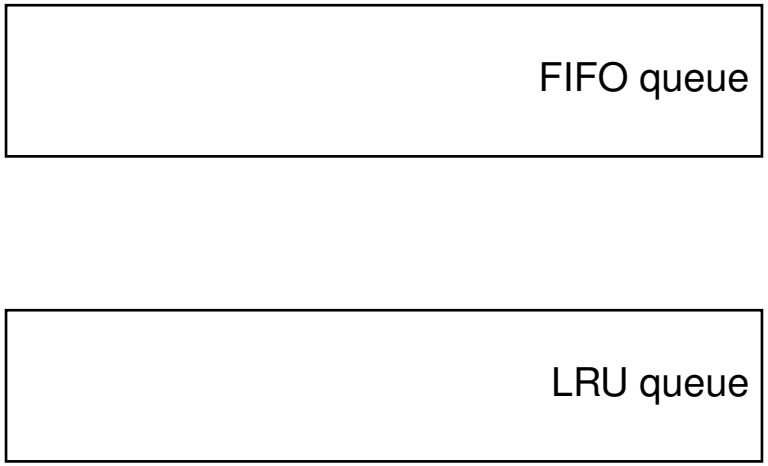
Programming Assignment: Buffer Manager

- Implement a Buffer Manager that uses the 2Q replacement strategy
- `BufferManager` class with `fix(page_id, exclusive)` and `unfix(page_id, dirty)` methods
- Page id is split into segment (16 bits) and segment page id (48 bits)
- Segments must be written into files that have the segment id as name
- Must be thread-safe!
- Use `std::mutex` and `std::shared_mutex`
- Must be efficient:
  - Hold latches as short as possible
  - Don't hold latches while doing I/O

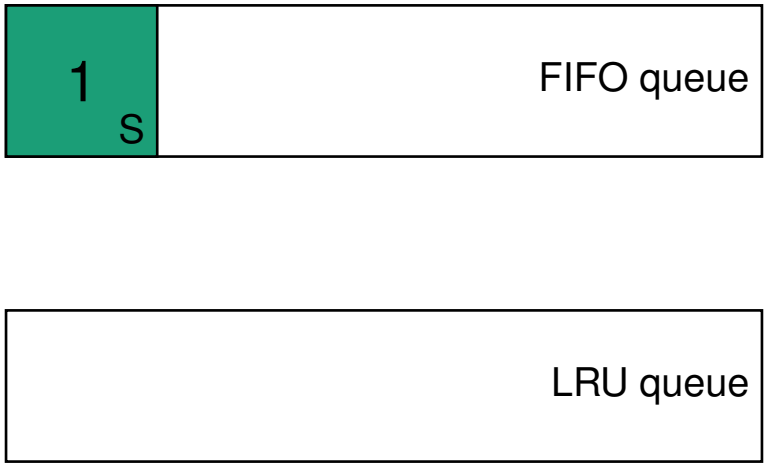
Example of Buffer Manager with 2Q

```
fix(1, false)
```



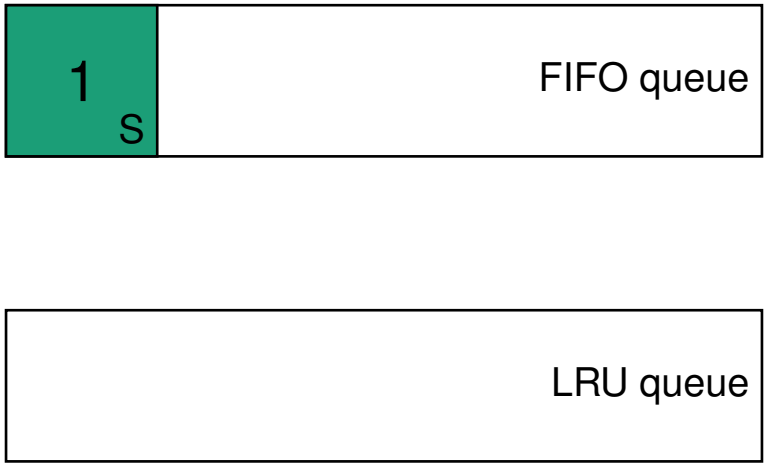
Example of Buffer Manager with 2Q

`fix(1, false)`✓



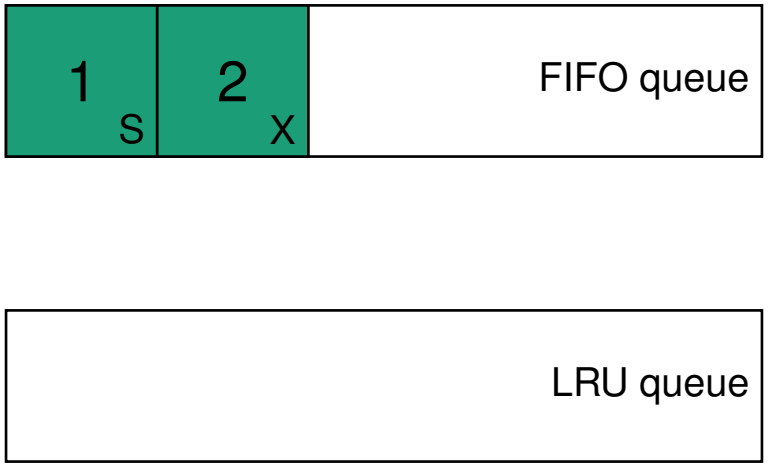
Example of Buffer Manager with 2Q

```
fix(2, true)
```



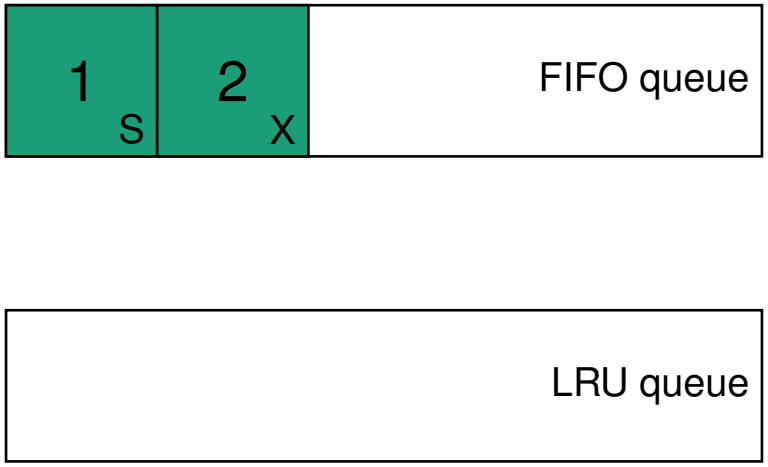
Example of Buffer Manager with 2Q

`fix(2, true)`✓



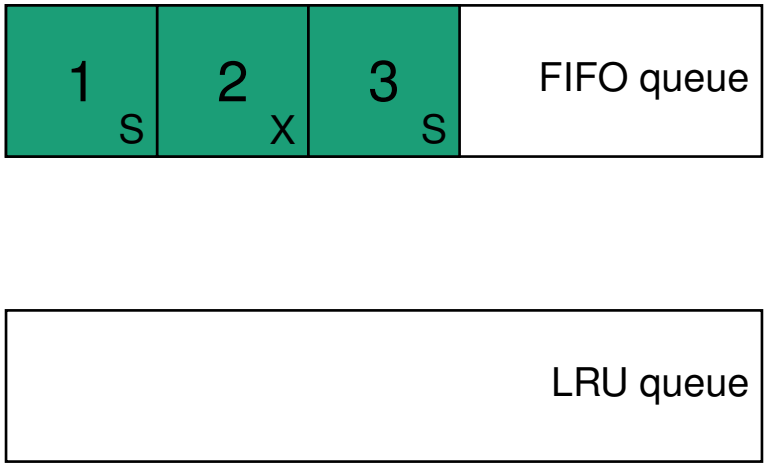
Example of Buffer Manager with 2Q

```
fix(3, false)
```



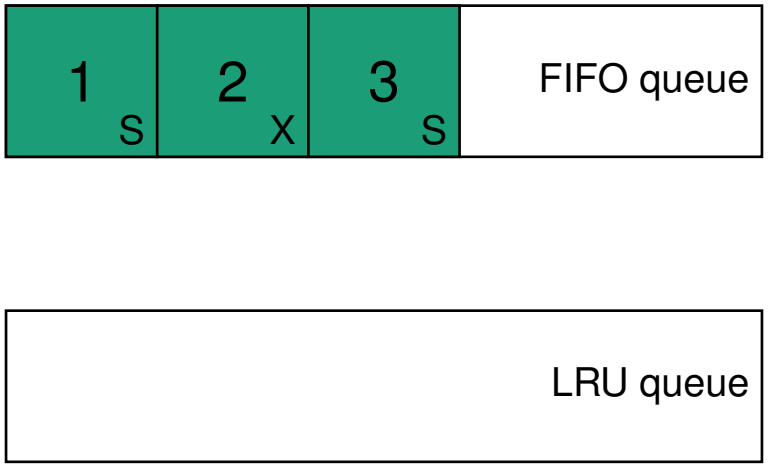
Example of Buffer Manager with 2Q

`fix(3, false)`✓



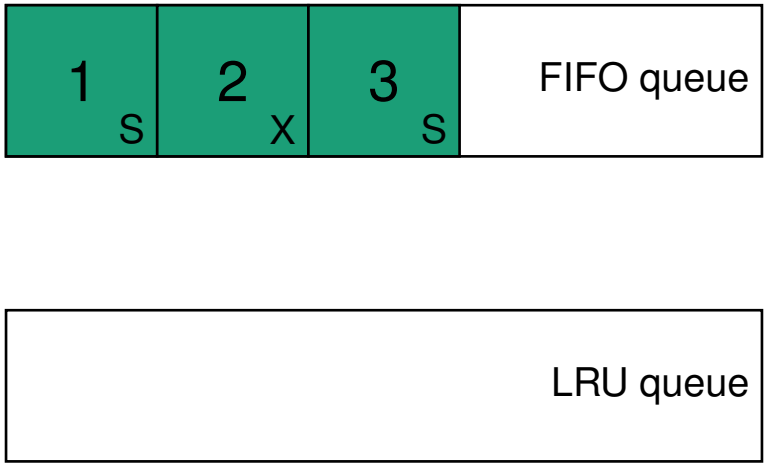
Example of Buffer Manager with 2Q

`fix(4, false)` → buffer full



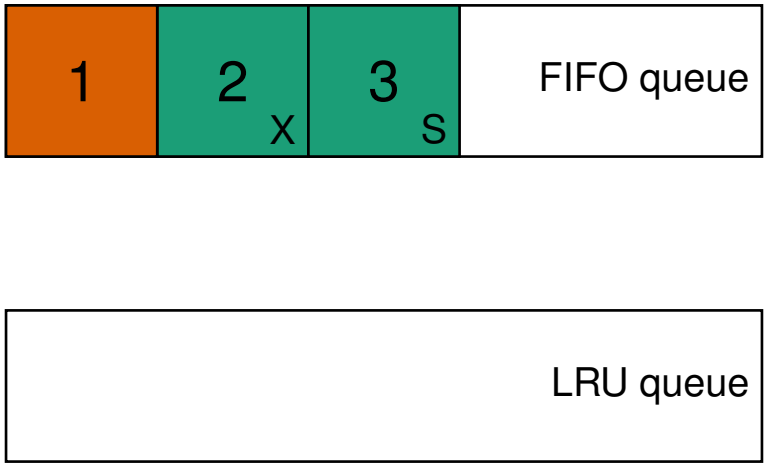
Example of Buffer Manager with 2Q

`unfix(1, false)`



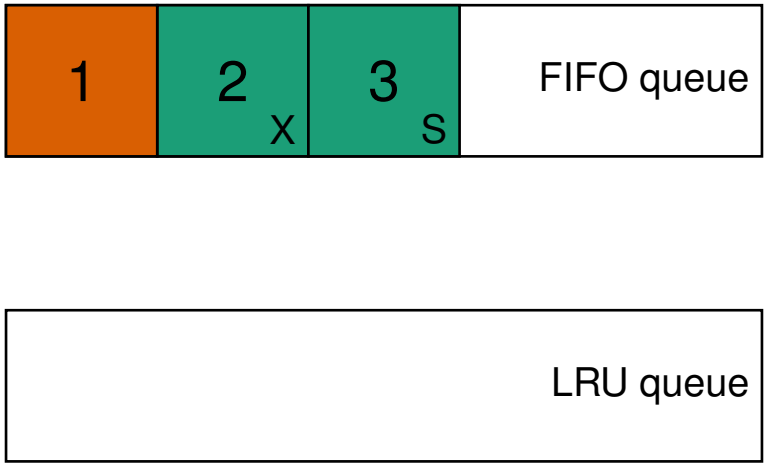
Example of Buffer Manager with 2Q

`unfix(1, false)`✓



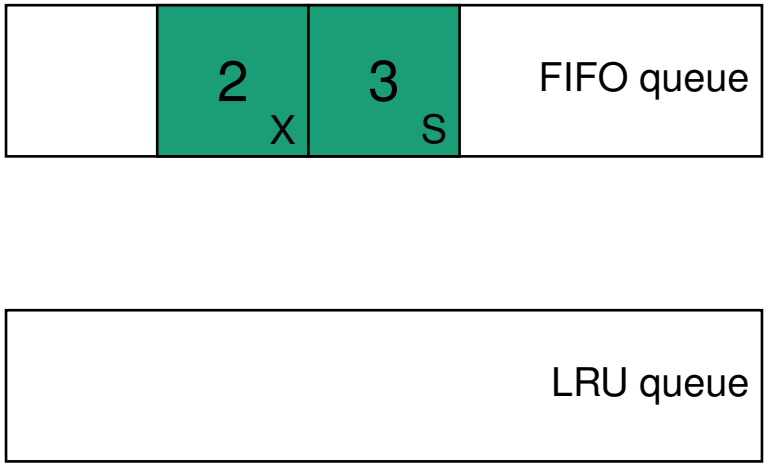
Example of Buffer Manager with 2Q

```
fix(4, false)
```



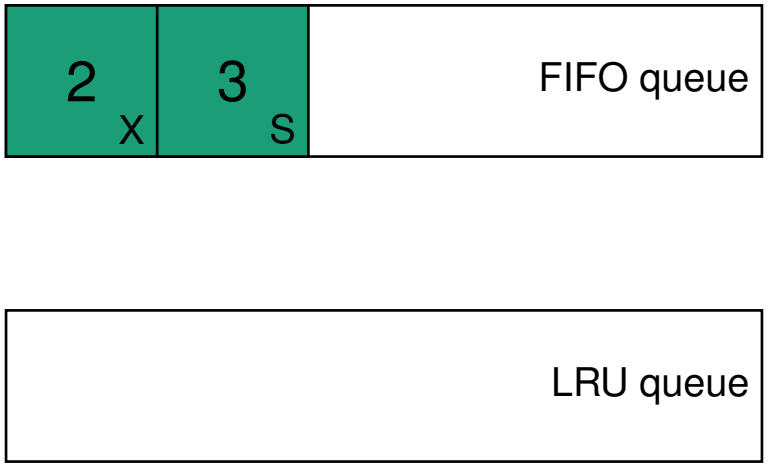
Example of Buffer Manager with 2Q

```
fix(4, false)
```



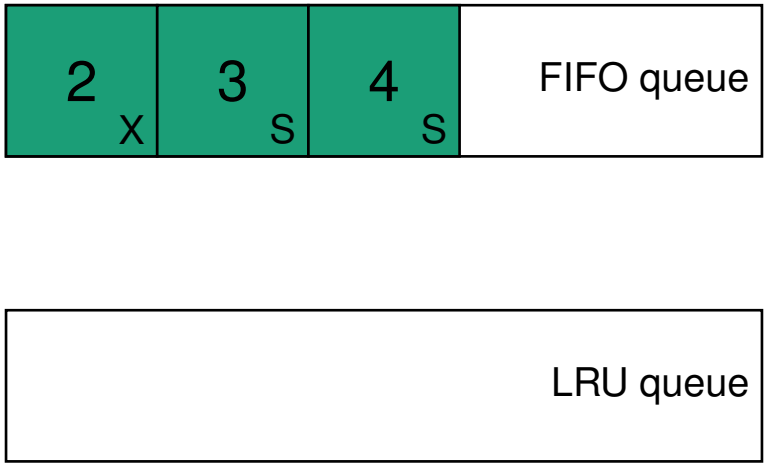
Example of Buffer Manager with 2Q

`fix(4, false)`✓



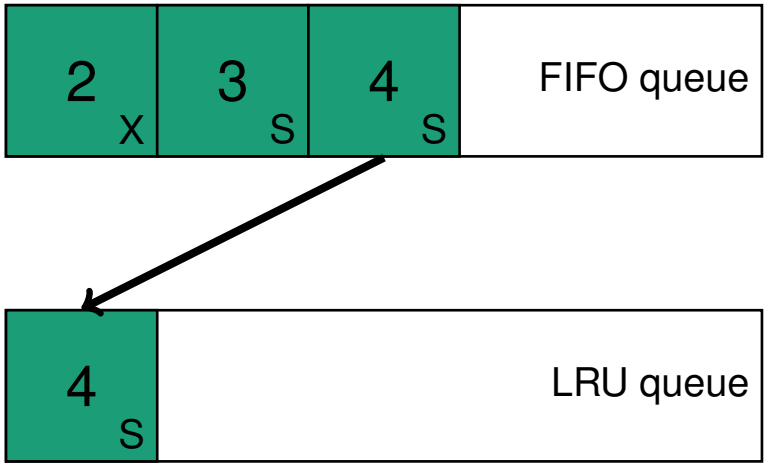
Example of Buffer Manager with 2Q

```
fix(4, false)
```



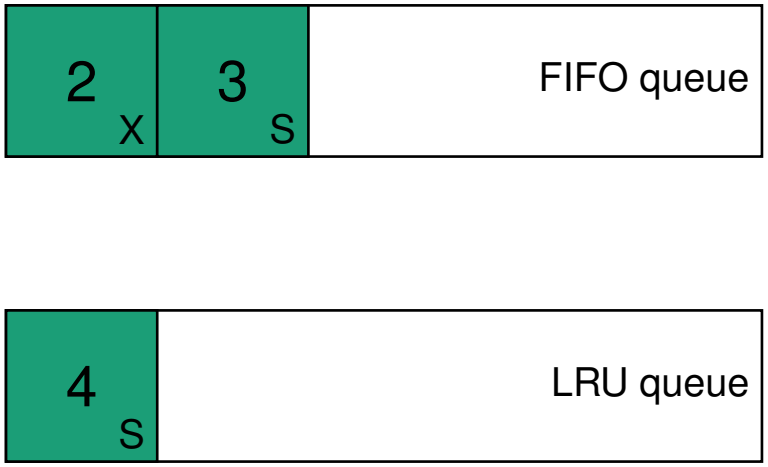
Example of Buffer Manager with 2Q

`fix(4, false)`



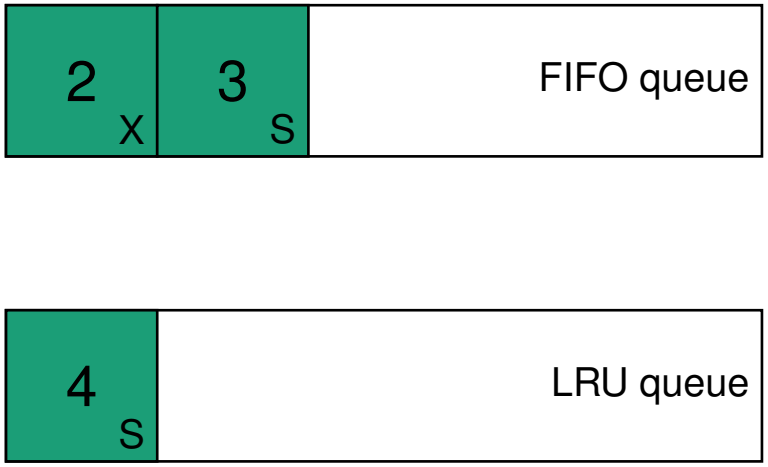
Example of Buffer Manager with 2Q

`fix(4, false)`✓



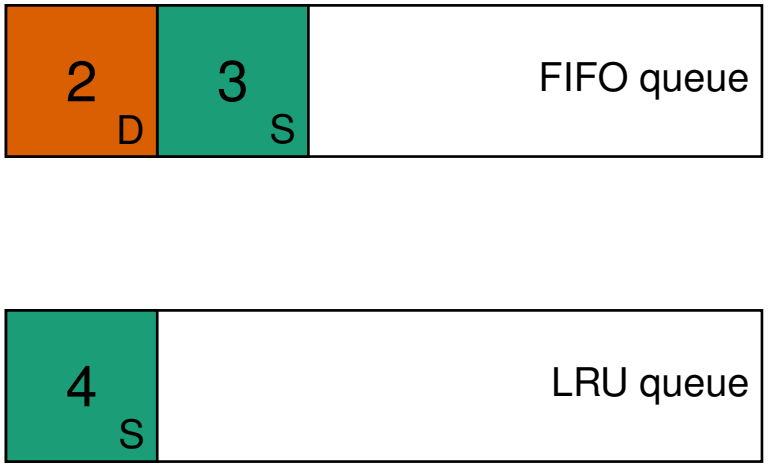
Example of Buffer Manager with 2Q

```
unfix(2, true)
```



Example of Buffer Manager with 2Q

`unfix(2, true)`✓

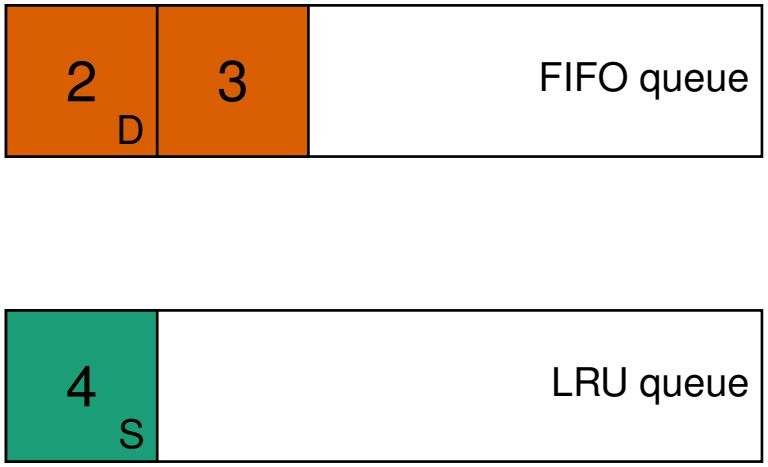


Example of Buffer Manager with 2Q

`unfix(3, false)`

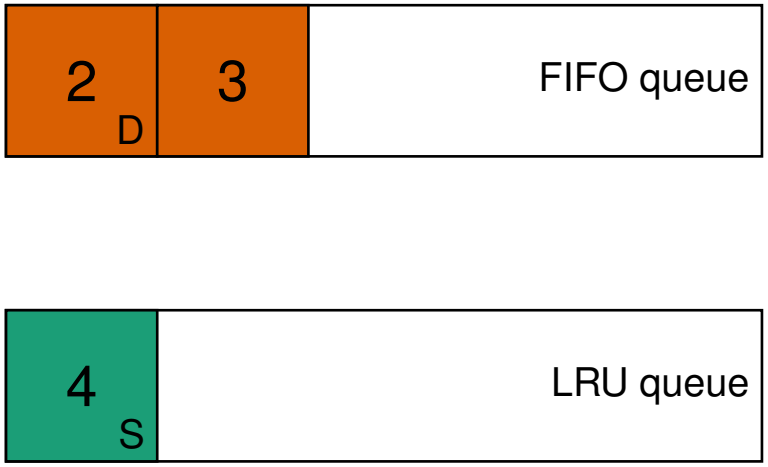
Example of Buffer Manager with 2Q

`unfix(3, false)`✓

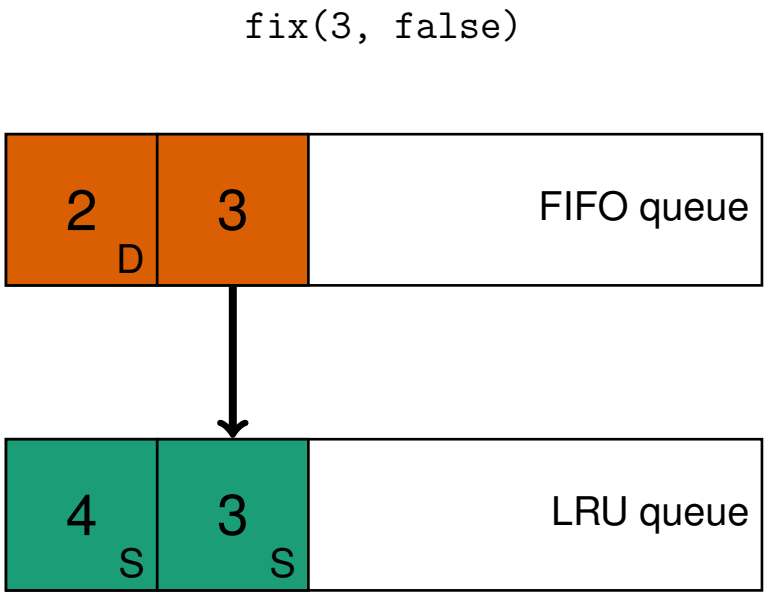


Example of Buffer Manager with 2Q

```
fix(3, false)
```

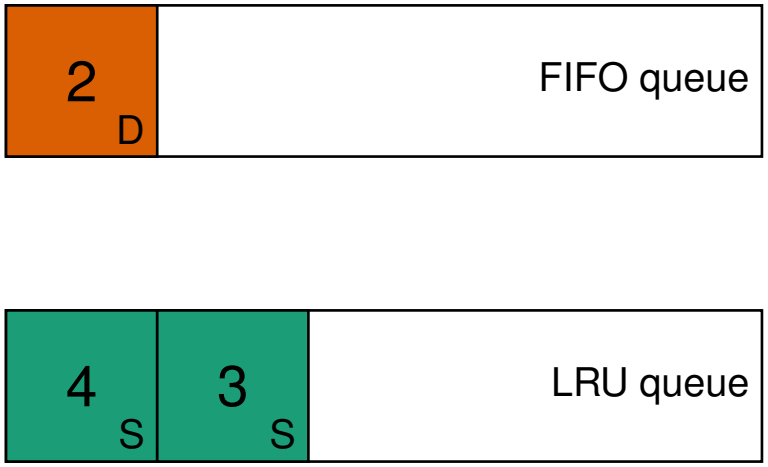


Example of Buffer Manager with 2Q



Example of Buffer Manager with 2Q

`fix(3, false)`✓



Example of Buffer Manager with 2Q

```
fix(4, false)
```

Example of Buffer Manager with 2Q

`fix(4, false)`✓