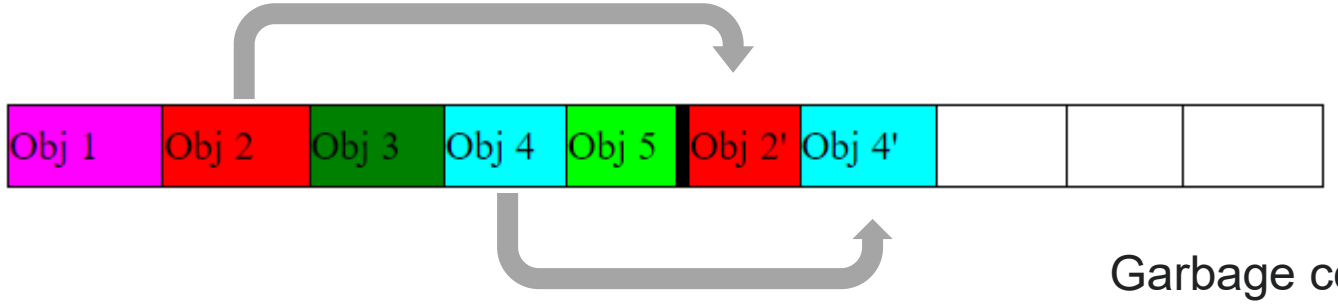
Cheney's Algorithm

Cheney's algorithm is a **stop and copy method of tracing garbage collection** in computer software systems.

The heap is divided into two equal halves,
only one of which is in use at any one time.



Garbage collection is performed by copying live objects from one semispace (the from-space) to the other (the to-space)

The entire old heap is then discarded in one piece.

Cheney's Algorithm

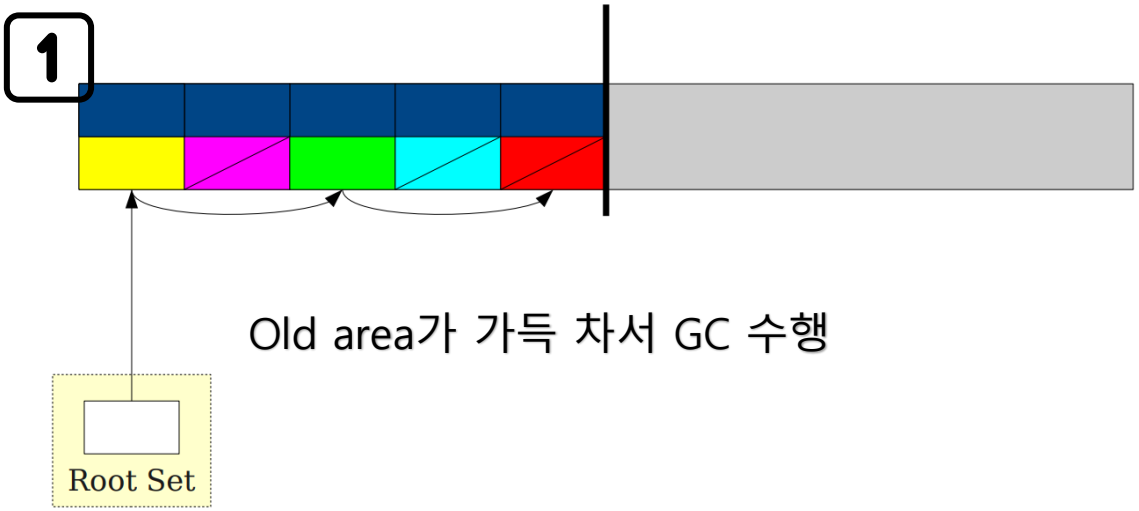
The only tricky part about stop-and-copy is **adjusting the pointers in the copied objects correctly**.

Solution

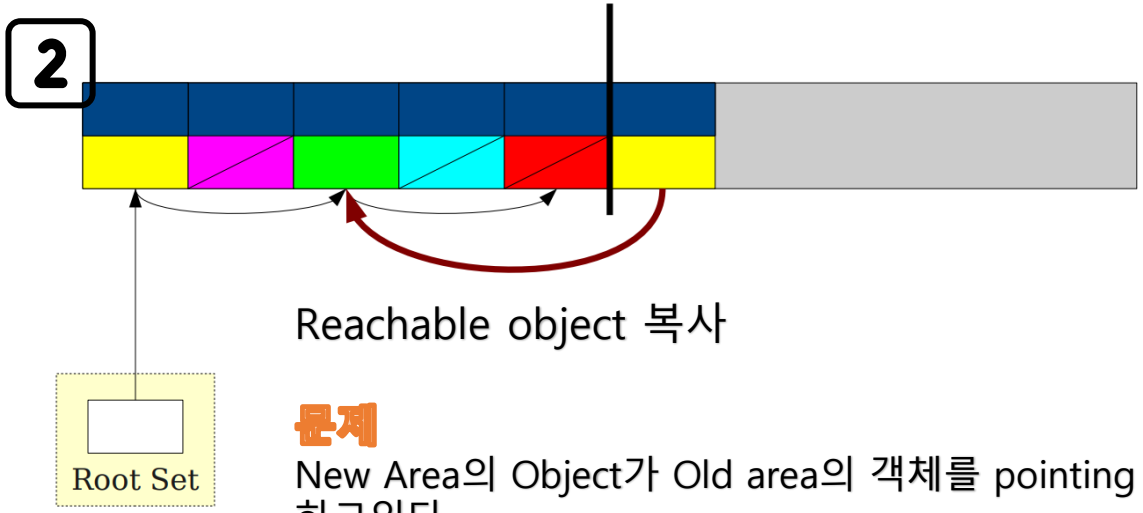
Have each object contain a extra space for a **forwarding pointer.**

- First, do a complete bitwise copy of the object.
  ⚠ All pointers still point to their original locations
- Next, set the forwarding pointer of the original object to point to the new object.
- Finally, after cloning each object, for each pointer
  1. Follow the pointer to the object it references.
  2. Replace the pointer with the pointee's forwarding pointer

Cheney's Algorithm – Forward Pointers



Old area가 가득 차서 GC 수행



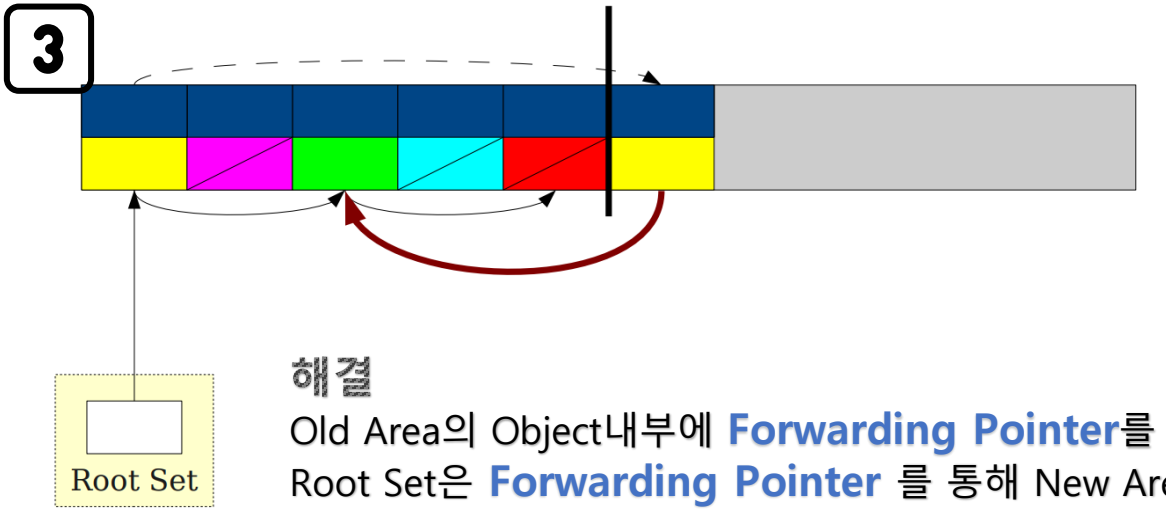
Reachable object 복사

문제

New Area의 Object가 Old area의 객체를 pointing 하고있다.
Old Area 객체는 곧 사라지게 된다

문제

Root Set 또한, Old Area의 Object를 pointing 하고 있다.
즉, 곧 사라질 Object를 reference 하고 있다.



해결

Old Area의 Object내부에 **Forwarding Pointer**를 위한 공간 형성
Root Set은 **Forwarding Pointer** 를 통해 New Area의 Object를 Reference 할 수 있다.

Cheney's Algorithm – Forward Pointers

같은 원리로 나머지 과정도 수행된다.

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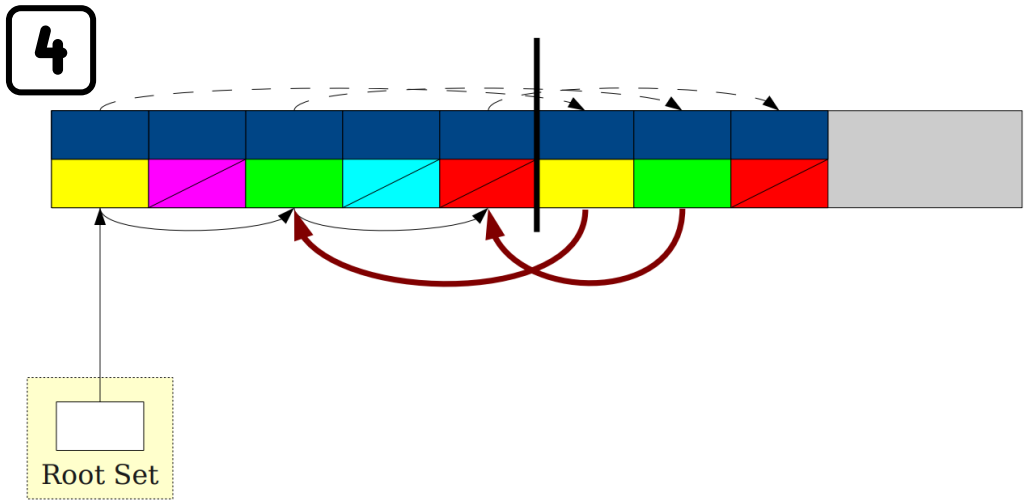

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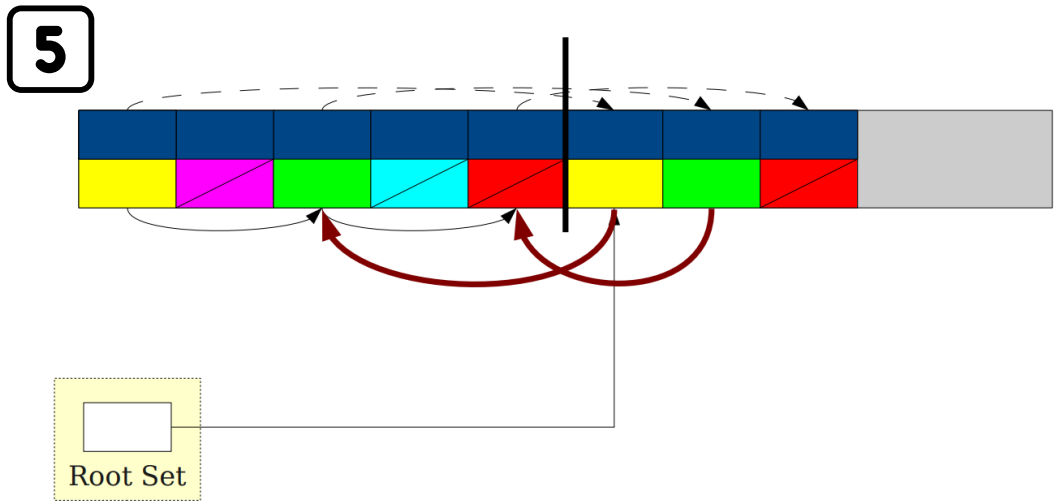

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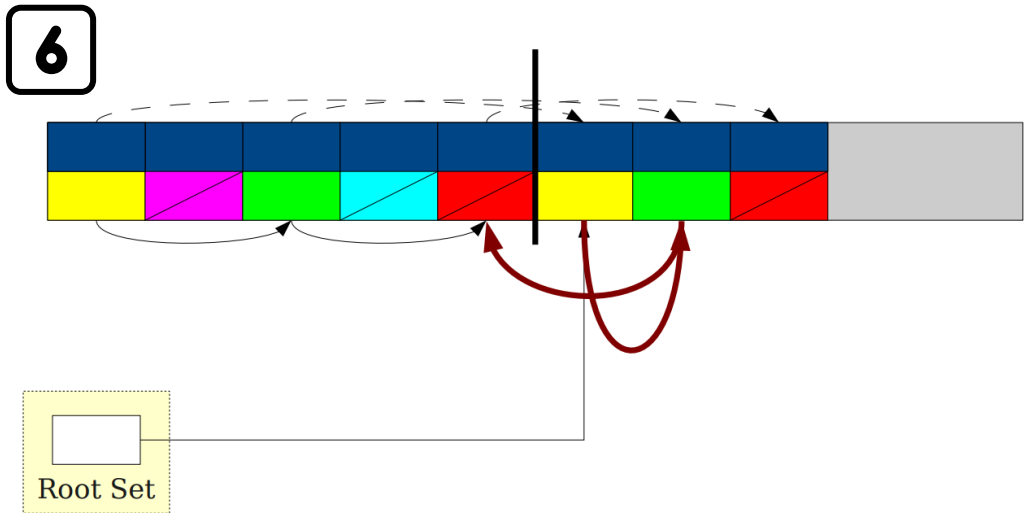

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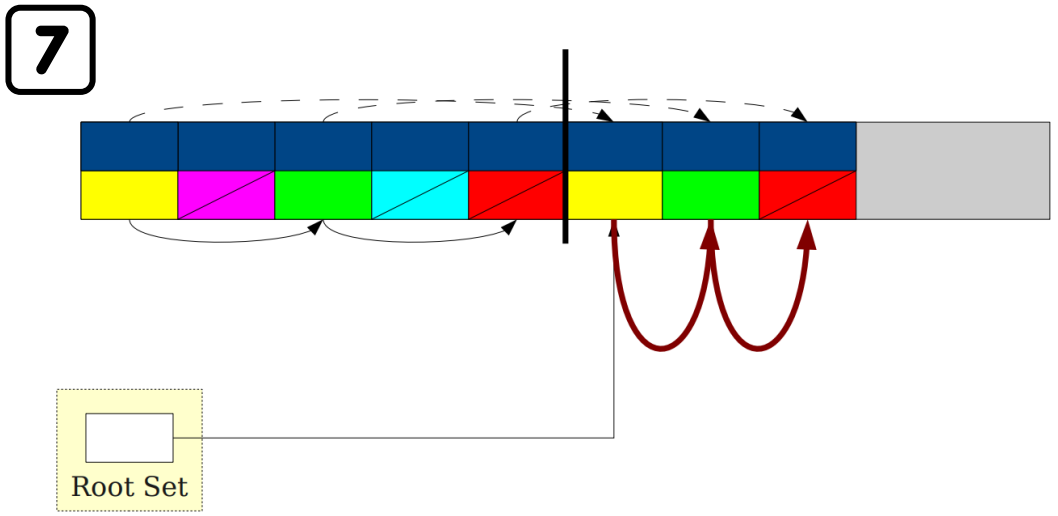
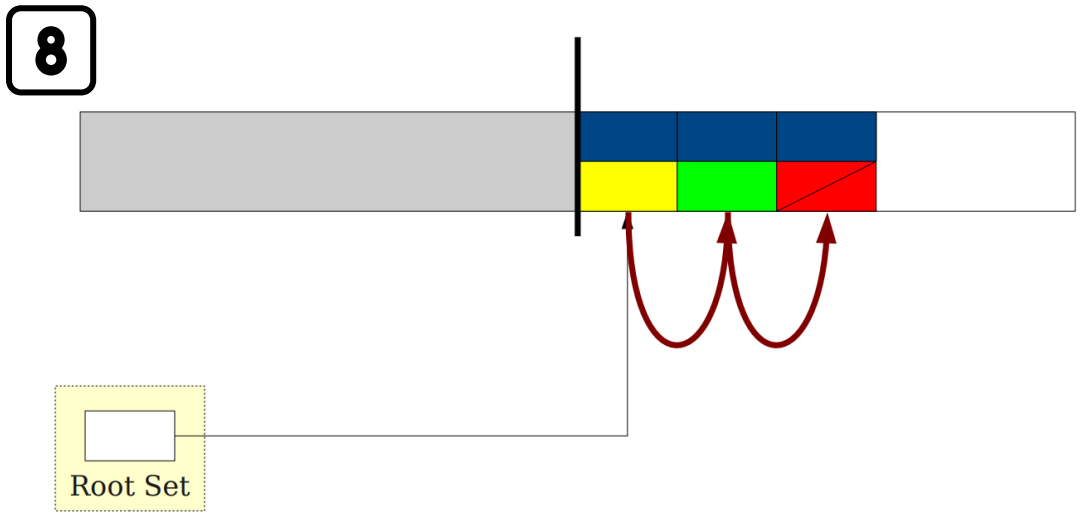


Cheney's Algorithm – Forward Pointers



Disadvantages

- 메모리의 절반을 항상 비워 두게 된다.

Solution :: Generational Garbage Collection