

Internet and HTTP



SoftUni Team
Technical Trainers



SoftUni



Software University

<https://softuni.bg>

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#python-web

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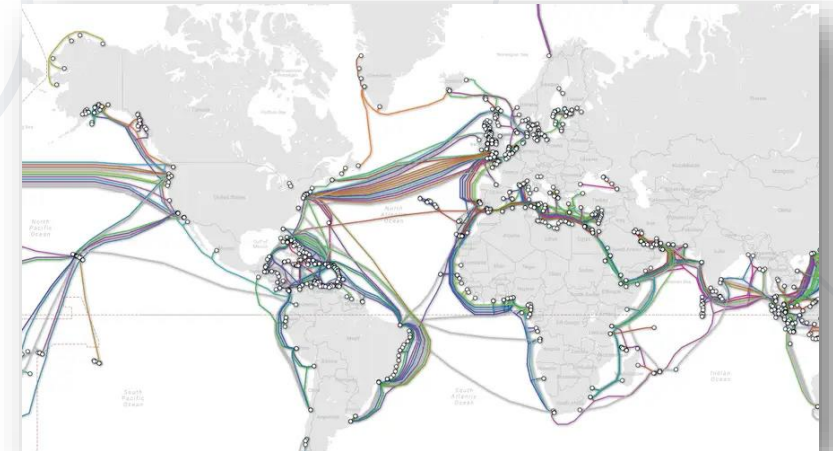


Introduction

An Introduction to the Internet

What is the Internet?

- **Vast network** that connects billions of devices together all over the globe
- Through **fiber optics, copper, satellites** or **cell phone network**
- We get indirectly **connected** through **ISPs** (Internet Service Providers)



Networks and Internet

- **Network** is a group of **two or more devices** that can communicate
- **The internet** is made of hundreds of thousands of **networks**
- These different systems **connect to each other, communicate with each other, and work together** because of standards for how data is sent



Web Server Work Model

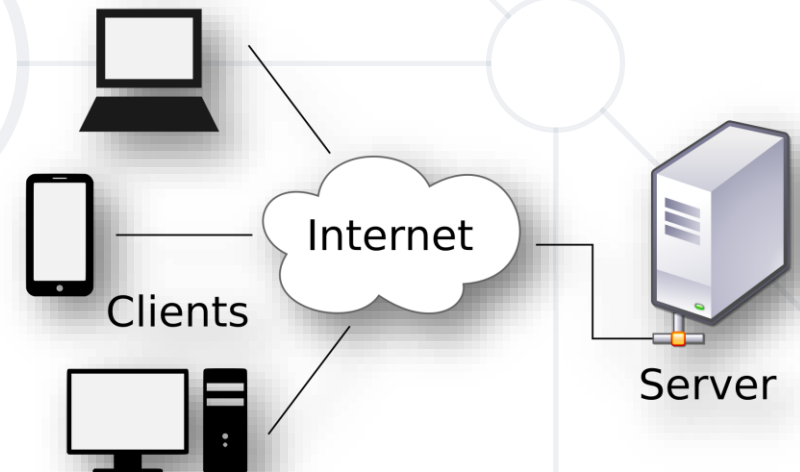




Important Definitions

Servers and Clients

- **Servers** are the machines that provide services to other machines
- **Clients** are the machines that are used to connect to those services



Network Protocol

- Set of **rules** and **standards**, that allow communication between network devices
- Include **mechanisms** for devices to **identify** and make **connections** with each other
- Example for standard network protocols:
 - TCP, UDP, IP, ARP
 - HTTP, FTP, TFTP, SMTP, SSH



Packets

- Every message, file or stream of information **sent over computer networks** is broken down into small chunks called **packets**
- Each packet contains **important information** inside of it called a **header**:
 - Contents
 - Origin
 - Destination



Internet Protocol (IP)

- All the devices on the Internet have **IP Addresses**
- Each IP address is **unique** to each computer or device at the edge of the network



IP Address

- An **IP Address** has many parts, organized in a hierarchy

Subnetworks

192.168.14.120

Device address

- This version of IP Addressing is called **IPv4**
 - Provides more than 4 billion **32 bits** unique addresses



Domain Name Server

- The **domain name** is a human way to access IP addresses for devices and websites around the world
- When a domain name is entered in the browser, a request is made to the **DNS**



IP Address	Domains
216.58.214.46	Google.com
217.174.159.195	Softuni.bg

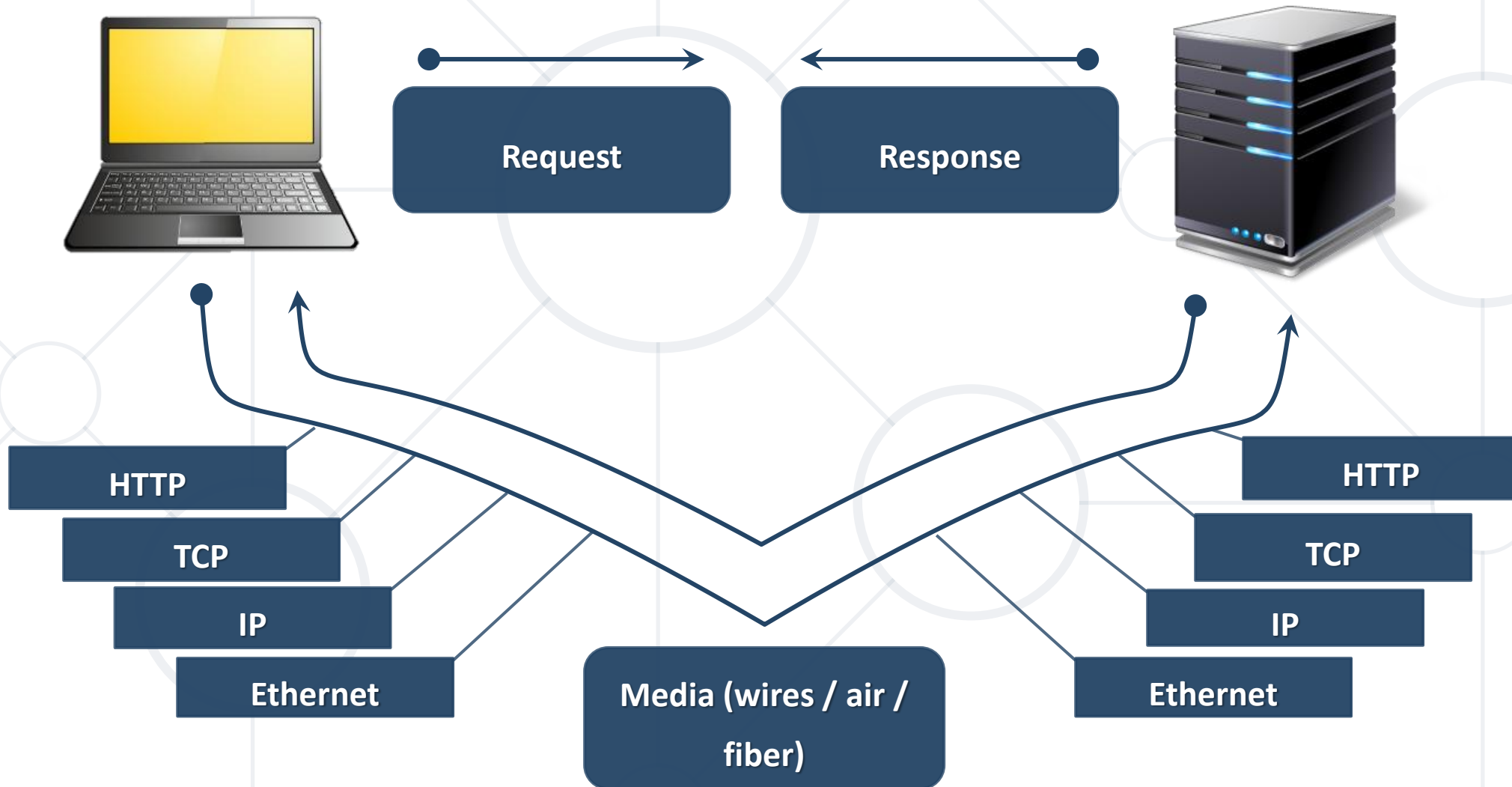
A background network diagram consisting of a central dark blue circle containing the text 'http://'. Surrounding this central circle are several smaller, light gray circles connected by thin gray lines, forming a web-like structure. The circles vary in size and are distributed across the frame, with some lines extending towards the edges.

http://

HTTP Basics

Web Communication Explained

Hyper Text Transfer Protocol



HTTP Request Methods

Method	Description
POST	Create / store a resource
GET	Read / retrieve a resource
PUT	Update / modify a resource
DELETE	Delete / remove a resource



The four basic functions of persistent storage.

Other HTTP Methods

CONNECT

HEAD

OPTIONS

TRACE

HTTP Conversation: Example

- HTTP **request**:

```
GET /courses/python HTTP/1.1
Host: softuni.bg
User-Agent: Mozilla/5.0
<CRLF>
```

The empty line denotes the end of the request headers

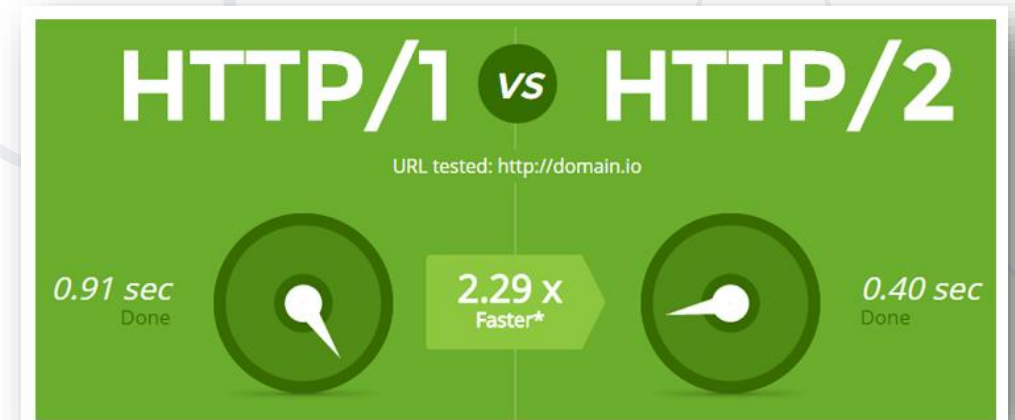
- HTTP **response**:

```
HTTP/1.1 200 OK
Date: Mon, 5 Jul 2023 13:09:03 GMT
Server: Microsoft-HTTPAPI/2.0
Last-Modified: Mon, 12 Jul 2023 15:33:23 GMT
Content-Length: 54
<CRLF>
<html><title>Hello</title>
Welcome to our site</html>
```

The empty line denotes the end of the response headers

What's HTTP/2.0

- Major revision of the **HTTP** network protocol used by the **World Wide Web**
 - Supported by most of the popular web browsers
- Fast and optimized, meets modern web usage requirements
- Completely Backwards-Compatible
- Almost **50%** of all the websites support **HTTP/2** (W3Techs statistics)





URL

Uniform Resource Locator

Uniform Resource Locator (URL)

- A **URL** is a reference to a web resource that specifies its location on a network and a mechanism for retrieving it
- A URL is a specific type of URI (**Uniform Resource Identifier**)

`http://localhost:8080/demo/index.html?id=27&lang=en#lecture`



The diagram illustrates the components of the URL `http://localhost:8080/demo/index.html?id=27&lang=en#lecture`. Brackets are placed under the string to group it into six parts, each with a label below: **Protocol** (http), **Host** (localhost), **Port** (8080), **Path** (/demo/index.html), **Query String** (?id=27&lang=en), and **Fragment** (#lecture).

- URLs are encoded according RFC 1738:
 - Safe URL characters: **[0-9a-zA-Z], \$, -, _, ., +, *, ', (,), , , !**
- All other characters are escaped by:

`%[character hex code]`

- Space is encoded as **"+"** or **"%20"**

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- URL-encoded string:

`%D0%9D%D0%B0%D0%BA%D0%BE%D0%B2-%E7%88%B1-SoftUni`

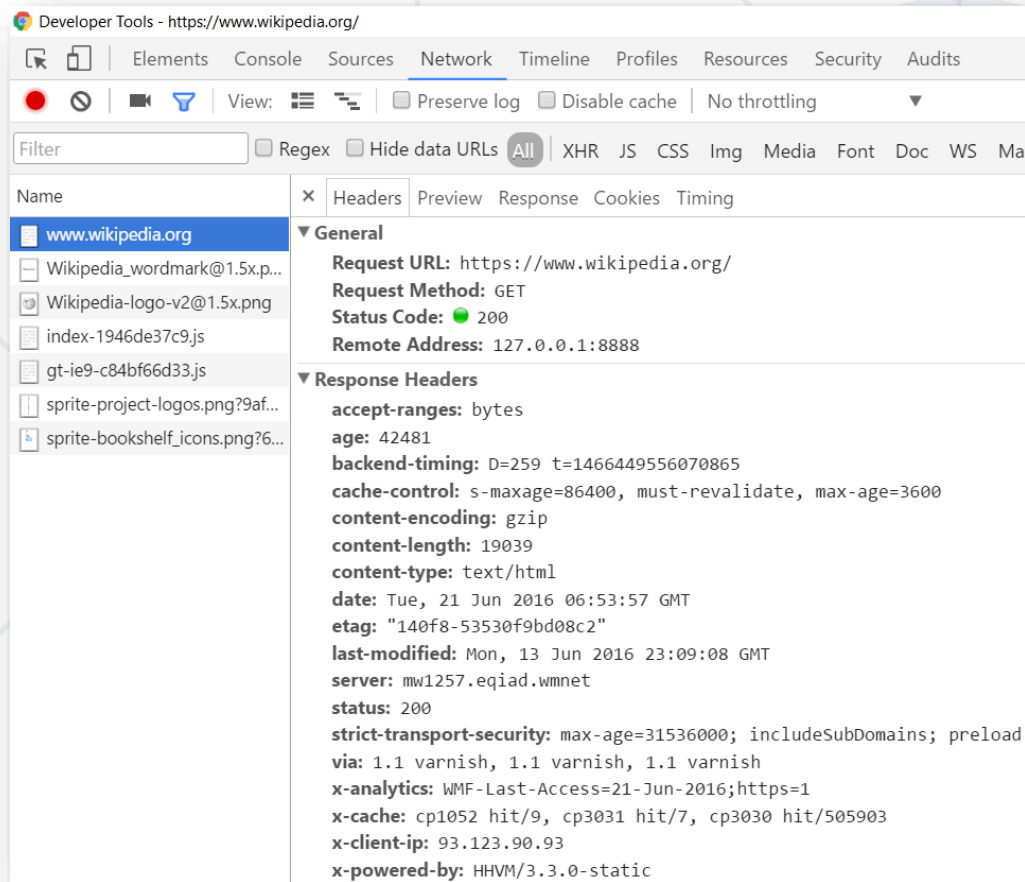
Char	URL Encoding
space	%20
щ	%D1%89
"	%22
#	%23
\$	%24
%	%25
&	%26



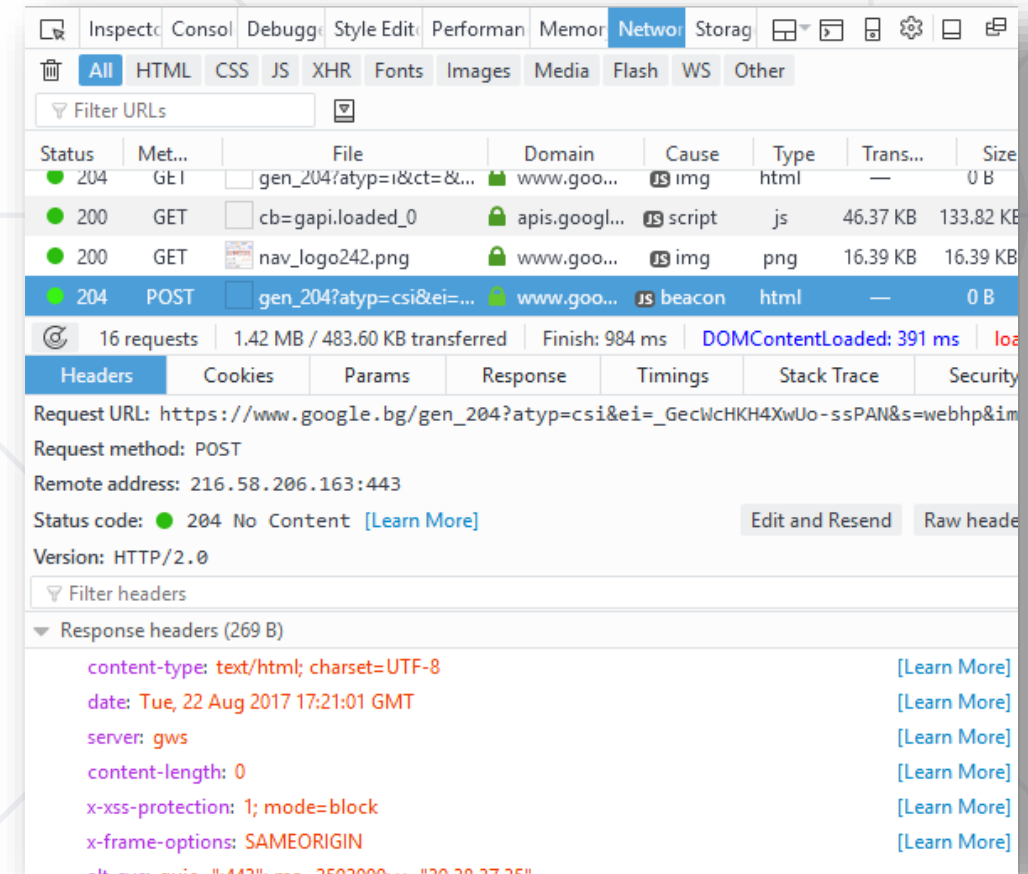
Tools for Developers

Dev Tools

Tools for Developers – Browser Dev Tools



Chrome Developer Tools



Mozilla Developer Tools



Postman – API platform



Rested – Firefox add-on

Postman – Register an Account

Build APIs together

Over 25 million developers use Postman. Get started by signing up or downloading the desktop app.

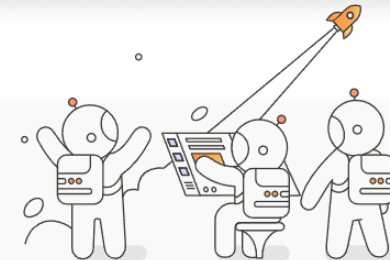
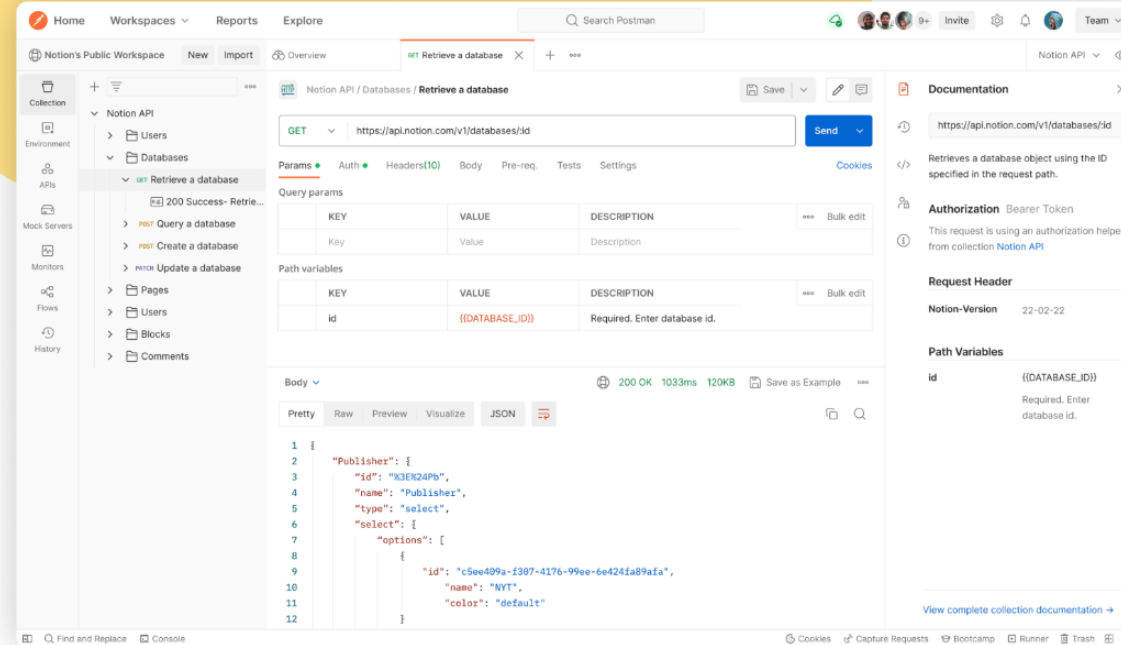
[Sign Up for Free](#)

Download the desktop app for

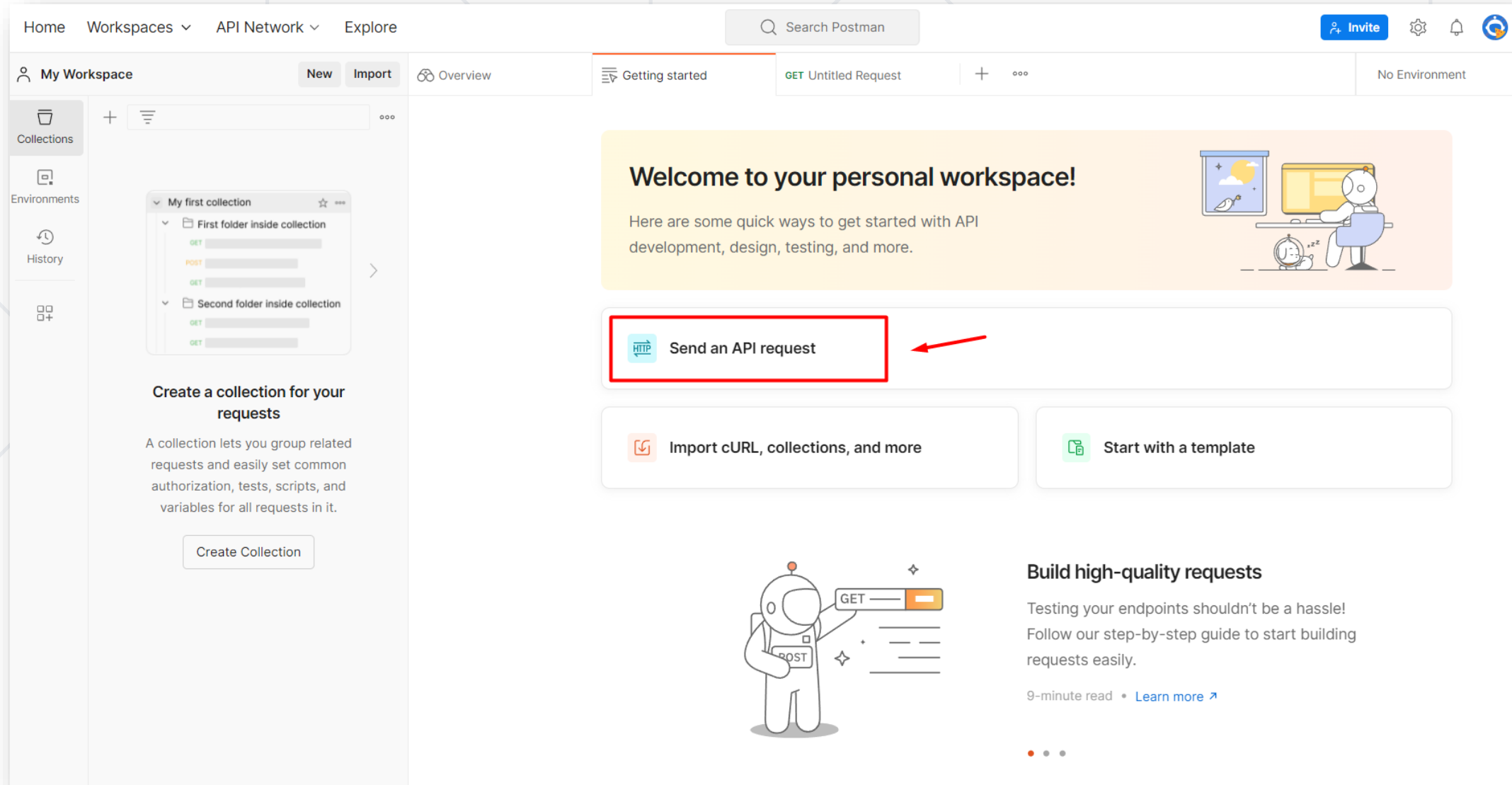


What is Postman?

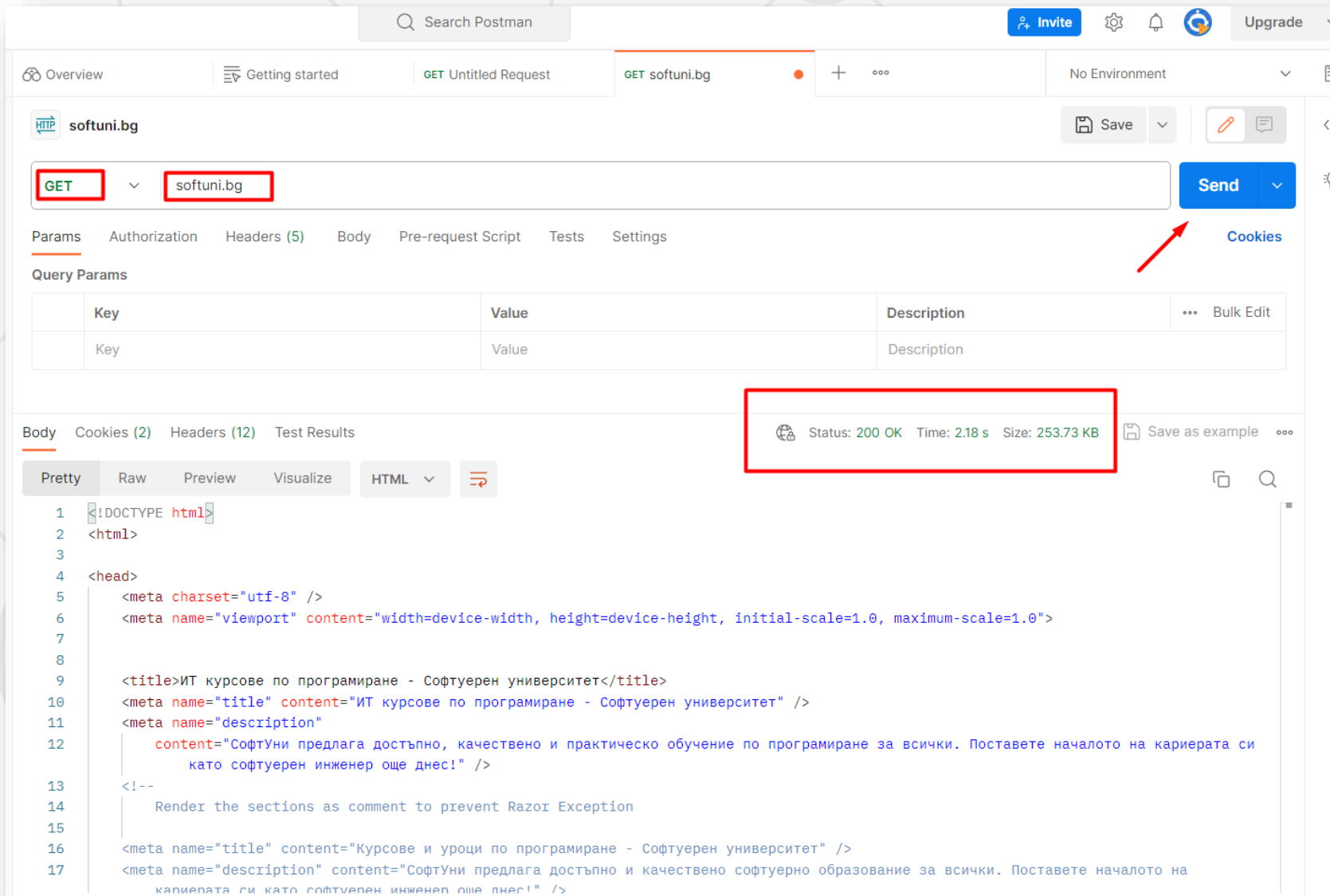
Postman is an API platform for building and using APIs. Postman simplifies each step of the API lifecycle and streamlines collaboration so you can create better APIs—faster.



Postman – Usage



Postman – GET Request



Search Postman

Invite Upgrade

Overview Getting started GET Untitled Request GET softuni.bg

No Environment

Save

Send

Params Authorization Headers (5) Body Pre-request Script Tests Settings

Query Params

Key	Value	Description	...	Bulk Edit
Key	Value	Description		

Body Cookies (2) Headers (12) Test Results

Status: 200 OK Time: 2.18 s Size: 253.73 KB Save as example

Pretty Raw Preview Visualize HTML

```
1 <!DOCTYPE html>
2 <html>
3
4 <head>
5   <meta charset="utf-8" />
6   <meta name="viewport" content="width=device-width, height=device-height, initial-scale=1.0, maximum-scale=1.0">
7
8
9   <title>ИТ курсове по програмиране - Софтуерен университет</title>
10  <meta name="title" content="ИТ курсове по програмиране - Софтуерен университет" />
11  <meta name="description"
12    content="СофтУни предлага достъпно, качествено и практическо обучение по програмиране за всички. Поставете началото на кариерата си като софтуерен инженер още днес!" />
13  <!--
14    Render the sections as comment to prevent Razor Exception
15  -->
16  <meta name="title" content="Курсове и уроци по програмиране - Софтуерен университет" />
17  <meta name="description" content="СофтУни предлага достъпно и качествено софтуерно образование за всички. Поставете началото на кариерата си като софтуерен инженер още днес!" />
```

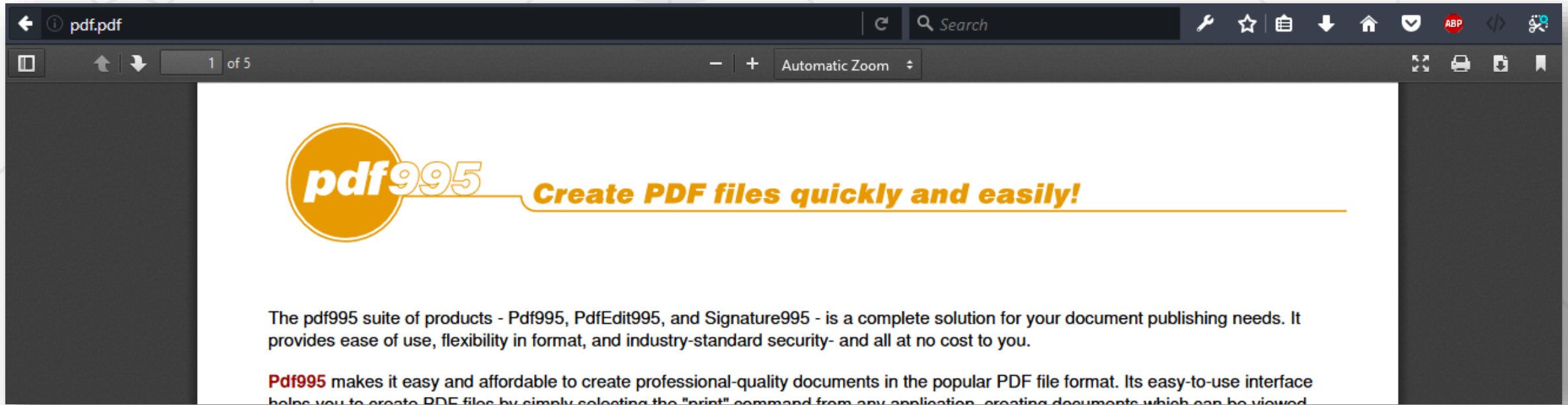


Multi-Purpose Internet Mail Extensions

MIME and Media Types

What is MIME?

- **MIME** == Multi-Purpose Internet Mail Extensions
 - Internet standard for encoding resources
 - Originally developed for email attachments
 - Used in many Internet protocols like HTTP and SMTP



Common MIME Media Types

MIME Type / Subtype	Description
application/json	JSON data
image/png	PNG image
image/gif	GIF image
text/html	HTML
text/plain	Text
text/xml	XML
video/mp4	MP4 video
application/pdf	PDF document



HTTP Request / HTTP Response

- Request message sent by a client consists of:

- HTTP **request line**

- Request **method** (GET / POST / PUT / DELETE / ...)

- Resource **URI** (URL)

- Protocol **version**

<method> <resource> HTTP/<version>

<headers>

(empty line)

<body>

- HTTP **request headers**

- Additional parameters

- HTTP **request body** – optional data e.g., posted form fields

GET Request Method – Example

```
<form method="get" action="/my-action">  
  Name: <input type="text" name="name" />  
  Age: <input type="text" name="age" />  
  <button>Submit</button>  
</form>
```

GET /my-action? HTTP/1.1

Host: localhost

<CRLF>

HTTP request line

HTTP request headers

The request body is empty

POST Request Method – Example

- The **POST** method transfers data in the HTTP body
- **POST** can send text and binary data e.g., upload files

```
POST /login HTTP/1.1
```

```
Host: localhost
```

```
Content-Length: 59
```

```
<CRLF>
```

```
username=test&password=top*secret!
```

```
<CRLF>
```

HTTP request line

HTTP request headers

The request body holds
the submitted form data

- The **response message** sent by the HTTP server consists of:
 - HTTP response **status line**
 - Protocol version
 - Status code
 - Status text
 - Response **headers**
 - Provide meta data about the returned resource
 - Response **body**
 - The content of the HTTP response (data)

```
HTTP/<version> <status code> <status text>  
<headers>  
<CRLF>  
<response body – the requested resource>
```

- HTTP response code classes
 - **1xx**: informational (e.g., "**100 Continue**")
 - **2xx**: successful (e.g., "**200 OK**", "**201 Created**")
 - **3xx**: redirection (e.g., "**304 Not Modified**", "**301 Moved Permanently**", "**302 Found**")
 - **4xx**: client error (e.g., "**400 Bad Request**", "**404 Not Found**", "**401 Unauthorized**", "**409 Conflict**")
 - **5xx**: server error (e.g., "**500 Internal Server Error**", "**503 Service Unavailable**")

HTTP Response – Example

- Example of **HTTP response** from the Web server:

```
HTTP/1.1 200 OK
```

HTTP response **status line**

```
Date: Fri, 17 Jul 2023 16:09:18 GMT+2
```

```
Server: Apache/2.2.14 (Linux)
```

```
Accept-Ranges: bytes
```

```
Content-Length: 84
```

```
Content-Type: text/html
```

```
<CRLF>
```

```
<html>
```

```
  <head><title>Test</title></head>
```

```
  <body>Test HTML page.</body>
```

```
</html>
```

HTTP response
headers

HTTP response
body

HTTP Response – Example

- Example of **HTTP response** with **error** result:

```
HTTP/1.1 404 Not Found
```

HTTP response status line

```
Date: Fri, 17 Nov 2023 16:09:18 GMT+2  
Server: Apache/2.2.14 (Linux)  
Connection: close  
Content-Type: text/html
```

HTTP response headers

```
<CRLF>
```

```
<html><head><title>404 Not Found</title></head>  
<body>  
<h1>Not Found</h1>  
<p>The requested URL /img/logo.gif was not found on this server.</p>  
<hr><address>Apache/2.2.14 Server at Port 80</address>  
</body></html>
```

The HTTP
response body

- HTTP **GET requesting** a moved URL:

```
GET / HTTP/1.1  
Host: http://softuni.org  
User-Agent: Gecko/20100115 Firefox/3.6  
<CRLF>
```

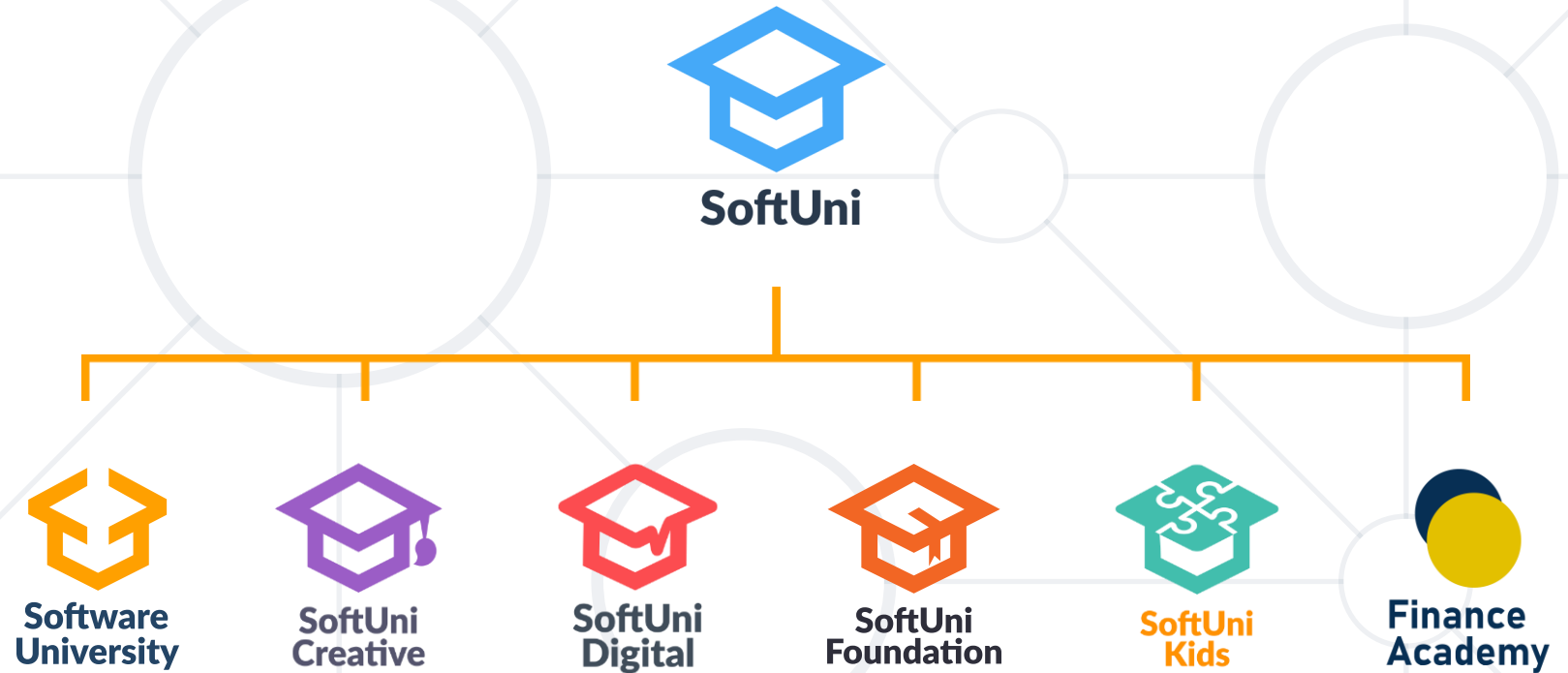
- The following HTTP response (**301 Moved Permanently**) tells the browser to request another URL:

```
HTTP/1.1 301 Moved Permanently  
Location: http://softuni.bg  
...
```


- **Internet**, Definitions of Internet
- What is **HTTP**
- What is **URL**
- Browser **Tools** for **Developers**
- **Postman** API Platform
- What is **MIME**



Questions?



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