Mr C plays Ring'a-Ring'o Roses!

ESC101: Fundamentals of Computing

Purushottam Kar

Lab Exam (Sun, 04 Nov)

- Morning exam (Mon, Tue batches)
  - 10:30 AM - 2 PM – starts 10:30 AM sharp
  - **CC-01**: B2, {B1 even roll numbers}
  - **CC-02**: B4, B5, B6
  - **CC-03**: B3
  - **MATH-LINUX**: B13, {B1 odd roll numbers}
- Go see your room during this week's lab
- Be there 15 minutes before your exam 10:15AM
- Cannot switch to afternoon session

Lab Exam (Sun, 04 Nov)

- Evening exam (Wed, Thu batches)
  - 2:30 PM - 6 PM – starts 2:30 PM sharp
  - **CC-01**: B9, {B8 odd roll numbers}
  - **CC-02**: B7, B10, B11
  - **CC-03**: B12
  - **MATH-LINUX**: B14, {B8 even roll numbers}
- Go see your room during this week's lab
- Be there 15 minutes before your exam 2:15 PM
- Cannot switch to morning session

Lab Exam (Sun, 04 Nov)

- **Syllabus** – till structures
- Open handwritten notes – However, **NO** printouts, photocopies, slides, websites, mobile phone, Ipad
- **USE OF ANY OF ABOVE WILL BE CONSIDERED CHEATING**
- Prutor CodeBook will be unavailable during lab exam
- Exam will be like labs - marks for passing test cases
- Marks for writing clean indented code, proper variable names, a few comments – illegible code poor marks

Are Arrays the Best?

Are Arrays the Best?

ADVANTAGES

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type

Allow us to give them very convenient names e.g. arr[i]

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type
Allow us to give them very convenient names e.g. arr[i]
Can access n-th element very very easily – just use arr[n-1]

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type
Allow us to give them very convenient names e.g. arr[i]
Can access n-th element very very easily – just use arr[n-1]
Very easy to set up, can also change size (realloc)

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type
Allow us to give them very convenient names e.g. arr[i]
Can access n-th element very very easily – just use arr[n-1]
Very easy to set up, can also change size (realloc)
Can have arrays of structures as well

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type
Allow us to give them very convenient names e.g. arr[i]
Can access n-th element very very easily – just use arr[n-1]
Very easy to set up, can also change size (realloc)
Can have arrays of structures as well
Inserting a new element at the end of the array simple

Are Arrays the Best?

ADVANTAGES

Allow us to create several variables of a given type
Allow us to give them very convenient names e.g. arr[i]
Can access n-th element very very easily – just use arr[n-1]
Very easy to set up, can also change size (realloc)
Can have arrays of structures as well
Inserting a new element at the end of the array simple

DISADVANTAGES

Are Arrays the Best?

ADVANTAGES

- Allow us to create several variables of a given type
- Allow us to give them very convenient names e.g. arr[i]
- Can access n-th element very very easily – just use arr[n-1]
- Very easy to set up, can also change size (realloc)
- Can have arrays of structures as well
- Inserting a new element at the end of the array simple

DISADVANTAGES

- Inserting in the middle/beginning of array tedious ☹ - need to shift elements one location to make space – can be time consuming too!

Are Arrays the Best?

ADVANTAGES

- Allow us to create several variables of a given type
- Allow us to give them very convenient names e.g. arr[i]
- Can access n-th element very very easily – just use arr[n-1]
- Very easy to set up, can also change size (realloc)
- Can have arrays of structures as well
- Inserting a new element at the end of the array simple

DISADVANTAGES

- Inserting in the middle/beginning of array tedious ☹ - need to shift elements one location to make space – can be time consuming too!
- Realloc is an expensive procedure – Mr C has to find new space for the enlarged array, allocate that space and then copy all old elements one by one ☹

Are Arrays the Best?

ADVANTAGES

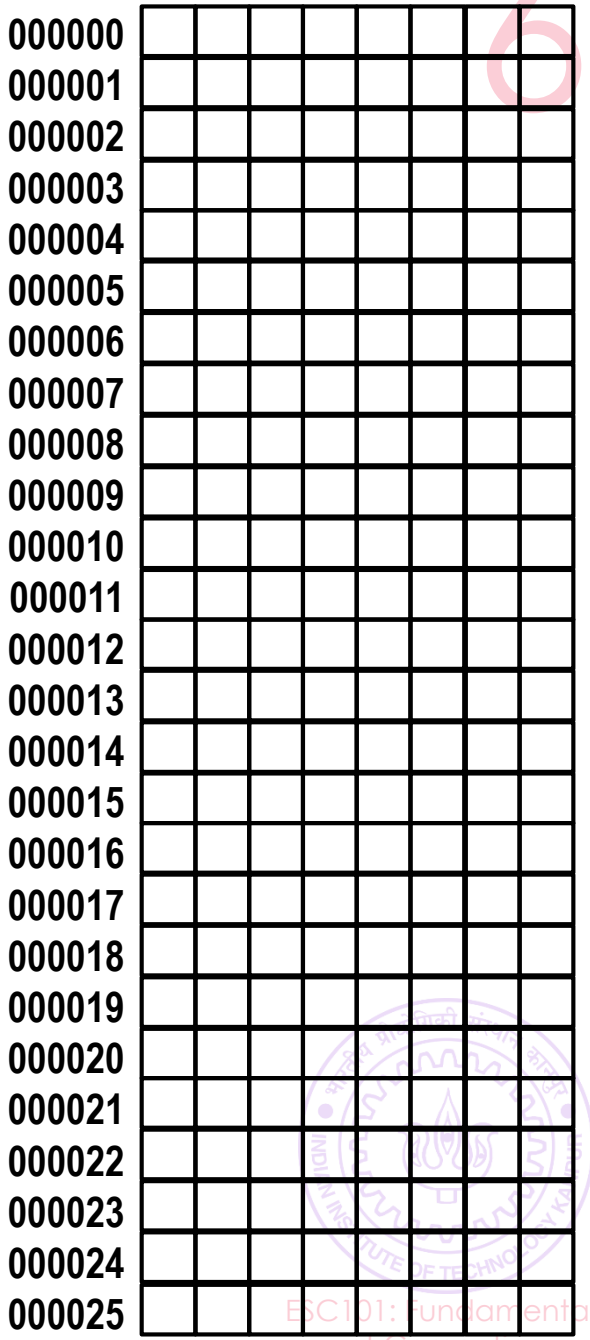
- Allow us to create several variables of a given type
- Allow us to give them very convenient names e.g. arr[i]
- Can access n-th element very very easily – just use arr[n-1]
- Very easy to set up, can also change size (realloc)
- Can have arrays of structures as well
- Inserting a new element at the end of the array simple

DISADVANTAGES

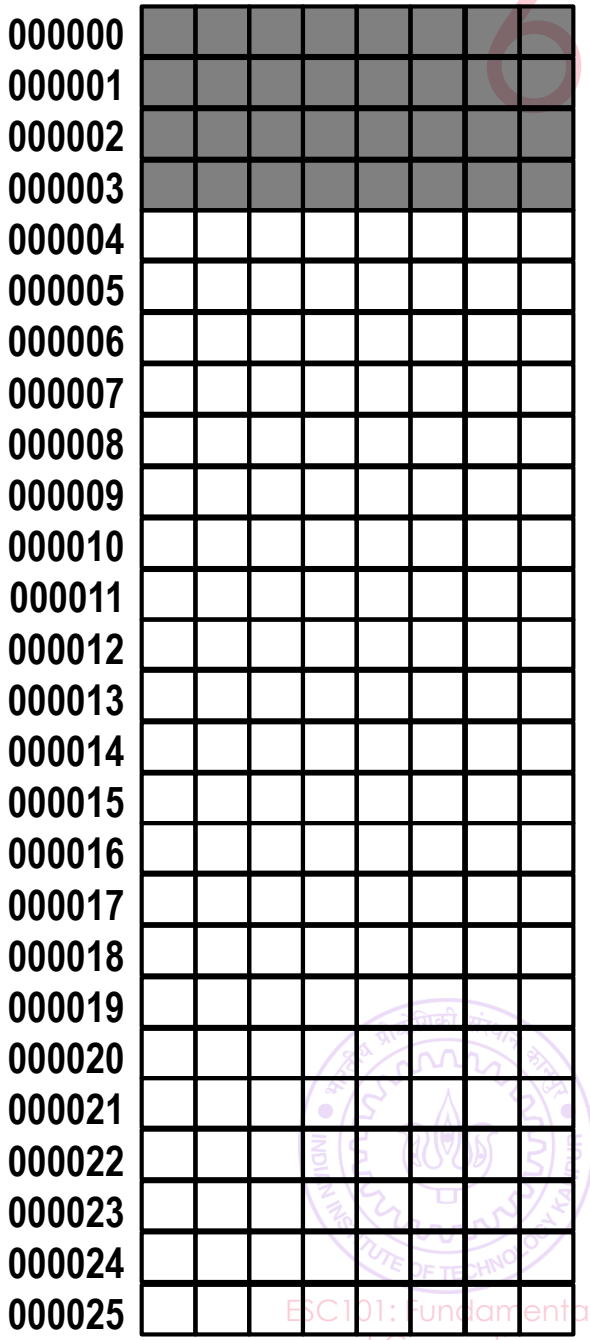
- Inserting in the middle/beginning of array tedious ☹ - need to shift elements one location to make space – can be time consuming too!
- Realloc is an expensive procedure – Mr C has to find new space for the enlarged array, allocate that space and then copy all old elements one by one ☹
- Sometimes if there is not enough memory, realloc may just fail and return a NULL pointer ☹

Realloc can fail!

Realloc can fail!

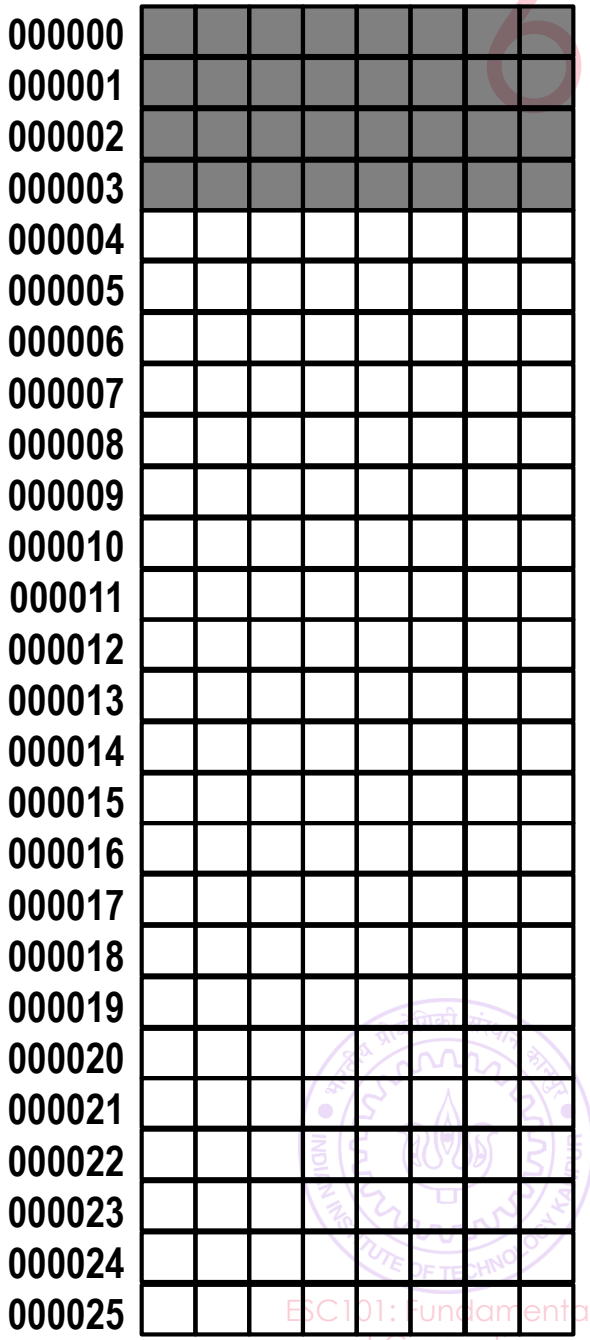


Realloc can fail!



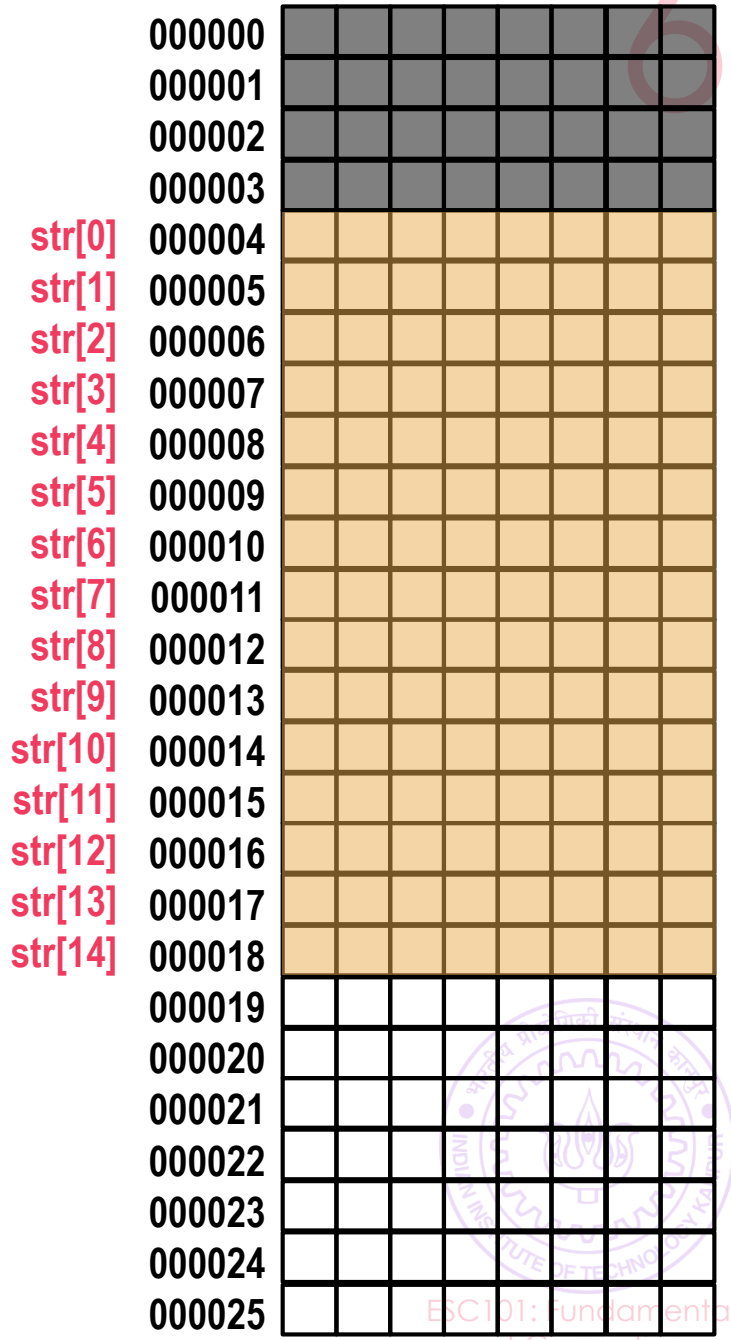
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
```



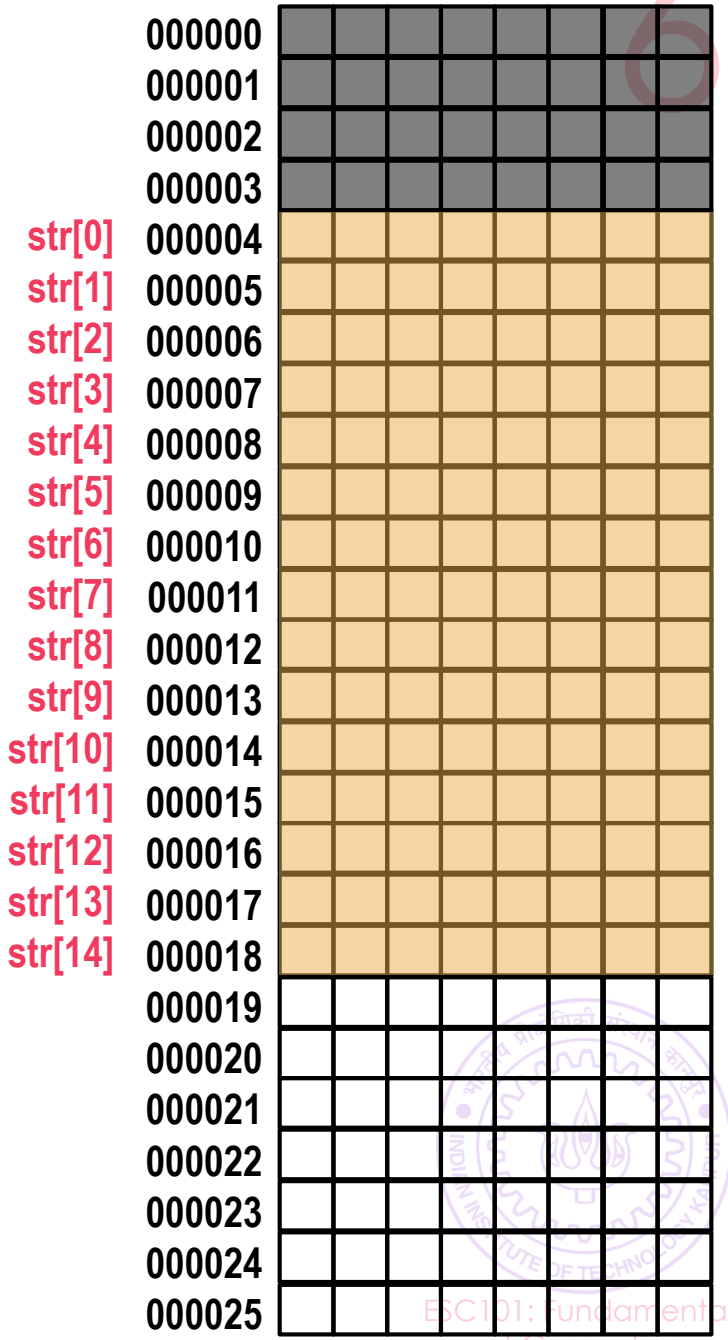
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
```



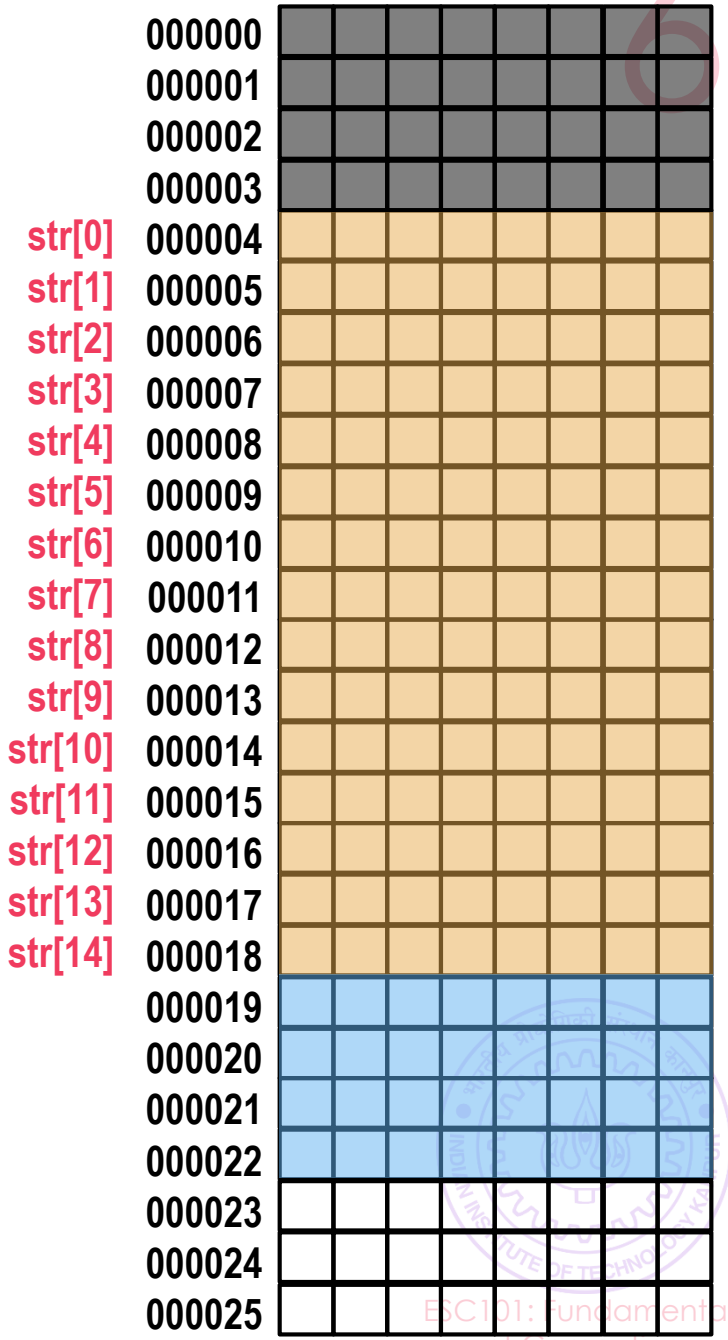
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
```



Realloc can fail!

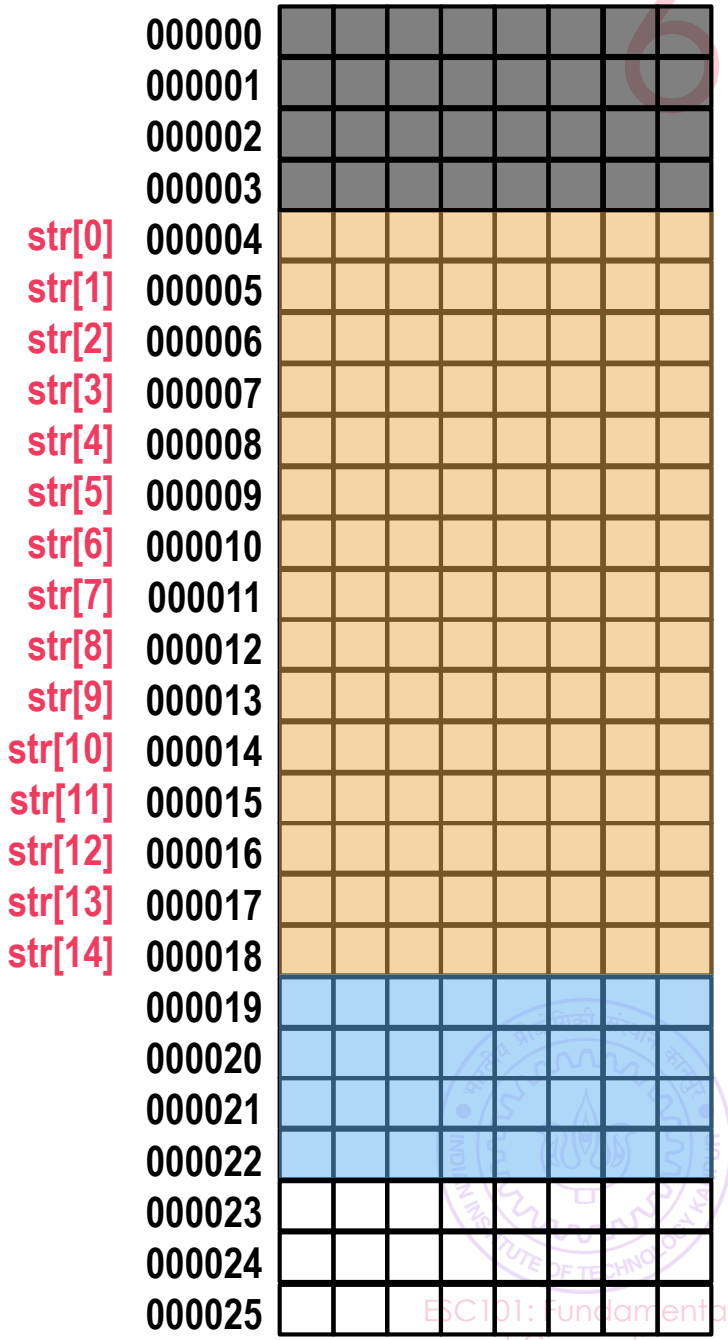
```
char *str = (char*)malloc(15 * sizeof(char));
int a;
```



Realloc can fail!

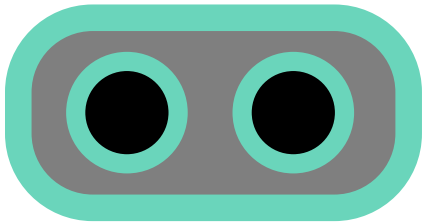
```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
```

a

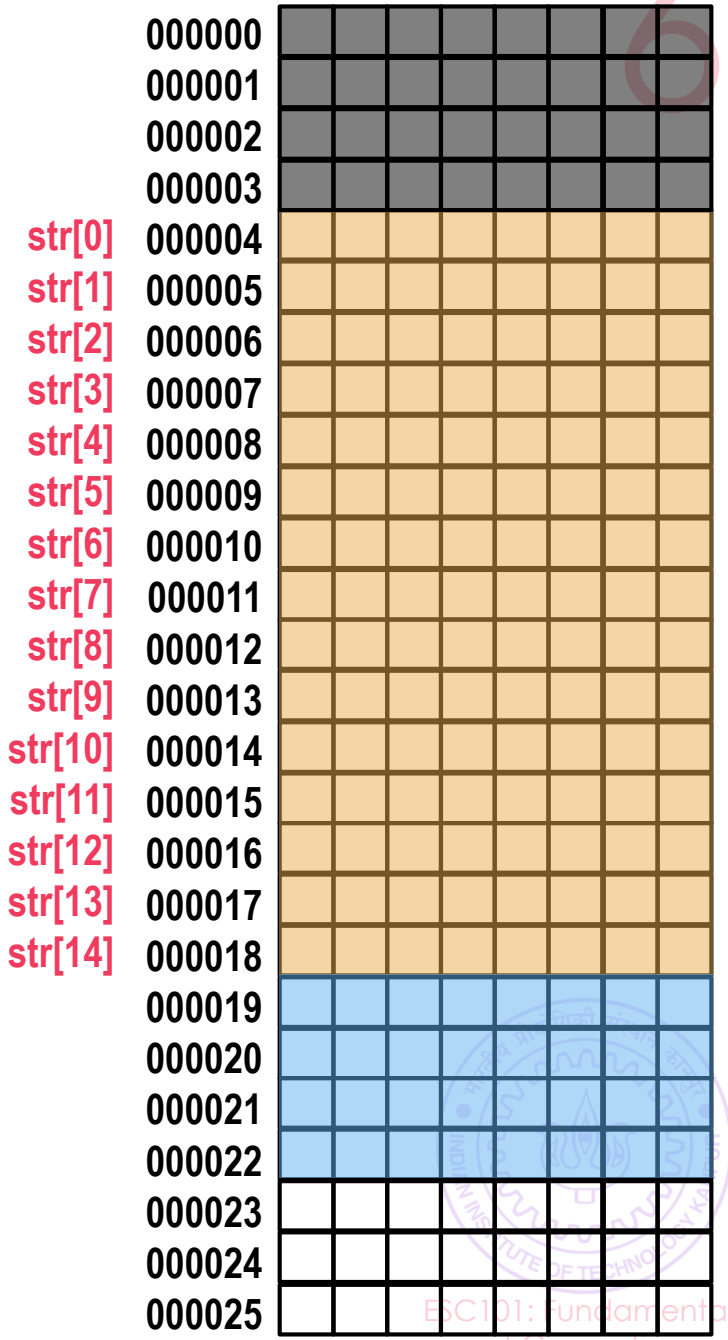


Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
```

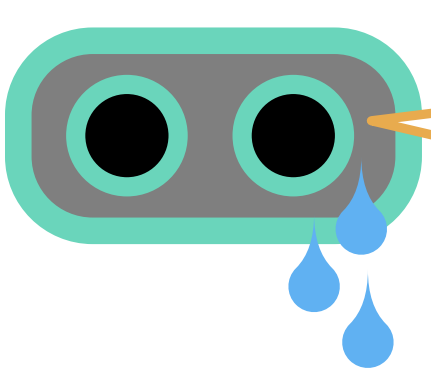


a

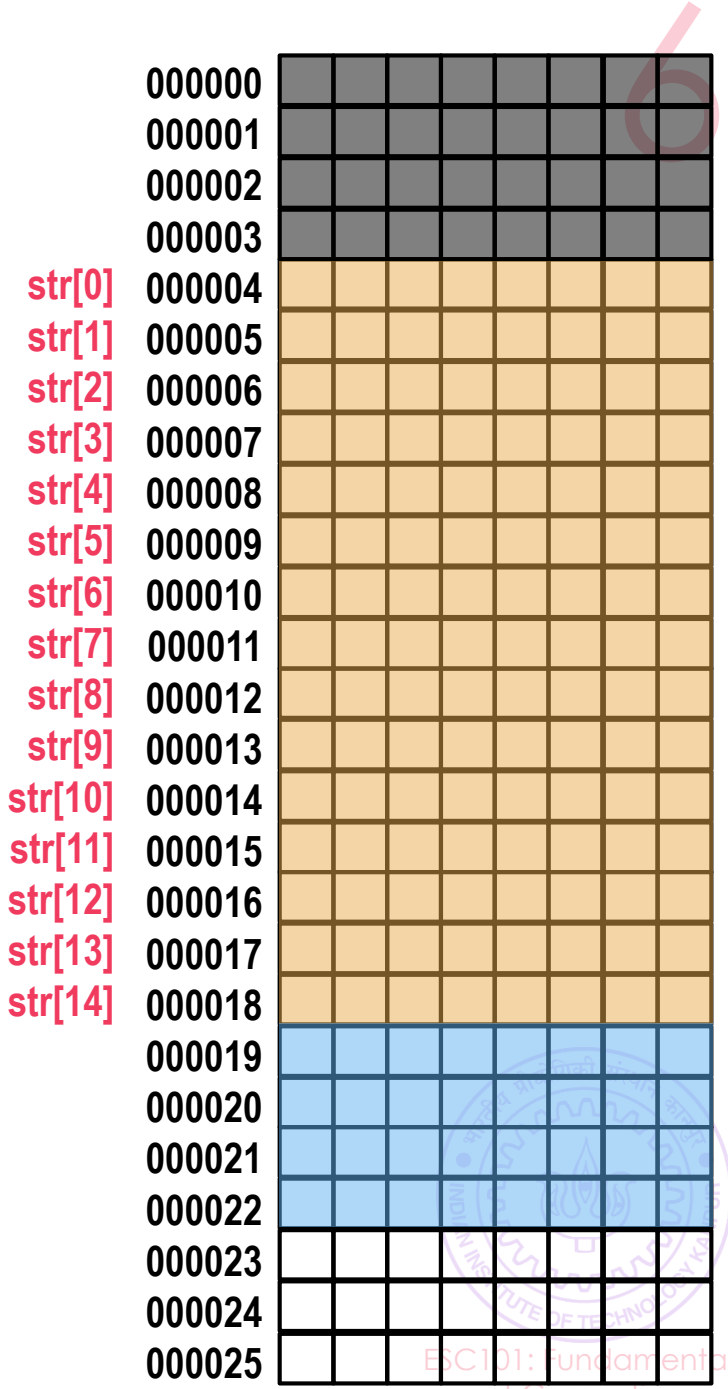


Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
```

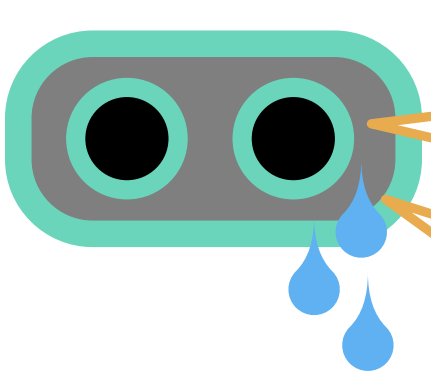


No more memory left for me to create a char array of length 18



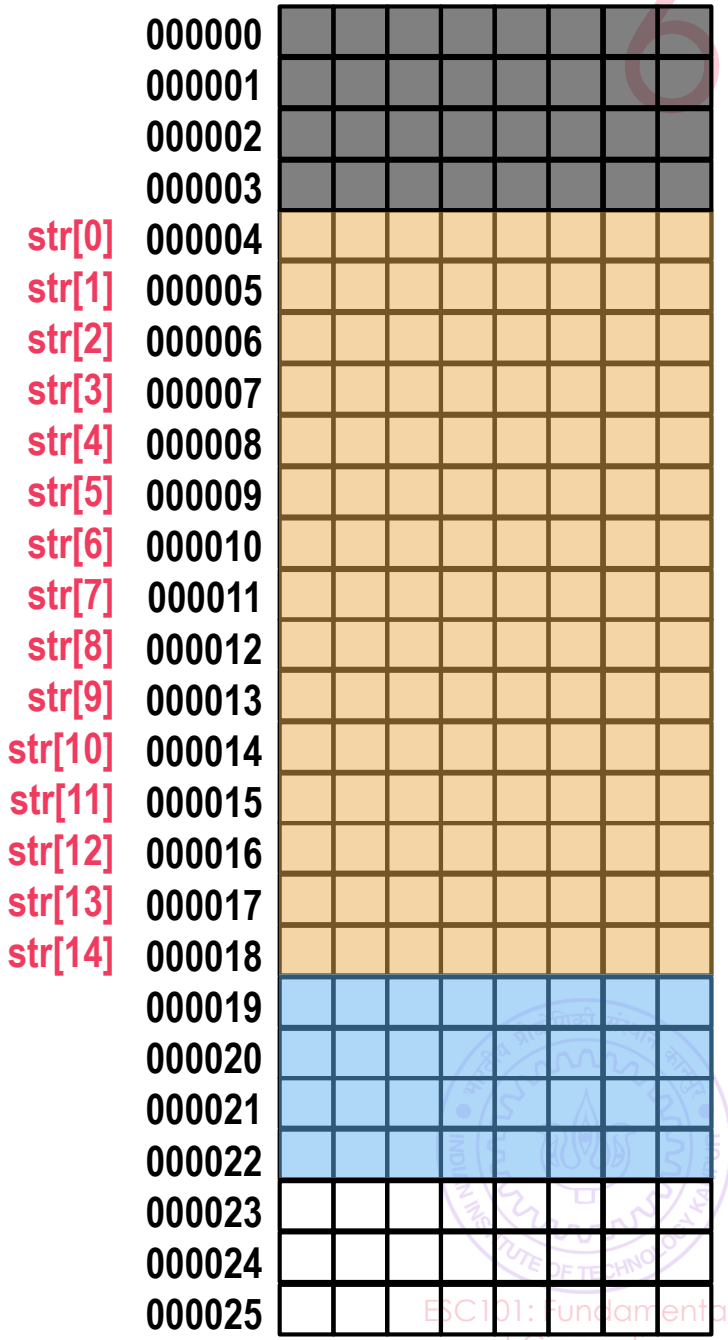
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
```



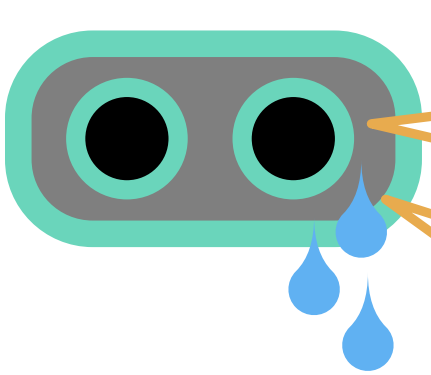
No more memory left for me to create a char array of length 18

I only have enough space to create a char array of length 3



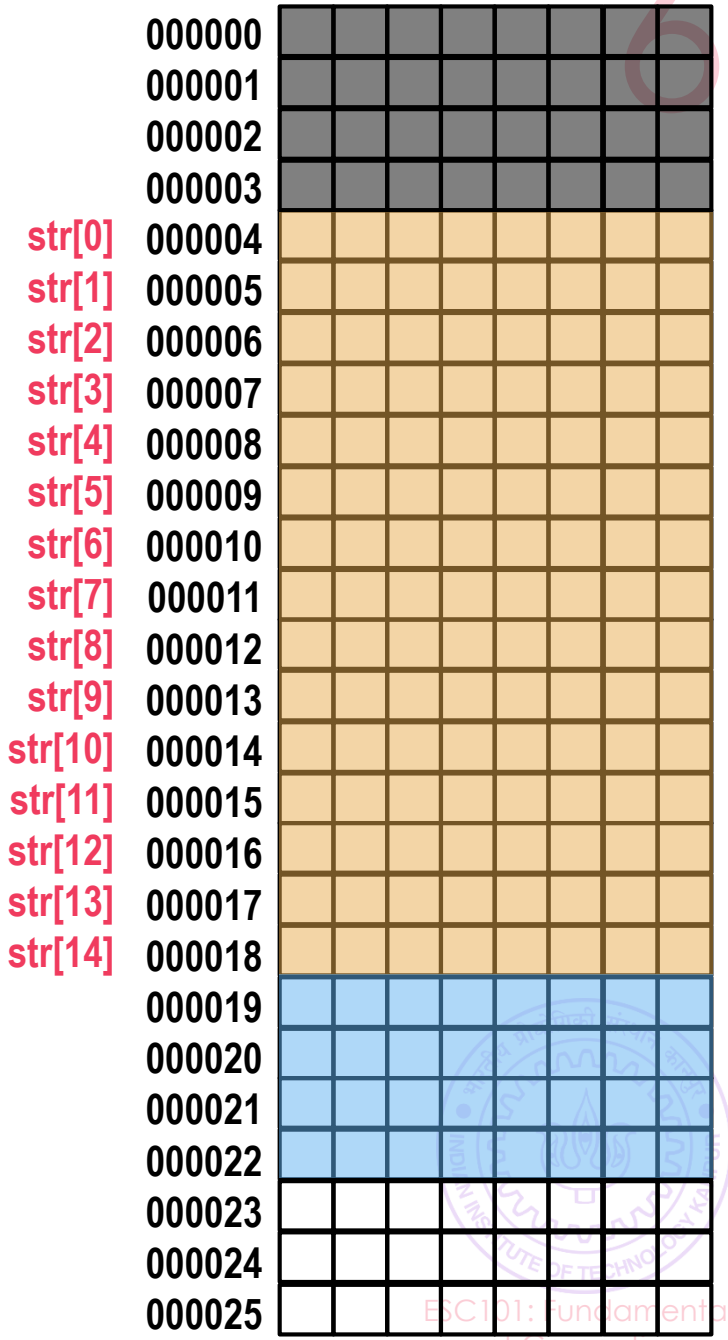
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```



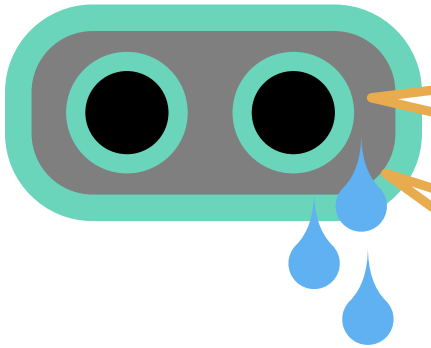
No more memory left for me to create a char array of length 18

I only have enough space to create a char array of length 3



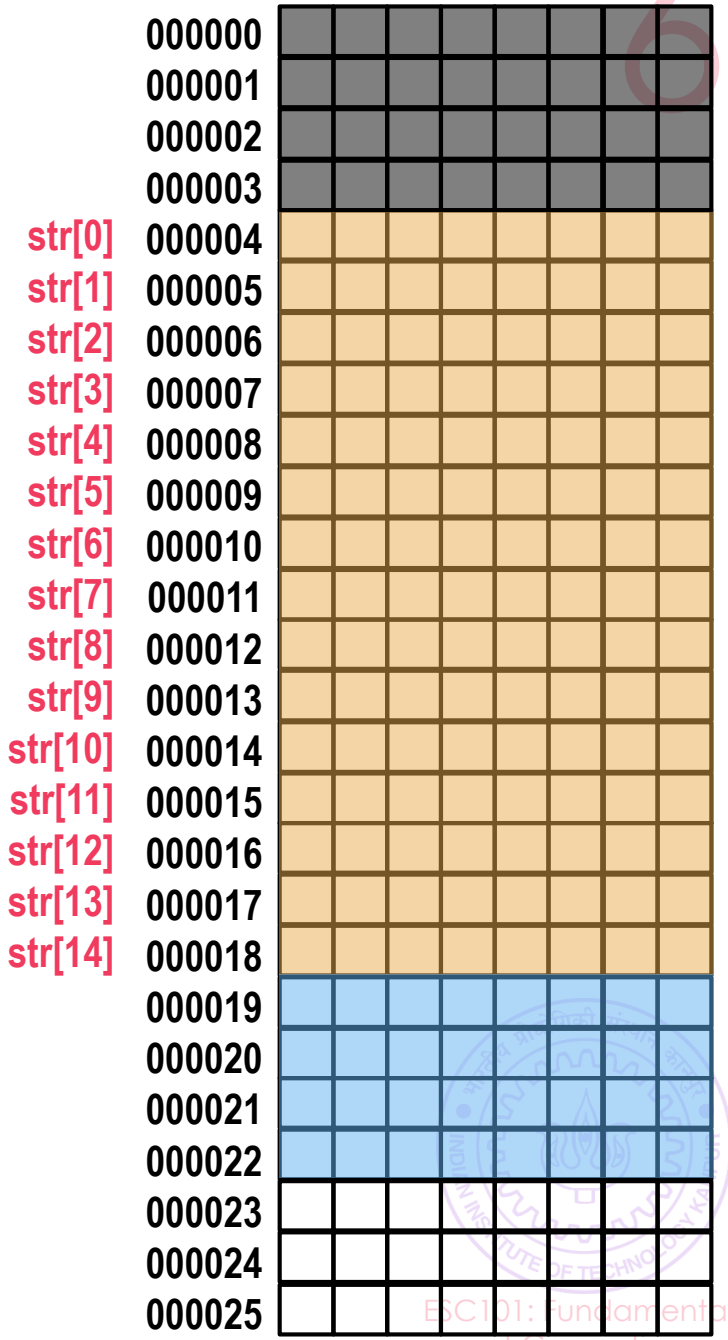
Realloc can fail!

```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```



No more memory left for me to create a char array of length 18

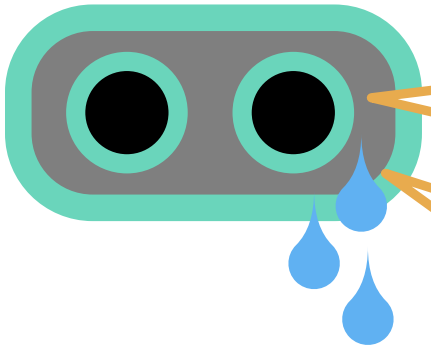
I only have enough space to create a char array of length 3



Rea

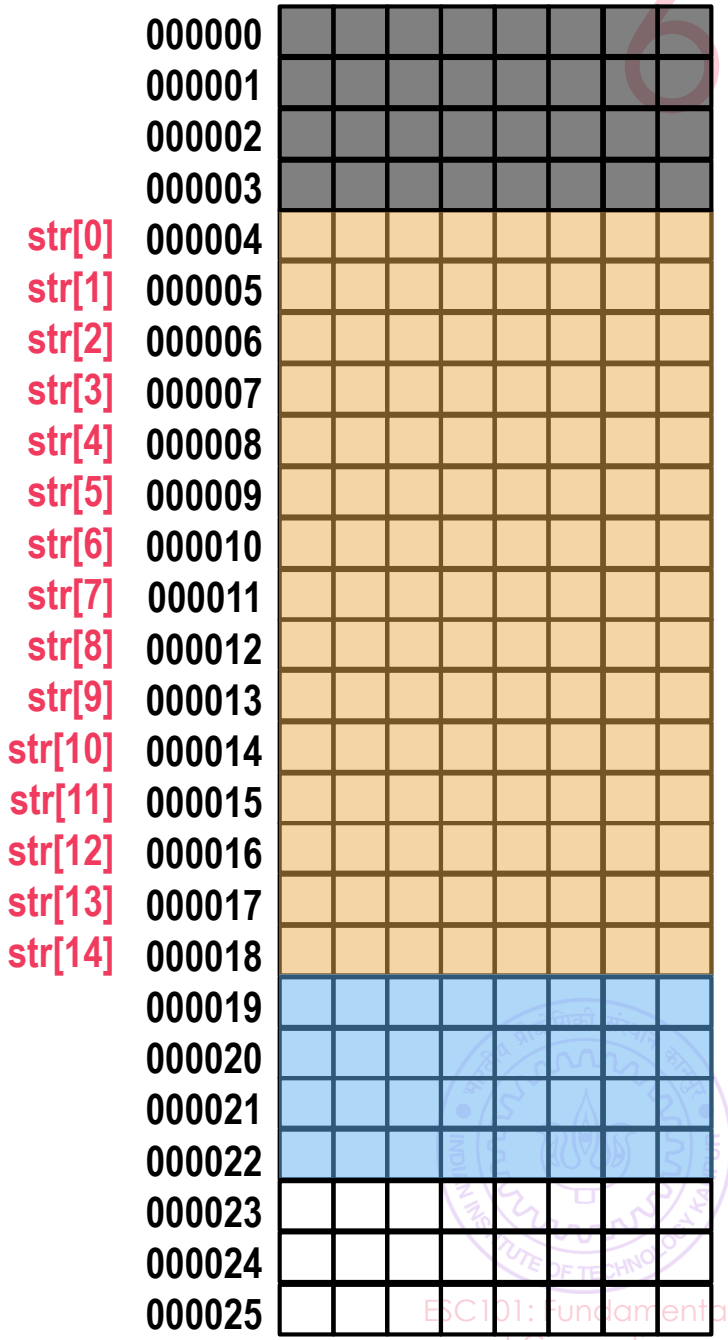
So close! We did have space for 18 characters, just not contiguous space

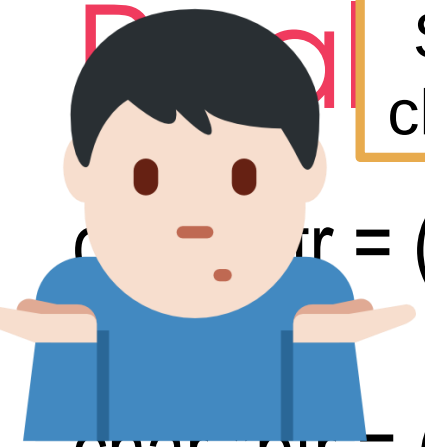
```
char *str = (char*)malloc(15 * sizeof(char));
int a;
char *ptr = (char*)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```



No more memory left for me to create a char array of length 18

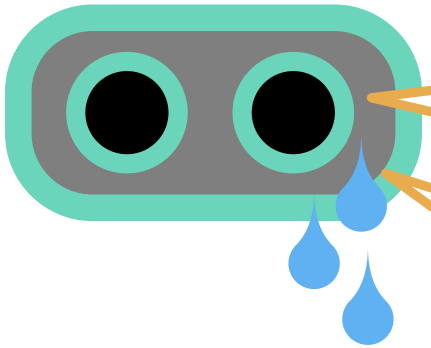
I only have enough space to create a char array of length 3





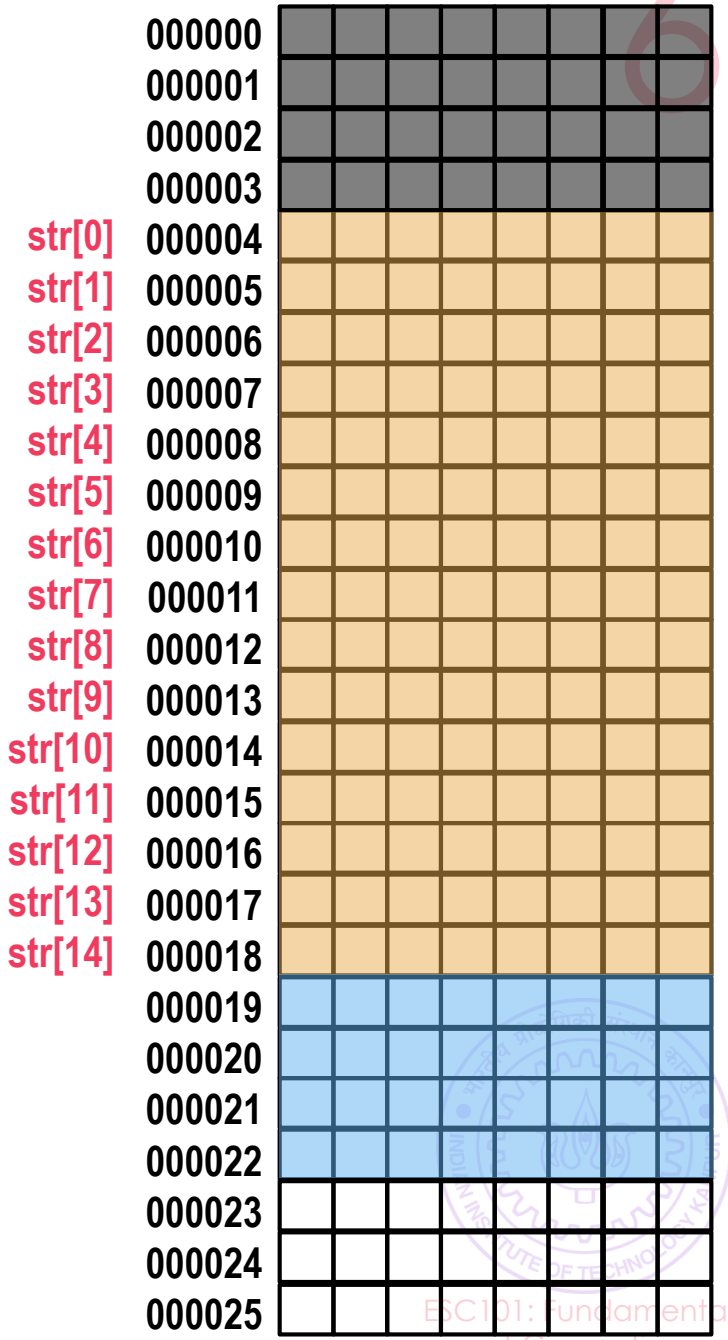
So close! We did have space for 18 characters, just not contiguous space

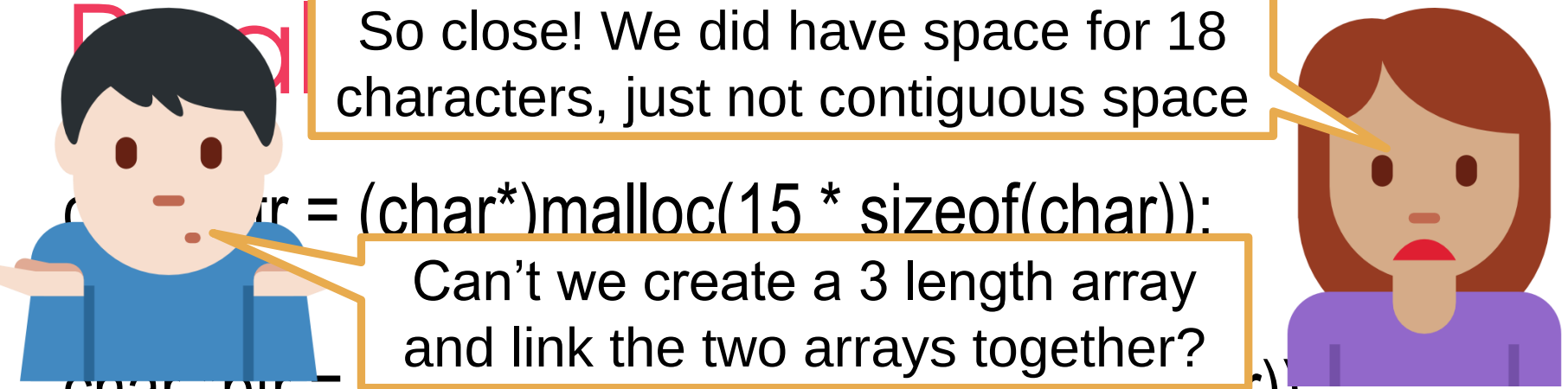
```
(  r = (char*)malloc(15 * sizeof(char));

char* ptr = (char*)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```



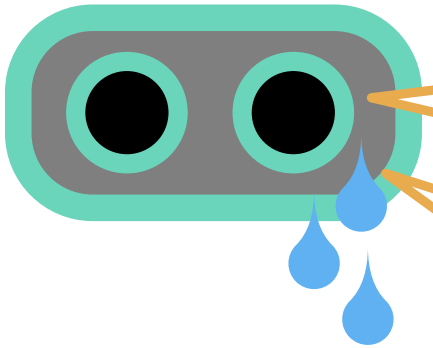
No more memory left for me to create a char array of length 18

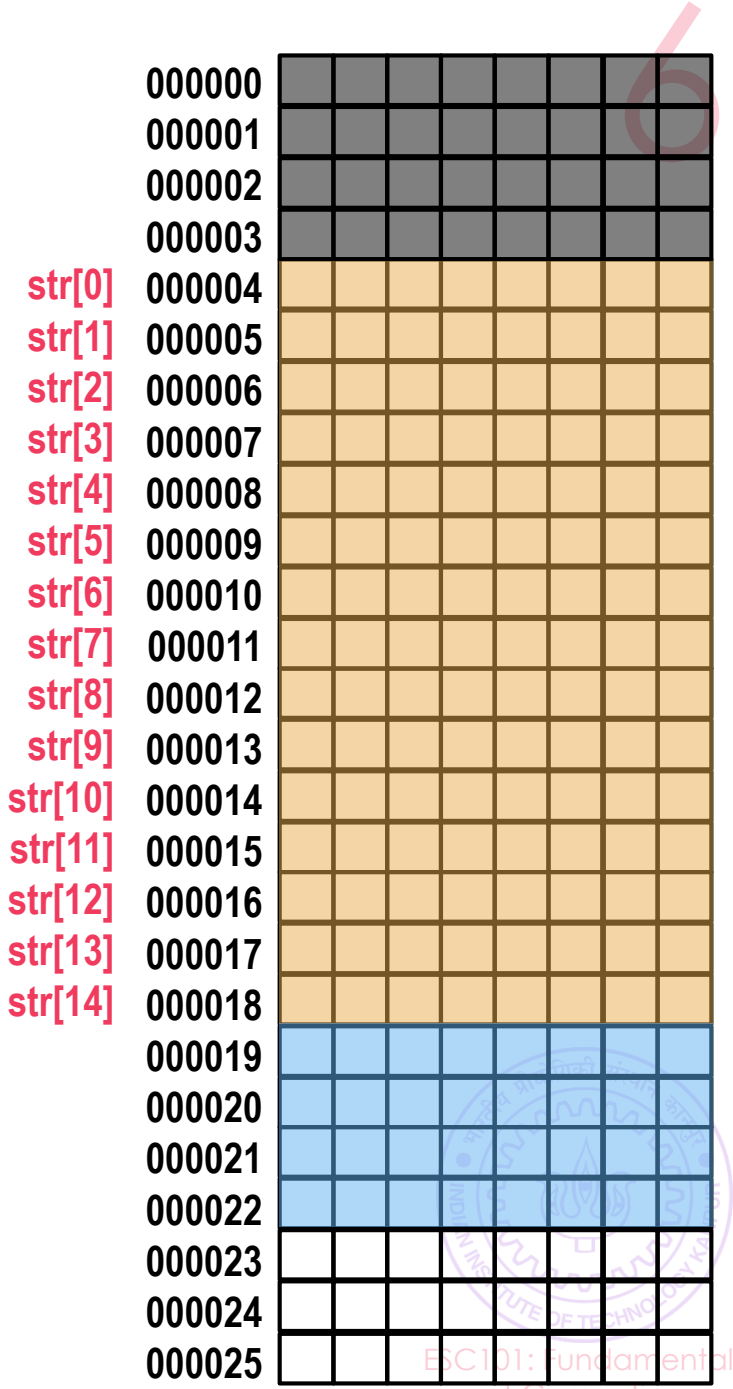
I only have enough space to create a char array of length 3

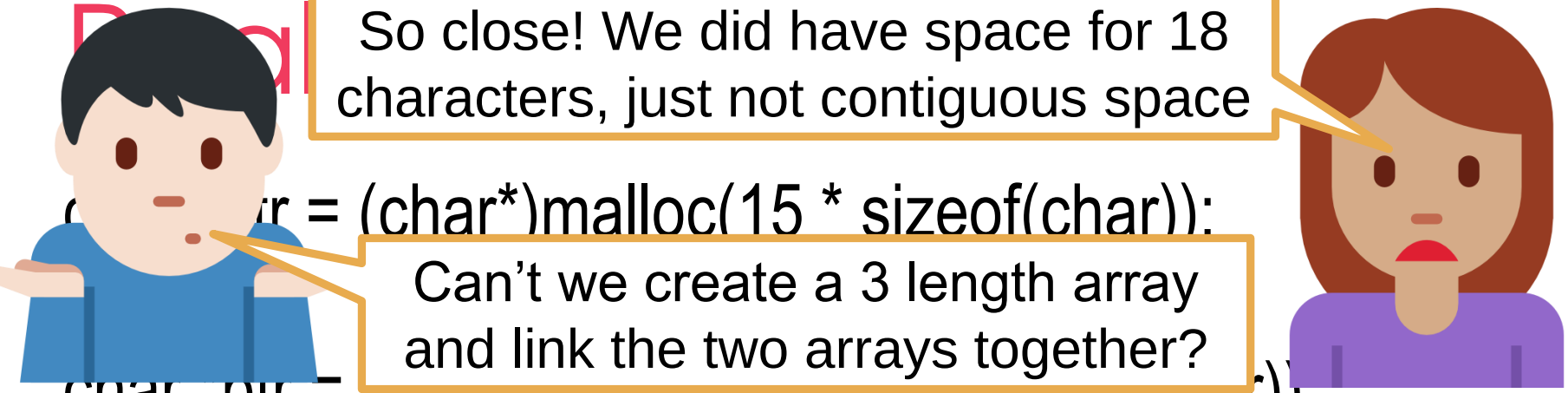




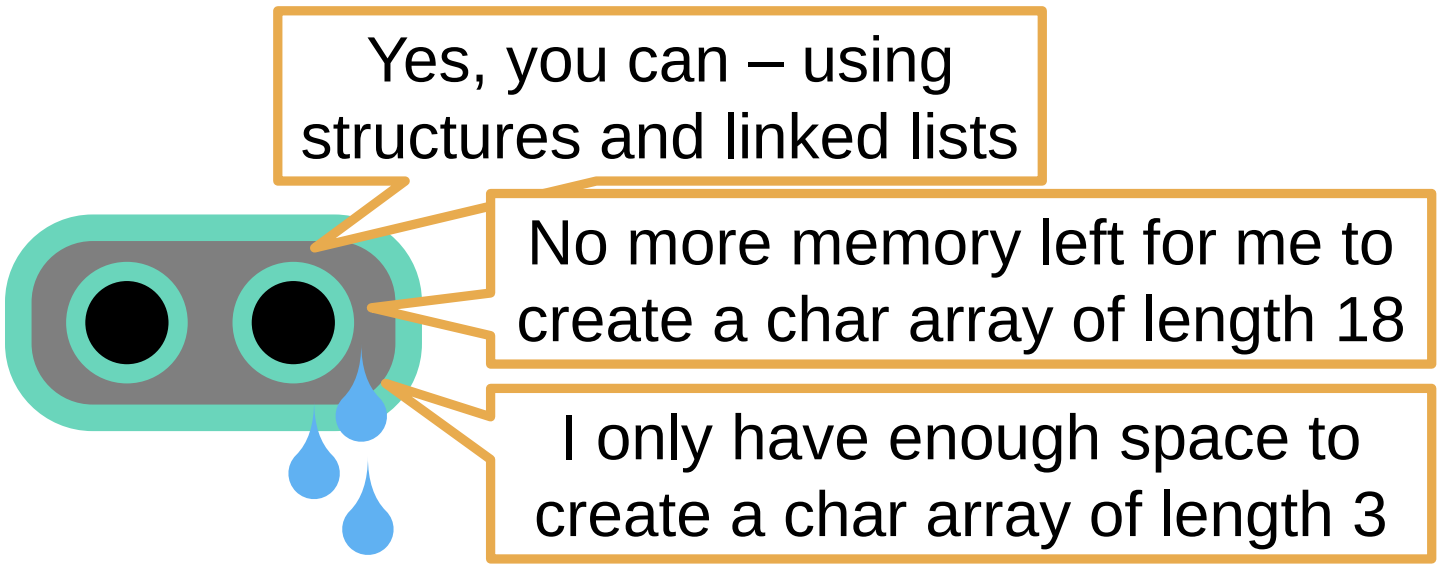

```
r = (char*)malloc(15 * sizeof(char));
char *ptr = (char *)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```

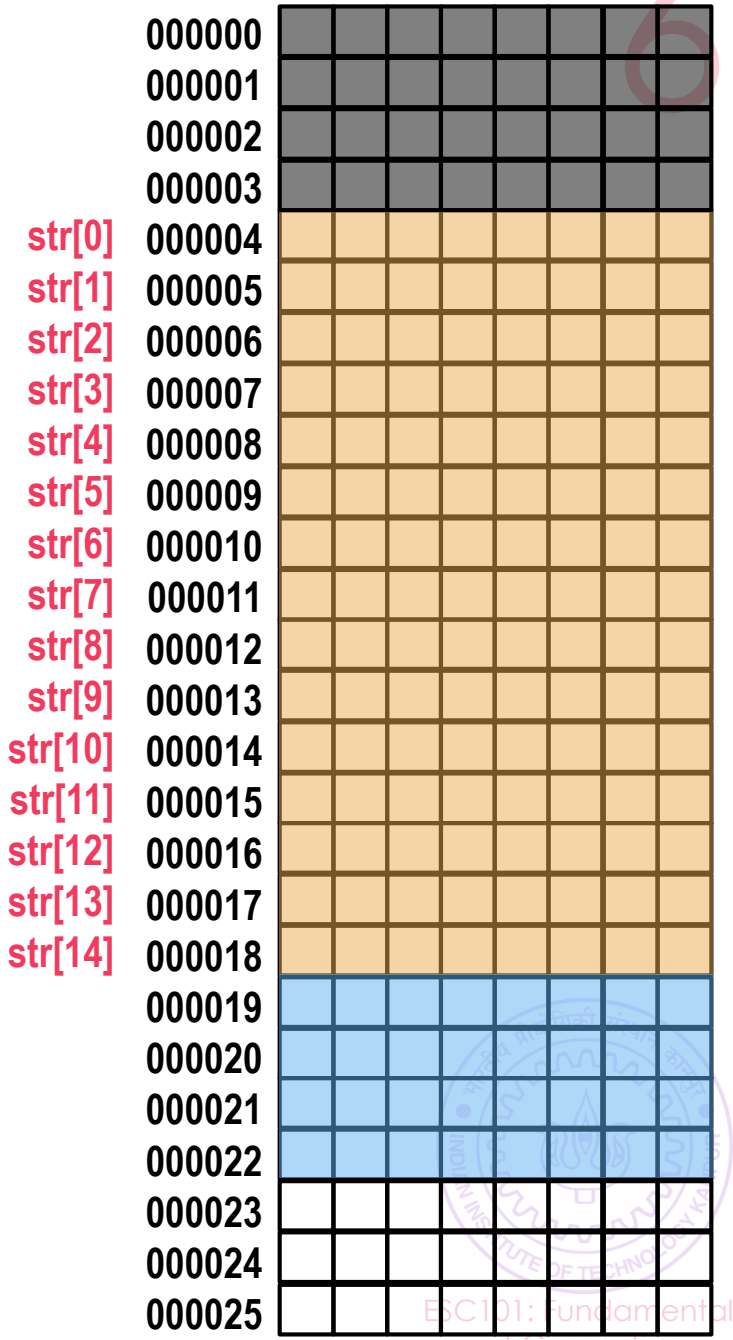






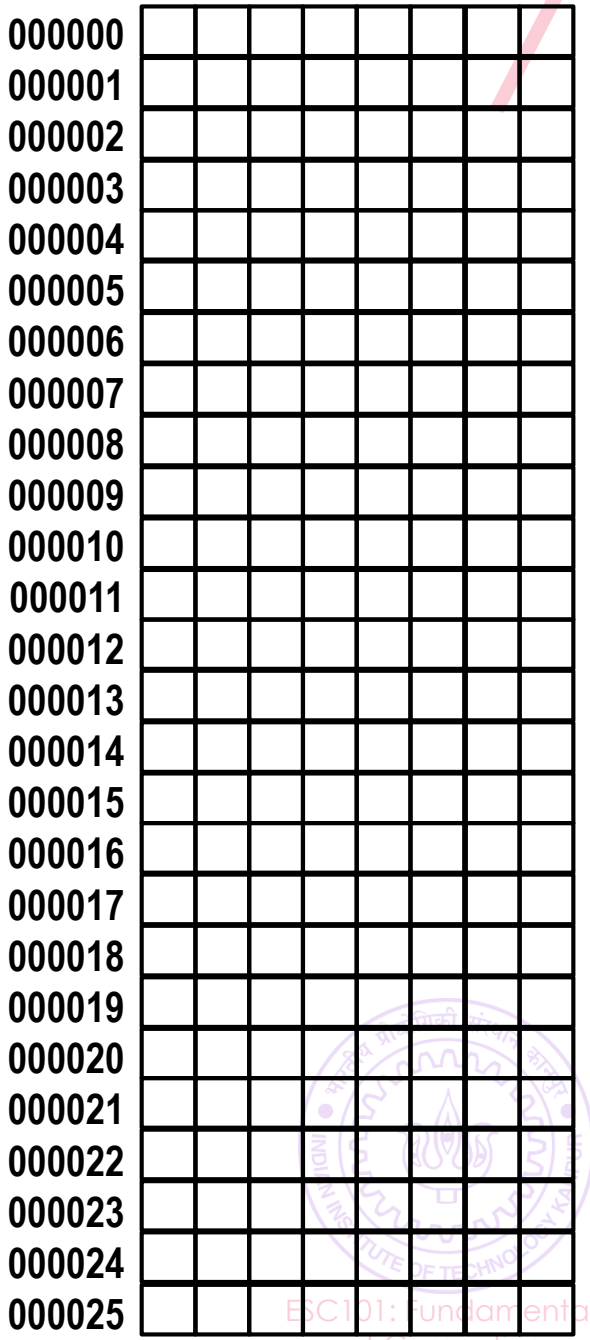

```
r = (char*)malloc(15 * sizeof(char));
char *ptr = (char *)realloc(str, 18 * sizeof(char));
if(ptr != NULL)
    str = ptr;
```



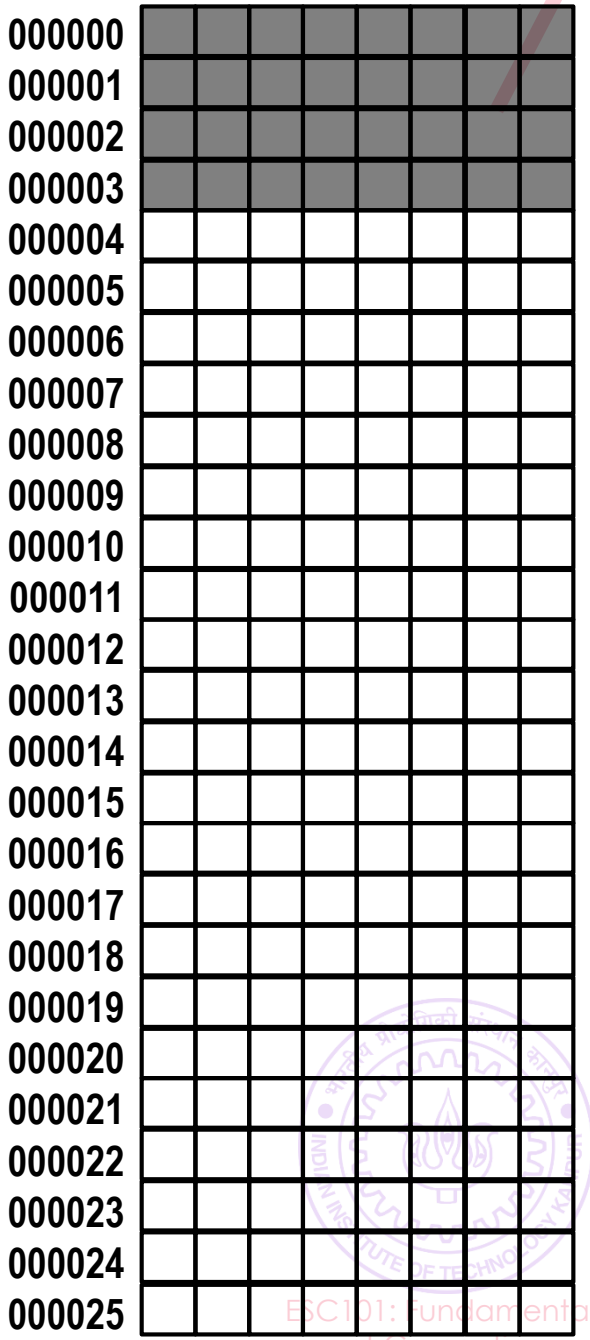


Linked Lists

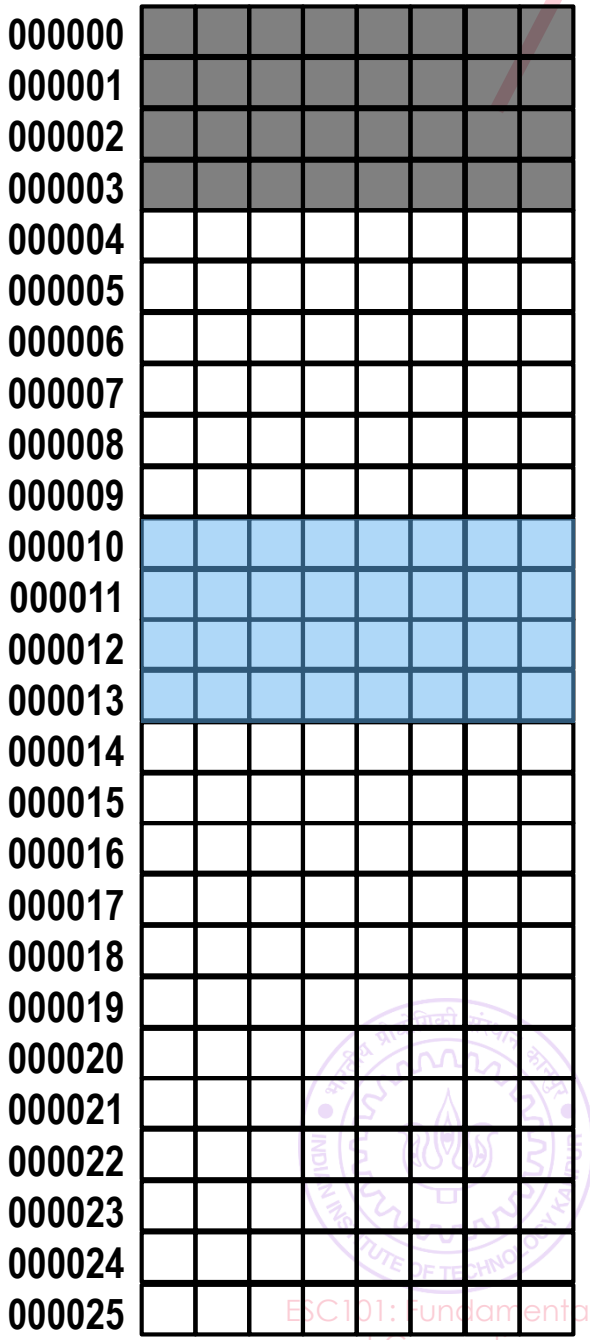
Linked Lists



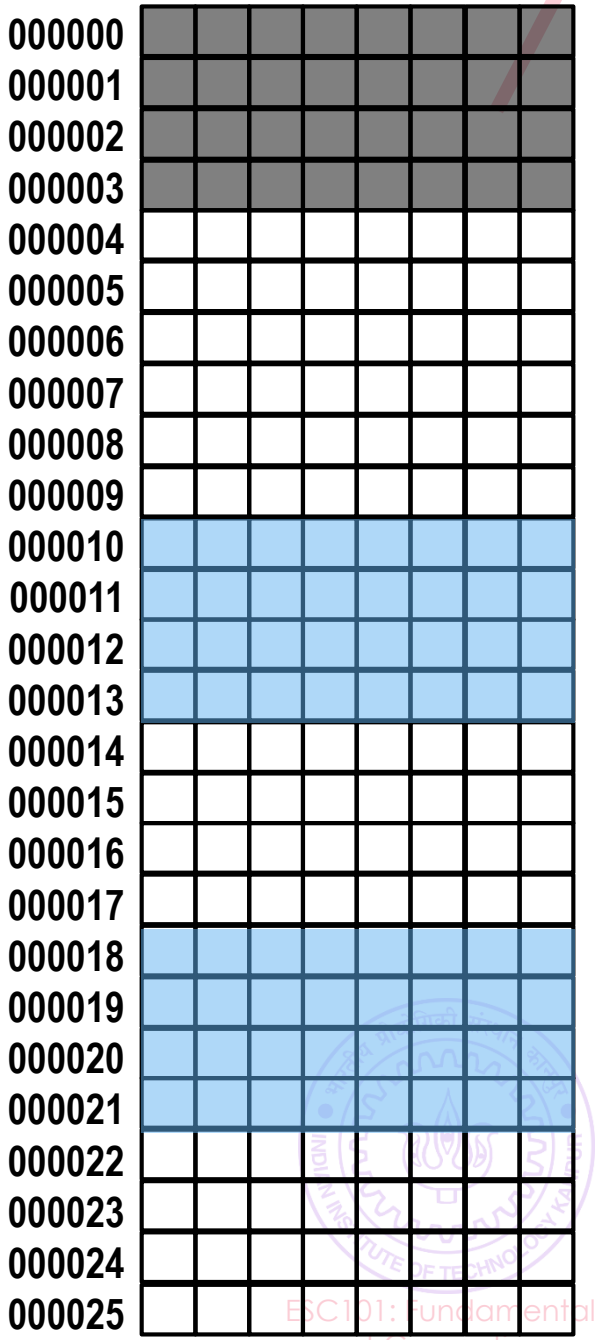
Linked Lists



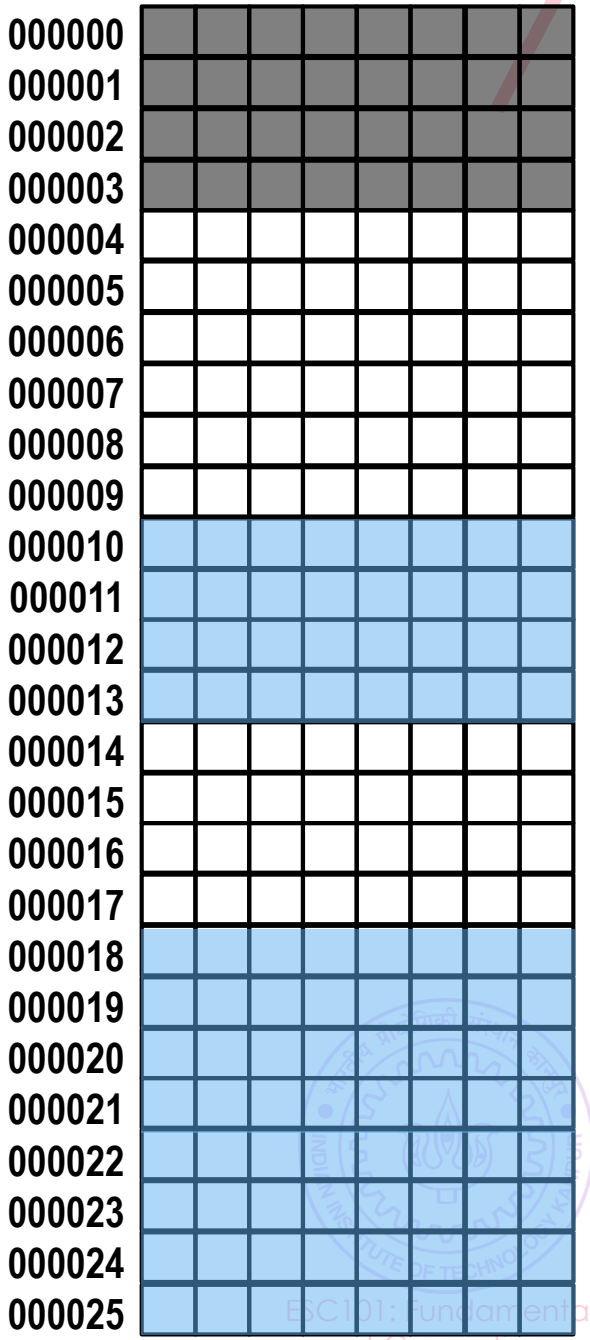
Linked Lists



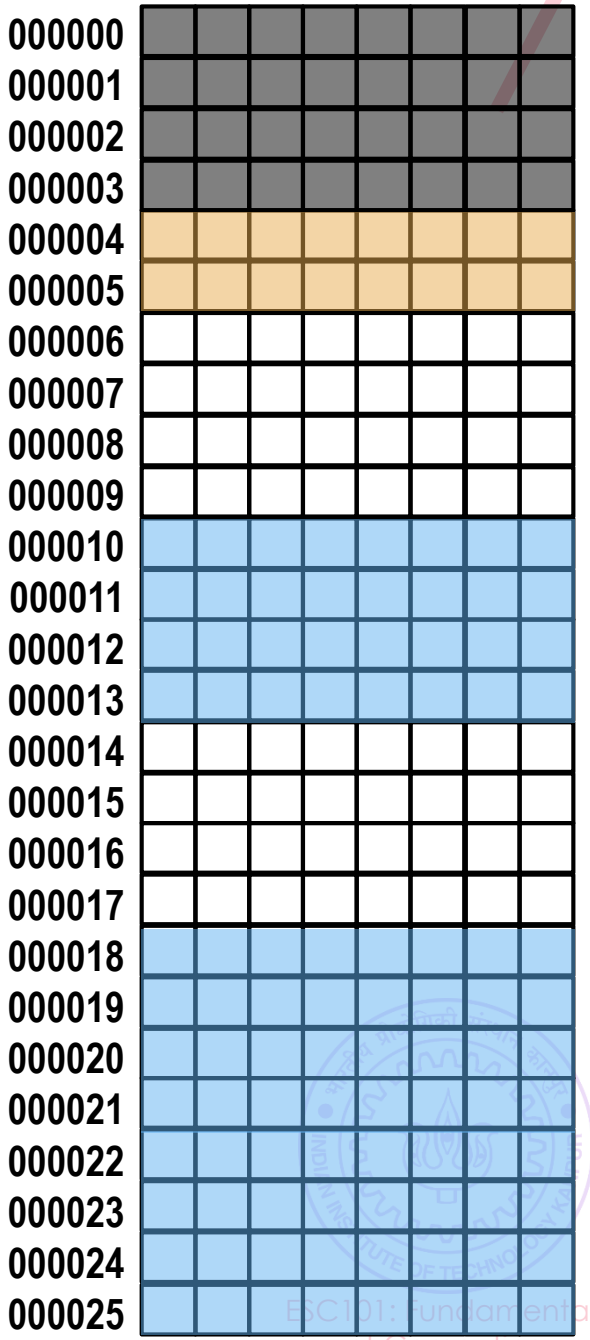
Linked Lists



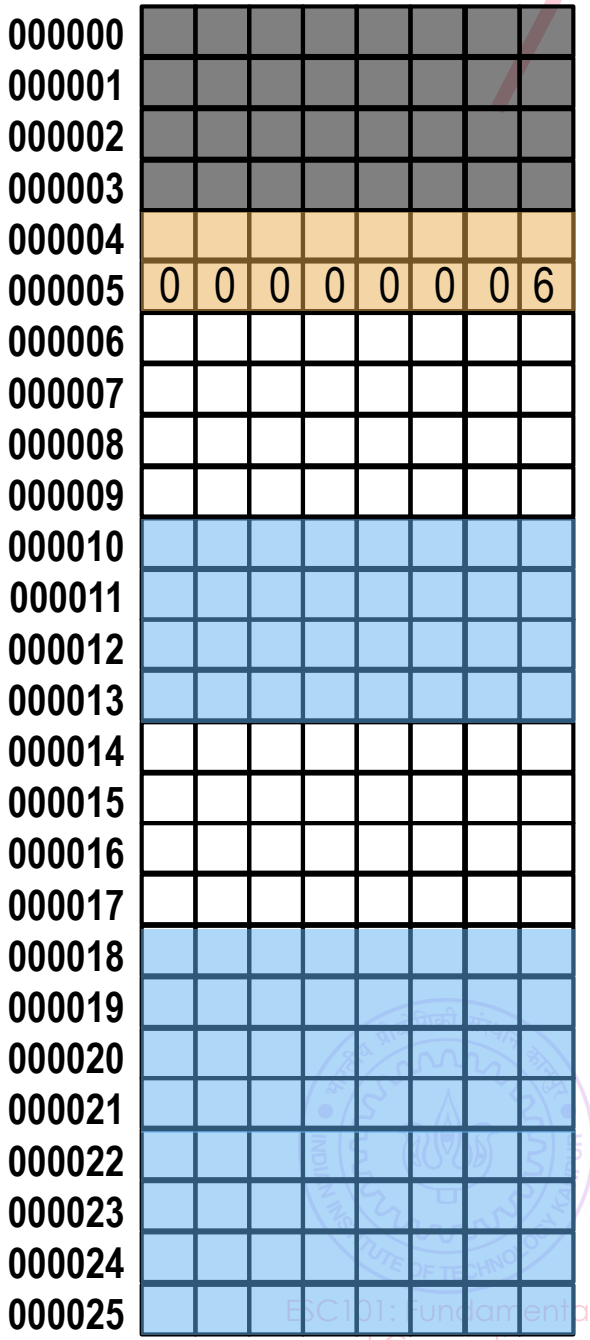
Linked Lists



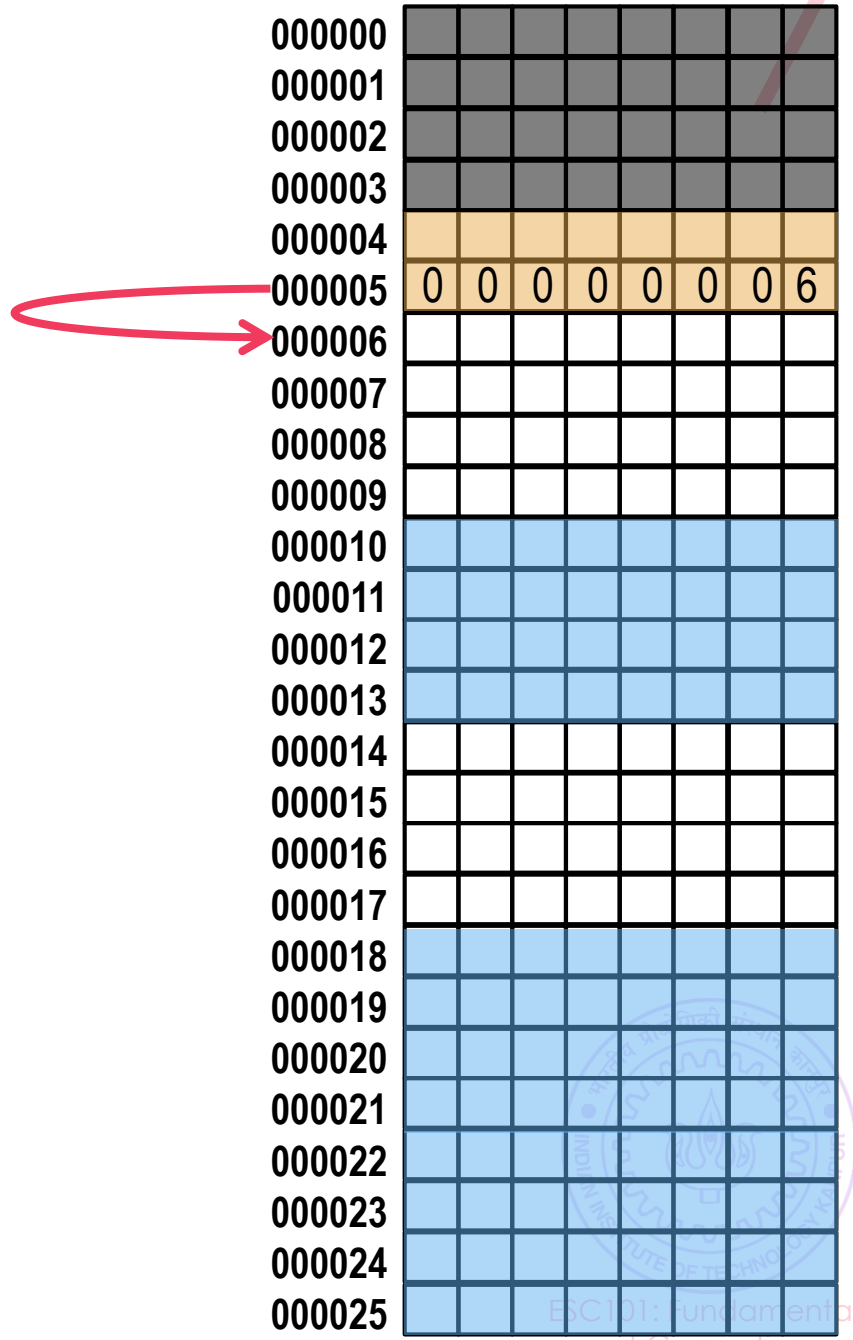
Linked Lists



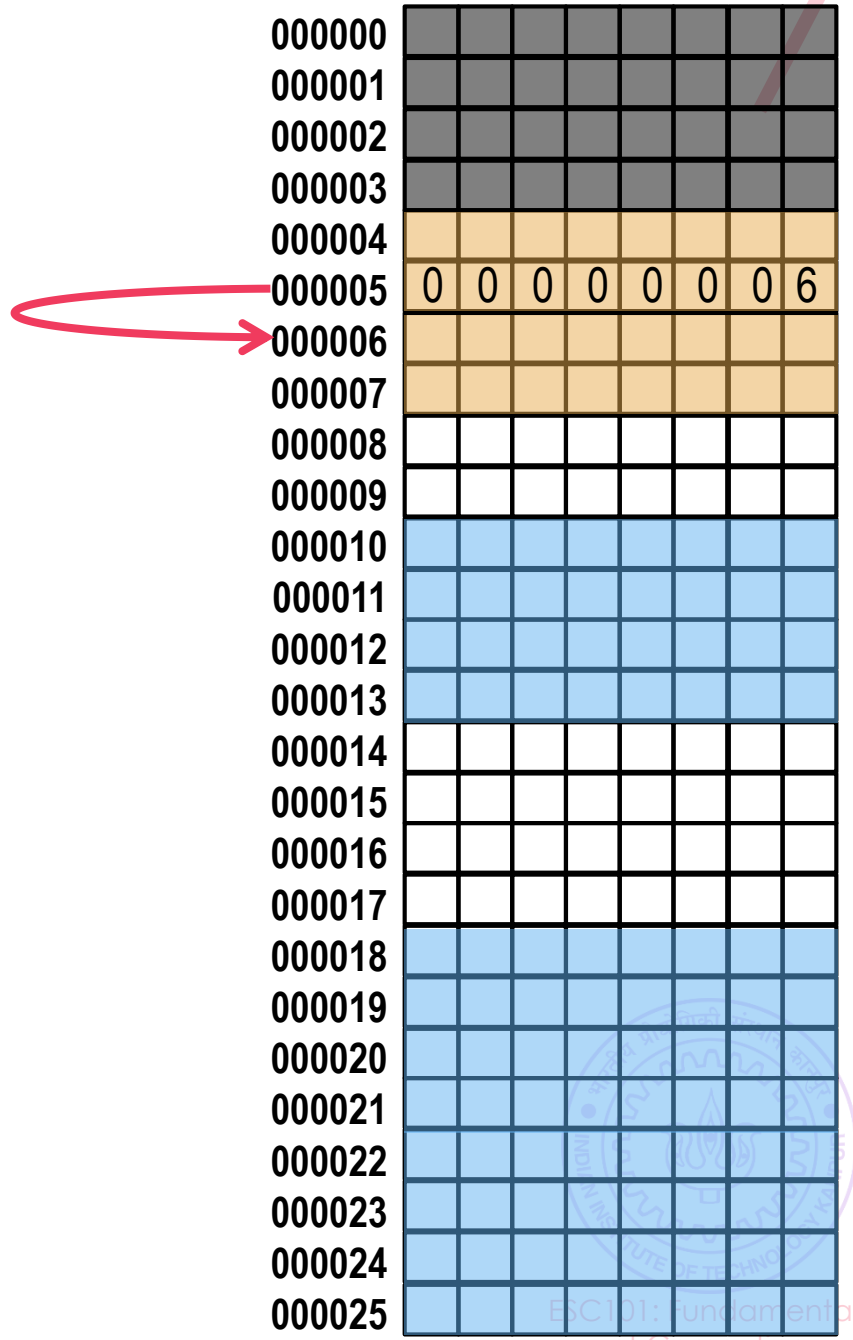
Linked Lists



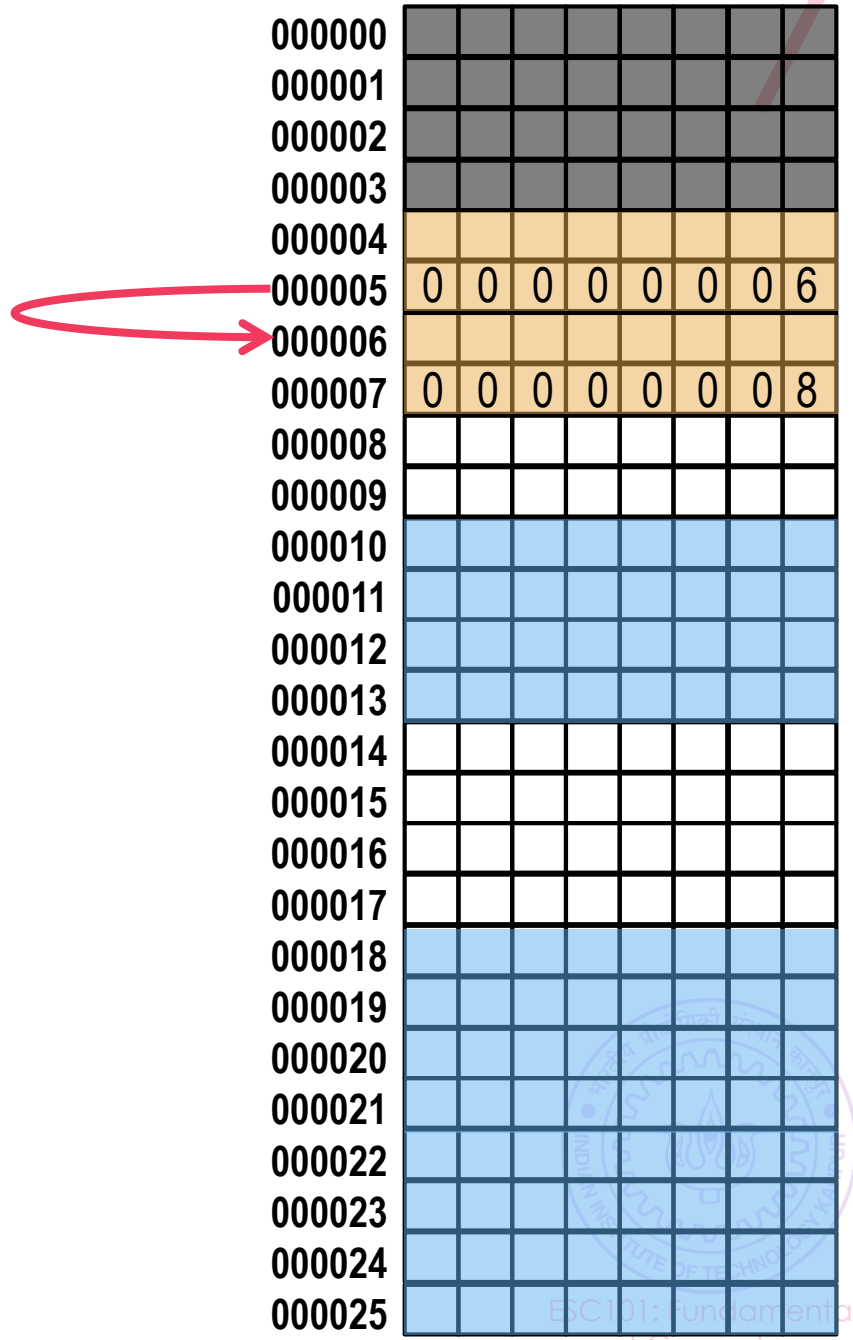
Linked Lists



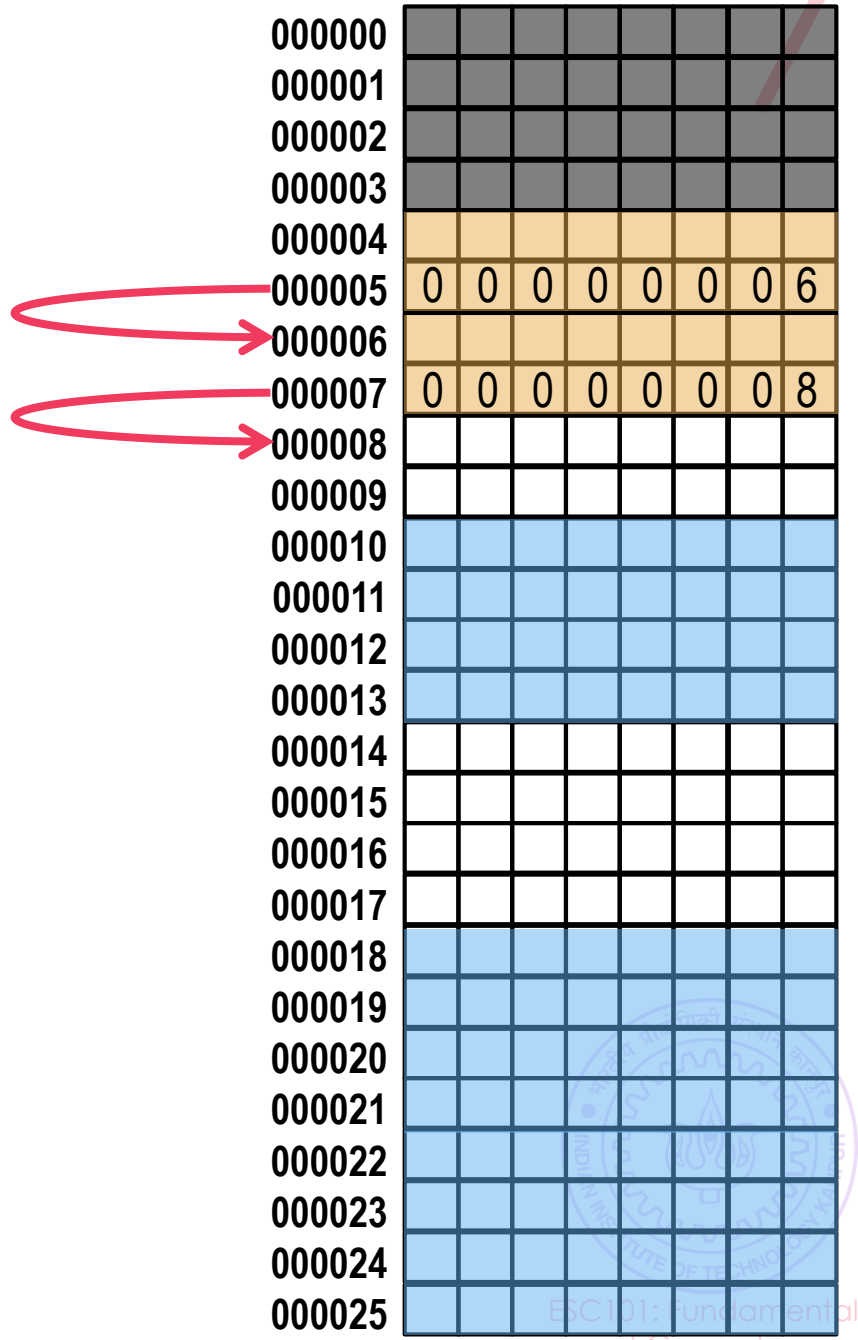
Linked Lists



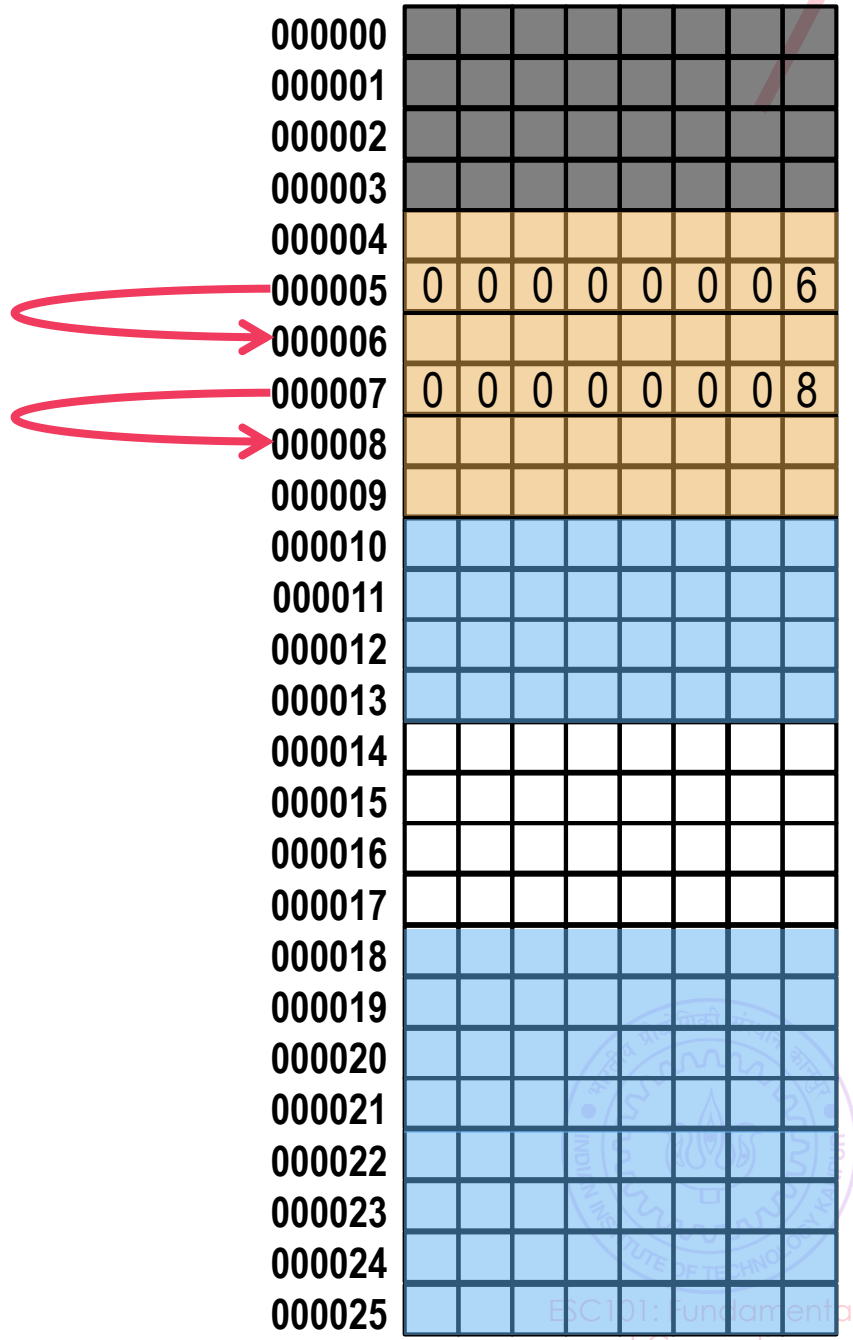
Linked Lists



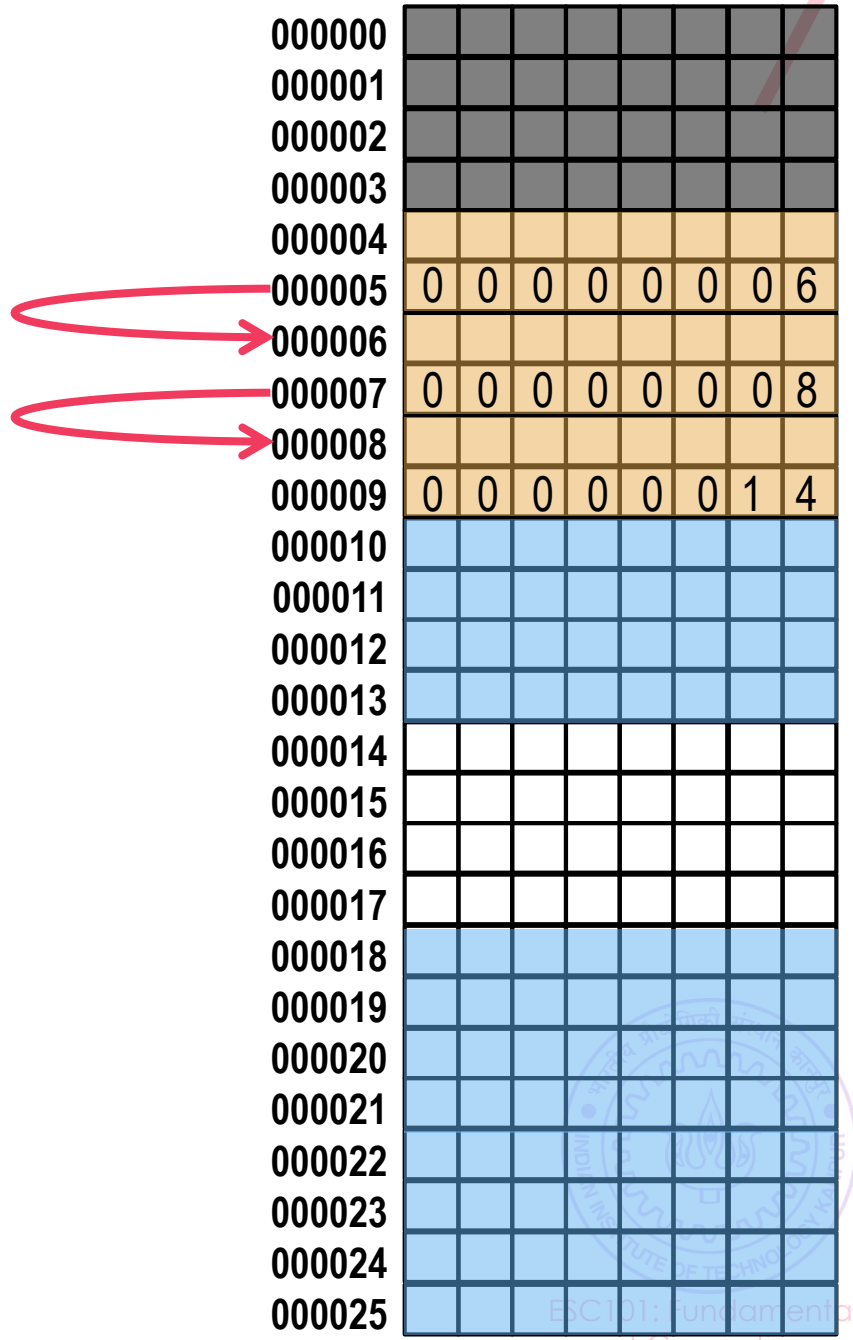
Linked Lists



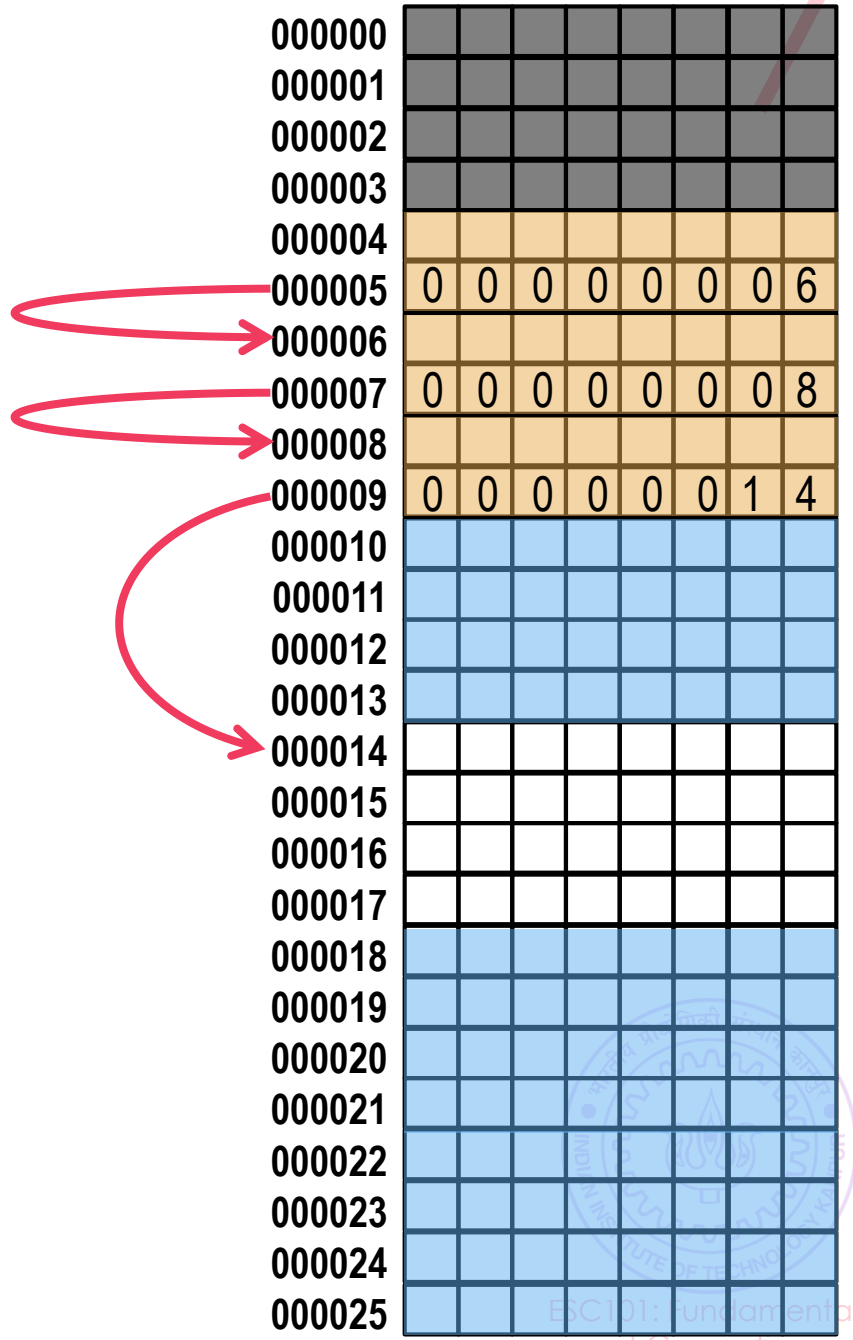
Linked Lists



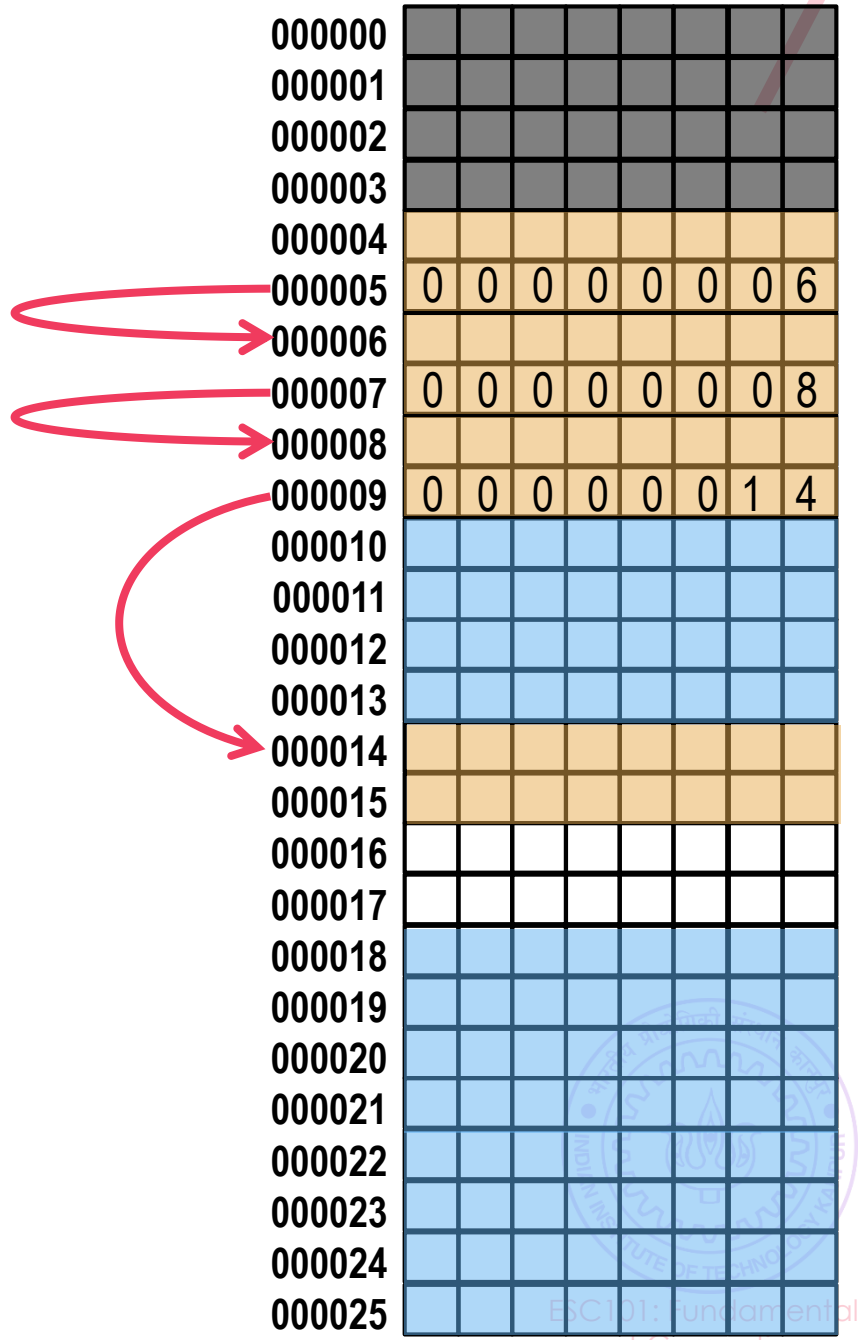
Linked Lists



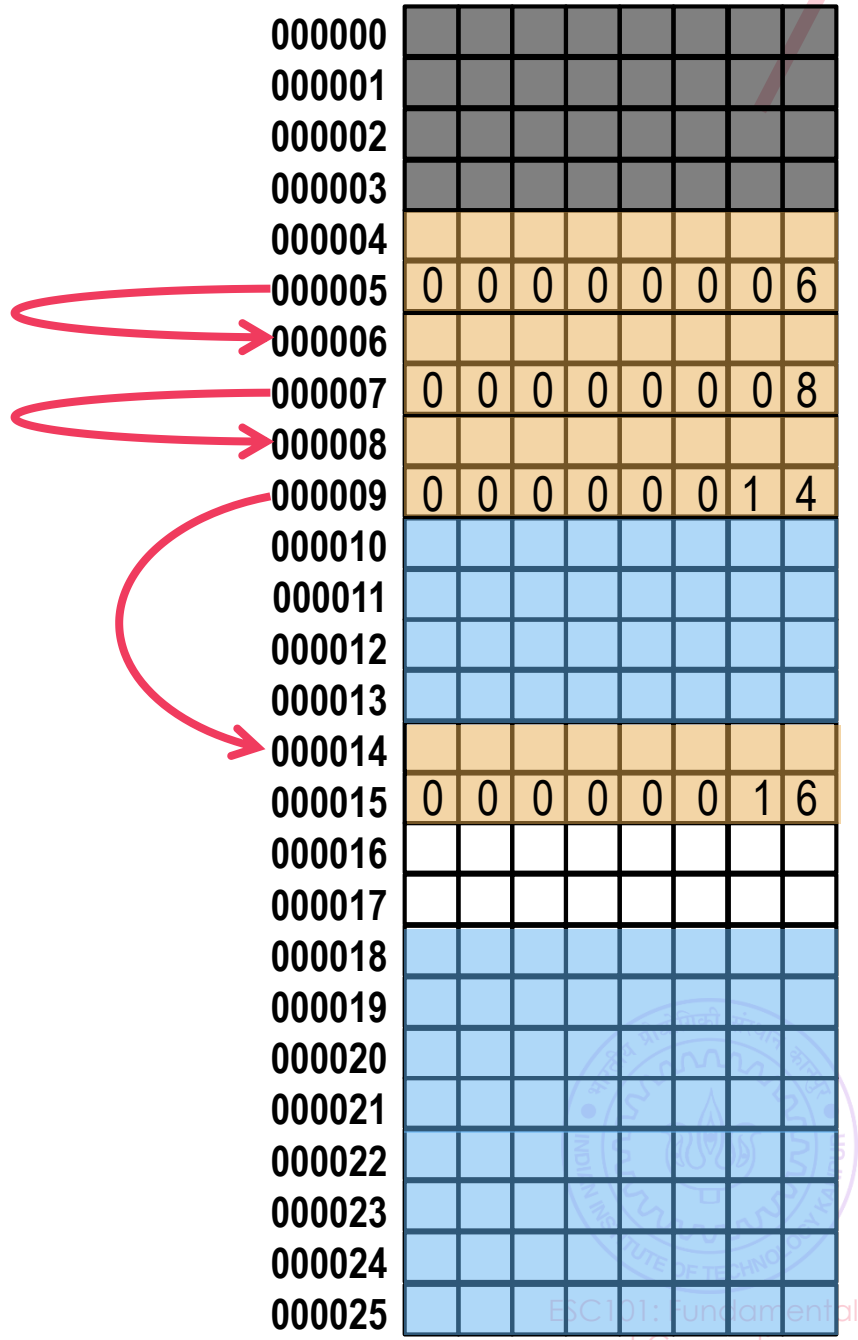
Linked Lists



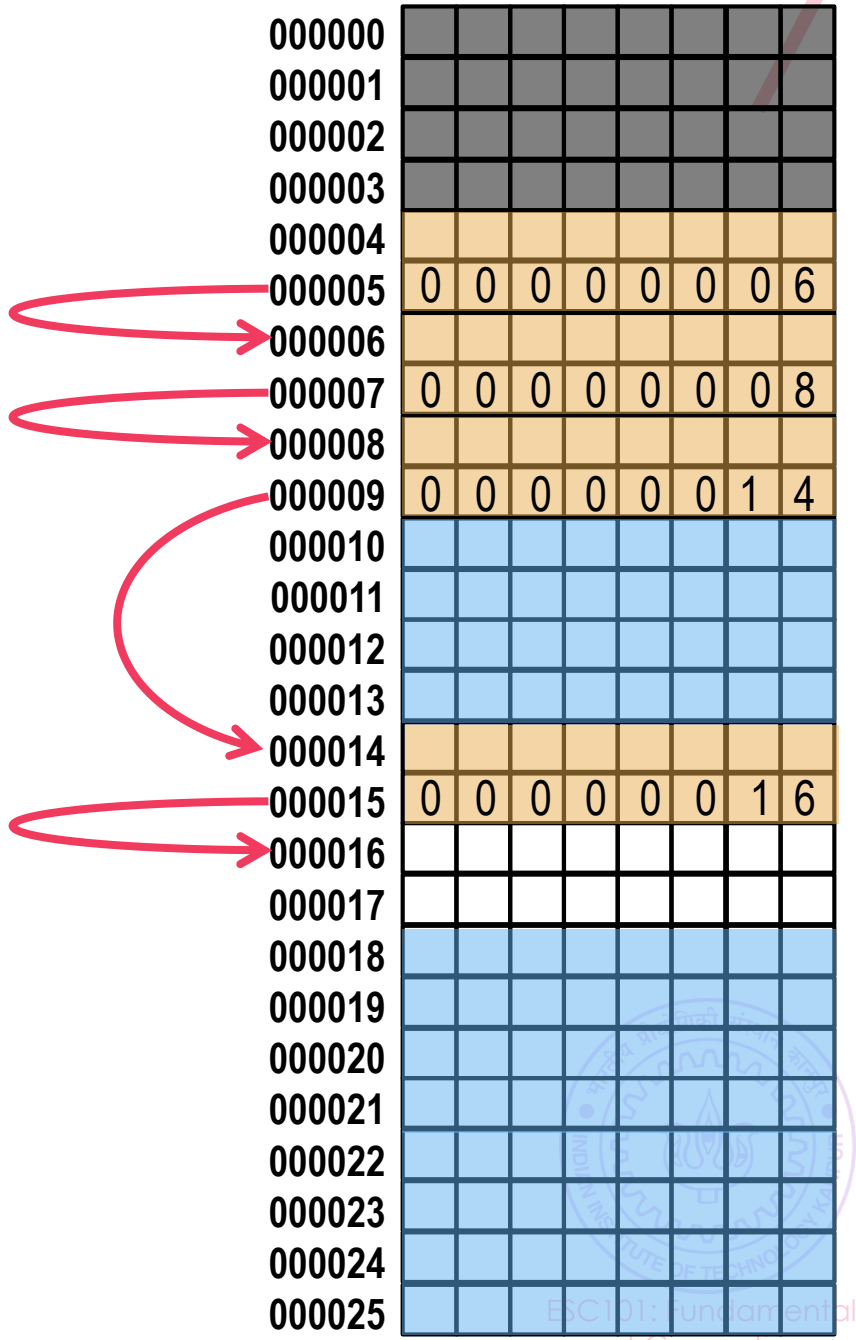
Linked Lists



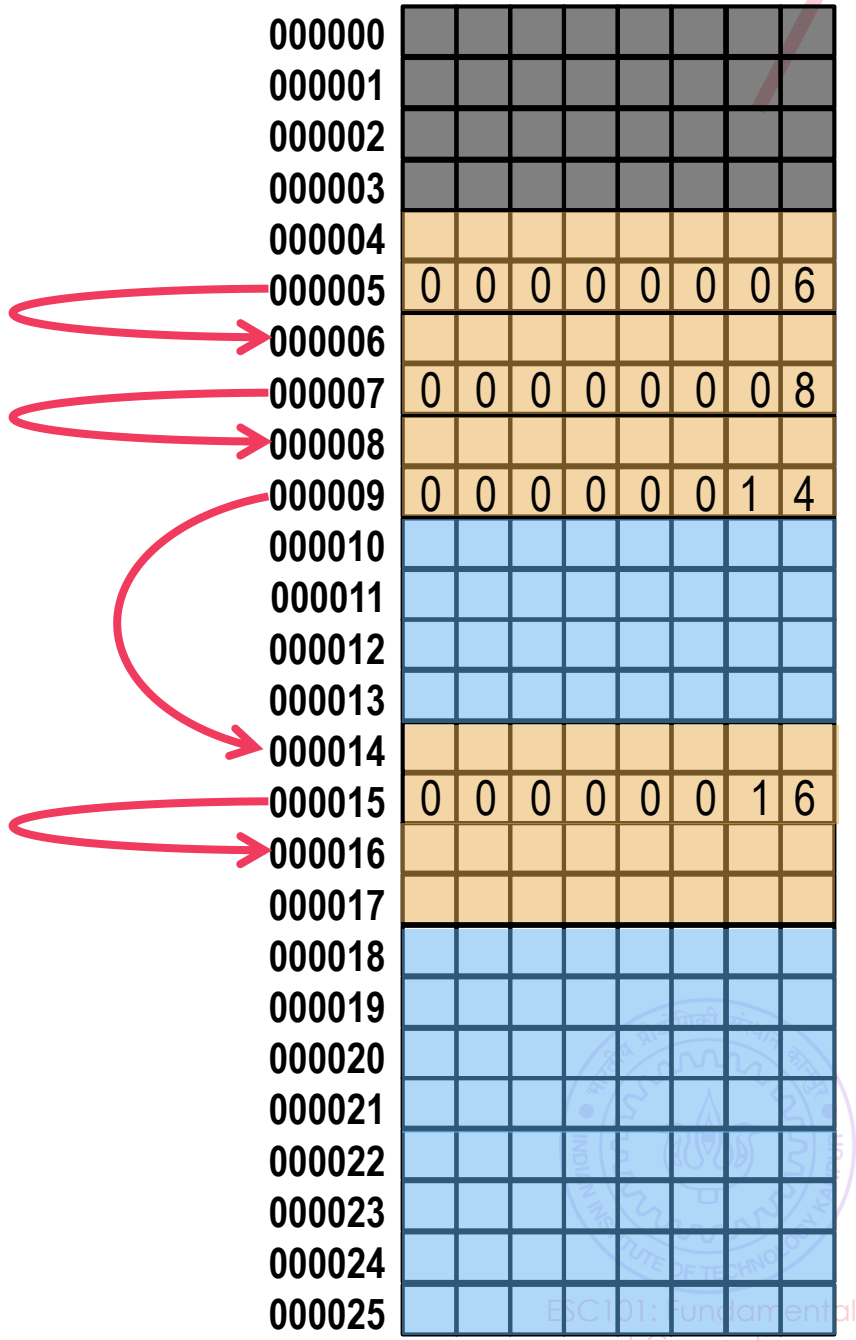
Linked Lists



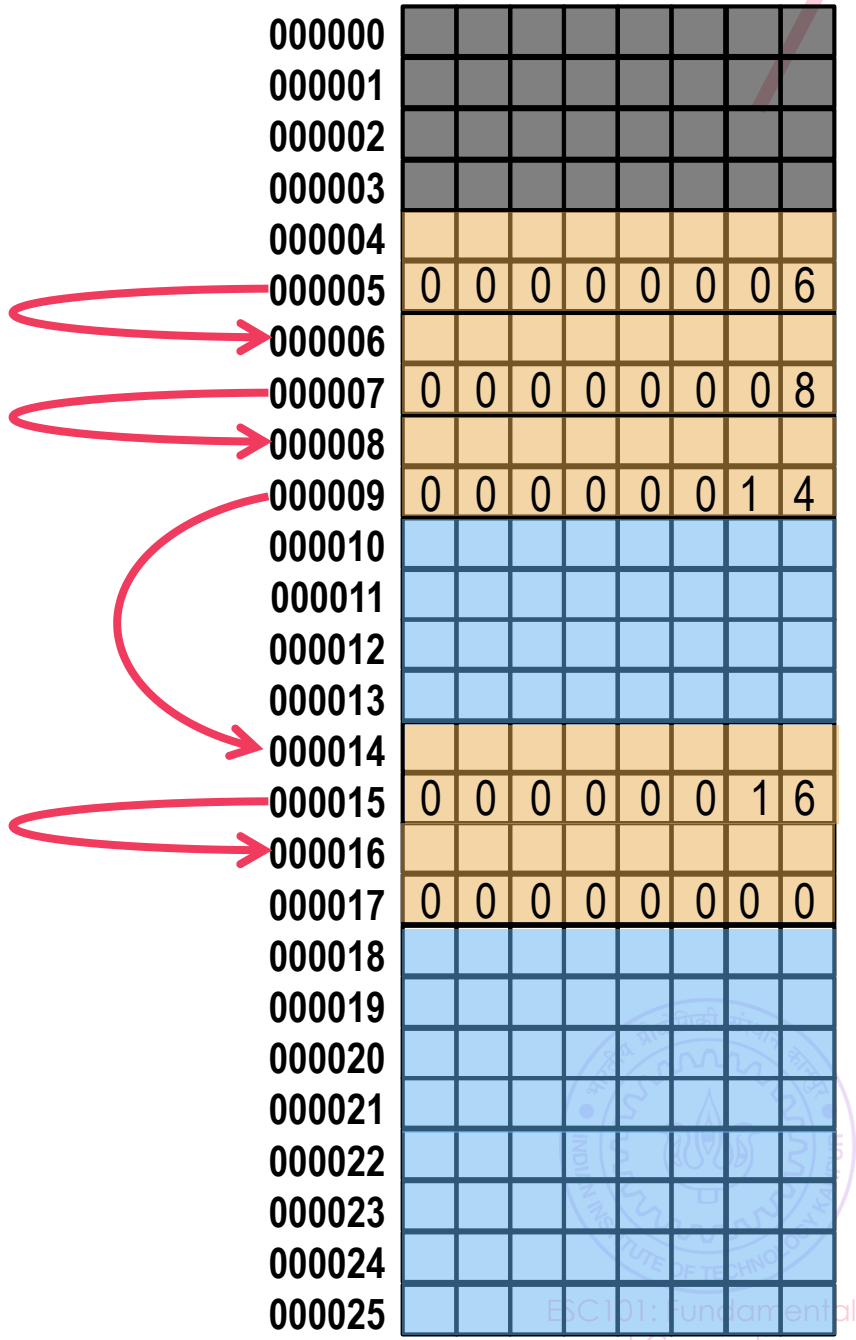
Linked Lists



Linked Lists

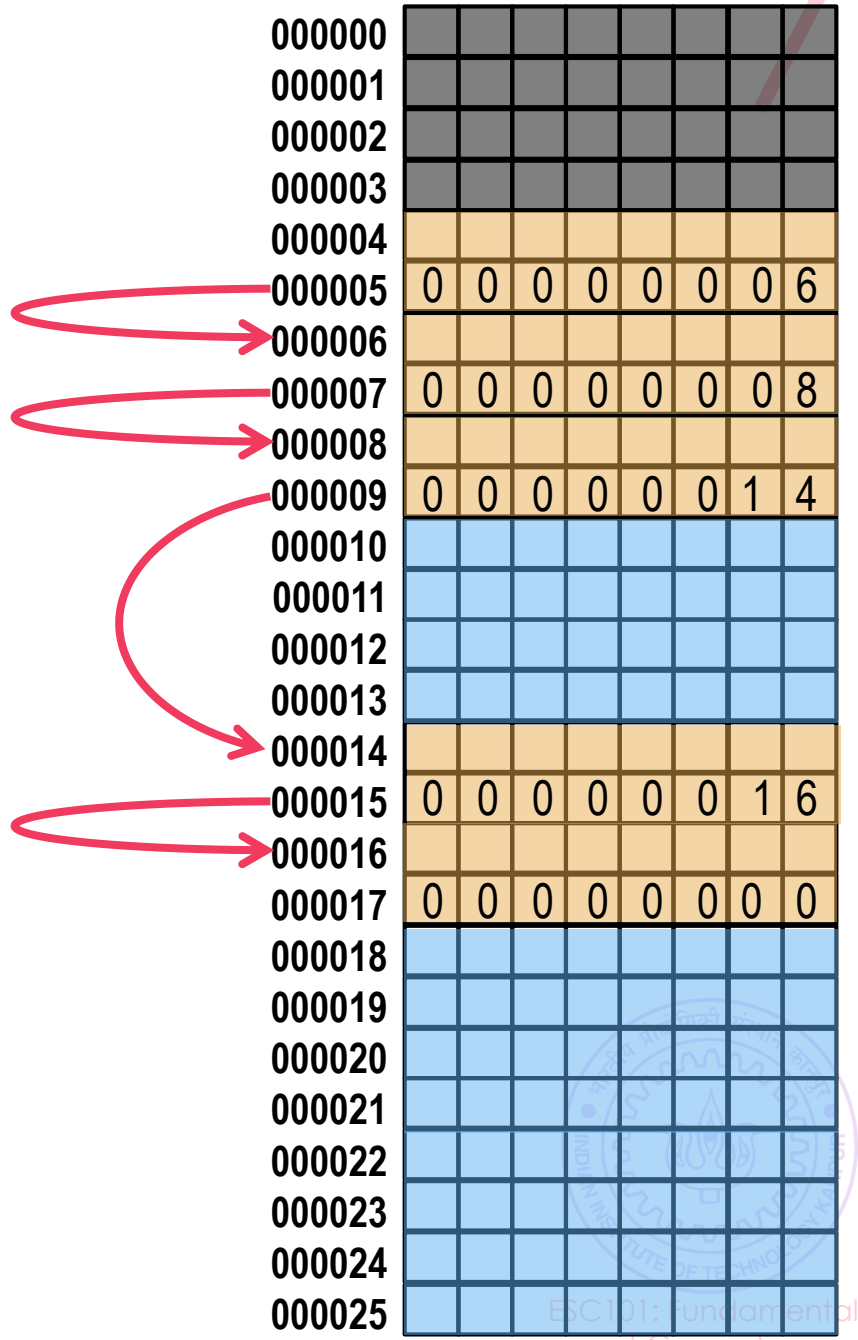


Linked Lists



Linked Lists

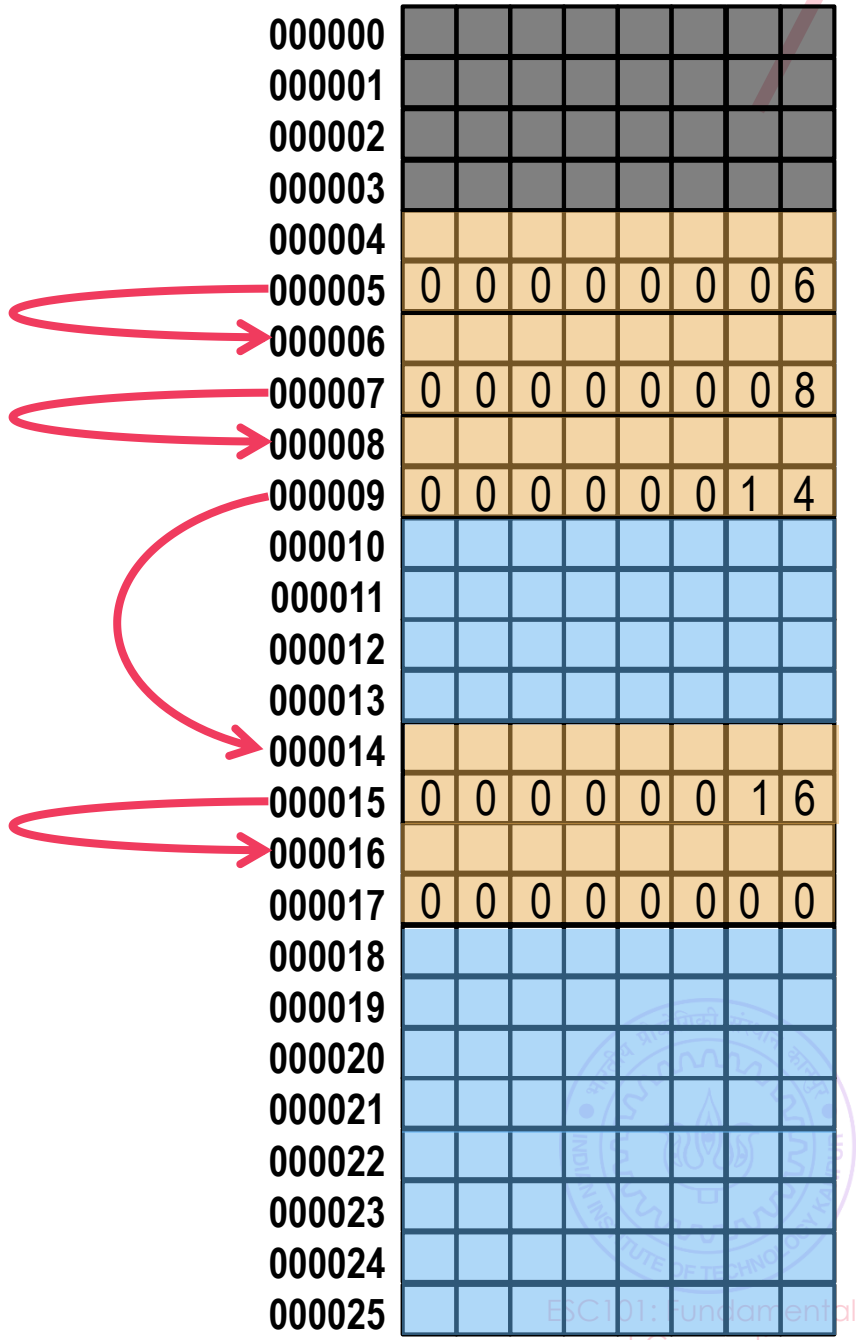
Allow for more efficient usage of space



Linked Lists

Allow for more efficient usage of space

ADVANTAGES

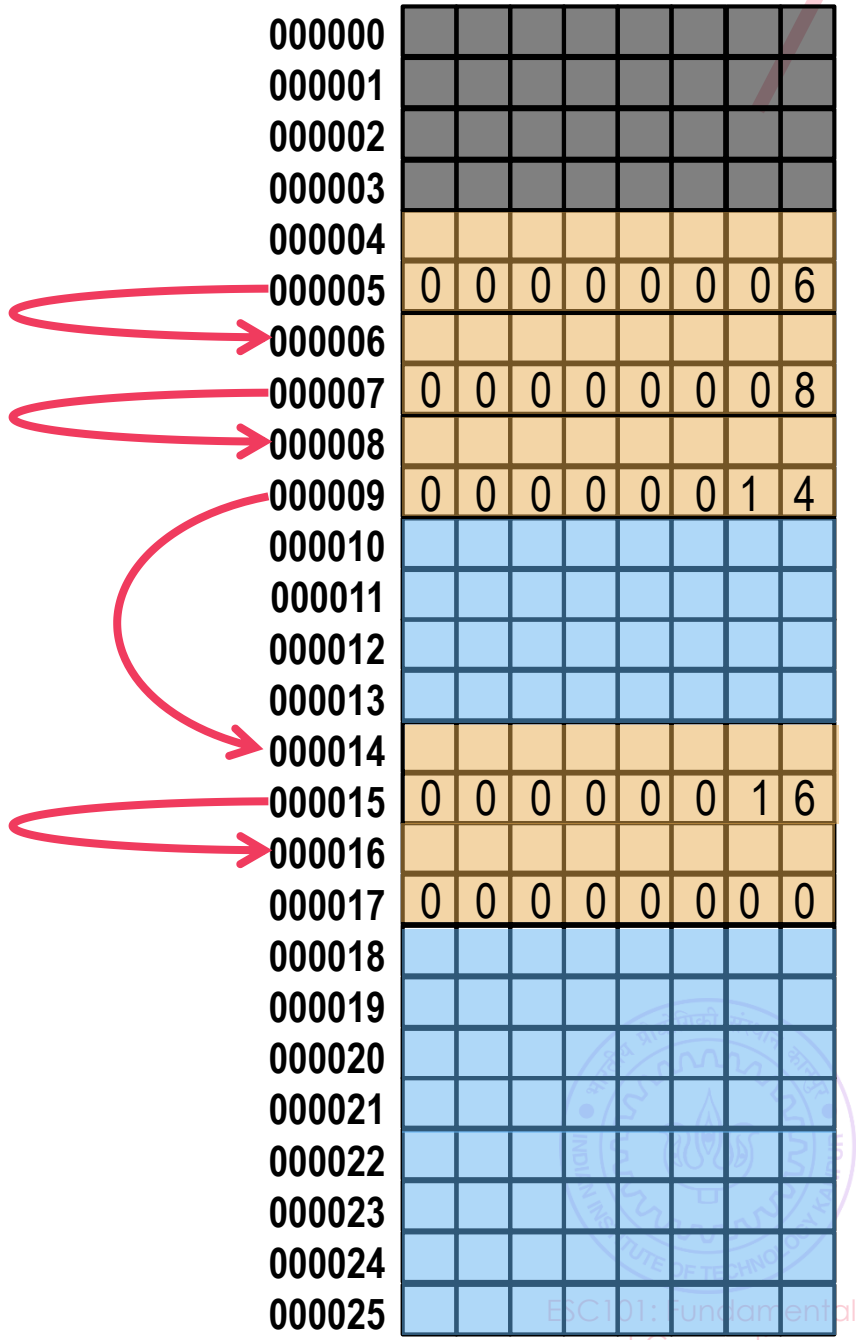


Linked Lists

Allow for more efficient usage of space

ADVANTAGES

Allow as many elements as you want

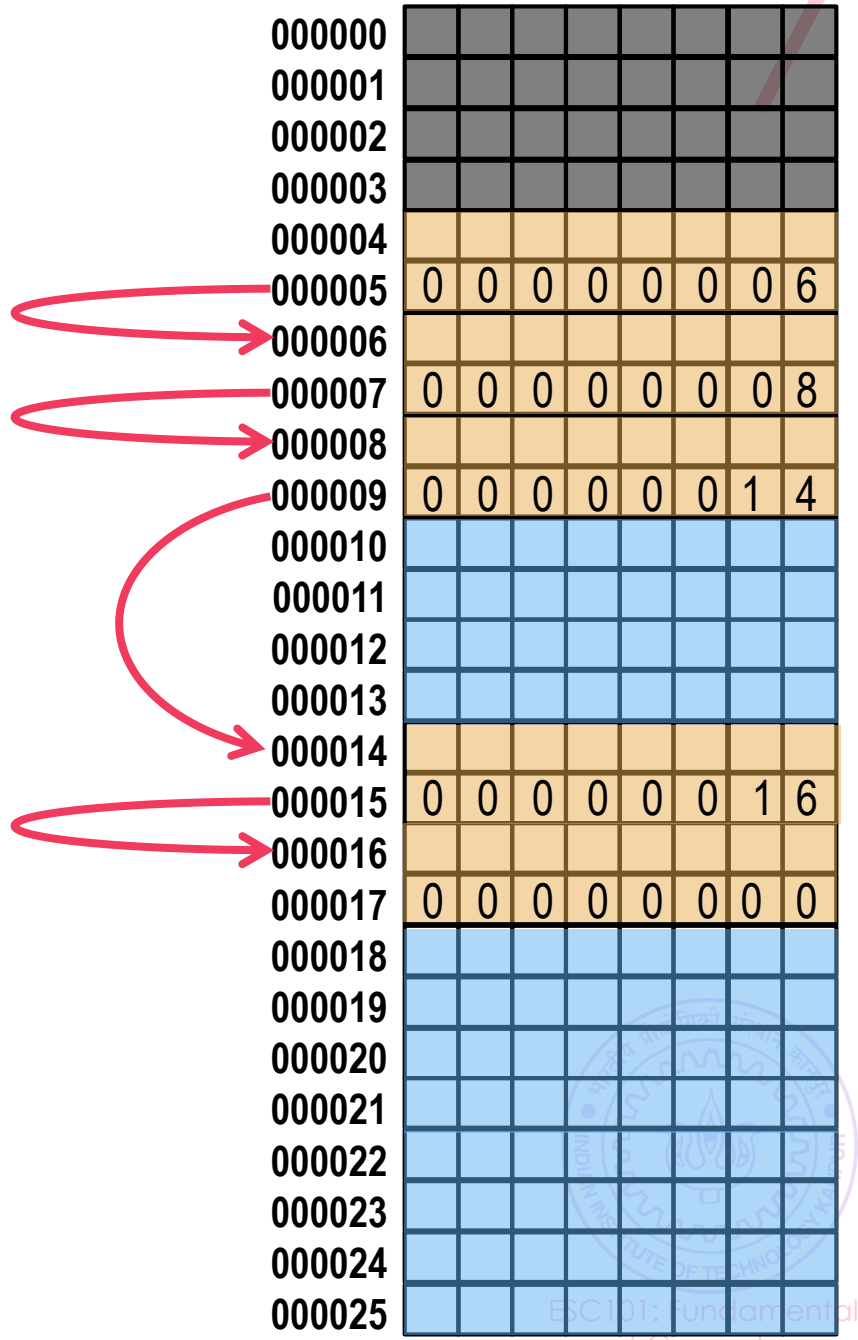


Linked Lists

Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better

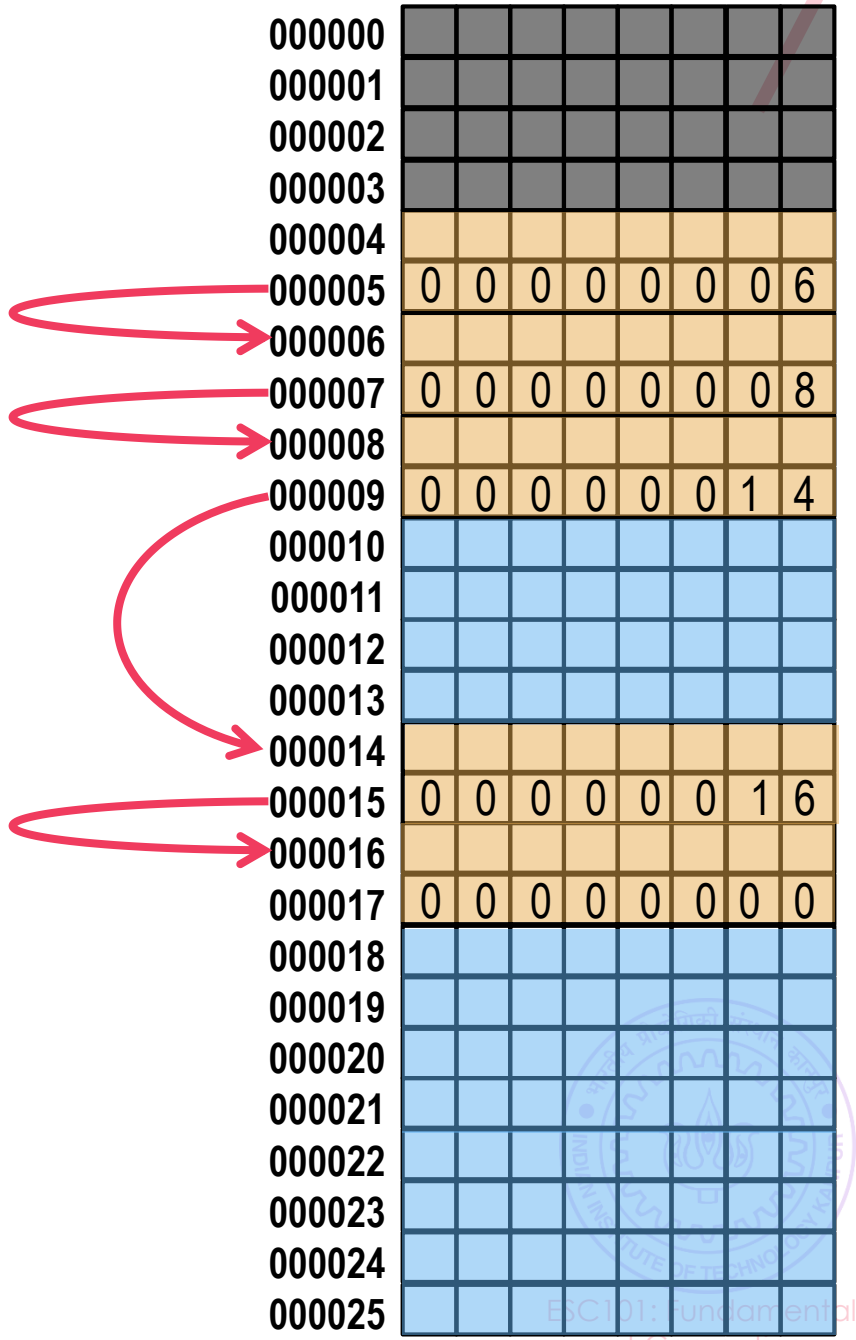


Linked Lists

Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc

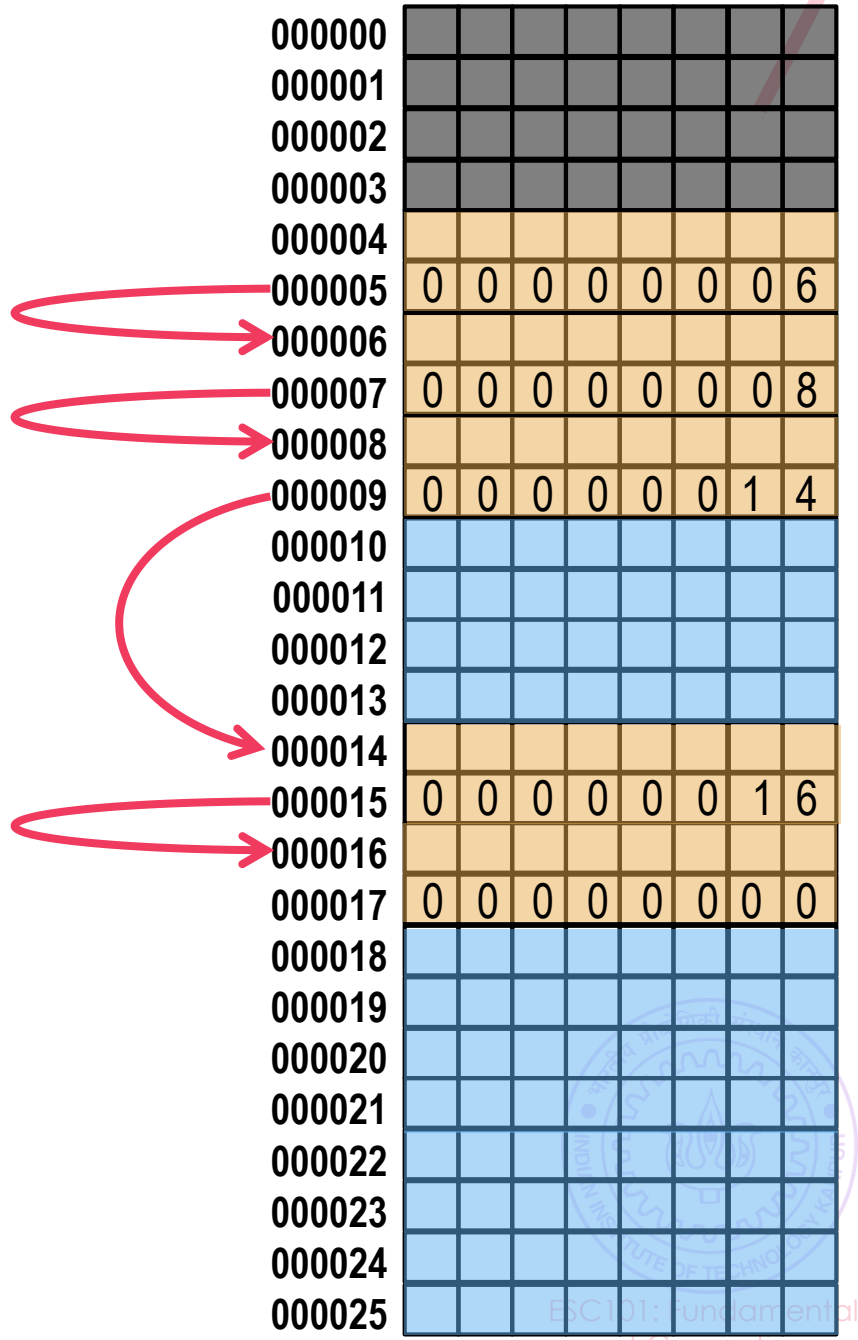


Linked Lists

Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc
- Inserting in the middle very simple



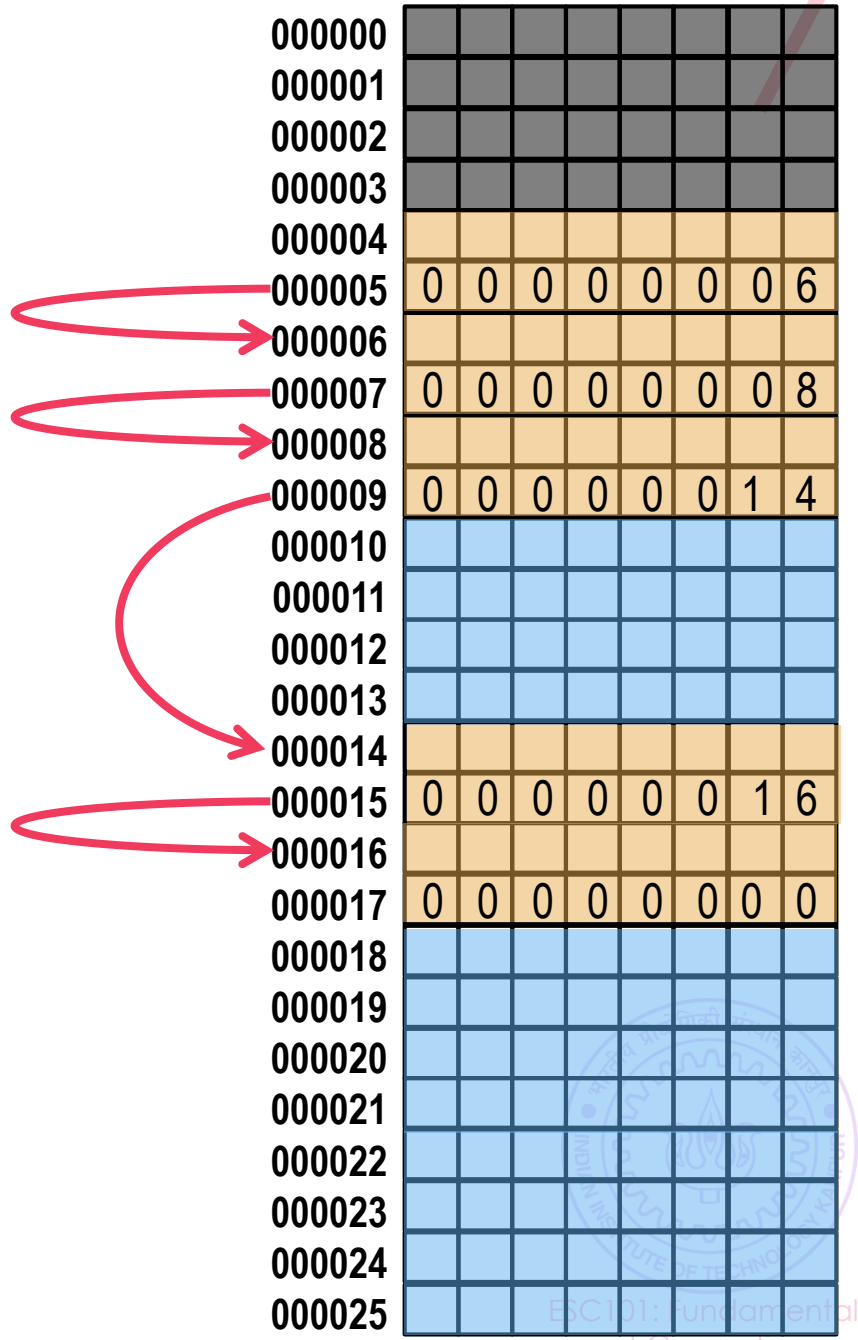
Linked Lists

Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc
- Inserting in the middle very simple

DISADVANTAGES



Linked Lists

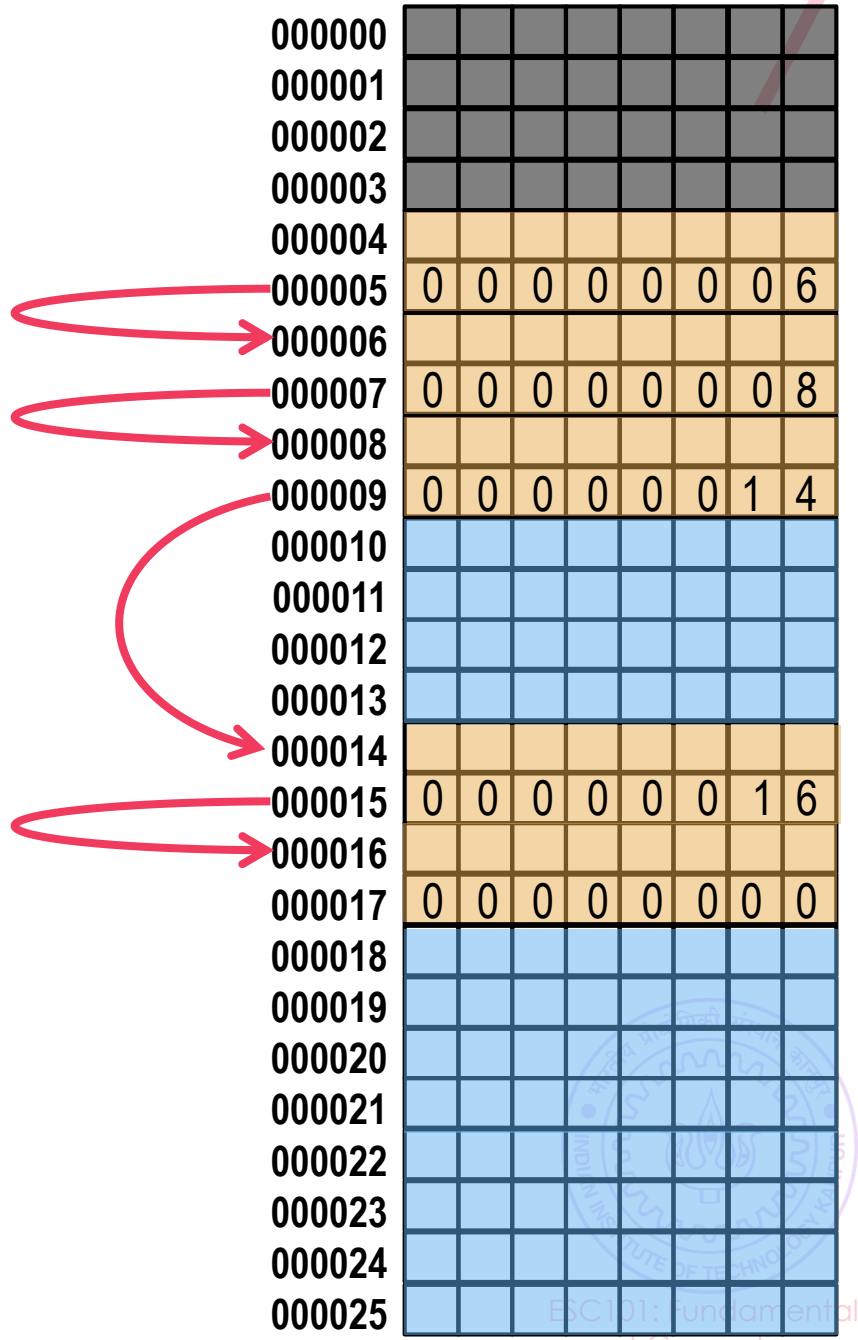
Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc
- Inserting in the middle very simple

DISADVANTAGES

- No convenient "names" for elements



Linked Lists

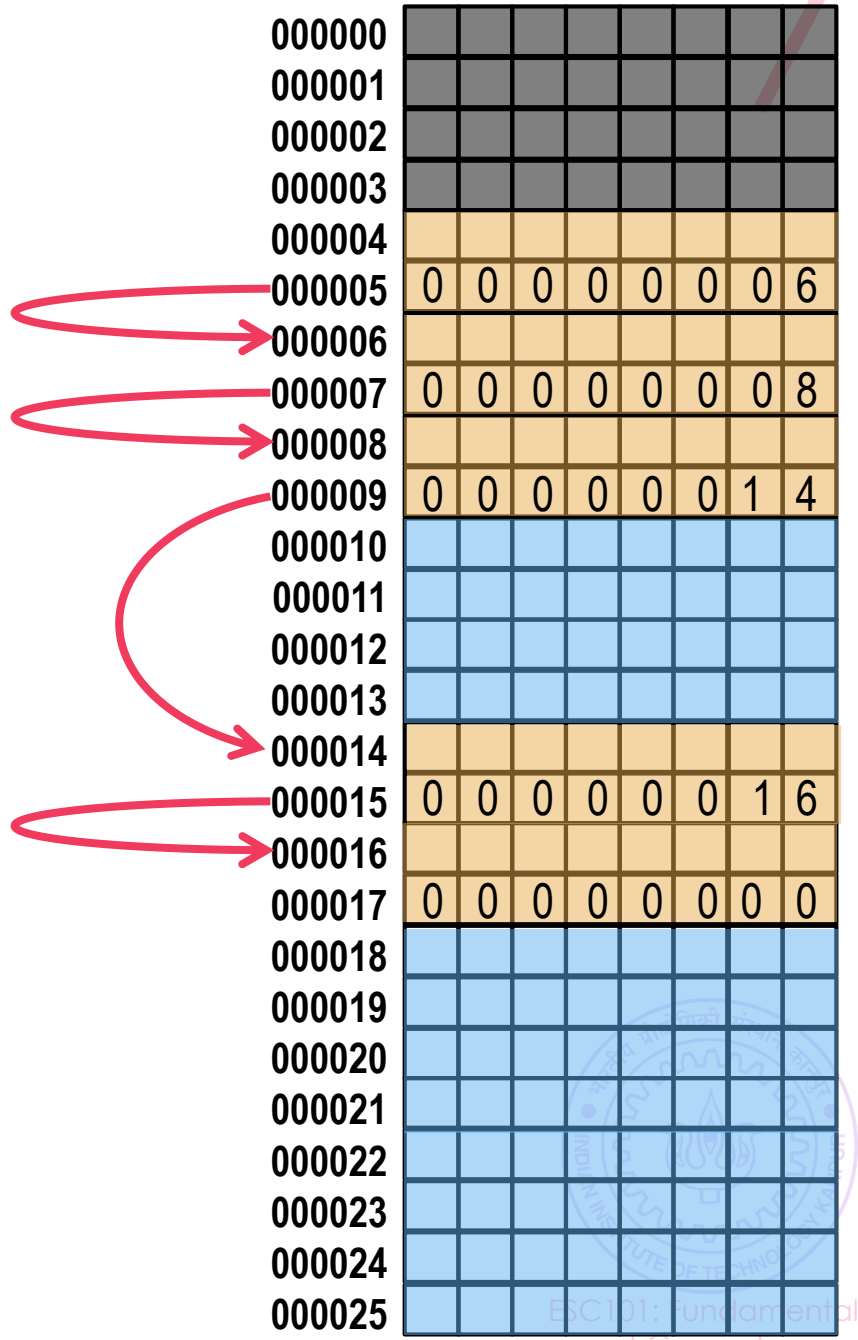
Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc
- Inserting in the middle very simple

DISADVANTAGES

- No convenient "names" for elements
- Accessing n-th element slow – require going through first n-1 elements



Linked Lists

Allow for more efficient usage of space

ADVANTAGES

- Allow as many elements as you want
- Do not require contiguous space to be available – pack things better
- Can expand without calling realloc
- Inserting in the middle very simple

DISADVANTAGES

- No convenient "names" for elements
- Accessing n-th element slow – require going through first n-1 elements
- Setting them up requires more work