

The Helpless Four OS

3.0

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Chapter 3

Data Structure Documentation

3.1 alarm Struct Reference

```
#include <R4.h>
```

Data Fields

- char `message` [20]
- int `time`
- struct `alarm` * `NextPtr`
- struct `alarm` * `PrevPtr`

3.1.1 Detailed Description

Definition at line 21 of file R4.h.

3.1.2 Field Documentation

3.1.2.1 message

```
char message[20]
```

Definition at line 24 of file R4.h.

3.1.2.2 NextPtr

```
struct alarm* NextPtr
```

Definition at line 27 of file R4.h.

3.1.2.3 PrevPtr

```
struct alarm* PrevPtr
```

Definition at line 28 of file R4.h.

3.1.2.4 time

```
int time
```

Definition at line 26 of file R4.h.

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

- MPX-cs450/mpx_core/modules/[R4.h](#)

3.2 alList Struct Reference

```
#include <R4.h>
```

Data Fields

- int [numAlarms](#)
- struct [alarm](#) * [head](#)
- struct [alarm](#) * [tail](#)

3.2.1 Detailed Description

Definition at line 31 of file R4.h.

3.2.2 Field Documentation

3.2.2.1 head

```
struct alarm* head
```

Definition at line 33 of file R4.h.

3.2.2.2 numAlarms

```
int numAlarms
```

Definition at line 32 of file R4.h.

3.2.2.3 tail

```
struct alarm* tail
```

Definition at line 34 of file R4.h.

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

- MPX-cs450/mpx_core/modules/[R4.h](#)

3.3 allocatedblocks Struct Reference

```
#include <R5.h>
```

Data Fields

- struct [CMCB](#) * [head](#)

3.3.1 Detailed Description

Definition at line 43 of file R5.h.

3.3.2 Field Documentation

3.3.2.1 head

```
struct CMCB* head
```

Definition at line 44 of file R5.h.

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

- MPX-cs450/mpx_core/modules/[R5.h](#)

3.4 CMCB Struct Reference

```
#include <R5.h>
```

Data Fields

- int [type](#)
- void * [addr](#)
- int [size](#)
- char [pcbname](#) [15]
- struct [CMCB](#) * [next](#)
- struct [CMCB](#) * [prev](#)

3.4.1 Detailed Description

Definition at line 22 of file R5.h.

3.4.2 Field Documentation

3.4.2.1 [addr](#)

```
void* addr
```

Definition at line 25 of file R5.h.

3.4.2.2 [next](#)

```
struct CMCB* next
```

Definition at line 29 of file R5.h.

3.4.2.3 [pcbname](#)

```
char pcbname[15]
```

Definition at line 28 of file R5.h.

3.4.2.4 prev

```
struct CMCB* prev
```

Definition at line 30 of file R5.h.

3.4.2.5 size

```
int size
```

Definition at line 27 of file R5.h.

3.4.2.6 type

```
int type
```

Definition at line 24 of file R5.h.

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

- MPX-cs450/mpx_core/modules/[R5.h](#)

3.5 context Struct Reference

```
#include <R2.h>
```

Data Fields

- [u32int gs](#)
- [u32int fs](#)
- [u32int es](#)
- [u32int ds](#)
- [u32int edi](#)
- [u32int esi](#)
- [u32int ebp](#)
- [u32int esp](#)
- [u32int ebx](#)
- [u32int edx](#)
- [u32int ecx](#)
- [u32int eax](#)
- [u32int eip](#)
- [u32int cs](#)
- [u32int eflags](#)

3.5.1 Detailed Description

Definition at line 44 of file R2.h.

3.5.2 Field Documentation

3.5.2.1 cs

`u32int` cs

Definition at line 47 of file R2.h.

3.5.2.2 ds

`u32int` ds

Definition at line 45 of file R2.h.

3.5.2.3 eax

`u32int` eax

Definition at line 46 of file R2.h.

3.5.2.4 ebp

`u32int` ebp

Definition at line 46 of file R2.h.

3.5.2.5 ebx

`u32int` ebx

Definition at line 46 of file R2.h.

3.5.2.6 ecx

`u32int` ecx

Definition at line 46 of file R2.h.

3.5.2.7 edi

`u32int` edi

Definition at line 46 of file R2.h.

3.5.2.8 edx

`u32int` edx

Definition at line 46 of file R2.h.

3.5.2.9 eflags

`u32int` eflags

Definition at line 47 of file R2.h.

3.5.2.10 eip

`u32int` eip

Definition at line 47 of file R2.h.

3.5.2.11 es

`u32int` es

Definition at line 45 of file R2.h.

3.5.2.12 esi

`u32int esi`

Definition at line 46 of file R2.h.

3.5.2.13 esp

`u32int esp`

Definition at line 46 of file R2.h.

3.5.2.14 fs

`u32int fs`

Definition at line 45 of file R2.h.

3.5.2.15 gs

`u32int gs`

Definition at line 45 of file R2.h.

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

- [MPX-cs450/mpx_core/modules/R2.h](#)

3.6 date_time Struct Reference

```
#include <system.h>
```

Data Fields

- int `sec`
- int `min`
- int `hour`
- int `day_w`
- int `day_m`
- int `day_y`
- int `mon`
- int `year`

3.6.1 Detailed Description

Definition at line 30 of file system.h.

3.6.2 Field Documentation

3.6.2.1 day_m

```
int day_m
```

Definition at line 35 of file system.h.

3.6.2.2 day_w

```
int day_w
```

Definition at line 34 of file system.h.

3.6.2.3 day_y

```
int day_y
```

Definition at line 36 of file system.h.

3.6.2.4 hour

```
int hour
```

Definition at line 33 of file system.h.

3.6.2.5 min

```
int min
```

Definition at line 32 of file system.h.

3.6.2.6 mon

```
int mon
```

Definition at line 37 of file system.h.

3.6.2.7 sec

```
int sec
```

Definition at line 31 of file system.h.

3.6.2.8 year

```
int year
```

Definition at line 38 of file system.h.

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

- [MPX-cs450/mpx_core/include/system.h](#)

3.7 footer Struct Reference

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

Data Fields

- [header head](#)

3.7.1 Detailed Description

Definition at line 16 of file heap.h.

3.7.2 Field Documentation

3.7.2.1 head

`header` head

Definition at line 17 of file heap.h.

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

- MPX-cs450/mpx_core/include/mem/[heap.h](#)

3.8 freeblocks Struct Reference

```
#include <R5.h>
```

Data Fields

- struct [CMCB](#) * [head](#)

3.8.1 Detailed Description

Definition at line 47 of file R5.h.

3.8.2 Field Documentation

3.8.2.1 head

struct [CMCB](#)* head

Definition at line 48 of file R5.h.

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

- MPX-cs450/mpx_core/modules/[R5.h](#)

3.9 gdt_descriptor_struct Struct Reference

```
#include <tables.h>
```

Data Fields

- [u16int](#) limit
- [u32int](#) base

3.9.1 Detailed Description

Definition at line 23 of file tables.h.

3.9.2 Field Documentation

3.9.2.1 base

`u32int` base

Definition at line 26 of file tables.h.

3.9.2.2 limit

`u16int` limit

Definition at line 25 of file tables.h.

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

- MPX-cs450/mpx_core/include/core/[tables.h](#)

3.10 gdt_entry_struct Struct Reference

```
#include <tables.h>
```

Data Fields

- `u16int` limit_low
- `u16int` base_low
- `u8int` base_mid
- `u8int` access
- `u8int` flags
- `u8int` base_high

3.10.1 Detailed Description

Definition at line 30 of file tables.h.

3.10.2 Field Documentation

3.10.2.1 access

`u8int` access

Definition at line 35 of file tables.h.

3.10.2.2 base_high

`u8int` base_high

Definition at line 37 of file tables.h.

3.10.2.3 base_low

`u16int` base_low

Definition at line 33 of file tables.h.

3.10.2.4 base_mid

`u8int` base_mid

Definition at line 34 of file tables.h.

3.10.2.5 flags

`u8int` flags

Definition at line 36 of file tables.h.

3.10.2.6 limit_low

```
uint64_t limit_low
```

Definition at line 32 of file tables.h.

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

- MPX-cs450/mpx_core/include/core/[tables.h](#)

3.11 header Struct Reference

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

Data Fields

- int [size](#)
- int [index_id](#)

3.11.1 Detailed Description

Definition at line 11 of file heap.h.

3.11.2 Field Documentation

3.11.2.1 index_id

```
int index_id
```

Definition at line 13 of file heap.h.

3.11.2.2 size

```
int size
```

Definition at line 12 of file heap.h.

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

- MPX-cs450/mpx_core/include/mem/[heap.h](#)

3.12 heap Struct Reference

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

Data Fields

- [index_table](#) index
- [u32int](#) base
- [u32int](#) max_size
- [u32int](#) min_size
- char [size](#) [1000]

3.12.1 Detailed Description

Definition at line 33 of file heap.h.

3.12.2 Field Documentation

3.12.2.1 base

[u32int](#) base

Definition at line 35 of file heap.h.

3.12.2.2 index

[index_table](#) index

Definition at line 34 of file heap.h.

3.12.2.3 max_size

[u32int](#) max_size

Definition at line 36 of file heap.h.

3.12.2.4 min_size

```
u32int min_size
```

Definition at line 37 of file heap.h.

3.12.2.5 size

```
char size[1000]
```

Definition at line 20 of file R5.h.

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

- MPX-cs450/mpx_core/include/mem/[heap.h](#)
- MPX-cs450/mpx_core/modules/[R5.h](#)

3.13 history Struct Reference

```
#include <serial.h>
```

Data Fields

- char * [buffer](#)
- struct [history](#) * [next](#)
- struct [history](#) * [prev](#)

3.13.1 Detailed Description

Definition at line 49 of file serial.h.

3.13.2 Field Documentation

3.13.2.1 buffer

```
char* buffer
```

Definition at line 51 of file serial.h.

3.13.2.2 next

```
struct history* next
```

Definition at line 52 of file serial.h.

3.13.2.3 prev

```
struct history* prev
```

Definition at line 53 of file serial.h.

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

- MPX-cs450/mpx_core/include/core/[serial.h](#)

3.14 idt_entry_struct Struct Reference

```
#include <tables.h>
```

Data Fields

- [u16int base_low](#)
- [u16int sselect](#)
- [u8int zero](#)
- [u8int flags](#)
- [u16int base_high](#)

3.14.1 Detailed Description

Definition at line 6 of file tables.h.

3.14.2 Field Documentation

3.14.2.1 base_high

```
u16int base_high
```

Definition at line 12 of file tables.h.

3.14.2.2 base_low

`ul6int base_low`

Definition at line 8 of file tables.h.

3.14.2.3 flags

`u8int flags`

Definition at line 11 of file tables.h.

3.14.2.4 sselect

`ul6int sselect`

Definition at line 9 of file tables.h.

3.14.2.5 zero

`u8int zero`

Definition at line 10 of file tables.h.

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

- [MPX-cs450/mpx_core/include/core/tables.h](#)

3.15 idt_struct Struct Reference

```
#include <tables.h>
```

Data Fields

- `u16int limit`
- `u32int base`

3.15.1 Detailed Description

Definition at line 16 of file tables.h.

3.15.2 Field Documentation

3.15.2.1 base

`u32int` base

Definition at line 19 of file tables.h.

3.15.2.2 limit

`u16int` limit

Definition at line 18 of file tables.h.

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

- MPX-cs450/mpx_core/include/core/[tables.h](#)

3.16 index_entry Struct Reference

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

Data Fields

- int [size](#)
- int [empty](#)
- `u32int` [block](#)

3.16.1 Detailed Description

Definition at line 20 of file heap.h.

3.16.2 Field Documentation

3.16.2.1 block

`u32int` block

Definition at line 23 of file heap.h.

3.16.2.2 empty

```
int empty
```

Definition at line 22 of file heap.h.

3.16.2.3 size

```
int size
```

Definition at line 21 of file heap.h.

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

- [MPX-cs450/mpx_core/include/mem/heap.h](#)

3.17 index_table Struct Reference

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

Data Fields

- [index_entry table](#) [TABLE_SIZE]
- [int id](#)

3.17.1 Detailed Description

Definition at line 27 of file heap.h.

3.17.2 Field Documentation

3.17.2.1 id

```
int id
```

Definition at line 29 of file heap.h.

3.17.2.2 table

```
index_entry table[TABLE\_SIZE]
```

Definition at line 28 of file heap.h.

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

- MPX-cs450/mpx_core/include/mem/[heap.h](#)

3.18 page_dir Struct Reference

```
#include <paging.h>
```

Data Fields

- [page_table](#) * [tables](#) [1024]
- [u32int](#) [tables_phys](#) [1024]

3.18.1 Detailed Description

Definition at line 34 of file paging.h.

3.18.2 Field Documentation

3.18.2.1 tables

```
page\_table* tables[1024]
```

Definition at line 35 of file paging.h.

3.18.2.2 tables_phys

```
u32int tables\_phys[1024]
```

Definition at line 36 of file paging.h.

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

- MPX-cs450/mpx_core/include/mem/[paging.h](#)

3.19 page_entry Struct Reference

```
#include <paging.h>
```

Data Fields

- `u32int present`: 1
- `u32int writeable`: 1
- `u32int usermode`: 1
- `u32int accessed`: 1
- `u32int dirty`: 1
- `u32int reserved`: 7
- `u32int frameaddr`: 20

3.19.1 Detailed Description

Definition at line 12 of file `paging.h`.

3.19.2 Field Documentation

3.19.2.1 accessed

`u32int` accessed

Definition at line 16 of file `paging.h`.

3.19.2.2 dirty

`u32int` dirty

Definition at line 17 of file `paging.h`.

3.19.2.3 frameaddr

`u32int` frameaddr

Definition at line 19 of file `paging.h`.

3.19.2.4 present

`u32int` present

Definition at line 13 of file paging.h.

3.19.2.5 reserved

`u32int` reserved

Definition at line 18 of file paging.h.

3.19.2.6 usermode

`u32int` usermode

Definition at line 15 of file paging.h.

3.19.2.7 writeable

`u32int` writeable

Definition at line 14 of file paging.h.

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

- [MPX-cs450/mpx_core/include/mem/paging.h](#)

3.20 page_table Struct Reference

```
#include <paging.h>
```

Data Fields

- [page_entry](#) pages [1024]

3.20.1 Detailed Description

Definition at line 26 of file paging.h.

3.20.2 Field Documentation

3.20.2.1 pages

```
page_entry pages[1024]
```

Definition at line 27 of file paging.h.

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

- MPX-cs450/mpx_core/include/mem/[paging.h](#)

3.21 param Struct Reference

```
#include <mpx_supt.h>
```

Data Fields

- int [op_code](#)
- int [device_id](#)
- char * [buffer_ptr](#)
- int * [count_ptr](#)

3.21.1 Detailed Description

Definition at line 31 of file mpx_supt.h.

3.21.2 Field Documentation

3.21.2.1 buffer_ptr

```
char* buffer_ptr
```

Definition at line 34 of file mpx_supt.h.

3.21.2.2 count_ptr

```
int* count_ptr
```

Definition at line 35 of file mpx_supt.h.

3.21.2.3 device_id

```
int device_id
```

Definition at line 33 of file mpx_supt.h.

3.21.2.4 op_code

```
int op_code
```

Definition at line 32 of file mpx_supt.h.

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

- MPX-cs450/mpx_core/modules/[mpx_supt.h](#)

3.22 pcb Struct Reference

```
#include <R2.h>
```

Data Fields

- char [name](#) [10]
- int [class](#)
- int [priority](#)
- int [state](#)
- int [suspended](#)
- unsigned char [stack](#) [1024]
- unsigned char * [top](#)
- struct [pcb](#) * [NextPtr](#)
- struct [pcb](#) * [PrevPtr](#)

3.22.1 Detailed Description

Definition at line 19 of file R2.h.

3.22.2 Field Documentation

3.22.2.1 class

```
int class
```

Definition at line 23 of file R2.h.

3.22.2.2 name

```
char name[10]
```

Definition at line 21 of file R2.h.

3.22.2.3 NextPtr

```
struct pcb* NextPtr
```

Definition at line 34 of file R2.h.

3.22.2.4 PrevPtr

```
struct pcb* PrevPtr
```

Definition at line 35 of file R2.h.

3.22.2.5 priority

```
int priority
```

Definition at line 25 of file R2.h.

3.22.2.6 stack

```
unsigned char stack[1024]
```

Definition at line 31 of file R2.h.

3.22.2.7 state

```
int state
```

Definition at line 27 of file R2.h.

3.22.2.8 suspended

```
int suspended
```

Definition at line 29 of file R2.h.

3.22.2.9 top

```
unsigned char* top
```

Definition at line 32 of file R2.h.

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

- MPX-cs450/mpx_core/modules/[R2.h](#)

3.23 Queue Struct Reference

```
#include <R2.h>
```

Data Fields

- int [numProcesses](#)
- struct [pcb](#) * [head](#)
- struct [pcb](#) * [tail](#)

3.23.1 Detailed Description

Definition at line 38 of file R2.h.

3.23.2 Field Documentation

3.23.2.1 head

```
struct pcb* head
```

Definition at line 40 of file R2.h.

3.23.2.2 numProcesses

```
int numProcesses
```

Definition at line 39 of file R2.h.

3.23.2.3 tail

```
struct pcb* tail
```

Definition at line 41 of file R2.h.

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

- [MPX-cs450/mpx_core/modules/R2.h](#)

Chapter 4

File Documentation

4.1 MPX-cs450/mpx_core/include/core/asm.h File Reference

```
#include <system.h>
#include <tables.h>
```

4.2 MPX-cs450/mpx_core/include/core/interrupts.h File Reference

Functions

- void [init_irq](#) (void)
- void [init_pic](#) (void)

4.2.1 Function Documentation

4.2.1.1 [init_irq\(\)](#)

```
void init_irq (
    void )
```

Definition at line 67 of file interrupts.c.

4.2.1.2 [init_pic\(\)](#)

```
void init_pic (
    void )
```

Definition at line 108 of file interrupts.c.

4.3 MPX-cs450/mpx_core/include/core/io.h File Reference

Macros

- #define [outb](#)(port, data) `asm volatile ("outb %%al,%%dx" : : "a" (data), "d" (port))`
- #define [inb](#)(port)

4.3.1 Macro Definition Documentation

4.3.1.1 inb

```
#define inb(  
    port )
```

Value:

```
{  
    unsigned char r;  
    asm volatile ("inb %%dx,%%al": "=a" (r): "d" (port));  
    r;  
}
```

Definition at line 15 of file io.h.

4.3.1.2 outb

```
#define outb(  
    port,  
    data ) asm volatile ("outb %%al,%%dx" : : "a" (data), "d" (port))
```

Definition at line 8 of file io.h.

4.4 MPX-cs450/mpx_core/include/core/serial.h File Reference

Data Structures

- struct [history](#)

Macros

- #define [COM1](#) 0x3f8
- #define [COM2](#) 0x2f8
- #define [COM3](#) 0x3e8
- #define [COM4](#) 0x2e8

Functions

- int [init_serial](#) (int device)
- int [serial_println](#) (const char *msg)
- int [serial_print](#) (const char *msg)
- int [set_serial_out](#) (int device)
- int [set_serial_in](#) (int device)
- int * [polling](#) (char *buffer, int *count)
- void [append](#) (char *s, char c)
- void [insertAtEnd](#) (struct [history](#) **current, char *buffer)

4.4.1 Macro Definition Documentation

4.4.1.1 COM1

```
#define COM1 0x3f8
```

Definition at line 4 of file serial.h.

4.4.1.2 COM2

```
#define COM2 0x2f8
```

Definition at line 5 of file serial.h.

4.4.1.3 COM3

```
#define COM3 0x3e8
```

Definition at line 6 of file serial.h.

4.4.1.4 COM4

```
#define COM4 0x2e8
```

Definition at line 7 of file serial.h.

4.4.2 Function Documentation

4.4.2.1 `append()`

```
void append (
    char * s,
    char c )
```

Definition at line 272 of file `serial.c`.

4.4.2.2 `init_serial()`

```
int init_serial (
    int device )
```

Definition at line 26 of file `serial.c`.

4.4.2.3 `insertAtEnd()`

```
void insertAtEnd (
    struct history ** current,
    char * buffer )
```

Definition at line 281 of file `serial.c`.

4.4.2.4 `polling()`

```
int* polling (
    char * buffer,
    int * count )
```

DELETE AND BACKSPACE checks if special = delete and the buffer isn't at the end of the line OR checks if letter = backspace sequence and the char to be deleted isn't null and location is greater than 0

Definition at line 94 of file `serial.c`.

4.4.2.5 `serial_print()`

```
int serial_print (
    const char * msg )
```

Definition at line 59 of file `serial.c`.

4.4.2.6 serial_println()

```
int serial_println (
    const char * msg )
```

Definition at line 44 of file serial.c.

4.4.2.7 set_serial_in()

```
int set_serial_in (
    int device )
```

Definition at line 87 of file serial.c.

4.4.2.8 set_serial_out()

```
int set_serial_out (
    int device )
```

Definition at line 75 of file serial.c.

4.5 MPX-cs450/mpx_core/include/core/tables.h File Reference

```
#include "system.h"
```

Data Structures

- struct [idt_entry_struct](#)
- struct [idt_struct](#)
- struct [gdt_descriptor_struct](#)
- struct [gdt_entry_struct](#)

Functions

- struct [idt_entry_struct](#) [__attribute__\(\(packed\)\)](#) idt_entry
- void [idt_set_gate](#) (u8int idx, u32int base, u16int sel, u8int flags)
- void [gdt_init_entry](#) (int idx, u32int base, u32int limit, u8int access, u8int flags)
- void [init_idt](#) ()
- void [init_gdt](#) ()

Variables

- [u16int base_low](#)
- [u16int sselect](#)
- [u8int zero](#)
- [u8int flags](#)
- [u16int base_high](#)
- [u16int limit](#)
- [u32int base](#)
- [u16int limit_low](#)
- [u8int base_mid](#)
- [u8int access](#)

4.5.1 Function Documentation

4.5.1.1 `__attribute__()`

```
struct gdt\_entry\_struct __attribute__ (  
    (packed) )
```

4.5.1.2 `gdt_init_entry()`

```
void gdt_init_entry (  
    int idx,  
    u32int base,  
    u32int limit,  
    u8int access,  
    u8int flags )
```

Definition at line 57 of file tables.c.

4.5.1.3 `idt_set_gate()`

```
void idt_set_gate (  
    u8int idx,  
    u32int base,  
    u16int sel,  
    u8int flags )
```

Definition at line 27 of file tables.c.

4.5.1.4 init_gdt()

```
void init_gdt ( )
```

Definition at line 75 of file tables.c.

4.5.1.5 init_idt()

```
void init_idt ( )
```

Definition at line 43 of file tables.c.

4.5.2 Variable Documentation

4.5.2.1 access

```
u8int access
```

Definition at line 3 of file tables.h.

4.5.2.2 base

```
u32int base
```

Definition at line 1 of file tables.h.

4.5.2.3 base_high

```
u8int base_high
```

Definition at line 4 of file tables.h.

4.5.2.4 base_low

```
u16int base_low
```

Definition at line 0 of file tables.h.

4.5.2.5 base_mid

`u8int base_mid`

Definition at line 2 of file tables.h.

4.5.2.6 flags

`u8int flags`

Definition at line 3 of file tables.h.

4.5.2.7 limit

`ul6int limit`

Definition at line 0 of file tables.h.

4.5.2.8 limit_low

`ul6int limit_low`

Definition at line 0 of file tables.h.

4.5.2.9 sselect

`ul6int sselect`

Definition at line 1 of file tables.h.

4.5.2.10 zero

`u8int zero`

Definition at line 2 of file tables.h.

4.6 MPX-cs450/mpx_core/include/mem/heap.h File Reference

Data Structures

- struct [header](#)
- struct [footer](#)
- struct [index_entry](#)
- struct [index_table](#)
- struct [heap](#)

Macros

- #define [TABLE_SIZE](#) 0x1000
- #define [KHEAP_BASE](#) 0xD000000
- #define [KHEAP_MIN](#) 0x10000
- #define [KHEAP_SIZE](#) 0x1000000

Functions

- [u32int_kmalloc](#) ([u32int](#) size, int align, [u32int](#) *phys_addr)
- [u32int_kmalloc](#) ([u32int](#) size)
- [u32int_kfree](#) ()
- void [init_kheap](#) ()
- [u32int_alloc](#) ([u32int](#) size, [heap](#) *hp, int align)
- [heap](#) * [make_heap](#) ([u32int](#) base, [u32int](#) max, [u32int](#) min)

4.6.1 Macro Definition Documentation

4.6.1.1 KHEAP_BASE

```
#define KHEAP_BASE 0xD000000
```

Definition at line 6 of file heap.h.

4.6.1.2 KHEAP_MIN

```
#define KHEAP_MIN 0x10000
```

Definition at line 7 of file heap.h.

4.6.1.3 KHEAP_SIZE

```
#define KHEAP_SIZE 0x1000000
```

Definition at line 8 of file heap.h.

4.6.1.4 TABLE_SIZE

```
#define TABLE_SIZE 0x1000
```

Definition at line 5 of file heap.h.

4.6.2 Function Documentation

4.6.2.1 _kmalloc()

```
u32int _kmalloc (  
    u32int size,  
    int align,  
    u32int * phys_addr )
```

Definition at line 24 of file heap.c.

4.6.2.2 alloc()

```
u32int alloc (  
    u32int size,  
    heap * hp,  
    int align )
```

Definition at line 57 of file heap.c.

4.6.2.3 init_kheap()

```
void init_kheap ( )
```

4.6.2.4 kfree()

```
u32int kfree ( )
```

4.6.2.5 kmalloc()

```
u32int kmalloc (
    u32int size )
```

Definition at line 52 of file heap.c.

4.6.2.6 make_heap()

```
heap* make_heap (
    u32int base,
    u32int max,
    u32int min )
```

Definition at line 71 of file heap.c.

4.7 MPX-cs450/mpx_core/include/mem/paging.h File Reference

```
#include <system.h>
```

Data Structures

- struct [page_entry](#)
- struct [page_table](#)
- struct [page_dir](#)

Macros

- #define [PAGE_SIZE](#) 0x1000

Functions

- void [set_bit](#) (u32int addr)
- void [clear_bit](#) (u32int addr)
- u32int [get_bit](#) (u32int addr)
- u32int [first_free](#) ()
- void [init_paging](#) ()
- void [load_page_dir](#) (page_dir *new_page_dir)
- page_entry * [get_page](#) (u32int addr, page_dir *dir, int make_table)
- void [new_frame](#) (page_entry *page)

4.7.1 Macro Definition Documentation

4.7.1.1 PAGE_SIZE

```
#define PAGE_SIZE 0x1000
```

Definition at line 6 of file paging.h.

4.7.2 Function Documentation

4.7.2.1 clear_bit()

```
void clear_bit (  
    u32int addr )
```

Definition at line 44 of file paging.c.

4.7.2.2 first_free()

```
u32int first_free ( )
```

4.7.2.3 get_bit()

```
u32int get_bit (  
    u32int addr )
```

Definition at line 56 of file paging.c.

4.7.2.4 get_page()

```
page_entry* get_page (  
    u32int addr,  
    page_dir * dir,  
    int make_table )
```

Definition at line 85 of file paging.c.

4.7.2.5 init_paging()

```
void init_paging ( )
```

Definition at line 111 of file paging.c.

4.7.2.6 load_page_dir()

```
void load_page_dir (
    page_dir * new_page_dir )
```

Definition at line 158 of file paging.c.

4.7.2.7 new_frame()

```
void new_frame (
    page_entry * page )
```

Definition at line 173 of file paging.c.

4.7.2.8 set_bit()

```
void set_bit (
    u32int addr )
```

Definition at line 32 of file paging.c.

4.8 MPX-cs450/mpx_core/include/string.h File Reference

```
#include <system.h>
```

Functions

- int [isspace](#) (const char *c)
- void * [memset](#) (void *s, int c, [size_t](#) n)
- char * [strcpy](#) (char *s1, const char *s2)
- char * [strcat](#) (char *s1, const char *s2)
- int [strlen](#) (const char *s)
- int [strcmp](#) (const char *s1, const char *s2)
- char * [strtok](#) (char *s1, const char *s2)
- int [atoi](#) (const char *s)

4.8.1 Function Documentation

4.8.1.1 atoi()

```
int atoi (
    const char * s )
```

Definition at line 48 of file string.c.

4.8.1.2 isspace()

```
int isspace (
    const char * c )
```

Definition at line 119 of file string.c.

4.8.1.3 memset()

```
void* memset (
    void * s,
    int c,
    size_t n )
```

Definition at line 137 of file string.c.

4.8.1.4 strcat()

```
char* strcat (
    char * s1,
    const char * s2 )
```

Definition at line 106 of file string.c.

4.8.1.5 strcmp()

```
int strcmp (
    const char * s1,
    const char * s2 )
```

Definition at line 79 of file string.c.

4.8.1.6 strcpy()

```
char* strcpy (
    char * s1,
    const char * s2 )
```

Definition at line 36 of file string.c.

4.8.1.7 strlen()

```
int strlen (
    const char * s )
```

Definition at line 24 of file string.c.

4.8.1.8 strtok()

```
char* strtok (
    char * s1,
    const char * s2 )
```

Definition at line 151 of file string.c.

4.9 MPX-cs450/mpx_core/include/system.h File Reference

Data Structures

- struct [date_time](#)

Macros

- #define [NULL](#) 0
- #define [no_warn](#)(p) if (p) while (1) break
- #define [asm](#) __asm__
- #define [volatile](#) __volatile__
- #define [sti](#)() [asm volatile](#) ("sti::")
- #define [cli](#)() [asm volatile](#) ("cli::")
- #define [nop](#)() [asm volatile](#) ("nop::")
- #define [hlt](#)() [asm volatile](#) ("hlt::")
- #define [iret](#)() [asm volatile](#) ("iret::")
- #define [GDT_CS_ID](#) 0x01
- #define [GDT_DS_ID](#) 0x02

Typedefs

- typedef unsigned int [size_t](#)
- typedef unsigned char [u8int](#)
- typedef unsigned short [u16int](#)
- typedef unsigned long [u32int](#)

Functions

- void [klogv](#) (const char *msg)
- void [kpanic](#) (const char *msg)

4.9.1 Macro Definition Documentation

4.9.1.1 asm

```
#define asm __asm__
```

Definition at line 11 of file system.h.

4.9.1.2 cli

```
#define cli( ) asm volatile ("cli"::)
```

Definition at line 15 of file system.h.

4.9.1.3 GDT_CS_ID

```
#define GDT_CS_ID 0x01
```

Definition at line 20 of file system.h.

4.9.1.4 GDT_DS_ID

```
#define GDT_DS_ID 0x02
```

Definition at line 21 of file system.h.

4.9.1.5 hlt

```
#define hlt( ) asm volatile ("hlt"::)
```

Definition at line 17 of file system.h.

4.9.1.6 iret

```
#define iret( ) asm volatile ("iret"::)
```

Definition at line 18 of file system.h.

4.9.1.7 no_warn

```
#define no_warn(  
    p ) if (p) while (1) break
```

Definition at line 7 of file system.h.

4.9.1.8 nop

```
#define nop( ) asm volatile ("nop"::)
```

Definition at line 16 of file system.h.

4.9.1.9 NULL

```
#define NULL 0
```

Definition at line 4 of file system.h.

4.9.1.10 sti

```
#define sti( ) asm volatile ("sti"::)
```

Definition at line 14 of file system.h.

4.9.1.11 volatile

```
#define volatile __volatile__
```

Definition at line 12 of file system.h.

4.9.2 Typedef Documentation

4.9.2.1 size_t

```
typedef unsigned int size_t
```

Definition at line 24 of file system.h.

4.9.2.2 u16int

```
typedef unsigned short u16int
```

Definition at line 26 of file system.h.

4.9.2.3 u32int

```
typedef unsigned long u32int
```

Definition at line 27 of file system.h.

4.9.2.4 u8int

```
typedef unsigned char u8int
```

Definition at line 25 of file system.h.

4.9.3 Function Documentation

4.9.3.1 klogv()

```
void klogv (  
    const char * msg )
```

Definition at line 11 of file system.c.

4.9.3.2 kpanic()

```
void kpanic (  
    const char * msg )
```

Definition at line 24 of file system.c.

4.10 MPX-cs450/mpx_core/kernel/core/interrupts.c File Reference

```
#include <system.h>  
#include <core/io.h>  
#include <core/serial.h>  
#include <core/tables.h>  
#include <core/interrupts.h>
```

Macros

- #define [PIC1](#) 0x20
- #define [PIC2](#) 0xA0
- #define [ICW1](#) 0x11
- #define [ICW4](#) 0x01
- #define [io_wait\(\)](#) [asm volatile](#) ("outb \$0x80")

Functions

- void [divide_error](#) ()
- void [debug](#) ()
- void [nmi](#) ()
- void [breakpoint](#) ()
- void [overflow](#) ()
- void [bounds](#) ()
- void [invalid_op](#) ()
- void [device_not_available](#) ()
- void [double_fault](#) ()
- void [coprocessor_segment](#) ()
- void [invalid_tss](#) ()
- void [segment_not_present](#) ()
- void [stack_segment](#) ()
- void [general_protection](#) ()

- void [page_fault](#) ()
- void [reserved](#) ()
- void [coprocessor](#) ()
- void [rtc_isr](#) ()
- void [sys_call_isr](#) ()
- void [isr0](#) ()
- void [do_isr](#) ()
- void [init_irq](#) (void)
- void [init_pic](#) (void)
- void [do_divide_error](#) ()
- void [do_debug](#) ()
- void [do_nmi](#) ()
- void [do_breakpoint](#) ()
- void [do_overflow](#) ()
- void [do_bounds](#) ()
- void [do_invalid_op](#) ()
- void [do_device_not_available](#) ()
- void [do_double_fault](#) ()
- void [do_coprocessor_segment](#) ()
- void [do_invalid_tss](#) ()
- void [do_segment_not_present](#) ()
- void [do_stack_segment](#) ()
- void [do_general_protection](#) ()
- void [do_page_fault](#) ()
- void [do_reserved](#) ()
- void [do_coprocessor](#) ()

Variables

- idt_entry [idt_entries](#) [256]

4.10.1 Macro Definition Documentation

4.10.1.1 ICW1

```
#define ICW1 0x11
```

Definition at line 20 of file interrupts.c.

4.10.1.2 ICW4

```
#define ICW4 0x01
```

Definition at line 21 of file interrupts.c.

4.10.1.3 io_wait

```
#define io_wait( ) asm volatile ("outb $0x80")
```

Definition at line 28 of file interrupts.c.

4.10.1.4 PIC1

```
#define PIC1 0x20
```

Definition at line 16 of file interrupts.c.

4.10.1.5 PIC2

```
#define PIC2 0xA0
```

Definition at line 17 of file interrupts.c.

4.10.2 Function Documentation

4.10.2.1 bounds()

```
void bounds ( )
```

4.10.2.2 breakpoint()

```
void breakpoint ( )
```

4.10.2.3 coprocessor()

```
void coprocessor ( )
```

4.10.2.4 coprocessor_segment()

```
void coprocessor_segment ( )
```

4.10.2.5 debug()

```
void debug ( )
```

4.10.2.6 device_not_available()

```
void device_not_available ( )
```

4.10.2.7 divide_error()

```
void divide_error ( )
```

4.10.2.8 do_bounds()

```
void do_bounds ( )
```

Definition at line 151 of file interrupts.c.

4.10.2.9 do_breakpoint()

```
void do_breakpoint ( )
```

Definition at line 143 of file interrupts.c.

4.10.2.10 do_coprocessor()

```
void do_coprocessor ( )
```

Definition at line 195 of file interrupts.c.

4.10.2.11 do_coprocessor_segment()

```
void do_coprocessor_segment ( )
```

Definition at line 167 of file interrupts.c.

4.10.2.12 do_debug()

```
void do_debug ( )
```

Definition at line 135 of file interrupts.c.

4.10.2.13 do_device_not_available()

```
void do_device_not_available ( )
```

Definition at line 159 of file interrupts.c.

4.10.2.14 do_divide_error()

```
void do_divide_error ( )
```

Definition at line 131 of file interrupts.c.

4.10.2.15 do_double_fault()

```
void do_double_fault ( )
```

Definition at line 163 of file interrupts.c.

4.10.2.16 do_general_protection()

```
void do_general_protection ( )
```

Definition at line 183 of file interrupts.c.

4.10.2.17 do_invalid_op()

```
void do_invalid_op ( )
```

Definition at line 155 of file interrupts.c.

4.10.2.18 do_invalid_tss()

```
void do_invalid_tss ( )
```

Definition at line 171 of file interrupts.c.

4.10.2.19 do_isr()

```
void do_isr ( )
```

Definition at line 54 of file interrupts.c.

4.10.2.20 do_nmi()

```
void do_nmi ( )
```

Definition at line 139 of file interrupts.c.

4.10.2.21 do_overflow()

```
void do_overflow ( )
```

Definition at line 147 of file interrupts.c.

4.10.2.22 do_page_fault()

```
void do_page_fault ( )
```

Definition at line 187 of file interrupts.c.

4.10.2.23 do_reserved()

```
void do_reserved ( )
```

Definition at line 191 of file interrupts.c.

4.10.2.24 do_segment_not_present()

```
void do_segment_not_present ( )
```

Definition at line 175 of file interrupts.c.

4.10.2.25 do_stack_segment()

```
void do_stack_segment ( )
```

Definition at line 179 of file interrupts.c.

4.10.2.26 double_fault()

```
void double_fault ( )
```

4.10.2.27 general_protection()

```
void general_protection ( )
```

4.10.2.28 init_irq()

```
void init_irq (
    void )
```

Definition at line 67 of file interrupts.c.

4.10.2.29 init_pic()

```
void init_pic (
    void )
```

Definition at line 108 of file interrupts.c.

4.10.2.30 invalid_op()

```
void invalid_op ( )
```

4.10.2.31 invalid_tss()

```
void invalid_tss ( )
```

4.10.2.32 isr0()

```
void isr0 ( )
```

4.10.2.33 nmi()

```
void nmi ( )
```

4.10.2.34 overflow()

```
void overflow ( )
```

4.10.2.35 page_fault()

```
void page_fault ( )
```

4.10.2.36 reserved()

```
void reserved ( )
```

4.10.2.37 rtc_isr()

```
void rtc_isr ( )
```

4.10.2.38 segment_not_present()

```
void segment_not_present ( )
```

4.10.2.39 stack_segment()

```
void stack_segment ( )
```

4.10.2.40 sys_call_isr()

```
void sys_call_isr ( )
```

4.10.3 Variable Documentation

4.10.3.1 idt_entries

```
idt_entry idt_entries[256] [extern]
```

Definition at line 17 of file tables.c.

4.11 MPX-cs450/mpx_core/kernel/core/kmain.c File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "modules/mpx_supt.h"
#include "modules/comhand.c"
#include "modules/R2.h"
#include "modules/Startup.h"
#include "modules/R5.h"
```

Functions

- void [makeComhand](#) ()
- void [makeldle](#) ()
- void [kmain](#) (void)

4.11.1 Function Documentation

4.11.1.1 kmain()

```
void kmain (
    void )
```

Definition at line 31 of file kmain.c.

4.11.1.2 makeComhand()

```
void makeComhand ( )
```

Definition at line 108 of file kmain.c.

4.11.1.3 makeldle()

```
void makeIdle ( )
```

Definition at line 126 of file kmain.c.

4.12 MPX-cs450/mpx_core/kernel/core/serial.c File Reference

```
#include <stdint.h>
#include <string.h>
#include <core/io.h>
#include <core/serial.h>
#include "modules/mpx_supt.h"
```

Macros

- `#define NO_ERROR 0`

Functions

- `int init_serial (int device)`
- `int serial_println (const char *msg)`
- `int serial_print (const char *msg)`
- `int set_serial_out (int device)`
- `int set_serial_in (int device)`
- `int * polling (char *buffer, int *count)`
- `void append (char *s, char c)`
- `void insertAtEnd (struct history **current, char *newdata)`

Variables

- `int serial_port_out = 0`
- `int serial_port_in = 0`
- `struct history * current = NULL`

4.12.1 Macro Definition Documentation

4.12.1.1 NO_ERROR

```
#define NO_ERROR 0
```

Definition at line 16 of file serial.c.

4.12.2 Function Documentation

4.12.2.1 `append()`

```
void append (
    char * s,
    char c )
```

Definition at line 272 of file `serial.c`.

4.12.2.2 `init_serial()`

```
int init_serial (
    int device )
```

Definition at line 26 of file `serial.c`.

4.12.2.3 `insertAtEnd()`

```
void insertAtEnd (
    struct history ** current,
    char * newdata )
```

Definition at line 281 of file `serial.c`.

4.12.2.4 `polling()`

```
int* polling (
    char * buffer,
    int * count )
```

DELETE AND BACKSPACE checks if special = delete and the buffer isn't at the end of the line OR checks if letter = backspace sequence and the char to be deleted isn't null and location is greater than 0

Definition at line 94 of file `serial.c`.

4.12.2.5 `serial_print()`

```
int serial_print (
    const char * msg )
```

Definition at line 59 of file `serial.c`.

4.12.2.6 serial_println()

```
int serial_println (
    const char * msg )
```

Definition at line 44 of file serial.c.

4.12.2.7 set_serial_in()

```
int set_serial_in (
    int device )
```

Definition at line 87 of file serial.c.

4.12.2.8 set_serial_out()

```
int set_serial_out (
    int device )
```

Definition at line 75 of file serial.c.

4.12.3 Variable Documentation

4.12.3.1 current

```
struct history* current =NULL
```

Definition at line 93 of file serial.c.

4.12.3.2 serial_port_in

```
int serial_port_in = 0
```

Definition at line 20 of file serial.c.

4.12.3.3 serial_port_out

```
int serial_port_out = 0
```

Definition at line 19 of file serial.c.

4.13 MPX-cs450/mpx_core/kernel/core/system.c File Reference

```
#include <string.h>
#include <system.h>
#include <core/serial.h>
```

Functions

- void [klogv](#) (const char *msg)
- void [kpanic](#) (const char *msg)

4.13.1 Function Documentation

4.13.1.1 klogv()

```
void klogv (
    const char * msg )
```

Definition at line 11 of file system.c.

4.13.1.2 kpanic()

```
void kpanic (
    const char * msg )
```

Definition at line 24 of file system.c.

4.14 MPX-cs450/mpx_core/kernel/core/tables.c File Reference

```
#include <string.h>
#include <core/tables.h>
```

Functions

- void `write_gdt_ptr` (`u32int`, `size_t`)
- void `write_idt_ptr` (`u32int`)
- void `idt_set_gate` (`u8int` `idx`, `u32int` `base`, `u16int` `sel`, `u8int` `flags`)
- void `init_idt` ()
- void `gdt_init_entry` (`int` `idx`, `u32int` `base`, `u32int` `limit`, `u8int` `access`, `u8int` `flags`)
- void `init_gdt` ()

Variables

- gdt_descriptor `gdt_ptr`
- gdt_entry `gdt_entries` [5]
- idt_descriptor `idt_ptr`
- idt_entry `idt_entries` [256]

4.14.1 Function Documentation

4.14.1.1 `gdt_init_entry()`

```
void gdt_init_entry (
    int idx,
    u32int base,
    u32int limit,
    u8int access,
    u8int flags )
```

Definition at line 57 of file tables.c.

4.14.1.2 `idt_set_gate()`

```
void idt_set_gate (
    u8int idx,
    u32int base,
    u16int sel,
    u8int flags )
```

Definition at line 27 of file tables.c.

4.14.1.3 `init_gdt()`

```
void init_gdt ( )
```

Definition at line 75 of file tables.c.

4.14.1.4 init_idt()

```
void init_idt ( )
```

Definition at line 43 of file tables.c.

4.14.1.5 write_gdt_ptr()

```
void write_gdt_ptr (
    u32int ,
    size_t )
```

4.14.1.6 write_idt_ptr()

```
void write_idt_ptr (
    u32int )
```

4.14.2 Variable Documentation

4.14.2.1 gdt_entries

```
gdt_entry gdt_entries[5]
```

Definition at line 13 of file tables.c.

4.14.2.2 gdt_ptr

```
gdt_descriptor gdt_ptr
```

Definition at line 12 of file tables.c.

4.14.2.3 idt_entries

```
idt_entry idt_entries[256]
```

Definition at line 17 of file tables.c.

4.14.2.4 idt_ptr

```
idt_descriptor idt_ptr
```

Definition at line 16 of file tables.c.

4.15 MPX-cs450/mpx_core/kernel/mem/heap.c File Reference

```
#include <system.h>
#include <string.h>
#include <core/serial.h>
#include <mem/heap.h>
#include <mem/paging.h>
```

Functions

- `u32int _kmalloc (u32int size, int page_align, u32int *phys_addr)`
- `u32int kmalloc (u32int size)`
- `u32int alloc (u32int size, heap *h, int align)`
- `heap * make_heap (u32int base, u32int max, u32int min)`

Variables

- `heap * kheap = 0`
- `heap * curr_heap = 0`
- `page_dir * kdir`
- `void * end`
- `void _end`
- `void __end`
- `u32int phys_alloc_addr = (u32int)&end`

4.15.1 Function Documentation

4.15.1.1 _kmalloc()

```
u32int _kmalloc (
    u32int size,
    int page_align,
    u32int * phys_addr )
```

Definition at line 24 of file heap.c.

4.15.1.2 alloc()

```
u32int alloc (
    u32int size,
    heap * h,
    int align )
```

Definition at line 57 of file heap.c.

4.15.1.3 kmalloc()

```
u32int kmalloc (
    u32int size )
```

Definition at line 52 of file heap.c.

4.15.1.4 make_heap()

```
heap* make_heap (
    u32int base,
    u32int max,
    u32int min )
```

Definition at line 71 of file heap.c.

4.15.2 Variable Documentation

4.15.2.1 __end

```
void __end
```

Definition at line 18 of file heap.c.

4.15.2.2 _end

```
void _end
```

Definition at line 18 of file heap.c.

4.15.2.3 curr_heap

```
heap* curr_heap = 0
```

Definition at line 15 of file heap.c.

4.15.2.4 end

```
void* end [extern]
```

4.15.2.5 kdir

```
page_dir* kdir [extern]
```

Definition at line 21 of file paging.c.

4.15.2.6 kheap

```
heap* kheap = 0
```

Definition at line 14 of file heap.c.

4.15.2.7 phys_alloc_addr

```
u32int phys_alloc_addr = (u32int)&end
```

Definition at line 22 of file heap.c.

4.16 MPX-cs450/mpx_core/kernel/mem/paging.c File Reference

```
#include <system.h>
#include <string.h>
#include "mem/heap.h"
#include "mem/paging.h"
```

Functions

- void `set_bit` (`u32int` addr)
- void `clear_bit` (`u32int` addr)
- `u32int` `get_bit` (`u32int` addr)
- `u32int` `find_free` ()
- `page_entry` * `get_page` (`u32int` addr, `page_dir` *dir, int make_table)
- void `init_paging` ()
- void `load_page_dir` (`page_dir` *new_dir)
- void `new_frame` (`page_entry` *page)

Variables

- `u32int` `mem_size` = 0x4000000
- `u32int` `page_size` = 0x1000
- `u32int` `nframes`
- `u32int` * `frames`
- `page_dir` * `kdir` = 0
- `page_dir` * `cdir` = 0
- `u32int` `phys_alloc_addr`
- `heap` * `kheap`

4.16.1 Function Documentation

4.16.1.1 `clear_bit()`

```
void clear_bit (  
    u32int addr )
```

Definition at line 44 of file paging.c.

4.16.1.2 `find_free()`

```
u32int find_free ( )
```

Definition at line 68 of file paging.c.

4.16.1.3 `get_bit()`

```
u32int get_bit (  
    u32int addr )
```

Definition at line 56 of file paging.c.

4.16.1.4 `get_page()`

```
page_entry* get_page (
    u32int addr,
    page_dir * dir,
    int make_table )
```

Definition at line 85 of file paging.c.

4.16.1.5 `init_paging()`

```
void init_paging ( )
```

Definition at line 111 of file paging.c.

4.16.1.6 `load_page_dir()`

```
void load_page_dir (
    page_dir * new_dir )
```

Definition at line 158 of file paging.c.

4.16.1.7 `new_frame()`

```
void new_frame (
    page_entry * page )
```

Definition at line 173 of file paging.c.

4.16.1.8 `set_bit()`

```
void set_bit (
    u32int addr )
```

Definition at line 32 of file paging.c.

4.16.2 Variable Documentation

4.16.2.1 cdir

```
page_dir* cdir = 0
```

Definition at line 22 of file paging.c.

4.16.2.2 frames

```
u32int* frames
```

Definition at line 19 of file paging.c.

4.16.2.3 kdir

```
page_dir* kdir = 0
```

Definition at line 21 of file paging.c.

4.16.2.4 kheap

```
heap* kheap [extern]
```

Definition at line 14 of file heap.c.

4.16.2.5 mem_size

```
u32int mem_size = 0x4000000
```

Definition at line 15 of file paging.c.

4.16.2.6 nframes

```
u32int nframes
```

Definition at line 18 of file paging.c.

4.16.2.7 page_size

```
u32int page_size = 0x1000
```

Definition at line 16 of file paging.c.

4.16.2.8 phys_alloc_addr

```
u32int phys_alloc_addr [extern]
```

Definition at line 22 of file heap.c.

4.17 MPX-cs450/mpx_core/lib/string.c File Reference

```
#include <system.h>
#include <string.h>
```

Functions

- int [strlen](#) (const char *s)
- char * [strcpy](#) (char *s1, const char *s2)
- int [atoi](#) (const char *s)
- int [strcmp](#) (const char *s1, const char *s2)
- char * [strcat](#) (char *s1, const char *s2)
- int [isspace](#) (const char *c)
- void * [memset](#) (void *s, int c, [size_t](#) n)
- char * [strtok](#) (char *s1, const char *s2)

4.17.1 Function Documentation

4.17.1.1 atoi()

```
int atoi (
    const char * s )
```

Definition at line 48 of file string.c.

4.17.1.2 isspace()

```
int isspace (
    const char * c )
```

Definition at line 119 of file string.c.

4.17.1.3 memset()

```
void* memset (
    void * s,
    int c,
    size_t n )
```

Definition at line 137 of file string.c.

4.17.1.4 strcat()

```
char* strcat (
    char * s1,
    const char * s2 )
```

Definition at line 106 of file string.c.

4.17.1.5 strcmp()

```
int strcmp (
    const char * s1,
    const char * s2 )
```

Definition at line 79 of file string.c.

4.17.1.6 strcpy()

```
char* strcpy (
    char * s1,
    const char * s2 )
```

Definition at line 36 of file string.c.

4.17.1.7 strlen()

```
int strlen (
    const char * s )
```

Definition at line 24 of file string.c.

4.17.1.8 strtok()

```
char* strtok (
    char * s1,
    const char * s2 )
```

Definition at line 151 of file string.c.

4.18 MPX-cs450/mpx_core/modules/BCDConversions.c File Reference

```
#include <system.h>
#include "BCDConversions.h"
```

Functions

- int [BCDtoInt](#) (unsigned char c)
- unsigned char [InttoBCD](#) (int i)

4.18.1 Function Documentation

4.18.1.1 BCDtoInt()

```
int BCDtoInt (
    unsigned char c )
```

BCDtoInt converts a value stored as BCD (unsigned char) to an integer
Inputs: c - BCD value to be converted
Outputs: result - converted value as an integer

Definition at line 9 of file BCDConversions.c.

4.18.1.2 InttoBCD()

```
unsigned char InttoBCD (  
    int i )
```

InttoBCD converts a value stored as integer to BCD (unsigned char) Inputs: i - integer value to be converted
Outputs: result - converted value as BCD

Definition at line 32 of file BCDConversions.c.

4.19 MPX-cs450/mpx_core/modules/BCDConversions.h File Reference

```
#include <system.h>
```

Functions

- int [BCDtoInt](#) (unsigned char c)
- unsigned char [InttoBCD](#) (int i)

4.19.1 Function Documentation

4.19.1.1 BCDtoInt()

```
int BCDtoInt (  
    unsigned char c )
```

BCDtoInt converts a value stored as BCD (unsigned char) to an integer Inputs: c - BCD value to be converted
Outputs: result - converted value as an integer

Definition at line 9 of file BCDConversions.c.

4.19.1.2 InttoBCD()

```
unsigned char InttoBCD (  
    int i )
```

InttoBCD converts a value stored as integer to BCD (unsigned char) Inputs: i - integer value to be converted
Outputs: result - converted value as BCD

Definition at line 32 of file BCDConversions.c.

4.20 MPX-cs450/mpx_core/modules/comhand.c File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "DateTime.h"
#include "R1.h"
#include "R2.h"
#include "R3.h"
#include "R4.h"
#include "R5.h"
```

Functions

- void [comhand](#) ()

4.20.1 Function Documentation

4.20.1.1 comhand()

```
void comhand ( )
```

Definition at line 19 of file comhand.c.

4.21 MPX-cs450/mpx_core/modules/DateTime.c File Reference

```
#include <system.h>
#include <string.h>
#include "DateTime.h"
#include "mpx_supt.h"
#include <core/io.h>
#include "BCDConversions.h"
#include "itoa.h"
```

Functions

- void [getdate](#) (char *args)
- void [gettime](#) (char *args)
- void [setdate](#) (char *date)
- void [settime](#) (char *time)
- int [isLeapYear](#) (int year)
- int [gettimeseconds](#) ()

4.21.1 Function Documentation

4.21.1.1 [getdate\(\)](#)

```
void getdate (  
    char * args )
```

getdate extracts and formats the date in mm/dd/yyyy format from RTC registers Inputs: date - character array (buffer) to write date into

Definition at line 14 of file DateTime.c.

4.21.1.2 [gettime\(\)](#)

```
void gettime (  
    char * args )
```

gettime extracts and formats the time in hh:mm:ss format from RTC registers Inputs: time - character array (buffer) to write time into

Definition at line 128 of file DateTime.c.

4.21.1.3 [gettimeseconds\(\)](#)

```
int gettimeseconds ( )
```

gettimeseconds extracts and calculates current time in seconds Outputs: result - current time in seconds

Definition at line 461 of file DateTime.c.

4.21.1.4 isLeapYear()

```
int isLeapYear (
    int year )
```

isLeapYear checks to see if given year is a leap year Inputs: year - year to check as an integer Outputs: 0 if the year is not a leap year, 1 if it is a leap year

Definition at line 431 of file DateTime.c.

4.21.1.5 setdate()

```
void setdate (
    char * date )
```

setdate sets the system date to the given point in time Inputs: date - character array containing date to set system date to in mm/dd/yyyy format

Definition at line 229 of file DateTime.c.

4.21.1.6 settime()

```
void settime (
    char * time )
```

settime sets the system clock to the given time Inputs: date - character array containing date to set system date to in hh/mm/ss format

Definition at line 348 of file DateTime.c.

4.22 MPX-cs450/mpx_core/modules/DateTime.h File Reference

```
#include <system.h>
```

Functions

- void [settime](#) (char *time)
- void [setdate](#) (char *date)
- void [gettime](#) (char *args)
- void [getdate](#) (char *args)
- int [isLeapYear](#) (int year)
- int [gettimeseconds](#) ()

4.22.1 Function Documentation

4.22.1.1 getdate()

```
void getdate (
    char * args )
```

getdate extracts and formats the date in mm/dd/yyyy format from RTC registers Inputs: date - character array (buffer) to write date into

Definition at line 14 of file DateTime.c.

4.22.1.2 gettime()

```
void gettime (
    char * args )
```

gettime extracts and formats the time in hh:mm:ss format from RTC registers Inputs: time - character array (buffer) to write time into

Definition at line 128 of file DateTime.c.

4.22.1.3 gettimeseconds()

```
int gettimeseconds ( )
```

gettimeseconds extracts and calculates current time in seconds Outputs: result - current time in seconds

Definition at line 461 of file DateTime.c.

4.22.1.4 isLeapYear()

```
int isLeapYear (
    int year )
```

isLeapYear checks to see if given year is a leap year Inputs: year - year to check as an integer Outputs: 0 if the year is not a leap year, 1 if it is a leap year

Definition at line 431 of file DateTime.c.

4.22.1.5 setdate()

```
void setdate (
    char * date )
```

setdate sets the system date to the given point in time Inputs: date - character array containing date to set system date to in mm/dd/yyyy format

Definition at line 229 of file DateTime.c.

4.22.1.6 settime()

```
void settime (
    char * time )
```

settime sets the system clock to the given time Inputs: date - character array containing date to set system date to in hh/mm/ss format

Definition at line 348 of file DateTime.c.

4.23 MPX-cs450/mpx_core/modules/itoa.c File Reference

```
#include "itoa.h"
#include <system.h>
#include "mpx_supt.h"
```

Functions

- void [itoa](#) (int i, char *buffer)
- char * [itoareturn](#) (int i)

4.23.1 Function Documentation

4.23.1.1 itoa()

```
void itoa (
    int i,
    char * buffer )
```

Definition at line 6 of file itoa.c.

4.23.1.2 itoareturn()

```
char* itoareturn (
    int i )
```

Definition at line 66 of file itoa.c.

4.24 MPX-cs450/mpx_core/modules/itoa.h File Reference

```
#include <system.h>
```

Functions

- void [itoa](#) (int i, char *buffer)
- char * [itoareturn](#) (int i)

4.24.1 Function Documentation

4.24.1.1 itoa()

```
void itoa (
    int i,
    char * buffer )
```

Definition at line 6 of file itoa.c.

4.24.1.2 itoareturn()

```
char* itoareturn (
    int i )
```

Definition at line 66 of file itoa.c.

4.25 MPX-cs450/mpx_core/modules/mpx_supt.c File Reference

```
#include "mpx_supt.h"
#include <mem/heap.h>
#include <string.h>
#include <core/serial.h>
```

Functions

- int `sys_req` (int op_code, int device_id, char *buffer_ptr, int *count_ptr)
- void `mpx_init` (int cur_mod)
- void `sys_set_malloc` (u32int(*func)(u32int))
- void `sys_set_free` (int(*func)(void *))
- void * `sys_alloc_mem` (u32int size)
- int `sys_free_mem` (void *ptr)
- void `idle` ()
- param * `getparam` ()

Variables

- param params
- int `current_module` = -1
- u32int(* `student_malloc`)(u32int)
- int(* `student_free`)(void *)

4.25.1 Function Documentation

4.25.1.1 `getparam()`

```
param* getparam ( )
```

Definition at line 189 of file mpx_supt.c.

4.25.1.2 `idle()`

```
void idle ( )
```

Definition at line 173 of file mpx_supt.c.

4.25.1.3 `mpx_init()`

```
void mpx_init (
    int cur_mod )
```

Definition at line 106 of file mpx_supt.c.

4.25.1.4 sys_alloc_mem()

```
void* sys_alloc_mem (
    u32int size )
```

Definition at line 144 of file mpx_supt.c.

4.25.1.5 sys_free_mem()

```
int sys_free_mem (
    void * ptr )
```

Definition at line 158 of file mpx_supt.c.

4.25.1.6 sys_req()

```
int sys_req (
    int op_code,
    int device_id,
    char * buffer_ptr,
    int * count_ptr )
```

Definition at line 49 of file mpx_supt.c.

4.25.1.7 sys_set_free()

```
void sys_set_free (
    int(*) (void *) func )
```

Definition at line 134 of file mpx_supt.c.

4.25.1.8 sys_set_malloc()

```
void sys_set_malloc (
    u32int(*) (u32int) func )
```

Definition at line 124 of file mpx_supt.c.

4.25.2 Variable Documentation

4.25.2.1 current_module

```
int current_module = -1
```

Definition at line 18 of file mpx_supt.c.

4.25.2.2 params

```
param params
```

Definition at line 15 of file mpx_supt.c.

4.25.2.3 student_free

```
int(* student_free) (void *) (  
    void * )
```

Definition at line 28 of file mpx_supt.c.

4.25.2.4 student_malloc

```
u32int(* student_malloc) (u32int) (  
    u32int )
```

Definition at line 24 of file mpx_supt.c.

4.26 MPX-cs450/mpx_core/modules/mpx_supt.h File Reference

```
#include <system.h>
```

Data Structures

- struct `param`

Macros

- `#define EXIT 0`
- `#define IDLE 1`
- `#define READ 2`
- `#define WRITE 3`
- `#define INVALID_OPERATION 4`
- `#define TRUE 1`
- `#define FALSE 0`
- `#define MODULE_R1 0`
- `#define MODULE_R2 1`
- `#define MODULE_R3 2`
- `#define MODULE_R4 4`
- `#define MODULE_R5 8`
- `#define MODULE_F 9`
- `#define IO_MODULE 10`
- `#define MEM_MODULE 11`
- `#define INVALID_BUFFER 1000`
- `#define INVALID_COUNT 2000`
- `#define DEFAULT_DEVICE 111`
- `#define COM_PORT 222`

Functions

- `int sys_req (int op_code, int device_id, char *buffer_ptr, int *count_ptr)`
- `void mpx_init (int cur_mod)`
- `void sys_set_malloc (u32int(*func)(u32int))`
- `void sys_set_free (int(*func)(void *))`
- `void * sys_alloc_mem (u32int size)`
- `int sys_free_mem (void *ptr)`
- `void idle ()`
- `param * getparam ()`

4.26.1 Macro Definition Documentation

4.26.1.1 COM_PORT

```
#define COM_PORT 222
```

Definition at line 29 of file mpx_supt.h.

4.26.1.2 DEFAULT_DEVICE

```
#define DEFAULT_DEVICE 111
```

Definition at line 28 of file mpx_supt.h.

4.26.1.3 EXIT

```
#define EXIT 0
```

Definition at line 6 of file mpx_supt.h.

4.26.1.4 FALSE

```
#define FALSE 0
```

Definition at line 13 of file mpx_supt.h.

4.26.1.5 IDLE

```
#define IDLE 1
```

Definition at line 7 of file mpx_supt.h.

4.26.1.6 INVALID_BUFFER

```
#define INVALID_BUFFER 1000
```

Definition at line 25 of file mpx_supt.h.

4.26.1.7 INVALID_COUNT

```
#define INVALID_COUNT 2000
```

Definition at line 26 of file mpx_supt.h.

4.26.1.8 INVALID_OPERATION

```
#define INVALID_OPERATION 4
```

Definition at line 10 of file mpx_supt.h.

4.26.1.9 IO_MODULE

```
#define IO_MODULE 10
```

Definition at line 21 of file mpx_supt.h.

4.26.1.10 MEM_MODULE

```
#define MEM_MODULE 11
```

Definition at line 22 of file mpx_supt.h.

4.26.1.11 MODULE_F

```
#define MODULE_F 9
```

Definition at line 20 of file mpx_supt.h.

4.26.1.12 MODULE_R1

```
#define MODULE_R1 0
```

Definition at line 15 of file mpx_supt.h.

4.26.1.13 MODULE_R2

```
#define MODULE_R2 1
```

Definition at line 16 of file mpx_supt.h.

4.26.1.14 MODULE_R3

```
#define MODULE_R3 2
```

Definition at line 17 of file mpx_supt.h.

4.26.1.15 MODULE_R4

```
#define MODULE_R4 4
```

Definition at line 18 of file mpx_supt.h.

4.26.1.16 MODULE_R5

```
#define MODULE_R5 8
```

Definition at line 19 of file mpx_supt.h.

4.26.1.17 READ

```
#define READ 2
```

Definition at line 8 of file mpx_supt.h.

4.26.1.18 TRUE

```
#define TRUE 1
```

Definition at line 12 of file mpx_supt.h.

4.26.1.19 WRITE

```
#define WRITE 3
```

Definition at line 9 of file mpx_supt.h.

4.26.2 Function Documentation

4.26.2.1 getparam()

```
param* getparam ( )
```

Definition at line 189 of file mpx_supt.c.

4.26.2.2 `idle()`

```
void idle ( )
```

Definition at line 173 of file `mpx_supt.c`.

4.26.2.3 `mpx_init()`

```
void mpx_init (
    int cur_mod )
```

Definition at line 106 of file `mpx_supt.c`.

4.26.2.4 `sys_alloc_mem()`

```
void* sys_alloc_mem (
    u32int size )
```

Definition at line 144 of file `mpx_supt.c`.

4.26.2.5 `sys_free_mem()`

```
int sys_free_mem (
    void * ptr )
```

Definition at line 158 of file `mpx_supt.c`.

4.26.2.6 `sys_req()`

```
int sys_req (
    int op_code,
    int device_id,
    char * buffer_ptr,
    int * count_ptr )
```

Definition at line 49 of file `mpx_supt.c`.

4.26.2.7 sys_set_free()

```
void sys_set_free (
    int(*) (void *) func )
```

Definition at line 134 of file mpx_supt.c.

4.26.2.8 sys_set_malloc()

```
void sys_set_malloc (
    u32int(*) (u32int) func )
```

Definition at line 124 of file mpx_supt.c.

4.27 MPX-cs450/mpx_core/modules/procsr3.c File Reference

```
#include "../include/system.h"
#include "../include/core/serial.h"
#include "mpx_supt.h"
#include "procsr3.h"
```

Macros

- #define [RC_1](#) 1
- #define [RC_2](#) 2
- #define [RC_3](#) 3
- #define [RC_4](#) 4
- #define [RC_5](#) 5

Functions

- void [proc1](#) ()
- void [proc2](#) ()
- void [proc3](#) ()
- void [proc4](#) ()
- void [proc5](#) ()

Variables

- char * [msg1](#) = "proc1 dispatched"
- char * [msg2](#) = "proc2 dispatched"
- char * [msg3](#) = "proc3 dispatched"
- char * [msg4](#) = "proc4 dispatched"
- char * [msg5](#) = "proc5 dispatched"
- int [msgSize](#) = 17
- char * [er1](#) = "proc1 ran after it was terminated"
- char * [er2](#) = "proc2 ran after it was terminated"
- char * [er3](#) = "proc3 ran after it was terminated"
- char * [er4](#) = "proc4 ran after it was terminated"
- char * [er5](#) = "proc5 ran after it was terminated"
- int [erSize](#) = 34

4.27.1 Macro Definition Documentation

4.27.1.1 RC_1

```
#define RC_1 1
```

Definition at line 7 of file procsr3.c.

4.27.1.2 RC_2

```
#define RC_2 2
```

Definition at line 8 of file procsr3.c.

4.27.1.3 RC_3

```
#define RC_3 3
```

Definition at line 9 of file procsr3.c.

4.27.1.4 RC_4

```
#define RC_4 4
```

Definition at line 10 of file procsr3.c.

4.27.1.5 RC_5

```
#define RC_5 5
```

Definition at line 11 of file procsr3.c.

4.27.2 Function Documentation

4.27.2.1 `proc1()`

```
void proc1 ( )
```

Definition at line 27 of file procsr3.c.

4.27.2.2 `proc2()`

```
void proc2 ( )
```

Definition at line 44 of file procsr3.c.

4.27.2.3 `proc3()`

```
void proc3 ( )
```

Definition at line 59 of file procsr3.c.

4.27.2.4 `proc4()`

```
void proc4 ( )
```

Definition at line 74 of file procsr3.c.

4.27.2.5 `proc5()`

```
void proc5 ( )
```

Definition at line 89 of file procsr3.c.

4.27.3 Variable Documentation

4.27.3.1 `er1`

```
char* er1 = "proc1 ran after it was terminated"
```

Definition at line 20 of file procsr3.c.

4.27.3.2 er2

```
char* er2 = "proc2 ran after it was terminated"
```

Definition at line 21 of file procsr3.c.

4.27.3.3 er3

```
char* er3 = "proc3 ran after it was terminated"
```

Definition at line 22 of file procsr3.c.

4.27.3.4 er4

```
char* er4 = "proc4 ran after it was terminated"
```

Definition at line 23 of file procsr3.c.

4.27.3.5 er5

```
char* er5 = "proc5 ran after it was terminated"
```

Definition at line 24 of file procsr3.c.

4.27.3.6 erSize

```
int erSize = 34
```

Definition at line 25 of file procsr3.c.

4.27.3.7 msg1

```
char* msg1 = "procl dispatched"
```

Definition at line 13 of file procsr3.c.

4.27.3.8 msg2

```
char* msg2 = "proc2 dispatched"
```

Definition at line 14 of file procsr3.c.

4.27.3.9 msg3

```
char* msg3 = "proc3 dispatched"
```

Definition at line 15 of file procsr3.c.

4.27.3.10 msg4

```
char* msg4 = "proc4 dispatched"
```

Definition at line 16 of file procsr3.c.

4.27.3.11 msg5

```
char* msg5 = "proc5 dispatched"
```

Definition at line 17 of file procsr3.c.

4.27.3.12 msgSize

```
int msgSize = 17
```

Definition at line 18 of file procsr3.c.

4.28 MPX-cs450/mpx_core/modules/procsr3.h File Reference

```
#include <system.h>
```

Functions

- void [proc1](#) ()
- void [proc2](#) ()
- void [proc3](#) ()
- void [proc4](#) ()
- void [proc5](#) ()

4.28.1 Function Documentation

4.28.1.1 [proc1\(\)](#)

```
void proc1 ( )
```

Definition at line 27 of file procsr3.c.

4.28.1.2 [proc2\(\)](#)

```
void proc2 ( )
```

Definition at line 44 of file procsr3.c.

4.28.1.3 [proc3\(\)](#)

```
void proc3 ( )
```

Definition at line 59 of file procsr3.c.

4.28.1.4 [proc4\(\)](#)

```
void proc4 ( )
```

Definition at line 74 of file procsr3.c.

4.28.1.5 [proc5\(\)](#)

```
void proc5 ( )
```

Definition at line 89 of file procsr3.c.

4.29 MPX-cs450/mpx_core/modules/R1.c File Reference

```
#include "R1.h"
```

Functions

- char * [version](#) ()
- void [help_help](#) ()
- void [help_version](#) ()
- void [help_getdate](#) ()
- void [help_setdate](#) ()
- void [help_gettime](#) ()
- void [help_settime](#) ()
- void [help_shutdown](#) ()
- void [help_suspendpcb](#) ()
- void [help_resumepcb](#) ()
- void [help_setpcbpriority](#) ()
- void [help_showpcb](#) ()
- void [help_showallprocesses](#) ()
- void [help_showreadyprocesses](#) ()
- void [help_showblockedprocesses](#) ()
- void [help_deletePCB](#) ()
- void [help_loadr3](#) ()
- void [help_color](#) ()
- void [help_yield](#) ()
- void [help_inf](#) ()
- void [help_alarm](#) ()
- void [help](#) (char *instr)
- void [color](#) (char *instr)

4.29.1 Function Documentation

4.29.1.1 [color\(\)](#)

```
void color (  
    char * instr )
```

Definition at line 277 of file R1.c.

4.29.1.2 [help\(\)](#)

```
void help (  
    char * instr )
```

Definition at line 152 of file R1.c.

4.29.1.3 help_alarm()

```
void help_alarm ( )
```

Definition at line 145 of file R1.c.

4.29.1.4 help_color()

```
void help_color ( )
```

Definition at line 123 of file R1.c.

4.29.1.5 help_deletePCB()

```
void help_deletePCB ( )
```

Definition at line 109 of file R1.c.

4.29.1.6 help_getdate()

```
void help_getdate ( )
```

Definition at line 26 of file R1.c.

4.29.1.7 help_gettime()

```
void help_gettime ( )
```

Definition at line 39 of file R1.c.

4.29.1.8 help_help()

```
void help_help ( )
```

Definition at line 11 of file R1.c.

4.29.1.9 help_inf()

```
void help_inf ( )
```

Definition at line 138 of file R1.c.

4.29.1.10 help_loadr3()

```
void help_loadr3 ( )
```

Definition at line 116 of file R1.c.

4.29.1.11 help_resumepcb()

```
void help_resumepcb ( )
```

Definition at line 67 of file R1.c.

4.29.1.12 help_setdate()

```
void help_setdate ( )
```

Definition at line 32 of file R1.c.

4.29.1.13 help_setpcbpriority()

```
void help_setpcbpriority ( )
```

Definition at line 74 of file R1.c.

4.29.1.14 help_settime()

```
void help_settime ( )
```

Definition at line 46 of file R1.c.

4.29.1.15 help_showallprocesses()

```
void help_showallprocesses ( )
```

Definition at line 88 of file R1.c.

4.29.1.16 help_showblockedprocesses()

```
void help_showblockedprocesses ( )
```

Definition at line 102 of file R1.c.

4.29.1.17 help_showpcb()

```
void help_showpcb ( )
```

Definition at line 81 of file R1.c.

4.29.1.18 help_showreadyprocesses()

```
void help_showreadyprocesses ( )
```

Definition at line 95 of file R1.c.

4.29.1.19 help_shutdown()

```
void help_shutdown ( )
```

Definition at line 53 of file R1.c.

4.29.1.20 help_suspendpcb()

```
void help_suspendpcb ( )
```

Definition at line 60 of file R1.c.

4.29.1.21 help_version()

```
void help_version ( )
```

Definition at line 18 of file R1.c.

4.29.1.22 help_yield()

```
void help_yield ( )
```

Definition at line 130 of file R1.c.

4.29.1.23 version()

```
char* version ( )
```

Definition at line 3 of file R1.c.

4.30 MPX-cs450/mpx_core/modules/R1.h File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
```

Functions

- char * [version](#) ()
- void [help](#) (char *instr)
- void [color](#) (char *instr)

4.30.1 Function Documentation

4.30.1.1 color()

```
void color (
    char * instr )
```

Definition at line 277 of file R1.c.

4.30.1.2 help()

```
void help (
    char * instr )
```

Definition at line 152 of file R1.c.

4.30.1.3 version()

```
char* version ( )
```

Definition at line 3 of file R1.c.

4.31 MPX-cs450/mpx_core/modules/R2.c File Reference

```
#include "R2.h"
```

Functions

- void [emptyqueues](#) ()
- int [FreePCB](#) (struct [pcb](#) *pointer)
- void [insert](#) (struct [pcb](#) *pcbPtr, struct [Queue](#) *q)
- void [insertblocked](#) (struct [pcb](#) *pcbPtr, struct [Queue](#) *q)
- void * [AllocatePCB](#) ()
- void * [SetupPCB](#) (char *processname, int processclass, int processpriority)
- struct [pcb](#) * [FindPCB](#) (char *name)
- void [InsertPCB](#) (struct [pcb](#) *pointer)
- void [RemovePCB](#) (struct [pcb](#) *pointer)
- void [createPCB](#) (char *processName, int processClass, int processPriority)
- void [blockPCB](#) (char *processName)
- void [unblockPCB](#) (char *processName)
- void [deletePCB](#) (char *name)
- void [suspendPCB](#) (char *name)
- void [resumePCB](#) (char *name)
- void [setPCBPRIORITY](#) (char *name, int priority)
- void [showPCB](#) (char *processname)
- void [showReady](#) ()
- void [showBlocked](#) ()
- void [showAll](#) ()
- [u32int](#) [sys_call](#) (struct [context](#) *registers)

Variables

- int `ready` = 0
- int `blocked` = 1
- int `running` = 2
- struct `pcb` * `cop`
- struct `context` * `saved_regs`
- struct `Queue` `readyQ` = {0, `NULL`, `NULL`}
- struct `Queue` * `y` = &`readyQ`
- struct `Queue` `blockedQ` = {0, `NULL`, `NULL`}
- struct `Queue` * `z` = &`blockedQ`
- int `buffersize` = 100

4.31.1 Function Documentation

4.31.1.1 AllocatePCB()

```
void* AllocatePCB ( )
```

Definition at line 122 of file R2.c.

4.31.1.2 blockPCB()

```
void blockPCB (
    char * processName )
```

Definition at line 326 of file R2.c.

4.31.1.3 createPCB()

```
void createPCB (
    char * processName,
    int processClass,
    int processPriority )
```

Definition at line 289 of file R2.c.

4.31.1.4 deletePCB()

```
void deletePCB (
    char * name )
```

Definition at line 401 of file R2.c.

4.31.1.5 emptyqueues()

```
void emptyqueues ( )
```

Definition at line 20 of file R2.c.

4.31.1.6 FindPCB()

```
struct pcb* FindPCB (
    char * name )
```

Definition at line 185 of file R2.c.

4.31.1.7 FreePCB()

```
int FreePCB (
    struct pcb * pointer )
```

Definition at line 35 of file R2.c.

4.31.1.8 insert()

```
void insert (
    struct pcb * pcbPtr,
    struct Queue * q )
```

insert generic insert function to be used by InsertPCB function, inserts a given PCB into a given [Queue](#). Sorted in H->L priority, FIFO order Inputs: pcbPtr - pointer to PCB that is to be inserted q - pointer to [Queue](#) that PCB is to be inserted into

Definition at line 50 of file R2.c.

4.31.1.9 insertblocked()

```
void insertblocked (
    struct pcb * pcbPtr,
    struct Queue * q )
```

Definition at line 101 of file R2.c.

4.31.1.10 InsertPCB()

```
void InsertPCB (
    struct pcb * pointer )
```

InsertPCB inserts a given PCB into the corresponding queue Inputs: pointer - pointer to the PCB to be inserted

Definition at line 214 of file R2.c.

4.31.1.11 RemovePCB()

```
void RemovePCB (
    struct pcb * pointer )
```

Definition at line 235 of file R2.c.

4.31.1.12 resumePCB()

```
void resumePCB (
    char * name )
```

Definition at line 462 of file R2.c.

4.31.1.13 setPCBPRIORITY()

```
void setPCBPRIORITY (
    char * name,
    int priority )
```

Definition at line 494 of file R2.c.

4.31.1.14 SetupPCB()

```
void* SetupPCB (
    char * processname,
    int processclass,
    int processpriority )
```

Definition at line 135 of file R2.c.

4.31.1.15 showAll()

```
void showAll ( )
```

Definition at line 606 of file R2.c.

4.31.1.16 showBlocked()

```
void showBlocked ( )
```

Definition at line 590 of file R2.c.

4.31.1.17 showPCB()

```
void showPCB (
    char * processname )
```

Definition at line 525 of file R2.c.

4.31.1.18 showReady()

```
void showReady ( )
```

Definition at line 574 of file R2.c.

4.31.1.19 suspendPCB()

```
void suspendPCB (
    char * name )
```

Definition at line 431 of file R2.c.

4.31.1.20 sys_call()

```
u32int sys_call (
    struct context * registers )
```

Definition at line 617 of file R2.c.

4.31.1.21 unblockPCB()

```
void unblockPCB (
    char * processName )
```

Definition at line 369 of file R2.c.

4.31.2 Variable Documentation

4.31.2.1 blocked

```
int blocked = 1
```

Definition at line 7 of file R2.c.

4.31.2.2 blockedQ

```
struct Queue blockedQ = {0, NULL, NULL}
```

Definition at line 15 of file R2.c.

4.31.2.3 buffersize

```
int buffersize = 100
```

Definition at line 18 of file R2.c.

4.31.2.4 cop

```
struct pcb* cop
```

Definition at line 11 of file R2.c.

4.31.2.5 ready

```
int ready = 0
```

Definition at line 6 of file R2.c.

4.31.2.6 readyQ

```
struct Queue readyQ = {0, NULL, NULL}
```

Definition at line 12 of file R2.c.

4.31.2.7 running

```
int running = 2
```

Definition at line 8 of file R2.c.

4.31.2.8 saved_regs

```
struct context* saved_regs
```

Definition at line 12 of file R2.c.

4.31.2.9 y

```
struct Queue* y = &readyQ
```

Definition at line 15 of file R2.c.

4.31.2.10 z

```
struct Queue* z = &blockedQ
```

Definition at line 17 of file R2.c.

4.32 MPX-cs450/mpx_core/modules/R2.h File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "itoa.h"
```

Data Structures

- struct [pcb](#)
- struct [Queue](#)
- struct [context](#)

Functions

- void [emptyqueues](#) ()
- int [FreePCB](#) (struct [pcb](#) *pointer)
- int [isEmpty](#) (struct [Queue](#) *q)
- void [insert](#) (struct [pcb](#) *pcbPtr, struct [Queue](#) *q)
- void [insertblocked](#) (struct [pcb](#) *pcbPtr, struct [Queue](#) *q)
- void * [AllocatePCB](#) ()
- void * [SetupPCB](#) (char *processname, int processclass, int processpriority)
- struct [pcb](#) * [FindPCB](#) (char *name)
- void [InsertPCB](#) (struct [pcb](#) *pointer)
- void [RemovePCB](#) (struct [pcb](#) *pointer)
- void [createPCB](#) (char *processName, int processClass, int processPriority)
- void [blockPCB](#) (char *processName)
- void [unblockPCB](#) (char *processName)
- void [deletePCB](#) (char *name)
- void [suspendPCB](#) (char *name)
- void [resumePCB](#) (char *name)
- void [setPCBPRIORITY](#) (char *name, int priority)
- void [showPCB](#) (char *processname)
- void [showReady](#) ()
- void [showBlocked](#) ()
- void [showAll](#) ()
- [u32int](#) [sys_call](#) (struct [context](#) *registers)

4.32.1 Function Documentation

4.32.1.1 AllocatePCB()

```
void* AllocatePCB ( )
```

Definition at line 122 of file R2.c.

4.32.1.2 blockPCB()

```
void blockPCB (
    char * processName )
```

Definition at line 326 of file R2.c.

4.32.1.3 createPCB()

```
void createPCB (
    char * processName,
    int processClass,
    int processPriority )
```

Definition at line 289 of file R2.c.

4.32.1.4 deletePCB()

```
void deletePCB (
    char * name )
```

Definition at line 401 of file R2.c.

4.32.1.5 emptyqueues()

```
void emptyqueues ( )
```

Definition at line 20 of file R2.c.

4.32.1.6 FindPCB()

```
struct pcb* FindPCB (
    char * name )
```

Definition at line 185 of file R2.c.

4.32.1.7 FreePCB()

```
int FreePCB (
    struct pcb * pointer )
```

Definition at line 35 of file R2.c.

4.32.1.8 insert()

```
void insert (
    struct pcb * pcbPtr,
    struct Queue * q )
```

insert generic insert function to be used by InsertPCB function, inserts a given PCB into a given [Queue](#). Sorted in H->L priority, FIFO order Inputs: pcbPtr - pointer to PCB that is to be inserted q - pointer to [Queue](#) that PCB is to be inserted into

Definition at line 50 of file R2.c.

4.32.1.9 insertblocked()

```
void insertblocked (
    struct pcb * pcbPtr,
    struct Queue * q )
```

Definition at line 101 of file R2.c.

4.32.1.10 InsertPCB()

```
void InsertPCB (
    struct pcb * pointer )
```

InsertPCB inserts a given PCB into the corresponding queue Inputs: pointer - pointer to the PCB to be inserted

Definition at line 214 of file R2.c.

4.32.1.11 isEmpty()

```
int isEmpty (
    struct Queue * q )
```

4.32.1.12 RemovePCB()

```
void RemovePCB (
    struct pcb * pointer )
```

Definition at line 235 of file R2.c.

4.32.1.13 resumePCB()

```
void resumePCB (
    char * name )
```

Definition at line 462 of file R2.c.

4.32.1.14 setPCBPRIORITY()

```
void setPCBPRIORITY (
    char * name,
    int priority )
```

Definition at line 494 of file R2.c.

4.32.1.15 SetupPCB()

```
void* SetupPCB (
    char * processname,
    int processclass,
    int processpriority )
```

Definition at line 135 of file R2.c.

4.32.1.16 showAll()

```
void showAll ( )
```

Definition at line 606 of file R2.c.

4.32.1.17 showBlocked()

```
void showBlocked ( )
```

Definition at line 590 of file R2.c.

4.32.1.18 showPCB()

```
void showPCB (
    char * processname )
```

Definition at line 525 of file R2.c.

4.32.1.19 showReady()

```
void showReady ( )
```

Definition at line 574 of file R2.c.

4.32.1.20 suspendPCB()

```
void suspendPCB (
    char * name )
```

Definition at line 431 of file R2.c.

4.32.1.21 sys_call()

```
u32int sys_call (
    struct context * registers )
```

Definition at line 617 of file R2.c.

4.32.1.22 unblockPCB()

```
void unblockPCB (
    char * processName )
```

Definition at line 369 of file R2.c.

4.33 MPX-cs450/mpx_core/modules/R3.c File Reference

```
#include <system.h>
#include <string.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "R2.h"
#include "R3.h"
#include "procsr3.h"
```

Functions

- void [yield](#) ()
- void * [loadr3](#) ()

4.33.1 Function Documentation

4.33.1.1 loadr3()

```
void* loadr3 ( )
```

Definition at line 20 of file R3.c.

4.33.1.2 yield()

```
void yield ( )
```

Definition at line 16 of file R3.c.

4.34 MPX-cs450/mpx_core/modules/R3.h File Reference

```
#include <system.h>
```

Functions

- void `yield` ()
- void * `loadr3` ()

4.34.1 Function Documentation

4.34.1.1 `loadr3()`

```
void* loadr3 ( )
```

Definition at line 20 of file R3.c.

4.34.1.2 `yield()`

```
void yield ( )
```

Definition at line 16 of file R3.c.

4.35 MPX-cs450/mpx_core/modules/R4.c File Reference

```
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "DateTime.h"
#include "R2.h"
#include "itoa.h"
#include "R4.h"
```

Functions

- void `printtime` ()
- int `convertsec` (char *msg)
- void `alarm` ()
- void `createAlarm` (char *message, char *time)
- void `checkAlarm` ()
- void `createInfinite` ()
- void `infinite` ()
- void `insertalarm` (struct `alarm` *alPtr)
- void `removealarm` (struct `alarm` *pointer)

Variables

- struct `alList` `list` = {0, `NULL`, `NULL`}
- struct `alList` * `alarmlist` = &`list`

4.35.1 Function Documentation

4.35.1.1 `alarm()`

```
void alarm ( )
```

Definition at line 43 of file R4.c.

4.35.1.2 `checkAlarm()`

```
void checkAlarm ( )
```

Definition at line 69 of file R4.c.

4.35.1.3 `convertsec()`

```
int convertsec (  
    char * msg )
```

Definition at line 29 of file R4.c.

4.35.1.4 createAlarm()

```
void createAlarm (
    char * message,
    char * time )
```

Definition at line 61 of file R4.c.

4.35.1.5 createInfinite()

```
void createInfinite ( )
```

Definition at line 107 of file R4.c.

4.35.1.6 infinite()

```
void infinite ( )
```

Definition at line 127 of file R4.c.

4.35.1.7 insertalarm()

```
void insertalarm (
    struct alarm * alPtr )
```

Definition at line 142 of file R4.c.

4.35.1.8 printtime()

```
void printtime ( )
```

Definition at line 19 of file R4.c.

4.35.1.9 removealarm()

```
void removealarm (
    struct alarm * pointer )
```

Definition at line 158 of file R4.c.

4.35.2 Variable Documentation

4.35.2.1 alarmlist

```
struct allist* alarmlist = &list
```

Definition at line 16 of file R4.c.

4.35.2.2 list

```
struct allist list = {0, NULL, NULL}
```

Definition at line 1 of file R4.c.

4.36 MPX-cs450/mpx_core/modules/R4.h File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "DateTime.h"
#include "R2.h"
#include "BCDConversions.h"
#include "itoa.h"
```

Data Structures

- struct [alarm](#)
- struct [allist](#)

Functions

- void [alarm](#) ()
- void [prnttime](#) ()
- void [checkAlarm](#) ()
- void [createAlarm](#) (char *message, char *time)
- void [infinite](#) ()
- void [createInfinite](#) ()
- int [convertsec](#) (char *time)
- void [insertalarm](#) (struct [alarm](#) *al)
- void [removealarm](#) (struct [alarm](#) *pointer)

4.36.1 Function Documentation

4.36.1.1 alarm()

```
void alarm ( )
```

Definition at line 43 of file R4.c.

4.36.1.2 checkAlarm()

```
void checkAlarm ( )
```

Definition at line 69 of file R4.c.

4.36.1.3 convertsec()

```
int convertsec (
    char * time )
```

Definition at line 29 of file R4.c.

4.36.1.4 createAlarm()

```
void createAlarm (
    char * message,
    char * time )
```

Definition at line 61 of file R4.c.

4.36.1.5 createInfinite()

```
void createInfinite ( )
```

Definition at line 107 of file R4.c.

4.36.1.6 infinite()

```
void infinite ( )
```

Definition at line 127 of file R4.c.

4.36.1.7 insertalarm()

```
void insertalarm (
    struct alarm * al )
```

Definition at line 142 of file R4.c.

4.36.1.8 printtime()

```
void printtime ( )
```

Definition at line 19 of file R4.c.

4.36.1.9 removealarm()

```
void removealarm (
    struct alarm * pointer )
```

Definition at line 158 of file R4.c.

4.37 MPX-cs450/mpx_core/modules/R5.c File Reference

```
#include "R5.h"
```

Functions

- int [isEmptyR5](#) ()
- void * [initHeap](#) (int size)
- void * [allocateMem](#) (int size)
- void [freeMem](#) (void *x)
- void [showfree](#) ()
- void [showallocated](#) ()
- void [printaddr](#) (int address)
- struct [CMCB](#) * [findCMCB](#) (void *x)

Variables

- struct `heap` * `heapStart`
- struct `allocatedblocks` * `allocblocks`
- struct `freeblocks` * `freeblocks`

4.37.1 Function Documentation

4.37.1.1 `allocateMem()`

```
void* allocateMem (  
    int size )
```

Definition at line 55 of file R5.c.

4.37.1.2 `findCMCB()`

```
struct CMCB* findCMCB (  
    void * x )
```

Definition at line 400 of file R5.c.

4.37.1.3 `freeMem()`

```
void freeMem (  
    void * x )
```

Definition at line 187 of file R5.c.

4.37.1.4 `initHeap()`

```
void* initHeap (  
    int size )
```

Definition at line 22 of file R5.c.

4.37.1.5 isEmptyR5()

```
int isEmptyR5 ( )
```

Definition at line 8 of file R5.c.

4.37.1.6 printaddr()

```
void printaddr (
    int address )
```

Definition at line 391 of file R5.c.

4.37.1.7 showallocated()

```
void showallocated ( )
```

Definition at line 363 of file R5.c.

4.37.1.8 showfree()

```
void showfree ( )
```

Definition at line 328 of file R5.c.

4.37.2 Variable Documentation

4.37.2.1 allocblocks

```
struct allocatedblocks* allocblocks
```

Definition at line 4 of file R5.c.

4.37.2.2 freeblocks

```
struct freeblocks* freeblocks
```

Definition at line 5 of file R5.c.

4.37.2.3 heapStart

```
struct heap* heapStart
```

Definition at line 3 of file R5.c.

4.38 MPX-cs450/mpx_core/modules/R5.h File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
#include "R2.h"
```

Data Structures

- struct [heap](#)
- struct [CMCB](#)
- struct [allocatedblocks](#)
- struct [freeblocks](#)

Functions

- int [isEmptyR5](#) ()
- void * [initHeap](#) (int size)
- void * [allocateMem](#) (int size)
- void [freeMem](#) (void *x)
- void [showfree](#) ()
- void [showallocated](#) ()
- void [printaddr](#) (int address)
- struct [CMCB](#) * [findCMCB](#) (void *x)

4.38.1 Function Documentation

4.38.1.1 allocateMem()

```
void* allocateMem (
    int size )
```

Definition at line 55 of file R5.c.

4.38.1.2 findCMCB()

```
struct CMCB* findCMCB (  
    void * x )
```

Definition at line 400 of file R5.c.

4.38.1.3 freeMem()

```
void freeMem (  
    void * x )
```

Definition at line 187 of file R5.c.

4.38.1.4 initHeap()

```
void* initHeap (  
    int size )
```

Definition at line 22 of file R5.c.

4.38.1.5 isEmptyR5()

```
int isEmptyR5 ( )
```

Definition at line 8 of file R5.c.

4.38.1.6 printaddr()

```
void printaddr (  
    int address )
```

Definition at line 391 of file R5.c.

4.38.1.7 showallocated()

```
void showallocated ( )
```

Definition at line 363 of file R5.c.

4.38.1.8 showfree()

```
void showfree ( )
```

Definition at line 328 of file R5.c.

4.39 MPX-cs450/mpx_core/modules/Startup.c File Reference

```
#include "Startup.h"
```

Functions

- void [startup](#) ()

4.39.1 Function Documentation

4.39.1.1 startup()

```
void startup ( )
```

Definition at line 3 of file Startup.c.

4.40 MPX-cs450/mpx_core/modules/Startup.h File Reference

```
#include <stdint.h>
#include <string.h>
#include <system.h>
#include <core/io.h>
#include <core/serial.h>
#include <core/tables.h>
#include <core/interrupts.h>
#include <mem/heap.h>
#include <mem/paging.h>
#include "mpx_supt.h"
```

Functions

- void [startup](#) ()

4.40.1 Function Documentation

4.40.1.1 startup()

```
void startup ( )
```

Definition at line 3 of file Startup.c.

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