

The garbage collector



What to expect

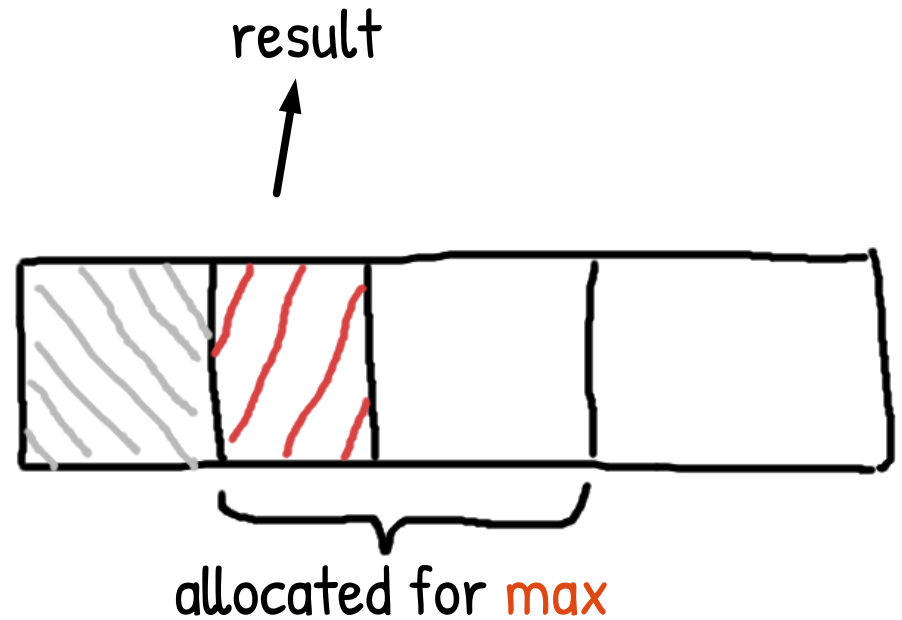
- Some history: Memory allocation in C
- Go memory allocation
- GC in action
- What's under the hood
- Conclusion

History: the stack

```
#include <stdio.h>

int max(int first, int second) {
    int result = first;
    if (second > first) {
        result = second;
    }
    return result;
}

int main(int argc, char *argv[]) {
    printf("max of %d and %d is %d\n",
        2, 5, max(2,5));
}
```



History: the stack

```
#include <stdio.h>

int max(int first, int second) {
    int result = first;
    if (second > first) {
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    }
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int main(int argc, char *argv[]) {
    printf("max of %d and %d is %d\n",
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}
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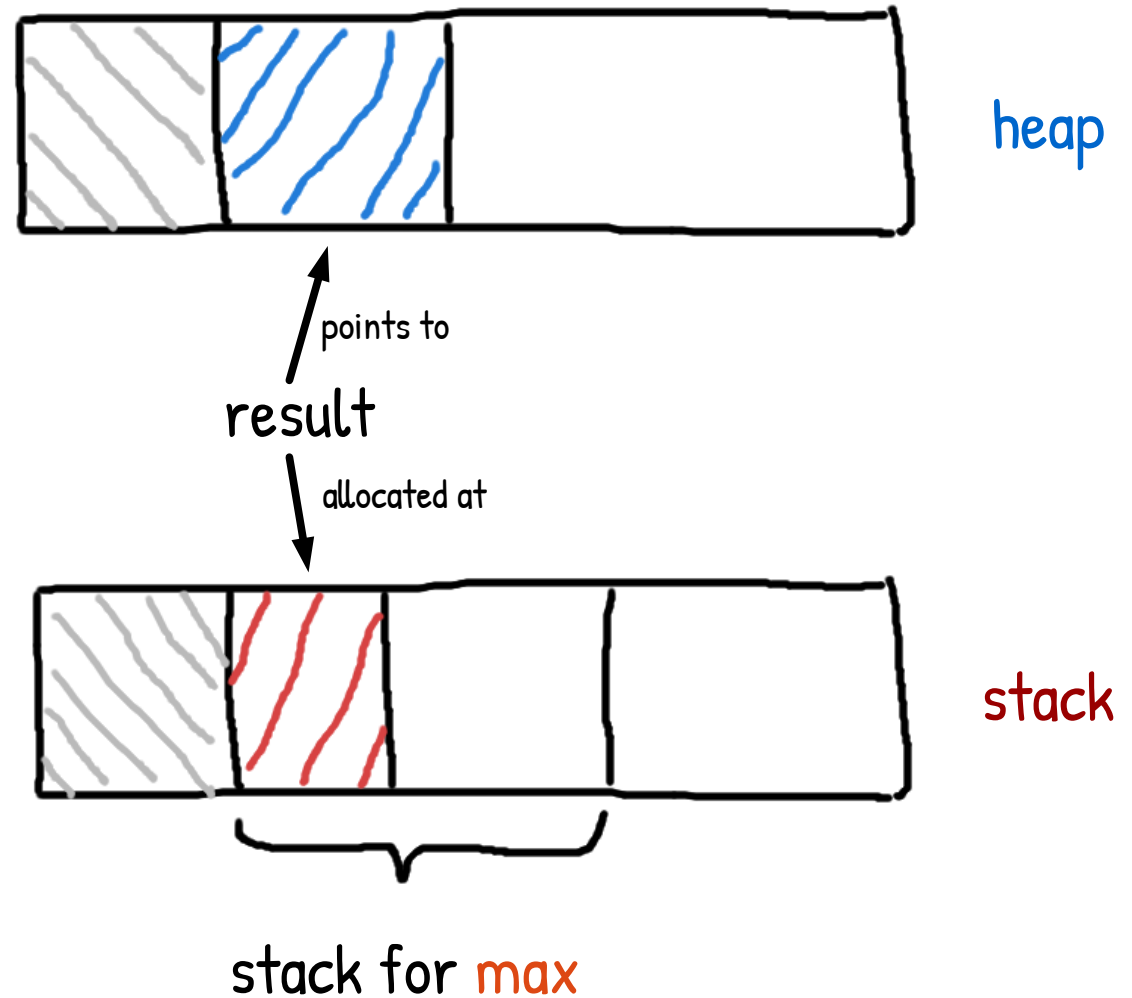
memory for **max** deallocated

History: the heap

```
#include <stdio.h>
#include <stdlib.h>

int *max(int first, int second) {
    int *result = malloc(sizeof(int));
    *result = first;
    if (second > first) {
        *result = second;
    }
    return result;
}

int main(int argc, char *argv[]) {
    int *myMax = max(2,5);
    printf("max of %d and %d is %d\n",
        2, 5, *myMax);
    free(myMax);
}
```



Memory allocation in Go

```
package main

import `fmt`

func max(first, second int) int {
    var result int = first
    if second > first {
        result = second
    }
    return result
}

func main() {
    fmt.Printf("max of %d and %d is %d\n", 2,
        5, max(2, 5))
}
```

Where is **result** allocated?



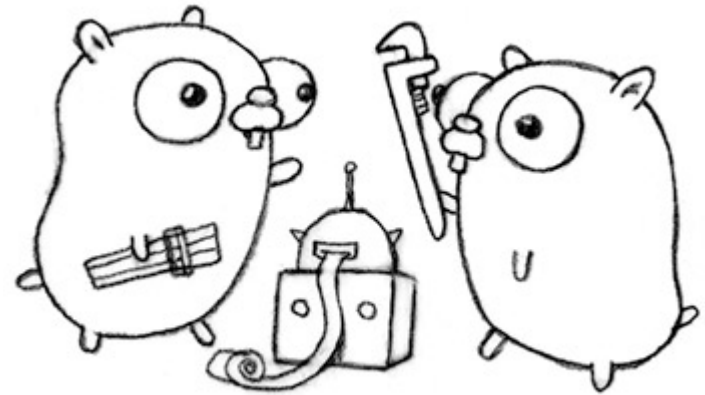
Memory allocation in Go

```
package main
import `fmt`

type Gopher struct {
    Weight int
}

func breed(first, second *Gopher) *Gopher {
    return &Gopher{(first.Weight+second.Weight)/2}
}

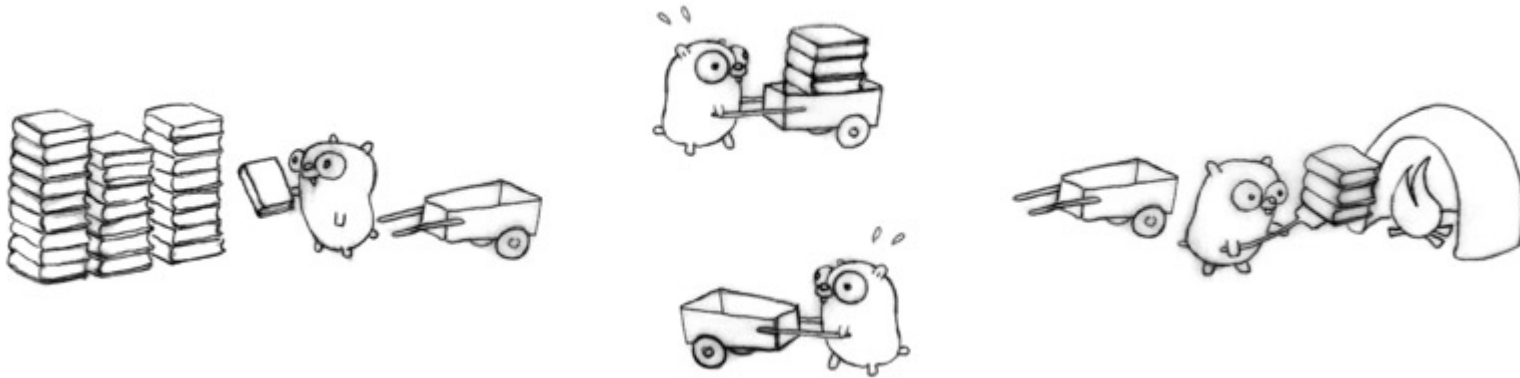
func main() {
    dad := Gopher{200}
    mom := Gopher{250}
    fmt.Printf("%v plus %v is %v\n",
        dad, mom, breed(&dad, &mom))
}
```



Where is the kid Gopher?

the Garbage Collector

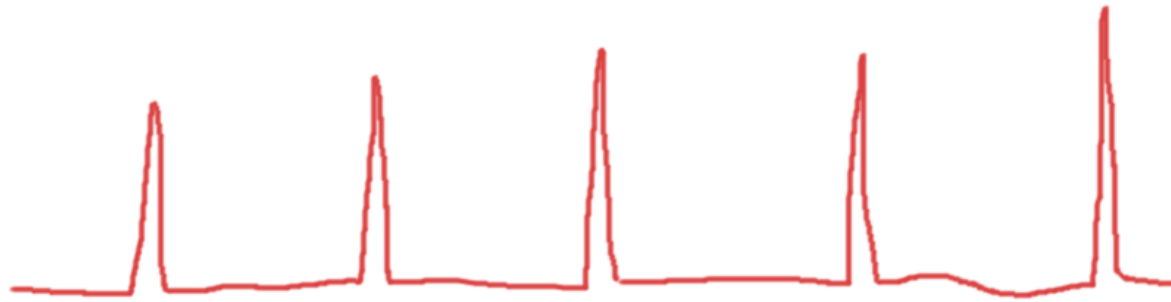
- To clean up heap memory that nobody cares about



GC in action

Why should you care?

- Go GC is a stop-the-world mark & sweep garbage collector
 - > i.e: no code running when GC
 - > i.e: slow response or timeout



i.e: timeout spike

Why should you care?

- Example: money transfer:

A -> [send money from user X to Y] -> B

A (waiting for ACK)..... -> B (GC. stopped)

A (timeout->failed)..... -> B (ran & ACK)

A (resend before getting ACK) -> B

Tuning

- `GOGC = X` (default = 100)
- `GOGC=off`
- `runtime/debug/#SetGCPercent.`
- `-gctrace, -gcdead`

Questions?