

Module 2: Client-Server Communication, Designing a Full Stack App, and Overview of the Microblog Code

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CUNY Tech Prep 2016-2017

Client-Server Communication

Understanding the HTTP Request-Response

Designing the Microblog (Our first full stack app)

Overview of the Microblog code

Client-Server Communication

In the context of web applications:

A **client** requests a web page, and the **server** responds with the requested web page or an error page.

In general:

Clients **request** a resource, and the server **responds** with that resource or an error status.

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Networked Applications

The client and server are separate programs, they can run and connect on the same machine, or run and connect from different machines across a network.

In both cases, they use the same network protocols.

What are clients?

What are clients?

- Web Browsers
 - Desktop: Google Chrome, Firefox, Safari, Microsoft IE
 - Mobile: Safari, Chrome
- Other Programs
 - Instead of a user at a browser making a request, it could be another program (Apps, scripts, etc)
 - Google does this to crawl the internet
 - But our own applications can do it as well using API's (We will look at this later)

How does a **client** know where to find the **server** for a webpage URL?

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What is a URL?

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What is a URL?

A Uniform Resource Locator also known as a web address.

Parts of the URL

`http://cuny.edu/index.html`

1

2

3

1. Application Protocol
2. Hostname
3. Resource Path

1. Application Protocols

- HTTP - Hypertext Transfer Protocol
- HTTPS - SSL Encrypted HTTP

2. Hostname

- Registered Name
- TLD - Top-Level Domain (.com, .edu, .org, .nyc, etc)
 - 1000's available

3. Path

- Maps to a filesystem path for a specific document
- Or, the path is passed to a Web Application as input

How does the **Hostname** get us to a specific server computer?

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Computers on a network are assigned an IP Address for computer to computer communication.

For computers on the internet, your Internet Service Provider (ISP) assigns you the IP address.

An IPv4 address is a 32-bit number. Each byte separated by a (.) period.

128.228.38.47

- `127.0.0.1` and `localhost` refer to the local machine
- `0.0.0.0` refers to the default address for local machine
- `10.0.0.0 - 10.255.255.255`
- `172.16.0.0 - 172.31.255.255`
- `192.168.0.0 - 192.168.255.255`

Private addresses can be used in closed networks (SOHO, Virtual Networking, WiFi Access Points)

How is `cuny.edu` translated to `128.228.38.47`?

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Domain Name System

A decentralized hierarchy of servers provide domain name resolution.

Service maps registered hostnames (domain names) to IP Addresses.

scheme:[//[user:pass@]host[:port]][/]path[?query][#fragment]

- **scheme**: Application protocols (http/https)
- **[user:pass@]**: Optional. Authentication information
- **host**: A hostname or IP Address
- **[:port]**: Optional. HTTP/HTTPS default ports 80/443
- **path**: Resource location. Can be /
- **[?query]**: Optional. Parameter and Argument list passed to web application
- **[#fragment]**: Optional. Identifier for secondary resource. Evaluated by client

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1. Extract domain name from URL
2. Lookup IP for domain name via DNS service
3. Send the entire URL request to the IP address found in (2)
4. Receive the documents requested via path.

https://en.wikipedia.org/wiki/Uniform_Resource_Locator

https://en.wikipedia.org/wiki/List_of_Internet_top-level_domains

Understanding HTTP Request - Response

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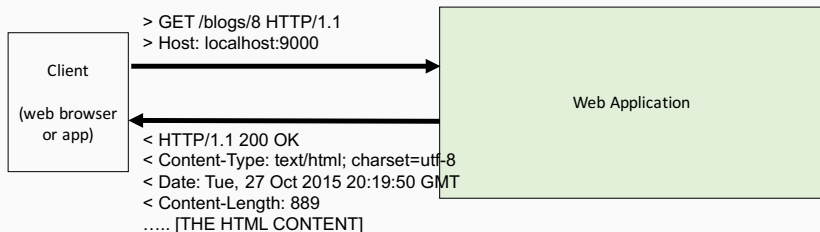


Figure 1: HTTP Request - Response

Wikipedia definition

HTTP is a stateless protocol. A stateless protocol does not require the HTTP server to retain information or status about each user for the duration of multiple requests. However, some web applications implement states or server side sessions using for instance HTTP cookies or Hidden variables within web forms.

The browser opens a connection upon request, and it is closed once the response is received.

HTTP Verbs

When we load a URL in our browser we are making a **GET** request

HTTP supports other types of **request methods**

`https://en.wikipedia.org/wiki/Hypertext_Transfer_Protocol#Request_methods`

We call these HTTP Verbs

They do not explicitly change anything about the request except some headers. It is up to your web application to interpret them appropriately.

HTTP Verbs

- **GET**
 - We typically use this request to retrieve a resource.
 - *GET* requests should not modify the content
- **POST**
 - Use this request type to create a new resource entity
- **PUT**
 - Use this request type to update an existing resource entity
- **DELETE**
 - Use this request type to delete an existing resource entity

The Response

HTTP returns a status code in the header

The **status code** lets the client know if the request succeeded, failed, or some other action is required.

In addition to the status code, **content** may be included in the response (the html, json, xml, file, etc).

Common Types of status codes

- 200 – Success
- 201 – Created
- 301 – Moved permanently
- 303 – See other (redirect)
- 400 – Bad request
- 404 – Not found
- 5xx – Server Errors

Full List:

https://en.wikipedia.org/wiki/List_of_HTTP_status_codes

`curl` is a command line tool for transferring data to and from URL's

Useful in testing web applications, API's, and for implementing web tools

Some useful options

- `-v`
 - Makes the output verbose. Displays HTTP headers
- `-X [METHOD]`
 - Allows you to change the HTTP verb from the default GET to POST, PUT, DELETE, PATCH, etc
- `-d "fieldname=value"`
 - Allows you to submit parameters to the URL

Examples

```
curl -v -X POST http://192.168.33.10:3000/posts
```

```
curl -v -X PUT http://192.168.33.10:3000/users/firstname
```

```
curl -v -X POST -d "name=Sally" http://192.168.33.10:3000/posts
```

Designing the Microblog (Our first full stack app)

Before we begin, we need to gather the requirements

- What is the purpose of the application? Does it deliver a service, product or content?
- Who will be the users of our application?
- What user interactions (UX) do we want to allow?
- Who can perform those interactions?
- What data will I need to store?

Next we should Mockup the screens and UX

List all of blog entry titles

My First Blog

My latest blog post is about React.JS

Jquery: learning some JavaScript

Tutorial: how to register a domain

Second post

First Blog post

Read a blog entry

My First Blog

My latest blog post is about React.JS

Today I learned about a new frontend JavaScript framework. It is called React and was developed at Facebook. Looks like a promising framework and it's Open Source!

Form to create a blog entry

My First Blog

New Blog Entry

Title:

Body:

Figure 2: Mockups

What data do we care about?

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- Our form tells us part of the story.
- We should at a minimum save the data our users entered
 - Is there more data we should be saving?

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How would you model a class for a Blog Entry (*Class Exercise*)

How do we manage the development of a project?

How much do we plan?

What requirements do we need upfront?

When do we start coding?

The Waterfall Development Approach

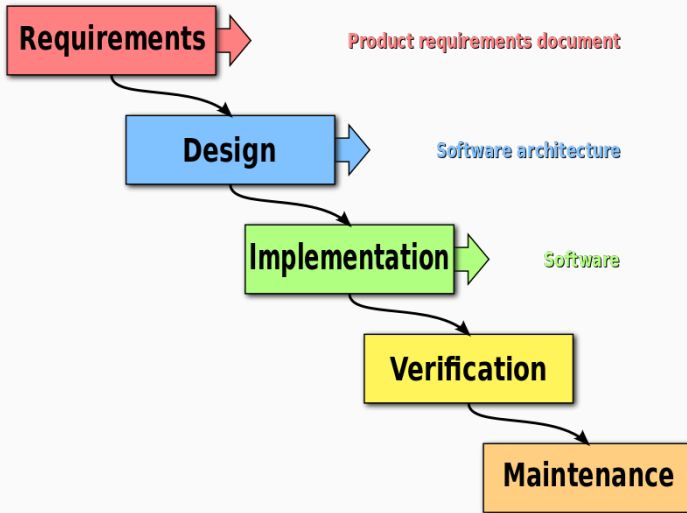


Figure 3:

https://en.wikipedia.org/wiki/Waterfall_model#/media/File:Waterfall_model.svg

The Agile Development Approach

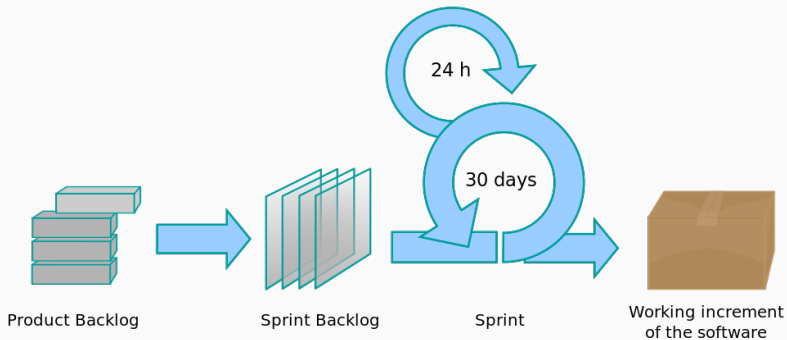


Figure 4:

[https://en.wikipedia.org/wiki/Scrum_\(software_development\)#/media/File:Scrum_process.](https://en.wikipedia.org/wiki/Scrum_(software_development)#/media/File:Scrum_process.)

The Agile Development Approach

Scrum is a framework for agile development. A sprint typically lasts 2 weeks or 30 days.

Agile does not have to use scrum. It is based on the following principles:

Iterative, Incremental, and Evolutionary

- Start small, and deliver early.
- Adapt to changes.
- Continuous feedback

Learn more:

https://en.wikipedia.org/wiki/Agile_software_development

<http://www.agilemanifesto.org/>

1. Customer satisfaction by early and continuous delivery of valuable software
2. Welcome changing requirements, even in late development
3. Working software is delivered frequently (weeks rather than months)
4. Close, daily cooperation between business people and developers
5. Projects are built around motivated individuals, who should be trusted
6. Face-to-face conversation is the best form of communication (co-location)

Twelve Agile Principles

7. Working software is the principal measure of progress
8. Sustainable development, able to maintain a constant pace
9. Continuous attention to technical excellence and good design
10. Simplicity—the art of maximizing the amount of work not done—is essential
11. Best architectures, requirements, and designs emerge from self-organizing teams
12. Regularly, the team reflects on how to become more effective, and adjusts accordingly

Overview of the Microblog Code

- Express.js
 - Web Framework. Provides Routing and Middleware plugin system.
- Sequelize.js
 - Promise-based ORM (Object-Relational Mapping) Library.
 - Abstraction for tables in our Relational Database
- Postgresql
 - Relational SQL Database
- Handlebars
 - Template Library for Views.
- Mocha/Chai
 - Mocha is a testing framework. Chai provides dialects for TDD/BDD

- package.json
- app.js

The Vagrant setup

File Structure

Database

Running/modifying the app

Running tests

Running the linter

Microblog Code (END)
