HTTP Basics

HTTP Request & HTTP Response

SoftUni Team

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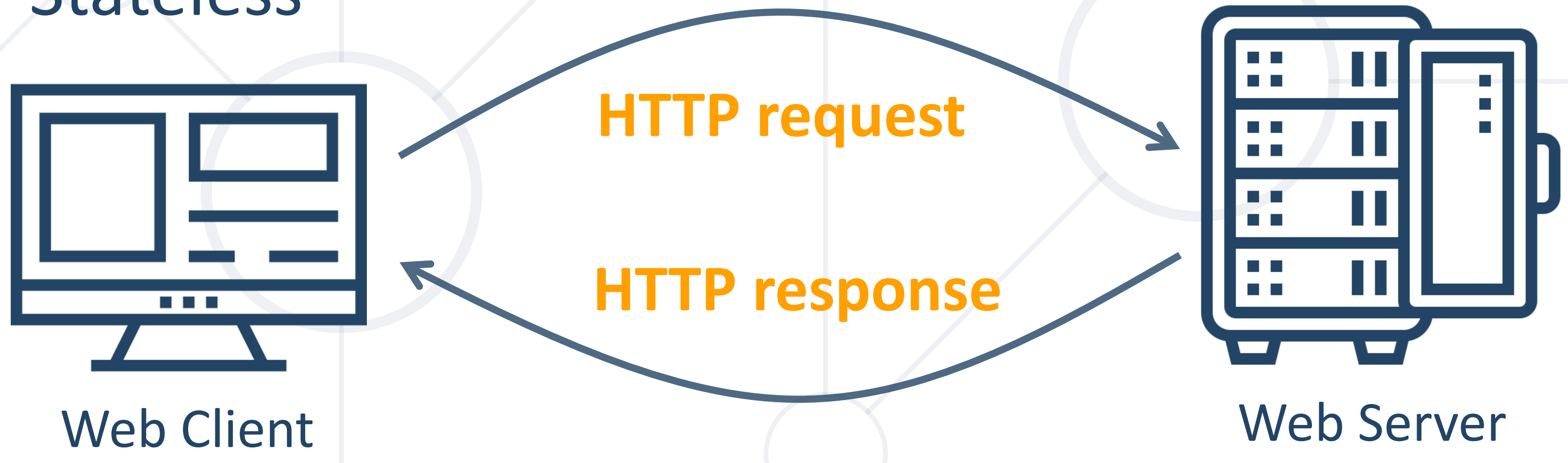
HTTP Protocol – Basics

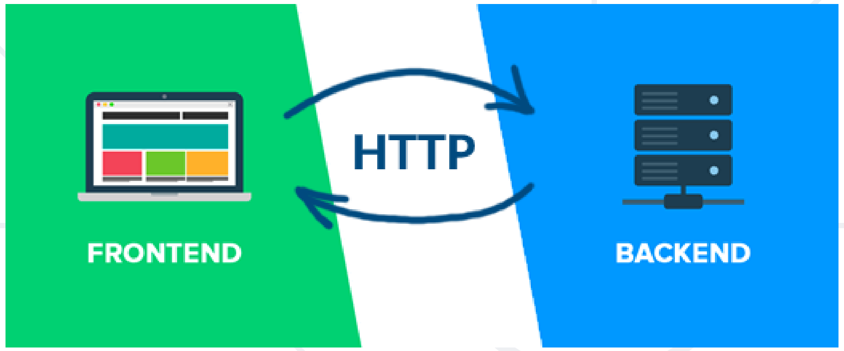
HTTP Basics

- **HTTP** (**H**yper**T**ext **T**ransfer **P**rotocol)
  - Text-based client-server protocol for the Internet
  - For transferring Web resources (HTML files, images, styles, etc.)
  - Request-response based, relies on URLs (like https://softuni.org)
  - Stateless



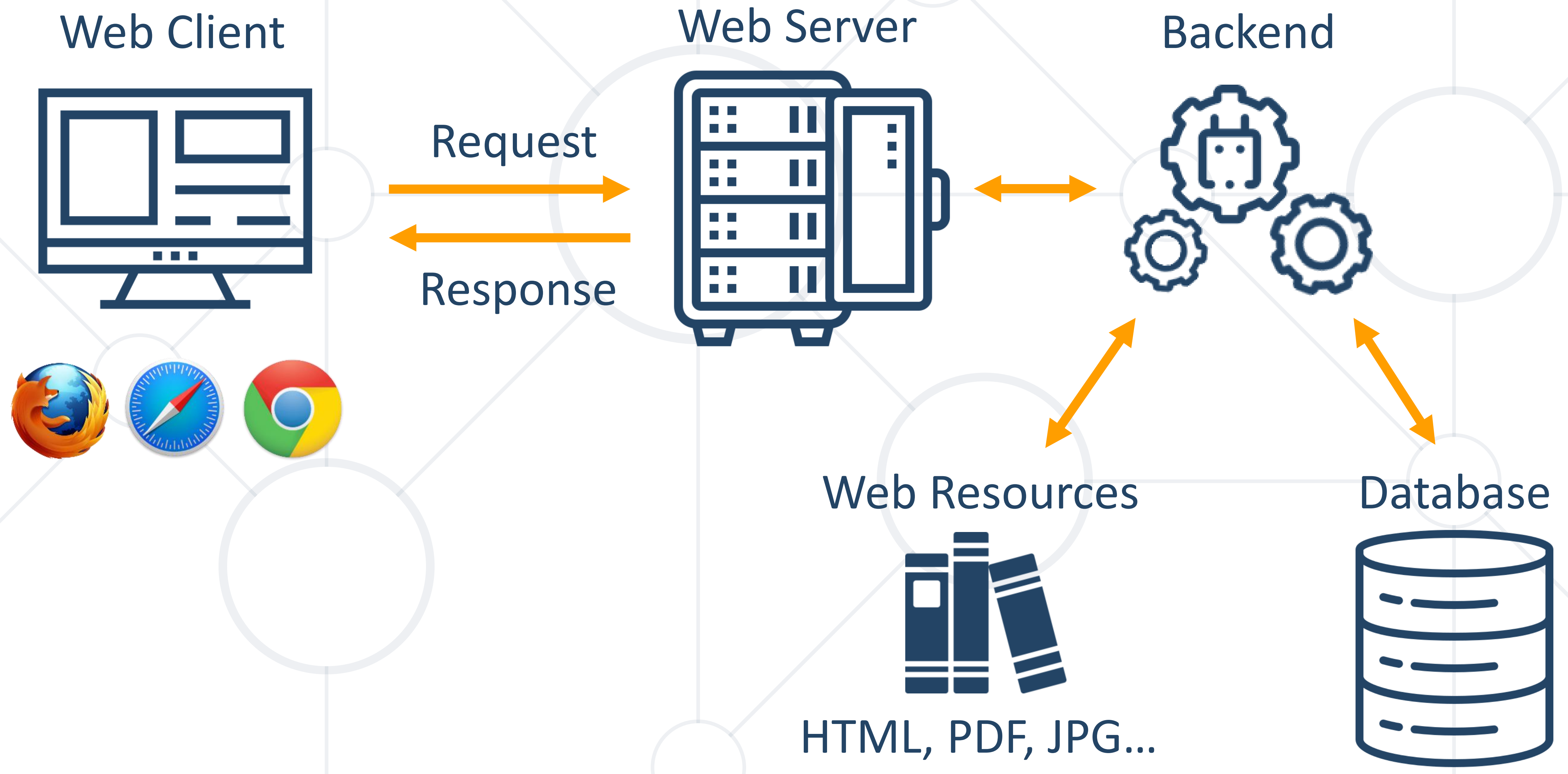
Front-End and Back-End

- **Front-end** and **back-end** separates the modern apps into **client-side** (UI) and **server-side** (data) components
- **Front-end** == client-side components (presentation layer), e.g. React app
  - Implement the **user interface** (UI)
- **Back-end** == server-side components (business logic APIs), e.g. ASP.NET Core
  - Provide **data storage and processing**

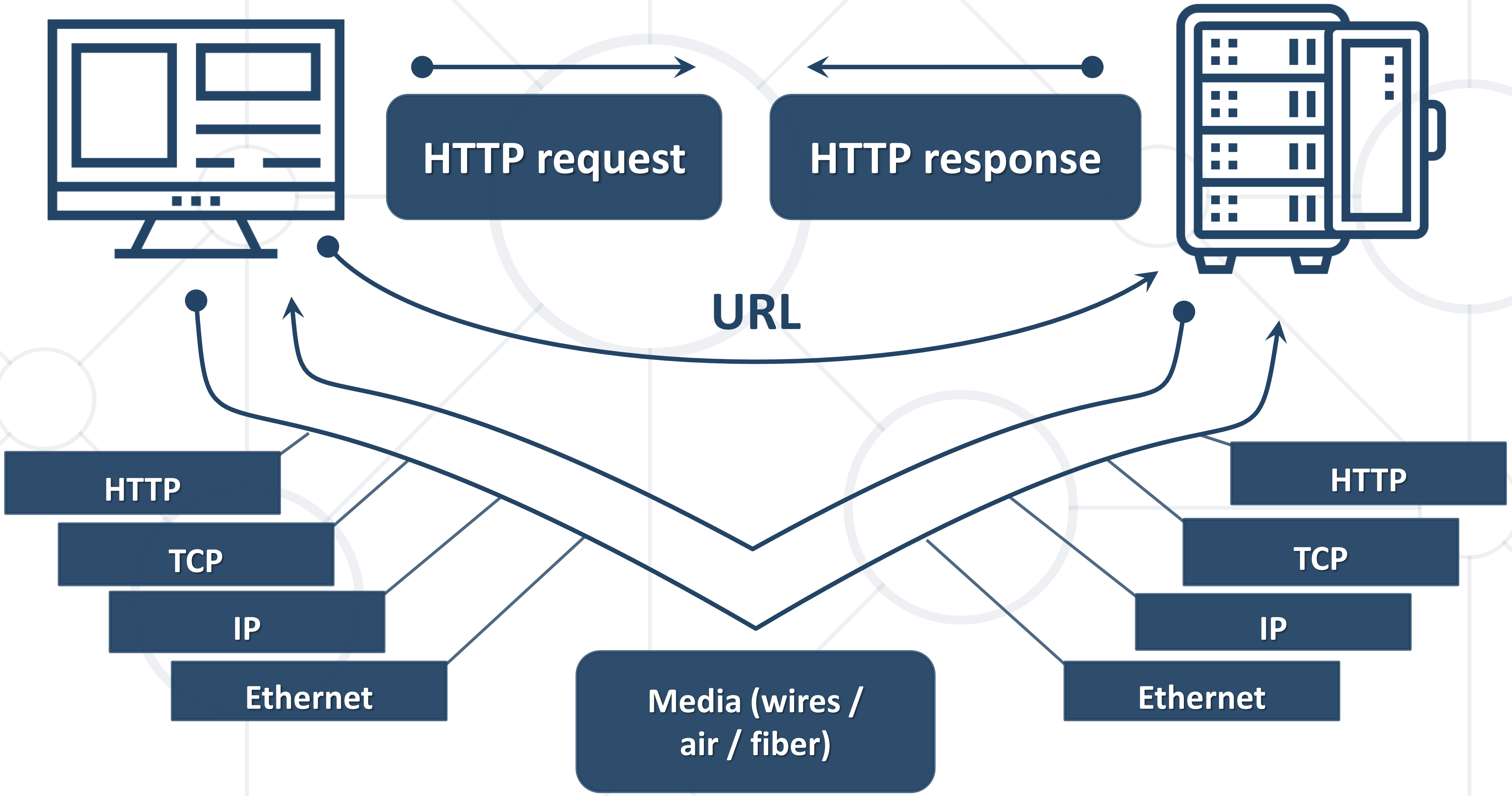


- **HTTP** connects front-end with back-end

The Client-Server Model in Web Apps

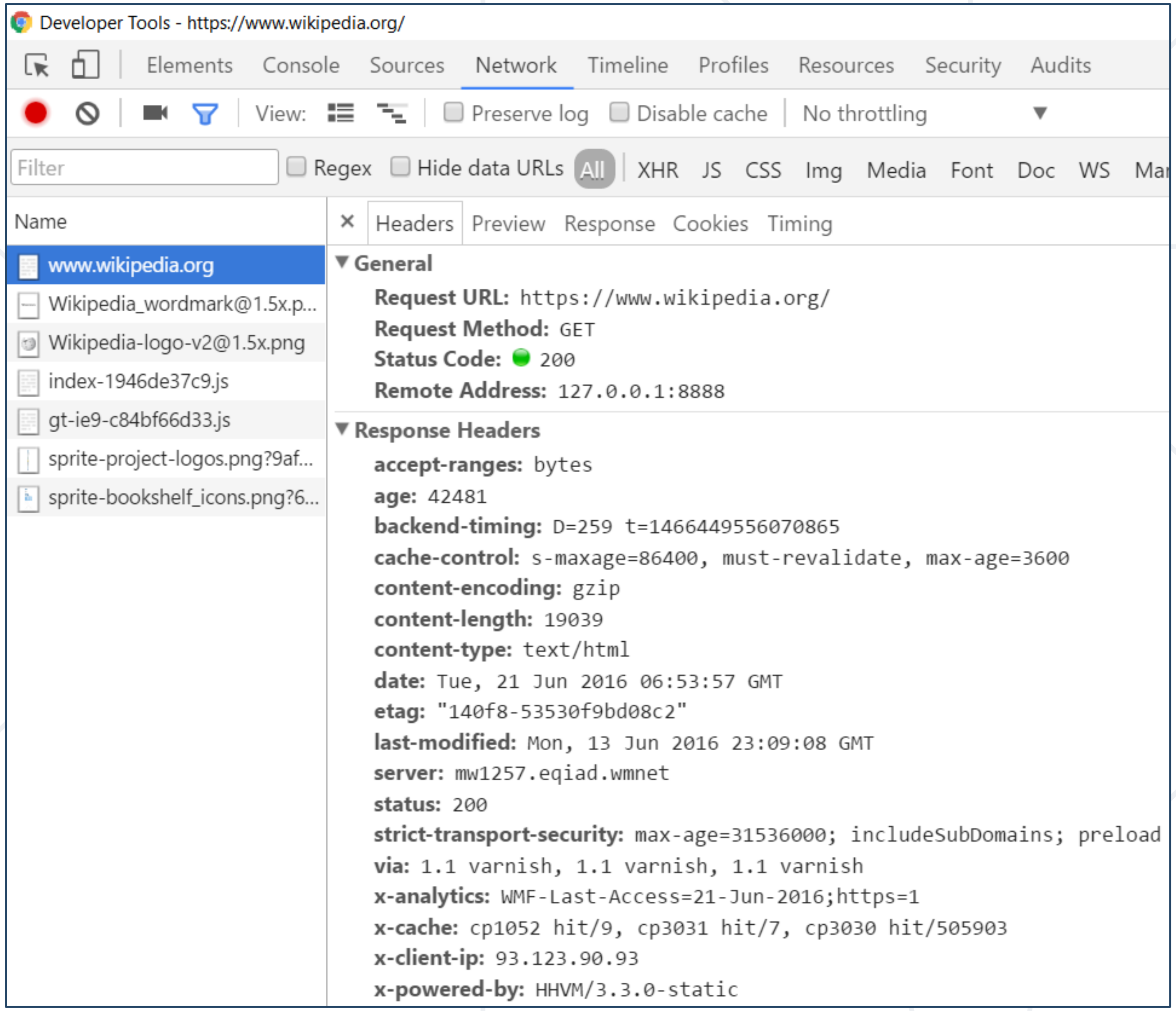


Network Layers and HTTP



HTTP Dev Tools

HTTP Developer Tools: Network Inspector



Name:
- www.wikipedia.org
- Wikipedia_wordmark@1.5x.p...
- Wikipedia-logo-v2@1.5x.png
- index-1946de37c9.js
- gt-ie9-c84bf66d33.js
- sprite-project-logos.png?9af...
- sprite-bookshelf_icons.png?6...

▼ General

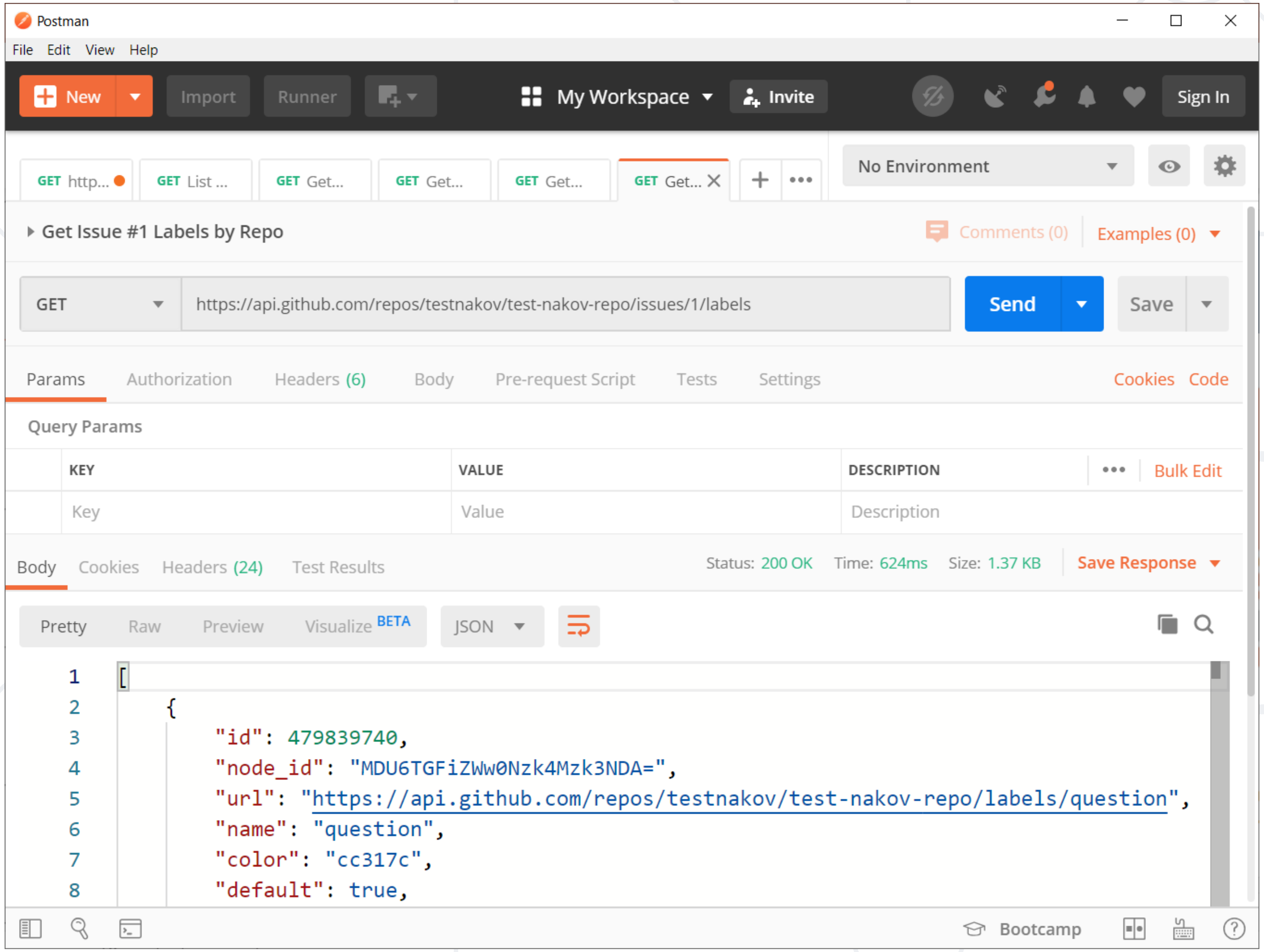
Request URL: `https://www.wikipedia.org/`
Request Method: `GET`
Status Code: ● `200`
Remote Address: `127.0.0.1:8888`

▼ Response Headers

accept-ranges: `bytes`
age: `42481`
backend-timing: `D=259 t=1466449556070865`
cache-control: `s-maxage=86400, must-revalidate, max-age=3600`
content-encoding: `gzip`
content-length: `19039`
content-type: `text/html`
date: `Tue, 21 Jun 2016 06:53:57 GMT`
etag: `"140f8-53530f9bd08c2"`
last-modified: `Mon, 13 Jun 2016 23:09:08 GMT`
server: `mw1257.eqiad.wmnet`
status: `200`
strict-transport-security: `max-age=31536000; includeSubDomains; preload`
via: `1.1 varnish, 1.1 varnish, 1.1 varnish`
x-analytics: `WMF-Last-Access=21-Jun-2016;https=1`
x-cache: `cp1052 hit/9, cp3031 hit/7, cp3030 hit/505903`
x-client-ip: `93.123.90.93`
x-powered-by: `HHVM/3.3.0-static`

- Chrome Developer Tools
  - Press **[F12]** in Chrome
  - Open the [Network] tab
  - Inspect the HTTP traffic

HTTP Developer Tools: HTTP Client Tools



Get Issue #1 Labels by Repo

GET https://api.github.com/repos/testnakov/test-nakov-repo/issues/1/labels

KEY	VALUE	DESCRIPTION
Key	Value	Description

Status: 200 OK Time: 624ms Size: 1.37 KB

```
[
    {
        "id": 479839740,
        "node_id": "MDU6TGFiZWw0Nzk4Mzk3NDA=",
        "url": "https://api.github.com/repos/testnakov/test-nakov-repo/labels/question",
        "name": "question",
        "color": "cc317c",
        "default": true,
```

Postman

- HTTP client tool for developers
- Compose and send HTTP requests
- Insomnia Core
- Postwoman

HTML Forms

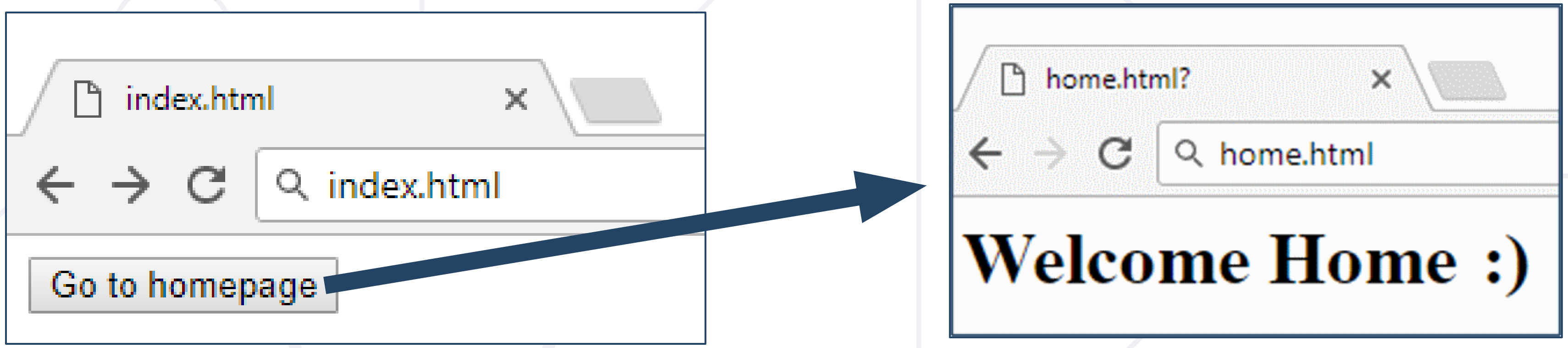
Form Submission: GET and POST

HTML Forms: Action

- The "**action**" **attribute** defines where to submit the form data

```
<form action="home.html">
  <input type="submit" value="Go to homepage"/>
</form>
```

Relative or full URL



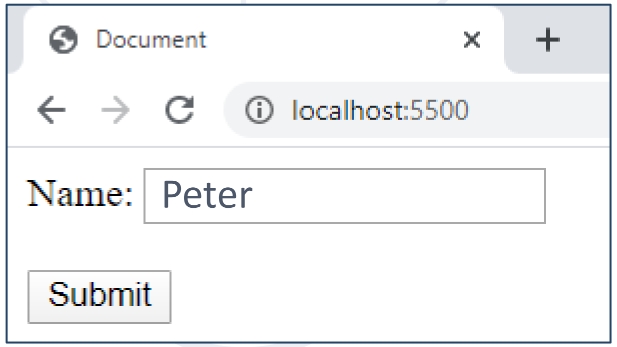
Welcome Home :)

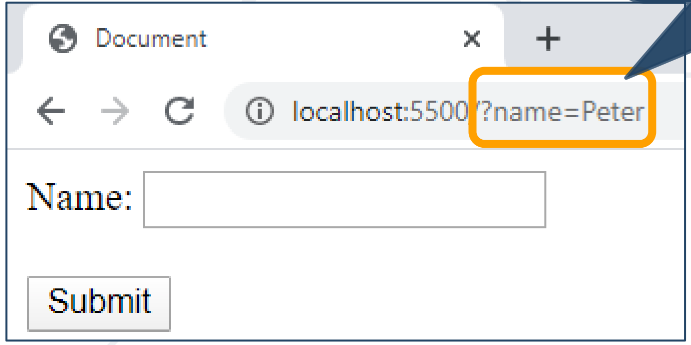
Example: https://repl.it/@nakov/http-form-example

HTML Forms: Method GET

- Forms can specify the **HTTP method** for sending the form data

```
<form method="get">
  Name: <input type="text" name="name">
  <br /><br />
  <input type="submit" value="Submit">
</form>
```



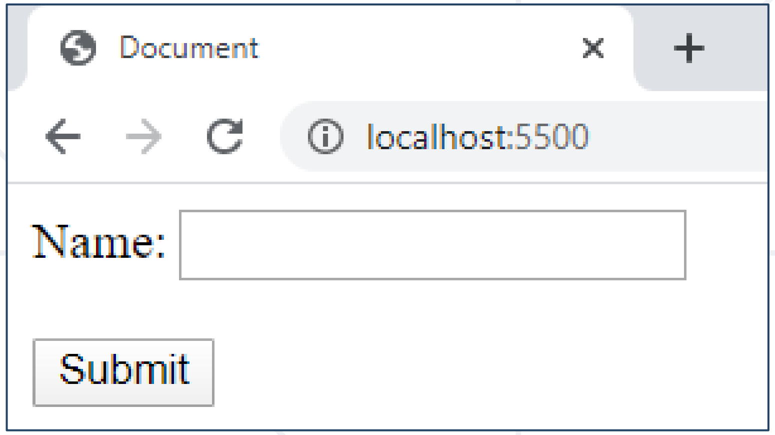


The form data is in the URL

Example: https://repl.it/@nakov/http-get-example

HTML Forms: Method POST

```
<form method="post">
  Name: <input type="text" name="name">
  <br /><br />
  <input type="submit" value="Submit">
</form>
```



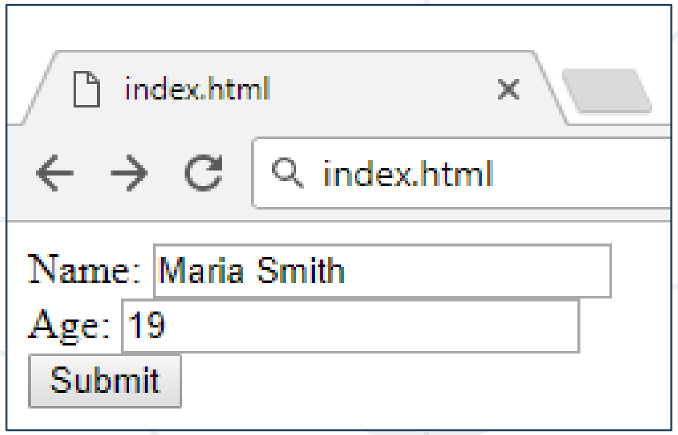
```
POST /index.html HTTP/1.1
Host: localhost
Content-Type: application/x-www-form-urlencoded
Content-Length: 10

name=Peter
```

The HTTP request body holds the submitted form data

Example: https://repl.it/@nakov/http-post-example

URL Encoded Form Data – Example

```
<form method="post">
  Name: <input type="text" name="name"/> <br/>
  Age: <input type="text" name="age"/> <br/>
  <input type="submit" />
</form>
```



Name: Maria Smith
Age: 19

```
POST /index.html HTTP/1.1
Host: localhost
Content-Type: application/x-www-form-urlencoded
Content-Length: 23

name=Maria+Smith&age=19
```

File upload fields are not supported (unless multipart encoding is set)

URL-encoded form data

Example: https://repl.it/@nakov/http-post-example-name-age

HTTP Request

Request Method, Headers, Body

HTTP Request Methods

- **HTTP** defines **methods** to indicate the desired action to be performed on the identified resource

Method	Description
GET	Retrieve a resource
POST	Create / store a resource
PUT	Update (replace) a resource
DELETE	Delete (remove) a resource
PATCH	Update resource partially (modify)
HEAD	Retrieve the resource's headers

CRUD == the four main functions of persistent storage

Method
CONNECT
OPTIONS
TRACE

HTTP GET Request – Example

```
GET /users/SoftUni-Tech-Module/repos HTTP/1.1
Host: api.github.com
Accept: */*
Accept-Language: en
Accept-Encoding: gzip, deflate
User-Agent: Mozilla/5.0 (Windows NT 10.0; WOW64)
 AppleWebKit/537.36 (KHTML, like Gecko)
 Chrome/54.0.2840.71 Safari/537.36
Connection: keep-alive
Cache-Control: no-cache

<CRLF>
```

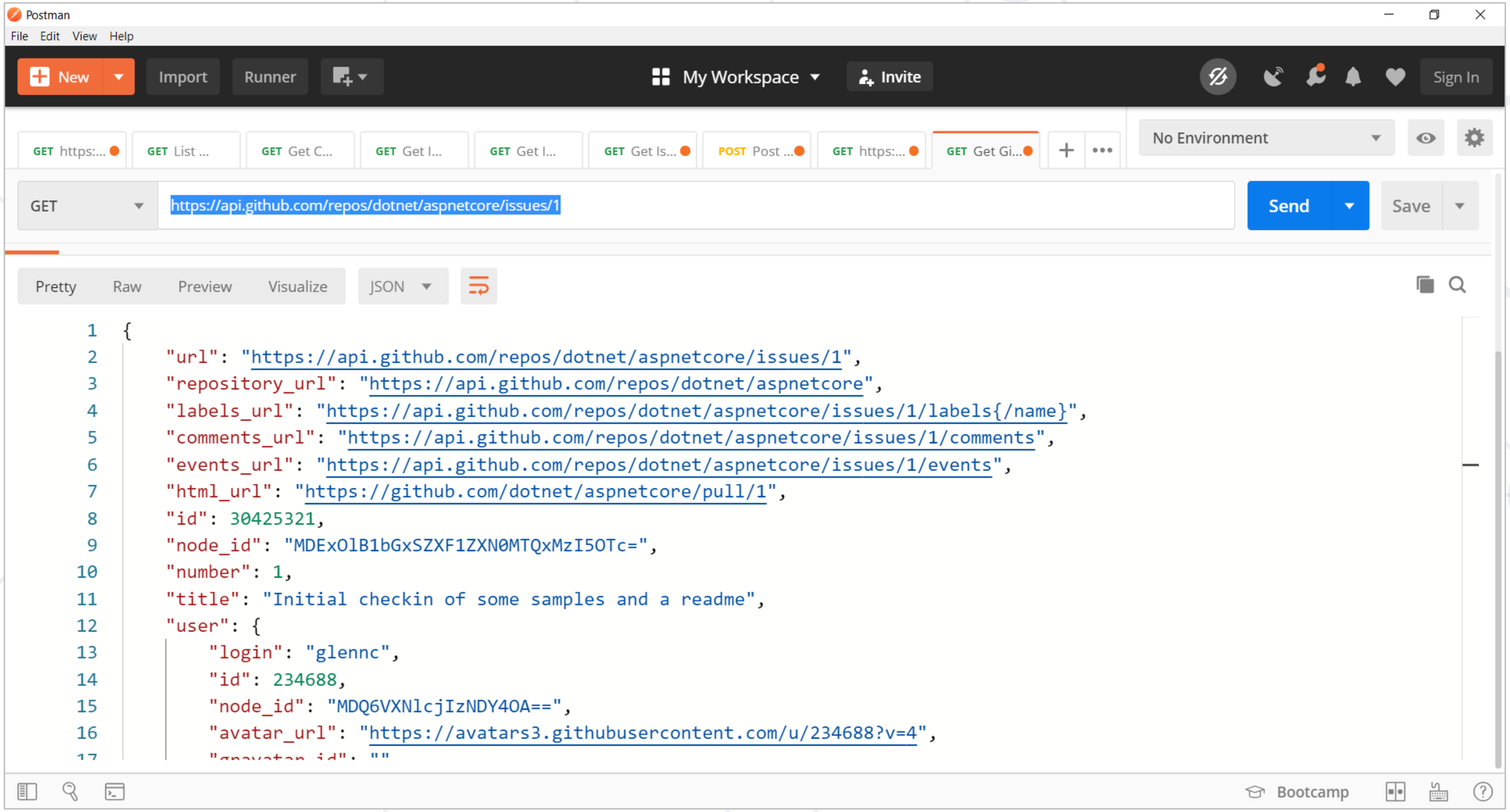
Realtive URI, not full URL

HTTP request line

HTTP headers

The request body is empty

HTTP GET – Example with Postman



GET https://api.github.com/repos/dotnet/aspnetcore/issues/1

```
{
    "url": "https://api.github.com/repos/dotnet/aspnetcore/issues/1",
    "repository_url": "https://api.github.com/repos/dotnet/aspnetcore",
    "labels_url": "https://api.github.com/repos/dotnet/aspnetcore/issues/1/labels{/name}",
    "comments_url": "https://api.github.com/repos/dotnet/aspnetcore/issues/1/comments",
    "events_url": "https://api.github.com/repos/dotnet/aspnetcore/issues/1/events",
    "html_url": "https://github.com/dotnet/aspnetcore/pull/1",
    "id": 30425321,
    "node_id": "MDExOlB1bGxSZXF1ZXN0MTQxMzI5OTc=",
    "number": 1,
    "title": "Initial checkin of some samples and a readme",
    "user": {
        "login": "glennc",
        "id": 234688,
        "node_id": "MDQ6VXNlcjIzNDY4OA==",
        "avatar_url": "https://avatars3.githubusercontent.com/u/234688?v=4",
```

HTTP POST Request – Example

```
POST /post HTTP/1.1
Host: postman-echo.com
Accept: */*
Accept-Encoding: gzip, deflate
Content-Type: application/json
Connection: keep-alive
Content-Length: 95
<CRLF>
{"title":"Found a bug",
 "body":"I'm having a problem with this.",
 "labels":["bug","minor"]}
<CRLF>
```

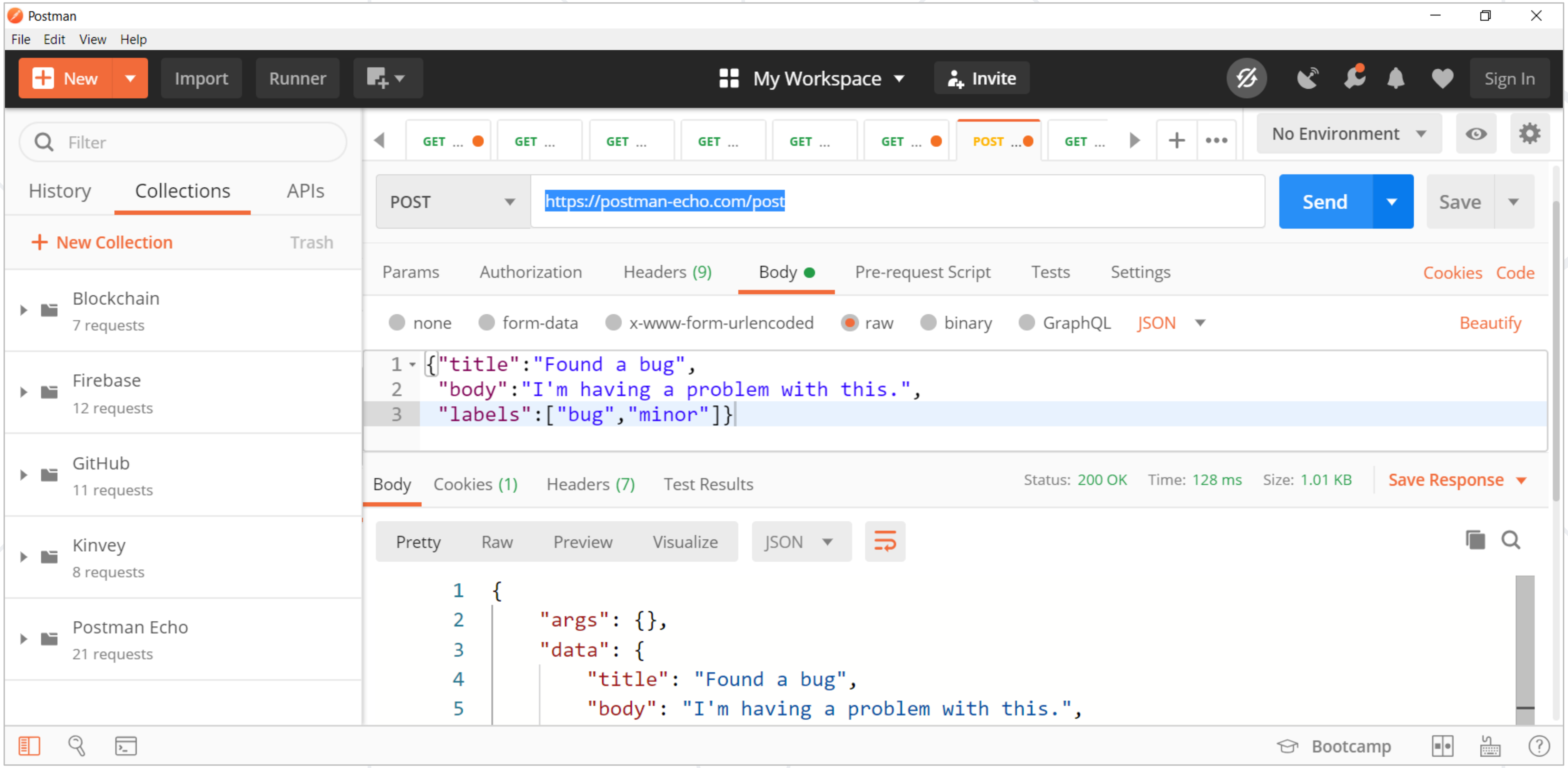
URL: https://postman-echo.com/post

HTTP request line

HTTP headers

The request body holds the submitted data

HTTP POST – Example with Postman



POST https://postman-echo.com/post

```
{"title":"Found a bug",
 "body":"I'm having a problem with this.",
 "labels":["bug","minor"]}
```

Status: 200 OK Time: 128 ms Size: 1.01 KB

```
{
    "args": {},
    "data": {
        "title": "Found a bug",
        "body": "I'm having a problem with this.",
```

HTTP Response

Response Status, Headers, Body

HTTP Response – Example

```
HTTP/1.1 200 OK

Date: Fri, 11 Nov 2016 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 status line

HTTP response headers

HTTP response body

HTTP Response Status Codes

Status Code	Action	Description
200	OK	Successfully retrieved resource
201	Created	A new resource was created
204	No Content	Request has nothing to return
301 / 302	Moved	Moved to another location (redirect)
400	Bad Request	Invalid request / syntax error
401 / 403	Unauthorized	Authentication failed / Access denied
404	Not Found	Invalid resource was requested
409	Conflict	Conflict was detected, e.g. duplicated email
500 / 503	Server Error	Internal server error / Service unavailable

Content-Type and Disposition

- The `Content-Type` / `Content-Disposition` headers specify how to process the HTTP request / response body

```
Content-Type: application/json
```

JSON-encoded data

```
Content-Type: text/html; charset=utf-8
```

UTF-8 encoded HTML page

```
Content-Type: application/pdf
Content-Disposition: attachment;
filename="Financial-Report-2020.pdf"
```

Download a PDF file

- Standard **media types**: https://iana.org/assignments/media-types

HTTP Conversation: Example

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

HTTP Request

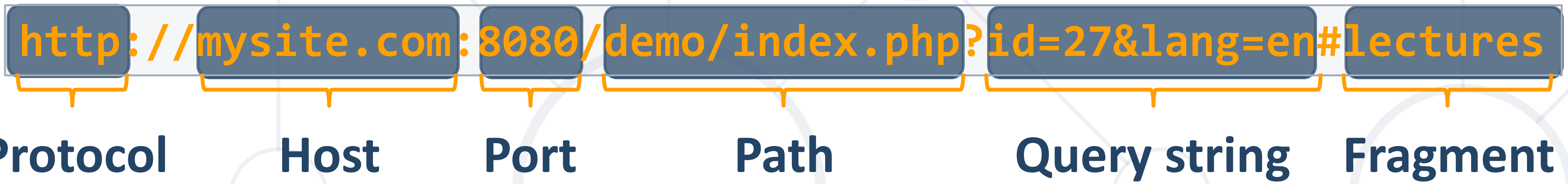
```
HTTP/1.1 200 OK
Date: Tue, 16 May 2020 15:13:41 GMT
Server: Microsoft-HTTPAPI/2.0
Last-Modified: Tue, 16 Jan 2018 15:13:42 GMT
Content-Length: 18586
<CRLF>
<html><title>Get a Tech Degree from…
</title>
```

HTTP Response

URL

Protocol, Host, Path, Query String

Uniform Resource Locator (URL)


http://mysite.com:8080/demo/index.php?id=27&lang=en#lectures
Protocol
Host
Port
Path
Query string
Fragment

- **Network protocol** (**http**, **ftp**, **https**...) – HTTP in most cases
- **Host** or **IP** address (**softuni.org**, **gmail.com**, **127.0.0.1**, **web**)
- **Port** (the default port is **80**) – integer in the range [0...65535]
- **Path** (**/forum**, **/path/index.php**)
- **Query string** (**?id=27&lang=en**)
- **Fragment** (**#slides**) – navigate to some section in the page

Query String

- Query string contains data that is **not part** of the path structure

```
http://example.com/path/to/page?name=tom&color=purple
```

- Commonly used in searches and dynamic pages
- It is the part of the URL after the question mark (**?**) symbol
- Parameters have **`name=value`** format
- Multiple parameters are separated by the **&** delimiter

URL Encoding

- URLs are encoded according to RFC 1738
  - Normal URL characters – have no special meaning

```
[0-9a-zA-Z]
```

  - Reserved URL characters – have a **special meaning**

```
!  *  '  (  )  ;  :  @  &  =  +  $  /  ,  ?  #  [  ]
```

  - Reserved characters are **escaped** by **percent encoding**

```
%[character hex code]
```

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

URL Encoding – Examples

- All other characters are escaped by **% hex code**, e.g.

Char	URL Encoding
space	%20
"	%22
#	%23
$	%24

Char	URL Encoding
%	%25
&	%26
щ	%D1%89
爱	%E7%88%B1

- Example:

```
Наков-爱-SoftUni
```

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

Each char is converted to its UTF-8 bytes, represented as hex digits

Valid and Invalid URLs – Examples

- Some valid URLs

```
http://www.google.bg/search?sourceid=navclient&ie=UTF-
8&rlz=1T4GGLL_enBG369BG369&q=http+get+vs+post
```

```
http://bg.wikipedia.org/wiki/%D0%A1%D0%BE%D1%84%D1%82%D1%83%D0%B5%D1
%80%D0%BD%D0%B0_%D0%B0%D0%BA%D0%B0%D0%B4%D0%B5%D0%BC%D0%B8%D1%8F
```

- Some invalid URLs

Should be: C%23+.NET+4.0

```
http://google.com/search?&q=C# .NET 4.0
```

```
http://google.com/search?&q=код
```

Should be: %D0%BA%D0%BE%D0%B4

Summary

- **HyperText Transfer Protocol**
  - Text-based client-server protocol for the Internet
  - Works with message pairs
    - **Request**: method + headers + body
    - **Response**: status + headers + body
- The **URL** parts: **protocol**, **host**, **port**, **path**, **query string** and **fragment**

Questions?

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Software University

SoftUni Svetlina

SoftUni Creative

SoftUni Digital

SoftUni Foundation

SoftUni Kids

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- Software University Foundation
  - softuni.foundation
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  - facebook.com/SoftwareUniversity
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