# Linux Memory Allocator SLOB and usage

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SLOB Memory Allocator stands for Simple List of Blocks. The **SLOB** (Simple List of Blocks) allocator is one of three available memory allocators in the Linux kernel. In memory allocation, there are three types as follows:-

1. SLAB
2. SLUB
3. SLOB

SLOB organizes memory into pages. Allocations greater than a page size (including metadata) are passed to the page frame allocator directly, via a call to alloc pages(). Each SLOB page is broken into individual chunks, which are referred to as blocks (as mentioned in mm/slob.c). The blocks are referenced from singly linked list within each page. Approach used in SLOB to reduce the fragmentation is to place all objects within three distinctive lists of different sizes. Three distinctive lists of different sizes like

1. Less than 256 bytes
2. Less than 1024 bytes
3. Less than 4096 bytes

Figure below show three distinctive lists: -
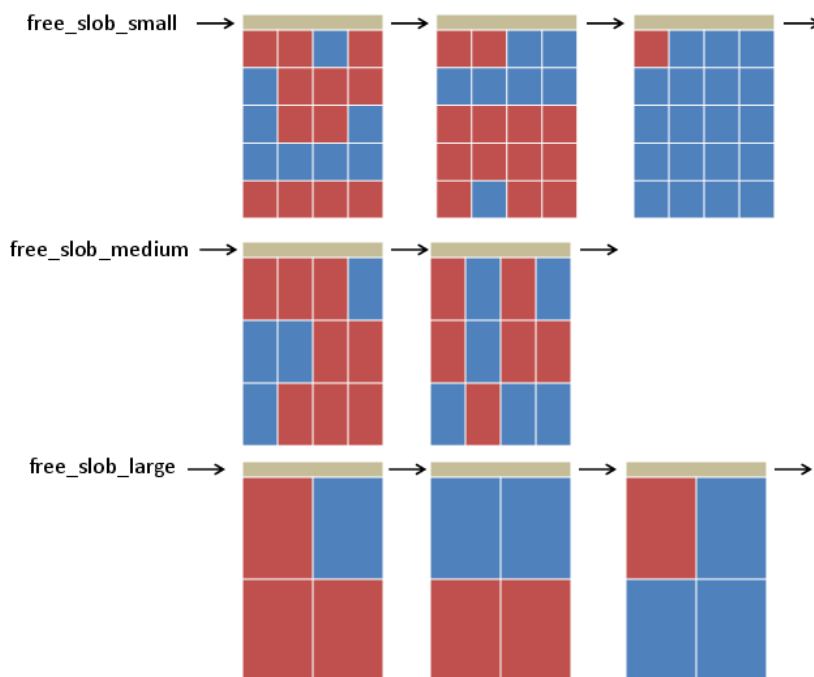
First-fit algorithm is used for allocation of memory. Initially, a SLOB page contains a single free block, which is fragmented as necessary to service smaller request sizes. Note that SLOB pages contain blocks of varying sizes, which differentiates SLOB from a classic slab allocator. The units' field for each slob page is checked against the requested allocation size. If the total amount of space available in the page is sufficient, the allocation is attempted. algorithm. If the page that the block belongs to is full (completely allocated), then the freelist pointer for that page is updated to point to the block and the page is reinserted into the appropriate linked list of partially full pages. The slob heap is a set of linked list of pages from alloc_pages(),and within each page, there is a singly-linked list of free blocks (slob_t). The heap is grown on demand. To reduce fragmentation, heap pages are segregated into three lists, with objects less than 256 bytes, objects less than 1024 bytes, and all other objects.

Usage:-
Primarily used Embedded systems(low memory footprint)
 -> Embedded Gentoo
 -> OpenEmbedded
 -> OpenWrt
 -> Commercial Embedded devices

Biggest drawback of SLOB Memory Allocator is its high degree to which it suffers internal fragmentation. SLOB's high fragmentation rate is the fact that it uses a simple first-fit algorithm for memory allocation.

Reference:-

- http://www.vsecurity.com/download/papers/slob-exploitation.pdf

- http://phrack.org/issues/66/15.html

- http://vulnfactory.org/research/slob.pdf

- http://en.wikipedia.org/wiki/SLOB