

202: Computer Science II

Northern Virginia Community College

Java Garbage Collection

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Garbage Collection

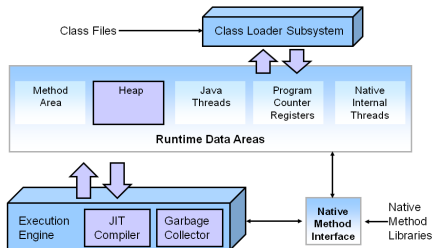
Java Garbage Collection Information:

- ▶ Objects are created on the heap in Java irrespective of scope.
- ▶ Garbage collection is a mechanism provided by Java Virtual Machine and relieves Java programmer from memory management (not true in C++)
- ▶ A daemon thread called Garbage Collector is responsible for Garbage Collection.
- ▶ Before removing an object from memory garbage collection thread invokes `finalize()` method of that object.
- ▶ You cannot force garbage collection in Java; it will only trigger if JVM thinks it needs a garbage collection based on Java heap size.
- ▶ Methods like `System.gc()` and `Runtime.gc()` request of Garbage collection to JVM but its not guaranteed to happen.
- ▶ `OutOfMemoryError` or `java.lang.OutOfMemoryError` can happen when heap space is full

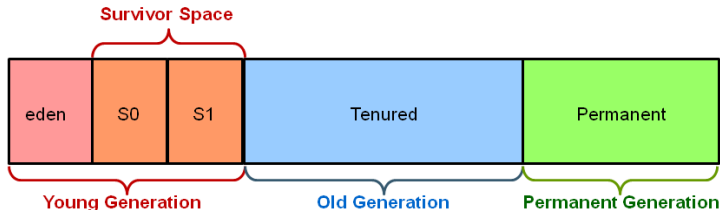
Garbage Collection

Garbage Collection Eligibility:

- ▶ All references explicitly set to null e.g. `object == null`
- ▶ Object is created inside a block and reference goes out of scope.
- ▶ Parent object set to null if holds reference to another object in its attributes, and when you set container object's reference null, child or contained object automatically become eligible.
- ▶ If an object has only lived weak references via `WeakHashMap`.

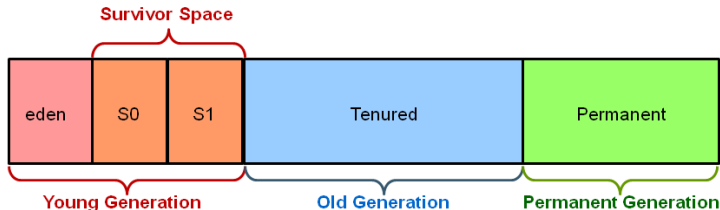


Garbage Collection



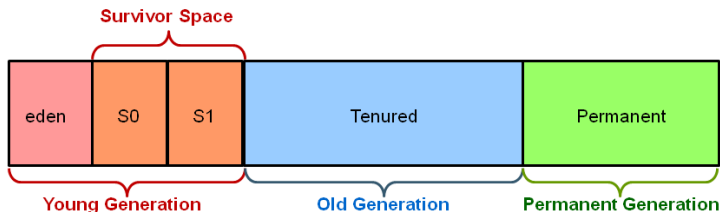
- ▶ The Young Generation is where all new objects are allocated and aged. When the young generation fills up, this causes a **minor garbage collection**.
 - A generation full of dead objects is collected very quickly.
 - Some surviving objects are aged and eventually move to the old generation.
 - Minor garbage collections are always **Stop the World** events (Halt application threads).

Garbage Collection



- ▶ The Old Generation is used to store long surviving objects. Typically, a threshold is set for young generation object and when that age is met, the object gets moved to the old generation. Eventually the old generation needs to be collected. This event is called a **major garbage collection**.
 - Major garbage collection are also Stop the World events.
 - Major collection is much slower because it involves all live objects (so should be minimized).

Garbage Collection



- ▶ The Permanent generation contains metadata required by the JVM to describe the classes and methods used in the application.
 - The permanent generation is populated by the JVM at runtime based on classes in use by the application.
 - Java SE library classes and methods may be stored here.

Garbage Collection

- ▶ New objects are allocated to the eden space. Survivor spaces start out empty.
- ▶ When the eden space fills up, minor garbage collection occurs.
- ▶ Referenced objects are moved to the first survivor space. Unreferenced objects are deleted as eden is cleared.
- ▶ At next minor GC, repeat above for eden space and survivor spaces (deleting unreferenced and moving referenced)

