Updated for iOS 9 and Swift 2.1

iPhone Application Programming
Lecture 1: Introduction

Prof. Dr. Jan Borchers
Media Computing Group
RWTH Aachen University

Winter Semester 2015/2016

http://hci.rwth-aachen.de/iphone

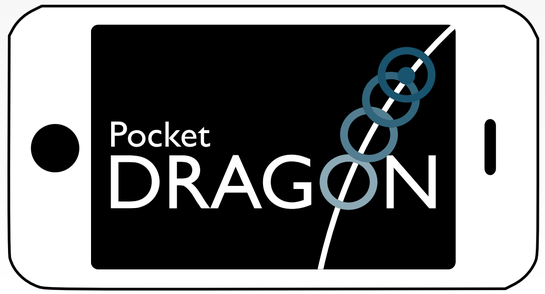
Media Computing Group | RWTH AACHEN UNIVERSITY

iPhone Programming Team

- Prof. Jan Borchers
- Nur Al-huda Hamdan
  - hamdan@cs.rwth-aachen.de
- Specialized topics presenters

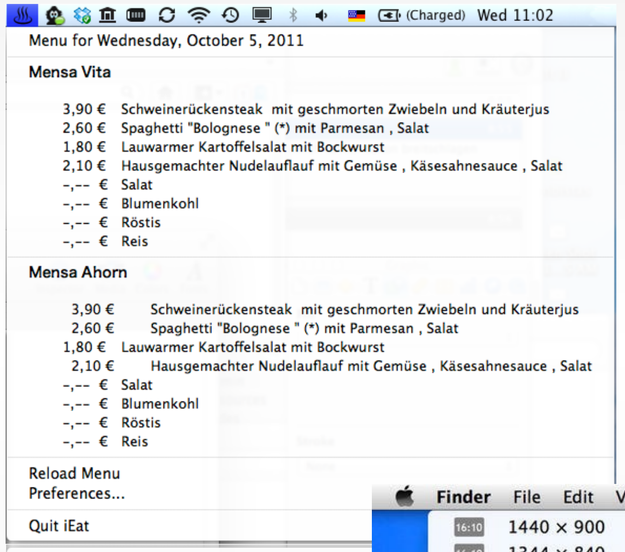
Media Computing Group | RWTH AACHEN UNIVERSITY

Our Projects with iOS

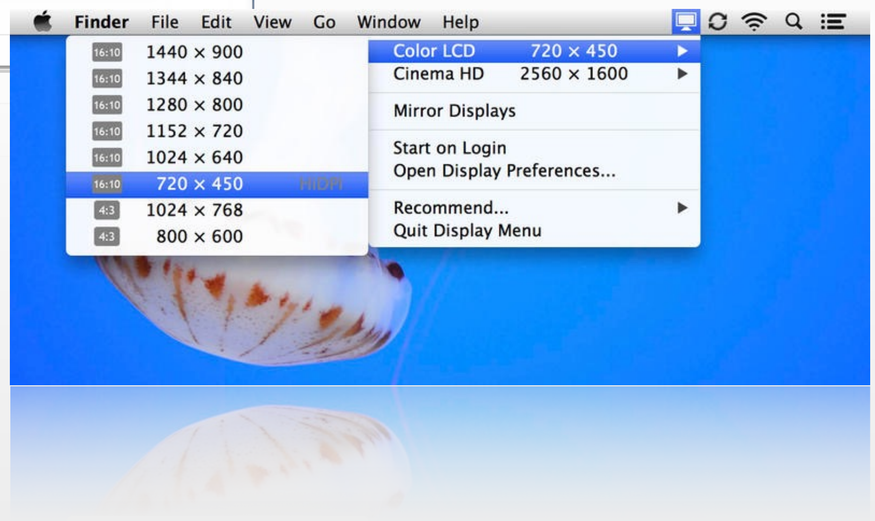


We Are in the App Store

iEat for OS X



Display Menu



iEat for iOS

Media Computing Group | RWTH AACHEN UNIVERSITY

Class Goals

- Understand the differences between desktop and mobile development
- Look at a software framework designed from scratch
- Illustrate how established software engineering patterns are applied in the real world

Media Computing Group | RWTH AACHEN UNIVERSITY

Class Topics

- Mobile application design principles
- Swift 2.1
- iOS development basics
- View controllers & dialogs
- Rendering
- Input techniques
- Location & maps
- Audio
- Networking
- Data persistence
- Integration

Media Computing Group | RWTH AACHEN UNIVERSITY

Administrative Stuff

- Lecture
  - Tue. 9:15–11:45, room 2222
  - Reading assignments
- Lab (16 spots)
  - Mon. 14:15–15:45, room 2222
  - Programming assignments
  - Final project with presentation (09.02.16)
- Final exam: 19.02.16, 10:00–12:00, room 2222

	3 ECTS Lecture only	6 ECTS Lecture + Lab
Assignments		20%
Project		20%
Final Exam	100%	60%

Media Computing Group | RWTH AACHEN UNIVERSITY

Requirements

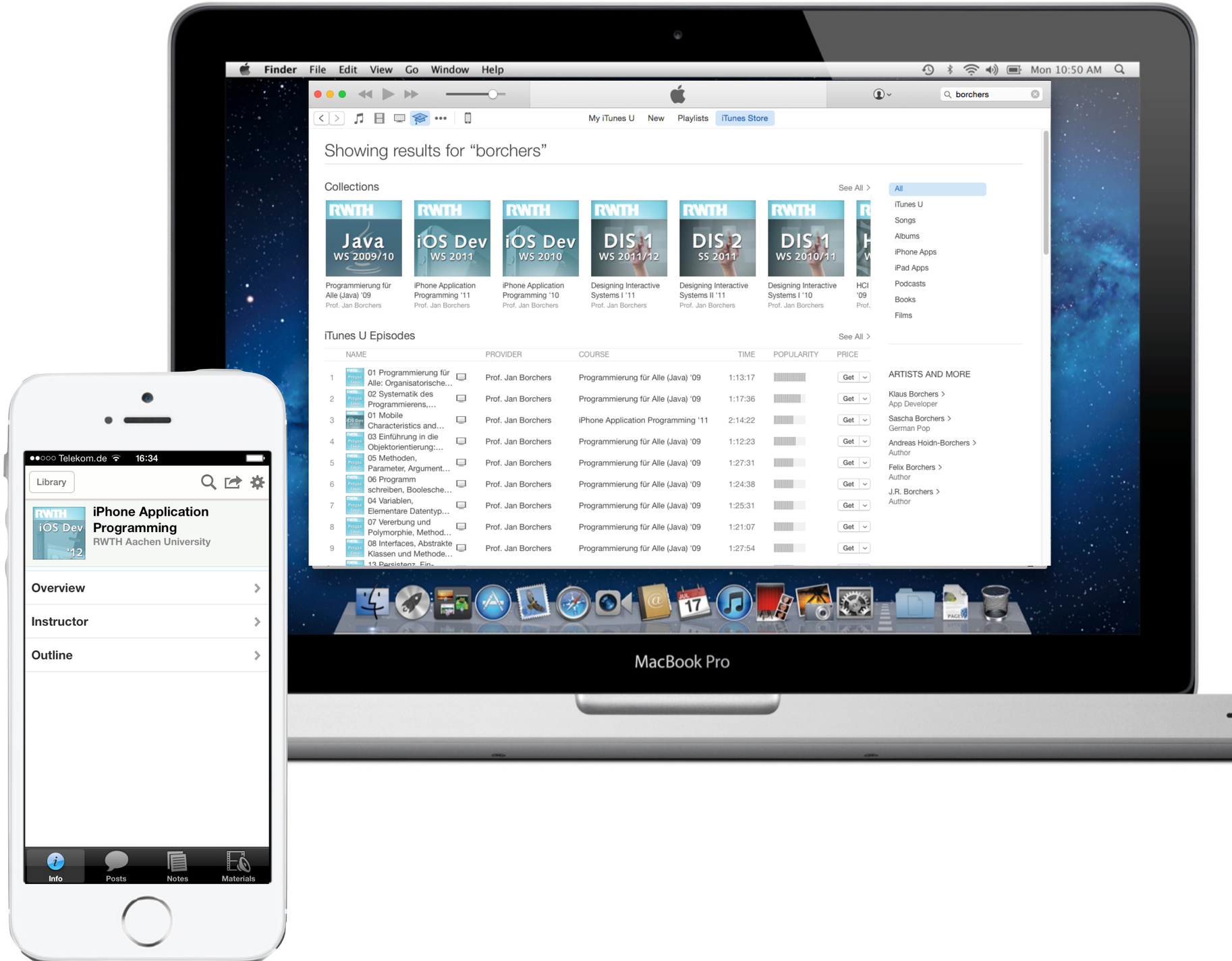
- OOP experience
- No Mac required
  - We will supply Macs & iPhones/iPods for the lab
- You must register for this course in CAMPUS
  - Register for exam before 20.11.15 (no exceptions)
- Lab: You already received the list of accepted students

iPhone Developer University Program

- RWTH is a member of the iPhone Developer University Program
- Free on-device development for you throughout the semester (without restrictions)
  - Free provisioning in Xcode 7

Media Computing Group | RWTH AACHEN UNIVERSITY

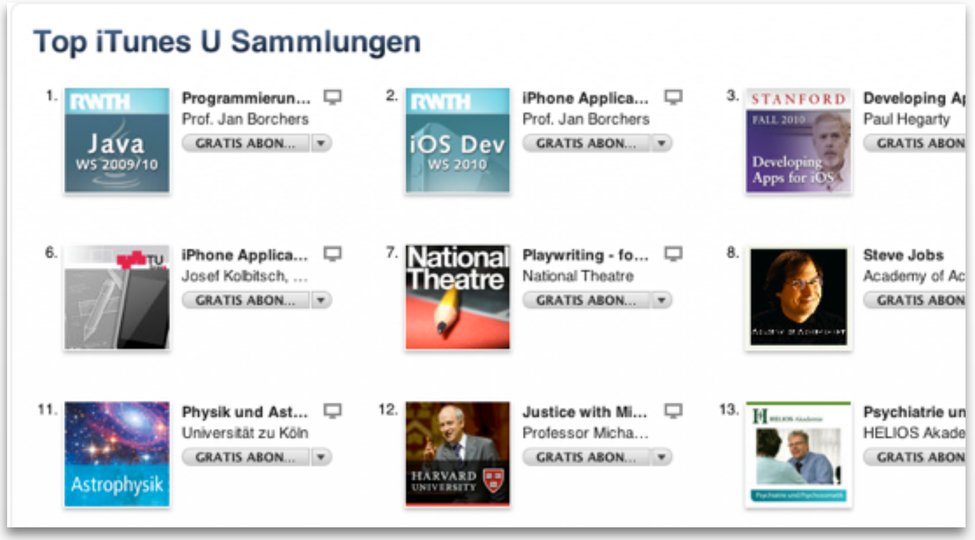
All slides and lecture videos will be available on iTunesU



http://hci.rwth-aachen.de/iphone

Why Take This Class?

- We know HCI, OS X, and iOS
  - Projects, publications, AATCe
- High iTunes U ranking
- Updated to latest iOS 9
- Updated to Swift 2.1



Developing for Mobile Platforms

Media Computing Group | RWTH AACHEN UNIVERSITY

The iOS Family

Media Computing Group | RWTH AACHEN UNIVERSITY

Mobile Device Characteristics

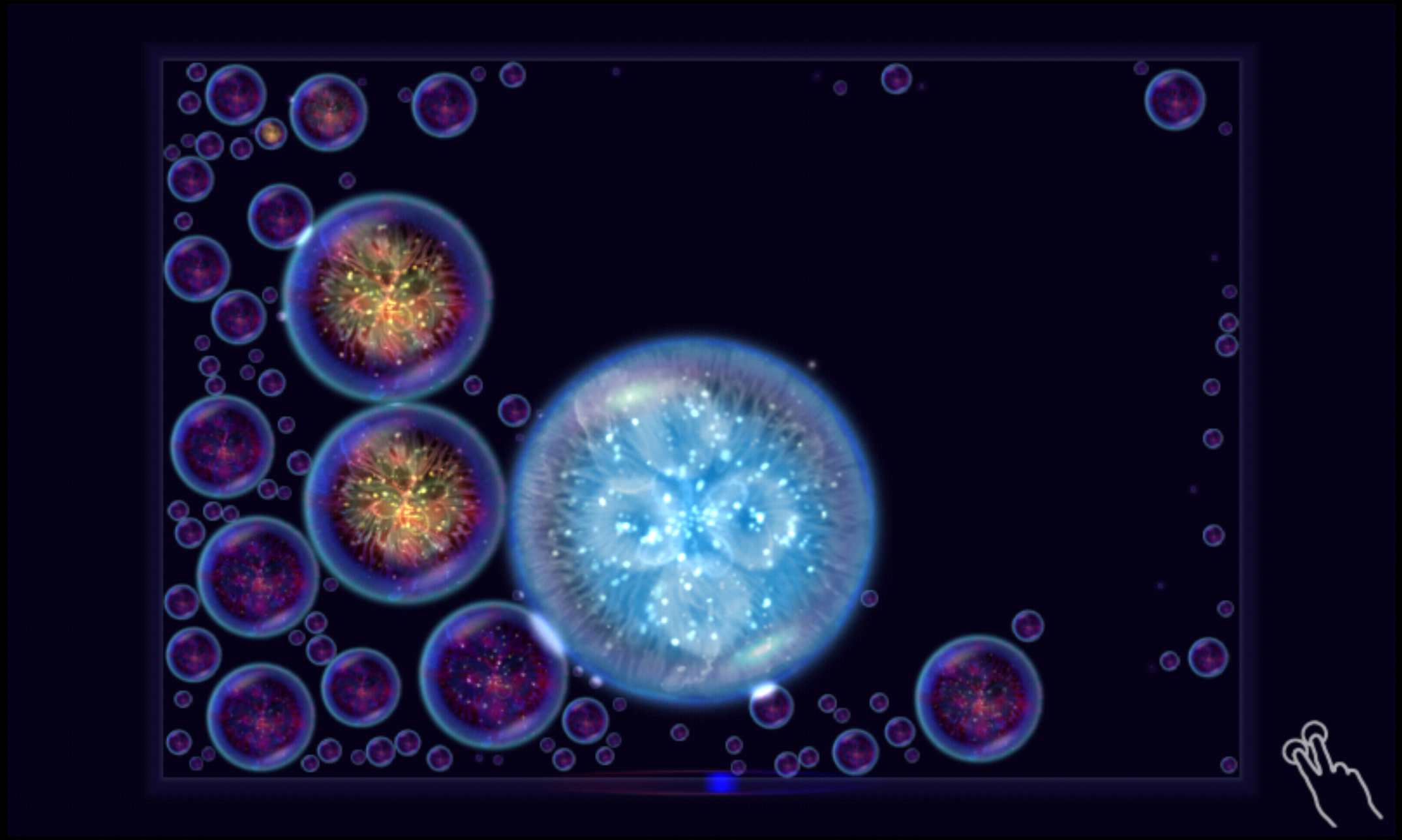
- Screen size is compact
- Memory is limited
- Users interact with one screen at a time
- Users interact with one application at a time (iPad is changing that)
- Onscreen help is minimal
- Context is key: task focus, attention split, peripheral use, movement, interaction time

Media Computing Group | RWTH AACHEN UNIVERSITY

10 Golden Rules of Interface Design (see DIS 1)

- Keep the interface simple
- Speak the user's language
- Be consistent and predictable
- Provide feedback
- Minimize memory load
- Avoid errors, help to recover, offer undo
- Design clear exits and closed dialogs
- Include help and documentation
- Offer shortcuts for experts
- Hire a graphics designer

Media Computing Group | RWTH AACHEN UNIVERSITY

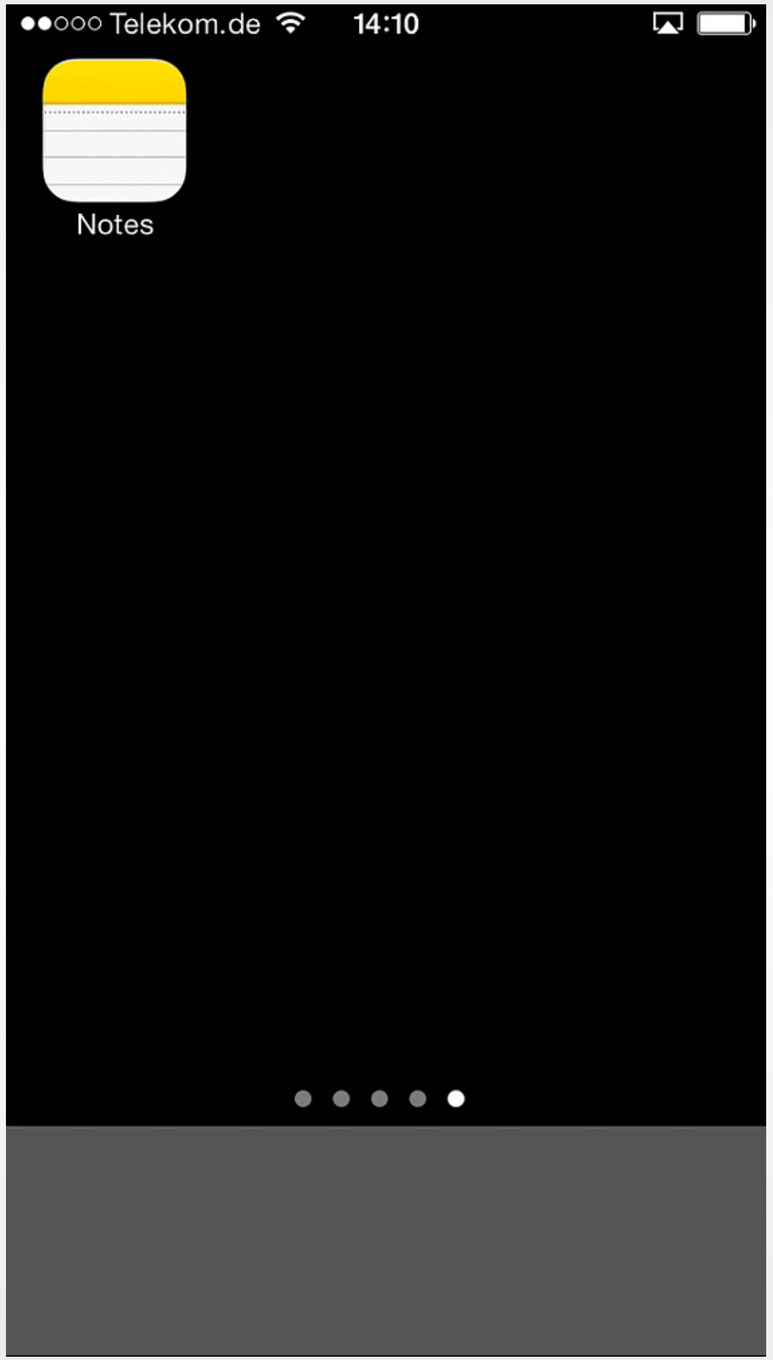


Onscreen help in Osmos HD

10 Golden Rules of Interface Design (see DIS 1)

- Keep the interface simple
- Speak the user's language
- Be consistent and predictable
- Provide feedback
- Minimize memory load
- Avoid errors, help to recover, offer undo
- Design clear exits and closed dialogs
- Include help and documentation
- Offer shortcuts for experts
- Hire a graphics designer

Media Computing Group | RWTH AACHEN UNIVERSITY



Media Computing Group
RWTH AACHEN UNIVERSITY

Life as an App

- The iPhone is an app-centric environment
- One app per task!
  - Define the task that users want to accomplish with your app
  - Do *one* thing, but do it well
- Data is stored per app
- Data exchange between some apps is difficult

Media Computing Group | RWTH AACHEN UNIVERSITY

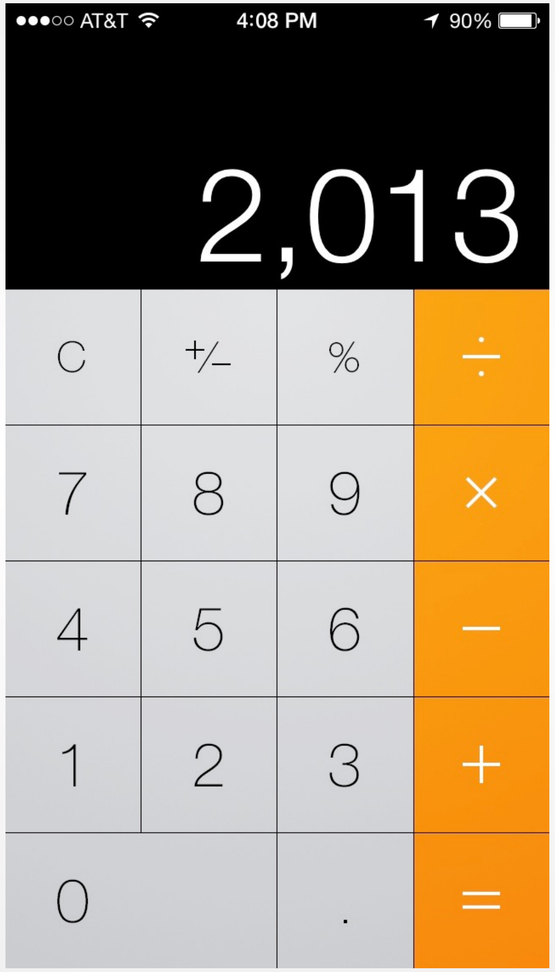
Designing the UI

- Make it obvious how to use your application
- Sort information from top to bottom
- Use visual weight for relative importance
- Use alignment for groupings or hierarchy

Media Computing Group | RWTH AACHEN UNIVERSITY

Designing the UI

- Text should always be legible
- Avoid inconsistent appearances
- Provide fingertip-size targets (44 x 44 points)
- Minimize text input



Media Computing Group | RWTH AACHEN UNIVERSITY

Interaction Design

- Multitouch interaction is still new
- Interaction patterns not established yet
- Follow Apple's examples if possible
- If you use complex gestures, help the user

Media Computing Group | RWTH AACHEN UNIVERSITY

Standard Gestures

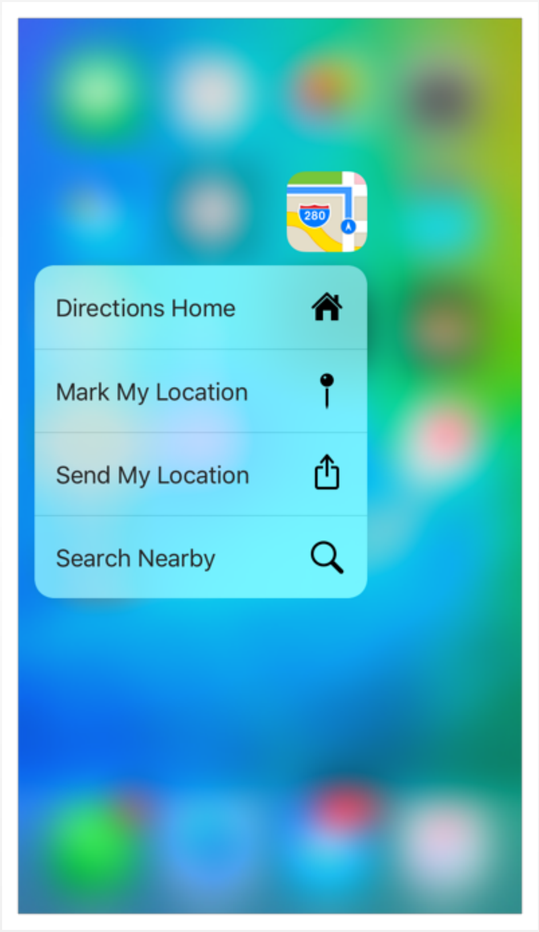
	Tap	To press or select a control or item (analogous to a single mouse click).
	Drag	To scroll or pan.
	Flick	To scroll or pan quickly.
	Swipe	In a table-view row, to reveal the Delete button.
	Double tap	To zoom in and center a block of content or an image. To zoom out (if already zoomed in).
	Pinch open	To zoom in.
	Pinch close	To zoom out.
	Touch and hold	In editable text, to display a magnified view for cursor positioning.

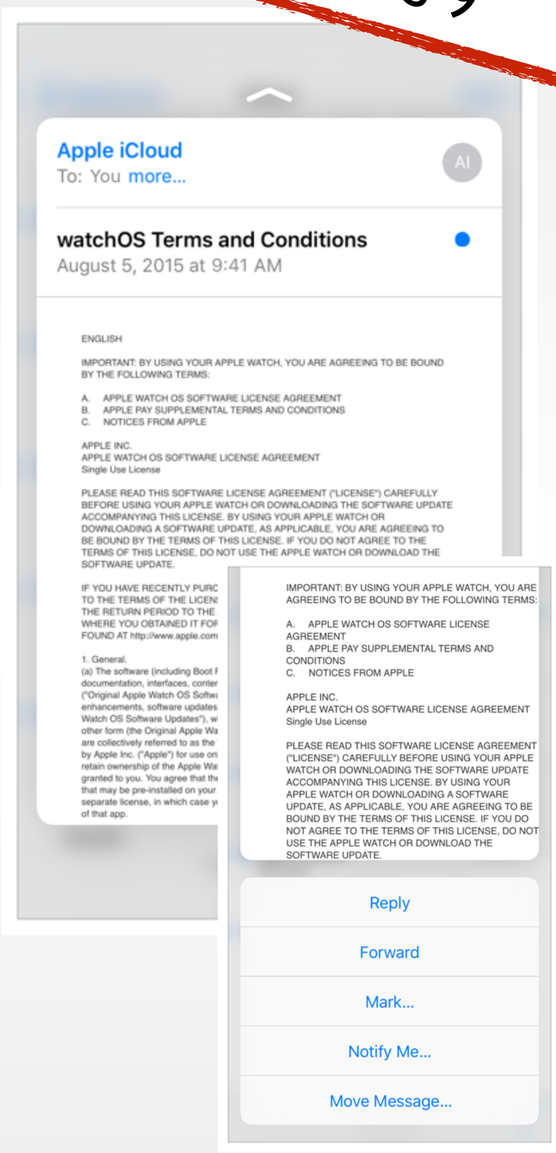
Media Computing Group | RWTH AACHEN UNIVERSITY

3D Touch

New! in iOS 9

- An additional interaction dimension (right click!)
- Detects several levels of pressure
- Quick Actions
- Peek and Pop
- Turn keyboard to trackpad
- Available for iPhone 6s and 6s Plus
- Apple Watch can also detect Force Touch



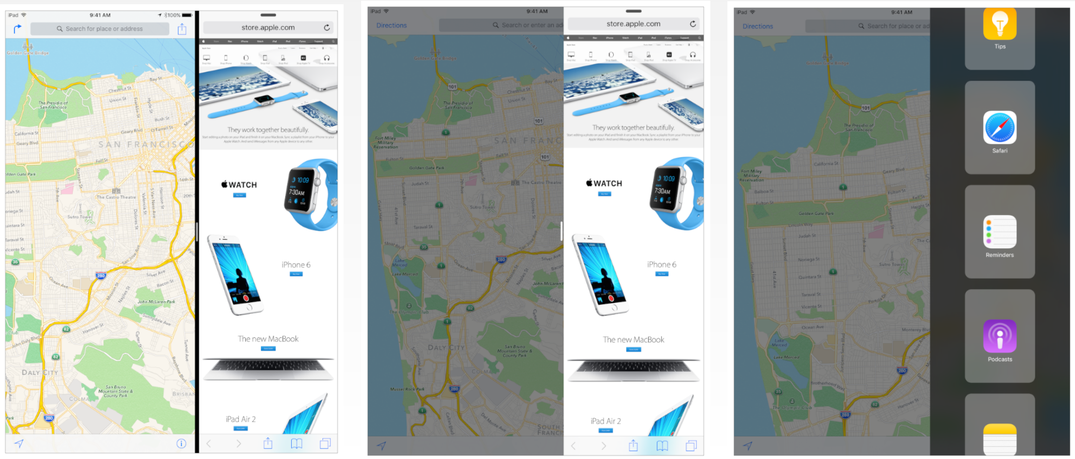


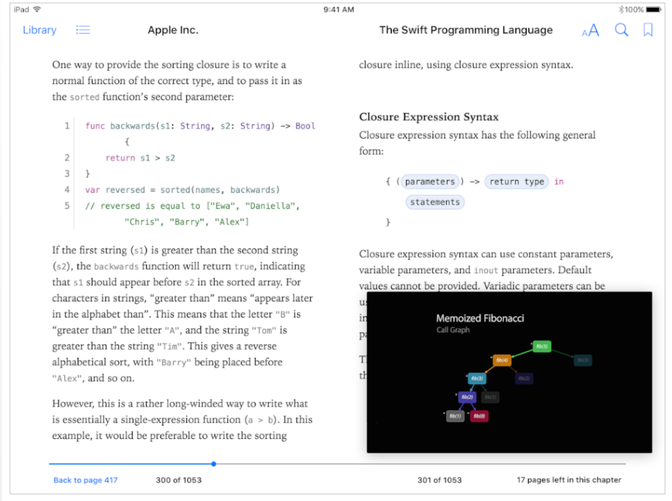
Media Computing Group | RWTH AACHEN UNIVERSITY

Multitasking on iPad

New! in iOS 9

- Slide Over
- Split View
- Picture in Picture

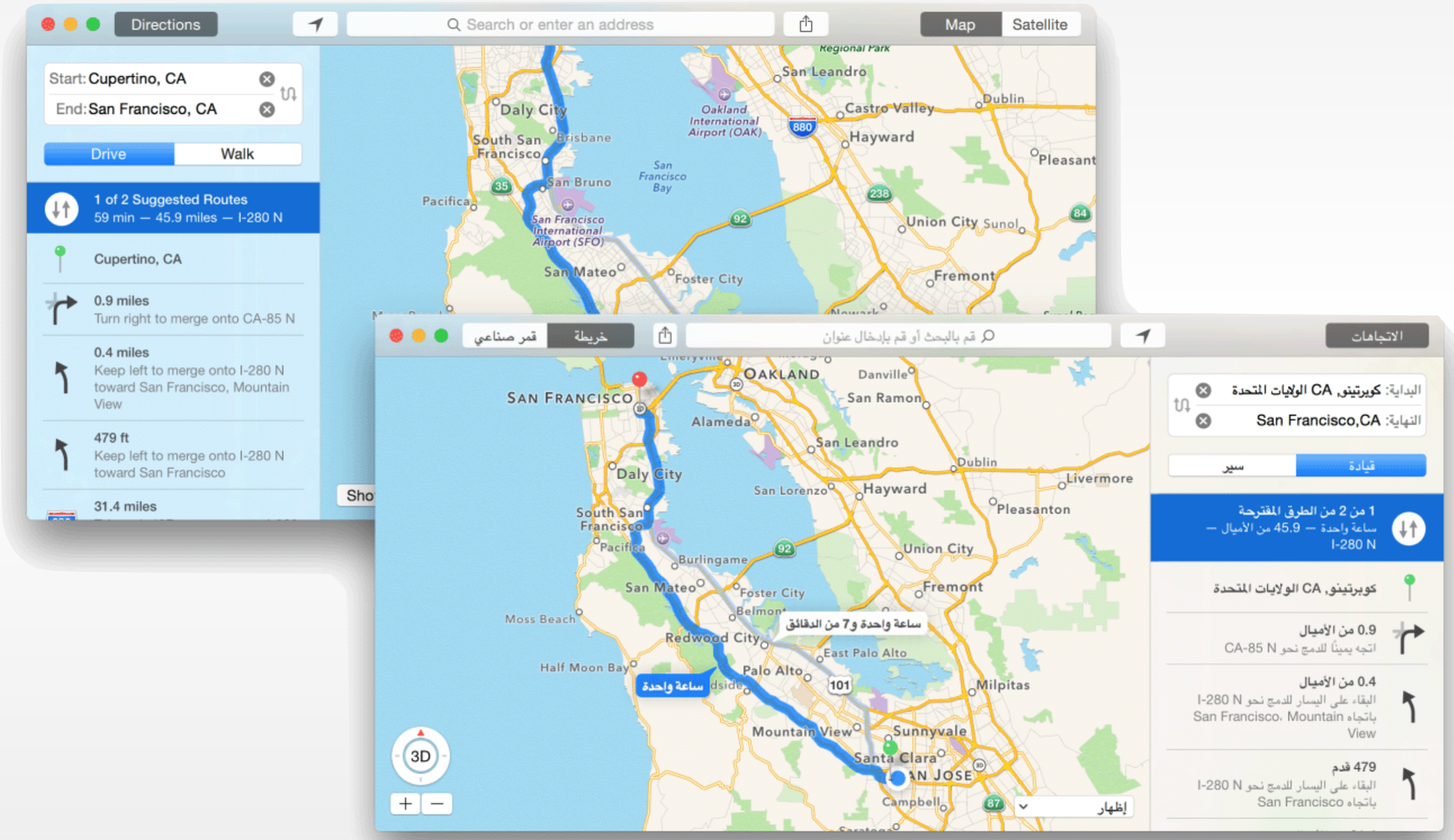




Media Computing Group | RWTH AACHEN UNIVERSITY

Supporting Right-to-Left Languages

New! in iOS 9



Media Computing Group | RWTH AACHEN UNIVERSITY

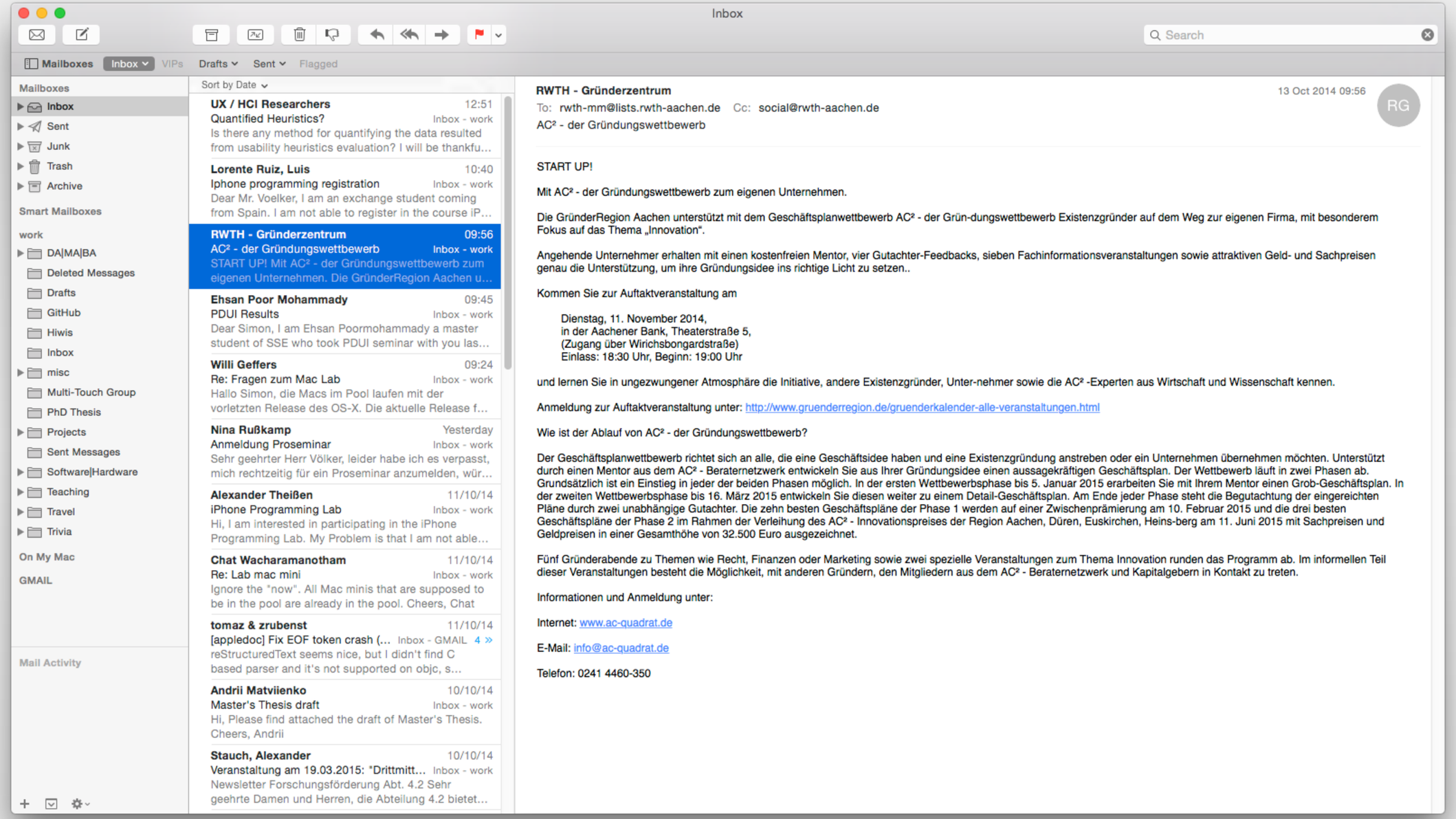
Designing the UI

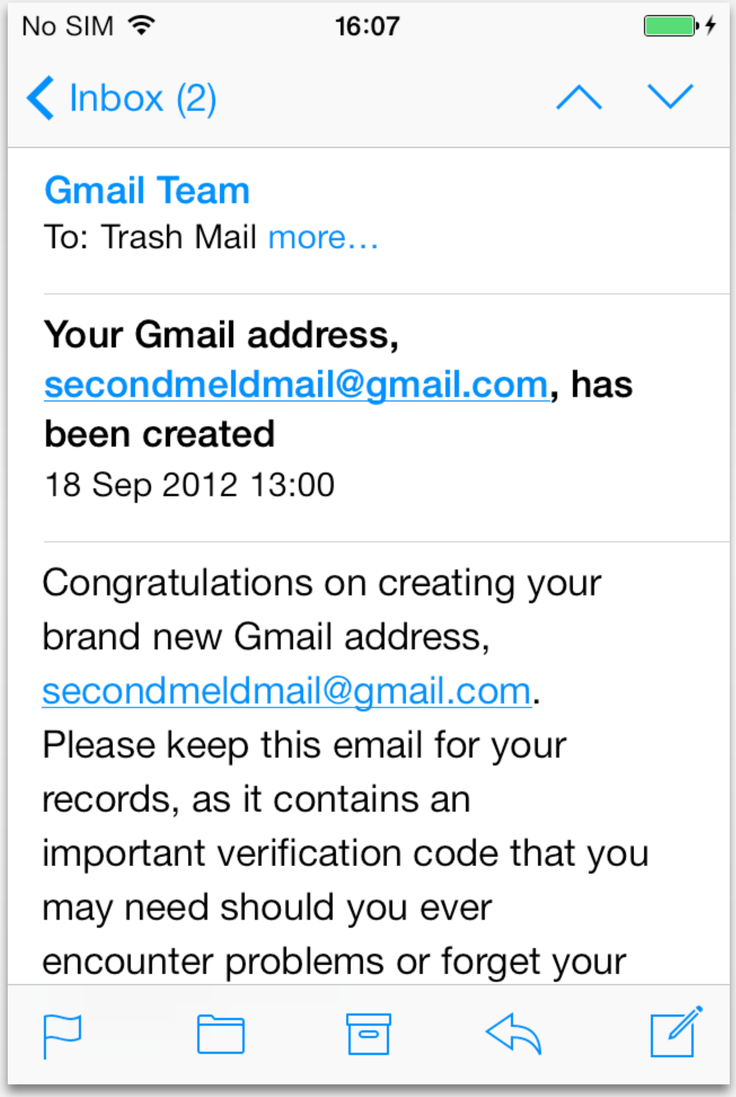
- Seven resolutions, three aspect ratios:

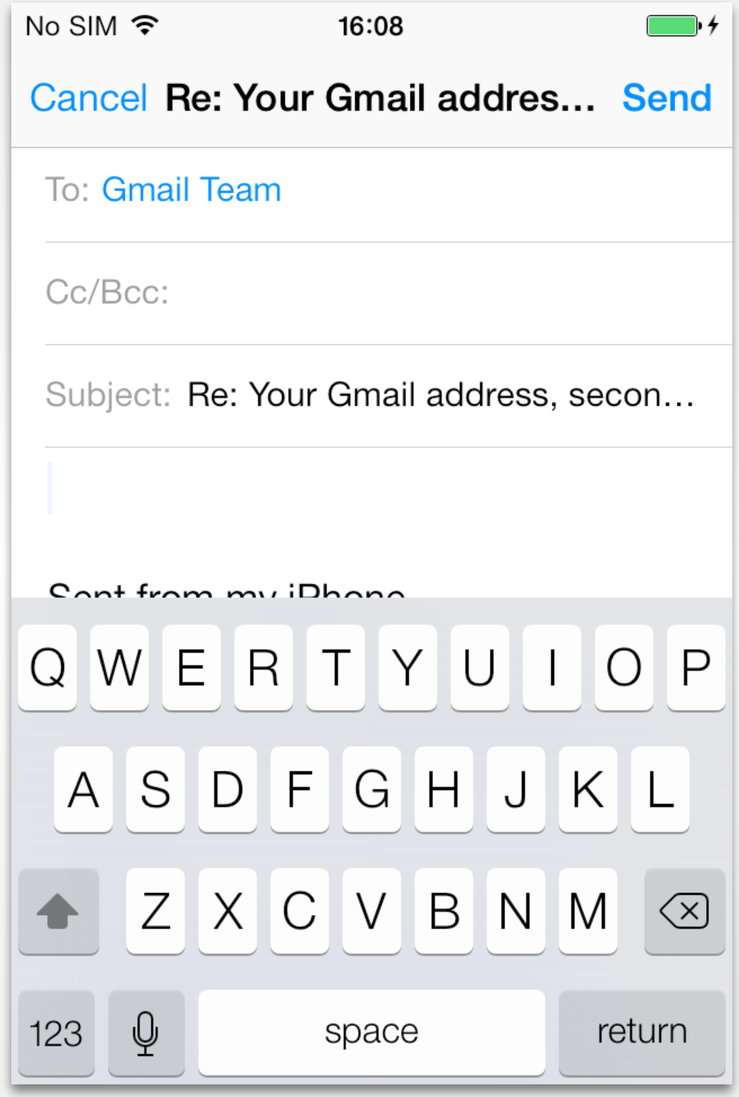
	Resolution		Aspect Ratio
	Classic	Retina	
iPhone	480 x 320	960 x 640	3:2
iPhone 5(S, C)		1136 x 640	16:9
iPhone 6(S)		1334 x 750	16:9
iPhone 6(S) Plus		1920 x 1080	16:9
iPad	1024 x 768	2048 x 1536	4:3
iPad Mini	1024 x 768		4:3

- Device orientation: portrait or landscape
- Designing for the iPad requires more than increasing the resolution

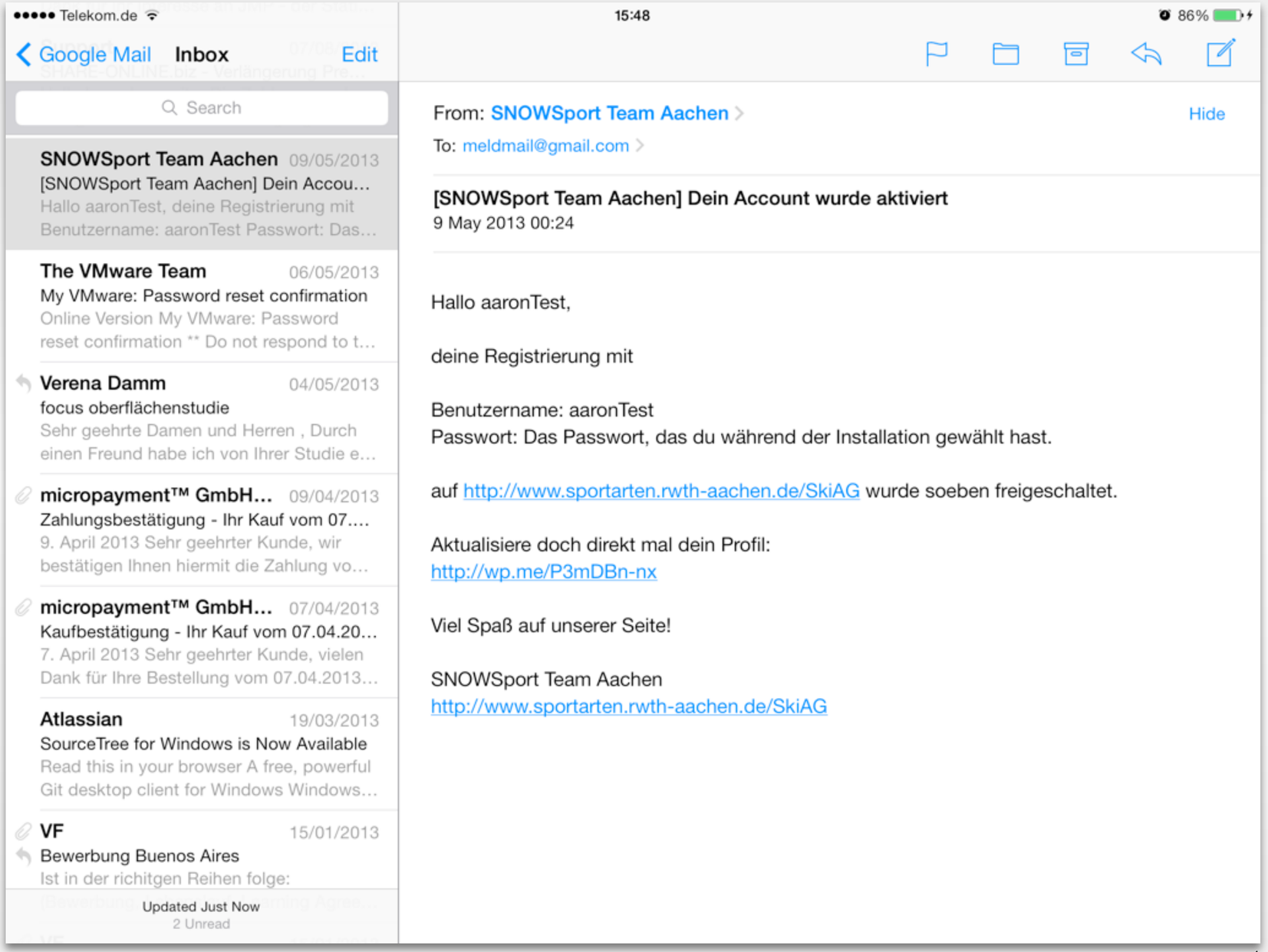
Media Computing Group | RWTH AACHEN UNIVERSITY

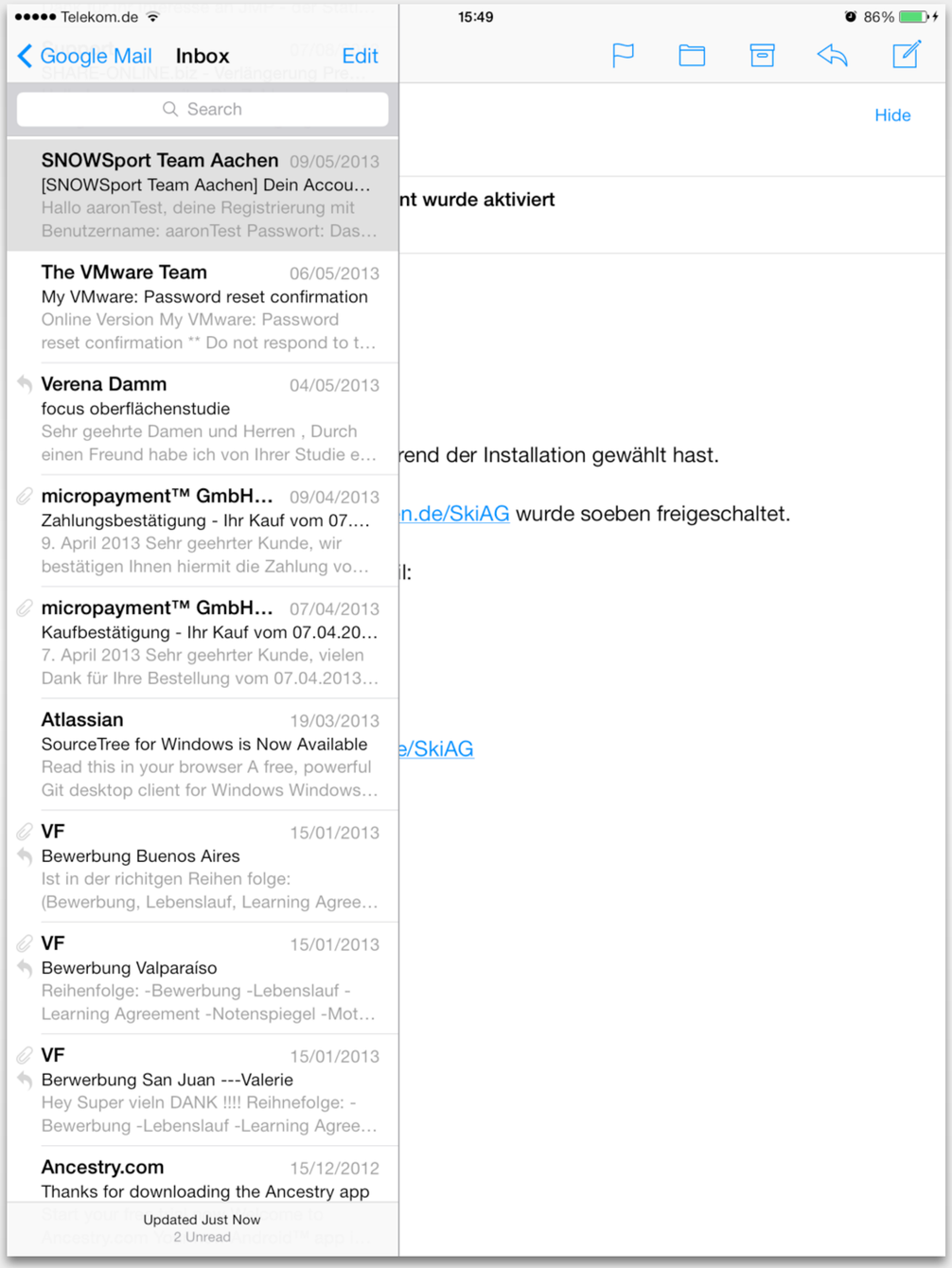

Inbox
Search
Mailboxes
Inbox
VIPs
Drafts
Sent
Flagged
Mailboxes
Inbox
Sent
Junk
Trash
Archive
Smart Mailboxes
work
DA|MA|BA
Deleted Messages
Drafts
GitHub
Hiwis
Inbox
misc
Multi-Touch Group
PhD Thesis
Projects
Sent Messages
Software|Hardware
Teaching
Travel
Trivia
On My Mac
GMAIL
Mail Activity
Sort by Date
UX / HCI Researchers 12:51
Quantified Heuristics? Inbox - work
Is there any method for quantifying the data resulted from usability heuristics evaluation? I will be thankfu...
Lorente Ruiz, Luis 10:40
Iphone programming registration Inbox - work
Dear Mr. Voelker, I am an exchange student coming from Spain. I am not able to register in the course iP...
RWTH - Gründerzentrum 09:56
AC² - der Gründungswettbewerb Inbox - work
START UP! Mit AC² - der Gründungswettbewerb zum eigenen Unternehmen. Die GründerRegion Aachen u...
Ehsan Poor Mohammady 09:45
PDUI Results Inbox - work
Dear Simon, I am Ehsan Poormohammady a master student of SSE who took PDUI seminar with you las...
Willi Geffers 09:24
Re: Fragen zum Mac Lab Inbox - work
Hallo Simon, die Macs im Pool laufen mit der vorletzten Release des OS-X. Die aktuelle Release f...
Nina Rußkamp Yesterday
Anmeldung Proseminar Inbox - work
Sehr geehrter Herr Völker, leider habe ich es verpasst, mich rechtzeitig für ein Proseminar anzumelden, wür...
Alexander Theißen 11/10/14
iPhone Programming Lab Inbox - work
Hi, I am interested in participating in the iPhone Programming Lab. My Problem is that I am not able...
Chat Wacharamanotham 11/10/14
Re: Lab mac mini Inbox - work
Ignore the "now". All Mac minis that are supposed to be in the pool are already in the pool. Cheers, Chat
tomaz & zrubenst 11/10/14
[appledoc] Fix EOF token crash (... Inbox - GMAIL 4
reStructuredText seems nice, but I didn't find C based parser and it's not supported on objc, s...
Andrii Matviienko 10/10/14
Master's Thesis draft Inbox - work
Hi, Please find attached the draft of Master's Thesis. Cheers, Andrii
Stauch, Alexander 10/10/14
Veranstaltung am 19.03.2015: "Drittmitt... Inbox - work
Newsletter Forschungsförderung Abt. 4.2 Sehr geehrte Damen und Herren, die Abteilung 4.2 bietet...
RWTH - Gründerzentrum
13 Oct 2014 09:56
To: rwth-mm@lists.rwth-aachen.de Cc: social@rwth-aachen.de
AC² - der Gründungswettbewerb
RG
START UP!
Mit AC² - der Gründungswettbewerb zum eigenen Unternehmen.
Die GründerRegion Aachen unterstützt mit dem Geschäftsplanwettbewerb AC² - der Grün-dungswettbewerb Existenzgründer auf dem Weg zur eigenen Firma, mit besonderem Fokus auf das Thema „Innovation".
Angehende Unternehmer erhalten mit einen kostenfreien Mentor, vier Gutachter-Feedbacks, sieben Fachinformationsveranstaltungen sowie attraktiven Geld- und Sachpreisen genau die Unterstützung, um ihre Gründungsidee ins richtige Licht zu setzen..
Kommen Sie zur Auftaktveranstaltung am
Dienstag, 11. November 2014,
in der Aachener Bank, Theaterstraße 5,
(Zugang über Wirichsbongardstraße)
Einlass: 18:30 Uhr, Beginn: 19:00 Uhr
und lernen Sie in ungezwungener Atmosphäre die Initiative, andere Existenzgründer, Unter-nehmer sowie die AC² -Experten aus Wirtschaft und Wissenschaft kennen.
Anmeldung zur Auftaktveranstaltung unter: http://www.gruenderregion.de/gruenderkalender-alle-veranstaltungen.html
Wie ist der Ablauf von AC² - der Gründungswettbewerb?
Der Geschäftsplanwettbewerb richtet sich an alle, die eine Geschäftsidee haben und eine Existenzgründung anstreben oder ein Unternehmen übernehmen möchten. Unterstützt durch einen Mentor aus dem AC² - Beraternetzwerk entwickeln Sie aus Ihrer Gründungsidee einen aussagekräftigen Geschäftsplan. Der Wettbewerb läuft in zwei Phasen ab. Grundsätzlich ist ein Einstieg in jeder der beiden Phasen möglich. In der ersten Wettbewerbsphase bis 5. Januar 2015 erarbeiten Sie mit Ihrem Mentor einen Grob-Geschäftsplan. In der zweiten Wettbewerbsphase bis 16. März 2015 entwickeln Sie diesen weiter zu einem Detail-Geschäftsplan. Am Ende jeder Phase steht die Begutachtung der eingereichten Pläne durch zwei unabhängige Gutachter. Die zehn besten Geschäftspläne der Phase 1 werden auf einer Zwischenprämierung am 10. Februar 2015 und die drei besten Geschäftspläne der Phase 2 im Rahmen der Verleihung des AC² - Innovationspreises der Region Aachen, Düren, Euskirchen, Heins-berg am 11. Juni 2015 mit Sachpreisen und Geldpreisen in einer Gesamthöhe von 32.500 Euro ausgezeichnet.
Fünf Gründerabende zu Themen wie Recht, Finanzen oder Marketing sowie zwei spezielle Veranstaltungen zum Thema Innovation runden das Programm ab. Im informellen Teil dieser Veranstaltungen besteht die Möglichkeit, mit anderen Gründern, den Mitgliedern aus dem AC² - Beraternetzwerk und Kapitalgebern in Kontakt zu treten.
Informationen und Anmeldung unter:
Internet: www.ac-quadrat.de
E-Mail: info@ac-quadrat.de
Telefon: 0241 4460-350





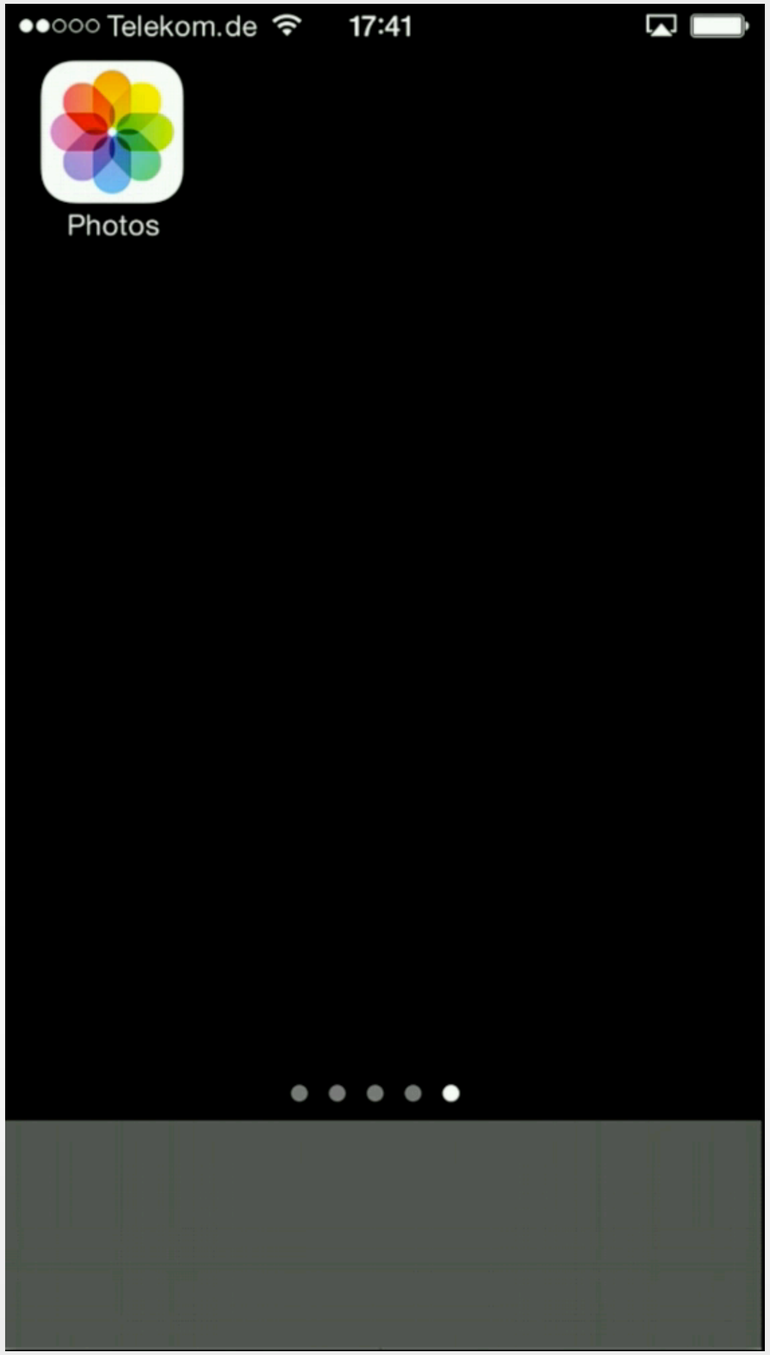
Media Computing Group | RWTH AACHEN UNIVERSITY


Telekom.de
15:48
86%
Google Mail
Inbox
Edit
Search
SNOWSport Team Aachen 09/05/2013
[SNOWSport Team Aachen] Dein Accou…
Hallo aaronTest, deine Registrierung mit Benutzername: aaronTest Passwort: Das…
The VMware Team 06/05/2013
My VMware: Password reset confirmation
Online Version My VMware: Password reset confirmation ** Do not respond to t…
Verena Damm 04/05/2013
focus oberflächenstudie
Sehr geehrte Damen und Herren , Durch einen Freund habe ich von Ihrer Studie e…
micropayment™ GmbH… 09/04/2013
Zahlungsbestätigung - Ihr Kauf vom 07.…
9. April 2013 Sehr geehrter Kunde, wir bestätigen Ihnen hiermit die Zahlung vo…
micropayment™ GmbH… 07/04/2013
Kaufbestätigung - Ihr Kauf vom 07.04.20…
7. April 2013 Sehr geehrter Kunde, vielen Dank für Ihre Bestellung vom 07.04.2013…
Atlassian 19/03/2013
SourceTree for Windows is Now Available
Read this in your browser A free, powerful Git desktop client for Windows Windows…
VF 15/01/2013
Bewerbung Buenos Aires
Ist in der richitgen Reihen folge:
Updated Just Now
2 Unread
From: SNOWSport Team Aachen
Hide
To: meldmail@gmail.com
[SNOWSport Team Aachen] Dein Account wurde aktiviert
9 May 2013 00:24
Hallo aaronTest,
deine Registrierung mit
Benutzername: aaronTest
Passwort: Das Passwort, das du während der Installation gewählt hast.
auf http://www.sportarten.rwth-aachen.de/SkiAG wurde soeben freigeschaltet.
Aktualisiere doch direkt mal dein Profil:
http://wp.me/P3mDBn-nx
Viel Spaß auf unserer Seite!
SNOWSport Team Aachen
http://www.sportarten.rwth-aachen.de/SkiAG



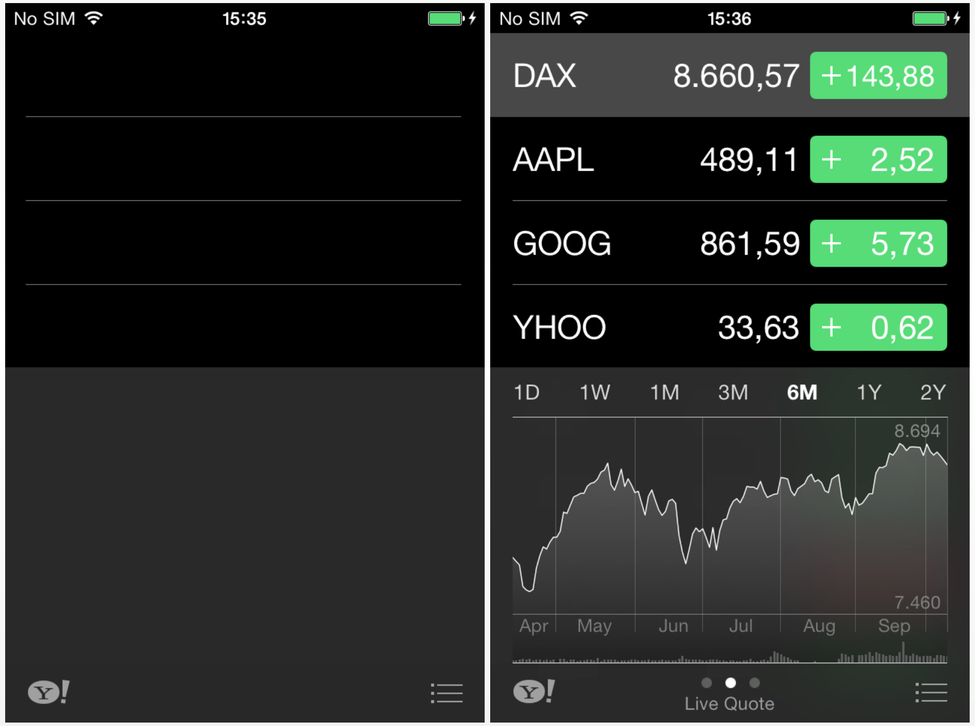
Media Computing Group | RWTH AACHEN UNIVERSITY

Media Computing Group | RWTH AACHEN UNIVERSITY


●●○○○ Telekom.de
17:41
Photos

Starting

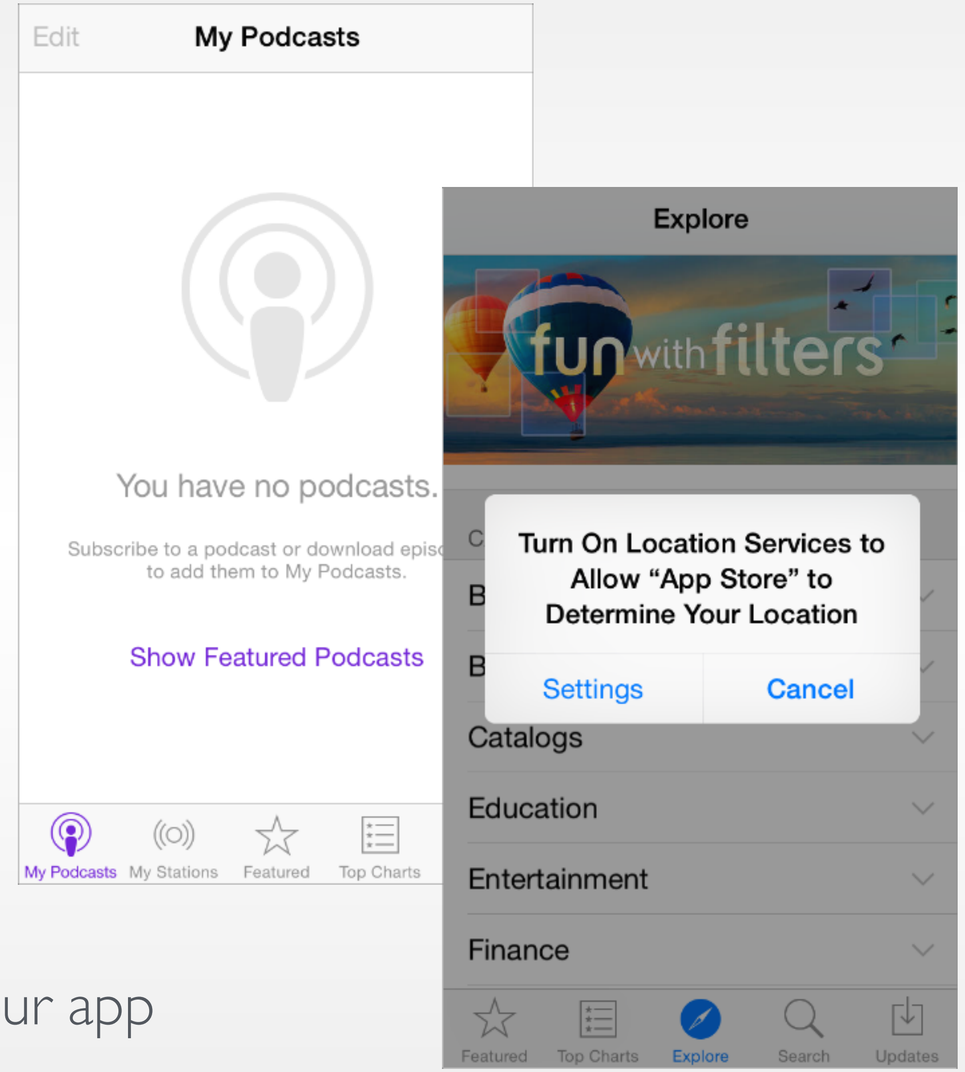
- Apps should start quickly to provide a fluid user experience
- Show a launch image that closely resembles the first screen of your app (launch file)
- Restore the state of last run (minimize user input)
- Delay a login requirement for as long as possible
- By default, launch in device's current orientation
- Think carefully before providing an onboarding experience



Media Computing Group | RWTH AACHEN UNIVERSITY

Stop

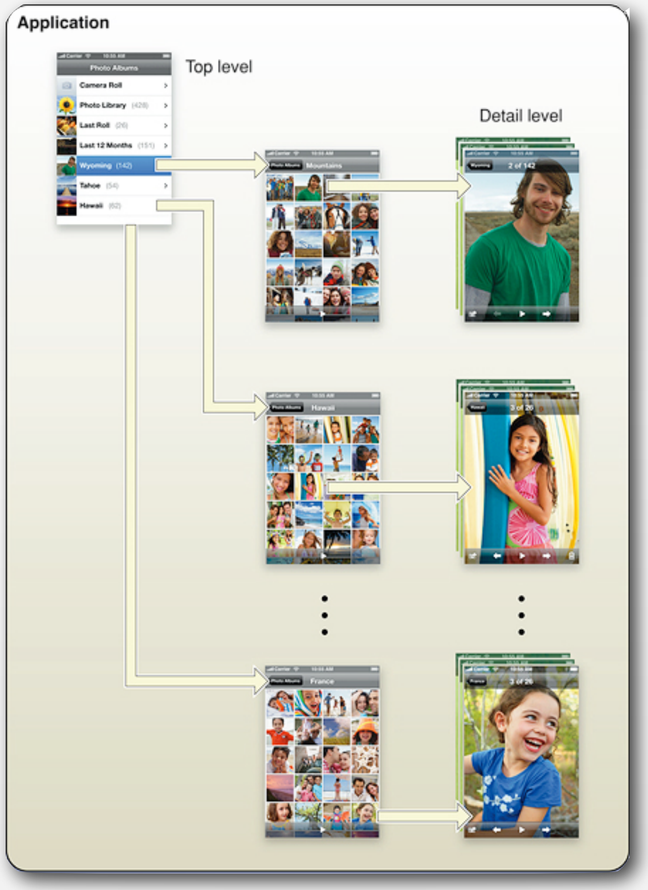
- No Quit button or menu item
- Be prepared to quit at any time
- Program flow interrupted by external events
  - Incoming phone call
- Store state when stopping
- Application moved to background
- Notify users what feature are unavailable and limiting your app



Media Computing Group | RWTH AACHEN UNIVERSITY

Application Styles

Productivity



Photos

Utility

Weather

Immersive

Seadragon

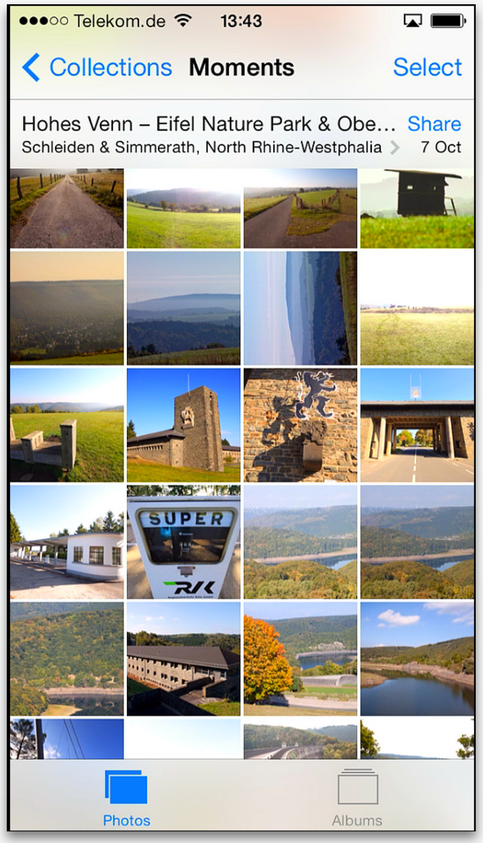
Media Computing Group | RWTH AACHEN UNIVERSITY

Productivity Applications

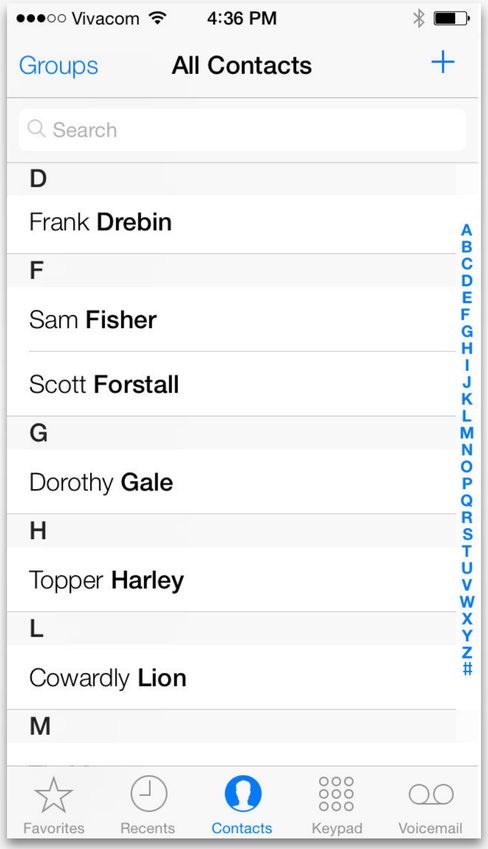
- Organizing and managing detailed information
- Often organize data hierarchically
- Organizing the list, add or remove items
- Examples: Contacts, Photos

Media Computing Group | RWTH AACHEN UNIVERSITY

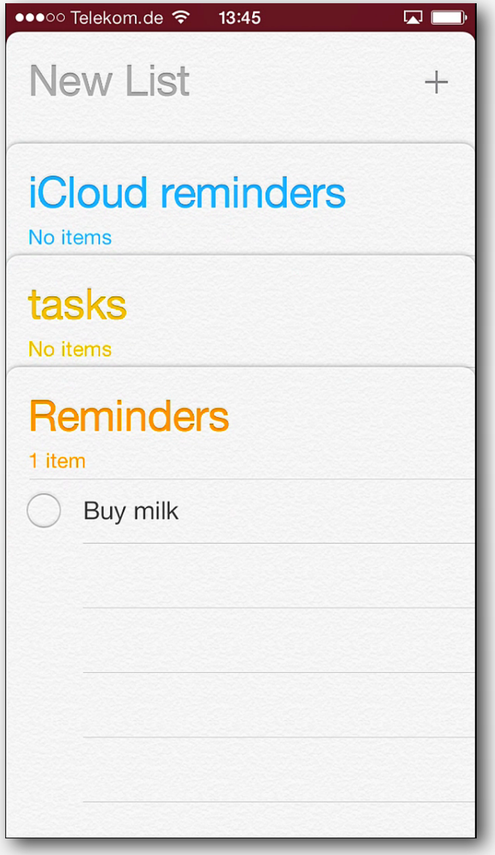
Productivity Applications



Photos



Contacts



Reminders

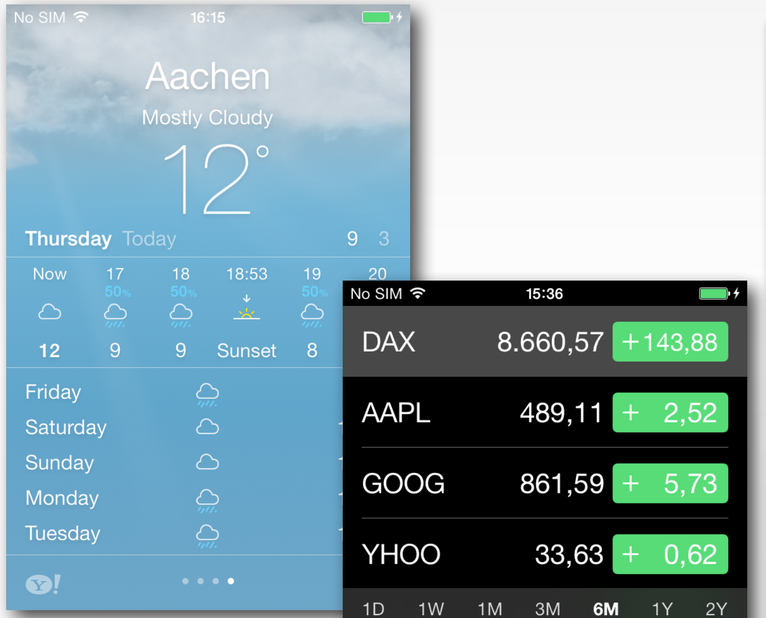
Media Computing Group | RWTH AACHEN UNIVERSITY

Utility Applications

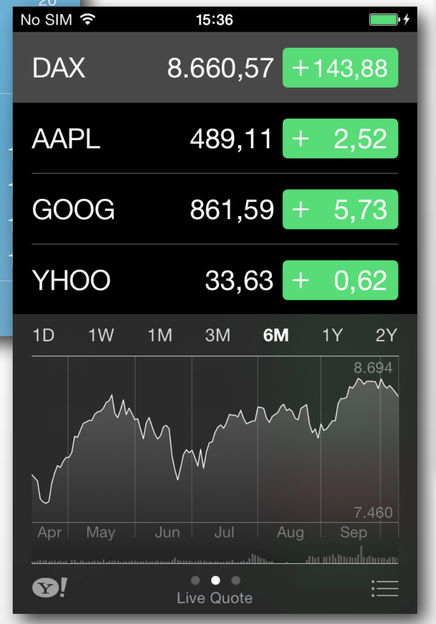
- Simple task, minimum user input
- Customized, visually attractive UI that enhances the displayed information
- Data is organized in flattened list of items
- Examples: Weather, Stocks

Media Computing Group | RWTH AACHEN UNIVERSITY

Utility Applications



Weather



Stocks

Elements

Media Computing Group | RWTH AACHEN UNIVERSITY

Immersive Applications

- Full-screen, visually rich UI
- Focussed on content and user experience
- Tends to hide much of the device's user interface
- Custom navigational methods
- Examples: Living Earth, Carpenter

Media Computing Group | RWTH AACHEN UNIVERSITY

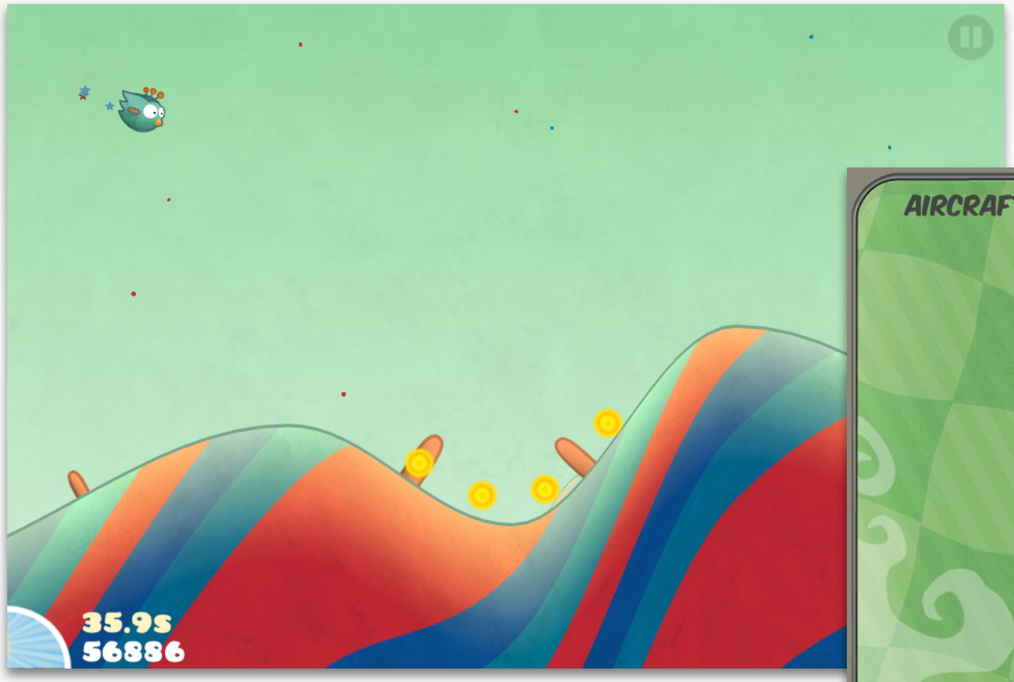
Immersive Applications

Living Earth

Carpenter

Media Computing Group | RWTH AACHEN UNIVERSITY

Games



Tiny Wings

FlightControl

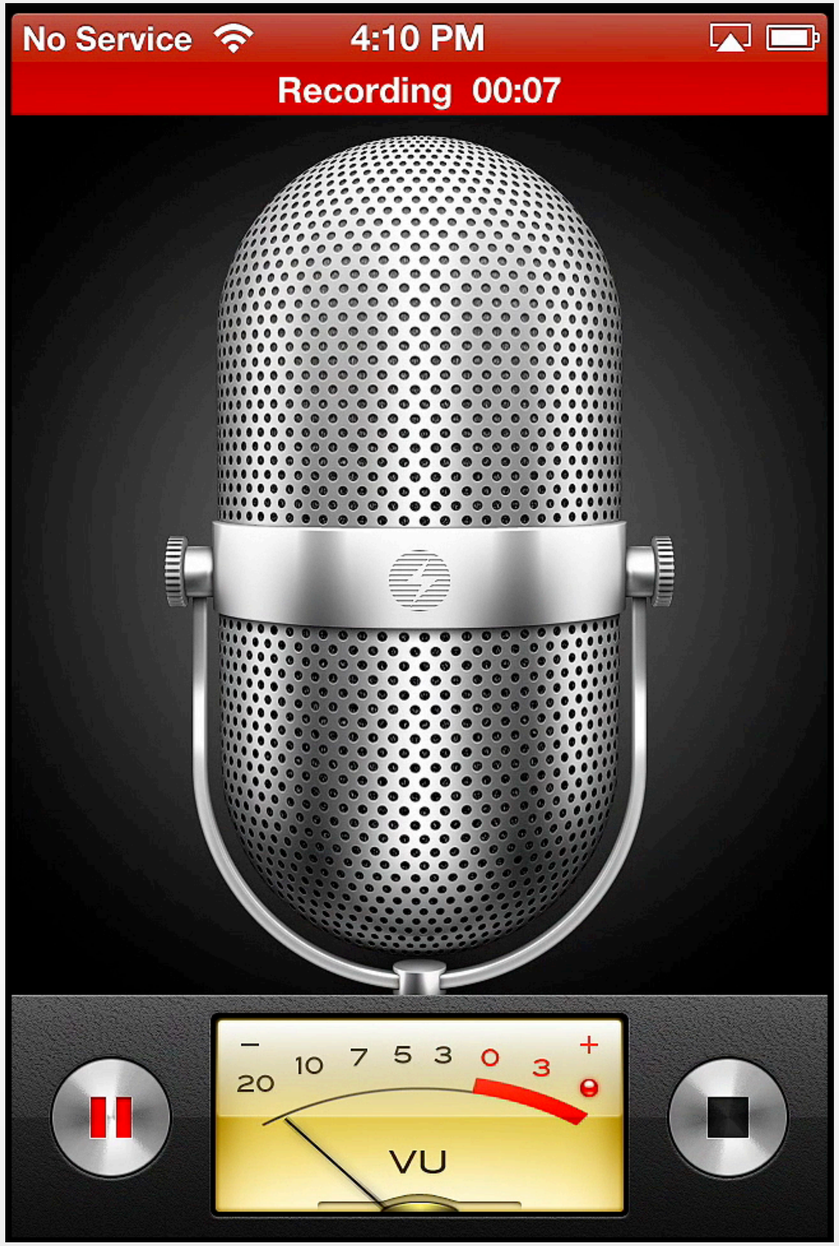
Media Computing Group | RWTH AACHEN UNIVERSITY

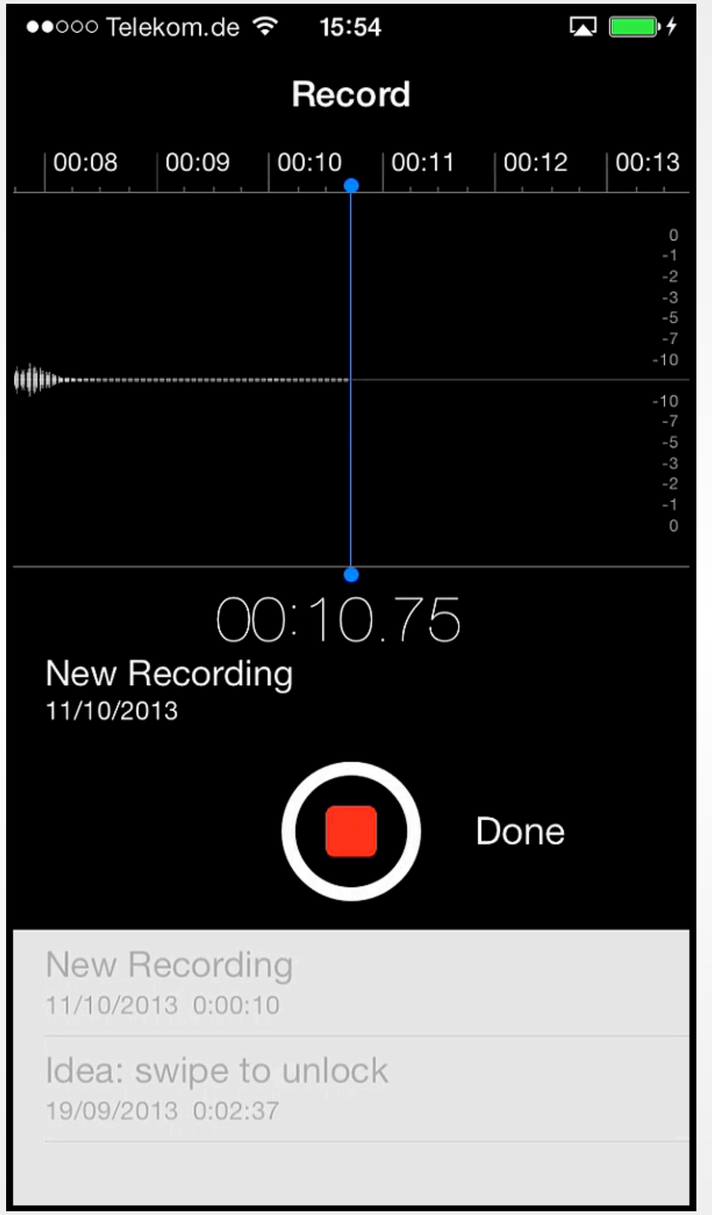
iOS Design Themes

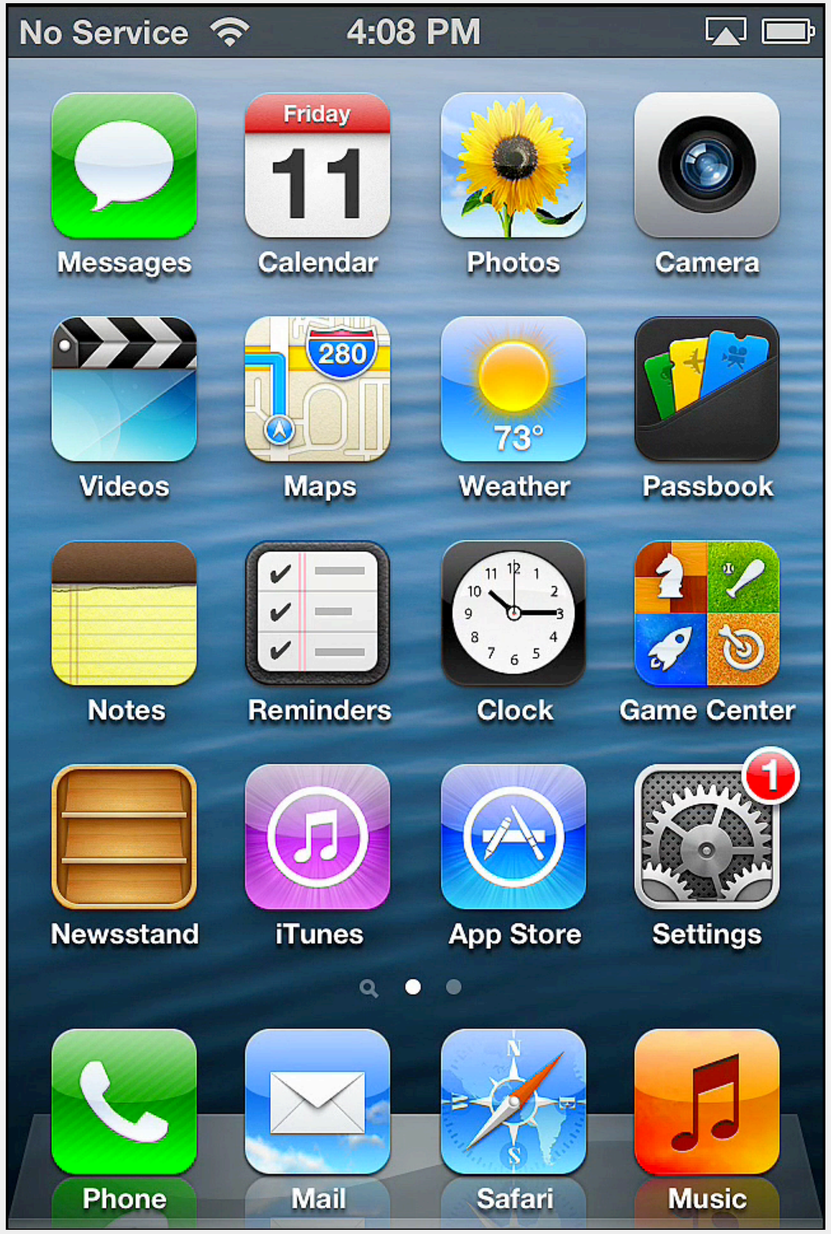
- **Deference**. The UI helps users understand and interact with the content, but never competes with it.
- **Clarity.** Text is legible at every size, icons are precise and lucid, adornments are subtle and appropriate, and a sharpened focus on functionality motivates the design.
- **Depth**. Visual layers and realistic motion impart vitality and heighten users' delight and understanding.

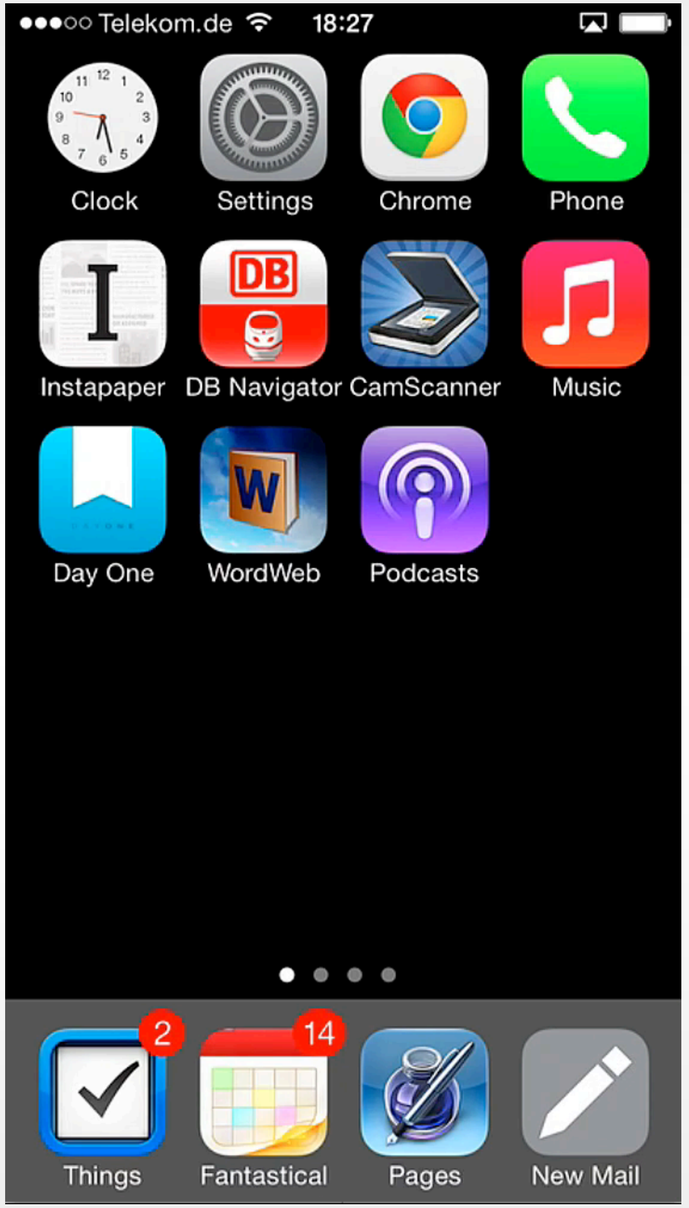
Media Computing Group | RWTH AACHEN UNIVERSITY

Media Computing Group | RWTH AACHEN UNIVERSITY

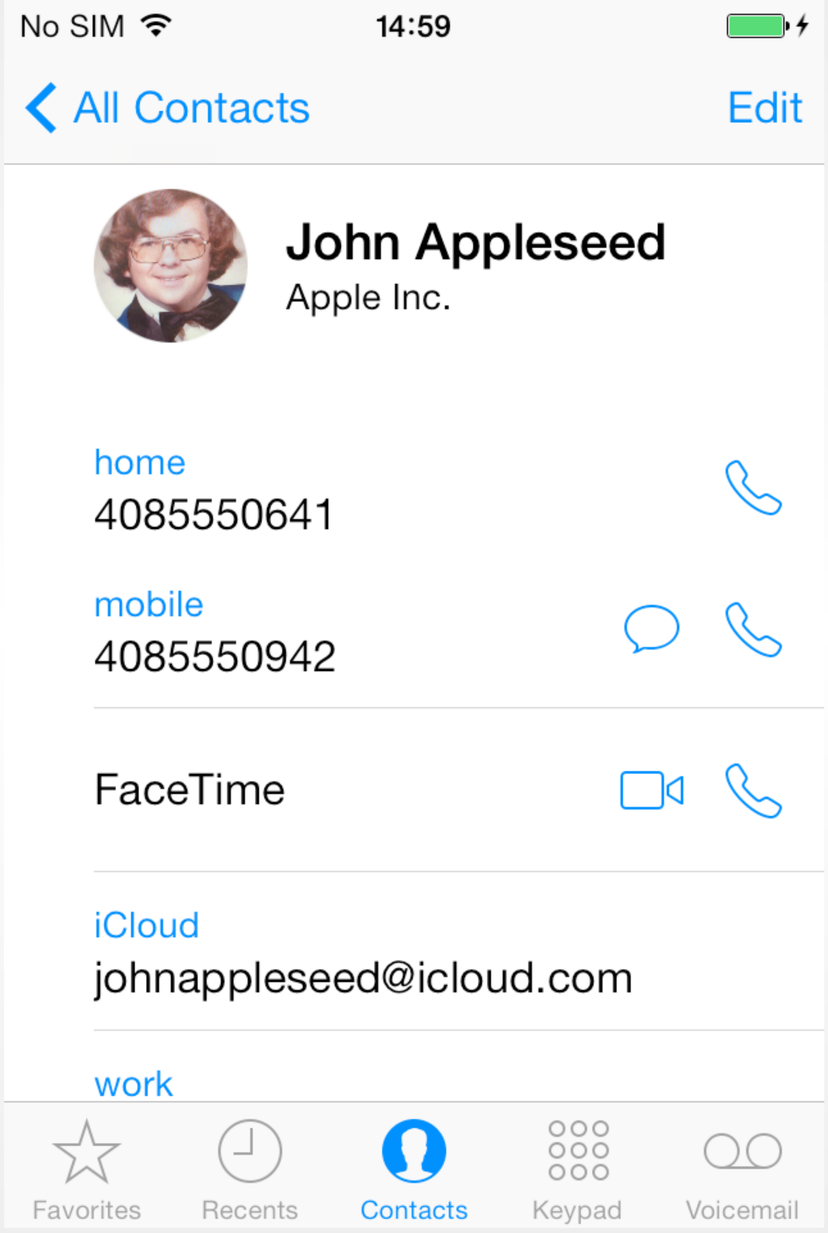

No Service
4:10 PM
Recording 00:07
VU


Telekom.de
15:54
Record
00:08
00:09
00:10
00:11
00:12
00:13
00:10.75
New Recording
11/10/2013
Done
New Recording
11/10/2013 0:00:10
Idea: swipe to unlock
19/09/2013 0:02:37

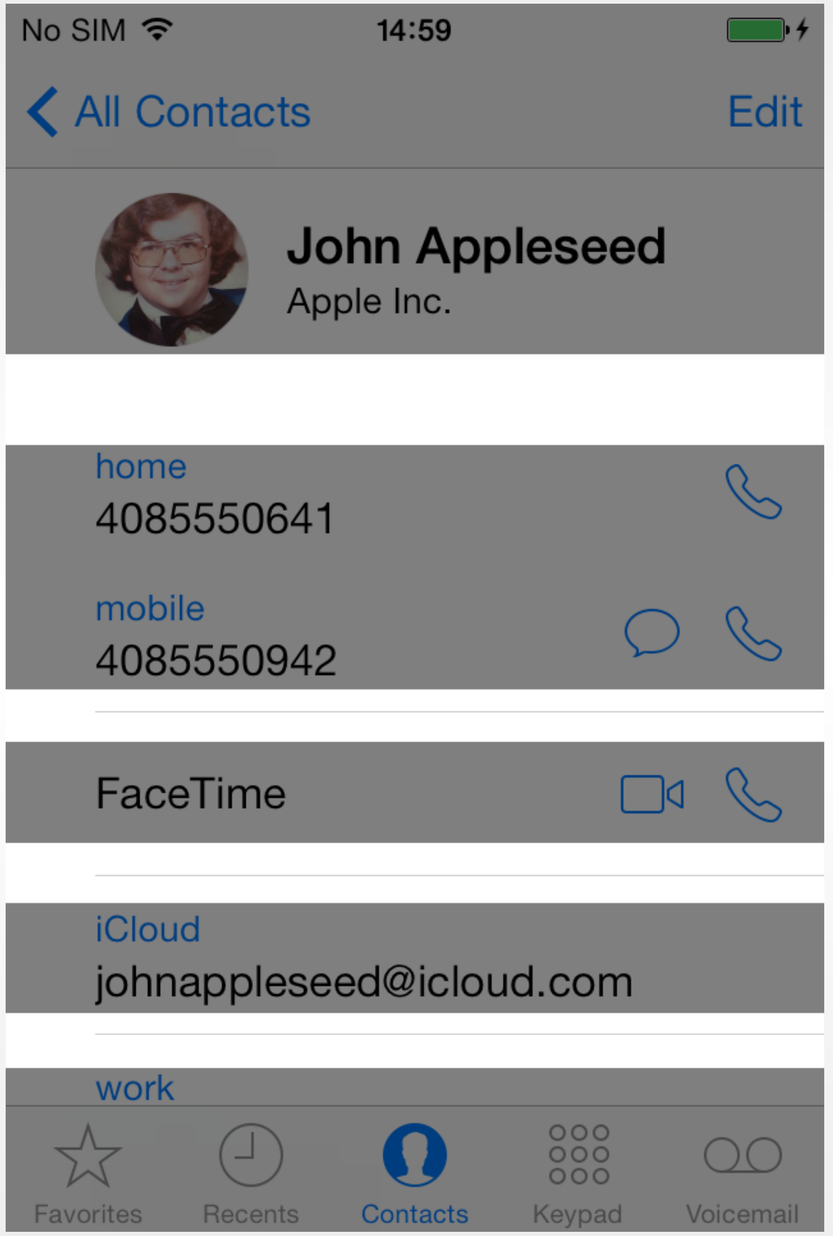




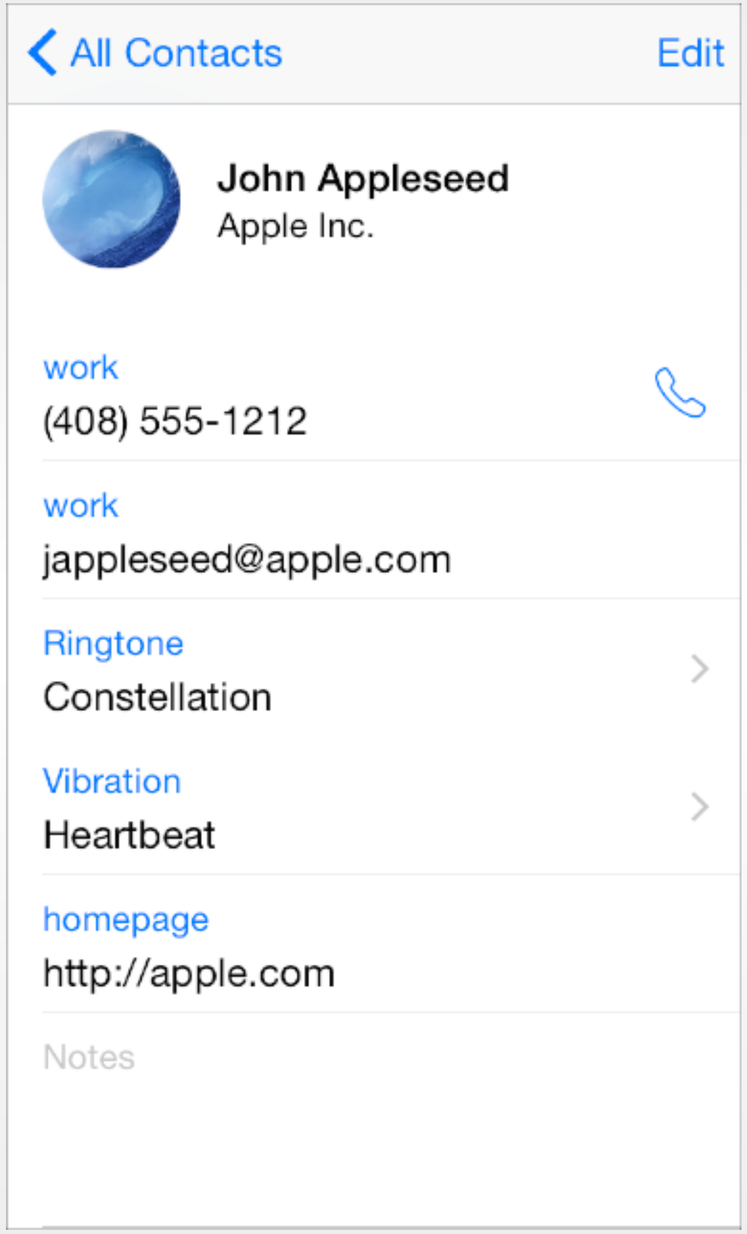
Media Computing Group | RWTH AACHEN UNIVERSITY



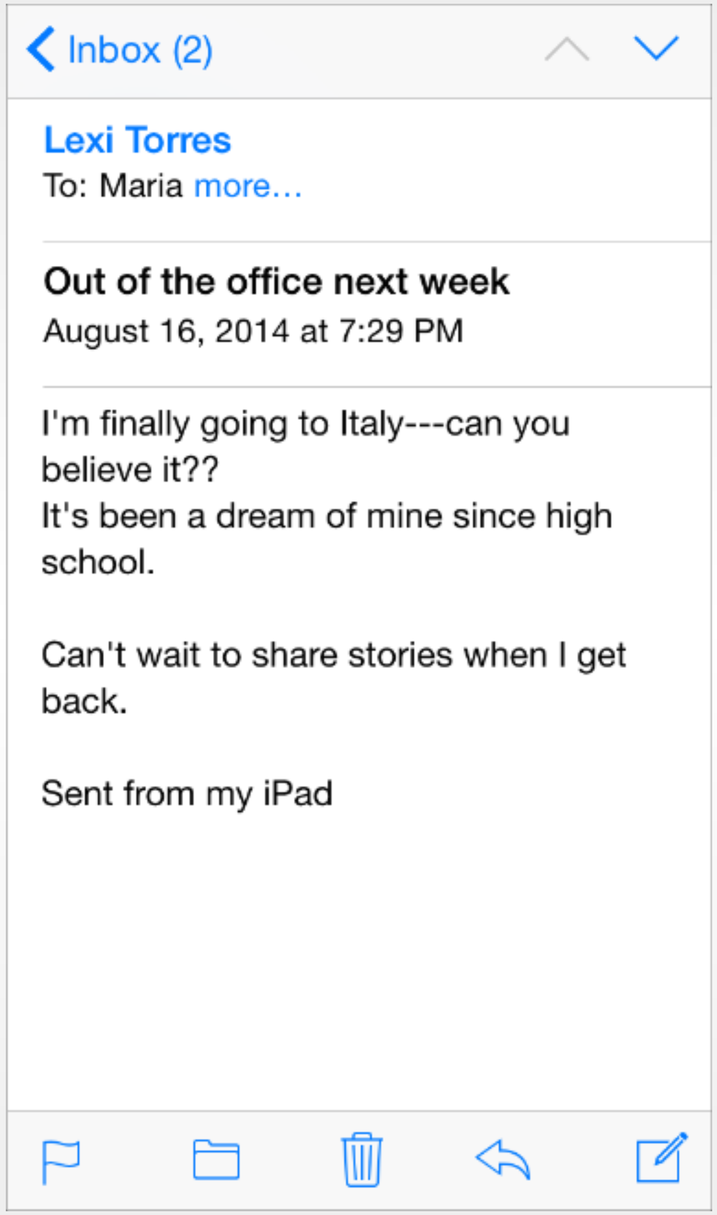
Media Computing Group | RWTH AACHEN UNIVERSITY

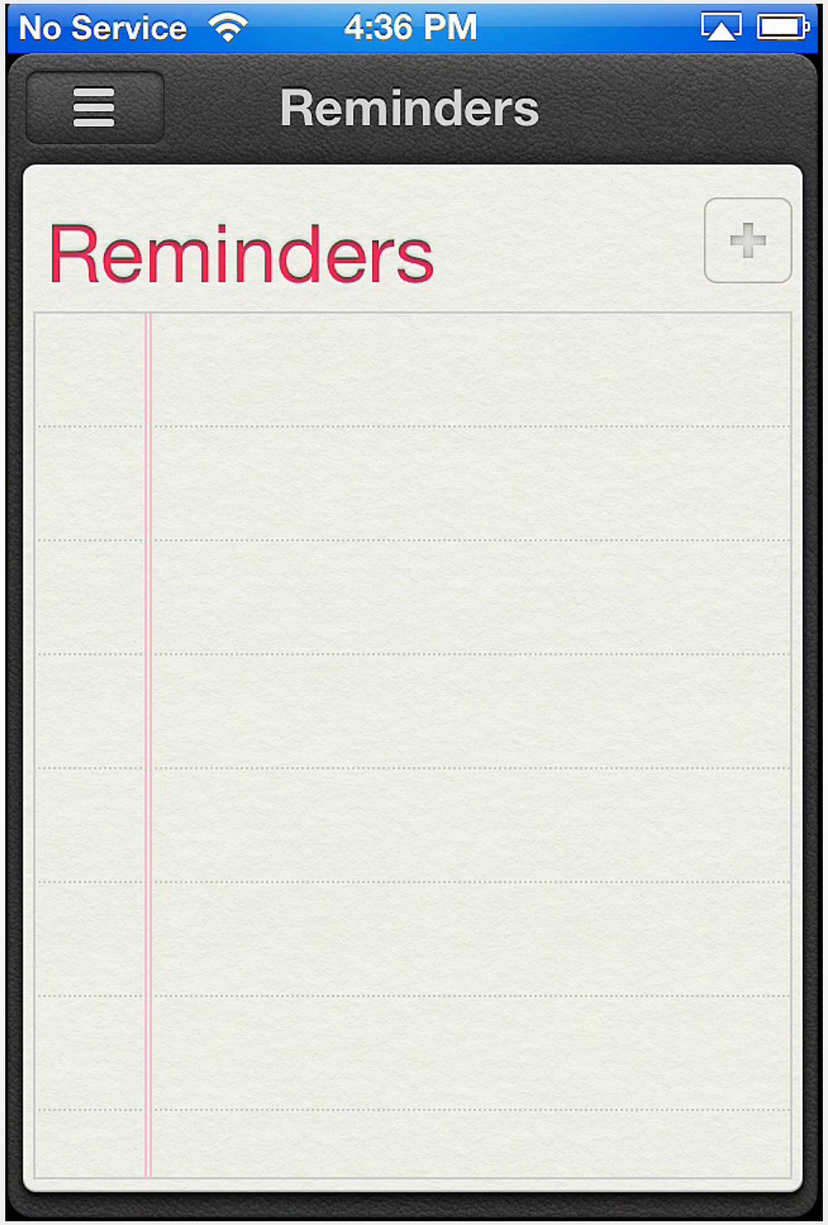


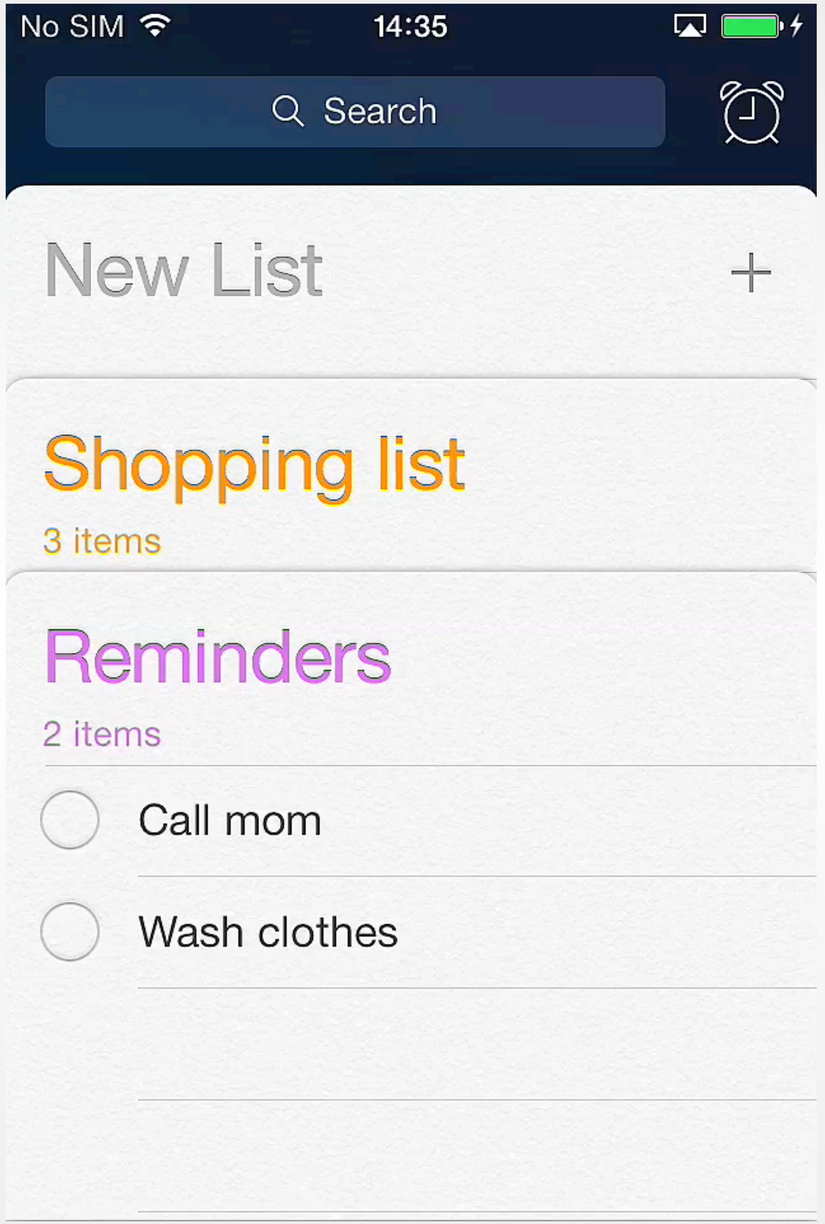
Media Computing Group | RWTH AACHEN UNIVERSITY



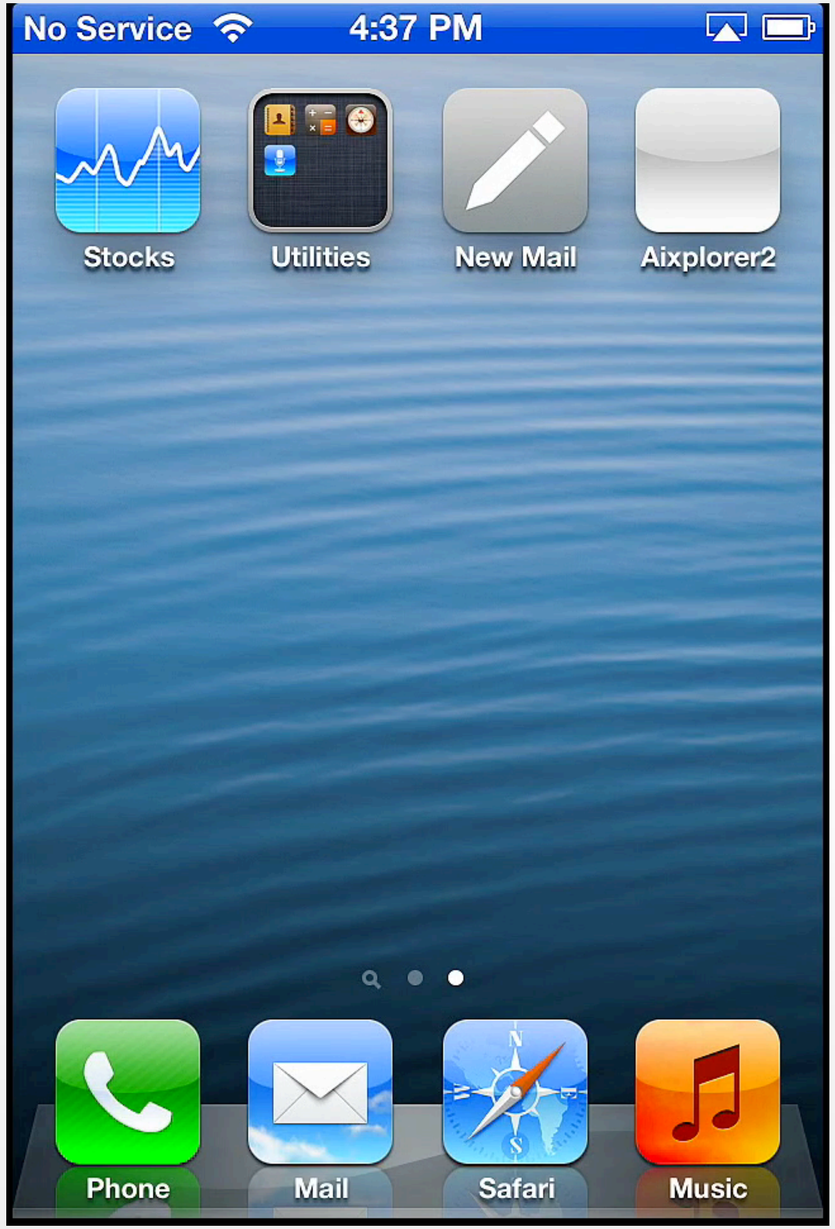
Media Computing Group | RWTH AACHEN UNIVERSITY

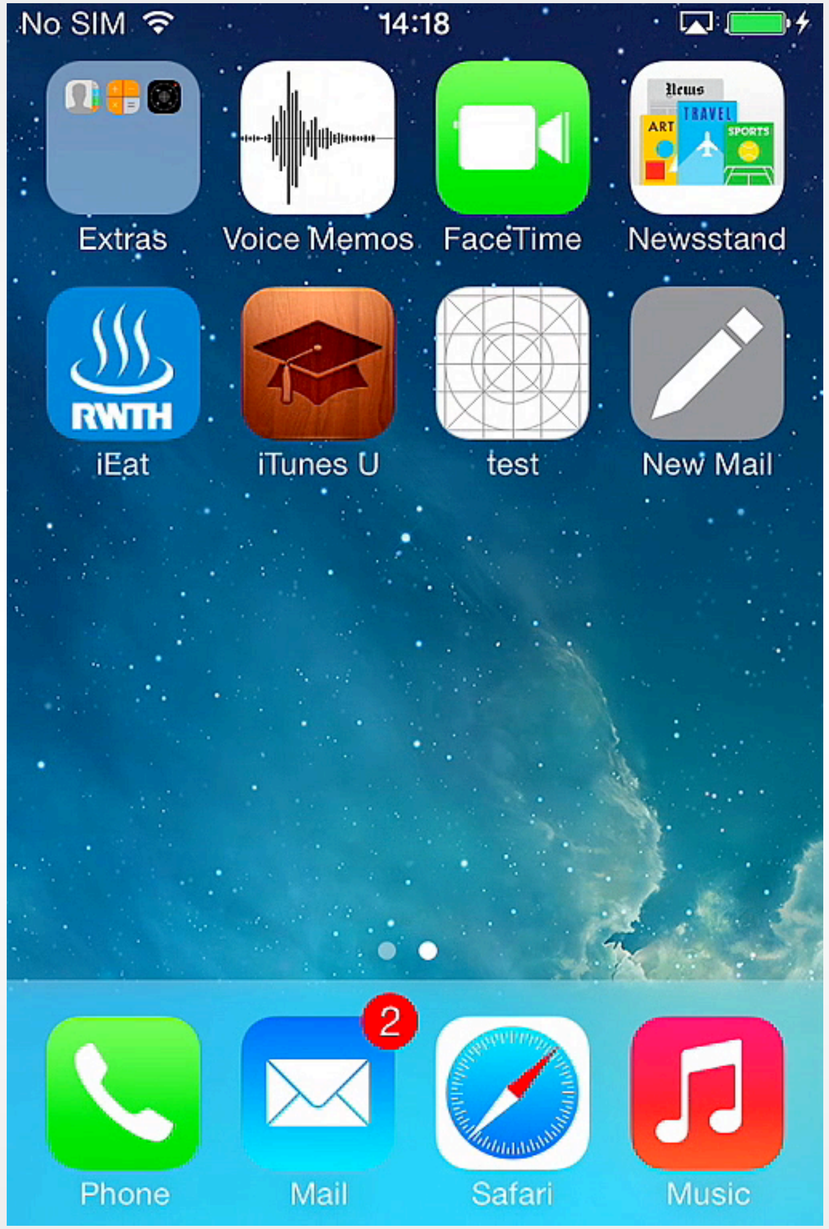

Inbox (2)
Lexi Torres
To: Maria more…
Out of the office next week
August 16, 2014 at 7:29 PM
I'm finally going to Italy---can you believe it??
It's been a dream of mine since high school.
Can't wait to share stories when I get back.
Sent from my iPad



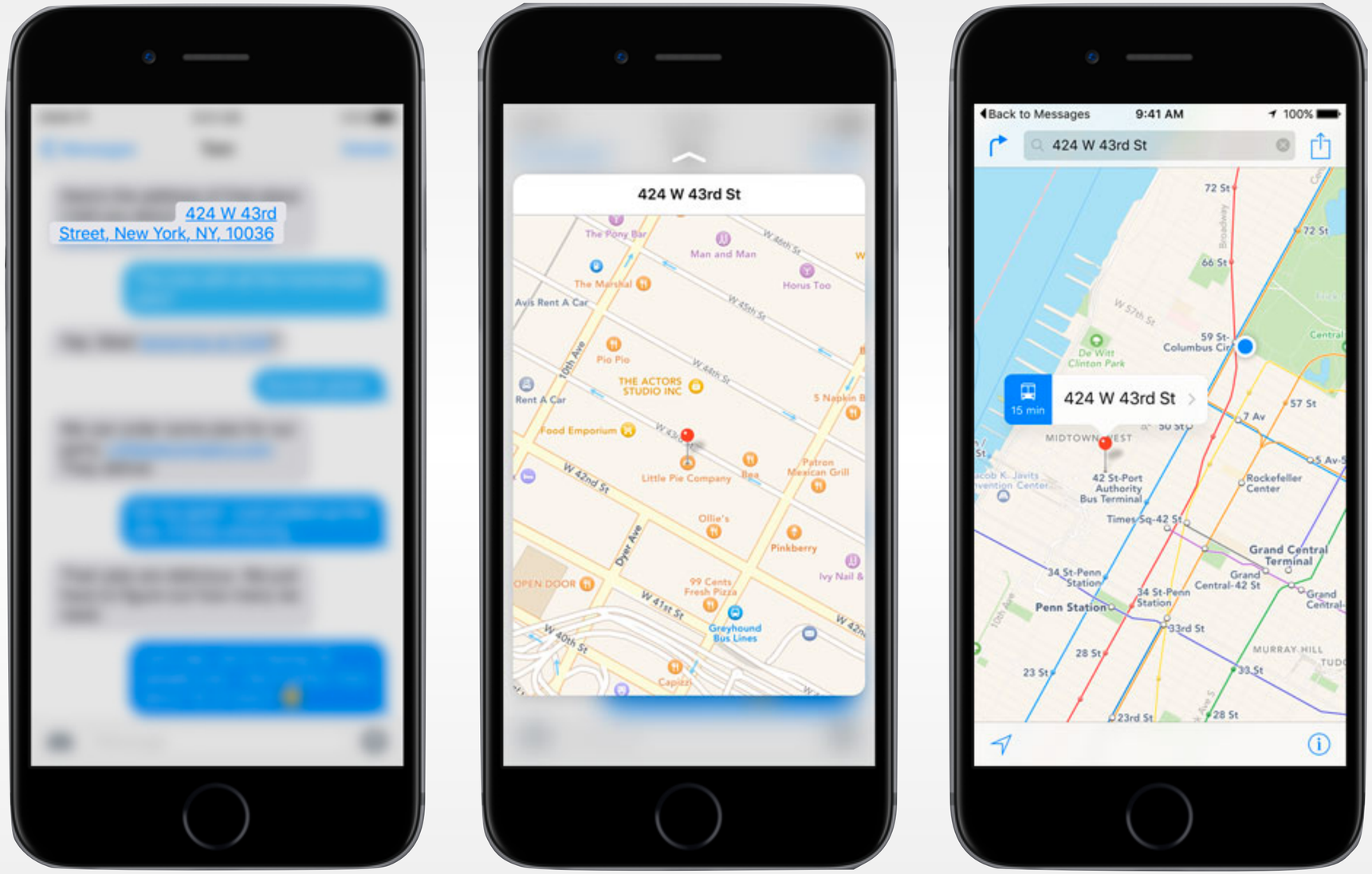


Media Computing Group
RWTH AACHEN UNIVERSITY

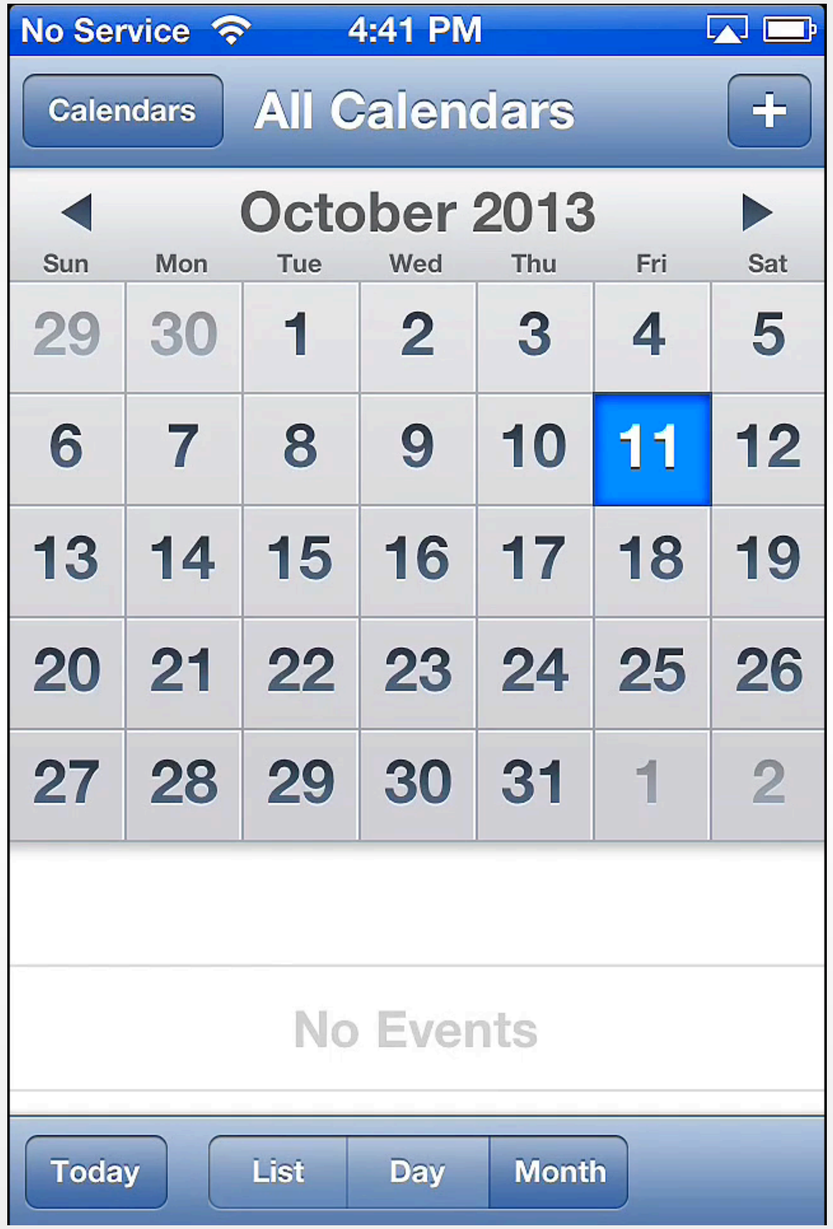


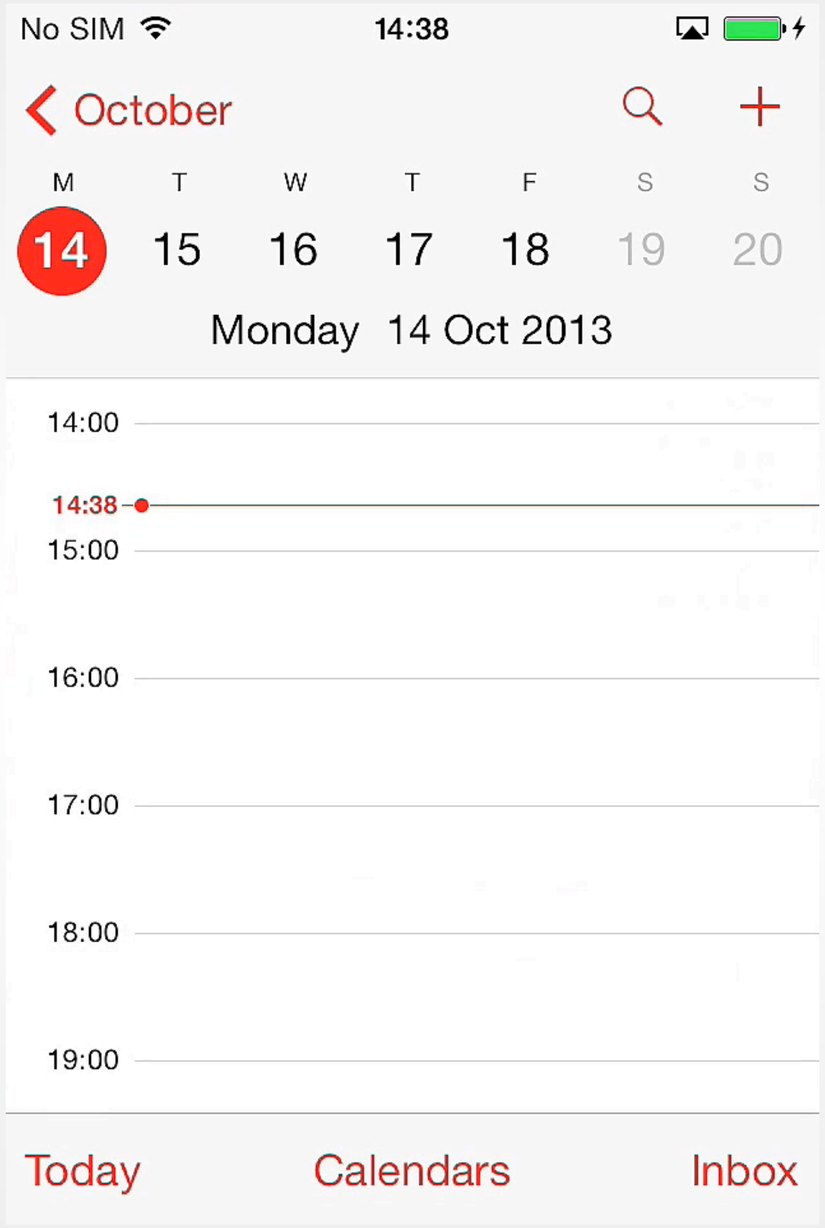


Media Computing Group | RWTH AACHEN UNIVERSITY



Media Computing Group | RWTH AACHEN UNIVERSITY





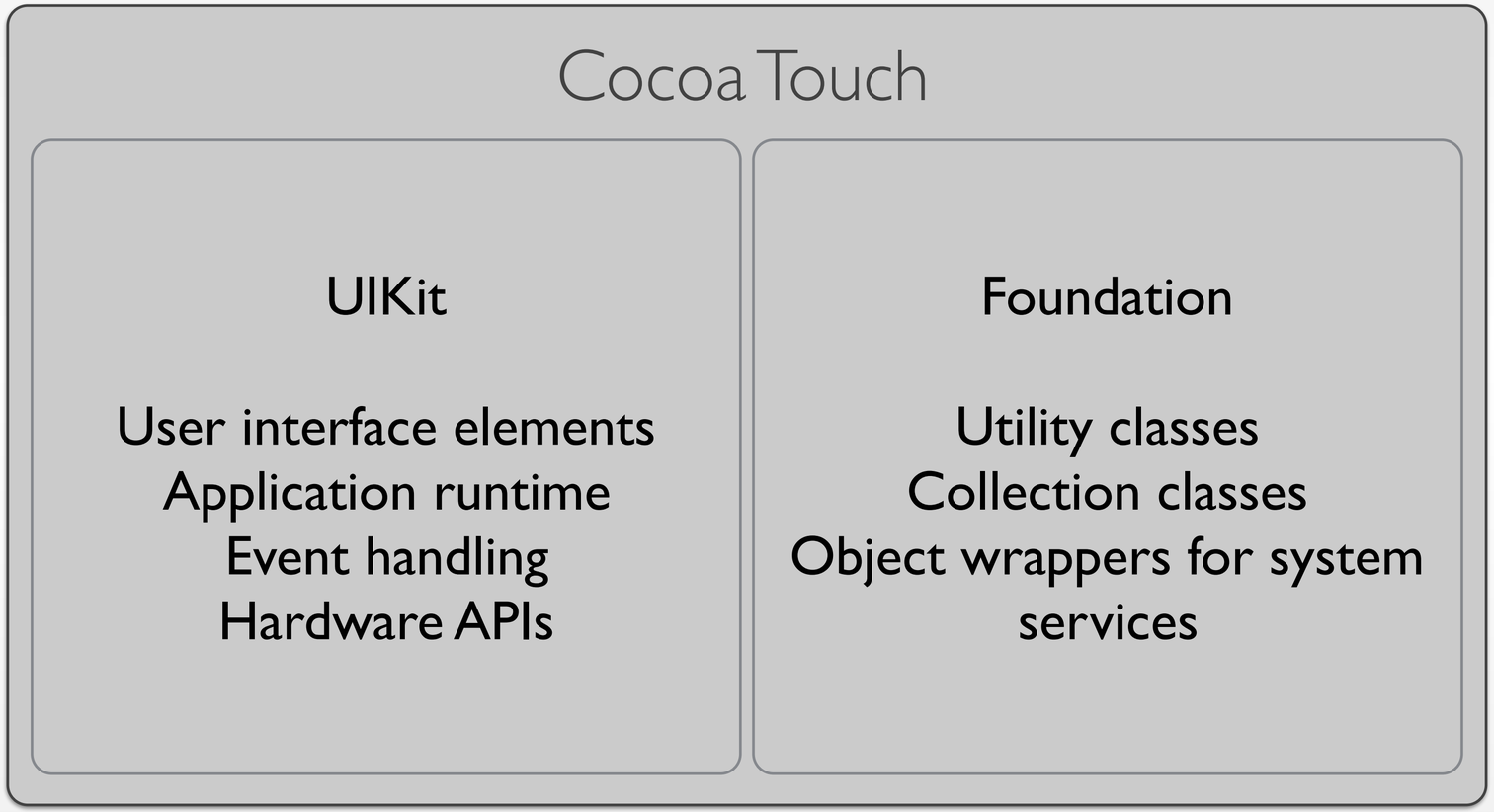
Media Computing Group | RWTH AACHEN UNIVERSITY

iOS Architecture: Overview

Media Computing Group | RWTH AACHEN UNIVERSITY

Media Computing Group | RWTH AACHEN UNIVERSITY

Cocoa Touch Architecture



Media Computing Group | RWTH AACHEN UNIVERSITY

Some iOS Frameworks

Core Data

WebKit

Bonjour

Store Kit

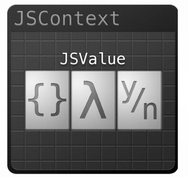
Text Kit

Core Location

Core Bluetooth

GL Kit

Event Kit



JavaScript Core

Security

Core Audio

Scene Kit

Sprite Kit

Game Center

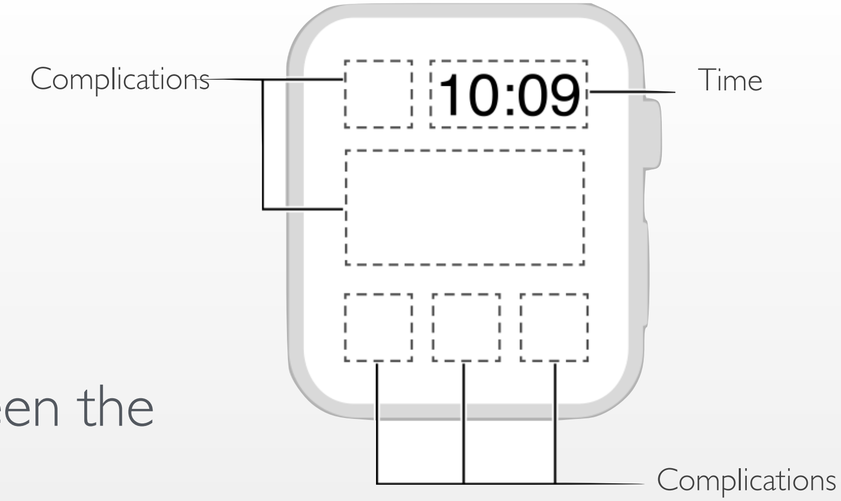
Media Computing Group | RWTH AACHEN UNIVERSITY

watchOS 2

- In watchOS 2 we now have native apps
- Apps can integrate more closely with the watch
- Programmatic access to hardware
  - Digital Crown (WKInterfacePicker)
  - Microphone, Taptic engine, and health sensors
- ClockKit allows building custom watch face Complications
- WatchConnectivity provides a two-way communication between the watch and the iPhone in real-time

WatchKit

HealthKit



Media Computing Group | RWTH AACHEN UNIVERSITY

Summary

- Mobile vs. desktop apps: user, task, context
- Keep hardware restrictions in mind
- Application styles: productivity, utility, immersive
- Required reading assignment:

Selected iOS Human Interface Guidelines and WWDC videos will be listed on hci.rwth-aachen.de/iphone (you will need this for the assignments, final project, and exam)