IN4MATX 285:
Interactive Technology Studio

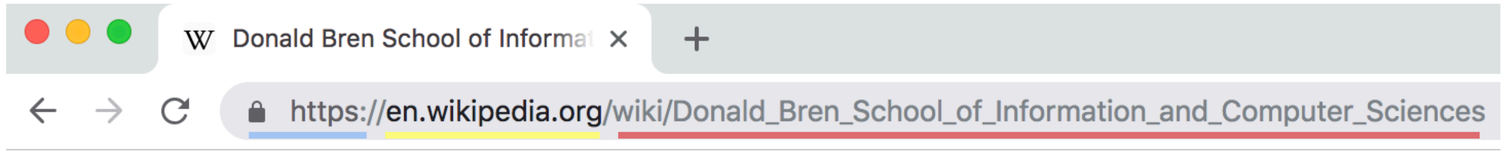
Practice: Frontend vs. Backend Development

Today’s goals

By the end of today, you should be able to…

- Define frontend and backend, as well as client and server
- Differentiate the roles of browsers and webservers in presenting web content
- Articulate the more appropriate target for a particular development task

Using the internet

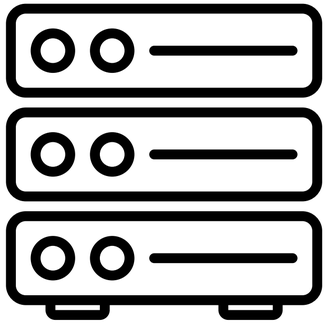


Protocol (how to handle info) Host (who has info) Resource (what info you want)

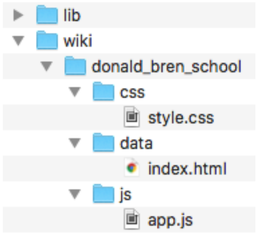
"Hey Wikipedia, I'd like to see the page for the school of ICS!"

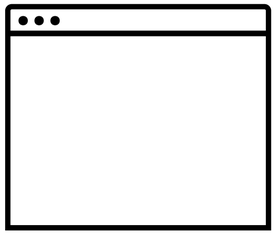
Request

Response

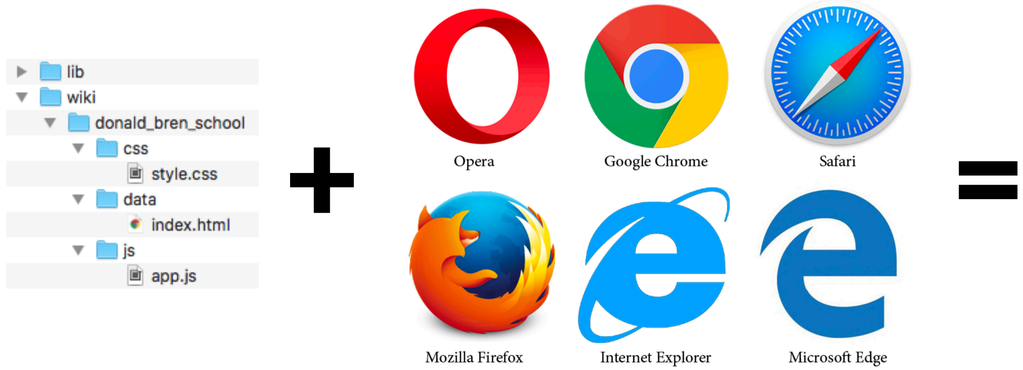


Web server





Your browser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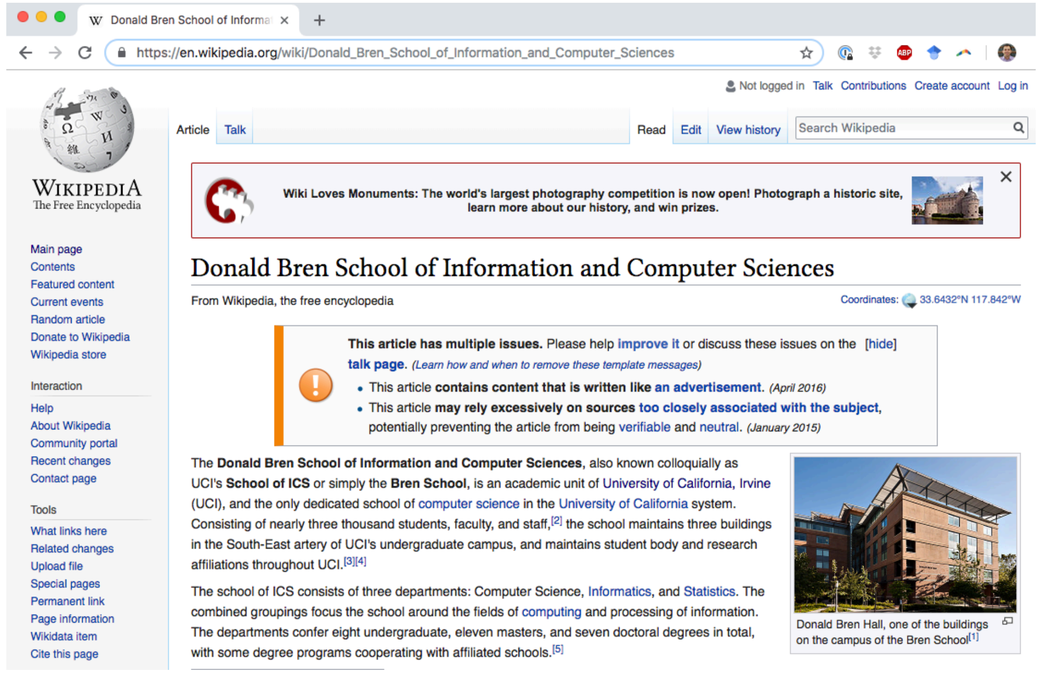
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This article may rely excessively on sources too closely associated with the subject, potentially preventing the article from being verifiable and neutral. (January 2015)
The Donald Bren School of Information and Computer Sciences, also known colloquially as UCI's School of ICS or simply the Bren School, is an academic unit of University of California, Irvine (UCI), and the only dedicated school of computer science in the University of California system. Consisting of nearly three thousand students, faculty, and staff,[2] the school maintains three buildings in the South-East artery of UCI's undergraduate campus, and maintains student body and research affiliations throughout UCI.[3][4]
The school of ICS consists of three departments: Computer Science, Informatics, and Statistics. The combined groupings focus the school around the fields of computing and processing of information. The departments confer eight undergraduate, eleven masters, and seven doctoral degrees in total, with some degree programs cooperating with affiliated schools.[5]
Donald Bren Hall, one of the buildings on the campus of the Bren School[1]
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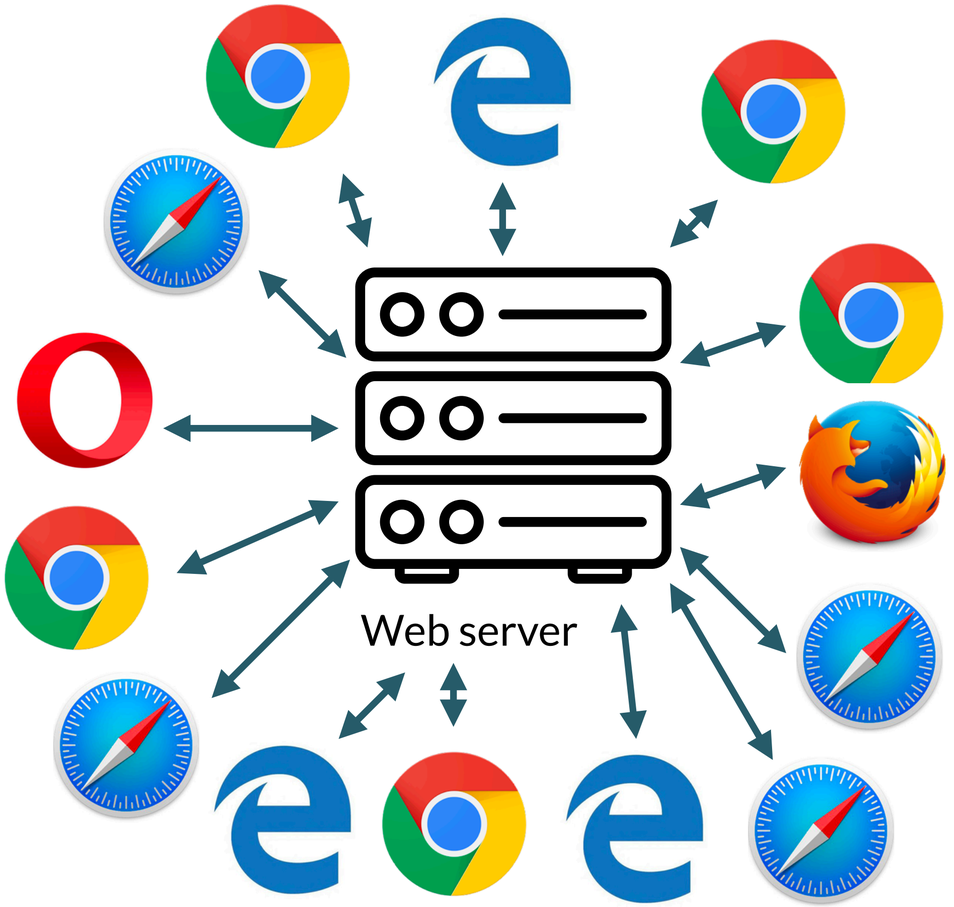
Using the internet

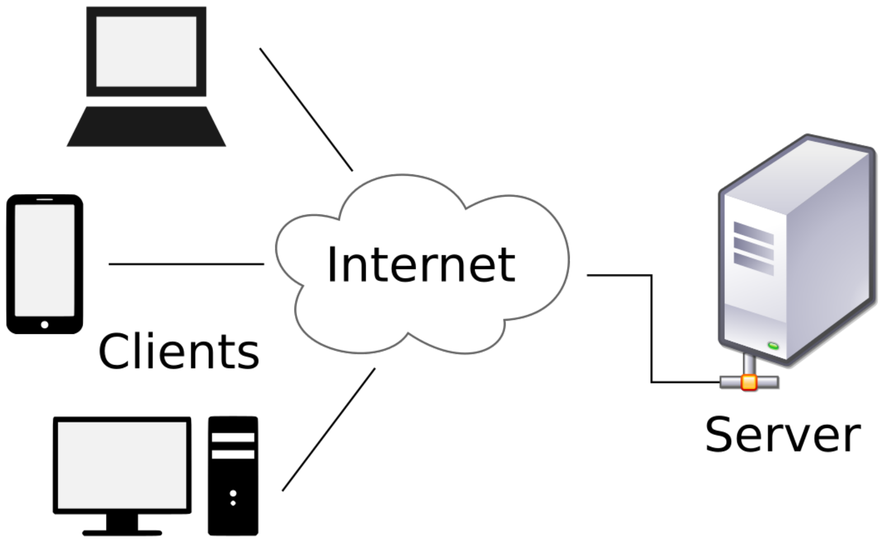
- Somewhere there exists a *webserver* that is sending you the files
- Your browser is the *client*
- Lots of clients, few webservers
  - Wikipedia gets 4,000 page views *every second*



https://en.wikipedia.org/wiki/Wikipedia:Statistics

Clients versus Servers

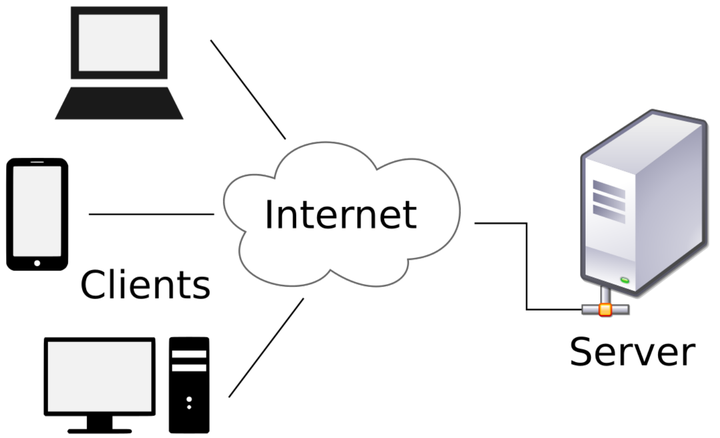
- Client: a user's device (or browser)
- Server: a shared device that manages resources
- Implementing large, complex applications requires both
- But you can often use the same programming languages, tools, etc. for both

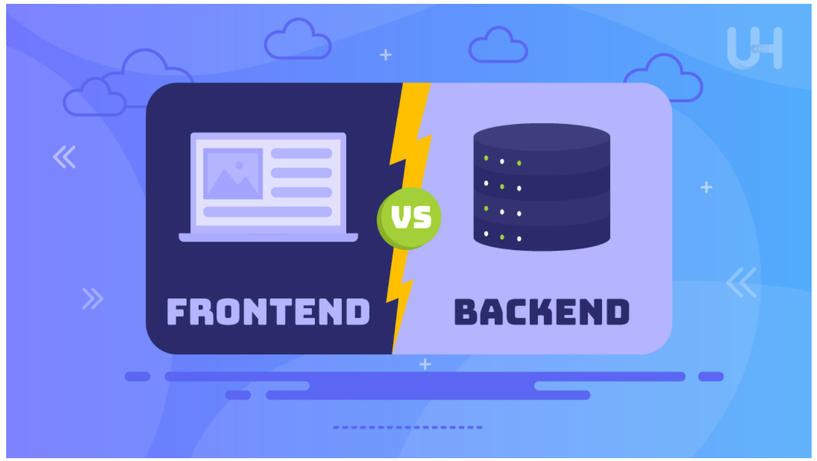


So what does any of this have to do with frontends and backends?

Clients, Servers, Frontend, and Backend

- The distinction between clients and servers largely parallels *frontend* versus *backend* development
- Frontend: everything a user sees and interacts with
- Backend: all of the logic that powers the functionality





Frontend development

- Programming the graphical/visual functionality
  - Interactive page elements (drop-downs, menus, etc.)
- Easier (relatively speaking) to start developing for
  - You write a bit of code and it opens up in your browser
- HTML/CSS/JavaScript are pretty standard, but not the only

Frontend development

- Very direct integration with design
  - You will be working most closely with these frontend developers
- Performance matters, but largely in its impact on user experience
  - Do animations look nice? Do pages take too long to load?

Backend development

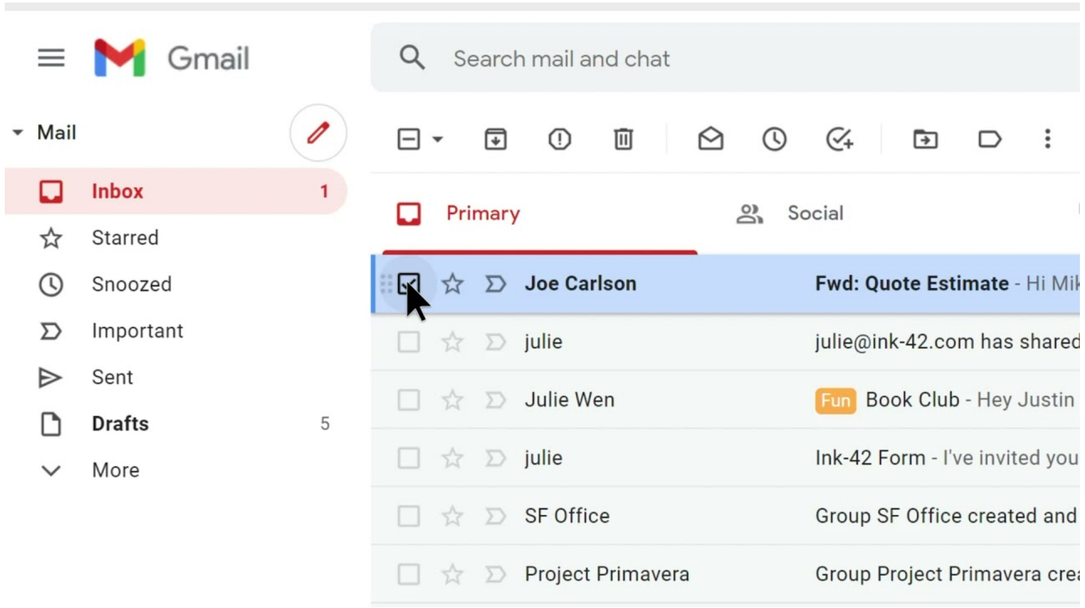
- Programming the logic and structure; typically nothing visual
  - Databases, authentication (more on this later in the quarter)
- Privacy and security measures are important
  - Enables access to all data, so subject to breaches etc.
- *Concurrency* is really important
  - Multiple frontends are likely connecting to the same backend, often simultaneously
  - What goes first?

Backend development

- Typically harder to set up
  - Can be made with lots of different programming languages and configurations
- Typically more powerful computers, capable of a lot of computation
  - Speed and efficiency are really important: handling lots of concurrent operations, with a lot of emphasis on optimization and math

One example: Gmail

- Frontend
  - Compose, navigate between inboxes, display of labels/stars/etc.
- Backend
  - Storage of email and drafts, syncing across users, authentication



Frontend or Backend?

- You record a video on your phone. Where are the controls for *editing* that video?

Frontend

Or…

Backend

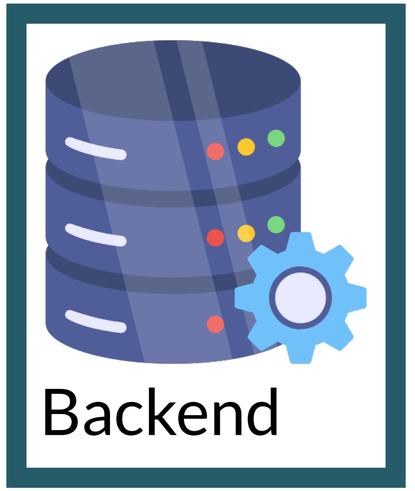
Editing is done via interfaces, so it will be implemented in the **frontend**.

Frontend or Backend?

- Your video has been edited, and is ready to be shared online. What will *host it* for others to see?

Frontend

Or…



Backend

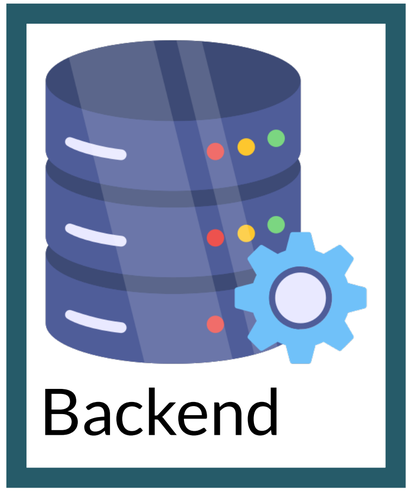
Backends are typically in charge of storage, especially for ensuring access across people and devices.

Frontend or Backend?

- You want to add AI-generated captions to your video. Which will *produce* the captions?

Frontend

Or…



It is computationally expensive to generate AI captions, so a **backend** will probably do it.

Frontend or Backend?

- Your friend uses a screen reader to access your video. What is their reader *processing* to make the content accessible?

Frontend

Or…

Backend

User-setup extensions like screen readers only have access to information visible in the **frontend**.

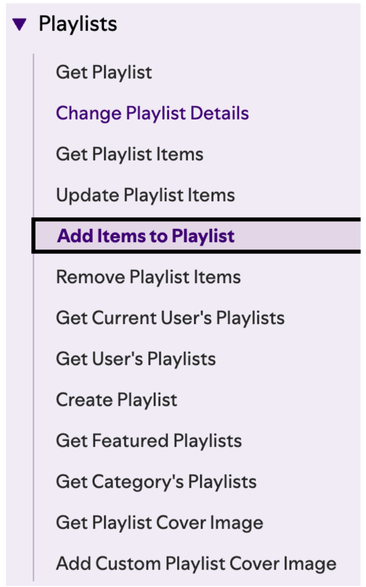
Frontend and Backend Communication

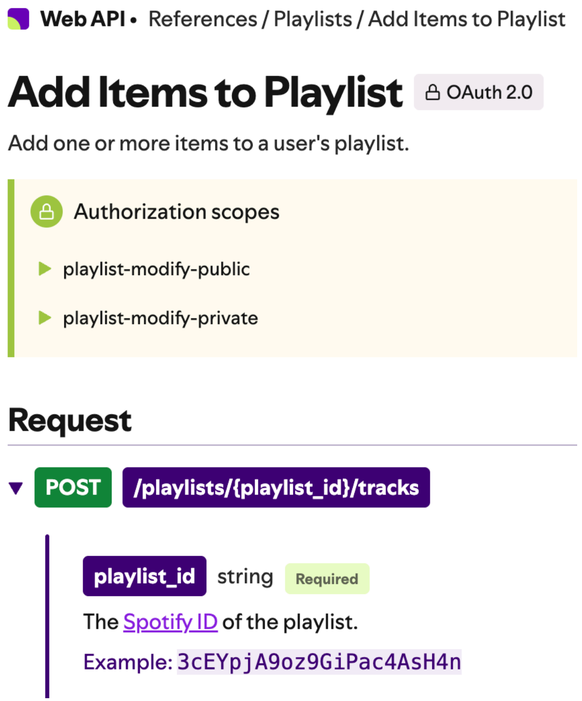
- Frontends and backends are *constantly* communicating with one another, especially in more interactive pages
- HTTP, the same protocol for getting pages from webservers, is used for most communication
- Clear specification is very important

Frontend and Backend Communication

One example: Spotify's API

- API: Application Programming Interface
- Lists what functionality is available in the backend
  - Provides specification for exactly how to tell the backend what to do
- In your frontend, you can then follow that specification





Frontend and Backend in practice

- Most applications need both a frontend and a backend
- In small projects, a developer might do both (“full stack” development)
- Larger projects typically divide the roles, and developers specialize

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