

Prerequisite software install

- RStudio
- R libraries (install.packages)
 - httr
 - jsonlite
 - tidyverse
 - plumber
 - gapminder
 - png

APIs & Plumber

Dr Olly Butters

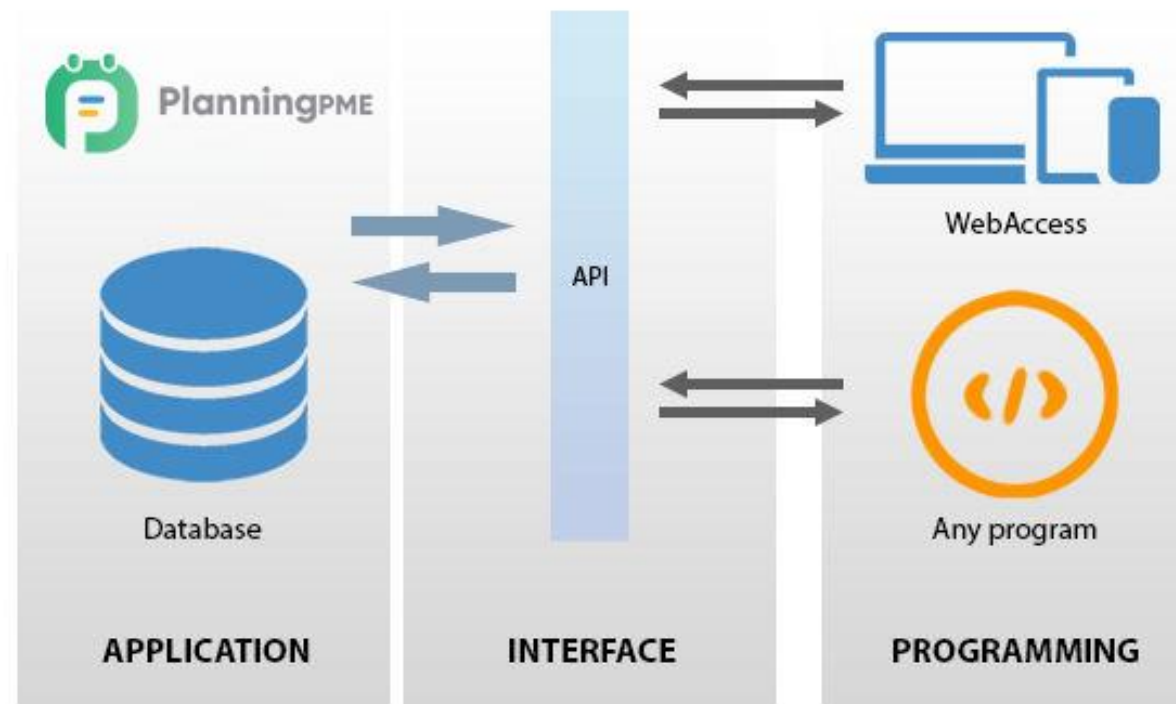
Public Health, Policy and Systems

Session overview

- What is an API, where are they used? (~25 mins)
- Exercise - Two R examples of using existing external APIs. (~15 mins)
- Introduction to plumber. (~15 mins)
- Exercise - Write some plumber code. (~30 mins)
- Final comments. (~5 mins)

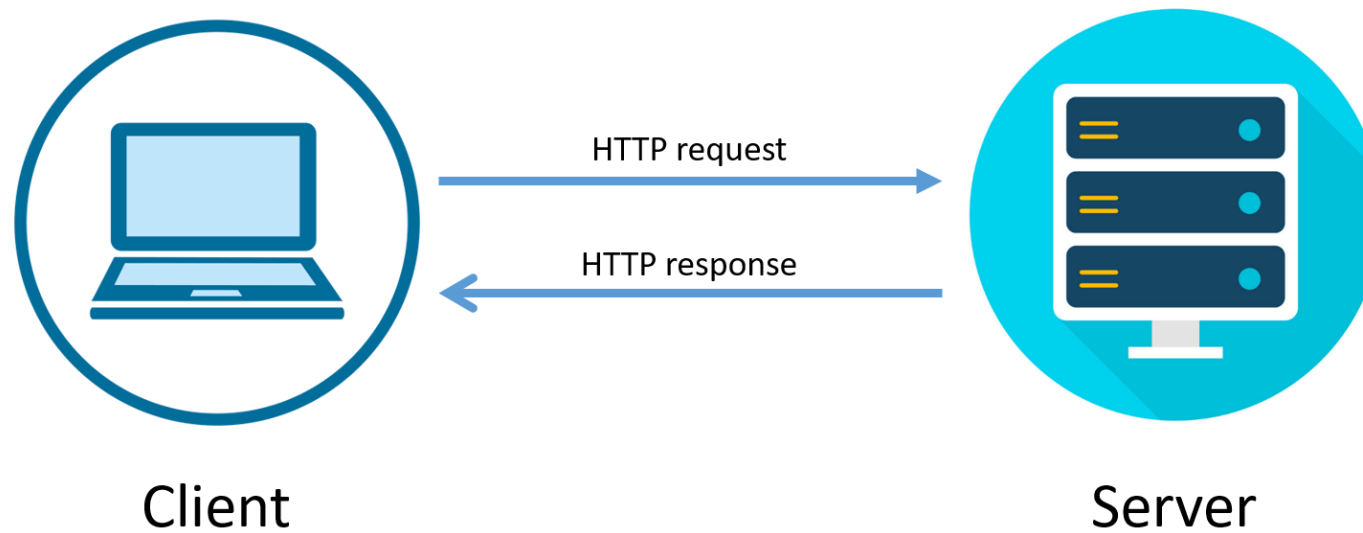
What is an API?

- Application Programming Interface.



<https://www.planningpme.com/planningpme-api.htm>

What is an API?

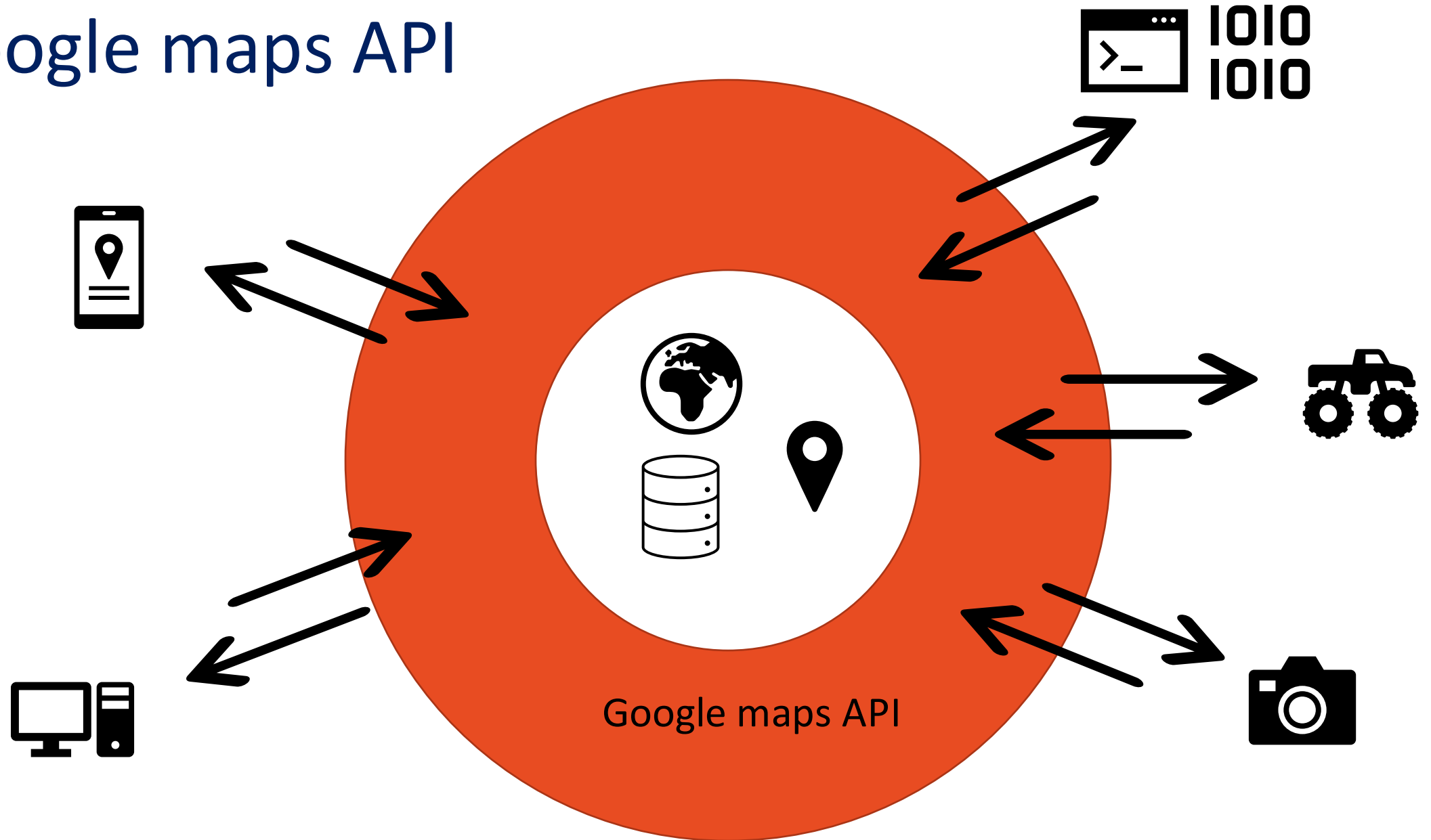


<https://bytesofgigabytes.com/networking/how-http-request-and-response-works/>

Why bother?

- Easier than connecting to underlying applications.
- Common language.
- Static interface.

Google maps API



Example APIs

Get data

- Google maps
- Wikidata
- Fitbit
- British library
- Data.parliament.uk

Add data

- Twitter
- Facebook
- Instagram

Book appointments

- GP systems
- Restaurants

Manage services

- Amazon Web Services
- Microsoft Azure

Real world interaction

- Google Nest
- Dishwasher
- Burglar alarm

Health data APIs

- Bioportal -> Look up ontologies etc.
- Gov health stats
- NHS Digital -> Loads of APIs to find/get/add data/
- Air quality.
- [UK government API catalogue](#)
- [Urban Observatory](#)
- <https://data.police.uk/docs/>

Anatomy of a query URL (the request)

The diagram illustrates the components of the URL `http://www.domain.com:1234/path/to/resource?a=b&x=y`. Red horizontal bars are placed under each component, with red lines connecting them to labels below or above the URL.

- protocol**: Points to `http://`
- host**: Points to `www.domain.com`
- port**: Points to `:1234`
- resource path**: Points to `/path/to/resource`
- query**: Points to `?a=b&x=y`

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Response

- Typically get a header and content in the response
- Response codes in header
 - 200 – OK
 - 404 – Not found
 - 500 – Internal server error
- Content is usually JSON or XML

Exercises: connect to some APIs

- Exercise 1: Using an API - how many people are in space right now?
- Exercise 2: Using an API - what is the UK Covid-19 case rate?

Swagger

- Web tool to help explore and use compliant APIs

OpenAQ 2.0.0 OAS3
/openapi.json
API for OpenAQ LCS

Servers
https://u50g7n0cbj.execute-api.us-east-1.amazonaws.com/

default

- GET /ping Pong
- GET /favicon.ico Favico

v2

- GET /v2/measurements Measurements Get
- GET /v2/averages Averages V2 Get
- GET /v2/locations Locations Get
- GET /v2/locations/{location_id} Locations Get
- GET /v2/latest Latest Get
- GET /v2/latest/{location_id} Latest Get
- GET /v2/cities Provides a simple listing of cities within the platform
- GET /v2/countries Countries Get
- GET /v2/countries/{country_id} Countries Get
- GET /v2/locations/tiles/{z}/{x}/{y}.pbf Get Tile
- GET /v2/locations/tiles/mobile/{z}/{x}/{y}.pbf Get Mobiletile
- GET /v2/locations/tiles/mobile-generalized/{z}/{x}/{y}.pbf Get Mobilegentile
- GET /v2/locations/tiles/tiles.json Tilejson
- GET /v2/locations/tiles/mobile/tiles.json Mobiletilejson
- GET /v2/locations/tiles/mobile-generalized/tiles.json Mobilegentilejson

Swagger

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API for OpenAQ LCS

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default

- GET** /ping Pong
- GET** /favicon.ico Favico

v2

GET /v2/measurements Measurements Get

Parameters Try it out

Name	Description
format string (query)	<input type="text" value="format"/>
date_from (query)	Default value : 2000-01-01T00:00:00+00:00 <input type="text" value="2000-01-01T00:00:00+00:00"/>
date_to (query)	Default value : 2022-02-07T10:37:00+00:00 <input type="text" value="2022-02-07T10:37:00+00:00"/>
limit integer (query) maximum: 100000	Change the number of results returned. Default value : 100 <input type="text" value="100"/>
page integer (query) maximum: 6000	Paginate through results. Default value : 1 <input type="text" value="1"/>
offset integer (query) maximum: 10000 minimum: 0	Default value : 0 <input type="text" value="0"/>
sort	Available values : asc_desc

Decorators

- Decorators let you modify function behaviour without modifying the function code!

#. I am a decorator

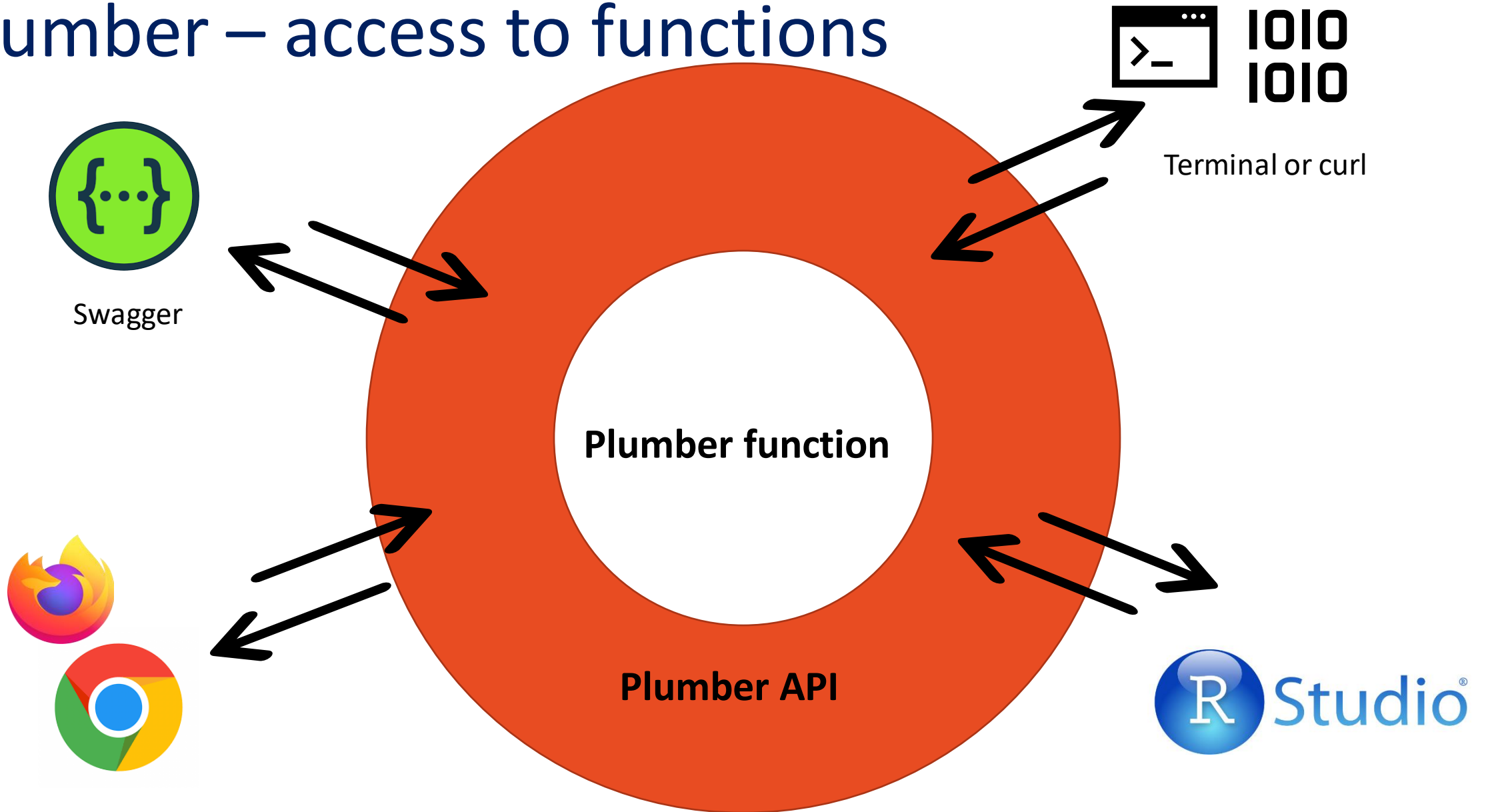
```
my_function <- function()  
{  
  #do awesome stuff  
}
```

- Common in other languages.

Plumber function

```
## Return the square of a number
## @param a The number to square
## @get /square
function(a) {
  as.numeric(a) * as.numeric(a)
}
```


Plumber – access to functions



Exercises: write some plumber code

- Exercise 3: Run example plumber functions (/hello, /square, /plot)
- Exercise 4: Write a plumber function to use gapminder data to show population of the UK in 1982
- Exercise 5: Write a plumber function to allow a user to find out the population of any country during any year in gapminder.
- Exercise 6: Write a plumber function to plot the population change of a user defined country.

Additional points

- GET/POST
- Bounds checks
- Security is vital on public APIs
- Good list of public APIs - <https://github.com/public-apis/public-apis>
- https://docs.openaq.org/#/v2/measurements_get_v2_measurements_get