JVM Architecture

Tuesday, 21 March 2023 1:03 PM

2 types of error:

- stackOverflow error
- OutofMemory Error

JVM specification
JVM implemenations
Hotspot - managed by oracle currently
Jrockit
IBM J9

Common memory for all threads

Heap memory

- Objects
- String literals
- Static variables/objects - moved to heap memory after java8

Young generation/Old Generation

GC - 2 types

- Minor GC
    - Occurs frequently - from eden to survivor
- Major GC
    - Occurs rarely - from survivor to old generation

Non heap memory

PermGen -> contains metadata of the classes, methods and the VM.

PermGen and it is used to store the class structure and the code for methods and constructo
MetaSize

Per Thread Memory
Java Stack/Native stack memory

- References of thread local variables and objects
- Primitive variables will be stored in stack memory itself

We can use **-Xms** and **-Xmx** JVM option to define the startup size and maximum size
use **-Xss** to define the stack memory size.

In Java Memory is divided into 3 parts.: 1.Method Area 2.Heap 3.Stack ors

of heap memory. We can

maximum size of heap memory. We can use **-Xss** to define the stack memory size.

In Java Memory is divided into 3 parts.: 1.Method Area 2.Heap 3.Stack

1.**Method Area** is memory where **class is loaded** and along with that static variables and constants are defined.

2.Stack is memory area where a method is loaded and its execution take place. All Local variables are stored in these.

3. Heap is that memory where objects are created , I mean where instance variables are created under object name.

Program counters

Garbage collection process:

- Mark Sweep Process
- Compact remaining objects in memory

Types of GC

- Serial GC
- Parallel GC
- Parallel Old GC
- CMS(Concurrent Mark Sweep) GC
- G1(Garbage First) GC

https://www.freecodecamp.org/news/garbage-collection-in-java-what-is-gc-and-how-it-works-in-the-jvm/
https://www.digitalocean.com/community/tutorials/garbage-collection-in-java
https://www.geeksforgeeks.org/garbage-collection-java/

References:

https://www.geeksforgeeks.org/jvm-works-jvm-architecture/

- https://www.digitalocean.com/community/tutorials/java-heap-space-vs-stack-memory
- https://amir-raza.medium.com/java-memory-allocations-stack-vs-heap-and-other-areas-9d3b34952185

- Metaspace reference:
  - https://www.geeksforgeeks.org/metaspace-in-java-8-with-examples/
  - https://stackoverflow.com/questions/24074164/what-is-the-use-of-metaspace-in-java-8
  - https://www.baeldung.com/java-permgen-metaspace
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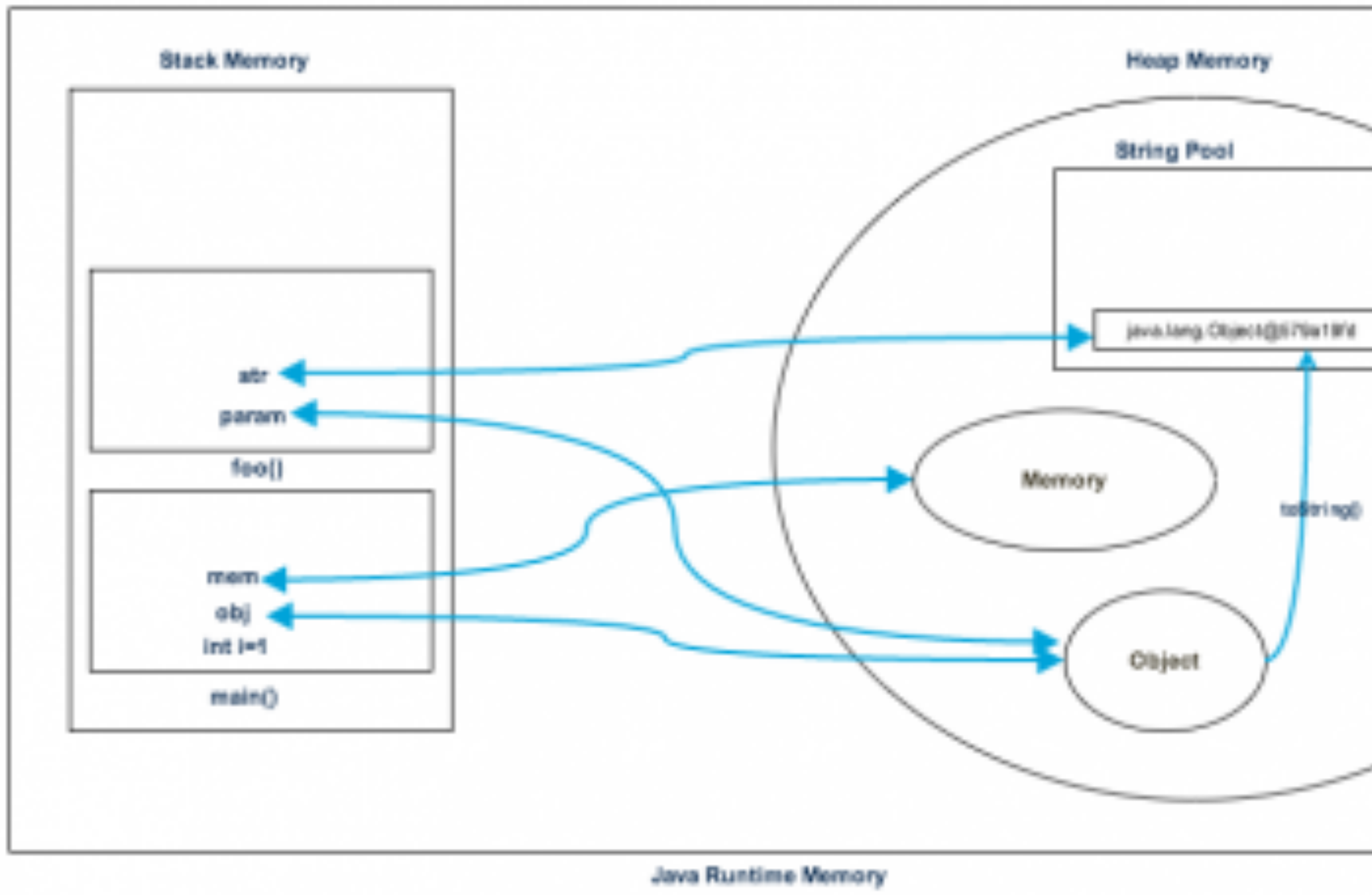
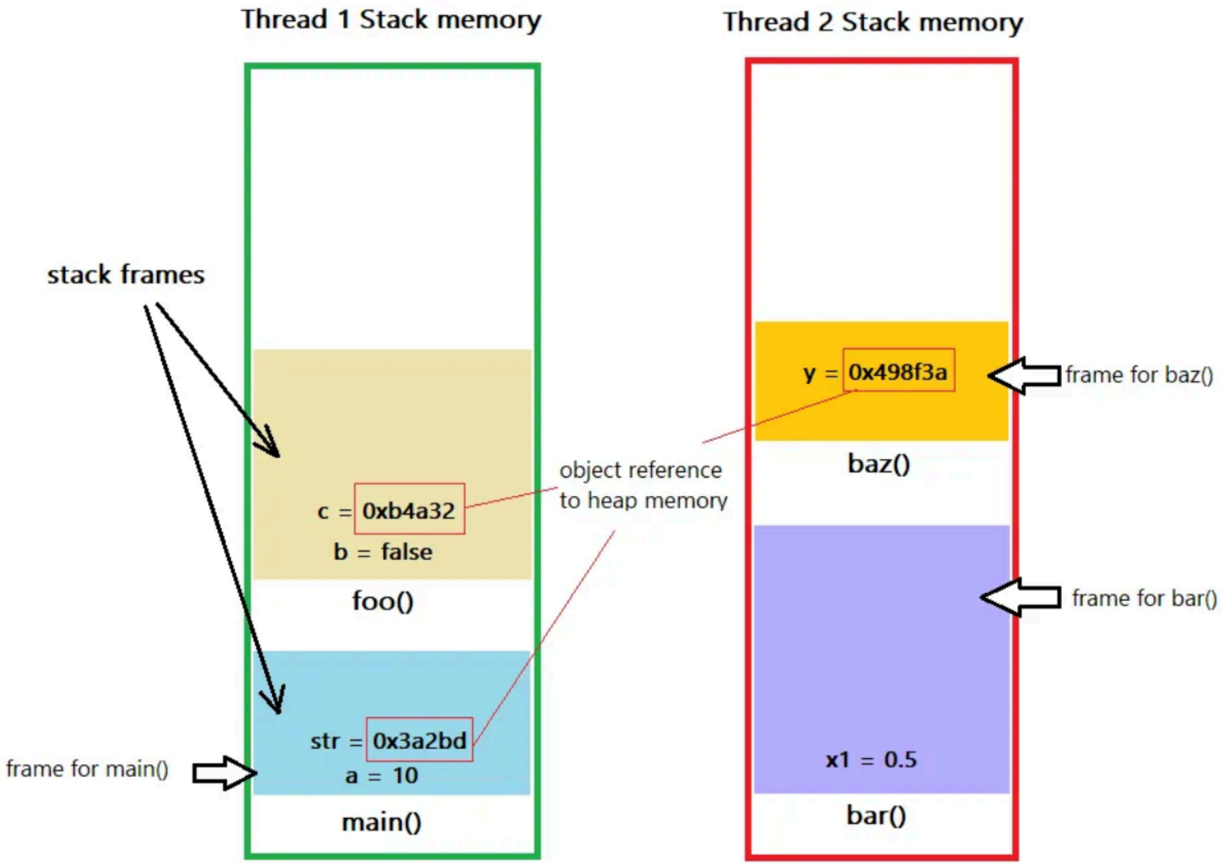

Stack Memory
Heap Memory
String Pool
java.lang.Object@
str
param
foo()
Memory
toString()
mem
obj
int i=1
Object
main()
Java Runtime Memory


Thread 1 Stack memory
Thread 2 Stack memory
stack frames
y = 0x498f3a
frame for baz()
baz()
object reference
to heap memory
c = 0xb4a32
b = false
foo()
frame for bar()
str = 0x3a2bd
a = 10
frame for main()
main()
x1 = 0.5
bar()

JVM Stack (Stack Memory)