COMP90018
Mobile GUIs

Anthony Quattrone

Programming Mobile Devices

- **Server-based approach**
  - Create a web service
  - Client (the mobile device) accesses the content via a browser
- **Device-based approach**
  - Develop application with an SDK
  - Deploy the application locally on the mobile device

UX Design Principles I

- **Minimize the amount of work required for a task**
  - Progressive disclosure: show only some information and let users choose if they require more details
  - Use examples: instead of (long-winded) descriptions use examples
  - Affordances of objects: if an object is clickable make sure it looks like it
  - Limit features: only provide the features that users need; otherwise you end up with a bad user experience
  - Use defaults: less typing and interaction speeds up tasks

http://uxmag.com/articles/the-psychologists-view-of-ux-design

UX Design Principles II

- **Acknowledge limitations of users**
  - Focus: only show information that is required
  - Easy readability: use headers and short blocks of information
  - Avoid multitasking: humans are not good at this
  - Preference or performance: people prefer short line lengths but read better at longer ones

http://uxmag.com/articles/the-psychologists-view-of-ux-design

UX Design Principles III

- **Acknowledge user mistakes**
  - Anticipation: be prepared for user mistakes, i.e., anticipate and prevent them
  - Use confirmation: if actions or errors have significant implication, use confirmation dialogs
  - Prefer prevention: preventions of errors is better than correction
  - Break difficult tasks up into smaller ones: easier for users to avoid errors
  - Transparent automatic error correction: support this but make it explicit to users

http://uxmag.com/articles/the-psychologists-view-of-ux-design

UX Design Principles IV

- **Acknowledge human memory**
  - Monitor user behavior: user action is more reliable than user surveys
  - Do not rely on human memory: keep tasks simple between views and pages (remind them!)
  - People can only remember 3 to 4 things at a time according to newer research

http://uxmag.com/articles/the-psychologists-view-of-ux-design

UX Design Principles V

- **Various tidbits**
  - Attention: decide whether to stand out in terms of being different or novel (colors, design, fonts, etc.) or if a task has to avoid distraction
  - Feedback: users have to know what happens, in particular, for long lasting tasks
  - Easy access to more information: people crave for information
  - Grouping: objects that are close (or of the same color) are assumed to go together
  - Canonical perspectives: help to identify objects

http://uxmag.com/articles/the-psychologists-view-of-ux-design

History of J2ME/Java ME

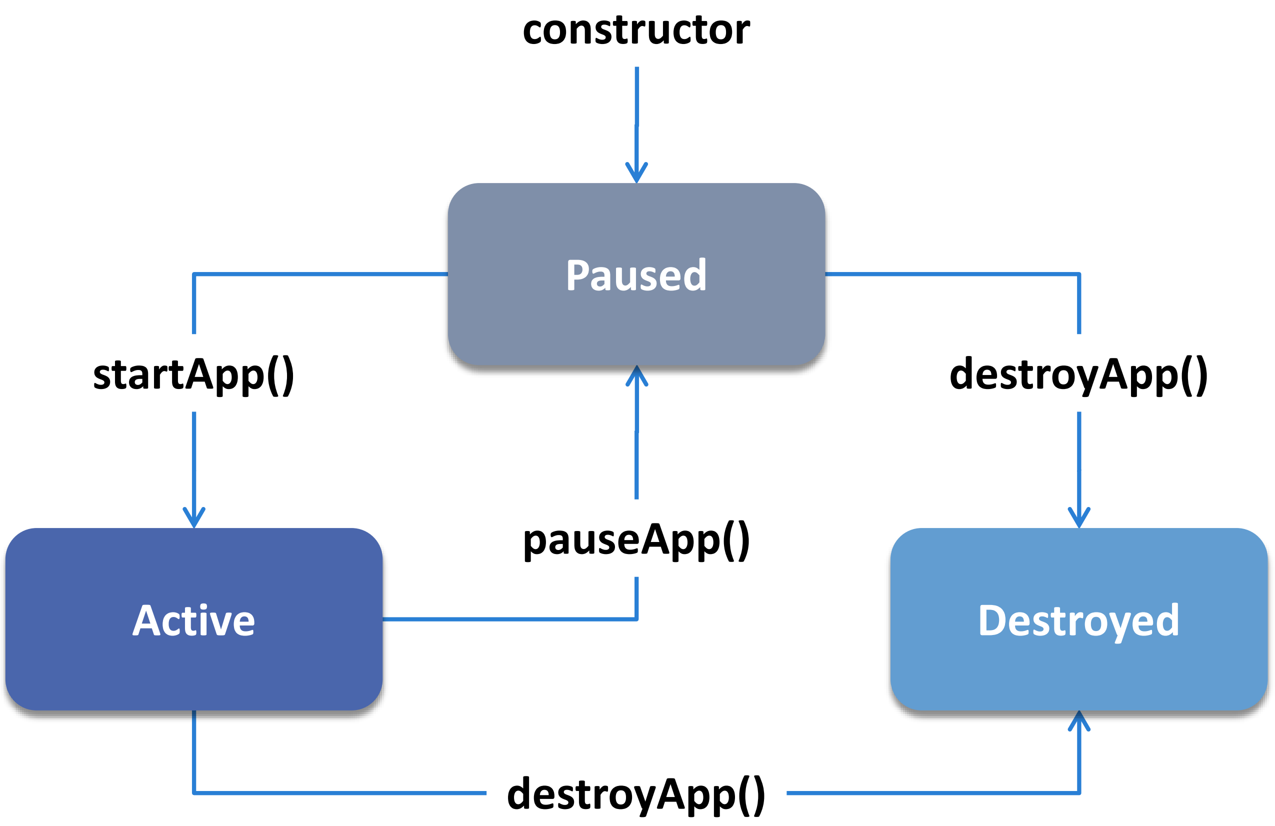
- **1990: Java**
  - Internal project at Sun Microsystems
- **1995: JDK 1.0**
  - Applets & servlets
- **1999: Division of Java**
  - Java 2 Enterprise Edition (J2EE)
  - Java 2 Standard Edition (J2SE)
  - Java 2 Micro Edition (J2ME)

Mobile Phones & Java ME

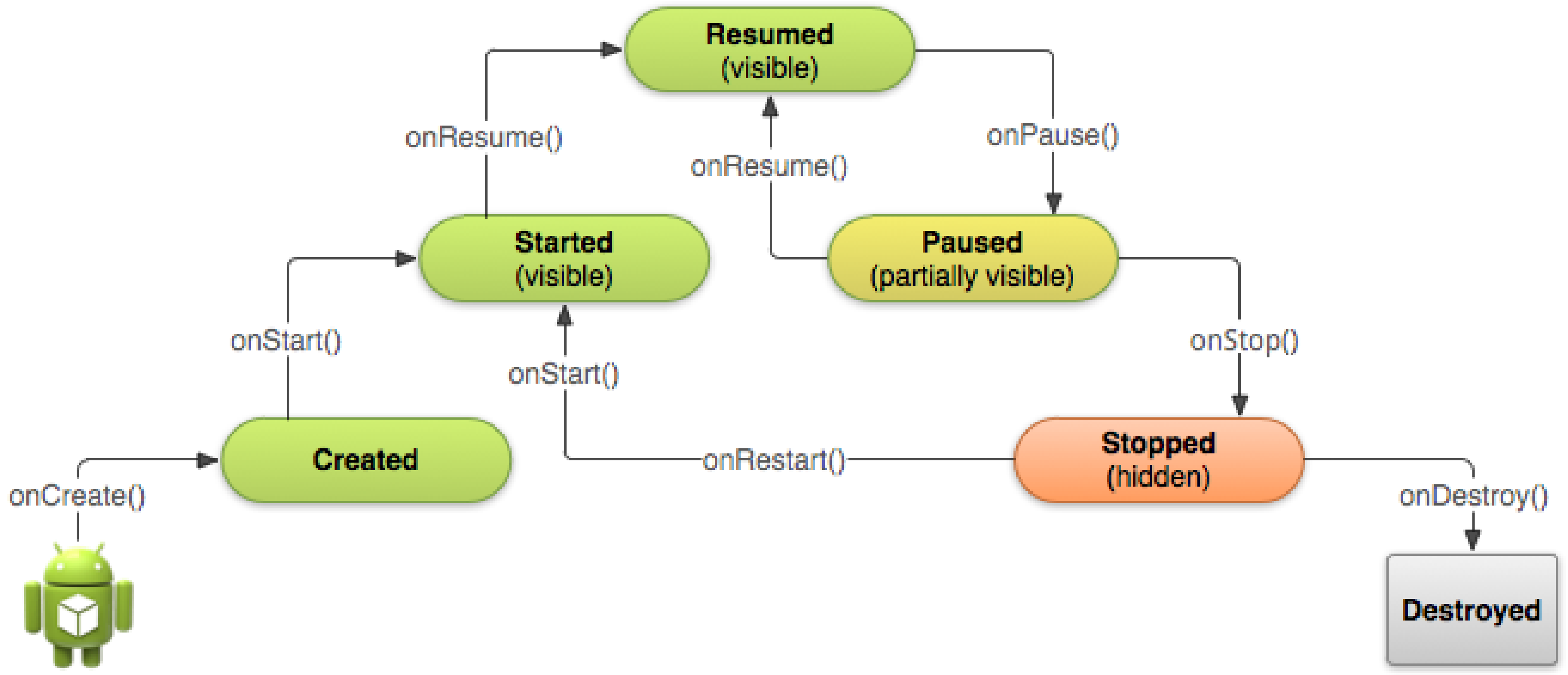
- **2000**
  - Mobile phones begin to support J2ME
- **2004**
  - 250 million mobile phones support J2ME
- **2005**
  - 700 million mobile phones support J2ME
  - Most mobile phone manufacturer support J2ME
- **MIDlet**
  - Like applets or servlets MIDlets (MID = mobile information device) have a small number of states

Source: http://www.java.com/en/about/

The Life Cycle of a MIDlet



Android Activities



MIDP GUI Programming

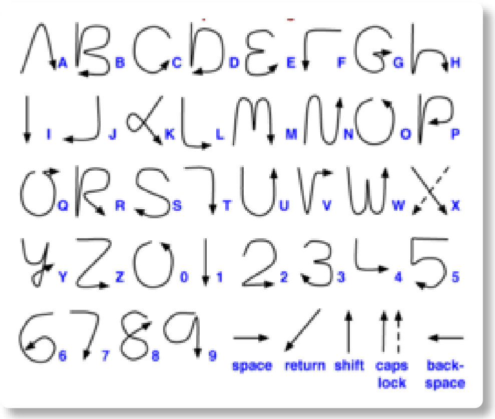
- **MIDP vs AWT**
  - AWT (abstract window toolkit) is designed for PCs
  - AWT is designed for a pointing device (mouse)
  - AWT supports window managements (resize windows, move windows)
- **Smartphones have different requirements**
  - A single screen; no overlapping windows (no window manager required); no complex tables
  - Input often limited to keypad or virtual keyboards

Input Mechanisms I

- **Keypad input**
  - Mobile phones: 12-digit keypad
  - Good for numbers, cumbersome for text
  - Predictive input technology: T9 = text on 9 buttons; only one button press per letter required
- **Keyboard input**
  - Bluetooth keyboards
  - Thumb-based keyboards (BlackBerry devices)
  - Virtual keyboards

Input Mechanisms II

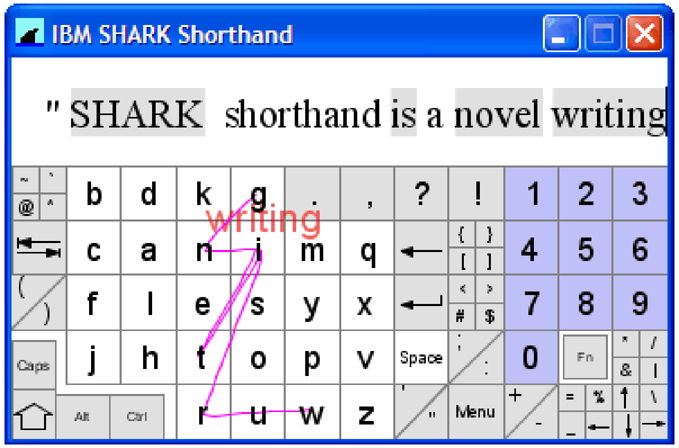
- **Pen-based input**
  - Touchscreen with a stylus
  - Soft keyboards
  - Character recognition
  - Handwriting recogntion
  - Graffiti (Palm OS)



- **Voice input**
  - Simple commands
  - Earlier: VoiceXML where complex commands are recognized by a server
  - Now: Siri

“Text Input is Terrible” (J. Hong)

- **Standard phones**
  - Multi-tap: 8 – 20 wpm, world record: 29 wpm
  - T9: approximately 20 wpm
- **Special hardware**
  - Twiddler, 26 to 47 wpm
- **Pen**
  - QWERTY keyboard: 34 wpm (world record: 212 wpm)
  - IBM SHARK: 60 – 80 wpm



Source http://www.cs.cmu.edu/~jasonh/presentations/intel2007-ultra-mobile-rant.ppt

UI Support

- **Large heterogeneity of mobile devices**
  - Screen size, screen orientation, input capabilities, …
- **Abstraction**
  - Use abstract descriptions: provide a “Cancel” button (instead of specifying where to draw a button)
  - Less code in your application
- **Discovery**
  - Learn a device’s capabilities at runtime

High-Level User Interfaces

Goal: portability

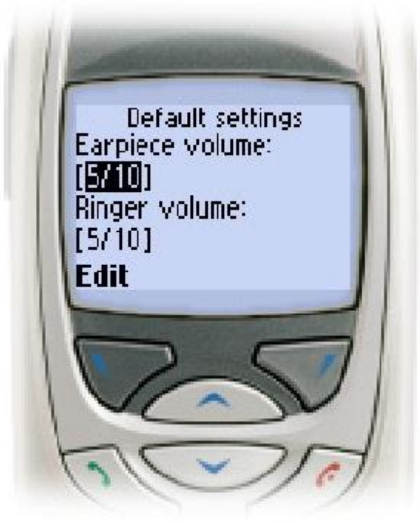
- High degree of abstraction
- No dedicated control of look and feel
- Benefit: application uses native look and feel!
- Good end-user experience

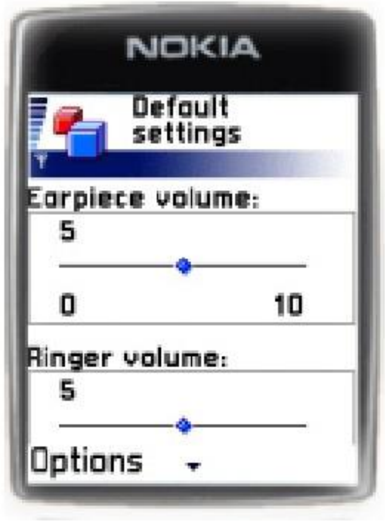
Consequences

- Drawing is performed by the OS of the device
- Navigation & low-level functions are done by the device

Same Code – Different UI Looks

```
form = new Form("Default settings");
form.append(new Gauge("Earpiece volume:",true,10,5));
form.append(new Gauge("Ringer volume:",true,10,5));
```





Low-Level User Interfaces

Goal: precise control and placement

- Games, charts, graphs, …
- Control of what is drawn on the display
- Handle events such as key presses and releases
- Access specific keys

Consequences for portability

- Platform-independent methods (use keys defined in canvas)
- Discover the size of the display, orientation, other capabilities (e.g., sensors)

(MIDP) GUI Guidelines

Ensure portability across different devices

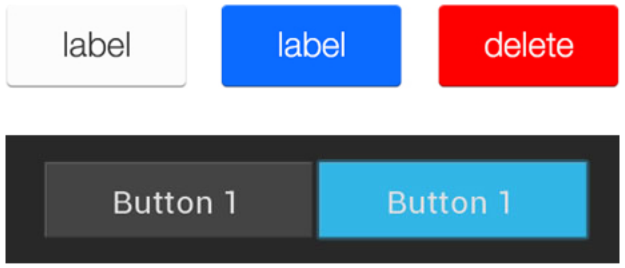
- Use high-level API
- Use platform independent parts of low-level API
- Discover screen resolutions

KISS principle

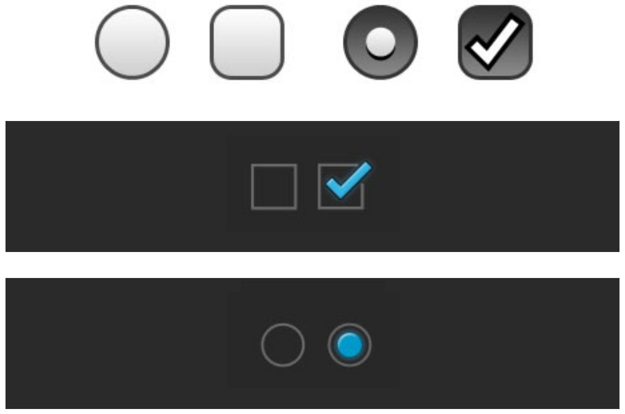
- Simple and easy to use UI
- Minimize user input and offer lists
- Pre-select likely choices

UI Elements I

- **Buttons**
  - iOS Developer Library (UIButton): "Intercepts touch events and sends an action message to a target object when tapped"
  - Android API (Button): "Communicates what action occurs when the user touches it"



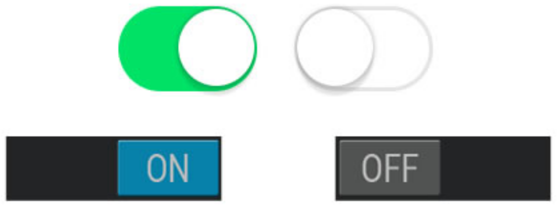
- **Checkboxes & radio buttons**
  - *iOS Developer Library (UIButton)*
  - Android API (Checkbox): "Select one or **more** options from a set"
  - Android API (Radio Button): "Select one option from a set"; options are **mutually exclusive**



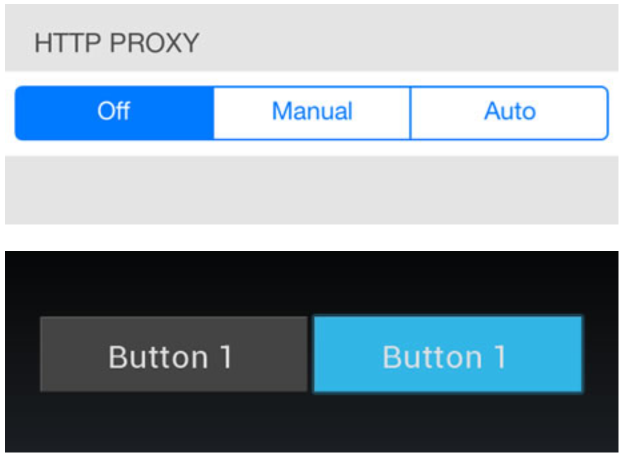
http://kintek.com.au/blog/portkit-ux-metaphor-equivalents-for-ios-and-android/

UI Elements II

- **Switches**
  - iOS Developer Library (UISwitch): “Create and manage the On/Off buttons”
  - Android API (Toggle Button): “Change a setting between two states”



- **Segmented controls**
  - iOS Developer Library (UISegmentedControl): “Horizontal control made of multiple segments, each segment functioning as a discrete button”
  - *Android API (Button)*



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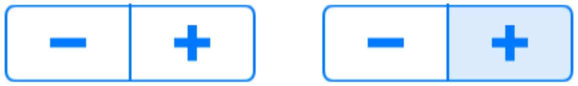
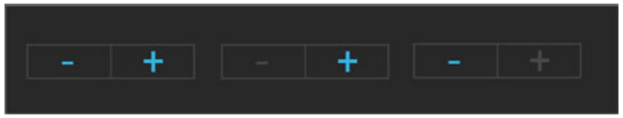
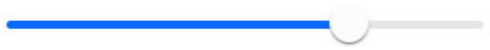
UI Elements III

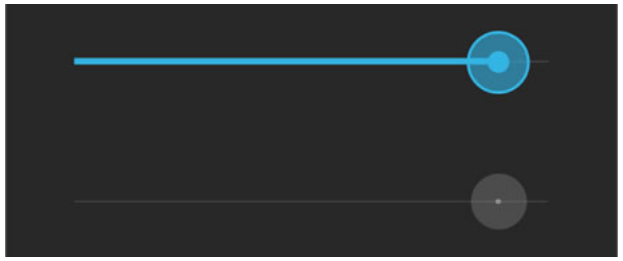
- **Stepper**
  - iOS Developer Library (UIStepper): "User interface for incrementing or decrementing a value"
  - *Android API (Button)*





- **Slider**
  - iOS Developer Library (UISlider): "Select a single value from a continuous range of values"
  - Android API (Seek Bar): "Select a value from a continuous or **discrete** range of values"





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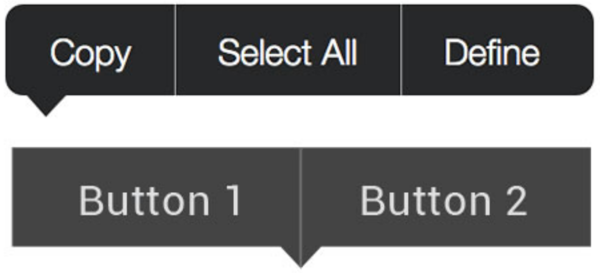
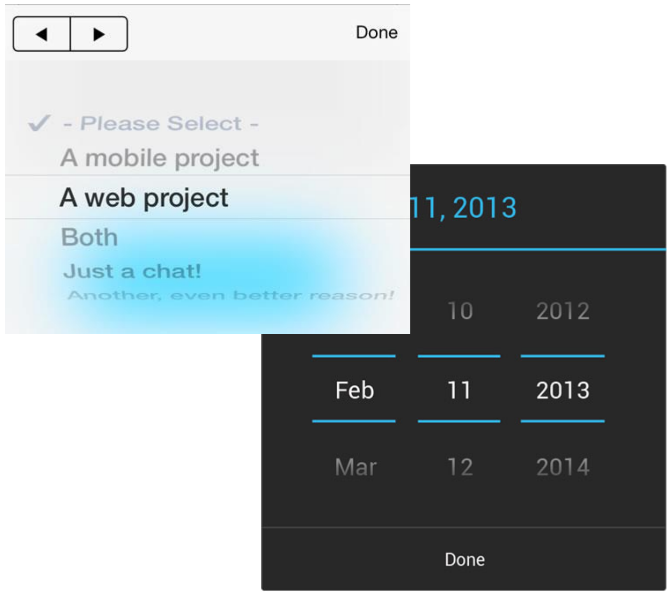
UI Elements IV

- **Popup menus**
  - iOS Developer Library (UIMenuController): “Menu interface for the Cut, Copy, Paste, Select, Select All, and Delete commands”
  - Android API (Popup Menu): “Modal menu anchored to a View”
- **Pickers**
  - iOS Developer Library (UIPickerView): “Spinning-wheel or slot-machine metaphor to show one or more sets of values”; there is also UIDatePicker
  - Android API (Picker): “Pick a **time** or pick a **date** as ready-to-use dialogs”





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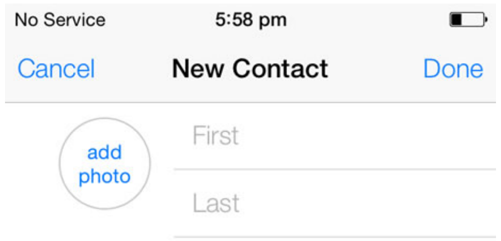
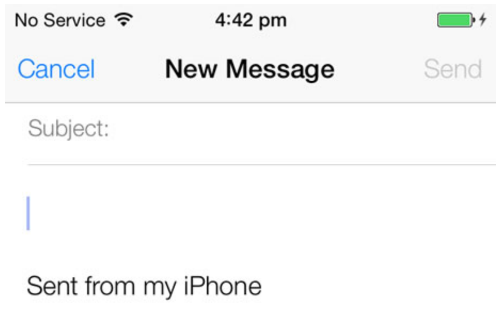
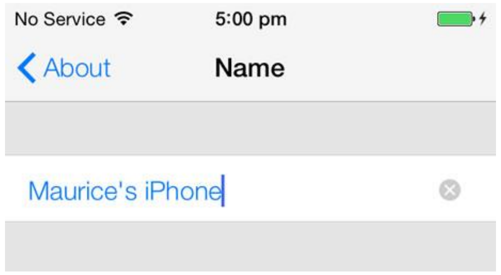
UI Elements V: Text Fields iOS

- UITextField
  - “Displays editable text and sends an action message to a target object when the user presses the return button”
  - Get small amounts of text from a user to perform an immediate action such as a search
- UITextView
  - Supports a scrollable, multiline, editable text region for larger texts
- UILabel
  - “Implements a read-only text view”







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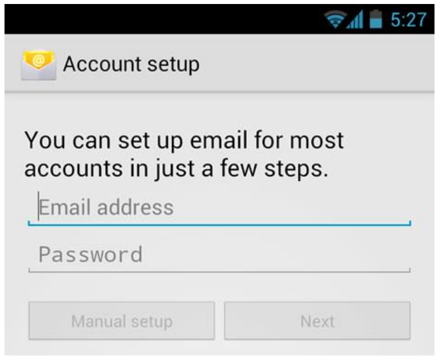
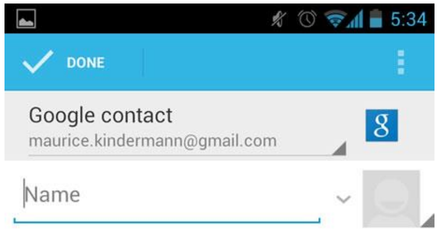
UI Elements VI: Text Fields Android

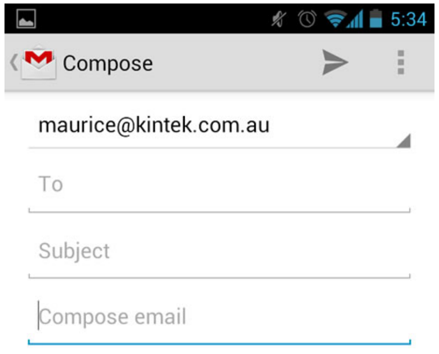
- **TextView**
  - “Displays text to the user and optionally allows them to edit it”
  - Provides “a complete text editor, however the basic class is configured to not allow editing”
- **EditText**
  - A layer “over TextView that configures itself to be editable”
- **Attributes**
  - autoLink: “URLs and email addresses are … converted to clickable links”
  - autoText: “automatically correct … common spelling errors”
  - password: “characters are displayed as password dots instead of themselves”
  - phoneNumber, capitalize, ...



You can set up email for most accounts in just a few steps.



maurice.kindermann@gmail.com



maurice@kintek.com.au

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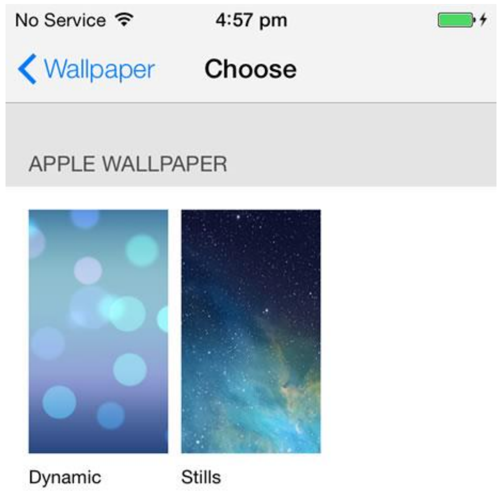
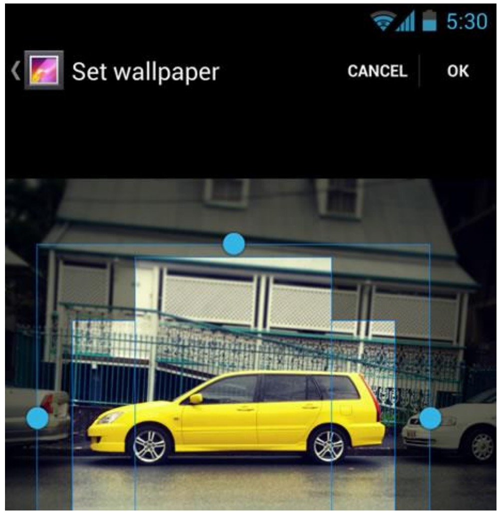
UI Elements VII

- **Images**
  - iOS Developer Library (UIImageView): “a view-based container for displaying either a single image or for animating a series of images”
  - Android API (ImageView): “displays an arbitrary image”





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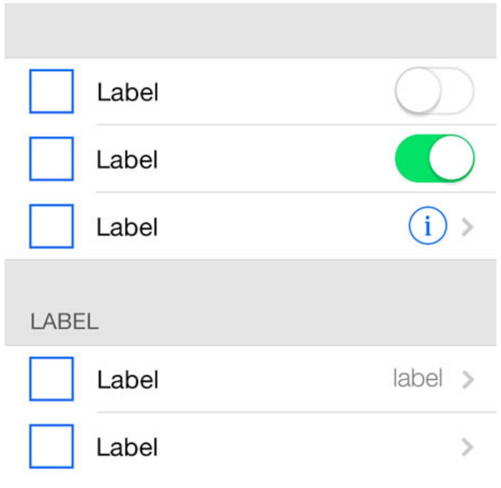
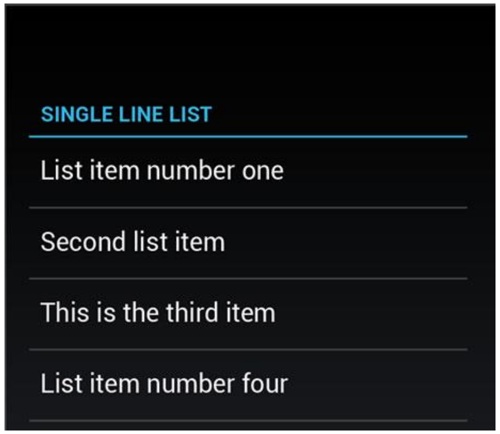
UI Elements VIII

- **Lists**
  - iOS Developer Library (UITableView): “means for displaying and editing hierarchical lists of information”
  - Android API (List View): “view group that displays a list of scrollable items”





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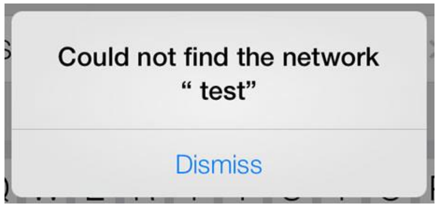
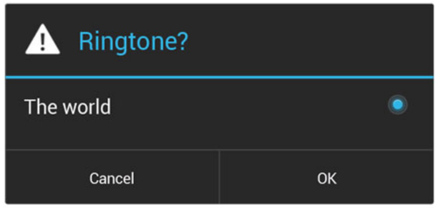
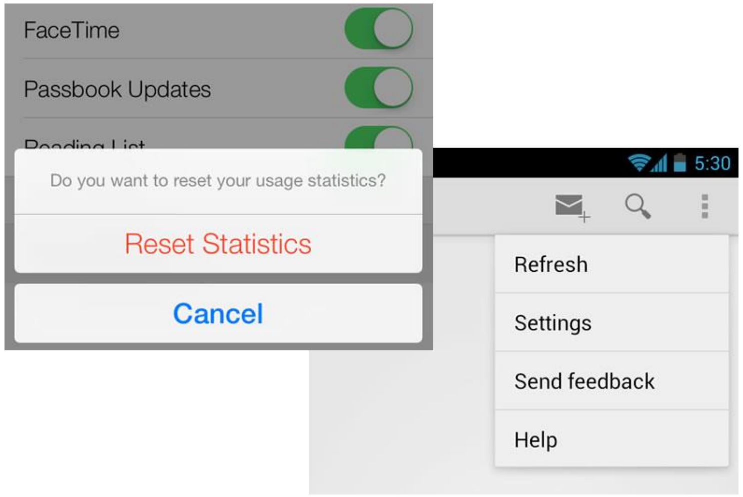
UI Elements IX

- **Alerts & Dialogs**
  - iOS Developer Library (UIAlertView): “display an alert message to the user”
  - Android API (Dialog): “small window that prompts the user to make a decision or enter additional information”
  - iOS Developer Library (UIActionSheet): “set of alternatives for how to proceed with a given task”
  - Android API (Spinner): “select one value from a set”







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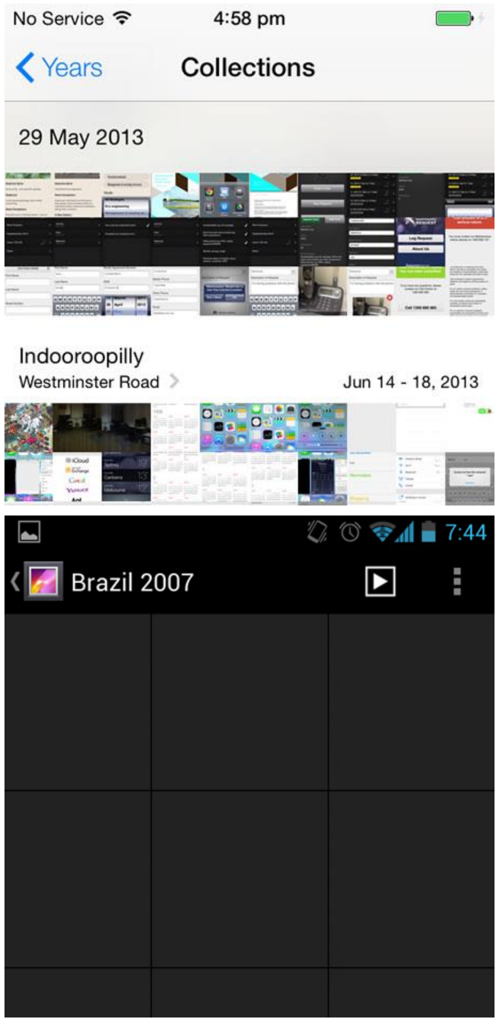
UI Elements X

- **Collections**
  - iOS Developer Library (UICollectionView): “ordered collection of data items and presents them using customizable layouts”
  - Android API (GridView): “shows items in [a] two-dimensional scrolling grid”



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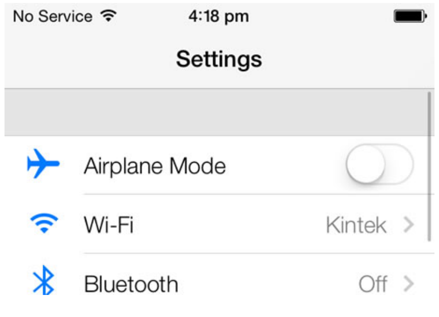
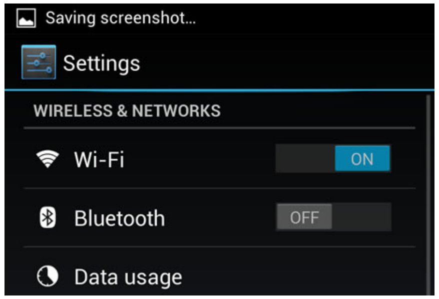
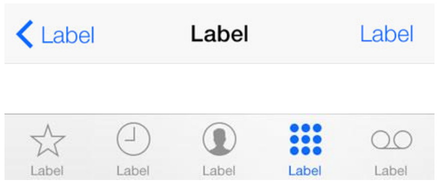
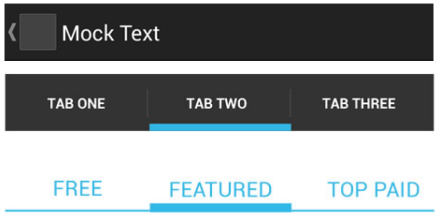
UI Elements XI

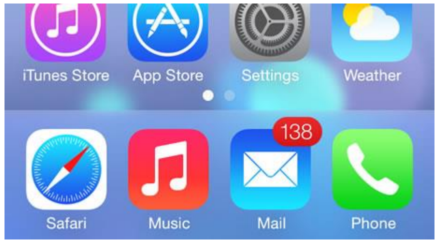
- Scroll views
  - iOS (UIScrollView) and Android (ScrollView)
- Navigation
  - iOS (UIBarButtonItem & UITabBar & UI Page Control) and Android (ActionBar)
- Refresh
  - iOS (UIRefreshControl)

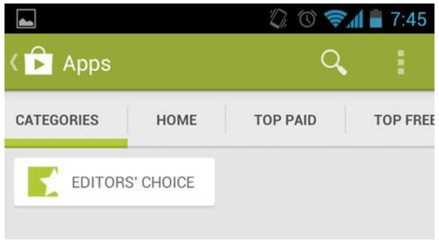

No Service 4:18 pm
Settings
Airplane Mode
Wi-Fi Kintek
Bluetooth Off

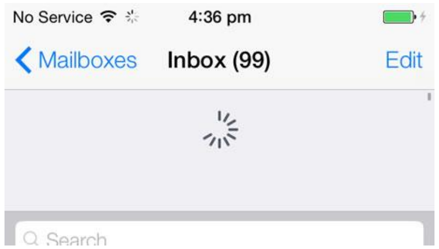

Saving screenshot...
Settings
WIRELESS & NETWORKS
Wi-Fi ON
Bluetooth OFF
Data usage

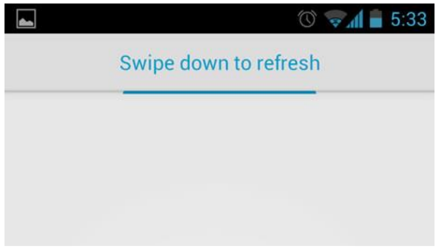












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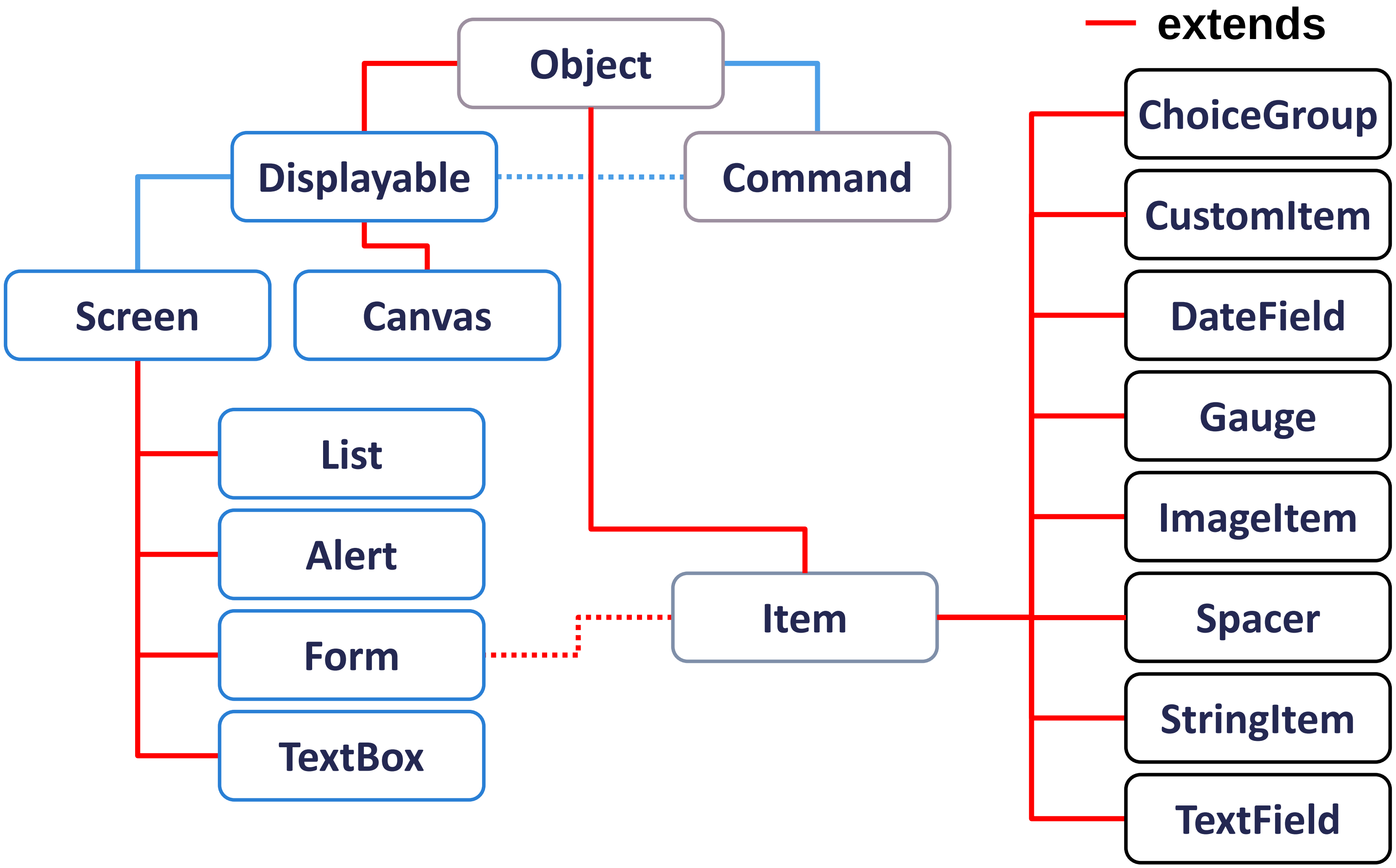
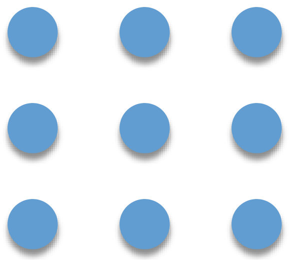
A Blast from the Past: LCDUI Package

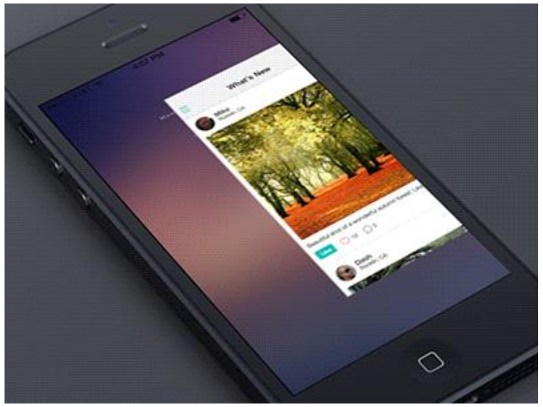


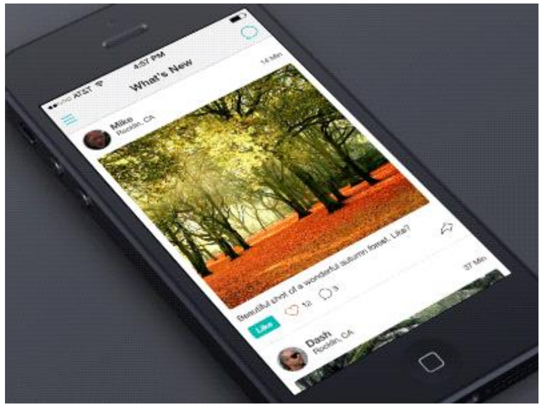
Mobile GUI: Think “Off Canvas”

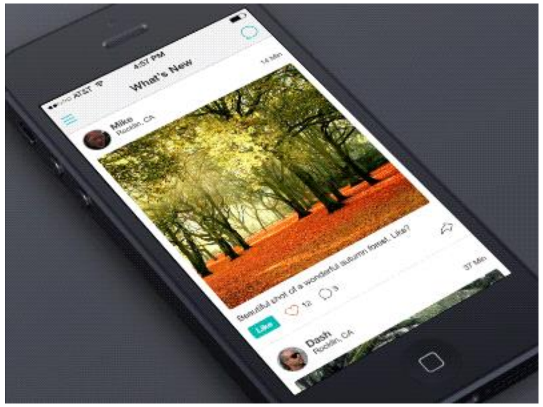
- **Connect 9 dots**
  - Use 4 lines (or less)
  - Solution: break free of the confined space of the dots



- **Mobile GUI**
  - Use side drawers

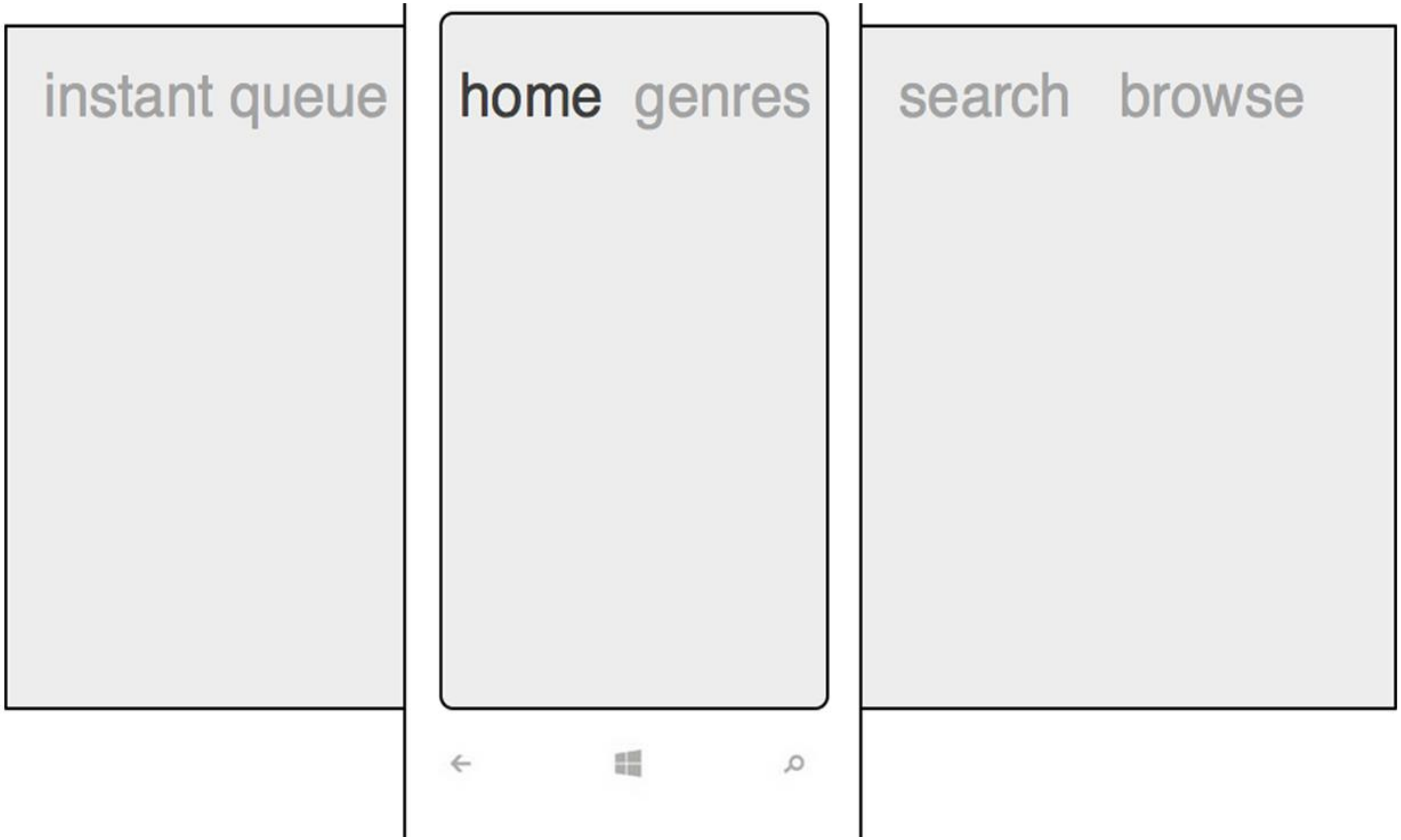






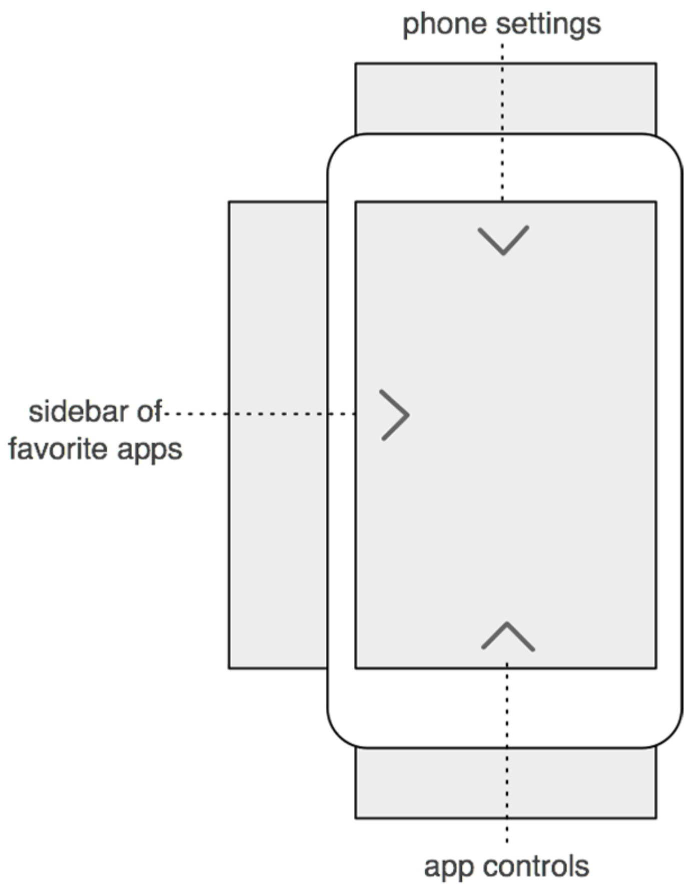
http://uxmag.com/articles/adapting-ui-to-ios-7-the-side-menu

Windows Phone: Panorama Control



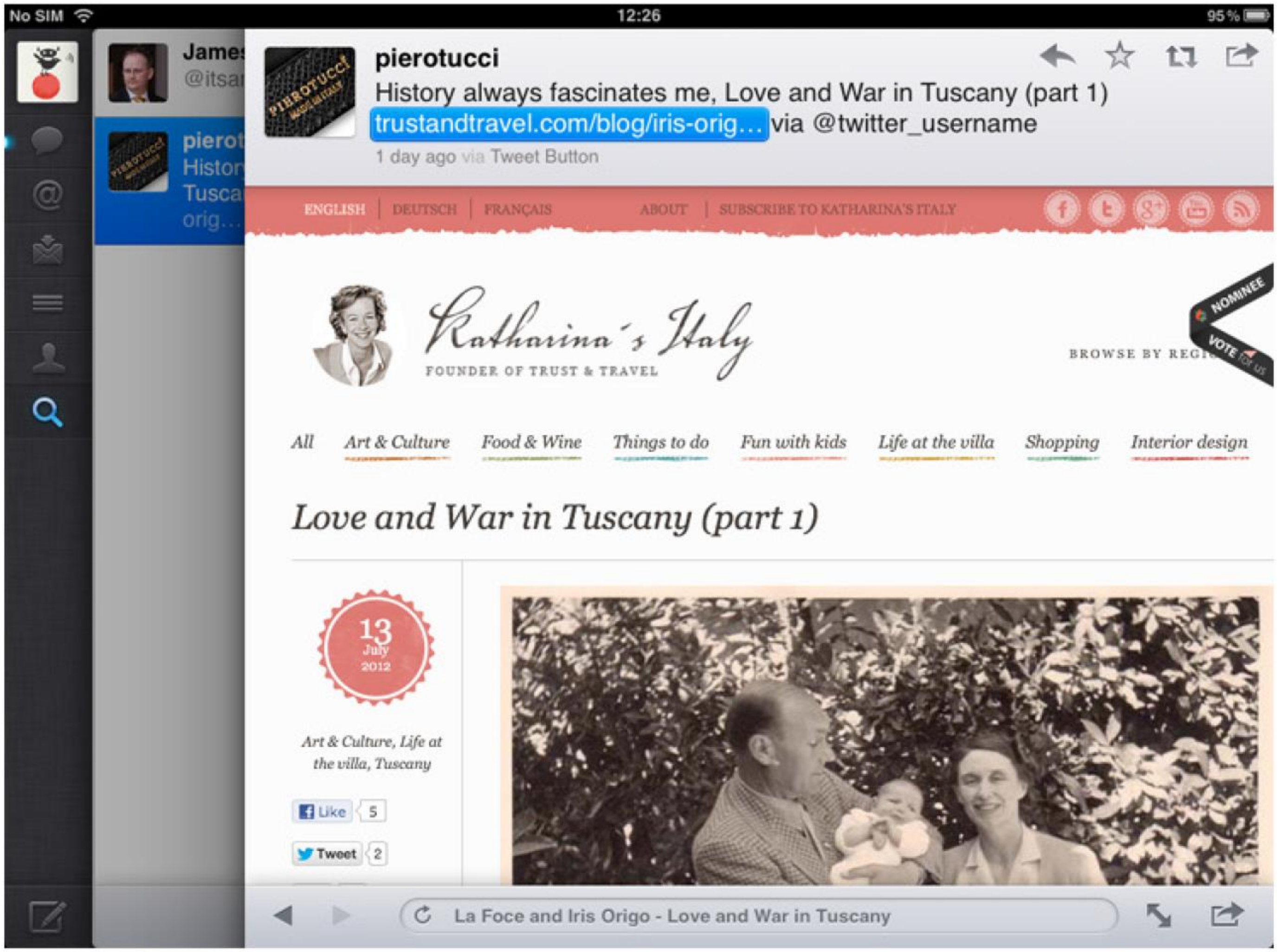
Ubuntu

- **Leave the screen entirely for the application!**



Theresa Neil: MOBILE DESIGN PATTERN GALLERY, 2nd Edition

Early Version of Twitter: iPad



History always fascinates me, Love and War in Tuscany (part 1) trustandtravel.com/blog/iris-orig… via @twitter_username

Love and War in Tuscany (part 1)

Art & Culture, Life at the villa, Tuscany

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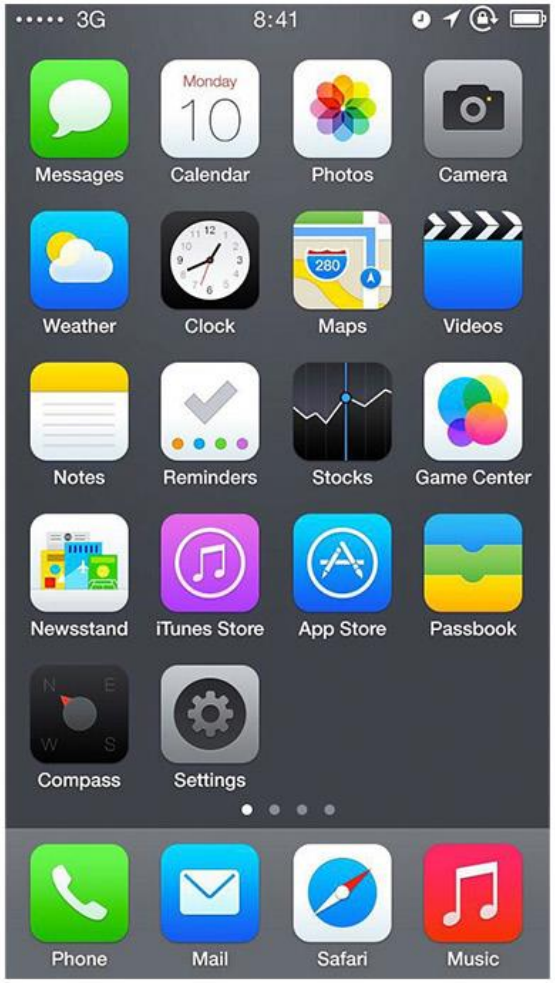
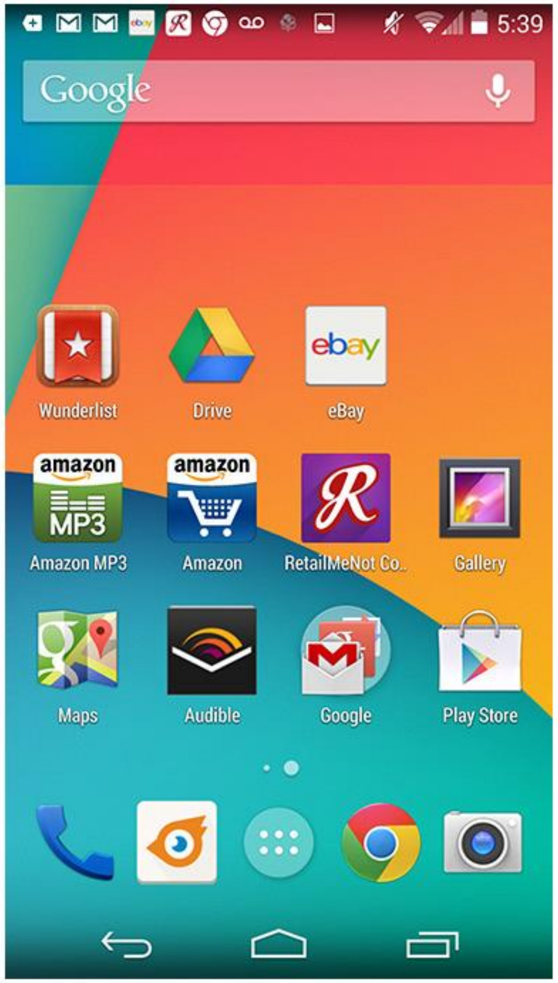
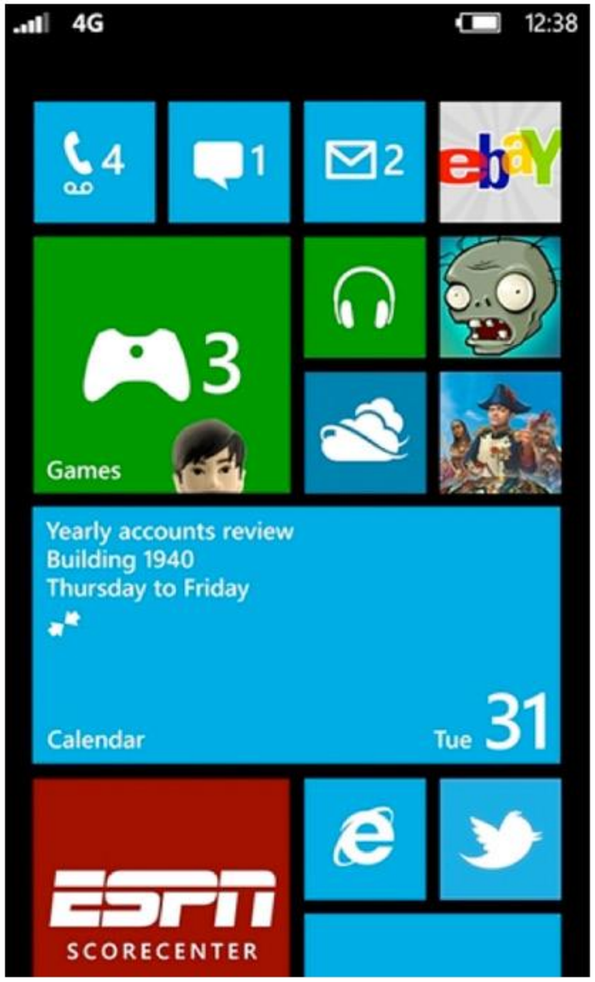
Springboards: Same Level of Importance







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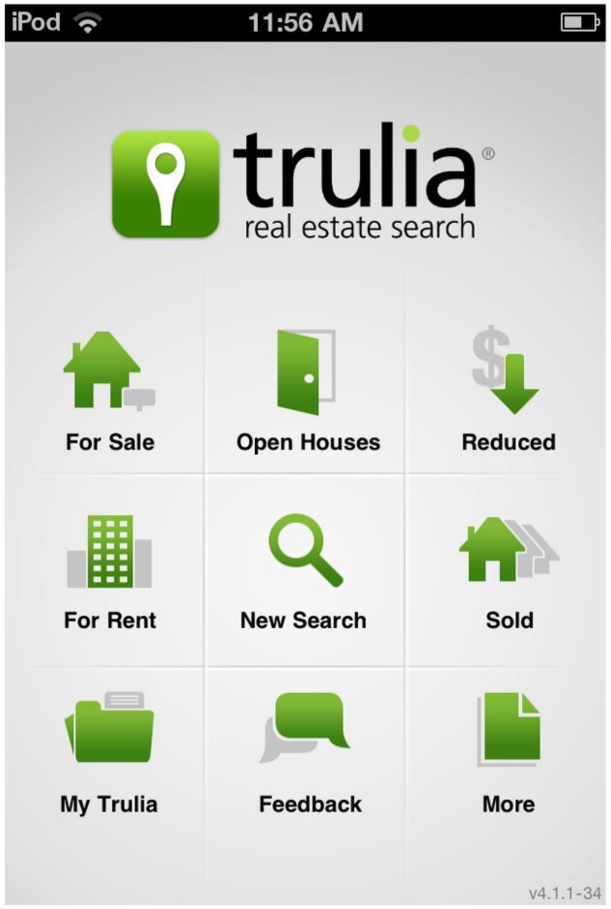
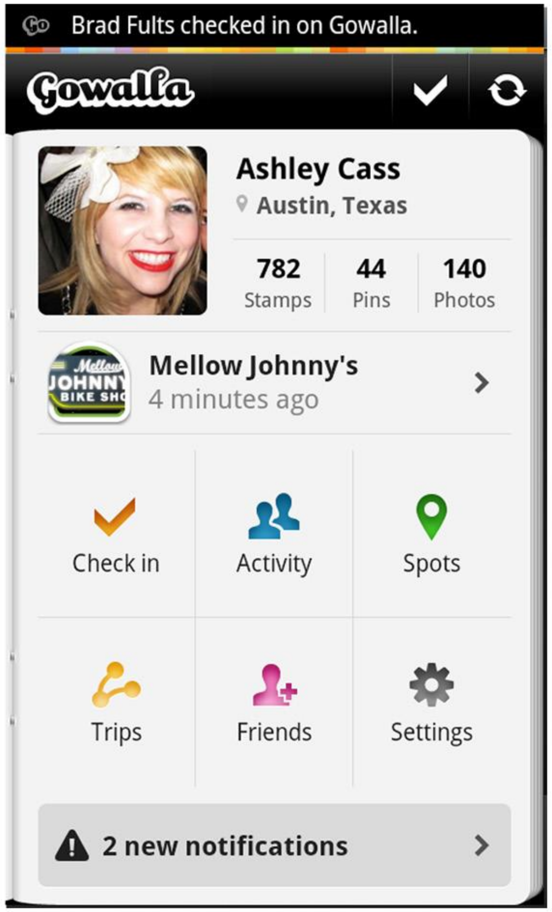
Springboards: Same Level of Importance





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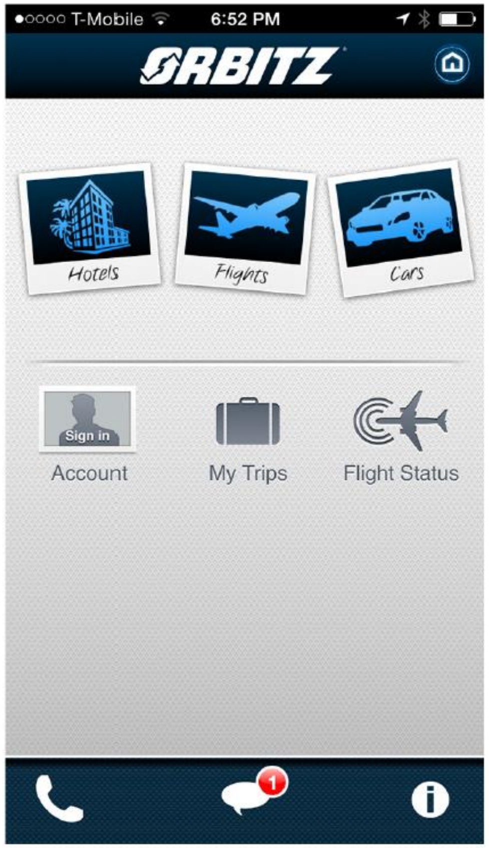
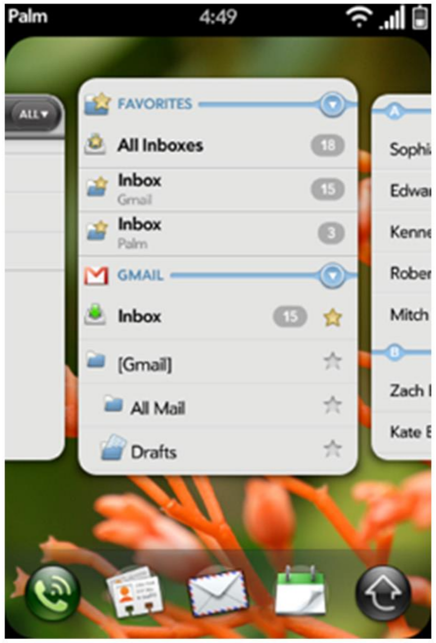
Advanced Springboards

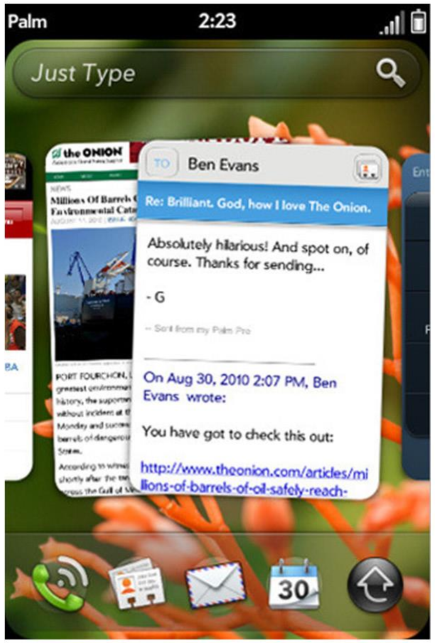
- Different graphics and layout implies hierarchy

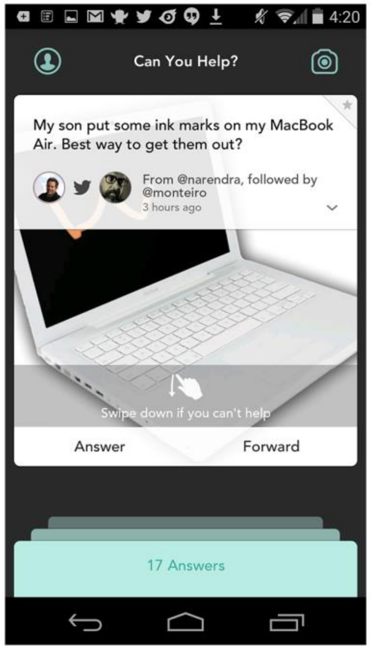


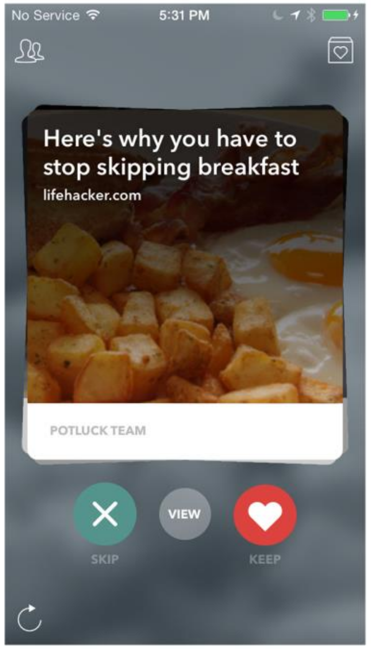
Cards

- **Card deck metaphor**
  - Stack, shuffle, discard, flip
  - Used in Palm webOS (2010/2011) or Jelly in iOS




Palm
2:23
Just Type
the ONION
Ben Evans
Re: Brilliant. God, how I love The Onion.
Absolutely hilarious! And spot on, of course. Thanks for sending...
- G
On Aug 30, 2010 2:07 PM, Ben Evans wrote:
You have got to check this out:
http://www.theonion.com/articles/millions-of-barrels-of-oil-safely-reach-


4:20
Can You Help?
My son put some ink marks on my MacBook Air. Best way to get them out?
From @narendra, followed by @monteiro
3 hours ago
Swipe down if you can't help
Answer
Forward
17 Answers



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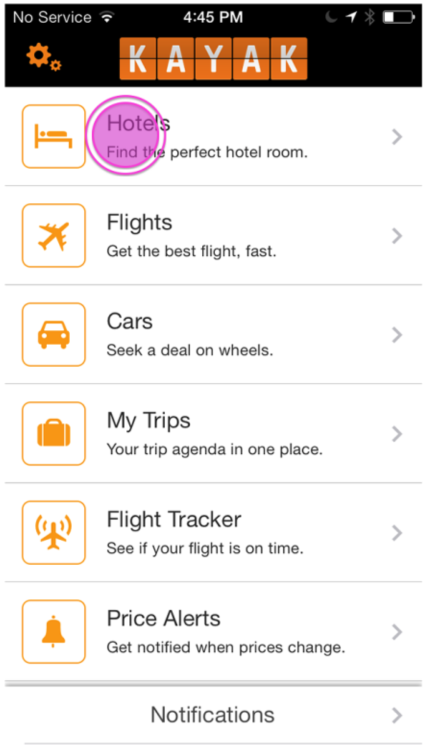
List Menus: Hierarchical Navigation


No Service 4:45 PM

KAYAK

Hotels
Find the perfect hotel room.

Flights
Get the best flight, fast.

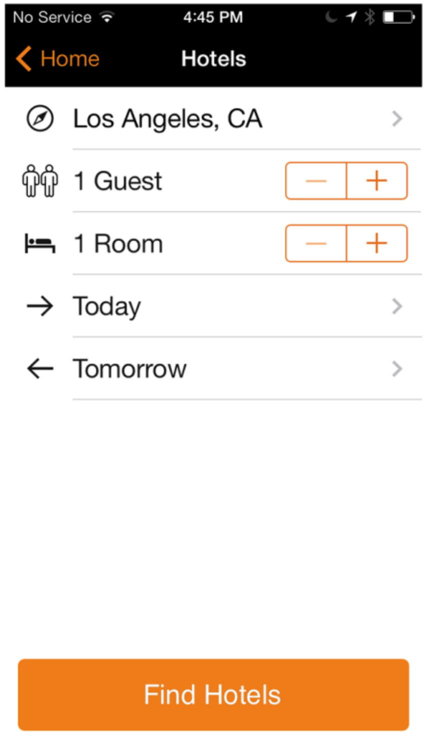
Cars
Seek a deal on wheels.

My Trips
Your trip agenda in one place.

Flight Tracker
See if your flight is on time.

Price Alerts
Get notified when prices change.

Notifications


No Service 4:45 PM

Home Hotels

Los Angeles, CA

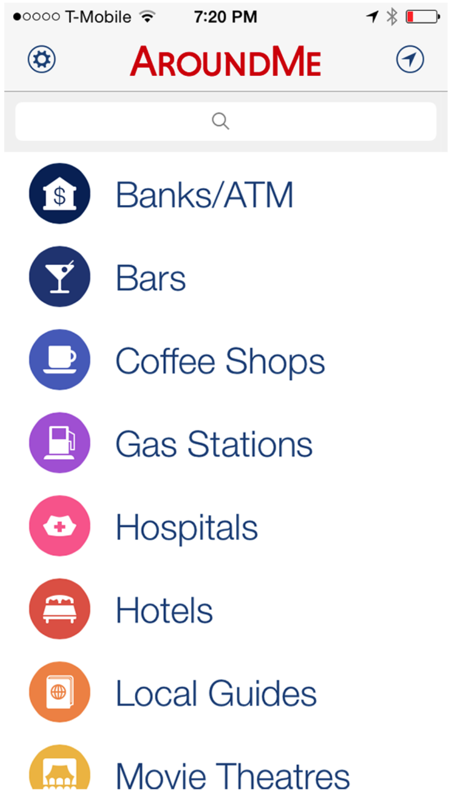
1 Guest – +

1 Room – +

Today

Tomorrow

Find Hotels


●○○○○ T-Mobile 7:20 PM

AROUNDME

Banks/ATM

Bars

Coffee Shops

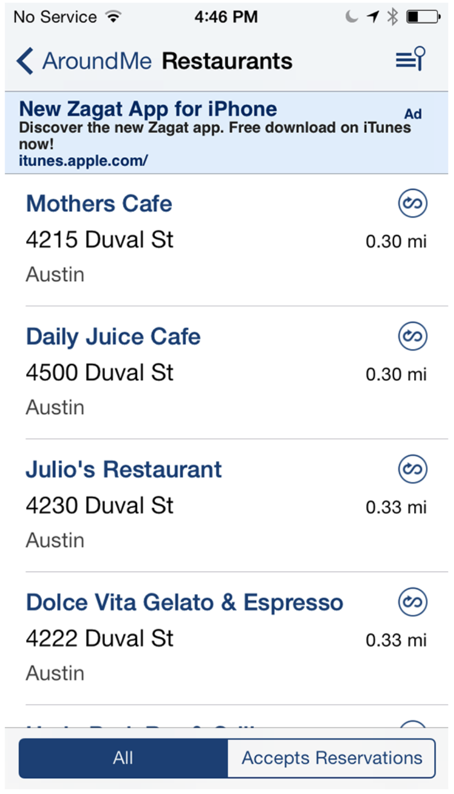
Gas Stations

Hospitals

Hotels

Local Guides

Movie Theatres


No Service 4:46 PM

AroundMe Restaurants

New Zagat App for iPhone Ad
Discover the new Zagat app. Free download on iTunes now!
itunes.apple.com/

Mothers Cafe
4215 Duval St 0.30 mi
Austin

Daily Juice Cafe
4500 Duval St 0.30 mi
Austin

Julio's Restaurant
4230 Duval St 0.33 mi
Austin

Dolce Vita Gelato & Espresso
4222 Duval St 0.33 mi
Austin

All | Accepts Reservations

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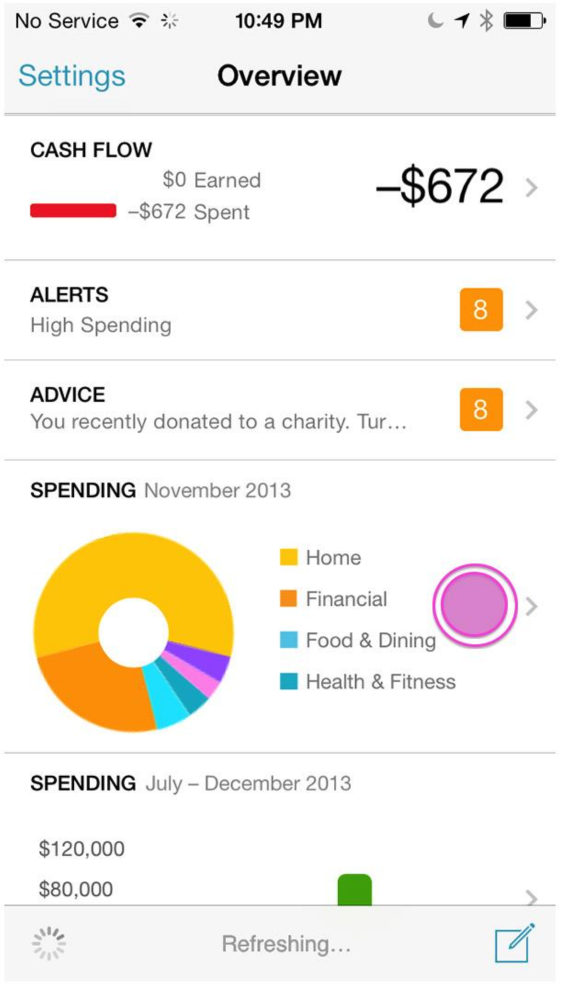
Dashboards

- Mint for iOS



No Service 10:49 PM

Settings **Overview**

CASH FLOW

$0 Earned

–$672 Spent

–$672

ALERTS

High Spending 8

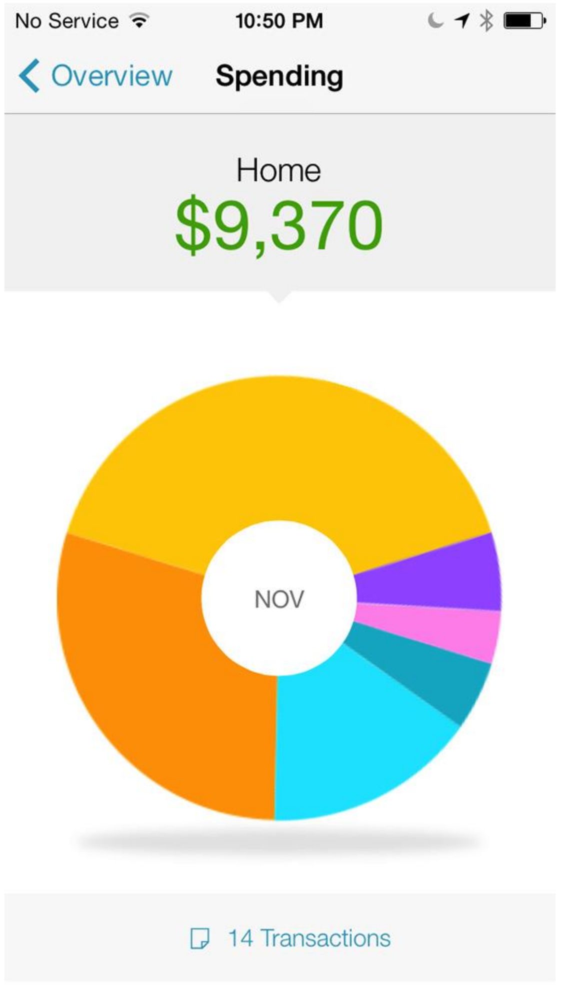
ADVICE

You recently donated to a charity. Tur… 8

SPENDING November 2013

SPENDING July – December 2013

Refreshing…



No Service 10:50 PM

Overview **Spending**

Home

$9,370

14 Transactions

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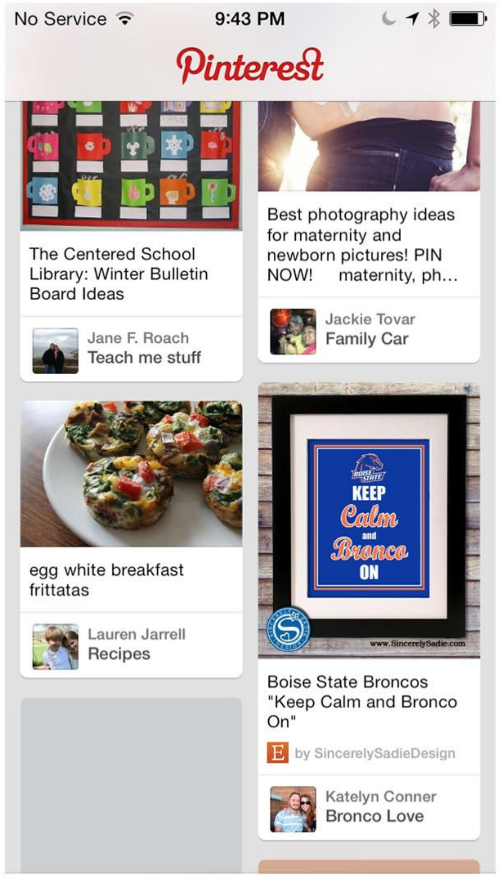
Emerging Patterns: Toolbar

- Pinterest for iOS: hiding and revealing the Toolbar


No Service 9:43 PM

Pinterest

The Centered School Library: Winter Bulletin Board Ideas

Jane F. Roach
Teach me stuff

Best photography ideas for maternity and newborn pictures! PIN NOW! maternity, ph...

Jackie Tovar
Family Car

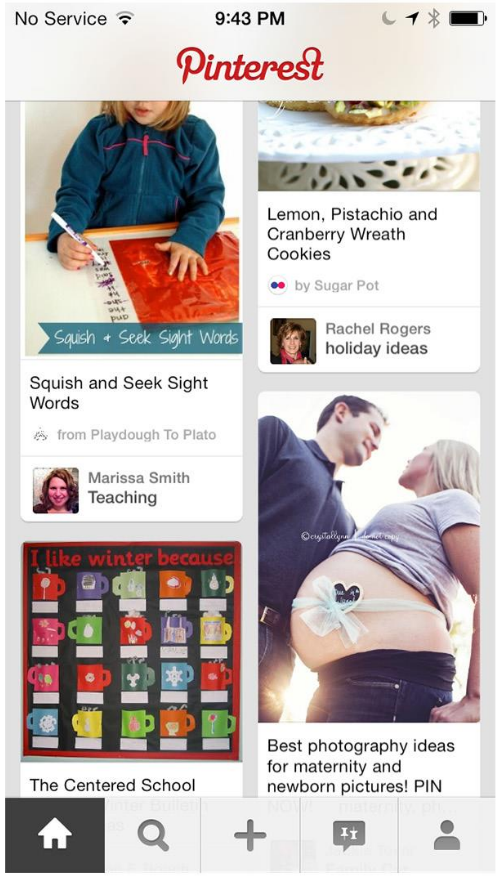
egg white breakfast frittatas

Lauren Jarrell
Recipes

Boise State Broncos "Keep Calm and Bronco On"

by SincerelySadieDesign

Katelyn Conner
Bronco Love


No Service 9:43 PM

Pinterest

Squish and Seek Sight Words

from Playdough To Plato

Marissa Smith
Teaching

Lemon, Pistachio and Cranberry Wreath Cookies

by Sugar Pot

Rachel Rogers
holiday ideas

The Centered School

Best photography ideas for maternity and newborn pictures! PIN

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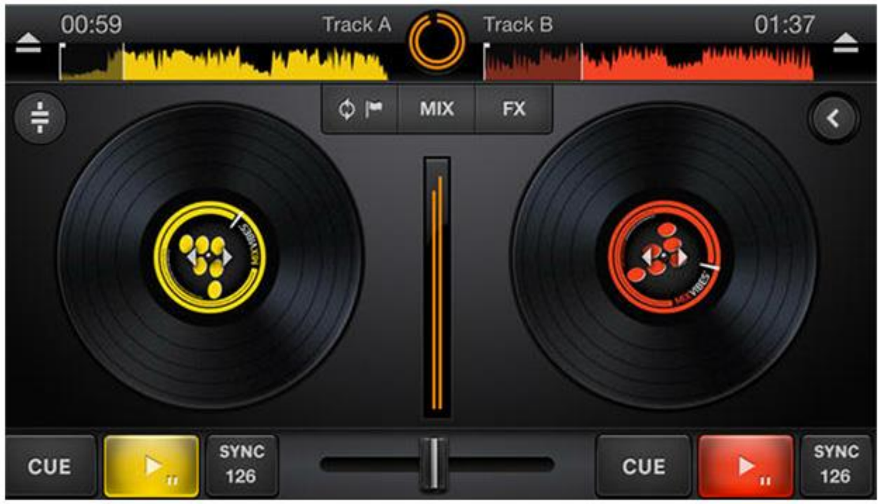
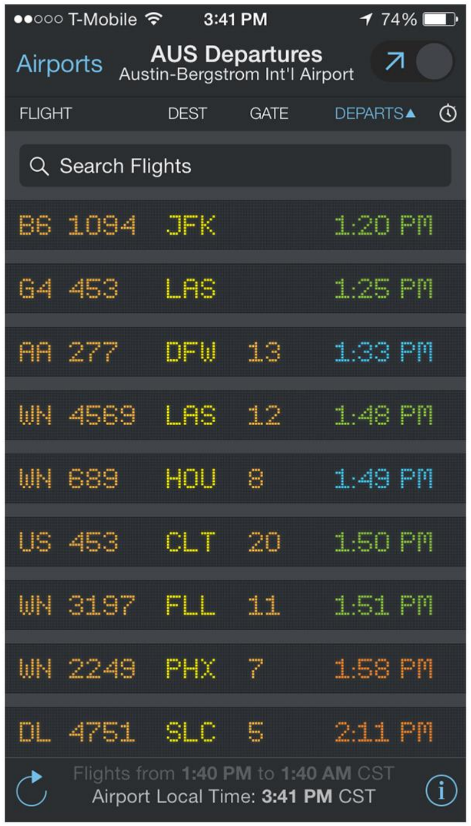
Emerging Patterns: Skeuomorphism

- Cross DJ & Flightboard for iOS





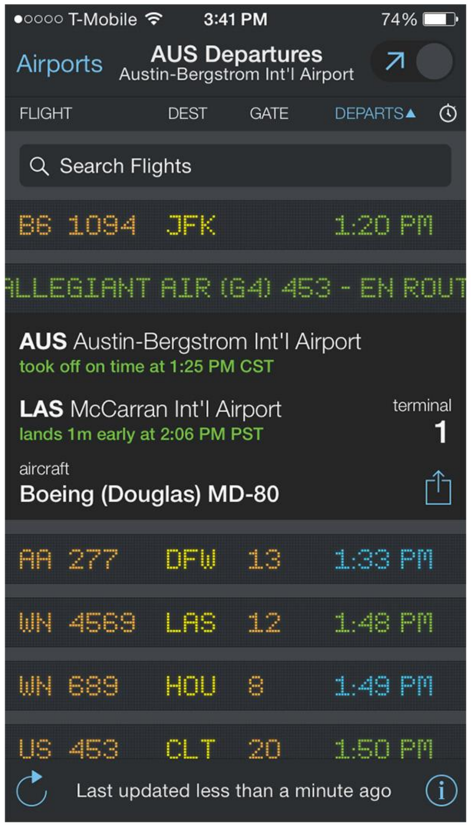
●●○○○ T-Mobile 3:41 PM 74%

Airports **AUS Departures** Austin-Bergstrom Int'l Airport

Search Flights

FLIGHT	DEST	GATE	DEPARTS▲
B6 1094	JFK		1:20 PM
G4 453	LAS		1:25 PM
AA 277	DFW	13	1:33 PM
WN 4569	LAS	12	1:48 PM
WN 689	HOU	8	1:49 PM
US 453	CLT	20	1:50 PM
WN 3197	FLL	11	1:51 PM
WN 2249	PHX	7	1:58 PM
DL 4751	SLC	5	2:11 PM

Flights from **1:40 PM** to **1:40 AM** CST
Airport Local Time: **3:41 PM** CST



●○○○○ T-Mobile 3:41 PM 74%

Airports **AUS Departures** Austin-Bergstrom Int'l Airport

Search Flights

FLIGHT	DEST	GATE	DEPARTS▲
B6 1094	JFK		1:20 PM

ALLEGIANT AIR (G4) 453 - EN ROUT

AUS Austin-Bergstrom Int'l Airport
took off on time at 1:25 PM CST

LAS McCarran Int'l Airport
lands 1m early at 2:06 PM PST
terminal 1

aircraft
Boeing (Douglas) MD-80

FLIGHT	DEST	GATE	DEPARTS▲
AA 277	DFW	13	1:33 PM
WN 4569	LAS	12	1:48 PM
WN 689	HOU	8	1:49 PM
US 453	CLT	20	1:50 PM

Last updated less than a minute ago

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