Final Project: Project MIX
The final project for CS 240 this semester is a course-wide microservice called “Project MIX”.

- **Frontend**
  User provides GPS coordinates as input, the client’s web browser makes a `POST /gps` request with the GPS coordinates, and the response to that POST request is data about the GPS coordinates.
  - A very basic frontend is provided. ...
    *this can/should be extended later!

- **Middleware**
  Receives the `POST /gps` request from the frontend, retrieves information about the GPS coordinates from bandend services, and returns all of the data back to the frontend via a formatted response.

Right Now: Every group is designing a middleware design and implementation right now. One design will be chosen to be used at the official class-wide MIX design based on your designs!

- **Bandend**
  The functional design of MIX requires that all data about the GPS coordinates is fetched by microservices called “Information Microservices” (IMs).

Many possible examples:
* The city it’s located within (ex: Urbana, IL); the state it’s located within (ex: Illinois); the weather forecast; the most popular restaurant within 1 mile; the walkability of the city/area; the most played song within the city/area; the state bird; the sales tax rate; the nearest Starbucks coffee shop (or any coffee shop); the zip code; and any number of millions of other things.

Right Now: Every group is designing a collection of IMs that will work with the class-wde microservice.

Cloud-Scale Content Distribution
As we deploy to a cloud-scale, there are three different types of content we need to deliver:

- **Static Content:**
  *Usually cached for...?*

- **Universally Rendered Content:**
  *Usually cached for...?*

- **Dynamic Content:**
  *Usually cached for...?*

Example: https://reddit.com/r/uiuc
reddit.com is a community organized into subreddits that focus on particular topics. r/uiuc/ is the subreddit for the UIUC community:
**Motivation:** Does the user need to visit our server for content that is served to all users?

- If not, what service could we rent?
- What advantages can we get by renting caches?

**Content Delivery Networks (CDNs)**
A Content Delivery Network (CDN) is a system of many servers physically located in geographically diverse locations.

- All CDNs must have a source for the content. This source is known as the _________________.
- All CDNs have many caches called _________________.
- Once the data from the origin is in the CDN cache, the CDN can serve this content. This provides five key benefits:
  1. 
  2. 
  3. 
  4. 
  5.

**Geographical Locations of Edge Servers**

**How do we use CDNs?**
Recall that looking up the IP address for cs.illinois.edu requires a series of DNS requests:

1. Ask a root name server for the NS records for “edu.”
   \[ \Rightarrow \text{IP address for the TLD name servers for “edu.” returned.} \]

2. Ask a “edu” TLD name server for the NS records for “illinois.edu.”
   \[ \Rightarrow \text{IP address for the SLD name servers for “illinois.edu.” returned.} \]

3. Ask a “illinois.edu” SLD name server for the NS records for “cs.illinois.edu.”
   \[ \Rightarrow \text{IP address for the sub-domain name servers for “cs.illinois.edu.” returned.} \]

4. Ask a “cs.illinois.edu” sub-domain name server for the A (or AAAA) records for “cs.illinois.edu.”
   \[ \Rightarrow \text{IP address for web server for cs.illinois.edu returned.} \]

Q: Could we program a specific DNS server that was geographically aware to return different data?

...what should the TTL of these A records be?