

Implicit List DMA (10 points):

Consider an implicit-list based allocator and memory architecture with the following properties:

- words are 4-bytes in width, and blocks and payload are word-aligned
- every block has word-sized boundary tags (each corresponding to a `size_t`) that store the size of the block and an allocated bit
- immediate coalescing is performed, and blocks are split during allocation whenever doing so results in two blocks with non-zero payload
- when splitting, the “lower” part of a block is allocated
- a first-fit search is used during allocation

WP1. Starting with the leftmost heap depicted on the worksheet, and moving from left to right, show the updated header/footer values on the heap after each successive call to `malloc`, `free`, and `realloc`.

WP1.

Start state: After After After
 malloc(25): free(0x8000503C): realloc(0x80005004, 10):

Addr.	Data	Addr.	Data	Addr.	Data	Addr.	Data
0x80005068	0x00000020	0x80005068		0x80005068		0x80005068	
0x...5064	—	0x...5064		0x...5064		0x...5064	
0x...5060	—	0x...5060		0x...5060		0x...5060	
0x...505c	—	0x...505c		0x...505c		0x...505c	
0x...5058	—	0x...5058		0x...5058		0x...5058	
0x...5054	—	0x...5054		0x...5054		0x...5054	
0x...5050	—	0x...5050		0x...5050		0x...5050	
0x...504c	0x00000020	0x...504c		0x...504c		0x...504c	
0x...5048	0x00000015	0x...5048		0x...5048		0x...5048	
0x...5044	—	0x...5044		0x...5044		0x...5044	
0x...5040	—	0x...5040		0x...5040		0x...5040	
0x...503c	—	0x...503c		0x...503c		0x...503c	
0x...5038	0x00000015	0x...5038		0x...5038		0x...5038	
0x...5034	0x00000028	0x...5034		0x...5034		0x...5034	
0x...5030	—	0x...5030		0x...5030		0x...5030	
0x...502c	—	0x...502c		0x...502c		0x...502c	
0x...5028	—	0x...5028		0x...5028		0x...5028	
0x...5024	—	0x...5024		0x...5024		0x...5024	
0x...5020	—	0x...5020		0x...5020		0x...5020	
0x...501c	—	0x...501c		0x...501c		0x...501c	
0x...5018	—	0x...5018		0x...5018		0x...5018	
0x...5014	—	0x...5014		0x...5014		0x...5014	
0x...5010	0x00000028	0x...5010		0x...5010		0x...5010	
0x...500c	0x00000011	0x...500c		0x...500c		0x...500c	
0x...5008	—	0x...5008		0x...5008		0x...5008	
0x...5004	—	0x...5004		0x...5004		0x...5004	
0x80005000	0x00000011	0x80005000		0x80005000		0x80005000	