

Департамент образования и науки города Москвы
Государственное автономное образовательное учреждение
высшего образования города Москвы
«Московский городской педагогический университет»
Институт цифрового образования
Департамент информатики, управления и технологий

ДИСЦИПЛИНА:

Распределенные системы

Лабораторная работа 2

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Преподаватель: Босенко Т.М.

Москва

2024

Шаг 1. Установка необходимых инструментов.

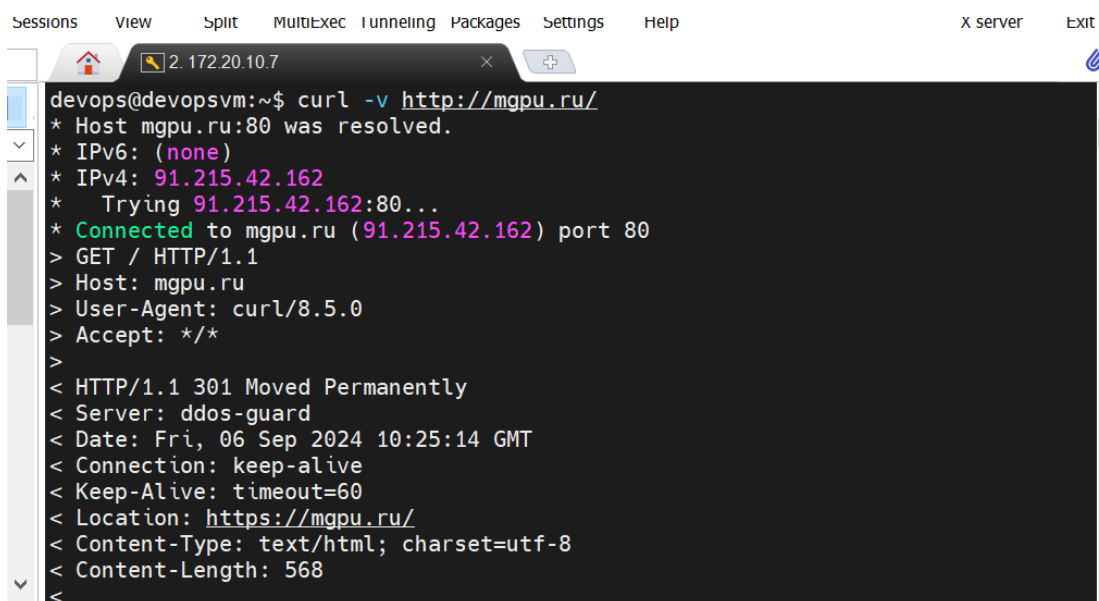
- 1.1. Установка telnet и curl. (Так как в моем случае они уже установлены, пропускаю этот шаг)
- 1.2. Сделать HTTP запрос — это отправить байты в сокет, сделаем с помощью telnet:

```
devops@devopsvm:~$ sudo telnet mgpu.ru 80
[sudo] password for devops:
Trying 91.215.42.162...
Connected to mgpu.ru.
Escape character is '^]'.
Connection closed by foreign host.
devops@devopsvm:~$
```

В ответе нам пришел 301 код и заголовок Location. Сервер попросил нас не ходить по незащищенному HTTP на домен mgpu.ru, а вместо этого пойти по адресу <https://mgpu.ru/>, иными словами открыть TCP соединение, внутри него открыть TLS соединение.

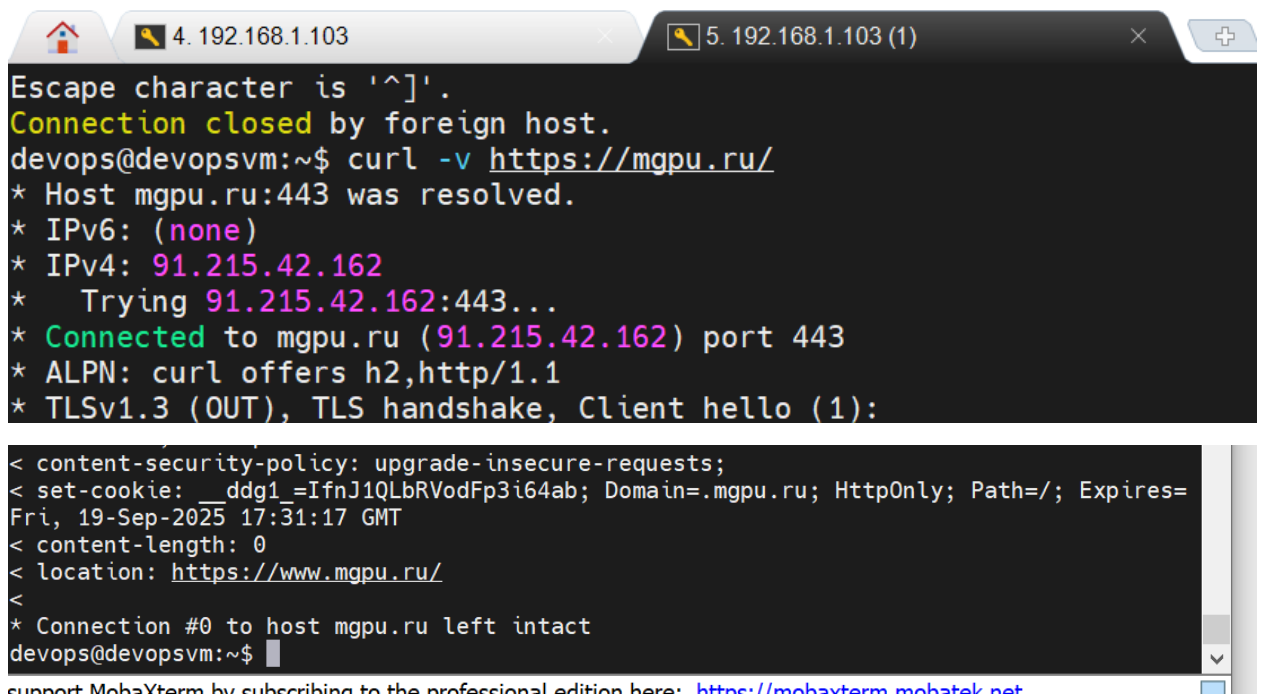
Код 301 Moved Permanently используется как константный редирект и скорее всего в следующий раз браузер не будет делать запрос, на который был получен ответ 301.

Чтобы руками не создавать TLS соединение, давайте воспользуемся утилитой curl. Просто `curl http://mgpu.ru` выведет в stdout тело ответа, stderr будет пустым, а мы хотим посмотреть содержимое запроса. Для этого можно указать опцию `-v`, тогда много дополнительной информации будет выведено в stderr:



```
devops@devopsvm:~$ curl -v http://mgpu.ru/
* Host mgpu.ru:80 was resolved.
* IPv6: (none)
* IPv4: 91.215.42.162
* Trying 91.215.42.162:80...
* Connected to mgpu.ru (91.215.42.162) port 80
> GET / HTTP/1.1
> Host: mgpu.ru
> User-Agent: curl/8.5.0
> Accept: */*
>
< HTTP/1.1 301 Moved Permanently
< Server: ddos-guard
< Date: Fri, 06 Sep 2024 10:25:14 GMT
< Connection: keep-alive
< Keep-Alive: timeout=60
< Location: https://mgpu.ru/
< Content-Type: text/html; charset=utf-8
< Content-Length: 568
<
```

Видим, что нас опять просят проследовать по новому URL:

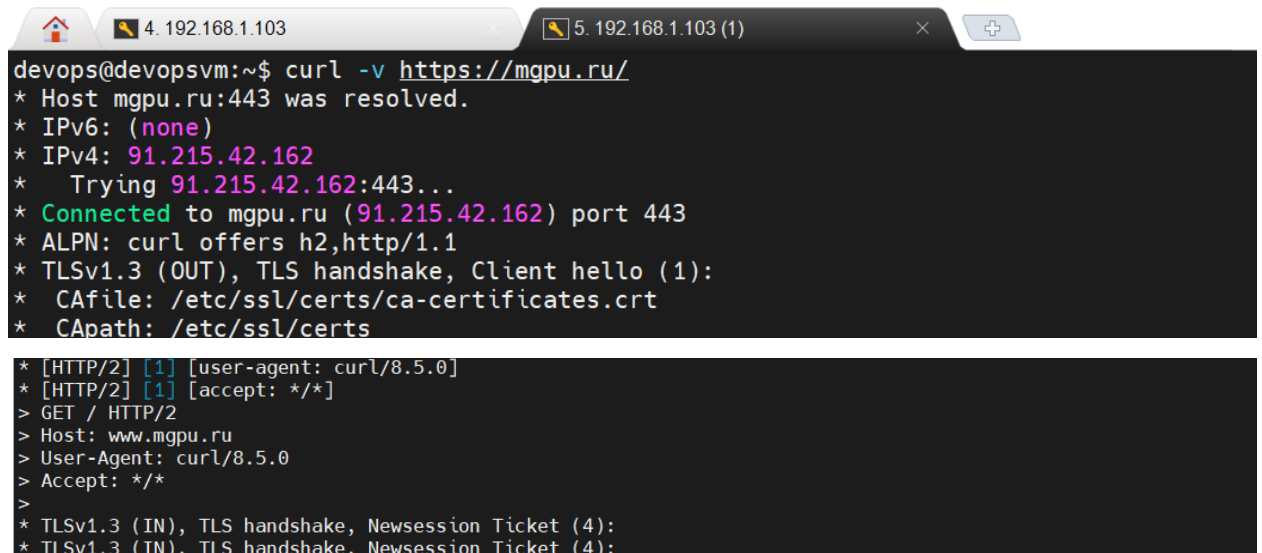


```
Escape character is '^['.
Connection closed by foreign host.
devops@devopsvm:~$ curl -v https://mgpu.ru/
* Host mgpu.ru:443 was resolved.
* IPv6: (none)
* IPv4: 91.215.42.162
* Trying 91.215.42.162:443...
* Connected to mgpu.ru (91.215.42.162) port 443
* ALPN: curl offers h2,http/1.1
* TLSv1.3 (OUT), TLS handshake, Client hello (1):

< content-security-policy: upgrade-insecure-requests;
< set-cookie: __ddg1=IfnJ1QLbRVodFp3i64ab; Domain=.mgpu.ru; HttpOnly; Path=/; Expires=
Fri, 19-Sep-2025 17:31:17 GMT
< content-length: 0
< location: https://www.mgpu.ru/
<
* Connection #0 to host mgpu.ru left intact
devops@devopsvm:~$
```

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Видим, что нас опять просят проследовать по новому URL HTTP/2 301 location: https://www.mgpu.ru/.



```
devops@devopsvm:~$ curl -v https://mgpu.ru/
* Host mgpu.ru:443 was resolved.
* IPv6: (none)
* IPv4: 91.215.42.162
* Trying 91.215.42.162:443...
* Connected to mgpu.ru (91.215.42.162) port 443
* ALPN: curl offers h2,http/1.1
* TLSv1.3 (OUT), TLS handshake, Client hello (1):
* CAfile: /etc/ssl/certs/ca-certificates.crt
* CApath: /etc/ssl/certs

* [HTTP/2] [1] [user-agent: curl/8.5.0]
* [HTTP/2] [1] [accept: */*]
> GET / HTTP/2
> Host: www.mgpu.ru
> User-Agent: curl/8.5.0
> Accept: */*
>
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
```

Прекрасно, мы получили ответ 200, причём curl выбрал HTTP/2 для запроса, и мы видим новую версию в тексте.

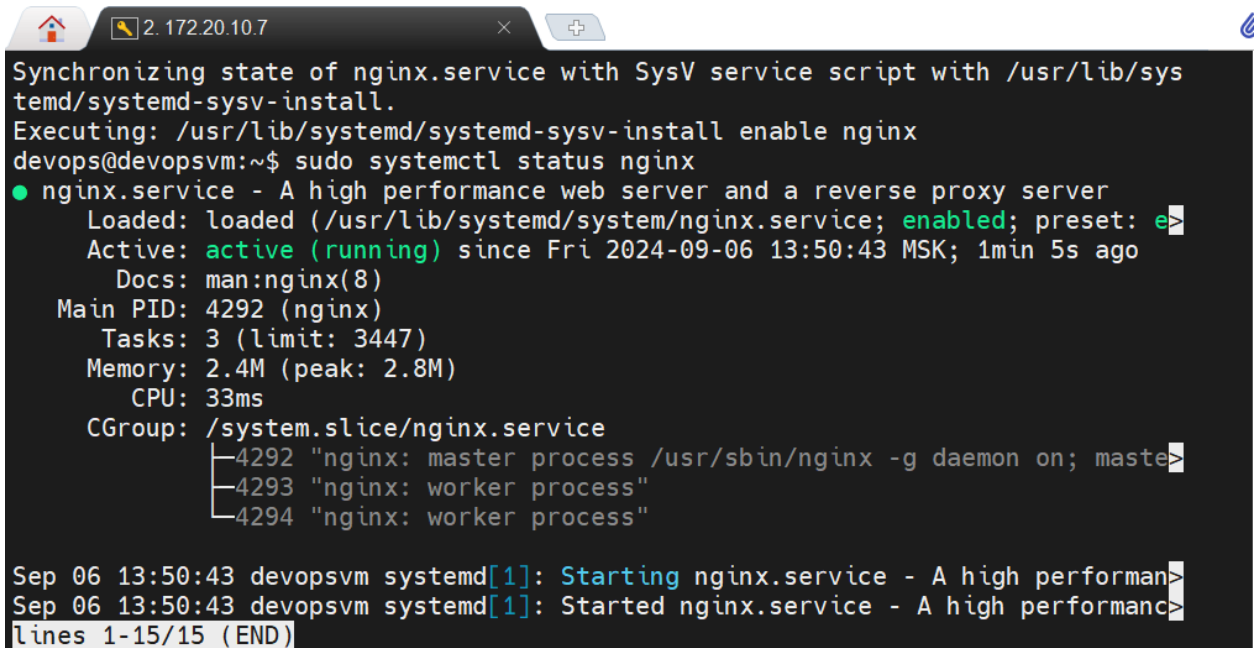
Теперь давайте повторим этот же запрос через браузер и наблюдаем воочию все эти редиректы.

The screenshot shows a web browser with the URL `mgpu.ru`. The page displays a banner for "ДОПОЛНИТЕЛЬНОЕ ОБРАЗОВАНИЕ В МГПУ" (Additional Education at MGPU) with the text "Даем знания, меняющие жизнь" (We give knowledge that changes life) and a button "Маркетплейс программ" (Marketplace of programs). Below the banner is a section titled "Главные новости" (Main news). The DevTools Network tab is open, showing a list of requests. The selected request is a GET request to `http://mgpu.ru/` with a status code of 301 Moved Permanently. The response headers show the remote address as `91.215.42.162:80` and the referer policy as `strict-origin-when-cross-origin`.

The screenshot shows the same web browser with the URL `mgpu.ru`. The page displays a banner for "RED BRICK 2024" with the text "17 сентября поражают для новеньких, вечеринка для всех" (September 17th is a surprise for newcomers, a party for everyone) and a button "Получить билет" (Get ticket). Below the banner is a section titled "Главные новости" (Main news). The DevTools Network tab is open, showing a list of requests. The selected request is a GET request to `https://www.mgpu.ru/` with a status code of 200 OK. The response headers show the remote address as `91.215.42.162:443` and the referer policy as `strict-origin-when-cross-origin`. The content encoding is `gzip`.

1.3. Установите и настройте nginx.

1.4. Проверьте статус работы nginx.

A terminal window with a dark background and light text. The title bar shows a home icon, a network icon, and the IP address 2.172.20.10.7. The terminal output shows the process of synchronizing the nginx.service state with the SysV service script, enabling it, and then checking its status with 'systemctl status nginx'. The status output shows that the service is loaded, active (running), and has been running since Fri 2024-09-06 13:50:43 MSK. It lists the main PID as 4292 and shows three tasks (one master and two workers). The bottom of the terminal shows the start of the service log.

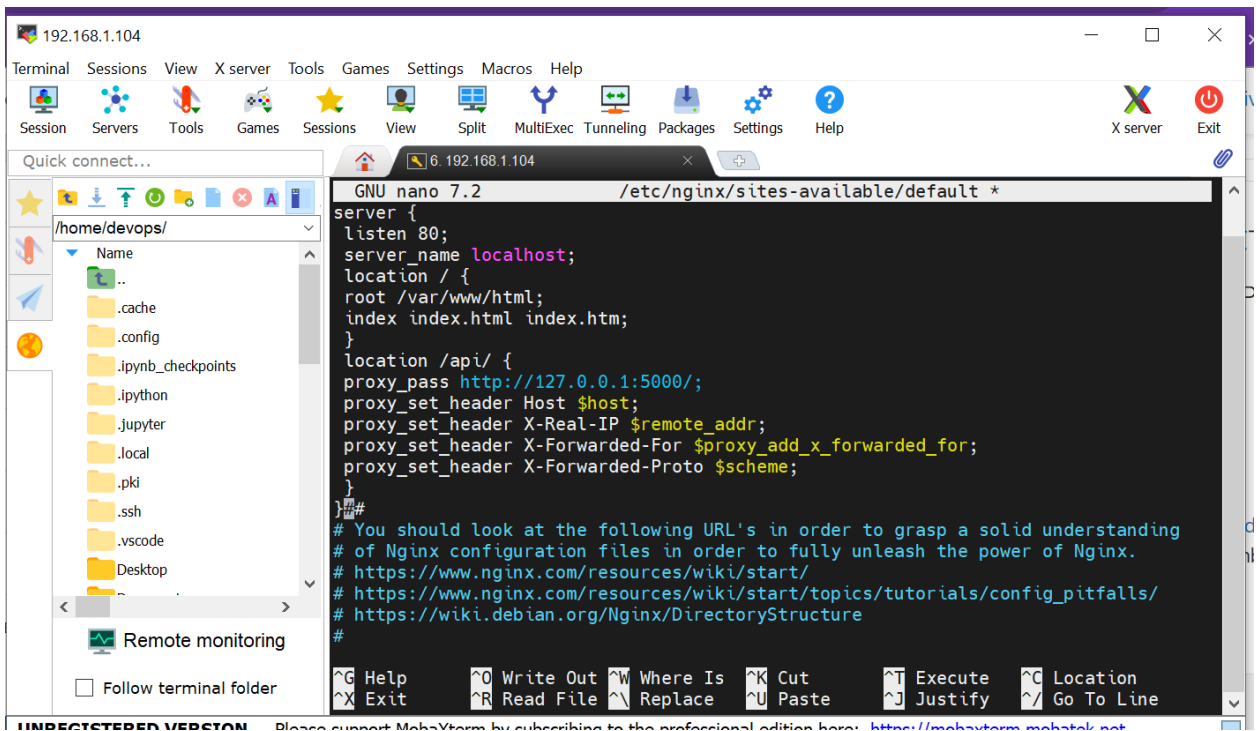
```
Synchronizing state of nginx.service with SysV service script with /usr/lib/sy
temd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable nginx
devops@devopsvm:~$ sudo systemctl status nginx
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset: ena
   Active: active (running) since Fri 2024-09-06 13:50:43 MSK; 1min 5s ago
     Docs: man:nginx(8)
  Main PID: 4292 (nginx)
    Tasks: 3 (limit: 3447)
   Memory: 2.4M (peak: 2.8M)
      CPU: 33ms
   CGroup: /system.slice/nginx.service
           └─4292 "nginx: master process /usr/sbin/nginx -g daemon on; maste
              └─4293 "nginx: worker process"
                 └─4294 "nginx: worker process"

Sep 06 13:50:43 devopsvm systemd[1]: Starting nginx.service - A high performan
Sep 06 13:50:43 devopsvm systemd[1]: Started nginx.service - A high performan
lines 1-15/15 (END)
```

1.5. Откройте конфигурационный файл nginx для редактирования

```
devops@devopsvm:~$ sudo nano /etc/nginx/sites-available/default
```

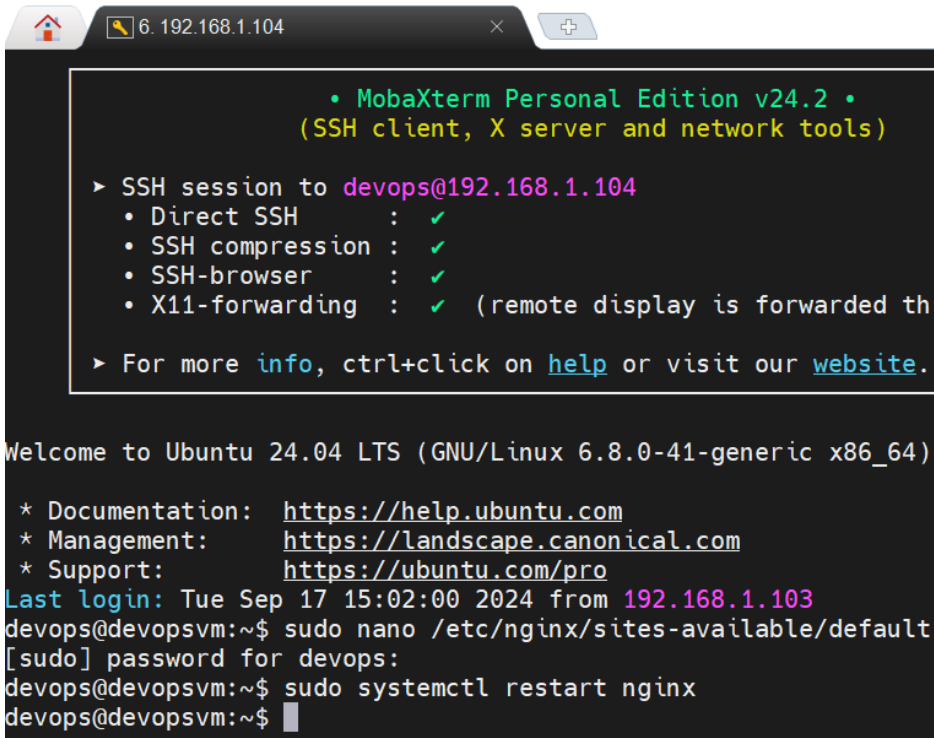
1.6. Настройте виртуальный хост для обработки запросов к вашему локальному сайту:

A screenshot of a terminal window running GNU nano 7.2. The terminal is displaying the configuration file /etc/nginx/sites-available/default. The configuration includes a server block listening on port 80, with a server_name of localhost. It has a default location for / and a proxy_pass configuration for /api/. The terminal window has a menu bar with options like Terminal, Sessions, View, X server, Tools, Games, Settings, Macros, Help. On the left, there is a file explorer showing the contents of /home/devops/. The bottom of the terminal shows a status bar with various keyboard shortcuts and a notice about the unregistered version of MobaXterm.

```
GNU nano 7.2 /etc/nginx/sites-available/default *
server {
    listen 80;
    server_name localhost;
    location / {
        root /var/www/html;
        index index.html index.htm;
    }
    location /api/ {
        proxy_pass http://127.0.0.1:5000/;
        proxy_set_header Host $host;
        proxy_set_header X-Real-IP $remote_addr;
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_set_header X-Forwarded-Proto $scheme;
    }
}

#
# You should look at the following URL's in order to grasp a solid understanding
# of Nginx configuration files in order to fully unleash the power of Nginx.
# https://www.nginx.com/resources/wiki/start/
# https://www.nginx.com/resources/wiki/start/topics/tutorials/config_pitfalls/
# https://wiki.debian.org/Nginx/DirectoryStructure
#
```

1.7. Перезапустите nginx для применения настроек:



```
• MobaXterm Personal Edition v24.2 •
(SSH client, X server and network tools)

> SSH session to devops@192.168.1.104
  • Direct SSH      : ✓
  • SSH compression : ✓
  • SSH-browser     : ✓
  • X11-forwarding  : ✓ (remote display is forwarded th

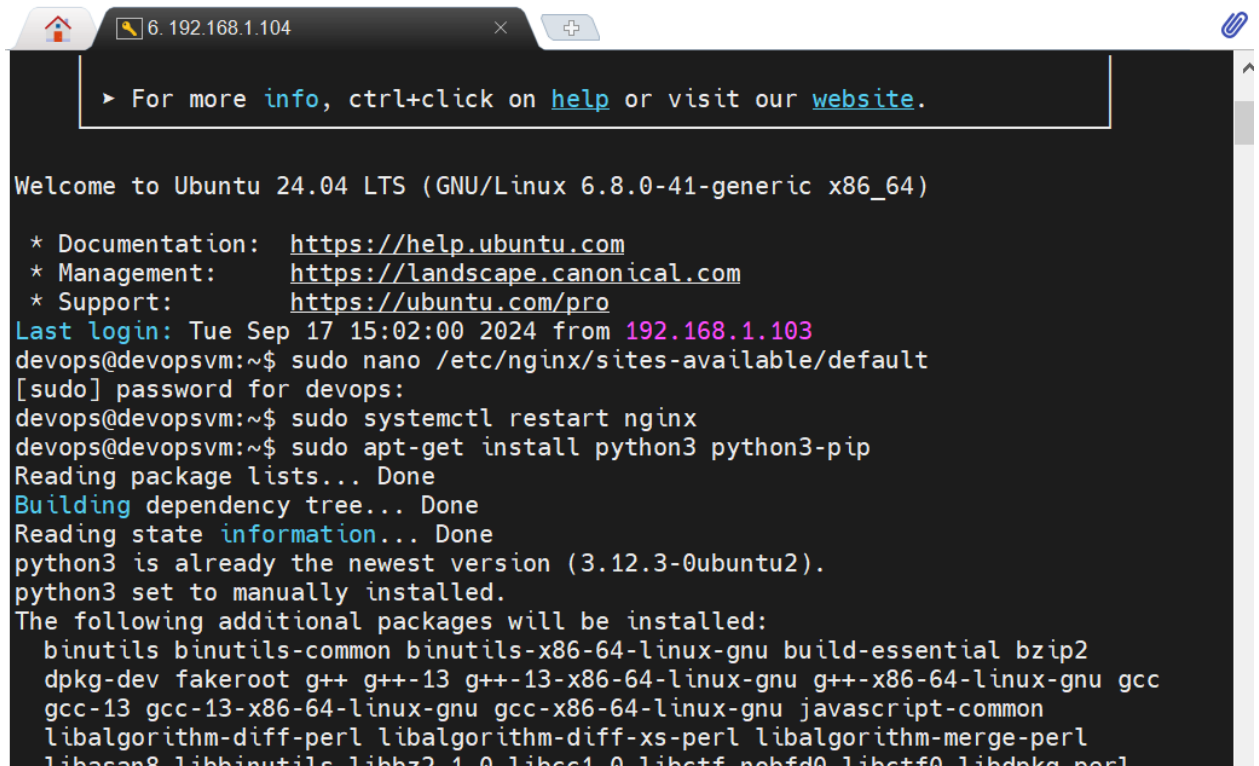
> For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-41-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Last login: Tue Sep 17 15:02:00 2024 from 192.168.1.103
devops@devopsvm:~$ sudo nano /etc/nginx/sites-available/default
[sudo] password for devops:
devops@devopsvm:~$ sudo systemctl restart nginx
devops@devopsvm:~$
```

Шаг 2. Реализация простого REST API на Python

2.1. Установить Python и необходимые модули:

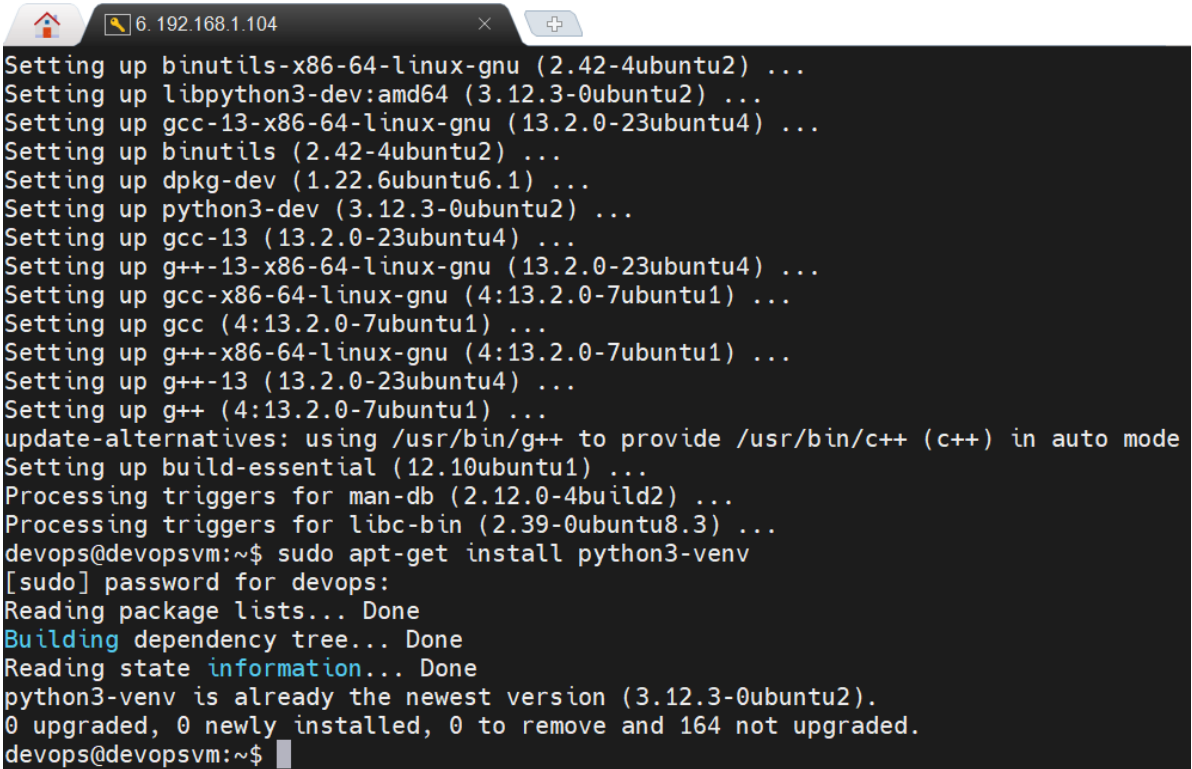


```
> For more info, ctrl+click on help or visit our website.

Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-41-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/pro
Last login: Tue Sep 17 15:02:00 2024 from 192.168.1.103
devops@devopsvm:~$ sudo nano /etc/nginx/sites-available/default
[sudo] password for devops:
devops@devopsvm:~$ sudo systemctl restart nginx
devops@devopsvm:~$ sudo apt-get install 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 additional packages will be installed:
  binutils binutils-common binutils-x86-64-linux-gnu build-essential bzip2
  dpkg-dev fakeroot g++ g++-13 g++-13-x86-64-linux-gnu g++-x86-64-linux-gnu gcc
  gcc-13 gcc-13-x86-64-linux-gnu gcc-x86-64-linux-gnu javascript-common
  libalgorithm-diff-perl libalgorithm-diff-xs-perl libalgorithm-merge-perl
  libasan8 libbinutils libbz2-1.0 libc6-1 libc6-i386 libcctf-nobfd0 libcctf0 libdpkg-perl
```


2.2. Установить пакет Virtualenv:



```
Setting up binutils-x86-64-linux-gnu (2.42-4ubuntu2) ...
Setting up libpython3-dev:amd64 (3.12.3-0ubuntu2) ...
Setting up gcc-13-x86-64-linux-gnu (13.2.0-23ubuntu4) ...
Setting up binutils (2.42-4ubuntu2) ...
Setting up dpkg-dev (1.22.6ubuntu6.1) ...
Setting up python3-dev (3.12.3-0ubuntu2) ...
Setting up gcc-13 (13.2.0-23ubuntu4) ...
Setting up g++-13-x86-64-linux-gnu (13.2.0-23ubuntu4) ...
Setting up gcc-x86-64-linux-gnu (4:13.2.0-7ubuntu1) ...
Setting up gcc (4:13.2.0-7ubuntu1) ...
Setting up g++-x86-64-linux-gnu (4:13.2.0-7ubuntu1) ...
Setting up g++-13 (13.2.0-23ubuntu4) ...
Setting up g++ (4:13.2.0-7ubuntu1) ...
update-alternatives: using /usr/bin/g++ to provide /usr/bin/c++ (c++) in auto mode
Setting up build-essential (12.10ubuntu1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.3) ...
devops@devopsvm:~$ sudo apt-get install python3-venv
[sudo] password for devops:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-venv is already the newest version (3.12.3-0ubuntu2).
0 upgraded, 0 newly installed, 0 to remove and 164 not upgraded.
devops@devopsvm:~$
```

2.3. Создать новую виртуальную среду Python

2.4. После создания виртуальной среды для ее активации выполнить

2.5. Независимо от того, используется виртуальная среда или нет, команда менеджера пакетов PIP для установки Flask будет одинаковой для обоих случаев.

2.6. Проверить версию flask

Далее скрин выполнения этих шагов:

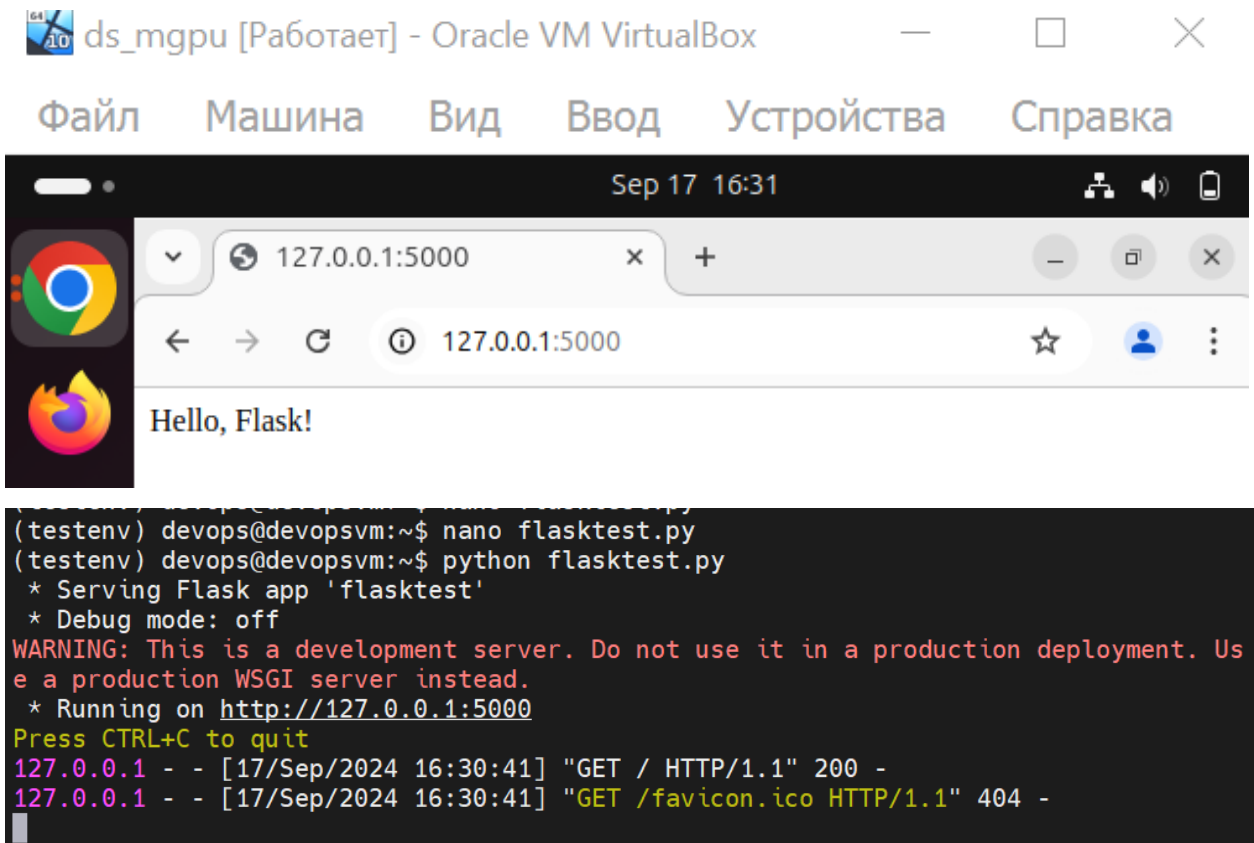
```
Reading state information... Done
python3-venv is already the newest version (3.12.3-0ubuntu2).
0 upgraded, 0 newly installed, 0 to remove and 164 not upgraded.
devops@devopsvm:~$ python3 -m venv testenv
devops@devopsvm:~$ source testenv/bin/activate
(testenv) devops@devopsvm:~$ pip install flask
Requirement already satisfied: flask in ./testenv/lib/python3.12/site-packages (3.0.3)
Requirement already satisfied: Werkzeug>=3.0.0 in ./testenv/lib/python3.12/site-packages (from flask) (3.0.4)
Requirement already satisfied: Jinja2>=3.1.2 in ./testenv/lib/python3.12/site-packages (from flask) (3.1.4)
Requirement already satisfied: itsdangerous>=2.1.2 in ./testenv/lib/python3.12/site-packages (from flask) (2.2.0)
Requirement already satisfied: click>=8.1.3 in ./testenv/lib/python3.12/site-packages (from flask) (8.1.7)
Requirement already satisfied: blinker>=1.6.2 in ./testenv/lib/python3.12/site-packages (from flask) (1.8.2)
Requirement already satisfied: MarkupSafe>=2.0 in ./testenv/lib/python3.12/site-packages (from Jinja2>=3.1.2->flask) (2.1.5)
(testenv) devops@devopsvm:~$ flask --version
Python 3.12.3
Flask 3.0.3
Werkzeug 3.0.4
(testenv) devops@devopsvm:~$
```

Шаг 3. Тестирование.

3.1. Создать файл с именем – flasktest.py

```
GNU nano 7.2 flasktest.py
import flask
app = flask.Flask(__name__)
@app.route('/')
def hello_world():
    return 'Hello, Flask!'
if __name__ == '__main__':
    app.run()
```

3.3. Проверка работы приложения flask 127.0.0.1:5000

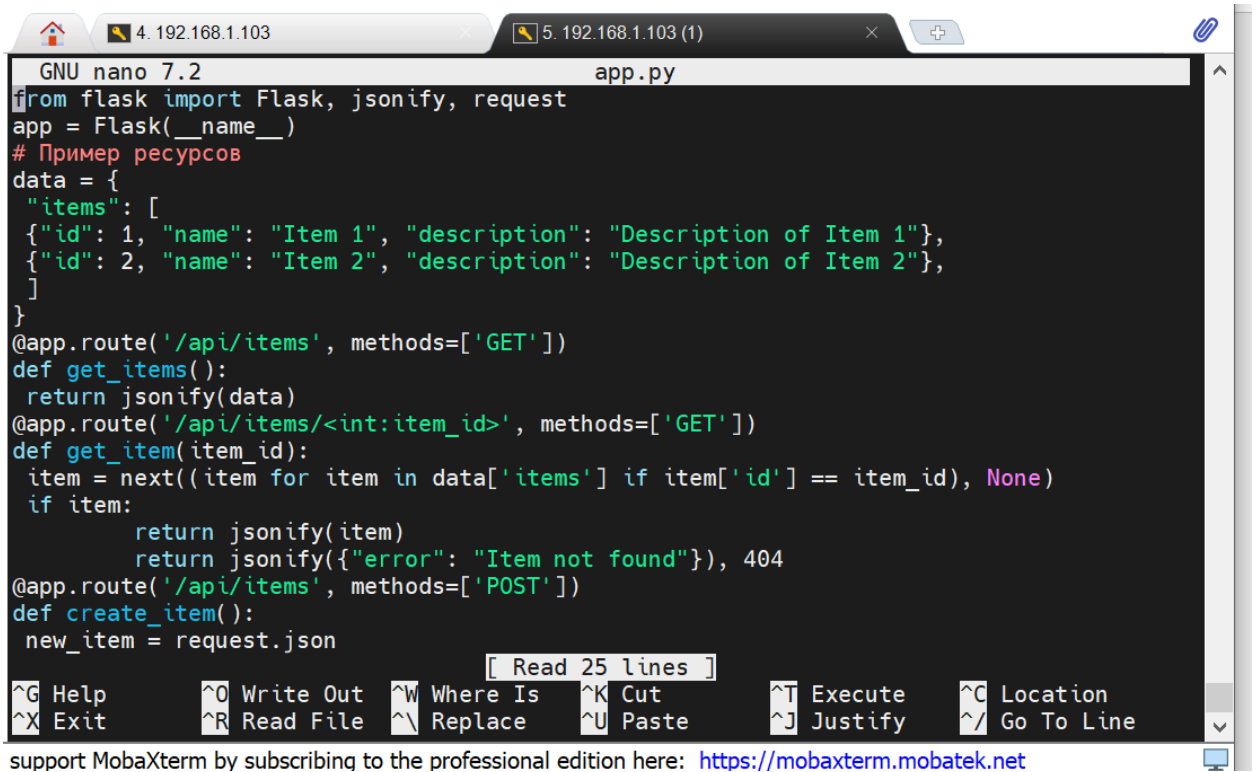


Остановить процесс fuser -k 5000/tcp

```
(testenv) devops@devopsvm:~$ fuser -k 5000/tcp
(testenv) devops@devopsvm:~$
```

Шаг 4. Создать простой Flask API.

```
(testenv) devops@devopsvm:~$ nano app.py
(testenv) devops@devopsvm:~$
```



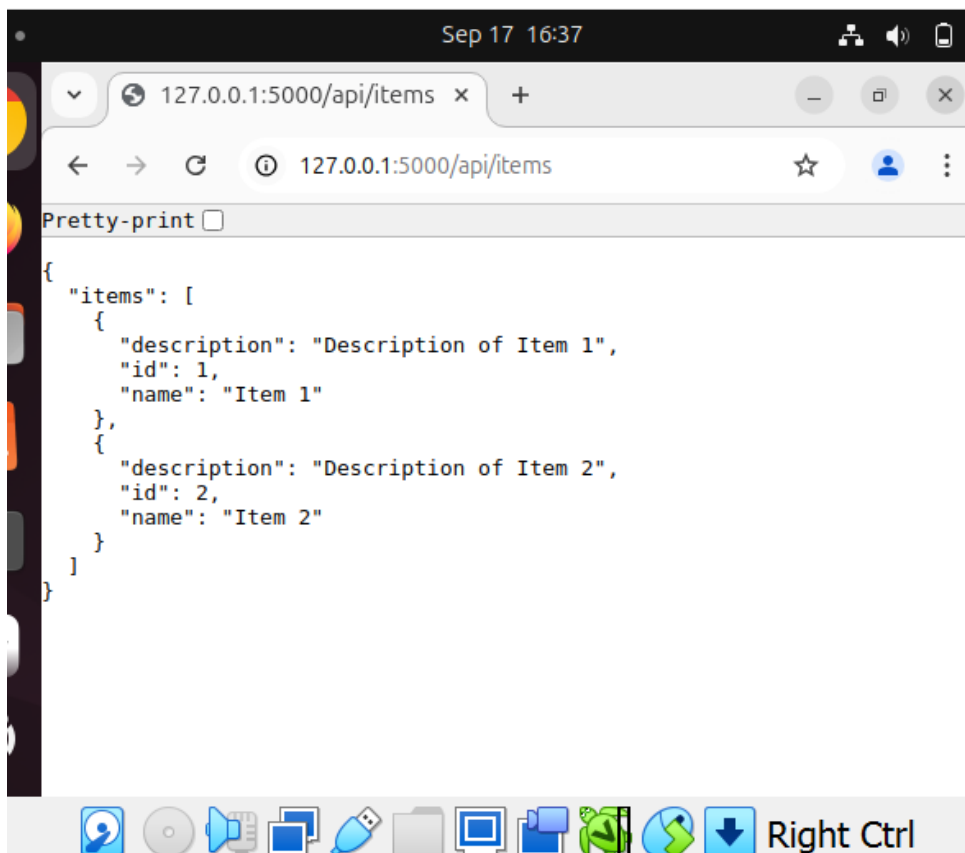
The screenshot shows a MobaXterm terminal window with two tabs. The active tab is titled '5. 192.168.1.103 (1)' and displays the GNU nano 7.2 editor editing a file named 'app.py'. The code is a Flask application with the following content:

```
from flask import Flask, jsonify, request
app = Flask(__name__)
# Пример ресурсов
data = {
    "items": [
        {"id": 1, "name": "Item 1", "description": "Description of Item 1"},
        {"id": 2, "name": "Item 2", "description": "Description of Item 2"},
    ]
}
@app.route('/api/items', methods=['GET'])
def get_items():
    return jsonify(data)
@app.route('/api/items/<int:item_id>', methods=['GET'])
def get_item(item_id):
    item = next((item for item in data['items'] if item['id'] == item_id), None)
    if item:
        return jsonify(item)
    return jsonify({"error": "Item not found"}), 404
@app.route('/api/items', methods=['POST'])
def create_item():
    new_item = request.json
```

Below the code, the nano editor's command palette is visible, showing options like 'Read 25 lines', 'Help', 'Exit', 'Write Out', 'Read File', 'Where Is', 'Replace', 'Cut', 'Paste', 'Execute', 'Justify', 'Location', and 'Go To Line'. At the bottom of the terminal window, there is a link: 'support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>'.

4.2. Запустите Flask API на порту 5000:

4.3 Проверка работы приложения flask.



```
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 403-885-407
127.0.0.1 - - [17/Sep/2024 16:37:28] "GET /api/items HTTP/1.1" 200 -

^C(testenv) devops@devopsvm:~$
(testenv) devops@devopsvm:~$ fuser -k 5000/tcp
(testenv) devops@devopsvm:~$
```

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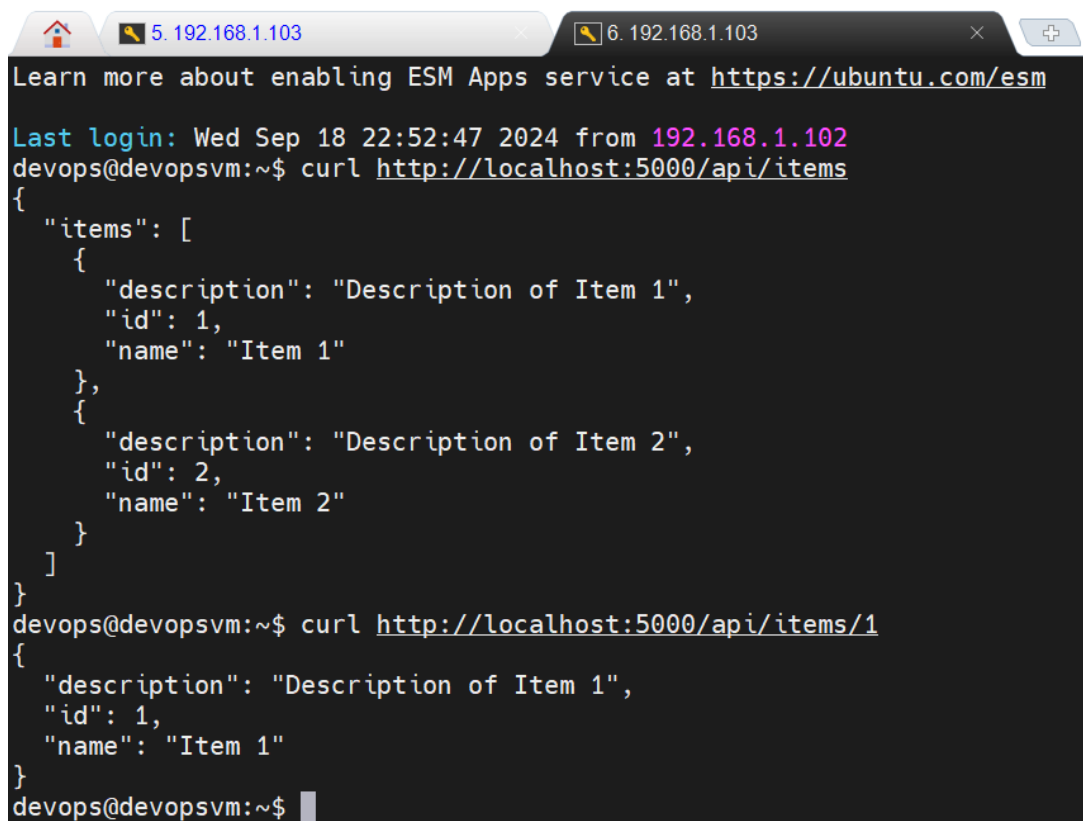
Шаг 5: Тестирование работы REST API через nginx

5.1. Используйте curl для взаимодействия с API через nginx.

Получение списка всех элементов.

Получение конкретного элемента.

Далее скрин выполнения ЭТИХ шагов:



```
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Wed Sep 18 22:52:47 2024 from 192.168.1.102
devops@devopsvm:~$ curl http://localhost:5000/api/items
{
  "items": [
    {
      "description": "Description of Item 1",
      "id": 1,
      "name": "Item 1"
    },
    {
      "description": "Description of Item 2",
      "id": 2,
      "name": "Item 2"
    }
  ]
}
devops@devopsvm:~$ curl http://localhost:5000/api/items/1
{
  "description": "Description of Item 1",
  "id": 1,
  "name": "Item 1"
}
devops@devopsvm:~$
```

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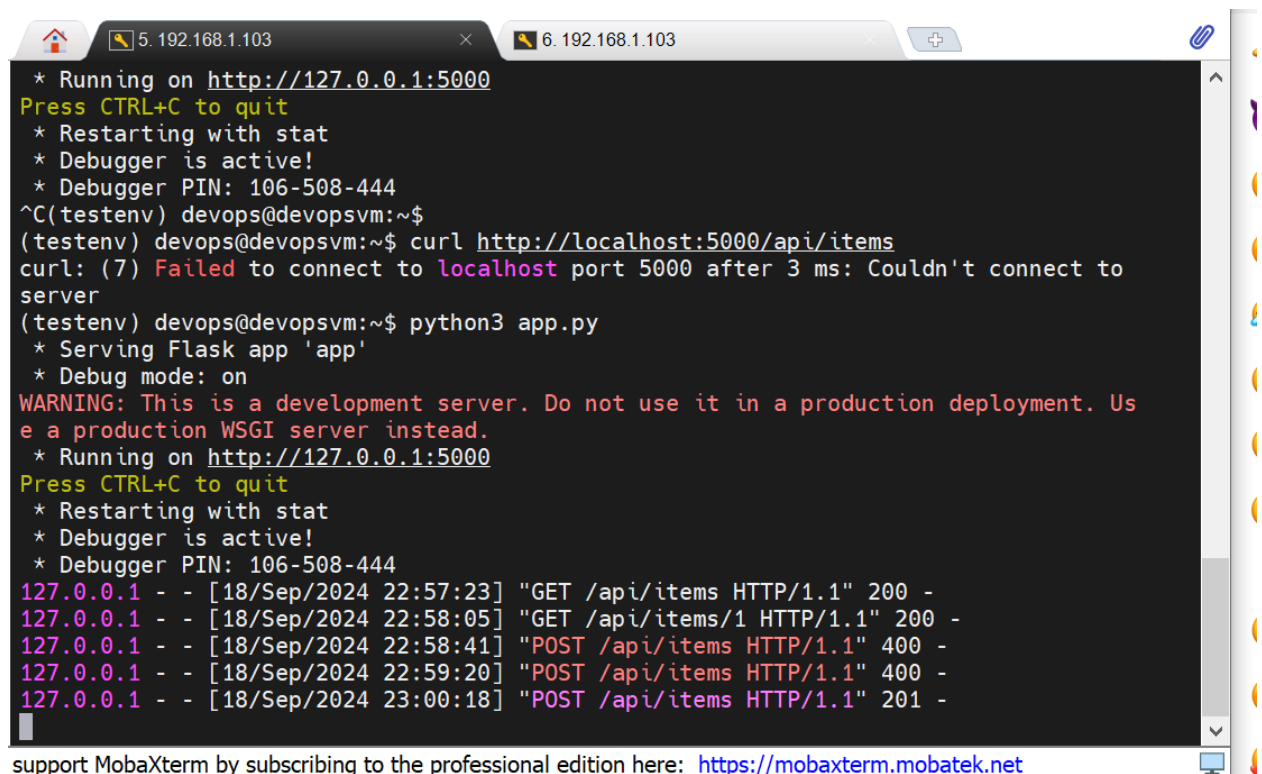
Создание нового элемента:

```
at 21/09/2024
devops@devopsvm:~$ curl -X POST -H "Content-Type: application/json" -d '{"id":3,"name":
"Item 3","description":"Description of Item 3"}' http://localhost:5000/api/items
{
  "description": "Description of Item 3",
  "id": 3,
  "name": "Item 3"
}
devops@devopsvm:~$
```

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5.2. Проверьте, как nginx передает запросы от клиента к Flask-серверу и возвращает ответ



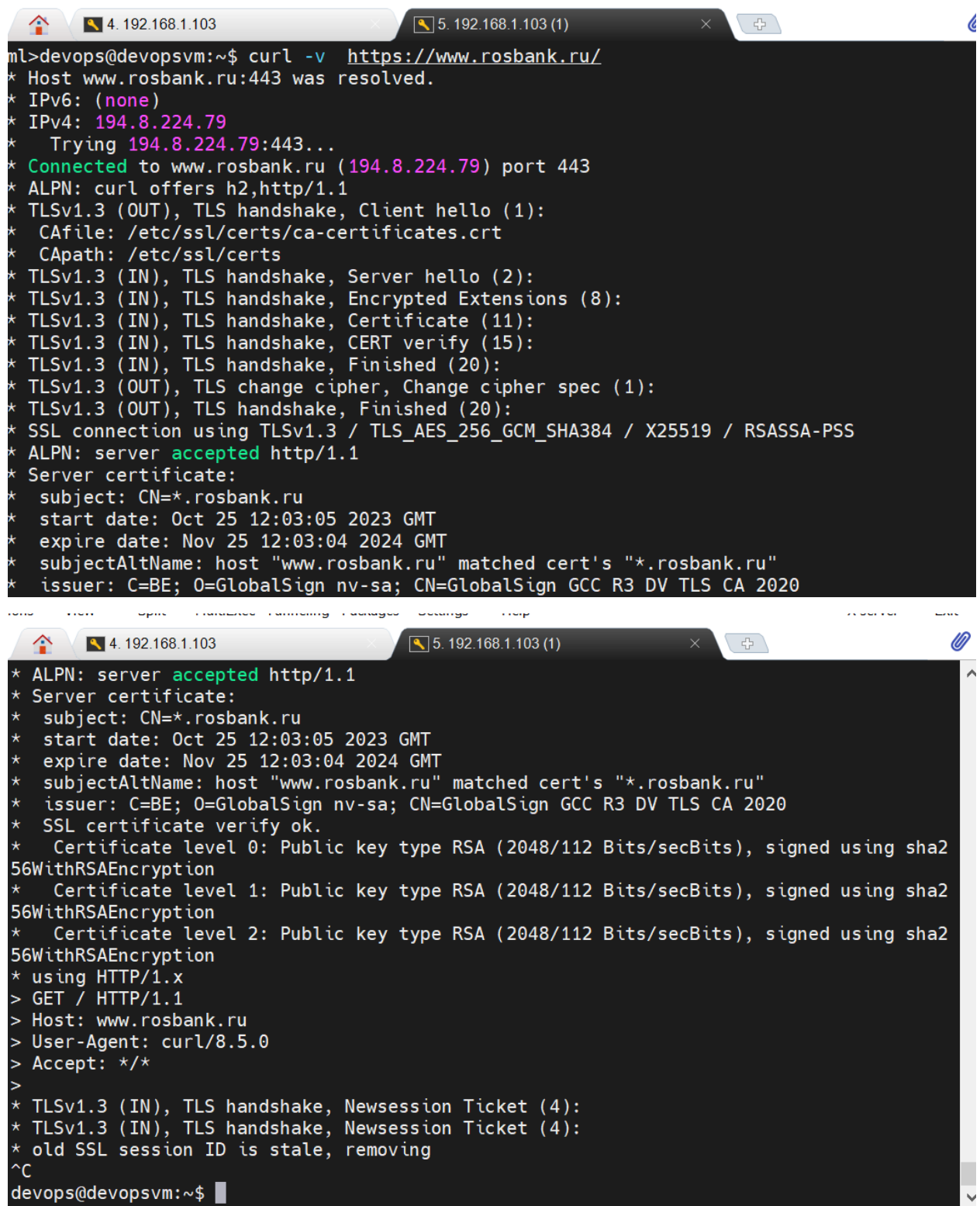
Индивидуальное задание:

Вариант 14.

1. HTTP-запросы. Отправка запроса к API rosbank.ru:

Заходим на сайт rosbank.ru и копируем ссылку.

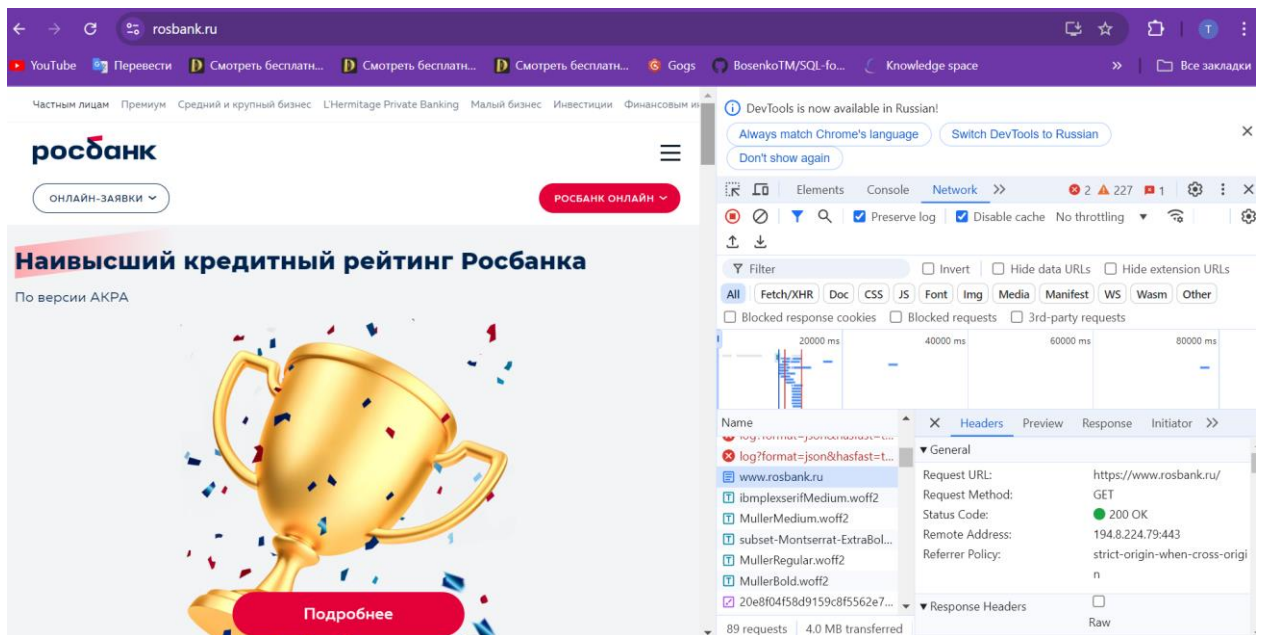
После этого с помощью curl обращаемся к api сайта:



```
ml>devops@devopsvm:~$ curl -v https://www.rosbank.ru/
* Host www.rosbank.ru:443 was resolved.
* IPv6: (none)
* IPv4: 194.8.224.79
* Trying 194.8.224.79:443...
* Connected to www.rosbank.ru (194.8.224.79) port 443
* ALPN: curl offers h2,http/1.1
* TLSv1.3 (OUT), TLS handshake, Client hello (1):
* CAfile: /etc/ssl/certs/ca-certificates.crt
* CPath: /etc/ssl/certs
* TLSv1.3 (IN), TLS handshake, Server hello (2):
* TLSv1.3 (IN), TLS handshake, Encrypted Extensions (8):
* TLSv1.3 (IN), TLS handshake, Certificate (11):
* TLSv1.3 (IN), TLS handshake, CERT verify (15):
* TLSv1.3 (IN), TLS handshake, Finished (20):
* TLSv1.3 (OUT), TLS change cipher, Change cipher spec (1):
* TLSv1.3 (OUT), TLS handshake, Finished (20):
* SSL connection using TLSv1.3 / TLS_AES_256_GCM_SHA384 / X25519 / RSASSA-PSS
* ALPN: server accepted http/1.1
* Server certificate:
* subject: CN=*.rosbank.ru
* start date: Oct 25 12:03:05 2023 GMT
* expire date: Nov 25 12:03:04 2024 GMT
* subjectAltName: host "www.rosbank.ru" matched cert's "*.rosbank.ru"
* issuer: C=BE; O=GlobalSign nv-sa; CN=GlobalSign GCC R3 DV TLS CA 2020
* ALPN: server accepted http/1.1
* Server certificate:
* subject: CN=*.rosbank.ru
* start date: Oct 25 12:03:05 2023 GMT
* expire date: Nov 25 12:03:04 2024 GMT
* subjectAltName: host "www.rosbank.ru" matched cert's "*.rosbank.ru"
* issuer: C=BE; O=GlobalSign nv-sa; CN=GlobalSign GCC R3 DV TLS CA 2020
* SSL certificate verify ok.
* Certificate level 0: Public key type RSA (2048/112 Bits/secBits), signed using sha2
56WithRSAEncryption
* Certificate level 1: Public key type RSA (2048/112 Bits/secBits), signed using sha2
56WithRSAEncryption
* Certificate level 2: Public key type RSA (2048/112 Bits/secBits), signed using sha2
56WithRSAEncryption
* using HTTP/1.x
> GET / HTTP/1.1
> Host: www.rosbank.ru
> User-Agent: curl/8.5.0
> Accept: */*
>
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
* TLSv1.3 (IN), TLS handshake, Newsession Ticket (4):
* old SSL session ID is stale, removing
^C
devops@devopsvm:~$
```

Мы получили ответ 200, соответственно, это адрес подходит.

Проверяем непосредственно в браузере:



Все соответствует.

2. Создать конфигурацию nginx и REST API, которая будет взаимодействовать с указанным сайтом или API. **Создание REST API для работы с ресурсами gia.ru.**

Устанавливаем nginx, если не установлен.

Проверяем статус работы:

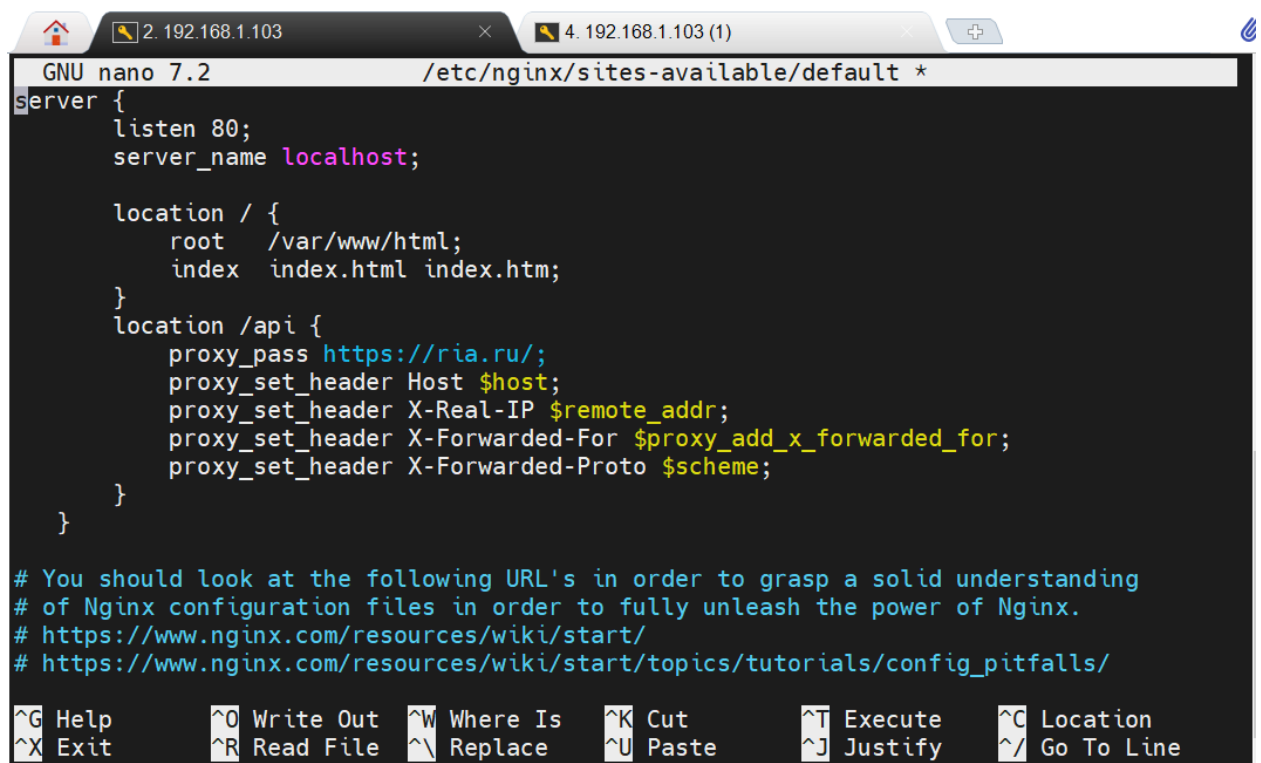
```
Learn more about enabling ESM Apps service at https://ubuntu.com/esm

Last login: Thu Sep 19 20:02:42 2024 from 192.168.1.102
devops@devopsvm:~$ sudo systemctl status nginx
[sudo] password for devops:
● nginx.service - A high performance web server and a reverse proxy server
   Loaded: loaded (/usr/lib/systemd/system/nginx.service; enabled; preset: enabled)
   Active: active (running) since Fri 2024-09-20 00:35:18 MSK; 2h 42min left
     Docs: man:nginx(8)
   Process: 1155 ExecStartPre=/usr/sbin/nginx -t -q -g daemon on; master_process on;
   Process: 1160 ExecStart=/usr/sbin/nginx -g daemon on; master_process on; (code=exi
 Main PID: 1166 (nginx)
    Tasks: 3 (limit: 3447)
   Memory: 3.7M (peak: 4.0M)
      CPU: 46ms
   CGroup: /system.slice/nginx.service
           └─1166 "nginx: master process /usr/sbin/nginx -g daemon on; master_proces
             └─1167 "nginx: worker process"
               └─1168 "nginx: worker process"

Sep 20 00:35:17 devopsvm systemd[1]: Starting nginx.service - A high performance web s
Sep 20 00:35:18 devopsvm nginx[1155]: 2024/09/20 00:35:17 [warn] 1155#1155: conflictin
Sep 20 00:35:18 devopsvm nginx[1160]: 2024/09/20 00:35:18 [warn] 1160#1160: conflictin
Sep 20 00:35:18 devopsvm systemd[1]: Started nginx.service - A high performance web se
lines 1-19/19 (END)
```


Настроим виртуальный хост для обработки запросов к сайту **ria.ru**

```
server {  
    listen 80;  
    server_name localhost;  
  
    location / {  
        root /var/www/html;  
        index index.html index.htm;  
    }  
    location /api {  
        proxy_pass https://ria.ru/;  
        proxy_set_header Host $host;  
        proxy_set_header X-Real-IP $remote_addr;  
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;  
        proxy_set_header X-Forwarded-Proto $scheme;  
    }  
}
```



The image shows a web browser window at the top with two tabs: '2. 192.168.1.103' and '4. 192.168.1.103 (1)'. Below the browser is a terminal window titled 'GNU nano 7.2 /etc/nginx/sites-available/default *'. The terminal displays the same Nginx configuration code as shown in the previous block. At the bottom of the terminal, there are several lines of text: '# You should look at the following URL's in order to grasp a solid understanding of Nginx configuration files in order to fully unleash the power of Nginx.', '# https://www.nginx.com/resources/wiki/start/', and '# https://www.nginx.com/resources/wiki/start/topics/tutorials/config_pitfalls/'. At the very bottom, there is a row of keyboard shortcuts: '^G Help', '^O Write Out', '^W Where Is', '^K Cut', '^T Execute', '^C Location', '^X Exit', '^R Read File', '^_ Replace', '^U Paste', '^J Justify', and '^_ Go To Line'.

```
GNU nano 7.2 /etc/nginx/sites-available/default *  
server {  
    listen 80;  
    server_name localhost;  
  
    location / {  
        root /var/www/html;  
        index index.html index.htm;  
    }  
    location /api {  
        proxy_pass https://ria.ru/;  
        proxy_set_header Host $host;  
        proxy_set_header X-Real-IP $remote_addr;  
        proxy_set_header X-Forwarded-For $proxy_add_x_forwarded_for;  
        proxy_set_header X-Forwarded-Proto $scheme;  
    }  
}  
  
# You should look at the following URL's in order to grasp a solid understanding  
# of Nginx configuration files in order to fully unleash the power of Nginx.  
# https://www.nginx.com/resources/wiki/start/  
# https://www.nginx.com/resources/wiki/start/topics/tutorials/config_pitfalls/  
  
^G Help    ^O Write Out  ^W Where Is  ^K Cut      ^T Execute   ^C Location  
^X Exit    ^R Read File  ^_ Replace   ^U Paste    ^J Justify   ^_ Go To Line
```

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Перезапускаем nginx для применения настроек

```
devops@devopsvm:~$ sudo systemctl restart nginx
devops@devopsvm:~$
```

Повторяем шаги 2.1 - 2.5:

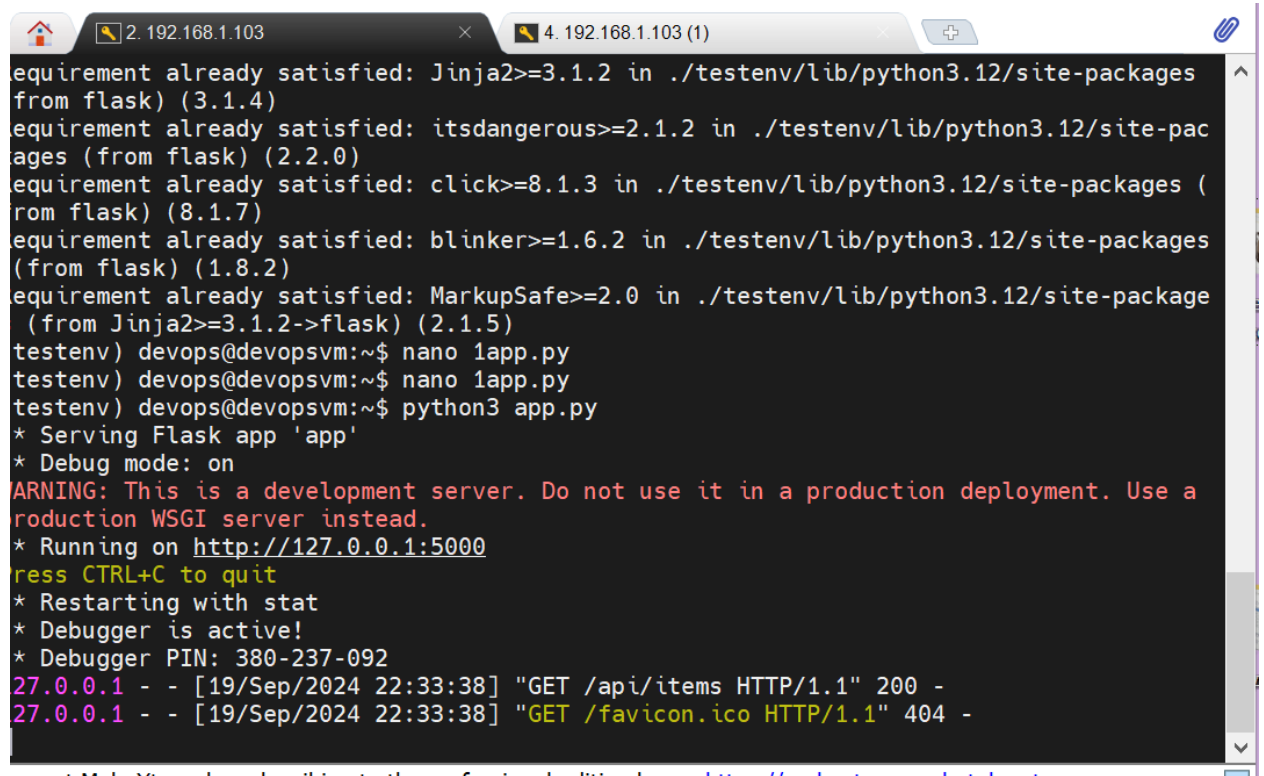
```
python3-pip is already the newest version (24.0+dfsg-1ubuntu1).
0 upgraded, 0 newly installed, 0 to remove and 157 not upgraded.
devops@devopsvm:~$ sudo apt-get install python3-venv
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
python3-venv is already the newest version (3.12.3-0ubuntu2).
0 upgraded, 0 newly installed, 0 to remove and 157 not upgraded.
devops@devopsvm:~$ python3 -m venv testenv
devops@devopsvm:~$ source testenv/bin/activate
(testenv) devops@devopsvm:~$ pip install flask
Requirement already satisfied: flask in ./testenv/lib/python3.12/site-packages (3.0.3)
Requirement already satisfied: Werkzeug>=3.0.0 in ./testenv/lib/python3.12/site-packages (from flask) (3.0.4)
Requirement already satisfied: Jinja2>=3.1.2 in ./testenv/lib/python3.12/site-packages (from flask) (3.1.4)
Requirement already satisfied: itsdangerous>=2.1.2 in ./testenv/lib/python3.12/site-packages (from flask) (2.2.0)
Requirement already satisfied: click>=8.1.3 in ./testenv/lib/python3.12/site-packages (from flask) (8.1.7)
Requirement already satisfied: blinker>=1.6.2 in ./testenv/lib/python3.12/site-packages (from flask) (1.8.2)
Requirement already satisfied: MarkupSafe>=2.0 in ./testenv/lib/python3.12/site-packages (from Jinja2>=3.1.2->flask) (2.1.5)
(testenv) devops@devopsvm:~$
```

Создаем файл:

```
GNU nano 7.2 1app.py *
app = Flask(__name__)
# Пример ресурсов
data = {
    "items": [
        {"id": 1, "name": "Item 1", "description": "Description of Item 1"},
        {"id": 2, "name": "Item 2", "description": "Description of Item 2"},
    ]
}
@app.route('/api/items', methods=['GET'])
def get_items():
    return jsonify(data)
@app.route('/api/items/<int:item_id>', methods=['GET'])
def get_item(item_id):
    item = next((item for item in data['items'] if item['id'] == item_id), None)
    if item:
        return jsonify(item)
    return jsonify({"error": "Item not found"}), 404
@app.route('/api/items', methods=['POST'])
def create_item():
    new_item = request.json
```

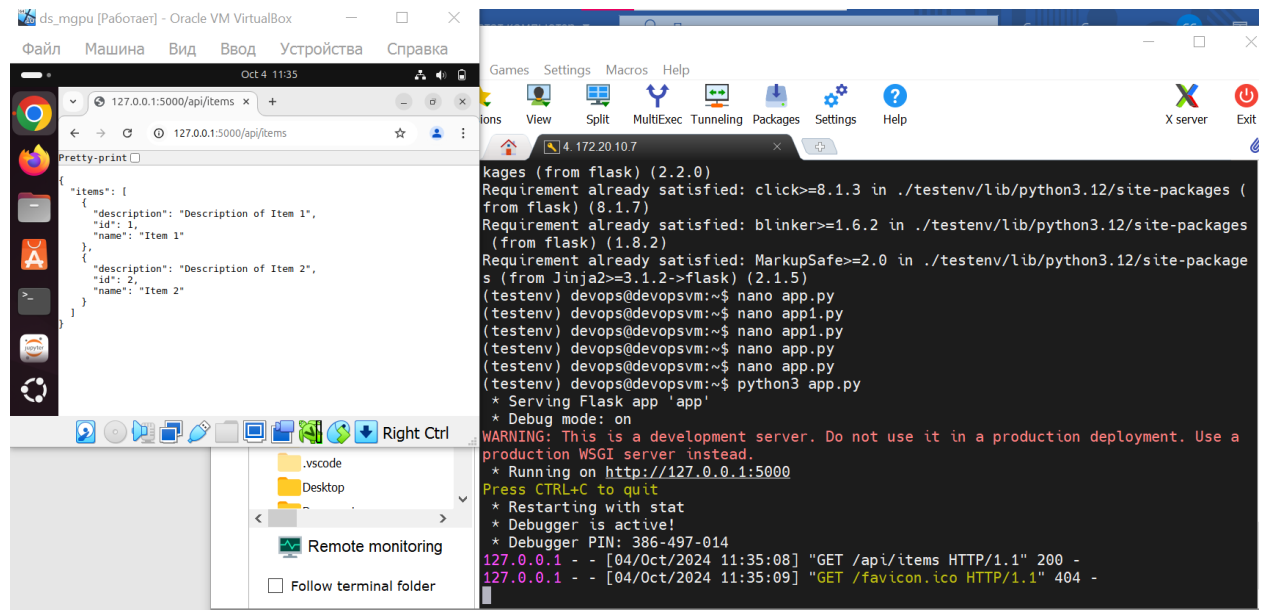
Support MobaXterm by subscribing to the professional edition here: <https://mobaxterm.mobatek.net>

Запускаем файл:



```
requirement already satisfied: Jinja2>=3.1.2 in ./testenv/lib/python3.12/site-packages
from flask) (3.1.4)
requirement already satisfied: itsdangerous>=2.1.2 in ./testenv/lib/python3.12/site-pac
ages (from flask) (2.2.0)
requirement already satisfied: click>=8.1.3 in ./testenv/lib/python3.12/site-packages (
rom flask) (8.1.7)
requirement already satisfied: blinker>=1.6.2 in ./testenv/lib/python3.12/site-packages
(from flask) (1.8.2)
requirement already satisfied: MarkupSafe>=2.0 in ./testenv/lib/python3.12/site-package
(from Jinja2>=3.1.2->flask) (2.1.5)
testenv) devops@devopsvm:~$ nano 1app.py
testenv) devops@devopsvm:~$ nano 1app.py
testenv) devops@devopsvm:~$ python3 app.py
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a
roduction WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 380-237-092
127.0.0.1 - - [19/Sep/2024 22:33:38] "GET /api/items HTTP/1.1" 200 -
127.0.0.1 - - [19/Sep/2024 22:33:38] "GET /favicon.ico HTTP/1.1" 404 -
```

Результат:



```
ds_mgrpu [Работаег] - Oracle VM VirtualBox
Файл Машина Вид Ввод Устройства Справка
Oct 4 11:35
127.0.0.1:5000/api/items
Pretty-print
{
  "items": [
    {
      "description": "Description of Item 1",
      "id": 1,
      "name": "Item 1"
    },
    {
      "description": "Description of Item 2",
      "id": 2,
      "name": "Item 2"
    }
  ]
}
Games Settings Macros Help
View Split MultiExec Tunneling Packages Settings Help
X server Exit
4. 172.20.10.7
kages (from flask) (2.2.0)
Requirement already satisfied: click>=8.1.3 in ./testenv/lib/python3.12/site-packages (
from flask) (8.1.7)
Requirement already satisfied: blinker>=1.6.2 in ./testenv/lib/python3.12/site-packages
(from flask) (1.8.2)
Requirement already satisfied: MarkupSafe>=2.0 in ./testenv/lib/python3.12/site-package
s (from Jinja2>=3.1.2->flask) (2.1.5)
(testenv) devops@devopsvm:~$ nano app.py
(testenv) devops@devopsvm:~$ nano app1.py
(testenv) devops@devopsvm:~$ nano app1.py
(testenv) devops@devopsvm:~$ nano app.py
(testenv) devops@devopsvm:~$ nano app.py
(testenv) devops@devopsvm:~$ python3 app.py
* Serving Flask app 'app'
* Debug mode: on
WARNING: This is a development server. Do not use it in a production deployment. Use a
production WSGI server instead.
* Running on http://127.0.0.1:5000
Press CTRL+C to quit
* Restarting with stat
* Debugger is active!
* Debugger PIN: 386-497-014
127.0.0.1 - - [04/Oct/2024 11:35:08] "GET /api/items HTTP/1.1" 200 -
127.0.0.1 - - [04/Oct/2024 11:35:09] "GET /favicon.ico HTTP/1.1" 404 -
```