Virtual Memory and Heap

CS 241

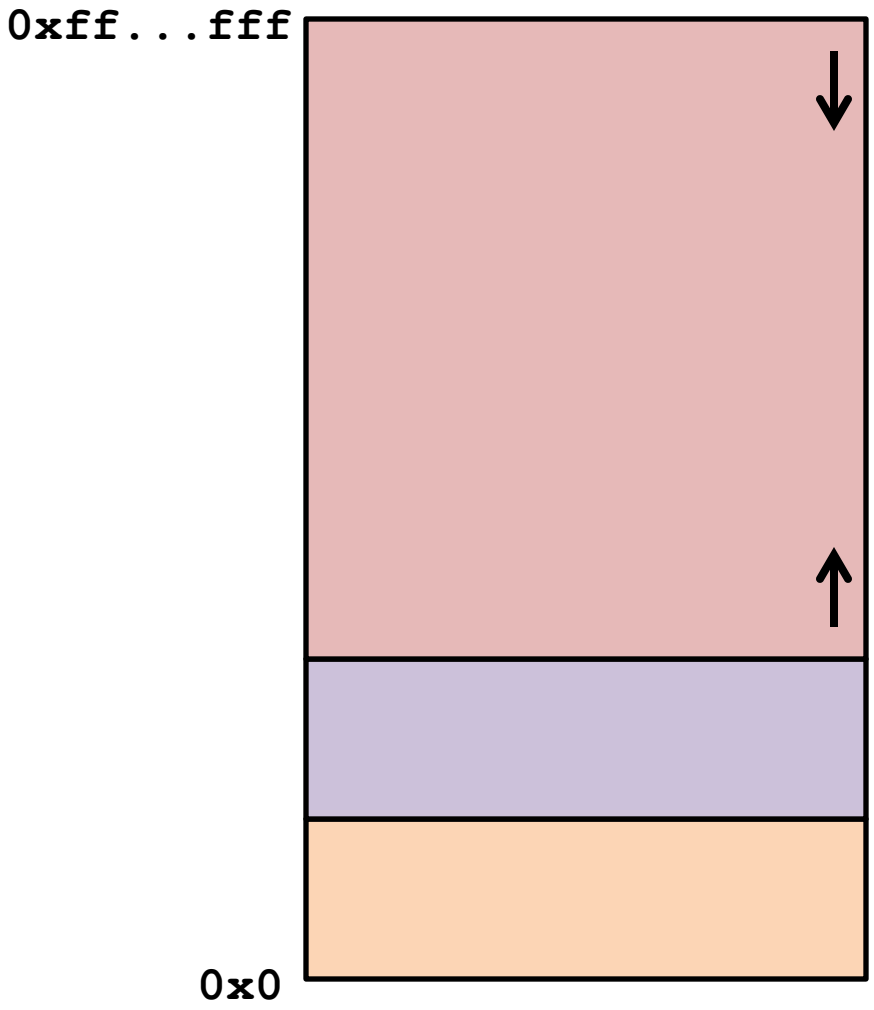
```
#include <stdio.h>
#include <stdlib.h>

int a;

void a() {
    int b;
}

void main() {
    int c;
    void *d = malloc(100);
    char *e = "Hello World";
}
```

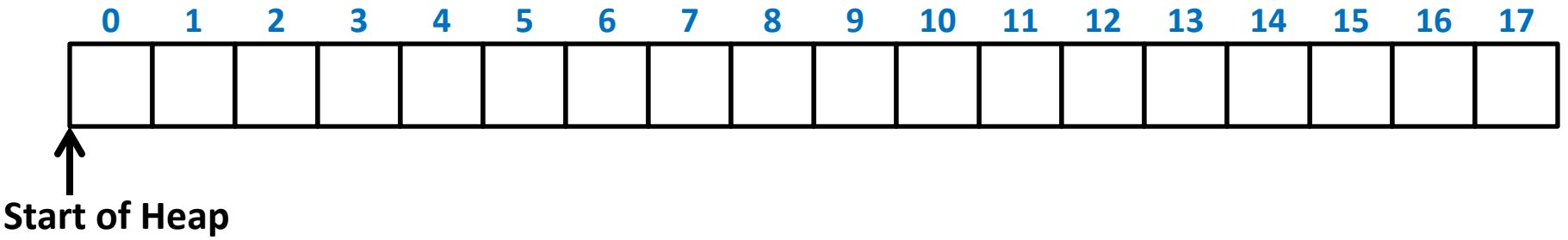
Memory Layout



Virtual Memory Address

- Every memory address your program sees is a **Virtual Memory Address**.
  - Program has an addressable space of several GB or TB. (0x0 – 0xFF…FFF)
  - Each virtual address space is unique to each process.
    - Two processes have different data in %p = 0x200.

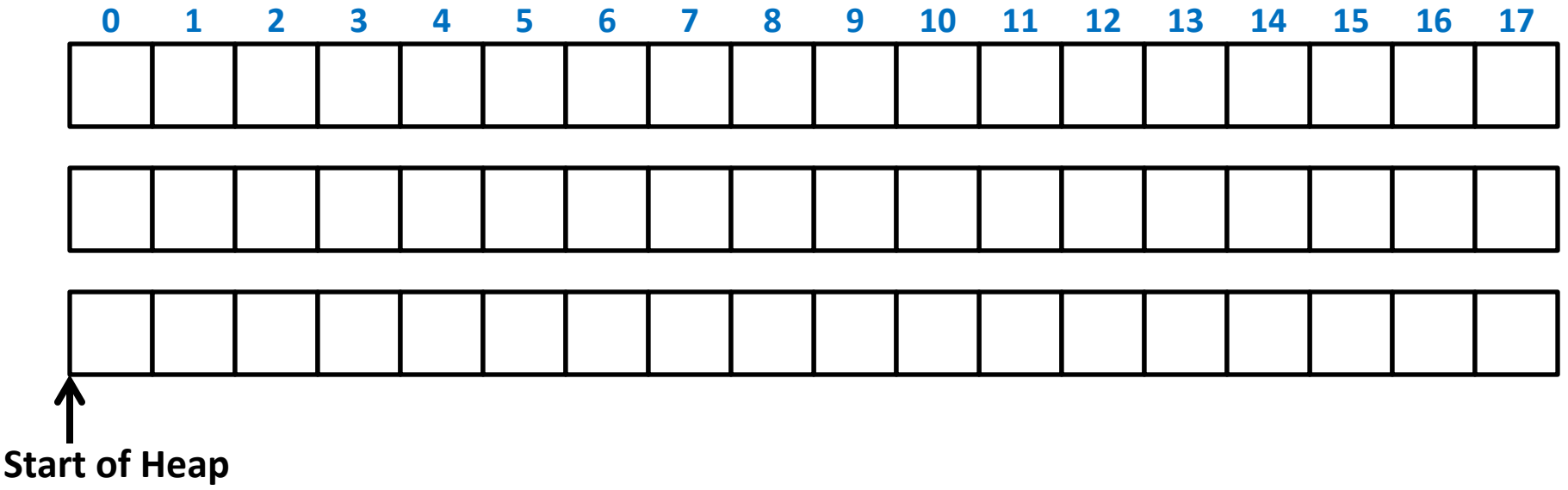
```
void main() {
    void *a = malloc(  3 );
    void *b = malloc(  6 );
    void *c = malloc(  4 );
    free(b);
    void *d = malloc(  5 );
    free(c);
    void *e = malloc(  4 );
}
```



Heap Memory Strategies

- Best Fit
- Worst Fit
- Next Fit
- First Fit

```
void main() {
    void *a = malloc(  3 );
    void *b = malloc(  6 );
    void *c = malloc(  4 );
    free(b);
    void *d = malloc(  5 );
    free(c);
    void *e = malloc(  4 );
}
```



Advantages/Disadvantages

- Best Fit
- Worst Fit
- Next Fit
- First Fit

Why won’t these strategies work as-is?