echoserver

Generated by Doxygen 1.8.1.2

Sat Aug 31 2013 23:10:03

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3.1 ThreadCount Struct Reference

Struct to synchronize access to the active thread count.

Data Fields

- pthread_mutex_t mutex
- int count

3.1.1 Detailed Description

Struct to synchronize access to the active thread count.

3.1.2 Field Documentation

3.1.2.1 int ThreadCount::count

Active thread count variable

3.1.2.2 pthread_mutex_t ThreadCount::mutex

Mutex for synchronized access

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

- debug_thread_counter.c

Chapter 4

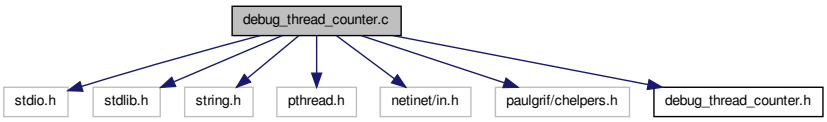
File Documentation

4.1 debug_thread_counter.c File Reference

Implementation of debug thread counter.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <pthread.h>
#include <netinet/in.h>
#include <paulgrif/chelpers.h>
#include "debug_thread_counter.h"
```

Include dependency graph for debug_thread_counter.c:



Data Structures

- struct ThreadCount

  Struct to synchronize access to the active thread count.

Typedefs

- typedef struct ThreadCount ThreadCount

  Struct to synchronize access to the active thread count.

Functions

- int get_thread_count (void)

  Gets the active thread count.
- void increment_thread_count (void)

  Increments the active thread count.

- void decrement_thread_count (void)

  Decrements the active thread count.

Variables

- static ThreadCount thread_count = {PTHREAD_MUTEX_INITIALIZER, 0}

  File scope variable holding the active thread count.

4.1.1 Detailed Description

Implementation of debug thread counter.

Author

Paul Griffiths

Copyright

4.1.2 Typedef Documentation

4.1.2.1 typedef struct ThreadCount ThreadCount

Struct to synchronize access to the active thread count.

4.1.3 Function Documentation

4.1.3.1 void decrement_thread_count (void)

Decrements the active thread count.

Used for debugging purposes to check that threads are exiting and being destroyed when expected.

4.1.3.2 int get_thread_count (void)

Gets the active thread count.

Used for debugging purposes to check that threads are exiting and being destroyed when expected.

Returns

The number of active threads (excluding the main thread).

4.1.3.3 void increment_thread_count (void)

Increments the active thread count.

Used for debugging purposes to check that threads are exiting and being destroyed when expected.

4.1.4 Variable Documentation

4.1.4.1 ThreadCount thread_count = {PTHREAD_MUTEX_INITIALIZER, 0} [static]

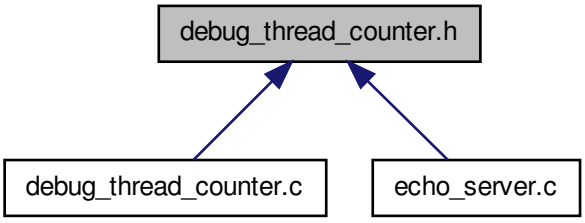
File scope variable holding the active thread count.

This variable is accessed and manipulated solely through the get_thread_count(), increment_thread_count(), and decrement_thread_count() functions.

4.2 debug_thread_counter.h File Reference

Interface to debug thread counter.

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



Macros

- #define DINCREMENT_THREAD_COUNT(arg) increment_thread_count()

  Calls increment_thread_count() only if DEBUG is defined.
- #define DDECREMENT_THREAD_COUNT(arg) decrement_thread_count()

  Calls decrement_thread_count() only if DEBUG is defined.

Functions

- void increment_thread_count (void)

  Increments the active thread count.
- void decrement_thread_count (void)

  Decrements the active thread count.
- int get_thread_count (void)

  Gets the active thread count.

4.2.1 Detailed Description

Interface to debug thread counter. A utility for counting active threads for debugging purposes.

Author

Paul Griffiths

Copyright

4.2.2 Macro Definition Documentation

4.2.2.1 #define DDECREMENT_THREAD_COUNT(*arg*) decrement_thread_count()

Calls decrement_thread_count() only if DEBUG is defined.

4.2.2.2 #define DINCREMENT_THREAD_COUNT(*arg*) increment_thread_count()

Calls increment_thread_count() only if DEBUG is defined.

4.2.3 Function Documentation

4.2.3.1 void decrement_thread_count (void)

Decrements the active thread count.

Used for debugging purposes to check that threads are exiting and being destroyed when expected.

4.2.3.2 int get_thread_count (void)

Gets the active thread count.

Used for debugging purposes to check that threads are exiting and being destroyed when expected.

Returns

The number of active threads (excluding the main thread).

4.2.3.3 void increment_thread_count (void)

Increments the active thread count.

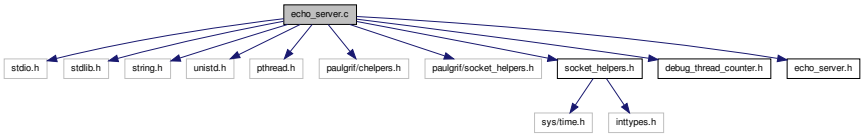
Used for debugging purposes to check that threads are exiting and being destroyed when expected.

4.3 echo_server.c File Reference

Implementation of echo server functions.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <pthread.h>
#include <paulgrif/chelpers.h>
#include <paulgrif/socket_helpers.h>
#include "socket_helpers.h"
#include "debug_thread_counter.h"
#include "echo_server.h"
```

Include dependency graph for echo_server.c:



Macros

- #define MAX_BUFFER_LEN 1024

  Maximum character buffer size.

Functions

- void * echo_server (void *arg)

  Main echo server handler thread function.

Variables

- static const long time_out_secs = 60

  File scope variable for default time out seconds.
- static const long time_out_usecs = 0

  File scope variable for default time out microseconds.
- static const char time_out_msg [] = "Timeout - closing connection.\n"

  File scope variable for timeout message.

4.3.1 Detailed Description

Implementation of echo server functions.

Author

Paul Griffiths

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4.3.2 Macro Definition Documentation

4.3.2.1 #define MAX_BUFFER_LEN 1024

Maximum character buffer size.

4.3.3 Function Documentation

4.3.3.1 void* echo_server (void * *arg*)

Main echo server handler thread function.

Provides echo server service to a provided connected socket. The server loops and echoes any whole lines provided. The server will time-out after a pre-defined period, if no input, or if no more input, is received.

Parameters

arg	Pointer to a ServerTag struct

Returns

NULL

4.3.4 Variable Documentation

4.3.4.1 const char time_out_msg[] = "Timeout - closing connection.\n" [static]

File scope variable for timeout message.

4.3.4.2 const long time_out_secs = 60 [static]

File scope variable for default time out seconds.

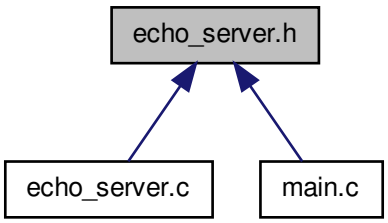
4.3.4.3 const long time_out_usecs = 0 [static]

File scope variable for default time out microseconds.

4.4 echo_server.h File Reference

Interface to echo server functions.

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



Functions

- void * echo_server (void *arg)

Main echo server handler thread function.

4.4.1 Detailed Description

Interface to echo server functions.

Author

Paul Griffiths

Copyright

4.4.2 Function Documentation

4.4.2.1 void* echo_server (void * *arg*)

Main echo server handler thread function.

Provides echo server service to a provided connected socket. The server loops and echoes any whole lines provided. The server will time-out after a pre-defined period, if no input, or if no more input, is received.

Parameters

arg	Pointer to a ServerTag struct

Returns

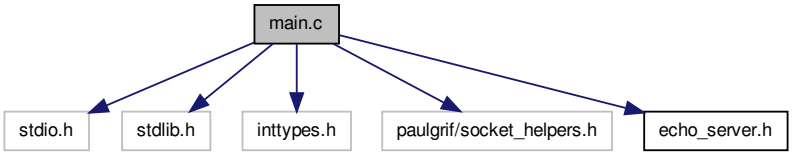
NULL

4.5 main.c File Reference

Main function for echoserver.

```
#include <stdio.h>
#include <stdlib.h>
#include <inttypes.h>
#include <paulgrif/socket_helpers.h>
#include "echo_server.h"
```

Include dependency graph for main.c:



Functions

- uint16_t get_port_from_commandline (const int argc, char **argv)

  Parses the command line for a specified TCP port.
- int main (int argc, char **argv)

  Main function.

4.5.1 Detailed Description

Main function for echoserver.

Author

Paul Griffiths

Copyright

4.5.2 Function Documentation

4.5.2.1 uint16_t get_port_from_commandline (const int *argc*, char ** *argv*)

Parses the command line for a specified TCP port.

Checks for the existence of a single command line argument, and if one and only one is present, attempts to interpret it as a TCP listening port, between 1 and 49151 (ports above 49151 are ephemeral ports).

Parameters

argc	The number of command line arguments, passed from main()
argv	The command line arguments, passed from main()

Returns

The specified TCP port if successful, or 0 on error.

4.5.2.2 int main (int *argc*, char ** *argv*)

Main function.

Main function.

Returns

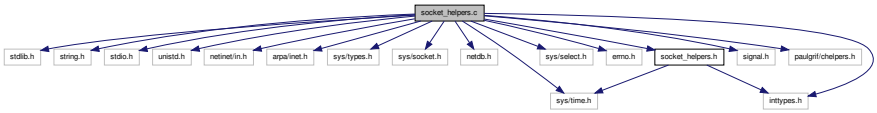
Exit status.

4.6 socket_helpers.c File Reference

Implementation of socket helper functions.

```
#include <stdlib.h>
#include <string.h>
#include <stdio.h>
#include <unistd.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netdb.h>
#include <sys/time.h>
#include <sys/select.h>
#include <errno.h>
#include <inttypes.h>
#include <signal.h>
#include <paulgrif/chelpers.h>
#include "socket_helpers.h"
```

Include dependency graph for socket_helpers.c:



Macros

- #define MAX_BUFFER_SIZE 1024

  Maximum character buffer size.

Functions

- ssize_t socket_readline_r (const int socket, char ∗buffer, const size_t max_len, char ∗∗error_msg)

  Reads a \n terminated line from a socket.
- ssize_t socket_readline_timeout_r (const int socket, char ∗buffer, const size_t max_len, struct timeval ∗time-_out, char ∗∗error_msg)

  Reads a \n terminated line from a socket with timeout.
- ssize_t socket_writeline_r (const int socket, const char ∗buffer, const size_t max_len, char ∗∗error_msg)

  Writes a line to a socket.

4.6.1 Detailed Description

Implementation of socket helper functions.

Author

Paul Griffiths

Copyright

4.6.2 Macro Definition Documentation

4.6.2.1 #define MAX_BUFFER_SIZE 1024

Maximum character buffer size.

4.6.3 Function Documentation

4.6.3.1 ssize_t socket_readline_r (const int *socket,* char * *buffer,* const size_t *max_len,* char ** *error_msg*)

Reads a \n terminated line from a socket.

The function will not overwrite the buffer, so `max_len` should be the size of the whole buffer, and function will at most write `max_len - 1` characters plus the terminating \0. Any terminating CR or LF characters will be stripped.

Parameters

socket	File description of the socket
buffer	The buffer into which to read
max_len	The maximum number of characters to read, including the terminating \0.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

The number of characters read, or -1 on encountering an error.

4.6.3.2 ssize_t socket_readline_timeout_r (const int *socket,* char * *buffer,* const size_t *max_len,* struct timeval * *time_out,* char ** *error_msg*)

Reads a \n terminated line from a socket with timeout.

Behaves the same as socket_readline(), except it will time out if no input is available on the socket after the specified time. Any terminating CR or LF characters will be stripped.

Parameters

socket	File description of the socket
buffer	The buffer into which to read
max_len	The maximum number of characters to read, including the terminating \0.
time_out	A pointer to a `timeval` struct containing the timeout period. Note that some implementations of `select()` may alter this variable, so the calling function should consider it unusable after return. In addition, on such an implementation, the value will specify the cumulative timeout period over the entire read line operation, rather than resetting after reading each character.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

The number of characters read, or -1 on encountering an error.

4.6.3.3 ssize_t socket_writeline_r (const int *socket,* const char * *buffer,* const size_t *max_len,* char ** *error_msg*)

Writes a line to a socket.

The function adds a network-standard terminating CRLF, so the provided string should not normally end in any newline characters.

Parameters

socket	File description of the socket
buffer	The buffer from which to write.
max_len	The maximum number of characters to write to the buffer. Due to the addition of CRLF, `max_len + 2` characters may actually be written.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

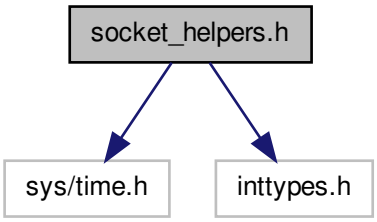
The number of characters written, or -1 on encountering an error.

4.7 socket_helpers.h File Reference

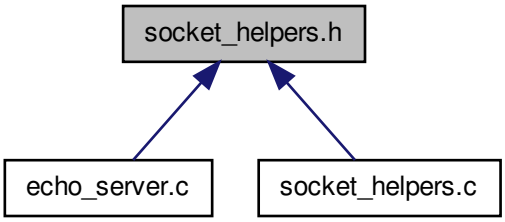
Interface to socket helper functions.

```
#include <sys/time.h>
#include <inttypes.h>
```

Include dependency graph for socket_helpers.h:



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



Functions

- ssize_t socket_readline_r (const int l_socket, char ∗buffer, const size_t max_len, char ∗∗error_msg)

Reads a \n terminated line from a socket.

- ssize_t socket_readline_timeout_r (const int l_socket, char *buffer, const size_t max_len, struct timeval *time_out, char **error_msg)

  Reads a \n terminated line from a socket with timeout.

- ssize_t socket_writeline_r (const int l_socket, const char *buffer, const size_t max_len, char **error_msg)

  Writes a line to a socket.

4.7.1 Detailed Description

Interface to socket helper functions.

Author

Paul Griffiths

Copyright

4.7.2 Function Documentation

4.7.2.1 ssize_t socket_readline_r (const int *socket*, char * *buffer*, const size_t *max_len*, char ** *error_msg*)

Reads a \n terminated line from a socket.

The function will not overwrite the buffer, so `max_len` should be the size of the whole buffer, and function will at most write `max_len - 1` characters plus the terminating \0. Any terminating CR or LF characters will be stripped.

Parameters

socket	File description of the socket
buffer	The buffer into which to read
max_len	The maximum number of characters to read, including the terminating \0.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

The number of characters read, or -1 on encountering an error.

4.7.2.2 ssize_t socket_readline_timeout_r (const int *socket*, char * *buffer*, const size_t *max_len*, struct timeval * *time_out*, char ** *error_msg*)

Reads a \n terminated line from a socket with timeout.

Behaves the same as socket_readline(), except it will time out if no input is available on the socket after the specified time. Any terminating CR or LF characters will be stripped.

Parameters

socket	File description of the socket
buffer	The buffer into which to read
max_len	The maximum number of characters to read, including the terminating \0.

time_out	A pointer to a `timeval` struct containing the timeout period. Note that some implementations of `select()` may alter this variable, so the calling function should consider it unusable after return. In addition, on such an implementation, the value will specify the cumulative timeout period over the entire read line operation, rather than resetting after reading each character.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

The number of characters read, or -1 on encountering an error.

4.7.2.3 ssize_t socket_writeline_r (const int *socket,* const char * *buffer,* const size_t *max_len,* char ** *error_msg*)

Writes a line to a socket.

The function adds a network-standard terminating CRLF, so the provided string should not normally end in any newline characters.

Parameters

socket	File description of the socket
buffer	The buffer from which to write.
max_len	The maximum number of characters to write to the buffer. Due to the addition of CRLF, `max_len + 2` characters may actually be written.
error_msg	A pointer to a char pointer which may point to an error message on failure. Set this to NULL to avoid setting an error message.

Returns

The number of characters written, or -1 on encountering an error.

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