# Data

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# Sending data via HTTP

**Sending** data is what HTTP is used for.

**HTTP** sets out rules for sending data.

**Rules** allow computers that know very little about each other to communicate without lengthy negotiations.

**Sometimes** HTTP is not enough. We need more rules.

**Building** on top of HTTP, we can send complex data — not just HTML, CSS and JavaScript.

**Commonly** these days we send images, videos, binary files, and even instances of objects.

# Why send objects over HTTP?

**Databases** store a lot of the world's data.

**Data** are usually stored using some sort of structure, so that they're reusable.

**Object** usually means blueprint, the plans of the house.

**Instance** usually means realisation of an object, like an actual house built from the plans.

**JavaScript** doesn't make the distinction too clear.

**Often** we would like to send a small chunk of structured data from a database server to a user's machine. Then their browser can display it nicely.

**HTTP with JSON** can do this.

# JSON

**JavaScript** Programming language.

**Object** Groups of name–value pairs.

**Notation** Set of rules for representing objects.

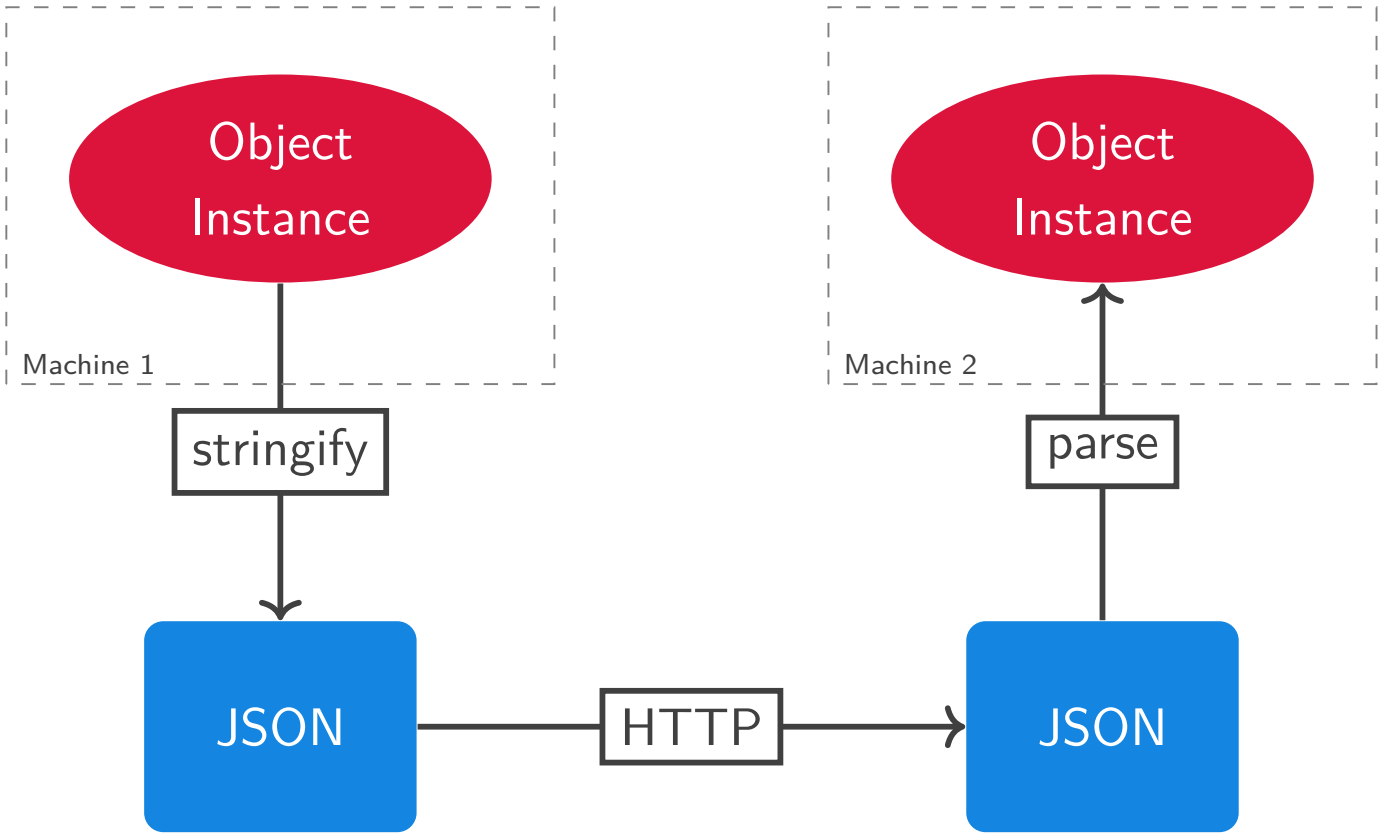
**JSON is** just text — text that conforms to a syntax.

**Influenced** by JavaScript's syntax, but it is useable in all languages.

**Represents** information in text form.

**Popular** because it is easy to send over HTTP and parse in JavaScript.

# Sending JSON



# JSON Example

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

# Using JSON in JavaScript

The key here is that an object instance on one machine can be turned into JSON text, transmitted, and then reconstructed into an object instance on another machine.

```
// Turning text into a JavaScript object.
var obj = JSON.parse(text);
// obj is an obect instance.

// Turning a JavaScript object into text.
var text = JSON.stringify(obj);
// text is a string.
```

# JSON Syntax

**Objects** identified by curly braces.

```
{}
```

**Name:Value** pairs within objects separated by a comma.

```
{"name": "Ian", "fingers": 10}
```

**Lists** identified by square brackets.

```
["Ian", "Marco", "Sam"]
```

**Double quotes** around all names and strings.

```
"Ian"
```

# JSON Types

- Numbers

  ```
  123.456
  ```

- Strings

  ```
  "Hello, world!"
  ```

- Boolean

  ```
  true
  ```

- Arrays

  ```
  [1,2,3]
  ```

- Objects

  ```
  {"name": "Ian"}
  ```

- null

  ```
  null
  ```

# eXtensible Markup Language

**XML** is a JSON alternative.

**eXtensible** Designed to accommodate change.

**Markup** Annotates text.

**Language** Set of rules for communication.

**JSON** seems to be used more frequently than XML in most modern web applications.

**XML** seems to be a little more verbose.

**XML** was designed with more uses in mind.

**HTML** and XML look similar.

# XML Example

```
<?xml version="1.0" encoding="UTF-8"?>
<book isbn-13="978-0131774292" isbn-10="0131774298">
  <title>Expert C Programming: Deep C Secrets</title>
  <publisher>Prentice Hall</publisher>
  <author>Peter van der Linden</author>
</book>
```

# Using XML

**Tags** are not pre-defined tag names – you make them up yourself.

**Syntax** follows a tree-like pattern. Tags can be nested within other tags.

**Document Object Model (DOM)** is a concept related to XML.

# XML Syntax

**Declaration** XML documents should have a single line at the start stating that they are XML, the version of XML used, and an encoding.

**Elements** are the main form of structure in XML, and are enclosed in angle brackets.

**Root element** XML must have a single root element that wraps all others.

**Attributes** Elements can have attributes, which are name–value pairs within the angle brackets. A given attribute name can only be specified once per element.

**Entity references** Certain characters must be escaped with entity references, e.g.`<` for <.

**Case sensitive** Everything in XML is case sensitive.

# XML Syntax Example

```
<?xml version="1.0" encoding="UTF-8"?>
<parent-element attribute-name="attribute-value">
  <child name="value">Text</child-element>
  <child name="value">Text</child-element>
  <child name="value">Text</child-element>
  <lone-warrior />
</parent-element>
```

# Document Object Model

**The DOM** is a programming interface for HTML and XML documents.

**Models** the document as a structured group of nodes that have properties and methods.

**Connects** web pages to scripts or programming languages.

**Use document.createElement** , document.createTextNode and document.element.appendChild to add to the DOM.

**Use document.getElementById** to access elements of the DOM.

**Extensively** used in web applications.

**AngularJS, jQuery and React** have different ideas about the developers relationship with the DOM.

developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model/Introduction

# Using JSON and XML

**JSON and XML** don't do anything by themselves — they're just text.

**HTTP** can be used to retrieve JSON (or XML) from a server.

**Developers** can use JavaScript to retrieve JSON (or XML) in the background of a web application.

**The DOM** of the web page currently displayed in a browser can then be manipulated to display this information.

**Web applications** are really just web pages that use this trick.

**The mechanism** by which a web application does this is called AJAX.

**Facebook** uses this to display new posts once the user has scrolled to the bottom of the screen.

# Asynchronous JavaScript and XML

**AJAX** stands for Asynchronous JavaScript and XML.

**Asynchronous** Doesn't block our other JavaScript code.

**JavaScript** Programming language for the web.

**XML** eXtensible Markup Language.

**Page refreshes** happen when the webpage is removed from the view, and a new one is rendered.

**JavaScript** can be used to change this behaviour. On clicking a link, and AJAX call can be triggered instead, and the web page remains.

**Location bar** can even be manipulated.

# More about AJAX

**AJAX** allows us to make a HTTP request from JavaScript, receive the response from that request and deal with it.

**Despite** the name, we don't have to receive XML — we can use JSON or anything else.

**Calls** happen asynchronously — other code can run while waiting.

**HTTP requests** are usually relatively slow.

**Callback functions** are used when HTTP transactions are complete.

**JavaScript** libraries provide easy-to-use AJAX functions.

# Raw AJAX Example

```
var xmlhttp = new XMLHttpRequest();

xmlhttp.onreadystatechange = function() {
  if (xmlhttp.readyState == 4) {
    var mydiv = document.getElementById("mydivid");
    mydiv.innerHTML = xmlhttp.responseText;
  }
};

xmlhttp.open("GET", "https://goo.gl/2GCplC");
xmlhttp.send();
```

# AJAX Example Explained

**XMLHttpRequest** is a built-in class that provides AJAX functionality in JavaScript.

**onreadystatechange** should be set to a function to run every time something happens in our HTTP call.

**open** is called to initialize the request.

**send** is used to send the request to the server.

**readyState** changes when the state of the AJAX call changes. This triggers a call to httpRequest.onreadystatechange.

# Using jQuery

jQuery is much easier to use.

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```
<script src="jquery.min.js"></script>

$.get("https://goo.gl/2GCplC", function(data) {
  $("#mydivid").html(data);
});
```