

Comp 322/422 - Software Development for Wireless and Mobile Devices

Fall Semester 2018 - Week 4

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Cordova app - API plugin examples - plugin test 4

plugins - geolocation

- add and use Cordova's **Geolocation** plugin
- helps us provide information about current location of user's device
- plugin returns data on device's location
 - *including latitude and longitude*
- plugin can use the following to help determine location
 - *GPS, network signals, phone network IDs...*
- API has been developed around the W3C's **Geolocation API Specification**
- **n.b.** may not always be able to return a reliable location due to
 - *location restrictions*
 - *lack of access to a network*
 - *a user may reject location tracking and awareness...*
- need to be aware of potential privacy and security concerns
 - *application's privacy policy important*
 - *how we collect and whether we store data or not*
 - *how and when we share such data with 3rd-party services*
- consider offering user a simple opt-in/out option for location services
 - *app needs fallback options to cover lack of location services*

Cordova app - API plugin examples - plugin test 4

plugins - geolocation

- now create our test application for the **geolocation** plugin

```
cordova create pluginstestgeo com.example.pluginstest PluginTestGeo
```

- add our required platforms for support and development,

```
cordova platform add android --save
```

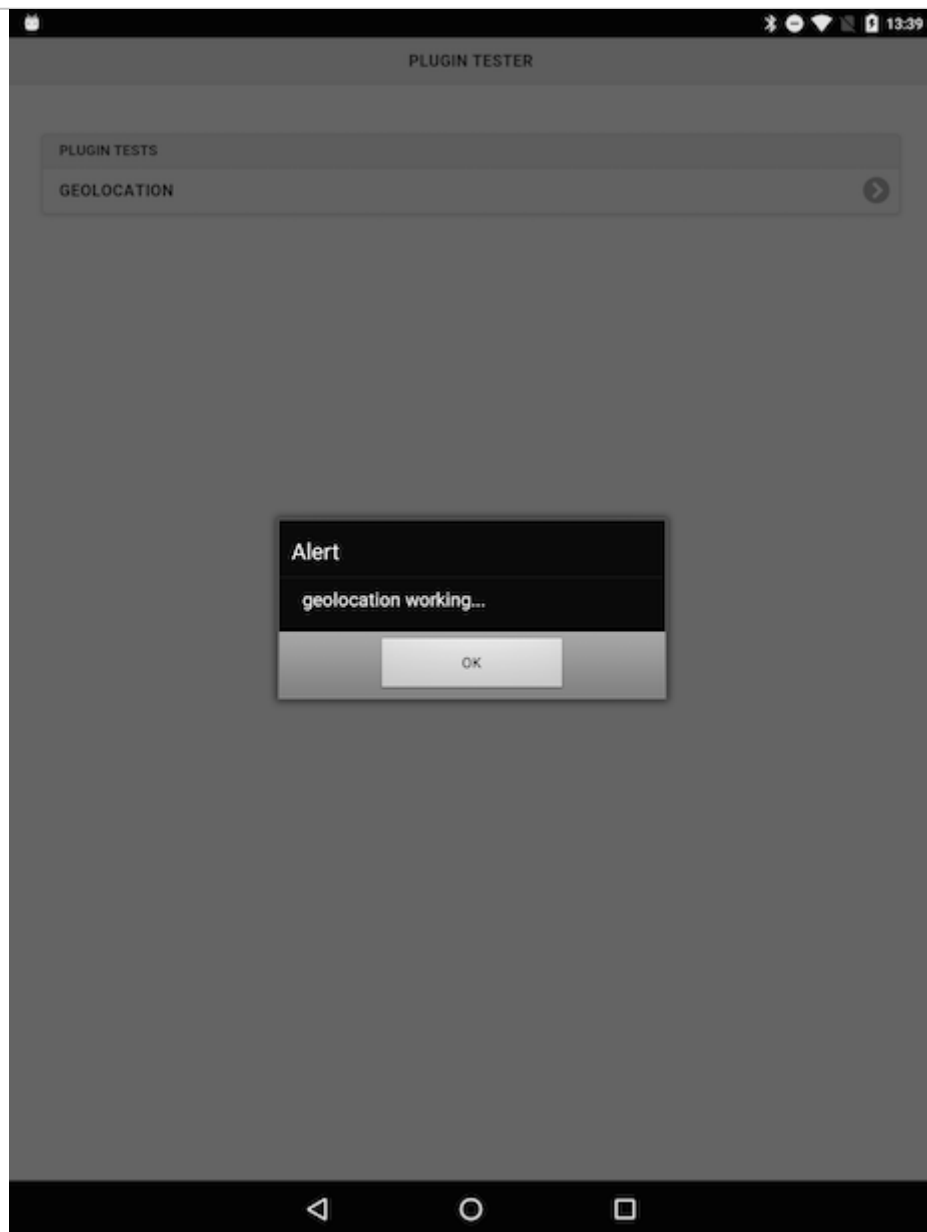
- update the www directory, modify initial settings in `config.xml`, and run initial test

```
//test in the Android emulator
cordova emulate android
//test on a connected Android device
cordova run android
```

- add **geolocation** plugin to our new project using the Cordova CLI

```
//cordova version 5.0+
cordova plugin add cordova-plugin-geolocation
//install directly via repo url
cordova plugin add https://github.com/apache/cordova-plugin-geolocation.git
```

Image - API Plugin Tester - Geolocation



API Plugin Tester - geolocation up and running

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - test plugin

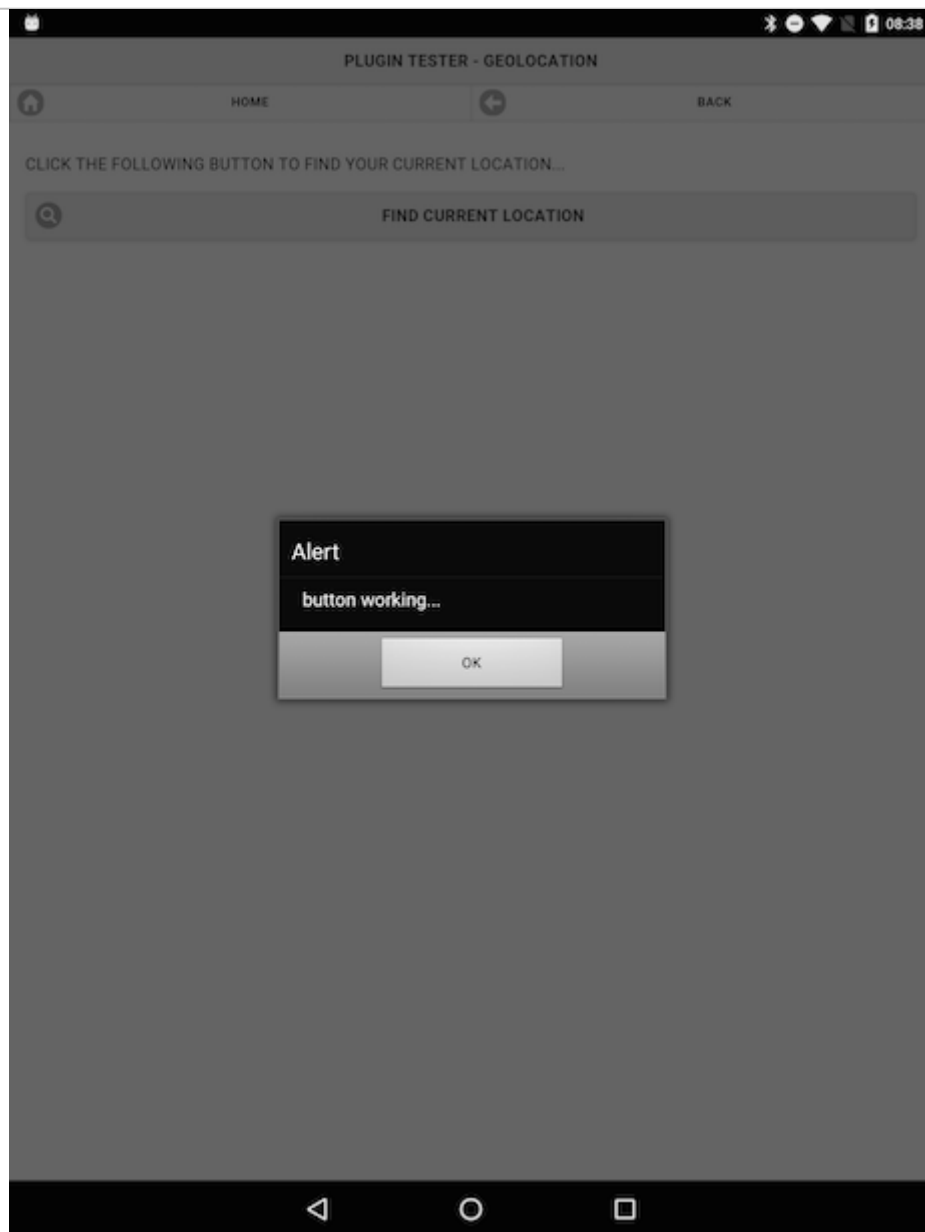
- add option to check and return current location of the user's device
- add a button to allow the user to request their current location
 - *then get the location's latitude and longitude*
 - *then output the location results to the user*

e.g.

```
<div id="content">
  <p>Click the following button to find your current location...</p>
  <button type="button" id="getLocation">Find Current Location</button>
</div>
```

- then update the `plugin.js` file to handle the touch event for this button
 - *get element from DOM*
 - *add event listener & test execution...*
- output test alert &c. for handler

Image - API Plugin Tester - Geolocation



API Plugin Tester - test geolocation button

Cordova app - API plugin examples - plugin test 4

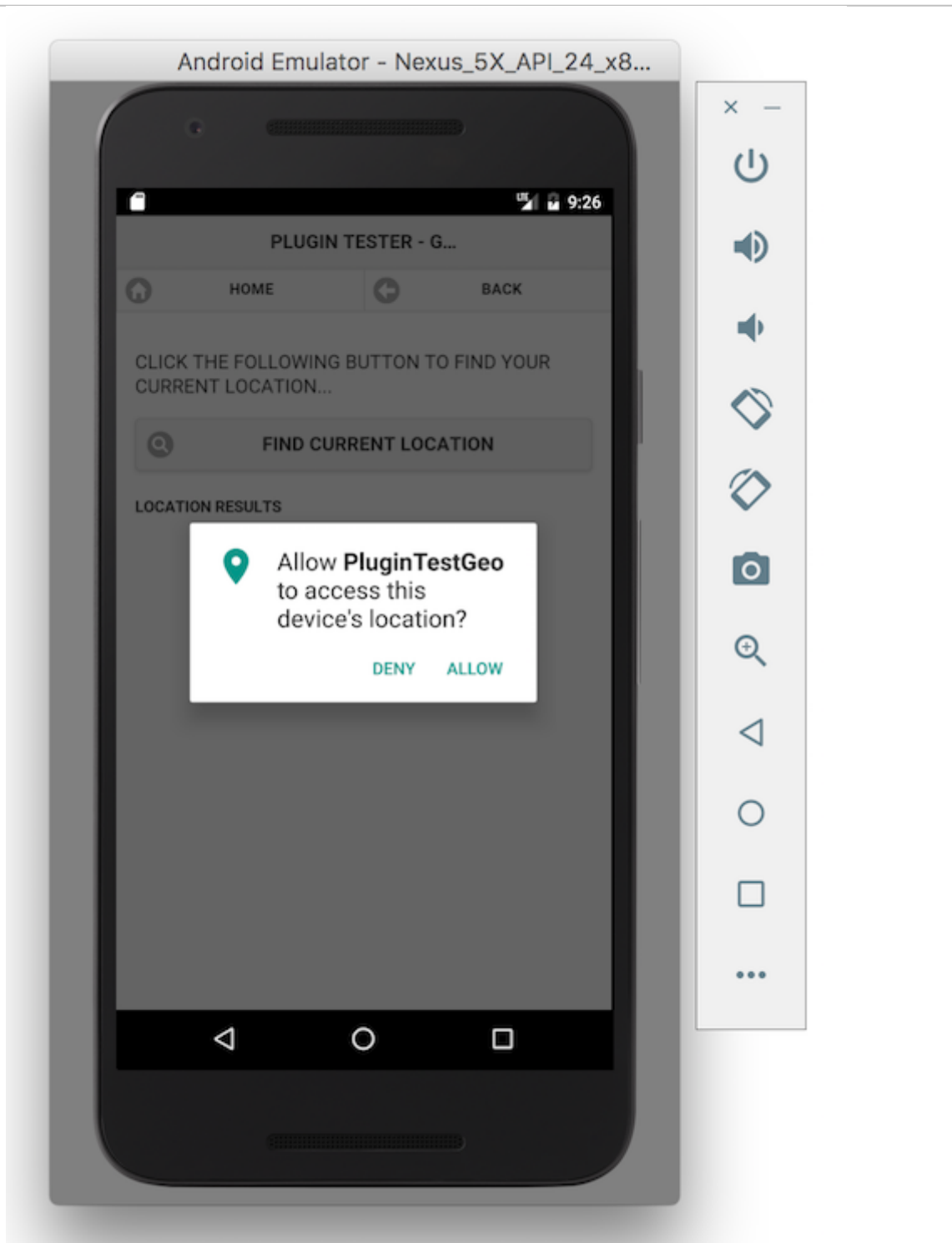
plugins - geolocation - test plugin

- add our logic for working with the navigator object and the geolocation plugin
- first function we need to add is `getLocation()`
 - *use navigator object to get current position of user's device*
- add our standard success and fail callbacks
 - *initially add a timeout for poor signal or reception*
 - *enable high accuracy for this check*
 - *asking plugin to use most accurate source available, e.g. GPS*
- `getLocation()` function is as follows,

```
function getLocation() {  
    navigator.geolocation.getCurrentPosition(onSuccess,  
        onFail, {  
            timeout: 15000,  
            enableHighAccuracy: true  
        });  
}
```

- standard callbacks for `onSuccess` and `onFail`

Image - API Plugin Tester - Geolocation permissions



API Plugin Tester - check geolocation permissions

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - test plugin

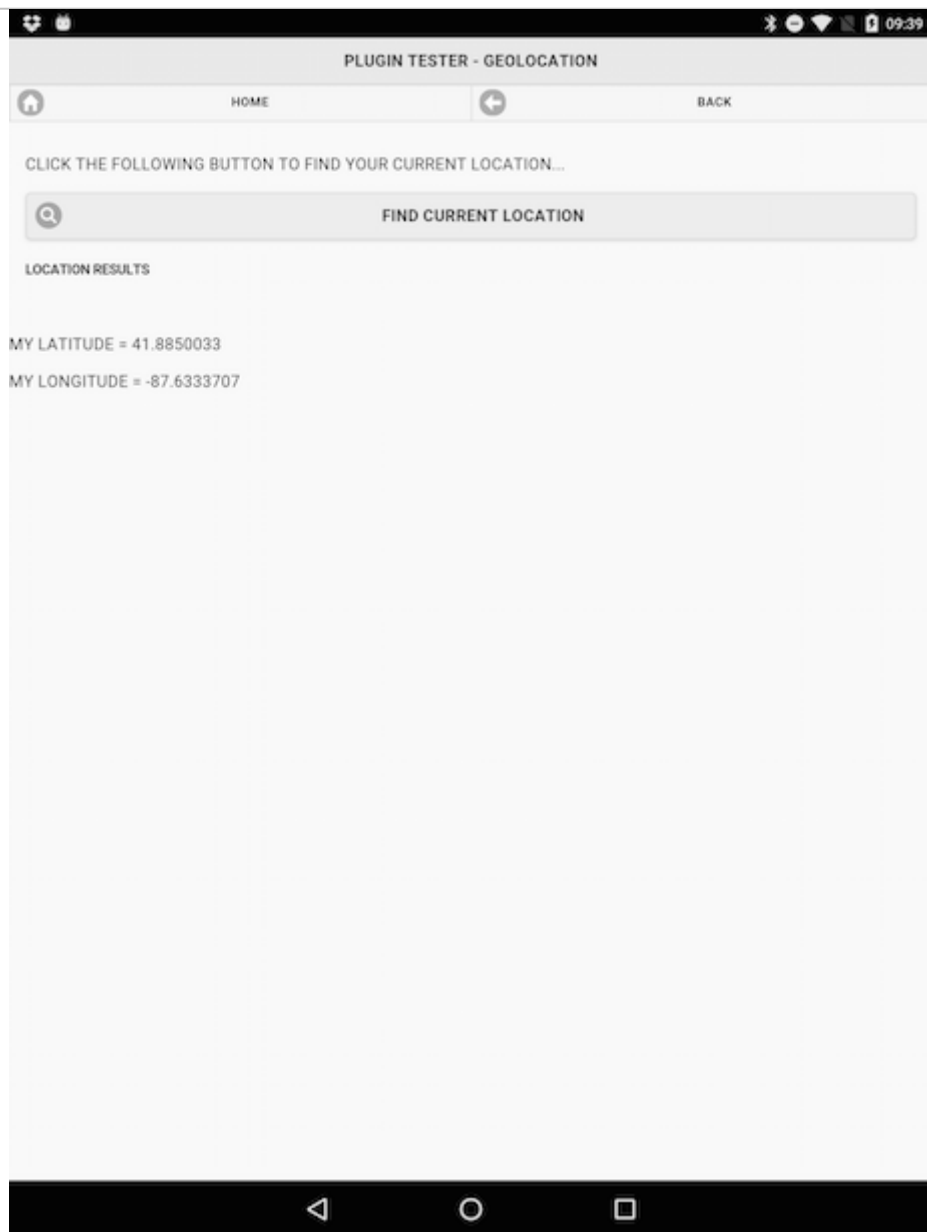
- successful return of location data
 - *use the latitude and longitude coordinates within our application*

```
function onSuccess(location) {  
    var myLatitude = location.coords.latitude;  
    var myLongitude = location.coords.longitude;  
    //output result to #location div...  
    // e.g. "<p>my latitude = "+myLatitude+"</p><p>my longitude = "+myLongitude+"</p>"  
}
```

- now store coordinates of user's location as latitude and longitude values
- various options for usage per application
 - *render to page, use with maps, add metadata to photos, track navigation...*
- also need to allow for the possibility of errors
 - *set our onFail callback as follows*

```
function onFail(error) {  
    // or output error to #location div...  
    // e.g. "location error code = "+error.code+" message = "+error.message  
}
```

Image - API Plugin Tester - Geolocation



API Plugin Tester - geolocation output

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - plugin options

- additional options and properties available to us in the callbacks
 - *navigator object and properties for returned location object*
- add options to navigator object for geolocation
 - *maximumAge* - cached position as long as it is not older than the specified age
 - *age is specified as a number in milliseconds, e.g. maximumAge: 3000*
- returned location object properties
 - **altitude** - *location.coords.altitude*
 - **heading** - *location.coords.heading*
 - **speed** - *location.coords.speed*
 - **timestamp** - *location.timestamp*
- fine-tune results for our users

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - monitor location

- set plugin to monitor a device's location for changes

```
navigator.geolocation.watchPosition
```

- checking user's device for changes in their current location
 - *then returns device's location if a change is detected*

```
var watchID = navigator.geolocation.watchPosition(onSuccess, onFail,  
{option...}  
);
```

- error callback and options are both optional
- also use returned ID with a `clearWatch ()` function to stop ongoing location check and monitoring

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - manual toggle

- add a toggle option to allow a user to choose
 - *auto or manual refresh of their location*
- toggle set to **on** - app will **watch** a user's position
- toggle set to **off** - explicit location request required
- option to disable `watchPosition()` helps save battery life, reduces privacy issues...
- toggle switch initially set to default **off** position
 - *location position requires explicit request*
- toggle switch set to **on**
 - *app calls `watchPosition()` method against global `navigator.geolocation` object*

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - manual toggle

- add a toggle switch to our UI

```
<form>
  <label for="flip-select">watch location:</label>
  <select id="setWatch" name="flipWatch">
    <option>off</option>
    <option>on</option>
  </select>
</form>
```

- then update our JS logic to handle a UI event on this UI grouping
- add a check for the current value of the toggle switch
 - *add to a property, e.g. watchState*
 - *simply checking set value of option for the switch*

Cordova app - API plugin examples - plugin test 4

plugins - geolocation - manual toggle

- as a user **changes** the state of the toggle switch to on
 - *need to call `watchPosition()` method against `geoLocation`*
 - *start constant polling of geolocation object*
- add a new function `getWatchID()`
 - *allows us to set a value for a `watchID` property*
 - *property set against `onDeviceReady()` function*

```
function getWatchID() {  
    watchID = navigator.geolocation.watchPosition(onSuccess,  
    onFail, {  
        enableHighAccuracy: true  
    });  
}
```

Cordova app - API plugin examples - plugin test 4

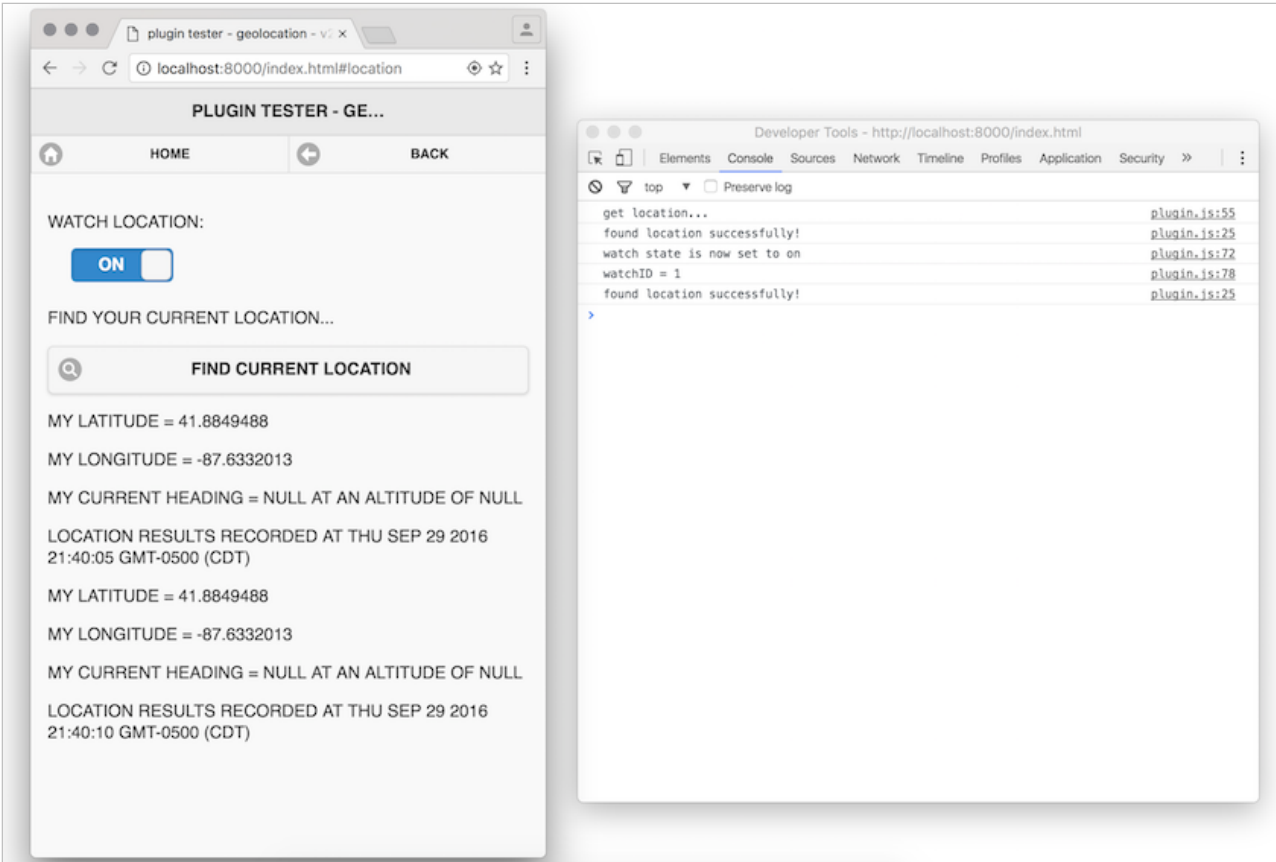
plugins - geolocation - manual toggle

- call `getWatchID()` - using standard callback, `onSuccess`
 - *get required location details*
 - *then set value for `watchID` property*

```
...
//check state of toggle
if (watchState === "on") {
    //call function to start watching...
    getWatchID();
    //output check of watchID
    console.log("watchID = "+watchID);
} else {
    //clear the location watching - stops location tracking...
    navigator.geolocation.clearWatch(watchID);
    //output check of watchID - check match against on watchID...
    console.log("clear watch..." + watchID);
}
...
```

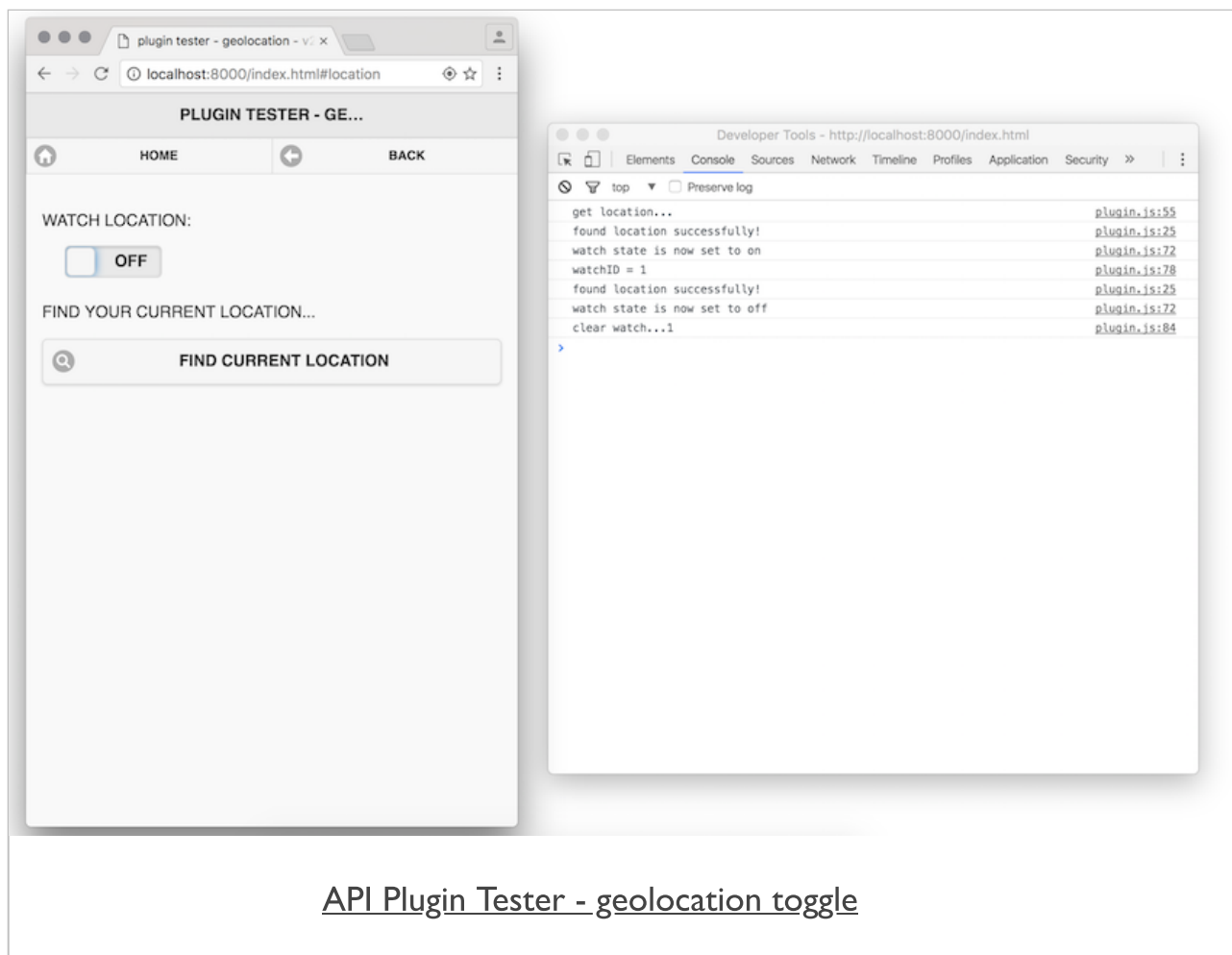
- update conditional statement
 - *clear output of coordinates, then clear watching of user's current location*

Image - API Plugin Tester - Geolocation toggle



API Plugin Tester - geolocation toggle

Image - API Plugin Tester - Geolocation toggle



API Plugin Tester - geolocation toggle

Image - Designing our app



Designing our app - fundamentals are important

Video - Pyramid builders

Minions (2015) Pyramid



Minions Pyramid Builders - Source: [YouTube](#)

Extra notes - mobile considerations

Extra design notes will start to be added to the course website, GitHub...e.g.

- design mockups
- design and interface
- design and data
- ...

& extra notes on JS &c.

Mobile Design & Development - Data Usage and Persistency

Fun Exercise

Four apps, one per group

- Books -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/videos/week4/books/>
- Cinema -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/videos/week4/cinema/>
- Plants -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/videos/week4/plants/>
- Travel -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/videos/week4/travel/>

For your assigned app, consider the following

- UI and UX in the app that requires data loading
 - *local or remote*
 - *how to update this data?*
- required data persistency in the app
 - *local or remote*
 - *temporary or long-term*
 - *account or session*

~ 10 minutes

Cordova app - API plugin examples - plugin test 2

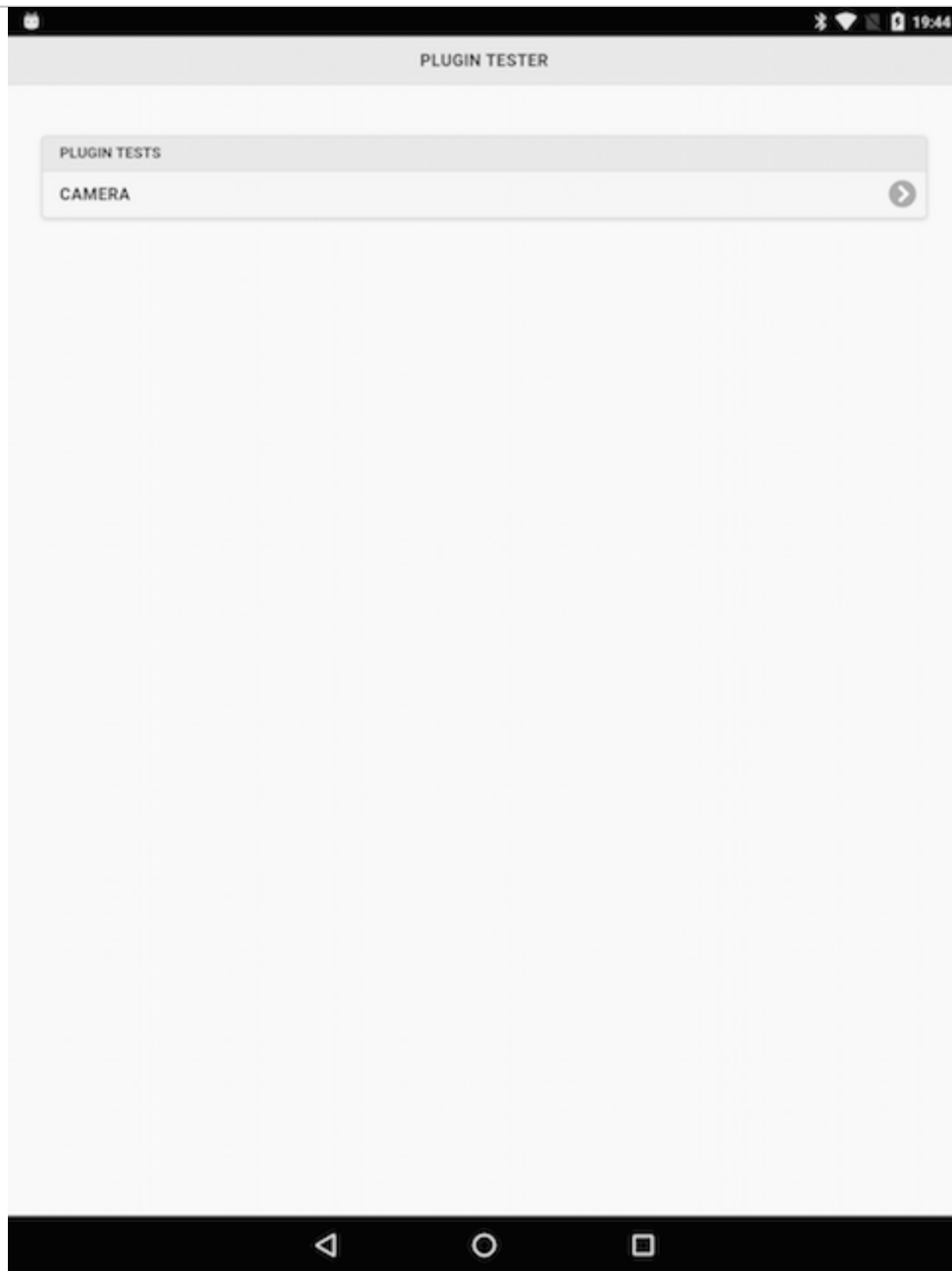
plugins - add camera plugin

- now add the camera plugin to our test application
- two ways we can add camera functionality to our application
 - *use the camera plugin*
 - *use the more generic Media Capture API*
- main differences include
 - **camera** plugin focuses on camera capture and functionality
 - **media capture** includes additional options such as video and audio recording
- add the camera plugin using the following Cordova CLI command

```
cordova plugin add cordova-plugin-camera
```

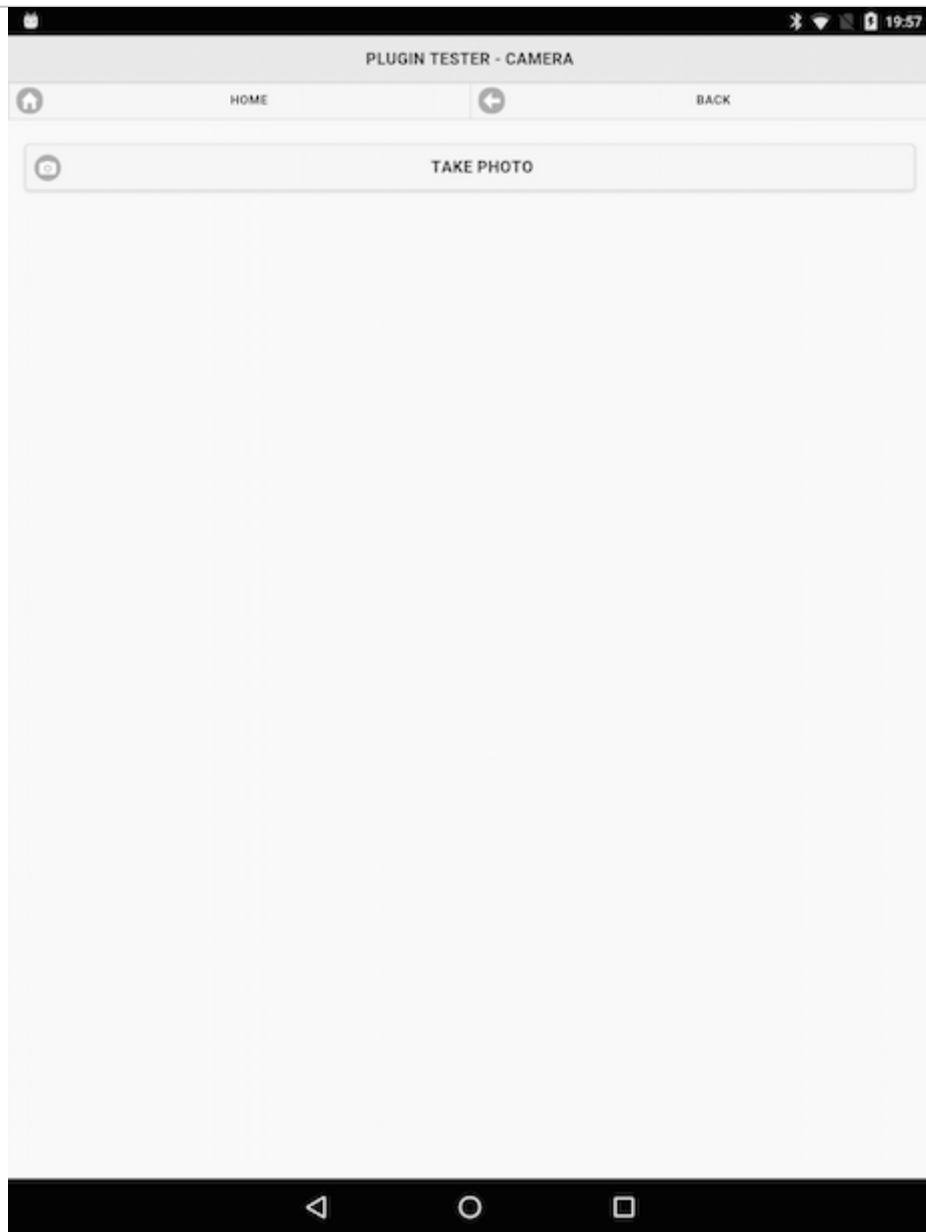
- provides standard navigator object
 - *enables taking pictures, and choose images from local image library*

Image - API Plugin Tester - Home



API Plugin Tester - initial home page

Image - API Plugin Tester - Camera



API Plugin Tester - initial camera page

Cordova app - API plugin examples - plugin test 2

plugins - add camera logic

- basic UI is now in place
- start to add some logic for taking photos with the device's camera
- need to be able to get photos from the device's image gallery
- app's logic in initial `plugin.js` file
- handlers for the tap events
 - a user tapping on the **takePhoto** button
 - then the options in the **photoSelector**
 - take a photo with the camera
 - get an existing photo from the gallery
- use the `onDeviceReady()` function
 - add our handlers and processors for both requirements
 - add functionality for camera and gallery components

Cordova app - API plugin examples - plugin test 2

plugins - add camera logic

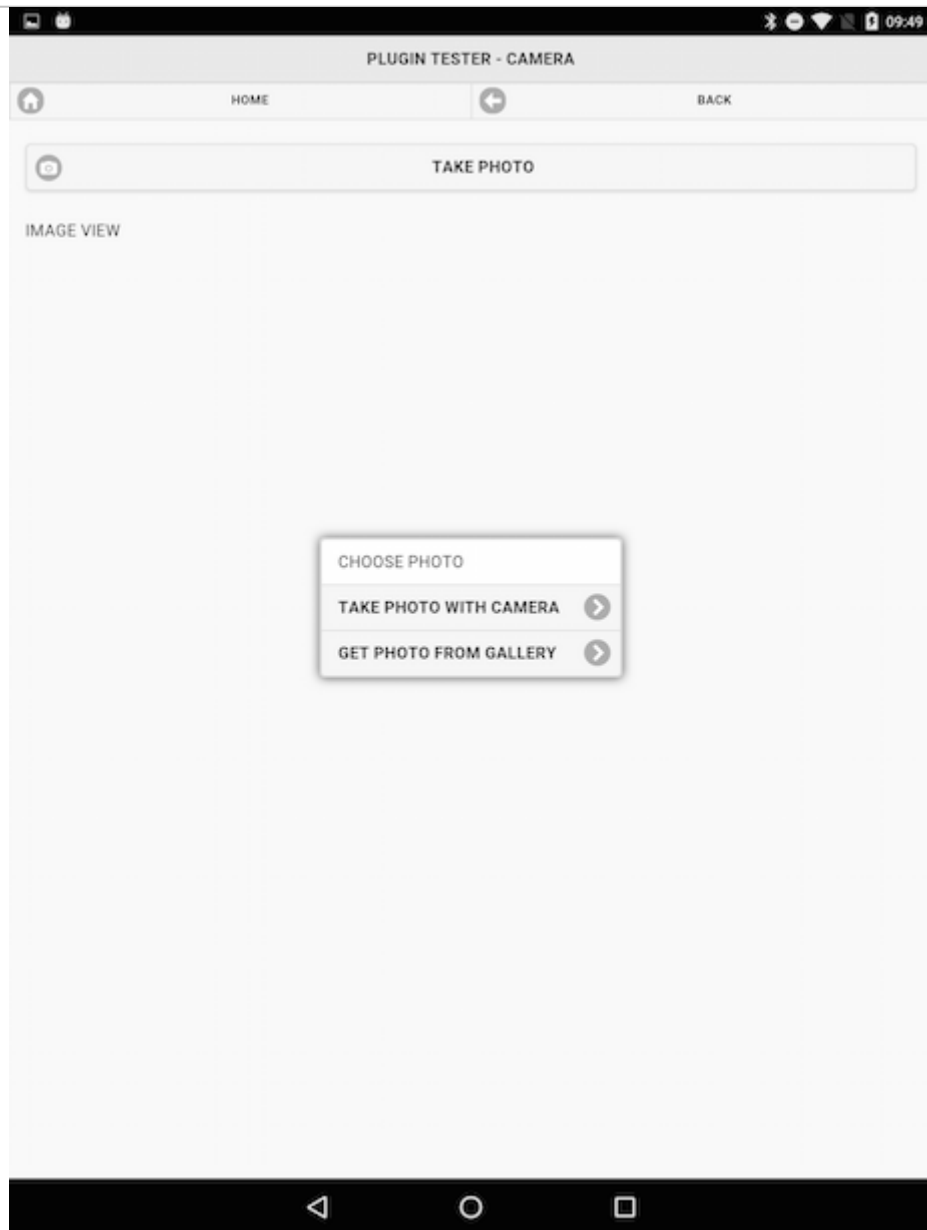
- add our handlers for the tap events
- initial handlers for takePhoto, cameraPhoto, and galleryPhoto

e.g.

```
let shutter = document.getElementById('takePhoto');
playButton.addEventListener('touchstart', takePhoto, false);

function takePhoto() {
  // show modal for camera options...
  // different call relative to chosen UI option...
}
```

Image - API Plugin Tester - Camera



API Plugin Tester - camera photo selector

Cordova app - API plugin examples - plugin test 2

plugins - add camera logic

- capture an image using this plugin with the native device's camera hardware
- use the provided navigator object for the camera
 - *then call the `getPicture` function*
- also specify required callback functions for the camera
 - *and add some required options for quality...*

```
//Use from Camera
navigator.camera.getPicture(onSuccess, onFail, {
  quality: 50,
  sourceType: Camera.PictureSourceType.CAMERA,
  destinationType: Camera.DestinationType.FILE_URI
});
```

- quality option has been reduced to 50 for testing
 - *choose a value between 0 and 100 for our final application*
 - *100 being original image file from the camera*
- option for `destinationType` now defaults to `FILE_URI` could be changed to `DATA_URL`
 - **NB:** *`DATA_URL` option can crash an app due to low memory, system resources...*
 - *returns a base-64 encoded image*
 - *then render in a chosen format such as a JPEG*

Cordova app - API plugin examples - plugin test 2

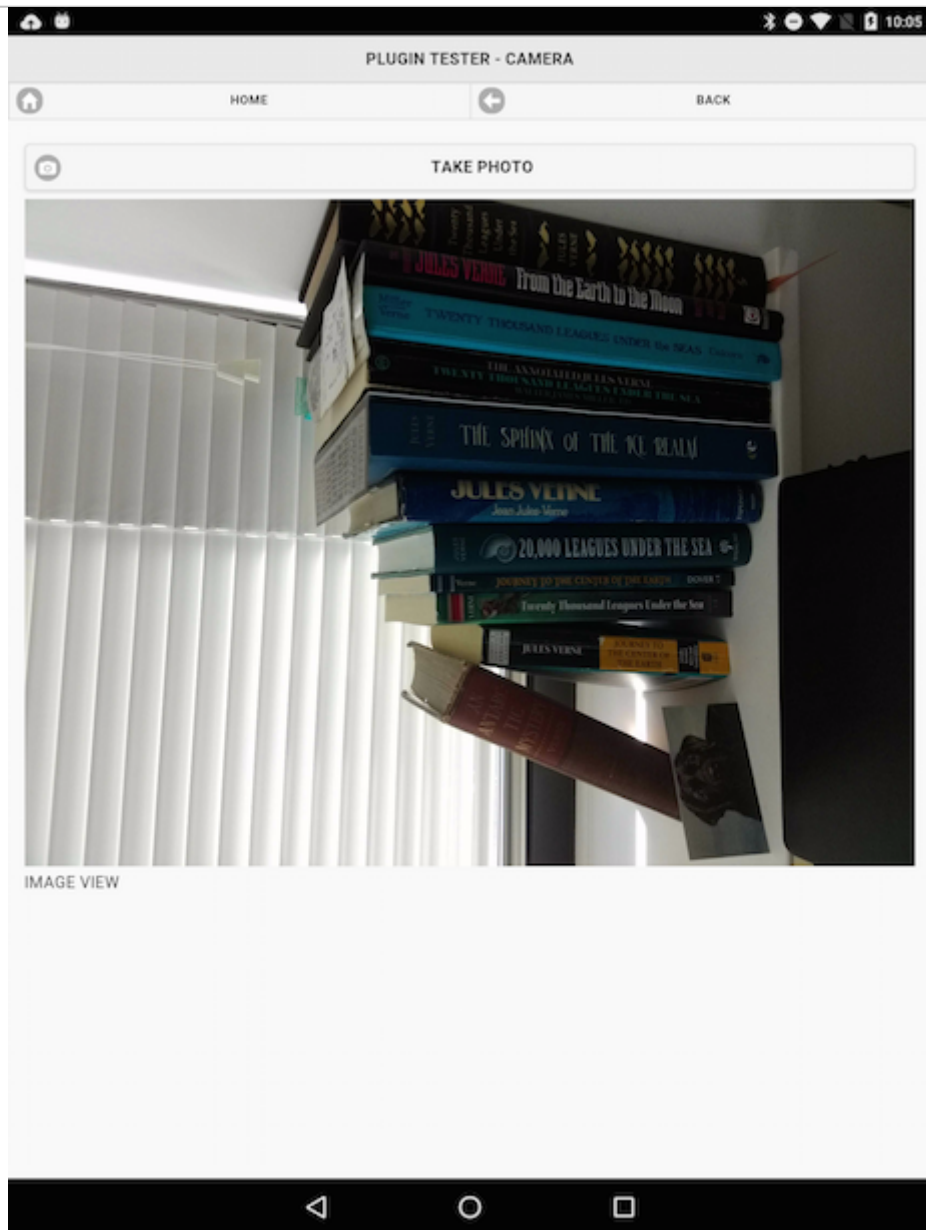
plugins - add camera logic

- two callback functions are `onSuccess` and `onFail`
 - *set logic for returned camera image and any error message*

```
function onSuccess(imageData) {  
    //JS selector...  
    var image = document.getElementById('imageView');  
    image.src = imageData;  
}  
  
function onFail(message) {  
    alert('Failed because: ' + message);  
}
```

- `onSuccess` function accepts a parameter for the returned image data
- using returned image data to output and render our image in the test `imageView`
- `onFail` function simply outputting a returned error message
- we can use these two callback functions to perform many different tasks
 - *we can pass the returned image data to a save function, or edit option...*
 - *they act like a bridge between our own logic and the native device's camera*

Image - API Plugin Tester - Camera



API Plugin Tester - image rotated

Cordova app - API plugin examples - plugin test 2

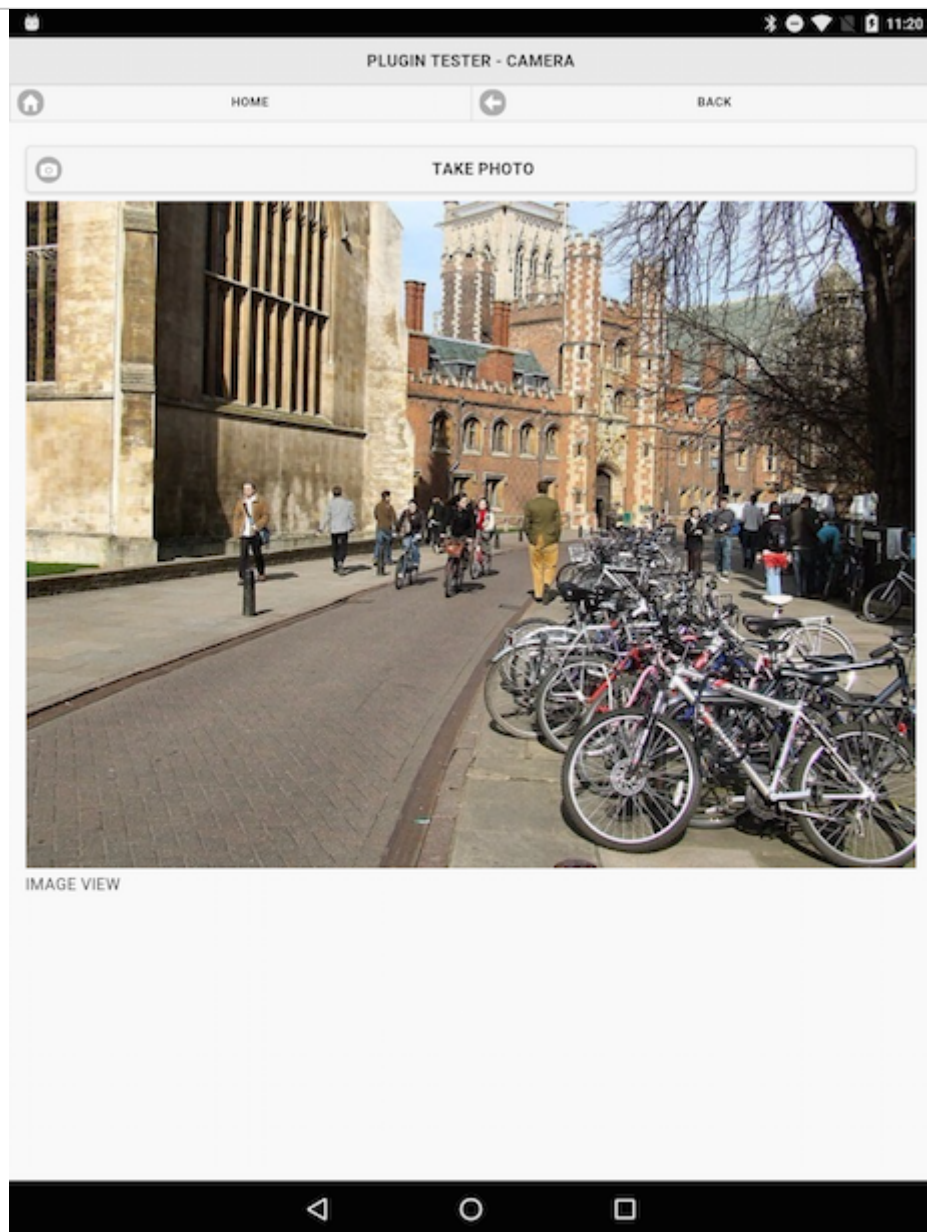
plugins - update camera logic

- returned an image from the camera
- update our application to select an image from gallery application
- add a conditional check to our `getPhoto()` function
 - *allows us to differentiate between a camera or gallery request*

```
navigator.camera.getPicture(onSuccess, onFail, {  
  sourceType: Camera.PictureSourceType.PHOTOLIBRARY,  
  destinationType: Camera.DestinationType.FILE_URI  
});
```

- update in the `sourceType` from CAMERA to PHOTOLIBRARY
- returned image respects original orientation of gallery image

Image - API Plugin Tester - Camera



API Plugin Tester - image from gallery.

Cordova app - API plugin examples - plugin test 2

plugins - fix camera logic

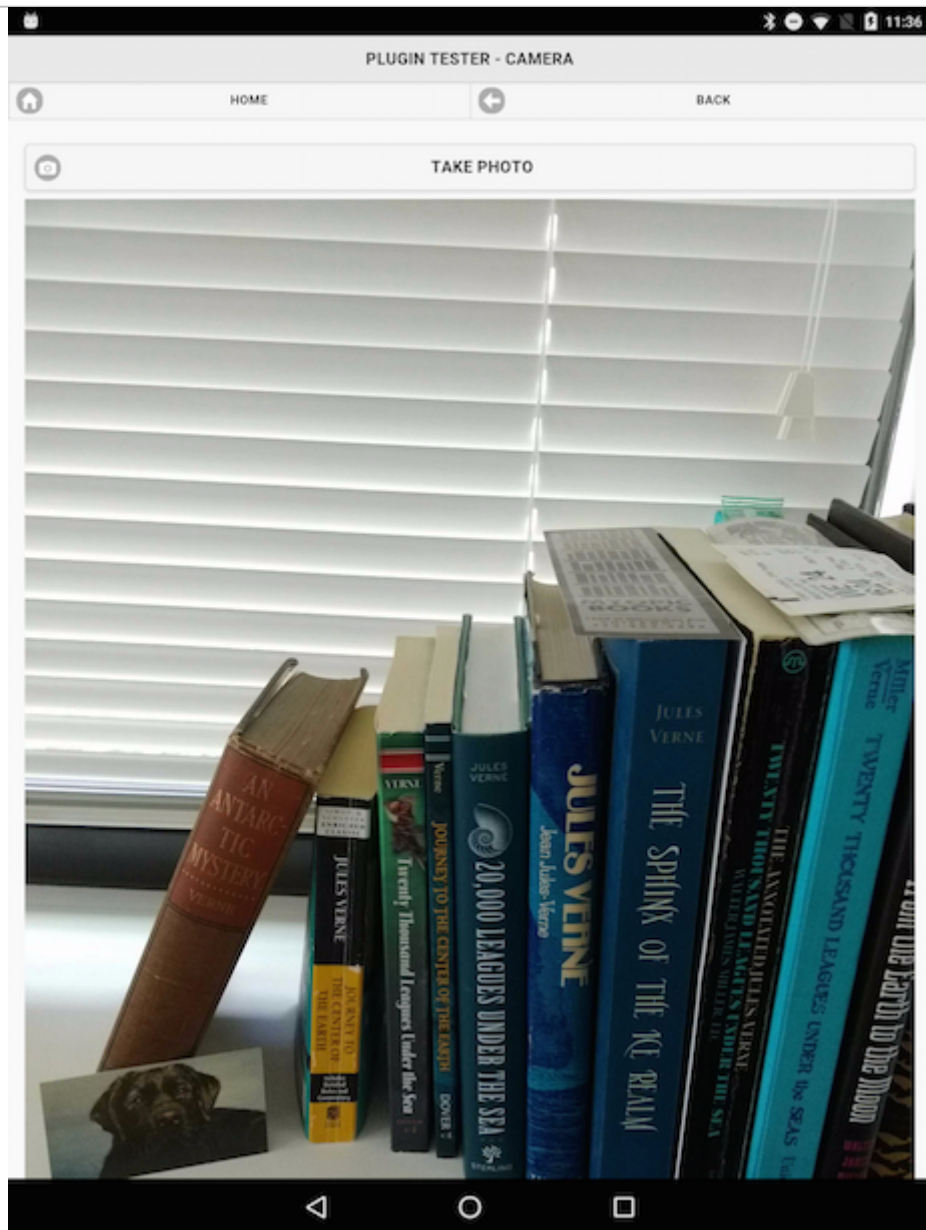
- need to fix the orientation issue with the returned image from the camera
- options for this plugin make it simple to update our logic for this requirement
 - *add a new option for the camera*

```
correctOrientation: true
```

- ensures that the original orientation of the camera is enforced
- updated logic is as follows

```
//Use from Camera
navigator.camera.getPicture(onSuccess, onFail, {
  quality: 50,
  correctOrientation: true,
  sourceType: Camera.PictureSourceType.CAMERA,
  destinationType: Camera.DestinationType.FILE_URI
});
```

Image - API Plugin Tester - Camera



API Plugin Tester - correct image orientation

Cordova app - API plugin examples - plugin test 2

plugins - camera updates

- continue to add many other useful options
 - *specifying front or back cameras on a device*
 - *type of media to allow*
 - *scaling of returned images*
 - *edit options...*
- in the app logic, also need to abstract the code further
 - *too much repetition in calls to the navigator object for the camera*
- then add more options and features
 - *save, delete, edit options*
 - *organise our images into albums*
 - *add some metadata for titles etc*
 - *add location tags for coordinates...*

Data considerations in mobile apps

- worked our way through Cordova's File plugin
- tested local and remote requests with JSON
- initial considerations for working with LocalStorage
- many other options for data storage in mobile applications
 - *IndexedDB*
 - *hosted NoSQL options, such as Redis and MongoDB*
 - *Firebase*
 - *query hosted remote SQL databases*
 - *and so on...*

Cordova app - IndexedDB

intro

- browser storage wars of recent years
 - *IndexedDB was crowned the winner over WebSQL*
- what do we gain with IndexedDB?
 - *useful option for developers to store relatively large amounts of client-side data*
 - *effectively stores data within the user's webview/browser*
 - *useful storage option for network apps*
 - *a powerful, and particularly useful, indexed based search API*
- IndexedDB differs from other local browser-based storage options
- localStorage is generally well supported
 - *limited in terms of the total amount of storage*
 - *no native search API*
- different solutions for different problems
 - *no universal best fit for storage...*
- browser support for mobile and desktop
 - *Can I use___?*
- Cordova plugin to help with IndexedDB support
 - *MSOpenTech - cordova-plugin-indexeddb*

Cordova app - IndexedDB - data test 2

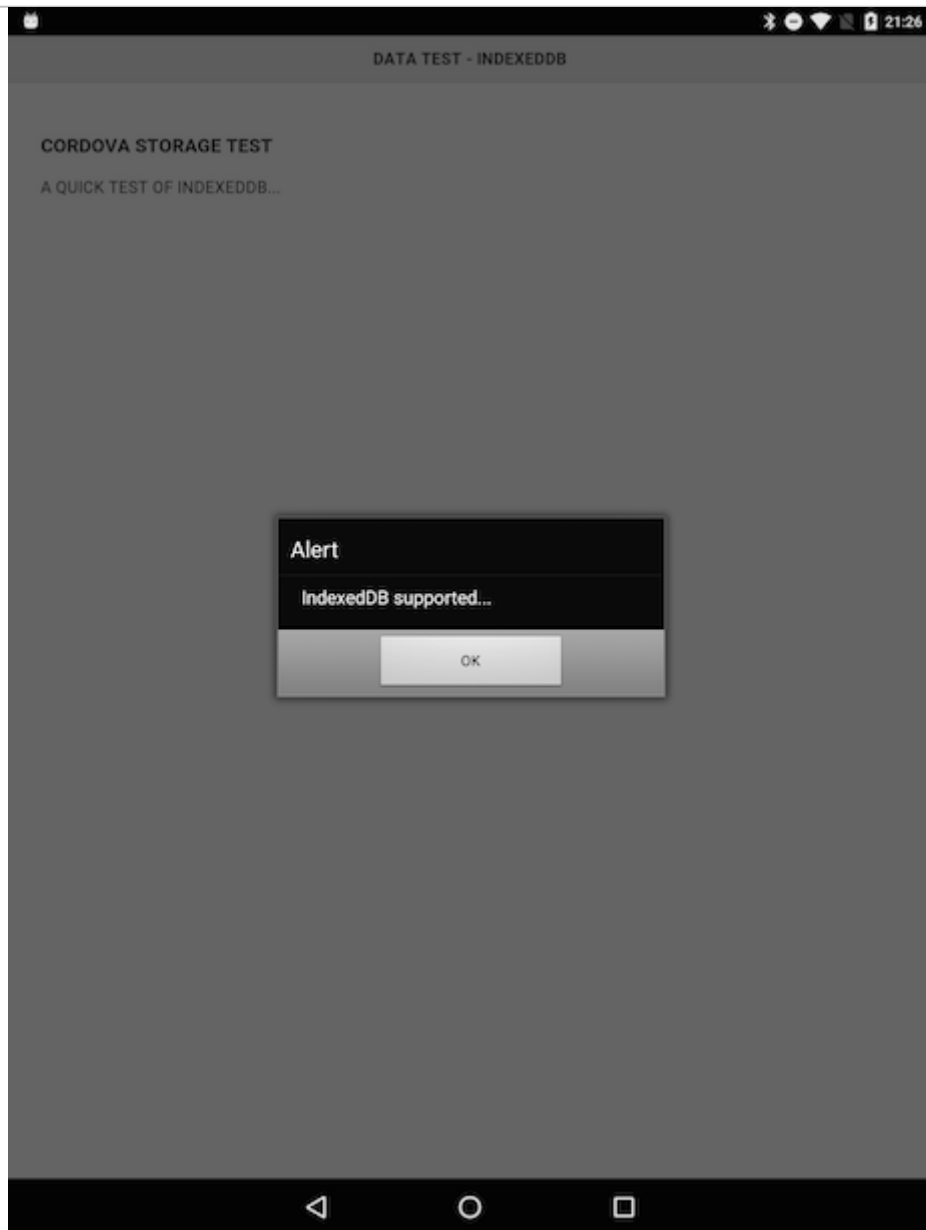
setup and test - part I

- testing our IndexedDB example with Cordova and Android
- perform our standard test for the deviceready event
 - *going to add a check for IndexedDB support and usage*
- in `onDeviceReady()` function
 - *add a quick check for IndexedDB support in the application's webview*

```
if("indexedDB" in window) {  
    console.log("IndexedDB supported...");  
} else {  
    console.log("No support...");  
}
```

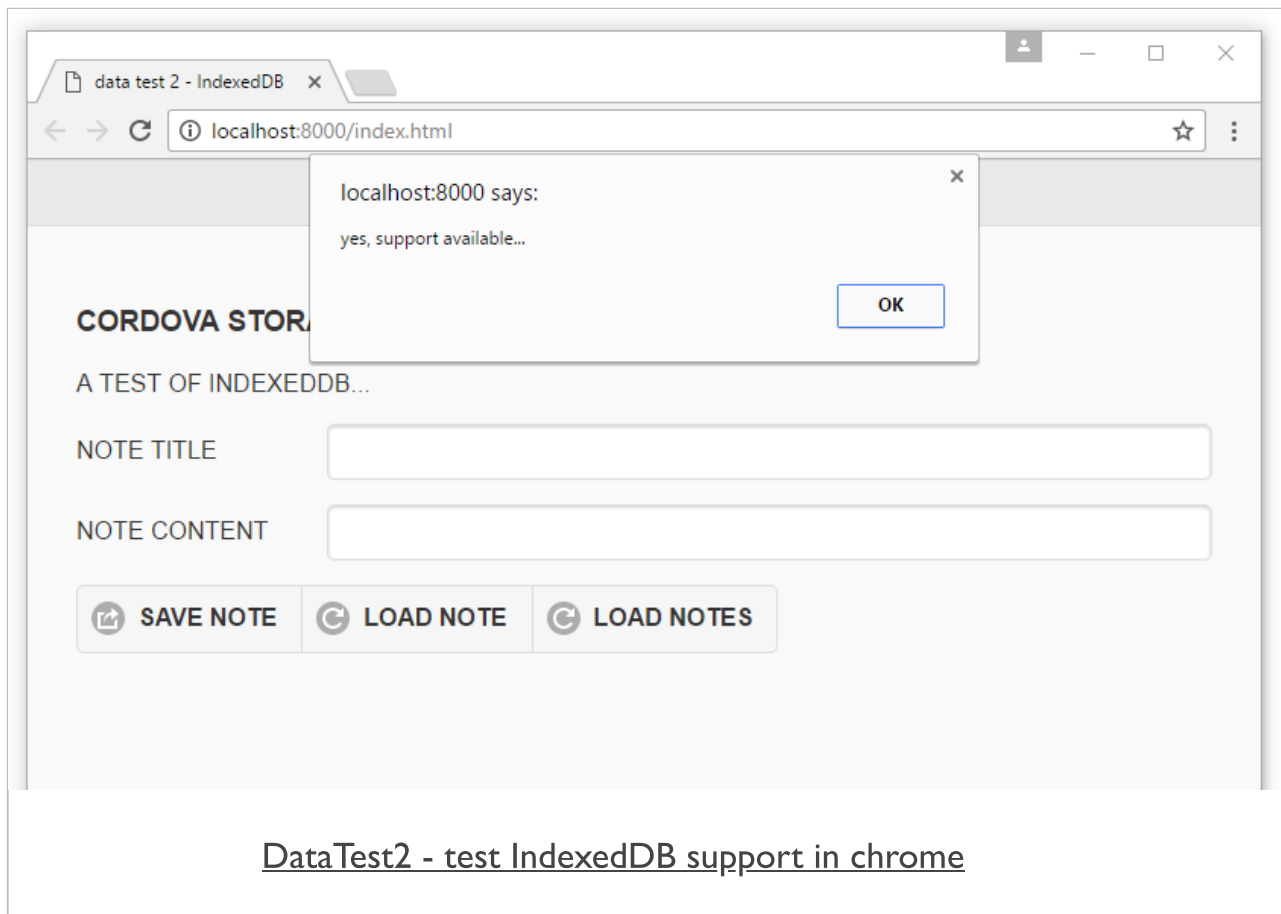
- Android support is available...

Image - IndexedDB Support



DataTest2 - test IndexedDB support in webview

Image - IndexedDB Support



Cordova app - IndexedDB - data test 2

setup and test - part 2

- update this check to ensure we have a quick reference later

```
//set variable for IndexedDB support
var indexedDBSupport = false;
//check IndexedDB support
if("indexedDB" in window) {
    indexedDBSupport = true;
    console.log("IndexedDB supported...");
} else {
    console.log("No support...");
}
```

- create initial variable to store the boolean result
- check variable after deviceready event has fired and returned successfully

Cordova app - IndexedDB - data test 2

database - part 1 - getting started

- start to build our IndexedDB database
- database is local to the browser,
 - *only available to users of the local, native app*
- IndexedDB databases follow familiar pattern of read and write privileges
 - *eg: browser-based storage options, including localStorage*
- create databases with the same name, and then deploy them to different apps
 - *remain domain specific as well*
- first thing we need to do is create an opening to our database

```
var openDB = indexedDB.open("422test", 1);
```

- creating a variable for our database connection
 - *specifying the name of the DB and a version*
- open request to the DB is an asynchronous operation

Cordova app - IndexedDB - data test 2

database - part 2 - getting started

- open request to the DB is an asynchronous operation
 - *add some useful event listeners to help with our application*
 - *success, error, upgradeneeded, `blocked`*
- upgradeneeded
 - *event will fire when the DB is first opened within our application*
 - *also if and when we update the version number for the DB*
- blocked
 - *fires when a previous or defunct connection to the DB has not been closed*

Cordova app - IndexedDB - data test 2

database - part 3 - create

- test creating a new DB
 - *then checking persistence during application loading and usage*

```
if(indexedDBSupport) {  
  var openDB = indexedDB.open("422test",1);  
  openDB.onupgradeneeded = function(e) {  
    console.log("DB upgrade...");  
  }  
  openDB.onsuccess = function(e) {  
    console.log("DB success...");  
    db = e.target.result;  
  }  
  openDB.onerror = function(e) {  
    console.log("DB error...");  
    console.dir(e);  
  }  
}
```

- `console.log()` - outputs a string representation
- `console.dir()` - prints a navigable tree

Image - IndexedDB Support

IndexedDB supported...	plugin.js:15
DB upgrade...	plugin.js:25
DB success...	plugin.js:29

DataTest2 - test IndexedDB open - first app load

Cordova app - IndexedDB - data test 2

database - part 4 - success

- performed a check to ensure that IndexedDB is supported
 - if yes, open a connection to the DB
 - also added checks for three events, including *upgrade*, *onsuccess*, and *errors*
- now ready to test the success event
 - event is passed a handler via *target.result*

```
...
openDB.onsuccess = function(e) {
  console.log("DB success...");
  db = e.target.result;
}
...
```

- handler is being stored in our global variable `db`
- run this test and check log output
 - outputs initial connection and upgrade status
 - then the success output for subsequent loading of the application

Image - IndexedDB Support

IndexedDB supported...

plugin.js:15

DB success...

plugin.js:29

DataTest2 - test IndexedDB open - after first app load

Cordova app - IndexedDB - data test 2

database - part 5 - data stores

- now start building our data stores in IndexedDB
- IndexedDB has a general concept for storing data
 - known as **Object Stores**
 - conceptually at least, known as (very) loose database tables
- within our object stores
 - add some data, plus a **keypath**, and an optional set of indices (indexes)
- a **keypath** is a unique identifier for the data
- Indices help us index and retrieve the data
- object stores created during upgradeneeded event for the current version
 - created when the app first loads
 - create object stores as part of this upgradeneeded event
- if we want to upgrade our object stores
 - update version
 - upgrade the object store using the upgradeneeded event

Cordova app - IndexedDB - data test 2

database - part 6 - data stores

- update our upgrade event to include the creation of our required object stores

```
...
openDB.onupgradeneeded = function(e) {
    console.log("DB upgrade...");
    //local var for db upgrade
    var upgradeDB = e.target.result;
    if (!upgradeDB.objectStoreNames.contains("422os")) {
        upgradeDB.createObjectStore("422os");
        console.log("new object store created...");
    }
}
...
```

- check a list of existing object stores
 - *list of existing object stores available in the property `objectStoreNames`*
- check this property for our required object store using the `contains` method
- if required object store unavailable we can create our new object store
 - *listen for result from this synchronous method*
- as a user opens our app for the first time
 - *the `upgradeneeded` event is run*
 - *code checks for an existing object store*
 - *if unavailable, create a new one*
 - *then run the `success` handler*

Image - IndexedDB Support

IndexedDB supported...	plugin.js:17
DB upgrade...	plugin.js:26
new object store created...	plugin.js:31
DB success...	plugin.js:35

[DataTest2 - test IndexedDB - create object store](#)

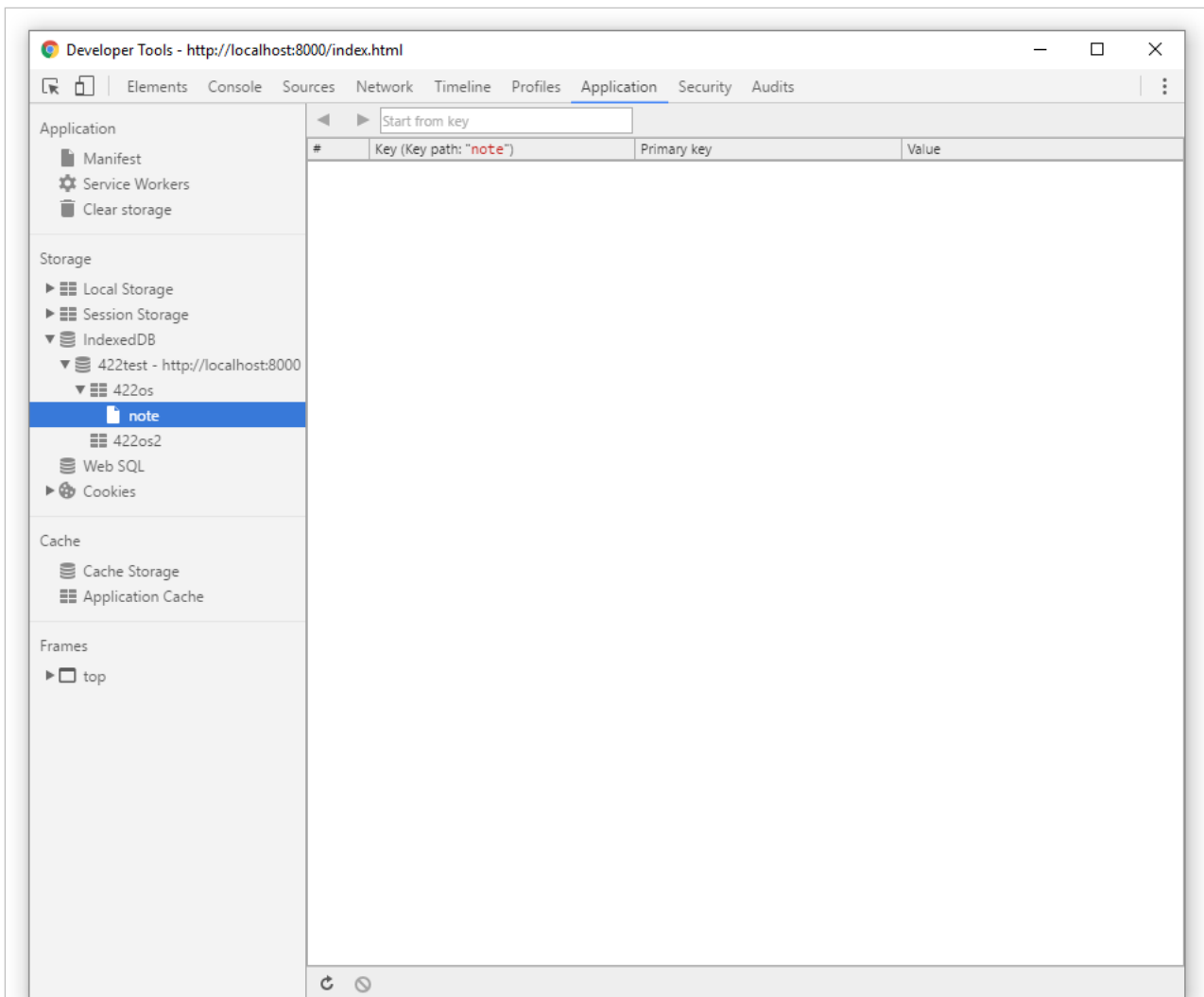
Cordova app - IndexedDB - data test 2

database - part 7 - extra data stores

- start to add further object stores
- can't simply create a new object store due to the `upgradeneeded` event
- increment the version number for the current database
 - *thereby invoking the `upgradeneeded` event*
- create our new object store using the same pattern

```
var openDB = indexedDB.open("422test",2);
openDB.onupgradeneeded = function(e) {
  console.log("DB upgrade...");
  //local var for db upgrade
  var upgradeDB = e.target.result;
  if (!upgradeDB.objectStoreNames.contains("422os")) {
    upgradeDB.createObjectStore("422os");
    console.log("new object store created...");
  }
  if (!upgradeDB.objectStoreNames.contains("422os2")) {
    upgradeDB.createObjectStore("422os2");
    console.log("new object store 2 created...");
  }
}
```

Image - IndexedDB Support



DataTest2 - test IndexedDB - initial object stores

Cordova app - IndexedDB - data test 2

database - part 8 - add data

- our database currently has two object stores
 - *now start adding some data for our application*
- IndexedDB allows us to simply store our objects in their default structure
 - *simply store JavaScript objects directly in our IndexedDB database*
- use transactions when working with data and IndexedDB
- transactions help us create a bridge between our app and the current database
 - *allowing us to add our data to the specified object store*
- a transaction includes two arguments
 - *first for the object store*
 - *second is the type of transaction*
 - *choose either *readonly* or *readwrite**

```
var dbTransaction = db.transaction(["422os"], "readwrite");
```

Cordova app - IndexedDB - data test 2

database - part 9 - add data

- use transaction to retrieve object store for our data
 - *requesting the 422os in this example*

```
var dataStore = dbTransaction.objectStore("422os");
```

- add some data using the new dataStore

```
// note
var note = {
  title:title,
  note:note
}
// add note
var addRequest = dataStore.add(note, key);
```

- for each object we can define the underlying naming schema
 - *best fit our applications*
- then add our object, with an associated key, to our dataStore

Cordova app - IndexedDB - data test 2

database - part 10 - add data

- now added an object to our object store
- request is asynchronous
 - *attach additional handlers for returned result*
 - *add a success and error handler*

```
// success handler
addRequest.onsuccess = function(e) {
    console.log("data stored...");
    // do something...
}
// error handler
addRequest.onerror = function(e) {
    console.log(e.target.error.name);
    // handle error...
}
```


Cordova app - IndexedDB - data test 2

database - part II - add data

- add a form for the note content and title
- set a save button to add the note data to the IndexedDB

```
<form id="noteForm">
  <div class="ui-field-contain">
    <label for="noteName">Note Title</label>
    <input type="text" id="noteName" name="noteName"></input>
  </div>
  <div class="ui-field-contain">
    <label for="noteContent">Note Content</label>
    <input type="text" id="noteContent" name="noteContent"></input>
  </div>
  <div data-role="controlgroup" data-type="horizontal">
    <input type="button" id="saveNote" data-icon="action" value="Save Note" data-
  </div>
</form>
```

- bind event handler to save button for click
 - submit add request to IndexedDB
 - store object data

Cordova app - IndexedDB - data test 2

database - part 12 - add data handlers

- now add our event handler for the save button
- handler gets note input from note form
- passes the data to the `saveNote ()` function

```
// handler for save button
$("#saveNote").on("tap", function(e) {
    e.preventDefault();
    var noteTitle = $("#noteName").val();
    var noteContent = $("#noteContent").val();
    saveNote(noteTitle, noteContent);
});
```

Cordova app - IndexedDB - data test 2

database - part 13 - add data handlers

```
//save note data to indexeddb
function saveNote(title, content){
  //define a note
  var note = {
    title:title,
    note:content
  }
  // create transaction
  var dbTransaction = db.transaction(["422os"],"readwrite");
  // define data object store
  var dataStore = dbTransaction.objectStore("422os");
  // add data to store
  var addRequest = dataStore.add(note,1);
  // success handler
  addRequest.onsuccess = function(e) {
    console.log("data stored...");
    // do something...
  }
  // error handler
  addRequest.onerror = function(e) {
    console.log(e.target.error.name);
    // handle error...
  }
}
```

Image - IndexedDB Support

IndexedDB supported...	plugin.js:17
DB upgrade...	plugin.js:26
new object store created...	plugin.js:31
new object store 2 created...	plugin.js:35
DB success...	plugin.js:39
data stored...	plugin.js:66

DataTest2 - test IndexedDB - save data to store

Image - IndexedDB Support

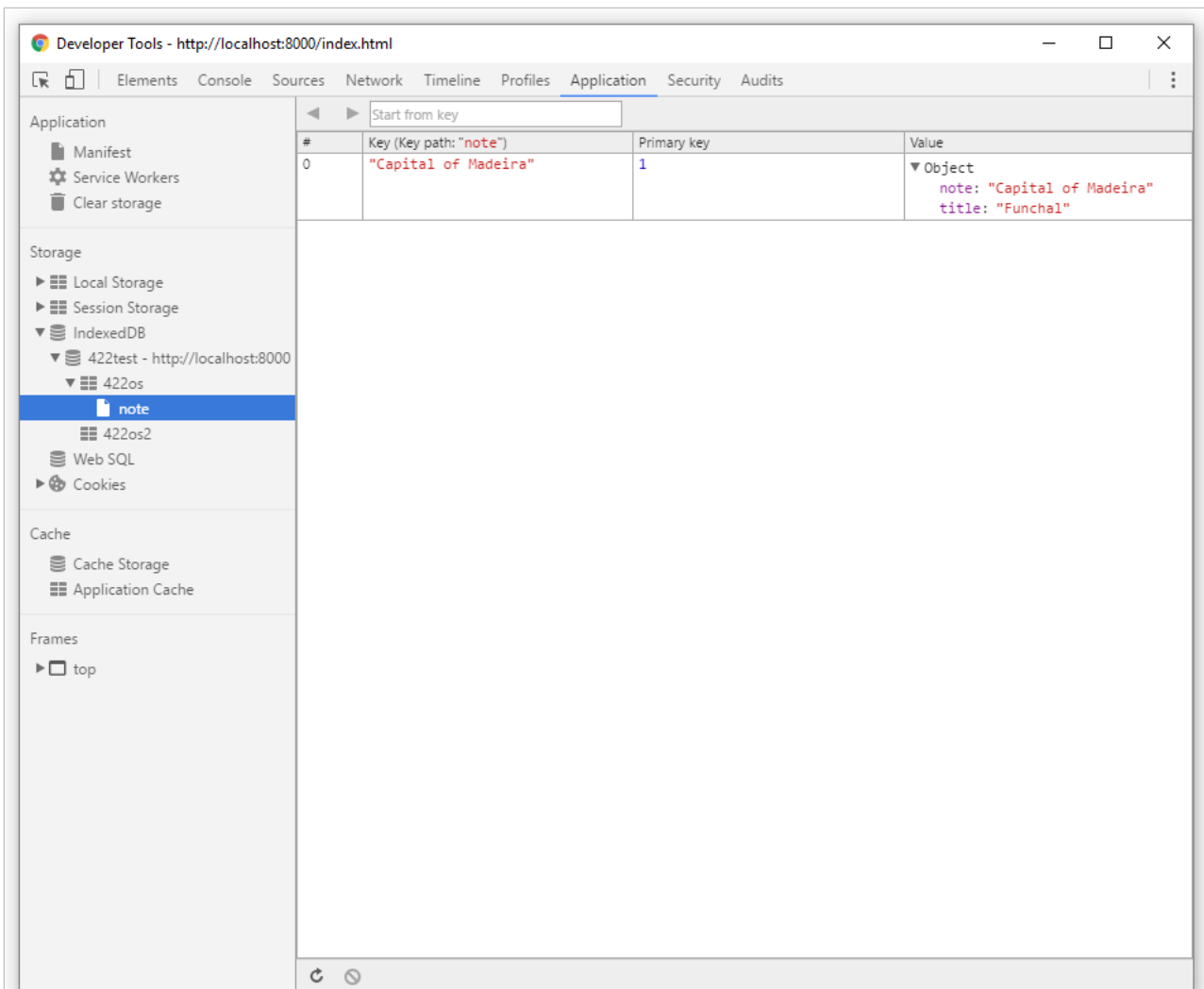


The screenshot shows a web browser's developer console with the IndexedDB storage area expanded. The left sidebar lists storage types: Frames, Web SQL, IndexedDB, Local Storage, Session Storage, Cookies, and Application Cache. Under IndexedDB, a database named '422test - file:/' is expanded, showing two stores: '422os' (selected) and '422os2'. The main panel displays a table of data for the '422os' store. The table has three columns: '#', 'Key', and 'Value'. There is one data row with index 0, key 1, and value '{title: "Funchal", note: "Capital of Madeira"}'. Below the table, the text 'DataTest2 - test IndexedDB - save data to store 2' is displayed.

#	Key	Value
0	1	{title: "Funchal", note: "Capital of Madeira"}

DataTest2 - test IndexedDB - save data to store 2

Image - IndexedDB Support



DataTest2 - test IndexedDB - save data to store 3

Cordova app - IndexedDB - data test 2

database - part 14 - multiple notes

- now created our IndexedDB
- created the object store
- setup the app's HTML and form
- and saved some data to the database...
- update our application to allow a user to add multiple notes to the database
- currently setting our key for a note in the `saveNote ()` function
 - *add another note, we get a constraint error output to the console*
 - *we're trying to add a note to an existing key in the database*
- need to update our logic for the app
 - *to allow us to work more effectively with **keys***

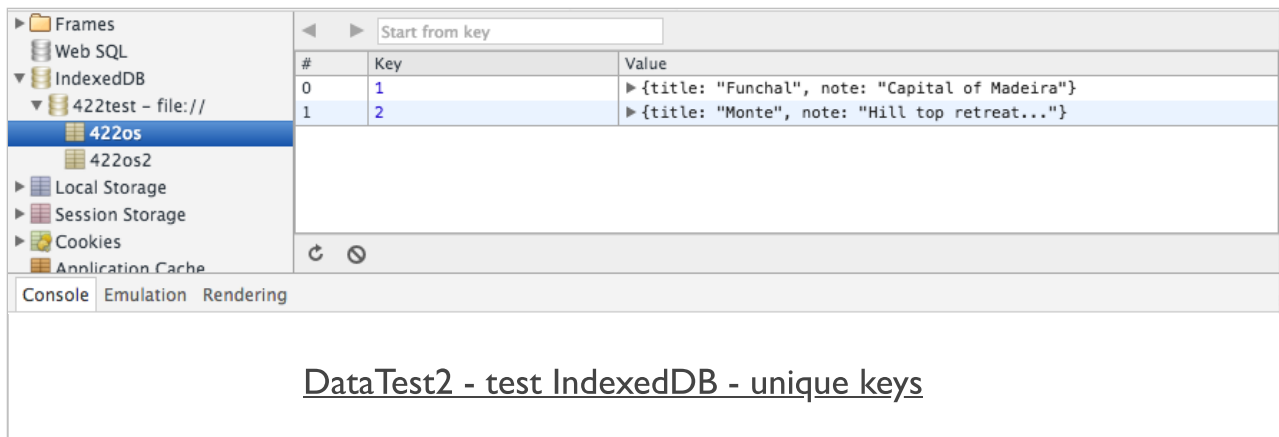
Cordova app - IndexedDB - data test 2

database - part 15 - keys

- keys in IndexedDB often considered similar to primary keys in SQL...
 - *a unique reference for our data objects*
- traditional databases can include tables without such keys
 - **NB:** every object store in IndexedDB needs to have a **key**
 - *able to use different types of keys for such stores*
- first option for a key is simply to create and add a key ourselves
 - *could programmatically create and update these keys*
 - *helps maintain unique ID for keys*
- could also provide a **keypath** for such keys
 - *often based on a given property of the passed data...*
 - *still need to ensure our key is unique*
- other option is to use a key generator within our code
 - *similar concept to SQL auto-increment*

```
db.createObjectStore("422os", { autoIncrement: true });
```


Image - IndexedDB Support

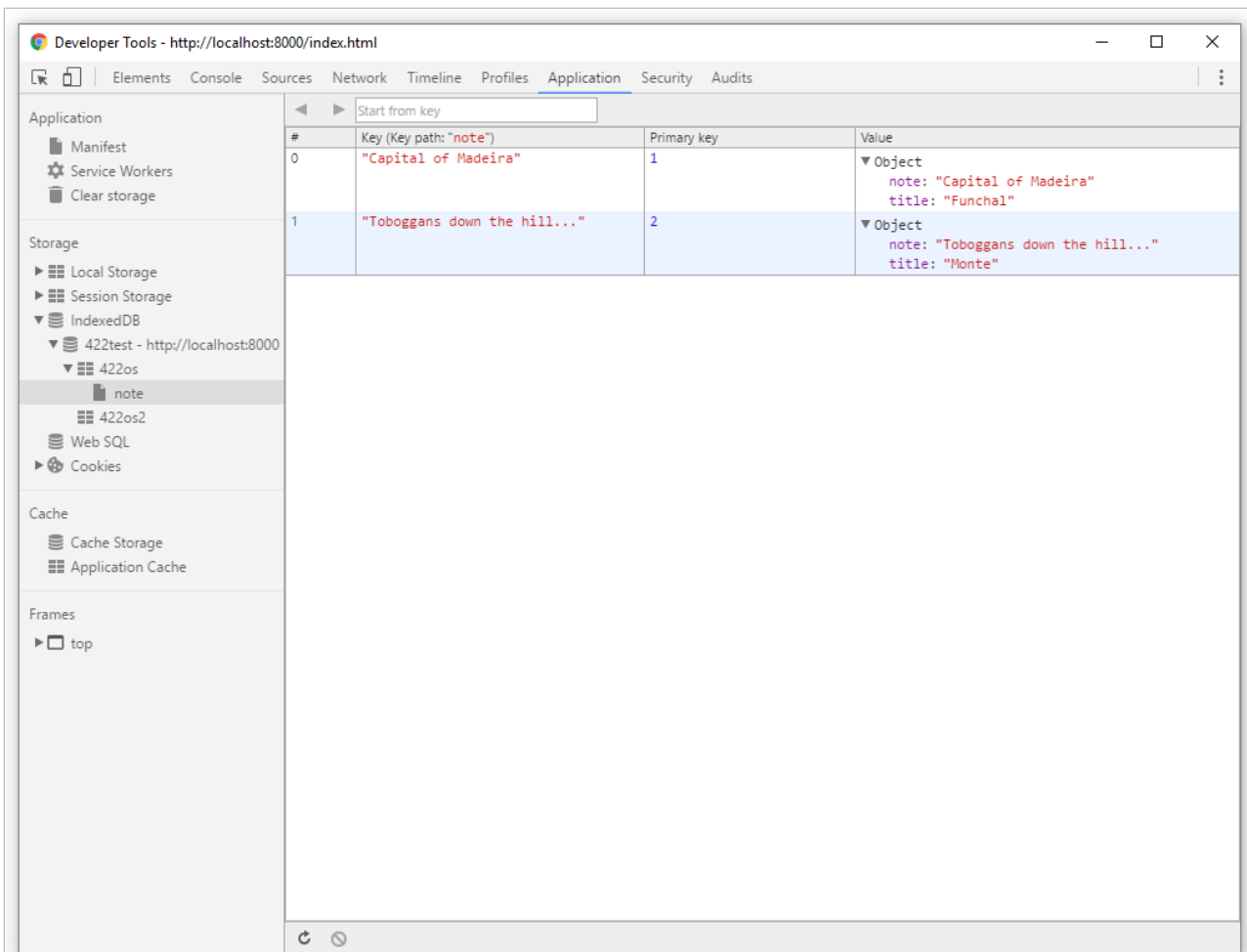


The screenshot shows a web browser's developer tools interface. On the left, the 'IndexedDB' section is expanded, showing a database named '422test' with two objects: '422os' and '422os2'. The '422os' object is selected, and its data is displayed in the main pane. The data is a table with two columns: '#', 'Key', and 'Value'. The table contains two rows of data. The first row has a key of '1' and a value of '{title: "Funchal", note: "Capital of Madeira"}'. The second row has a key of '2' and a value of '{title: "Monte", note: "Hill top retreat..."}'.

#	Key	Value
0	1	{title: "Funchal", note: "Capital of Madeira"}
1	2	{title: "Monte", note: "Hill top retreat..."}

Below the table, there is a search bar labeled 'Start from key' and a 'Console' tab. The console shows the message: DataTest2 - test IndexedDB - unique keys

Image - IndexedDB Support



DataTest2 - test IndexedDB - unique keys 2

Mobile Design & Development - Data Usage and Persistency

Fun Exercise

Four apps, one per group

- Book Exchange Map -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/books/>
- Chat Map -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/chat/>
- Cycle Map -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/cycle/>
- Physio Map -
<http://linode4.cs.luc.edu/teaching/cs/demos/422/gifs/physio/>

For your assigned app, consider the following

- relevant use of mapping and geolocation within the app
 - *does the map &c. help the app?*
 - *what is the value of geolocation in the app?*
- what type of data needs to be stored in this app?
 - *local options...*
 - *remote or cloud options...*

~ 10 minutes

References

- Aaron, Marcus. *Graphic Design for Electronic Documents and User Interfaces*. ACM Press. 1992.
- Cordova API
 - *plugin - camera*
 - *plugin - file*
 - *plugin - geolocation*
- Cordova Guide
 - *app templates*
- GitHub
 - *cordova-plugin-indexeddb*
- MDN
 - *IndexedDB*