Minimal JSON that web developers should know

What is JSON?

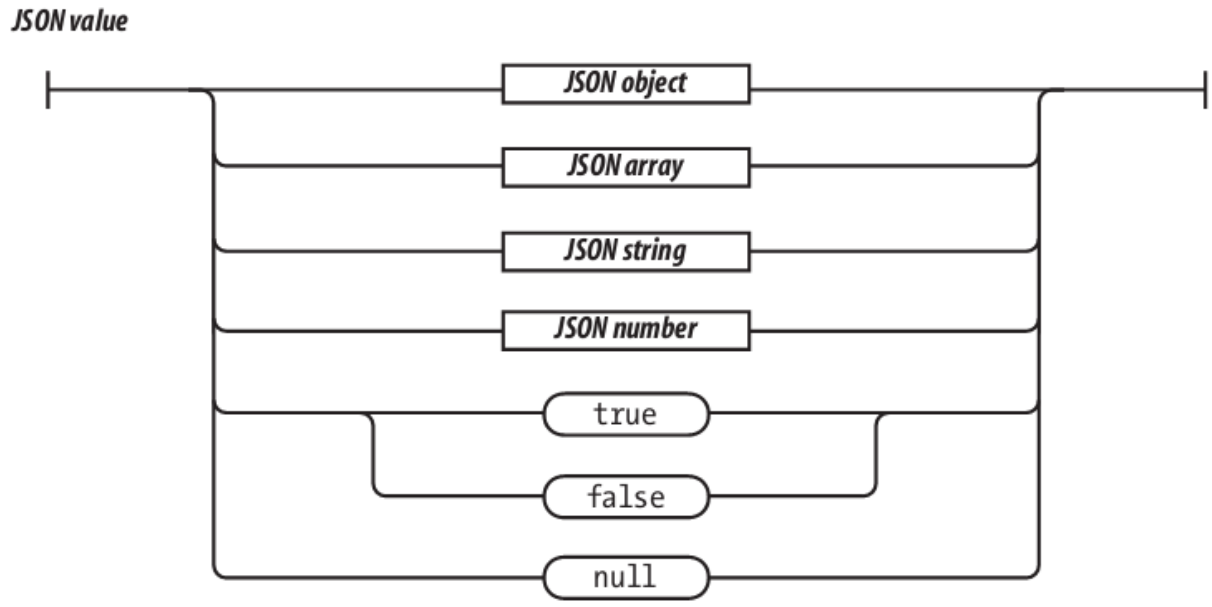
JSON is short notation for **"JavaScript Object Notation"**, and is a way to store information in an organized, easy-to-access manner. It gives us a human-readable collection of data that we can access in a really logical manner.

Features of JSON

- JSON is lightweight text-data interchange format
- JSON is language independent
- JSON is "self-describing" and easy to understand
- It is derived from the JavaScript programming language for representing simple data structures and associative arrays, called objects. Despite its relationship to JavaScript, it is language-independent, with parsers available for most programming languages.

JSON uses JavaScript syntax for describing data objects, but JSON is still language and platform independent. JSON parsers and JSON libraries exists for many different programming languages.

JSON Structural diagram:



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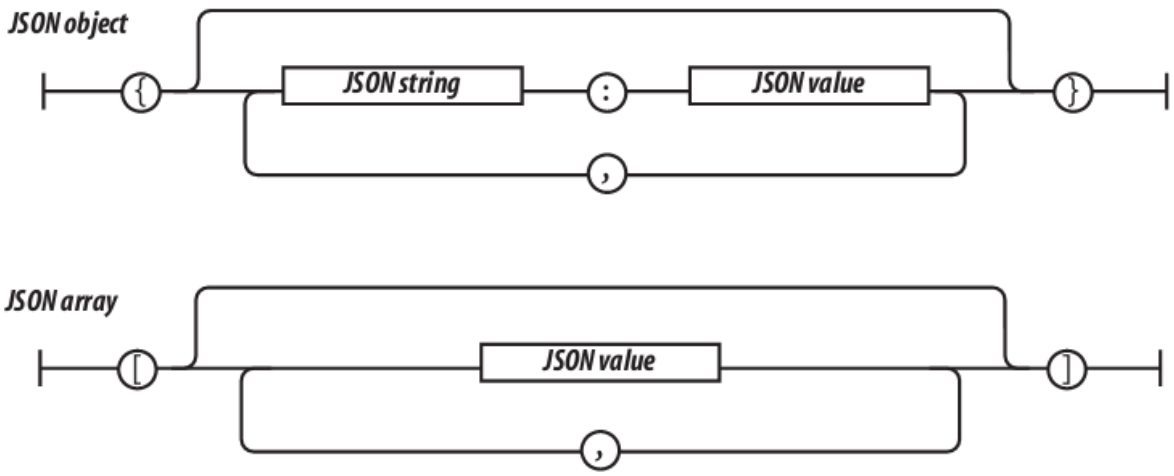

Why to use JSON Over XML?

There are times when you may be unsure what format to choose when transmitting data between a server and web application. Here are a few reasons why you might choose to use JSON rather than XML and a few why you might choose XML rather than JSON.

What is XML?

Extensible Markup Language (XML) is a set of rules for encoding documents in machine-readable form. XML's design goals emphasize simplicity, generality, and usability over the Internet.

Reasons to choose JSON over XML

- JSON requires less tags than XML – XML items must be wrapped in open and close tags whereas JSON you just name the tag once
- Because JSON is transportation-independent, you can just bypass the XMLHttpRequest object for getting your data.
- JavaScript is not just data – you can also put methods and all sorts of goodies in JSON format.
- JSON is better at helping procedural decisions in your JavaScript based on objects and their values (or methods).
- JSON is easier to read than XML – Obviously a personal preference

Reasons to choose XML over JSON

- Easy to take XML and apply XSLT to make XHTML.
- XML is supported by many more desktop applications than JSON.
- JSON can be put in the XML on the way back to the client – the benefit of both! It's called XJAX

(stands for X-domain JavaScript And XML).

Much Like XML

- JSON is plain text
- JSON is "self-describing" (human readable)
- JSON is hierarchical (values within values)
- JSON can be parsed by JavaScript
- JSON data can be transported using AJAX

Much Unlike XML

- No end tag
- Shorter
- Quicker to read and write
- Can be parsed using built-in JavaScript eval()
- Uses arrays
- No reserved words

Why JSON?

For AJAX applications, JSON is faster and easier than XML:

Using XML

- Fetch an XML document
- Use the XML DOM to loop through the document
- Extract values and store in variables

Using JSON

- Fetch a JSON string
- eval() the JSON string

JSON syntax is a subset of JavaScript syntax

JSON Syntax Rules

JSON syntax is a subset of the JavaScript object notation syntax:

- Data is in name/value pairs
- Data is separated by commas
- Curly braces hold objects
- Square brackets hold arrays

JSON Name/Value Pairs
JSON data is written as name/value pairs.

A name/value pair consists of a field name (in double quotes), followed by a colon, followed by a value:

```
"firstName" : "kantepalli"
```

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This is simple to understand, and equals to the JavaScript statement:

```
firstName = "kantepalli"
```

JSON's basic types are:

- **Number** (double precision floating-point format in JavaScript, generally depends on implementation)
- **String** (double-quoted Unicode, with backslash escaping)
- **Boolean** (true or false)
- **Array** (an ordered sequence of values, comma-separated and enclosed in square brackets; the values do not need to be of the same type)
- **Object** (an unordered collection of key:value pairs with the **':'** character separating the key and the value, comma-separated and enclosed in curly braces; the keys must be strings and should be distinct from each other)
- **null** (empty)

JSON Objects

JSON objects are written inside curly brackets. Objects can contain multiple name/values pairs:

```
{ "firstName":"kantepalli" , "lastName":"rajasekhar" }
```

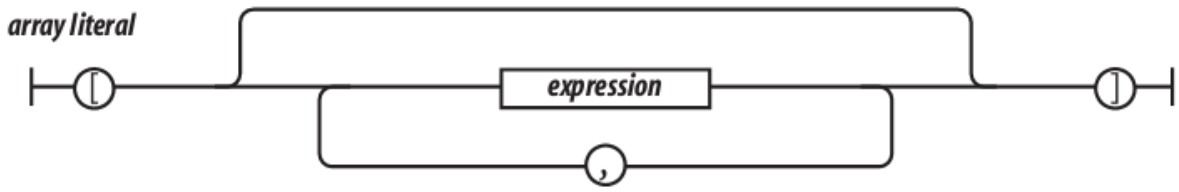
This is also simple to understand, and equals to the JavaScript statements:

```
firstName = "kantepalli"
lastName = "rajasekhar"
```

JSON Arrays

JSON arrays are written inside square brackets. An array can contain multiple objects:

Syntax :




```
{
 "employees": [
        { "firstName":"kantepalli" , "lastName":"rajasekhar" },
        { "firstName":"uday" , "lastName":"kiran" },
        { "firstName":"shiva" , "lastName":"kondur" }
   ]
}
```

In the example above, the object "employees" is an array containing three objects. Each object is a record of a person (with a first name and a last name).

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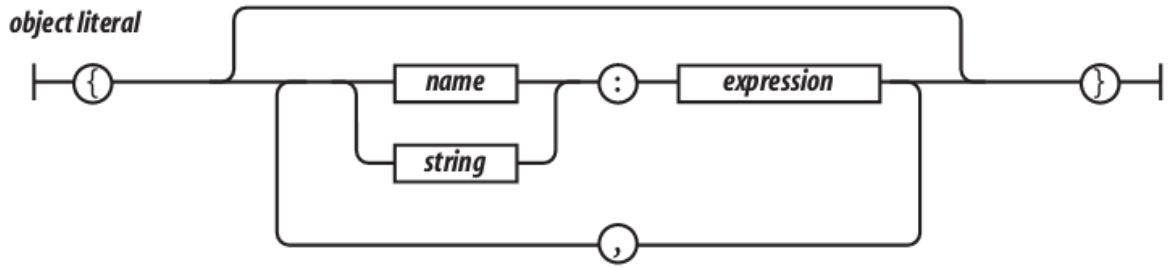
JSON Uses JavaScript Syntax

Because JSON uses JavaScript syntax, no extra software is needed to work with JSON within JavaScript. With JavaScript you can create an array of objects and assign data to it like this:

- Converting a JSON Text to a JavaScript Object
- One of the most common use of JSON is to fetch JSON data from a web server (as a file or as an HttpRequest), convert the JSON data to a JavaScript object, and then it uses the data in a web page.
- For simplicity, this can be demonstrated by using a string as input (instead of a file).

JSON Example - Object From String

Create a JavaScript string containing JSON syntax**:**




```
var txt = '{ "employees" : [' +
'{ "firstName":"rajasekhar" , "lastName":"kantepalli" },' +
'{ "firstName":"uday" , "lastName":"meduri" },' +
'{ "firstName":"shiva" , "lastName":"kondur" } ]}';
```

Since JSON syntax is a subset of JavaScript syntax, the JavaScript function eval() can be used to convert a JSON text into a JavaScript object.

The eval() function uses the JavaScript compiler which will parse the JSON text and produce a JavaScript object. The text must be wrapped in parenthesis to avoid a syntax error:

```
var obj = eval ("(" + txt + ")");
```

Use the JavaScript object in your page:

Example

```
<p>
First Name: <span id="fname"></span><br />
Last Name: <span id="lname"></span><br />
</p>
<script>
document.getElementById("fname").innerHTML = obj.employees[1].firstName
document.getElementById("lname").innerHTML = obj.employees[1].lastName
</script>
```

JSON Parser

The **eval()** function can compile and execute any JavaScript. This represents a potential security problem.

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It is safer to use a JSON parser to convert a JSON text to a JavaScript object. A JSON parser will recognize only JSON text and will not compile scripts.

In browsers that provide native JSON support, JSON parsers are also faster.

Native JSON support is included in newer browsers and in the newest ECMAScript (JavaScript) standard.

Storing JSON Data in Arrays

A slightly more complicated example involves storing two people in one variable. To do this, we enclose multiple objects in square brackets, which signifies an array. For instance, if I needed to include information about sachin and dhoni's information in one variable,

```
var india = [{
    "name" : "sachin",
    "age" : "40",
    "gender" : "male"
},
{
    "name" : "dhoni",
    "age" : "32",
    "gender" : "male"
}];
```

To access this information, we need to access the array index of the person we wish to access.

For example, we would use the following snippet to access info stored in india:

```
document.write(india[1].name); // Output: dhoni
document.write(india[0].age); // Output: 40
```

Object with nested array

This object contains comma-delimited key/value pairs and a nested array. The nested array can be accessed with the object name, property or 'key' containing the array and an array index.

```
newObject = {
 "first": "kantepalli",
 "last": "rajasekhar",
 "age": 25,
 "sex": "M",
 "location": "hyd",
 "interests": [ "reading", "playing", "browsing" ]
}
console.log( newObject.interests[0] ); //Reading (dot '.' notation)
console.log( newObject["interests"][0] ); //Reading (bracket '[]' notaion)
```

Object with nested object

This object contains multiple comma-delimited key/value pairs and a nested object. To access an object within an object, property names or 'keys' can be chained together -or- property names can be used like an array in place of indexes.

```
newObject = {
       "first": "kantepalli",
       "last": "rajasekhar",
```

```
        "age": 25,
        "sex": "M",
        "location": "hyd",
        "favorites": {
               "color": "sky blue",
               "sport": "cricket",
               "hobby":"browsing"
              }
}
console.log( newObject.favorites.color ); //sky blue
console.log( newObject["favorites"]["color"] );sky blue`
```

Object with nested arrays and objects

This object is more complex and typical of what might come from an API. It contains key/value pairs, nested arrays and nested objects. Any of its elements can be accessed with a combination of the above techniques.

```
newObject = {
 "first": "kantepalli",
 "last": "rajasekhar",
 "age": 25,
 "sex": "M",
 "location": "hyd",
 "interests": [ "Reading", "playing", "browsing" ],
 "favorites": {
  "color": "Blue",
  "sport": "cricket",
  "hobby":"browsing"
 },
 "skills": [
  {
   "category": "javascript",
   "tests": [
    { "name": "jquery", "score": 90 },
    { "name": "jlinq", "score": 96 }
   ]
  },
  {
   "category": "DB",
   "tests": [
    { "name": "sql", "score": 70 },
    { "name": "msbi", "score": 84 }
   ]
  },
  {
   "category": "frameworks",
   "tests": [
    { "name": "dhtmlx", "score": 97 },
    { "name": "extjs", "score": 93 }
   ]
```

```
  }
 ]
}
console.log( newObject.skills[0].category );//javascript
console.log( newObject["skills"][0]["category"] );//javascript
console.log( newObject.skills[1].tests[0].score );//70
console.log( newObject["skills"][1]["tests"][0]["score"] );//70
```

How to parse json data with jquery / javascript?

Assuming your server side script doesn't set the proper Content-Type: application/json response header you will need to indicate to jQuery that this is JSON by using the dataType: 'json' parameter.

Then you could use the $.each() function to loop through the data:

```
$.ajax({
    type: 'GET',
    url: 'http://example/functions.php',
    data: { get_param: 'value' },
    dataType: 'json',
    success: function (data) {
        $.each(data, function(index, element) {
            $('body').append($('<div>', {
                text: element.name
            }));
        });
    }
});
```

or use the $.getJSON method:

```
$.getJSON('/functions.php', { get_param: 'value' }, function(data) {
    $.each(data, function(index, element) {
        $('body').append($('<div>', {
            text: element.name
        }));
    });
});
```

Serialization and **De-serialization** :

- what if we need to store this object in a cookie?
- What if we need to pass the object to a web services via an Ajax request?
- What if that web service wants to return a modified version of the object?

The answer is **serialization**:

Serialization is the process of turning any object into a string.

De-serialization turns that string back into a native object.

Perhaps the best string notation we can use in JavaScript is JSON — JavaScript Object Notation. JSON is a lightweight data-interchange format inspired by JavaScript object literal notation as shown above. JSON is supported by PHP and many other server-side languages (refer to json.org).

Minimal JSON that web developers should know

There are two JSON methods in JavaScript:

1. JSON.stringify(*obj*) — converts an JavaScript object to a JSON string
2. JSON.parse(*str*) — converts a JSON string back to a JavaScript object

Unfortunately, very few browsers provide these methods. To date, only Firefox 3.5, Internet Explorer 8.0 and Chrome 3 beta offer native support. Some JavaScript libraries offer their own JSON tools (such as YUI) but many do not (including jQuery).

This converts a JSON string to an object using eval().

Before you rush off to implement JSON serialization functions in all your projects, there are a few gotchas:

- This code has been intentionally kept short. It will work in most situations, but there are subtle differences with the native JSON.stringify and JSON.parse methods.
- Not every JavaScript object is supported. For example, a Date() will return an empty object, whereas native JSON methods will encode it to a date/time string.
- The code will serialize functions, e.g. var obj1 = { myfunc: function(x) {} }; whereas native JSON methods will not.
- Very large objects will throw recursion errors.
- The use of eval() in JSON.parse is inherently risky. It will not be a problem if you are calling your own web services, but calls to third-party applications could accidentally or intentionally break your page and cause security issues. If necessary, a safer (but longer and slower) JavaScript parser is available from json.org.

Stringify:

Convert a value to JSON, optionally replacing values if a replacer function is specified, or optionally including only the specified properties if a replacer array is specified.

```
JSON.stringify(value[, replacer [, space]])
```

Description

JSON.stringify converts an object to JSON notation representing it.

```
assert(JSON.stringify({}) === '{}');
assert(JSON.stringify(true) === 'true');
assert(JSON.stringify("foo") === '"foo"');
assert(JSON.stringify([1, "false", false]) === '[1,"false",false]');
assert(JSON.stringify({ x: 5 }) === '{"x":5}');
JSON.stringify({x: 5, y: 6}); // '{"x":5,"y":6}' or '{"y":6,"x":5}'
```

Properties of non-array objects are not guaranteed to be stringified in any particular order. Do not rely on ordering of properties within the same object within the stringification.

Boolean, Number, and String objects are converted to the corresponding primitive values during stringification, in accord with the traditional conversion semantics.

If undefined, a function, or an XML value is encountered during conversion it is either omitted (when it is found in an object) or censored to null (when it is found in an array).

Space argument

The space argument may be used to control spacing in the final string. If it is a number, successive levels in the stringification will each be indented by this many space characters (up to 10). If it is a string, successive levels will indented by this string (or the first ten characters of it).

```
JSON.stringify({ a: 2 }, null, " ");   // '{\n "a": 2\n}'
```

Using a tab character mimics standard pretty-print appearance:

```
JSON.stringify({ uno: 1, dos : 2 }, null, '\t')
// returns the string:
// '{           \
//     "uno": 1, \
//     "dos": 2  \
// }'
```

A JSON stringifier goes in the opposite direction, converting JavaScript data structures into JSON text. JSON does not support cyclic data structures, so be careful to not give cyclical structures to the JSON stringifier.

var myJSONText = JSON.stringify(myObject, replacer);

If the **stringify** method sees an object that contains a toJSON method, it calls that method, and stringifies the value returned. This allows an object to determine its own JSON representation.

The **stringifier** method can take an optional array of strings. These strings are used to select the properties that will be included in the JSON text.

The **stringifier** method can take an optional replacer function. It will be called after the toJSON method (if there is one) on each of the values in the structure. It will be passed each key and value as parameters, and this will be bound to object holding the key.

The value returned will be stringified.Values that do not have a representation in JSON (such as functions and undefined) are excluded.Nonfinite numbers are replaced with null. To substitute other values, you could use a replacer function like this:

```
function replacer(key, value) {
    if (typeof value === 'number' && !isFinite(value)) {
        return String(value);
    }
    return value;
}
```

toJSON behavior

If an object being stringified has a property named toJSON whose value is a function, then the toJSON method customizes JSON stringification behavior: instead of the object being serialized, the value returned by the toJSON method when called will be serialized. For example:

Minimal JSON that web developers should know

```
var obj = {
  foo: 'foo',
  toJSON: function () {
    return 'bar';
  }
};
var json = JSON.stringify({x: obj});
json will be the string '{"x":"bar"}'.
```

To convert a JSON text into an object, you can use the eval() function. eval() invokes the JavaScript compiler. Since JSON is a proper subset of JavaScript, the compiler will correctly parse the text and produce an object structure. The text must be wrapped in parens to avoid tripping on an ambiguity in JavaScript's syntax.

```
var myObject = eval('(' + myJSONtext + ')');
```

The eval function is very fast. However, it can compile and execute any JavaScript program, so there can be security issues. The use of eval is indicated when the source is trusted and competent. It is much safer to use a JSON parser.

In web applications over XMLHttpRequest, communication is permitted only to the same origin that provide that page, so it is trusted. But it might not be competent.

If the server is not rigorous in its JSON encoding, or if it does not scrupulously validate all of its inputs, then it could deliver invalid JSON text that could be carrying dangerous script. The eval function would execute the script, unleashing its malice.

To defend against this, a JSON parser should be used. A JSON parser will recognize only JSON text, rejecting all scripts. In browsers that provide native JSON support, JSON parsers are also much faster than eval. It is expected that native JSON support will be included in the next ECMAScript standard.

```
var myJSONObject = {"javascript": [
        {"jquery": "framework1", "exp": "expert"},
        {"dhtmlx": "framework2", " exp ": "expert"},
        {"sencha": "framework3", " exp ": "middle"}
    ]
};
var myObject = JSON.parse(myJSONtext, reviver);
```

The optional reviver parameter is a function that will be called for every key and value at every level of the final result. Each value will be replaced by the result of the reviver function. This can be used to reform generic objects into instances of pseudoclasses, or to transform date strings into Date objects.

```
myData = JSON.parse(text, function (key, value) {
    var type;
    if (value && typeof value === 'object') {
        type = value.type;
        if (typeof type === 'string' && typeof window[type] ===
'function') {
            return new (window[type])(value);
        }
    }
    return value;
});
```

Minimal JSON that web developers should know

Difference between JSON and JSONP

Ajax - "Asynchronous Javascript and XML". Ajax loosely defines a set of technologies to help make web applications present a richer user experience. Data updating and refreshing of the screen is done asynchronously using javascript and xml (or json or just a normal http post).

JSON - "Javascript Object Notation". JSON is like xml in that it can be used to describe objects, but it's more compact and has the advantage of being actual javascript. An object expressed in JSON can be converted into an actual object to be manipulated in javascript code.

By default, Ajax requests have to occur in the same domain of the page where the request originates. **JSONP** - "JSON with padding" - was created to allow you to request JSON resources from a different domain. (CORS is a newer and better alternative to JSONP.)

REST - "Representational State Transfer". Applications using REST principles have a Url structure and a request/response pattern that revolve around the use of resources. In a pure model, the HTTP Verbs Get, Post, Put and Delete are used to retrieve, create, update and delete resources respectively. Put and Delete are often not used, leaving Get and Post to map to select (GET) and create, update and delete (POST)

Example :

```
<!DOCTYPE html>
<html>
<head>
  <style>img{ height: 100px; float: left; }</style>
  <script src="http://code.jquery.com/jquery-1.5.js"></script>
</head>
<body>
  <div id="images">
  </div>
  <script>
    $.getJSON("http://api.playme.com/artist.getTracks?pMethodName=?",
      {
        artistCode: "421",
        apikey: "[Your API key here]" ,
        format: "jsonp"
      },
      function(data) {
        $.each(data.response.tracks.track, function(i,track){
         $("<img/>").attr({
           src: track.images.img_256,
           alt: track.name
         }).appendTo("#images");
        });
      });
  </script>
</body>
</html>
```

Minimal JSON that web developers should know

JSON to XML and XML to JSON converter online
http://www.utilities-online.info/xmltojson/#.UlVPzdKnqBc

JS Beautifier

- http://jsbeautifier.org/
- http://jquery.org.cn/css/cssbeautify/

References :

- http://json.org/
- http://www.jsonexample.com/
- http://www.copterlabs.com/blog/json-what-it-is-how-it-works-how-to-use-it/
- http://www.codeproject.com/Articles/210568/Quick-JSON-Tutorial

Books:

- JavaScript Good parts-Douglas Crockford
- JavaScript for webdevelopers- Nicholas C. Zakas
- jQuery: Novice to Ninja by Earle Castledine and Craig Sharkie

About Author:

Rajasekhar Kantepalli, is working at United Online as a Web Developer and has sound knowledge in front-end web technologies like JavaScript, jQuery,CSS3. You can catch him at :

Gmail: kprsekhar@gmail.com
Twitter: https://twitter.com/kprsekhar
Facebook: https://www.facebook.com/pages/Way-2-Webdev/622407137778962
LinkedIn: http://in.linkedin.com/in/krajasekhar
Websites: http://kprsekhar.blogspot.com and http://rajasekharwebdev.wordpress.com

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