Client-Server Interaction

Language Technology and Web Applications

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Milestone I

16th October 2024, 10:15 am

- Briefly present your concept to the class
- One presenter per team, one slide
- 2 minutes for presenting the slide, 2 minutes for questions

Where we are

Past weeks: **Static** web application

- Document structure and styles
- Manipulation of document using JavaScript

Now: **Dynamic** web application

- Sending user input to the server
- Retrieving data from the server
- Processing and storing data on the server

Learning Goals for this Week

- You can write a simple HTML form
- You can explain the basic elements of an HTTP request
- You can perform asynchronous requests in JavaScript (with the help of documentation)

Topics

1. Web Forms
2. HTTP
3. Ajax
4. Backend Programming

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Elements of an HTML Form

- Fields
- A submit button
- Metadata on what should happen with the form data

Example

```
<form action="/my-handling-form-page" method="post">

    <label for="name">Name:</label>
    <input type="text" id="name" name="username">

    <button type="submit">Send!</button>

</form>
```

Name: Send!

Types of Text Inputs

```
<input type="text">
<input type="number">
<input type="password">
<input type="email">
<input type="tel">
<input type="search">
<input type="url">
```

Multi-Line Text Input

```
<textarea name="message" rows="3" cols="30">
    Write something here
</textarea>
```

Write something here

Check Boxes

```
<p>Choose your monster's features:</p>
<div>
  <input type="checkbox" id="scales" name="scales" checked>
  <label for="scales">Scales</label>
</div>
<div>
  <input type="checkbox" id="horns" name="horns">
  <label for="horns">Horns</label>
</div>
```

Choose your monster's features:

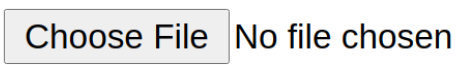
- [x] Scales
- [ ] Horns

Boolean Attributes

- `checked` (for checkboxes)
- `required`
- `readonly`
- `disabled`
- `hidden`

Uploading files

```
<form method="post" enctype="multipart/form-data">
    <input type="file" name="profile-pic">
</form>
```



Practical Exercise

Analyze the form on the federal health insurance premium calculator:

`https://priminfo.ch`

1. What HTML elements do you recognize from the previous slides?
2. Can you manipulate the elements using the browser's developer tools (e.g., enable a disabled field)?

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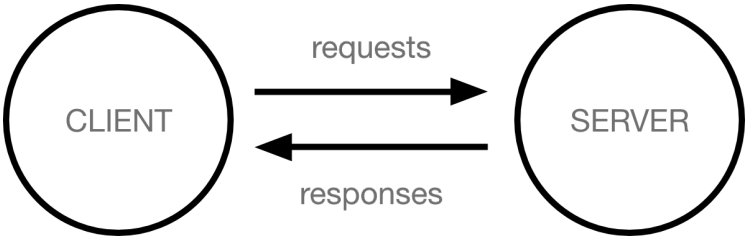
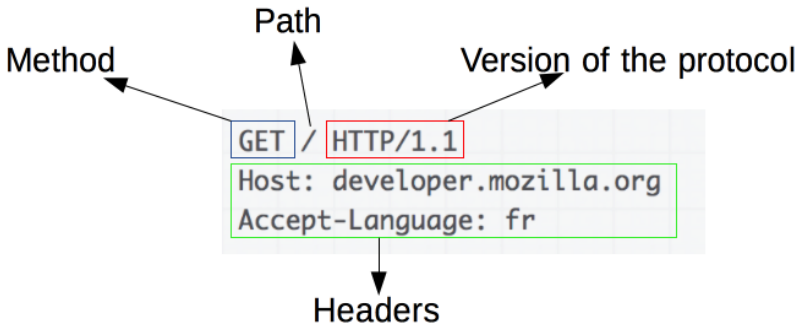
Clients and Servers



Metadata of an HTTP Request



Examples of a Host

- example.com
- subdomain.example.com

- example.com:80
- 172.23.66.232:53402

- localhost
- 127.0.0.1

Examples of a Path

- /
- /index.html
- /shop/

“Query Parameters”:

- /shop/?key1=value1
- /shop/?key1=value1&key2=value2

Encoding of Query Parameters

`{'q': 'hello'}` → `q=hello`

`{'q': 'foo bar'}` → `q=foo%20bar` or `q=foo+bar`

`{'q': 'grüezi'}` → `q=gr%C3%BCezi`

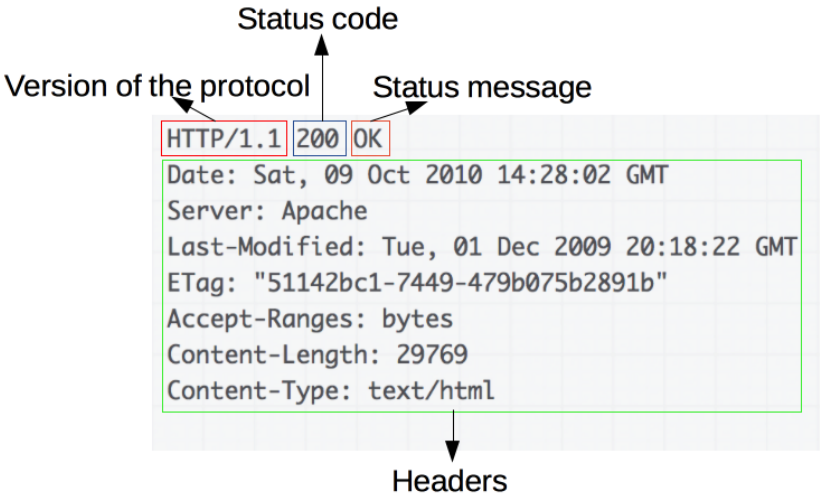
Examples of Request Headers

- `Accept-Language: de-CH`
  Informs the server about the human language the server is expected to send back.

- `Referer: https://www.google.com/`
  The address of the previous web page

- `User-Agent: Mozilla/5.0 (Macintosh; Intel Mac OS X x.y; rv:42.0) Gecko/20100101 Firefox/42.0`
  Application type, operating system, software vendor or software version of the client

Metadata of an HTTP Response



Examples of HTTP Status Codes

- `200 OK`
- `302 Found` (= a redirect)
- `403 Forbidden`
- `404 Not Found`
- `500 Internal Server Error`

Examples of Response Headers

- `Content-Type: text/html; charset=utf-8`
  Media type of the resource
- `Last-Modified: Mon, 18 Jul 2016 02:36:04 GMT`
  The last modification date of the resource
- `Set-Cookie: mykey=myvalue; expires=Mon, 17-Jul-2017 16:06:00 GMT; Max-Age=31449600; Path=/; secure`
  Send cookies from the server to the client

Examples of Content Types (“MIME Types”)

- `text/html`
- `text/css`
- `text/javascript`
- `image/png`
- `image/gif`
- `application/zip`
- `application/pdf`
- `application/json`

Content of an HTTP Message

Also called: *body*, *payload*

Content of **responses**:

- A file of the specified content type (e.g. `text/html`)

Content of **requests**:

- Form data
- Uploaded file(s)

Difference between GET and POST

GET

- “Read”: Retrieve data from the server
- No request body

POST

- “Write”: Submit data to the server
- Request body (“payload”)

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Motivation

- So far, posting the form requires a complete reload of the page.
- But many modern web applications exchange information all the time.
- Javascript can be used to perform an HTTP request at any time (“asynchronous request” / “Ajax”).

Ajax GET Request

```
const request = new Request(
    'https://example.com',
    {method: 'GET'}
);

fetch(request).then(function(response) {
    if (response.status === 200) {
      console.log(response);
    }
});
```

fetch returns a Promise

```
var callback1 = function() {
    // ...
};

var callback2 = function() {
    // ...
};

Promise.then(callback1).catch(callback2);
```

Alternative Callback Syntax

```
Promise.then(function(data) {
    // ...
})
```

can also be written as:

```
Promise.then(data => {
    // ...
})
```

Ajax POST Request

```
const request = new Request(
    'https://example.com',
    {
        method: 'POST',
        body: '{"foo": "bar"}',
    }
);

fetch(request).then(response => {
    if (response.status === 200) {
      console.log(response);
    }
});
```

Form Submit Events

```
<form id="my-form">
  <input type="text" name="username">
  <button type="submit">Send!</button>
</form>

<script>
  const form = document.querySelector('#my-form');
  form.addEventListener('submit', function(event) {
      console.log('The form was submitted.')
      // Disable the synchronous POST request
      event.preventDefault();
      // Perform an asynchronous request
      const request = ...
  });
</script>
```

Repetition Quiz

https://t.uzh.ch/1BW

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Goal

- Use Python to write a server script that processes HTTP requests

Code Structure

```
from http.server import BaseHTTPRequestHandler, HTTPServer

class HTTPRequestHandler(BaseHTTPRequestHandler):

    def do_GET(self):
        ...

    def do_POST(self):
        ...

if __name__ == '__main__':
    server = HTTPServer(
        ("localhost", 5000),
        RequestHandlerClass=HTTPRequestHandler,
    )
    server.serve_forever()
```

Handling a GET Request

```
def do_GET(self):
    html = """
    <html>
        <head>
            <meta charset="utf-8">
            <title>My first form</title>
        </head>
        <body>
            <!-- Write something here -->
        </body>
    <html>"""
    response_body = html.encode("utf-8")
    self.send_response(200)
    self.send_header("Content-Type", "text/html")
    self.send_header('Content-Length', str(len(response_body)))
    self.end_headers()
    self.wfile.write(response_body)
```

Handling a POST Request

```
import urllib

def do_POST(self):
    content_length = int(self.headers['Content-Length'])
    request_body = self.rfile.read(content_length).decode("utf-8")
    request_data = urllib.parse.parse_qs(request_body)
    html = """
    <html>
        <!-- ... -->
    <html>
    """
    response_body = html.encode("utf-8")
    self.send_response(200)
    self.send_header("Content-Type", "text/html")
    self.send_header('Content-Length', str(len(response_body)))
    self.end_headers()
    self.wfile.write(response_body)
```