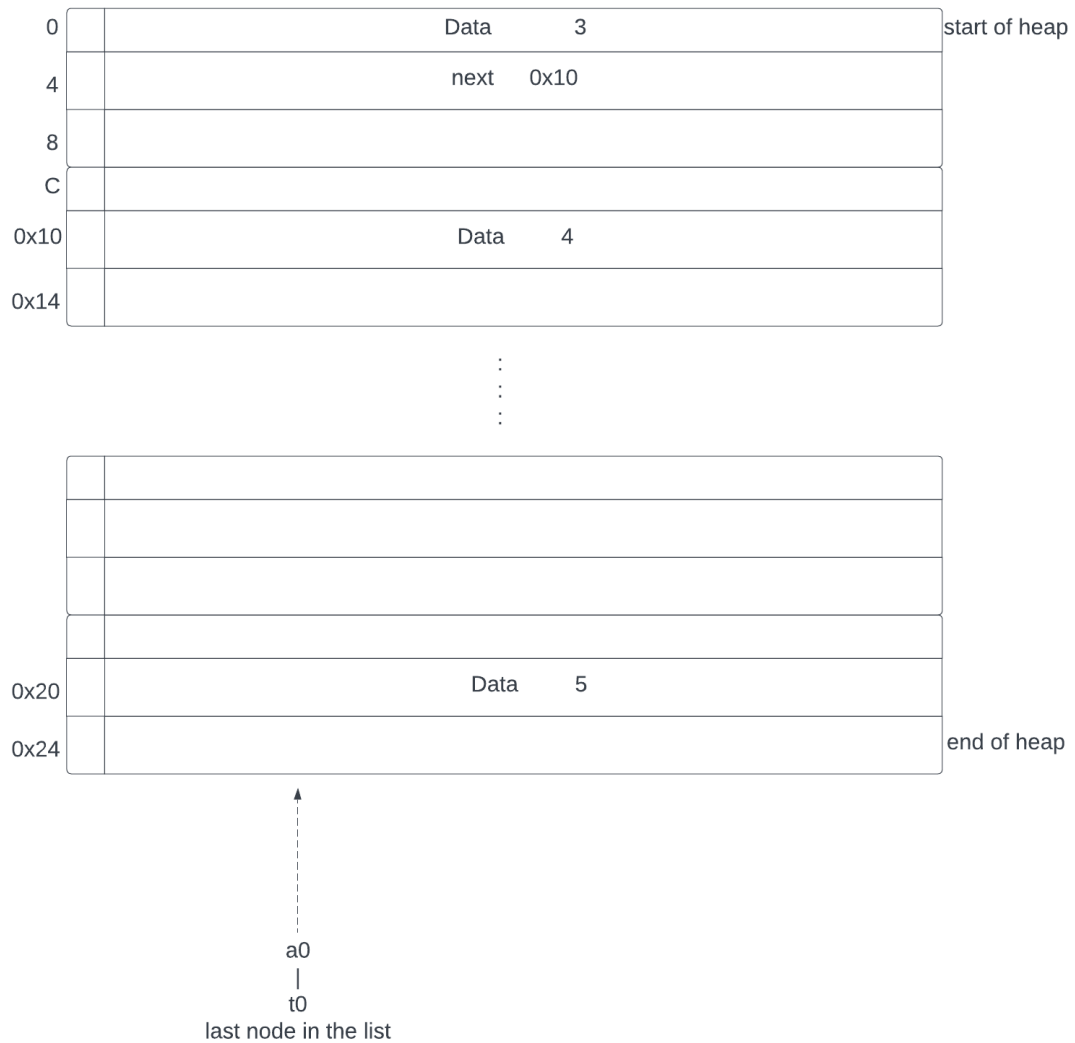


Lab 7 Report

1. Diagram of the heap for `mknodes` :



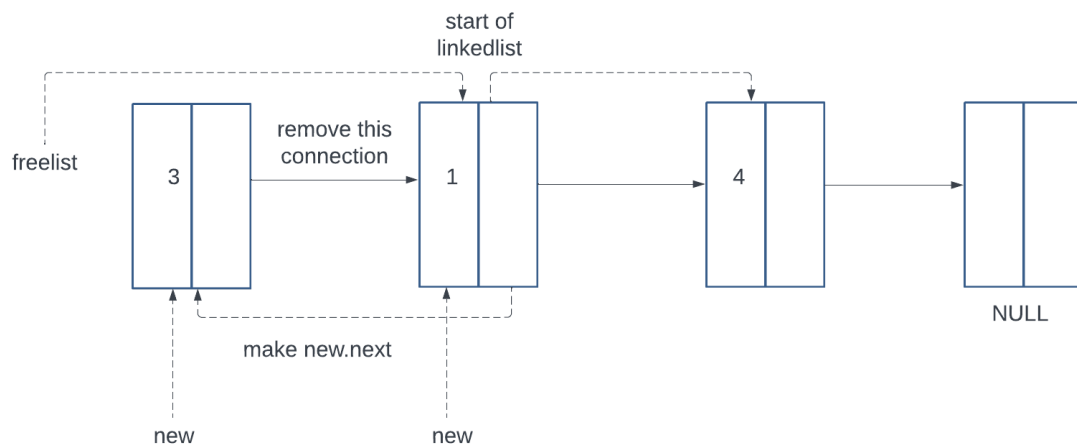
`$a0` : heap address

`$t0` : pointer to block

`$v0` : first node

Pointer is the value of address where the next node is in the heap

2. Diagram for `new()` :



freelist gets shorter, linked list gets longer after calling `new()`

3. Hand-written C code for `new()` :

```
struct node* new(Node * free_list) {  
    if (free_list == NULL) {  
        return NULL;  
    } else {  
        Node * new_node = free_list;  
        Node * new_free_list = free_list.next;  
        new_node.next = NULL;  
        return new_node;  
    }  
}
```

4. Output for `insert()` :

- **Call insert on these nodes input:** 5, 4, 3, 8, 2, 6, 7, 1

FP Regs	Int Regs [10]	Data	Text
Int Regs [10]		Data	
PC = 4194336 EPC = 0 Cause = 0 BadVAddr = 0 Status = 805371664 HI = 0 LO = 0 R0 [r0] = 0 R1 [at] = 268500992 R2 [v0] = 10 R3 [v1] = 268501872 R4 [a0] = 268501144 R5 [a1] = 268501080 R6 [a2] = 268501072 R7 [a3] = 0 R8 [t0] = 0 R9 [t1] = 8 R10 [t2] = 268501096 R11 [t3] = 268501112 R12 [t4] = 8 R13 [t5] = 268501112 R14 [t6] = 0 R15 [t7] = 0 R16 [s0] = 268500992 R17 [s1] = 268501024 R18 [s2] = 8 R19 [s3] = 268501024 R20 [s4] = 0 R21 [s5] = 0 R22 [s6] = 0 R23 [s7] = 0 R24 [t8] = 0 R25 [t9] = 0 R26 [k0] = 0 R27 [k1] = 0 R28 [gp] = 268468224 R29 [sp] = 2147483080 R30 [s8] = 0 R31 [ra] = 4194328	User data segment [10000000]..[10040000] [10000000]..[1000ffff] 00000000 [10010000] 0000000005 0000000004 0000000003 0000000000 [10010010] 0000000002 0000000006 0000000007 0000000001 [10010020] 0000000000 0000000000 0265010214 0000000000 [10010030] 0268501032 0000000000 0265010400 0000000000 [10010040] 0268501048 0000000000 0265010556 0000000000 [10010050] 0268501064 0000000000 0265011044 0000000001 [10010060] 0268501112 0000000007 0265010858 0000000006 [10010070] 0268501120 0000000002 0000000000 0000000000 [10010080] 0268501128 0000000003 0265011136 0000000004 [10010090] 0268501096 0000000005 1325400208 1864397941 [100100a0] 1919295590 1847616869 1936024687 1702109243 [100100b0] 1852403058 1852404833 1919950951 1634887535 [100100c0] 0000002659 0000000000 0000000000 0000000000 [100100d0]..[1003ffff] 00000000		
	User Stack [7ffffdc8]..[80000000] [7ffffdc8] 0000000001 2147483149 [7ffffdd0] 0000000000 2147483636 2147483598 2147483576 [7ffffde0] 2147483512 2147483497 2147483462 2147483396 [7ffffdf0] 2147483381 2147483362 2147483324 2147483267 [7ffffee0] 2147483203 2147483189 0000000000 1934962432 [7ffffef0] 0796095077 1805694308 1278178678 0758604385 [7fffff00] 1634561349 1852402735 0761554283 1953720684 [7fffff10] 1836278062 1129338800 1095517791 0809325383 [7fffff20] 1476407416 1398752080 1230393925 1314866499 [7fffff30] 1027951937 1819308129 1952539497 0778989417 [7fffff40] 0778923875 1970430316 1953574515 1835626611 [7fffff50] 0892744494 0825439024 0909323825 0858992693 [7fffff60] 1409299761 1229213773 1982007378 1714385505 [7fffff70] 1701800175 1647276914 2019700584 1785409657 [7fffff80] 1899311417 2020631409 2030851176 0959737972 [7fffff90] 0808477561 1852256304 0803101743 1178828447 [7fffffa0] 1163089247 1163157330 1163875416 1146045262 [7fffffb0] 1028083273 1177647152 2016426549 2016426544 [7fffffc0] 1330118704 0792544589 1919251285 1768173427 [7fffffd0] 1970696293 1162367744 0792546380 0795765090 [7fffffe0] 0006045306 1598575443 1213486401 1129272159 [7ffffff0] 1882144075 1635150194 1949263220 1664053357 [7ffff000] 1630432623 1701805408 1969310958 1684562798 [7ffff010] 1195459630 1833004404 0792941930 1953720652 [7ffff020] 1919250021 1095762035 0792545364 0796029813 [7ffff030] 0908314466 1852400175 1937859642 1651715954 [7ffff040] 0792358505 1852400243 1196379136 1162698004 [7ffff050] 1701405757 0007698032 1347635524 1029259596 [7ffff060] 1769107503 1702125942 1886221359 1836016431 [7ffff070] 1886413102 1814577948 1660183393 1412325504 [7ffff080] 1800105235 1466874008 1810880337 1083781687		

Console
1 2 3 4 5 6 7 8

- Call insert on these nodes input: 5, 4, 3, 8, 2, 6, 7, 1, 9, 10, 11, 12, 13, 14, 15, 16

=> This input will cause the program to terminate and print out the error message (since NUMNODES is 15 but we insert 16 nodes)

FP Regs	Int Regs [10]	Data	Text
Int Regs [10]		Data	
PC = 4194336 EPC = 0 Cause = 0 BadVAddr = 0 Status = 805371664 HI = 0 LO = 0 R0 [r0] = 0 R1 [at] = 268500992 R2 [v0] = 10 R3 [v1] = 0 R4 [a0] = 268501176 R5 [a1] = 268501112 R6 [a2] = 0 R7 [a3] = 0 R8 [t0] = 0 R9 [t1] = 15 R10 [t2] = 268501064 R11 [t3] = 0 R12 [t4] = 14 R13 [t5] = 0 R14 [t6] = 0 R15 [t7] = 0 R16 [s0] = 268500992 R17 [s1] = 268501056 R18 [s2] = 16 R19 [s3] = 268501056 R20 [s4] = 0 R21 [s5] = 0 R22 [s6] = 0 R23 [s7] = 0 R24 [t8] = 0 R25 [t9] = 0 R26 [k0] = 0 R27 [k1] = 0 R28 [gp] = 268468224 R29 [sp] = 2147483080 R30 [s8] = 0 R31 [ra] = 4194328	User data segment [10000000]..[10040000] [10000000]..[1000ffff] 00000000 [10010000] 0000000005 0000000004 0000000003 0000000000 [10010010] 0000000002 0000000006 0000000007 0000000001 [10010020] 0000000009 0000000010 0000000011 0000000012 [10010030] 0000000013 0000000014 0000000015 0000000016 [10010040] 0000000000 0000000015 0000000016 0000000001 [10010050] 0268501064 0000000013 0268501072 0000000012 [10010060] 0268501080 0000000011 0268501088 0000000010 [10010070] 0268501096 0000000000 0265011136 0000000001 [10010080] 0268501144 0000000007 0268501120 0000000006 [10010090] 0268501152 0000000002 0268501104 0000000000 [100100a0] 0268501168 0000000003 0268501168 0000000004 [100100b0] 0268501128 0000000005 1325400208 1864397941 [100100c0] 1919295590 1847616869 1936024687 1702109243 [100100d0] 1852403058 1852404833 1919950951 1634887535 [100100e0] 0000002659 0000000000 0000000000 0000000000 [100100f0]..[1003ffff] 00000000		
	User Stack [7ffffdc8]..[80000000] [7ffffdc8] 0000000001 2147483149 [7ffffdd0] 0000000000 2147483636 2147483598 2147483576 [7ffffde0] 2147483512 2147483497 2147483462 2147483396 [7ffffdf0] 2147483381 2147483362 2147483324 2147483267 [7ffffee0] 2147483203 2147483189 0000000000 1934962432 [7ffffef0] 0796095077 1805694308 1278178678 0758604385 [7fffff00] 1634561349 1852402735 0761554283 1953720684 [7fffff10] 1836278062 1129338800 1095517791 0809325383 [7fffff20] 1476407416 1398752080 1230393925 1314866499 [7fffff30] 1027951937 1819308129 1952539497 0778989417 [7fffff40] 0778923875 1970430316 1953574515 1835626611 [7fffff50] 0892744494 0825439024 0909323825 0858992693 [7fffff60] 1409299761 1229213773 1982007378 1714385505 [7fffff70] 1701800175 1647276914 2019700584 1785409657 [7fffff80] 1899311417 2020631409 2030851176 0959737972 [7fffff90] 0808477561 1852256304 0803101743 1178828447 [7fffffa0] 1163089247 1163157330 1163875416 1146045262 [7fffffb0] 1028083273 1177647152 2016426549 2016426544 [7fffffc0] 1330118704 0792544589 1919251285 1768173427 [7fffffd0] 1970696293 1162367744 0792546380 0795765090 [7fffffe0] 0006045306 1598575443 1213486401 1129272159 [7ffffff0] 1882144075 1635150194 1949263220 1664053357 [7ffff000] 1630432623 1701805408 1969310958 1684562798 [7ffff010] 1195459630 1833004404 0792941930 1953720652 [7ffff020] 1919250021 1095762035 0792545364 0796029813 [7ffff030] 0908314466 1852400175 1937859642 1651715954 [7ffff040] 0792358505 1852400243 1196379136 1162698004 [7ffff050] 1701405757 0007698032 1347635524 1029259596 [7ffff060] 1769107503 1702125942 1886221359 1836016431 [7ffff070] 1886413102 1814577948 1660183393 1412325504 [7ffff080] 1800105235 1466874008 1810880337 1083781687		

Console
Out of free nodes; terminating program 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15