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Государственное автономное образовательное учреждение
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Институт цифрового образования
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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

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

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 [7,240 B]

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

Low Battery
20% battery remaining

Terminal Help

client.py

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

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

bash + - [] [X] ...

```
]
Fetched 1,593 kB in 15s (106 kB/s)
Reading package lists... Done
● devops@devopsvm:~/Downloads$ sudo apt-get install -y python3 python3-pip
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3 is already the newest version (3.12.3-0ubuntu2).
python3 set to manually installed.
The following packages will be upgraded:
  python3-pip
1 upgraded, 0 newly installed, 0 to remove and 209 not upgraded.
Need to get 0 B/1,317 kB of archives.
After this operation, 0 B of additional disk space will be used.
(Reading database ... 194424 files and directories currently installed.)
Preparing to unpack .../python3-pip_24.0+dfsg-1ubuntu1.1_all.deb ...
Unpacking python3-pip (24.0+dfsg-1ubuntu1.1) over (24.0+dfsg-1ubuntu1) ...
Setting up python3-pip (24.0+dfsg-1ubuntu1.1) ...
Processing triggers for man-db (2.12.0-4build2) ...
○ devops@devopsvm:~/Downloads$
```

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

Файл
Вставить
Буфер обмена

192.168.118.235 — Подключение к удаленному рабочему столу

client.py - Downloads - Power Just now

Low Battery
20% battery remaining

Terminal Help

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'Error: {response.status_code} {response.text}')
19     except requests.exceptions.RequestException as e:
20         print(f'Error: {e}')
21
```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

bash

```
• 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-asgiref python3-itsdangerous python3-openssl python3-pyasyncore
  python3-pyinotify python3-simplejson python3-werkzeug
Suggested packages:
  python3-dotenv python-flask-doc python-openssl-doc python3-openssl-dbg
  python-pyinotify-doc ipython3 python-werkzeug-doc python3-lxml
  python3-watchdog
The following NEW packages will be installed:
  python3-asgiref 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

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

```
E: Unable to locate package openssl
• 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$
```

```
devops@devopsvm:~/Downloads$ openssl req -x509 -newkey rsa:4096 -keyout ca_key.pem -out ca-cert.pem -days 365 -nodes
```

[illegible]

```
-----
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) []:
Email Address []:
○ devops@devopsvm:~/Downloads$
```

```
devops@devopsvm:~/Downloads$ openssl req -newkey rsa:4096 -keyout server_key.pem  
-out server_req.pem -nodes
```

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) []:
Email Address []:
```

```
Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
```

```
devops@devopsvm:~/Downloads$
```

[illegible]

```

• devops@devopsvm:~/Downloads$ openssl x509 -req -in client_req.pem -CA ca_cert.pem -CAkey ca_key.pem -CAcreateserial -out client_cert.pem -days 365
Certificate request self-signature ok
subject=C = RU, ST = Some-State, O = Internet Widgits Pty Ltd
• devops@devopsvm:~/Downloads$

```

```

Subject: e - NO; 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
			<pre> ave 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) []: Email Address []: • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • devops@devopsvm:~/Downloads/lw_05\$ • 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. Either identify and stop that program, or start the server with a different port. • devops@devopsvm:~/Downloads/lw_05\$ </pre>	<pre> • 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. Either identify and stop that program, or start the server with a different port. • devops@devopsvm:~/Downloads/lw_05\$ </pre>

```

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

```

Ln 5, Col 66 Spaces: 4 UTF-8 LF


```
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 YOUR 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 ("äöwмß½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,Ä0\x00\x9fİ©I"İ=A+Ä/\x00\x9eÄ$A(\x00kA#A'\x00gA")
127.0.0.1 - - [01/Nov/2024 13:24:34] "x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x145\x1c30= \x08bðÄ\x11\x89;@x0d\x870jÜ·ð\x85\x18-\x1a¿~\x9enh³\x16\x9fg\x98çöÜ\x14çjC\x885¥^x8c\x0eü\x1bN0\x85äöwмß½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,Ä0\x00\x9fİ©I"İ=A+Ä/\x00\x9eÄ$A(\x00kA#A'\x00gA" 400 -
○ devops@devopsvm:~/Downloads/lw_05$ python3 client2.py
Ошибка заповса: HTTPSConnectionPool(host='localhost', port=8000): Max retries exceeded with url: /api/data (Caused by NewConnectionError('<urllib3.connection.HTTPSConnection object at 0x74a5e83d5a30>: 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(SSL_ERROR(1, '[SSL: WRONG_VERSION_NUMBER] wrong version number' (ssl.c:1000))))
○ devops@devopsvm:~/Downloads/lw_05$ python3 client2.py
Select Indentation
```

```
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 YOUR 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 ("äöwмß½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,Ä0\x00\x9fİ©I"İ=A+Ä/\x00\x9eÄ$A(\x00kA#A'\x00gA")
127.0.0.1 - - [01/Nov/2024 13:24:34] "x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x145\x1c30= \x08bðÄ\x11\x89;@x0d\x870jÜ·ð\x85\x18-\x1a¿~\x9enh³\x16\x9fg\x98çöÜ\x14çjC\x885¥^x8c\x0eü\x1bN0\x85äöwмß½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,Ä0\x00\x9fİ©I"İ=A+Ä/\x00\x9eÄ$A(\x00kA#A'\x00gA" 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 ("x86Pëð3iIH")
127.0.0.1 - - [01/Nov/2024 13:28:16] "x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x1f6÷\x98A\x82\x04\x98}\x1a¿i\x8800%`ädK{ðç\x88é=\x9f3s Þå\x8a\x1bHò\x13İ¿IF\x09\x86Pëð3iIH" 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 YOUR 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(SSL_ERROR(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$
```

```
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 YOUR 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://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 ("âwmB½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,A0\x00\x9fi@I"i=Å+Å/\x00\x9eÅ$Å(\x00kÅ#Å"\x00gÅ")
127.0.0.1 - - [01/Nov/2024 13:24:34] "\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x91\x14$ \x1c30= \x08pðÅ\x11\x89j@x0d\x870zÜ'ð\x85\x18-\x1a2~\x9enh º\x16\x9fG\x98çöÜ\x14çjC\x885¥^\x8c\x0eü\x1bNö\x85âwmB½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,A0\x00\x9fi@I"i=Å+Å/\x00\x9eÅ$Å(\x00kÅ#Å"\x00gÅ" 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 ("x86Pð3iIH")
127.0.0.1 - - [01/Nov/2024 13:28:16] "\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03«Åe\x1f&+\x98Å\x82\x04\x98»\x1a½I\x8800%âdk{ðç\x88é=\x9f½s Pã\x8a\x1bHð\x13I½IF\x09\x86Pð3iIH" 400 -
127.0.0.1 - - [01/Nov/2024 13:28:36] "POST /api/data HTTP/1.1" 503 -
127.0.0.1 - - [01/Nov/2024 13:31:56] "GET /api/data HTTP/1.1" 405 -

Reading state information... Done
The following NEW packages will be installed:
curl
0 upgraded, 1 newly installed, 0 to remove and 209 not upgraded.
Need to get 227 kB of archives.
After this operation, 534 kB of additional disk space will be used.
Get:1 http://ru.archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu10.4 [227 kB]
Fetched 227 kB in 1s (307 kB/s)
Selecting previously unselected package curl.
(Reading database ... 194697 files and directories currently installed.)
Preparing to unpack .../curl_8.5.0-2ubuntu10.4_amd64.deb ...
Unpacking curl (8.5.0-2ubuntu10.4) ...
Setting up curl (8.5.0-2ubuntu10.4) ...
Processing triggers for man-db (2.12.0-4build2) ...
● devops@devopsvm:~/Downloads/Lw_05$ curl http://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 requested URL.</p>
○ devops@devopsvm:~/Downloads/Lw_05$
```

```
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 YOUR 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://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 ("âwmB½»i\x87\x00>\x13\x02\x13\x03\x13\x01A,A0\x00\x9fi@I"i=Å+Å/\x00\x9eÅ$Å(\x00kÅ#Å"\x00gÅ")
127.0.0.1 - - [01/Nov/2024 13:24:34] "\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03«Åe\x1f&+\x98Å\x82\x04\x98»\x1a½I\x8800%âdk{ðç\x88é=\x9f½s Pã\x8a\x1bHð\x13I½IF\x09\x86Pð3iIH" 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 ("x86Pð3iIH")
127.0.0.1 - - [01/Nov/2024 13:28:16] "\x16\x03\x01\x02\x00\x01\x00\x01ü\x03\x03«Åe\x1f&+\x98Å\x82\x04\x98»\x1a½I\x8800%âdk{ðç\x88é=\x9f½s Pã\x8a\x1bHð\x13I½IF\x09\x86Pð3iIH" 400 -
127.0.0.1 - - [01/Nov/2024 13:28:36] "POST /api/data HTTP/1.1" 503 -
127.0.0.1 - - [01/Nov/2024 13:31:56] "GET /api/data HTTP/1.1" 405 -

Get:1 http://ru.archive.ubuntu.com/ubuntu noble/universe amd64 tree amd64 4.2.1-1-2ubuntu3 [47.1 kB]
Fetched 47.1 kB in 0s (163 kB/s)
Selecting previously unselected package tree.
(Reading database ... 194704 files and directories currently installed.)
Preparing to unpack .../tree_4.2.1-1-2ubuntu3_amd64.deb ...
Unpacking tree (4.2.1-1-2ubuntu3) ...
Setting up tree (4.2.1-1-2ubuntu3) ...
Processing triggers for man-db (2.12.0-4build2) ...
● devops@devopsvm:~/Downloads/Lw_05$ tree
.
├── AFKS.txt
├── ca-cert.pem
├── ca.cert.pem
├── ca.cert.srl
├── ca_key.pem
├── client2.py
├── client_cert.pem
├── client_key.pem
├── client.py
├── coordinator.py
├── server_cert.pem
├── server_key.pem
├── server.py
└── server_req.pem

1 directory, 15 files
○ 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 предпочитаемый 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     except requests.exceptions.SSLError as ssl_error:
24         print(f"SSL error: {ssl_error}")
25     except requests.exceptions.RequestException as req_error:
26         print(f"Request error: {req_error}")
27
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
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://10.193.23.72:5000
Press CTRL+C to quit

```

Параллельно запускаем python3 client.py.


```
● devops@devopssvm:~/Downloads/lw_05$ p  
ython3 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 ("x9e\xxa  
dL8ÜYÄP%øÊ\x9eg@×¼V\17ð:Âío\x12\x03ÉG\x88  
Ë6\x9aL\x00>\x13\x02\x13\x03\x13\x01À,ÅØ\x  
00\x9fİ©Ĭ"Î³Ã+À/\x00\x9eĂŠÁ(\x00kĂ#A'\x00g  
Ă")  
127.0.0.1 - - [15/Nov/2024 13:26:36] "\x16  
\x03\x01\x02\x00\x01\x00\x01ü\x03\x037ýqÆ\  
x02J"øçŕ\u0ff\x9dwÛ.x1aI<Ç\xle"H¹\x8ae3\xl1  
Ö\x17*q\x80+ \x9eL8ÜYÄP%øÊ\x9eg@×¼V\17ð:  
Âío\x12\x03ÉG\x88Ë6\x9aL\x00>\x13\x02\x13\  
x03\x13\x01À,ÅØ\x00\x9fİ©Ĭ"Î³Ã+À/\x00\x9eĂ  
ŠÁ(\x00kĂ#A'\x00gĂ" 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,ÅØ\x00\  
x9fİ©Ĭ"Î³Ã+À/\x00\x9eĂŠÁ(\x00kĂ#A'\x00gĂ")  
127.0.0.1 - - [15/Nov/2024 13:35:56] "\x16  
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03Pmµöİ  
3ö\x8eo\x95\x16ööo\x19\x81B\x8b(E7ñ*¢÷$ßUì  
\x856? 4Ð,yWF³~E)dšáe!\x0f"xæ\x8dx ô4+I\x8d  
\x1eò+\x91F\x11\x00>\x13\x02\x13\x03\x13\x  
01À,ÅØ\x00\x9fİ©Ĭ"Î³Ã+À/\x00\x9eĂŠÁ(\x00kĂ  
#A'\x00gĂ" 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 ("ášódøS1  
\x89êvEqý\x10\x92²bX<' Jącz@\x19Ăä\x9f\x00>  
\x13\x02\x13\x03\x13\x01À,ÅØ\x00\x9fİ©Ĭ"Î³  
Ã+À/\x00\x9eĂŠÁ(\x00kĂ#A'\x00gĂ")  
127.0.0.1 - - [15/Nov/2024 13:39:05] "\x16  
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03\x7f\  
x04\x98\x88e\x8dl(hÃOĤè\x8f-}6«<&@D»byŁ\x1  
9İ|\x13\x05\x10 çB\x1e±áođøS1\x89êvEqý\x10  
\x92²bX<' Jącz@\x19Ăä\x9f\x00>\x13\x02\x13\  
x03\x13\x01À,ÅØ\x00\x9fİ©Ĭ"Î³Ã+À/\x00\x9eĂ  
ŠÁ(\x00kĂ#A'\x00gĂ" 400 -  
127.0.0.1 - - [15/Nov/2024 13:41:58] code  
400, message Bad request version ('Ůİrç{Ôæ  
\x97ÉtéĚ(Űō⊙\x0eK0œe\x16/'2\x03ieää')  
127.0.0.1 - - [15/Nov/2024 13:41:58] "\x16  
\x03\x01\x02\x00\x01\x00\x01ü\x03\x03Ă`K.F  
flo-âpx9fpõ,r\x96cİČ\x1f=\x15ð\x82\x98Ë\x0  
ƒ¾;\x16³+ Ůİrç{Ôæ\x97ÉtéĚ(Űō⊙\x0eK0œe\x16/  
'2\x03ieää'" 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: HTTPConnectionPool(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 reques
ted 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.