Lecture 02: JSON Structure and Types

Lecture 02: JSON – Structure, Data Types & Conversion, and Technological Advancements from XML to JSON

Time: 2 Hours
Course: Advanced Web Technologies (CSC337)

Lecture Objectives

By the end of this lecture, students will be able to:

1. Understand JSON (JavaScript Object Notation) and its structure.
2. Learn about different data types in JSON.
3. Convert data between JSON and other formats.
4. Compare XML and JSON, exploring why JSON has become more dominant.

Part 1: Introduction to JSON (30 minutes)

What is JSON?

- JSON stands for **JavaScript Object Notation**.
- It is a lightweight data-interchange format.
- **Human-readable and easy to parse**.
- Used widely in web applications for storing and exchanging data.

Basic Structure of JSON

JSON consists of **key-value pairs**, similar to dictionaries in Python or objects in JavaScript.

Example: JSON Object

```
json

{
    "name": "John Doe",
    "age": 25,
    "email": "johndoe@example.com",
    "skills": ["JavaScript", "Python", "React"],
    "address": {
        "street": "123 Main St",
```

```
        "city": "New York",
        "zip": "10001"
    }
}
```

- **Keys** are always strings (inside double quotes `""`).
- **Values** can be:
  - Strings
  - Numbers
  - Booleans (true/false)
  - Arrays
  - Objects (nested structures)

Activity 1: Identifying JSON Structure

Students will be given a JSON snippet and asked to identify keys, values, and data types.

Part 2: JSON Data Types (30 minutes)

JSON supports the following data types:

Data Type	Example
String	`"name": "Alice"`
Number	`"age": 30`
Boolean	`"isStudent": false`
Array	`"languages": ["Python", "Java"]`
Object	`"address": {"city": "Boston", "zip": "02108"}`
Null	`"middleName": null`

Example: JSON Array

```
json

{
    "students": [
        {"name": "Alice", "age": 22},
        {"name": "Bob", "age": 23}
    ]
}
```

- Arrays are enclosed in square brackets `[]`.
- Objects inside arrays are enclosed in curly braces `{}`.

Quick Quiz

Which of the following is a valid JSON format?

1. `{name: "John", age: 25}`
2. `{"name": "John", "age": 25}`
3. `{["name": "John"], ["age": 25]}`

(Correct Answer: **2**)

Part 3: JSON Conversion (30 minutes)

Converting JSON to String and Vice Versa

In JavaScript:

- **Convert an object to JSON string (serialization)**:

```
javascript

let obj = { name: "Alice", age: 30 };
let jsonString = JSON.stringify(obj);
console.log(jsonString);
```

Output:

```
json

{"name":"Alice","age":30}
```

- **Convert JSON string to object (deserialization)**:

```
javascript

let jsonData = '{"name": "Alice", "age": 30}';
let obj = JSON.parse(jsonData);
console.log(obj.name);
```

Output:

```
nginx

Alice
```

Activity 2: Hands-on JSON Parsing

Students will write JavaScript code to convert JSON objects into strings and vice versa.

Part 4: XML vs JSON (30 minutes)

What is XML?

- XML (**eXtensible Markup Language**) is another format for storing and exchanging data.
- Uses **tags** like HTML.
- Example:

```
xml

<person>
    <name>John Doe</name>
```

```
    <age>25</age>
    <email>johndoe@example.com</email>
</person>
```

JSON vs XML: Which One is Better?

Feature	JSON	XML
Readability	Easier to read	More complex
Data Size	Smaller	Larger
Speed	Faster	Slower
Syntax	Simple	Uses tags
Parsing	Built-in JavaScript support	Requires extra libraries

Why JSON is Preferred?

1. **Lighter**: JSON has less data overhead.
2. **Faster Parsing**: JSON is easier to parse in JavaScript.
3. **Better Integration**: Works well with web APIs and modern frameworks like React, Angular.

Final Quiz: JSON vs XML

1. What is the main advantage of JSON over XML?
    - (a) Easier to read
    - (b) Requires more space
    - (c) Slower in processing
    - (d) Uses tags

(Correct Answer: (a))

2. Which function converts a JSON string to an object in JavaScript?
    - (a) `` `JSON.toObject()` ``
    - (b) `` `JSON.stringify()` ``
    - (c) `` `JSON.parse()` ``
    - (d) `` `convert.JSON()` ``

(Correct Answer: (c))

Conclusion

- JSON is a widely used format for storing and exchanging data.
- It is simpler, more efficient, and preferred over XML in modern web development.
- Understanding JSON structures, data types, and conversions is crucial for web technologies.

Homework

1. **Write a JSON file** describing yourself (name, age, hobbies, address).
2. **Convert it into a JavaScript object** using `` `JSON.parse()` ``.
3. **Compare JSON and XML** with at least three examples.