visual C++ Redistributable with the repair option: vc_redist.x64.exe /repair