

Activities Visual Studio Code Jan 5 11:38 AM

File Edit Selection View Go Run ... memory_simulator

EXPLORER

- MEMORY_SIMULATOR
 - .vscode
 - docs
 - include
 - src
 - allocator
 - buddy
 - cache
 - stats
 - virtual_memory
 - main.cpp**
 - main.o
 - tests
 - Makefile
 - memsim
- DEBUG CONSOLE
 - Filter (e.g. text, exclude, escape)
 - OUTLINE
 - TIMELINE

PROBLEMS OUTPUT TERMINAL PORTS

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
```

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

```
[0x015c - 0x03ff] 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
```

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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 <llsize> <llblock> <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 0x00

> 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

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