Московский государственный технический университет им. Н.Э. Баумана

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Курсовая работа по дисциплине «Сетевые технологии в АСОИУ» «Локальная безадаптерная сеть»

Описание программы
(вид документа)

писчая бумага
(вид носителя)

24
(количество листов)

ИСПОЛНИТЕЛИ:

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1. Общие сведения

Наименование: “Программа посылки сообщений через com-порты Чат”.

Программа выполняется на языке программирования Python/C и работает под управлением операционной системы Windows XP и выше/Linux.

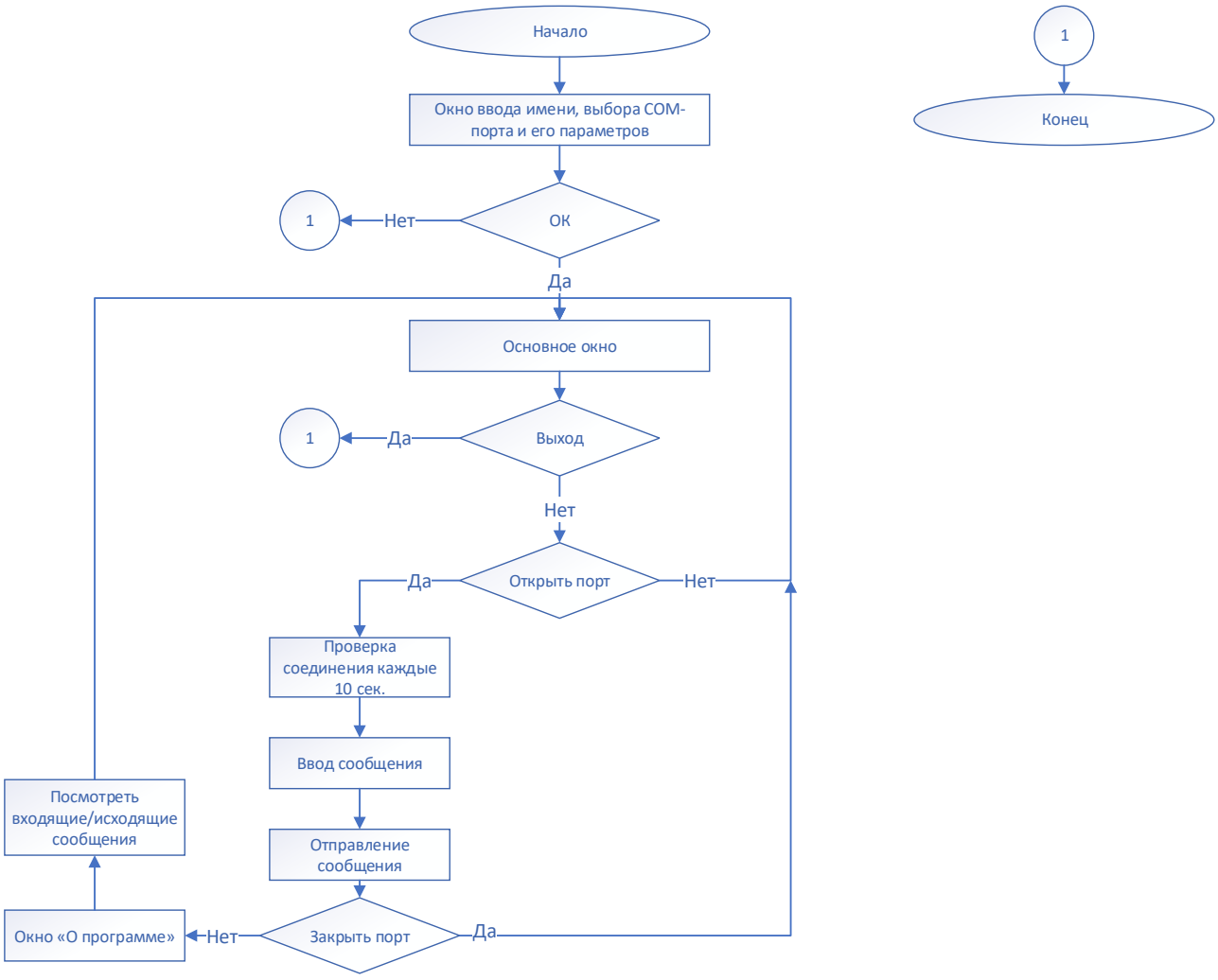
2. Назначение разработки

Программа должна реализовывать функцию передачи текстовых сообщений и файлов между двумя ПЭВМ, соединенными через интерфейс RS-232C с использованием нуль-модемного кабеля.

3. Описание логической структуры

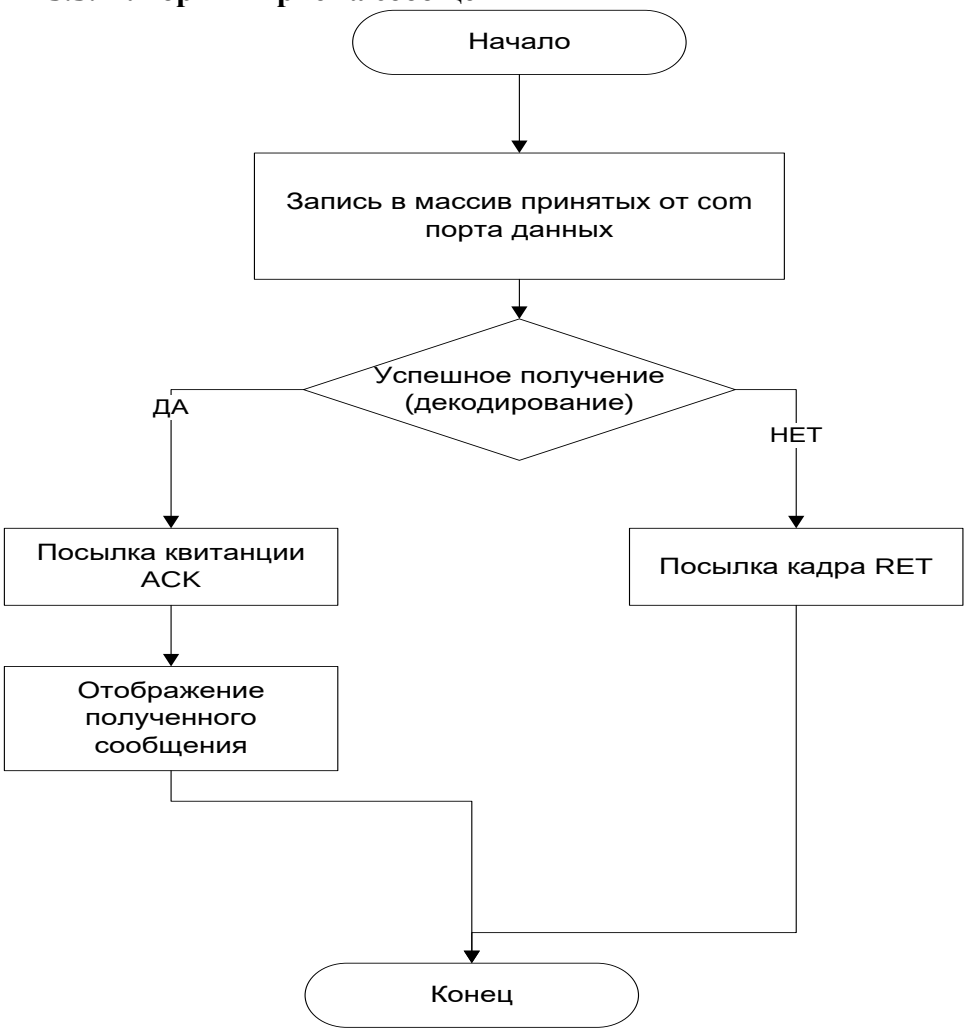
3.1. Алгоритм интерфейсной части прораммы

Алгоритм интерфейсной части приведен на рисунке.



3.2. Алгоритм передачи сообщения

3.3. Алгоритм приема сообщения



4. Используемые технические средства

Программа должна работать на IBM-совместимой ЭВМ следующей конфигурации:

4.1. Центральный процессор Pentium 4 или выше;
4.2. Объем оперативной памяти 512 Мб;
4.3. Видеоадаптер и монитор VGA и выше;
4.4. Стандартная клавиатура;
4.5. Свободного пространства на жестком диске 2Мб;

Для работы программы требуются два IBM-совместимых компьютера, соединенных нуль-модемным кабелем через интерфейс RS-232C.

5. Входные и выходные данные

5.1. Входные данные.

Входными данными является текстовое сообщение, набранное пользователем или файл, выбранный пользователем.

5.2. Выходные данные.

Выходными данными являются:

- текст переданного сообщения на ПЭВМ;
- сообщения об ошибках и выполнении передачи.

6. Спецификация данных

6.1. Внутренние данные

Данные указаны без учета стартовых и стоповых байтов.

Запрос на соединение:

Наименование	Тип поля	Размер (байт)
UPLINK	Byte	1

Поддержание соединения:

Наименование	Тип поля	Размер (байт)
LINKACTIVE	Byte	1

Положительная квитанция:

Наименование	Тип поля	Размер (байт)
ACK	Byte	1

Разрыв соединения:

Наименование	Тип поля	Размер (байт)
DOWNLINK	Byte	1

7. Спецификация функций

```
def main(): - головная функция программы
def configure_window(ser): - окно настроек
def clicked(): - нажатие на кнопку «OK»
def validation(name, com_port, speed_b, size_b, parity_b, bit_stop, ser): - Валидация параметров COM-порта
def cut_port_name(str): - Обрезаем полное имя COM-порта до <COM(цифра)>
def chat(ser): - главное окно программы
def check_connect(): - проверка соединения, посылает сигнал «ACK_LINKACTIVE»
def fn_in(): - функция приема строки
def fn_out(): - запуск основного потока
def fn_send(): - отправление сообщения
def fn_disp(): - отображение сообщения на дисплее
def open_port(): - кнопка «Открыть порт»
def about_program(): - меню
def source_message(): - Окно - Отправленные сообщения
def dest_message(): - Окно - Пришедшие сообщения
```

7.1. Функции в классе SerialBase

Инициализация

```
def port(self, port): – порт
def baudrate(self, baudrate): - пропускная способность
def bytesize(self, bytesize): - размер байта
def parity(self, parity): - бит четности
def stopbits(self, stopbits): - стопбит
def timeout(self, timeout): - таймаут
Настройки:
def write_timeout(self, timeout): - изменить таймаут
def xonxoff(self, xonxoff): - XON/XOFF
def rtscts(self, rtscts): - Change RTS/CTS flow control setting.
def dsrdtr(self, dsrdtr=None): - Change DsrDtr flow control setting.
def inter_byte_timeout(self, ic_timeout): - Change inter-byte timeout setting.
```

```
def __repr__(self): - Отобразить всю информацию о порте
```

7.2. Функции в классе Serial

```
def open(self): - открытие порта
def _reconfigure_port(self): - Set communication parameters on opened port.(настроить порт)
def close(self): - закрытие порта
def _cancel_overlapped_io(self, overlapped): - прекращение чтения/записи данных
def cancel_read(self): - ссылается на _cancel_overlapped_io
def cancel_write(self): - ссылается на _cancel_overlapped_io
def ft_write(self, data): - запись в буффер
def in_waiting(self): - возвращает количество байт в input буффере
def ft_read(self, size=1): - чтение из буффера
```

8. Листинг основных функций

main.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-
from my_package.ft_serial_1 import Serial
from my_package.conf_com_port import configure_window
from my_package.chat import chat

def main():
    ser = Serial()
    configure_window(ser)
    # ser.timeout = 2
    chat(ser)
if __name__== "__main__":
    main()
```

Configurations.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-

"""
COM-порт: Параметры
"""
BAUDRATES = (50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800,
             9600, 19200, 38400, 57600, 115200, 230400, 460800, 500000,
             576000, 921600, 1000000, 1152000, 1500000, 2000000, 2500000,
             3000000, 3500000, 4000000)
PARITY_NONE, PARITY_EVEN, PARITY_ODD, PARITY_MARK, PARITY_SPACE = 'None',
'Even', 'Odd', 'Mark', 'Space'
STOPBITS_ONE, STOPBITS_ONE_POINT_FIVE, STOPBITS_TWO = (1, 1.5, 2)

PARITY_NAMES = {
    PARITY_NONE: 'None',
    PARITY_EVEN: 'Even',
    PARITY_ODD: 'Odd',
    PARITY_MARK: 'Mark',
    PARITY_SPACE: 'Space',
}

FIVEBITS, SIXBITS, SEVENBITS, EIGHTBITS = (5, 6, 7, 8)
BYTESIZES = (FIVEBITS, SIXBITS, SEVENBITS, EIGHTBITS)
PARITIES = (PARITY_NONE, PARITY_EVEN, PARITY_ODD, PARITY_MARK, PARITY_SPACE)
STOPBITS = (STOPBITS_ONE, STOPBITS_ONE_POINT_FIVE, STOPBITS_TWO)
```

ft_serial_1.py:

```
import ctypes
import time
from serial import win32
```

```
from .code_Hemming import *
from .ft_serial import SerialBase, to_bytes
from . import ft_serial

class Serial(SerialBase):
   BAUDRATES = (50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800,
             2400, 4800,9600, 19200, 38400, 57600, 115200)

   def __init__(self, *args, **kwargs):
      self._port_handle = None
      self._overlapped_read = None
      self._overlapped_write = None
      super(Serial, self).__init__(*args, **kwargs)

   """
      Open port with current settings
   """

   def open(self):
      if self._port is None:
         print("ERROR: Port must be configured before it can be used.")
         exit(1)
      if self.is_open:
         print("ERROR: Port is already opened.")
         exit(1)
      port = self.name
      try:
         if port.upper().startswith('COM') and int(port[3:]) > 8:
            port = '\\\\.\\' + port
      except ValueError:
         pass
      self._port_handle = win32.CreateFile(
         port,
         win32.GENERIC_READ | win32.GENERIC_WRITE,
         0, # exclusive access
         None, # no security
         win32.OPEN_EXISTING,
         win32.FILE_ATTRIBUTE_NORMAL | win32.FILE_FLAG_OVERLAPPED,
         0
      )
      """
         Bad COM port
      """
      if self._port_handle == win32.INVALID_HANDLE_VALUE:
         self._port_handle = None
         print("ERROR: Could not open port {}".format(self.port))
         exit(1)

      try:
         self._overlapped_read = win32.OVERLAPPED()
         self._overlapped_read.hEvent = win32.CreateEvent(None, 1, 0, None)
         self._overlapped_write = win32.OVERLAPPED()
         self._overlapped_write.hEvent = win32.CreateEvent(None, 0, 0, None)

         # Setup a 4k buffer
         win32.SetupComm(self._port_handle, 4096, 4096)

         # Save original timeout values:
         self._orgTimeouts = win32.COMMTIMEOUTS()
         win32.GetCommTimeouts(self._port_handle,
ctypes.byref(self._orgTimeouts))

         self._reconfigure_port()
```

```
            win32.PurgeComm(
                self._port_handle,
                win32.PURGE_TXCLEAR | win32.PURGE_TXABORT |
                win32.PURGE_RXCLEAR | win32.PURGE_RXABORT)
        except:
            try:
                self._close()
            except:
                # ignore any exception when closing the port
                # also to keep original exception that happened when setting up
                pass
            self._port_handle = None
            raise
        else:
            self.is_open = True

    def _reconfigure_port(self):
        """Set communication parameters on opened port."""
        if not self._port_handle:
            print("ERROR: Can only operate on a valid port handle")
            exit(1)

        timeouts = win32.COMMTIMEOUTS()
        if self._timeout is None:
            pass
        elif self._timeout == 0:
            timeouts.ReadIntervalTimeout = win32.MAXDWORD
        else:
            timeouts.ReadTotalTimeoutConstant = max(int(self._timeout * 1000), 1)
        if self._timeout != 0 and self._inter_byte_timeout is not None:
            timeouts.ReadIntervalTimeout = max(int(self._inter_byte_timeout *
1000), 1)

        if self._write_timeout is None:
            pass
        elif self._write_timeout == 0:
            timeouts.WriteTotalTimeoutConstant = win32.MAXDWORD
        else:
            timeouts.WriteTotalTimeoutConstant = max(int(self._write_timeout *
1000), 1)

        win32.SetCommTimeouts(self._port_handle, ctypes.byref(timeouts))
        win32.SetCommMask(self._port_handle, win32.EV_ERR)

        """Setup the connection info
            Get state and modify it"""
        comDCB = win32.DCB()
        win32.GetCommState(self._port_handle, ctypes.byref(comDCB))
        """Set baudrate"""
        comDCB.BaudRate = self._baudrate
        """Set bytesize"""
        if self._bytesize == ft_serial.FIVEBITS:
            comDCB.ByteSize = 5
        elif self._bytesize == ft_serial.SIXBITS:
            comDCB.ByteSize = 6
        elif self._bytesize == ft_serial.SEVENBITS:
            comDCB.ByteSize = 7
        elif self._bytesize == ft_serial.EIGHTBITS:
            comDCB.ByteSize = 8

        """Set parity"""
        if self._parity == ft_serial.PARITY_NONE:
            comDCB.Parity = win32.NOPARITY
            comDCB.fParity = 0
```

```
      elif self._parity == ft_serial.PARITY_EVEN:
         comDCB.Parity = win32.EVENPARITY
         comDCB.fParity = 1  # Enable Parity Check
      elif self._parity == ft_serial.PARITY_ODD:
         comDCB.Parity = win32.ODDPARITY
         comDCB.fParity = 1  # Enable Parity Check
      elif self._parity == ft_serial.PARITY_MARK:
         comDCB.Parity = win32.MARKPARITY
         comDCB.fParity = 1  # Enable Parity Check
      elif self._parity == ft_serial.PARITY_SPACE:
         comDCB.Parity = win32.SPACEPARITY
         comDCB.fParity = 1  # Enable Parity Check
      else:
         print("ERROR: Unsupported parity mode: {}".format(self._parity))
         exit(1)

      """Set stopbit"""
      if self._stopbits == ft_serial.STOPBITS_ONE:
         comDCB.StopBits = win32.ONESTOPBIT
      elif self._stopbits == ft_serial.STOPBITS_ONE_POINT_FIVE:
         comDCB.StopBits = win32.ONE5STOPBITS
      elif self._stopbits == ft_serial.STOPBITS_TWO:
         comDCB.StopBits = win32.TWOSTOPBITS
      else:
         print("ERROR: Unsupported number of stop bits:
{!r}".format(self._stopbits))
         exit(1)

      comDCB.fBinary = 1  # Enable Binary Transmission
      # Char. w/ Parity-Err are replaced with 0xff (if fErrorChar is set to
TRUE)
      if self._rs485_mode is None:
         if self._rtscts:
            comDCB.fRtsControl = win32.RTS_CONTROL_HANDSHAKE
         else:
            comDCB.fRtsControl = win32.RTS_CONTROL_ENABLE if self._rts_state
else win32.RTS_CONTROL_DISABLE
         comDCB.fOutxCtsFlow = self._rtscts

      if self._dsrdtr:
         comDCB.fDtrControl = win32.DTR_CONTROL_HANDSHAKE
      else:
         comDCB.fDtrControl = win32.DTR_CONTROL_ENABLE if self._dtr_state else
win32.DTR_CONTROL_DISABLE
      comDCB.fOutxDsrFlow = self._dsrdtr
      comDCB.fOutX = self._xonxoff
      comDCB.fInX = self._xonxoff
      comDCB.fNull = 0
      comDCB.fErrorChar = 0
      comDCB.fAbortOnError = 0
      comDCB.XonChar = ft_serial.XON
      comDCB.XoffChar = ft_serial.XOFF

      if not win32.SetCommState(self._port_handle, ctypes.byref(comDCB)):
         print(
            'ERROR: Cannot configure port, something went wrong. '
            'Original message: {!r}'.format(ctypes.WinError()))
         exit(1)

   """Close port"""
   def close(self):
      if self.is_open:
         self._close()
         self.is_open = False
```

```
    def _close(self):
        if self._port_handle is not None:
            win32.SetCommTimeouts(self._port_handle, self._orgTimeouts)
            if self._overlapped_read is not None:
                self.cancel_read()
                win32.CloseHandle(self._overlapped_read.hEvent)
                self._overlapped_read = None
            if self._overlapped_write is not None:
                self.cancel_write()
                win32.CloseHandle(self._overlapped_write.hEvent)
                self._overlapped_write = None
            win32.CloseHandle(self._port_handle)
            self._port_handle = None

    """##-------------Stop read information-------##"""""
    def _cancel_overlapped_io(self, overlapped):
        """Cancel a blocking read operation, may be called from other thread"""
        # check if read operation is pending
        rc = win32.DWORD()
        err = win32.GetOverlappedResult(
            self._port_handle,
            ctypes.byref(overlapped),
            ctypes.byref(rc),
            False)
        if not err and win32.GetLastError() in (win32.ERROR_IO_PENDING,
win32.ERROR_IO_INCOMPLETE):
            # cancel, ignoring any errors (e.g. it may just have finished on its
own)
            win32.CancelIoEx(self._port_handle, overlapped)

    def cancel_read(self):
        self._cancel_overlapped_io(self._overlapped_read)


    """##-------------Stop write information-------##"""""
    def cancel_write(self):
        self._cancel_overlapped_io(self._overlapped_write)

    """--------------------Write info----------------------"""

    def ft_write(self, data):
        if not self.is_open:
            print("Port is not opened")
            exit(1)
        data_encode = encode(data)
        data_encode_with_errors = set_errors(data_encode)
        data_encode_with_errors = data_encode_with_errors.encode('utf-8')
        n = win32.DWORD()
        success = win32.WriteFile(self._port_handle, data_encode_with_errors,
len(data_encode_with_errors),
                                  ctypes.byref(n), self._overlapped_write)
        self._buffer.append(data_encode_with_errors)
        return len(data)


    def write(self, data):
        if not self.is_open:
            print("Port is not opened")
            exit(1)
        data = to_bytes(data)
        if data:
            n = win32.DWORD()
            success = win32.WriteFile(self._port_handle, data, len(data),
```

```
                                    ctypes.byref(n), self._overlapped_write)
            if self._write_timeout != 0:
               if not success and win32.GetLastError() not in (win32.ERROR_SUCCESS,
win32.ERROR_IO_PENDING):
                  print("WriteFile failed ({!r})".format(ctypes.WinError()))
                  exit(1)
               win32.GetOverlappedResult(self._port_handle, self._overlapped_write,
                                         ctypes.byref(n), True)
               if win32.GetLastError() == win32.ERROR_OPERATION_ABORTED:
                  return n.value
               if n.value != len(data):
                  print("Write timeout")
                  exit(1)
               return n.value
            else:
               errorcode = win32.ERROR_SUCCESS if success else win32.GetLastError()
               if errorcode in (win32.ERROR_INVALID_USER_BUFFER,
win32.ERROR_NOT_ENOUGH_MEMORY,
                                win32.ERROR_OPERATION_ABORTED):
                  return 0
               elif errorcode in (win32.ERROR_SUCCESS, win32.ERROR_IO_PENDING):
                  # no info on true length provided by OS function in async mode
                  return len(data)
               else:
                  print("WriteFile failed ({!r})".format(ctypes.WinError()))
                  exit(1)
         else:
            return 0

      @property
      def in_waiting(self):
         """Return the number of bytes currently in the input buffer."""
         flags = win32.DWORD()
         comstat = win32.COMSTAT()
         if not win32.ClearCommError(self._port_handle, ctypes.byref(flags),
ctypes.byref(comstat)):
            # print("ClearCommError failed ({!r})".format(ctypes.WinError()))
            pass
         return comstat.cbInQue

      """-------------------Read info-----------------"""

      def ft_read(self, size=1):
         if not self.is_open:
            print("ERROR: Port is not opened")
         if size > 0:
            win32.ResetEvent(self._overlapped_read.hEvent)
            flags = win32.DWORD()
            comstat = win32.COMSTAT()
            n = min(comstat.cbInQue, size) if self.timeout == 0 else size
            if n > 0:
               buf = ctypes.create_string_buffer(n)
               rc = win32.DWORD()
               read_ok = win32.ReadFile(self._port_handle,
                                        buf,
                                        n,
                                        ctypes.byref(rc),
                                        ctypes.byref(self._overlapped_read))
               buffer = buf.raw.decode('utf-8')
               buffer = decode(buffer)
               return buffer
         else:
            return []
```

```
   def read(self, size=1):
      if not self.is_open:
         print("ERROR: Port is not opened")
         exit(1)
      if size > 0:
         win32.ResetEvent(self._overlapped_read.hEvent)
         flags = win32.DWORD()
         comstat = win32.COMSTAT()
         if not win32.ClearCommError(self._port_handle, ctypes.byref(flags),
ctypes.byref(comstat)):
            print("ERROR: ClearCommError failed
({!r})".format(ctypes.WinError()))
            exit(1)
         n = min(comstat.cbInQue, size) if self.timeout == 0 else size
         if n > 0:
            buf = ctypes.create_string_buffer(n)
            rc = win32.DWORD()
            read_ok = win32.ReadFile(self._port_handle,
                                     buf,
                                     n,
                                     ctypes.byref(rc),
                                     ctypes.byref(self._overlapped_read))
            if not read_ok and win32.GetLastError() not in (win32.ERROR_SUCCESS,
win32.ERROR_IO_PENDING):
               print("ERROR: ReadFile failed ({!r})".format(ctypes.WinError()))
               exit(1)
            if not read_ok:
               print("ERROR: Something bad")
               return buf.value
            result_ok = win32.GetOverlappedResult(self._port_handle,

ctypes.byref(self._overlapped_read),
                                                  ctypes.byref(rc),
                                                  True)
            if not result_ok:
               if win32.GetLastError() != win32.ERROR_OPERATION_ABORTED:
                  raise SerialException("GetOverlappedResult failed
({!r})".format(ctypes.WinError()))
            read = buf.raw[:rc.value]
         else:
            read = bytes()
      else:
         read = bytes()
      return bytes(read)
```

ft_serial.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-
import io
import time
import sys

PARITY_NONE, PARITY_EVEN, PARITY_ODD, PARITY_MARK, PARITY_SPACE = 'None',
'Even', \
                                                                  'Odd', 'Mark',
'Space'
STOPBITS_ONE, STOPBITS_ONE_POINT_FIVE, STOPBITS_TWO = (1, 1.5, 2)
FIVEBITS, SIXBITS, SEVENBITS, EIGHTBITS = (5, 6, 7, 8)

PARITY_NAMES = {
    PARITY_NONE: 'None',
    PARITY_EVEN: 'Even',
    PARITY_ODD: 'Odd',
```

```
    PARITY_MARK: 'Mark',
    PARITY_SPACE: 'Space',
}

def to_bytes(seq):
    """convert a sequence to a bytes type"""
    if isinstance(seq, bytes):
        return seq
    elif isinstance(seq, bytearray):
        return bytes(seq)
    elif isinstance(seq, memoryview):
        return seq.tobytes()
    elif isinstance(seq, str):
        raise TypeError('unicode strings are not supported, please encode to
bytes: {!r}'.format(seq))
    else:
        # handle list of integers and bytes (one or more items) for Python 2 and
3
        return bytes(bytearray(seq))

# create control bytes
XON = to_bytes([17])
XOFF = to_bytes([19])

CR = to_bytes([13])
LF = to_bytes([10])

class SerialBase(io.RawIOBase):
    """\
    Serial port base class. Provides __init__ function and properties to
    get/set port settings.
    """

    # default values, may be overridden in subclasses that do not support all
values
    BAUDRATES = (50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 4800,
                 9600, 19200, 38400, 57600, 115200, 230400, 460800, 500000,
                 576000, 921600, 1000000, 1152000, 1500000, 2000000, 2500000,
                 3000000, 3500000, 4000000)
    BYTESIZES = (FIVEBITS, SIXBITS, SEVENBITS, EIGHTBITS)
    PARITIES = (PARITY_NONE, PARITY_EVEN, PARITY_ODD, PARITY_MARK, PARITY_SPACE)
    STOPBITS = (STOPBITS_ONE, STOPBITS_ONE_POINT_FIVE, STOPBITS_TWO)

    def __init__(self,
                 port=None,
                 baudrate=9600,
                 bytesize=EIGHTBITS,
                 parity=PARITY_NONE,
                 stopbits=STOPBITS_ONE,
                 timeout=None,
                 xonxoff=False,
                 rtscts=False,
                 write_timeout=None,
                 dsrdtr=False,
                 inter_byte_timeout=None,
                 username = None,
                 **kwargs):
        """Initialize comm port object. If a "port" is given, then the port will
be
            opened immediately. Otherwise a Serial port object in closed state
            is returned.
        """

        self.is_open = False
```

```
        self.portstr = None
        # correct values are assigned below through properties
        self.name = None
        self._port = None
        self._baudrate = None
        self._bytesize = None
        self._parity = None
        self._stopbits = None
        self._timeout = None
        self._write_timeout = None
        self._xonxoff = None
        self._rtscts = None
        self._dsrdtr = None
        self._inter_byte_timeout = None
        self._rs485_mode = None  # disabled by default
        self._rts_state = True
        self._dtr_state = True
        self._break_state = False
        self._exclusive = None
        self._buffer = []
        self._username = None

        # assign values using get/set methods using the properties feature
        self.port = port
        self.baudrate = baudrate
        self.bytesize = bytesize
        self.parity = parity
        self.stopbits = stopbits
        self.timeout = timeout
        self.write_timeout = write_timeout
        self.xonxoff = xonxoff
        self.rtscts = rtscts
        self.dsrdtr = dsrdtr
        self.inter_byte_timeout = inter_byte_timeout

        ##-- Открываем порт
        if port is not None:
            self.open()

    ##-------------Порт----------##
    @property
    def port(self):
            """\
                Get the current port setting. The value that was passed on init
or using
                setPort() is passed back.
            """
            return self._port

    @port.setter
    def port(self, port):
        if port is not None and not isinstance(port, str):
            print("ERROR: \"port\" must be None or a string")
            exit(1)
        was_open = self.is_open
        if was_open:
            self.close()
        self.portstr = port
        self._port = port
        self.name = self.portstr
        if was_open:
            self.open()

    ##---------Скорость--------##
```

```
@property
def baudrate(self):
    return self._baudrate

@baudrate.setter
def baudrate(self, baudrate):
    try:
        b = int(baudrate)
    except TypeError:
        raise ValueError("Not a valid baudrate: {!r}".format(baudrate))
    else:
        if b < 0:
            print("ERROR: \'baudrate\' must be positive")
            exit(1)
        self._baudrate = b
        if self.is_open:
            pass

##____Бит данных____##
@property
def bytesize(self):
    """Get the current byte size setting."""
    return self._bytesize

@bytesize.setter
def bytesize(self, bytesize):
    """Change byte size."""
    if bytesize not in self.BYTESIZES:
        print("ERROR: Not a valid byte size: \'" + str(bytesize) + "\'")
        exit(1)
    self._bytesize = bytesize
    if self.is_open:
        pass
        # self._reconfigure_port()

##____Бит четности____##
@property
def parity(self):
    """Get the current parity setting."""
    return self._parity

@parity.setter
def parity(self, parity):
    """Change parity setting."""
    if parity not in self.PARITIES:
        print("ERROR: Not a valid parity: {!r}".format(parity))
        exit(1)
    self._parity = parity
    if self.is_open:
        pass
        # self._reconfigure_port()

##----------Стопбит----------##
@property
def stopbits(self):
    """Get the current stop bits setting."""
    return self._stopbits

@stopbits.setter
def stopbits(self, stopbits):
    """Change stop bits size."""
    if stopbits not in self.STOPBITS:
        print("ERROR: Not a valid stop bit size: {!r}".format(stopbits))
        exit(1)
```

```
        self._stopbits = stopbits
        if self.is_open:
            pass
            # self._reconfigure_port()

    ##-------------------Set timeout--------------##
    @property
    def timeout(self):
        return self._timeout

    @timeout.setter
    def timeout(self, timeout):
        if timeout is not None:
            try:
                timeout + 1
            except TypeError:
                raise ValueError("Not a valid timeout: {!r}".format(timeout))
            if timeout < 0:
                raise ValueError("Not a valid timeout: {!r}".format(timeout))
        self._timeout = timeout
        if self.is_open:
            self._reconfigure_port()

    ##--------Set the copy of timeout-----------##
    @property
    def write_timeout(self):
        """Get the current timeout setting."""
        return self._write_timeout

    @write_timeout.setter
    def write_timeout(self, timeout):
        """Change timeout setting."""
        if timeout is not None:
            if timeout < 0:
                raise ValueError("Not a valid timeout: {!r}".format(timeout))
            try:
                timeout + 1     # test if it's a number, will throw a TypeError
if not...
            except TypeError:
                raise ValueError("Not a valid timeout: {!r}".format(timeout))

        self._write_timeout = timeout
        if self.is_open:
            self._reconfigure_port()

    ##----------Set xonxoff--------##

    @property
    def xonxoff(self):
        """Get the current XON/XOFF setting."""
        return self._xonxoff

    @xonxoff.setter
    def xonxoff(self, xonxoff):
        """Change XON/XOFF setting."""
        self._xonxoff = xonxoff
        if self.is_open:
            self._reconfigure_port()

    ##---------Set rtscts------------##

    @property
    def rtscts(self):
        """Get the current RTS/CTS flow control setting."""
```

```
        return self._rtscts

    @rtscts.setter
    def rtscts(self, rtscts):
        """Change RTS/CTS flow control setting."""
        self._rtscts = rtscts
        if self.is_open:
            self._reconfigure_port()

    ##----------Set dsrdtr----------##

    @property
    def dsrdtr(self):
        """Get the current DSR/DTR flow control setting."""
        return self._dsrdtr

    @dsrdtr.setter
    def dsrdtr(self, dsrdtr=None):
        """Change DsrDtr flow control setting."""
        if dsrdtr is None:
            # if not set, keep backwards compatibility and follow rtscts setting
            self._dsrdtr = self._rtscts
        else:
            # if defined independently, follow its value
            self._dsrdtr = dsrdtr
        if self.is_open:
            self._reconfigure_port()

    ##----------Set inter byte timeout----------##

    @property
    def inter_byte_timeout(self):
        """Get the current inter-character timeout setting."""
        return self._inter_byte_timeout

    @inter_byte_timeout.setter
    def inter_byte_timeout(self, ic_timeout):
        """Change inter-byte timeout setting."""
        if ic_timeout is not None:
            if ic_timeout < 0:
                raise ValueError("Not a valid timeout: {!r}".format(ic_timeout))
            try:
                ic_timeout + 1      # test if it's a number, will throw a
TypeError if not...
            except TypeError:
                raise ValueError("Not a valid timeout: {!r}".format(ic_timeout))

        self._inter_byte_timeout = ic_timeout
        if self.is_open:
            self._reconfigure_port()

    ##---------Display all info about port----------##
    def __repr__(self):
        """String representation of the current port settings and its state."""
        return '{name}<id=0x{id:x}, open={p.is_open}>(port={p.portstr!r}, ' \
               'baudrate={p.baudrate!r}, bytesize={p.bytesize!r},
parity={p.parity!r}, ' \
               'stopbits={p.stopbits!r}, timeout={p.timeout!r},
xonxoff={p.xonxoff!r}, ' \
               'rtscts={p.rtscts!r}, dsrdtr={p.dsrdtr!r})'.format(
                   name=self.__class__.__name__, id=id(self), p=self)
```

conf_com_port.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-
from tkinter import *
from tkinter.ttk import *
from my_package.configurations import BAUDRATES, BYTESIZES, PARITIES, STOPBITS
import serial
from serial.tools import list_ports
from my_package.validation import validation, cut_port_name

def configure_window(ser):
    """Создание окна настроек параметров"""
    conf_window = Tk()
    conf_window.geometry('500x300')
    conf_window.title('Настройки')

    """Имя пользователя"""
    label_name = Label(conf_window, text='Имя пользователя:', font=("Calibri",
15))
    label_name.grid(row=0, column=0)
    default_name = StringVar(conf_window, value='Andrew')
    name = Entry(conf_window, width=20, textvariable=default_name)
    name.grid(row=0, column=1)

    """COM-port"""
    label_port = Label(conf_window, text='Порт:', font=("Calibri", 15))
    label_port.grid(row=1, column=0)
    com_port = Combobox(conf_window)
    com_port['values'] = cut_port_name(list_ports.comports())
    com_port.current(0)
    com_port.grid(row=1, column=1)

    """Скорость обмена"""
    label_speed = Label(conf_window, text='Скорость:', font=("Calibri", 15))
    label_speed.grid(row=2, column=0)
    speed_b = Combobox(conf_window)
    speed_b['values'] = BAUDRATES
    speed_b.current(12)
    speed_b.grid(row=2, column=1)

    """Размер байта"""
    label_byte_size = Label(conf_window, text='Размер байта:', font=("Calibri",
15))
    label_byte_size.grid(row=3, column=0)
    size_b = Combobox(conf_window)
    size_b['values'] = BYTESIZES
    size_b.current(3)
    size_b.grid(row=3, column=1)

    """Бит четности"""
    label_bit_parity = Label(conf_window, text='Бит четности:', font=("Calibri",
15))
    label_bit_parity.grid(row=4, column=0)
    parity_b = Combobox(conf_window)
    parity_b['values'] = PARITIES
    parity_b.current(0)
    parity_b.grid(row=4, column=1)

    """Стоп бит"""
    label_stop_bit = Label(conf_window, text='Стоп бит:', font=("Calibri", 15))
    label_stop_bit.grid(row=5, column=0)
    bit_stop = Combobox(conf_window)
    bit_stop['values'] = STOPBITS
    bit_stop.current(0)
```

```
    bit_stop.grid(row=5, column=1)

    ##-- Настройки сохраняются
    def clicked():
        if validation(name, com_port, speed_b, size_b, parity_b, bit_stop, ser):
            conf_window.destroy()

    """Кнопка завершения настроек"""
    button = Button(conf_window, text="OK", command=clicked)
    # button.focus_set()
    # button.bind('<Button-1>', clicked)
    # button.bind('<Return>', clicked)
    button.grid(column=2)
    conf_window.mainloop()
```

validation.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-
from tkinter.messagebox import *
from my_package.configurations import BAUDRATES, BYTESIZES, PARITIES, STOPBITS

cut_port = []
##---Обрезаем полное имя COM-порта до <COM(цифра)>
def cut_port_name(str):
    global cut_port
    for i in range(len(str)):
        cut_port.append(str[i])
        cut_port[i] = cut_port[i].device
    return cut_port


def validation(name, com_port, speed_b, size_b, parity_b, bit_stop, ser):
    """
    Валидация параметров COM-порта
    """
    username = name.get()
    if not username:
        showerror("Username isn't define.", "Пожалуйста, введите имя")
        return False
    ser.username = username
    port = com_port.get()
    if port not in cut_port:
        showerror("Bad COM-port.", port + " не существует")
        return False
    ser.port = port
    speed = speed_b.get()
    # speed_u = unicode(speed, 'utf-8')
    if int(speed) not in BAUDRATES:
        showerror("Bad baudrate.", speed + " не существует")
        return False
    ser.baudrate = speed
    byte_size = size_b.get()
    # byte_size_u = unicode(byte_size, 'utf-8')
    if int(byte_size) not in BYTESIZES:
        showerror("Bad bytesize.", byte_size + " не существует")
        return False
    ser.bytesize = int(byte_size)
    parity = parity_b.get()
    if parity not in PARITIES:
        showerror("Bad parity.", parity + " не существует")
        return False
    ser.parity = parity
    stopbits = bit_stop.get()
```

```
    # stopbits_u = unicode(stopbits, 'utf-8')
    # if stopbits_u.isnumeric() == False or float(stopbits) not in STOPBITS:
    try:
        if float(stopbits) not in STOPBITS:
            showerror("Bad stopbit.", stopbits + " не существует")
            return False
    except:
        showerror("Bad stopbit.", stopbits + " не существует")
        return False
    ser.stopbits = float(stopbits)
    return True
```

chat.py:

```
#! /usr/bin/env python
# -*- coding: utf-8 -*-
import threading
import time
from datetime import datetime
from tkinter import *

def chat(ser):
    global out_flag
    global tr_in
    global in_list

    # -- массив полученных строк
    in_list = []
    # -- признаки занятости ввода-вывода
    out_flag = []


    def check_connect():
        time.sleep(10)
        while True:
            if ser.is_open:
                listbox.insert(END, datetime.strftime(datetime.now(), "%H:%M:%S") +
" ACK_LINKACTIVE")
                # ser.write("ACK_LINKACTIVE\r\n".encode('utf-8'))
                ser.ft_write("ACK_LINKACTIVE")
                time.sleep(10)

    global in_st
    in_st = []
    # функция приема строки
    def fn_in():
        global in_list
        global in_st
        while 1:
            if ser.is_open:
                # --ждем прихода к нам строки
                while ser.in_waiting > 0:
                    if ser.is_open:
                        # window.after(10000, check_connect)
                        # in_st = ser.readline()
                        data_to_read = ser.in_waiting
                        in_st = ser.ft_read(data_to_read)
                        # if in_st == b"ACK_LINKACTIVE\r\n":
                        if in_st == "ACK_LINKACTIVE":
                            listbox.insert(END,  datetime.strftime(datetime.now(),
"%H:%M:%S") + " LINKACTIVE")
                            in_st = []
                        else:
                            # if in_st != b'':
```

```
                    if in_st != '':
                        in_list.append(in_st)
            time.sleep(1)    ##-- CPU не будет нагреваться до 100С
                  # in_len = len(in_st)
            ## -- ждем освобождения входного буфера и записываем в него
            # if ser.is_open:
            #  if in_st != []:
            #     in_list.append(in_st)
            #  time.sleep(1)

## -- запустить поток приема
global start_thread
start_thread = 0
tr_in = threading.Thread(target=fn_in)
tr_in.daemon = True
# tr_in.start()

thread_2 = threading.Thread(target=check_connect)
thread_2.daemon = True

## -- запустить основной поток
def fn_out():
    global out_flag
    out_flag = 1

##--Отправление сообщений(через кнопку "Отправить"
global buffer_for_source_message
buffer_for_source_message = []

def fn_send():
    # global user_name
    out_st = enter.get()
    if len(out_st) > 0:
        # ser.write((out_st + '\r\n').encode('utf-8'))
        ser.ft_write((out_st + '\r\n'))
        listbox.insert(END, ser.username + ": " + out_st)
        buffer_for_source_message.append(ser.username + ": " + out_st)
        try:
            listbox_source.insert(END, ser.username + ": " + out_st)
        except:
            print("Source message window is closed")
    enter.delete(0, END)

## == вывести строки в листбокс
global buffer_for_dest_message
buffer_for_dest_message = []

def fn_disp():
    global out_flag
    while len(in_list) > 0:
        st = in_list.pop(0)
        listbox.insert(END, st)
        buffer_for_dest_message.append(st)
        try:
            listbox_dest.insert(END, st)
        except:
            print("Destination message window is closed")
    if out_flag:
        fn_send()
        out_flag = 0
    window.after(100, fn_disp)

window = Tk()
window.geometry('716x400')
```

```
    scrollbar = Scrollbar(window)
    scrollbar.pack(side=RIGHT, fill=Y)

    listbox = Listbox(window, yscrollcommand=scrollbar.set, font=('Calibri', 12))
    listbox.place(x=0, y=0, width=600, height=340)

    scrollbar.config(command=listbox.yview)

    enter = Entry(window, font=('Calibri', 15))
    enter.place(x=0, y=340, width=600, height=40)

    def open_port():
        global tr_in
        global start_thread
        state = DISABLED
        if ser.is_open == False:
            ser.open()
            if ser.is_open:
                listbox.insert(END, "Port " + ser.port + " is opened")
                button_open.config(text="Закрыть порт")
                button_display.config(state=NORMAL)
                # if tr_in._started._flag == False:
                if start_thread == 0:
                    tr_in.start()
                    thread_2.start()
                    start_thread = 1
        else:
            ser.close()
            if ser.is_open == False:
                listbox.insert(END, "Port " + ser.port + " is closed")
                button_open.config(text="Открыть порт")
                button_display.config(state=DISABLED)
    button_open = Button(window, text="Открыть порт", command=open_port)
    button_open.focus_set()
    button_open.place(x=600,y=0, width=100, height=40)

    global counter_info_window
    counter_info_window = 0
    def about_program():
        """Меню-справка о создателях программы
        Количество открытых окон не должно превышать одного"""
        global counter_info_window
        if counter_info_window == 0:
            temp_window = Toplevel(window)
            def close_window():
                global counter_info_window
                counter_info_window -= 1
                temp_window.destroy()
            temp_window.protocol("WM_DELETE_WINDOW", close_window)
            temp_window.title('О программе')
            temp_window.geometry('300x100')
            student_1 = Label(temp_window, text="Анастасия Молева", font=('Arial',
15))
            student_1.grid(row=0,column=0)
            student_2 = Label(temp_window, text="Матиенко Андрей", font=('Arial',
15))
            student_2.grid(row=1,column=0)
            student_3 = Label(temp_window, text="Белоусов Евгений", font=('Arial',
15))
            student_3.grid(row=2,column=0)
            counter_info_window += 1

    mainmenu = Menu(window)
```

```
    window.config(menu=mainmenu)
    mainmenu.add_command(label="О программе", command=about_program)

    ##--Исходящие сообщения(source_message)
    global counter_source_window
    counter_source_window = 0
    def source_message():
        """Окно - Отправленные сообщения
           Если окно открыто, то кнопка становится недоступной"""
        global listbox_source
        global counter_source_window
        if counter_source_window == 0:
            window_source_message = Toplevel(window)
            def close_window():
                global counter_source_window
                counter_source_window -= 1
                window_source_message.destroy()
                button_source_message.config(state='normal')
            window_source_message.protocol("WM_DELETE_WINDOW", close_window)
            window_source_message.title('Исходящие сообщения')
            window_source_message.geometry('600x400+500+200')
            listbox_source = Listbox(window_source_message, font=('Calibri', 12))
            listbox_source.place(x=0, y=0, width=600, height=340)
            counter_source_window += 1
            button_source_message.config(state=DISABLED)
            for i in buffer_for_source_message:
                listbox_source.insert(END, i)

    button_source_message = Button(window, text='Исходящие',
command=source_message, state='normal')
    button_source_message.place(x=600,y=200, width=100,height=40)
    ##----------------

    ##--Приходящие сообщения(destination_message)
    global count_dest_window
    count_dest_window = 0
    def dest_message():
        """Окно - Пришедшие сообщения
           Если окно открыто, то кнопка становится недоступной"""
        global listbox_dest
        global count_dest_window
        if count_dest_window == 0:
            window_dest_message = Toplevel(window)
            def close_window():
                global count_dest_window
                count_dest_window -= 1
                window_dest_message.destroy()
                button_dest_message.config(state='normal')
            window_dest_message.protocol("WM_DELETE_WINDOW", close_window)
            window_dest_message.title('Приходящие сообщения')
            window_dest_message.geometry('600x400+800+200')
            listbox_dest = Listbox(window_dest_message, font=('Calibri', 12))
            listbox_dest.place(x=0, y=0, width=600, height=340)
            button_dest_message.config(state=DISABLED)
            for i in buffer_for_dest_message:
                listbox_dest.insert(END, i)
            count_dest_window += 1

    button_dest_message = Button(window, text='Приходящие', command=dest_message,
state='normal')
    button_dest_message.place(x=600,y=250,width=100,height=40)
    ##---------------------

    button_display = Button(window, text='Отправить', command=fn_out,
```

```
state=DISABLED,)
    button_display.place(x=600, y=340, width=100, height=40)
    window.after(10, fn_disp)
    window.mainloop()
```