Telnetlib3 Documentation

Release 1.0.0

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Python 3 asyncio Telnet server and client Protocol library.

Contents:
telnetlib3 is a Telnet Client and Server library for python. This project requires python 3.3 and later, using the asyncio module.

**Quick Example**

Authoring a Telnet Server using Streams interface that offers a basic war game:

```python
import asyncio, telnetlib3

@asyncio.coroutine
def shell(reader, writer):
    writer.write('Would you like to play a game? ')
    inp = yield from reader.read(1)
    if inp:
        writer.echo(inp)
        writer.write('
They say the only way to win ')
        writer.write('is to not play at all.'

    yield from writer.drain()
    writer.close()

loop = asyncio.get_event_loop()
coro = telnetlib3.create_server(port=6023, shell=shell)
server = loop.run_until_complete(coro)
loop.run_until_complete(server.wait_closed())
```

Authoring a Telnet Client that plays the war game with this server:

```python
import asyncio, telnetlib3

@asyncio.coroutine
def shell(reader, writer):
    buf = ''
    while True:
```

```python
outp = yield from reader.read(1024)
if not outp:
    # EOF
    return

print(outp, end='', flush=True)

if '?' in outp:
    # reply all questions with 'y'.
    writer.write('y')

print()

loop = asyncio.get_event_loop()
coro = telnetlib3.open_connection('localhost', 6023, shell=shell)
reader, _ = loop.run_until_complete(coro)
loop.run_until_complete(reader.protocol.waiter_closed)
```

## Command-line

Two command-line scripts are distributed with this package.

### telnetlib3-client

Small terminal telnet client. Some example destinations and options:

```
telnetlib3-client rainmaker.wunderground.com
telnetlib3-client --encoding=cp437 --force-binary blackflag.acid.org
telnetlib3-client htc.zapto.org
```

### telnetlib3-server

Telnet server providing the default debugging shell. This provides a simple shell server that allows introspection of the session’s values.

Both command-line scripts accept argument `--shell=my_module.fn_shell` describing a python module path to a coroutine of signature `shell(reader, writer)`.

## Features

The following RFC specifications are implemented:


Further Reading

Further documentation available at https://telnetlib3.readthedocs.org/
accessories

Accessory functions.

**encoding_from_lang**(lang)
Parse encoding from LANG environment value.

Example:

```python
>>> encoding_from_lang('en_US.UTF-8@misc')
'UTF-8'
```

**name_unicode**(ucs)
Return 7-bit ascii printable of any string.

**eightbits**(number)
Binary representation of number padded to 8 bits.

Example:

```python
>>> eightbits(ord('a'))
'0b01100001'
```

**make_logger**(name, loglevel='info', logfile=None, logfmt='%(asctime)s %(levelname)s %(filename)s:%(lineno)d %(message)s')
Create and return simple logger for given arguments.

**repr_mapping**(mapping)
Return printable string, ‘key=value [key=value ...]’ for mapping.

**function_lookup**(pymod_path)
Return callable function target from standard module.function path.

**make_reader_task**(reader, size=4096)
Return asyncio task wrapping coroutine of reader.read(size).
Telnetlib3 Documentation, Release 1.0.0

client

Telnet Client API for the ’telnetlib3’ python package.

class TelnetClient (term='unknown', cols=80, rows=25, tspeed=(38400, 38400), xdisploc='', *args, **kwargs)
Bases: telnetlib3.client_base.BaseClient
Telnet client that supports all common options.

This class is useful for automation, it appears to be a virtual terminal to the remote end, but does not require an interactive terminal to run.

DEFAULT_LOCALE = ‘en_US’

begin_negotiation()
Begin on-connect negotiation.

A Telnet client is expected to send only a minimal amount of client session options immediately after connection, it is generally the server which dictates server option support.

Deriving implementations should always call super().begin_negotiation().

begin_shell(result)

check_negotiation(final=False)
Callback, return whether negotiation is complete.

Parameters final (bool) – Whether this is the final time this callback will be requested to answer regarding protocol negotiation.

Returns Whether negotiation is over (client end is satisfied).

Return type bool

Method is called on each new command byte processed until negotiation is considered final, or after connect_maxwait has elapsed, setting _waiter_connected to value self when complete.

This method returns False until connect_minwait has elapsed, ensuring the server may batch telnet negotiation demands without prematurely entering the callback shell.

Ensure super().check_negotiation() is called and conditionally combined when derived.

connection_lost(exc)
Called when the connection is lost or closed.

Parameters exc (Exception) – exception. None indicates a closing EOF sent by this end.

connection_made(transport)
Callback for connection made to server.

data_received(data)
Process bytes received by transport.

duration
Time elapsed since client connected, in seconds as float.

encoding(outgoing=None, incoming=None)
Return encoding for the given stream direction.

Parameters

• outgoing (bool) – Whether the return value is suitable for encoding bytes for transmission to server.
• **incoming** *(bool)* – Whether the return value is suitable for decoding bytes received by the client.

**Raises** **TypeError** – when a direction argument, either **outgoing** or **incoming**, was not set **True**.

**Returns** 'US-ASCII' for the directions indicated, unless **BINARY** **RFC 856** has been negotiated for the direction indicated or :attr:`force_binary` is set **True**.

**Return type** str

Value resolution order (first-matching):

• value set by **set_encoding()**.

• value of **get_extra_info()** using key argument, **lang**.

• value of **default_encoding**.

• US-ASCII when binary transmission not allowed.

**eof_received()**

Called when the other end calls write_eof() or equivalent.

**get_extra_info**(name, default=None)

Get optional client protocol or transport information.

**idle**

Time elapsed since data last received, in seconds as float.

**pause_writing()**

**resume_writing()**

**send_charset**(offered)

Callback for responding to CHARSET requests.

Receives a list of character encodings offered by the server as **offered** such as ('LATIN-1', 'UTF-8'), for which the client may return a value agreed to use, or None to disagree to any available offers. Server offerings may be encodings or codepages.

The default implementation selects any matching encoding that python is capable of using, preferring any that matches **self.encoding** if matched in the offered list.

**Parameters** **offered**(list) – list of CHARSET options offered by server.

**Returns** character encoding agreed to be used.

**Return type** str or None.

**send_env**(keys)

Callback for responding to NEW_ENVIRON requests.

**Parameters** **keys**(dict) – Values are requested for the keys specified. When empty, all environment values that wish to be volunteered should be returned.

**Returns** dictionary of environment values requested, or an empty string for keys not available. A return value must be given for each key requested.

**Return type** dict[(key, value), .]

**send_naws()**

Callback for responding to NAWS requests.

**Return type** (int, int)

**Returns** client window size as (rows, columns).
send_tspeed()
Callback for responding to TSPEED requests.

send_ttype()
Callback for responding to TTYPE requests.

send_xdisploc()
Callback for responding to XDISPLOC requests.

open_connection(host=None, port=23, *, client_factory=None, loop=None, family=0, flags=0, local_addr=None, log=None, encoding='utf8', encoding_errors='replace', force_binary=False, term='unknown', cols=80, rows=25, tspeed=(38400, 38400), xdisploc='', shell=None, connect_minwait=2.0, connect_maxwait=3.0, waiter_closed=None, _waiter_connected=None, limit=None)
Connect to a TCP Telnet server as a Telnet client.

Parameters

- host (str) – Remote Internet TCP Server host.
- port (int) – Remote Internet host TCP port.
- client_factory (client_base.BaseClient) – Client connection class factory. When None, TelnetTerminalClient is used when stdin is attached to a terminal, TelnetClient otherwise.
- loop (asyncio.base_events.BaseEventLoop) – set the event loop to use. The return value of asyncio.get_event_loop() is used when unset.
- family (int) – Same meaning as asyncio.BaseEventLoop.create_connection().
- flags (int) – Same meaning as asyncio.BaseEventLoop.create_connection().
- local_addr (tuple) – Same meaning as asyncio.BaseEventLoop.create_connection().
- log (logging.Logger) – target logger, if None is given, one is created using the namespace 'telnetlib3.server'.
- encoding (str) – The default assumed encoding, or False to disable unicode support. This value is used for decoding bytes received by and encoding bytes transmitted to the Server. These values are preferred in response to NEW_ENVIRON RFC 1572 as environment value LANG, and by CHARSET RFC 2066 negotiation.

The server's attached reader, writer streams accept and return unicode, unless this value explicitly set False. In that case, the attached streams interfaces are bytes-only.
- term (str) – Terminal type sent for requests of TTYPE, RFC 930 or as Environment value TERM by NEW_ENVIRON negotiation, RFC 1672.
- cols (int) – Client window dimension sent as Environment value COLUMNS by NEW_ENVIRON negotiation, RFC 1672 or NAWS RFC 1073.
- rows (int) – Client window dimension sent as Environment value LINES by NEW_ENVIRON negotiation, RFC 1672 or NAWS RFC 1073.
- tspeed (tuple) – Tuple of client BPS line speed in form (rx, tx) for receive and transmit, respectively. Sent when requested by TSPEED, RFC 1079.
- xdisploc (str) – String transmitted in response for request of XDISPLOC, RFC 1086 by server (X11).
- **shell (asyncio.coroutine)** – A coroutine that is called after negotiation completes, receiving arguments `(reader, writer)`. The reader is a `TelnetStreamReader` instance, the writer is a `TelnetStreamWriter` instance.

- **connect_minwait (float)** – The client allows any additional telnet negotiations to be demanded by the server within this period of time before launching the shell. Servers should assert desired negotiation on-connect and in response to 1 or 2 round trips. A server that does not make any telnet demands, such as a TCP server that is not a telnet server will delay the execution of `shell` for exactly this amount of time.

- **connect_maxwait (float)** – If the remote end is not complaint, or otherwise confused by our demands and failing to reply to pending negotiations, the shell continues anyway after the greater of this value or `connect_minwait` elapsed.

- **force_binary (bool)** – When True, the encoding specified is used for both directions even when failing BINARY negotiation, RFC 856. This parameter has no effect when `encoding=False`.

- **encoding_errors (str)** – Same meaning as `codecs.Codec`.

- **connect_minwait – XXX**

- **connect_maxwait** – If the remote end is not complaint, or otherwise confused by our demands, the shell continues anyway after the greater of this value has elapsed. A client that is not answering option negotiation will delay the start of the shell by this amount.

- **limit (int)** – The buffer limit for reader stream.

  **Return (reader, writer)** The reader is a `TelnetStreamReader` instance, the writer is a `TelnetStreamWriter` instance. This function is a coroutine().

### client_base

Module provides class `BaseClient`.

```python
class BaseClient (shell=None, log=None, loop=None, encoding='utf8', encoding_errors='strict',
                   force_binary=False, connect_minwait=1.0, connect_maxwait=4.0, limit=None,
                   waiter_closed=None, _waiter_connected=None):

    Base Telnet Client Protocol.

    Class initializer.

    begin_negotiation ()
    Begin on-connect negotiation.

    A Telnet client is expected to send only a minimal amount of client session options immediately after connection, it is generally the server which dictates server option support.

    Deriving implementations should always call super().begin_negotiation().

    begin_shell (result)

    check_negotiation (final=False)
    Callback, return whether negotiation is complete.

    Parameters final (bool) – Whether this is the final time this callback will be requested to answer regarding protocol negotiation.
```

2.3. client_base
Returns Whether negotiation is over (client end is satisfied).

Return type bool

Method is called on each new command byte processed until negotiation is considered final, or after `connect_maxwait` has elapsed, setting `_waiter_connected` to value `self` when complete.

This method returns False until `connect_minwait` has elapsed, ensuring the server may batch telnet negotiation demands without prematurely entering the callback shell.

Ensure `super().check_negotiation()` is called and conditionally combined when derived.

`connection_lost(exc)`

Called when the connection is lost or closed.

Parameters `exc` (`Exception`) – exception. None indicates a closing EOF sent by this end.

`connection_made(transport)`

Called when a connection is made.

Sets attributes `_transport`, `_when_connected`, `_last_received`, reader and writer.

Ensure `super().connection_made(transport)` is called when derived.

`data_received(data)`

Process bytes received by transport.

`duration`

Time elapsed since client connected, in seconds as float.

`encoding(outgoing=False, incoming=False)`

Encoding that should be used for the direction indicated.

The base implementation always returns `default_encoding` or, when unspecified, US-ASCII.

`eof_received()`

Called when the other end calls write_eof() or equivalent.

`get_extra_info(name, default=None)`

Get optional client protocol or transport information.

`idle`

Time elapsed since data last received, in seconds as float.

`pause_writing()`

`resume_writing()`

`client_shell`

`telnet_client_shell(telnet_reader, telnet_writer)`

Minimal telnet client shell for POSIX terminals.

This shell performs minimal tty mode handling when a terminal is attached to standard in (keyboard), notably raw mode is often set and this shell may exit only by disconnect from server, or the escape character, ^].

stdin or stdout may also be a pipe or file, behaving much like nc(1).

This function is a coroutine().
server

The `main()` function here is wired to the command line tool by name telnetlib3-server. If this server’s PID receives the SIGTERM signal, it attempts to shutdown gracefully.

The `TelnetServer` class negotiates a character-at-a-time (WILL-SGA, WILL-ECHO) session with support for negotiation about window size, environment variables, terminal type name, and to automatically close connections clients after an idle period.

class `TelnetServer` (term=`unknown`, cols=80, rows=25, timeout=300, *args, **kwargs)

    Bases: `telnetlib3.server_base.BaseServer`

    Telnet Server protocol performing common negotiation.

    TTYPE_LOOPMAX = 8
    begin_advanced_negotiation()
    begin_negotiation()
    begin_shell(result)
    check_negotiation(final=False)
    connection_lost(exc)
        Called when the connection is lost or closed.
        Parameters exc (Exception) – exception. None indicates close by EOF.
    connection_made(transport)
    data_received(data)
    duration
        Time elapsed since client connected, in seconds as float.
    encoding(outgoing=None, incoming=None)
        Return encoding for the given stream direction.
        Parameters
            • outgoing (bool) – Whether the return value is suitable for encoding bytes for transmission to client end.
            • incoming (bool) – Whether the return value is suitable for decoding bytes received from the client.
        Raises TypeError – when a direction argument, either outgoing or incoming, was not set True.
        Returns 'US-ASCII' for the directions indicated, unless BINARY RFC 856 has been negotiated for the direction indicated or :attr:`force_binary` is set True.
    Return type str

Value resolution order (first-matching):

• value set by `set_encoding()`.
• value of `get_extra_info()` using key argument, LANG.
• value of `default_encoding`.
• US-ASCII when binary transmission not allowed.
eof_received()
   Called when the other end calls write_eof() or equivalent.
   This callback may be exercised by the nc(1) client argument -z.

get_extra_info(name, default=None)
   Get optional server protocol or transport information.

idle
   Time elapsed since data last received, in seconds as float.

negotiation_should_advance()
   Whether advanced negotiation should commence.
   
   Return type  bool
   
   Returns  True if advanced negotiation should be permitted.
   
   The base implementation returns True if any negotiation options were affirmatively acknowledged by
   client, more than likely options requested in callback begin_negotiation().

on_charset(charset)
   Callback for CHARSET response, RFC 2066.

on_environ(mapping)
   Callback receives NEW_ENVIRON response, RFC 1572.

on_naws(rows, cols)
   Callback receives NAWS response, RFC 1073.

   Parameters
     
     • rows (int) – screen size, by number of cells in height.
     
     • cols (int) – screen size, by number of cells in width.

on_request_charset()
   Definition for CHARSET request by client, RFC 2066.
   
   This method is a callback from TelnetWriter.request_charset(), first entered on receipt of
   (WILL, CHARSET) by server. The return value defines the request made to the client
   for encodings.

   Rtype list a list of unicode character strings of US-ASCII characters, indicating the encodings
   offered by the server in its preferred order.
   
   Any empty return value indicates that no encodings are offered.
   
   The default return value begins:

   ['UTF-8', 'UTF-16', 'LATIN1', 'US-ASCII', 'BIG5', 'GBK', ...]

on_request_environ()
   Definition for NEW_ENVIRON request of client, RFC 1572.
   
   This method is a callback from TelnetWriter.request_environ(), first entered on receipt of
   (WILL, NEW_ENVIRON) by server. The return value defines the request made to the client
   for environment values.

   Rtype list a list of unicode character strings of US-ASCII characters, indicating the environment
   keys the server requests of the client. If this list contains the special byte constants, USERVAR
   or VAR, the client is allowed to volunteer any other additional user or system values.
   
   Any empty return value indicates that no request should be made.
   
   The default return value is:
on_timeout()
Callback received on session timeout.

Default implementation writes “Timeout.” bound by CRLF and closes.

This can be disabled by calling set_timeout() with duration value of 0 or value of the same for keyword argument timeout.

on_tspeed(rx, tx)
Callback for TSPEED response, RFC 1079.

on_ttype(ttype)
Callback for TTYPE response, RFC 930.

on_xdisplloc(xdisplloc)
Callback for XDISPLOC response, RFC 1096.

pause_writing()

resume_writing()

set_timeout(duration=-1)
Restart or unset timeout for client.

Parameters duration (int) – When specified as a positive integer, schedules Future self.waiter_timeout with attached instance callback timeout(). When -1, the value of get_extra_info() for keyword timeout is used. When non-True, waiter_timeout is cancelled.

create_server(host=None, port=23, protocol_factory=<class 'telnetlib3.server.TelnetServer'>, **kwds)
Create a TCP Telnet server.

Parameters

• host (str) – The host parameter can be a string, in that case the TCP server is bound to host and port. The host parameter can also be a sequence of strings, and in that case the TCP server is bound to all hosts of the sequence.

• port (int) – listen port for TCP Server.

• protocol_factory (server_base.BaseServer) – An alternate protocol factory for the server, when unspecified, TelnetServer is used.

• shell (asyncio.coroutine) – A coroutine that is called after negotiation completes, receiving arguments (reader, writer). The reader is a TelnetStreamReader instance, the writer is a TelnetStreamWriter instance.

• log (logging.Logger) – target logger, if None is given, one is created using the namespace 'telnetlib3.server'.

• encoding (str) – The default assumed encoding, or False to disable unicode support. Encoding may be negotiation to another value by the client through NEW_ENVIRON RFC 1572 by sending environment value of LANG, or by any legal value for CHARSET RFC 2066 negotiation.

The server’s attached reader, writer streams accept and return unicode, unless this value explicitly set False. In that case, the attached streams interfaces are bytes-only.

• encoding_errors (str) – Same meaning as codecs.Codec. Default value is strict.
- **force_binary** (bool) – When True, the encoding specified is used for both directions even when BINARY mode, RFC 856, is not negotiated for the direction specified. This parameter has no effect when encoding=False.

- **term** (str) – Value returned for `writer.get_extra_info('term')` until negotiated by TTYPE RFC 930, or NAWS RFC 1572. Default value is 'unknown'.

- **cols** (int) – Value returned for `writer.get_extra_info('cols')` until negotiated by NAWS RFC 1572. Default value is 80 columns.

- **rows** (int) – Value returned for `writer.get_extra_info('rows')` until negotiated by NAWS RFC 1572. Default value is 25 rows.

- **timeout** (int) – Causes clients to disconnect if idle for this duration, in seconds. This ensures resources are freed on busy servers. When explicitly set to False, clients will not be disconnected for timeout. Default value is 300 seconds (5 minutes).

- **connect_maxwait** (float) – If the remote end is not complaint, or otherwise confused by our demands, the shell continues anyway after the greater of this value has elapsed. A client that is not answering option negotiation will delay the start of the shell by this amount.

- **limit** (int) – The buffer limit for the reader stream.

**Return asyncio.Server** The return value is the same as `loop.create_server()`, An object which can be used to stop the service.

This function is a coroutine().

**run_server** (host='localhost', port=6023, loglevel='info', logfile=None, logfmt='%(asctime)s %(levelname)s %(filename)s:%(lineno)d %(message)s', shell=<function telnet_server_shell>, encoding='utf8', force_binary=False, timeout=300, connect_maxwait=4.0)

Program entry point for server daemon.

This function configures a logger and creates a telnet server for the given keyword arguments, serving forever, completing only upon receipt of SIGTERM.

**parse_server_args()**
begin_negotiation()

Begin on-connect negotiation.

A Telnet server is expected to demand preferred session options immediately after connection. Deriving implementations should always call super().begin_negotiation().

begin_shell(result)

check_negotiation(final=False)

Callback, return whether negotiation is complete.

Parameters final (bool) – Whether this is the final time this callback will be requested to answer regarding protocol negotiation.

Returns Whether negotiation is over (server end is satisfied).

Return type bool

Method is called on each new command byte processed until negotiation is considered final, or after connect_maxwait has elapsed, setting _waiter_connected to value self when complete.

Ensure super().check_negotiation() is called and conditionally combined when derived.

connection_lost(exc)

Called when the connection is lost or closed.

Parameters exc (Exception) – exception. None indicates close by EOF.

collection_made(transport)

Called when a connection is made.

Sets attributes _transport, _when_connected, _last_received, reader and writer.

Ensure super().connection_made(transport) is called when derived.

data_received(data)

Process bytes received by transport.

duration

Time elapsed since client connected, in seconds as float.

encoding(outgoing=False, incoming=False)

Encoding that should be used for the direction indicated.

The base implementation always returns default_encoding or, when unspecified, US-ASCII.

eof_received()

Called when the other end calls write_eof() or equivalent.

This callback may be exercised by the nc(1) client argument -z.

gt_extra_info(name, default=None)

Get optional server protocol or transport information.

idle

Time elapsed since data last received, in seconds as float.

negotiation_should_advance()

Whether advanced negotiation should commence.

Return type bool

Returns True if advanced negotiation should be permitted.

The base implementation returns True if any negotiation options were affirmatively acknowledged by client, more than likely options requested in callback begin_negotiation().
server_shell

telnet_server_shell (reader, writer)
A default telnet shell, appropriate for use with telnetlib3.create_server.
This shell provides very simple REPL, allowing introspection and state toggling of the connected client session.
This function is a coroutine().

slc

Special Line Character support for Telnet Linemode Option (RFC 1184).
class SLC (mask=b'x03', value=b'x00')
    Bases: object
    Defines the willingness to support a Special Linemode Character.
    Defined by its SLC support level, mask and default keyboard ASCII byte value (may be negotiated by client).

    ack
    Returns True if SLC_ACK bit is set.

cantchange
    Returns True if SLC level is SLC_CANTCHANGE.

default
    Returns True if SLC level is SLC_DEFAULT.

flushin
    Returns True if SLC_FLUSHIN bit is set.

flushout
    Returns True if SLC_FLUSHIN bit is set.

level
    Returns SLC level of support.

nosupport
    Returns True if SLC level is SLC_NOSUPPORT.

set_flag (flag)
    Set SLC option flag, flag.

set_mask (mask)
    Set SLC option mask, mask.

set_value (value)
    Set SLC keyboard ascii value to byte.

variable
    Returns True if SLC level is SLC_VARIABLE.
generate_slctab(tabset={b'\x0c': <telnetlib3.slc.SLC object>, b'\x06': <telnetlib3.slc.SLC object>, b'\x0f': <telnetlib3.slc.SLC object>, b'\r': <telnetlib3.slc.SLC object>, b'\e': <telnetlib3.slc.SLC object>, b'\n': <telnetlib3.slc.SLC object>, b'\x10': <telnetlib3.slc.SLC object>, b'\x02': <telnetlib3.slc.SLC object>, b'\x12': <telnetlib3.slc.SLC_nosupport object>, b'\x11': <telnetlib3.slc.SLC_nosupport object>, b'\x05': <telnetlib3.slc.SLC object>, b'\x01': <telnetlib3.slc.SLC object>, b'\x07': <telnetlib3.slc.SLC object>, b'\x04': <telnetlib3.slc.SLC object>, b'\x08': <telnetlib3.slc.SLC object>, b'\v': <telnetlib3.slc.SLC object>})

Returns full ‘SLC Tab’ for definitions found using tabset. Functions not listed in tabset are set as SLC_NOSUPPORT.

class Linemode (mask=b'x00')

    Bases: object

    A mask of LMODE_MODE_LOCAL means that all line editing is performed on the client side (default). A mask of the NULL () indicates that editing is performed on the remote side. Valid bit flags of mask are: LMODE_MODE_TRAPSIG, LMODE_MODE_ACK, LMODE_MODE_SOFT_TAB, and LMODE_MODE_LIT_ECHO.

    ack
      Returns True if mode has been acknowledged.

    lit_echo
      Returns True if non-printable characters are displayed as-is.

    local
      True if linemode is local.

    remote
      True if linemode is remote.

    soft_tab
      Returns True if client will expand horizontal tab ( ).

    trapsig
      True if signals are trapped by client.

snoop (byte, slctab, slc_callbacks)

    Scan slctab for matching byte values.

    Returns (callback, func_byte, slc_definition) on match. Otherwise, (None, None, None). If no callback is assigned, the value of callback is always None.

generate_forwardmask (binary_mode, tabset, ack=False)

    Generate a 32-byte (binary_mode is True) or 16-byte (False) Forwardmask class instance appropriate for the specified slctab.

    Forwardmask is formed by a bitmask of all 256 possible 8-bit keyboard ascii input, or, when not ‘outbinary’, a 16-byte 7-bit representation of each value, and whether or not they should be “forwarded” by the client on the transport stream.

class Forwardmask (value, ack=False)

    Bases: object

    ForwardMask object using the bytemask value received by server.

    bytemask value received by server after IAC SB LINEMODE DO FORWARDMASK. It must be a bytestring of length 16 or 32.

    description_table ()

      Returns list of strings describing obj as a tabular ASCII map.
name_slc_command\((byte)\)
Given an SLC byte, return global mnemonic as string.

class SLC\((mask=b'x03', value=b'x00')\)
Bases: object

Defines the willingness to support a Special Linemode Character.
Defined by its SLC support level, mask and default keyboard ASCII byte value (may be negotiated by client).

ack
Returns True if SLC_ACK bit is set.

cantchange
Returns True if SLC level is SLC_CANTCHANGE.

default
Returns True if SLC level is SLC_DEFAULT.

flushin
Returns True if SLC_FLUSHIN bit is set.

flushout
Returns True if SLC_FLUSHOUT bit is set.

level
Returns SLC level of support.

nosupport
Returns True if SLC level is SLC_NOSUPPORT.

set_flag\((flag)\)
Set SLC option flag, flag.

set_mask\((mask)\)
Set SLC option mask, mask.

set_value\((value)\)
Set SLC keyboard ascii value to byte.

variable
Returns True if SLC level is SLC_VARIABLE.

class SLC_nosupport
Bases: telnetlib3.slc.SLC

SLC definition inferring our unwillingness to support the option.

ack
Returns True if SLC_ACK bit is set.

cantchange
Returns True if SLC level is SLC_CANTCHANGE.

default
Returns True if SLC level is SLC_DEFAULT.

flushin
Returns True if SLC_FLUSHIN bit is set.

flushout
Returns True if SLC_FLUSHOUT bit is set.
level
  Returns SLC level of support.

nosupport
  Returns True if SLC level is SLC_NOSUPPORT.

set_flag (flag)
  Set SLC option flag, flag.

set_mask (mask)
  Set SLC option mask, mask.

set_value (value)
  Set SLC keyboard ascii value to byte.

variable
  Returns True if SLC level is SLC_VARIABLE.

stream_reader

Module provides class TelnetReader and TelnetReaderUnicode.

class TelnetReader (limit=65536, loop=None)
  Bases: asyncio.streams.StreamReader
  A reader interface for the telnet protocol.

  at_eof ()
    Return True if the buffer is empty and ‘feed_eof’ was called.

  exception ()

  feed_data (data)

  feed_eof ()

  read (n=-1)
    Read up to n bytes from the stream.

    If n is not provided, or set to -1, read until EOF and return all read bytes. If the EOF was received and the internal buffer is empty, return an empty bytes object.

    If n is zero, return empty bytes object immediately.

    If n is positive, this function try to read n bytes, and may return less or equal bytes than requested, but at least one byte. If EOF was received before any byte is read, this function returns empty byte object.

    Returned value is not limited with limit, configured at stream creation.

    If stream was paused, this function will automatically resume it if needed.

  readexactly (n)
    Read exactly n bytes.

    Raise an IncompleteReadError if EOF is reached before n bytes can be read. The IncompleteReadError.partial attribute of the exception will contain the partial read bytes.

    if n is zero, return empty bytes object.

    Returned value is not limited with limit, configured at stream creation.

    If stream was paused, this function will automatically resume it if needed.
**readline()**

Read one line.

Where “line” is a sequence of characters ending with CR LF, LF, or CR NUL. This readline function is a strict interpretation of Telnet Protocol RFC 854.

The sequence “CR LF” must be treated as a single “new line” character and used whenever their combined action is intended; The sequence “CR NUL” must be used where a carriage return alone is actually desired; and the CR character must be avoided in other contexts.

And therefore, a line does not yield for a stream containing a CR if it is not succeeded by NUL or LF.

<table>
<thead>
<tr>
<th>Given stream</th>
<th>readline() yields</th>
</tr>
</thead>
<tbody>
<tr>
<td>--\r\x00---</td>
<td>--\r,---...</td>
</tr>
<tr>
<td>--\r\n---</td>
<td>--\r\n,---...</td>
</tr>
<tr>
<td>--\n---</td>
<td>--\n,---...</td>
</tr>
<tr>
<td>--\r---</td>
<td>--\r,---...</td>
</tr>
</tbody>
</table>

If EOF is received before the termination of a line, the method will yield the partially read string.

This method is a coroutine().

**readuntil(separator=b’\n’)**

Read data from the stream until separator is found.

On success, the data and separator will be removed from the internal buffer (consumed). Returned data will include the separator at the end.

Configured stream limit is used to check result. Limit sets the maximal length of data that can be returned, not counting the separator.

If an EOF occurs and the complete separator is still not found, an IncompleteReadError exception will be raised, and the internal buffer will be reset. The IncompleteReadError.partial attribute may contain the separator partially.

If the data cannot be read because of over limit, a LimitOverrunError exception will be raised, and the data will be left in the internal buffer, so it can be read again.

**set_exception(exc)**

**set_transport(transport)**

class **TelnetReaderUnicode** (fn_encoding, *, limit=65536, loop=None, encoding_errors='replace')

A Unicode StreamReader interface for Telnet protocol.

**Parameters fn_encoding (callable)** – function callback, receiving boolean keyword argument, incoming=True, which is used by the callback to determine what encoding should be used to decode the value in the direction specified.

**at_eof()**

Return True if the buffer is empty and ‘feed_eof’ was called.

**decode (buf, final=False)**

Decode bytes buf using preferred encoding.

**exception()**

**feed_data (data)**

**feed_eof()**
**read** *(n=-1)*
Read up to *n* bytes.

If the EOF was received and the internal buffer is empty, return an empty string.

**Parameters** *n* *(int)* – If *n* is not provided, or set to -1, read until EOF and return all characters as one large string.

**Return type** str

This method is a coroutine().

**readexactly** *(n)*
Read exactly *n* unicode characters.

**Raises** asyncio.IncompleteReadError – if the end of the stream is reached before *n* can be read. the asyncio.IncompleteReadError.partial attribute of the exception contains the partial read characters.

**Return type** str

This method is a coroutine().

**readline** *
Read one line.

See ancestor method, **readline**() for details.

This method is a coroutine().

**readuntil** *(separator=b’\n’)*
Read data from the stream until separator is found.

On success, the data and separator will be removed from the internal buffer (consumed). Returned data will include the separator at the end.

Configured stream limit is used to check result. Limit sets the maximal length of data that can be returned, not counting the separator.

If an EOF occurs and the complete separator is still not found, an IncompleteReadError exception will be raised, and the internal buffer will be reset. The IncompleteReadError.partial attribute may contain the separator partially.

If the data cannot be read because of over limit, a LimitOverrunError exception will be raised, and the data will be left in the internal buffer, so it can be read again.

**set_exception** *(exc)*

**set_transport** *(transport)*

### stream_writer

Module provides TelnetWriter and TelnetWriterUnicode.

**class** TelnetWriter *(transport, protocol, *, client=False, server=False, reader=None, loop=None, log=None)*

**Bases:** asyncio.streams.StreamWriter

A writer interface for the telnet protocol.

Telnet IAC Interpreter.

2.10. stream_writer
Almost all negotiation actions are performed through the writer interface, as any action requires writing bytes to the underlying stream. This class implements `feed_byte()`, which acts as a Telnet *Is-A-Command* (IAC) interpreter.

The significance of the last byte passed to this method is tested by instance attribute `is_oob`, following the call to `feed_byte()` to determine whether the given byte is in or out of band.

A minimal Telnet Protocol method, `asyncio.Protocol.data_received()`, should forward each byte to `feed_byte`, which returns `True` to indicate the given byte should be forwarded to a Protocol reader method `asyncio.StreamReader.feed_data()`.

### Parameters

- **client** *(bool)* – Whether the IAC interpreter should react from the client point of view.
- **server** *(bool)* – Whether the IAC interpreter should react from the server point of view.
- **log** *(logging.Logger)* – target logger, if None is given, one is created using the namespace 'telnetlib3.stream_writer'.
- **loop** *(asyncio.base_events.BaseEventLoop)* – set the event loop to use. The return value of `asyncio.get_event_loop()` is used when unset.

```pythonyte_count = 0
can_write_eof()
client
    Whether this stream is of the client’s point of view.

close()

cmd_received = None
default_linemode = <b'\x10': lit_echo:True, soft_tab:False, ack:False, trapsig:False, remote:True, local:False>
default_slc_tab = {b'\x0c': <telnetlib3.slc.SLC object>, b'\x06': <telnetlib3.slc.SLC object>, b'\x03': <telnetlib3.slc.SLC object>}
drain()
    Flush the write buffer.
    The intended use is to write
    w.write(data) yield from w.drain()

echo(data)
    Conditionally write data to transport when “remote echo” enabled.

    Parameters data *(bytes)* – string received as input, conditionally written.

    Return type None

    The default implementation depends on telnet negotiation willingness for local echo, only an RFC-compliant telnet client will correctly set or unset echo accordingly by demand.

feed_byte(byte)
    Feed a single byte into Telnet option state machine.

    Parameters byte *(int)* – an 8-bit byte value as integer (0-255), or a bytes array. When a bytes array, it must be of length 1.

    Rtype bool Whether the given byte is “in band”, that is, should be duplicated to a connected terminal or device. False is returned for an IAC command for each byte until its completion.
get_extra_info(name, default=None)
     Get optional server protocol information.

handle_abort(byte)
     Handle IAC Abort (ABORT, SLC_ABORT).
     Similar to Interrupt Process (IP), but means only to abort or terminate the process to which the NVT is
     connected.

handle_ao(byte)
     Handle IAC Abort Output (AO) or SLC_AO.
     Discards any remaining output on the transport buffer.
     [...], a reasonable implementation would be to suppress the remainder of the text string, but
     transmit the prompt character and the preceding <CR><LF>.

handle_ayt(byte)
     Handle IAC Are You There (AYT, SLC_AYT).
     Provides the user with some visible (e.g., printable) evidence that the system is still up and running.

handle_brk(byte)
     Handle IAC Break (BRK, SLC_BRK).
     Sent by clients to indicate BREAK keypress. This is not the same as IP (^c), but a means to map system-
dependent break key such as found on an IBM Systems.

handle_charset(charset)
     Receive character set as string, RFC 2066.

handle_dm(cmd)
     Handle IAC Data-Mark (DM).

handle_do(opt)
     Process byte 3 of series (IAC, DO, opt) received by remote end.
     This method can be derived to change or extend protocol capabilities, for most cases, simply returning
     True if supported, False otherwise.
     In special cases of various RFC statutes, state is stored and answered in willing affirmative, with the
     exception of:
     •DO TM is always answered WILL TM, even if it was already replied to. No state is stored (“Timing
       Mark”), and the IAC callback registered by set_ext_callback() for cmd TM is called with
       argument byte DO.
     •DO LOGOUT executes extended callback registered by cmd LOGOUT with argument DO (indicating
       a request for voluntary logoff).
     •DO STATUS sends state of all local, remote, and pending options.

handle_dont(opt)
     Process byte 3 of series (IAC, DONT, opt) received by remote end.
     This only results in self.local_option[opt] set to False, with the exception of (IAC, DONT,
     LOGOUT), which only signals a callback to handle_logout(DONT).

handle_ec(byte)
     Handle IAC Erase Character (EC, SLC_EC).
     Provides a function which deletes the last preceding undeleted character from data ready on current line of
     input.
**handle_el**(byte)
Handle IAC Erase Line (EL, SLC_EL).

Provides a function which discards all the data ready on current line of input. The prompt should be re-displayed.

**handle_environ**(env)
Receive environment variables as dict, [RFC 1572](http://example.com).

**handle_eof**(byte)
Handle IAC End of Record (EOF, SLC_EOF).

**handle_eor**(byte)
Handle IAC End of Record (CMD_EOR, SLC_EOR).

**handle_ew**(slc)
Handle SLC_EW (Erase Word).

Provides a function which deletes the last preceding undeleted character, and any subsequent bytes until next whitespace character from data ready on current line of input.

**handle_ga**(cmd)
Handle IAC Go-Ahead (GA).

**handle_ip**(byte)
Handle IAC Interrupt Process (IP, SLC_IP).

**handle_lnext**(slc)
Handle SLC Literal Next (LNEXT) (Next character is received raw).

**handle_logout**(cmd)
Handle (IAC, (DO | DONT | WILL | WONT), LOGOUT), [RFC 727](http://example.com).

Only the server end may receive (DO, DONT). Only the client end may receive (WILL, WONT).

**handle_naws**(width, height)
Receive window size width and height, [RFC 1073](http://example.com).

**handle_nop**(cmd)
Handle IAC No-Operation (NOP).

**handle_rp**(slc)
Handle SLC Repaint (RP).

**handle_send_client_charset**(charsets)
Send character set selection as string, [RFC 2066](http://example.com).

Given the available encodings presented by the server, select and return only one. Returning an empty string indicates that no selection is made (request is ignored).

**handle_send_client_environ**(keys)
Send environment variables as dict, [RFC 1572](http://example.com).

If argument keys is empty, then all available values should be sent. Otherwise, keys is a set of environment keys explicitly requested.

**handle_send_naws**()
Send window size width and height, [RFC 1073](http://example.com).

**handle_send_server_charset**(charsets)
Send character set (encodings) offered to client, [RFC 2066](http://example.com).

**handle_send_server_environ**()
Server requests environment variables as list, [RFC 1572](http://example.com).
handle_send_sndloc()  
Send LOCATION value location, RFC 779.

handle_send_tspeed()  
Send terminal speed from TSPEED as int, RFC 1079.

handle_send_ttype()  
Send TTYPE value ttype, RFC 1091.

handle_send_xdisploc()  
Send XDISPLAY value xdisploc, RFC 1096.

handle_sndloc(location)  
Receive LOCATION value location, RFC 779.

handle_subnegotiation(buf)  
Callback for end of sub-negotiation buffer.

SB options handled here are TTYPE, XDISPLOC, NEW_ENVIRON, NAWS, and STATUS, and are delegated to their handle_ equivalent methods. Implementors of additional SB options should extend this method.

handle_susp(byte)  
Handle IAC Suspend Process (SUSP, SLC_SUSP).

Suspends the execution of the current process attached to the NVT in such a way that another process will take over control of the NVT, and the suspended process can be resumed at a later time.

If the receiving system does not support this functionality, it should be ignored.

handle_tm(cmd)  
Handle IAC (WILL, WONT, DO, DONT) Timing Mark (TM).

TM is essentially a NOP that any IAC interpreter must answer, if at least it answers WONT to unknown options (required), it may still be used as a means to accurately measure the “ping” time.

handle_tspeed(rx, tx)  
Receive terminal speed from TSPEED as int, RFC 1079.

handle_ttype(ttype)  
Receive TTYPE value ttype, RFC 1091.

A string value that represents client’s emulation capability.

Some example values: VT220, VT100, ANSITERM, ANSI, TTY, and 5250.

handle_will(opt)  
Process byte 3 of series (IAC, DONT, opt) received by remote end.

The remote end requests we perform any number of capabilities. Most implementations require an answer in the affirmative with DO, unless DO has meaning specific for only client or server end, and dissenting with DONT.

WILL ECHO may only be received for clients, answered with DO. WILL NAWS may only be received for servers, answered with DO. BINARY and SGA are answered with DO. STATUS, NEW_ENVIRON, XDISPLOC, and TTYPE is answered with sub-negotiation SEND. The env variables requested in response to WILL NEW_ENVIRON is “SEND ANY”. All others are replied with DONT.

The result of a supported capability is a response of (IAC, DO, opt) and the setting of self.remote_option[opt] of True. For unsupported capabilities, RFC specifies a response of (IAC, DONT, opt). Similarly, set self.remote_option[opt] to False.

handle_wont(opt)  
Process byte 3 of series (IAC, WONT, opt) received by remote end.
(IAC, WONT, opt) is a negative acknowledgment of (IAC, DO, opt) sent.

The remote end requests we do not perform a telnet capability.

It is not possible to decline a WONT. T.remote_option[opt] is set False to indicate the remote end’s refusal to perform opt.

handle_xdisplc(xdisploc)
Receive XDISPLAY value xdisploc, RFC 1096.

handle_xoff(byte)
Handle SLC Transmit-Off (XOFF).

handle_xon(byte)
Handle SLC Transmit-On (XON).

iac(cmd, opt=b'')
Send Is-A-Command 3-byte negotiation command.

Returns True if command was sent. Not all commands are legal in the context of client, server, or pending negotiation state, emitting a relevant debug warning to the log handler if not sent.

iaclist = None

inbinary
Whether binary data is expected to be received on reader, RFC 856.

is_oob
The previous byte should not be received by the API stream.

lflow = True

linemode
Linemode instance for stream.

Note: value is meaningful after successful LINEMODE negotiation, otherwise does not represent the linemode state of the stream.

Attributes of the stream’s active linemode may be tested using boolean instance attributes, edit, trapsig, soft_tab, lit_echo, remote, local.

mode
String describing NVT mode.

Rtype str One of:

kludge: Client acknowledges WILL-ECHO, WILL-SGA, character-at- a-time and remote line editing may be provided.

local: Default NVT half-duplex mode, client performs line editing and transmits only after pressing send (usually CR)

remote: Client supports advanced remote line editing, using mixed-mode local line buffering (optionally, echoing) until send, but also transmits buffer up to and including special line characters (SLCs).

outbinary
Whether binary data may be written to the writer, RFC 856.

protocol
The protocol attached to this stream.
request_charset()
    Request sub-negotiation CHARSET, RFC 2066.
    Returns True if request is valid for telnet state, and was sent.
    The sender requests that all text sent to and by it be encoded in one of character sets specified by
    string list codepages, which is determined by function value returned by callback registered using
    set_ext_send_callback() with value CHARSET.
request_environ()
    Request sub-negotiation NEW_ENVIRON, RFC 1572.
    Returns True if request is valid for telnet state, and was sent.
request_forwardmask(fmask=None)
    Request the client forward their terminal control characters.
    Characters are indicated in the Forwardmask instance fmask. When fmask is None, a forwardmask is
    generated for the SLC characters registered by slctab.
request_status()
    Send IAC-SB-STATUS-SEND sub-negotiation (RFC 859).
    This method may only be called after IAC-WILL-STATUS has been received. Returns True if status
    request was sent.
request_tspeed()
    Send IAC-SB-TSPEED-SEND sub-negotiation, RFC 1079.
    This method may only be called after IAC-WILL-TSPEED has been received. Returns True if TSPEED
    request was sent.
request_ttype()
    Send TTYPE SEND sub-negotiation, RFC 930.
    Returns True if request is valid for telnet state, and was sent.
request_xdisploc()
    Send XDISPLOC, SEND sub-negotiation, RFC 1086.
    Returns True if request is valid for telnet state, and was sent.
send_eor()
    Transmit IAC CMD_EOR (End-of-Record), RFC 885.
    Returns True if sent. If IAC-DO-EOR has not been received, False is returned and IAC-CMD_EOR is not
    transmitted.
send_ga()
    Transmit IAC GA (Go-Ahead).
    Returns True if sent. If IAC-DO-SGA has been received, then False is returned and IAC-GA is not trans-
    mitted.
send_iac(buf)
    Send a command starting with IAC (base 10 byte value 255).
    No transformations of bytes are performed. Normally, if the byte value 255 is sent, it is escaped as IAC
    + IAC. This method ensures it is not escaped..
send_lineflow_mode()
    Send LFLOW mode sub-negotiation, RFC 1372.
    Returns True if request is valid for telnet state, and was sent.
send_linemode(linemode=None)
    Set and Inform other end to agree to change to linemode, linemode.
    An instance of the Linemode class, or self.linemode when unset.

server
    Whether this stream is of the server’s point of view.

set_ext_callback(cmd, func)
    Register func as callback for receipt of cmd negotiation.

    Parameters cmd (bytes) – One of the following listed bytes:

    • LOGOUT: for servers and clients, receiving one argument. Server end may receive DO or DONT as argument cmd, indicating client’s wish to disconnect, or a response to WILL, LOGOUT, indicating it’s wish not to be automatically disconnected. Client end may receive WILL or WONT, indicating server’s wish to disconnect, or acknowledgment that the client will not be disconnected.

    • SNDLOC: for servers, receiving one argument: the string describing the client location, such as 'ROOM 641-A', RFC 779.

    • NAWS: for servers, receiving two integer arguments (width, height), such as (80, 24), RFC 1073.

    • TSPEED: for servers, receiving two integer arguments (rx, tx) such as (57600, 57600), RFC 1079.

    • TTYPE: for servers, receiving one string, usually the terminfo(5) database capability name, such as ‘xterm’, RFC 1091.

    • XDISPLOC: for servers, receiving one string, the DISPLAY host value, in form of <host>:<dispnum>[.<screennum>], RFC 1096.

    • NEW_ENVIRON: for servers, receiving a dictionary of (key, val) pairs of remote client environment item values, RFC 1408.

    • CHARSET: for servers, receiving one string, the character set negotiated by client. RFC 2066.

set_ext_send_callback(cmd, func)
    Register callback for inquires of sub-negotiation of cmd.

    Parameters

    • func (callable) – A callable function for the given cmd byte. Note that the return type must match those documented.

    • cmd (bytes) – These callbacks must return any number of arguments, for each registered cmd byte, respectively:

        – SNDLOC: for clients, returning one argument: the string describing client location, such as b'ROOM 641-A', RFC 779.

        – NAWS: for clients, returning two integer arguments (width, height), such as (80, 24), RFC 1073.

        – TSPEED: for clients, returning two integer arguments (rx, tx) such as (57600, 57600), RFC 1079.

        – TTYPE: for clients, returning one string, usually the terminfo(5) database capability name, such as ‘xterm’, RFC 1091.

        – XDISPLOC: for clients, returning one string, the DISPLAY host value, in form of <host>:<dispnum>[.<screennum>], RFC 1096.

        – NEW_ENVIRON: for clients, returning a dictionary of (key, val) pairs of environment item values, RFC 1408.
- CHARSET: for clients, receiving iterable of strings of character sets requested by server, callback must return one of those strings given, RFC 2066.

```python
set_iac_callback(cmd, func)
```
Register callable `func` as callback for IAC `cmd`.

BRK, IP, AO, AYT, EC, EL, CMD_EOR, EOF, SUSP, ABORT, and NOP.

These callbacks receive a single argument, the IAC `cmd` which triggered it.

```python
set_slc_callback(slc_byte, func)
```
Register `func` as callable for receipt of `slc_byte`.

**Parameters**

- `slc_byte(bytes)` – any of SLC_SYNCH, SLC_BRK, SLC_IP, SLC_AO, SLC_AYT, SLC_EOR, SLC_ABORT, SLC_EOF, SLC_EC, SLC_EL, SLC_EW, SLC_RP, SLC_XON, SLC_XOFF, ...

- `func(callable)` – These callbacks receive a single argument: the SLC function byte that fired it. Some SLC and IAC functions are intermixed; which signaling mechanism used by client can be tested by evaluating this argument.

```python
slc_received = None
slc_simulated = True
```

**transport**

- `will_echo`
  Whether Server end is expected to echo back input sent by client.

  From server perspective: the server should echo (duplicate) client input back over the wire, the client is awaiting this data to indicate their input has been received.

  From client perspective: the server will not echo our input, we should chose to duplicate our input to standard out ourselves.

```python
write(data)
```
Write a bytes object to the protocol transport.

**Return type** None

```python
write_eof()
```

```python
writelines(lines)
```
Write unicode strings to transport.

Note that newlines are not added. The sequence can be any iterable object producing strings. This is equivalent to calling write() for each string.

```python
xon_any = False
```

**class TelnetWriterUnicode(transport, protocol, fn_encoding, *, encoding_errors=’strict’, **kwds)**

Bases: telnetlib3.stream_writer.TelnetWriter

A Unicode StreamWriter interface for Telnet protocol.

See ancestor class, TelnetWriter for details.

Requires the `fn_encoding` callback, receiving mutually boolean keyword argument `outgoing=True` to determine what encoding should be used to decode the value in the direction specified.

The encoding may be conditionally negotiated by CHARSET, RFC 2066, or discovered by LANG environment variables by NEW_ENVIRON, RFC 1572.
Telnetlib3 Documentation, Release 1.0.0

byte_count = 0

can_write_eof()

client
    Whether this stream is of the client’s point of view.

close()

cmd_received = None

default_linemode = <dict \':lit_echo': True, \'soft_tab': False, \'ack': False, \'trapsig': False, \'remote': True, \'local': False'>
default_slc_tab = {\'\x10\': <telnetlib3.slc.SLC object>, \'\x06\': <telnetlib3.slc.SLC object>, \'\x0f\': <telnetlib3.slc.SLC object>, ... object>, \'\x08\': <telnetlib3.slc.SLC object>, \'\t\': <telnetlib3.slc.SLC object>, \'\x03\': <telnetlib3.slc.SLC object>}
drain()
    Flush the write buffer.
    The intended use is to write
    w.write(data) yield from w.drain()

echo (string, errors=None)
    Conditionally write string to transport when “remote echo” enabled.

    Parameters
    • string (str) – string received as input, conditionally written.
    • errors (str) – same as meaning in codecs.Codec.

    This method may only be called from the server perspective. The default implementation depends on telnet negotiation willingness for local echo: only an RFC-compliant telnet client will correctly set or unset echo accordingly by demand.

encode (string, errors)
    Encode string using protocol-preferred encoding.

    Parameters
    • errors (str) – same as meaning in codecs.Codec. When None, value of errors_encoding is used.
    • errors – same as meaning in codecs.Codec, when None (default), value of class initializer keyword argument, encoding_errors.

feed_byte (byte)
    Feed a single byte into Telnet option state machine.

    Parameters byte (int) – an 8-bit byte value as integer (0-255), or a bytes array. When a bytes array, it must be of length 1.

    Rtype bool
    Whether the given byte is “in band”, that is, should be duplicated to a connected terminal or device. False is returned for an IAC command for each byte until its completion.

get_extra_info (name, default=None)
    Get optional server protocol information.

handle_abort (byte)
    Handle IAC Abort (ABORT, SLC_ABORT).

    Similar to Interrupt Process (IP), but means only to abort or terminate the process to which the NVT is connected.
**handle_ao (byte)**
Handle IAC Abort Output (AO) or SLC_AO.
Discards any remaining output on the transport buffer.

[...] a reasonable implementation would be to suppress the remainder of the text string, but transmit the prompt character and the preceding <CR><LF>.

**handle_ayt (byte)**
Handle IAC Are You There (AYT, SLC_AYT).
Provides the user with some visible (e.g., printable) evidence that the system is still up and running.

**handle_brk (byte)**
Handle IAC Break (BRK, SLC_BRK).
Sent by clients to indicate BREAK keypress. This is not the same as IP (^c), but a means to map system-dependent break key such as found on an IBM Systems.

**handle_charset (charset)**
Receive character set as string, RFC 2066.

**handle_dm (cmd)**
Handle IAC Data-Mark (DM).

**handle_do (opt)**
Process byte 3 of series (IAC, DO, opt) received by remote end.

This method can be derived to change or extend protocol capabilities, for most cases, simply returning True if supported, False otherwise.

In special cases of various RFC statutes, state is stored and answered in willing affirmative, with the exception of:

- **DO TM** is always answered **WILL TM**, even if it was already replied to. No state is stored (“Timing Mark”), and the IAC callback registered by `set_ext_callback()` for cmd TM is called with argument byte **DO**.
- **DO LOGOUT** executes extended callback registered by cmd LOGOUT with argument **DO** (indicating a request for voluntary logoff).
- **DO STATUS** sends state of all local, remote, and pending options.

**handle_dont (opt)**
Process byte 3 of series (IAC, DONT, opt) received by remote end.

This only results in `self.local_option[opt]` set to **False**, with the exception of (IAC, DONT, LOGOUT), which only signals a callback to `handle_logout(DONT)`.

**handle_ec (byte)**
Handle IAC Erase Character (EC, SLC_EC).

Provides a function which deletes the last preceding undeleted character from data ready on current line of input.

**handle_el (byte)**
Handle IAC Erase Line (EL, SLC_EL).

Provides a function which discards all the data ready on current line of input. The prompt should be re-displayed.

**handle_environ (env)**
Receive environment variables as dict, RFC 1572.
handle_eof (byte)
    Handle IAC End of Record (EOF, SLC_EOF).

handle_eor (byte)
    Handle IAC End of Record (CMD_EOR, SLC_EOR).

handle_ew (slc)
    Handle SLC_EW (Erase Word).
    Provides a function which deletes the last preceding undeleted character, and any subsequent bytes until
    next whitespace character from data ready on current line of input.

handle_ga (cmd)
    Handle IAC Go-Ahead (GA).

handle_ip (byte)
    Handle IAC Interrupt Process (IP, SLC_IP).

handle_lnext (slc)
    Handle SLC Literal Next (LNEXT) (Next character is received raw).

handle_logout (cmd)
    Handle (IAC, (DO | DONT | WILL | WONT), LOGOUT), RFC 727.
    Only the server end may receive (DO, DONT). Only the client end may receive (WILL, WONT).

handle_naws (width, height)
    Receive window size width and height, RFC 1073.

handle_nop (cmd)
    Handle IAC No-Operation (NOP).

handle_rp (slc)
    Handle SLC Repaint (RP).

handle_send_client_charset (charsets)
    Send character set selection as string, RFC 2066.
    Given the available encodings presented by the server, select and return only one. Returning an empty
    string indicates that no selection is made (request is ignored).

handle_send_client_environ (keys)
    Send environment variables as dict, RFC 1572.
    If argument keys is empty, then all available values should be sent. Otherwise, keys is a set of environ-
    ment keys explicitly requested.

handle_send_naws ()
    Send window size width and height, RFC 1073.

handle_send_server_charset (charsets)
    Send character set (encodings) offered to client, RFC 2066.

handle_send_server_environ ()
    Server requests environment variables as list, RFC 1572.

handle_send_sndloc ()
    Send LOCATION value location, RFC 779.

handle_send_tspeed ()
    Send terminal speed from TSPEED as int, RFC 1079.

handle_send_ttype ()
    Send TTYPE value ttype, RFC 1091.
handle_send_xdisploc()
    Send XDISPLAY value xdisploc, RFC 1096.

handle_sndloc(location)
    Receive LOCATION value location, RFC 779.

handle_subnegotiation(buf)
    Callback for end of sub-negotiation buffer.
    SB options handled here are TTYPE, XDISPLOC, NEW_ENVIRON, NAWS, and STATUS, and
    are delegated to their handle_ equivalent methods. Implementors of additional SB options
    should extend this method.

handle_susp(byte)
    Handle IAC Suspend Process (SUSP, SLC_SUSP).
    Suspends the execution of the current process attached to the NVT in such a way that another process will
    take over control of the NVT, and the suspended process can be resumed at a later time.
    If the receiving system does not support this functionality, it should be ignored.

handle_tm(cmd)
    Handle IAC (WILL, WONT, DO, DONT) Timing Mark (TM).
    TM is essentially a NOP that any IAC interpreter must answer, if at least it answers WONT to unknown
    options (required), it may still be used as a means to accurately measure the “ping” time.

handle_tspeed(rx, tx)
    Receive terminal speed from TSPEED as int, RFC 1079.

handle_ttype(ttype)
    Receive TTYPE value ttype, RFC 1091.
    A string value that represents client’s emulation capability.
    Some example values: VT220, VT100, ANSITERM, ANSI, TTY, and 5250.

handle_will(opt)
    Process byte 3 of series (IAC, DONT, opt) received by remote end.
    The remote end requests we perform any number of capabilities. Most implementations require an answer
    in the affirmative with DO, unless DO has meaning specific for only client or server end, and dissenting
    with DONT.
    WILL ECHO may only be received for clients, answered with DO. WILL NAWS may only be received
    for servers, answered with DO. BINARY and SGA are answered with DO. STATUS, NEW_ENVIRON,
    XDISPLOC, and TTYPE is answered with sub-negotiation SEND. The env variables requested in response
    to WILL NEW_ENVIRON is “SEND ANY”. All others are replied with DONT.
    The result of a supported capability is a response of (IAC, DO, opt) and the setting of self.
    remote_option[opt] of True. For unsupported capabilities, RFC specifies a response of (IAC,
    DONT, opt). Similarly, set self.remote_option[opt] to False.

handle_wont(opt)
    Process byte 3 of series (IAC, WONT, opt) received by remote end.
    (IAC, WONT, opt) is a negative acknowledgment of (IAC, DO, opt) sent.
    The remote end requests we do not perform a telnet capability.
    It is not possible to decline a WONT. T.remote_option[opt] is set False to indicate the remote
    end’s refusal to perform opt.
handle_xdisploc(xdisploc)
    Receive XDISPLAY value xdisploc, RFC 1096.

handle_xoff(byte)
    Handle SLC Transmit-Off (XOFF).

handle_xon(byte)
    Handle SLC Transmit-On (XON).

iac(cmd, opt=b"")
    Send Is-A-Command 3-byte negotiation command.

    Returns True if command was sent. Not all commands are legal in the context of client, server, or pending
    negotiation state, emitting a relevant debug warning to the log handler if not sent.

iac_received = None

inbinary
    Whether binary data is expected to be received on reader, RFC 856.

is_oob
    The previous byte should not be received by the API stream.

lflow = True

linemode
    Linemode instance for stream.

    Note: value is meaningful after successful LINEMODE negotiation, otherwise does not represent the
    linemode state of the stream.

Attributes of the stream’s active linemode may be tested using boolean instance attributes, edit, trapsig, soft_tab, lit_echo, remote, local.

mode
    String describing NVT mode.

Rtype str
    One of:

    kludge: Client acknowledges WILL-ECHO, WILL-SGA. character-at-
    a-time and remote line editing may be provided.

    local: Default NVT half-duplex mode, client performs line editing and transmits only
    after pressing send (usually CR)

    remote: Client supports advanced remote line editing, using mixed-mode local line
    buffering (optionally, echoing) until send, but also transmits buffer up to and including
    special line characters (SLCs).

outbinary
    Whether binary data may be written to the writer, RFC 856.

protocol
    The protocol attached to this stream.

request_charset()
    Request sub-negotiation CHARSET, RFC 2066.

    Returns True if request is valid for telnet state, and was sent.
The sender requests that all text sent to and by it be encoded in one of character sets specified by string list `codepages`, which is determined by function value returned by callback registered using `set_ext_send_callback()` with value `CHARSET`.

`request_environ()`
Request sub-negotiation NEW_ENVIRON, RFC 1572.
Returns True if request is valid for telnet state, and was sent.

`request_forwardmask(fmask=None)`
Request the client forward their terminal control characters.
Characters are indicated in the `Forwardmask` instance `fmask`. When `fmask` is None, a forwardmask is generated for the SLC characters registered by `slctab`.

`request_status()`
Send IAC-SB-STATUS-SEND sub-negotiation (RFC 859).
This method may only be called after IAC-WILL-STATUS has been received. Returns True if status request was sent.

`request_tspeed()`
Send IAC-SB-TSPEED-SEND sub-negotiation, RFC 1079.
This method may only be called after IAC-WILL-TSPEED has been received. Returns True if TSPEED request was sent.

`request_ttype()`
Send TTYPE SEND sub-negotiation, RFC 930.
Returns True if request is valid for telnet state, and was sent.

`request_xdisploc()`
Send XDISPLOC, SEND sub-negotiation, RFC 1086.
Returns True if request is valid for telnet state, and was sent.

`send_eor()`
Transmit IAC CMD_EOR (End-of-Record), RFC 885.
Returns True if sent. If IAC-DO-EOR has not been received, False is returned and IAC-CMD_EOR is not transmitted.

`send_ga()`
Transmit IAC GA (Go-Ahead).
Returns True if sent. If IAC-DO-SGA has been received, then False is returned and IAC-GA is not transmitted.

`send_iac(buf)`
Send a command starting with IAC (base 10 byte value 255).
No transformations of bytes are performed. Normally, if the byte value 255 is sent, it is escaped as IAC + IAC. This method ensures it is not escaped.

`send_lineflow_mode()`
Send LFLOW mode sub-negotiation, RFC 1372.
Returns True if request is valid for telnet state, and was sent.

`send_linemode(linemode=None)`
Set and Inform other end to agree to change to linemode, `linemode`.
An instance of the Linemode class, or self.linemode when unset.
server

Whether this stream is of the server’s point of view.

`set_ext_callback(cmd, func)`

Register `func` as callback for receipt of `cmd` negotiation.

**Parameters**

- `cmd` (bytes) – One of the following listed bytes:
  - LOGOUT: for servers and clients, receiving one argument. Server end may receive DO or DONT as argument `cmd`, indicating client’s wish to disconnect, or a response to WILL, LOGOUT, indicating it’s wish not to be automatically disconnected. Client end may receive WILL or WONT, indicating server’s wish to disconnect, or acknowledgment that the client will not be disconnected.
  - SNDLOC: for servers, receiving one argument: the string describing the client location, such as `ROOM 641-A'`, **RFC 779**.
  - NAWS: for servers, receiving two integer arguments (width, height), such as (80, 24), **RFC 1073**.
  - TSPEED: for servers, receiving two integer arguments (rx, tx) such as (57600, 57600), **RFC 1079**.
  - TTYPE: for servers, receiving one string, usually the terminfo(5) database capability name, such as ‘xterm’, **RFC 1091**.
  - XDISPLOC: for servers, receiving one string, the DISPLAY host value, in form of `<host>:<dispnum>[.<screennum>]`, **RFC 1096**.
  - NEW_ENVIRON: for servers, receiving a dictionary of (key, val) pairs of remote client environment item values, **RFC 1408**.
  - CHARSET: for servers, receiving one string, the character set negotiated by client. **RFC 2066**.

`set_ext_send_callback(cmd, func)`

Register callback for inquires of sub-negotiation of `cmd`.

**Parameters**

- `func` (callable) – A callable function for the given `cmd` byte. Note that the return type must match those documented.
- `cmd` (bytes) – These callbacks must return any number of arguments, for each registered `cmd` byte, respectively:
  - SNDLOC: for clients, returning one argument: the string describing client location, such as b’ROOM 641-A’, **RFC 779**.
  - NAWS: for clients, returning two integer arguments (width, height), such as (80, 24), **RFC 1073**.
  - TSPEED: for clients, returning two integer arguments (rx, tx) such as (57600, 57600), **RFC 1079**.
  - TTYPE: for clients, returning one string, usually the terminfo(5) database capability name, such as ‘xterm’, **RFC 1091**.
  - XDISPLOC: for clients, returning one string, the DISPLAY host value, in form of `<host>:<dispnum>[.<screennum>]`, **RFC 1096**.
  - NEW_ENVIRON: for clients, returning a dictionary of (key, val) pairs of environment item values, **RFC 1408**.
  - CHARSET: for clients, receiving iterable of strings of character sets requested by server, callback must return one of those strings given, **RFC 2066**.
set_iac_callback(cmd, func)

Register callable func as callback for IAC cmd.

BRK, IP, AO, AYT, EC, EL, CMD_EOR, EOF, SUSP, ABORT, and NOP.

These callbacks receive a single argument, the IAC cmd which triggered it.

set_slc_callback(slc_byte, func)

Register func as callable for receipt of slc_byte.

Parameters

- slc_byte(bytes) – any of SLC_SYNCH, SLC_BRK, SLC_IP, SLC_AO, SLC_AYT,
  SLC_EOR, SLC_ABORT, SLC_EOF, SLC_SUSP, SLC_EC, SLC_EL, SLC_EW,
  SLC_RP, SLC_XON, SLC_XOFF ...

- func(callable) – These callbacks receive a single argument: the SLC function byte
  that fired it. Some SLC and IAC functions are intermixed; which signaling mechanism
  used by client can be tested by evaluating this argument.

slc_received = None

slc_simulated = True

transport

will_echo

Whether Server end is expected to echo back input sent by client.

From server perspective: the server should echo (duplicate) client input back over the wire, the client is
awaiting this data to indicate their input has been received.

From client perspective: the server will not echo our input, we should chose to duplicate our input to
standard out ourselves.

write(string, errors=None)

Write unicode string to transport, using protocol-preferred encoding.

Parameters

- string(str) – unicode string text to write to endpoint using the protocol’s preferred
  encoding. When the protocol encoding keyword is explicitly set to False, the given
  string should be only raw b'bytes'.

- errors(str) – same as meaning in codecs.Codec, when None (default), value of
  class initializer keyword argument, encoding_errors.

Return type None

write_eof()

writelines(lines, errors=None)

Write unicode strings to transport.

Note that newlines are not added. The sequence can be any iterable object producing strings. This is
equivalent to calling write() for each string.

xon_any = False

telopt

name_command(byte)

Return string description for (maybe) telnet command byte.
**name_commands** *(cmds, sep=' ')*

Return string description for array of (maybe) telnet command bytes.
CHAPTER 3

RFCs

Implemented

Not Implemented

- **RFC 861**, “Telnet Extended Options List”, May 1983. describes a method of negotiating options after all possible 255 option bytes are exhausted by future implementations. This never happened (about 100 remain), it was perhaps, ambitious in thinking more protocols would incorporate Telnet (such as FTP did).

- **RFC 927**, “TACACS User Identification Telnet Option”, describes a method of identifying terminal clients by a 32-bit UUID, providing a form of ‘rlogin’. This system, published in 1984, was designed for MILNET by BBN, and the actual TACACS implementation is undocumented, though partially re-imagined by Cisco in **RFC 1492**. Essentially, the user’s credentials are forwarded to a TACACS daemon to verify that the client does in fact have access. The UUID is a form of an early Kerberos token.

- **RFC 933**, “Output Marking Telnet Option”, describes a method of sending banners, such as displayed on login, with an associated ID to be stored by the client. The server may then indicate at which time during the session the banner is relevant. This was implemented by Mitre for DOD installations that might, for example, display various levels of “TOP SECRET” messages each time a record is opened – preferably on the top, bottom, left or right of the screen.

- **RFC 946**, “Telnet Terminal Location Number Option”, only known to be implemented at Carnegie Mellon University in the mid-1980’s, this was a mechanism to identify a Terminal by ID, which would then be read and forwarded by gatewaying hosts. So that user traveling from host A -> B -> C appears as though his “from” address is host A in the system “who” and “finger” services. There exists more appropriate solutions, such as the “Report Terminal ID” sequences CSI + c and CSI + 0c for vt102, and ESC + z (vt52), which sends a terminal ID in-band as ASCII.

- **RFC 1041**, “Telnet 3270 Regime Option”, Jan 1988
- **RFC 1043**, “Telnet Data Entry Terminal Option”, Feb 1988
- **RFC 1143**, “The Q Method of Implementing .. Option Negotiation”, Feb 1990
- **RFC 1205**, “5250 Telnet Interface”, Feb 1991
- **RFC 1412**, “Telnet Authentication: SPX”
- **RFC 1416**, “Telnet Authentication Option”
- **RFC 2217**, “Telnet Com Port Control Option”, Oct 1997

Additional Resources

These RFCs predate, or are superseded by, **RFC 854**, but may be relevant for study of the telnet protocol.

- **RFC 97** A First Cut at a Proposed Telnet Protocol
- **RFC 137** Telnet Protocol.
- **RFC 139** Discussion of Telnet Protocol.
- **RFC 318** Telnet Protocol.
- **RFC 328** Suggested Telnet Protocol Changes.
- **RFC 340** Proposed Telnet Changes.
3.3. Additional Resources

- RFC 393 Comments on TELNET Protocol Changes.
- RFC 435 Telnet Issues.
- RFC 513 Comments on the new Telnet Specifications.
- RFC 529 A Note on Protocol Synch Sequences.
- RFC 559 Comments on the new Telnet Protocol and its Implementation.
- RFC 563 Comments on the RCTE Telnet Option.
- RFC 593 Telnet and FTP Implementation Schedule Change.
- RFC 595 Some Thoughts in Defense of the Telnet Go-Ahead.
- RFC 596 Second Thoughts on Telnet Go-Ahead.
- RFC 652 Telnet Output Carriage-Return Disposition Option.
- RFC 653 Telnet Output Horizontal Tabstops Option.
- RFC 654 Telnet Output Horizontal Tab Disposition Option.
- RFC 655 Telnet Output Formfeed Disposition Option.
- RFC 656 Telnet Output Vertical Tabstops Option.
- RFC 657 Telnet Output Vertical Tab Disposition Option.
- RFC 658 Telnet Output Linefeed Disposition.
- RFC 659 Announcing Additional Telnet Options.
- RFC 698 Telnet Extended ASCII Option.
- RFC 718 Comments on RCTE from the TENEX Implementation Experience.
- RFC 719 Discussion on RCTE.
- RFC 726 Remote Controlled Transmission and Echoing Telnet Option.
- RFC 732 Telnet Data Entry Terminal Option (Obsoletes: RFC 731)
- RFC 734 SUPDUP Protocol.
- RFC 735 Revised Telnet Byte Macro Option (Obsoletes: RFC 729, RFC 736)
- RFC 749 Telnet SUPDUP-Output Option.
- RFC 818 The Remote User Telnet Service.

The following further describe the telnet protocol and various extensions of related interest:

- “Mud Terminal Type Standard,” http://tintin.sourceforge.net/mtts/
• “Telnet RFCs,” http://www.omnifarious.org/~hopper/telnet-rfc.html
• “Telnet Options”, http://www.iana.org/assignments/telnet-options/telnet-options.xml
We welcome contributions via GitHub pull requests:

- Fork a Repo
- Creating a pull request

## Developing

Prepare a developer environment. Then, from the telnetlib3 code folder:

```
pip install --editable .
```

Any changes made in this project folder are then made available to the python interpreter as the ‘telnetlib3’ module irregardless of the current working directory.

## Running Tests

Install and run tox

```
pip install --upgrade tox
tox
```

*Py.test* <https://pytest.org> is the test runner. tox commands pass through positional arguments, so you may for example use `looponfailing` <https://pytest.org/latest/xdist.html#running-tests-in-looponfailing-mode> with python 3.5, stopping at the first failing test case:

```
tox -epy35 -- -fx
```
Style and Static Analysis

All standards enforced by the underlying tools are adhered to by this project, with the declarative exception of those found in landscape.yml, or inline using pylint: disable= directives.

Perform static analysis using tox target sa:

tox -esa
CHAPTER 5

History

1.0.0

- First general release for standard API: Instead of encouraging twisted-like override of protocol methods, we provide a “shell” callback interface, receiving argument pairs (reader, writer).

0.5.0

- bugfix: linemode MODE is now acknowledged.
- bugfix: default stream handler sends 80 x 24 in cols x rows, not 24 x 80.
- bugfix: waiter_closed future on client defaulted to wrong type.
- bugfix: telnet shell (TelSh) no longer paints over final exception line.

0.4.0

- bugfix: cannot connect to IPv6 address as client.
- change: TelnetClient.CONNECT_DEFERED class attribute renamed DEFERRED. Default value changed to 50ms from 100ms.
- change: TelnetClient.waiter renamed to TelnetClient.waiter_closed.
- enhancement: TelnetClient.waiter_connected future added.

0.3.0

- bugfix: cannot bind to IPv6 address #5.
- enhancement: Futures waiter_connected, and waiter_closed added to server.
- change: TelSh.feed_sle merged into TelSh.feed_byte as sle_function keyword.
- change: TelnetServer.CONNECT_DEFERED class attribute renamed DEFERRED. Default value changed to 50ms from 100ms.
- enhancement: Default TelnetServer.PROMPT_IMMEDIATELY = False ensures prompt is not displayed until negotiation is considered final. It is no longer “aggressive”.
- enhancement: TelnetServer.pause_writing and resume_writing callback wired.
• enhancement: TelSh.pause_writing and resume_writing methods added.

0.2.4
• bugfix: pip installation issue #8.

0.2
• enhancement: various example programs were included in this release.

0.1
• Initial release.
CHAPTER 6

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