# 2o48.hackable.c

16D0

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# Chapter 1

# 2o48.hackable.c

An hackable 2048 game written in C

Used ncurses.h to control the input and output

### USAGE

#### Welcome:

Enter the size of board that you want to play. The size must be 1∼9, The version number of game executable will be displayed at center of screen;

#### Play:

Use arrow left/down/up/right or key hjkl to move Type : to input commands;

#### Command:

```
#### Stash in memory:
    ##### s | save  [n]
        Save current board and continuing current game in a new board
        n (optional): board number to jump to;
    ##### s! | saveto  [n]
        Save current board to a new board and continuing current game in a current board
        n (optional): board number to save to;
    ##### r | read  [n]
        Read from a board saved in memory
        n (optional):board number to read from;

#### Save in file:
    The file name will be 2048[.%d].%X.save,
    where %d is the board number and %X is version number in hexadecimal;
    ##### w | write
        Write current board to file;
    ##### wb | writeboard  [n]
        Write board specfied to file
        n :board number to save;
    ##### o | open  [n]
        Open a board saved in file
        n (optional): board number to read;

####Gaming option
    ##### q | quit | (ctrl+c)
        Quit the game with a confirming;
    ##### q! | quit!
        Quit the game without confirming;
    ##### wq | writequit
```

```
Write current board to file and quit without confirming
```

## Lisense

# Chapter 2

# File Index

## 2.1 File List

Here is a list of all files with brief descriptions:

2048.c . . . . . 5

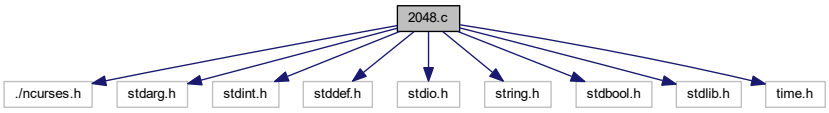
# Chapter 3

# File Documentation

## 3.1 2048.c File Reference

```
#include "./ncurses.h"
#include <string.h>
#include <stdbool.h>
#include <stdlib.h>
#include <time.h>
```

Include dependency graph for 2048.c:




### Macros

- #define PWD ":2048"
- #define PWD_LEN 5
- #define MAX_BOARD_NUM 16
- #define MAX_BOARD_SIZE 16
- #define EUP false,1
- #define EDOWN false,-1
- #define ELEFT true,1
- #define ERIGHT true,-1
- #define MENU_POSITION_Y row-1
- #define MENU_POSITION_X 0
- #define WARNING_POSITION_Y row-2
- #define WARNING_POSITION_X 0

### Functions

- void settings ()

  *Set the global settings.*
- char AlignCol (int curcol, int direction)

  *Align the vertical direction.*

- char AlignLine (int curline, int direction)

  *Align the horizontal direction.*
- char CheckEat (char *a, char *b)

  *Check while the two number can be eated.*
- void Clrboard (int boardToClr)

  *Empty the board specified.*
- char * Display (char in)

  *Get the grid's display string.*
- char Eat (bool isH, int direction)

  *Eat the board at the direction specified.*
- char EatCol (int curcol, int direction)

  *Eat the vertical direction.*
- char EatLine (const int curline, int direction)

  *Eat the horizontal direction.*
- int GetRandNums ()

  *Get random grid ranged fron 0 to MAX_RANDNUM on board.*
- unsigned int Rando (int N)

  *Generate random num ranged fron 0 to N-1.*
- void command ()

  *Show and handle commands inputed by :*
- void die ()

  *Handle when no empty grid present.*
- void play ()

  *Handle for main game.*
- void showBoard (int offy, int offx)

  *Print the board to screen.*
- void welcome ()

  *Print welcome message and input the size of the board.*
- int c_checksum ()

  *Calculate the checksum for saving.*
- void c_currentStr (bool show)

  *Genetate the string representing current board.*
- void c_forceQuit ()

  *Quit the game.*
- void c_loadStr ()
- void c_readBoard (int from)

  *Read the saved board.*
- void c_readFromDisk (int boards)

  *Read the saved file.*
- void c_saveBoard (int to, bool jmp)

  *Save the board in memory.*
- void c_tryQuit ()

  *Ask player whether to quit.*
- int c_version ()

  *Calculate the game's version.*
- void c_warning (char *warn)

  *Print a warning to screen.*
- bool c_writeBoardToDisk (char boards)

  *Write the board to disk.*
- void c_loadStr (int iptN, FILE *fp)

  *Load the string representing saved board.*
- int main ()

  *Main executable.*

### Variables

- const int NA =127
- int P_RANDNUM =30
- int MAX_RANDNUM =2
- const char cs_pwd [PWD_LEN+1] =PWD
- char board [MAX_BOARD_NUM][MAX_BOARD_SIZE][MAX_BOARD_SIZE]
- char boardstr [MAX_BOARD_SIZE][MAX_BOARD_SIZE][5]
- int boardseed [MAX_BOARD_NUM]
- unsigned char curs =0
- char eat [256][256][2]

  *Eat table(TODO:use eat array in CheckEat)*
- char display [256][16]
- int point [256]

  *Point table(TODO:use eat array in CheckEat)*
- char N =5
- int row
- int col

## 3.1.1 Macro Definition Documentation

#### 3.1.1.1 #define EDOWN false,-1

Eat down

Definition at line 40 of file 2048.c.

#### 3.1.1.2 #define ELEFT true,1

Eat left

Definition at line 41 of file 2048.c.

#### 3.1.1.3 #define ERIGHT true,-1

Rat right

Definition at line 42 of file 2048.c.

#### 3.1.1.4 #define EUP false,1

Eat up

Definition at line 39 of file 2048.c.

#### 3.1.1.5 #define MAX_BOARD_NUM 16

The maxium board num (for saving in game)

Definition at line 20 of file 2048.c.

#### 3.1.1.6 #define MAX_BOARD_SIZE 16

The maxium board size

Definition at line 24 of file 2048.c.

#### 3.1.1.7 #define MENU_POSITION_X 0

the X position to print menu

Definition at line 55 of file 2048.c.

#### 3.1.1.8 #define MENU_POSITION_Y row-1

the Y position to print menu

Definition at line 54 of file 2048.c.

#### 3.1.1.9 #define PWD ":2048"

The password for the save file and represent the version of the game Should and only be changed when the saved file isn't/shouldn't compatible with others

Definition at line 5 of file 2048.c.

#### 3.1.1.10 #define PWD_LEN 5

The length of PWD

Definition at line 9 of file 2048.c.

#### 3.1.1.11 #define WARNING_POSITION_X 0

the X position to print warning

Definition at line 57 of file 2048.c.

#### 3.1.1.12 #define WARNING_POSITION_Y row-2

the Y position to print warning

Definition at line 56 of file 2048.c.

### 3.1.2 Function Documentation

#### 3.1.2.1 char AlignCol ( int *curcol,* int *direction* )

Align the vertical direction.

**Parameters**

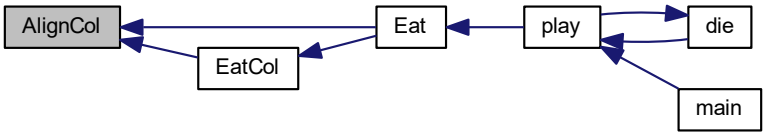
| | |
|---|---|
| *curcol* | Current column to align |
| *direction* | The direction to align to<br>`positive for up and negative for down` |

**Returns**

The number of blank grid in the column

Definition at line 170 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.2 char AlignLine ( int *curline,* int *direction* )

Align the horizontal direction.

**Parameters**

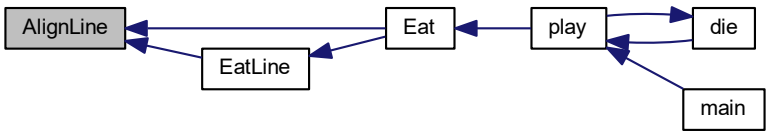
| | |
|---|---|
| *curline* | Current line to align |
| *direction* | The direction to align to<br>`positive for left and negative for right` |

**Returns**

The number of blank grid in the column

Definition at line 200 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.3 int c_checksum ( )

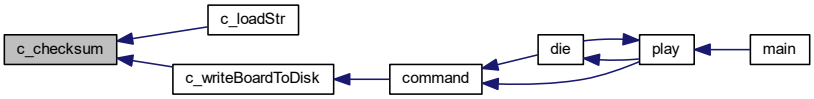
Calculate the checksum for saving.

**Returns**

The checksum for current board

Definition at line 496 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.4 void c_currentStr ( bool *show* )

Genetate the string representing current board.

**Parameters**

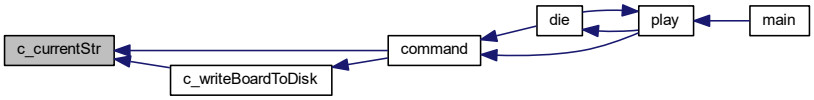
| | |
|---|---|
| *show* | If need to print the string to screen |

**Returns**

void

Definition at line 521 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.5 void c_forceQuit ( )

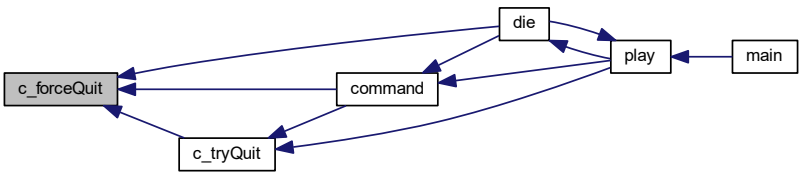
Quit the game.

**Returns**

void

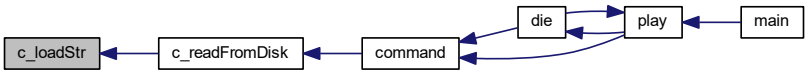
Definition at line 550 of file 2048.c.

Here is the caller graph for this function:



#### 3.1.2.6 void c_loadStr ( )

Here is the caller graph for this function:




#### 3.1.2.7 void c_loadStr ( int *iptN*, FILE * *fp* )

Load the string representing saved board.

**Parameters**

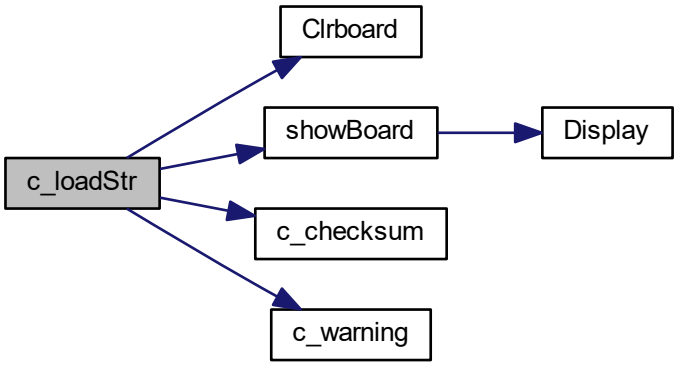
| | |
|---|---|
| *iptN* | The N in the saved game |
| *fp* | The file stream to read from |

**Returns**

void

Definition at line 559 of file 2048.c.

Here is the call graph for this function:




#### 3.1.2.8 void c_readBoard ( int *from* )

Read the saved board.

**Parameters**

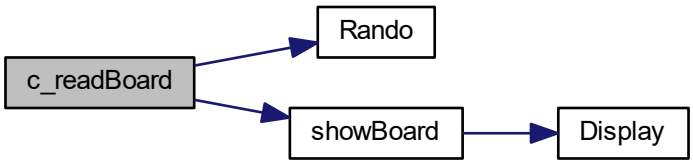
| | |
|---|---|
| *from* | The number of board to read from |

**Returns**

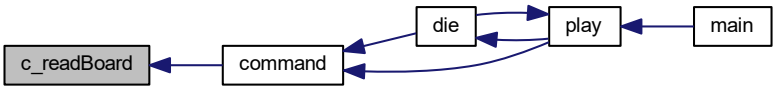
void

Definition at line 606 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.9 void c_readFromDisk ( int *boards* )

Read the saved file.

**Parameters**

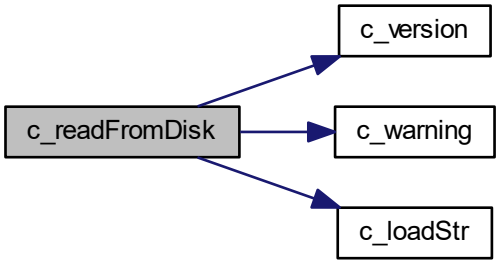
| | |
|---|---|
| *boards* | The number of the saved board.NA for not to use |

**Returns**

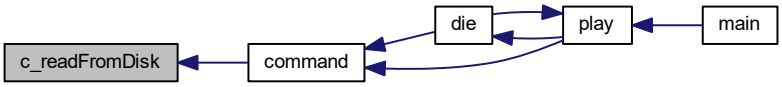
void

Definition at line 623 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.10 void c_saveBoard ( int *to*, bool *jmp* )

Save the board in memory.

**Parameters**

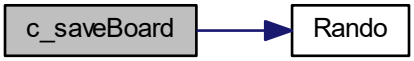
| | |
|---|---|
| *to* | The number of the board to save to.NA for auto find nnext |
| *jmp* | If should jump to new board |

**Returns**

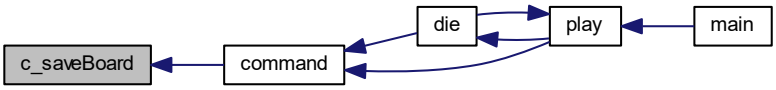
void

Definition at line 659 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.11 void c_tryQuit ( )

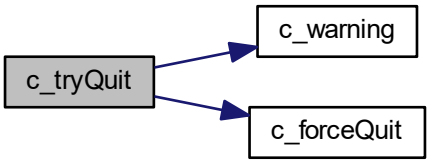
Ask player whether to quit.

**Returns**

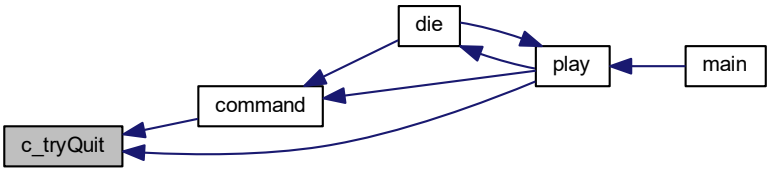
void

Definition at line 682 of file 2048.c.

Here is the call graph for this function:



Here is the caller graph for this function:




#### 3.1.2.12 int c_version ( )

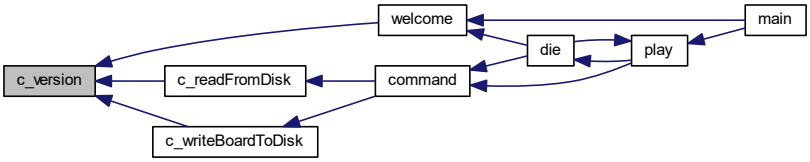
Calculate the game's version.

**Returns**

Version

Definition at line 673 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.13 void c_warning ( char * *warn* )

Print a warning to screen.

**Parameters**

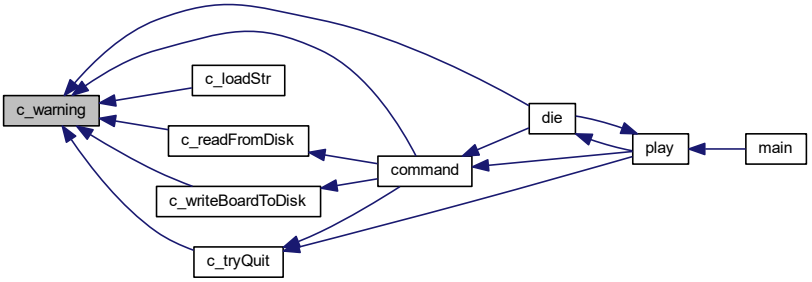
| | |
|---|---|
| *warn* | The string to print |

**Returns**

void

Definition at line 754 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.14 bool c_writeBoardToDisk ( char *boards* )

Write the board to disk.

**Parameters**

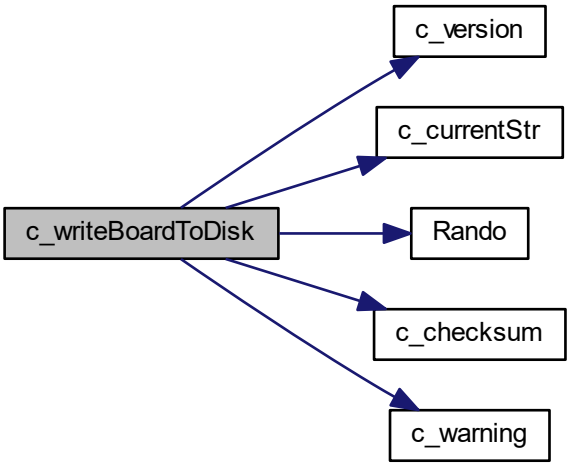
| | |
|---|---|
| *boards* | The number of board to save |

**Returns**

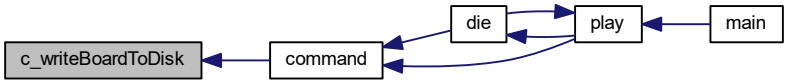
Whether the file is saved successfully

Definition at line 705 of file 2048.c.

Here is the call graph for this function:



Here is the caller graph for this function:




#### 3.1.2.15 char CheckEat ( char * a, char * b )

Check while the two number can be eated.

**Parameters**

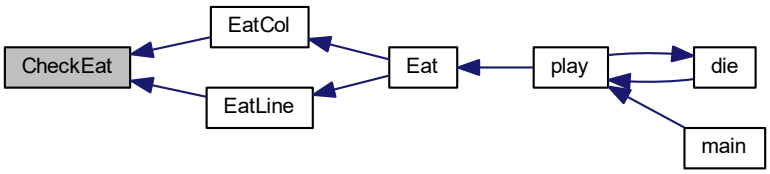
| | |
|---|---|
| *a* | Value a |
| *b* | Value b |

**Returns**

The final value of a

Definition at line 228 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.16 void Clrboard ( int *boardToClr* )

Empty the board specified.

**Parameters**

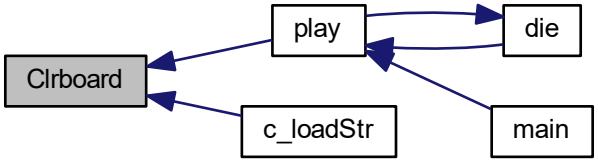
| | |
|---|---|
| *boardToClr* | The board to empty |

**Returns**

void

Definition at line 238 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.17 void command ( )

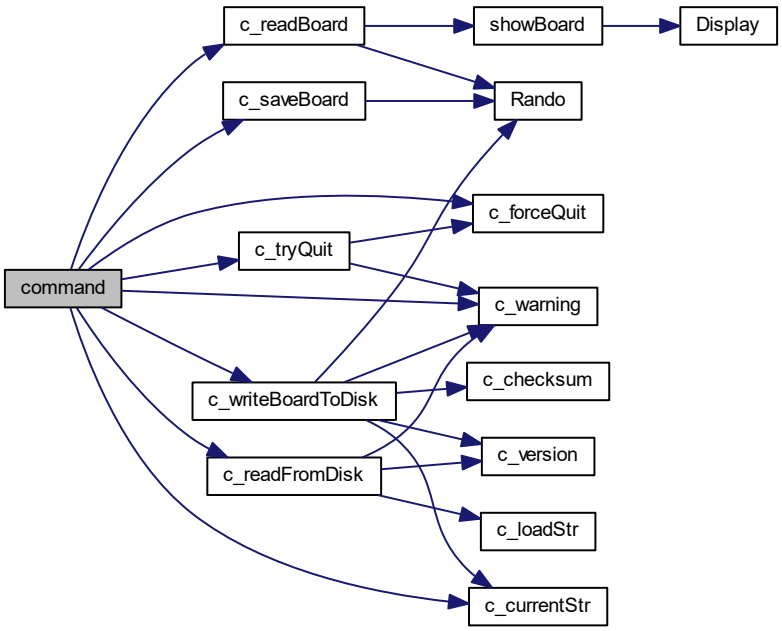
Show and handle commands inputed by :

**Returns**

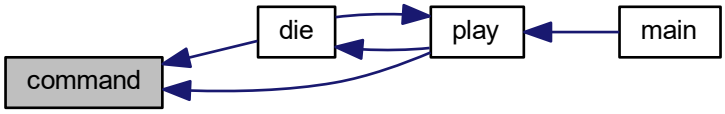
void

Definition at line 343 of file 2048.c.

Here is the call graph for this function:



Here is the caller graph for this function:




#### 3.1.2.18 void die ( )

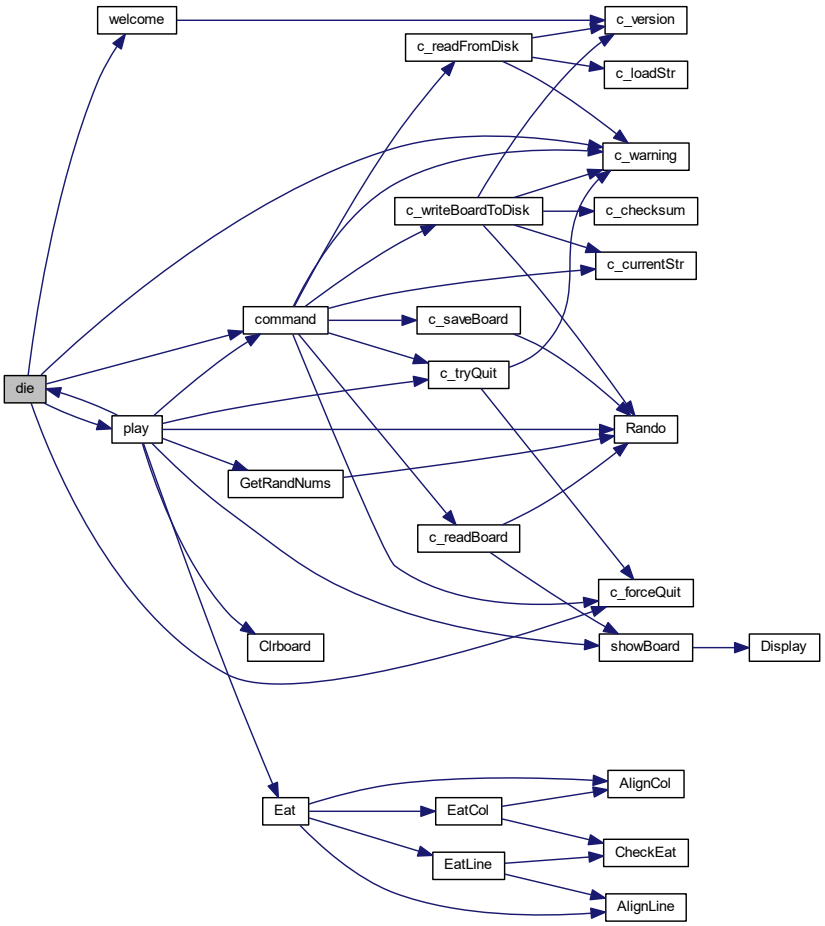
Handle when no empty grid present.

**Returns**

void

Definition at line 387 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:


#### 3.1.2.19 char * Display ( char *in* )

Get the grid's display string.

**Parameters**

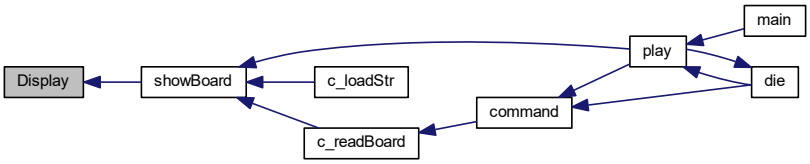
| | |
|---|---|
| *in* | The grid's value |

**Returns**

The string to display

Definition at line 244 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.20 char Eat ( bool *isH*, int *direction* )

Eat the board at the direction specified.

**Parameters**

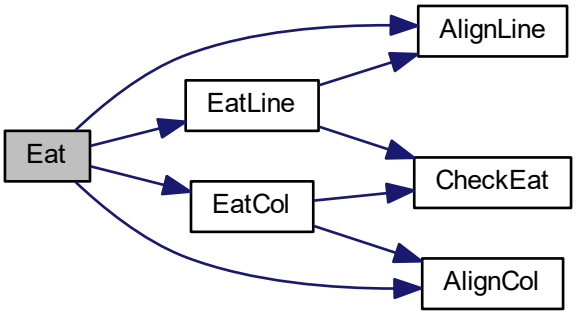
| | |
|---|---|
| *isH* | Is horizontal<br>`true for horizontal and false for vertical` |
| *direction* | The direction to eat to<br>`positive for left/up and negative for right/down` |

**Returns**

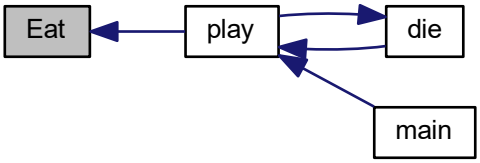
The number of empty grids

Definition at line 256 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.21 char EatCol ( int *curcol*, int *direction* )

Eat the vertical direction.

**Parameters**

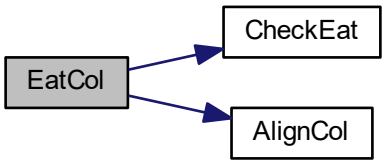
| | |
|---|---|
| *curcol* | Current column to eat |
| *direction* | The direction to eat<br>`positive for up and negative for down` |

**Returns**

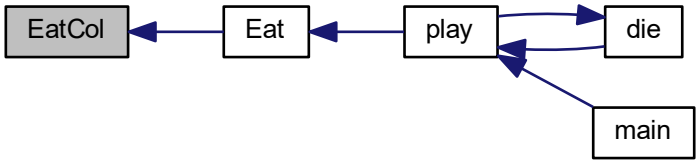
The number of blank grid in the column

Definition at line 277 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.22 char EatLine ( const int *curline*, int *direction* )

Eat the horizontal direction.

**Parameters**

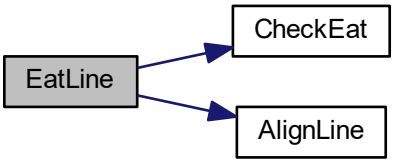
| | |
|---|---|
| *curline* | Current line to eat |
| *direction* | The direction to eat<br>`positive for left and negative for right` |

**Returns**

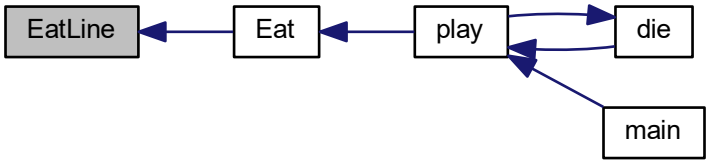
The number of blank grid in the column

Definition at line 292 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:




#### 3.1.2.23 int GetRandNums ( )

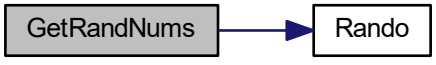
Get random grid ranged fron 0 to MAX_RANDNUM on board.

**Returns**

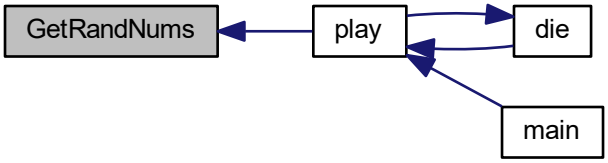
The number of random grid generated

Definition at line 303 of file 2048.c.

Here is the call graph for this function:



Here is the caller graph for this function:




#### 3.1.2.24 int main ( )

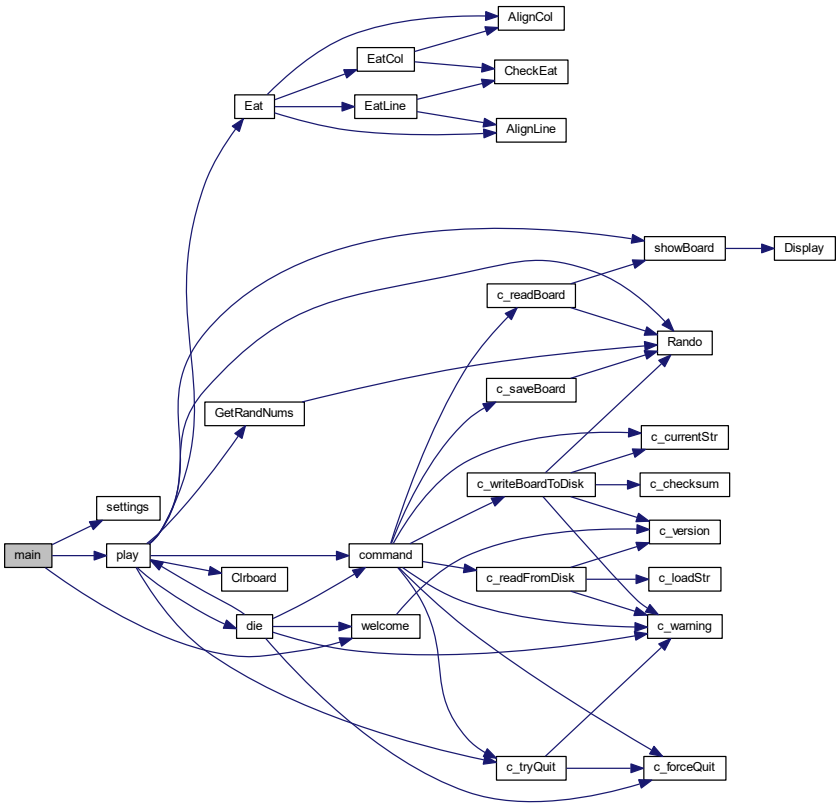
Main executable.

**Returns**

0

Definition at line 762 of file 2048.c.

Here is the call graph for this function:



#### 3.1.2.25 void play ( )

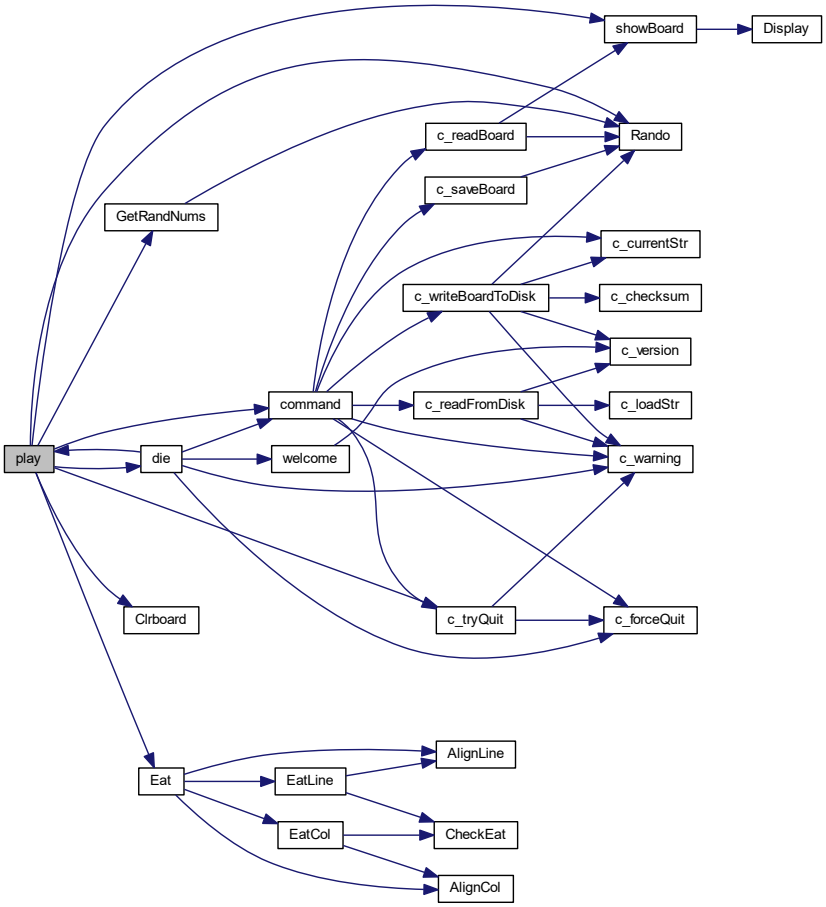
Handle for main game.

**Returns**

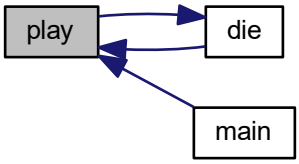
void

Definition at line 409 of file 2048.c.

Here is the call graph for this function:



Here is the caller graph for this function:




#### 3.1.2.26 unsigned int Rando ( int *N* )

Generate random num ranged fron 0 to N-1.

**Parameters**

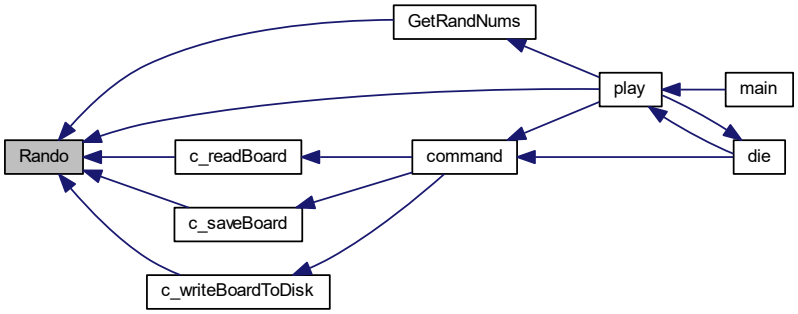
| | |
|---|---|
| *N* | The upper bound of the random number |

**Returns**

The random number

Definition at line 315 of file 2048.c.

Here is the caller graph for this function:




#### 3.1.2.27 void settings ( )

Set the global settings.

TODO:use a ini instead?

**Returns**

void

Definition at line 92 of file 2048.c.

Here is the caller graph for this function:


#### 3.1.2.28 void showBoard ( int *offy*, int *offx* )

Print the board to screen.

**Parameters**

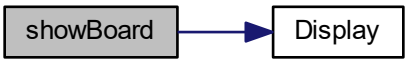
| | |
|---|---|
| *offy* | The y position for the left-up corner |
| *offx* | The x position for the left-up corner |

**Returns**

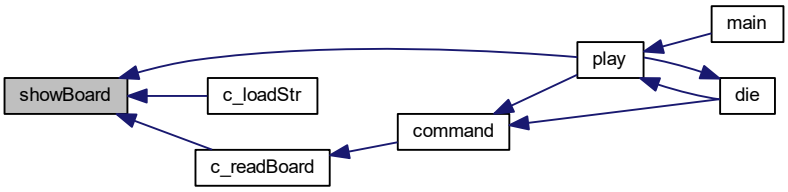
void

Definition at line 450 of file 2048.c.

Here is the call graph for this function:




Here is the caller graph for this function:



#### 3.1.2.29 void welcome ( )

Print welcome message and input the size of the board.

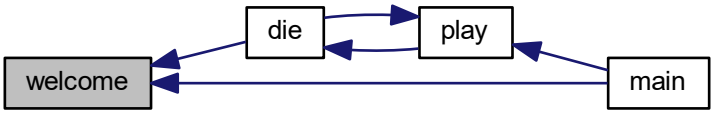
**Returns**

void

Definition at line 477 of file 2048.c.

Here is the call graph for this function:


Here is the caller graph for this function:




### 3.1.3 Variable Documentation

#### 3.1.3.1 char board[MAX_BOARD_NUM][MAX_BOARD_SIZE][MAX_BOARD_SIZE]

The boards to storage game progress

Definition at line 61 of file 2048.c.

#### 3.1.3.2 int boardseed[MAX_BOARD_NUM]

The random seed of the boards

Definition at line 65 of file 2048.c.

#### 3.1.3.3 char boardstr[MAX_BOARD_SIZE][MAX_BOARD_SIZE][5]

The output string

Definition at line 63 of file 2048.c.

#### 3.1.3.4 int col

Definition at line 86 of file 2048.c.

#### 3.1.3.5 const char cs_pwd[PWD_LEN+1] =PWD

The password when generating the checksum

Definition at line 59 of file 2048.c.

#### 3.1.3.6 unsigned char curs =0

Current board

Definition at line 67 of file 2048.c.

#### 3.1.3.7 char display[256][16]

Display table

Will display a as string display[a]

Definition at line 77 of file 2048.c.

#### 3.1.3.8 char eat[256][256][2]

Eat table(TODO:use eat array in CheckEat)

Will set a=eat[a][b][0] and b=eat[a][b][1] when eating a and b

Definition at line 73 of file 2048.c.

#### 3.1.3.9 int MAX_RANDNUM =2

The maxium level of filling an grid.

Definition at line 26 of file 2048.c.

#### 3.1.3.10 char N =5

The size of the board

Definition at line 83 of file 2048.c.

#### 3.1.3.11 const int NA =127

Stand for invalid grid.

Definition at line 16 of file 2048.c.

#### 3.1.3.12 int P_RANDNUM =30

The probability of an empty grid becoming filled

Definition at line 25 of file 2048.c.

#### 3.1.3.13 int point[256]

Point table(TODO:use eat array in CheckEat)

Will count a by point[a] when adding up the points

Definition at line 81 of file 2048.c.

#### 3.1.3.14 int row

The size of the screen

Definition at line 86 of file 2048.c.

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