

# Designing Mobile Applications



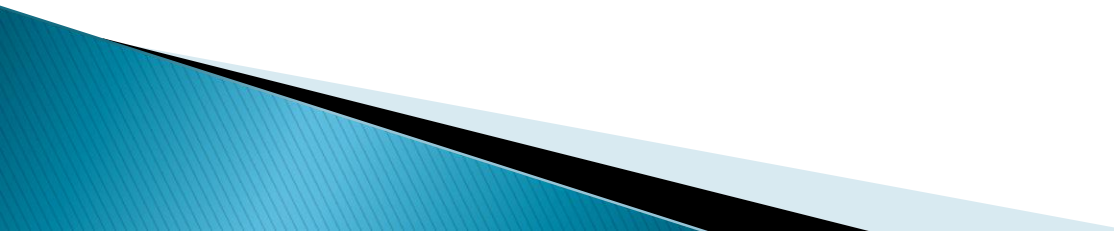
# Don't believe me, believe Google!



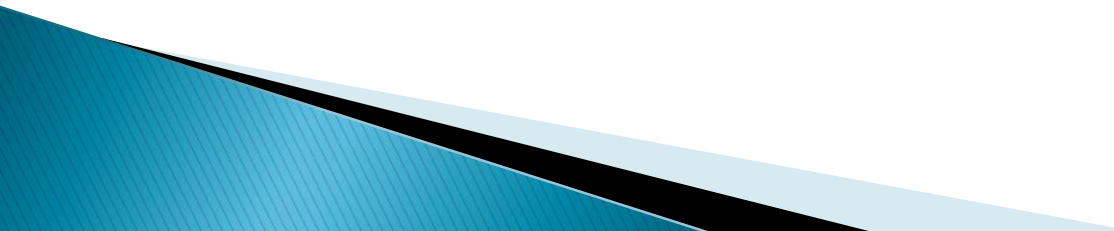
Google programmers are doing work on mobile applications first because they are better apps and that what top programmers want to develop.

Eric Schmidt

# Why starting with mobile?

- ▶ Growth = Opportunity
  - ▶ Constraints = Focus
  - ▶ Capabilities = Innovation
- 

# Considerations

- ▶ Multiple screen sizes and densities
  - ▶ Performance optimization
  - ▶ Touch targets, gestures and actions
  - ▶ Location systems
  - ▶ Device capabilities
- 

Growth = Opportunity



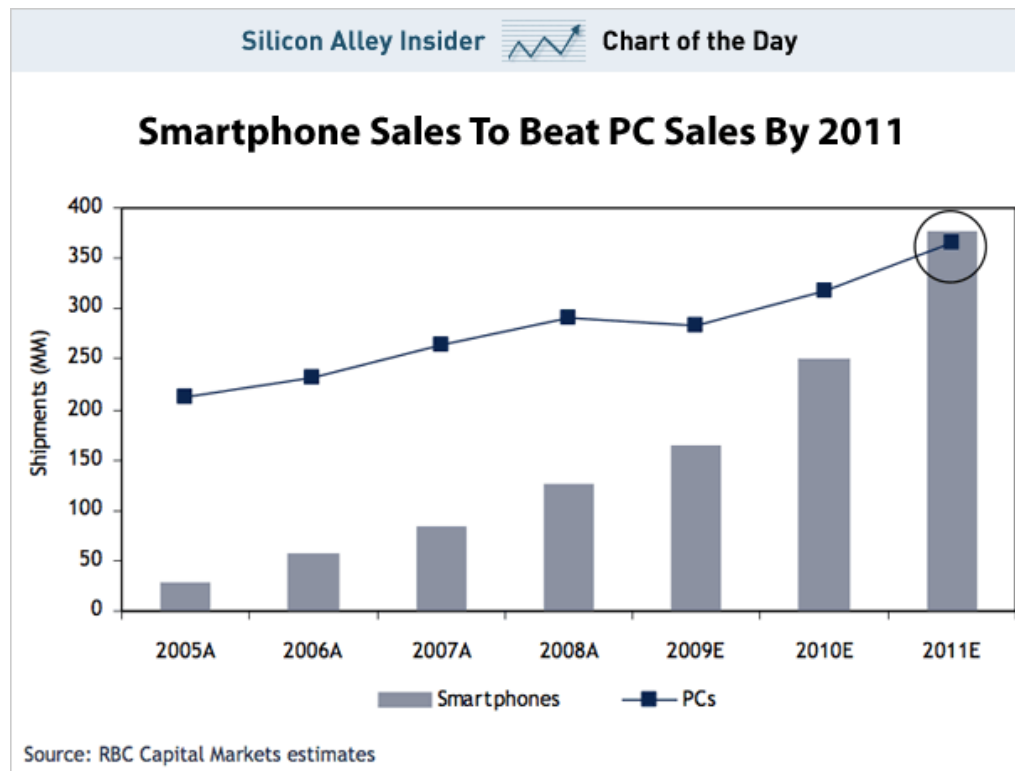
# Growth = Opportunity



In next years up to 90% of the mobile market will be smartphones

# Growth = Opportunity

- ▶ Mobile web growth has outpaced desktop web growth 8x





# Growth = Opportunity

- ▶ People come online on mobile first on new markets.





# Constraints = Focus



# Constraints = Focus

- ▶ Screen size
  - Focus on core actions
  - Know your users
  - Use scalable design

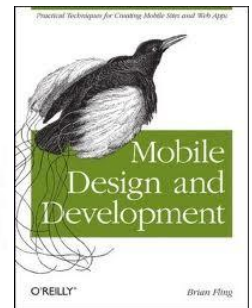
# Constraints = Focus

Create a product!

Don't just reimagine one for small screens.

Great products are created from scratch never ported!

Brian Fling





My goal was initially just to make a mobile companion, but I became convinced that it was possible to create a version of FB that was actually better than the website.

Joe Hewitt

# Screen size



# Focus on core actions

- ▶ The main function should be immediately apparent !!

# Focus on core actions

The screenshot displays the Southwest Airlines website interface. At the top, the Southwest logo is on the left, and a search bar with the text "Search Southwest" and a "GO" button is on the right. Below the logo is the tagline "The Southwest Difference" and links for "Sign Up 'n Save", "Help", and "Travel Tools".

The main navigation bar includes "Special Offers" (Travel Deals & Packages), "Air", "Car", "Hotel", "Vacations", "Travel Guide" (Forums & Destination Suggestions), and "Rapid Rewards®" (Earn Flights Faster). Below this is a "WHY FLY SOUTHWEST" link.

The central banner features a "Get A Free Holiday Photo Before You Fly" promotion with a "Learn More" button. To the left of the banner is a flight search form with tabs for "Air", "Car", and "Hotel". The "Air" tab is active, showing options for "Round Trip" or "One-Way", "From", "To", "Depart", "Return", "1 Adult age", "0 Seniors 65", and a "Promo Code" field. A "Search" button is at the bottom of the form. Below the search form is a "Where We Fly Advanced Search" link.

On the right side of the banner, there are "Quick Air Links" (Check In, Change Flight, Check Flight Status), "My Account" (Enroll Now, Rapid Rewards #, Password, Remember me, Log In), "Manage Travel", "Rapid Rewards", and "Travel Guide".

Below the banner, a "News" section states: "During the busy holiday travel season, you can scratch bag fees off of your to-do list. Bags Fly Free® on Southwest." Below this are three sections: "Air" (View All Offers), "Hotel" (View All Offers), and "Car" (View All Offers). Each section lists travel deals and offers.

On the right side of the page, there are two promotional banners: "Jackpot" (Earn Double Credit on Las Vegas Jackpot Packages) and "Play Cart Commander" (For A Chance To Win Big).

At the bottom right, there is an "EarlyBird Check-In" section with a lightbulb icon, listing benefits: Automatic Check-In, Better Seat Selection, Earlier access to overhead bins, and a price of "All for only \$10 one-way". A "Learn more" link is provided.



# Focus on core actions



# Focus on core actions

Bank of America

Locations • Contact Us • Help • Sign In • En Español

Enter keyword(s) Search

PERSONAL • SMALL BUSINESS • CORPORATE & INSTITUTIONAL • ABOUT BANK OF AMERICA •

**Online Banking**

Easy. Secure. Free.  
Enroll View demo | Learn more

Enter Online ID:  
[Input field]  
Save this Online ID  
Account in:  
[Dropdown menu]  
Where do I enter my Passcode?  
Sign In

Forgot or need help with your ID?  
Reset Passcode

**Your Privacy & Security**  
Report phishing email  
McAfee® - 1 year free  
Know your credit scores  
Our security commitment

**ATMs & Banking Centers**  
Enter ZIP code or city, state  
[Input field] Go  
More search options

**Help for homeowners facing hardship.**  
Find out more »

**Sign in to other services**  
Military Bank Online  
Online Investing  
Wealth Management Online  
Privacy Assist®  
Future Scholar

**Find the best checking account for you. Open online in minutes.** Learn more

**Products & Services**  
Checking  
Savings & CDs  
Credit Cards  
Mortgage  
Refinance  
Home Equity  
Auto Loans  
Insurance & Protection  
IRAs  
Open an Account »

**Manage Your Money**  
Merrill Edge Online  
Investing  
Order Debit Card  
Facts About Fees  
Online Banking »  
View Your Accounts  
Bill Pay  
Use Mobile Banking  
Track Your Expenses  
Enroll in Online Banking »

**Achieve Your Goals**  
Investment Services  
Merrill Lynch  
Plan for Retirement  
Keep the Change®  
Add It Up™ Cash Back  
Financial Solutions  
Student Banking  
Search for a Home  
More Options »

Get a \$50 statement credit after qualifying transaction(s). Get started >>

Bank safer online: Online Banking offers guaranteed security. Learn more >>

UP TO 20% CASH BACK  
Add It Up® Earn up to 20% cash back at over 400 retailers. Earn More >>

Online Bill Pay. Manage your payments online anytime. Learn More »

Facing financial hardships? We may be able to help. Learn More »

Notice Of Changes In Temporary FDIC Insurance Coverage For Transaction Accounts. Learn More »

As of January 1, 2010 Bank of America no longer participates in the FDIC's Transaction Account Guarantee Program. Coverage under the FDIC's basic deposit insurance rules continues to apply. Learn More »



Carrier 3:03 PM

Bank of America

**Main Menu**

Mobile Banking Sign In >

Locations Near Me >

What is Mobile Banking? >

About Bank of America >

www.bankofamerica.com

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# Focus on core actions



- ▶ 60 menu items on the actual website
- ▶ 9 items on the mobile version



# App design matters!

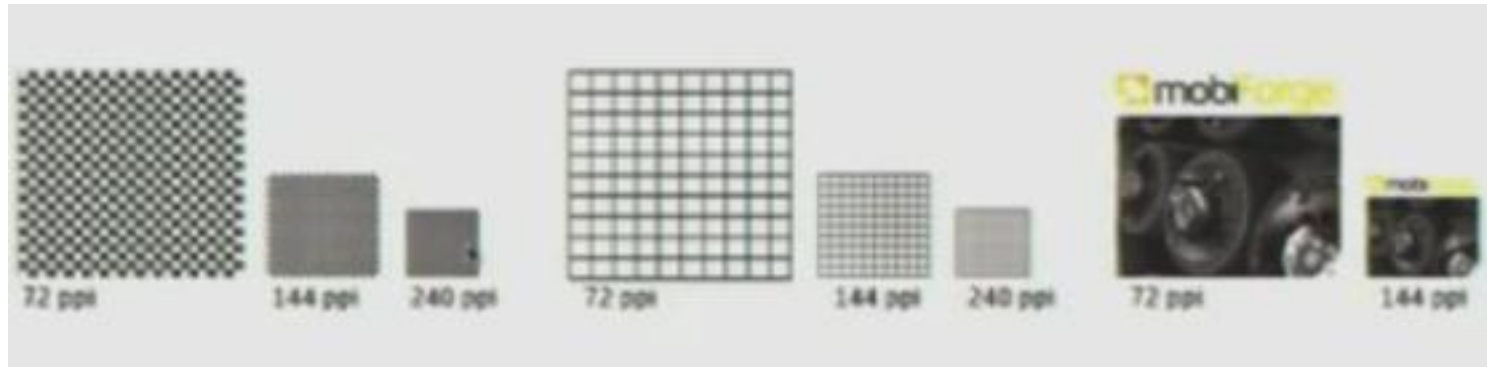
- ▶ Users are expecting a well designed mobile experience



# Design for multiple screen sizes

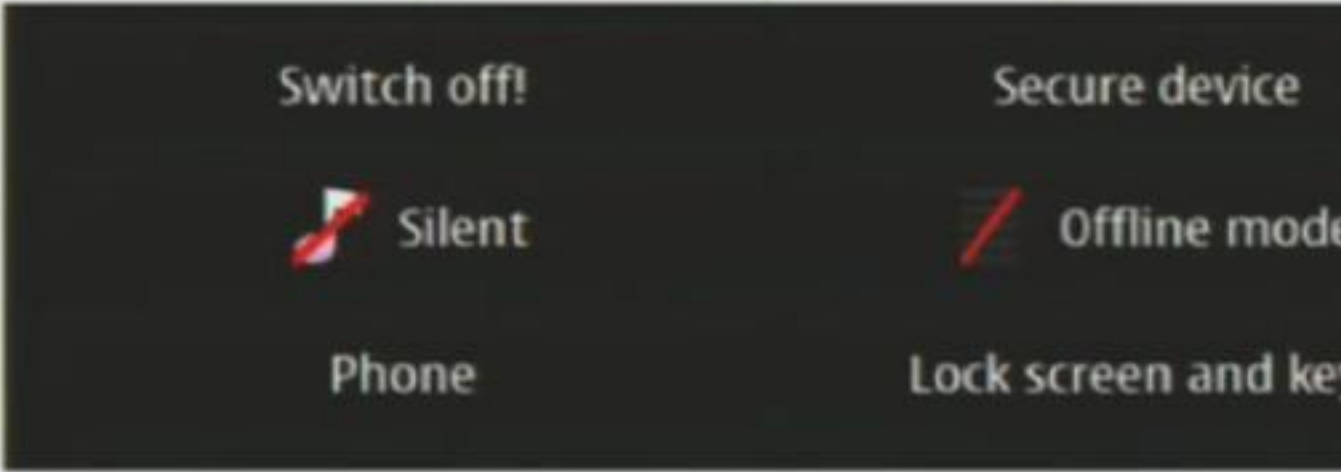

- ▶ Iphone 3G
  - 320x480 3,5in 164ppi
- ▶ Motorola Droid, Nexus One
  - 480x854 3.7in 264ppi
- ▶ Iphone 4
  - 960x640 3,5in 326ppi

# The impact of ppi

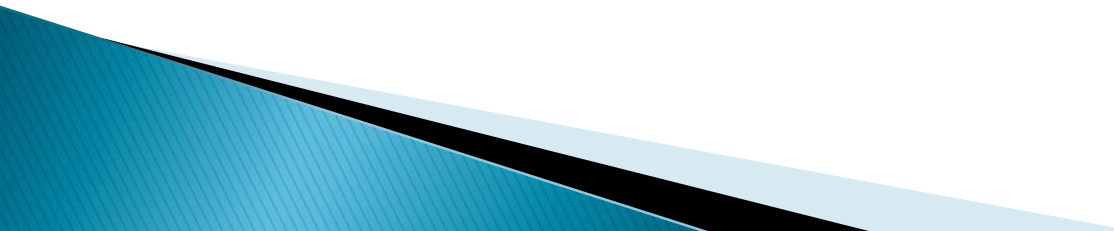




# The impact of ppi

Cinema Display	1920x1200	24 in	94ppi
			
Nokia N900	800x480	3.5 in	266ppi
			

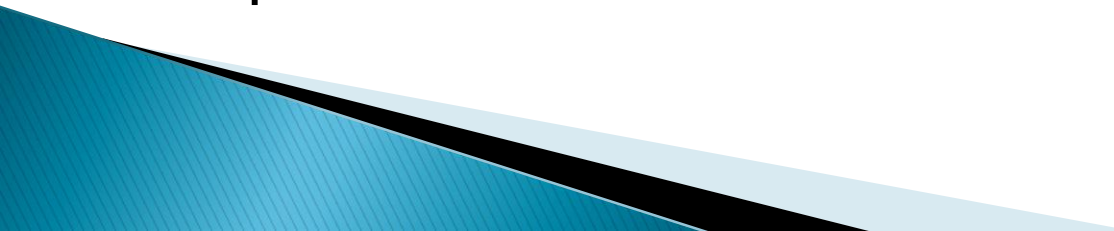
# What devices are we targeting?

- ▶ Define device groups
  - ▶ Create a default reference design
  - ▶ Define rules for content and design adaptation
  - ▶ Opt for web standards and flexible layout
- 

# Speed



# Some tips

- ▶ Keep performance on top of mind
    - Reduce requests and file size
    - Eliminate redirects
    - Use css sprites to serve multiple images
    - Consolidate css and js into a single file
    - Minify your code
  - ▶ Take advantage of HTML5
    - Load content lazily
    - Use application cache for local content storage
    - Use css 3 and canvas tag instead of images where possible.
- 

# Performance matters



100ms delay results in 1% sales loss



500ms delay drops search traffic by 20%  
According to study if you do it consistently over a period of 2 weeks you lose the users permanently.



400ms delay results in 5–9% drop in full page traffic

# Context

- ▶ Quick bursts everywhere
- ▶ One handed interactions !!



### During a typical day

- ▶ 84% at home
- ▶ 80% during misc times throughout the day
- ▶ 74% waiting in lines
- ▶ 64% at work



# Use cases for mobile apps

- ▶ Social

- Facebook, Twitter

- ▶ Entertainment

- Angry Birds

- ▶ Communication

- Email, Skype

- ▶ Local

- Yelp, Maps

- ▶ Information

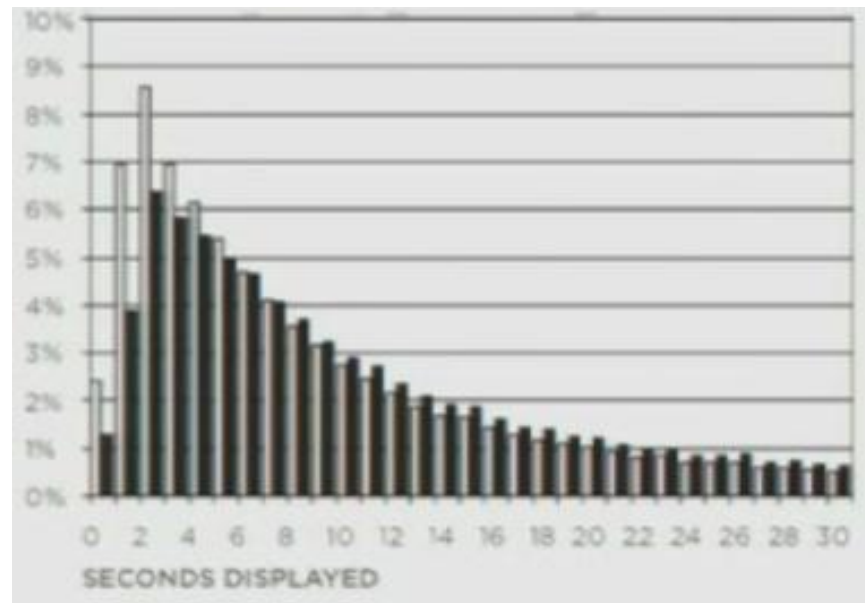
- Google search, Wiki

- ▶ Utilities

- Calendar, Flashlight

# Browsing patterns

- ▶ 25% of documents displayed for less than 4s
- ▶ 52% of all visits were shorter than 10s
- ▶ Peak value was located between 2 and 3 sec



# One handed interactions

- ▶ Simplify UI
- ▶ Big buttons

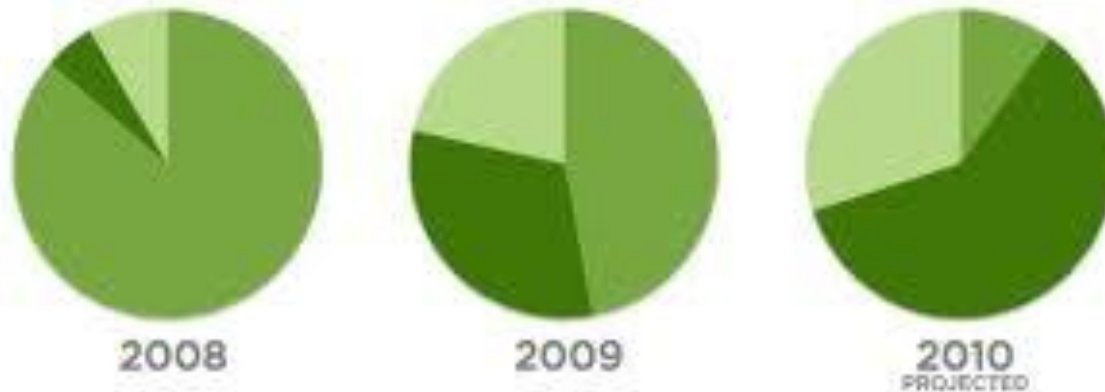
# Capabilities = Innovation



# Touch

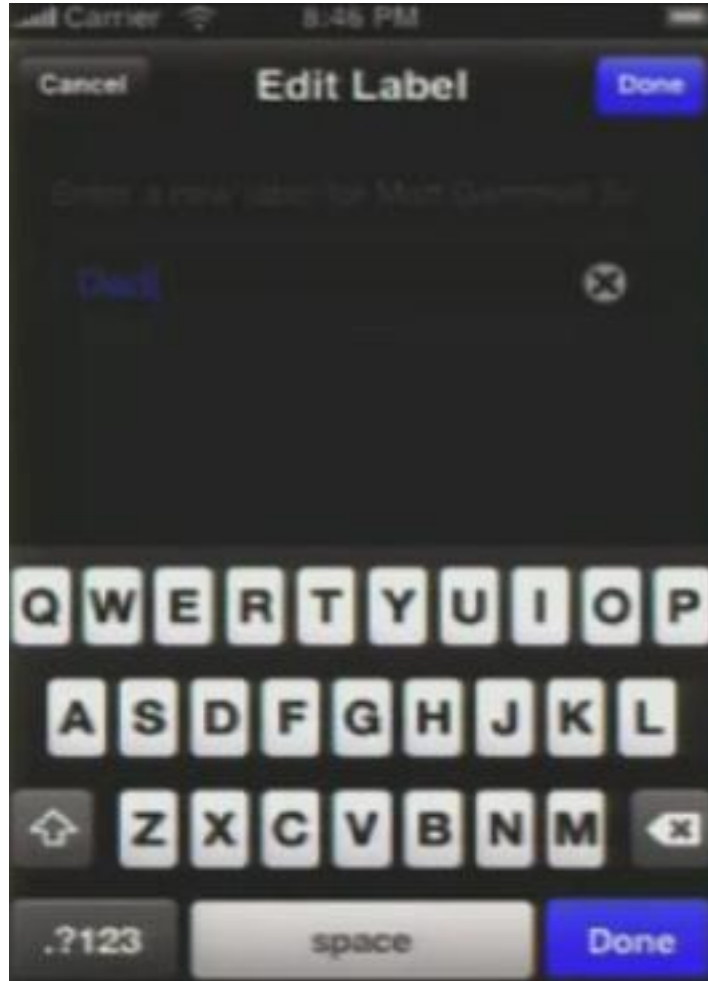
## Nokia smartphone mix

■ Keypad ■ Qwerty Only ■ Touch INCLUDES QWERTY + TOUCH



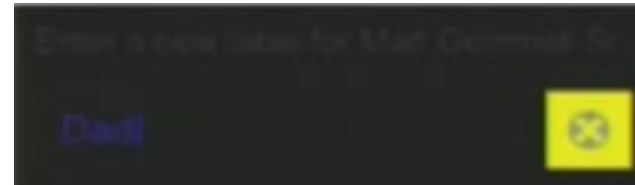
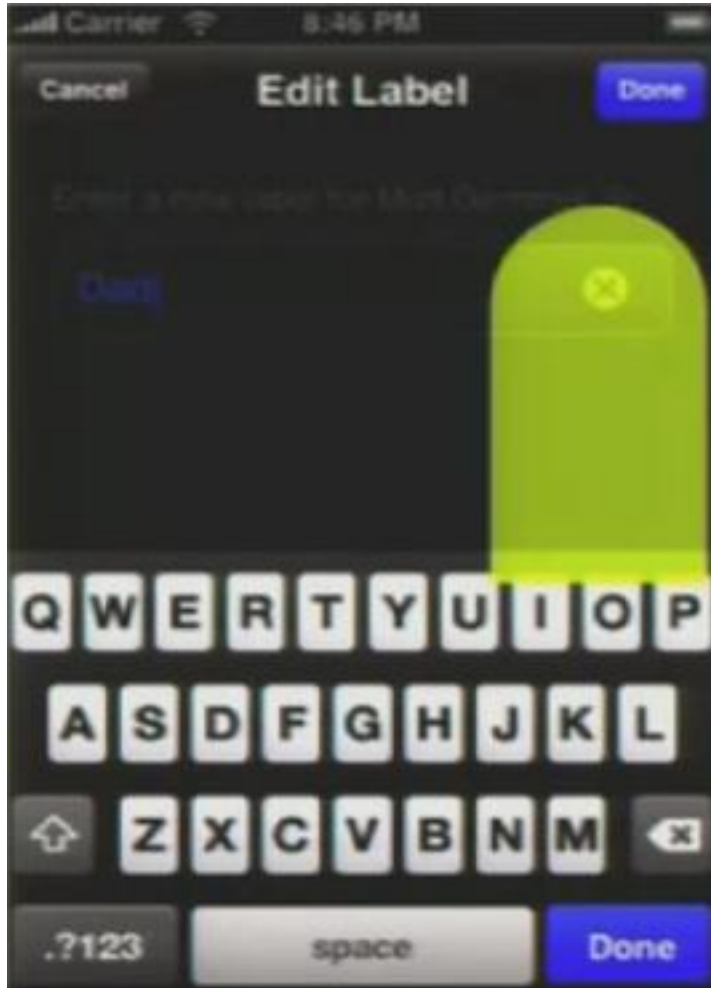
Source: Nokia - Nokia Capital Markets Day 2009

# Touch



- ▶ Apple recommends a minimum target size
  - 29px wide
  - 44px tall

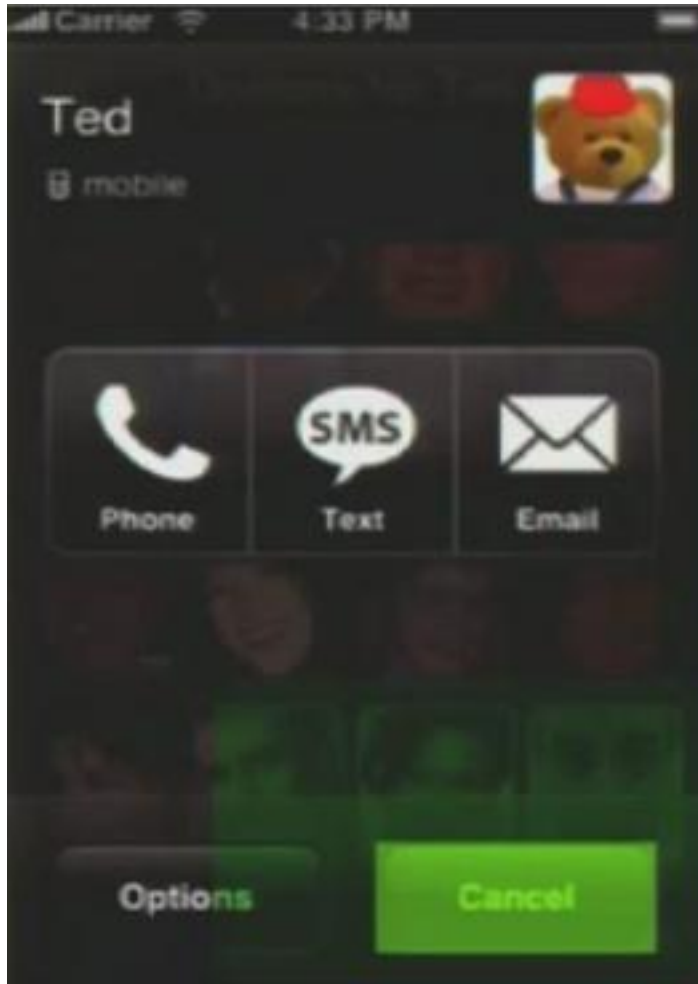
# Touch



- ▶ Apple recommends a minimum target size
  - 29px wide
  - 44px tall

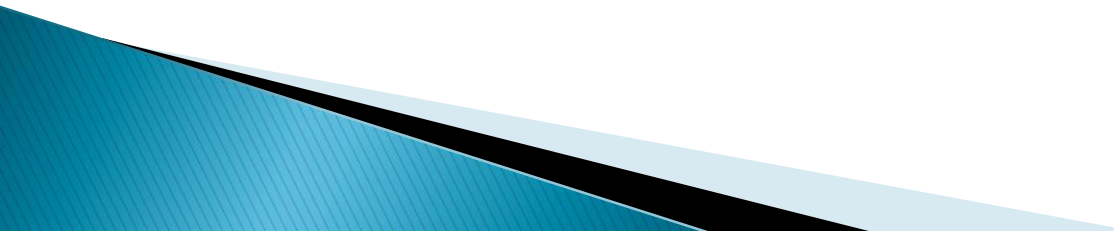


# Target sizes for slipping fingers



- ▶ Add room for error

# Touch gestures

- ▶ Tap (multi)
  - ▶ Double tap
  - ▶ Drag (multi)
  - ▶ Flick
  - ▶ Pinch (multi)
  - ▶ Spread (multi)
  - ▶ Press
  - ▶ Press & tap
  - ▶ Press & drag
  - ▶ Rotate
- 

# Tap & Press

Tap



Press



Multi-finger  
tap



Press  
and tap

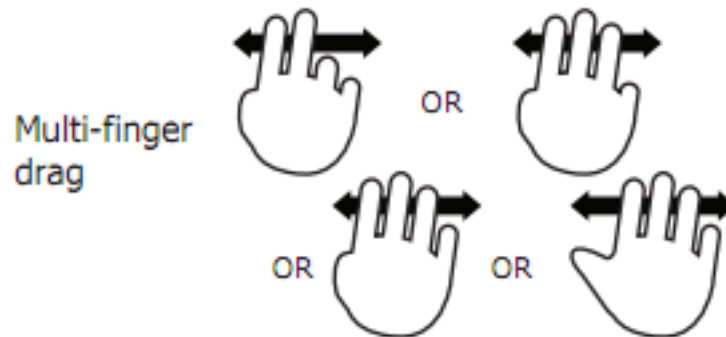


1



2

# Drag

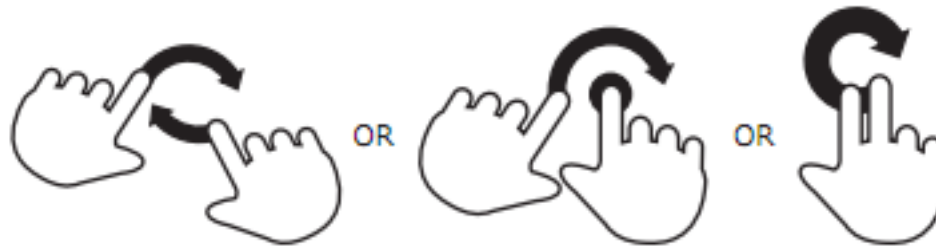


# Pinch & spread

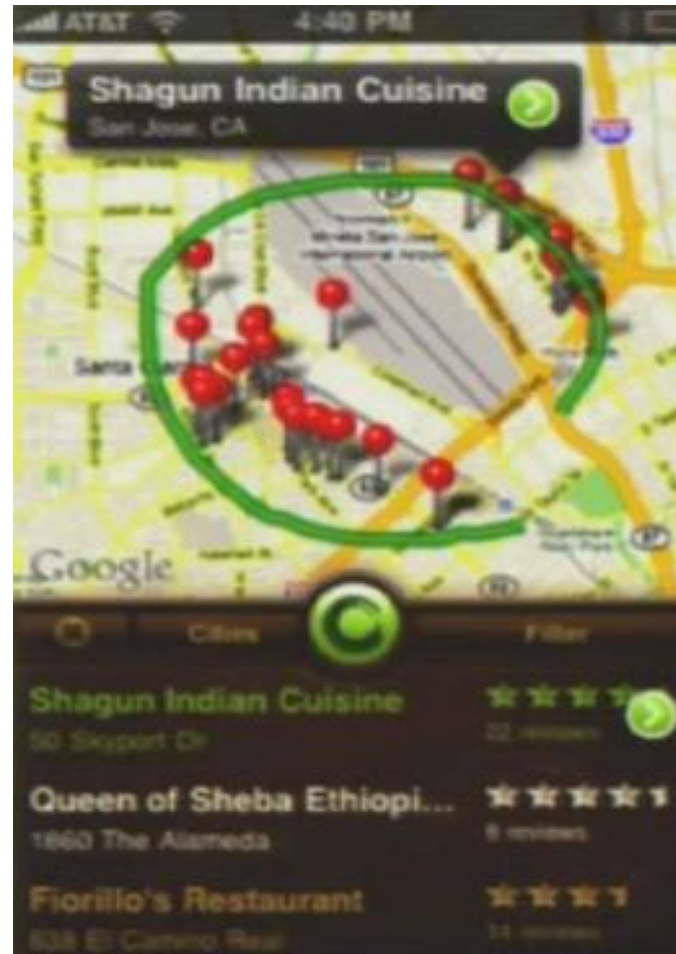


# Rotate

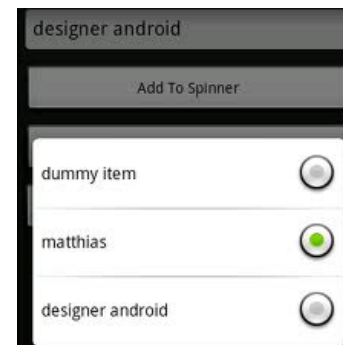
Rotate



# Gestures as input



# Comboboxes





# Picker controls




October	23	2005
November	24	2006
December	25	2007
January	26	2008
February	27	2009

# No hover

- ▶ Maybe good because of hover overload
  - Hover is not an intentional user action



# Location as input

  
Real people. Real reviews.®


San Francisco, CA

WelcomeAbout MeWrite a ReviewFind ReviewsInvite FriendsMessagingTalkEventsMember Search

Yelp San FranciscoOther Cities | New York | San Jose | Los Angeles | Chicago | Palo Alto | Oakland | More »

 Yelp is the fun and easy way to find and talk about great (and not so great) local businesses

**Best of yelp**  
4462 reviewed



1. Rancho Parnassus
2. Chiotras Grocery
3. Smitten Ice Cream
4. Deli Board
5. Gary Danko

[...see more »](#)


**Restaurants**  
6969 reviewed



1. Edgewise Arts
2. Jon Casey...
3. Michael Bruno...
4. Chabo's Jewelry
5. Just Bands

[...see more »](#)

**Shopping**  
3021 reviewed



1. Cyclops Tattoo
2. Alisha Valverde...
3. Lyle Tuttle...
4. Aesthetics by...
5. Lucky Van's Tattoo

[...see more »](#)

**Beauty and Spas**  
3021 reviewed

**Nightlife**  
1210 reviewed




1. Red Hots Burlesque
2. Viracocha
3. Brava Theater Center
4. 9:20 Special
5. SFJAZZ

[...see more »](#)

**Best of yelp**

**Browse by Category**

- Professional Services 8487
- Shopping 7113
- Health and Medical 6836
- Home Services 5729
- Restaurants 4556
- Food 3631
- Beauty and Spas 3097
- Local Services 3002
- Event Planning & Services
- Arts & Entertainment 2166
- Active Life 1949
- Real Estate 1829
- Hotels & Travel 1590
- Education 1552
- Automotive 1491
- Nightlife 1222
- Financial Services 1152
- Pets 655
- Mass Media 487
- Public Services &... 485
- Local Flavor 410
- Religious Organizations 366

**Get the Yelp app on your mobile phone**  
It's free and helps you find great, local businesses on the go!

**Yelp Deals**  
Deal ends in 22:17:55

**\$50 for \$100 Worth of Jewelry**  
Mabel Chong  
★★★★☆ 20 reviews  
Reg. Price Discount Savings  
\$100 50% \$50

**Review of the Day**

Voted by our members!



Vivian H.

Yu Zen  
4.5

Lately, it seems as if Japanese food is all I like to eat. I really wanted to try traditional Japanese food at Kappou Gomi, but then I started to crave for fresh, raw fish. Off to Yu Zen! Of... [Read more »](#)

# Location as input



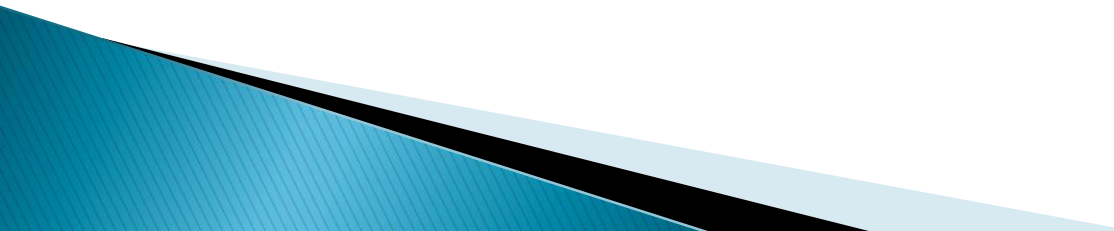
# Geo location methods

- ▶ GPS
  - Best quality
  - High battery consumption
- ▶ Wifi
  - 100m accuracy
- ▶ Cell tower triangulation
  - Minimal battery consumption
  - Good for most cases
- ▶ IP address
  - Only good on a country level. Maybe city.

# Context aware computing

- ▶ Being in a place provides context
  - What can you infer now ?
- ▶ Throw time in the mix
  - How about now?

# Mobile Device Capabilities

- ▶ Application cache for local storage
  - ▶ CSS 3 & Canvas for performance optimization
  - ▶ Multitouch sensors
  - ▶ Location detection
  
  - ▶ Device positioning & motion: Accelerometers
  - ▶ Orientation: Digital compass
  - ▶ Audio: Microphone
  - ▶ Video & Image: Camera
  - ▶ Push real-time notifications
  - ▶ Peer to Peer connections: Bluetooth or WiFi
  - ▶ Ambient light: light/dark environment awareness
  - ▶ RFID reader: identify & track objects with broadcasted identifiers
  - ▶ Haptic feedback: feel different surfaces on a screen
  - ▶ Biometrics: retinal, fingerprints, etc.
- 

# Multiple orientation

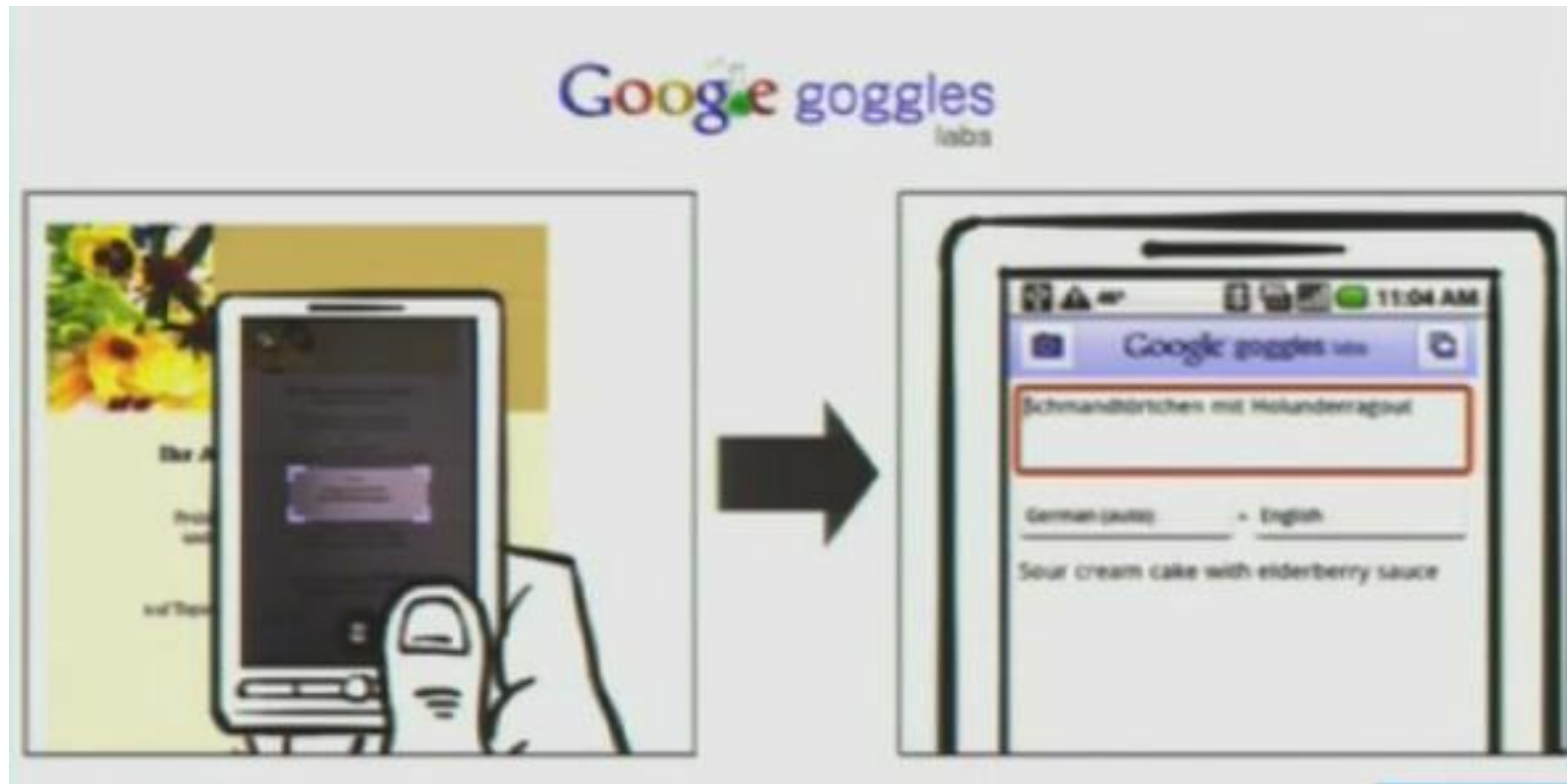




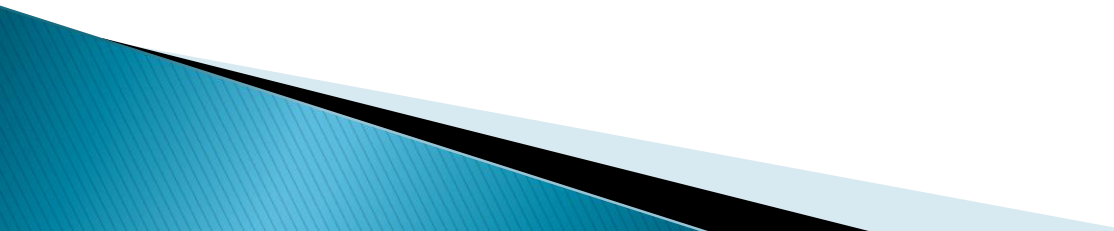
# Location and Orientation as input



# Images as input



# So what are my options?

- ▶ Native
    - Objective C, Java Android
  - ▶ Web
    - HTML5, CSS3, Javascript
  - ▶ Hybrid?
    - PhoneGap, Titanium, Rhodes
- 

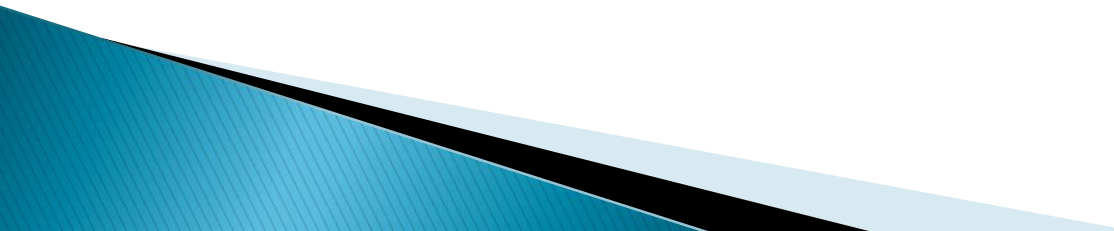
# Iphone vs Android



# Iphone vs Android



# Dive into technical stuff

- ▶ What is AJAX ?
  - ▶ How to make asynchronous Web requests ?
  - ▶ Using jQTouch to set up touch events.
  - ▶ Animations with jQTouch.
- 

# jQuery recap

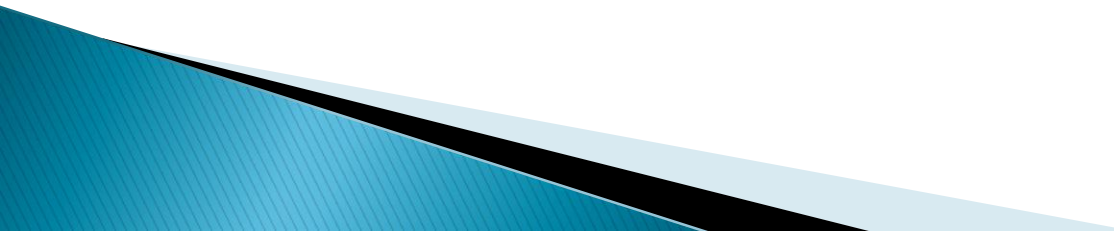
- ▶ `$("#hello"); //id:hello`
- ▶ `$(".hello"); //class:hello`
- ▶ `$("div"); //all divs`
- ▶ `$("div", "#main"); // all divs inside main`
- ▶ `$("div").each(function(){  
    $(this).doSomething();  
}); // act on every div`
- ▶ `$("#hello").css("background-color", "black");`

# Network & Javascript





# Topics

- ▶ GET vs POST
  - ▶ Asynchronous vs Synchronous
  - ▶ XML vs JSON
- 

# Basics: GET & POST

- ▶ **GET** `http://example.com/index.html?hello=yes&goodbye=no`
  - No message body
  - Query is in the URL
  - Shouldn't change data on server
- ▶ **POST** `http://example.com/index.php`
  - Message body has parameters
  - Can have side-effects, change data on server
  - Can carry more data
  - This is an *action*

# In other words...

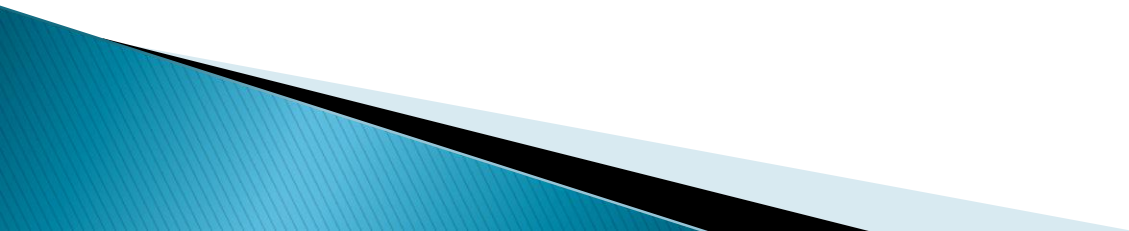
- ▶ *fetch using GET*
- ▶ *change using POST*

# AJAX

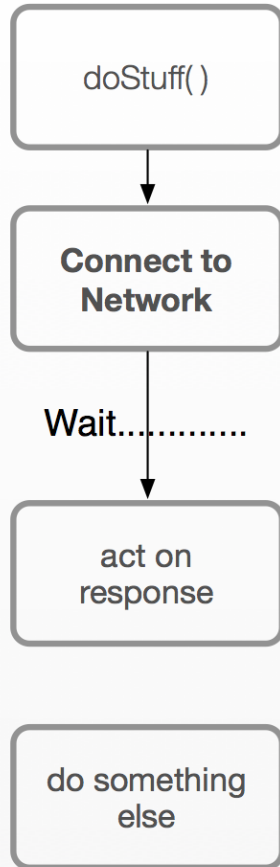
**Asynchronous  
Javascript  
And  
XML**

# What does asynchronous mean?

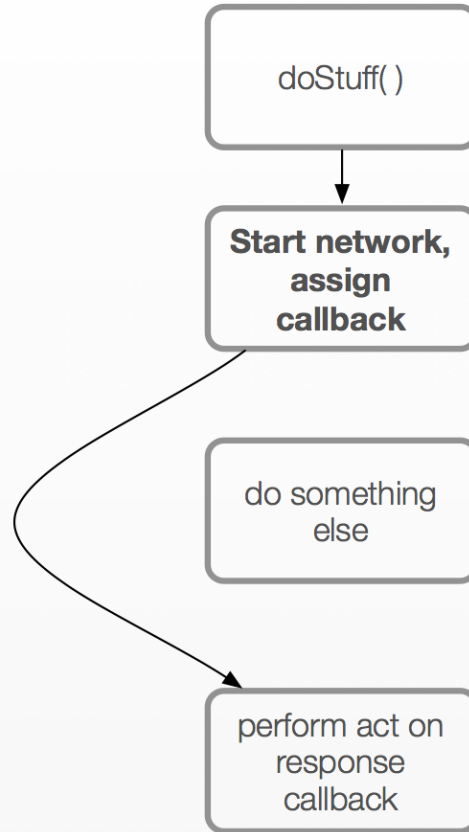
- ▶ In context of network connections: let other stuff happen while a network request is going on



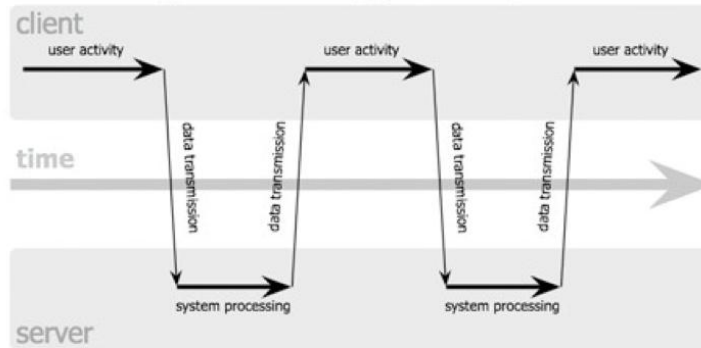
## Synchronous



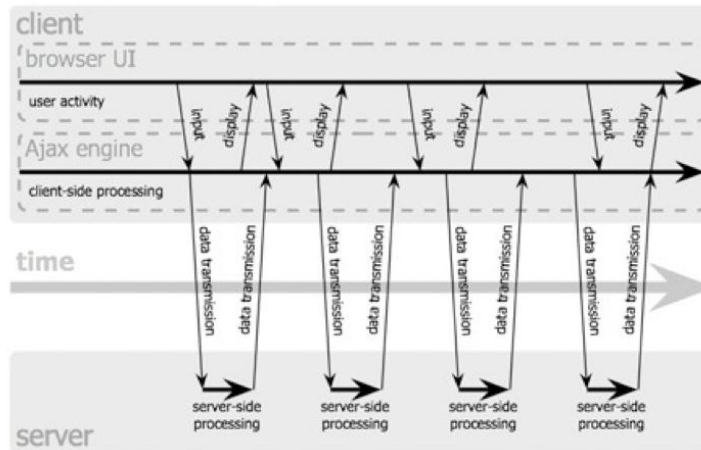
## Asynchronous



### classic web application model (synchronous)



### Ajax web application model (asynchronous)



# XML?

- ▶ Many people use JSON instead of XML
  - easier to build/parse than XML

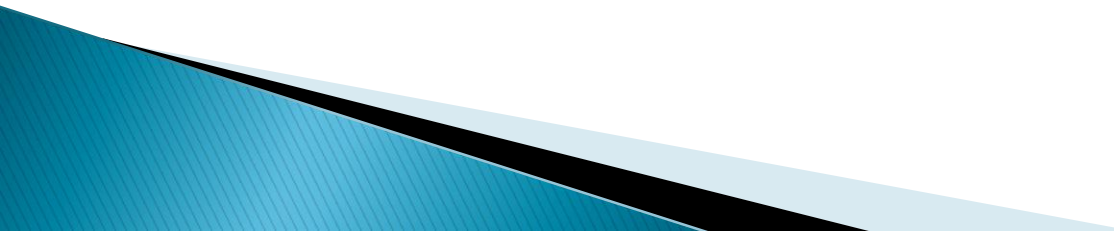


# What is JSON?

- ▶ **JavaScript Object Notation**
  - Takes the array, object, and string notation from JS & makes it a transport format (can send around a string that evaluates to JSON)

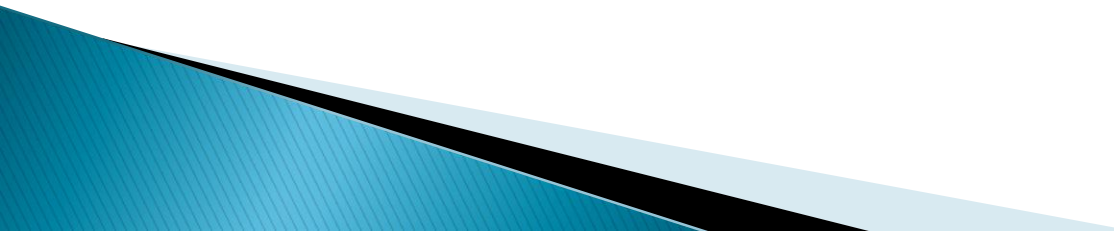
# Sample JSON

```
{  
  classes: [{  
    "name": "SAE",  
    "location": "Amph 1"  
  }, {  
    "name": "Diktia",  
    "location": "Aith 2"  
  }  
]}
```



# Sample JSON

```
{
  classes: [{
    "name": "SAE",
    "location": "Amph 1"
  }, {
    "name": "Diktia",
    "location": "Aith 2"
  }
]} // this is an object with an array inside that
    contains two objects
```



# JSON.parse( )

- ▶ Takes JSON data, encoded in a string
- ▶ Returns an object you can use in JS

# Example

```
>> var a = "[5,4,3,2,1,\"hello\"]"
```

```
>> var b = JSON.parse(a);
```

```
>> a.length
```

```
6
```

```
>> a[5]
```

```
"hello"
```



# JSON.stringify

- ▶ Takes a Javascript Array, Object, or String, and turns it into JSON

# Example

```
var a = {"dog":"bark", "cat":"meow"};
```

```
>> JSON.stringify(a);
```

```
"{\\"dog\\":\\"bark\\", \\"cat\\":\\"meow\\"}"
```

# Asynchronous Requests in jQuery

- ▶ overall function: `.ajax()`
  - Shortcuts: `.get`, `.post`, `.getJSON`



# \$.ajax

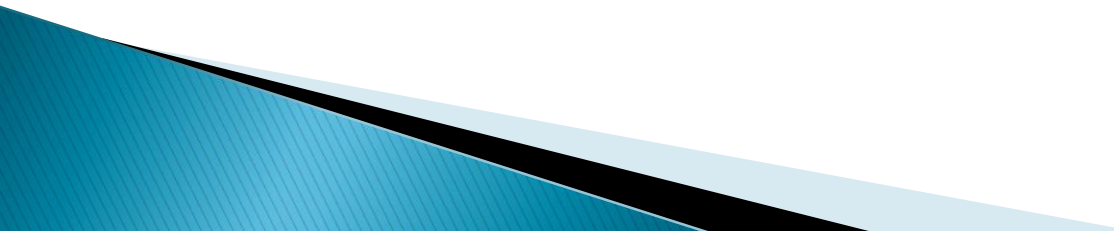
```
var options = {  
  data: {  
    "animals":["dog", "cat", "cow"]  
  },  
  dataType: "json",  
  error: onError,  
  success: successFn,  
  url: "/postAnimal.php"  
};  
  
$.ajax(options);
```

# Success & Failure

```
response: {'dog':'bark', 'cat':'meow', 'cow':'moo'}
```

```
function onSuccess(data) {  
    $.each(data, function(i, item) {  
        $("<div>" + i + " says " + item + "</div>")  
        .appendTo("#animals");  
    })  
}
```

```
function onError(function(request, settings) {  
    $("#status").append("<div>Error fetching " +  
        settings.url + "</div>")  
})
```



# Shortcuts

```
$.get(url, data, successCallback);
```

```
// no error callback
```

```
// grabs HTML or XML
```

```
$.getJSON(url, data, successCallback);
```

```
// also no error callback
```

```
// but grabs & parses JSON
```

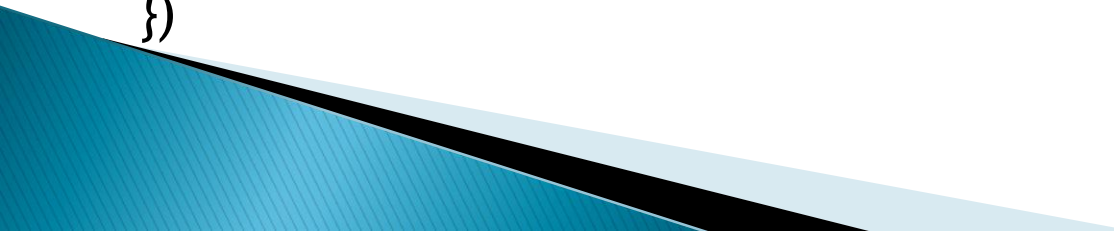


# A simple form

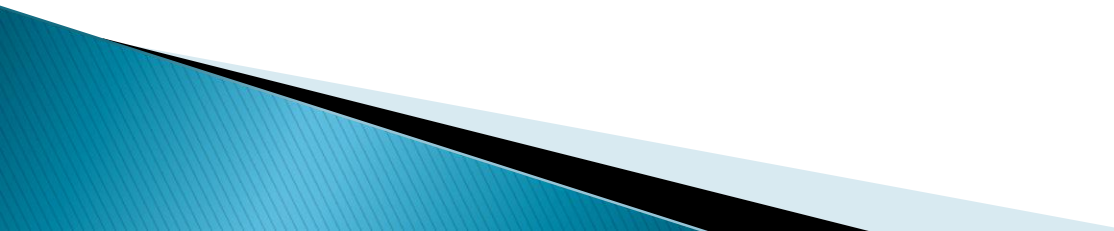
```
<form id="mainform" method="POST" action="server.php">  
  <td>Your name</td>  
  <td>  
    <input type="text" name="name"/>  
  </td>  
  <td>E-mail</td>  
  <td>  
    <input type="text" name="email"/>  
  </td>  
  <td colspan="2">  
    <input type="submit" value="send form"/>  
  </td>  
</form>
```

# Form submission in \$

```
$("#mainform").submit(function(event){  
    var keyvals = {};  
    $("input[type!=submit]",  
    "#mainform").each(function(i,el){  
        el = $(el);  
        keyvals[el.attr("name")] = el.val();  
    })  
  
    $.post($(this).attr("action"), keyvals, function(response){  
        $("#response").html(response);  
    })  
    return false; //prevents normal submit event from firing  
})
```



# jQTouch

- ▶ jQTouch Basics & Workflow
  - ▶ Changing list input style
  - ▶ Overriding styles
  - ▶ Setting up animations
  - ▶ Swipes & Touches
- 

# jQTouch

- ▶ Include it after jQuery gets loaded
- ▶ There's also a “jQuery Touch”, that's a different project

# jQTouch Basics

```
<head>
```

```
  <style type="text/css" media="screen">@import "../jqt/jqtouch.css";</style>
```

```
  <style type="text/css" media="screen">@import "../jqt/theme.css";</style>
```

```
  <script src="../jquery.js" type="text/javascript" charset="utf-8"></script>
```

```
  <script src="../jqt/jqtouch.js" type="text/javascript" charset="utf-8"></script>
```

```
  <script type="text/javascript" charset="utf-8">
```

```
    var jQT = new $.jQTouch();
```

```
  </script>
```

```
</head>
```







# Workflow

- ▶ Add divs to your page with meaningful IDs
- ▶ Set up links to those ids with anchors inside LIs:
  - `<ul><li><a href="#yourid">your link</ a></li></ul>`
- ▶ jQTouch handles the animations
- ▶ `target=_blank` on external links

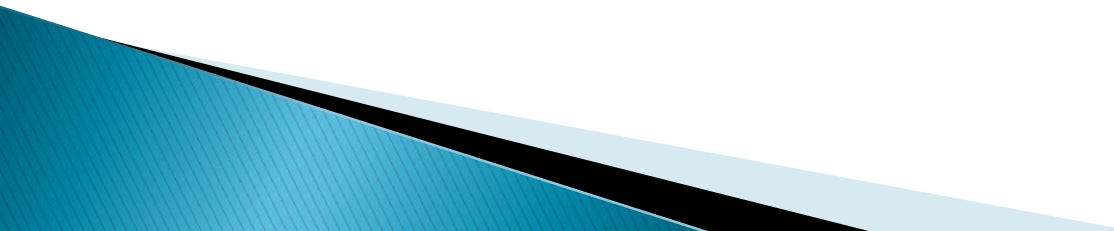
# Content can be fetched asynchronously

- ▶ Just specify a URL instead of a hash



# Configuring webapp

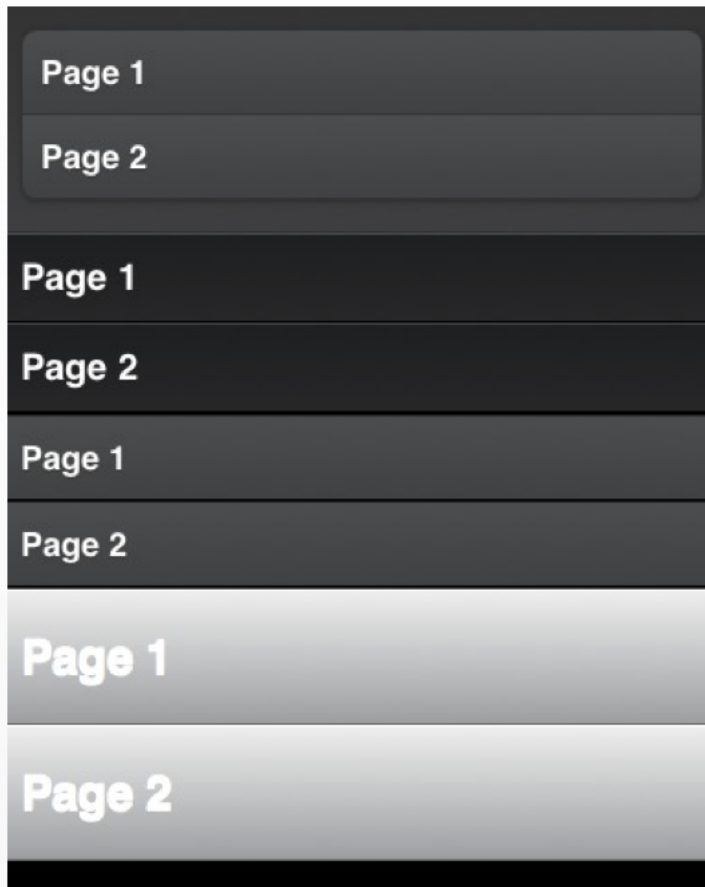
```
var jQT = new $.jQTouch({  
    statusBar: 'black',  
    icon: 'cs.png',  
    addGlossToIcon: true, // defaults to true  
    startUpScreen: 'my-start.png'  
});
```



# Specifying list type

- ▶ Change class of `<ul>`
- ▶ Default theme options: rounded, edgetoedge, plastic, metal

# List types



Rounded

edgetoedge

plastic

metal

# Customization

- ▶ Include basic jqtouch.css
- ▶ Optionally include theme.css
- ▶ Add your own styles by overwriting
- ▶ Use Web Browser tools to check what styles are active



# Specifying animation

- ▶ Specify class on your `<a>` link

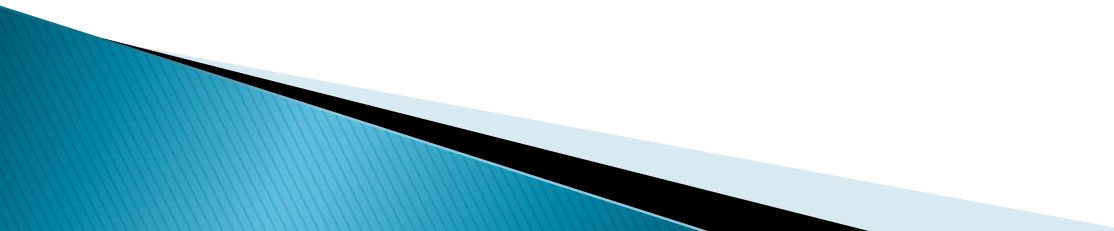
# Available Animations

- ▶ slide
  - ▶ slideup
  - ▶ dissolve
  - ▶ fade
  - ▶ flippop
  - ▶ swap
  - ▶ cube
- 

# Example

```
<div id="example">  
  <ul class="rounded">  
    <li><a class="flip" href="#one">Page 1 </a>  
    <li><a class="swap" href="#two">Page 2 </a>  
  </ul>  
</div>
```

# Detecting Touches

- ▶ jQuery will set an “active” class on touch&hover for anything with a “.touch” class
  - ▶ Will take off the active class if the touch ends up not being a tap (if you move your finger)
  - ▶ And if you swipe sideways, will fire .swipe
- 

# Source

```
<script type="text/javascript" charset="utf-8">
  var jQT = new $.jQTouch({});
  $(document).ready(function(){
    $(".touch").swipe(function(){
      alert("SWIPE");
    })
    $(".touch").bind("touchstart", function(){
      $(".touch").unselect();
    })
  })
</script>...
```

```
<div id="example">
  <div class="touch cta">Touch this.</div>
  <div class="touch cta">Or touch that.</div>
</div>
```

# Geolocation API

- ▶ `navigator.geolocation.getCurrentPosition`  
(callback)

# Sample code

```
navigator.geolocation.getCurrentPosition(handlePosition)
```

```
function handlePosition(position) {  
    $("#lat").html(position.coords.latitude);  
    $("#lon").html(position.coords.longitude);  
}
```

# Getting orientation change

// event name: orientationchange

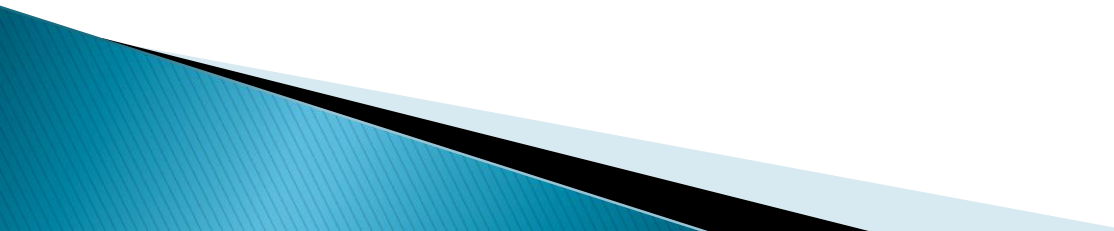
// using jQuery:

```
$("#body").bind("orientationchange", function(event) {  
    react()  
})
```



# Source

```
function setOrientation() {  
    var orientation = (window.innerWidth < window.innerHeight) ?  
    'portrait' : 'landscape';  
    $("#orientation").html(orientation);  
}  
  
$(document).ready(function(){  
    setOrientation();  
    $("body").bind("orientationchange", function(event){  
        setOrientation();  
    })  
})
```



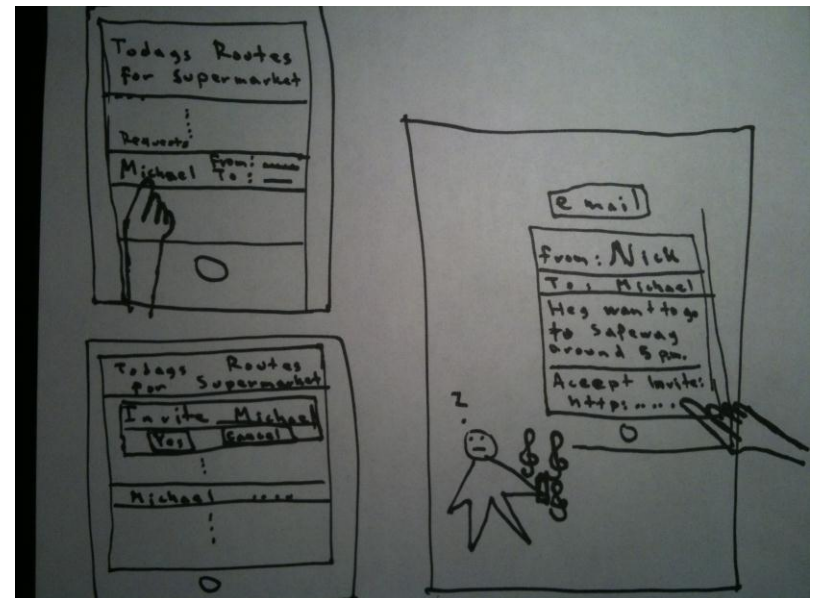
# Design Tools



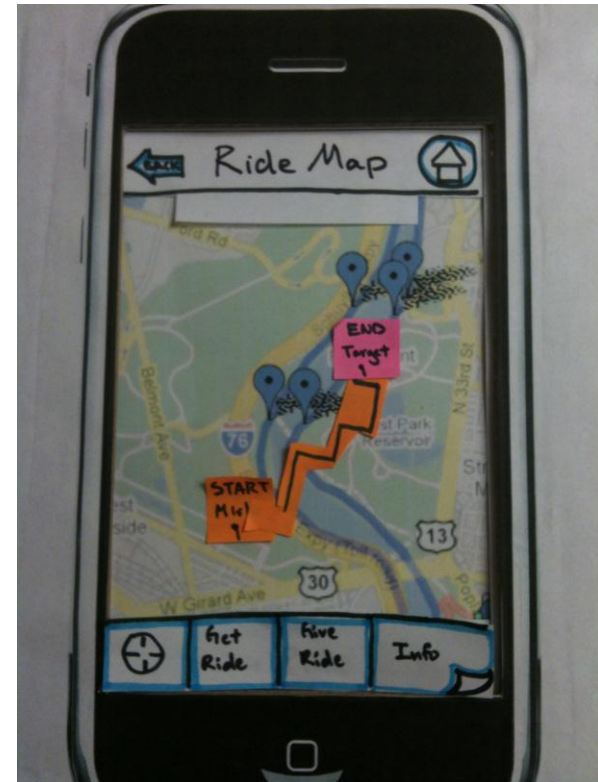
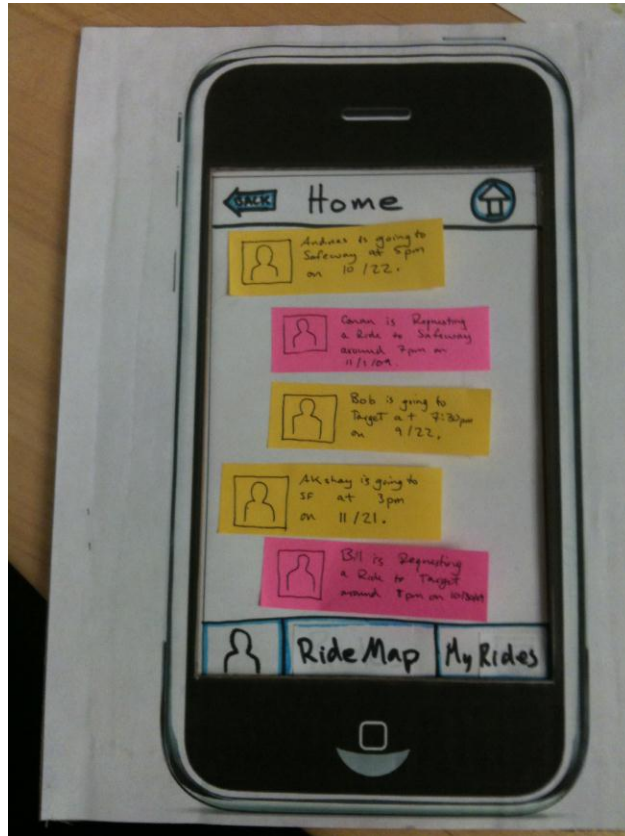
# NeedFinding

- ▶ Brainstorming
  - Go for quantity in the beginning not quality
- ▶ Do your homework
  - Check references to learn from previous attempts in the same area
- ▶ Follow users
  - Yes I mean stalk them

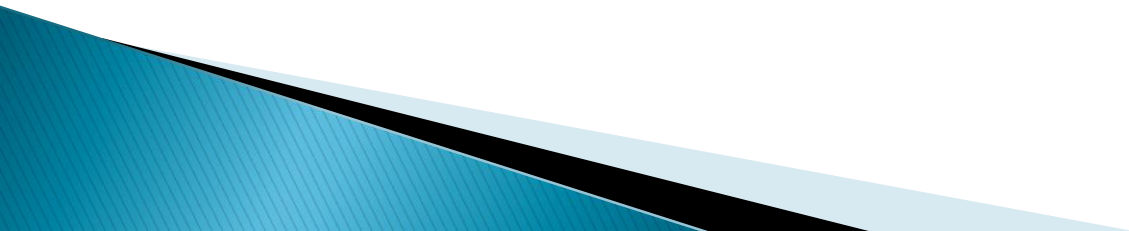
# Story boarding



# Paper prototyping



# Video Prototyping



# Functional Prototyping

- ▶ HTML Mockups
  - Create a minimal design that will allow you to test user flows
- ▶ Minimum Viable Product (MVP)
  - Launch a product with the minimum features and iterate

# Evaluation



- ▶ A/B Testing is king
  - Metrics, metrics, metrics



- ▶ Gather user feedback



# Questions?

