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ДИСЦИПЛИНА:

Распределенные системы

Лабораторная работа 5

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Москва

2024

Лабораторная работа 5.

Реализация механизмов безопасности в распределенной системе. Настройка и тестирование отказоустойчивой системы.

Цель работы

1. Изучение и реализация механизмов безопасности в распределенной системе, таких как аутентификация и шифрование данных.
2. Настройка и тестирование отказоустойчивости распределенной системы.

Задачи

1. Создание сертификатов X.509 для аутентификации.
2. Реализация аутентификации на основе сертификатов X.509.
3. Реализация шифрования данных.
4. Настройка и тестирование отказоустойчивости распределенной системы.

Необходимое программное обеспечение

- - Операционная система: Ubuntu 22.04.
- - Язык программирования: Python 3.
- - Библиотеки: Flask, cryptography.

Работа на паре:

192.168.118.235 — Подключение к удаленному рабочему столу

client.py - Downloads - Power Just now
Low Battery
20% battery remaining

Terminal Help

... client.py x

```
client.py
  3     def make_request():
  4         ...
  5
  6         # Set up verify and cert parameters for SSL/TLS
  7         s = requests.Session()
  8         s.verify = 'ca_cert.pem' # Path to the CA certificate for verification
  9         s.cert = ('client_cert.pem', 'client_key.pem') # Client certificate and key
 10
 11     try:
 12         # Make the HTTPS request without `context`
 13         response = s.post('https://localhost:8000/api/data', json=...)
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

devops@devopsvm:~/Downloads\$ sudo apt-get update
[sudo] password for devops:
Hit:1 http://ru.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://ru.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://ru.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 https://dl.google.com/linux/chrome/deb stable InRelease [1,825 B]
Get:6 http://ru.archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [114 kB]
Get:7 http://ru.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:8 http://ru.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [710 kB]
Get:9 http://ru.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [305 kB]
Get:10 http://ru.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:11 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [7,240 B]
Get:12 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [

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192.168.118.235 — Подключение к удаленному рабочему столу

client.py - Downloads -

Terminal Help

... client.py x

Low Battery
20% battery remaining

```
3 def make_request():
4     """
5
6     # Set up verify and cert parameters for SSL/TLS
7     s = requests.Session()
8     s.verify = 'ca_cert.pem' # Path to the CA certificate for verification
9     s.cert = ('client_cert.pem', 'client_key.pem') # Client certificate and key
10
11    try:
12        # Make the HTTPS request without `context`
13        response = s.post('https://localhost:8000/api/data', json={})
14
15        if response.status_code == 200:
16            print(response.json())
17        else:
18            print(f"Request failed with status code {response.status_code}")
19
20    except requests.exceptions.RequestException as e:
21        print(f"An error occurred: {e}")
22
23
24    finally:
25        s.close()
26
27
28    print("Fetched 1,593 kB in 15s (106 kB/s)")
29    print("Reading package lists... Done")
30
31 ● devops@devopsvm:~/Downloads$ sudo apt-get install -y python3 python3-pip
32 Reading package lists... Done
33 Building dependency tree... Done
34 Reading state information... Done
35 python3 is already the newest version (3.12.3-0ubuntu2).
36 python3 set to manually installed.
37 The following packages will be upgraded:
38   python3-pip
39 1 upgraded, 0 newly installed, 0 to remove and 209 not upgraded.
40 Need to get 0 B/1,317 kB of archives.
41 After this operation, 0 B of additional disk space will be used.
42 (Reading database ... 194424 files and directories currently installed.)
43 Preparing to unpack .../python3-pip_24.0+dfsg-1ubuntu1.1_all.deb ...
44 Unpacking python3-pip (24.0+dfsg-1ubuntu1.1) over (24.0+dfsg-1ubuntu1) ...
45 Setting up python3-pip (24.0+dfsg-1ubuntu1.1) ...
46 Processing triggers for man-db (2.12.0-4build2) ...
47
48 ○ devops@devopsvm:~/Downloads$
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

bash + □ ⚡ ...

Файл Вставить Буфер обмена

Ln 1, Col 1 Spaces: 4 UTF-8 LF Python

192.168.118.235 — Подключение к удаленному рабочему столу

client.py - Downloads - Power Just now

Terminal Help

... client.py x

client.py

```
3 def make_request():
4     ...
5
6     # Set up verify and cert parameters for SSL/TLS
7     s = requests.Session()
8     s.verify = 'ca_cert.pem' # Path to the CA certificate for verification
9     s.cert = ('client_cert.pem', 'client_key.pem') # Client certificate and key
10
11    try:
12        # Make the HTTPS request without 'context'
13        response = s.post('https://localhost:8000/api/data', json=)
14
15        if response.status_code == 200:
16            print(response.json())
17        else:
18            print(f"Request failed with status code {response.status_code}")
19
20
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

● devops@devopsvm:~/Downloads\$ sudo apt-get install -y python3-flask python3-cryptography

Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-cryptography is already the newest version (41.0.7-4ubuntu0.1).
python3-cryptography set to manually installed.
The following additional packages will be installed:
 python3-asgi-ref python3-itsdangerous python3-openssl python3-pyasyncore
 python3-pyinotify python3-simplejson python3-werkzeug
Suggested packages:
 python3-dotenv python3-flask-doc python3-openssl-doc python3-openssl-dbg
 python3-pyinotify-doc ipython3 python3-werkzeug-doc python3-lxml
 python3-watchdog
The following NEW packages will be installed:
 python3-asgi-ref python3-flask python3-itsdangerous python3-openssl
 python3-pyasyncore python3-pyinotify python3-simplejson python3-werkzeug
0 upgraded, 8 newly installed, 0 to remove and 209 not upgraded.
Need to get 429 kB of archives.
After this operation, 2,140 kB of additional disk space will be used.

No Notifications

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E: Unable to locate package opensst

● devops@devopsvm:~/Downloads\$ sudo apt-get install -y openssl

Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
openssl is already the newest version (3.0.13-0ubuntu3.4).
openssl set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 209 not upgraded.

○ devops@devopsvm:~/Downloads\$


```

Subject: C - RU, ST - Some State, O - Internet Widgits Pty Ltd
● devops@devopsvm:~/Downloads$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:da:73:70 brd ff:ff:ff:ff:ff:ff
    inet 192.168.118.236/24 brd 192.168.118.255 scope global dynamic noprefixroute enp0s3
        valid_lft 2425sec preferred_lft 2425sec
3: enp0s10: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:e6:aa:2c brd ff:ff:ff:ff:ff:ff
    inet 192.168.118.235/24 brd 192.168.118.255 scope global dynamic noprefixroute enp0s10
        valid_lft 2427sec preferred_lft 2427sec
    inet6 fe80::72b2:645e:228d:3b7c/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
● devops@devopsvm:~/Downloads$ cd /home/devops/Downloads/lw_05
● devops@devopsvm:~/Downloads/lw_05$ openssl genrsa -out server_key.pem 2048
● devops@devopsvm:~/Downloads/lw_05$ openssl req -new -x509 -key server_key.pem -out server_cert.pem -days 365
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:RU
State or Province Name (full name) [Some-State]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name) []:

```

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

ave some blank
For some fields there will be a default val
ue,
If you enter '.', the field will be left bl
ank.
-----
Country Name (2 letter code) [AU]:RU
State or Province Name (full name) [Some-St
ate]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet W
idgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name)
[]:
Email Address []:
● devops@devopsvm:~/Downloads/lw_05$ python3
server.py
  * Serving Flask app 'server'
  * Debug mode: off
Address already in use
Port 5000 is in use by another program. Eit
her identify and stop that program, or star
t the server with a different port.
● devops@devopsvm:~/Downloads/lw_05$ []
● devops@devopsvm:~/Downloads/lw_05$ python3
server.py
  * Serving Flask app 'server'
  * Debug mode: off
WARNING: This is a development server. Do n
ot use it in a production deployment. Use a
production WSGI server instead.
  * Running on all addresses (0.0.0.0)
  * Running on https://127.0.0.1:5000
  * Running on https://192.168.118.235:5000
Press CTRL+C to quit
● devops@devopsvm:~/Downloads/lw_05$ []

```

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PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```

State or Province Name (full name) [Some-State]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YO
R name) []:
Email Address []:
● devops@devopsvm:~/Downloads/lw_05$ python3 client.py
Request error: HTTPSConnectionPool(host='localhost', port=8000): Max retries exceeded with url: /api/data (Caused by NewConnectionError('<urllib3.connection.HTTPSConnection object at 0x7057efd10b30>: Failed to establish a new connection: [Errno 111] Connection refused'))
● devops@devopsvm:~/Downloads/lw_05$ python3 server.py
* Serving Flask app 'server'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
)
* Running on https://127.0.0.1:5000
* Running on https://192.168.118.235:5000
Press CTRL+C to quit

```

* Running on all addresses (0.0.0.0)
)
* Running on http://127.0.0.1:8000
* Running on http://192.168.118.235:8000
Press CTRL+C to quit

○ devops@devopsvm:~/Downloads/lw_05\$ python3 coordinator.py
* Serving Flask app 'coordinator'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
)
* Running on http://127.0.0.1:8000
* Running on http://192.168.118.235:8000
Press CTRL+C to quit

127.0.0.1 - - [01/Nov/2024 13:24:34] code 400, message Bad request version ("âòwmß»i\x87\x00>\x13\x02\x13\x03\x13\x01A,ÀØ\x00\x9fí®Í»A+À/\x00\x9eÀ\(\x00kÀ#\'\x00gÀ")
127.0.0.1 - - [01/Nov/2024 13:24:34]
"\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x14S\x1c30= \x08þðÀ\x11\x89;j@\x0d\x87øÙ́ð\x85\x18-\x1a\x9enh`"\x16\x9fG\x98çöÜ\x14çjC\x885¥`\x8c\x0eü\x1bNö\x85âòwmß»i\x87\x00>\x13\x02\x13\x03\x13\x01A,ÀØ\x00\x9fí®Í»A+À/\x00\x9eÀ\(\x00kÀ#\'\x00gÀ"
" 400 -

3.connection.HTTPSConnection object at 0x7523f8ba160>: Failed to establish a new connection: [Errno 111] Connection refused"))
● devops@devopsvm:~/Downloads/lw_05\$ curl http://localhost:8000/api/data
Command 'curl' not found, but can be installed with:
sudo snap install curl # version 8.1.2, or
sudo apt install curl # version 8.5.0-2ubuntu10.4
See 'snap info curl' for additional versions.
● devops@devopsvm:~/Downloads/lw_05\$ python3 client.py
SSL error: HTTPSConnectionPool(host='localhost', port=8000): Max retries exceeded with url: /api/data (Caused by SSLError(SSLError(1, '[SSL: WRONG_VERSION_NUMBER] wrong version number (_ssl.c:1000)')))

○ devops@devopsvm:~/Downloads/lw_05\$ python3 client2.py

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

```

State or Province Name (full name) [Some-State]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YO
R name) []:
Email Address []:
● devops@devopsvm:~/Downloads/lw_05$ python3 client.py
Request error: HTTPSConnectionPool(host='localhost', port=8000): Max retries exceeded with url: /api/data (Caused by NewConnectionError('<urllib3.connection.HTTPSConnection object at 0x7057efd10b30>: Failed to establish a new connection: [Errno 111] Connection refused'))
● devops@devopsvm:~/Downloads/lw_05$ python3 server.py
* Serving Flask app 'server'
* Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
* Running on all addresses (0.0.0.0)
)
* Running on https://127.0.0.1:5000
* Running on https://192.168.118.235:5000
Press CTRL+C to quit

```

)

* Running on http://127.0.0.1:8000
* Running on http://192.168.118.235:8000
Press CTRL+C to quit

127.0.0.1 - - [01/Nov/2024 13:24:34] code 400, message Bad request version ("âòwmß»i\x87\x00>\x13\x02\x13\x03\x13\x01A,ÀØ\x00\x9fí®Í»A+À/\x00\x9eÀ\(\x00kÀ#\'\x00gÀ")
127.0.0.1 - - [01/Nov/2024 13:24:34]
"\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x14S\x1c30= \x08þðÀ\x11\x89;j@\x0d\x87øÙ́ð\x85\x18-\x1a\x9enh`"\x16\x9fG\x98çöÜ\x14çjC\x885¥`\x8c\x0eü\x1bNö\x85âòwmß»i\x87\x00>\x13\x02\x13\x03\x13\x01A,ÀØ\x00\x9fí®Í»A+À/\x00\x9eÀ\(\x00kÀ#\'\x00gÀ"
" 400 -

127.0.0.1 - - [01/Nov/2024 13:26:55]
"POST /api/data HTTP/1.1" 503 -
127.0.0.1 - - [01/Nov/2024 13:28:01]
"POST /api/data HTTP/1.1" 503 -
127.0.0.1 - - [01/Nov/2024 13:28:16]
code 400, message Bad request version ('x86Pëö3iiH')
127.0.0.1 - - [01/Nov/2024 13:28:16]
"\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03«Äe\x1f&\x98Á\x82\x04\x98\x1a\x8800%ädk{óç\x88é¤\x9f¤s þå\x8a\x1bHò\x13Í\x09\x86Pëö3iiH" 400 -
127.0.0.1 - - [01/Nov/2024 13:28:36]
"POST /api/data HTTP/1.1" 503 -

DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.

Country Name (2 letter code) [AU]:RU
State or Province Name (full name) [Some-State]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YO
R name) []:
Email Address []:
● devops@devopsvm:~/Downloads/lw_05\$ ● devops@devopsvm:~/Downloads/lw_05\$ python3 client.py
SSL error: HTTPSConnectionPool(host='localhost', port=8000): Max retries exceeded with url: /api/data (Caused by SSLError(SSLError(1, '[SSL: WRONG_VERSION_NUMBER] wrong version number (_ssl.c:1000)')))

● devops@devopsvm:~/Downloads/lw_05\$ python3 client2.py
Ошибка: 503 - {"error": "All servers are down"}

○ devops@devopsvm:~/Downloads/lw_05\$

Вариант №16 Добавление поддержки многоязычности

- Реализуйте в server.py механизм локализации ответов на различные языки.
- Обновите client.py, чтобы он мог указывать предпочтаемый язык при отправке запросов.

Меняем код client.py под условия многоязычности.

```
lw_05 > ✎ client.py
 1  import requests
 2
 3  def make_request():
 4      data = {
 5          "certificate": open('client_cert.pem', 'r').read(),
 6          "data": "some_data",
 7          "language": "en"
 8      }
 9
10     # Set up verify and cert parameters for SSL/TLS
11     s = requests.Session()
12     s.verify = 'ca_cert.pem' # Path to the CA certificate for verifying the server
13     s.cert = ('client_cert.pem', 'client_key.pem') # Client certificate and key
14
15     try:
16         # Make the HTTPS request without `context`
17         response = s.post('https://localhost:8000/api/data', json=data)
18
19         if response.status_code == 200:
20             print(response.json())
21         else:
22             print(f"Error: {response.status_code} - {response.text}")
23
24     except requests.exceptions.SSLError as ssl_error:
25         print(f"SSL error: {ssl_error}")
26     except requests.exceptions.RequestException as req_error:
27         print(f"Request error: {req_error}")
28
29     if __name__ == '__main__':
30         make_request()
```

Добавляем в код server.py в get_data() - preferred_language.

```

lw_05 > server.py
  1  from flask import Flask, request, g
  2  import ssl
  3  from cryptography.hazmat.primitives import hashes
  4  from cryptography.hazmat.primitives.asymmetric import padding
  5  from cryptography.x509 import load_pem_x509_certificate
  6  from cryptography.hazmat.backends import default_backend
  7  from cryptography.fernet import Fernet
  8
  9 app = Flask(__name__)
10
11 @app.before_request
12 def verify_client_cert():
13     cert = request.get_json()['certificate']
14     # Verify certificate against CA
15     if not verify_certificate(cert):
16         return "Invalid certificate", 401
17
18 @app.route('/api/data', methods=['POST'])
19 def get_data():
20     data = request.get_json()['data']
21     preferred_language = request.get_json().get('language', 'en')
22     # Decrypt data
23     decrypted_data = decrypt_data(data)
24     # Process decrypted data
25     return {'result': localization.translations.get(preferred_language, localization.translations['en'])['success']}
26
27 def verify_certificate(cert_pem):
28     # Load certificate
29     certificate = load_pem_x509_certificate(cert_pem.encode(), default_backend())
30     # Verify certificate against CA
31     try:
32         certificate.public_key().verify(
33             certificate.signature,
34             certificate.tbs_certificate_bytes,
35             padding.PKCS1v15(),
36             hashes.SHA256()
37         )
38         return True
39     except:
40         return False
41
42 def decrypt_data(encrypted_data):
43     # Load encryption key
44     key = open('encryption_key.txt', 'rb').read()
45     # Decrypt data
46     cipher = Fernet(key)
47     return cipher.decrypt(encrypted_data.encode())
48
49 if __name__ == '__main__':
50     context = ssl.create_default_context(ssl.Purpose.CLIENT_AUTH)
51     context.load_cert_chain('server_cert.pem', 'server_key.pem')
52     context.verify_mode = ssl.CERT_REQUIRED
53     context.load_verify_locations('ca_cert.pem')
54     app.run(host='0.0.0.0', port=5000, ssl_context=context)

```

Запускаем python3 server.py.

```

● devops@devopsvm:~/Downloads/lw_05$ p
yton3 server.py
 * Serving Flask app 'server'
 * Debug mode: off
WARNING: This is a development server. Do
not use it in a production deployment. Use
a production WSGI server instead.
 * Running on all addresses (0.0.0.0)
 * Running on https://127.0.0.1:5000
 * Running on https://10.193.23.72:5000
Press CTRL+C to quit

```

Параллельно запускаем python3 client.py.

```
● devops@devopsvm:~/Downloads/lw_05$ python3 coordinator.py
  * Serving Flask app 'coordinator'
  * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
  * Running on all addresses (0.0.0.0)
  * Running on http://127.0.0.1:8000
  * Running on http://10.193.23.72:8000
Press CTRL+C to quit
127.0.0.1 - - [15/Nov/2024 13:26:36] code
400, message Bad request version ("ÃœÅP%øE\x9eg@x³V\x17ð:Ãio\x12\x03EG\x88
È6\x9aL\x00>\x13\x02\x13\x03\x13\x01À,À0\x
00\x9fÌ©Ì"Ì¤À+À/\x00\x9eÀ$À(\x00kÀ#À'\x00g
À")
127.0.0.1 - - [15/Nov/2024 13:26:36] "\x16
\x03\x01\x02\x00\x01\x00\x01ü\x03\x037ýqÈ\
x02J"øç¶\x0f\x9dwÈ\x1aI<ç\x1e"Ì¹\x8aê3\x11
Ø\x17*q\x80+ \x9eLÅP%øE\x9eg@x³V\x17ð:
Ãio\x12\x03EG\x88È6\x9aL\x00>\x13\x02\x13\
\x03\x13\x01À,À0\x00\x9fÌ©Ì"Ì¤À+À/\x00\x9eÀ
$À(\x00kÀ#À'\x00gÀ" 400 -
127.0.0.1 - - [15/Nov/2024 13:29:51] "POST
/api/data HTTP/1.1" 503 -
127.0.0.1 - - [15/Nov/2024 13:31:09] "POST
/api/data HTTP/1.1" 503 -
127.0.0.1 - - [15/Nov/2024 13:31:56] "GET
/api/data HTTP/1.1" 405 -
127.0.0.1 - - [15/Nov/2024 13:35:56] code
400, message Bad request version ("ò+\x91F
\x11\x00>\x13\x02\x13\x03\x13\x01À,À0\x00\
\x9fÌ©Ì"Ì¤À+À/\x00\x9eÀ$À(\x00kÀ#À'\x00gÀ")
127.0.0.1 - - [15/Nov/2024 13:35:56] "\x16
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03PmpµØí
3ö\x8eo\x95\x16@o\x19\x81D\x8b(E7ñ*©÷$ßÜì
\x856? 4Ð,ÿWF¹~E)d±æe!\x0f"æ\x8dx 64+I\x8d
\xleò+\x91F\x11\x00>\x13\x02\x13\x03\x13\x
01À,À0\x00\x9fÌ©Ì"Ì¤À+À/\x00\x9eÀ$À(\x00kÀ
#À'\x00gÀ" 400 -
127.0.0.1 - - [15/Nov/2024 13:38:22] "GET
/api/data HTTP/1.1" 405 -
127.0.0.1 - - [15/Nov/2024 13:39:05] code
400, message Bad request version ("±áÓdØS1
\x89êvÉqý\x10\x92²bX<'Jæcz@\'x19Àå\x9f\x00>
\x13\x02\x13\x03\x13\x01À,À0\x00\x9fÌ©Ì"Ì¤
À+À/\x00\x9eÀ$À(\x00kÀ#À'\x00gÀ")
127.0.0.1 - - [15/Nov/2024 13:39:05] "\x16
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x7f\
\x04\x98\x88e\x8d1(hÁÓæè\x8f-}6«<@>D»bÝL\x1
9Ì|\x13\x05\x10 ƒß\x1e±áÓdØS1\x89êvÉqý\x10
\x92²bX<'Jæcz@\'x19Àå\x9f\x00>\x13\x02\x13\
\x03\x13\x01À,À0\x00\x9fÌ©Ì"Ì¤À+À/\x00\x9eÀ
$À(\x00kÀ#À'\x00gÀ" 400 -
127.0.0.1 - - [15/Nov/2024 13:41:58] code
400, message Bad request version ('ÜÍrç{Ôæ
\x97ÉtéÆ(ÜÛ@\'x0eKÛ@e\x16/`2\x03ieæè')
127.0.0.1 - - [15/Nov/2024 13:41:58] "\x16
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03À`K.F
¶o¬äp\x9fp®,r\x96cïç\x1f=\x15ð\x82\x98È\x0
f³; \x16³+ ÜÍrç{Ôæ\x97ÉtéÆ(ÜÛ@\'x0eKÛ@e\x16/
`2\x03ieæè" 400 -
```

Также параллельно запускаем client.py.

Сервер настроен только на HTTP и не поддерживает HTTPS, можно легко адаптировать ваш клиентский код для работы с HTTP. Для этого достаточно убрать параметры, относящиеся к SSL/TLS, такие как verify и cert, и использовать URL с протоколом http:// вместо https://.

То есть запускаем client2.py.

Останавливаем и убеждаемся, что сервер действительно работает и слушает запросы на указанном порту.

```
devops@devopsvm:~/Downloads/lw_05$ openssl
genrsa -out client_key.pem 2048
devops@devopsvm:~/Downloads/lw_05$ openssl
req -new -x509 -key client_key.pem -out c
lient_cert.pem -days 365
You are about to be asked to enter informa
tion that will be incorporated
into your certificate request.
What you are about to enter is what is cal
led a Distinguished Name or a DN.
There are quite a few fields but you can l
eave some blank
For some fields there will be a default va
lue,
If you enter '.', the field will be left b
lank.
-----
Country Name (2 letter code) [AU]:RU
State or Province Name (full name) [Some-S
tate]:
Locality Name (eg, city) []:
Organization Name (eg, company) [Internet
Widgits Pty Ltd]:
Organizational Unit Name (eg, section) []:
Common Name (e.g. server FQDN or YOUR name
) []:
Email Address []:
devops@devopsvm:~/Downloads/lw_05$ python3
client.py
SSL error: HTTPSConnectionPool(host='local
host', port=8000): Max retries exceeded wi
th url: /api/data (Caused by SSLError(SSLE
rror(1, '[SSL: WRONG VERSION NUMBER] wrong
version number (_ssl.c:1000)')))

devops@devopsvm:~/Downloads/lw_05$ python3
client2.py
^Z
[1]+  Stopped                  python3 clie
nt2.py
devops@devopsvm:~/Downloads/lw_05$ python3
client2.py
Ошибка: 503 - {"error":"All servers are do
wn"}

devops@devopsvm:~/Downloads/lw_05$ curl ht
tp://localhost:8000/api/data
<!doctype html>
<html lang=en>
<title>405 Method Not Allowed</title>
<h1>Method Not Allowed</h1>
<p>The method is not allowed for the reque
sted URL.</p>

devops@devopsvm:~/Downloads/lw_05$ tree
.
├── ca-cert.pem
├── ca_cert.pem
├── ca_cert.srl
├── ca_key.pem
├── client1.py
├── client2.py
├── client_cert.pem
├── client_key.pem
├── client.py
├── client_req.pem
├── coordinator.py
├── server1.py
├── server_cert.pem
├── server_key.pem
└── server.py

server_req.pem

1 directory, 16 files
```

По итогу выводим дерево.