

echoclient

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Chapter 1

File Index

1.1 File List

Here is a list of all files with brief descriptions:

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Chapter 2

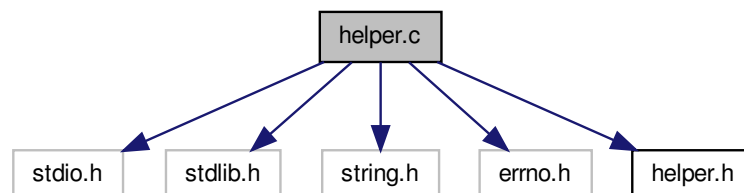
File Documentation

2.1 helper.c File Reference

Implementation of helper functions.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <errno.h>
#include "helper.h"
```

Include dependency graph for helper.c:



Macros

- `#define MAX_BUFFER_SIZE 1024`
Maximum character buffer size.

Functions

- void `mk_errmsg` (const char *buffer, char **error_msg)
Sets an error message.
- void `mk_errno_errmsg` (const char *buffer, char **error_msg)
Sets an error message based on errno.

2.1.1 Detailed Description

Implementation of helper functions.

Author

Paul Griffiths

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2.1.2 Macro Definition Documentation

2.1.2.1 `#define MAX_BUFFER_SIZE 1024`

Maximum character buffer size.

2.1.3 Function Documentation

2.1.3.1 `void mk_errmsg (const char * buffer, char ** error_msg)`

Sets an error message.

This function provides a thread-safe way for a function to set an error message.

Parameters

<i>buffer</i>	A buffer containing the error message.
<i>error_msg</i>	A pointer to a char pointer which will refer to the error message. This should be free()d by the called.

2.1.3.2 `void mk_errno_errmsg (const char * buffer, char ** error_msg)`

Sets an error message based on errno.

This function provides a thread-safe way for a function to set an error message, with the usual caveat that errno itself is not threadsafe.

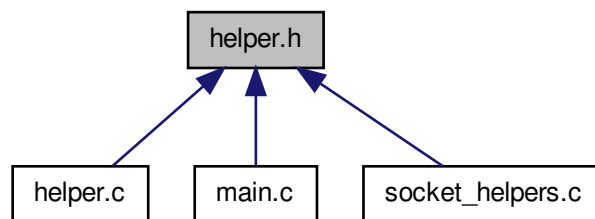
Parameters

<i>buffer</i>	A buffer containing the error message.
<i>error_msg</i>	A pointer to a char pointer which will refer to the error message. This should be free()d by the called.

2.2 helper.h File Reference

Interface to helper functions.

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



Macros

- `#define DPRINTF(arg) printf arg`
Calls `printf()` only when `DEBUG` is defined.
- `#define DFPRINTF(arg) fprintf arg`
Calls `fprintf()` only when `DEBUG` is defined.

Functions

- void `mk_errmsg` (const char *buffer, char **error_msg)
Sets an error message.
- void `mk_errno_errmsg` (const char *buffer, char **error_msg)
Sets an error message based on `errno`.

2.2.1 Detailed Description

Interface to helper functions. Interface to helper functions.

Author

Paul Griffiths

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2.2.2 Macro Definition Documentation

2.2.2.1 `#define DFPRINTF(arg) fprintf arg`

Calls `fprintf()` only when `DEBUG` is defined.

Parameters

<code>arg</code>	The normal parameters to <code>fprintf()</code>
------------------	---

2.2.2.2 #define DPRINTF(*arg*) printf *arg*

Calls printf() only when DEBUG is defined.

Parameters

<i>arg</i>	The normal parameters to printf()
------------	-----------------------------------

2.2.3 Function Documentation

2.2.3.1 void mk_errmsg (const char * *buffer*, char ** *error_msg*)

Sets an error message.

This function provides a thread-safe way for a function to set an error message.

Parameters

<i>buffer</i>	A buffer containing the error message.
<i>error_msg</i>	A pointer to a char pointer which will refer to the error message. This should be free()d by the called.

2.2.3.2 void mk_errno_errmsg (const char * *buffer*, char ** *error_msg*)

Sets an error message based on errno.

This function provides a thread-safe way for a function to set an error message, with the usual caveat that errno itself is not threadsafe.

Parameters

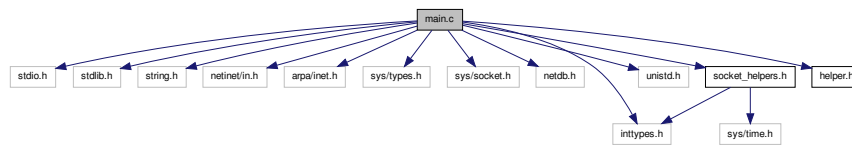
<i>buffer</i>	A buffer containing the error message.
<i>error_msg</i>	A pointer to a char pointer which will refer to the error message. This should be free()d by the called.

2.3 main.c File Reference

Main function for echoclient.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <netinet/in.h>
#include <arpa/inet.h>
#include <sys/types.h>
#include <sys/socket.h>
#include <netdb.h>
#include <inttypes.h>
#include <unistd.h>
#include "socket_helpers.h"
#include "helper.h"
```

Include dependency graph for main.c:



Macros

- `#define MAX_BUFFER_LEN 1024`
Maximum character buffer size.

Functions

- `void run_echo_client (const int conn_socket)`
Runs the echo client.
- `int connect_with_command_line_args (int argc, char **argv)`
Attempts to connect to a service specified in cmdline args.
- `int main (int argc, char **argv)`
Main function.

2.3.1 Detailed Description

Main function for echoclient. Main function for echoclient.

Author

Paul Griffiths

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2.3.2 Macro Definition Documentation

2.3.2.1 `#define MAX_BUFFER_LEN 1024`

Maximum character buffer size.

2.3.3 Function Documentation

2.3.3.1 `int connect_with_command_line_args (int argc, char ** argv)`

Attempts to connect to a service specified in cmdline args.

Expects `argc` to be 3, with `argv[1]` specifying a hostname or IP address, and `argv[2]` specifying a valid port.

Parameters

<code>argc</code>	Number of command line arguments, passed from <code>main()</code>
<code>argv</code>	Command line arguments, passed from <code>main()</code>

Returns

The file descriptor of the connected socket on success, or -1 on failure.

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

Main function.

Connects to an echo server and runs the echo client.

Returns

Exit status.

2.3.3.3 void run_echo_client (const int conn_socket)

Runs the echo client.

Parameters

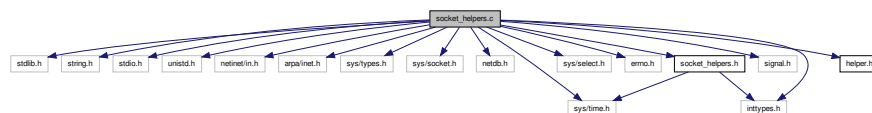
<i>conn_socket</i>	File descriptor of the connected socket to use.
--------------------	---

2.4 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 "socket_helpers.h"
#include "helper.h"
```

Include dependency graph for socket_helpers.c:

**Macros**

- `#define MAX_BUFFER_SIZE 1024`
Maximum character buffer size.

- `#define ERROR_RETURN (-1)`
Generic function return failure code.

Functions

- `ssize_t socket_readline` (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` (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` (const int socket, const char *buffer, const size_t max_len, char **error_msg)
Writes a line to a socket.
- `uint16_t port_from_string` (const char *port_str)
Extracts a valid TCP/UDP port from a string.
- `int conn_socket_from_string` (const char *host, const char *port, char **error_msg)
Creates a connected sock from a hostname and port.
- `void ignore_sigpipe` (void)
Ignores the SIGPIPE signal.

2.4.1 Detailed Description

Implementation of socket helper functions.

Author

Paul Griffiths

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2.4.2 Macro Definition Documentation

2.4.2.1 `#define ERROR_RETURN (-1)`

Generic function return failure code.

Provided for visibility when returning with error.

2.4.2.2 `#define MAX_BUFFER_SIZE 1024`

Maximum character buffer size.

2.4.3 Function Documentation

2.4.3.1 `int conn_socket_from_string (const char * host, const char * port, char ** error_msg)`

Creates a connected sock from a hostname and port.

Parameters

<i>host</i>	A string containing the hostname to which to connect.
<i>port</i>	A string containing the port to which to connect.
<i>error_msg</i>	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 file descriptor of the connected socket on success, or -1 on failure.

2.4.3.2 void ignore_sigpipe (void)

Ignores the SIGPIPE signal.

The write() system call will, when writing to a closed socket, elicit an RST (reset) flag. A second write() system call will trigger a SIGPIPE signal to be raised. The default action of SIGPIPE is to terminate the program, with no error message, which is not desirable. If we want to do anything special when SIGPIPE is triggered, we could set up a handler, but if we don't, then ignoring SIGPIPE is fine, provided our socket functions respond appropriately to the condition (write() will return EPIPE after an ignored SIGPIPE signal).

2.4.3.3 uint16_t port_from_string (const char * port_str)

Extracts a valid TCP/UDP port from a string.

Parameters

<i>port_str</i>	The string from which to extract
-----------------	----------------------------------

Returns

The port number on success, or zero if *port_str* does not contain a valid TCP/UDP port (port 0 is reserved and cannot be used).

2.4.3.4 ssize_t socket_readline (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.

Parameters

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

2.4.3.5 ssize_t socket_readline_timeout (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.

Parameters

<i>socket</i>	File description of the socket
<i>buffer</i>	The buffer into which to read
<i>max_len</i>	The maximum number of characters to read, including the terminating \0.
<i>time_out</i>	A pointer to a <code>timeval</code> struct containing the timeout period. Note that some implementations of <code>select()</code> 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.
<i>error_msg</i>	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.

2.4.3.6 `ssize_t socket_writeline (const int socket, const char * buffer, const size_t max_len, char ** error_msg)`

Writes a line to a socket.

Parameters

<i>socket</i>	File description of the socket
<i>buffer</i>	The buffer from which to write.
<i>max_len</i>	The maximum number of characters to read from the buffer.
<i>error_msg</i>	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.

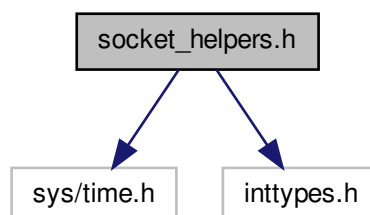
2.5 socket_helpers.h File Reference

Interface to socket helper functions.

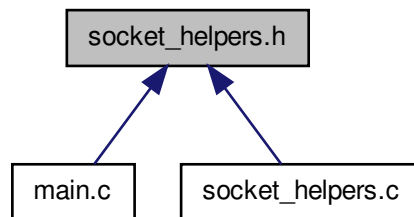
```
#include <sys/time.h>
```

```
#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](#) (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](#) (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](#) (const int l_socket, const char *buffer, const size_t max_len, char **error_msg)
Writes a line to a socket.
- uint16_t [port_from_string](#) (const char *port_str)
Extracts a valid TCP/UDP port from a string.
- int [conn_socket_from_string](#) (const char *host, const char *port, char **error_msg)
Creates a connected sock from a hostname and port.
- void [ignore_sigpipe](#) (void)
Ignores the SIGPIPE signal.

2.5.1 Detailed Description

Interface to socket helper functions.

Author

Paul Griffiths

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2.5.2 Function Documentation

2.5.2.1 int conn_socket_from_string (const char * host, const char * port, char ** error_msg)

Creates a connected sock from a hostname and port.

Parameters

<i>host</i>	A string containing the hostname to which to connect.
<i>port</i>	A string containing the port to which to connect.
<i>error_msg</i>	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 file descriptor of the connected socket on success, or -1 on failure.

2.5.2.2 void ignore_sigpipe (void)

Ignores the SIGPIPE signal.

The write() system call will, when writing to a closed socket, elicit an RST (reset) flag. A second write() system call will trigger a SIGPIPE signal to be raised. The default action of SIGPIPE is to terminate the program, with no error message, which is not desirable. If we want to do anything special when SIGPIPE is triggered, we could set up a handler, but if we don't, then ignoring SIGPIPE is fine, provided our socket functions respond appropriately to the condition (write() will return EPIPE after an ignored SIGPIPE signal).

2.5.2.3 uint16_t port_from_string (const char * port_str)

Extracts a valid TCP/UDP port from a string.

Parameters

<i>port_str</i>	The string from which to extract
-----------------	----------------------------------

Returns

The port number on success, or zero if *port_str* does not contain a valid TCP/UDP port (port 0 is reserved and cannot be used).

2.5.2.4 ssize_t socket_readline (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.

Parameters

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

2.5.2.5 `ssize_t socket_readline_timeout (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.

Parameters

<i>socket</i>	File description of the socket
<i>buffer</i>	The buffer into which to read
<i>max_len</i>	The maximum number of characters to read, including the terminating \0.
<i>time_out</i>	A pointer to a <code>timeval</code> struct containing the timeout period. Note that some implementations of <code>select()</code> 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.
<i>error_msg</i>	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.

2.5.2.6 `ssize_t socket_writeline (const int socket, const char * buffer, const size_t max_len, char ** error_msg)`

Writes a line to a socket.

Parameters

<i>socket</i>	File description of the socket
<i>buffer</i>	The buffer from which to write.
<i>max_len</i>	The maximum number of characters to read from the buffer.
<i>error_msg</i>	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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