

# **Comp 424 - Client-side Web Design**

---

Fall Semester 2016 - Week 11

Dr Nick Hayward

# Contents

---

- AJAX and JSON - continued
- Complementary Server-side considerations
  - *Node.js*
- Quiz

# HTML5, CSS, & JS - example - part 7

---

## working with Flickr API - update travel notes

- add option to Travel Notes app to allow a user to view images from Flickr
- need to update app's HTML, CSS, and JS
- modify how our notes, and associated options, are rendered to our users
- add a search option for photos on Flickr
- render our images to match the notes
- app's structure still reflects three primary content categories
  - *header, main, and footer with slight modifications to the main category*
- main content category updated to create two distinct rows for initial content
  - *contain defined semantic containers*
- row containing `.note-input` and Flickr search option `.contextual-choice`
  - *then split this row into two columns of 6*

# HTML5, CSS, & JS - example - part 8

---

*working with Flickr API - update travel notes HTML*

- updated HTML for .note-input and Flickr search  
.contextual-choice

```
<div class="row">
  <!-- note input -->
  <section class="note-input col-6">
    <h5>add note</h5>
    <input><button>add</button>
  </section>
  <!-- contextual choice -->
  <section class="contextual-choice col-6">
    <h5>search flickr</h5>
    <input><button>search</button>
  </section>
</div>
```

# HTML5, CSS, & JS - example - part 9

---

## working with Flickr API - update travel notes HTML

- update the HTML for rendering the images
  - *add alongside our notes*
- create another row for these containers
  - *add two section containers for `.note-output` and `.contextual-output`*
- make `.note-output` slightly larger to show primary app focus

```
<div class="row">
  <!-- note output -->
  <section class="note-output col-7 flex-container">
  </section>
  <!-- contextual output -->
  <section class="contextual-output col-5 flex-container">
  </section>
</div>
```

# HTML5, CSS, & JS - example - part 10

---

## working with Flickr API - update travel notes JS

- add further functionality to **Travel Notes** app
- split our JS logic into three files to help with organisation
  - a main loader file, *travel.js*,
  - and a file each for notes and contextual options
- updated app structure for JS

```
...  
  
|- assets  
  |- scripts  
    |- contextual.js  
    |- notes.js  
    |- travel.js  
...
```

- underlying logic for the notes will remain the same
  - move loading of default notes to the *travel.js* main loader file
- updates for searching, returning, and rendering images from Flickr
  - added to the *contextual.js* file

# HTML5, CSS, & JS - example - part II

---

## working with Flickr API - update travel notes JS

- test Flickr API in our app using some set data for image tags
  - *respond to the user clicking on the search button*
  - *submit our query to Flickr*
  - *process the returned JSON for the images*
  - *render them for viewing*
- request and process our images using the familiar pattern

```
//get the Flickr public feed JSON for images
function getImages(data) {
  var img_tags = data;

  //.get returns an object derived from a Deferred object - do not need explicit deferred object
  var $deferredNotesRequest = $.getJSON (
    "http://api.flickr.com/services/feeds/photos_public.gne?jsoncallback=?",
    { tags: img_tags,
      tagmode: "all",
      format: "json"
    });
  return $deferredNotesRequest;
}
```

# HTML5, CSS, & JS - example - part 12

---

## working with Flickr API - update travel notes JS

- returned data using standard deferred promise object
  - *add a new function to handle the processing of the images*

```
function processImages(data) {  
    $.when(getImages($img_data)).done(function(response) {  
        //use jQuery's generic iterative function for the response...  
        $.each( response.items, function( i, item ) {  
            createImage(item.media.m);  
            //limit test images to 4  
            if ( i === 3 ) {  
                return false;  
            }  
        });  
    });  
}
```

- using deferred promise object with `.when( )` function chained to `.done( )` function
- add jQuery's generic iterative function to help us process the response
  - *instead of standard JavaScript `.forEach( )` option*
- loop through each value, and pass the image to our new function, `createImage( )`
  - *ready for rendering to our app's DOM*
  - *limit number of images for testing*



# HTML5, CSS, & JS - example - part 13

---

## working with Flickr API - update travel notes JS

```
//manage new image output
function createImage(data) {
  //create each image element
  var img = $('<img class="flex-img">');
  //add image
  img.attr("src", data);
  //append to DOM
  $(".contextual-output").append(img);
}
```

- `.createImage( )` function accepts a parameter for image data
- then process ready for rendering to the app's DOM
- image is added to a new `img` element with a new class of `.flex-img`
  - *creates a flex item for rendering*
- added to the new `.contextual-output` section
- rendered images displayed as thumbnails for the user
  - *complementary to the existing notes*

# HTML5, CSS, & JS - example - part 14

---

## working with Flickr API - update travel notes JS

- to add images to the app
  - a user can enter their requested tags in the search field
  - then click on the *search* button to return any available images
- event handler for this search button click uses the requested tags
  - passes them as a parameter to the *processImages ( )* function

```
//handle user event for image `search` button click
$(".contextual-choice button").on("click", function(e) {
    //test tags for testing image search
    $img_data = "cannes,france,boules"
    //process images
    processImages($img_data);
});
```

# Image - HTML5, CSS, & JS - Travel Notes & Flickr

**travel notes**  
record notes from various places visited...

menu...

search...





**add note**

**search flickr**

Cannes, a resort town on the French Riviera, is synonymous with glamour thanks to its world-famous film festival. Its Boulevard de la Croisette, curving along the coast, is lined with sandy beaches, upmarket boutiques and palatial hotels. It's also home to the Palais des Festivals, a modern building complete with red carpet and Allée des Stars – Cannes' walk of fame.

Nice, capital of the French Riviera, skirts the pebbly shores of the Baie des Anges. Founded by the Greeks and later a retreat for 19th-century Europe's elite, the city today balances old-world decadence with modern urban energy. Its sunshine and liberal attitude have long attracted artists, whose work hangs in its museums. With vibrant markets and diverse restaurants, it's also renowned for its food.

Antibes is a resort town between Cannes and Nice on the French Riviera (or Côte d'Azur). It's known for its Mediterranean beaches, annual Jazz à Juan music festival and old town enclosed by 16th-century ramparts. Luxury yachts moor at the huge Port Vauban marina, overlooked by star-shaped, 16th-century Fort Carré. The Promenade Amiral-de-Grasse walkway along Vauban's walls has views of the Alps.



app's copyright information, additional links...

Travel Notes & Flickr - test loading images

# HTML5, CSS, & JS - example - part 15

---

## working with Flickr API - update travel notes CSS

- need to update and modify existing CSS
  - *helps with correct rendering of the thumbnail images*
- CSS additions are initially modest
  - *reflects integration with existing app, grid, and flex layouts*
- add new ruleset for image rendering in the `.contextual-output` section

```
/* contextual output images */  
.contextual-output img {  
  margin: 5px;  
  padding: 5px;  
  border: 1px solid #b1c4b1;  
}
```

- update `.flex-container` class to change `justify-content` property to value of `space-around`
- add new ruleset for a `.flex-img` class.

```
/* flex image */  
.flex-img {  
  flex-basis: 150px;  
  flex-grow: 0;  
}
```

- specify size of a thumbnail image
  - *initially restrict their ability to grow relative to flex*

# HTML5, CSS, & JS - example - part 16

---

## working with Flickr API - update travel notes JS

- we can now request, process, and render images from Flickr to Travel Notes app
  - *still need to accept and process search queries from search input field.*
- add option to check search input field
  - *then submit query to Flickr for images*

```
//get input value for image search
function getImageInput() {
    //define img value
    var img_val = "";
    //define input field
    var $img_tags = $(".contextual-choice input");
    if ($img_tags.val() !== "") {
        img_val = $img_tags.val();
        return img_val;
    } else {
        return img_val;
    }
}
```

# HTML5, CSS, & JS - example - part 17

---

working with Flickr API - update travel notes JS

- use `getImageInput()` function with a modified `processImages()` function

```
//process image production, loading, and pass to rendering
function processImages() {
    //check img visibility for contextual-output - clear existing images
    if (checkVisible($(".contextual-output img")) === false) {
        //empty existing images
        $(".contextual-output").empty();
    }

    //get data from image search input field
    var $img_data = getImageInput();

    //use image data to get images, and pass for rendering
    $.when(getImages($img_data)).done(function(response) {
        console.log("done..." + response);

        //use jQuery's generic iterative function for the response...
        $.each( response.items, function( i, item ) {
            createImage(item.media.m);

            //limit test images to 4
            if ( i === 3 ) {
                return false;
            }
        });
    });
}
```

# HTML5, CSS, & JS - example - part 18

---

## *working with Flickr API - update travel notes JS*

- updated `processImages ( )` function then called within event handlers
  - *for the search button and a keypress in the search input field*

```
//handle user event for image search button click
$(".contextual-choice button").on("click", function(e) {
    //process images
    processImages();
});

//handle user event for keyboard press
$(".contextual-choice input").on("keypress", function(e) {
    //check code for keyboard press
    if (e.keyCode === 13) {
        //process images
        processImages();
    }
});
```

- DEMO - travel notes & Flickr

# Image - HTML5, CSS, & JS - Travel Notes & Flickr

**travel notes**  
record notes from various places visited...

menu...

search...







**add note**

**search flickr**

Curral das Freiras is a civil parish in the municipality of Câmara de Lobos in the Portuguese archipelago of Madeira. The population in 2011 was 2,001, in an area of 25.03 km². It is situated in the mountainous interior of the island.

Câmara de Lobos (Portuguese pronunciation: [literally, Portuguese: chamber of the wolves]) is a municipality, parish and city in the south-central coast of the island of Madeira. Technically a suburb of the much larger capital city of Funchal, it is one of the larger population centres and an extension of the Funchal economy.

Funchal is the largest city, the municipal seat and the capital of Portugal's Autonomous Region of Madeira. The city has a population of 111,892, making it the 6th largest city in Portugal, and has been the capital of Madeira for more than five centuries. Because of its high cultural and historical value, Funchal is one of Portugal's main tourist attractions. It is also popular as a destination for New Year's Eve, and it is the leading Portuguese port on cruise liner dockings.



app's copyright information, additional links...

Travel Notes & Flickr - different layout



# HTML5, CSS, & JS - example - part 19

---

## **working with Flickr API - update travel notes JS**

- room for improvement, updates, abstraction, and general refactoring of the existing code
- return to this issue when we consider refactoring the code in general
  - *there are still a few simple features we need to add*
- for example,
  - *add images to the `.contextual-output` section, resize `.note-output` section*
  - *moves focus to the current images*
  - *check loading progress of the notes and images*
  - *show feedback to the user*
  - *need to output a title for the images*
  - *set using the search query*

# HTML5, CSS, & JS - example - part 20

---

## working with Flickr API - modify travel notes JS

- first modification is to resize the `.notes-output`
  - *create more space for the images*
  - *gently shift focus to the new images*
- update existing `.createImage()` function in the `contextual.js` file

```
//manage new image output
function createImage(data) {
  ...
  if (checkVisible($(".contextual-output img")) === true) {
    $(".note-output").removeClass("col-12");
    $(".note-output").addClass("col-4");
    $(".contextual-output").fadeIn("slow");
  }
  ...
}
```

- add check to ensure images are not visible in the DOM
- remove current class from `.note-output` section
  - *12 column class for the grid*
- add new grid class to resize `.note-output` to 4 columns
  - *then fade in the `.contextual-output` class*
  - *set in the app's HTML to a class of `.col-8`*

# HTML5, CSS, & JS - example - part 2I

---

*working with Flickr API - modify travel notes JS*

- next modification is some initial error handling
  - *checking for an empty array of images from the returned Flickr JSON*
- check `processImages ( )` function for an empty array of image items

```
...  
  
if (response.items.length === 0) {  
    var img = "";  
    createImage(img);  
} else {  
    //return images from items array...  
}  
...
```

- checks images in the items array for the promise object
- if not, send an empty variable as a parameter to our `createImage ( )` function

# HTML5, CSS, & JS - example - part 22

---

## working with Flickr API - modify travel notes JS

- check for empty value in `createImage()` function
  - *handle the simple errors as follows*

```
if (data !== "") {  
    //create each image element  
    var $img = $('<img class="flex-img">').attr("src", data);  
    //add image  
    img_output = $img;  
} else {  
    var $img_error = $('<p class="flex-item error">').html("No images available...");  
    //add error  
    img_output = $img_error;  
}
```

- we've abstracted the return variable for the image output
  - *can hold either the image or the error output...*
- add a check to see whether the `.contextual-output` section is visible or not
- modify the column class for the `.note-output` section
- then append our image output
- then show the `.contextual-output` section within the app
- DEMO - travel notes & Flickr

# Image - HTML5, CSS, & JS - Travel Notes & Flickr

**travel notes**  
record notes from various places visited...

menu...

search...

**add note**

**search flickr**

Curral das Freiras is a civil parish in the municipality of Câmara de Lobos in the Portuguese archipelago of Madeira. The population in 2011 was 2,001, in an area of 25.03 km². It is situated in the mountainous interior of the island.

Câmara de Lobos (Portuguese pronunciation: [literally, Portuguese: chamber of the wolves]) is a municipality, parish and city in the south-central coast of the island of Madeira. Technically a suburb of the much larger capital city of Funchal, it is one of the larger population centres and an extension of the Funchal economy.

Funchal is the largest city, the municipal seat and the capital of Portugal's Autonomous Region of Madeira. The city has a population of 111,892, making it the 6th largest city in Portugal, and has been the capital of Madeira for more than five centuries. Because of its high cultural and historical value, Funchal is one of Portugal's main tourist attractions. It is also popular as a destination for New Year's Eve, and it is the leading Portuguese port on cruise liner dockings.

No images available. Please try a different search.

app's copyright information, additional links...

Travel Notes & Flickr - error checking

# HTML5, CSS, & JS - example - part 23

---

## working with Flickr API - modify travel notes JS

- continue to modify and build our Travel Notes app
- add some metadata for the returned images
  - using the title and link from the search query response
- add initial metadata output in the `contextual.js` file
  - modify the `processImages()` function
  - metadata from Flickr JSON response in the deferred promise object

```
...  
  
//create object for search metadata  
var search_meta = {title:response.title, link:response.link};  
  
...
```

- then pass this to a new function, called `metaOutput()`

```
//prepare and render metadata for returned search...  
  
function metaOutput(data) {  
  if (data !== "") {  
    //search metadata from response  
    var search_title = data.title;  
    var search_link = data.link;  
  
    //build heading output for metadata heading  
    var metaHeading = '<h6>'+search_title+' | <a href="'+search_link+'>Flickr</a></h6>';  
  
    //render metadata to contextual-output  
    $(".contextual-output").prepend(metaHeading);  
  }  
}
```

- DEMO - travel notes & Flickr - initial metadata

# Image - HTML5, CSS, & JS - Travel Notes & Flickr

travel notes

record notes from various places visited...

menu...

search...

add note

add

search flickr

search







Delete all

Curral das Freiras is a civil parish in the municipality of Câmara de Lobos in the Portuguese archipelago of Madeira. The population in 2011 was 2,001, in an area of 25.03 km². It is situated in the mountainous interior of the island.

Câmara de Lobos (Portuguese pronunciation: [literally, Portuguese: chamber of the wolves] is a municipality, parish and city in the south-central coast of the island of Madeira. Technically a suburb of the much larger capital city of Funchal, it is one of the larger population centres and an extension of the Funchal economy.

Funchal is the largest city, the municipal seat and the capital of Portugal's Autonomous Region of Madeira. The city has a population of 111,892, making it the 6th largest city in Portugal, and has been the capital of Madeira for more than five centuries. Because of its high cultural and historical value, Funchal is one of Portugal's main tourist attractions. It is also popular as a destination for New Year's Eve, and it is the leading Portuguese port on cruise liner dockings.

Recent Uploads tagged curraldasfreiras | [Flickr](#)



app's copyright information, additional links...

Travel Notes & Flickr - initial metadata

# HTML5, CSS, & JS - example - part 24

---

## travel notes - basic refactoring of JS

- as we continue to add features and modify existing code
  - *may start to see unnecessary repetition and function calls in the code*
- eg: initial error handling for our contextual images
  - *createImage ( ) function is being called in the processImages ( ) function*
  - *called regardless of returned image data*
- createImage ( ) is being used unnecessarily to manage the error handling
- move check to processImages ( ) function
  - *then call function to render necessary error message*

```
function outputError(message) {  
    var $img_error = $('<p class="flex-item error">').html(message);  
    //check for visible contextual-output - if not visible  
    if (checkVisible($(".contextual-output")) === true) {  
        $(".note-output").removeClass("col-12");  
        $(".note-output").addClass("col-4");  
    }  
    //append output to DOM  
    $(".contextual-output").append($img_error);  
    //fade in contextual-output with appended results  
    $(".contextual-output").fadeIn("slow");  
}
```



# HTML5, CSS, & JS - example - part 25

---

## travel notes - basic refactoring of JS

- updated `processImages()` function can call `.outputError()` function as needed

```
...  
if (response.items.length !== 0) {  
  //logic to add metadata and each image...  
}  
else {  
  var img_error = "No images available - please try a different search.";  
  outputError(img_error);  
}  
...
```

- use this function to output error messages for any type of contextual data
- also remove some unnecessary replication of code
  - *by adding a simple function to change an element's class*

```
//modify element class - from, to  
function changeClass(element, size1, size2) {  
  $(element).removeClass(size1);  
  $(element).addClass(size2);  
}
```

- resize a class, for example to modify our grid output
  - *call this function - pass the selector to update, original class to remove, and new class to add*

# HTML5, CSS, & JS - example - part 26

---

## *working with Flickr API - modify travel notes JS*

- add a modification to check for the image loading and the notes
  - *offer status feedback to the user*

```
//add initial loader spinner for ajax...  
$(".contextual-output").html('');
```


- remove it when the deferred promise object has returned

```
//remove ajax spinner  
$(".spinner").remove();
```

- DEMO - travel notes & Flickr - spinner

# Image - HTML5, CSS, & JS - Travel Notes & Flickr

---

<b>travel notes</b> record notes from various places visited...	menu...	search...
<b>add note</b> <input type="text"/> <input type="button" value="add"/>	<b>search flickr</b> <input type="text"/> <input type="button" value="search"/>	
		
app's copyright information, additional links...		

Travel Notes & Flickr - spinner

# JS Server-side considerations - save data

---

## *save JSON in travel notes app*

- need to be able to save our simple notes
- now load from a JSON file as the app starts
  - *also we can add new notes, delete existing notes...*
- not as simple as writing to our existing JSON file direct from JS
  - *security implications if that was permitted directly from the browser*
- need to consider a few server-side options
- could use a combination of PHP on the server-side
  - *with AJAX jQuery on the client-side*
  - *traditional option with a simple ajax post to a PHP file on the server-side*
- consider JavaScript options on the client and server-side
- brief overview of working with **Node.js**

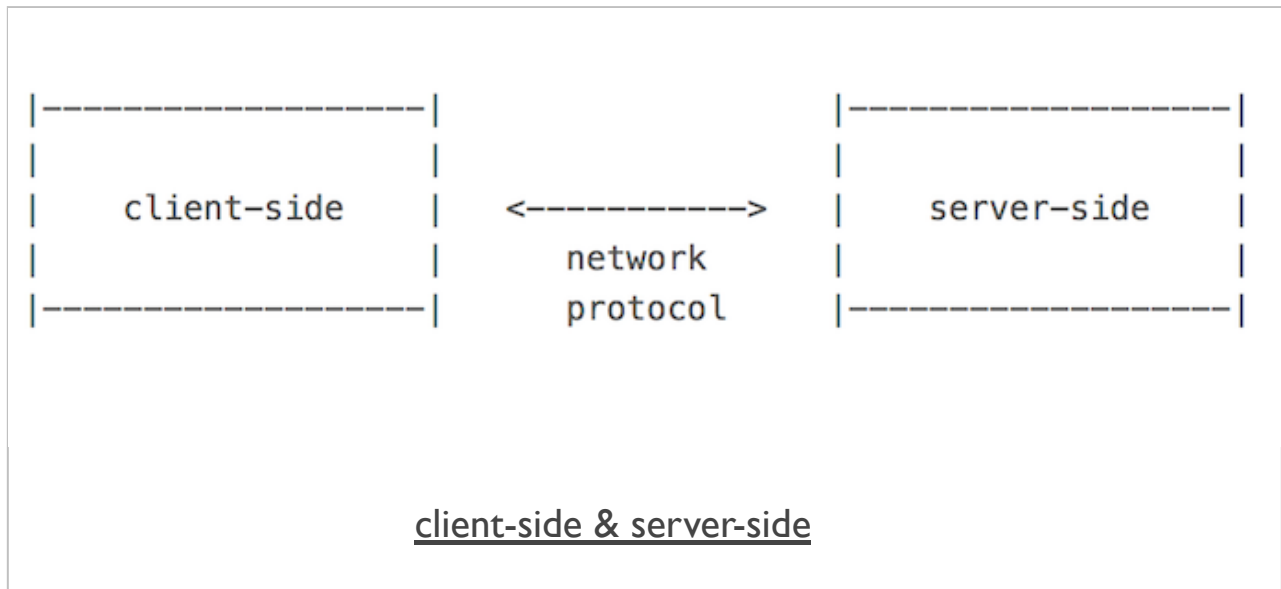
# Server-side considerations - intro

---

- normally define computer programs as either client-side or server-side programs
- server-side programs normally abstract a resource over a network
  - *enabling many client-side programs to access at the same time*
  - *a common example is file requests and transfers*
- we can think of the client as the web browser
- a web server as the remote machine abstracting resources
- abstracts them via **hypertext transfer protocol**
  - *HTTP for short*
- designed to help with the transfer of HTML documents
  - *HTTP now used as an abstracted wrapper for many different types of resources*
  - *may include documents, media, databases...*

# Image - Client-side and server-side computing

---



# Server-side considerations - Node.js

---

## *intro - what is Node.js?*

- Node.js is, in essence, a JavaScript runtime environment
  - *designed to be run outside of the browser*
- designed as a general purpose utility
- can be used for many different tasks including
  - *asset compilation*
  - *monitoring*
  - *scripting*
  - *web servers*
- with Node.js, role of JS is changing
  - *moving from client-side to a support role in back-end development*

# Server-side considerations - Node.js

---

## *intro - speed of Node.js*

- a key advantage touted for Node.js is its speed
- many companies have noted the performance benefits of implementing Node.js
  - *including PayPal, Walmart, LinkedIn...*
- a primary reason for this speed boost is the underlying architecture of Node.js
- Node.js uses an **event-based** architecture
- instead of a threading model popular in compiled languages
- Node.js uses a single event thread by default
- all I/O is asynchronous



# Server-side considerations - Node.js

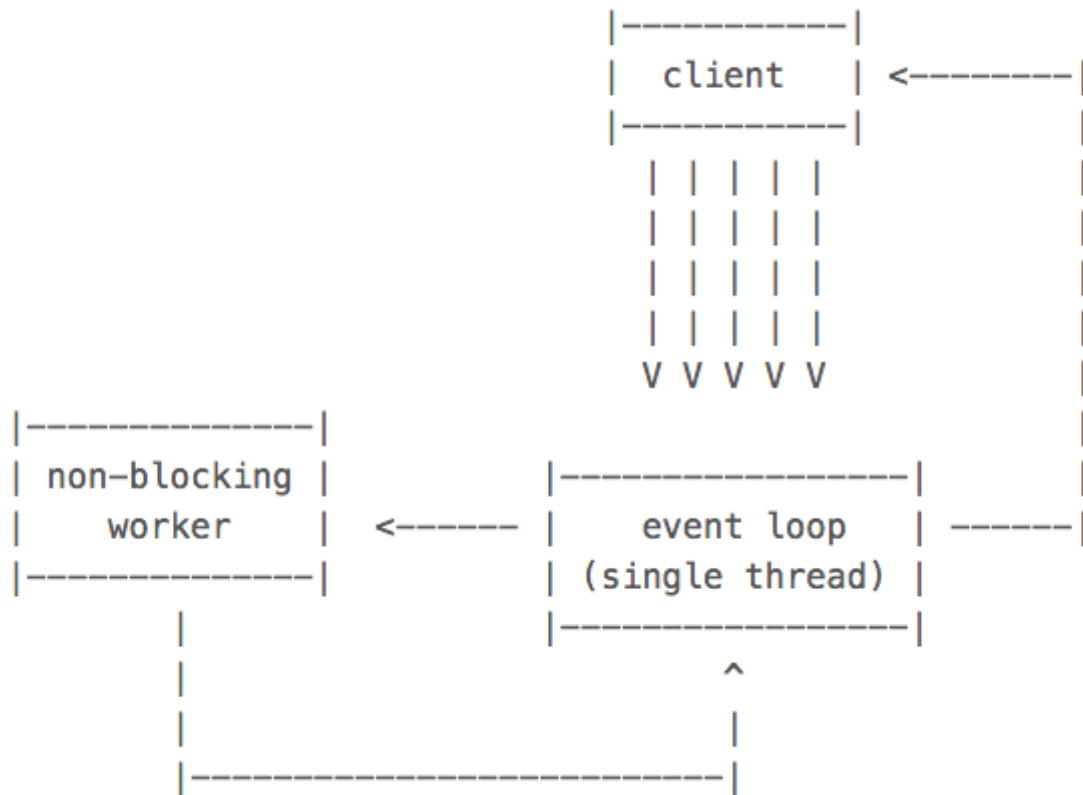
---

## *intro - conceptual model for processing in Node.js*

- how does Node.js, and its underlying processing model, actually work?
- client sends a hypertext transfer protocol, HTTP, request
  - *request or requests sent to Node.js server*
- event loop is then informed by the host OS
  - *passes applicable request and response objects as JavaScript closures*
  - *passed to associated worker functions with callbacks*
- long running jobs continue to run on various assigned worker threads
- responses are sent from the non-blocking workers back to the main event loop
  - *returned via a callback*
- event loop returns any results back to the client
  - *effectively when they're ready*

# Image - Client-side and server-side computing

---



Node.js - conceptual model for processing

# Server-side considerations - Node.js

---

## *intro - threaded architecture*

- concurrency allows multiple things to happen at the same time
- common practice on servers due to the nature of multiple user queries
- Java, for example, will create a new thread on each connection
  - *threading is inherently resource expensive*
- size of a thread is normally around 4MB of memory
- naturally limits the number of threads that can run at the same time
- also inherently more complicated to develop platforms that are thread-safe
  - *thereby allowing for such functionality*
- due to this complexity
  - *many languages, eg: Ruby, Python, and PHP, do not have threads that allow for real concurrency*
  - *without custom binaries*
- JavaScript is similarly single-threaded
  - *able to run multiple code paths in parallel due to **events***

# Server-side considerations - Node.js

---

## *intro - event-driven architecture*

- JavaScript originally designed to work within the confines of the web browser
- had to handle restrictive nature of a single thread and single process for the whole page
- synchronous blocking in code would lock up a web page from all actions
  - *JavaScript was built with this in mind*
- due to this style of I/O handling
  - *Node.js is able to handle millions of concurrent requests on a single process*
- added, using libraries, to many other existing languages
  - *Akka for Java*
  - *EventMachine for Ruby*
  - *Twisted for Python*
  - ...
- JavaScript syntax already assumes events through its use of callbacks
- **NB:** if a query etc is CPU intensive instead of I/O intensive
  - *thread will be tied up*
  - *everything will be blocked as it waits for it to finish*

# Server-side considerations - Node.js

---

## *intro - callbacks*

- in most languages
  - *send an I/O query & wait until result is returned*
  - *wait before you can continue your code procedure*
- for example, submit a query to a database for a user ID
  - *server will pause that thread/process until database returns result for ID query*
- in JS, this concept is rarely implemented as standard
- in JS, more common to pass the I/O call a **callback**
- in JS, this **callback** will need to run when task is completed
  - *eg: find a user ID and then do something, such as output to a HTML element*
- biggest difference in these approaches
  - *whilst the database is fetching the user ID query*
  - *thread is free to do whatever else might be useful*
  - *eg: accept another web request, listen to a different event...*
- this is one of the reasons that Node.js returns good benchmarks and is easily scaled
- **NB:** makes Node.js well suited for I/O heavy and intensive scenarios

# Demos

---

## Travel notes app - series 4

- DEMO 2 - Travel Notes & Flickr
- DEMO 3 - Travel Notes & Flickr - error checking
- DEMO 4 - Travel Notes & Flickr - initial metadata
- DEMO 5 - Travel Notes & Flickr - spinner

# References - JS & Libraries

---

- Flickr API
- Public feeds
- Public feed - public photos & video
- jQuery
- jQuery
- jQuery API
- jQuery - deferred
- jQuery - .getJSON()
- jQuery - JSONP
- jQuery :parent selector
- jQuery - promise
- MDN
- MDN - JS Objects
- Node.js
- Node.js home
- Node.js - download
- Various
- Create your own AJAX loader
- W3
- W3 - JS Object
- W3 - JS Performance