JSON – Java Script Object Notation

WEEK 05

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What is JSON

JSON is a data interchange format

Interactive Web 2.0 applications, no more use page replacement. Data transfer without refreshing a page.

The most important aspects of data transfer are simplicity, extensibility, interoperability, openness and human readability

Key idea in AJAX – Asynchronous Java Script and XML.

Topics to cover

Overview of the working of JSON

Properties of JSON as a data format

JSON with AJAX

Advantages of using JSON with AJAX

Security Concerns in using JSON

Where does it fit the best

How does it work?

JSON is a subset of Java Script. JSON can be parsed by a Java Script parser.

It can represent either complex or simple data as it has data types

They are Strings, Number, Boolean, Objects and Arrays

Strings

Sequence of 0 or more Unicode characters

No separate character type

- A character is represented as a string with a length of 1

Wrapped in "double quotes"

Backslash escapement

Numbers

Integer

Real

Scientific

No octal or hex

No **`NaN`** or **`Infinity`**

- Use **`null`** instead

Booleans

```
true
```

```
false
```

Array

An array can be shown as

["Sunday", "Monday", "Tuesday", "Wednesday“]

All data types are intuitive and similar to other programming languages

Also compatible with other languages like C, C++, C#, ColdFusion, Python and many more.

Object

Objects are unordered containers of key/value pairs

Objects are wrapped in **{ }**

, separates key/value pairs

: separates keys and values

Keys are strings

Values are JSON values

- struct, record, hashtable, object

Object


```
{"name":"Jack B. Nimble","at large":
true,"grade":"A","level":3,
"format":{"type":"rect","width":1920,
"height":1080,"interlace":false, "framerate":24}}
```

Object

```
{
    "name":      "Jack B. Nimble",
    "at large": true,
    "grade":     "A",
    "format": {
        "type":       "rect",
        "width":      1920,
        "height":     1080,
        "interlace": false,
        "framerate": 24
    }
}
```

Arrays vs Objects

Use objects when the key names are arbitrary strings.

Use arrays when the key names are sequential integers.

Properties of JSON

It's simultaneously human- and machine-readable format.

It has support for Unicode, allowing almost any information in any human language to be communicated;

The self-documenting format that describes structure and field names as well as specific values.

The strict syntax and parsing requirements that allow the necessary parsing algorithms to remain simple, efficient, and consistent;

The ability to represent the most general computer science data structures: records, lists and trees.

JSON in AJAX

JSON can be used in AJAX as follows:

Include it in HTML directly

<html>... <script> var data = *JSONdata*; </script>... </html>

JSON is used with XMLHttpRequest and can be converted into a JavaScript structure

responseData = eval('(' + responseText + ')');

Why is JSON better suited for AJAX?

JSON is widely used in AJAX. The X in AJAX stands for XML.

E.g.

```
{
"fullname": “Murtaza Fazal",
"org": “Pakistan",
}
```

```
<?xml version='1.0‘ encoding='UTF-8'?>
<element>
<fullname>Murtaza Fazal</fullname>
<org>Pakistan</org>
</element>
```

Security Concerns

- Same Origin Policy - JavaScript to access the contents of a Webpage, both the JavaScript and the Web page must originate from the same domain.
- Malicious website could serve up JavaScript that loads sensitive information from other websites using a client's credentials and communicates it back to the attacker.
- Although the malicious JavaScript can’t directly manipulate the contents, it can view the execution of the JavaScript and store the results it returns.
- This problem gets aggravated with JSON as the JSON arrays are themselves JavaScript objects and any malicious user can view them directly.

Where can JSON be used?

JSON is a light weight data format that can be used for transferring medium amounts of data.

It can be used in Java Script and then rendered on HTML pages

AJAX has many applications for JSON

Thus, use JSON for applications that are browser based.

JSON Is Not...

JSON is not a document format.

JSON is not a markup language.

JSON is not a general serialization format.

- No cyclical/recurring structures.
- No invisible structures.
- No functions.

Versionless

JSON has no version number.

No revisions to the JSON grammar are anticipated.

JSON is very stable.

JSON Is Not XML

objects

arrays

strings

numbers

booleans

null

- element
- attribute
- attribute string
- content
- <![CDATA[ ]]>
- entities
- declarations
- schema
- stylesheets
- comments
- version
- namespace

Data Interchange

JSON is a simple, common representation of data.

Communication between servers and browser clients.

Communication between peers.

Language independent data interchange.

```
public class Student {
  public string Name { get ; set;}
  public string StdId { get; set;}
  public List<Course> courseList;
  public Student () {
    courseList = new List<Course>();
  }

}

public class Course {
  public string CourseCode { get; set;}
  public string CourseName { get; set;}
}
```

```
Student std = new Student();
std.Name = “Ahmed”;
std.StdId = “k022120”;
std.courseList.Add(new Course()
{CourseCode=“CS101”, CourseName=“ITC”},
{CourseCode=“CS102”, CourseName=“CP”},
{CourseCode=“CS423”, CourseName=“IPT”});
```