Slide Note

Real World Objects vs. Program Objects

Real world objects – Shirts image representation

Program Objects – Shirts JavaScript representation

```
const shirts = [
    {
        color: "red",
        size: "XL",
        brand: "Nike",
        material: "cotton"
    },
    {
        color: "blue",
        size: "XL",
        brand: "Nike",
        material: "cotton"
    },
    {
        color: "navy blue",
        size: "XL",
        brand: "Nike",
        material: "cotton"
    }
]
```

Slide Note

Format: the shape of something or the way it is arranged or produced

Arrangement of Real-World Objects

- The way real world things are arranged depends on their location.
- Mannequins, hangers, display units, carry bags, shelves are different arrangements.
- The arrangement or format of things needs to be changed when things move from one location to another.

Slide Note

Think and Tell

- Real-world objects are transported from place A to place B in boxes and/or carry bags.
- How are program objects transported from computer A to computer B in web environment?

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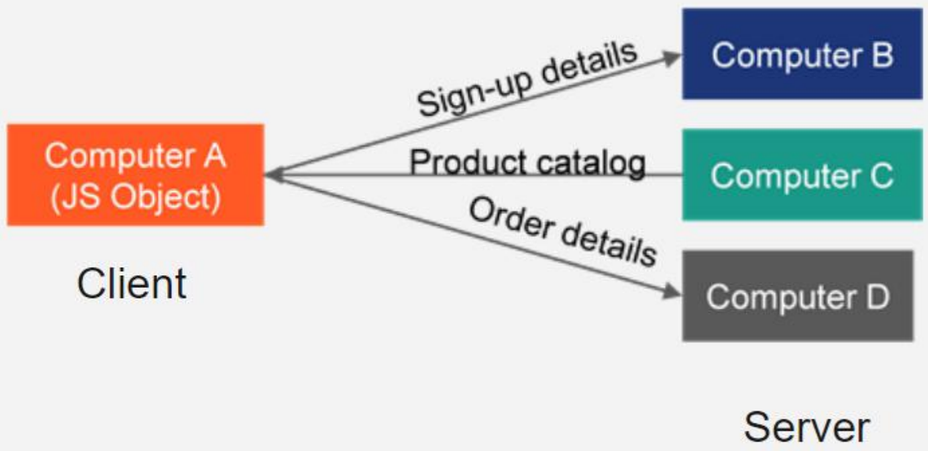
Program Objects – Data Formats

- Data format defines the arrangement or structure of data in a program or application.
- Listed below are a few examples of data with the type of arrangement.
  - Array – sequential
  - Object - key value pair
  - MS Word – paragraph
  - MS Excel – tabular

Slide Note

How to send and receive will be a separate discussion that will happen in the subsequent sprint

At this stage, it is important to know about what format the data travels over the web.

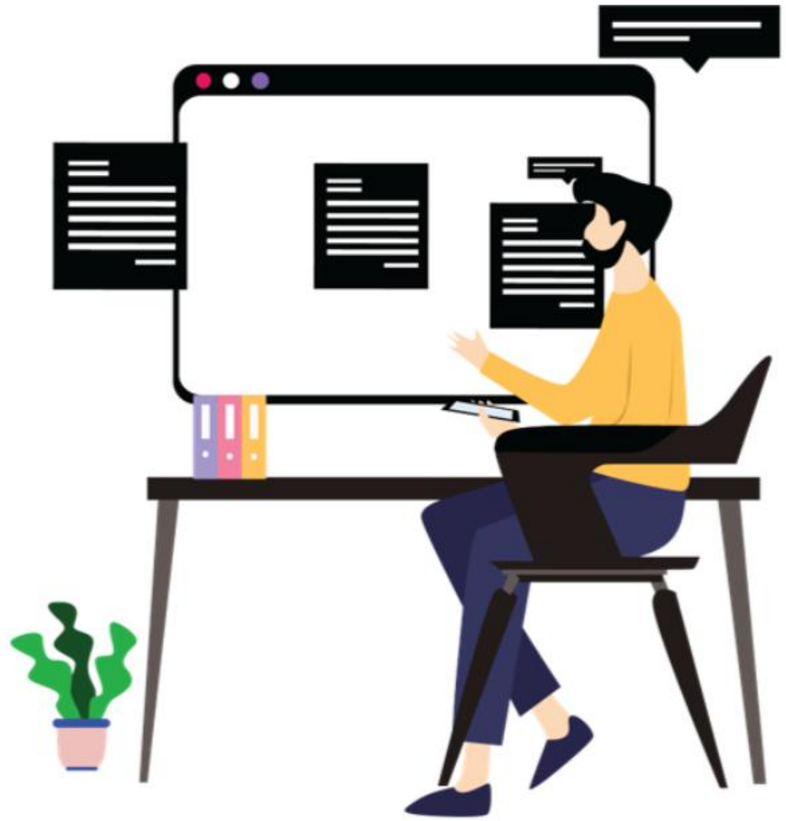


Communication Over the Web

- A web page that is interactive does a lot of communication with web servers to:
  - Store data
  - Fetch data
- At the client end, JavaScript objects are created to send or receive data.
- However, the data format supported by server systems can vary from system to system.
- Also, the systems may be developed using languages other than JavaScript.
- This results in data format mismatch while transporting data between client and server.
- How can we resolve this?

Slide Note

Model Real World Data Using Objects



Slide Note

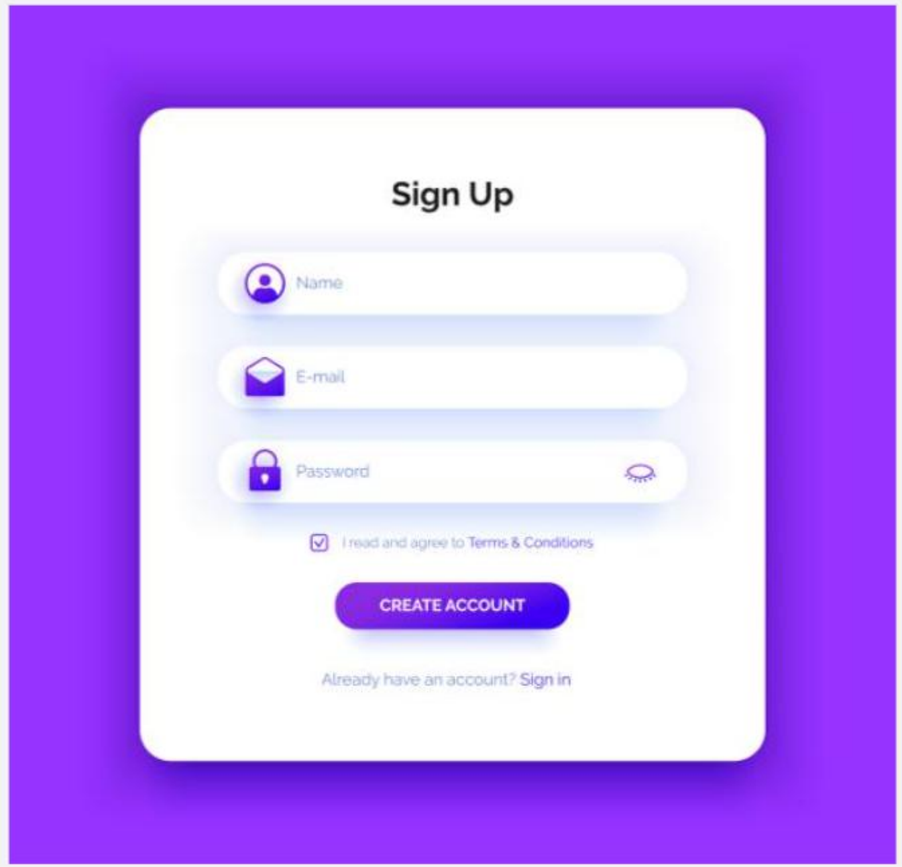
Learning Objectives

- Explain the need to convert JavaScript object to JSON
- Model data using JSON – JavaScript Object Notation
- Explain different JSON constructs
- Perform conversions between JSON and JavaScript object
- Compare JSON and JavaScript object

Slide Note

Sign Up Scenario

- Sign up is a very common process on the web.
- Users sign up with social media networking sites, online shopping sites, online reservation sites, etc., to create an account.
- During sign up, details need to be provided by the user from the browser.
- Is the entire sign-up process managed by a browser running on a single client machine?
- Or are there multiple machines involved?



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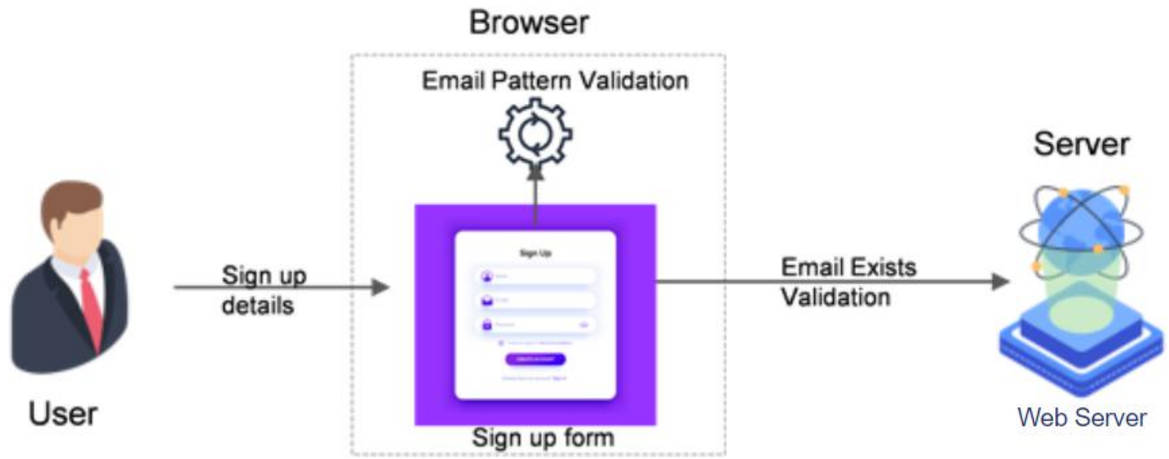
Sign Up – Email Validation

- On the web, multiple machines operate to process a user request.
- For example, client machine captures sign up details and validates email if it is in correct format.
- The email is then sent to the server machine to ensure it is not already taken by another user.
- At both the ends, different programming languages are used to write code.
- So, the machines need to send and receive data in a format that both can understand.
- Thus, it is necessary to convert data in a format that is language-independent.



Slide Note

Data Interchange between machines requires data format conversion

Slide Note

```
firstName: Sara,
lastName: Jones,
email: sara.jones@gmail.com,
state: California,
city: San Jose,
countryOfOrigin: USA
```

keys: firstName, lastName, email, state, city, countryOfOrigin

values: Sara, Jones, sara.jones@gmail.com, California, San Jose, USA

What Data Format Should Be Used Over Web?

- Different types of systems interact on the web, so the format of data should be language-independent.
- Text format is one of the simplest data formats that is understood by all systems.
- The data in textual format should carry information that contains the value and the name that represents the value.
- This kind of information is usually represented in key-value pair format, where the key is the identifier for the value.
- Is there any format that holds information in key-value pair format as text?

Slide Note

Model Data Using JSON

Slide Note

JSON – JavaScript Object Notation

- JSON is a text-based format.
- It follows JavaScript object syntax, so it holds data in key-value pair format and thus is named JavaScript Object Notation.
- Being text format, it is lightweight.
- JSON is completely language-independent but uses conventions similar to JavaScript object.
- Note: JavaScript object syntax and JSON syntax are not interchangeable.

Slide Note

JSON Structure

- JSON is a string whose format resembles JavaScript object literal format.
- JSON can represent strings, numbers, Booleans, null, arrays, and objects made up of these values.
- JSON data is in key-value pairs that are separated by commas.
- The key should be unique and should be contained in double quotes.
- The values should follow JavaScript literal syntax – strings in quotes, the number without quotes, Boolean values should be true or false, arrays should be in `[]` and object in `{}`.
- A JSON string can be stored in a text file with `.json` extension.

```
{
    "movieTitle": "Top Gun: Maverick",
    "yearOfRelease": 2022,
    "director": "Joseph Kosinski",
    "cast": ["Tom Cruise", "Jennifer Connelly"],
    "genre": "action"
}
```

Slide Note

Simple JSON

- The JSON shown on the slide represents data of a movie.
- `movieTitle`, `yearOfRelease`, `director`, `genre`, `isOnOTT` are JSON keys that represent property names.
- The values of these properties follow the syntax of literals in JavaScript:
  - Strings are in quotes
  - Numbers are without quotes
  - The Boolean value is either `true` or `false`

```
{
    "movieTitle": "Top Gun: Maverick",
    "yearOfRelease": 2022,
    "director": "Joseph Kosinski",
    "genre": "action",
    "isOnOTT": false
}
```

Slide Note

JSON Array

- JSON can also hold array data.
- Arrays should be in `[]`.
- In the JSON shown on the slide, the `cast` property is of the type array and holds the list of values placed within the square brackets `[]`.

```
{
    "movieTitle": "Top Gun: Maverick",
    "yearOfRelease": 2022,
    "director": "Joseph Kosinski",
    "cast": ["Tom Cruise", "Jennifer Connelly"],
    "genre": "action"
}
```

Slide Note

Complex JSON

- JSON data can be complex.
- It can include primitive types, arrays and objects.
- The JSON data shown here represents an array of movies, where each movie is an object.
- The movie object has primitive type properties such as `movieTitle`, `yearOfRelease`, `director`, `genre`, and `isOnOTT`. And the property `cast` is an array of objects.

```
{
    "movies": [
        {
            "movieTitle": "Top Gun: Maverick",
            "yearOfRelease": 2022,
            "director": "Joseph Kosinski",
            "cast": [
                {
                    "actorName": "Tom Cruise",
                    "onScreenName": "Capt. Pete"
                },
                {
                    "actorName": "Jennifer Connelly",
                    "onScreenName": "Penny Benjamin"
                },
                {
                    "actorName": "Miles Teller",
                    "onScreenName": "Lt. Bradley"
                }
            ],
            "genre": "action",
            "isOnOTT": false
        }
    ]
}
```

Slide Note

Is My JSON Valid?

- JSON is a text, hence it can accept any characters.
- So, how can we ensure that it follows the JSON syntax rules?
- JSONLint is an online validator and reformatter for JSON.
- To use this tool, copy the JSON data and paste it in editor view at this URL.
- Once the validate button is clicked, the JSON pasted is validated.
- Also, it reformats and tidies the pasted JSON.
- Note: The JavaScript types `undefined`, and `Functions` and `Symbols` are not valid JSON values.

Slide Note

Create and Validate JSON

Create simple JSON data that represents a single movie.

Validate the JSON data using the online validator at this link.

Click here for the demo solution.

DEMO

Slide Note

Create and Validate JSON Array

Create the JSON array that represents the list of movies.

Validate the JSON data using the online validator at this link.

Click here for the demo solution.

DEMO

Slide Note

Create Complex and Validate JSON

Create complex JSON data using arrays and objects to represent the list of movies where each movie contains an array of the movie star cast.

Validate the JSON data using the online validator at this link.

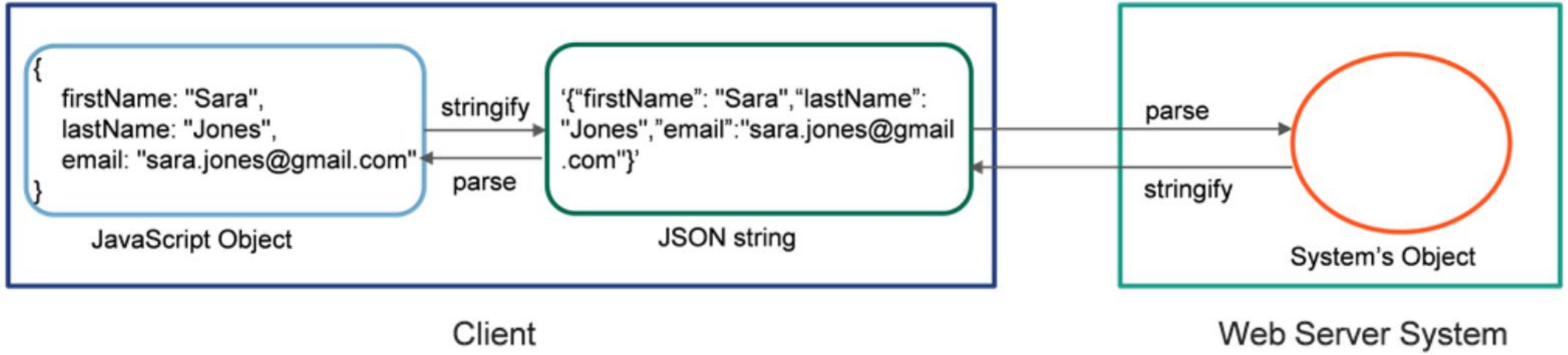
Click here for the demo solution.

DEMO

Slide Note

How Do Systems Work With JSON Data?

- JSON exists as a string due, so it is useful to transmit data across a network.
- At the client end, JSON is converted (parsed) to a native JavaScript object to extract the information it holds.
- JavaScript provides a global JSON object that has methods to convert JavaScript object to JSON string, and vice versa.



Slide Note

Conversions between JSON and JavaScript Object

Slide Note

The JSON Object

- JSON data is based upon JavaScript syntax but is distinct from it.
- While sending or receiving JSON data, conversions are required.
- JSON is a standard built-in object in JavaScript.
- It has two methods that assists in conversions.

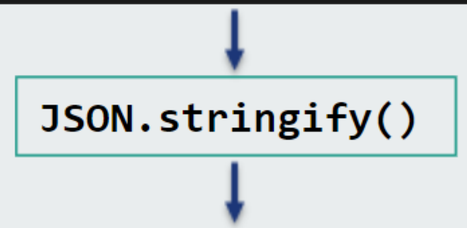
Slide Note

Stringify JavaScript Object

- The `JSON.stringify()` method converts a JavaScript object or value to a JSON string.
- If the operation is successful, the method returns a JSON string.
- If the operation fails, the method returns `undefined` value.
- Boolean, Number, and String objects are converted to the corresponding primitive values during stringification.

JavaScript Object

```
const customer = {
    firstName: "Robert",
    lastName: "Johnson",
    email: "robert.j@gmail.com",
    age: NaN,
    phoneNumbers: ['+12055110415','+12514120145'],
    address: {
        streetNumber: "252a",
        streetName: "Hale Hall",
        city: "Huntsville",
        state: "Alabama",
        postalCode: "AL"
    }
};
```



{"firstName":"Robert","lastName":"Johnson","email":"robert.j@gmail.com","age":null,"phoneNumbers":["+12055110415","+12514120145","+12565130876"],"address":{"streetNumber":"252a","streetName":"Hale Hall","city":"Huntsville","state":"Alabama","postalCode":"AL"}}

JSON String

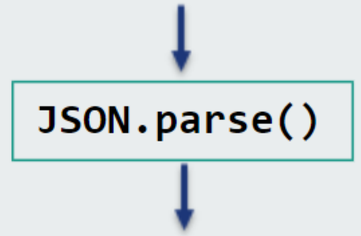
Slide Note

Parse JSON to JavaScript Object

- The `JSON.parse()` method parses a JSON string and constructs a JavaScript object as described by the string.
- Parsing is the process of analyzing strings of symbols in a computer language. It confirms the rules of languages are implemented.
- The value returned by the method could be an object, array, string, number, Boolean or null value corresponding to the given JSON text.

JSON String

{"firstName":"Robert","lastName":"Johnson","email":"robert.j@gmail.com","age":null,"phoneNumbers":["+12055110415","+12514120145","+12565130876"],"address":{"streetNumber":"252a","streetName":"Hale Hall","city":"Huntsville","state":"Alabama","postalCode":"AL"}}




```
const customer = {
    firstName: "Robert",
    lastName: "Johnson",
    email: "robert.j@gmail.com",
    age: NaN,
    phoneNumbers: ['+12055110415','+12514120145'],
    address: {
        streetNumber: "252a",
        streetName: "Hale Hall",
        city: "Huntsville",
        state: "Alabama",
        postalCode: "AL"
    }
};
```

JavaScript Object

Slide Note

Convert JavaScript Object to JSON

Write JavaScript program to convert a JavaScript object to JSON.

Click here for the demo solution.

DEMO

Slide Note

Convert JSON to JavaScript Object

Write a JavaScript program to convert JSON to a JavaScript object.

Click here for the demo solution.

DEMO

Slide Note

Quick Check

Which of the following is not a valid JSON value?

1. null

2. Boolean

3. array

4. undefined

Slide Note

Quick Check: Solution

Which of the following is not a valid JSON value?

1. null

2. Boolean

3. array

4. **undefined**

Explanation:
Although JSON follows JavaScript object notation, it does not support all the datatypes supported by JavaScript.
JSON does not support types such as Function, Undefined and Date.

Slide Note

Quick Check

Is the JSON data given below valid?

```
{
    'name': 'logitech mouse',
    'color': 'white',
    'price': 10
}
```

1. Yes

2. No

Slide Note

Quick Check: Solution

Is the JSON data shown below valid?

```
{
    'name': 'logitech mouse',
    'color': 'white',
    'price': 10
}
```

1. Yes

2. **No**

Explanation:
In JSON, property names and string values should be enclosed with double quotes, not single quotes.

Slide Note

Comparing JavaScript Object With JSON

JavaScript

- Property names in objects need not be quoted.
- Trailing commas are permitted in JavaScript object literal.
- `undefined`, `NaN` and `Infinity` are valid JavaScript values.
- Object literals allow comments.

```
const book = {
    title: "Pride and Prejudice",
    "author": 'Jane Austen',
    'pages': 0450,
    price: NaN,
    rating: undefined,
    stock: Infinity, // value will change
    category: ['suspense', 'romance'],
}
```

Valid JavaScript Object

JSON

- Property names must be double-quoted strings.
- Trailing commas are forbidden.
- `undefined`, `NaN` and `Infinity` are not valid JSON values.
- Comments are not supported by JSON data.

```
{
    title: "Pride and Prejudice",
    "author": 'Jane Austen',
    'pages': 0450,
    price: NaN,
    rating: undefined,
    stock: Infinity, // value will change
    category: ['suspense', 'romance'],
}
```

Invalid JSON String