Web Services  We describe anything that provides data back from an HTTP endpoint as a “web service”. Three main categories:

1. GET /cs240/sp2022/ HTTP/1.1
2. Host: courses.grainger.illinois.edu

Advantages: Disadvantages:

2. National Weather Service API:
   https://api.weather.gov/points/{latitude},{longitude}

Location of 2215 CIF:

1. GET /points/ HTTP/1.1
2. Host: api.weather.gov

RESTful Requirements:

3. POST /q/api/queues/788/staff/1 HTTP/1.1
   Content-Length: 477

HTTP Verbs (Defined in RFC 7231 §4)
Every HTTP request has an “action verb” that describes the action requested of the web server:

- GET: Requests a representation of the specified resource. Requests using GET should only retrieve data.
- POST: Submits an entity to the specified resource, often causing a change in state or side effects on the server.
- PUT: Replaces all current representations of the target resource with the request payload.
- DELETE: Deletes the specified resource.
- Less Used: PATCH, CONNECT, OPTIONS, TRACE, HEAD

Why the Web Works:
Allowing Maximal Flexibility and Acceptance

Containers:
Containers provide an ____________ of a system that can be deployed in an isolated environment on heterogeneous systems.

- As a container developer, you build a Dockerfile that specifies the snapshot of the system you want to provide and then build that snapshot into a ____________.

Create a Dockerfile to specify how to build the image:

mp3/Dockerfile

1. FROM gcc:latest
2. COPY ./docker/entrypoint.sh /
3. RUN chmod +x entrypoint.sh
4. ENTRYPOINT ["/entrypoint.sh"]

To build it:

$ docker build --tag mp3-docker .

- As a user of a container, you specify the name of the docker image that you want to use to launch that image:

  $ docker run -it --rm -v "pwd":/mp3 mp3-docker "make"
  $ docker run --rm -it -p 27017:27017 mongo

Containers provide an ____________ of a system that can be deployed in an isolated environment on heterogeneous systems.
Python Programming
All modern programming languages provide many libraries for quickly and easily working with web requests. In CS 240, we will focus on Python and use the **flask** library for web requests.

Python Overview:
- Python is an “interpreted” programming language:
  - **Note**: Python only allows one thread to access the CPU (others can be blocked or ready, but there is no parallel execution)! *(Simplifies the execution environment, but prevents optimizations that are possible in C/C++.)*

- Python is a “dynamically typed” programming language:
  - Python’s control-flow is whitespace delimited:

- Python places heavy emphasis on code readability:

```
13/hello.py
1 s1 = "Hello"
2 s2 = " World"
3 for i in range(10):
4     if i < 5:
5         print(s1)
6     elif i < 8:
7         print(s1 + s2)
8     else:
9         print(s2)
```

Flask Library:
The flask library focuses on providing a simple interface to handling web requests:

```
13/app.py
1 from flask import Flask
2 app = Flask(__name__)
3
4 # Route for "/" for a web-based interface to this micro-service:
5 @app.route('/')
6 def index():
7     from flask import render_template
8     return render_template("index.html")
9
10 # Extract a hidden "uiuc" GIF from a PNG image:
11 @app.route('/extract', methods=['POST'])
12 def extract_hidden_gif():
13     # ...```

Import Statements (Line 1, 7):

Python Comments (4, 10):

Python Function Definitions (Lines 6, 12):

Python Decorator (Lines 5, 11):

Running a Python program:

*Flask is widely used, lots of great resources available! (This is why we use widely used libraries!)*