LameOS

1.0

Generated by Doxygen 1.9.1

Chapter 1

Class Index

1.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 2

File Index

2.1 File List

Here is a list of all files with brief descriptions:

Chapter 3

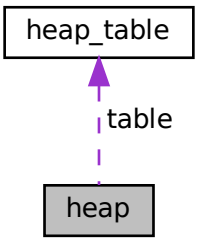
Class Documentation

3.1 heap Struct Reference

Defines the physical structure of the heap.

`#include <heap.h>`

Collaboration diagram for heap:



Public Attributes

- struct heap_table * table
- void * saddr

3.1.1 Detailed Description

Defines the physical structure of the heap.

The heap is loaded at 16MB and is a contiguous 100MB block of memory, growing upwards towards 116MB. The heap data structure contains a pointer to the heap table data structure, and a void pointer the start address of the heap physical memory.

See also

kheap.c

Note

Allocated in the .bss section

3.1.2 Member Data Documentation

3.1.2.1 saddr

```
void* heap::saddr
```

3.1.2.2 table

```
struct heap_table* heap::table
```

The documentation for this struct was generated from the following file:

- /home/fransys/prog/C/bootable_code/src/memory/heap/heap.h

3.2 heap_table Struct Reference

Defines the logical structure of the heap table.

```
#include <heap.h>
```

Public Attributes

- HEAP_BLOCK_TABLE_ENTRY * entries
- size_t total

3.2.1 Detailed Description

Defines the logical structure of the heap table.

(Allocation) The heap table is loaded at 32KB in memory, and is 25,600 bytes in size. Each index in the table represents a 4096B block in the heap. 0x00 means free, 0x01 means taken, 0x80 means has next, 0x40 means block is first in allocation series.

See also

kheap.c

Note

Allocated in the .bss section

3.2.2 Member Data Documentation

3.2.2.1 entries

```
HEAP_BLOCK_TABLE_ENTRY* heap_table::entries
```

3.2.2.2 total

```
size_t heap_table::total
```

The documentation for this struct was generated from the following file:

- /home/fransys/prog/C/bootable_code/src/memory/heap/heap.h

3.3 idt_desc Struct Reference

Interrupt Descriptor Table (IDT) Descriptor.

```
#include <idt.h>
```

Public Attributes

- uint16_t offset_1
- uint16_t selector
- uint8_t zero
- uint8_t type_attr
- uint16_t offset_2

3.3.1 Detailed Description

Interrupt Descriptor Table (IDT) Descriptor.

This structure represents a single entry in the Interrupt Descriptor Table (IDT). The IDT is used by the processor to handle interrupts and exceptions. Each IDT descriptor corresponds to a specific interrupt or exception and provides the necessary information for the processor to handle them correctly.

3.3.2 Member Data Documentation

3.3.2.1 offset_1

```
uint16_t idt_desc::offset_1
```

3.3.2.2 offset_2

```
uint16_t idt_desc::offset_2
```

3.3.2.3 selector

```
uint16_t idt_desc::selector
```

3.3.2.4 type_attr

```
uint8_t idt_desc::type_attr
```

3.3.2.5 zero

```
uint8_t idt_desc::zero
```

The documentation for this struct was generated from the following file:

- /home/fransys/prog/C/bootable_code/src/idt/idt.h

3.4 idtr_desc Struct Reference

IDT Register (IDTR) Descriptor.

```
#include <idt.h>
```

Public Attributes

- uint16_t limit
- uint32_t base

3.4.1 Detailed Description

IDT Register (IDTR) Descriptor.

This structure represents the IDT Register (IDTR) descriptor, which provides the base address and limit of the Interrupt Descriptor Table (IDT). The IDTR is a control register used by the processor to locate and access the IDT.

3.4.2 Member Data Documentation

3.4.2.1 base

```
uint32_t idtr_desc::base
```

3.4.2.2 limit

```
uint16_t idtr_desc::limit
```

The documentation for this struct was generated from the following file:

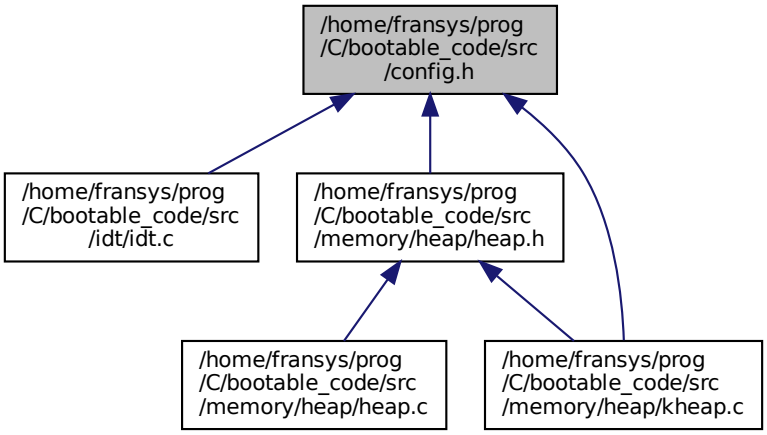
- /home/fransys/prog/C/bootable_code/src/idt/idt.h

Chapter 4

File Documentation

4.1 /home/fransys/prog/C/bootable_code/src/config.h File Reference

This graph shows which files directly or indirectly include this file:



Macros

- #define KERNEL_CODE_SELECTOR 0X08

  Code Segment Selector.
- #define KERNEL_DATA_SELECTOR 0X10

  Data Segment Selector.
- #define LAMEOS_TOTAL_INTERRUPTS 512

  Macro Constant Defining Total Interrupts.
- #define LAMEOS_HEAP_SIZE_BYTES 104857600

  Size of the kernel heap in bytes.
- #define LAMEOS_HEAP_BLOCK_SIZE 4096
- #define LAMEOS_HEAP_ADDRESS 0x01000000

  The starting address of the kernel heap, (16 MB).
- #define LAMEOS_HEAP_TABLE_ADDRESS 0x00007E00

  The address of the kernel heap table (32 KB).

4.1.1 Macro Definition Documentation

4.1.1.1 KERNEL_CODE_SELECTOR

```
#define KERNEL_CODE_SELECTOR 0X08
```

Code Segment Selector.

The offset of the code_seg entry in the GDT is 0x08.

4.1.1.2 KERNEL_DATA_SELECTOR

```
#define KERNEL_DATA_SELECTOR 0X10
```

Data Segment Selector.

The offset of the data_seg entry in the GDT is 0x10.

4.1.1.3 LAMEOS_HEAP_ADDRESS

```
#define LAMEOS_HEAP_ADDRESS 0x01000000
```

The starting address of the kernel heap, (16 MB).

The kernel heap begins here and ends at 16 MB + 100 MB = 116 MB, Which is 0x01000000 + 0x6400000 = 0x6F00000.

4.1.1.4 LAMEOS_HEAP_BLOCK_SIZE

```
#define LAMEOS_HEAP_BLOCK_SIZE 4096
```

4.1.1.5 LAMEOS_HEAP_SIZE_BYTES

```
#define LAMEOS_HEAP_SIZE_BYTES 104857600
```

Size of the kernel heap in bytes.

(100 MB)

4.1.1.6 LAMEOS_HEAP_TABLE_ADDRESS

```
#define LAMEOS_HEAP_TABLE_ADDRESS 0x00007E00
```

The address of the kernel heap table (32 KB).

The size of the heap table itself is 32 KB, which is 0x8000 bytes.

4.1.1.7 LAMEOS_TOTAL_INTERRUPTS

```
#define LAMEOS_TOTAL_INTERRUPTS 512
```

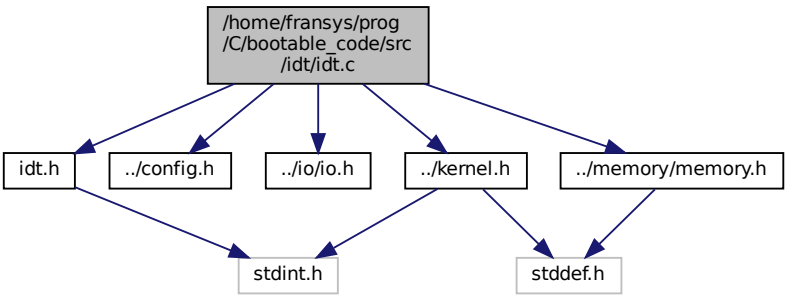
Macro Constant Defining Total Interrupts.

The IDT is an array of 512 descriptors, each 8 bytes long. Although in reality only 256 are actually available for use by programmers. The rest are reserved by the CPU for one reason or another.

4.2 /home/fransys/prog/C/bootable_code/src/idt/idt.c File Reference

```
#include "idt.h"
#include "../config.h"
#include "../io/io.h"
#include "../kernel.h"
#include "../memory/memory.h"
```

Include dependency graph for idt.c:



Functions

- void idt_load (struct idtr_desc *ptr)

  Wrapper function for assembly routine idt_load.
- void int21h ()
- void no_interrupt ()
- void int21h_handler ()
- void no_interrupt_handler ()
- void idt_zero ()

  Interrupt Zero Definition.
- void idt_set (int interrupt_no, void *address)

  Defines an IDT descriptor.
- void idt_init ()

  Initialize Kernel Interrupt Descriptor Table (IDT).

Variables

- struct idt_desc idt_descriptors [LAMEOS_TOTAL_INTERRUPTS]

  Array of 512 IDT Descriptors.
- struct idtr_desc idtr_descriptor

  A struct representing the IDT register (IDTR).

4.2.1 Function Documentation

4.2.1.1 idt_init()

```
void idt_init ( )
```

Initialize Kernel Interrupt Descriptor Table (IDT).

Initializes kernel IDT array by zeroing every descpritor in the array, Sets the IDTR descriptor limit and base, Intended to set each IDT descriptor, but currently only sets the interrupt descriptor 0, Concludes Loads the IDTR by calling wrapper function idt_load, for the asm function of the same name. The asm routine idt_load loads the IDTR with the kernel IDTR struct.

Note

There is a 1:1 mapping between the IDT and the CPU's interrupt numbers.

See also

memset in src/memory/memory.c

idt_set in src/idt/idt.c

idt_load in src/idt/idt.asm

4.2.1.2 idt_load()

```
void idt_load (
            struct idtr_desc * ptr )
```

Wrapper function for assembly routine idt_load.

The wrapper fct is called from within idt_init. It loads the IDTR by calling the assembly function idt_load. By loading the kernel IDTR struct, the processor knows where the kernel IDT struct-array is located in memory.

Note

The assembly routine is exposed to the linker by `global idt_load` in the idt.asm file.

See also

idt_init in src/idt/idt.c

idt_load in src/idt/idt.asm

Parameters

ptr	a void pointer to the IDTR descriptor

4.2.1.3 idt_set()

```
void idt_set (
             int interrupt_no,
             void * address )
```

Defines an IDT descriptor.

Defines a descriptor by setting the offset, selector, zero, type_attr, and offset_2 fields of the descriptor. The offset is the address of the programmable interrupt routine. The selector is the kernel code selector. The zero field is unused and set to zero. The type_attr field is set to 0xEE, which is the type and attributes for a 32-bit interrupt gate. The offset_2 field is the upper 16 bits of the offset.

See also

idt_init in src/idt/idt.c

Parameters

interrupt_no	The CPU interrupt number to map fct address to.
address	The address of the programmable interrupt routine.

4.2.1.4 idt_zero()

```
void idt_zero ( )
```

Interrupt Zero Definition.

This interrupt routine is called by the CPU when a divide by zero exception occurs. It is mapped to interrupt 0 in the CPU's IDT when idt_init is called. The routine clears the screen and prints an error message.

See also

idt_load in src/idt/idt.asm

4.2.1.5 int21h()

```
void int21h ( )
```

4.2.1.6 int21h_handler()

```
void int21h_handler ( )
```

4.2.1.7 no_interrupt()

```
void no_interrupt ( )
```

4.2.1.8 no_interrupt_handler()

```
void no_interrupt_handler ( )
```

4.2.2 Variable Documentation

4.2.2.1 idt_descriptors

```
struct idt_desc idt_descriptors[LAMEOS_TOTAL_INTERRUPTS]
```

Array of 512 IDT Descriptors.

The kernel maintains an array of 512 IDT descriptors. Each descriptor corresponds to a specific interrupt or exception. The array is initialized by idt_init.

4.2.2.2 idtr_descriptor

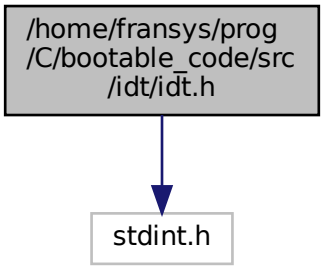
```
struct idtr_desc idtr_descriptor
```

A struct representing the IDT register (IDTR).

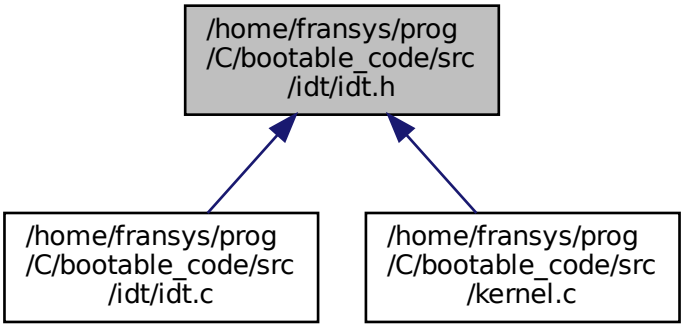
The IDTR is a control register used by the processor to locate and access the IDT. The IDTR is initialized by idt_init.

4.3 /home/fransys/prog/C/bootable_code/src/idt/idt.h File Reference

`#include <stdint.h>`
Include dependency graph for idt.h:



This graph shows which files directly or indirectly include this file:



Classes

- struct idt_desc

  Interrupt Descriptor Table (IDT) Descriptor.
- struct idtr_desc

  IDT Register (IDTR) Descriptor.

Functions

- struct idt_desc __attribute__ ((packed))
- void idt_init ()

  Initialize Kernel Interrupt Descriptor Table (IDT).

Variables

- uint16_t offset_1
- uint16_t selector
- uint8_t zero
- uint8_t type_attr
- uint16_t offset_2
- uint16_t limit
- uint32_t base

4.3.1 Function Documentation

4.3.1.1 __attribute__()

```
struct idtr_desc __attribute__ (
             (packed)  )
```

4.3.1.2 idt_init()

```
void idt_init ( )
```

Initialize Kernel Interrupt Descriptor Table (IDT).

Initializes the Interrupt Descriptor Table (IDT) by: Zeroing out the user-IDT array, Setting the IDT Register (IDTR) descriptor limit and base, Setting the IDT descriptors for each programmed interrupt, and Loading the IDTR by calling the assembly function idt_load.

See also

idt_init in src/idt/idt.c

Initializes kernel IDT array by zeroing every descpritor in the array, Sets the IDTR descriptor limit and base, Intended to set each IDT descriptor, but currently only sets the interrupt descriptor 0, Concludes Loads the IDTR by calling wrapper function idt_load, for the asm function of the same name. The asm routine idt_load loads the IDTR with the kernel IDTR struct.

Note

There is a 1:1 mapping between the IDT and the CPU's interrupt numbers.

See also

memset in src/memory/memory.c

idt_set in src/idt/idt.c

idt_load in src/idt/idt.asm

4.3.2 Variable Documentation

4.3.2.1 base

```
uint32_t base
```

4.3.2.2 limit

```
uint16_t limit
```

4.3.2.3 offset_1

```
uint16_t offset_1
```

4.3.2.4 offset_2

```
uint16_t offset_2
```

4.3.2.5 selector

```
uint16_t selector
```

4.3.2.6 type_attr

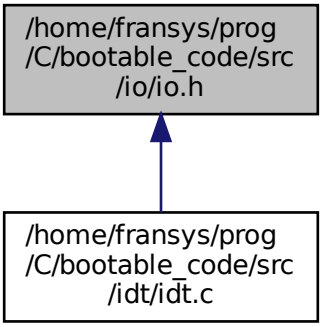
```
uint8_t type_attr
```

4.3.2.7 zero

```
uint8_t zero
```

4.4 /home/fransys/prog/C/bootable_code/src/io/io.h File Reference

This graph shows which files directly or indirectly include this file:



Functions

- unsigned char insb (unsigned short port)

  C wrapper of BIOS `insb` instruction Reads a byte in from a PIO port.
- unsigned short insw (unsigned short port)

  C wrapper of BIOS `insw` instruction Reads a word in from a PIO port.
- void outb (unsigned short port, unsigned char val)

  C wrapper of BIOS `outb` instruction Writes a byte out to a PIO port.
- void outw (unsigned short port, unsigned short val)

  C wrapper of BIOS `outw` instruction Writes a word out to a PIO port.

4.4.1 Function Documentation

4.4.1.1 insb()

```
unsigned char insb (
            unsigned short port )
```

C wrapper of BIOS `insb` instruction Reads a byte in from a PIO port.

See also

/src/io/io.asm

Parameters

port	The PIO port to read from, range 0x0000 - 0xFFFF (0-65535).

Returns

unsigned char, the byte read in from the port.

Note

This function is implemented in assembly. A char is 1 byte.

4.4.1.2 insw()

```
unsigned short insw (
            unsigned short port )
```

C wrapper of BIOS `insw` instruction Reads a word in from a PIO port.

Parameters

port	The PIO port to read from, range 0x0000 - 0xFFFF (0-65535).

Returns

unsigned short, the word read in from the port.

Note

This function is implemented in assembly. A short is 2 bytes.

4.4.1.3 outb()

```
void outb (
            unsigned short port,
            unsigned char val )
```

C wrapper of BIOS `outb` instruction Writes a byte out to a PIO port.

Parameters

port	The PIO port to write to, range 0x0000 - 0xFFFF (0-65535).
val	The byte to write out to the port.

Note

This function is implemented in assembly. A char is 1 byte.

4.4.1.4 outw()

```
void outw (
            unsigned short port,
            unsigned short val )
```

C wrapper of BIOS `outw` instruction Writes a word out to a PIO port.

Parameters

port	The PIO port to write to, range 0x0000 - 0xFFFF (0-65535).
val	The word to write out to the port.

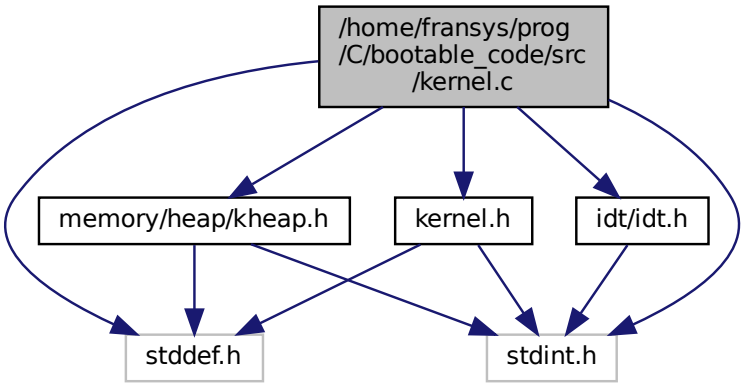
Note

This function is implemented in assembly. A short is 2 bytes.

4.5 /home/fransys/prog/C/bootable_code/src/kernel.c File Reference

```
#include "kernel.h"
#include <stddef.h>
#include <stdint.h>
#include "idt/idt.h"
#include "memory/heap/kheap.h"
```

Include dependency graph for kernel.c:



Functions

- uint16_t term_make_char (char c, char color)

  Decodes a character and color into a uint16_t.
- void term_putchar (int x, int y, char c, char color)

  Writes a character to the VGA framebuffer.
- void term_initialize ()

  Initializes the VGA framebuffer.
- size_t strlen (const char *str)

  Returns the length of a string.
- void term_writechar (char c, char color)

  Writes a character, advancing cursor, newline if necessary.
- void print (const char *str)

  Writes a string using term_writechar.
- void lame_color_show ()

  This is what LameOS is all about.
- void kernel_main ()

Variables

- uint16_t * video_mem = 0

  Pointer to VGA Framebuffer.
- uint16_t term_row = 0

  VGA Framebuffer Width.
- uint16_t term_col = 0

  VGA Framebuffer Height.

4.5.1 Function Documentation

4.5.1.1 kernel_main()

```
void kernel_main ( )
```

4.5.1.2 lame_color_show()

```
void lame_color_show ( )
```

This is what LameOS is all about.

This function iterates kaleidoscopically through all characters and colors in the VGA framebuffer. It does this forever. EPILEPSY WARNING!

4.5.1.3 print()

```
void print (
            const char * str )
```

Writes a string using term_writechar.

This function writes a string by iterating through the string and writing each character using term_writechar to the VGA framebuffer.

Parameters

str	The string to write.

4.5.1.4 strlen()

```
size_t strlen (
            const char * str )
```

Returns the length of a string.

This function returns the length of a string by iterating through the string until it reaches a null terminator, maintaining a count as it goes.

Parameters

str	The string to get the length of.

Returns

size_t The length of the string.

4.5.1.5 term_initialize()

```
void term_initialize ( )
```

Initializes the VGA framebuffer.

This function initializes the VGA framebuffer by clearing the screen and setting the video_mem pointer to 0xB8000. The screen is cleared by calling term_putchar with space characters and a black background on position in the framebuffer.

Note

sets term_row and term_col to 0. Useful for related functions.

4.5.1.6 term_make_char()

```
uint16_t term_make_char (
            char c,
            char color )
```

Decodes a character and color into a uint16_t.

The VGA framebuffer is a 2D array of uint16_t. Each uint16_t represents a character and its color. The first 8 bits of the uint16_t are the character and the last 8 bits are the color.

Parameters

c	The character to display.
color	The color of the character.

Returns

uint16_t The character and color encoded into a uint16_t.

4.5.1.7 term_putchar()

```
void term_putchar (
            int x,
            int y,
            char c,
            char color )
```

Writes a character to the VGA framebuffer.

This function writes a character and color, given by c and color, to the VGA framebuffer at the specified location, given by x and y. The function first converts the x and y to a 1D index, then writes the character and color to the framebuffer at that index.

Parameters

x	The x coordinate, column, range 0-79.
y	The y coordinate, row, range 0-24.
c	The character to display, range 0-255.
color	The color of the character, range 0-15.

4.5.1.8 term_writechar()

```
void term_writechar (
            char c,
            char color )
```

Writes a character, advancing cursor, newline if necessary.

Writes a character, advancing the cursor. If the cursor is at the end of the line, the cursor is moved to the next line.

Parameters

c	The character to write.
color	The color of the character.

4.5.2 Variable Documentation

4.5.2.1 term_col

```
uint16_t term_col = 0
```

VGA Framebuffer Height.

The VGA framebuffer is 25 characters high.

4.5.2.2 term_row

```
uint16_t term_row = 0
```

VGA Framebuffer Width.

The VGA framebuffer is 80 characters wide.

4.5.2.3 video_mem

```
uint16_t* video_mem = 0
```

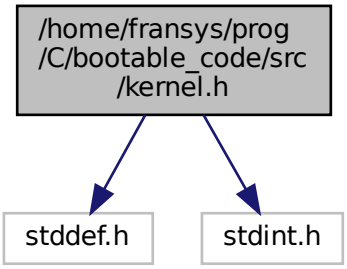
Pointer to VGA Framebuffer.

The kernel uses the VGA framebuffer to display text on the screen. The framebuffer is located at 0xB8000. The kernel writes to the framebuffer using the term_putchar function.

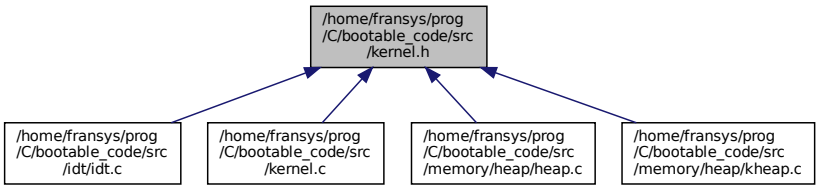
4.6 /home/fransys/prog/C/bootable_code/src/kernel.h File Reference

```
#include <stddef.h>
#include <stdint.h>
```

Include dependency graph for kernel.h:



This graph shows which files directly or indirectly include this file:



Macros

- #define VGA_WIDTH 80

  Macro Constant for VGA framebuffer width.
- #define VGA_HEIGHT 25

  Macro Constant for VGA framebuffer height.

Functions

- void kernel_main ()
- void term_initialize ()

  Initializes the VGA framebuffer.
- size_t strlen (const char ∗str)

  Returns the length of a string.
- uint16_t term_make_char (char c, char color)

  Decodes a character and color into a uint16_t.
- void term_putchar (int x, int y, char c, char color)

  Writes a character to the VGA framebuffer.
- void term_writechar (char c, char color)

  Writes a character, advancing cursor, newline if necessary.
- void print (const char ∗str)

  Writes a string using term_writechar.
- void lame_color_show ()

  This is what LameOS is all about.

4.6.1 Macro Definition Documentation

4.6.1.1 VGA_HEIGHT

```
#define VGA_HEIGHT 25
```

Macro Constant for VGA framebuffer height.

4.6.1.2 VGA_WIDTH

```
#define VGA_WIDTH 80
```

Macro Constant for VGA framebuffer width.

4.6.2 Function Documentation

4.6.2.1 kernel_main()

```
void kernel_main ( )
```

4.6.2.2 lame_color_show()

```
void lame_color_show ( )
```

This is what LameOS is all about.

This function iterates kaleidoscopically through all characters and colors in the VGA framebuffer. It does this forever. EPILEPSY WARNING!

4.6.2.3 print()

```
void print (
            const char * str )
```

Writes a string using term_writechar.

This function writes a string by iterating through the string and writing each character using term_writechar to the VGA framebuffer.

Parameters

str	The string to write.

4.6.2.4 strlen()

```
size_t strlen (
            const char * str )
```

Returns the length of a string.

This function returns the length of a string by iterating through the string until it reaches a null terminator, maintaining a count as it goes.

Parameters

str	The string to get the length of.

Returns

size_t The length of the string.

4.6.2.5 term_initialize()

```
void term_initialize ( )
```

Initializes the VGA framebuffer.

This function initializes the VGA framebuffer by clearing the screen and setting the video_mem pointer to 0xB8000. The screen is cleared by calling term_putchar with space characters and a black background on position in the framebuffer.

Note

sets term_row and term_col to 0. Useful for related functions.

4.6.2.6 term_make_char()

```
uint16_t term_make_char (
            char c,
            char color )
```

Decodes a character and color into a uint16_t.

The VGA framebuffer is a 2D array of uint16_t. Each uint16_t represents a character and its color. The first 8 bits of the uint16_t are the character and the last 8 bits are the color.

Parameters

c	The character to display.
color	The color of the character.

Returns

uint16_t The character and color encoded into a uint16_t.

4.6.2.7 term_putchar()

```
void term_putchar (
            int x,
            int y,
            char c,
            char color )
```

Writes a character to the VGA framebuffer.

This function writes a character and color, given by c and color, to the VGA framebuffer at the specified location, given by x and y. The function first converts the x and y to a 1D index, then writes the character and color to the framebuffer at that index.

Parameters

x	The x coordinate, column, range 0-79.
y	The y coordinate, row, range 0-24.
c	The character to display, range 0-255.
color	The color of the character, range 0-15.

4.6.2.8 term_writechar()

```
void term_writechar (
            char c,
            char color )
```

Writes a character, advancing cursor, newline if necessary.

Writes a character, advancing the cursor. If the cursor is at the end of the line, the cursor is moved to the next line.

Parameters

c	The character to write.
color	The color of the character.

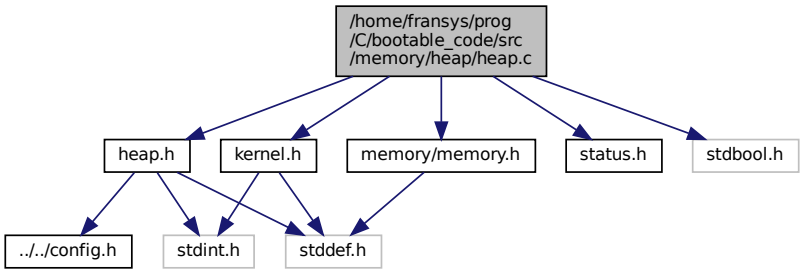
4.7 /home/fransys/prog/C/bootable_code/src/memory/heap/heap.c File Reference

Heap management implementation.

```
#include "heap.h"
#include "kernel.h"
#include "memory/memory.h"
#include "status.h"
```

```
#include <stdbool.h>
```

Include dependency graph for heap.c:



Functions

- static int heap_check_table (void *ptr, void *end, struct heap_table *table)

  Checks if the heap table has a valid block count.
- static bool heap_check_alignment (void *ptr)

  Validates if a given pointer is correctly aligned to the heap block size.
- int heap_create (struct heap *heap, void *ptr, void *end, struct heap_table *table)

  Initializes a heap object and its corresponding heap table.
- static uint32_t heap_align_value_to_upper (uint32_t val)

  Adjusts a provided value to align with the next upper heap block boundary.
- static int heap_get_entry_type (HEAP_BLOCK_TABLE_ENTRY entry)

  Retrieves the status of a heap block table entry.
- int heap_get_start_block (struct heap *heap, uint32_t total_blocks)

  Finds a contiguous sequence of free blocks in the heap.
- void * heap_block_to_address (struct heap *heap, uint32_t block)

  Converts a heap block index into its corresponding memory address.
- void heap_mark_blocks_taken (struct heap *heap, int start_block, int total_blocks)

  Marks a range of blocks in the heap as taken.
- void * heap_malloc_blocks (struct heap *heap, uint32_t total_blocks)

  Allocates a specified number of blocks in the heap.
- void heap_mark_blocks_free (struct heap *heap, int start_block)
- int heap_address_to_block (struct heap *heap, void *address)

  Marks a sequence of blocks in the heap as free.
- void * heap_malloc (struct heap *heap, size_t size)

  Allocates a block of memory from the heap.
- void heap_free (struct heap *heap, void *ptr)

  Deallocates a block of memory from the heap.

4.7.1 Detailed Description

Heap management implementation.

This file implements the interface defined in heap.h. It provides functionality for heap management, including memory allocation, memory deallocation, heap initialization, block address calculation, and so on. The heap management strategies are used throughout the operating system's kernel, including memory management and task scheduling.

4.7.2 Function Documentation

4.7.2.1 heap_address_to_block()

```
int heap_address_to_block (
            struct heap * heap,
            void * address )
```

Marks a sequence of blocks in the heap as free.

This function is responsible for marking a sequence of blocks in the heap as free. It works with a start block index and continues marking subsequent blocks as free until it hits a block that does not have the 'HEAP_BLOCK_HAS↩_NEXT' flag set. This indicates the end of a previously allocated sequence of blocks.

The function iterates over the heap block table entries starting from the given 'start_block' index. For each block, it retrieves the corresponding table entry and sets it to 'HEAP_BLOCK_TABLE_ENTRY_FREE' indicating that the block is now free. It also checks if the current block was part of a multi-block allocation by examining the 'HEAP↩_BLOCK_HAS_NEXT' flag. If this flag is not set, it means the end of the sequence has been reached, and the function stops marking blocks as free.

Parameters

heap	Pointer to the heap object in which the blocks are to be freed.
start_block	The index of the first block in the sequence to be freed.

4.7.2.2 heap_align_value_to_upper()

```
static uint32_t heap_align_value_to_upper (
            uint32_t val )  [static]
```

Adjusts a provided value to align with the next upper heap block boundary.

Invoked by heap_malloc(), this function ensures that the provided value (val), which represents an end pointer within the heap, is aligned with a heap block boundary. This is critical for maintaining consistency within the heap structure and enabling efficient memory allocation.

The alignment process involves checking if the provided value is already a multiple of the heap block size (LAMEOS_HEAP_BLOCK_SIZE). If it is, no adjustment is necessary, and the function simply returns the original value.

However, if the value is not a multiple of the block size (i.e., it falls within a block), the function needs to adjust it. It first subtracts the remainder of the value divided by the block size from the value itself. This effectively 'rounds down' the value to the start of the current heap block. Then, it adds the size of a full heap block to this result. The final value is thus rounded up to the start of the next heap block, ensuring alignment with the block boundary.

Parameters

val	The end pointer value to be rounded up to the next heap block boundary. This value should be within the heap memory range.

Returns

uint32_t Returns the end pointer value adjusted to align with the heap block size. This will be the original value if it's already a multiple of the block size, or the next upper block boundary otherwise.

See also

heap_malloc()

4.7.2.3 heap_block_to_address()

```
void* heap_block_to_address (
            struct heap * heap,
            uint32_t block )
```

Converts a heap block index into its corresponding memory address.

This function assists in the conversion of a relative block index within the heap into an absolute memory address. The function achieves this by taking the start address of the heap and adding the product of the block index and the predefined size of each heap block (LAMEOS_HEAP_BLOCK_SIZE).

This form of address calculation is central to the functioning of a heap memory manager, enabling the translation from an abstract block index to a physical memory address that can be utilized for storing and retrieving data. This function is typically invoked during the memory allocation process, where specific blocks within the heap are allocated to meet a requested memory size.

It's important to note that this function doesn't check if the block index is within the valid range of the heap or whether the block at the given index is free or allocated.

Parameters

heap	Pointer to the heap object. The base address for the heap memory resides in this structure.
block	The block index within the heap to be translated into a memory address.

Returns

void∗ The absolute memory address that corresponds to the given block index within the heap.

See also

heap_malloc_blocks()

4.7.2.4 heap_check_alignment()

```
static bool heap_check_alignment (
            void * ptr )  [static]
```

Validates if a given pointer is correctly aligned to the heap block size.

Invoked by heap_create(), this function checks whether the supplied pointer adheres to the alignment requirements of the heap block size. In a correctly functioning heap, each block of memory must start at an address that is a multiple of the heap block size (LAMEOS_HEAP_BLOCK_SIZE). To determine alignment, the function calculates the modulus of the pointer's value and the heap block size. In memory arithmetic, a pointer that is correctly aligned to a particular block size will have a modulus of zero when its value is divided by the block size. Therefore, if the modulus is zero, the function deems the pointer correctly aligned and returns true. Conversely, if the modulus is non-zero, it denotes misalignment and the function returns false.

Parameters

ptr	The pointer whose alignment is to be verified. It could point to any arbitrary location within the heap.

Returns

true (1) if the pointer is aligned correctly with respect to the heap block size, ensuring that it points to the start of a block.

false (0) if the pointer is not aligned, indicating it may point to the middle of a block or some other misaligned location.

See also

heap_create()

4.7.2.5 heap_check_table()

```
static int heap_check_table (
            void * ptr,
            void * end,
            struct heap_table * table )  [static]
```

Checks if the heap table has a valid block count.

Called by heap_create(). It compares the number of blocks physically present in the heap with the block count as indicated by the heap table structure. Is a 'sanity check' to ensure that the heap table is valid at the point of heap creation.

The function works by first calculating the total size of the heap. This is accomplished by performing pointer arithmetic between the end and start pointers of the heap. It then translates this size into the number of blocks by dividing the total heap size by the size of a single heap block (LAMEOS_HEAP_BLOCK_SIZE). The result of this division yields the total number of blocks in the heap.

Next, the function compares the computed total number of blocks with the total number of blocks as stated in the heap table. If the two totals do not match, the function sets the result to -EINVARG, signalling an invalid argument error. Otherwise, the function returns 0, indicating a valid heap table.

Parameters

ptr	Pointer to the start of the heap. It provides the base address for the heap memory.
end	Pointer to the end of the heap. It serves as the boundary of the heap memory.
table	Pointer to the heap table. The heap table keeps track of the total number of blocks in the heap.

Returns

int Returns 0 if the heap table is valid, -EINVARG otherwise. -EINVARG is a flag indicating that an invalid argument was encountered.

See also

heap_create()

4.7.2.6 heap_create()

```
int heap_create (
            struct heap * heap,
            void * ptr,
            void * end,
            struct heap_table * table )
```

Initializes a heap object and its corresponding heap table.

This function is invoked by kheap_init() to setup a heap object. It conducts a series of validation checks and initializations to ensure the heap is ready for use.

The function begins by verifying the alignment of the start (ptr) and end pointers of the heap. If either pointer is not correctly aligned to the heap block size, the function aborts the heap creation process and returns -EINVARG to signal the alignment error.

If both pointers are correctly aligned, the function proceeds to initialize the heap object. It first wipes the heap object's memory using memset, setting all bytes to zero. This ensures a clean, predictable state for the new heap object. Then, it sets the start address of the heap (saddr) and associates the heap object with its heap table.

After initializing the heap object, the function validates the heap table by calling heap_check_table(). If this function reports an error (by returning a value less than 0), the function halts the creation process and returns the error code.

If the heap table is valid, the function then initializes the heap table. It calculates the size of the table in bytes and sets all entries in the heap table to indicate they're free.

Parameters

heap	The heap object to initialize. This will house all the essential data about the heap.
ptr	The start address of the heap. It must be aligned to the heap block size.
end	The end address of the heap. It also must be aligned to the heap block size.
table	The heap table associated with the heap. It keeps track of the state of each block in the heap.

Returns

int Returns 0 if the heap object and table are successfully initialized. Returns -EINVARG if an alignment or heap table check fails.

See also

kheap_init()

4.7.2.7 heap_free()

```
void heap_free (
            struct heap * heap,
            void * ptr )
```

Deallocates a block of memory from the heap.

The function frees up the previously allocated block of memory by marking it as free in the heap's block table. The address of the block to be freed is passed to the function as 'ptr'.

The process begins by converting the memory address 'ptr' to a block index within the heap using the helper function 'heap_address_to_block()'. The resulting block index represents the start of the block(s) that were previously allocated.

After obtaining the start block index, 'heap_mark_blocks_free()' is called to mark the associated block(s) in the heap's block table as free. This effectively deallocates the block of memory and makes it available for future allocation requests.

Parameters

heap	Pointer to the heap object from which the memory is to be deallocated.
ptr	Pointer to the start of the block of memory to be deallocated.

See also

heap_mark_blocks_free().

4.7.2.8 heap_get_entry_type()

```
static int heap_get_entry_type (
            HEAP_BLOCK_TABLE_ENTRY entry )  [static]
```

Retrieves the status of a heap block table entry.

This utility function extracts the type (status) of a heap block table entry. It performs a bitwise AND operation with the hexadecimal value 0x0F on the provided entry, effectively isolating the lower 4 bits. These bits represent the status of the block.

The usage of the lower 4 bits for block status enables efficient storage and retrieval of this information. Possible status values include 0x00 for a free block and 0x01 for a taken (allocated) block.

It's important to note that this function interprets the status of a single heap block, not an array or sequence of blocks. It aids in the process of finding, allocating, and freeing blocks within the heap.

Parameters

entry	The heap block table entry to examine. This value corresponds to a single block within the heap.

Returns

int Returns 0 if the heap block is free, or 1 if the block is taken.

See also

heap_get_start_block()

4.7.2.9 heap_get_start_block()

```
int heap_get_start_block (
            struct heap * heap,
            uint32_t total_blocks )
```

Finds a contiguous sequence of free blocks in the heap.

This function is invoked when trying to allocate a chunk of memory from the heap. It scans the heap's block table for a contiguous sequence of free blocks that can accommodate the requested memory size. The total size of the memory request is represented in terms of the number of blocks (total_blocks).

The search process starts from the beginning of the heap block table, iterating through each block entry. It maintains a count of consecutive free blocks (bc) and the start index of the first block in this free sequence (bs).

For each block, it uses the heap_get_entry_type() function to check if the block is free. If a block is not free, it resets the free block count and start index to start the search anew from the next block. If a block is free and it's the first in a new sequence, the function records its index as the start index.

The function keeps incrementing the free block count until it reaches the total required block count or until it encounters a taken block. If it successfully finds a sufficient sequence of free blocks, it returns the start index of this sequence. Otherwise, it returns an -ENOMEM error to indicate insufficient memory in the heap.

Parameters

heap	Pointer to the heap object. This heap contains the block table to search.
total_blocks	The total number of contiguous blocks needed.

Returns

int Returns the start index of the free block sequence if successful. If unable to find sufficient contiguous free blocks, it returns -ENOMEM.

4.7.2.10 heap_malloc()

```
void* heap_malloc (
            struct heap * heap,
            size_t size )
```

Allocates a block of memory from the heap.

The function begins by aligning the requested size to the heap block size. This is done using the helper function 'heap_align_value_to_upper()'. The alignment ensures that the allocated block of memory will start at an address that is a multiple of 'LAMEOS_HEAP_BLOCK_SIZE', thereby respecting the architecture's memory alignment restrictions. This aligned size is then divided by the block size to determine the total number of blocks needed to satisfy the request.

After the total number of blocks is calculated, 'heap_malloc_blocks()' is called to allocate these blocks from the heap. If successful, 'heap_malloc_blocks()' returns a pointer to the start of the allocated memory.

Parameters

heap	Pointer to the heap object from which the memory is to be allocated.
size	The number of bytes to allocate.

Returns

void∗ If the allocation is successful, a pointer to the allocated memory is returned. If the allocation fails, the return value is NULL.

See also

heap_malloc_blocks().

4.7.2.11 heap_malloc_blocks()

```
void* heap_malloc_blocks (
            struct heap * heap,
            uint32_t total_blocks )
```

Allocates a specified number of blocks in the heap.

This function is tasked with finding and allocating a contiguous sequence of free blocks in the heap. The number of blocks required is specified as an input parameter. It follows a three-step process:

1. Locate the start of a sufficient sequence of free blocks: It does so by calling the helper function heap_get_start_block(). This function returns the index of the first block in a sufficient sequence of free blocks. If no such sequence exists, the function returns an error code, and heap_malloc_blocks() immediately returns, indicating a failed allocation.
2. Compute the memory address corresponding to the first block: This step involves calling the helper function heap_block_to_address() with the heap object and the first block index obtained in the previous step. This function calculates the memory address corresponding to a given block index by offsetting the heap's start address with the product of the block index and the block size.

3. Mark the found blocks as taken: In the final step, the function calls heap_mark_blocks_taken() to mark the blocks as taken in the heap's block table. This function updates the entries in the block table corresponding to the allocated blocks, setting their status as taken and updating the linking flags accordingly.

The function then returns the memory address computed in step 2. This address points to the start of the allocated memory block in the heap.

Parameters

heap	Pointer to the heap object from which the memory is to be allocated.
total_blocks	The number of contiguous blocks to be allocated.

Returns

void∗ If the allocation was successful, a pointer to the start of the allocated memory. If not, the function returns NULL.

4.7.2.12 heap_mark_blocks_free()

```
void heap_mark_blocks_free (
            struct heap * heap,
            int start_block )
```

Parameters

heap	
start_block	

4.7.2.13 heap_mark_blocks_taken()

```
void heap_mark_blocks_taken (
            struct heap * heap,
            int start_block,
            int total_blocks )
```

Marks a range of blocks in the heap as taken.

This function is used when allocating memory from the heap. It receives the index of the first block and the total number of blocks to be marked as taken. It then proceeds to mark these blocks in the heap's block table as taken.

The marking process involves setting the status of each block entry in the heap's block table. The first block is marked with the HEAP_BLOCK_TABLE_ENTRY_TAKEN and HEAP_BLOCK_IS_FIRST flags. If there are multiple blocks, the first block also receives the HEAP_BLOCK_HAS_NEXT flag to indicate that the allocated sequence of blocks continues in the subsequent block.

For the following blocks, the function marks them with the HEAP_BLOCK_TABLE_ENTRY_TAKEN flag. If a block isn't the last in the sequence, it also receives the HEAP_BLOCK_HAS_NEXT flag.

Parameters

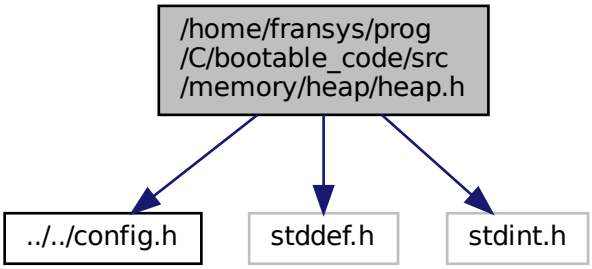
heap	Pointer to the heap object. This heap contains the block table to be updated.
start_block	The index of the first block to be marked as taken.
total_blocks	The total number of contiguous blocks to be marked as taken.

4.8 /home/fransys/prog/C/bootable_code/src/memory/heap/heap.h File Reference

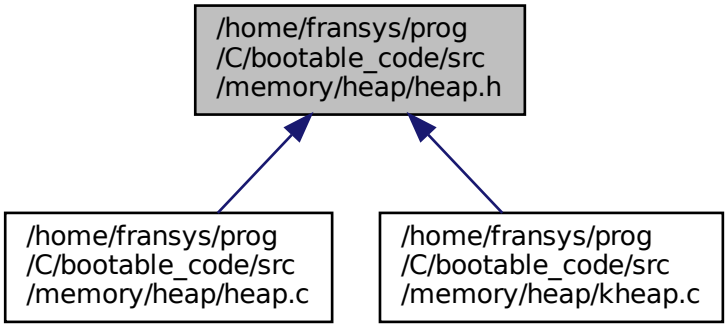
Heap management interface.

```
#include "../../config.h"
#include <stddef.h>
#include <stdint.h>
```

Include dependency graph for heap.h:



This graph shows which files directly or indirectly include this file:



Classes

- struct heap_table

  Defines the logical structure of the heap table.
- struct heap

  Defines the physical structure of the heap.

Macros

- #define HEAP_BLOCK_TABLE_ENTRY_TAKEN 0x01

  Represents a block entry that is currently occupied.
- #define HEAP_BLOCK_TABLE_ENTRY_FREE 0x00

  Represents a block entry that is currently free.
- #define HEAP_BLOCK_HAS_NEXT 0b10000000

  Bitmask indicating that the current block has a subsequent block.
- #define HEAP_BLOCK_IS_FIRST 0b01000000

  Bitmask indicating that the block is the first in a series of blocks.

Typedefs

- typedef unsigned char HEAP_BLOCK_TABLE_ENTRY

  Defines a type for heap block table entries.

Functions

- int heap_create (struct heap *heap, void *ptr, void *end, struct heap_table *table)

  Initializes a heap object and its corresponding heap table.
- void * heap_malloc (struct heap *heap, size_t size)

  Allocates a block of memory from the heap.
- void heap_free (struct heap *heap, void *ptr)

  Deallocates a block of memory from the heap.

4.8.1 Detailed Description

Heap management interface.

This file declares the interface for the heap management functions. These functions include memory allocation, memory deallocation, heap initialization, and block address calculation, etc. This header file is intended to be used by kernel modules that need direct control over heap management.

4.8.2 Macro Definition Documentation

4.8.2.1 HEAP_BLOCK_HAS_NEXT

```
#define HEAP_BLOCK_HAS_NEXT 0b10000000
```

Bitmask indicating that the current block has a subsequent block.

This is 128 decimal, or 0x80 hexadecimal.

4.8.2.2 HEAP_BLOCK_IS_FIRST

```
#define HEAP_BLOCK_IS_FIRST 0b01000000
```

Bitmask indicating that the block is the first in a series of blocks.

This is 64 decimal, or 0x40 hexadecimal.

4.8.2.3 HEAP_BLOCK_TABLE_ENTRY_FREE

```
#define HEAP_BLOCK_TABLE_ENTRY_FREE 0x00
```

Represents a block entry that is currently free.

4.8.2.4 HEAP_BLOCK_TABLE_ENTRY_TAKEN

```
#define HEAP_BLOCK_TABLE_ENTRY_TAKEN 0x01
```

Represents a block entry that is currently occupied.

4.8.3 Typedef Documentation

4.8.3.1 HEAP_BLOCK_TABLE_ENTRY

```
HEAP_BLOCK_TABLE_ENTRY
```

Defines a type for heap block table entries.

4.8.4 Function Documentation

4.8.4.1 heap_create()

```
int heap_create (
            struct heap * heap,
            void * ptr,
            void * end,
            struct heap_table * table )
```

Initializes a heap object and its corresponding heap table.

This function is invoked by kheap_init() to setup a heap object. It conducts a series of validation checks and initializations to ensure the heap is ready for use.

The function begins by verifying the alignment of the start (ptr) and end pointers of the heap. If either pointer is not correctly aligned to the heap block size, the function aborts the heap creation process and returns -EINVARG to signal the alignment error.

If both pointers are correctly aligned, the function proceeds to initialize the heap object. It first wipes the heap object's memory using memset, setting all bytes to zero. This ensures a clean, predictable state for the new heap object. Then, it sets the start address of the heap (saddr) and associates the heap object with its heap table.

After initializing the heap object, the function validates the heap table by calling heap_check_table(). If this function reports an error (by returning a value less than 0), the function halts the creation process and returns the error code.

If the heap table is valid, the function then initializes the heap table. It calculates the size of the table in bytes and sets all entries in the heap table to indicate they're free.

Parameters

heap	The heap object to initialize. This will house all the essential data about the heap.
ptr	The start address of the heap. It must be aligned to the heap block size.
end	The end address of the heap. It also must be aligned to the heap block size.
table	The heap table associated with the heap. It keeps track of the state of each block in the heap.

Returns

int Returns 0 if the heap object and table are successfully initialized. Returns -EINVARG if an alignment or heap table check fails.

See also

kheap_init()

4.8.4.2 heap_free()

```
void heap_free (
            struct heap * heap,
            void * ptr )
```

Deallocates a block of memory from the heap.

The function frees up the previously allocated block of memory by marking it as free in the heap's block table. The address of the block to be freed is passed to the function as 'ptr'.

The process begins by converting the memory address 'ptr' to a block index within the heap using the helper function 'heap_address_to_block()'. The resulting block index represents the start of the block(s) that were previously allocated.

After obtaining the start block index, 'heap_mark_blocks_free()' is called to mark the associated block(s) in the heap's block table as free. This effectively deallocates the block of memory and makes it available for future allocation requests.

Parameters

heap	Pointer to the heap object from which the memory is to be deallocated.
ptr	Pointer to the start of the block of memory to be deallocated.

See also

heap_mark_blocks_free().

4.8.4.3 heap_malloc()

```
void* heap_malloc (
            struct heap * heap,
            size_t size )
```

Allocates a block of memory from the heap.

The function begins by aligning the requested size to the heap block size. This is done using the helper function 'heap_align_value_to_upper()'. The alignment ensures that the allocated block of memory will start at an address that is a multiple of 'LAMEOS_HEAP_BLOCK_SIZE', thereby respecting the architecture's memory alignment restrictions. This aligned size is then divided by the block size to determine the total number of blocks needed to satisfy the request.

After the total number of blocks is calculated, 'heap_malloc_blocks()' is called to allocate these blocks from the heap. If successful, 'heap_malloc_blocks()' returns a pointer to the start of the allocated memory.

Parameters

heap	Pointer to the heap object from which the memory is to be allocated.
size	The number of bytes to allocate.

Returns

void* If the allocation is successful, a pointer to the allocated memory is returned. If the allocation fails, the return value is NULL.

See also

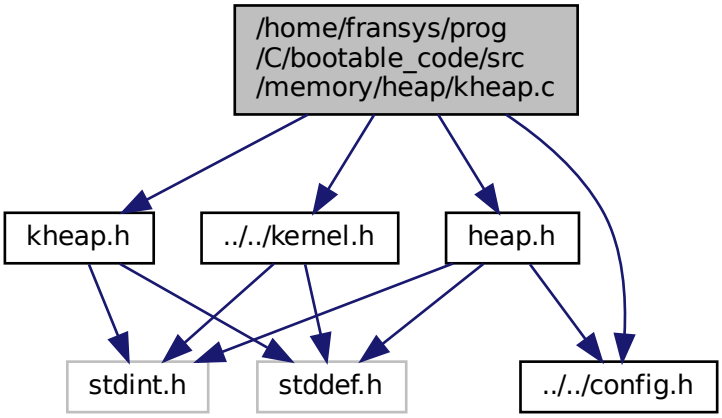
heap_malloc_blocks().

4.9 /home/fransys/prog/C/bootable_code/src/memory/heap/kheap.c File Reference

Kernel heap management implementation.

```
#include "kheap.h"
#include "../../config.h"
#include "../../kernel.h"
#include "heap.h"
```

Include dependency graph for kheap.c:



Functions

- void kheap_init ()

  Initializes the kernel heap.
- void * kmalloc (size_t size)

  Allocates memory from the kernel heap.
- void kfree (void *ptr)

  Frees memory on the kernel heap.

Variables

- struct heap kernel_heap

  Global heap object used by the kernel.
- struct heap_table kernel_heap_table

  Global heap table used by the kernel.

4.9.1 Detailed Description

Kernel heap management implementation.

This file contains the implementations for the kernel heap management functions declared in 'kheap.h'. These functions include memory allocation, memory deallocation, and heap initialization functions for the kernel heap. It uses the heap management interfaces provided in 'heap.h'.

4.9.2 Function Documentation

4.9.2.1 kfree()

```
void kfree (
            void * ptr )
```

Frees memory on the kernel heap.

This function wraps the heap_free function, providing an interface for kernel-level memory deallocation. It will free the block of memory that the provided pointer points to, making it available again for future allocations.

Parameters

ptr	A pointer to the memory block on the heap to be freed.

See also

heap_free()

4.9.2.2 kheap_init()

```
void kheap_init ( )
```

Initializes the kernel heap.

Initializes the kernel heap and the heap table with pre-defined memory size and table addresses. If the heap creation fails, it logs a message indicating the failure.

The kernel heap size and table address are defined by constants LAMEOS_HEAP_SIZE_BYTES, LAMEOS_↩ HEAP_BLOCK_SIZE, and LAMEOS_HEAP_TABLE_ADDRESS. The heap creation is done using heap_create() function, which checks the heap alignment, heap block counts and initializes the heap table.

See also

heap_create()

4.9.2.3 kmalloc()

```
void* kmalloc (
            size_t size )
```

Allocates memory from the kernel heap.

This function wraps the heap_malloc function, providing an interface for kernel-level memory allocation. The requested size is passed to the heap manager, which will return a pointer to a block of memory of at least the requested size.

Parameters

size	The amount of memory, in bytes, to allocate from the heap.

Returns

void∗ A pointer to the allocated memory on the heap. If the heap cannot fulfill the request, this will be a NULL pointer.

See also

heap_malloc()

4.9.3 Variable Documentation

4.9.3.1 kernel_heap

```
struct heap kernel_heap
```

Global heap object used by the kernel.

This is the heap object that the kernel uses to allocate and deallocate memory.

4.9.3.2 kernel_heap_table

```
struct heap_table kernel_heap_table
```

Global heap table used by the kernel.

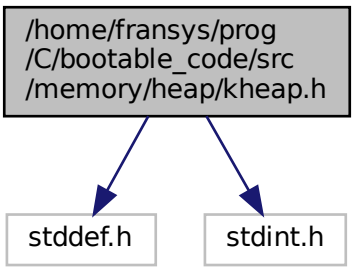
This is the heap table object that keeps track of the state of each block in the kernel heap.

4.10 /home/fransys/prog/C/bootable_code/src/memory/heap/kheap.h File Reference

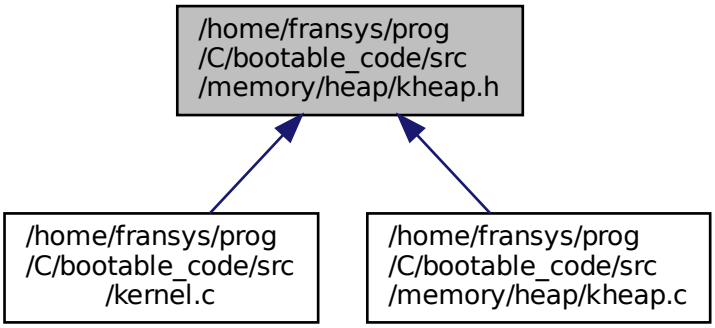
Kernel heap management interfaces.

```
#include <stddef.h>
#include <stdint.h>
```

Include dependency graph for kheap.h:



This graph shows which files directly or indirectly include this file:



Functions

- void * kmalloc (size_t size)

  Allocates memory from the kernel heap.
- void kfree (void *ptr)

  Frees memory on the kernel heap.
- void kheap_init ()

  Initializes the kernel heap.

4.10.1 Detailed Description

Kernel heap management interfaces.

This file declares the functions used for managing the kernel heap. This includes initialization of the heap, as well as memory allocation and deallocation. The `kmalloc` function is used to allocate memory, and `kfree` is used to free previously allocated memory. The `kheap_init` function is used to initialize the heap.

4.10.2 Function Documentation

4.10.2.1 kfree()

```
void kfree (
            void * ptr )
```

Frees memory on the kernel heap.

This function wraps the heap_free function, providing an interface for kernel-level memory deallocation. It will free the block of memory that the provided pointer points to, making it available again for future allocations.

Parameters

ptr	A pointer to the memory block on the heap to be freed.

See also

heap_free()

4.10.2.2 kheap_init()

```
void kheap_init ( )
```

Initializes the kernel heap.

Initializes the kernel heap and the heap table with pre-defined memory size and table addresses. If the heap creation fails, it logs a message indicating the failure.

The kernel heap size and table address are defined by constants LAMEOS_HEAP_SIZE_BYTES, LAMEOS_↩ HEAP_BLOCK_SIZE, and LAMEOS_HEAP_TABLE_ADDRESS. The heap creation is done using heap_create() function, which checks the heap alignment, heap block counts and initializes the heap table.

See also

heap_create()

4.10.2.3 kmalloc()

```
void* kmalloc (
            size_t size )
```

Allocates memory from the kernel heap.

This function wraps the heap_malloc function, providing an interface for kernel-level memory allocation. The requested size is passed to the heap manager, which will return a pointer to a block of memory of at least the requested size.

Parameters

size	The amount of memory, in bytes, to allocate from the heap.

Returns

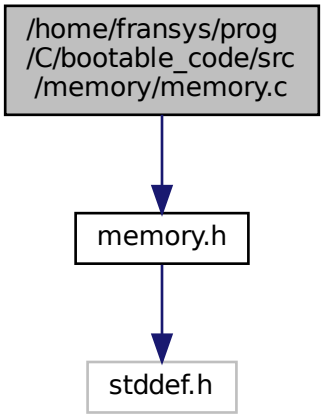
void* A pointer to the allocated memory on the heap. If the heap cannot fulfill the request, this will be a NULL pointer.

See also

heap_malloc()

4.11 /home/fransys/prog/C/bootable_code/src/memory/memory.c File Reference

`#include "memory.h"`
Include dependency graph for memory.c:



Functions

- void * memset (void *ptr, int c, size_t size)

  Generic memset implementation.

4.11.1 Function Documentation

4.11.1.1 memset()

```
void* memset (
            void * ptr,
            int c,
            size_t size )
```

Generic memset implementation.

Takes a void pointer ptr to a memory location, an int c to fill each byte with, and a size_t size to fill to. (size_t is the loop parameter).

Parameters

ptr	
c	
size	

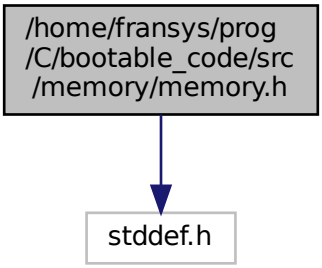
Returns

void * A pointer to the base address of the memory location after being filled.

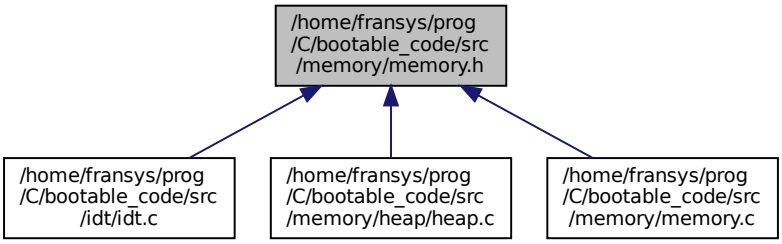
4.12 /home/fransys/prog/C/bootable_code/src/memory/memory.h File Reference

```
#include <stddef.h>
```

Include dependency graph for memory.h:



This graph shows which files directly or indirectly include this file:



Functions

- void ∗ memset (void ∗ptr, int c, size_t size)

  Generic memset implementation.

4.12.1 Function Documentation

4.12.1.1 memset()

```
void* memset (
            void * ptr,
            int c,
            size_t size )
```

Generic memset implementation.

Takes a void pointer ptr to a memory location, an int c to fill each byte with, and a size_t size to fill to. (size_t is the loop parameter).

Parameters

ptr	
c	
size	

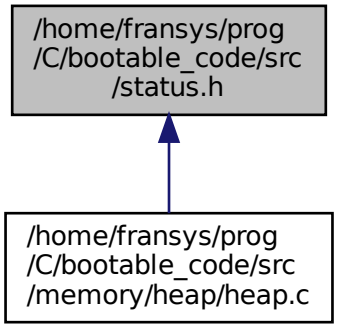
Returns

void ∗ A pointer to the base address of the memory location after being filled.

4.13 /home/fransys/prog/C/bootable_code/src/status.h File Reference

Defines system-level status codes.

This graph shows which files directly or indirectly include this file:



Macros

- #define LAMEOS_OK 0

  A status code representing successful completion.
- #define EIO 1

  A status code representing an input/output error.
- #define EINVARG 2

  A status code representing an invalid argument error.
- #define ENOMEM 3

  A status code representing an out of memory error.

4.13.1 Detailed Description

Defines system-level status codes.

This file contains definitions for various system-level status codes that can be returned by various parts of the operating system, such as the kernel or device drivers.

4.13.2 Macro Definition Documentation

4.13.2.1 EINVARG

```
#define EINVARG 2
```

A status code representing an invalid argument error.

4.13.2.2 EIO

```
#define EIO 1
```

A status code representing an input/output error.

4.13.2.3 ENOMEM

```
#define ENOMEM 3
```

A status code representing an out of memory error.

4.13.2.4 LAMEOS_OK

```
#define LAMEOS_OK 0
```

A status code representing successful completion.

Chapter 5

Example Documentation

5.1 User

Size of each block in the kernel heap in bytes, (4 KB). requests 1 byte of memory. The kernel will allocate 4 KB.

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