COMP 307

Principles of Web Development

Lecture 19

Unit 5 – Backend Design

API-based Websites

Contents

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Class Outline

- What is an API based website?
- Testing without a UI
  - postman as an important testing platform
- Example API in industry
  - RSS
  - Google maps

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Readings

- MyCourses Readings
  - WWW How to Program:
    - 14.10 – RSS, 27.5 – Maps, 28.1-28.4 – Services
  - Full Stack Developer:
    - Ch 10 – About APIs
- Internet Resources
  - API based websites
  - Postman
    - https://www.freecodecamp.org/news/how-to-test-and-play-with-web-apis-the-easy-way-with-postman/
  - Examples
    - https://www.w3schools.com/xml/xml_rss.asp
    - https://www.w3schools.com/graphics/google_maps_intro.asp

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What is an API-based website?

A website without any HTML pages.

There is no GUI.

The website is ONLY a **service**. 3-Tired.

- Users send queries to the “service”, and
- Receive a string as a reply.

Examples:

- Get the temperature
- Get the path from A to B as a series of steps
- Find the status of your order

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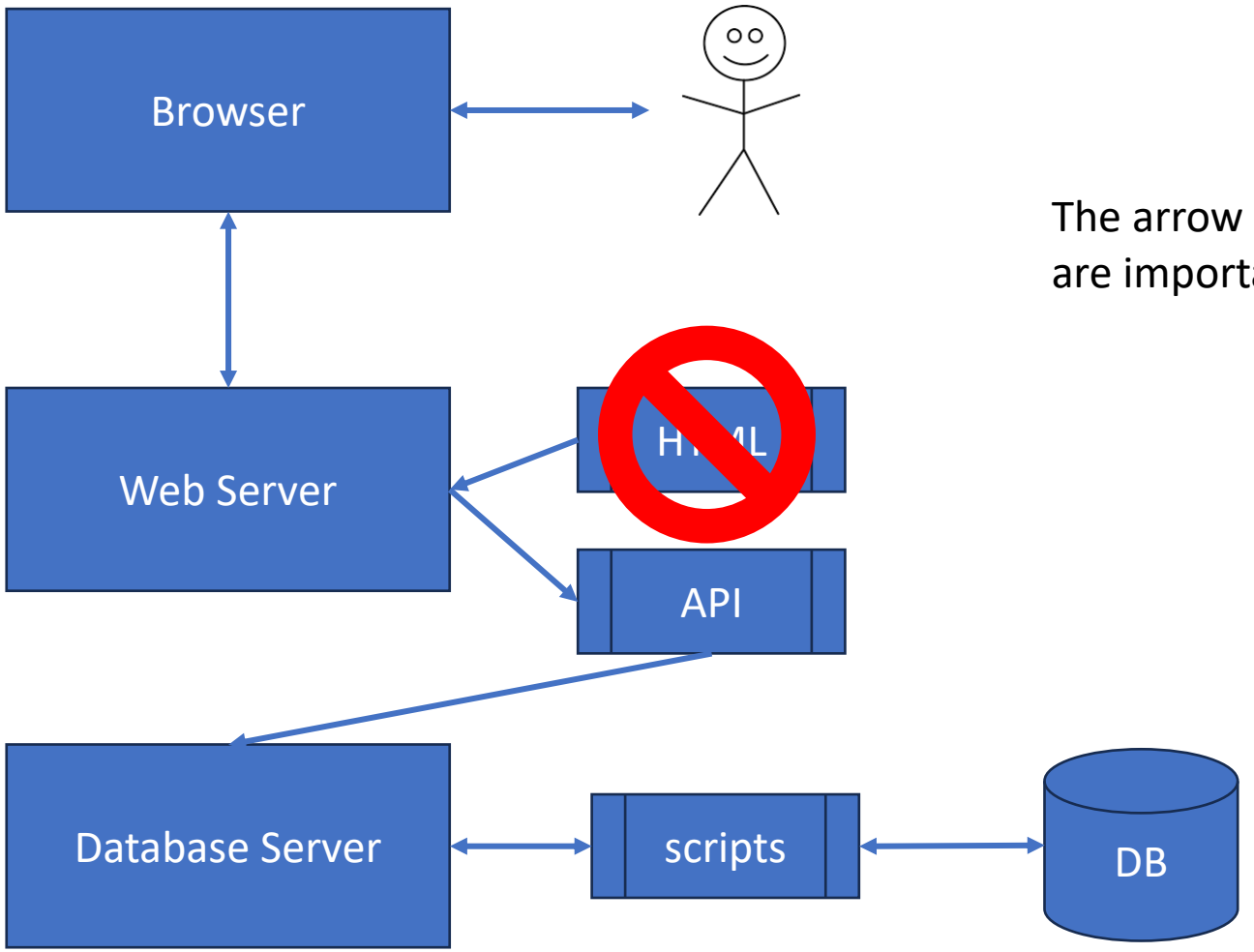
3-tired Architectures (3 machines)



The arrow directions are important.

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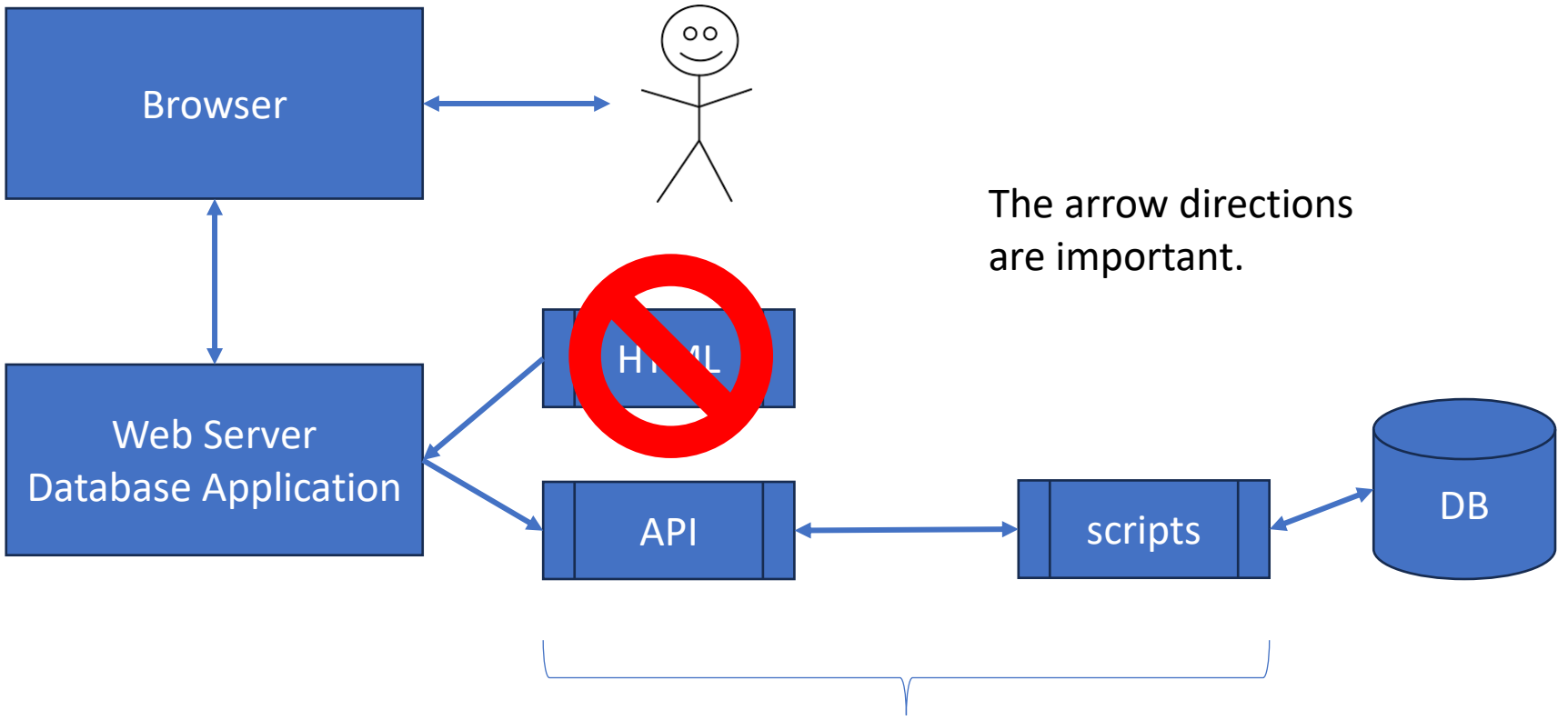
3-tired Architectures (2 machines)



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How do user's use it?

someone else made the website, youre just writing the backend calls

- Website has:
  - A landing page (static) "what is this site about"
  - A URL signature instructions page (static)
  - A REST server connected to server-side PHP/Python scripts or Node.JS functions called services.
    - Each script/function maps 1:1 to a URL signature from the instructions page.
    - A formatted string is returned:
      - XML, JSON, CSV, other.
- User must create an app or website that calls the service "URL endpoints" to get the data they want.

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Development Steps

- What is the purpose of the service?
- Make a catalogue of URL signatures by type that implement service's functions
- Build the server-side software to handle the REST calls
- Test with postman (or another similar tool)
- Write documentation and publish online with HTML for users

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Example

- Plan
  - What is the purpose of the service?
    - Book review service
  - Make a catalogue of URL signatures by type
- Development
  - Build the server-side software to handle the REST calls
  - Test with postman (or another similar tool)
  - Write documentation and publish online with HTML for users

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Example

- Plan
  - What is the purpose of the service?
    - Book review service
  - Make a catalogue of URL signatures by type
    - Registration
    - Profile
    - Review
    - Query

types

- Development
  - Build the server-side software to handle the REST calls
  - Test with postman (or another similar tool)
  - Write documentation and publish online with HTML for users

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Example

- Plan
  - What is the purpose of the service?
    - Book review website
  - Make a catalogue of URL signatures by type
    - Registration
      - URL/registration/new?username=bla&pass=ble
      - URL/registration/del?username=bla
    - Profile
    - Review
    - Query

<= these are bad, can see password and can delete someones account w/o the pass

urls for each type

What others?

write signatures using types in the name

- Development
  - Build the server-side software to handle the REST calls
  - Test with postman (or another similar tool)
  - Write documentation and publish online with HTML for users

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Example

- Plan
  - Example: URL/registration/new?username=bla&pass=ble
- Development
  - Build the server-side software to handle the REST calls
    - U=$_post['username']
    - P=$_post['pass']
    - If (select * from acct where username=U) != null then return "Username already exists"
    - Else insert into acct (U, P)
    - Return "User account created"
  - Test with postman (or another similar tool)
  - Write documentation and publish online with HTML for users

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Example Documentation

- By Type
  - Function title
  - Function description or purpose
  - Function URL endpoint signature from user perspective
  - Definition of parameters
  - Complete list of return values and their meaning
- Examples:
  - https://developers.google.com/maps/documentation/maps-static/start#Locations
  - https://www.dropbox.com/developers/documentation/http/documentation
  - https://stripe.com/docs/api

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Standard Software Testing Methods

- Testing pipelines
  - A collection of testing techniques to fully validate software
- Manual Testing
  - Great for UI testing. User inputs/clicks to see results.
- Automated Testing
  - Unit testing: expected return value error messages.
  - Testing scripts: logfile stores output for human review.
- Use-case testing
  - Real life run of site under one strict situation.
- Limited release testing
  - A subset of real users get to use the software before general release for sanity checking and unexpected use-cases.

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API-based website

- Testing pipeline
  - Developer starts with postman to find big errors
  - Lead automates with scripts for exhaustive testing (edge cases, load)
  - Then use-case testing
  - After limited release testing
  - Loop back to fix and repeat as needed
- Manual Testing
  - Use tool like postman
- Automated Testing
  - Unit testing: N/A, but boundary checking within scripts useful.
  - Testing scripts:
    - Use multiple scripts – each containing multiple tests on a common theme
- Use-case testing
  - Build special scripts that test all the features that would be commonly be used in a specific use case.

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postman

- Introduction to postman
- Demo postman

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postman

- Examples:
  - Pokemon
    - https://pokeapi.co/api/v2/pokemon/squirtle/
  - LOTR
    - https://the-one-api.dev/v2/movie
    - Plus, the authorization “Bearer Token”. Get token from: https://the-one-api.dev
  - Vybihal
    - Good testing
      - Entering things it should be able to handle to see if it crashes or returns something unexpected.
        - Things = proper URL, vars and values in query
    - Breaking testing
      - Entering things the software was not designed to handle to see if it breaks, and to see what it returns.
        - Things = incorrect and non-existing URL/vars/values in query

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Example industry APIs

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RSS Feeds

- API Use-case

tells you when something changed

  - Your website is updated frequently
  - Your website has a lot of data
  - User's do not have the time to look through your website to find the update
  - They would like to register for a service that sends them updates by email or using an "aggregator" app they receive RSS messages that are collected and categorizes by the app.
- Example API
  - URL/register/new?user=name&pass=secret&dest=ip/email
  - URL/register/del?user=name&pass=secret
  - URL/feed/add?user=name&topic=category
  - URL/feed/remove?user=name&topic=category

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RSS Feeds

- ## Example Result

```
<?xml version="1.0" encoding="UTF-8" ?>
<rss version="2.0">
<channel>
  <title>W3Schools Home Page</title>
  <link>https://www.w3schools.com</link>
  <description>Free web building tutorials</description>
  <item>
    <title>RSS Tutorial</title>
    <link>https://www.w3schools.com/xml/xml_rss.asp</link>
    <description>New RSS tutorial on W3Schools</description>
  </item>
  <item>
    <title>XML Tutorial</title>
    <link>https://www.w3schools.com/xml</link>
    <description>New XML tutorial on W3Schools</description>
  </item>
</channel>
</rss>
```

Output returned by API URL/feed/add

Notice the return packet is an XML file using RSS tag/attribute rules.

User's app/website needs to display/process it.

- ## References
  - https://www.rssboard.org/rss-specification
  - https://www.w3schools.com/xml/xml_rss.asp

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Google Maps API

- Example call & display

```
<!DOCTYPE html>
<html>
<body>

  <h1>My First Google Map</h1>
  <div id="googleMap" style="width:100%;height:400px;"></div>

  <script>
   function myMap() {
     var mapProp= {
              center:new google.maps.LatLng(51.508742,-0.120850),
              zoom:5,
     };
     var map = new google.maps.Map(document.getElementById("googleMap"),mapProp);
   }
  </script>

  <script src="https://maps.googleapis.com/maps/api/js?key=YOUR_KEY&callback=myMap">
  </script>

</body>
</html>
```

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Google Maps API

- Get the free limited developer key
  - https://developers.google.com/maps/documentation/javascript/get-api-key
- Read the documentation
  - https://console.cloud.google.com/google/maps-apis/api-list
- Demo example

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Prepare for Next Class

- Assignments
  - Mini 6 due
  - Project out
- Lab this week
  - Lab E – SQL & Mongo
- Do on your own
  - Do postman with Pokémon & LOTR
  - Get the Google Maps example to display

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