MOBILE PLATFORM

OVERVIEW

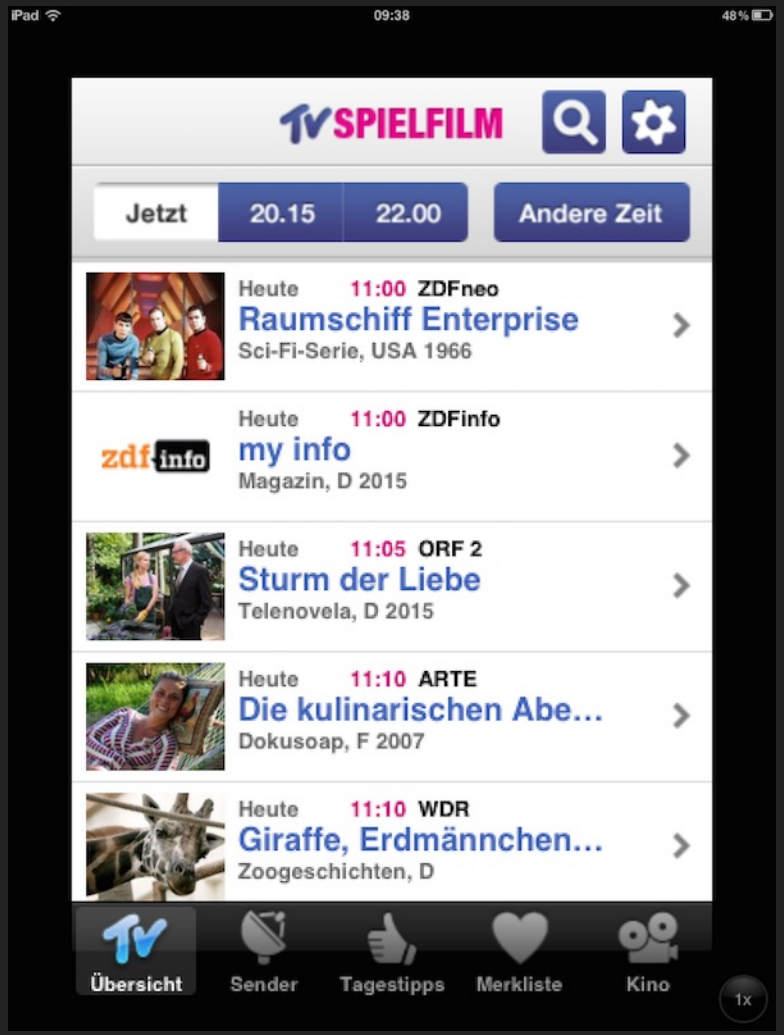
- Features of mobile devices
  - Device sensors
  - Touch control
- Platforms and ecosystems
  - Android
  - iOS
  - Windows Phone
  - Others...
- Ecosystems compared

FEATURES OF MOBILE DEVICES

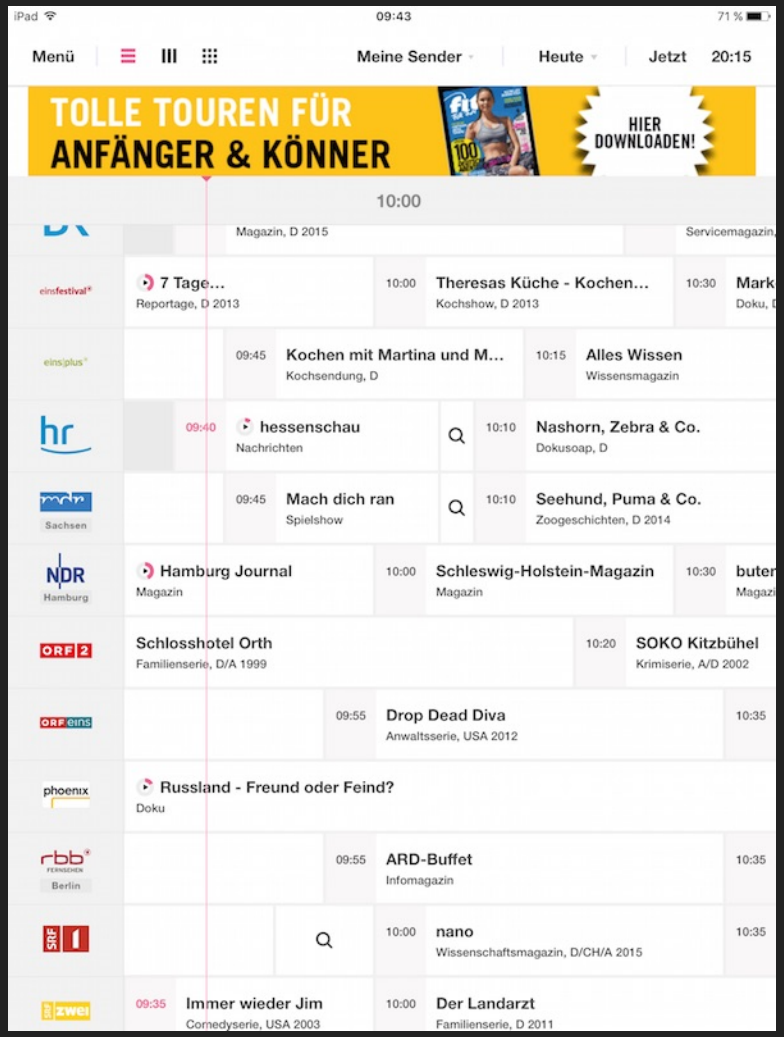
- Smaller screens (here smartphones and tablets differ)
- Different input concepts (touch, keyboard, stylus)
- Slow, unstable network connection
- Less powerful processors
- Batteries – minimize power consumption

↓ more ↓

IPHONE APP ON TABLET SCREEN



TABLET APP


iPad
09:43
71 %
Menü
Meine Sender
Heute
Jetzt
20:15
TOLLE TOUREN FÜR ANFÄNGER & KÖNNER
HIER DOWNLOADEN!
10:00
Magazin, D 2015
Servicemagazin,
einsfestival
7 Tage...
Reportage, D 2013
10:00
Theresas Küche - Kochen...
Kochshow, D 2013
10:30
einsplus
09:45
Kochen mit Martina und M...
Kochsendung, D
10:15
Alles Wissen
Wissensmagazin
hr
09:40
hessenschau
Nachrichten
10:10
Nashorn, Zebra & Co.
Dokusoap, D
mdr Sachsen
09:45
Mach dich ran
Spielshow
10:10
Seehund, Puma & Co.
Zoogeschichten, D 2014
NDR Hamburg
Hamburg Journal
Magazin
10:00
Schleswig-Holstein-Magazin
Magazin
10:30
ORF 2
Schlosshotel Orth
Familienserie, D/A 1999
10:20
SOKO Kitzbühel
Krimiserie, A/D 2002
ORF eins
09:55
Drop Dead Diva
Anwaltsserie, USA 2012
10:35
phoenix
Russland - Freund oder Feind?
Doku
rbb Berlin
09:55
ARD-Buffet
Infomagazin
10:35
SRF 1
10:00
nano
Wissenschaftsmagazin, D/CH/A 2015
10:35
ZDF zwei
09:35
Immer wieder Jim
Comedyserie, USA 2003
10:00
Der Landarzt
Familienserie, D 2011

APPLE PENCIL

DEVICE SENSORS

- Camera
- Microphone
- Geolocation, GPS
- Acceleromter
- Gyroscope
- Magnetometer
- Battery state
- Proximity sensor

GEOLOCATION API

	ACCURACY	POSITIONING TIME	BATTERY LIFE
GPS	10m	2-10 minutes (only indoors)	5-6 hours on most phones
WiFi	50m (improves with density)	Almost instant (server connect and lookup)	No additional effect
Cell tower triangulation	100-1400m (based on density)	Almost instant (server connect and lookup)	Negligible
Single cell tower	500-2500m (based on density)	Almost instant (server connect and lookup)	Negligible
IP	Country: 99% City: 46% US, 53% International Zip: 0%	Almost instant (server connect and lookup)	Negligible

TABLE 3.1: An overview of the different ways a modern mobile device can detect your location. Smartphones make hybrid use of GPS, WiFi, and cell tower triangulation; laptops and desktops use WiFi, IP, and only rarely GPS.

(Source: *Mobile First*, Luke Wroblewski)

GEOLOCATION-API: APPLICATION POSSIBILITIES

- Local weather, traffic or other information
- Indication of certain facilities in the proximity
- Interaction with people nearby
- Suitable defaults in search results
- Suitable settings depending on location

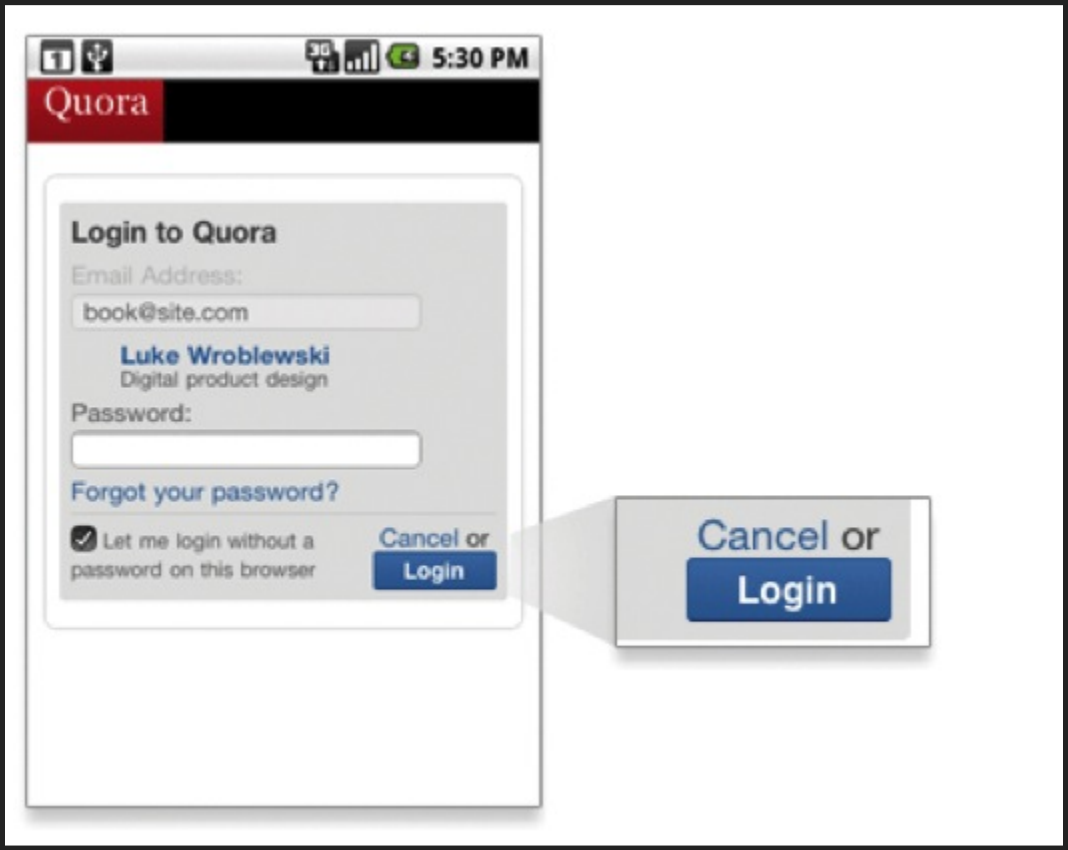
TOUCH CONTROL

- Bigger control elements required
- "44 x 44 points is the comfortable minimum size of a tappable UI element" (iOS Human Interface Guidelines)

Point: "On a standard-resolution device screen, one point equals one pixel, but other resolutions might dictate a different relationship. On a Retina display, for example, one point equals two pixels." (iOS Human Interface Guidelines)

This is different to the CSS unit pt (also: Point).

TOUCH CONTROL: DISTANCE

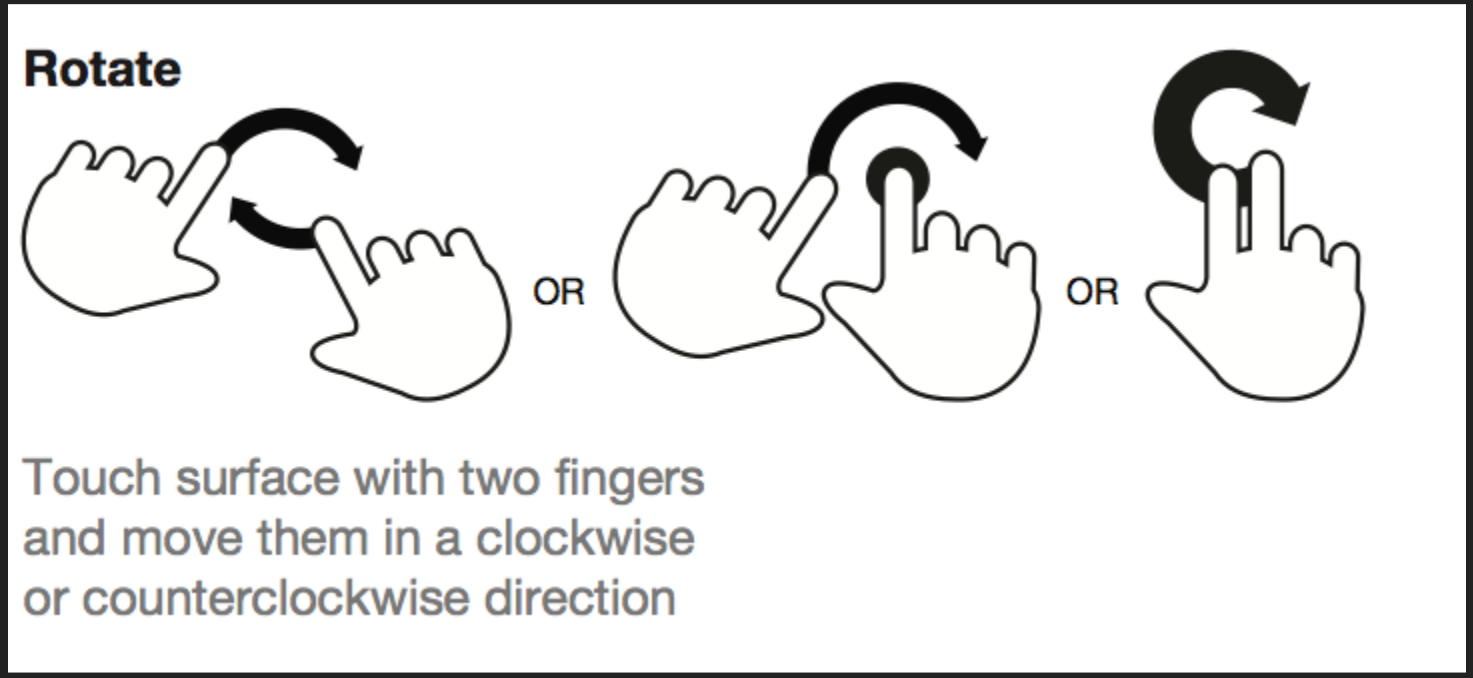


TOUCH CONTROL: REACH

TOUCH CONTROL: GESTURES

Gesture	Action
Tap	To press or select a control or item (analogous to a single mouse click).
Drag	To scroll or pan (that is, move side to side). To drag an element.
Flick	To scroll or pan quickly.
Swipe	With one finger, to reveal the Delete button in a table-view row, the hidden view in a split view (iPad only), or the Notification Center (from the top edge of the screen). With four fingers, to switch between apps on iPad.
Double tap	To zoom in and center a block of content or an image. To zoom out (if already zoomed in).
Pinch	Pinch open to zoom in. Pinch close to zoom out.
Touch and hold	In editable or selectable text, to display a magnified view for cursor positioning.
Shake	To initiate an undo or redo action.

TOUCH CONTROL: GESTURES



Touch Gesture Reference Guide

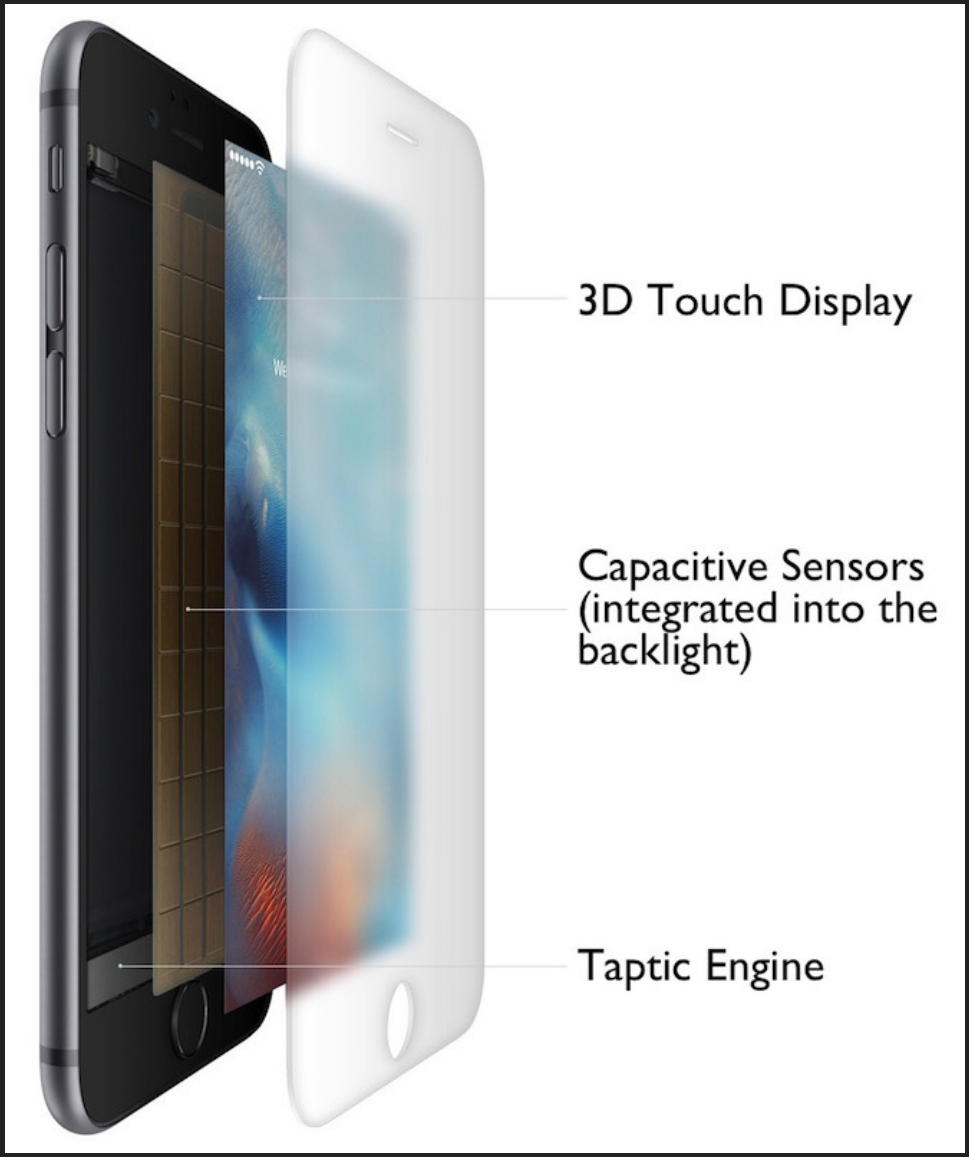
FORCE TOUCH

- Senses the level of force exerted on a touch display
- Apple MacBook notebooks, followed by Apple Watch (2015)
- iPhone 6s
  - Force Touch called "3D Touch"
  - Accounts for changes in gravity as you hold your phone
  - Combined with Taptic Engine for feedback
  - Available autumn 2015
- Huawei Mate S with Force-Touch-Display
  - Announced, probably available late 2015

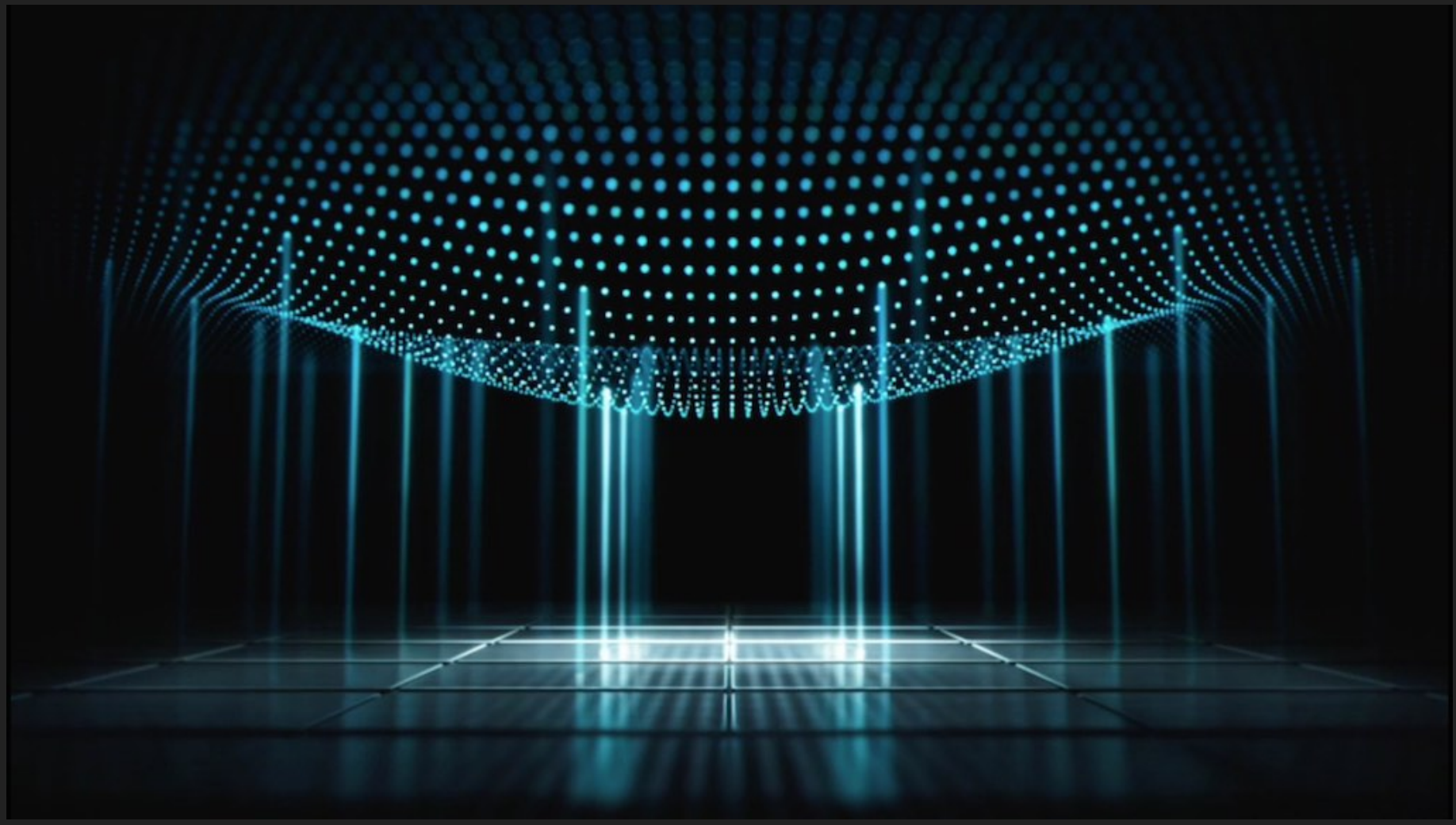
↓ more ↓

HUAWEI MATE S

IPHONE 6S 3D TOUCH



IPHONE 6S 3D TOUCH



IPHONE 6S TAPTIC ENGINE

IPHONE 6S TAPTIC ENGINE

PLATFORMS AND ECOSYSTEMS

ANDROID AND IOS

- Dominate the smartphone market
- Easily 90% in key markets
- Also at the top in terms of developer mindshare
- But: Mobile space changes continuously

Platform	Market Share			
	Q3 2014	Q3 2013	Q3 2012	Q3 2011
Android	84.4%	81.2%	74.9%	57.4%
iOS (Apple)	11.7%	12.8%	14.4%	13.8%
Windows Phone	2.9%	3.6%	2.0%	1.2%
BlackBerry	0.5%	1.7%	4.1%	9.6%
Other	0.6%	0.6%	4.5%	18.8%

(Source: idc.com/prodserv/smartphone-os-market-share)

ANDROID AND IOS

- iOS was popular first (called iPhone OS back then)
- Market share of Android is much bigger now
- So let's start with Android...

ANDROID

- Open Handset Alliance led by Google
- Publicly available since November 2007

The Rise of Android

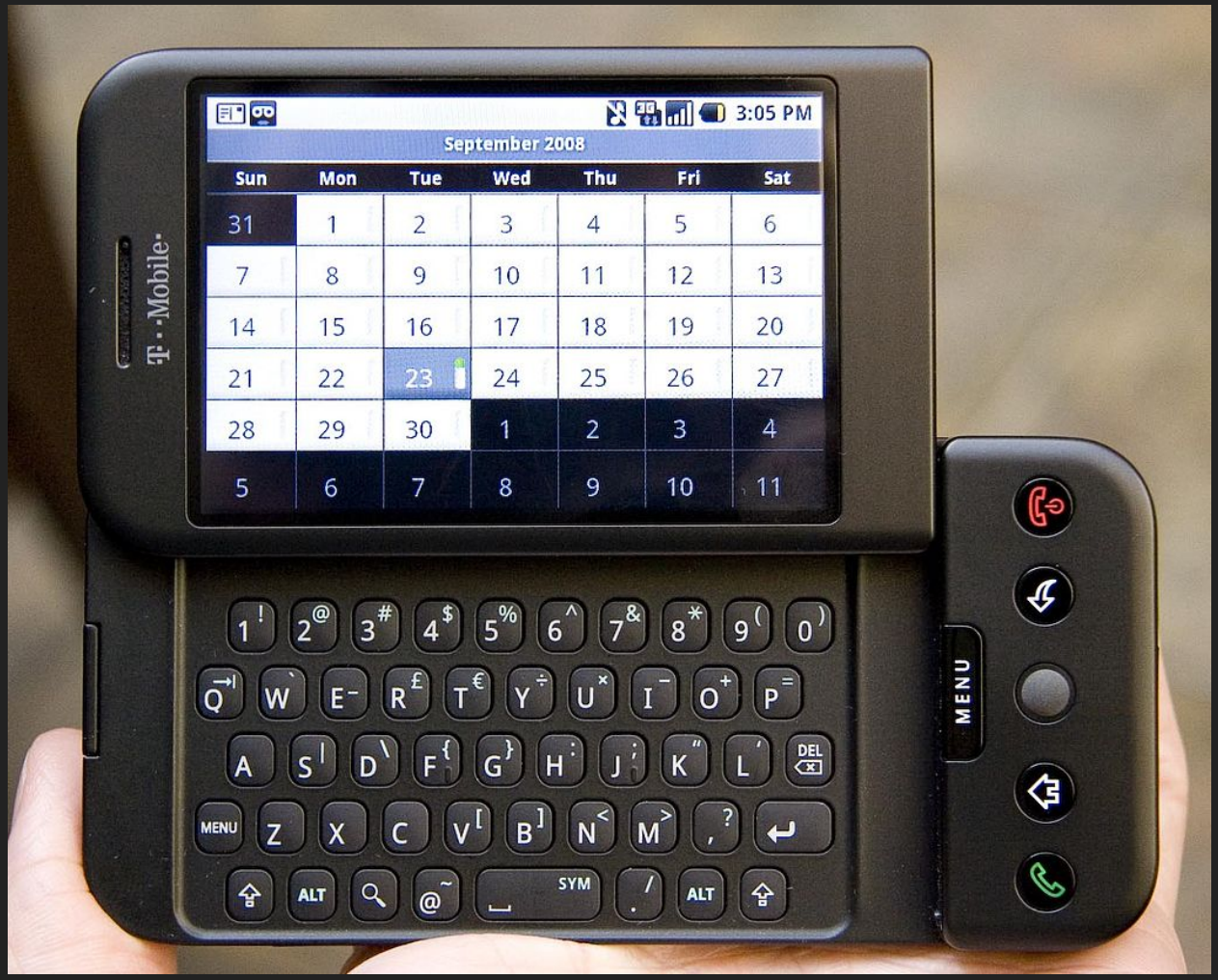
ANDROID'S PURPOSE

- Spreading the use of Google services across the mobile web
- Makes economic sense to offer Android for free
- In 2009 device vendors needed an answer to the iPhone
- Android was available (and free...)
- Free is cheaper than not free
- Most device vendors jumped on the Android bandwagon
- Except for Apple, Nokia, and BlackBerry
- Nokia and BlackBerry failed

ANDROID DIFFERENTIATION

- Google allowed Android differentiation
- Purpose: Get device vendors to adopt it
- Vendors could create their own interface layer
- They could also change default apps, including the browser
- Samsung TouchWiz, HTC Sense, MotoBlur, ...
- Differentiation is the positive slant on fragmentation

T-MOBILE G1: 1ST ANDROID SMARTPHONE



ANDROID: WHAT IS IT?

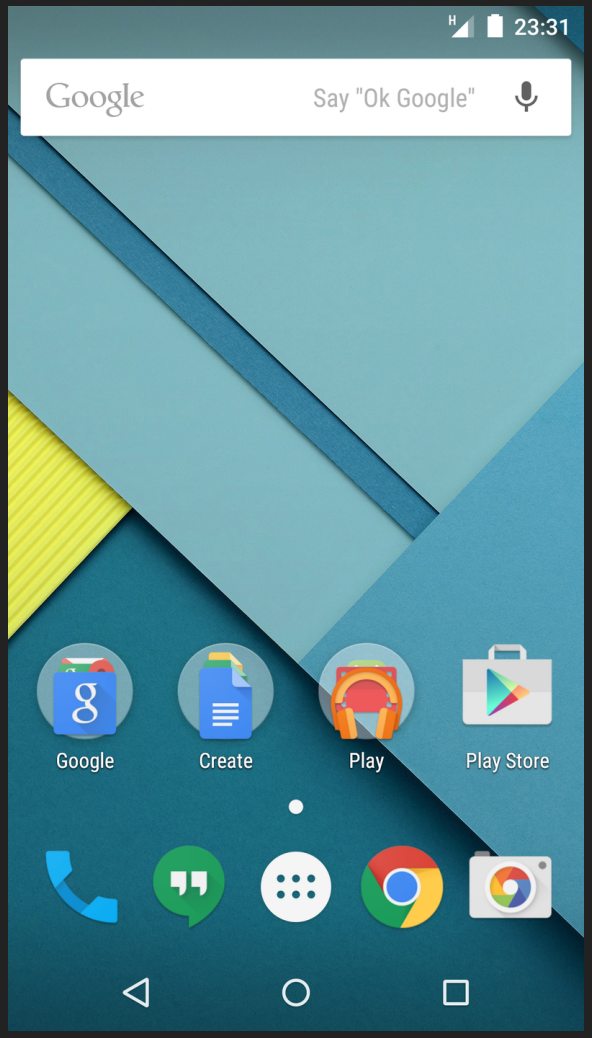
- Operating system
- Collection of pre-installed applications
- Application framework supported by a comprehensive set of tools

ANDROID: VERSIONS

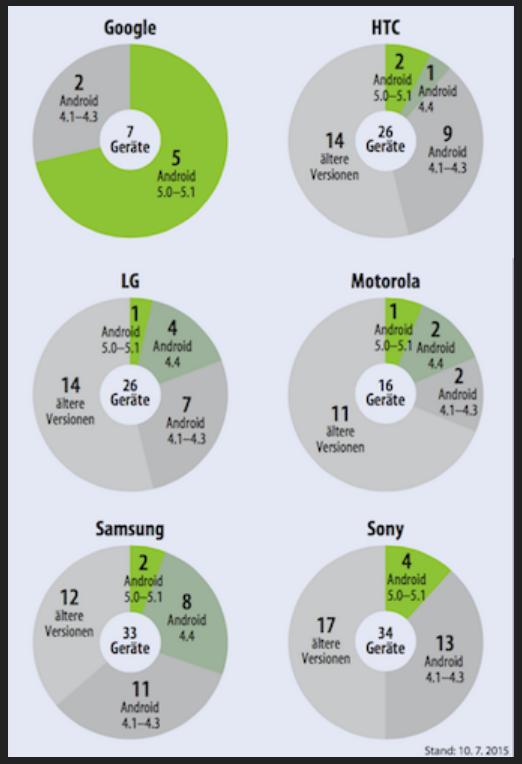
- Current: Android 5.x (Lollipop)
  - New UI toolkit *Material Design*
  - Runtime Dalvik replaced with the new Android Runtime (ART, improves performance by a factor of up to 4x)
  - Improved battery life, privacy features, cross-device user accounts, extensions to the notification system
- Next: Android M
  - New permission system
  - Lots of other improvements

↓ more ↓

ANDROID 5 "LOLLIPOP"



ANDROID PROBLEM: FRAGMENTATION

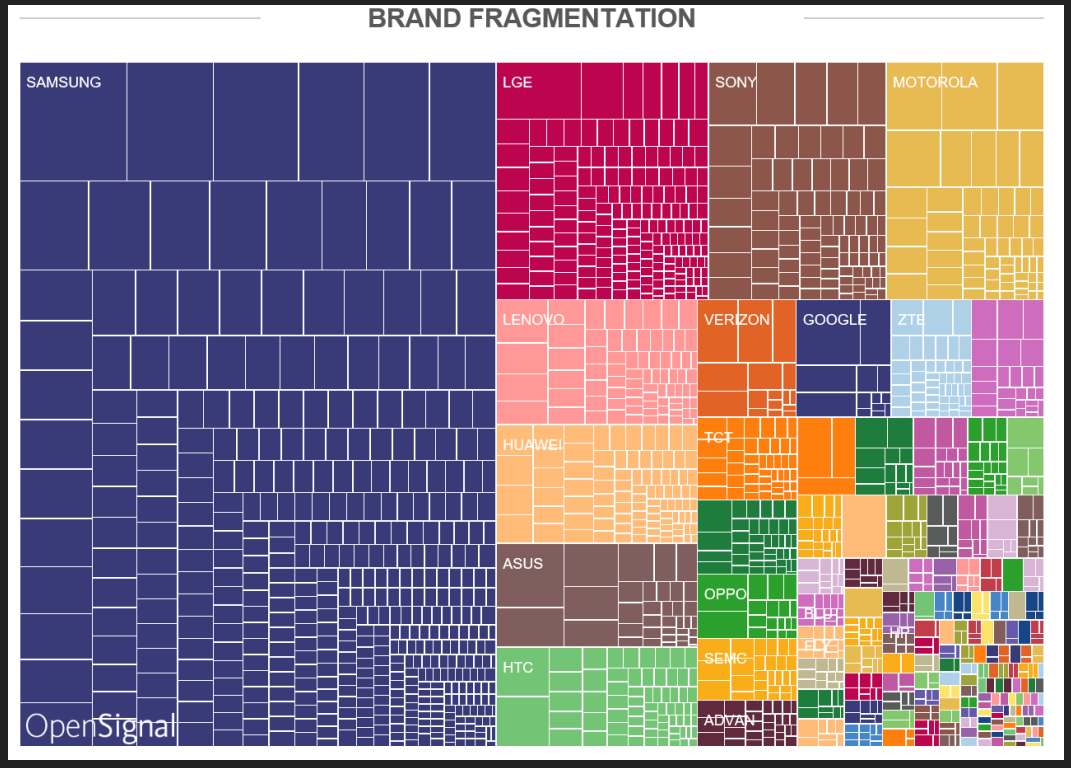


- Many different devices by various manufacturers
- Only partially updated to current versions
- Image: c't 18/2015 p.107, Smartphones sold in Germany 2011-2013)

+ more +

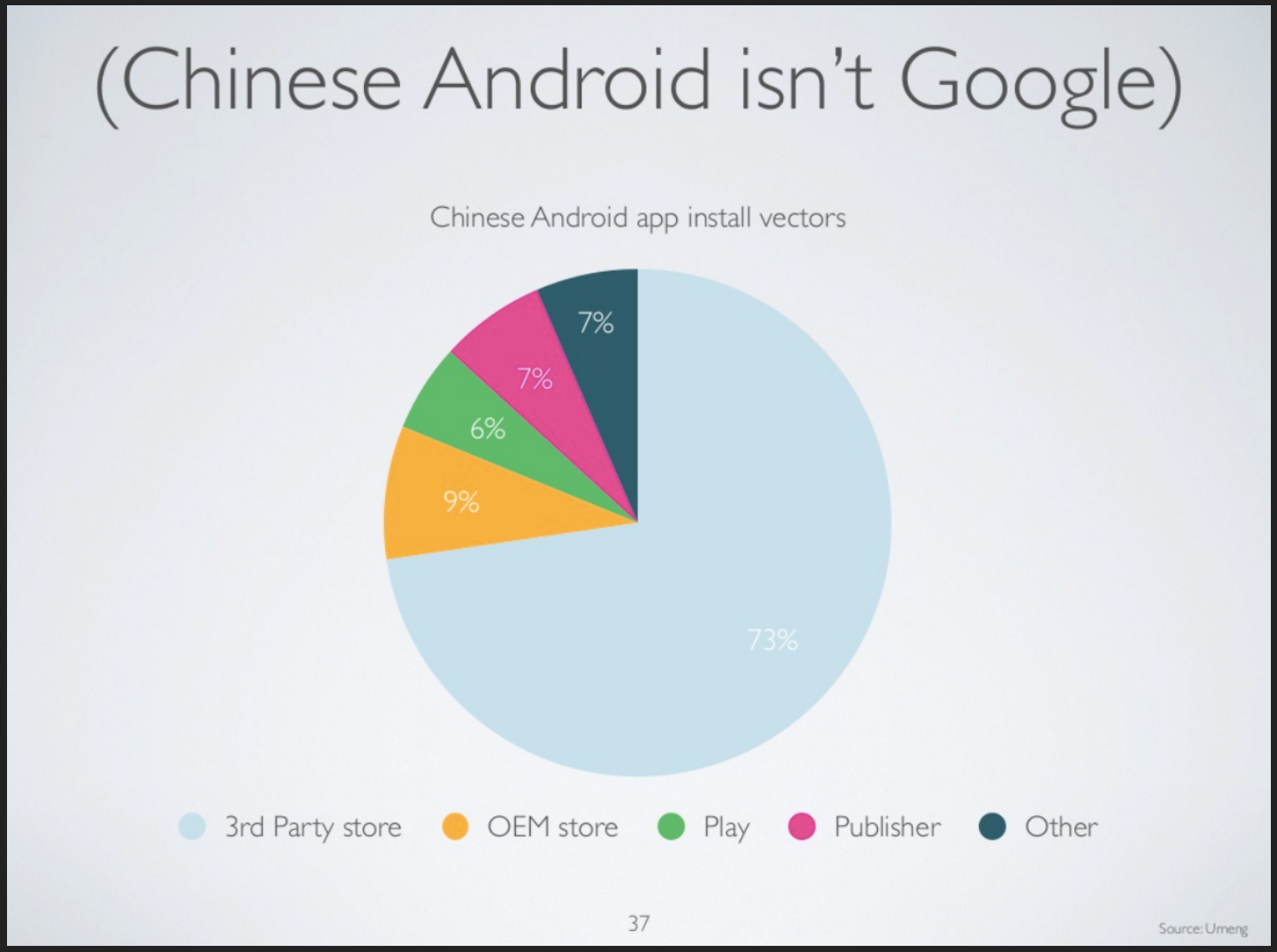
↓more↓

ANDROID PROBLEM: FRAGMENTATION



opensignal.com/reports/2015/08/android-fragmentation/

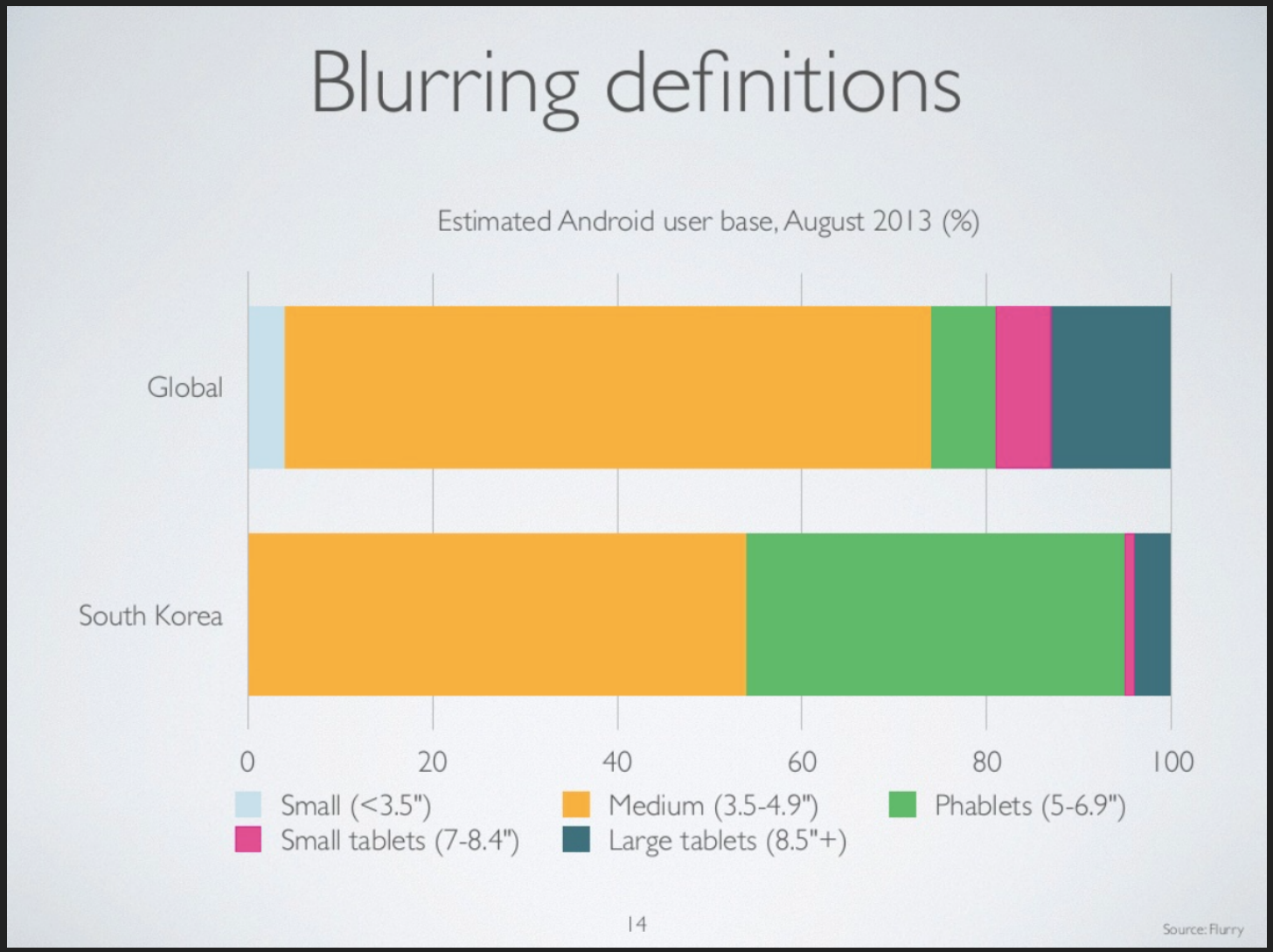
CHINESE ANDROID



REGIONAL DIFFERENCES

- Regional market share of each platform varies significantly
- China is the largest smartphone market today
  - More than 40% of worldwide Android shipments in Q3 2013
  - Typically based on the Android Open Source Platform (AOSP)
  - No Google Play Store, no Google Mobile Services

REGIONAL DIFFERENCES



ANDROID: DEVELOPMENT

- Programming language for Android is based on Java
- Only a subset of the Java libraries and packages are supported
- Android SDK available for Windows, Mac OS X, and Linux
- Android Studio: prepacked IDE based on IntelliJ

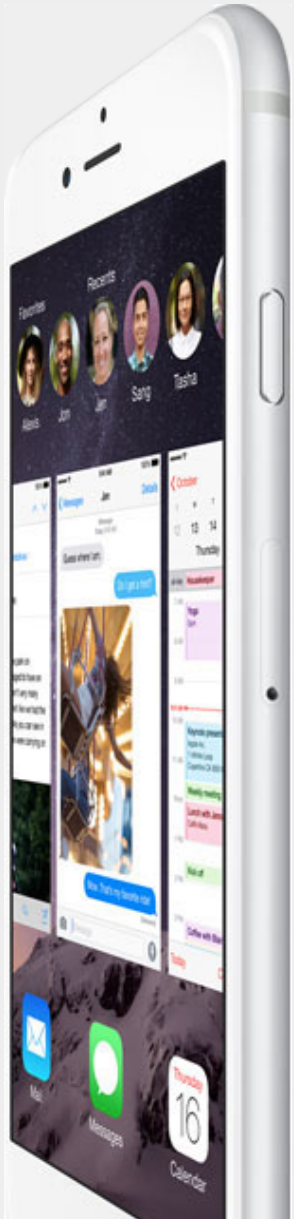
developers.google.com/android/

ANDROID: MONETIZATION

- Advertising, click- or view-based
- Different in-app billing possibilities
- Card.io's SDK for camera-enabled credit card scanning

developers.google.com/ads/

IOS: ECOSYSTEM



- 9 million registered iOS developers (summer 2014)
- This is a 47% increase from the previews year
- 1.4 million apps are available on iOS (January 2015)
- App billings rose another 50 percent within one year
- 25 bn dollars payed to ios developers

IOS: HISTORY (1)

- iPhone unveiled by Steve Jobs January 9th 2007
- OS named iPhone OS
- November 2010: launch of the fourth generation of the OS
  - renamed to iOS
  - launch of the original iPad
- New version each year
- iOS7 was touted as a major UI refresh

And Then Steve Said, ‘Let There Be an iPhone’

IOS: HISTORY (2)

- iOS8 launched in September 2014
  - new frameworks and services: HealthKit, HomeKit, CloudKit
  - new device: Apple Watch
  - Tighter integration between iOS devices and Macs running Yosemite
- iOS9
  - News app based on RSS
  - Split views on iPad
  - Siri improved, proactive assistant
  - Faster graphics, longer battery life
- High adoption rate of each iOS version soon after release

Release Notes

IOS: DEVELOPMENT

- Layers of technologies
- Cocoa Touch: Primary framework developers interact with
- IDE: XCode, Interface Builder, iOS Simulator
- Programming Languages: Objective-C, Swift (2014)
- App Store: deploying apps to consumers
- Apple developer account needed

developer.apple.com

APP STORE

- Primary method for deploying apps to consumers
- Each app submitted is reviewed
- Strict rules on how 3rd party applications run on iOS and use the Sandbox
- Users can control the apps access to their data (i.e. contacts, calendars, photos) or GPS location
- Developers must prepare for cases where the user has denied these type of requests
- Monetization: Ads, selling app, in-app purchases

https://developer.apple.com/iad/

WINDOWS PHONE

- Has become the 'third ecosystem' in the smartphone universe
- Windows Phone and PC platform are going to converge
- Universal app store, universal app APIs and universal tooling
- Targets phones, tablets, PCs, TVs via the Xbox One, embedded devices
- Windows 10 was released on 29. July 2015

↓ more ↓

WINDOWS 10


LTE
1:31
Welcome Miranda!
How can I help you today?
Cortana
5
Maps
10
Mail
Photos
Xbox
Interview new consultant
Fourth Coffee
10:00 AM
Calendar
Mon 26

WINDOWS: ECOSYSTEM

- Microsoft bought the Nokia Devices and Services business 2014
- Removed any licensing costs associated with some device types
- In 2014 the overall progress was far lower than it was hoped
- Second place after Android in some countries
- Windows Phone vendors: Microsoft, Samsung, Celkon Mobiles, Micromax, Lava International, Miia, Highscreen, Kazam, Blue, NGM, Yezz, Allview, Archos, HTC and others

WINDOWS: LANGUAGES AND TOOLING

- Development in C/C++, C# or VB.NET
- Microsoft Visual Studio IDE
- WinRT XAML platform for event-driven applications
- DirectX for games
- Additionally HTML5 and JS based apps are possible
- Without coding: Windows Phone App Studio or Project Siena app
- Portable Class Libraries (PCL) and Windows Runtime Components

METRO DESIGN PARADIGM

- "Flat" design paradigm that influenced Android and iOS heavily
- Simple-to-use interface that focuses on typography and content
- Principles
  - Content not Chrome
  - Alive in motion
  - Typography is beautiful
  - Authentically digital
- Important for the overall experience are the 'live tiles'
- Small widgets that reside on the start screen
- Updated programmatically or even remotely

THE UNDERDOGS


ЦИDЗЯDΦG

FIREFOX OS

- Mozilla Foundation
- Linux based, open source
- Aimed at lower end smartphones
- Browser engine Gecko as a runtime environment for apps
- First release published in February 2013

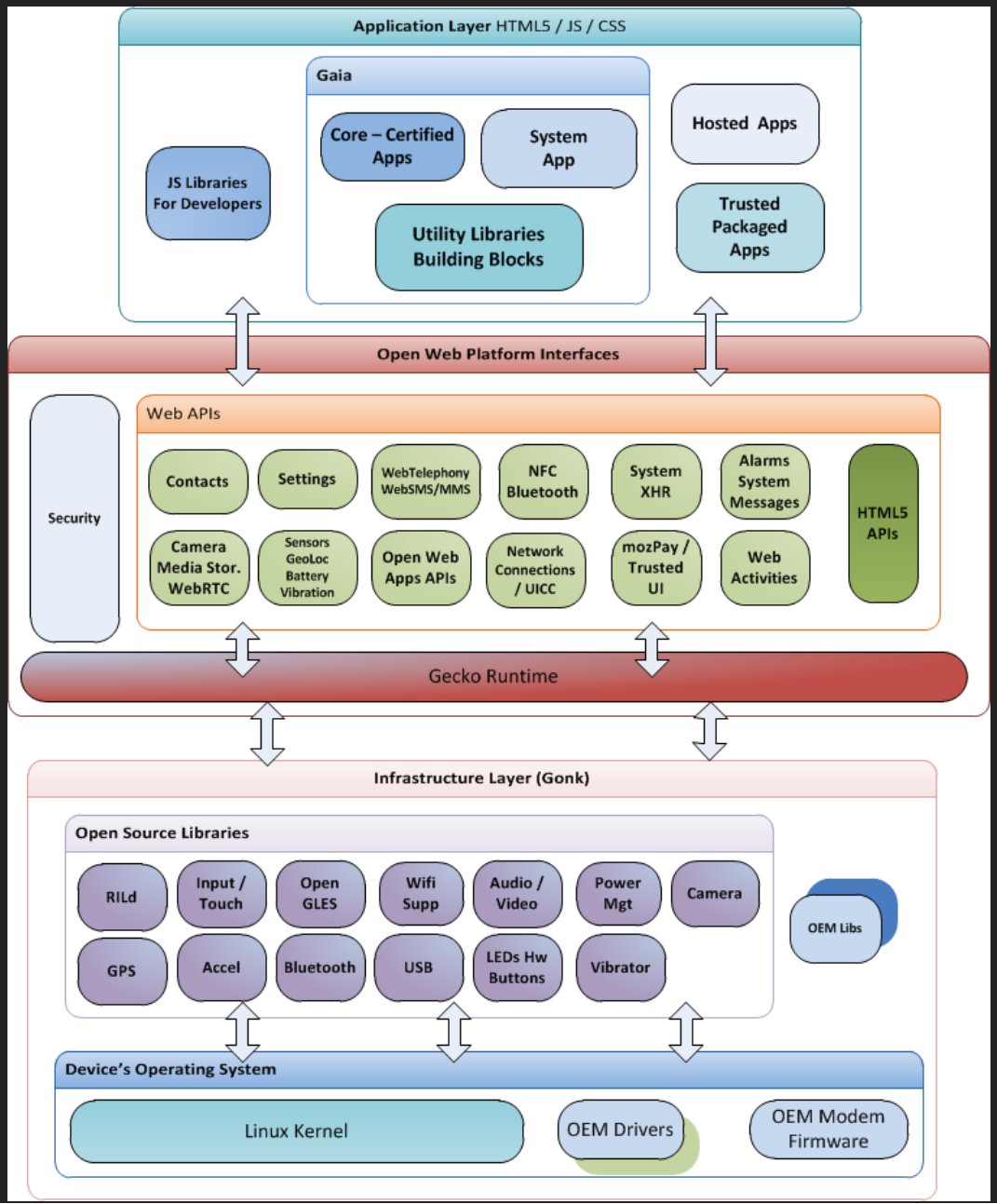
Firefox OS

FIREFOX OS

- Smartphone interface called Gaia
  - Home screen, phone app, settings, ...
  - Based on open web technologies
- User interface similar to Android
- Hosted apps: loaded via a URL
- Packaged apps: installed on the smartphone
  - Can run offline
  - Access to more device features

↓ more ↓

FIREFOX OS


Application Layer HTML5 / JS / CSS
Gaia
Core – Certified Apps
System App
Utility Libraries Building Blocks
JS Libraries For Developers
Hosted Apps
Trusted Packaged Apps
Open Web Platform Interfaces
Security
Web APIs
Contacts
Settings
WebTelephony WebSMS/MMS
NFC Bluetooth
System XHR
Alarms System Messages
HTML5 APIs
Camera Media Stor. WebRTC
Sensors GeoLoc Battery Vibration
Open Web Apps APIs
Network Connections / UICC
mozPay / Trusted UI
Web Activities
Gecko Runtime
Infrastructure Layer (Gonk)
Open Source Libraries
RILd
Input / Touch
Open GLES
Wifi Supp
Audio / Video
Power Mgt
Camera
GPS
Accel
Bluetooth
USB
LEDs Hw Buttons
Vibrator
OEM Libs
Device's Operating System
Linux Kernel
OEM Drivers
OEM Modem Firmware

FIREFOX OS

- Cooperation with wireless carriers
  - Telefonica
  - Deutsche Telekom
- Geographic focus
  - South America
  - Asia
  - Eastern Europe

FIREFOX OS: DEVICES

- First device: ZTE Open (80USD), 2013, promoted for emerging markets
- Alcatel's One Touch Fire, European market in October 2013 (€90)
- Has not really taken off so far

↓ more ↓

FIREFOX OS: DEVICES

Firefox-Smartphones

Alcatel OneTouch Fire E

Geeksphone Revolution

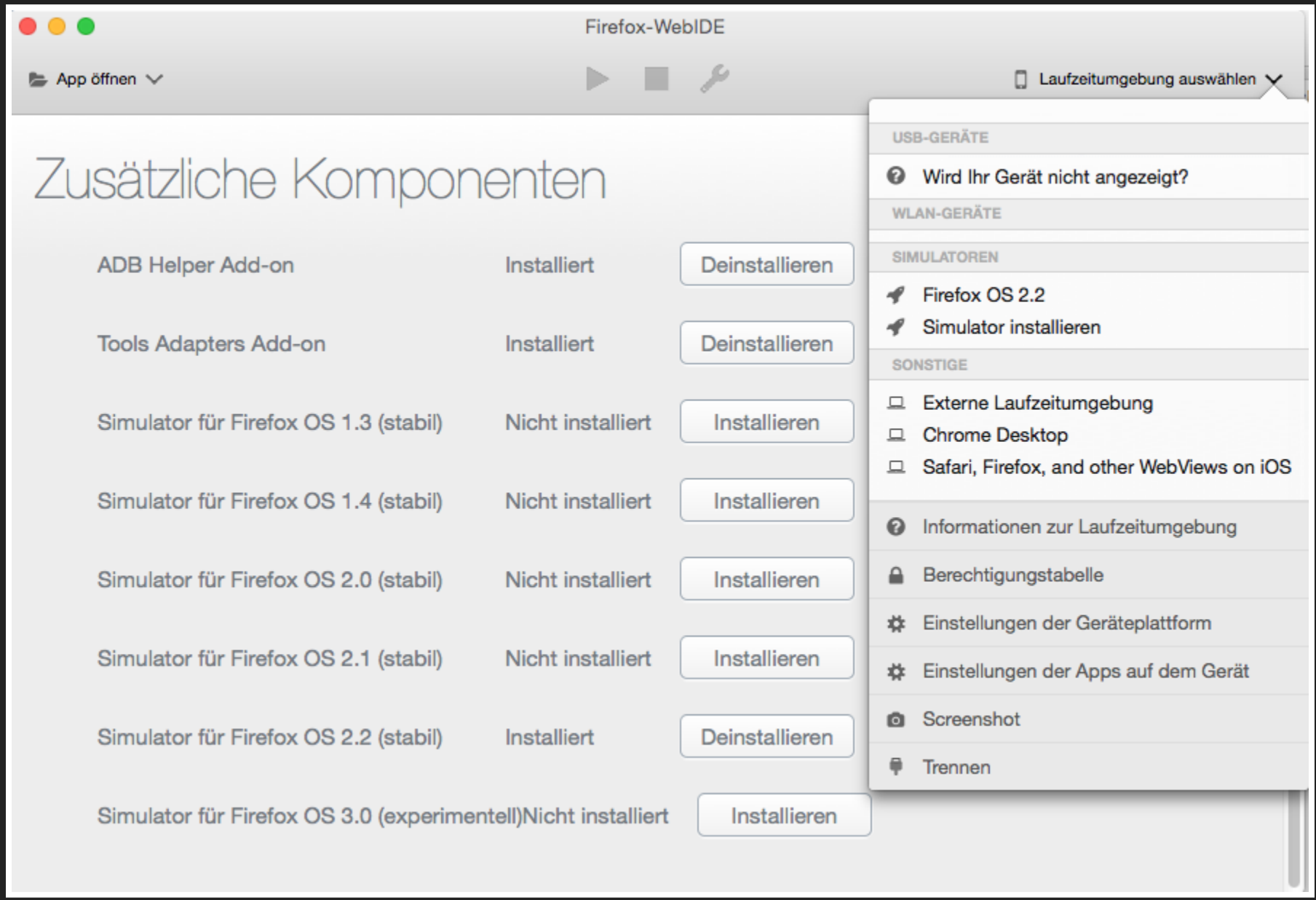
ZTE Open C

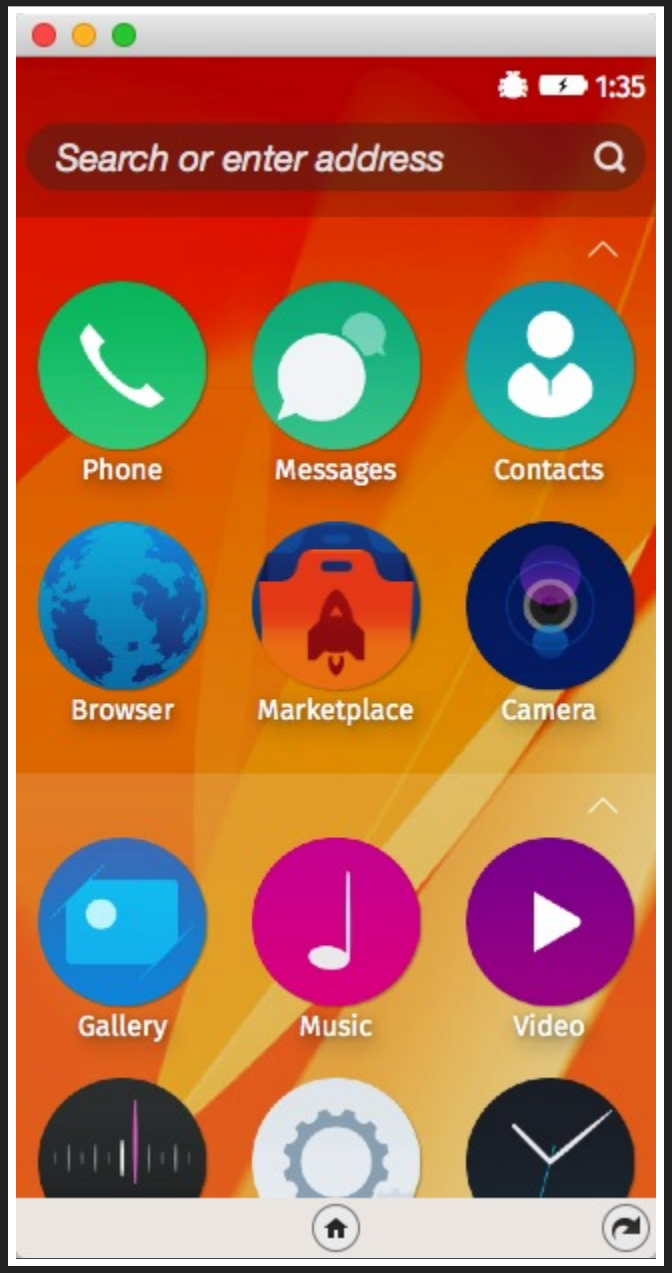
FIREFOX OS: DEVELOPMENT

- HTML-based
- Uses HTML/JavaScript/CSS as the native development languages
- Easy for a web developer to write native apps
- Need to know: JavaScript API provided by Firefox OS, how to package Apps

MDN Firefox OS

FIREFOX OS: SIMULATOR




1:35
Search or enter address
Phone
Messages
Contacts
Browser
Marketplace
Camera
Gallery
Music
Video

FIREFOX OS: MARKETPLACE

- Global AppStore called Marketplace
- Apps often based on mobile web apps (Facebook, Twitter, ...)
- Few games
- Popular apps missing
- Apps are reviewed
- Developers get 70% of the generated revenue

Marketplace

(Closer look at Firefox OS: planned for MOBA2)

BLACKBERRY

- Eight years ago: number 2 in smartphone business
- Now a niche system
- Although most drawbacks were fixed
- Devices with and without real keyboards

Blackberry 10 OS

↓ more ↓

BLACKBERRY


11:33 AM
Wed, Mar 6
in 27 minutes:
Team Lunch
12:00 PM (1.5hrs)
BlackBerry
BlackBerry
BlackBerry Hub
Wednesday, March 6

BLACKBERRY OS

- Particularly suited for messaging
- BlackBerry hub for messages
  - E-Mails from various accounts
  - Twitter
  - Facebook
  - SMS
  - WhatsApp
  - BlackBerry's chat system BBM

BLACKBERRY OS

- Business data and apps separated from private data and apps
- Private area: Android runtime available
  - Based on AOSP (Android Open Source Project)
  - No access to Google's Play Store
  - Amazon App Store can be used

BLACKBERRY OS

- Development Options
  - C Native SDK
  - C++ Cascades SDK
  - HTML5 WebWorks
  - Android Runtime
  - BlackBerry App Generator
- Distribution: BlackBerry AppWorld

UBUNTU PHONE

- Also known as *Ubuntu Touch*
- Mobile version of the Ubuntu operating system
- Designed primarily for touchscreen mobile devices
- Qt5-based touch user interface

Ubuntu Phone

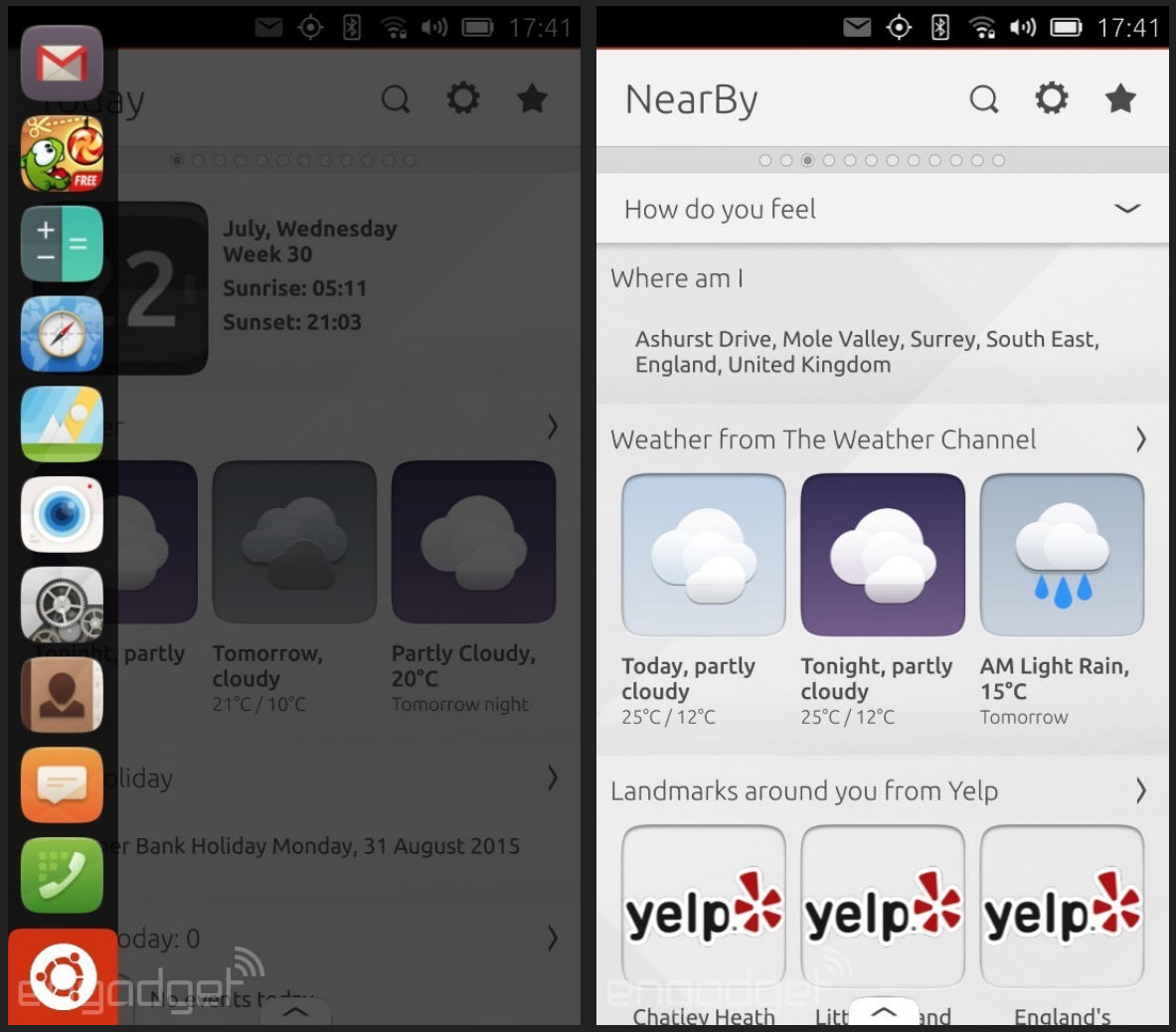
UBUNTU PHONE

- No Home-, Back- or Search-Keys
- Instead, gestures are used
- Scopes to present information on the home screen
  - Videos, Music, Weather, ...
  - Can be activated sequentially (swipe gesture)
  - About 50 Scopes in the Ubuntu App Store
- Sidebar with frequently used apps

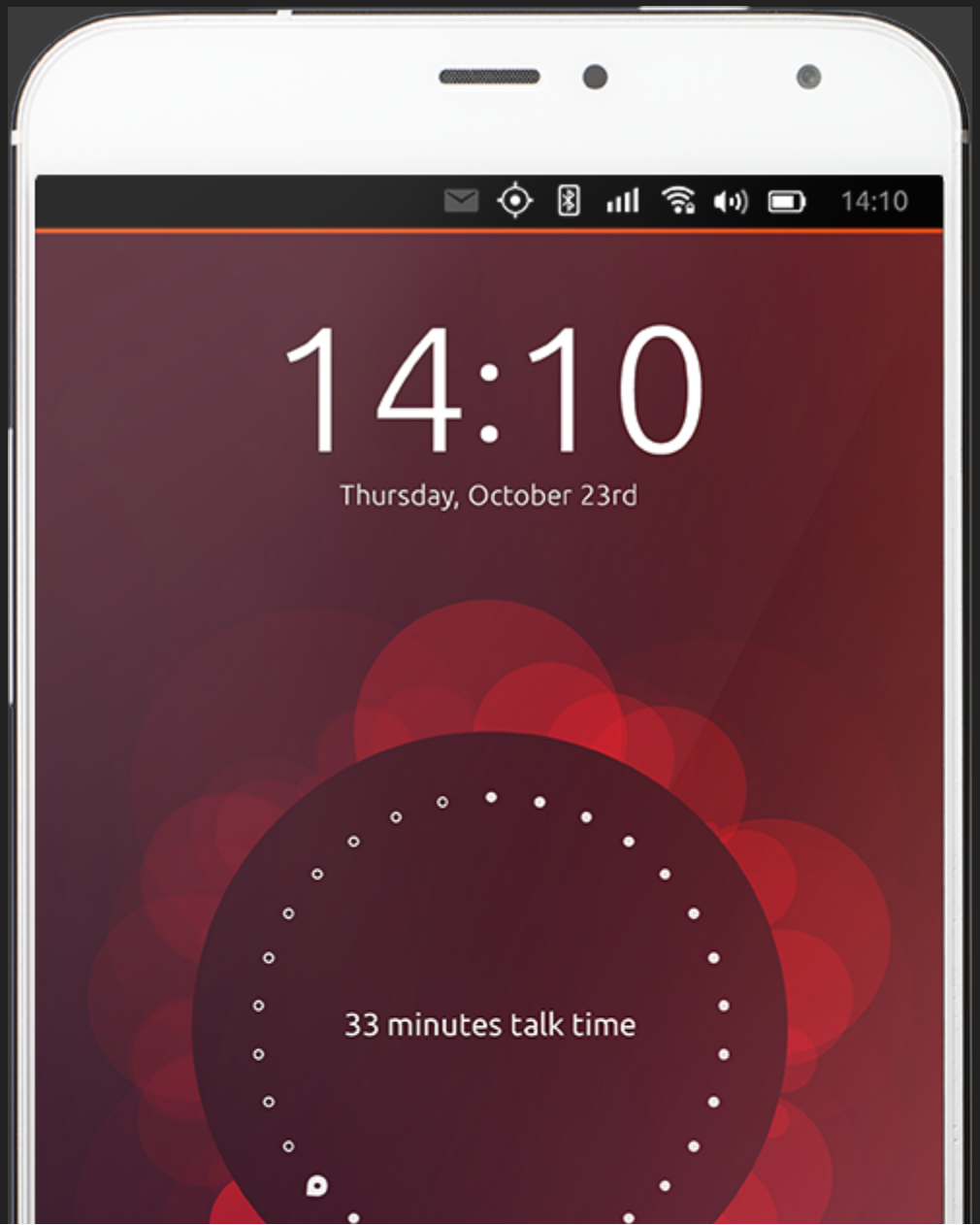
"Make Android look like Ubuntu Phone"

↓ more ↓

UBUNTU PHONE



MEIZU MX4 UBUNTU EDITION



UBUNTU PHONE

- Based on Linux (root access)
- Uses frameworks originally developed for Maemo and MeeGo
- Can be ported to most recent Android smartphones
- First phones with Ubuntu appeared 2015 (originally announced for 2013)
- Can be installed on Google Nexus Smartphones

TIZEN

- Open source, Linux based
- Intel, Samsung, brand of the Linux Foundation
- Also contributing: Fujitsu, NTT Docomo, Huawei, Vodafone, Orange
- Designed for various smart devices:
  Smartphones, tablets, netbooks, watches, tvs, car multimedia
- Source code mostly open source
- Based on work of Nokia (Maemo), Intel (Moblin, MeeGo), LiMo Foundation (LiMo) and Samsung (Bada OS)

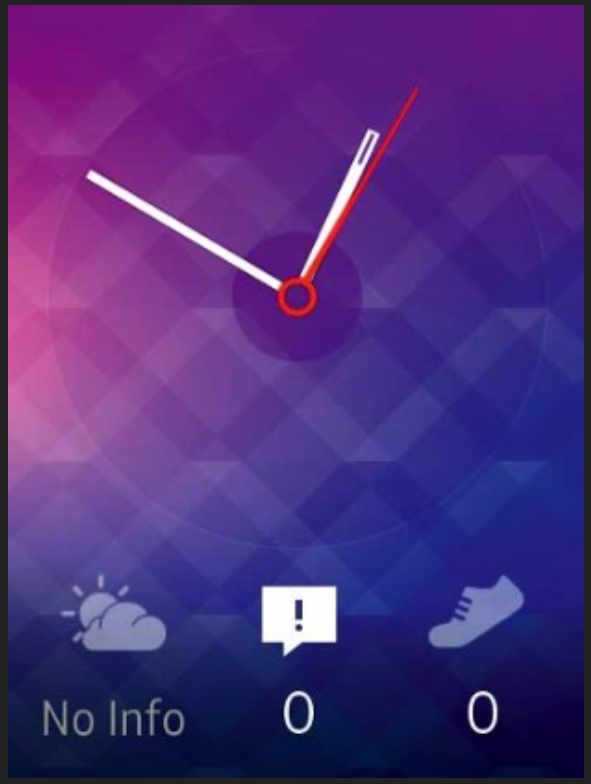
www.tizen.org

TIZEN: DEVICES

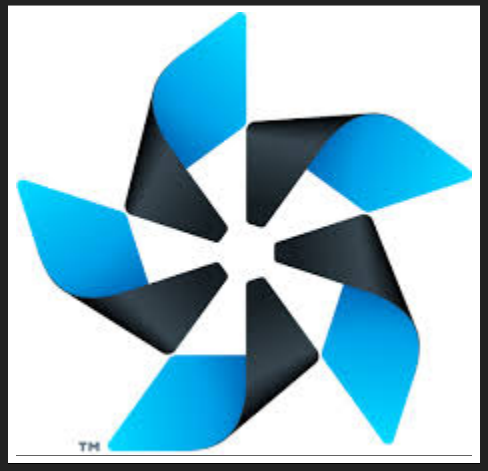
- First public evailable Tizen device: Samsung's camera NX300M
- Also: Samsung Smartwatches Gear 2 and Gear 2 Neo
- All Samsung Smart TVs released during 2015 will run Tizen
- January 2015: first Tizen powered smartphone (Z1) launched in India

↓ more ↓

TIZEN: DEVICES



TIZEN: LOGO



TIZEN: SAMSUNG Z1

- Sold in India
- 80€
- 4 GB Flash Storage
- 3 MP Camera
- Dualcore processor
- Dual SIM

TIZEN: DEVELOPMENT

- Web Apps (HTML5, CSS, JS)
  - Tizen web browser is one of the best HTML5 implementation on mobile devices
  - Comprehensive list of HTML5 features available
- Also possible: native apps in C++ (Bada Framework)
- Tizen SDK contains an Eclipse-based IDE

TIZEN: APPS

- Main hub for distributing apps will be the TizenStore
- TizenStore tailored to Indian market
- Meets requirements for a successful smartphone OS
- Availability of smartphones missing

- Jolla (founded by former Nokia employees)
- Sailfish OS based on MeGo and Mer (community project)
- Homescreen with tiles
- Controlled with gestures

jolla.com/jolla/
blog.jolla.com/

SAILFISH OS: DEVICES

- Jolla phone November 2013
- Jolla tablet in May 2015 (??)

SAILFISH OS: APPS

- Sailfish OS is able to run
  - Sailfish-native apps
  - Android apps
  - MeeGo-native apps (not all)
  - Linux apps compiled for Sailfish device
- Alien Dalvik runtime for Android apps
  - Android apps run out of the box
  - Yandex and Aptoide shops available in the Jolla Store
  - Google Play Store can be added manually
- Jolla Store with several hundred apps

SAILFISH OS: SYSTEM

- Access to the Linux system
  - Tools like systemd, bash, rpm available
- Active community:
  - together.jolla.com/questions/
  - talk.maemo.org

FEATURE PHONE PLATFORMS (REP.)

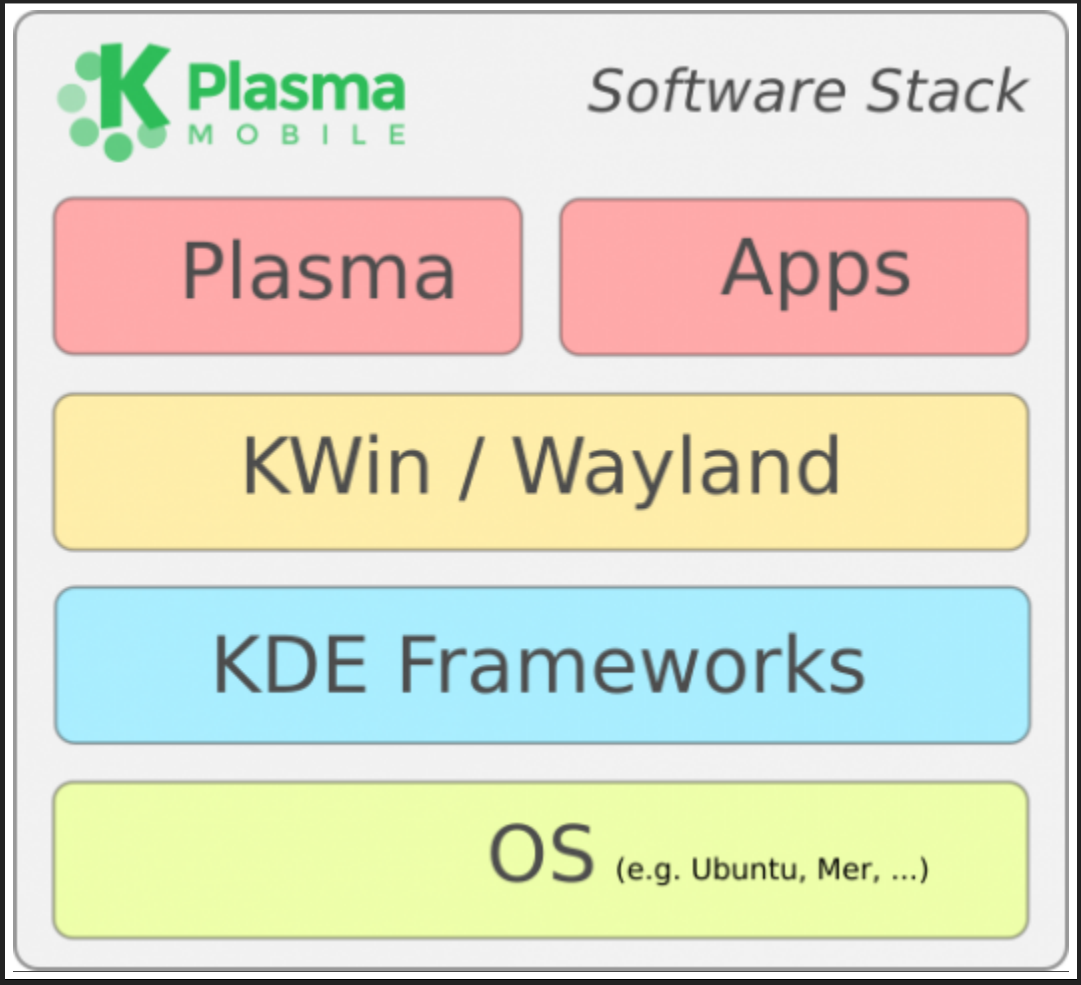
- Globally one third of all phones sold in Q3 2014 were feature phones
- Install base much higher than that
- But: Android is increasingly taking over the low-cost handset market
- Apps typically developed using Java ME or BREW (Qualcomm)

JAVA ME (J2ME)

- Oldest mobile application platform
- Still widely used
- Designed to run primarily on feature phones
- Most mobile phones in use today are feature phones
- Dominates this market segment
- Gradually being phased out by low-end smartphones

EXPERIMENTAL SYSTEMS

- Example: KDE Plasma 5



OLDER SYSTEMS

SYMBIAN OS

- Nokia
- Word wide market share was more than 50%
- Also used by Siemens, Panasonic, Samsung
- Symbian S60 (2008)
- Symbian 3 (2011)
- Cooperation with Microsoft (2011): end of Symbian OS

PALM OS

- Developed by Palm for PDAs in 1996
- Simple, single-tasking environment
- Touch screen
- Devices have a detachable stylus to facilitate making selections
- Handwriting recognition input system called Graffiti

↓ more ↓

PALM OS

Palm OS (2004)

PALM TREO

WEBOS

- Developed by Palm in 2009
- Based on web technologies
- 2010: HP acquired Palm
- 2012: WebOS Open Source
- 2013: bought by LG
- Now used in LS's Smart TVs

WINDOWS MOBILE

Windows Mobile (2006)

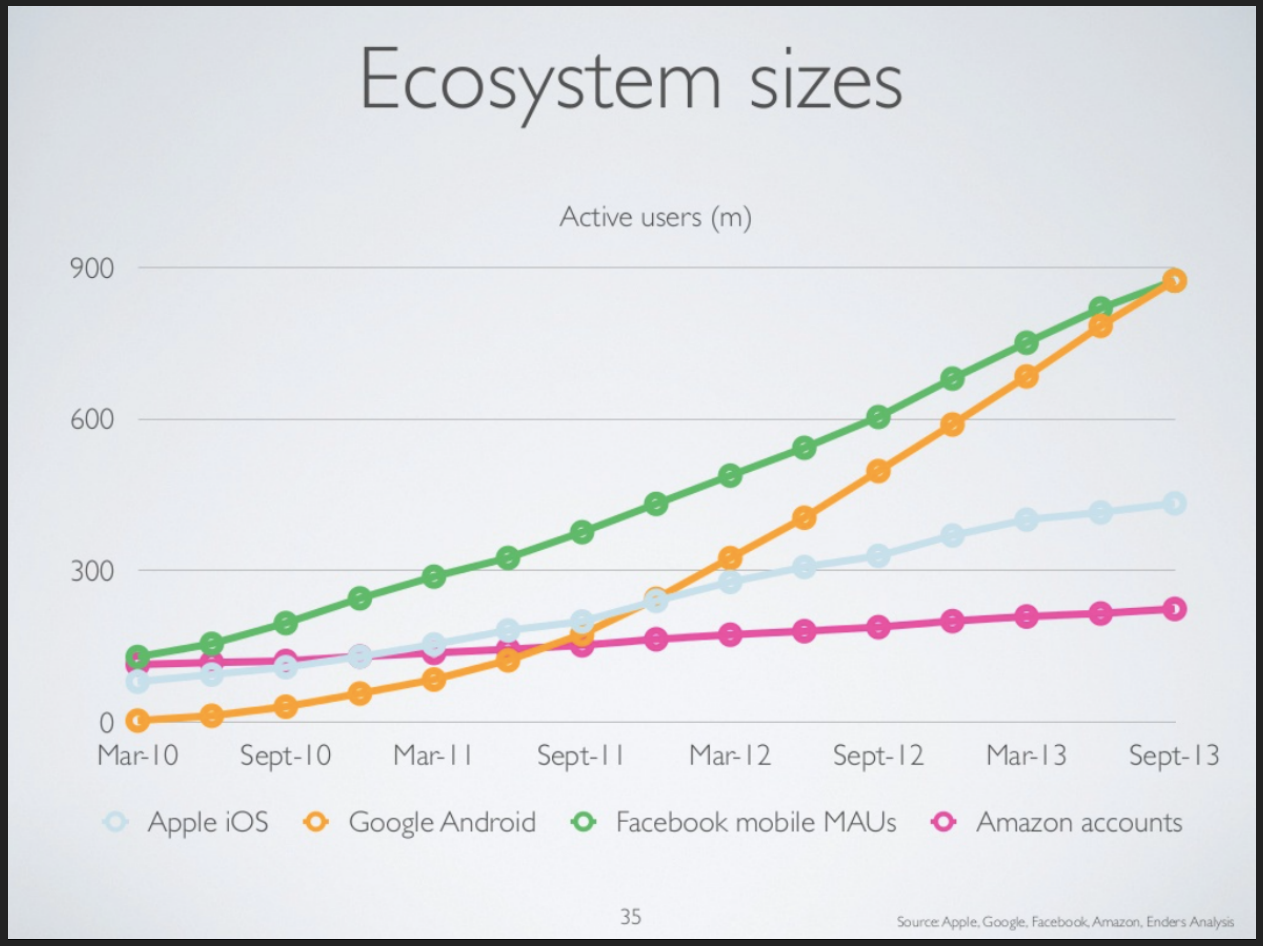
- Successor of Windows CE
- Predecessor of Windows Phone

BADA OS

- Samsung 2010
- In large part a copy of Android
- Unsuccessful attempt to gain market share withz cheap phones
- Discontinued in 2013

ECOSYSTEMS COMPARED

ECOSYSTEM SIZES



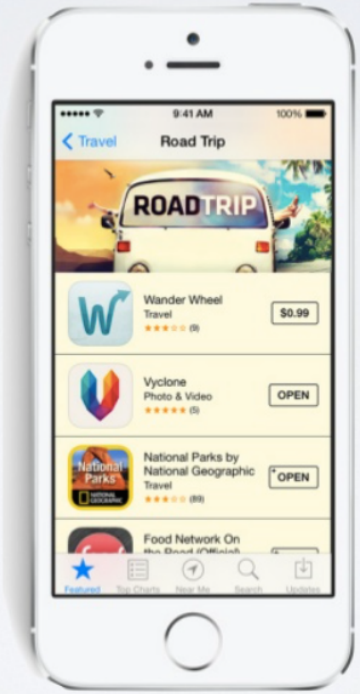
- netmarketshare
- kantarworldpanel

- StatCounter

ECOSYSTEM DIFFERENCES

Ecosystem is the key leverage point

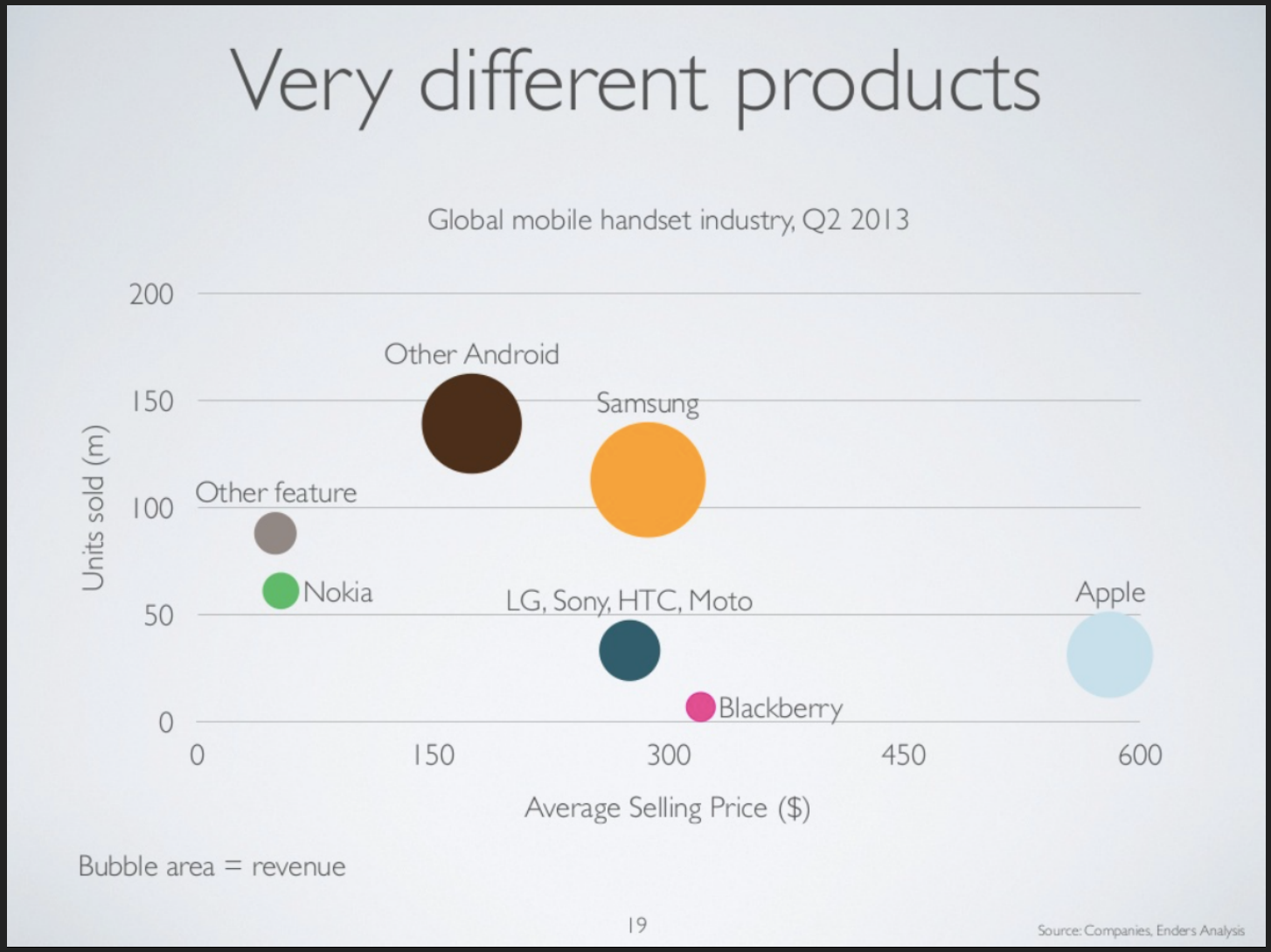
For Apple, the ecosystem is what sells hardware



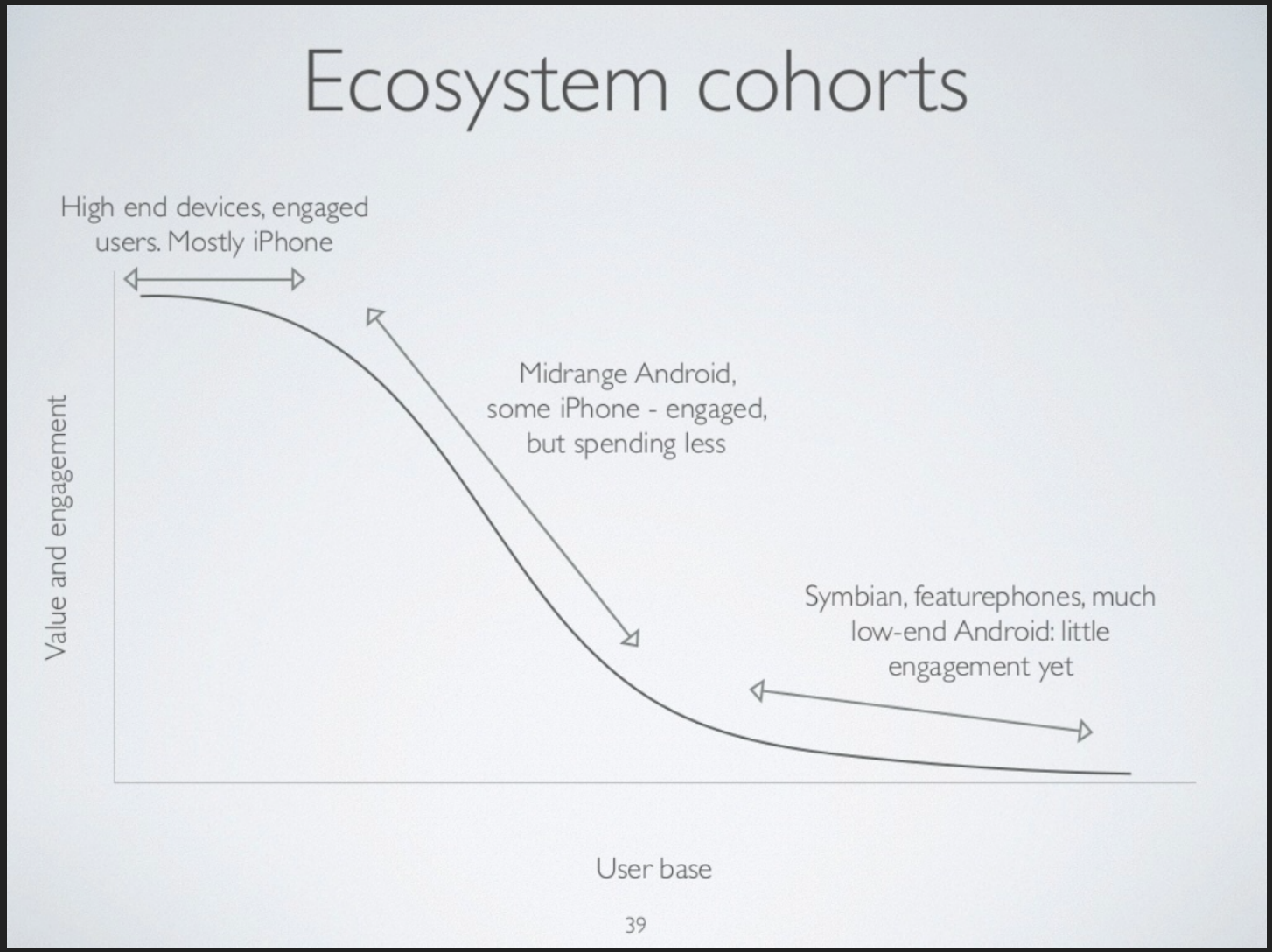
For Amazon, Google and Facebook, the experience on the phone is what drives engagement with all their services

39

PRODUCT CATEGORIES



ECOSYSTEM COHORTS



SOURCES AND FURTHER INFORMATION

SOURCES

- Slides and other material from courses WEB1, WBE
- Mobile Developer’s Guide To The Galaxy, 15th Edition, Enough Software, http://www.enough.de/index.php?id=mobile_developers_guide
- Organizing Mobile (Luke Wroblewski) http://alistapart.com/article/organizing-mobile
- Mobile First (Luke Wroblewski, A Book Apart) http://www.abookapart.com/products/mobile-first

SOURCES

- Mobile is eating the world, Benedict Evans, 2013, http://de.slideshare.net/bge20/2013-11-mobile-eating-the-world
- Mobile, context and discovery, Benedict Evans, keynote at the InContext 2014 conference, http://de.slideshare.net/bge20/2014-02-incontext, Youtube: https://www.youtube.com/watch?v=VnhbvS0MBXE