

**САНКТ-ПЕТЕРБУРГСКИЙ НАЦИОНАЛЬНЫЙ
ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ ИТМО**

Дисциплина: Веб-программирование

Отчет

Лабораторная работа №1

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Задача №1

Реализовать клиентскую и серверную часть приложения. Клиент отправляет серверу сообщение «Hello, server!». Сообщение должно отразиться на стороне сервера. Сервер в ответ отправляет клиенту сообщение «Hello, client!». Сообщение должно отобразиться у клиента.

Обязательно использовать библиотеку socket.

Реализовать с помощью протокола UDP.

Ход выполнения №1

Код server.py

```
import socket

server_socket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)

server_address = ('localhost', 1234)
server_socket.bind(server_address)

print('Server is on. Waiting for messages...')

while True:
    message, client_address = server_socket.recvfrom(1024)

    print(
        f'Got a message from a client {client_address}: {message.decode()}'
    )

    response = 'Hello, client!'
    server_socket.sendto(response.encode(), client_address)
```

Код client.py

```
import socket

client_socket = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)

server_address = ('localhost', 1234)

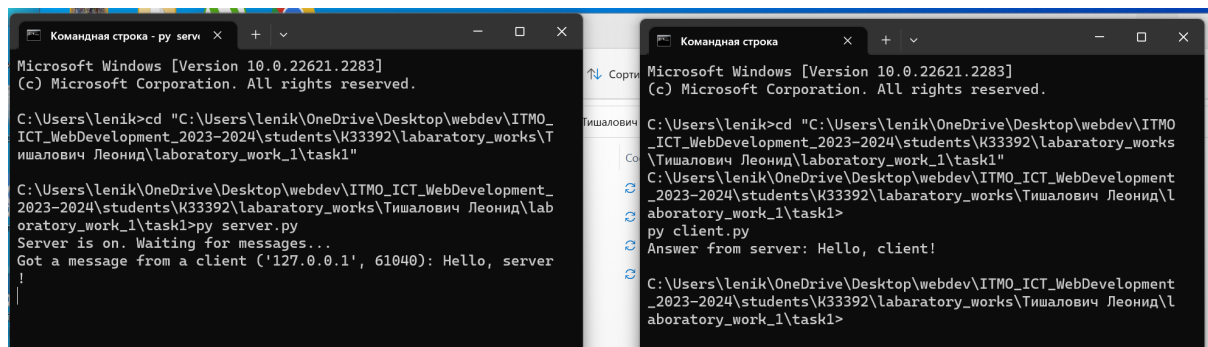
message = 'Hello, server!'
client_socket.sendto(message.encode(), server_address)

response, _ = client_socket.recvfrom(1024)

print(f'Answer from server: {response.decode()}')

client_socket.close()
```

Результат



```
Microsoft Windows [Version 10.0.22621.2283]
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C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task1"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task1>py server.py
Server is on. Waiting for messages...
Got a message from a client ('127.0.0.1', 61040): Hello, server!
```

```
Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task1"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task1>py client.py
Answer from server: Hello, client!
```

Задача №2

Реализовать клиентскую и серверную часть приложения. Клиент запрашивает у сервера выполнение математической операции, параметры, которые вводятся с клавиатуры. Сервер обрабатывает полученные данные и возвращает результат клиенту.

Ход выполнения №2

Код server.py

```
import socket

server_address = ('localhost', 12345)

server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
server_socket.bind(server_address)
server_socket.listen(1)

print("Server is on {}:{}".format(server_address[0], server_address[1]))

def calculate_hypotenuse(a, b):
    return (a ** 2 + b ** 2) ** 0.5

while True:
    client_socket, client_address = server_socket.accept()
    print("Connection from {}:{}".format(client_address[0], client_address[1]))

    try:
        a = float(client_socket.recv(1024).decode('utf-8'))
        b = float(client_socket.recv(1024).decode('utf-8'))

        result = calculate_hypotenuse(a, b)

        client_socket.send(str(result).encode('utf-8'))
    except ValueError:
        client_socket.send("Error: wrong data.".encode('utf-8'))
    except:
        client_socket.send(
            "Error: couldn't handle response.".encode('utf-8'))

    client_socket.close()
```

Код client.py

```
import socket

server_address = ('localhost', 12345)

client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

client_socket.connect(server_address)

while True:
    try:
        a = float(input("Input cathets length: "))
        b = float(input("Input cathets length: "))

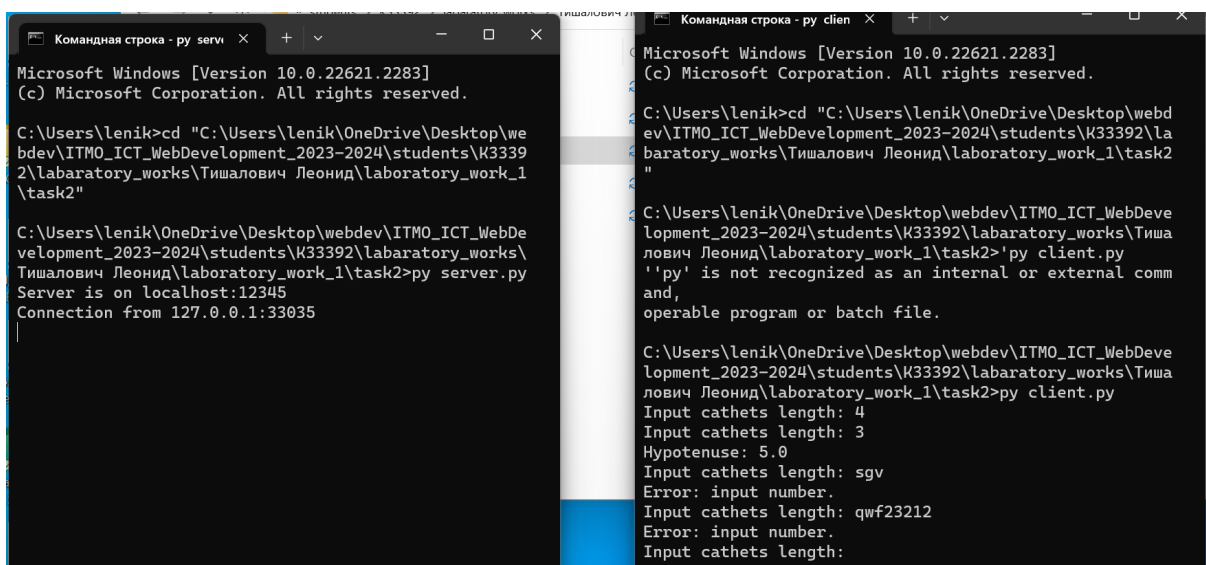
        client_socket.send(str(a).encode('utf-8'))
        client_socket.send(str(b).encode('utf-8'))

        # Получаем результат от сервера
        result = client_socket.recv(1024).decode('utf-8')

        print("Hypotenuse: {}".format(result))
    except ValueError:
        print("Error: input number.")
    except Exception as e:
        print("Error: {}".format(e))
        break

client_socket.close()
```

Результат



The image shows two side-by-side Windows command prompt windows. The left window, titled 'Командная строка - py servi', shows the execution of a server program. The user navigates to the directory 'C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2' and runs 'py server.py'. The server starts listening on localhost:12345 and receives a connection from 127.0.0.1:33035. The right window, titled 'Командная строка - py clien', shows the execution of a client program. The user navigates to the same directory and runs 'py client.py'. The client prompts for two cathetus lengths (4 and 3) and receives the hypotenuse result (5.0) from the server. Subsequent attempts to input 'sgv' and 'qwef23212' result in 'Error: input number.' messages.

```
Microsoft Windows [Version 10.0.22621.2283]
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C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2>py server.py
Server is on localhost:12345
Connection from 127.0.0.1:33035

Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2>'py client.py'
'py' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task2>py client.py
Input cathets length: 4
Input cathets length: 3
Hypotenuse: 5.0
Input cathets length: sgv
Error: input number.
Input cathets length: qwef23212
Error: input number.
Input cathets length:
```

Задача №3

Реализовать серверную часть приложения. Клиент подключается к серверу.

В ответ клиент получает http-сообщение, содержащее html-страницу, которую сервер подгружает из файла index.html.

Обязательно использовать библиотеку socket

Ход выполнения №3

Код server.py

```
import socket

server_address = ('localhost', 1234)

server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

server_socket.bind(server_address)

server_socket.listen(100)

print(f"Server is on {server_address[0]}:{server_address[1]}")

while True:
    client_socket, client_address = server_socket.accept()
    print(f"Connection from {client_address}")

    with open('index.html', 'r', encoding='utf-8') as file:
        html_content = file.read()

    response = f"HTTP/1.1 200 OK\r\nContent-Length: {len(html_content)}\r\n\r\n{html_content}"
    client_socket.sendall(response.encode('utf-8'))

    client_socket.close()
```

Код client.py

```
import socket

server_address = ('localhost', 1234)

client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

client_socket.connect(server_address)

http_request = "GET / HTTP/1.1\r\nHost: localhost\r\n\r\n"
client_socket.sendall(http_request.encode('utf-8'))

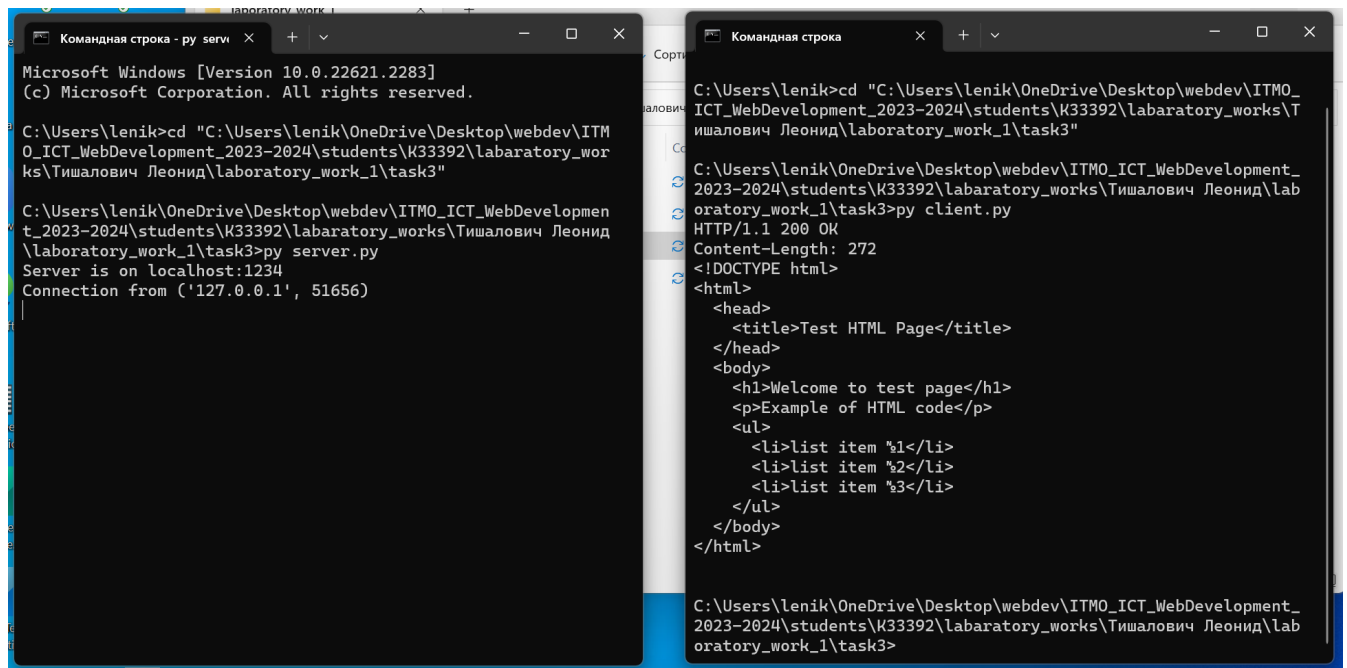
response = b""
while True:
    try:
        data = client_socket.recv(1024)
    except:
        break
    response += data

client_socket.close()

http_response = response.decode('utf-8')
header, html_content = http_response.split('\r\n\r\n', 1)

print(header)
print(html_content)
```

Результат



```
Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task3"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task3>py server.py
Server is on localhost:1234
Connection from ('127.0.0.1', 51656)

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task3"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task3>py client.py
HTTP/1.1 200 OK
Content-Length: 272
<!DOCTYPE html>
<html>
  <head>
    <title>Test HTML Page</title>
  </head>
  <body>
    <h1>Welcome to test page</h1>
    <p>Example of HTML code</p>
    <ul>
      <li>list item %1</li>
      <li>list item %2</li>
      <li>list item %3</li>
    </ul>
  </body>
</html>

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO_ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task3>
```

Задача №4

Реализовать двухпользовательский или многопользовательский чат.

Обязательно использовать библиотеку threading

Ход выполнения

Код server.py

```
import socket
import threading

server_address = ('localhost', 12345)

server_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)

server_socket.bind(server_address)

server_socket.listen(5)

clients = []

def handle_client(client_socket):
    while True:
        try:
            message = client_socket.recv(1024).decode('utf-8')
            if not message:
                break

            for client in clients:
                if client != client_socket:
                    client.send(message.encode('utf-8'))

        except:
            break

    clients.remove(client_socket)
    client_socket.close()

print("Server is on {}:{}".format(server_address[0], server_address[1]))

while True:
    client_socket, client_address = server_socket.accept()
    print("Connection from {}:{}".format(client_address[0], client_address[1]))

    clients.append(client_socket)

    client_thread = threading.Thread(
        target=handle_client, args=(client_socket,))
    client_thread.start()
```

Код client.py

```
import socket
import threading

server_address = ('localhost', 12345)

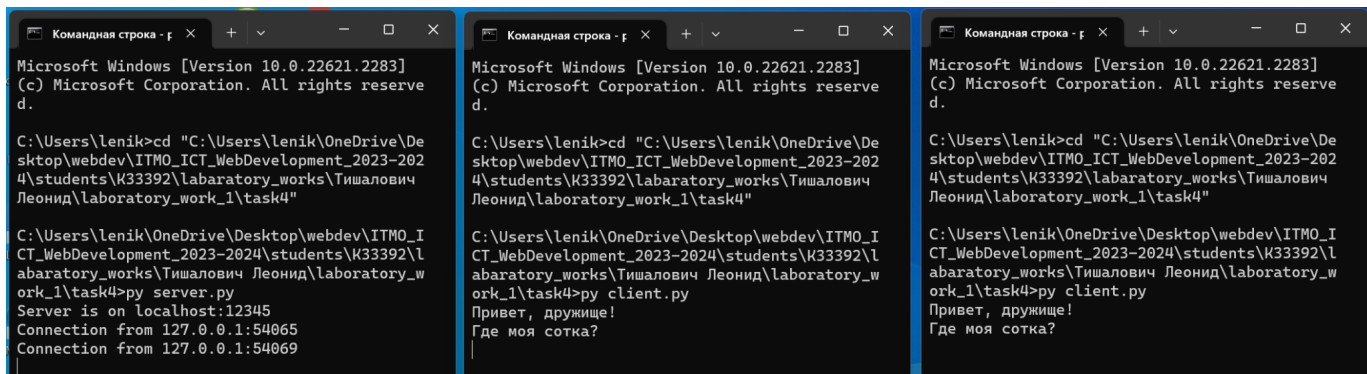
client_socket = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
client_socket.connect(server_address)

def receive_messages():
    while True:
        try:
            message = client_socket.recv(1024).decode('utf-8')
            print(message)
        except:
            break

receive_thread = threading.Thread(target=receive_messages)
receive_thread.start()

while True:
    message = input()
    client_socket.send(message.encode('utf-8'))
```

Результат:



The image shows three side-by-side screenshots of Windows command prompts. The first window shows the execution of 'server.py', which outputs 'Server is on localhost:12345' and shows two incoming connections from 127.0.0.1. The second window shows the execution of 'client.py', which outputs 'Привет, дружище!' and 'Где моя сотка?'. The third window shows the execution of 'client.py' again, outputting 'Привет, дружище!' and 'Где моя сотка?'.

```
Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4>py server.py
Server is on localhost:12345
Connection from 127.0.0.1:54065
Connection from 127.0.0.1:54069

Microsoft Windows [Version 10.0.22621.2283]
(c) Microsoft Corporation. All rights reserved.

C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4>py client.py
Привет, дружище!
Где моя сотка?

Microsoft Windows [Version 10.0.22621.2283]
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C:\Users\lenik>cd "C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4"

C:\Users\lenik\OneDrive\Desktop\webdev\ITMO ICT_WebDevelopment_2023-2024\students\K33392\laboratory_works\Тишалович Леонид\laboratory_work_1\task4>py client.py
Привет, дружище!
Где моя сотка?
```

Вывод:

В ходе лабораторной работы были приобретены навыки работы с библиотекой socket и частично threading. Появилось понимание работы сокетов на практике.