

Activities Visual Studio Code Jan 5 11:38 AM

File Edit Selection View Go Run ... ↻ ↺ memory\_simulator 65%

EXPLORER PROBLEMS OUTPUT TERMINAL PORTS

MEMORY\_SIMULATOR  
  > .vscode  
  > docs  
  > include  
  src  
    > allocator  
    > buddy  
    > cache  
    > stats  
    > virtual\_memory  
      main.cpp  
      main.o  
      tests  
      Makefile  
      memsim  
      DEBUG CONSOLE

pratik@pratik-asus-mzp:/media/pratik/New Volume/memory\_simulator\$ make run  
./memsim  
Memory Management Simulator  
Type 'help' to see available commands  
> help  
Commands:  
  > init memory <size>  
  > set allocator first\_fit | best\_fit | worst\_fit | buddy  
  > malloc <size>  
  > free <id>  
  > dump  
  > stats  
  
  cache init <cache\_size> <block\_size> <fifo|lru>  
  cache access <address>  
  cache dump  
  cache stats  
  
  mlcache init <l1size> <l1block> <l2size> <l2block> <fifo|lru>  
  mlcache access <address>  
  mlcache dump  
  mlcache stats  
  
  exit  
  > init memory 1024  
  Memory initialized: 1024 bytes  
  > set allocator first\_fit  
  > malloc 100  
  Allocated block id=1 using First Fit at address=0x0000 (size=100)  
  > malloc 200  
  Allocated block id=2 using First Fit at address=0x0064 (size=200)  
  > malloc 50  
  Allocated block id=3 using First Fit at address=0x012c (size=50)  
  > dump  
  Memory Layout:  
  [0x0000 - 0x0063] USED (id=1)  
  [0x0064 - 0x012b] USED (id=2)  
  [0x012c - 0x015d] USED (id=3)  
  [0x015e - 0x03ff] FREE

Filter (e.g. text, !exclude, \escape)

Ln 229, Col 1 Spaces: 4 UTF-8 LF { C++ 8 Linux

```
[0x0000 - 0x0063] FREE
> free 2
Block id=2 freed successfully
> dump
Memory Layout:
[0x0000 - 0x0063] USED (id=1)
[0x0064 - 0x012b] FREE
[0x012c - 0x015d] USED (id=3)
[0x015e - 0x03ff] FREE
> stats

Memory Statistics
-----
Total Memory: 1024 bytes
Used Memory: 150 bytes
Free Memory: 874 bytes
Allocated Blocks: 2
Free Blocks: 2
Largest Free Block: 674 bytes
External Fragmentation: 200 bytes
```

```
pratik@pratik-asus-mzp:/media/pratik/New Volume/memory_simulator$ make run
./memsim
Memory Management Simulator
Type 'help' to see available commands
> help
Commands:
init memory <size>
set allocator first_fit | best_fit | worst_fit | buddy
malloc <size>
free <id>
dump
stats

cache init <cache_size> <block_size> <fifo|lru>
cache access <address>
cache dump
cache stats

mlcache init <l1size> <l1block> <l2size> <l2block> <fifo|lru>
mlcache access <address>
mlcache dump
mlcache stats

exit
> init memory 1024
Memory initialized: 1024 bytes
> set allocator buddy
Allocator set to Buddy System
> malloc 100
Allocated 128 bytes at address 0x0
> malloc 150
Allocated 256 bytes at address 0x100
> malloc 120
Allocated 128 bytes at address 0x80
```

```
Allocated 128 bytes at address 0x80
```

```
> dump
```

```
Buddy Memory Layout:
```

```
[0x0200 - 0x03ff] FREE (512)
[0x0000 - 0x007f] USED (128)
[0x0080 - 0x00ff] USED (128)
[0x0100 - 0x01ff] USED (256)
```

```
> free 0
```

```
Freed block at address 0x0
```

```
> free 128
```

```
Freed block at address 0x80
```

```
> dump
```

```
Buddy Memory Layout:
```

```
[0x0000 - 0x00ff] FREE (256)
[0x0200 - 0x03ff] FREE (512)
[0x0100 - 0x01ff] USED (256)
```

```
> stats
```

#### Memory Statistics

---

Total Memory:	1024 bytes
Used Memory:	0 bytes
Free Memory:	1024 bytes
Allocated Blocks:	0
Free Blocks:	1
Largest Free Block:	1024 bytes
External Fragmentation:	0 bytes

```
exit
> cache init 64 16 fifo
Cache initialized: 4 lines, Block 16 bytes, Policy fifo
> cache access 32
Access address 32
Cache MISS
> cache access 32
Access address 32
Cache HIT
> cache dump
Set 0: [INVALID]
Set 1: [INVALID]
Set 2: [Tag=0]
Set 3: [INVALID]
> cache stats
Hits: 1 Misses: 1 Hit Ratio: 0.5
```

```
> mlcache init 64 16 128 16 fifo
Multi-level cache initialized
> mlcache access 32
Access address 32
L1 MISS
L2 MISS → Main Memory
> mlcache access 32
Access address 32
L1 HIT
> mlcache dump

--- L1 Cache ---
Set 0: [INVALID]
Set 1: [INVALID]
Set 2: [Tag=0]
Set 3: [INVALID]

--- L2 Cache ---
Set 0: [INVALID]
Set 1: [INVALID]
Set 2: [Tag=0]
Set 3: [INVALID]
Set 4: [INVALID]
Set 5: [INVALID]
Set 6: [INVALID]
Set 7: [INVALID]
> mlcache stats

Multi-Level Cache Stats:
L1 → Hits: 2 Misses: 1 Hit Ratio: 0.666667
L2 → Hits: 1 Misses: 1 Hit Ratio: 0.5
Main Memory Accesses: 1
> █
```