

Exercise: Networks, Internet and Protocols

Problems for exercises and homework for the ["Software Technologies" course @ Software University.](#)

1. Explore the local network configuration

1.1. Find your IP address in the local network

1. Open the command prompt by typing "cmd" in the Windows search bar and clicking on the "Command Prompt" app;
2. Type "ipconfig" and press enter;
3. Your IP address will be listed under "IPv4 Address";

```
Command Prompt

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Ethernet adapter vEthernet (WSL):

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : fe80::49fa:5346:ee7b:1ea0%43
    IPv4 Address. . . . . : 172.18.48.1
    Subnet Mask . . . . . : 255.255.240.0
    Default Gateway . . . . . :

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 3:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . :
    Link-local IPv6 Address . . . . . : 
    IPv4 Address. . . . . : 
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.0.1

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :
```

1.2. Ping your router

1. In the command prompt, type "ping 192.168.0.1" and press enter.
2. If your router responds, it means you're connected to it.

```
Pinging 192.168.0.1 with 32 bytes of data:
Reply from 192.168.0.1: bytes=32 time=2ms TTL=64
Reply from 192.168.0.1: bytes=32 time=3ms TTL=64
Reply from 192.168.0.1: bytes=32 time=3ms TTL=64
Reply from 192.168.0.1: bytes=32 time=3ms TTL=64

Ping statistics for 192.168.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 2ms, Maximum = 3ms, Average = 2ms
```

1.3. List IP addresses with their MAC addresses

1. In the command prompt, type "arp -a" and press enter.
2. This will show you a list of IP addresses and their corresponding MAC addresses.

```
Interface: 192.168.0.105 --- 0x9
Internet Address      Physical Address      Type
192.168.0.1          d8-07-b6-e1-a6-2d    dynamic
192.168.0.101        b0-e4-d5-b2-d1-28    dynamic
192.168.0.107        48-b0-2d-30-5f-e6    dynamic
192.168.0.255        ff-ff-ff-ff-ff-ff    static
224.0.0.2            01-00-5e-00-00-02    static
224.0.0.22          01-00-5e-00-00-16    static
224.0.0.251         01-00-5e-00-00-fb    static
224.0.0.252         01-00-5e-00-00-fc    static
239.255.255.250     01-00-5e-7f-ff-fa    static
255.255.255.255     ff-ff-ff-ff-ff-ff    static

Interface: 172.18.48.1 --- 0x2b
Internet Address      Physical Address      Type
172.18.63.255        ff-ff-ff-ff-ff-ff    static
224.0.0.2            01-00-5e-00-00-02    static
224.0.0.22          01-00-5e-00-00-16    static
224.0.0.251         01-00-5e-00-00-fb    static
239.255.255.250     01-00-5e-7f-ff-fa    static
```

1.4. List all open sockets and ports

1. In the command prompt, type "netstat -an" and press enter.
2. This will show you a list of all open sockets and ports on your computer.

```
Active Connections

Proto Local Address           Foreign Address         State
TCP   0.0.0.0:135             0.0.0.0:0              LISTENING
TCP   0.0.0.0:445             0.0.0.0:0              LISTENING
TCP   0.0.0.0:3306            0.0.0.0:0              LISTENING
TCP   0.0.0.0:5040            0.0.0.0:0              LISTENING
TCP   0.0.0.0:7680            0.0.0.0:0              LISTENING
TCP   0.0.0.0:33060           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49664           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49665           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49666           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49667           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49668           0.0.0.0:0              LISTENING
TCP   0.0.0.0:49669           0.0.0.0:0              LISTENING
TCP   0.0.0.0:53952           0.0.0.0:0              LISTENING
TCP   127.0.0.1:64363         127.0.0.1:64364        ESTABLISHED
TCP   127.0.0.1:64364         127.0.0.1:64363        ESTABLISHED
TCP   127.0.0.1:64365         127.0.0.1:64366        ESTABLISHED
TCP   127.0.0.1:64366         127.0.0.1:64365        ESTABLISHED
TCP   172.18.48.1:139        0.0.0.0:0              LISTENING
TCP   192.168.0.105:139      0.0.0.0:0              LISTENING
TCP   192.168.0.105:49820    192.168.0.107:8008     ESTABLISHED
TCP   192.168.0.105:49821    192.168.0.101:8008     ESTABLISHED
```

1.5. Trace the route to a certain IP address

1. In the command prompt, type "tracert google.com" (replace "google.com" with the IP address or domain name you want to trace) and press enter.
2. This will show you the path that your computer takes to reach that IP address, including any routers or other network devices along the way.

```

Tracing route to google.com [172.217.17.110]
over a maximum of 30 hops:

  0  3 ms    2 ms    1 ms   192.168.0.1
  1  *        4 ms    3 ms   10.108.0.2
  2  *        *       *      Request timed out.
  3  *        *       *      Request timed out.
  4  4 ms     4 ms    6 ms   212-39-66-222.ip.btc-net.bg [212.39.66.222]
  5  3 ms     3 ms    6 ms   216.239.59.239
  6  8 ms     5 ms    5 ms   142.251.227.251
  7  4 ms     4 ms    4 ms   sof02s47-in-f14.1e100.net [172.217.17.110]

Trace complete.

```

2. Lookup domain DNS records online

2.1. Find the IP address behind judge.softuni.org

1. Go to the website <https://mxtoolbox.com/DNSLookup.aspx>
2. Enter **judge.softuni.org** or the domain name you want to look up in the "DNS Lookup" field.
3. Click on the "DNS Lookup" button to perform the lookup.
4. The resulting output will show you the DNS records associated with the hostname, including the IP address if one exists.

SuperTool Beta7

judge.softuni.org DNS Lookup

a:judge.softuni.org Find Problems

Type	Domain Name	IP Address
A	judge.softuni.org	172.67.168.4 Cloudflare, Inc. (AS13335)
A	judge.softuni.org	104.21.58.55 Cloudflare, Inc. (AS13335)

2.2. Find the mail server for the domain softuni.org

- Go to the website <https://mxtoolbox.com/MXLookup.aspx>
- Enter **softuni.org** in the "MX Lookup" field.
 - Click on the "MX Lookup" button to perform the lookup.

SuperTool Beta7

softuni.org MX Lookup

mx:softuni.org Find Problems Solve Email Delivery Problems

Pref	Hostname	IP Address	TTL	
10	mail.xs-software.com	193.203.198.10 XS Software JSC (AS51605)	5 min	Blacklist Check SMTP Test
20	mail2.xs-software.com	193.203.198.10 XS Software JSC (AS51605)	5 min	Blacklist Check SMTP Test

3. Play with Dev Tools

To open Dev Tools in Google Chrome on Windows, press **F12** or **Ctrl + Shift + I**

1. Open a REST service with the Web browser

- Open a REST service URL in the browser e.g., <https://restcountries.com/>. You can read the documentation there or directly navigate to <https://restcountries.com/v2/name/Bulgaria/>
- You can use the web browser's Dev Tools to explore the response headers, request headers, and JSON data returned by the service.

2. Execute HTTP GET

-

3. Execute HTTP POST (fill a login form and submit it and see the requests in the Web browser Dev Tools)

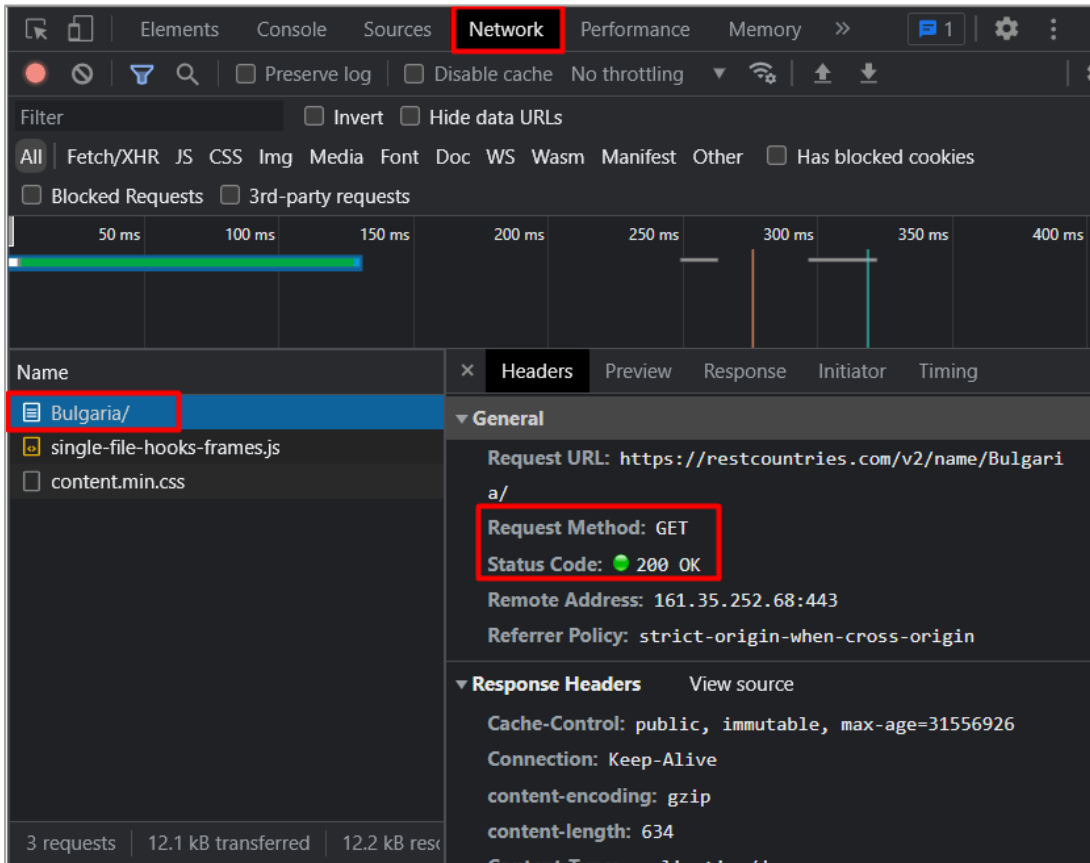
-

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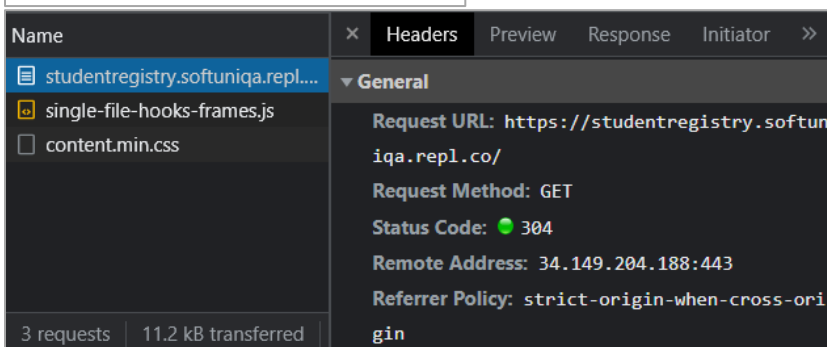
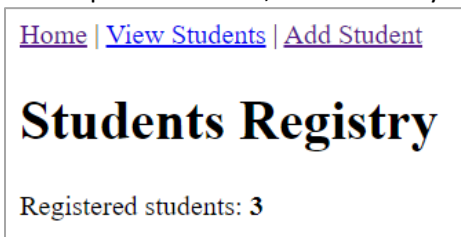
```
[
  {
    "name": "Bulgaria",
    "topLevelDomain": [
      ".bg"
    ],
    "alpha2Code": "BG",
    "alpha3Code": "BGR",
    "callingCodes": [
      "359"
    ],
    "capital": "Sofia",
    "altSpellings": [
      "BG",
      "Republic of Bulgaria",
      "Република България"
    ],
    "subregion": "Eastern Europe",
    "region": "Europe",
    "population": 6927288,
    "latlng": [
      43,
      25
    ]
  }
]
```

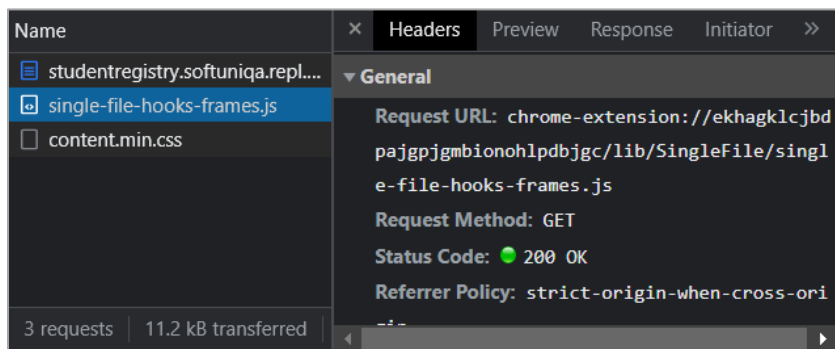


3.2. Execute HTTP GET

To execute an HTTP GET request, navigate to <https://studentregistry.softuniqa.repl.co>

- Open the web browser's Dev Tools, if they're not already open.
- In the Dev Tools, you should see a new HTTP GET request listed in the network panel. Click on it to see the request and response headers, as well as any JSON or HTML data returned by the service.



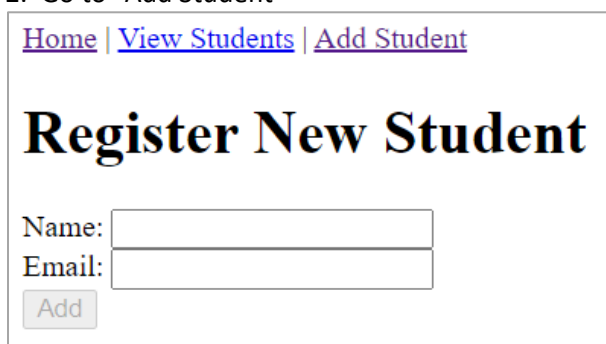


3.3. Execute HTTP POST

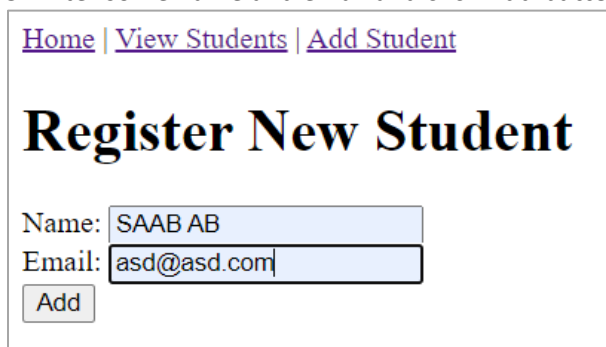
1. To execute an HTTP POST request, navigate to <https://studentregistry.softuniqa.repl.co>



2. Go to "Add Student"



3. Open the web browser's Dev Tools, if they're not already open.
4. In the Dev Tools, go to the "Network" tab.
5. Enter some name and email and **click Add button**.



6. In the Dev Tools, you should see a new HTTP GET request listed in the network panel. Click on it to see the request and response headers, as well as any JSON or HTML data returned by the service.

The screenshot shows the 'Headers' tab of a web browser's developer tools. On the left, a list of resources includes 'add-student', 'students', 'single-file-hooks-frames.js', and 'content.min.css'. The 'add-student' resource is selected. The main panel shows the 'General' section with the following details:

- Request URL:** `https://studentregistry.softuniqa.repl.co/add-student`
- Request Method:** `POST`
- Status Code:** `200` (indicated by a yellow circle icon)
- Remote Address:** `34.149.204.188:443`
- Referrer Policy:** `strict-origin-when-cross-origin`

Below the 'General' section, the 'Response Headers' section is visible, showing:

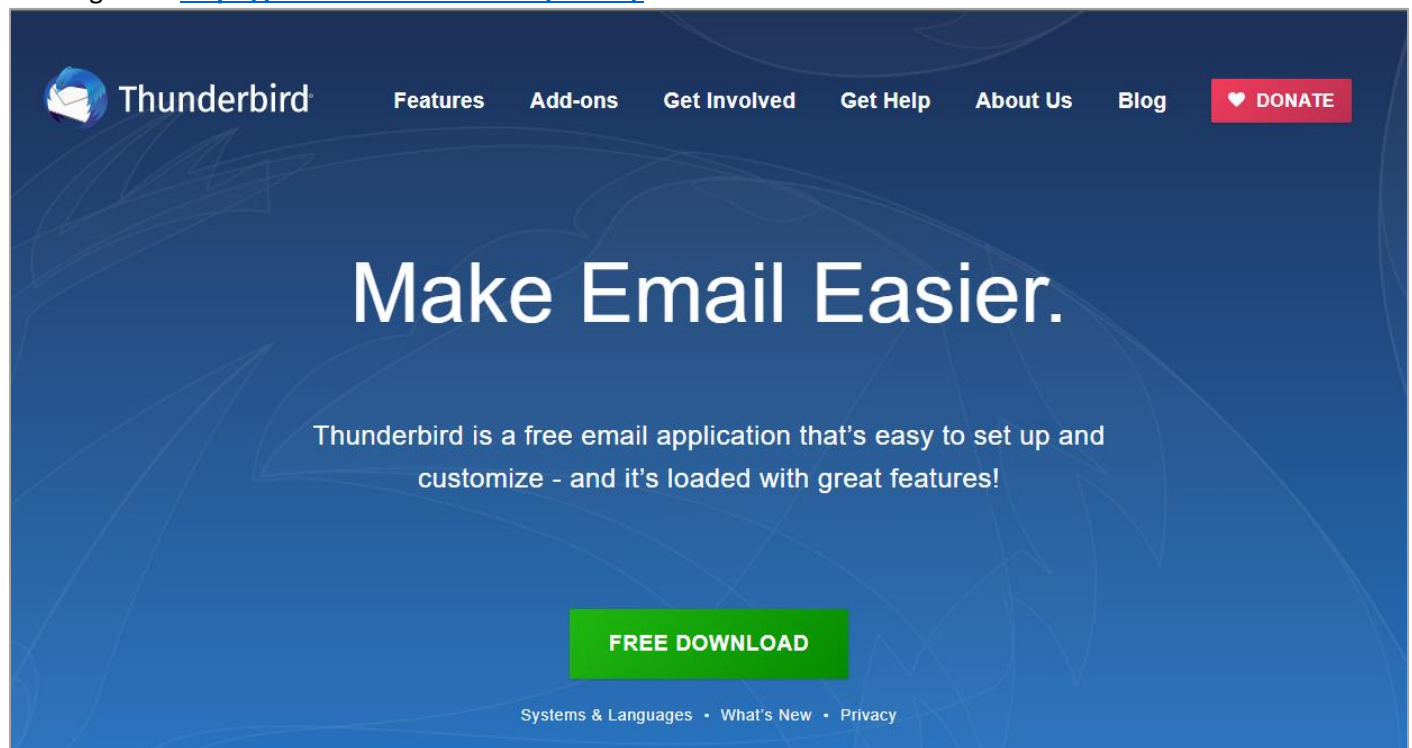
- content-length:** `62`
- content-type:** `text/html; charset=utf-8`
- date:** `Fri, 21 Apr 2023 14:23:13 GMT`
- expect-ct:** `max-age=2592000, report-uri="https://sentry.repl.co/149/monitoring/2023-04-21-14:23:13-149-06"`

At the bottom of the developer tools, a summary bar shows: 4 requests, 11.7 kB transferred, and 11.5 kB received.

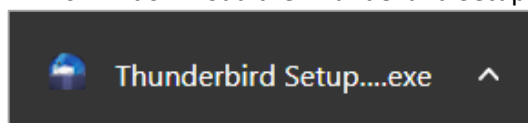
4. * Email setup (optional exercise)

4.1. Download and install Thunderbird

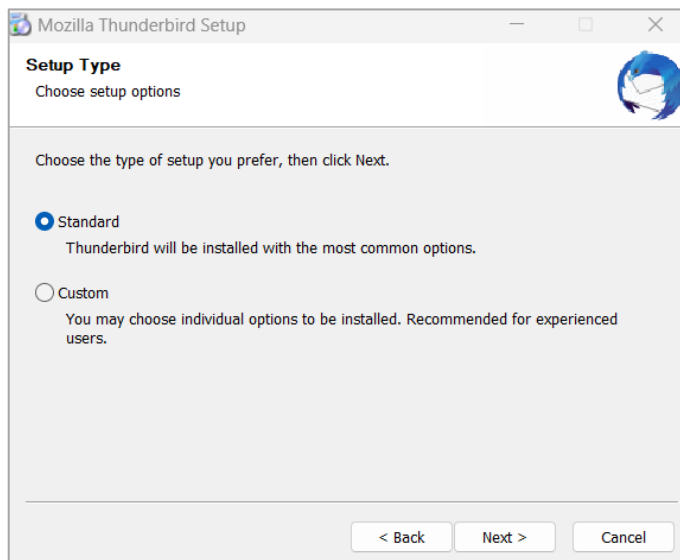
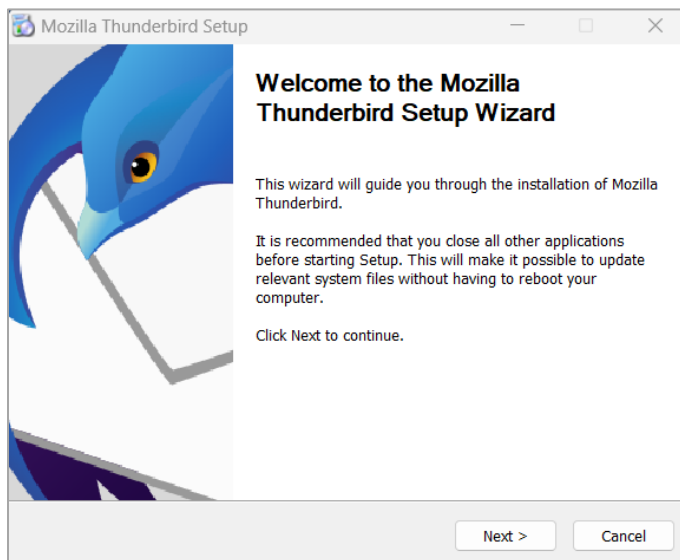
1. Navigate to <https://www.thunderbird.net/en-US/> and click "FREE DOWNLOAD" button



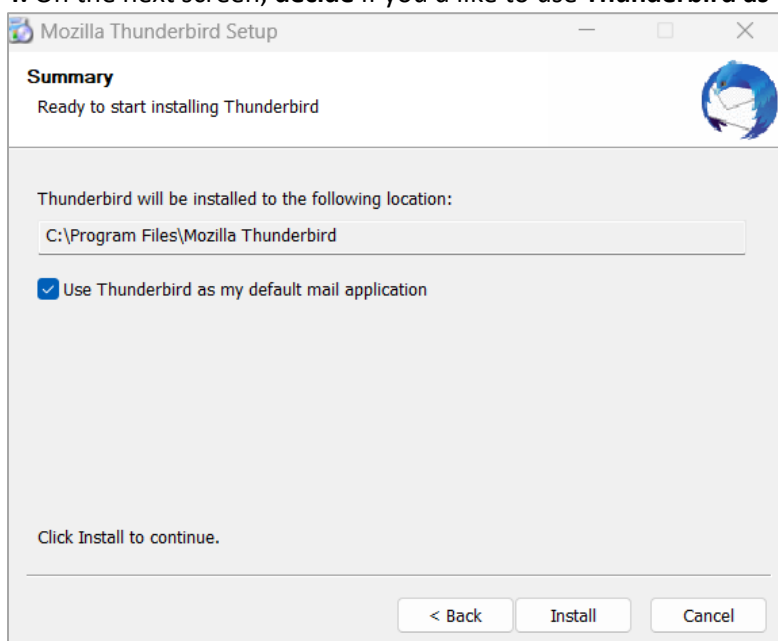
2. This will download the Thunderbird Setup.exe. Open it to start the installation. Give permission to make changes.



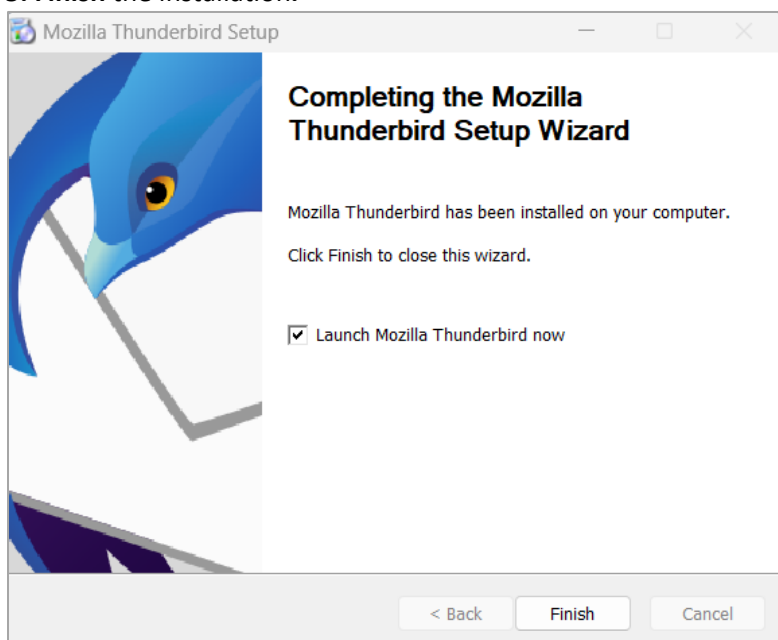
3. On the **welcome screen** hit "Next" and on the next screen choose "Standard Setup Type".



4. On the next screen, **decide** if you'd like to use **Thunderbird as your default email application** or not. Hit **"Install"**.



5. **Finish** the installation.

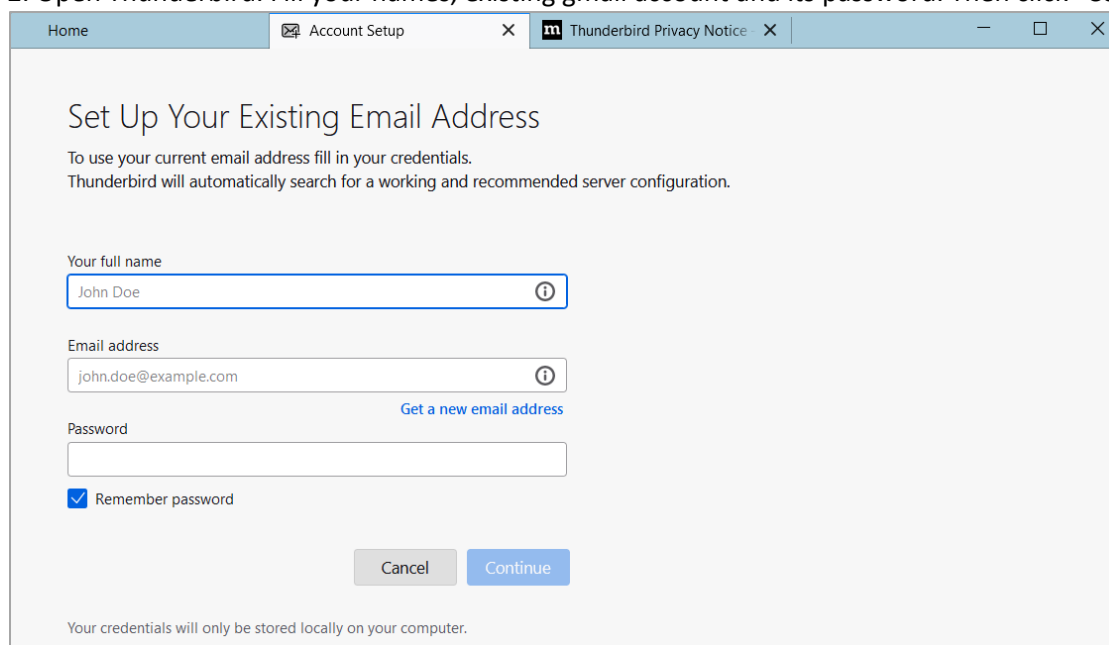


4.2. Configure Gmail to work with Thunderbird

1. To **configure Thunderbird to work with Gmail**, first **ensure IMAP is enabled on your Gmail account** (the default for new Gmail accounts).

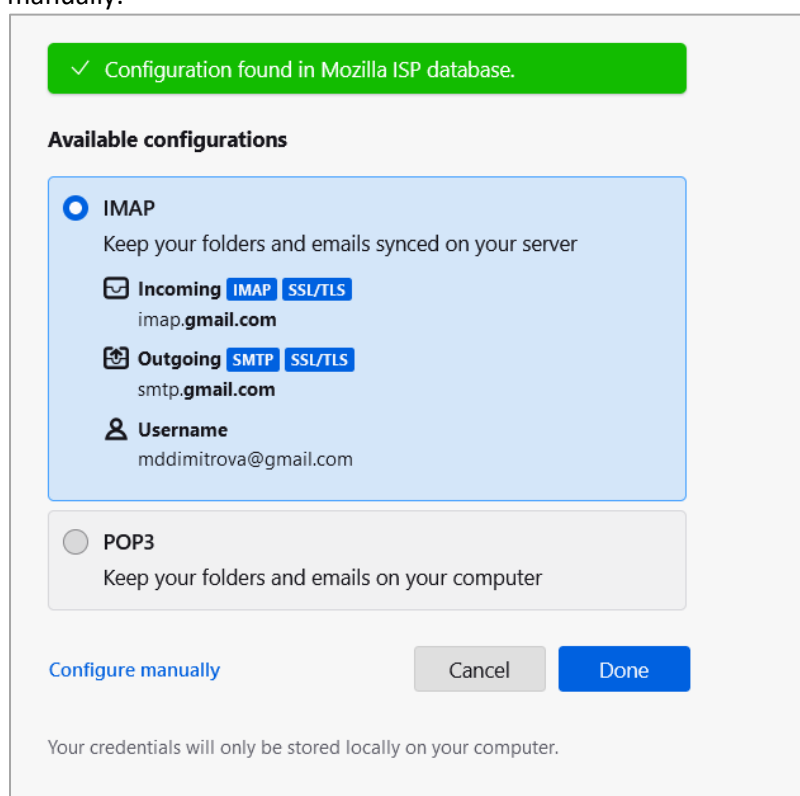
- On your computer, **open Gmail**.
- In the top right, click **Settings** and then **See all settings**.
- Click the **Forwarding and POP/IMAP** tab.
- In the **"IMAP access"** section, select **Enable IMAP**.
- Click **Save Changes**.

2. Open Thunderbird. Fill your names, existing gmail account and its password. Then click "Continue".



The screenshot shows the 'Set Up Your Existing Email Address' window in Thunderbird. The window has a title bar with 'Home', 'Account Setup', and 'Thunderbird Privacy Notice' tabs. The main content area has the heading 'Set Up Your Existing Email Address' and a subtext: 'To use your current email address fill in your credentials. Thunderbird will automatically search for a working and recommended server configuration.' There are three input fields: 'Your full name' (containing 'John Doe'), 'Email address' (containing 'john.doe@example.com'), and 'Password' (empty). A link 'Get a new email address' is next to the email field. Below the password field is a checked checkbox 'Remember password'. At the bottom are 'Cancel' and 'Continue' buttons. A footer note states: 'Your credentials will only be stored locally on your computer.'

3. If successful you will get the following message. Click **"Done"** and you're ready to go. Or you can configure it manually.



The screenshot shows the configuration success screen. At the top is a green banner with a checkmark and the text 'Configuration found in Mozilla ISP database.' Below this is the heading 'Available configurations'. There are two options: 'IMAP' (selected with a radio button) and 'POP3' (unselected). The 'IMAP' option includes the text 'Keep your folders and emails synced on your server' and details for incoming (imap.gmail.com), outgoing (smtp.gmail.com), and username (mddimitrova@gmail.com) settings. The 'POP3' option includes the text 'Keep your folders and emails on your computer'. At the bottom are 'Configure manually', 'Cancel', and 'Done' buttons. A footer note states: 'Your credentials will only be stored locally on your computer.'

Home
Account Setup
Thunderbird Privacy Notice

Manual configuration

INCOMING SERVER

Protocol: IMAP
Hostname: imap.gmail.com
Port: 993
Connection security: SSL/TLS
Authentication method: OAuth2
Username: @gmail.com

OUTGOING SERVER

Hostname: smtp.gmail.com
Port: 465
Connection security: SSL/TLS
Authentication method: OAuth2
Username: @gmail.com

Advanced config

Re-test
Cancel
Done

4. Next you will have to **authorize Thunderbird** to access your google account. Maybe you will have to confirm that it is you via your mobile phone.

Mozila Thunderbird Email wants to access your Google Account

@gmail.com

This will allow **Mozila Thunderbird Email** to:

Read, compose, send, and permanently delete all your email from Gmail

See, edit, download, and permanently delete your contacts

See, edit, share, and permanently delete all the calendars you can access using Google Calendar

By clicking Allow, you allow this app and Google to use your information in accordance with their respective [privacy policies](#). You can change this and other [Account Permissions](#) at any time.

Deny
Allow

5. Thunderbird is now ready to use and will automatically download your messages in its Inbox.

✓ Account successfully created

You can now use this account with Thunderbird.

You can improve the experience by connecting related services and configuring advanced account settings.



⚙ Account settings

🔑 End-to-end encryption

✍ Add a signature

⬇ Download dictionaries

Connect your linked services

Thunderbird detected other services linked to your email account.

Address Books

Thunderbird found one address book linked to your email account.

CARDDAV Address Book

Connect

👤 Connect to a CardDAV address book

👤 Connect to an LDAP address book