Virtual Memory:
Allocating Kernel Memory

Allocating Kernel Memory

Learning outcomes:

1) Understand kernel memory.
2) Understand Buddy System.
3) Understand Slab Allocation.

Summary of memory management

Memory hierarchy :

1) cache memory.
2) memory.
3) disk storage.
4) removable storage.

Memory manager: keep track of which parts of memory are in use and allocate or deallocate memory to processes when necessary.

Allocating Kernel Memory

Kernel Memory:

The kernel memory in the task manager is part of the total amount of memory available in the computer, and it is not available by the processes in the operating system.

Allocating Kernel Memory

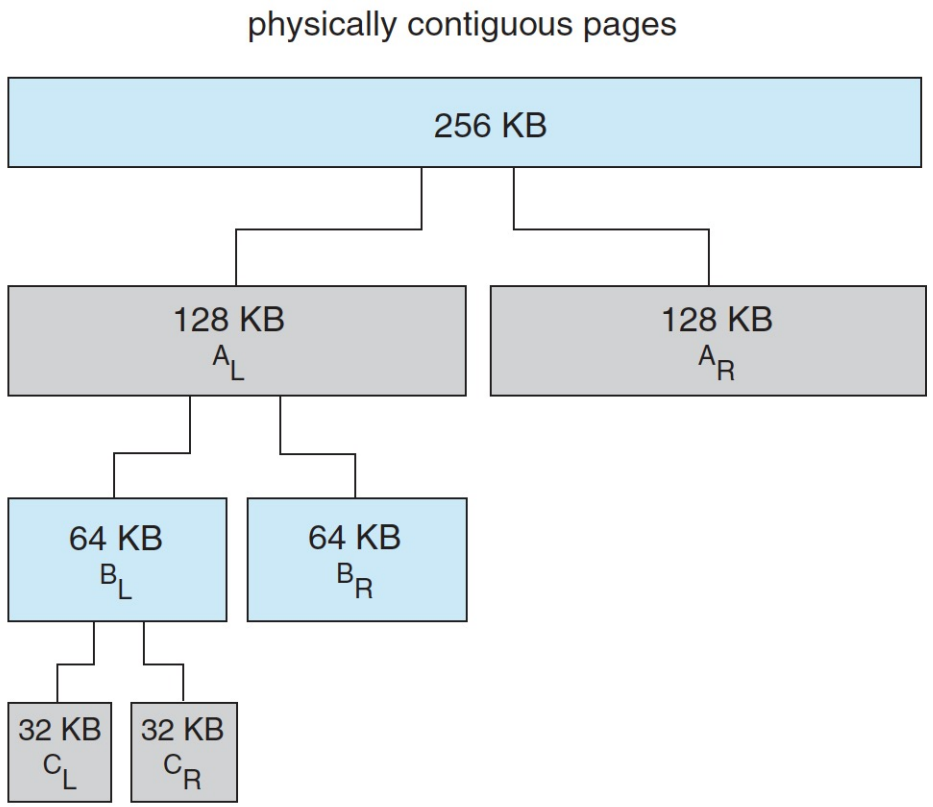
Kernel memory is often allocated from a free-memory pool different from the list used to satisfy ordinary user-mode processes. There are two primary reasons for this:

1) The kernel requests memory for data structures of varying sizes, some of which are less than a page in size.

2) Pages allocated to user-mode processes do not necessarily have to be in contiguous physical memory.

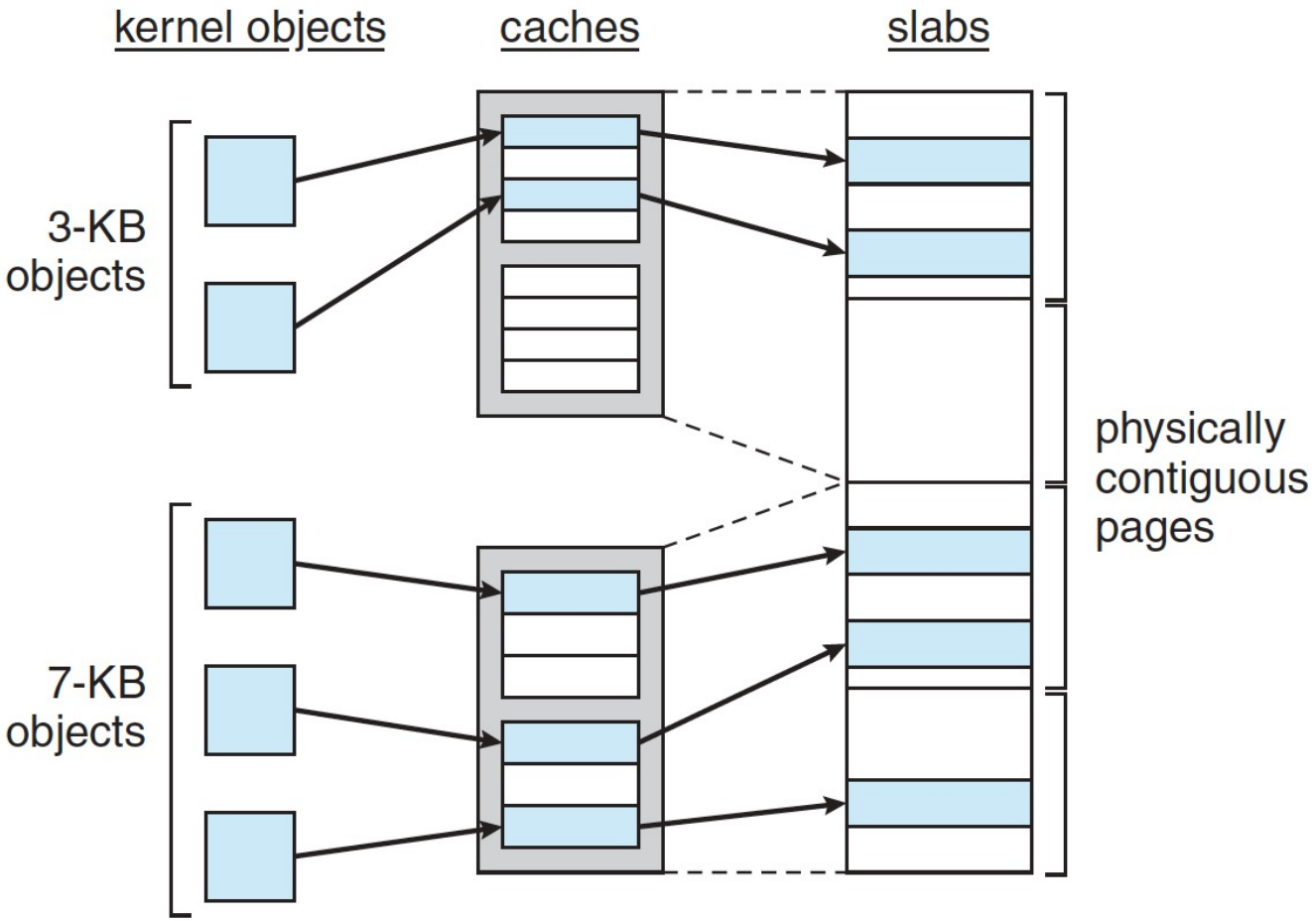
Allocating Kernel Memory

Buddy System: The buddy system allocates memory from a fixed-size segment consisting of physically contiguous pages.



Slab Allocation

Slab Allocation: A slab is made up of one or more physically contiguous pages. A cache consists of one or more slabs.



Slab Allocation

In Linux, a slab may be in one of three possible states:

1) Full. All objects in the slab are marked as used.
2) Empty. All objects in the slab are marked as free.
3) Partial. The slab consists of both used and free objects.

The slab allocator provides two main benefits:

1) No memory is wasted due to fragmentation.
2) Memory requests can be satisfied quickly.