

SSH

version 0.9

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SSH Reference Manual

Short Summaries

- Erlang Module **ssh** [page 5] – Main API of the SSH application
- Erlang Module **ssh_cli** [page 6] – SSH Command Line Interface.
- Erlang Module **ssh_cm** [page 8] – SSH connection layer.
- Erlang Module **ssh_sftp** [page 10] – SFTP client.
- Erlang Module **ssh_sftpd** [page 16] – SSH FTP server.
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- Erlang Module **ssh_sshd** [page 18] – SSH server with erlang shell.
- Erlang Module **ssh_transport** [page 19] – SSH transport layer.

ssh

The following functions are exported:

- `start() -> ok | {error, Reason}`
[page 5] Starts the SSH application
- `stop() -> ok | {error, Reason}`
[page 5] Stops the SSH application
- `stop`
[page 5] Stops the SSH application

ssh_cli

The following functions are exported:

- `listen(Shell)`
[page 6] Start an SSH server with a CLI
- `listen(Shell, Port)`
[page 6] Start an SSH server with a CLI
- `listen(Shell, Port, Options)`
[page 6] Start an SSH server with a CLI
- `listen(Shell, Addr, Port, Options)`
[page 6] Start an SSH server with a CLI
- `stop(Pid) -> ok | {error, Reason}`
[page 6] Stop the listener

ssh_cm

The following functions are exported:

- `connect(Host) -> {ok, Pid} | {error, Error}`
[page 8] Connect to an ssh daemon
- `connect(Host, Options) -> {ok, Pid} | {error, Error}`
[page 8] Connect to an ssh daemon
- `connect(Host, Port, Options) -> {ok, Pid} | {error, Error}`
[page 8] Connect to an ssh daemon
- `listen(UserFun, Options) -> ok`
[page 9] Start an ssh shell
- `listen(UserFun, Port, Options) -> ok`
[page 9] Start an ssh shell
- `listen(UserFun, Addr, Port, Options) -> ok`
[page 9] Start an ssh shell
- `stop_listener(Pid) -> ok | {error, Reason}`
[page 9] Stop the listener

ssh_sftp

The following functions are exported:

- `connect(CM) -> {ok, Pid} | {error, Reason}`
[page 10] Connect to an SFTP server
- `connect(Host, Options) -> {ok, Pid} | {error, Reason}`
[page 10] Connect to an SFTP server
- `connect(Host, Port, Options) -> {ok, Pid} | {error, Reason}`
[page 10] Connect to an SFTP server
- `read_file(Server, File) -> {ok, Data} | {error, Reason}`
[page 10] Read a file
- `write_file(Server, File, Iolist) -> ok | {error, Reason}`
[page 10] Write a file
- `list_dir(Server, Path) -> {ok, Filenames} | {error, Reason}`
[page 11] List directory
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[page 11] Open a file and return a handle
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- `read(Server, Handle, Len) -> {ok, Data} | eof | {error, Error}`
[page 11] Read from an open file
- `pread(Server, Handle, Position, Length) -> {ok, Data} | eof | {error, Error}`
[page 11] Read from an open file
- `aread(Server, Handle, Len) -> {async, N} | {error, Error}`
[page 12] Read asynchronously from an open file

- `pread(Server, Handle, Position, Length) -> {async, N} | {error, Error}`
[page 12] Read asynchronously from an open file
- `write(Server, Handle, Data) -> ok | {error, Error}`
[page 12] Write to an open file
- `pwrite(Server, Handle, Position, Data) -> ok | {error, Error}`
[page 12] Write to an open file
- `awrite(Server, Handle, Data) -> ok | {error, Error}`
[page 12] Write asynchronously to an open file
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[page 13] Get information about a file
- `read_link_info(Server, Name) -> {ok, FileInfo} | {error, Reason}`
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- `rename(Server, OldName, NewName) -> ok | {error, Reason}`
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[page 14] Delete a file
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[page 15] Create a directory
- `del_dir(Server, Name) -> ok | {error, Reason}`
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- `stop(Server) -> ok`
[page 15] Stop sftp session

ssh_sftpd

The following functions are exported:

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[page 16] Starts sftp server
- `listen(Port, Options) -> {ok, Pid} | {error, Error}`
[page 16] Starts sftp server
- `listen(Addr, Port, Options) -> {ok, Pid} | {error, Error}`
[page 16] Starts sftp server

ssh_ssh

The following functions are exported:

- `connect(Host) -> ok`
[page 17] Start an ssh shell
- `connect(Host, Options) -> ok`
[page 17] Start an ssh shell
- `connect(Host, Port, Options) -> ok`
[page 17] Start an ssh shell

ssh_sshd

The following functions are exported:

- `listen(Port) -> {ok, Pid}|{error, Error}`
[page 18] Connect to an ssh daemon
- `listen(Port, Options) -> {ok, Pid}|{error, Error}`
[page 18] Connect to an ssh daemon
- `listen(Addr, Port, Options) -> {ok, Pid}|{error, Error}`
[page 18] Connect to an ssh daemon
- `stop(Pid) -> ok | {error, Reason}`
[page 18] Stop the listener

ssh_transport

No functions are exported.

SSH

Erlang Module

Interface module for the SSH application

Exports

`start() -> ok | {error, Reason}`

Types:

- Reason = term()

Starts the SSH application. Require that the *crypto* application has been started.

`stop() -> ok | {error, Reason}`

`stop`

Types:

- Reason = term()

Stops the SSH application

ssh_cli

Erlang Module

This module implements a CLI (Command Line Interface), for an SSH server. It's used by `ssh_sshd` to provide an interactive erlang shell as an ssh server.

Since `ssh_cli` uses the `group` module, the CLI provides full editing just like in the erlang shell, with history (ctrl-p and ctrl-n), line editing and configurable tab expansion (completion).

A full example of how to use `ssh_cli` is provided in `ssh/examples/ssh_sample_cli.erl`.

Exports

```
listen(Shell)
listen(Shell, Port)
listen(Shell, Port, Options)
listen(Shell, Addr, Port, Options)
```

Types:

- Shell = pid() | fun()
- Port = integer()
- Addr = string()
- Options = [{Option, Value}]
- Option = atom()
- Value = term()

Starts a daemon listening on Port. The Shell fun is a function spawning a shell process, containing a read-eval-print-loop using ordinary erlang io (e.g. `get_line/1` and `fprint`).

The daemon's group leader will be connected to the SSH daemon, so that the io will be sent to the remote SSH shell client.

An example of how `ssh_cli` can be used can be found in `ssh/examples/ssh_cli_sample.erl`.

The module `ssh_sshd` is implemented using `ssh_cli`.

For options, see `ssh_cm:listen`.

```
stop(Pid) -> ok | {error, Reason}
```

Types:

- Pid = pid()
- Reason = atom()

Stops the listener given by `Pid`, existing connections will stay open.

ssh_cm

Erlang Module

This module implements the SSH connection layer.

Exports

```
connect(Host) -> {ok, Pid} | {error, Error}
connect(Host, Options) -> {ok, Pid} | {error, Error}
connect(Host, Port, Options) -> {ok, Pid} | {error, Error}
```

Types:

- Host = string()
- Port = integer()
- Options = [{Option, Value}]

Connects to an SSH server. A `gen_server` is started and returned if connection is successful, but no channel is started, that is done with `session_open/2`. The `Host` is a string with the address of a host running an SSH server. The `Port` is an integer, the port to connect to. The default is 22, the registered port for SSH.

Options are:

- `{user_dir, String}` Sets the user directory, normally `~/.ssh` (containing the files `known_hosts`, `id_rsa<c>`, `<c>id_dsa`, `authorized_keys`).
- `{silently_accept_hosts, Boolean}` When true, (default is false), hosts are added to the file `known_hosts` without asking the user.
- `{user_interaction, Boolean}` If true, which is the default, password questions and adding hosts to `known_hosts` will be asked interactively to the user. (This is done during connection to an SSH server.) If false, both these interactions will throw and the server will not start.
- `{public_key_alg, ssh_rsa | ssh_dsa}` Sets the preferred public key algorithm to use for user authentication. If the the preferred algorithm fails of some reason, the other algorithm is tried. The default is to try `ssh_rsa` first.
- `{connect_timeout, Milliseconds | infinity}` Sets the default timeout when trying to connect to an SSH server. This timeout will also affect calls later when using the SSH connection.
- `{user, String}` Provide a username. If this option is not given, ssh reads from the environment (`LOGNAME` or `USER` on unix, `USERNAME` on Windows).
- `{password, String}` Provide a password for password authentication. If this option is not given, the user will be asked for a password.
- `{user_auth, Fun/3}` Provide a fun for password authentication. The fun will be called as `fun(User, Password, Opts)` and should return true or false.

`{key_cb, KeyCallbackModule}` Provide a special call-back module for key handling. The call-back module should be modeled after the `ssh_file` module. The function that must be exported are: `private_host_rsa_key/2`, `private_host_dsa_key/2`, `lookup_host_key/3` and `add_host_key/3`.

As usual, boolean options that should be true can be given as an atom instead of a tuple, e.g. `silently_accept_hosts` instead of `{silently_accept_hosts, true}`.

```
listen(UserFun, Options) -> ok
listen(UserFun, Port, Options) -> ok
listen(UserFun, Addr, Port, Options) -> ok
```

Types:

- `UserFun = fun() -> Pid`
- `Port = integer()`
- `Addr = string() | any`
- `Options = [{Option, Value}]`
- `Option = atom()`
- `Value = term()`

Starts a server listening for SSH connections on the given port.

`UserFun` is a function that should spawn and return a server upon incoming connections on the given port (and address).

`Port` is the port that the server should listen on. Everytime a connection is made on that port, the `UserFun` is called, and the returned process is used as a user process for the server.

Options are:

`{system_dir, String}` Sets the system directory, containing the host files that identifies the host for ssh. The default is `/etc/ssh`, but note that SSH normally requires the host files there to be readable only by root.

`{user_passwords, [{User, Password}]}` Provide passwords for password authentication. They will be used when someone tries to connect to the server and public key user authentication fails. The option provides a list of valid user names and the corresponding password. `User` and `Password` are strings.

`{password, String}` Provide a global password that will authenticate any user (use with caution!).

If neither of these options is given, the server will be unable to authenticate with password.

```
stop_listener(Pid) -> ok | {error, Reason}
```

Types:

- `Pid = pid()`
- `Reason = atom()`

Stops the listener, given by `Pid`, existing connections will stay open.

ssh_sftp

Erlang Module

This module implements an SFTP (SSH FTP) client. SFTP is a secure, encrypted file transfer service available for SSH.

The errors returned are from the SFTP server, and are often not posix error codes.

Exports

```
connect(CM) -> {ok, Pid} | {error, Reason}
connect(Host, Options) -> {ok, Pid} | {error, Reason}
connect(Host, Port, Options) -> {ok, Pid} | {error, Reason}
```

Types:

- Host = string()
- CM = pid()
- Port = integer()
- Options = [{Option, Value}]
- Option = atom()
- Value = term()
- Reason = term()

Connects to an SFTP server. A `gen_server` is started and returned if connection is successful. This server is used to perform SFTP commands on the server.

For options, see `ssh_cm:connect`.

```
read_file(Server, File) -> {ok, Data} | {error, Reason}
```

Types:

- Server = pid()
- File = string()
- Data = binary()
- Reason = term()

Reads a file from the server, and returns the data in a binary, like `file:read_file/1`.

```
write_file(Server, File, Iolist) -> ok | {error, Reason}
```

Types:

- Server = pid()
- File = string()
- Data = binary()

- Reason = term()

Writes a file to the server, like `file:write_file/2`. The file is created if it's not there.

```
list_dir(Server, Path) -> {ok, Filenames} | {error, Reason}
```

Types:

- Server = pid()
- Path = string()
- Filenames = [Filename]
- Filename = string()
- Reason = term()

Lists the given directory on the server, returning the filenames as a list of strings.

```
open(Server, File, Mode) -> {ok, Handle} | {error, Reason}
```

Types:

- Server = pid()
- File = string()
- Mode = [Modeflag]
- Modeflag = read | write | creat | trunc | append | binary
- Handle = term()
- Reason = term()

Opens a file on the server, and returns a handle that is used for reading or writing.

```
opendir(Server, Path) -> {ok, Handle} | {error, Reason}
```

Types:

- Server = pid()
- Path = string()
- Reason = term()

Opens a handle to a directory on the server, the handle is used for reading directory contents.

```
close(Server, Handle) -> ok | {error, Reason}
```

Types:

- Server = pid()
- Handle = term()
- Reason = term()

Closes a handle to an open file or directory on the server.

```
read(Server, Handle, Len) -> {ok, Data} | eof | {error, Error}
```

```
pread(Server, Handle, Position, Length) -> {ok, Data} | eof | {error, Error}
```

Types:

- Server = pid()
- Handle = term()
- Position = integer()

- `Len = integer()`
- `Data = string() | binary()`
- `Reason = term()`

Reads `Len` bytes from the file referenced by `Handle`. Returns `{ok, Data}`, or `eof`, or `{error, Reason}`. If the file is opened with `binary`, `Data` is a binary, otherwise it is a string.

If the file is read past `eof`, only the remaining bytes will be read and returned. If no bytes are read, `eof` is returned.

The `pread` function reads from a specified position, combining the `position` and `read` functions.

```
aread(Server, Handle, Len) -> {async, N} | {error, Error}
```

```
apread(Server, Handle, Position, Length) -> {async, N} | {error, Error}
```

Types:

- `Server = pid()`
- `Handle = term()`
- `Position = integer()`
- `Len = integer()`
- `N = term()`
- `Reason = term()`

Reads from an open file, without waiting for the result. If the handle is valid, the function returns `{async, N}`, where `N` is a term guaranteed to be unique between calls of `aread`. The actual data is sent as a message to the calling process. This message has the form `{async_reply, N, Result}`, where `Result` is the result from the read, either `{ok, Data}`, or `eof`, or `{error, Error}`.

The `apread` function reads from a specified position, combining the `position` and `aread` functions.

```
write(Server, Handle, Data) -> ok | {error, Error}
```

```
pwrite(Server, Handle, Position, Data) -> ok | {error, Error}
```

Types:

- `Server = pid()`
- `Handle = term()`
- `Position = integer()`
- `Data = iolist()`
- `Reason = term()`

Write data to the file referenced by `Handle`. The file should be opened with `write` or `append` flag. Returns `ok` if successful and `{error, Reason}` otherwise.

Typical error reasons are:

`ebadf` The file is not opened for writing.

`enospc` There is a no space left on the device.

```
awrite(Server, Handle, Data) -> ok | {error, Error}
```

```
apwrite(Server, Handle, Position, Data) -> ok | {error, Error}
```


Types:

- Server = pid()
- Handle = term()
- Position = integer()
- Len = integer()
- Data = binary()
- Reason = term()

Writes to an open file, without waiting for the result. If the handle is valid, the function returns `{async, N}`, where `N` is a term guaranteed to be unique between calls of `awrite`. The result of the write operation is sent as a message to the calling process. This message has the form `{async_reply, N, Result}`, where `Result` is the result from the write, either `ok`, or `{error, Error}`.

The `apwrite` writes on a specified position, combining the position and `awrite` operations.

```
position(Server, Handle, Location) -> {ok, NewPosition | {error, Error}}
```

Types:

- Server = pid()
- Handle = term()
- Location = Offset | {bof, Offset} | {cur, Offset} | {eof, Offset} | bof | cur | eof
- Offset = int()
- NewPosition = integer()
- Reason = term()

Sets the file position of the file referenced by `Handle`. Returns `{ok, NewPosition}` (as an absolute offset) if successful, otherwise `{error, Reason}`. `Location` is one of the following:

Offset The same as `{bof, Offset}`.

`{bof, Offset}` Absolute offset.

`{cur, Offset}` Offset from the current position.

`{eof, Offset}` Offset from the end of file.

`bof | cur | eof` The same as above with `Offset 0`.

```
read_file_info(Server, Name) -> {ok, FileInfo} | {error, Reason}
```

```
get_file_info(Server, Handle) -> {ok, FileInfo} | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Handle = term()
- FileInfo = record()
- Reason = term()

Returns a `file_info` record from the file specified by `Name` or `Handle`, like `file:read_file_info/2`.

```
read_link_info(Server, Name) -> {ok, FileInfo} | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Handle = term()
- FileInfo = record()
- Reason = term()

Returns a `file_info` record from the symbolic link specified by Name or Handle, like `file:read_link_info/2`.

```
write_file_info(Server, Name, Info) -> ok | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Info = record()
- Reason = term()

Writes file information from a `file_info` record to the file specified by Name, like `file:write_file_info`.

```
read_link(Server, Name) -> {ok, Target} | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Target = string()
- Reason = term()

Read the link target from the symbolic link specified by name, like `file:read_link/1`.

```
make_symlink(Server, Name, Target) -> ok | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Target = string()
- Reason = term()

Creates a symbolic link pointing to Target with the name Name, like `file:make_symlink/2`.

```
rename(Server, OldName, NewName) -> ok | {error, Reason}
```

Types:

- Server = pid()
- OldName = string()
- NewName = string()
- Reason = term()

Renames a file named OldName, and gives it the name NewName, like `file:rename/2`

```
delete(Server, Name) -> ok | {error, Reason}
```

Types:

- Server = pid()
- Name = string()
- Reason = term()

Deletes the file specified by Name, like `file:delete/1`

`make_dir(Server, Name) -> ok | {error, Reason}`

Types:

- Server = pid()
- Name = string()
- Reason = term()

Creates a directory specified by Name. Name should be a full path to a new directory. The directory can only be created in an existing directory.

`del_dir(Server, Name) -> ok | {error, Reason}`

Types:

- Server = pid()
- Name = string()
- Reason = term()

Deletes a directory specified by Name. The directory should be empty, and

`stop(Server) -> ok`

Types:

- Server = pid()

Stops the `sftp` session, closing the connection. Any open files on the server will be closed.

ssh_sftpd

Erlang Module

This module implements an SFTP server.

Exports

```
listen(Port) -> {ok, Pid}|{error, Error}
listen(Port, Options) -> {ok, Pid}|{error, Error}
listen(Addr, Port, Options) -> {ok, Pid}|{error, Error}
```

Types:

- Port = integer()
- Addr = string()
- Options = [{Option, Value}]

Starts an SFTP server on the given port. The server listens for connection of an SFTP client.

Options are:

`{cwd, String}` Sets the initial current working directory for the server.

`{file_handler, CallbackModule}` Determines which module to call for communicating with the file server. Default value is `ssh_sftpd_file` that uses the file and filelib API:s to access the standard OTP file server. This option may be used to plug in the use of other file servers.

`{root, String}` Sets the root for the file system. The given root will be prepended to all paths, after they are converted to absolute paths. (Preventing an SFTP-client to see anything above the given root.)

For more options, see `ssh_cm:listen`.

ssh_ssh

Erlang Module

This module implements a simple SSH client in erlang, providing an interactive shell to another computer.

Exports

```
connect(Host) -> ok  
connect(Host, Options) -> ok  
connect(Host, Port, Options) -> ok
```

Types:

- Host = string()
- Port = integer()
- Options = [Option]

`connect` starts an interactive shell to an SSH server on the given `Host`. The function waits for user input, and will not return until the remote shell is ended. (e.g. on `exit` from the shell).

For options, see `ssh_cm:connect`

ssh_sshd

Erlang Module

This module implements an erlang shell as an SSH server.

Exports

```
listen(Port) -> {ok, Pid}|{error, Error}
listen(Port, Options) -> {ok, Pid}|{error, Error}
listen(Addr, Port, Options) -> {ok, Pid}|{error, Error}
```

Types:

- Addr = string()
- Port = integer()
- Options = [{Option, Value}]

Create a listener on the given port. (It calls `ssh_cli:listen` with `shell:start/0` as argument.) An SSH client can be used to connect to the listener and execute erlang commands.

Unix example:

```
1> ssh_sshd:listen(9999, [{system_dir, "."}])
<0.59.0>
```

On a unix shell:

```
bash@balin$ ssh -p 9999 balin
Eshell V5.4.9.1 (abort with ^G)
1> exit().
Connection to balin closed.
bash@balin$
```

This assumes that the current dir contains a private host key.

For options, see `ssh_cli:listen/3` and `ssh_cm:listen/4`.

```
stop(Pid) -> ok | {error, Reason}
```

Types:

- Pid = pid()
- Reason = atom()

Stops the listener given by Pid.

ssh_transport

Erlang Module

This module implements the SSH connection layer, as described in `draft-ietf-secsh-transport-24`.

This module should not normally be called by a client application.

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