

# Internet and HTTP



**SoftUni Team**  
**Technical Trainers**



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**Software University**

<https://softuni.bg>

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sli.do

**#python-web**

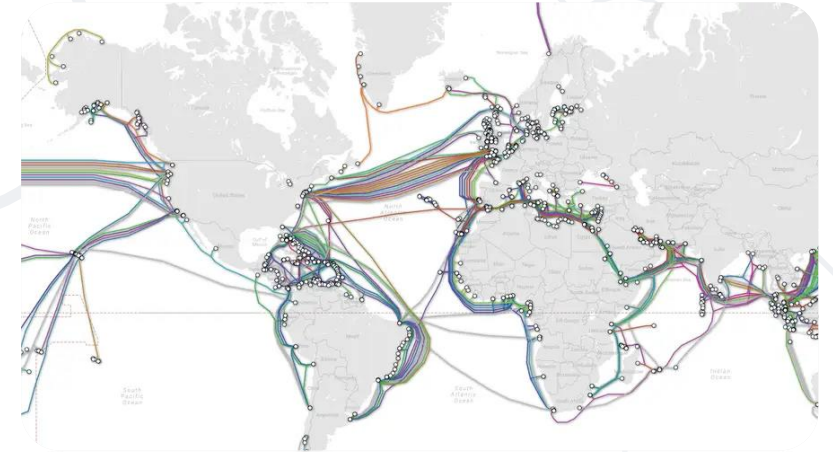


# Introduction

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** though **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



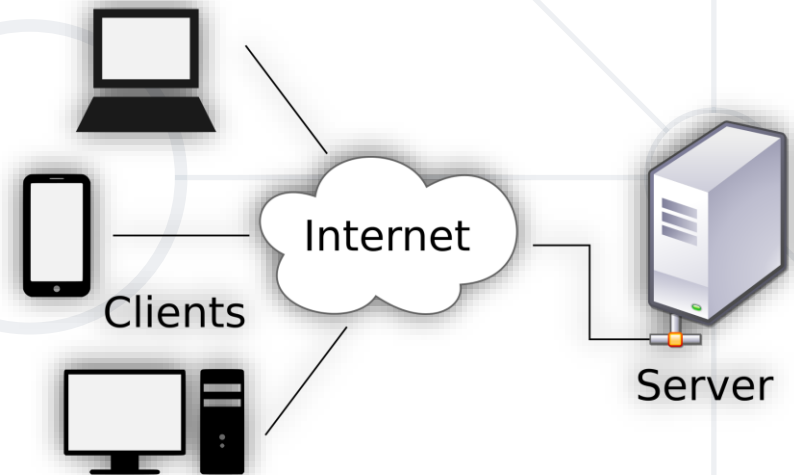


# **Important Definitions**



# 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



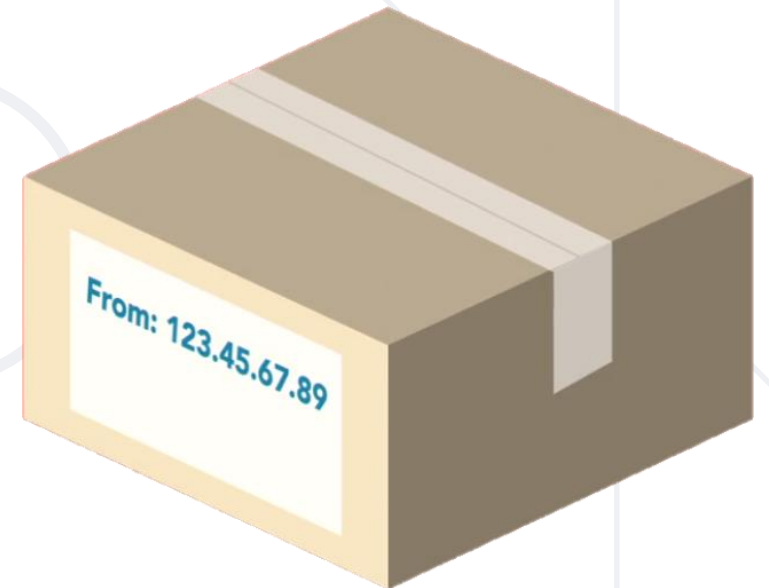
# Network Protocol

- 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 a device at the edge of the network



# IP Address

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

192.168.14.120

Subnetworks

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

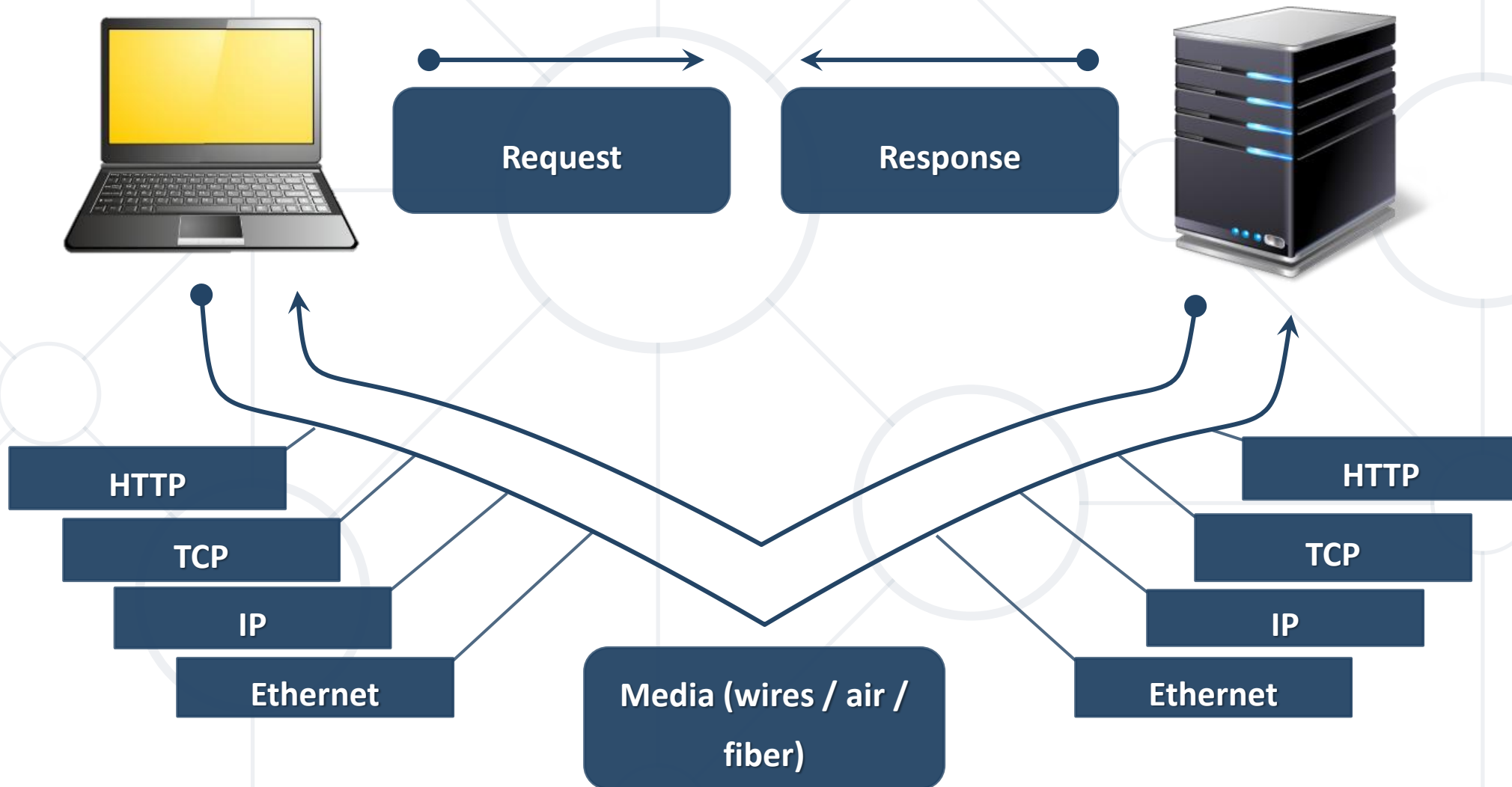
A background network diagram consisting of a central dark blue circle containing the text 'http://'. Surrounding this central circle are several smaller, light gray circles connected by thin gray lines, forming a web-like structure. The central circle is the largest and most prominent, while the surrounding circles vary in size and are connected in a non-uniform pattern, suggesting a decentralized network.

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 persistence storage.

## Other HTTP Methods

CONNECT

HEAD

OPTIONS

TRACE

# HTTP Conversation: Example

- HTTP **request**:

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

The empty line denotes the end of the request headers

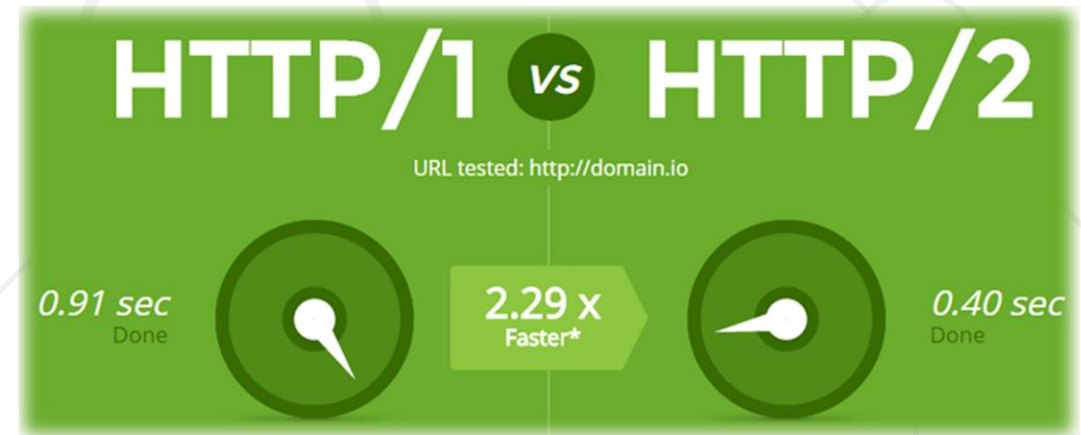
- HTTP **response**:

```
HTTP/1.1 200 OK
Date: Mon, 5 Jul 2010 13:09:03 GMT
Server: Microsoft-HTTPAPI/2.0
Last-Modified: Mon, 12 Jul 2014 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

Developer Tools - https://www.wikipedia.org/

Elements Console Sources **Network** Timeline Profiles Resources Security Audits

View: [Icons] Preserve log Disable cache No throttling

Filter [ ] [ ] Regex [ ] Hide data URLs [All] XHR JS CSS Img Media Font Doc WS Mar

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...

Headers Preview Response Cookies Timing

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

Inspecto Console Debugg Style Edit Performan Memor **Networ** Storag [Icons]

[All] HTML CSS JS XHR Fonts Images Media Flash WS Other

Filter URLs [ ]

Status	Met...	File	Domain	Cause	Type	Trans...	Size
204	GET	gen_204?atyp=i&ct=8...	www.goo...	img	html	—	0 B
200	GET	cb=gapi.loaded_0	apis.googl...	script	js	46.37 KB	133.82 KB
200	GET	nav_logo242.png	www.goo...	img	png	16.39 KB	16.39 KB
204	POST	gen_204?atyp=csi&ei=...	www.goo...	JS beacon	html	—	0 B

16 requests 1.42 MB / 483.60 KB transferred Finish: 984 ms DOMContentLoaded: 391 ms loa

Headers Cookies Params Response Timings Stack Trace Security

Request URL: https://www.google.bg/gen\_204?atyp=csi&ei=\_GecWcCHKH4XwUo-ssPAN&s=webhp&im

Request method: POST

Remote address: 216.58.206.163:443

Status code: 204 No Content [Learn More] Edit and Resend Raw head

Version: HTTP/2.0

Filter headers

Response headers (269 B)

content-type: text/html; charset=UTF-8 [Learn More]  
date: Tue, 22 Aug 2017 17:21:01 GMT [Learn More]  
server: gws [Learn More]  
content-length: 0 [Learn More]  
x-xss-protection: 1; mode=block [Learn More]  
x-frame-options: SAMEORIGIN [Learn More]  
x-ua-compatible: "MSIE 10.0; Windows 7.0; ..."

Mozilla Developer Tools





Postman - Chrome



Rested - Firefox

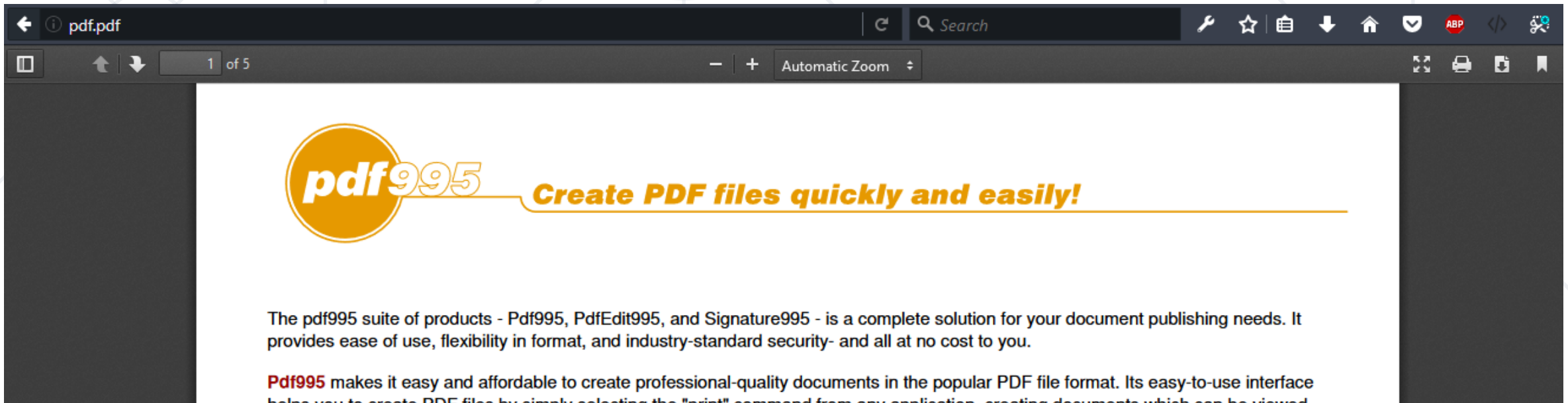


# **Multi-Purpose Internet Mail Extensions**

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

```
<method> <resource> HTTP/<version>  
<headers>  
(empty line)  
<body>
```

# GET Request Method – Example

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

HTTP request line

GET /HTTP/1.1

Host: localhost

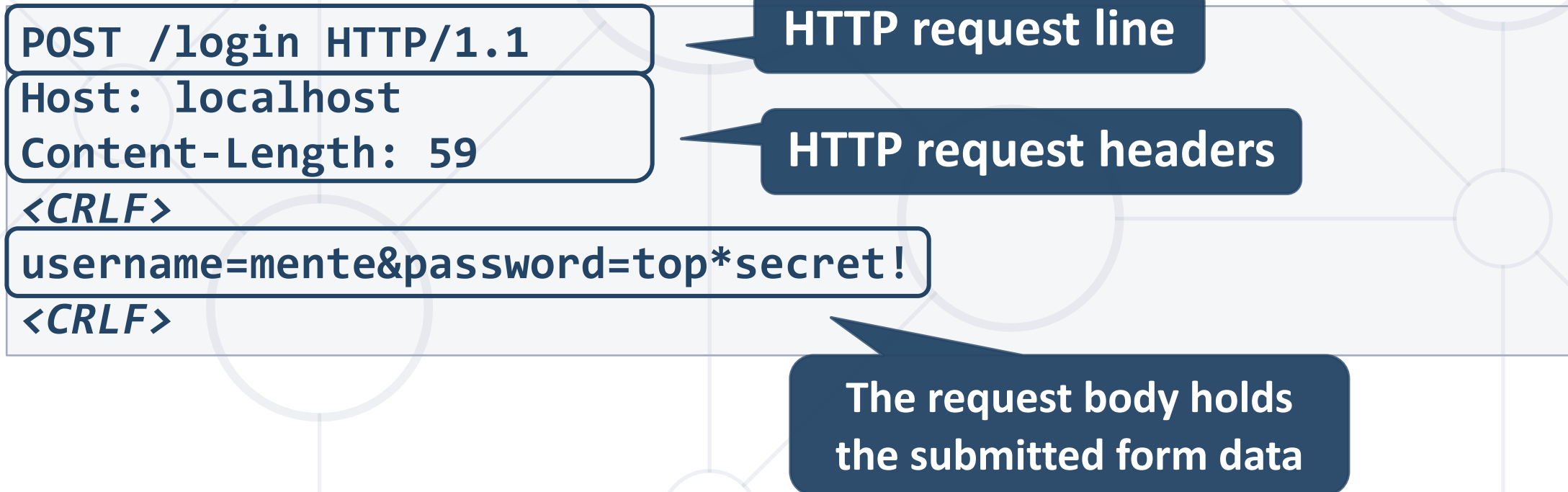
<CRLF>

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





- The **response message** sent by the HTTP server consists of:

- HTTP response **status line**

- Protocol version
- Status code
- Status text

```
HTTP/<version> <status code> <status text>  
<headers>  
<CRLF>
```

- Response **headers**

- Provide meta data about the returned resource

- Response **body**

- The content of the HTTP response (data)

```
<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 2010 16:09:18 GMT+2  
Server: Apache/2.2.14 (Linux)  
Accept-Ranges: bytes  
Content-Length: 84  
Content-Type: text/html
```

HTTP response **headers**

```
<CRLF>
```

```
<html>  
  <head><title>Test</title></head>  
  <body>Test HTML page.</body>  
</html>
```

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 2014 16:09:18 GMT+2
```

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

```
Connection: close
```

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

```
<CRLF>
```

HTTP response headers

```
<HTML><HEAD><TITLE>404 Not Found</TITLE></HEAD>
```

```
<BODY>
```

```
<H1>Not Found</H1>
```

```
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>
```

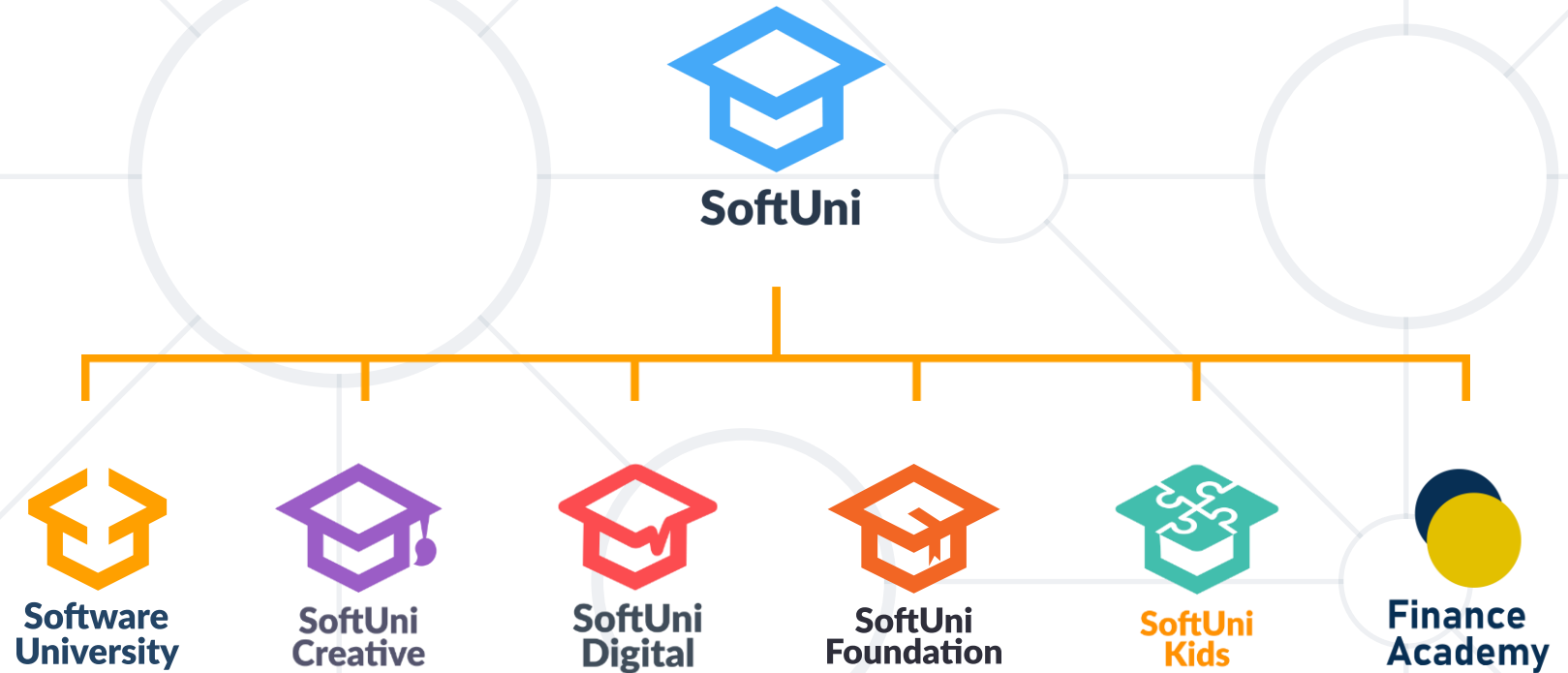
- The following HTTP response (**301 Moved Permanently**) tells the browser to request another URL:

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

- Internet, Definitions of Internet
- Sending and Receiving Information
- What is HTTP
- What is URL
- Browser Tools for Developers
- What is MIME



# Questions?



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**AMBITIONED**

 **DRAFT  
KINGS**



**SOFTWARE  
GROUP**

createX



**Postbank**

Решения за твоето утре



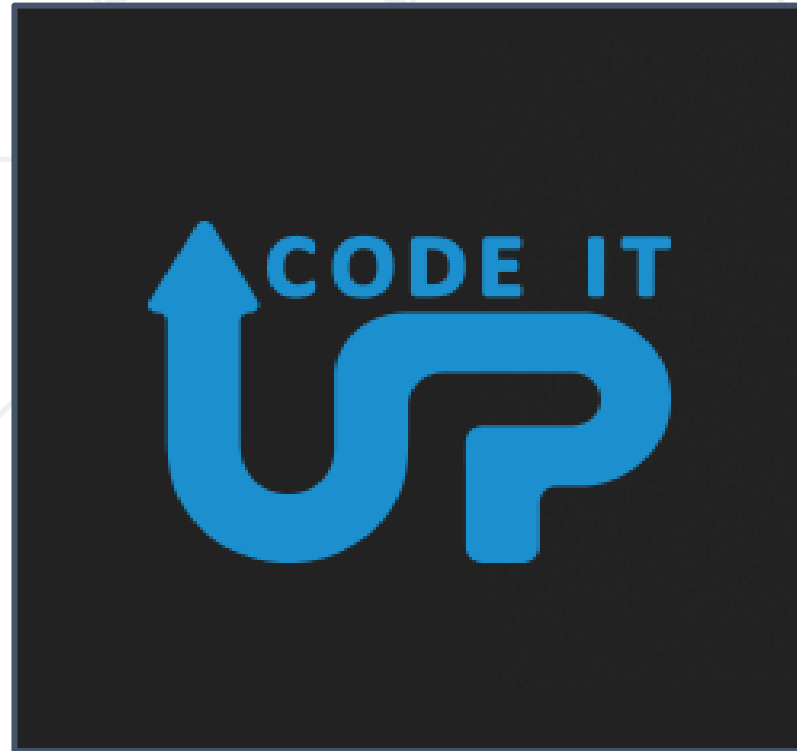
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