Web Mapping & Visualisation

The Web's Architecture and Economy

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Today

- A (brief an opinionated) history of the Web
- The server/client model
- The modern web mapping eco-system
- API overview

A (brief and opinionated) history of Web trends

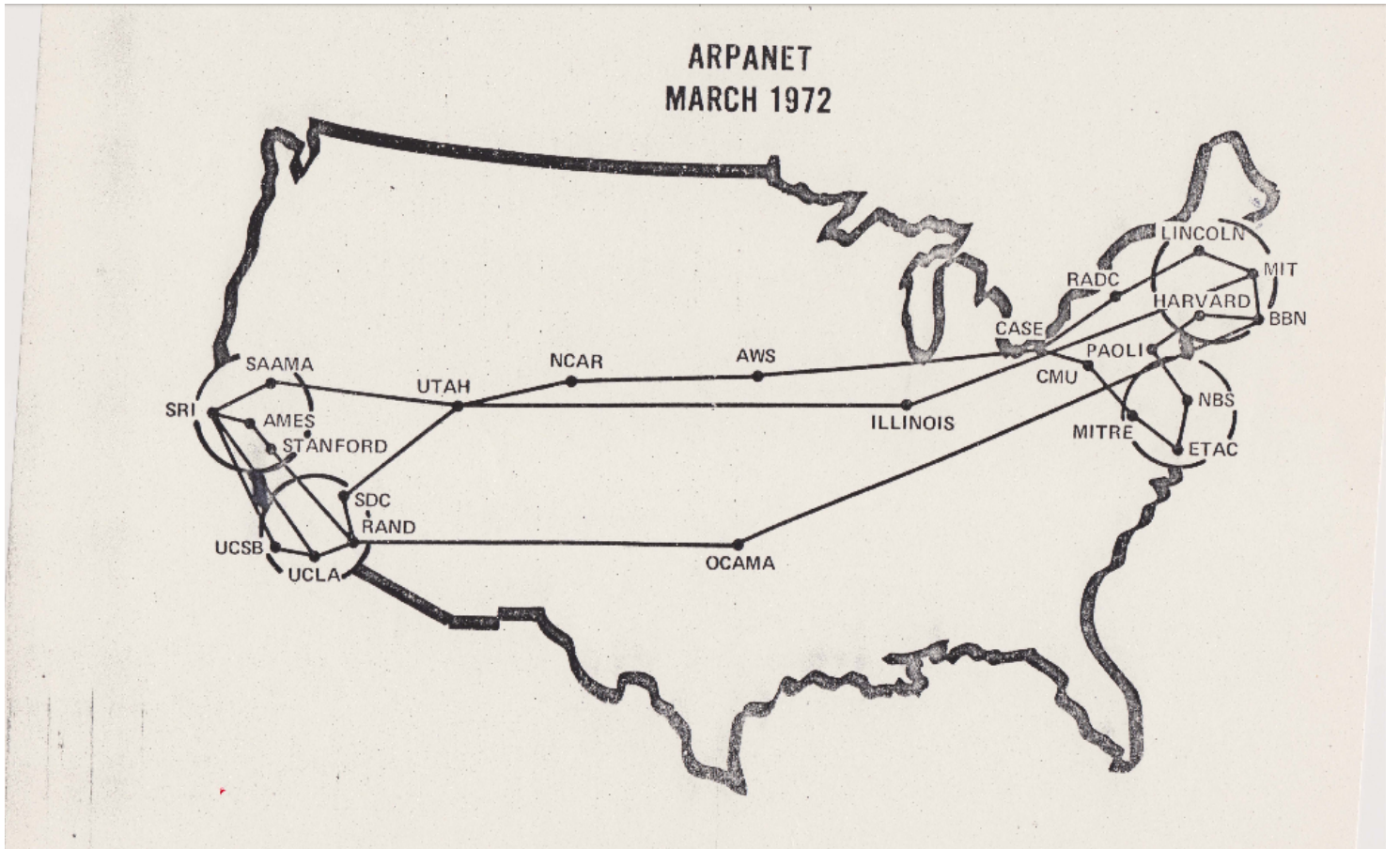
Inspired by…

Pre 1970s

The seeds:

- US (e.g. Licklider's "Galactic Network")
- Mostly military contracts (e.g. D/ARPA –> ARPANET) and "research'y"
- Develop protocols for machine communication

1970s - Birth of the *internet*



1980s

- Growth of the “web”
- From experimental validation to scaled up insfrastructure
- Free software (e.g. “Free as in Freedom”)

1990s

- Civilian and commercial growth
- Web 1.0
- Open Source software (e.g. “The cathedral and the Bazaar”)

2000s

- Web 2.0
- Mobile
- Web mapping takes off (hello Google Maps!)

2010s

- Consolidation of ‘GAFA’ –> concentration
- IoT
- Death of the desktop?

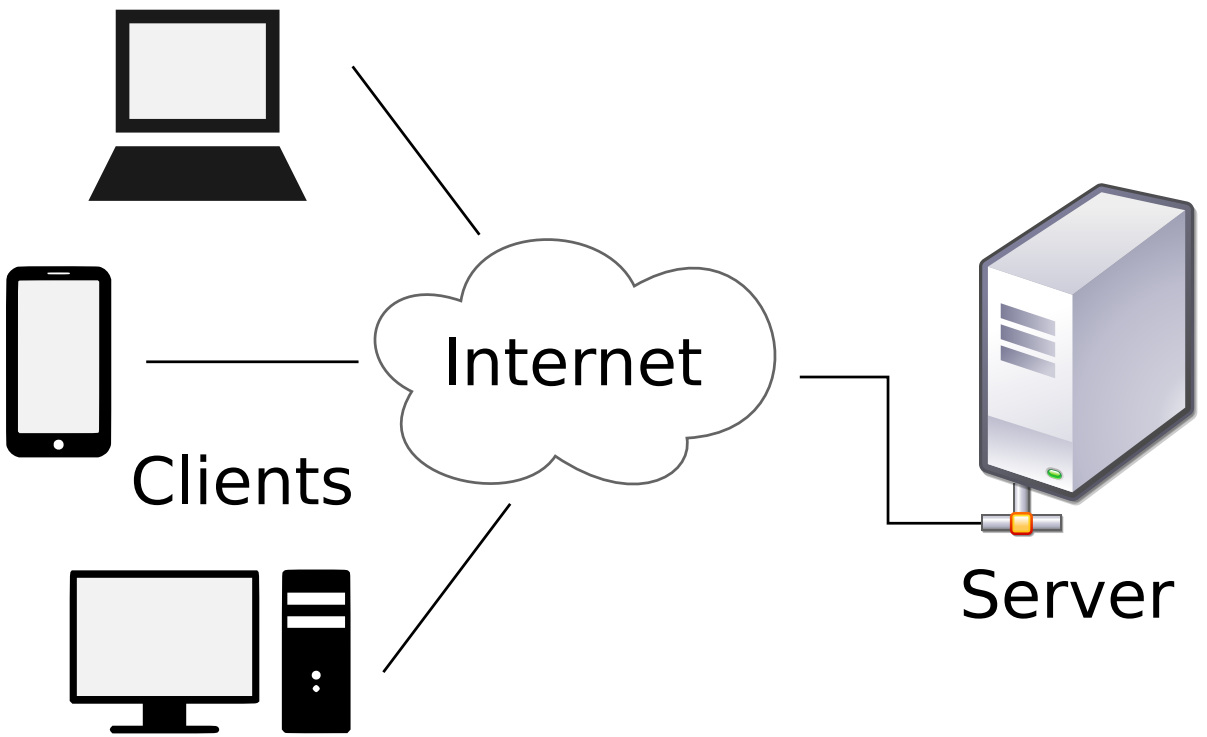
2020s

- Web3
- Government regulation and legislation
- AI

Ideas to retain

- The Web is technology to build decentralised systems
- Economics (for the most part) have turned it into a concentrated economy
- Computing today is physically distributed but socio-economically concentrated

The server/client model


Internet
Clients
Server

Benefits

- Interoperability of disparate platforms
- Optimise on hard/software for each task (“distribute”)
- Separate data collection (e.g. sensor), storage (e.g. data centre), intensive computing (e.g. compute cluster), interaction (e.g. mobile)

Disadvantages

- Requires (cheap & ubiquitous) connectivity
- More complex than an isolated approach (e.g. desktop)
- Harder to “keep afloat”

Building blocks of a web map

Backend	*Frontend*
	
Server	Client
Data, mapping (GIS)	Style (CSS), web (HTML)

The current web mapping landscape

Structure

- **Software**: a lot of open-source projects
- **Platforms**: a concentrated few (web infrastructure is hard and expensive!)
- **Business model**: software as a service

The trade off…

convenience + agility

Vs

flexibility + ownership

This course: Not focused on engineering the backend/ infastructure, prioritises frontend design/development

Data challenges

- Bias (Who is/isn’t represented?)
- Licensing (Who controls the data, what can you do with it?)
- Access (How technically complex is to use?)

D. Arribas Bel (2014), Accidental, open and everywhere: Emerging data sources for the understanding of cities

APIs

What do APIs actually do?

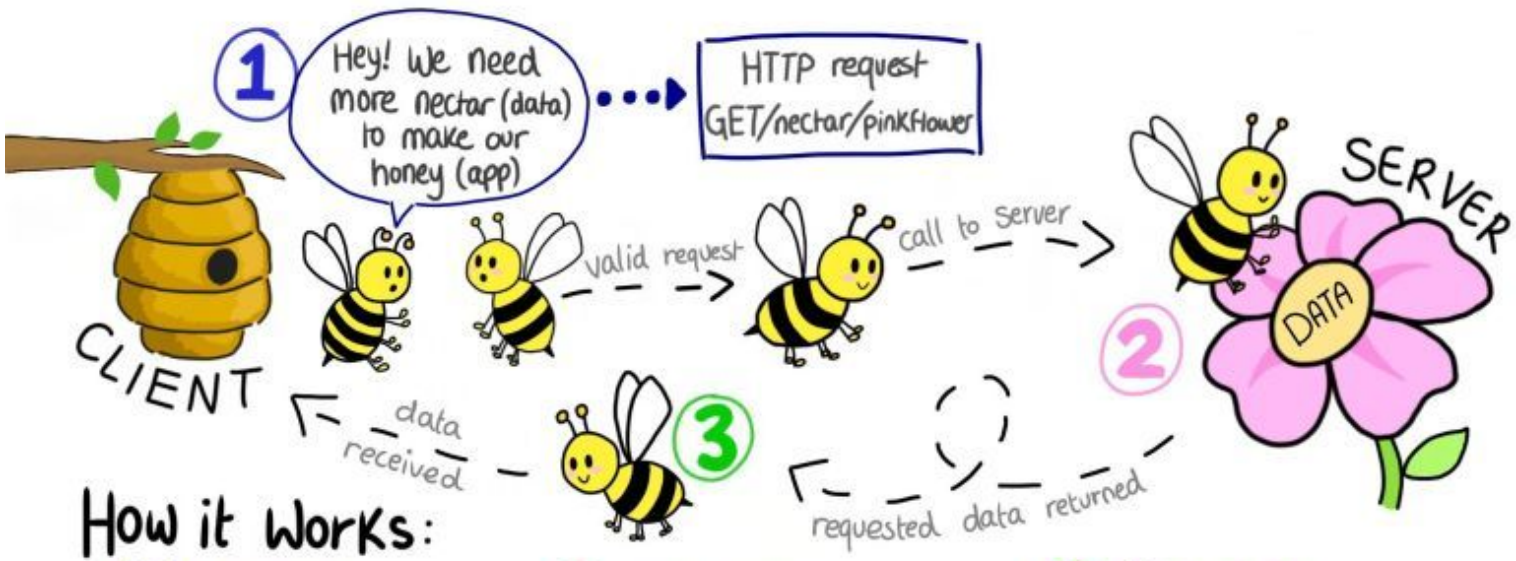
- Application Programming Interfaces (“APIs”)
- Instead of having to download a data set, APIs allow you to request (parts of) a database directly from a remote server to a local machine.

When you work with web APIs, two different computers - **a client and server** - will interact with each other to request and provide data, respectively.

What is an API?

@Rapid_API

An application programming interface allows two programs to communicate. On the web, APIs sit between an application and a web server, and facilitate the transfer of data.



How it Works:

1 Request
API call is initiated by by the Client application via a HTTP request

2 Receive
Our worker bee acts as an API, going to a flower (server) to collect nectar (data)

3 Response
The API transfers the requested data back to the requesting application, usually in JSON format

Web API structure

- Often require Authentication using tokens (potentially linked to billing)
- Adhere to a particular style known as Representation State Transfer or REST (in most cases)
- RESTful APIs are convenient because we use them to query database using URLs over HTTP

Accessing APIs

Plug-n-play packages. Many common APIs are available through user-written Py libraries.

Writing our own API request. If no wrapper function is available, we have to write our own API request and format the response ourselves.

Week 3 Lab Content

Main Goal: Testing out example APIs and access methods:

- ‘Plug-n-Play’ API packages with the *Census* package.
- Writing our own requests looking at bike sharing in London.
- Spatial data APIs (OSM data using the geocoder from *geopy*)