INLS 672
Web Development 2

JavaScript and Open Data

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Part 1: Open Data and JSON

Part 2: Example using Open Data

Open Data

Open data is free, publicly available data that anyone can access and use without restrictions. Actual use of open data is greatly improved when it is represented in a standard format.

W3C Recommendation: Data on the Web Best Practices

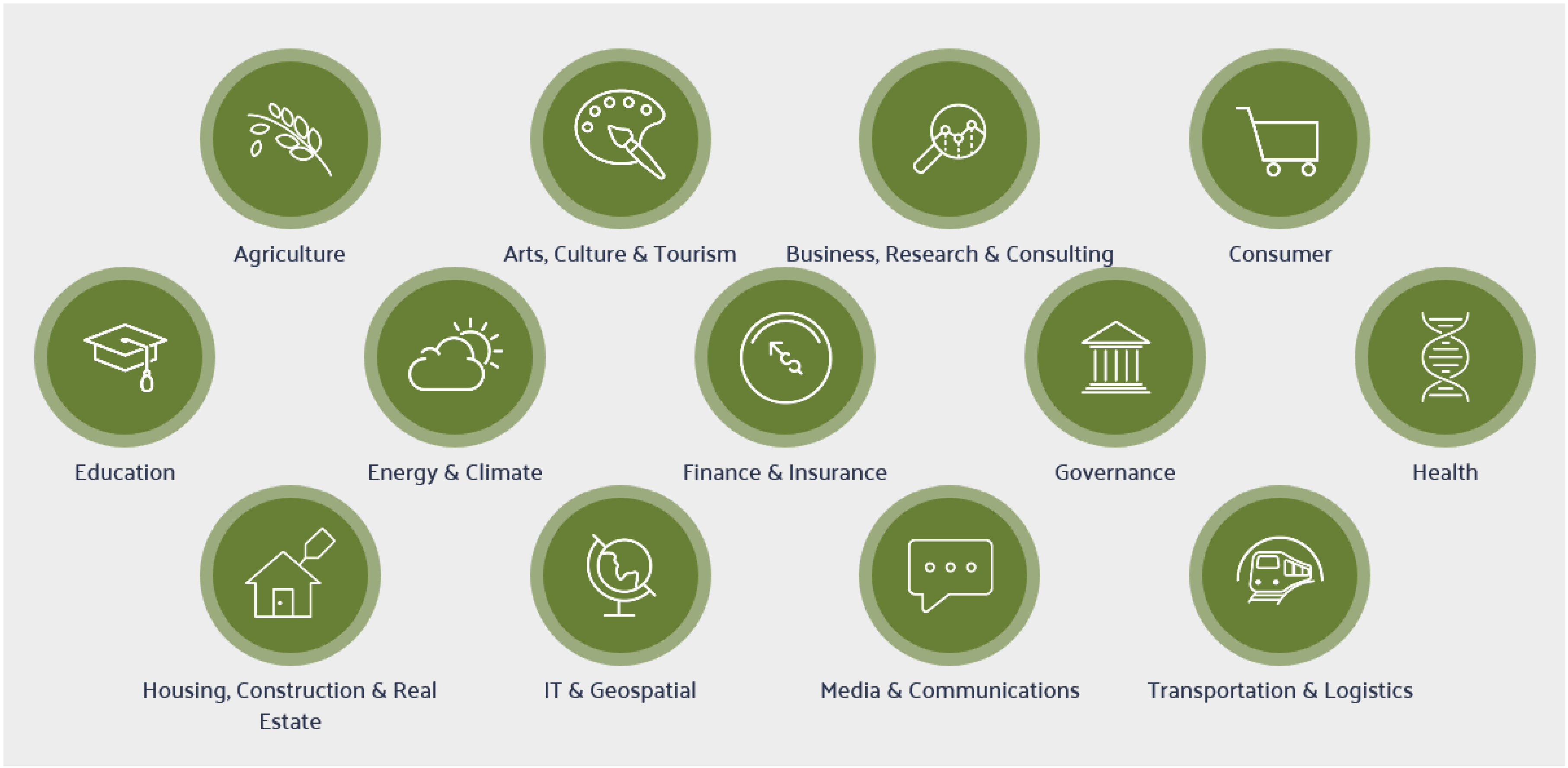
- As data becomes more ubiquitous, and data sets become larger and more complex, processing by computers becomes more crucial.
- Data becomes useful when it has been processed and transformed into information.
- Best Practice for Data Formats: Make data available in a machine-readable, standardized format that is easily parseable including, but not limited to, CSV, XML, HDF5, JSON and RDF

Why important?

Because Open Data is publicly accessible (and free), anyone can use it for a variety of purposes, such as forecasting trends, understanding purchasing patterns, and discovering new opportunities for innovation.

Open Data Use Cases

The Open Data Impact Map is a public database of organizations that use open government data for advocacy, to develop products and services, improve operations, inform strategy and conduct research.



A few sources of Open Data

- Data.gov
- HealthData.gov
- Hawaii Open Data
- NYC Open data
- Chapel Hill Open Data
- Socrata Open Data
- Kaggle Datasets
- RSS Feeds (XML): NASA, Apple, Wired
- Open Food Facts
- Reddit: Jeopardy! dataset of 200,000+ questions
- Learning Hub: 50 Best Open Data Sources

Open Data Formats

What does open data look like?

- JSON, XML, RDF, CSV, …
- Data.gov has 50+ formats

Both JSON and XML are widely used because they are

- Lightweight, and easy for humans to read and write
- Easy for applications to parse and generate
- Language-independent, and most programming languages provide built-in parsers to handle these formats

Some benefits of JSON over XML

- Less verbose, simpler syntax
- Maps more directly to the data structures of programming languages, e.g., JavaScript and Python

Quick view: XML and JSON to represent employee names

XML

```
<employees>
    <employee>
        <firstName>John</firstName> <lastName>Doe</lastName>
    </employee>
    <employee>
        <firstName>Anna</firstName> <lastName>Smith</lastName>
    </employee>
    <employee>
        <firstName>Peter</firstName> <lastName>Jones</lastName>
    </employee>
</employees>
```

JSON

```
{"employees":[
    {"firstName":"John", "lastName":"Doe"},
    {"firstName":"Anna", "lastName":"Smith"},
    {"firstName":"Peter", "lastName":"Jones"}
]}
```

JSON Data Format

```
{"employees":[
    {"firstName":"John", "lastName":"Doe"},
    {"firstName":"Anna", "lastName":"Smith"},
    {"firstName":"Peter", "lastName":"Jones"}
  ]
}
```

JSON is built on two structures

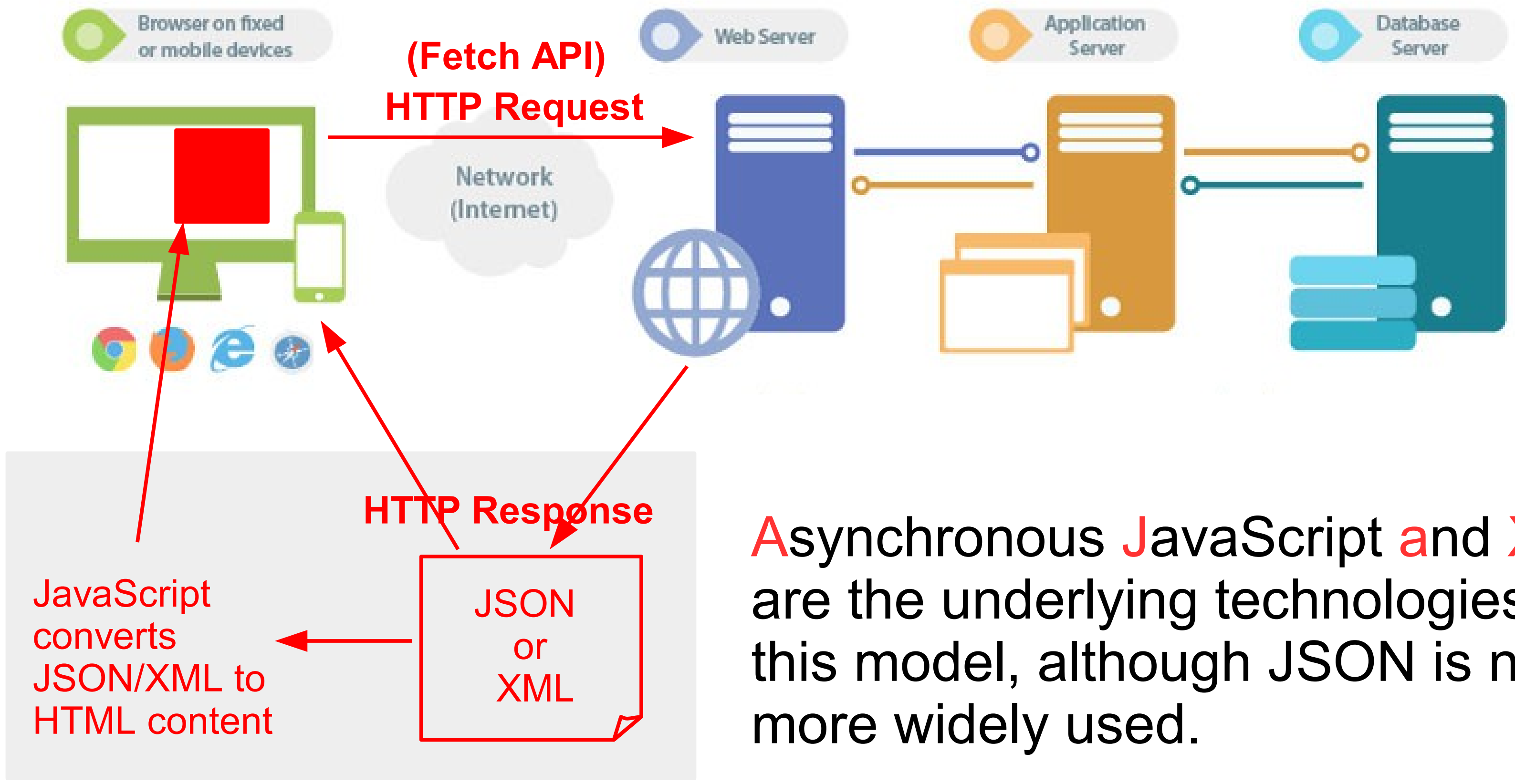
- A collection of name/value pairs (objects, delimited by {…})
- An ordered list of values (similar to an array, delimited by […])

Syntax is important!

- JSON requires double quotes to delimit strings and property names. Single quotes are not valid.
- Validation is important – even a single misplaced comma or colon may make the JSON text impossible to parse

JSONLint is a useful tool for validating and formatting JSON

'AJAX' programming model



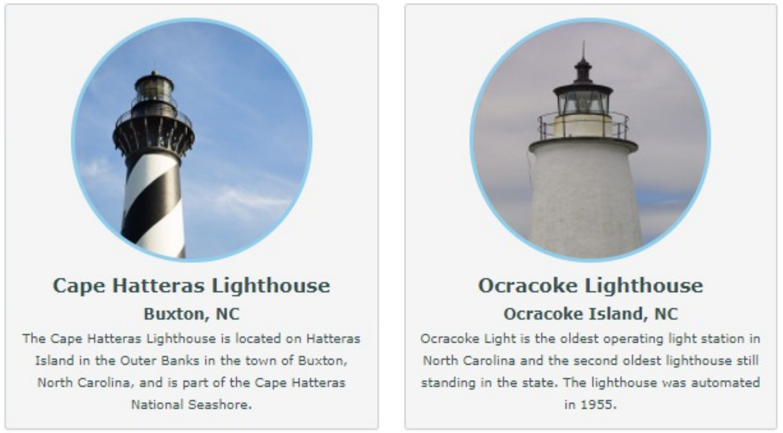
Asynchronous JavaScript and XML are the underlying technologies for this model, although JSON is now more widely used.

The AJAX model allows web apps to make quick, incremental updates to the user interface without reloading the entire web page. This makes the application faster and more responsive to user actions.

MDN: Ajax: Getting Started

Lighthouse Example

lighthouses.html



Cape Hatteras Lighthouse

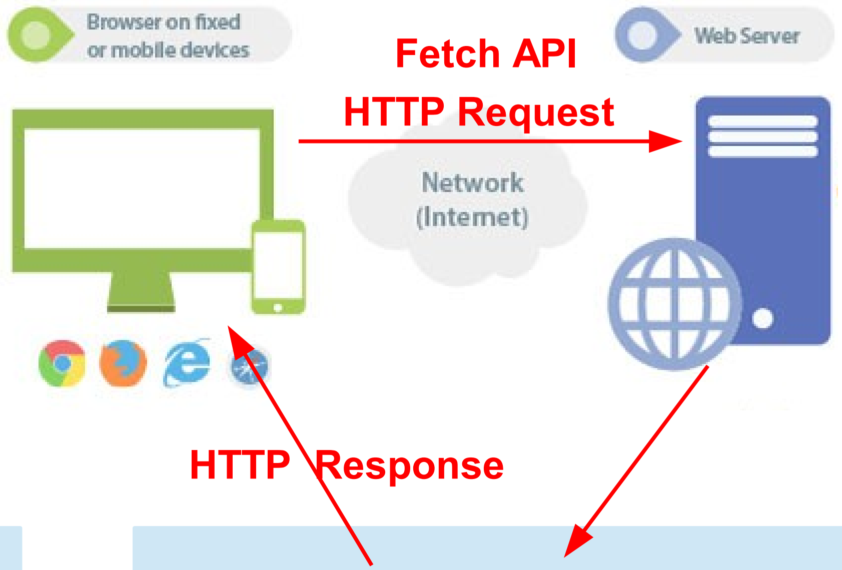
Buxton, NC

The Cape Hatteras Lighthouse is located on Hatteras Island in the Outer Banks in the town of Buxton, North Carolina, and is part of the Cape Hatteras National Seashore.

Ocracoke Lighthouse

Ocracoke Island, NC

Ocracoke Light is the oldest operating light station in North Carolina and the second oldest lighthouse still standing in the state. The lighthouse was automated in 1955.



```
async function getLighthouses() {
    let url = 'https://.../lighthouses.json';
    try {
        let response = await fetch(url);
        return await response.json();
    } catch (error) {
        console.log(error);  }
}

async function renderLighthouses() {
    let lighthouses = await getLighthouses();
    let html = '';
    . . .
    let container = document.querySelector('.container');
    container.innerHTML = html; }

renderLighthouses();
```

lighthouses.js

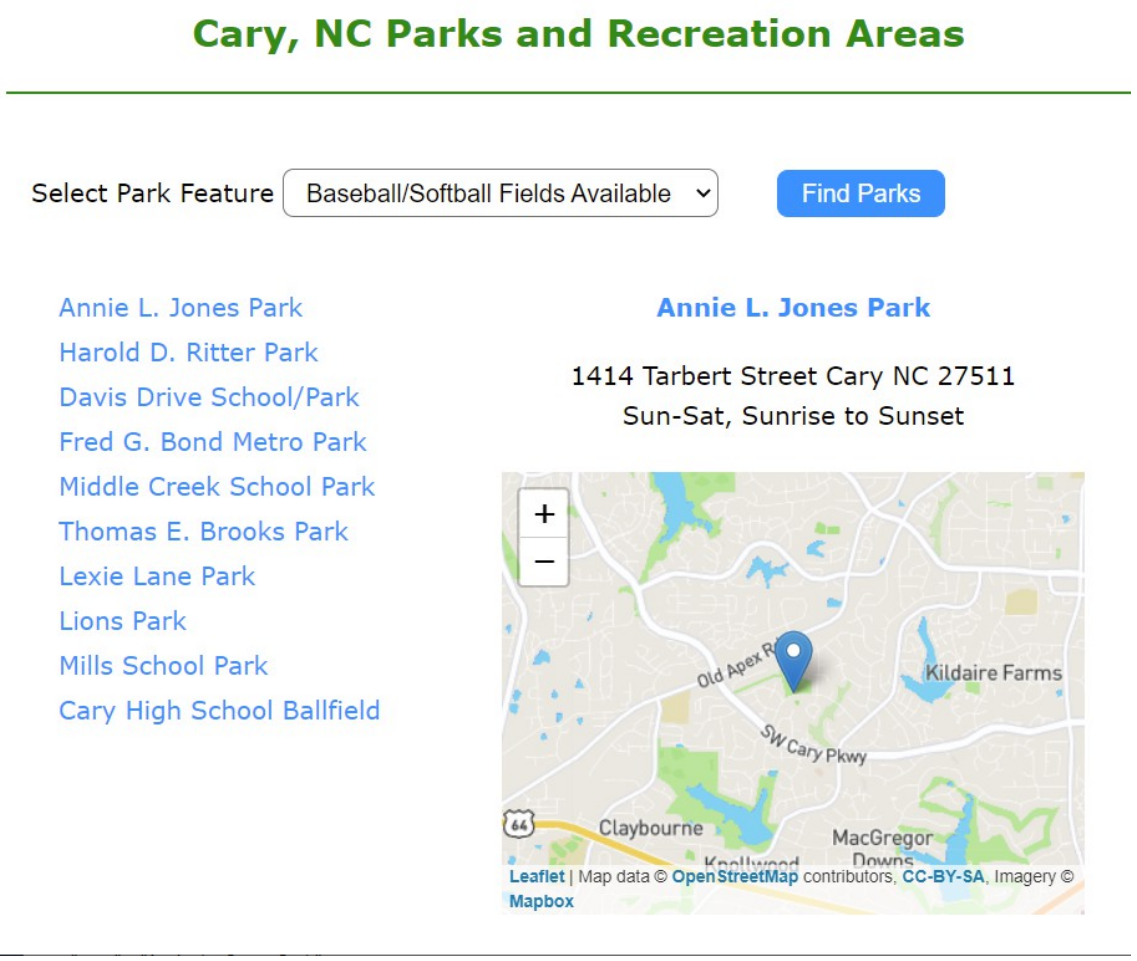
```
[{
  "name": "Cape Hatteras Lighthouse"
  "location": "Buxton, NC",
  "image": "...hatteras.jpg",
  "description": "The Cape Hatteras ..."
 },

 {
  "name": "Ocracoke Lighthouse",
  "location": "Ocracoke Island, NC",
  "image": "...ocracoke.jpg",
  "description": "Ocracoke Light is ..."
 }
]
```

lighthouses.json

Part 1: Open Data and JSON

Part 2: Example using Open Data

Cary Parks Example: creating a web app from open JSON data



Cary, NC Parks and Recreation Areas

Select Park Feature [Baseball/Softball Fields Available] Find Parks

- Annie L. Jones Park
- Harold D. Ritter Park
- Davis Drive School/Park
- Fred G. Bond Metro Park
- Middle Creek School Park
- Thomas E. Brooks Park
- Lexie Lane Park
- Lions Park
- Mills School Park
- Cary High School Ballfield

Annie L. Jones Park

1414 Tarbert Street Cary NC 27511
Sun-Sat, Sunrise to Sunset

+
−
Old Apex Rd
Kildaire Farms
SW Cary Pkwy
64
Claybourne
MacGregor Downs
Knollwood
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

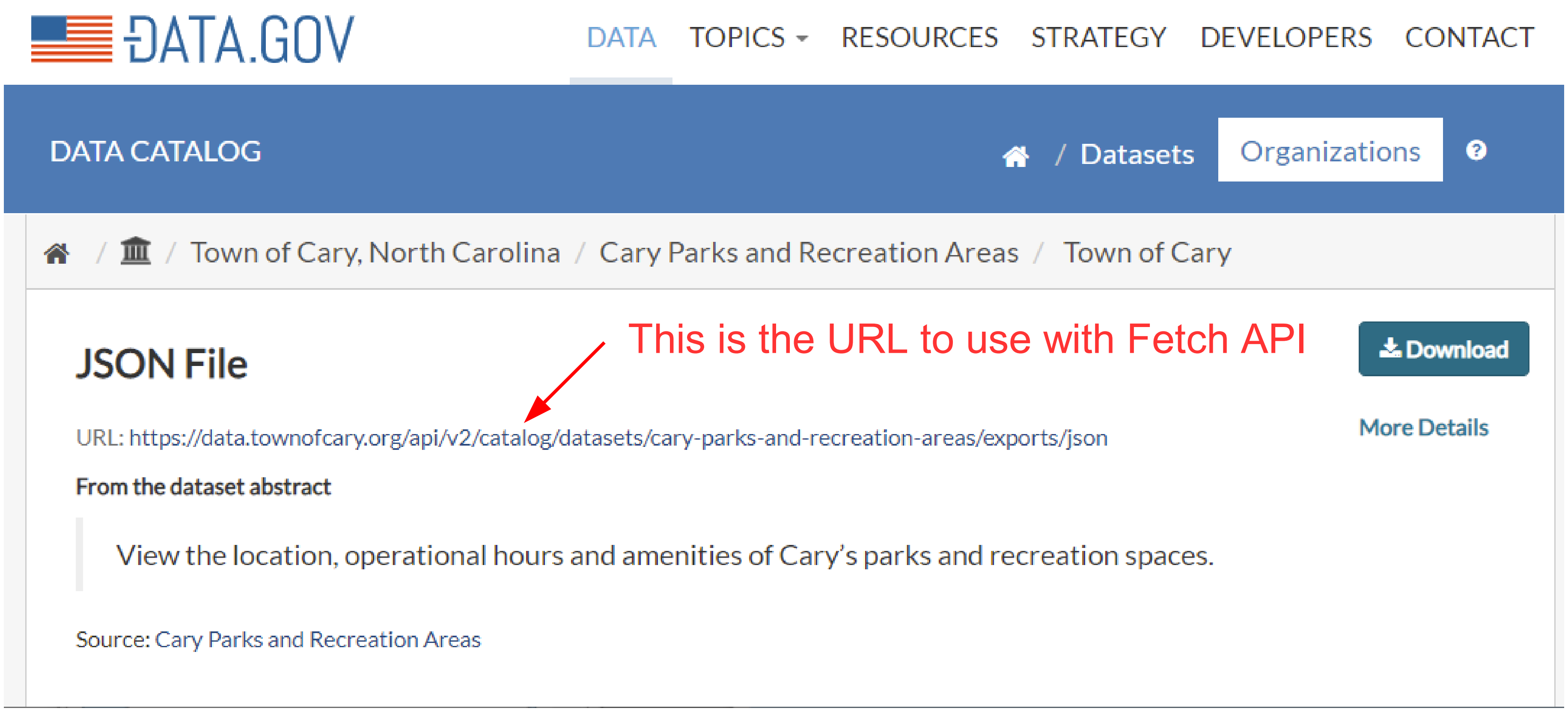
`cary-parks.html`

```
{
  "parkarea": 9.81,
  "name": "Annie L. Jones Park",
  "operhours": "Sunrise to Sunset",
  "operdays": "Sun-Sat",
  "value": "Yes",
  "geo_point_2d": {
    "lat": 35.7604589057,
    "lon": -78.8134952866
  },
  "parkurl": "http://www.townofcary.org/recreation-enjo
  "geo_shape": {
    "geometry": {
      "type": "Point",
      "coordinates": [
        -78.81349528661539,
        35.7604589056837
      ]
    },
    "type": "Feature",
    "properties": {}
  },
  "feature": "Trailhead Location",
  "fulladdr": "1414 Tarbert Street Cary NC 27511"
},
{
  "parkarea": 16.39,
  "name": "Davis Drive Park",
  "operhours": "Sunrise to Sunset",
  "operdays": "Sun-Sat",
  "value": "Yes",
  "geo_point_2d": {
    "lat": 35.7737687366,
    "lon": -78.8457150359
  },
  "parkurl": "http://www.townofcary.org/recreation-enjo
  "geo_shape": {
    "geometry": {
      "type": "Point",
      "coordinates": [
        -78.84571503589946,
        35.773768736589595
      ]
    },
    "type": "Feature",
    "properties": {}
  },
  "feature": "Nature Trails Available",
  "fulladdr": "1610 Davis Drive Cary NC 27519"
},
```

JSON data

Cary Parks data source: Data.gov

- Data.gov → Data
- Filters: Formats → JSON, Organization → Town of Cary, NC
- Select: Cary Parks and Recreation Areas, and the 2nd JSON file



Town of Cary, North Carolina / Cary Parks and Recreation Areas / Town of Cary

JSON File

This is the URL to use with Fetch API

URL: https://data.townofcary.org/api/v2/catalog/datasets/cary-parks-and-recreation-areas/exports/json

From the dataset abstract

> View the location, operational hours and amenities of Cary's parks and recreation spaces.

Source: Cary Parks and Recreation Areas

Know your data! How to view the JSON data

Here's the URL for Cary Parks and Recreation Areas:

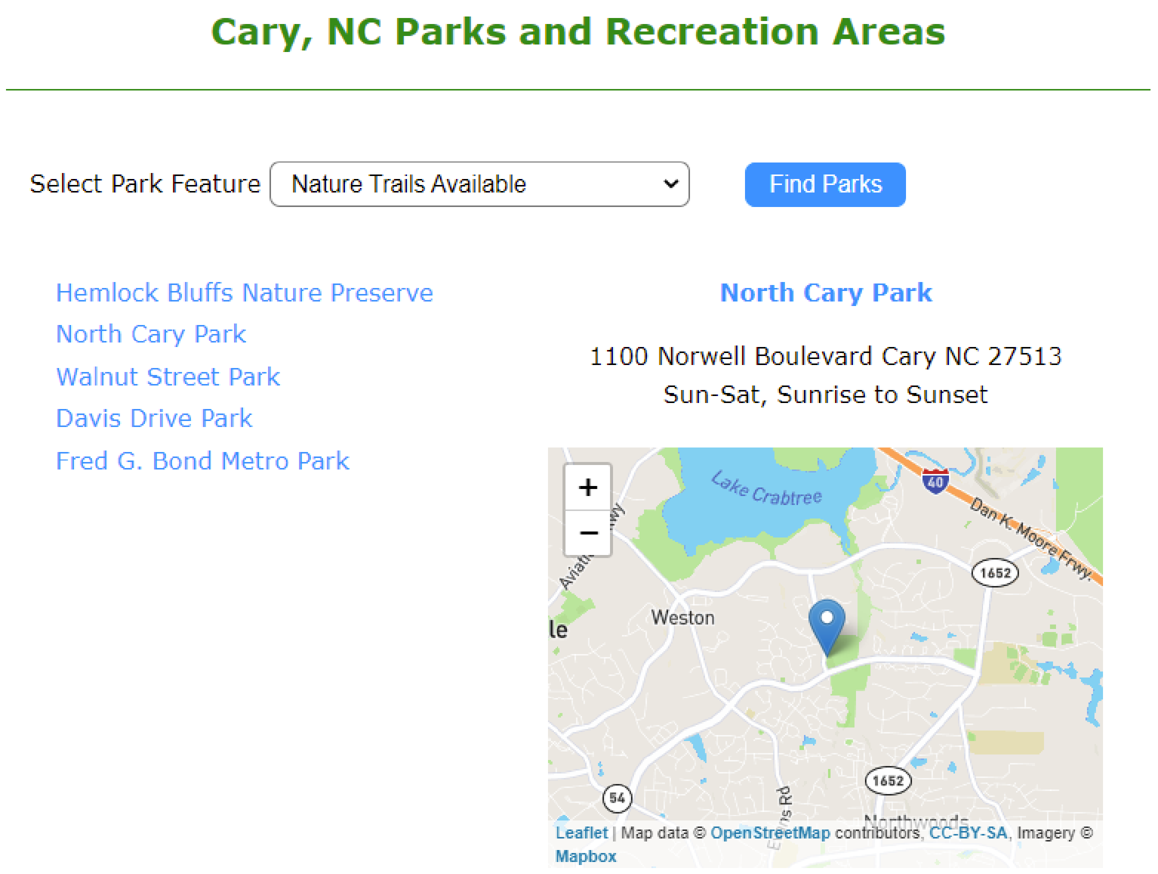
https://data.townofcary.org/api/v2/catalog/datasets/cary-parks-and-recreation-areas/exports/json

You can view the contents several ways..

- With Chrome, the default behavior is to download, and then view the contents with a text editor
- With Firefox (recommended), view the data in the browser
  - As raw data, either un-formatted or 'pretty print' for readable text
  - In a JSON format where you can expand/collapse objects
- With various JSON validating and formatting tools such as
  - JSONLint
  - JSON Formatter and Validator
  - JSON formatter

Cary Parks: User Interface

This example renders the JSON data as a web page, but it also allows the user to interact with the content.



Cary, NC Parks and Recreation Areas

Select Park Feature [Nature Trails Available] Find Parks

- Hemlock Bluffs Nature Preserve
- North Cary Park
- Walnut Street Park
- Davis Drive Park
- Fred G. Bond Metro Park

North Cary Park

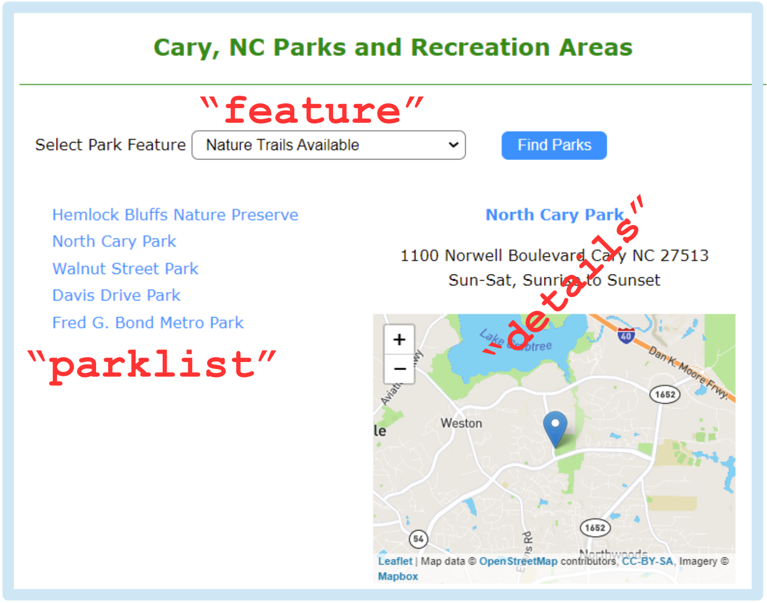
1100 Norwell Boulevard Cary NC 27513
Sun-Sat, Sunrise to Sunset

+
−
Lake Crabtree
40
Dan K. Moore Frwy.
1652
Weston
54
Northwoods
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

- Select a Park Feature from dropdown list
- Click Find Parks button to view a list of parks with the feature
- Click a park name from the list to view details
- Click park name in the details area to view its website

cary-parks.html, cary-parks.js, cary-parks.css

Cary Parks: Initial HTML Structure


Cary, NC Parks and Recreation Areas
"feature"
Select Park Feature
Nature Trails Available
Find Parks
Hemlock Bluffs Nature Preserve
North Cary Park
Walnut Street Park
Davis Drive Park
Fred G. Bond Metro Park
"parklist"
North Cary Park
1100 Norwell Boulevard Cary NC 27513
Sun-Sat, Sunrise to Sunset
"details"
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

```
  <body>
     <header>Cary, NC Parks and Recreation Areas</header>
     <section id="controls">
        <span>Select Park Feature
           <select id="feature">
           </select>
           <button id="findParks">Find Parks</button>
         </span>
     </section>

    <div id="wrapper">
       <section id="parklist">
       </section>
       <section id="details">
       </section>
    </div>
  <script src="cary-parks.js"></script>
  </body>
</html>
```

cary-parks.html

Park features found in the JSON data is inserted as a list of `<option>` elements for the `<select>` element

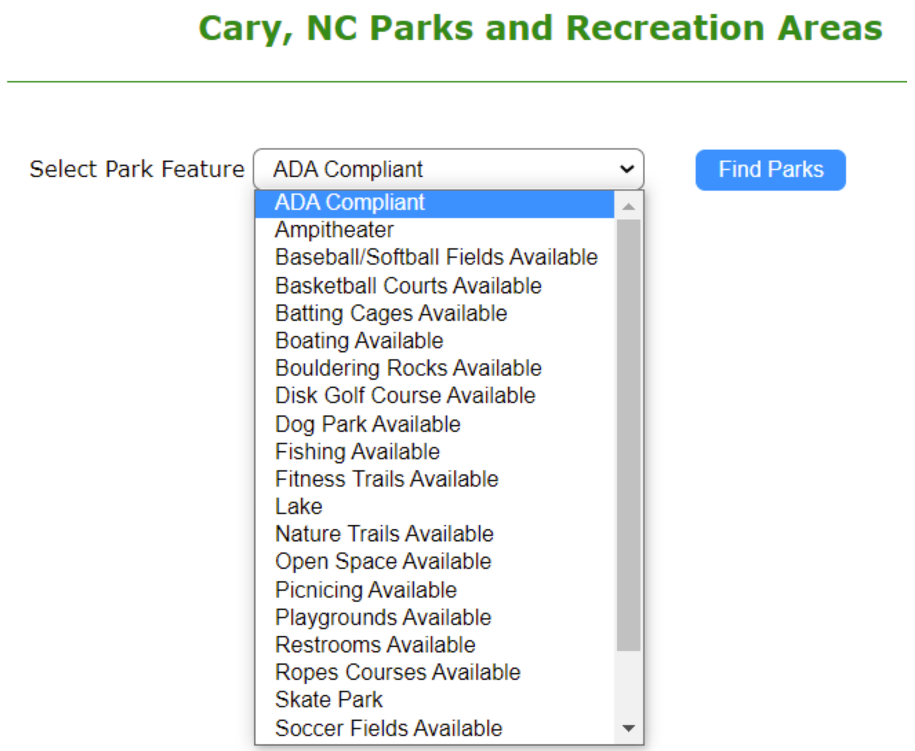
Park names found in the JSON data is inserted as a list of `<li>` elements for the `<section>` element

Detail information about the park (address, hours, and map) are inserted in the `<section>` element

JSON data for 1st park

```
[{
  "parkarea": 9.81,
  "name": "Annie L. Jones Park",
  "operhours": "Sunrise to Sunset",
  "operdays": "Sun-Sat",
  "value": "Yes",
  "geo_point_2d": {
       "lat": 35.7604589057,
       "lon": -78.8134952866
  },
  "parkurl": "http://www.townofcary.org/recreation-enjoyment/parks-
                     greenways-environment/parks/annie-jones-park",
  "geo_shape": {
       "geometry": {
          "type": "Point",
          "coordinates": [-78.81349528661539, 35.7604589056837]
       },
       "type": "Feature",
       "properties": {}
  },
  "feature": "Picnicing Available",
  "fulladdr": "1414 Tarbert Street Cary NC 27511"
},

. . .

]
```

Step 1: Browser loads `cary-parks.html`

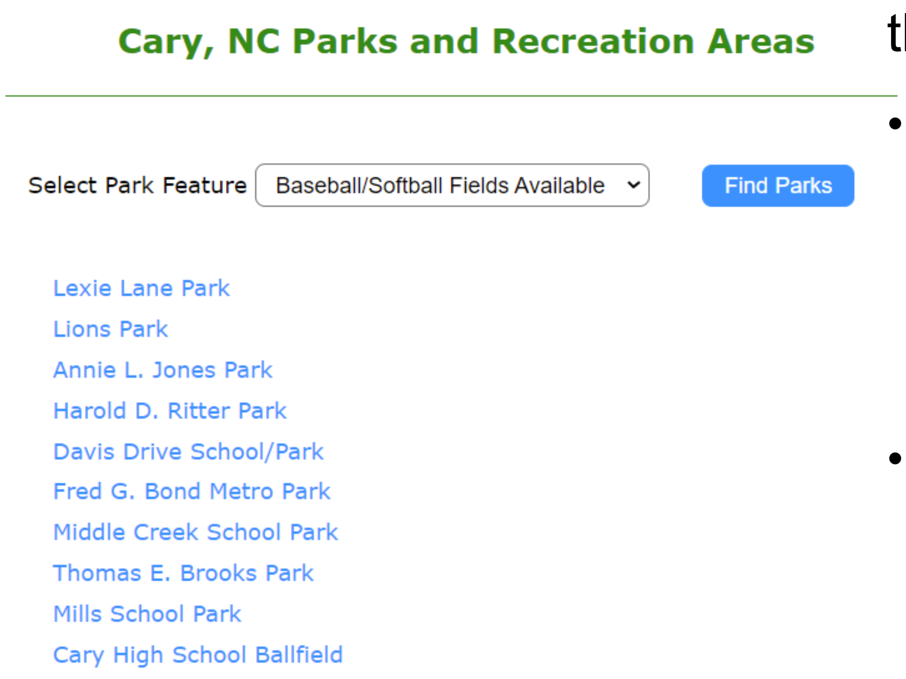


Cary, NC Parks and Recreation Areas

ADA Compliant
Ampitheater
Baseball/Softball Fields Available
Basketball Courts Available
Batting Cages Available
Boating Available
Bouldering Rocks Available
Disk Golf Course Available
Dog Park Available
Fishing Available
Fitness Trails Available
Lake
Nature Trails Available
Open Space Available
Picnicing Available
Playgrounds Available
Restrooms Available
Ropes Courses Available
Skate Park
Soccer Fields Available

- Browser renders the initial HTML structure, and the runs
- Runs `cary-parks.js` which calls `loadData()` to
  - Fetch the JSON data located at the URL
  - Create a JSON object from the data that defines the list of parks and their related information
  - Loop through the list of parks to get a list of all the features
  - Populate the `<option>` elements in the dropdown from the feature list

Step 2: User selects a feature and clicks 'Find Parks' button

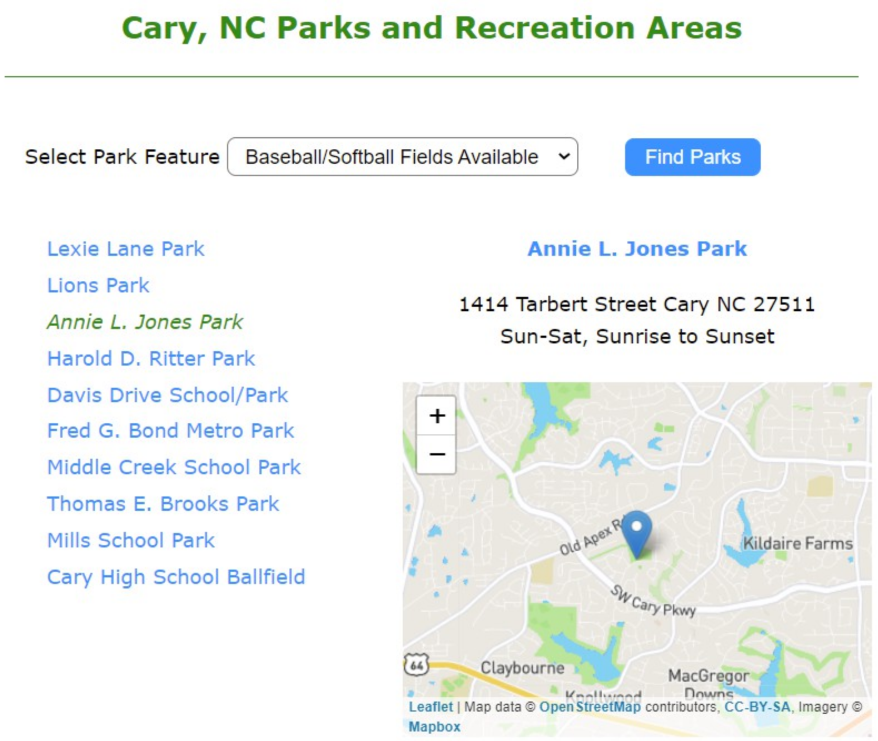

Cary, NC Parks and Recreation Areas

Lexie Lane Park
Lions Park
Annie L. Jones Park
Harold D. Ritter Park
Davis Drive School/Park
Fred G. Bond Metro Park
Middle Creek School Park
Thomas E. Brooks Park
Mills School Park
Cary High School Ballfield

When the 'Find Parks' button is clicked, the `getParks()` function is called to

- Loop through the list of parks in the JSON object. If the feature attribute of the park matches the one selected by the user, then it is added to the page using an HTML template string for a `<li>` element
- Add a click event listener (implemented with `onclick`) to each park `<li>` element so when the park name is clicked, the `showDetails()` function is called
- Pass the following park attributes as parameters to `showDetails()`: name, url, address, hours/days of operation, latitude, and longitude

Step 3: User clicks on park name to view details


Cary, NC Parks and Recreation Areas

Select Park Feature: Baseball/Softball Fields Available | Find Parks

- Lexie Lane Park
- Lions Park
- *Annie L. Jones Park*
- Harold D. Ritter Park
- Davis Drive School/Park
- Fred G. Bond Metro Park
- Middle Creek School Park
- Thomas E. Brooks Park
- Mills School Park
- Cary High School Ballfield

Annie L. Jones Park

1414 Tarbert Street Cary NC 27511

Sun-Sat, Sunrise to Sunset

+
−
Old Apex Rd
Kildaire Farms
SW Cary Pkwy
Claybourne
MacGregor Downs
Knollwood
Leaflet | Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

When the park name is clicked, the `showDetails()` function is called to

- To add the name (with linked url), address, and hours/days of operation to an HTML template string with `<h4>` and `<p>` elements
- To call the `showMap()` function with the latitude and longitude parameter to display a map using the Leaflet API.