

# Android Development

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# Agenda

- ◆ Who am I?
- ◆ Where do I work?
- ◆ What do I teach?
- ◆ What do I research?
- ◆ What do I teach in ESIGELEC?
- ◆ An introduction on Android.

who am I?

# Presentation

- ◆ Professor at PUC-PR
- ◆ Mobile developer of Pinterest
- ◆ Researcher in GPGPU, games and mobile
- ◆ Developer of mobile Apps for more than 20 years
- ◆ pHD and MD in Computer Science



embarca a previsão é que a obra  
comece nas próximas semanas  
e terminar no terreno de 20 mil metros  
quadrados na região de Penha.  
A construção do prédio do Instituto Federal  
de Educação, Ciência e Tecnologia (IFRR), o antigo Celet.  
A cidade foi contemplada na  
última fase do Programa Na-

transformação econômica que  
virá com a implementação do  
Comperj. Todos esses setores  
dependerão de mão de obra qua-  
lificada, que vamos formar no  
novo instituto federal.

Ainda não há custo definido  
para a obra, que será bancada  
integralmente com recursos

viarem as documentações  
necessárias.

Ano passado, durante visita  
de uma comitiva do Congresso Nacional às instala-  
ções da Petrobras na Ilha do  
Fundão, no Rio de Janeiro,  
um diretor pediu uma indica-  
ção para uma vaga técnica na

sil, o Comperj, e temos  
que ter mão de obra capaz de  
atender à demanda do setor.  
Niterói é uma cidade polo e  
deve ter esse papel reafirma-  
do — afirma o deputado federa-  
lista Chico D'Angelo (PT), que  
negociou com Fernando Hen-  
rique Cardoso, ex-ministro de Educa-

ção, que o governo queria.  
Além disso, logística e constru-  
ção civil devem também ser im-  
plantados — diz o presidente da  
Comissão de Educação da Câmera  
dos Vereadores, Vitor Junior  
(PT), responsável pela organi-  
zação da grupo que discutirá  
os cursos oferecidos.

explica Gusmão.

Além de Niterói, duas unida-  
des serão construídas no Rio  
— uma no Complexo do Aé-  
rion e outra na Cidade da Deus  
— e outras duas na Baixada  
Fluminense — em Belford Ro-  
xo e em São João de Meriti. ■

Pedro Teodoro

## Incubadoras são o ensaio para a criação da primeira empresa

Universidade ajuda empreendedores a ingressarem no mercado de trabalho

Luis Gustavo Schmitt  
lgschmitt@uol.com.br

**U**ma salinha apertada e escondida sob a escada do corredor do quinto andar da Faculdade de Engenharia da UFF, no campus da Praia Vermelha, abriga o Laboratório de Mídias Digitais e Novas Tecnologias. O local é uma usina de inovação e uma espécie de garagem de Steve Jobs (local onde o bruxo da Apple começou a montar os seus primeiros

uma boa ideia para criar um  
negócio, mas não têm dinheiro  
ou um espaço para trabalhar.

Marcelo Zamith, de 35 anos,  
Mark Joselli, de 30, e José Ri-  
cardo da Silva Junior, de 31, conheceram-se no doutorado  
em Computação. Desde 2008,  
o trio pesquisa Tecnologia de  
Computação em Alta Performance  
para identificar a topografia de poços de petróleo. O  
estudo rendeu frutos e, em  
2009, eles foram contratados  
pela Petrobras.

— Aplicamos placas gráficas  
a óleos, com realidade aumentada.

óleo. Um processo que chejava  
e levava três dias passou a ser feito  
em horas — conta Zamith.

O projeto de pré-incubação  
precede a criação de uma em-  
presa estruturada na universida-  
de. O coordenador acadêmico  
da Incubadora da UFF, Sérgio  
Macena, explica que os em-  
preendedores aproveitam a es-  
trutura da instituição para cons-  
olidar seu modelo de negócio.

— Eles recebem todo o  
apoio necessário para que  
possam sobreviver no merca-  
do. Passam a ter assessoria  
contábil, jurídica, marketing,

desenvolvimento de software e  
que funciona por meio de uma  
parceria da UFF com o Instituto  
Vital Brazil. A empresa, que con-  
ta com assessoria de alunos da  
universidade, é especializada em  
exames de sangue em papel de  
filtro. As amostras são colhidas  
por meio de uma agulha e ficam  
marcadas no papel. A IBM já apli-  
cou os testes em 79 municípios do  
estado pela rede do SUS.

— Essa técnica permite que  
oitro exames de pré-natal sejam  
feitos de uma só vez. Anteriormente, era preciso que a  
gestante fizesse os exames se-



Newspaper of my first startup.



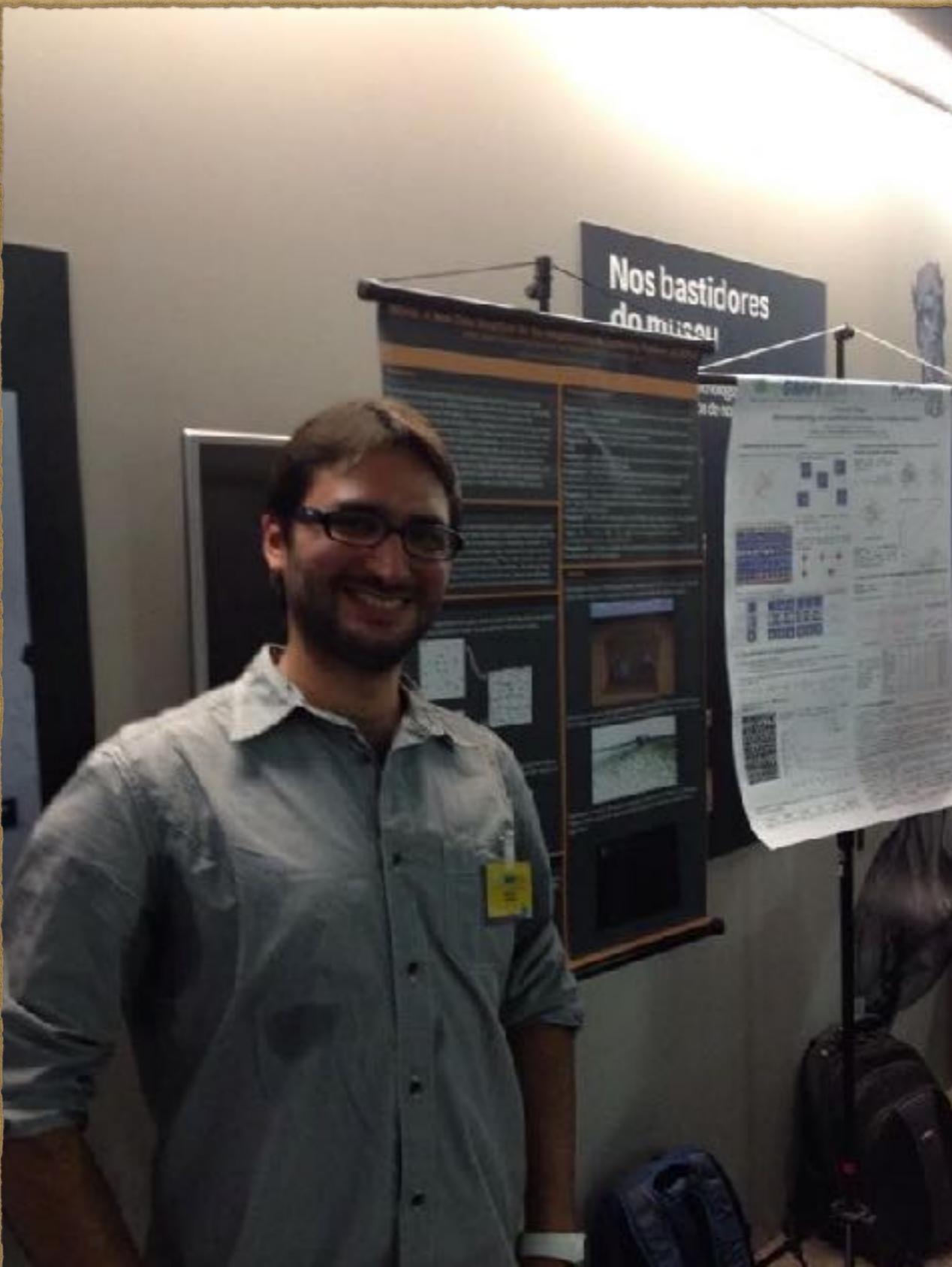
Content

Advertising

Content

## MobileTv

I was part of the team that developed the first TV for  
mobile of Latin America



Got the Best pHD  
Thesis in Brazil of 2014

Won the Apple  
Distinguished Educator in  
2015





One of my students received the Apple Design  
Awards for best game



Another has received best series game for a game  
that teach deaf children how to read.



And a group of students were  
hackaton winners

Where do I work?

# PUCPR

- ◆ Pontifical Catholic University of Paraná
- ◆ Located in Curitiba in the State of Paraná
- ◆ More than 31,000 students
- ◆ Five academic units:
  - ◆ the Center for Biological and Health Sciences,
  - ◆ the Center for Exact Sciences and Technology,
  - ◆ the Center for Juridical and Social Sciences,
  - ◆ the Center for Humanities and Theology,
  - ◆ and the Business School.



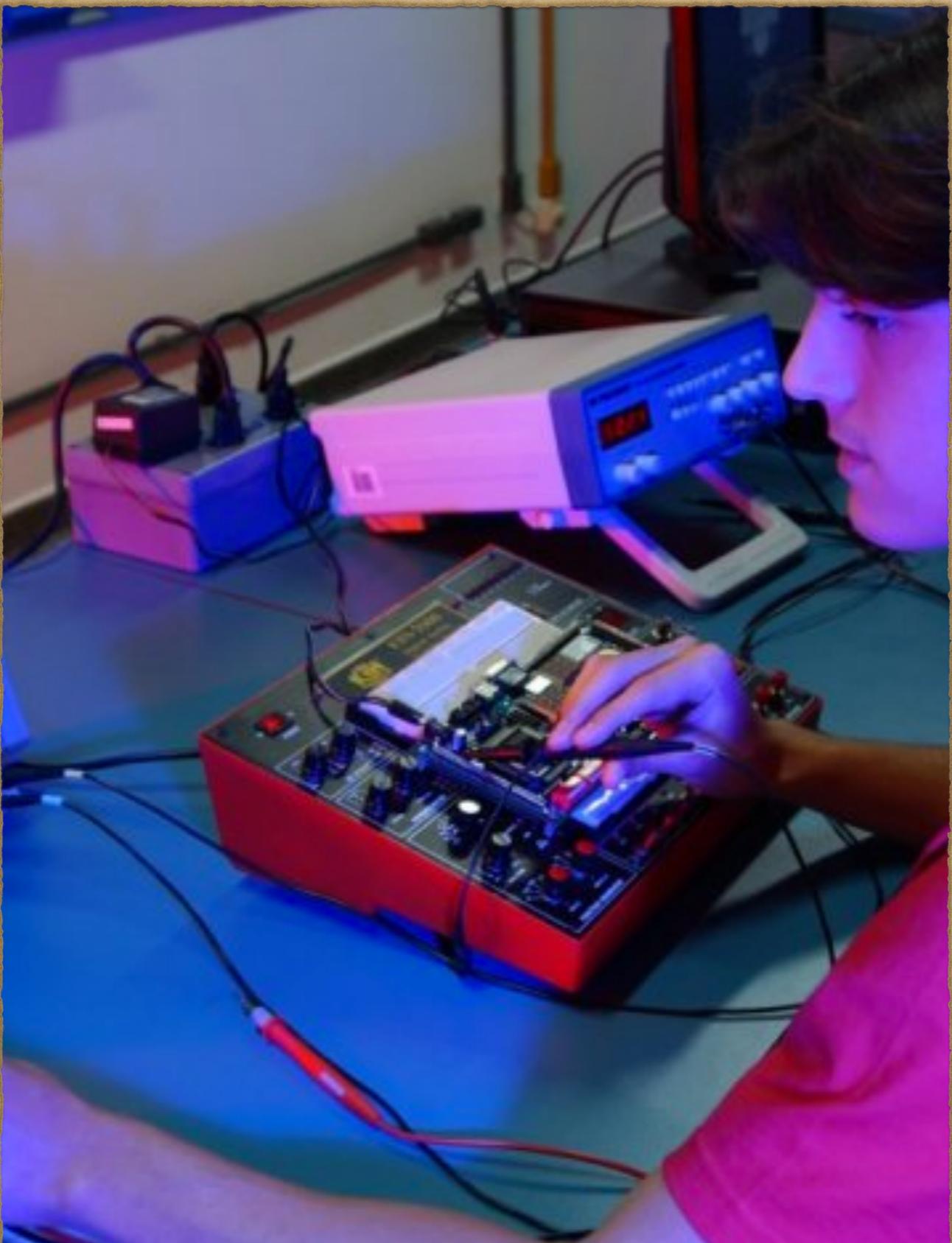
# PUCPR

- ◆ PUCPR offers graduation, MBA, Master and PhDs courses in different fields;
  - ◆ 63 graduation courses;
  - ◆ 175 pos graduation courses
  - ◆ and more than 2,000 R&D projects with more than 100 patents
- ◆ PUCPR has a central biblioteca, laboratories equipped with computers, projectors
- ◆ Focus on Teaching, Research, Innovation and Internationalisation

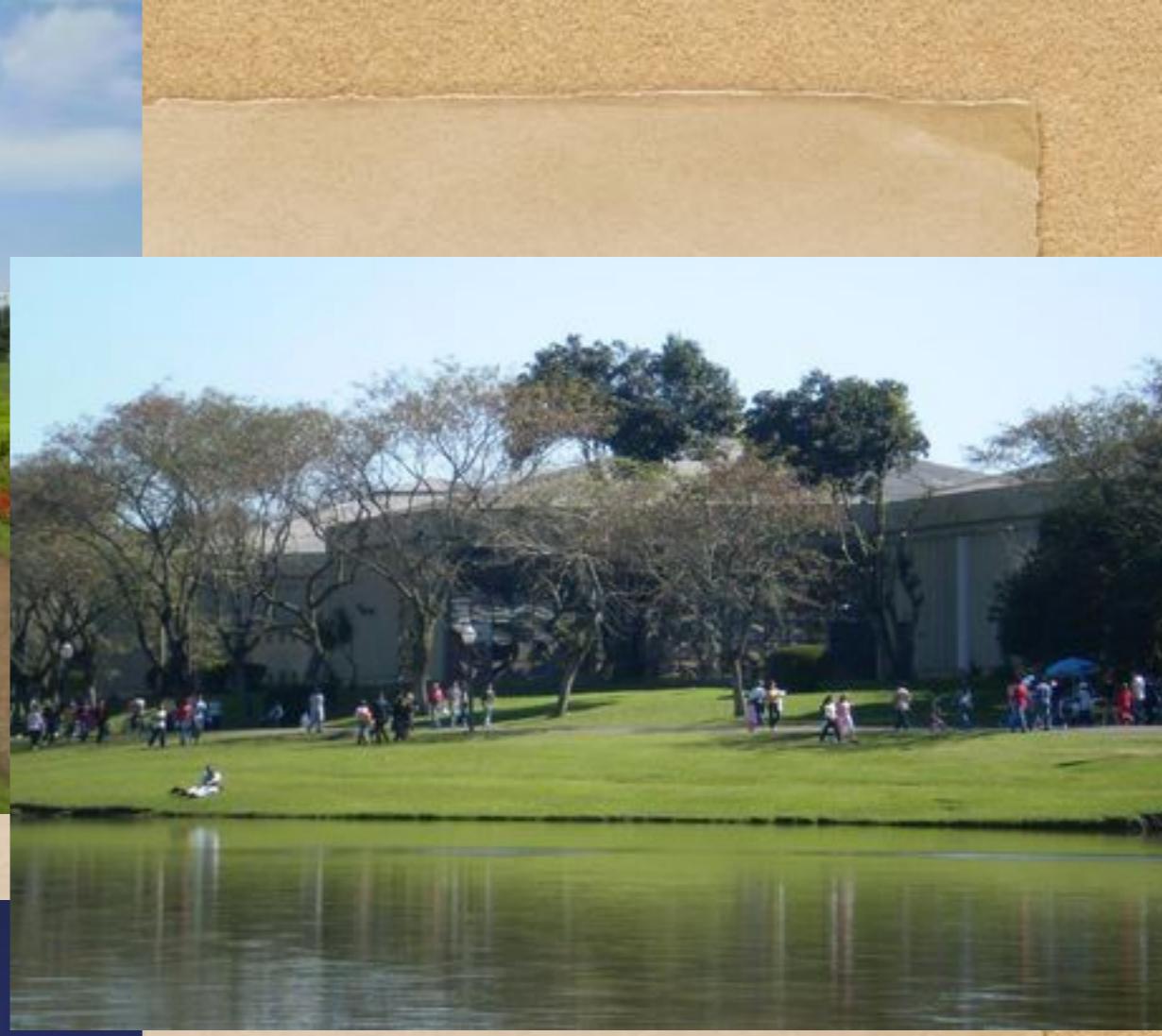


 MIC CWB







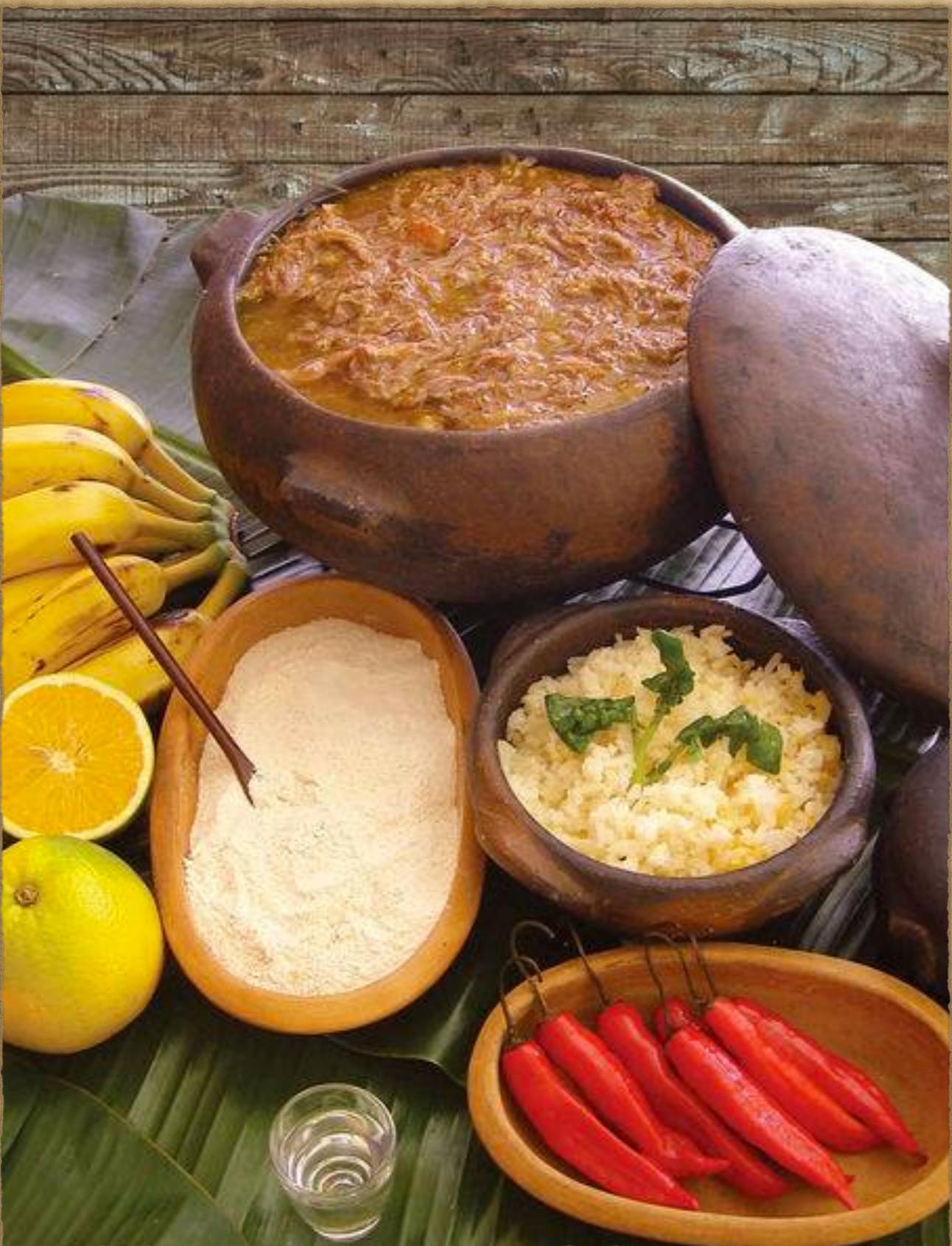












what do I teach?

# Games/Mobile Development

- ◆ I teach on the Graduation Program and PostGraduation Program
- ◆ Subject:
  - ◆ Mobile Development
  - ◆ Game Development
  - ◆ Blockchain development



- ◆ A 2 year program with concentration on the development of apps for iOS
- ◆ They develop an app and also a startup

James  
Delivery  
startup that delivers  
convenience to your home





Super pads  
Create and Play top songs



# Jump-o

Minimalist game



# Vector Race

Autorama game

# Eternal

Social network that help  
plan a marriage party



eternal

A rede social do seu Casamento



Acesse com o Facebook

Entrar

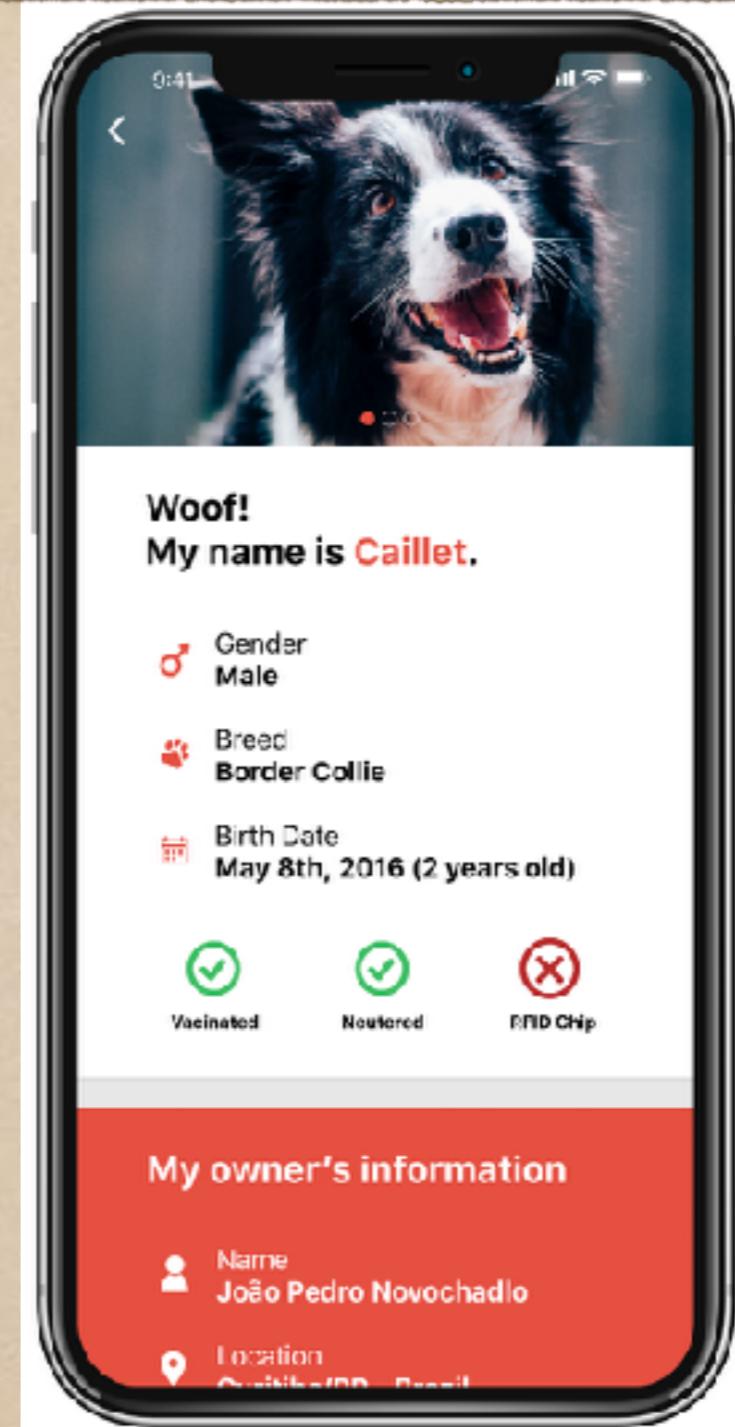


Wyz

Game to help deaf children to read

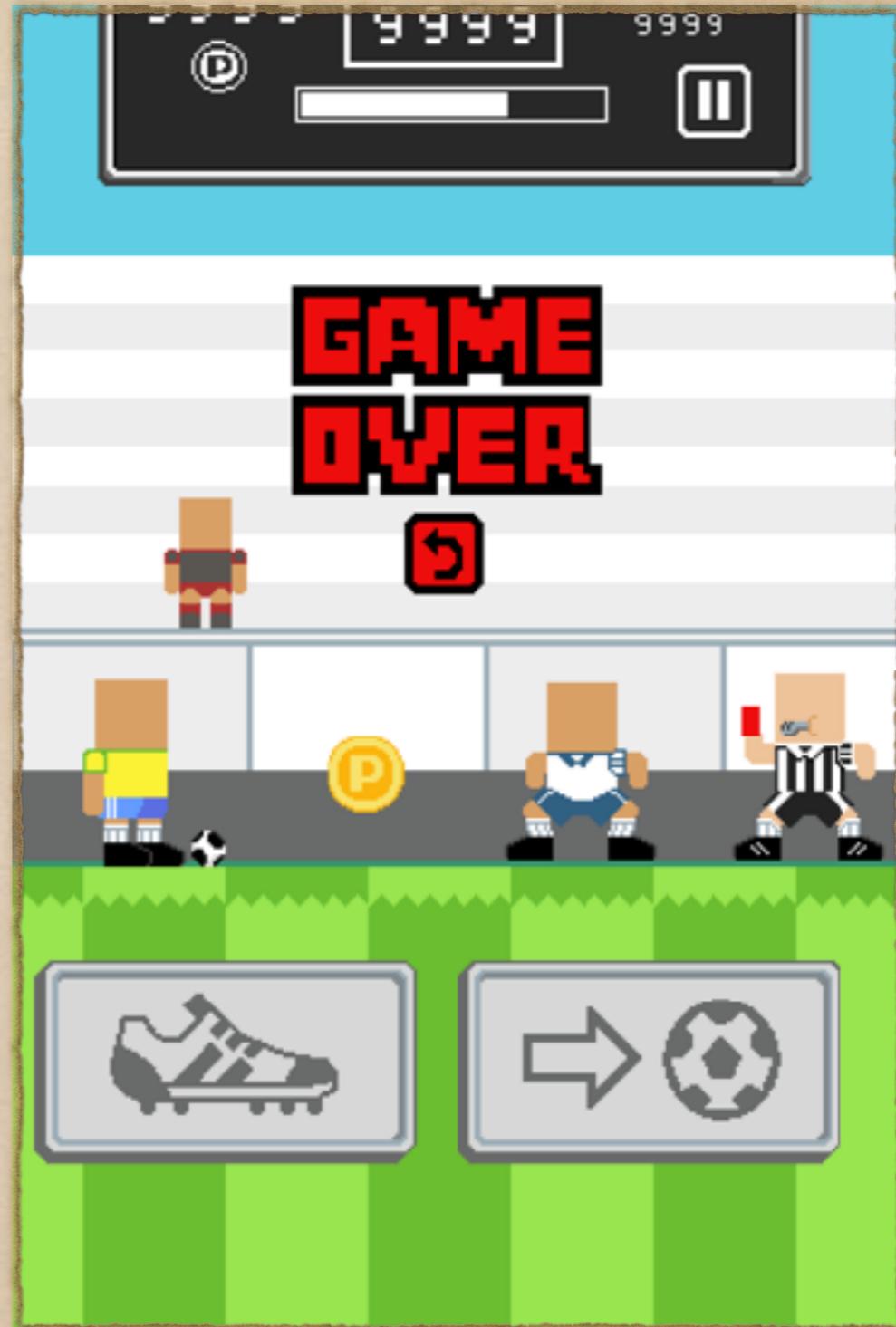
# Kryptags

App with nfc technology to  
track pets



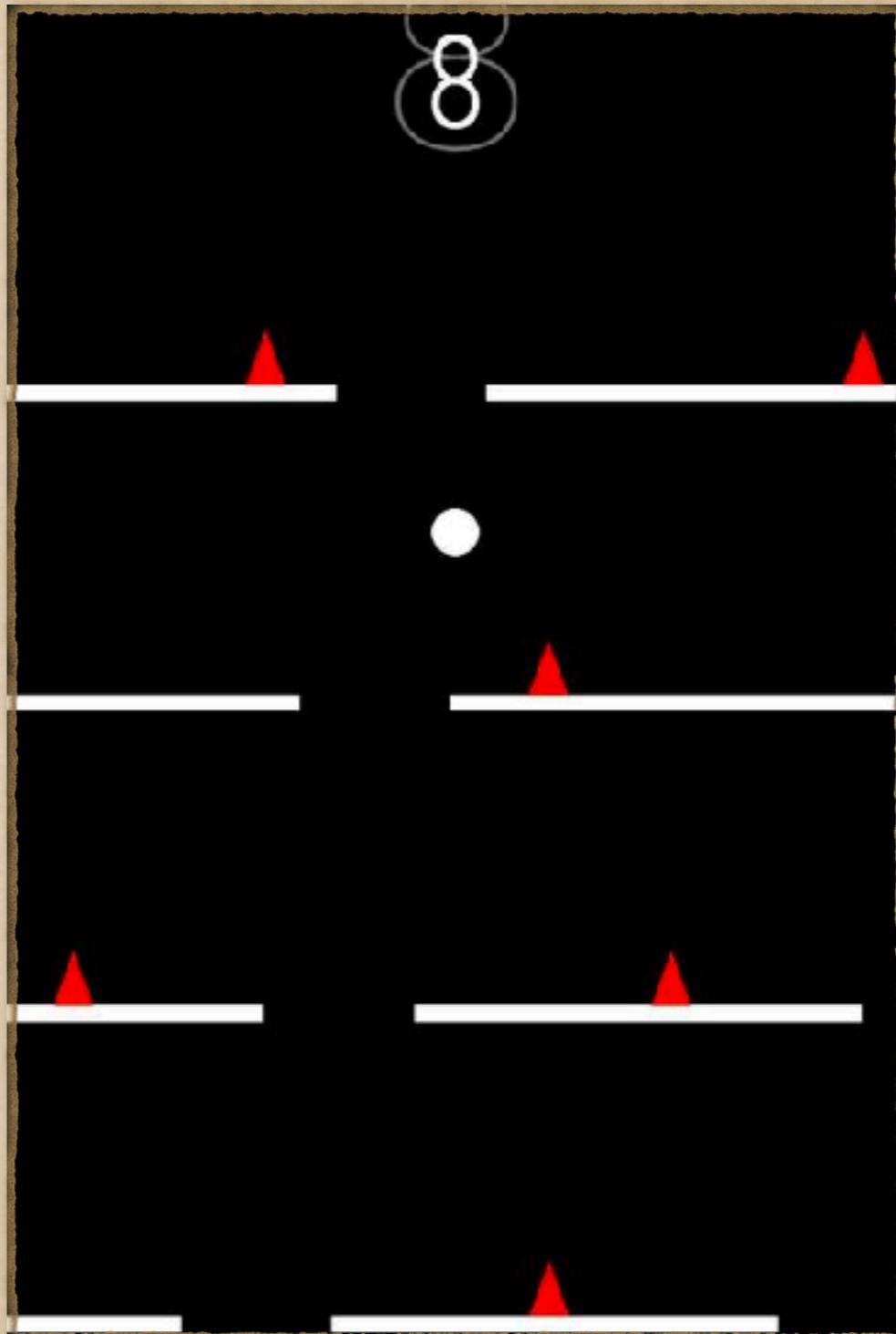
# Soccer Runner

Hyper casual game



# Linear Jump

Hyper casual game



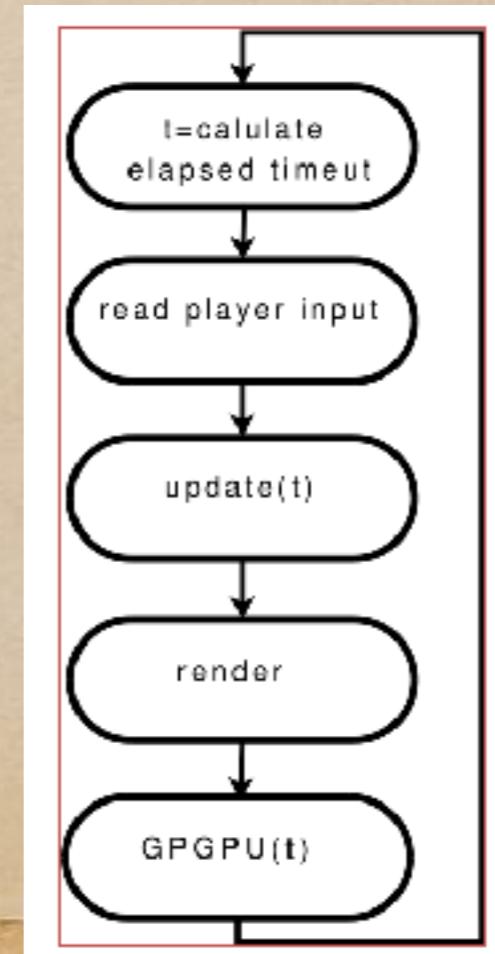
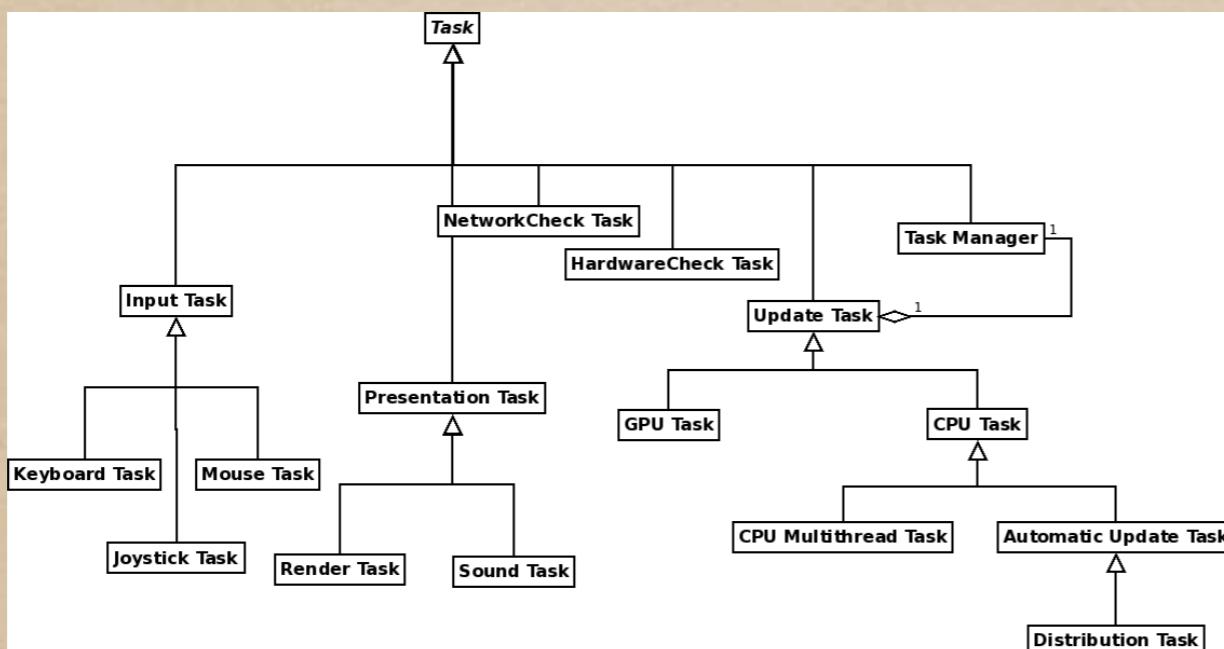
# Bottle Stack

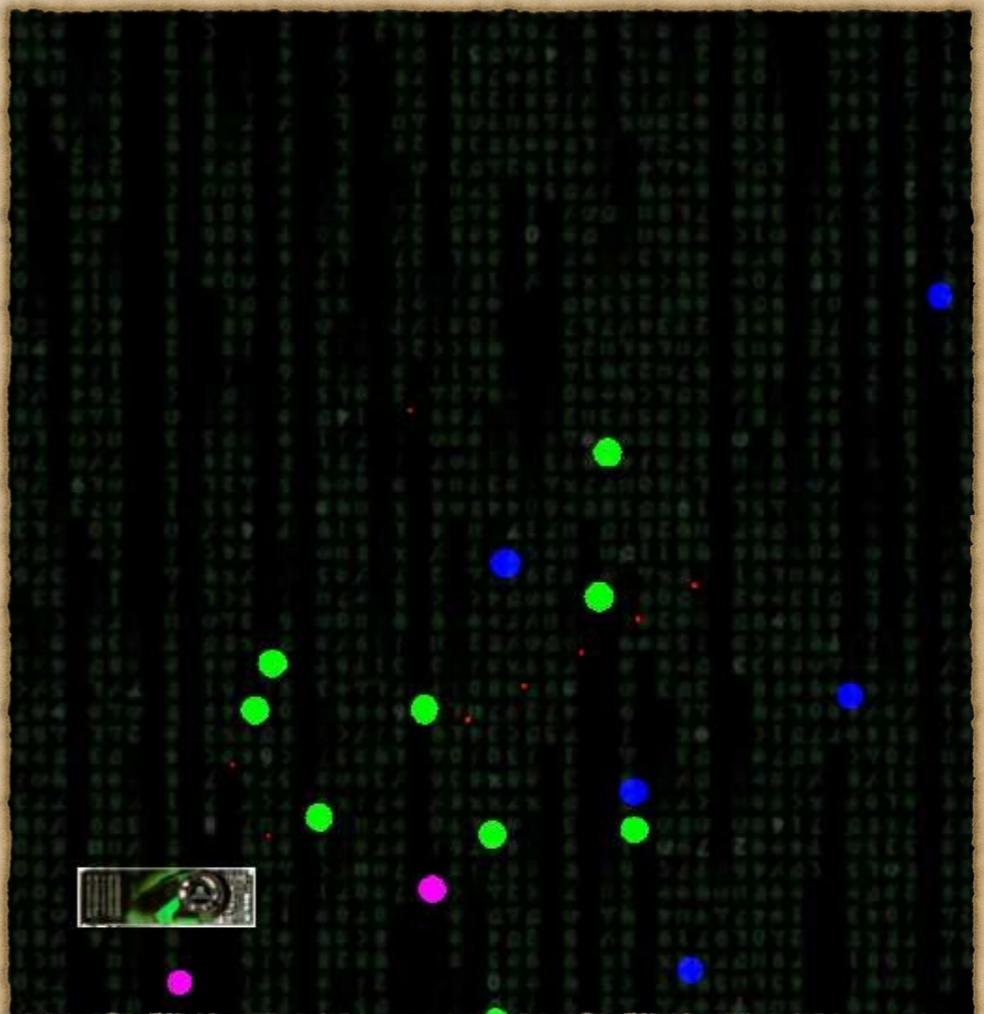
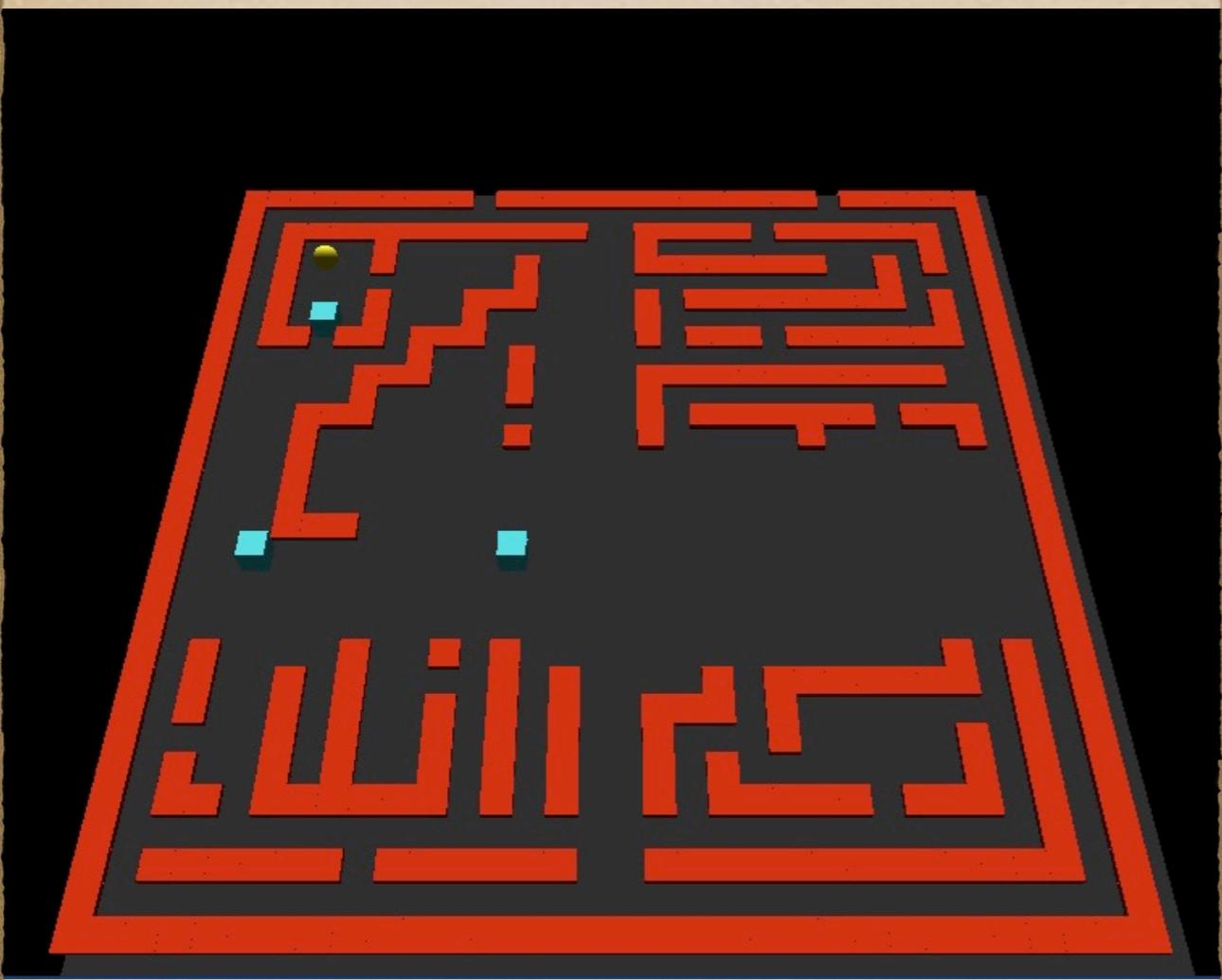


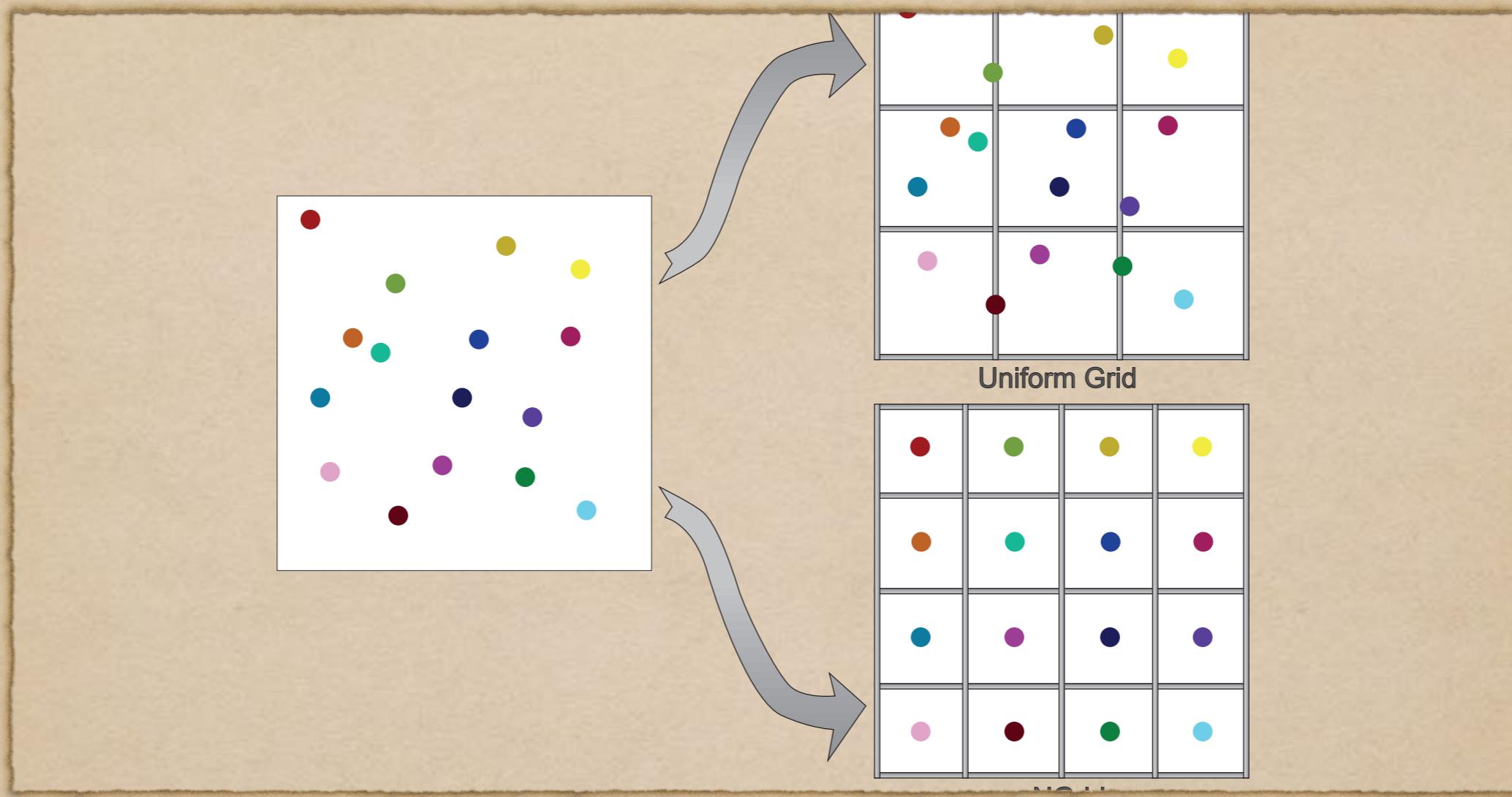
What do I research?

# New Game Architectures

- ◆ How to develop new architectures and framework in games to get the best of the hardware.

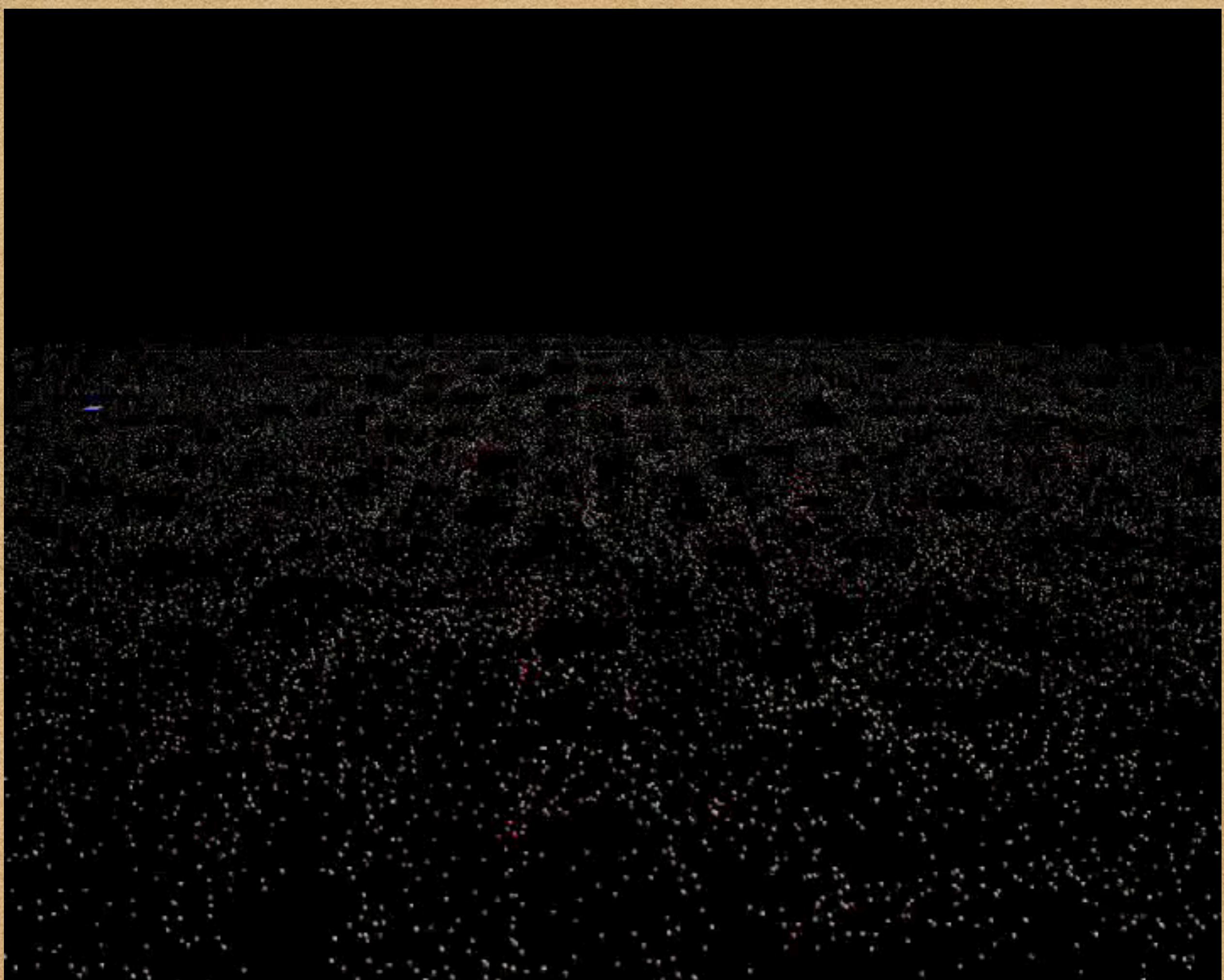






# Data Structures

Created a new Data Structure for games and  
interactive applications.



Points: 202

FPS: 100



# GPU Wars

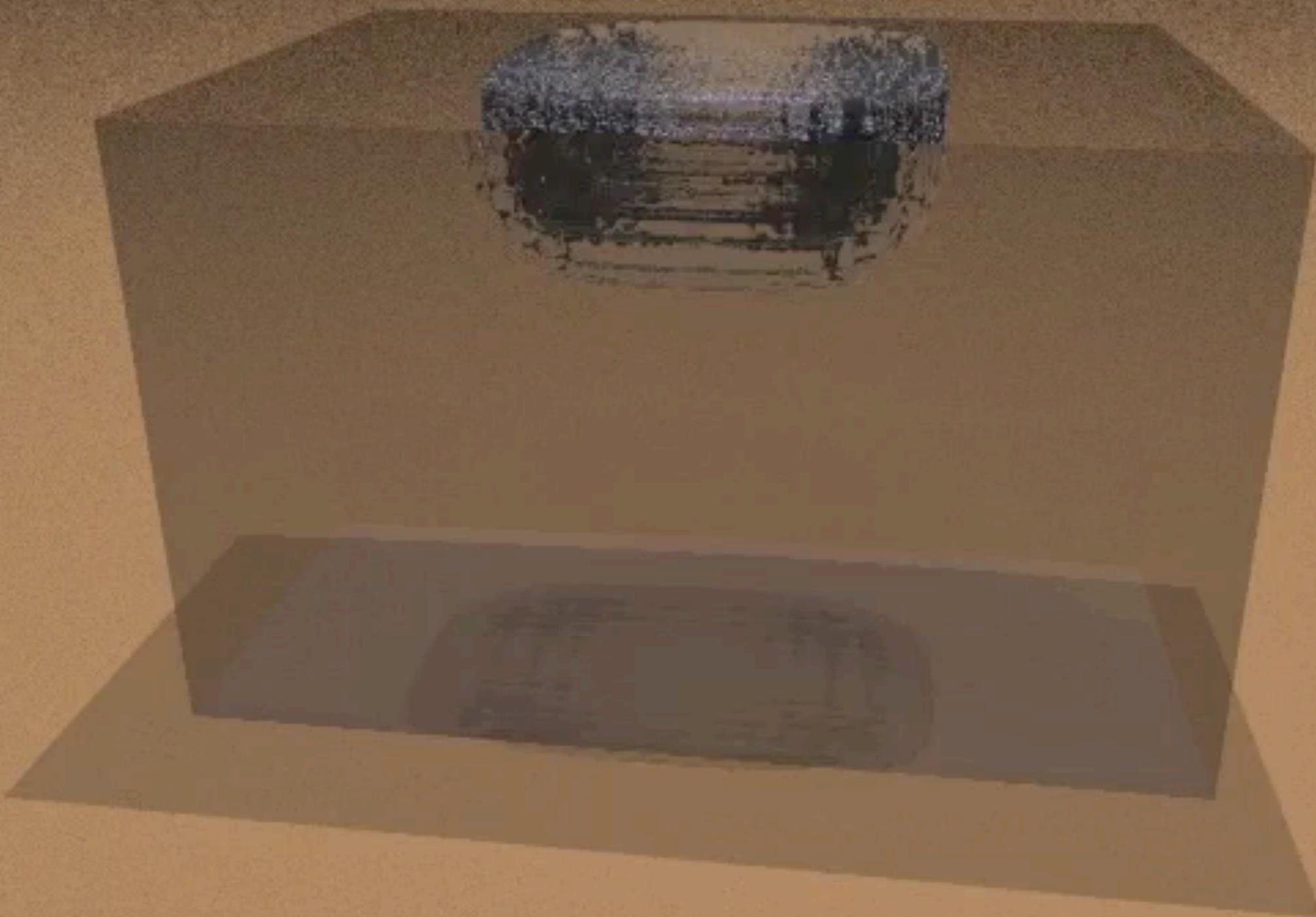


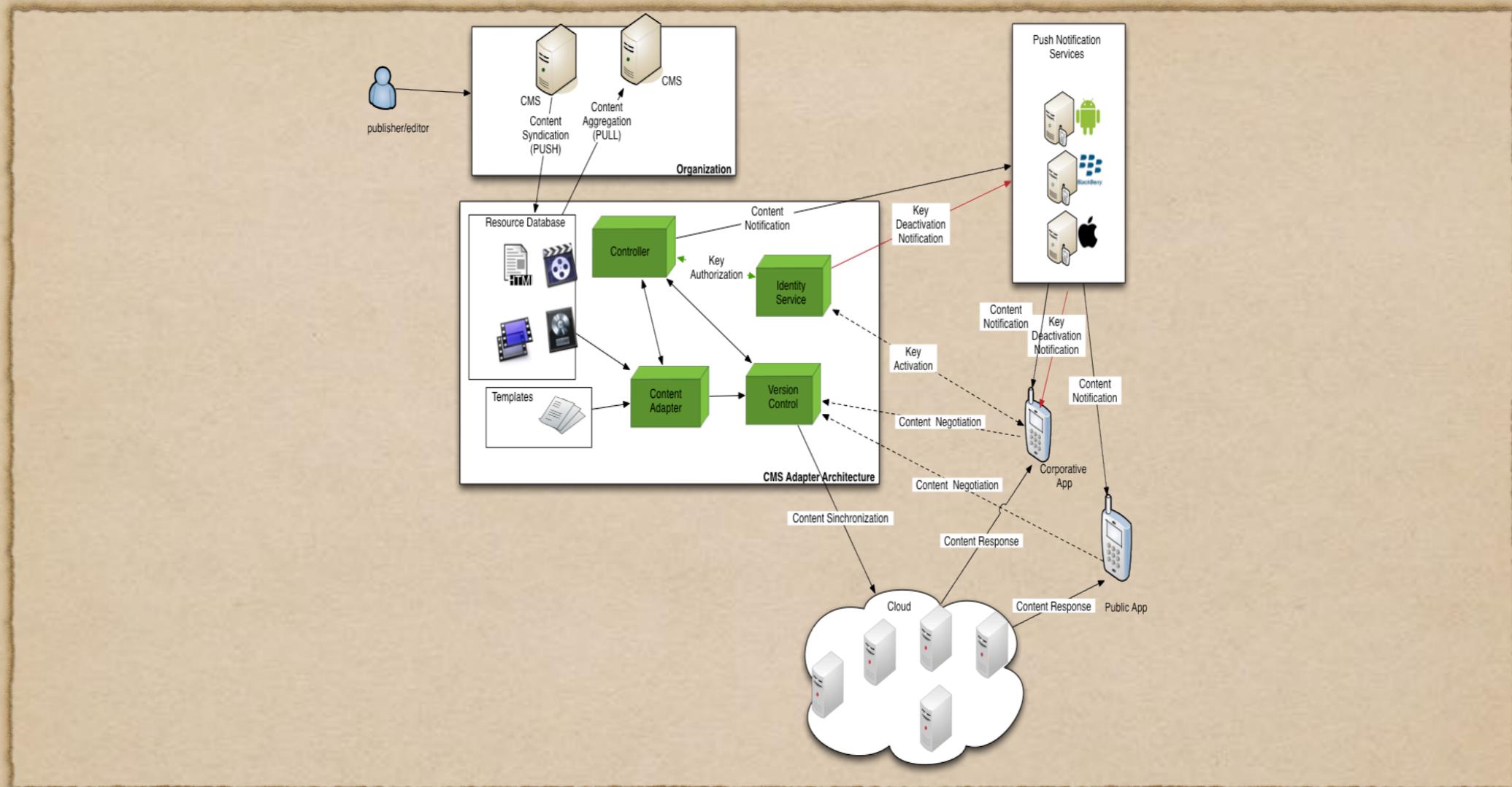


RsBalls

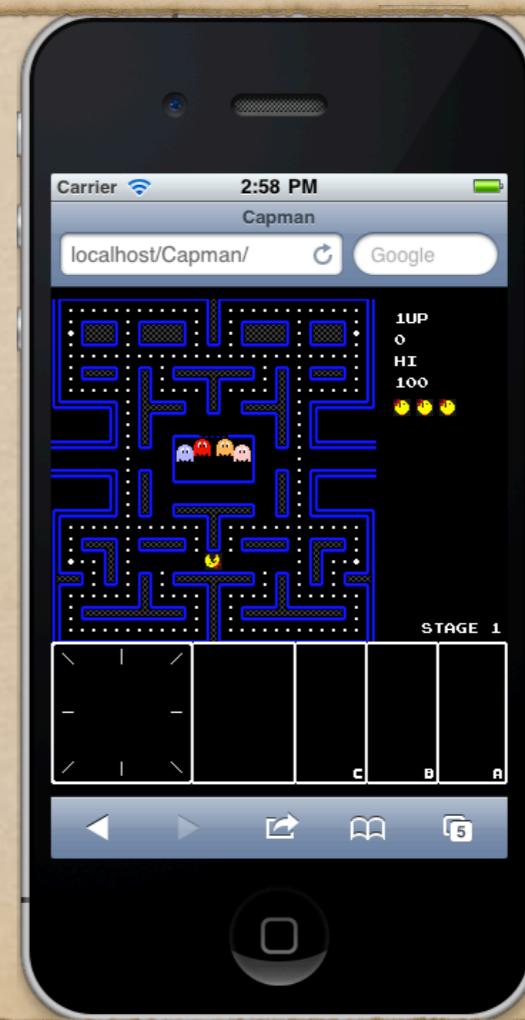
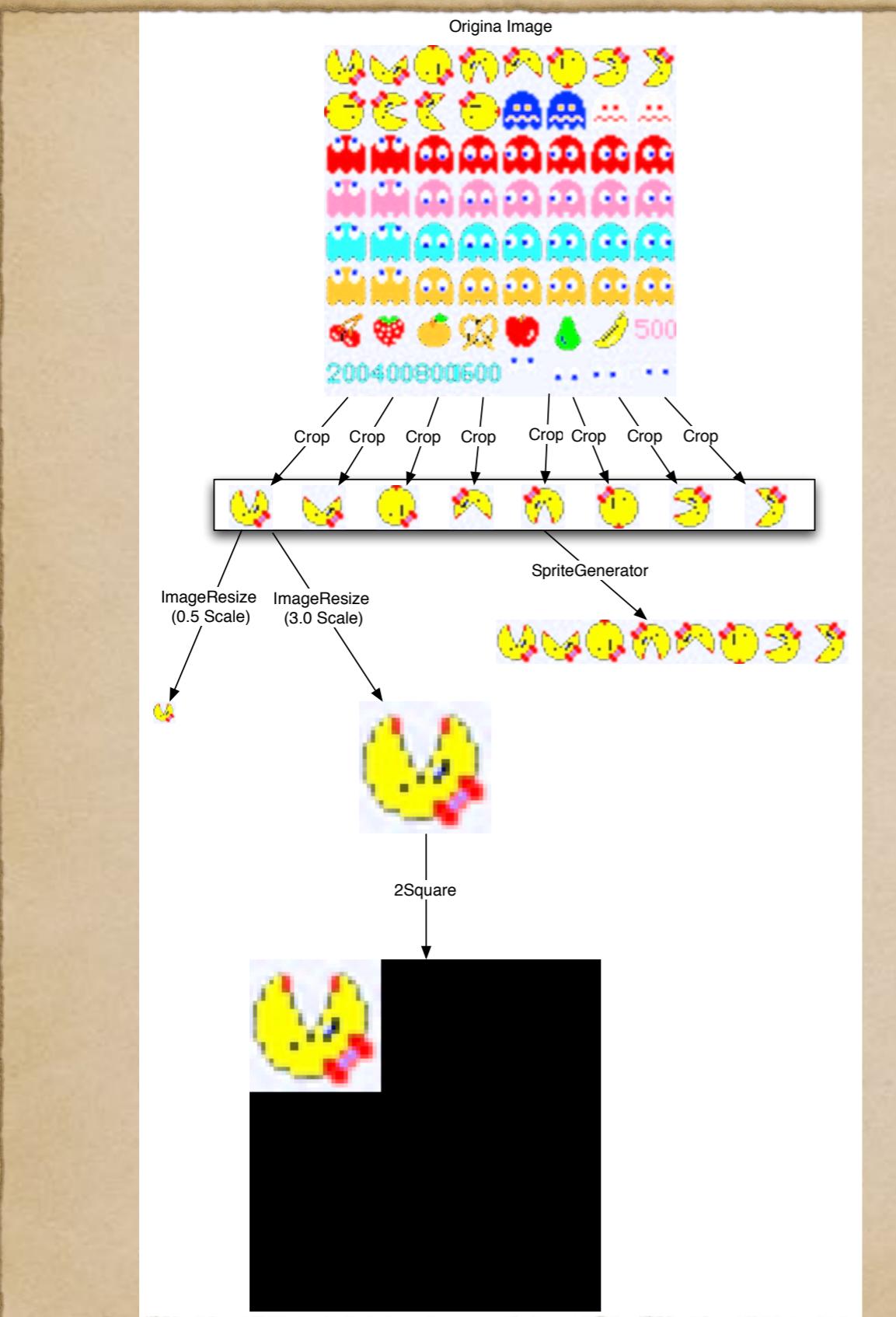
particles1024

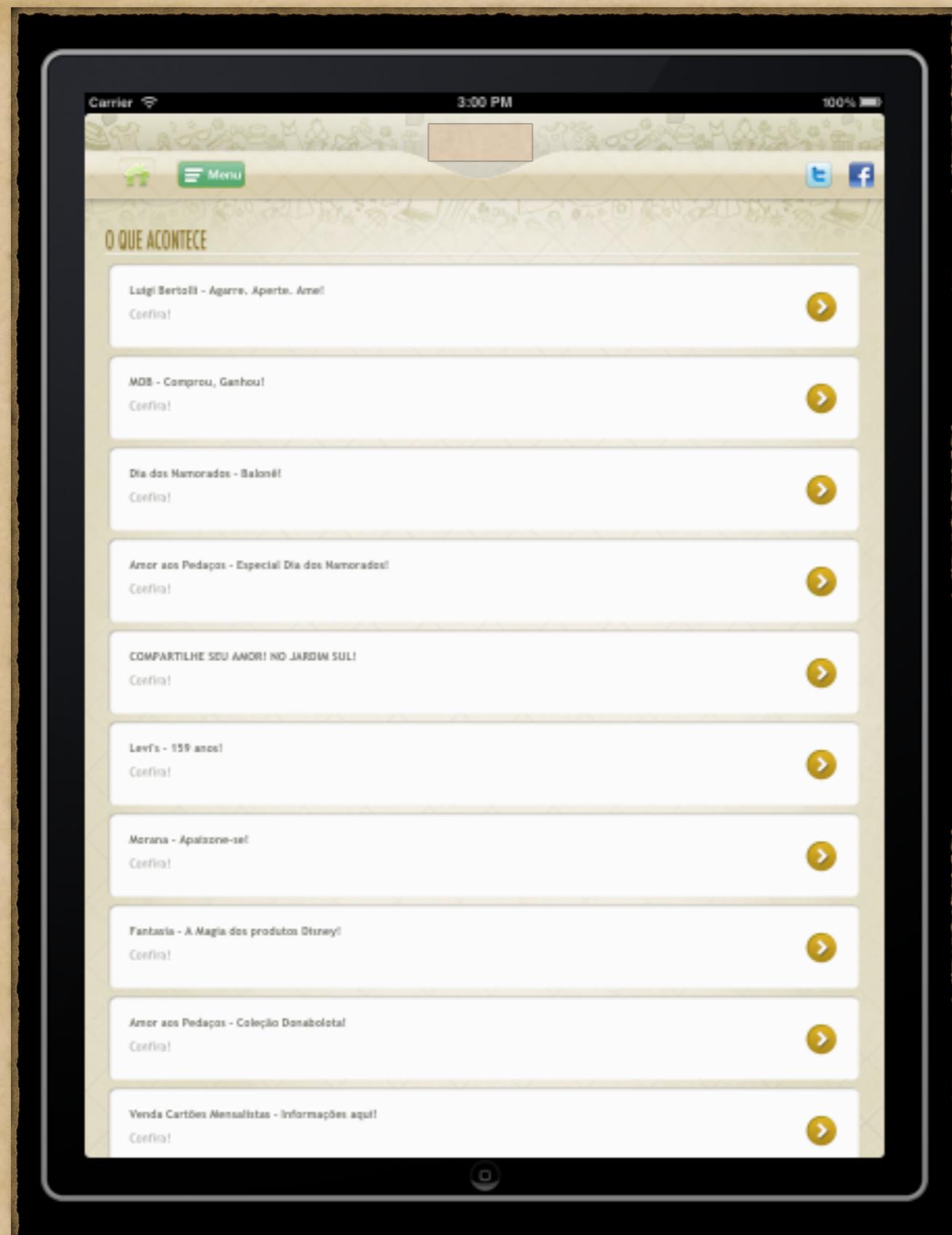


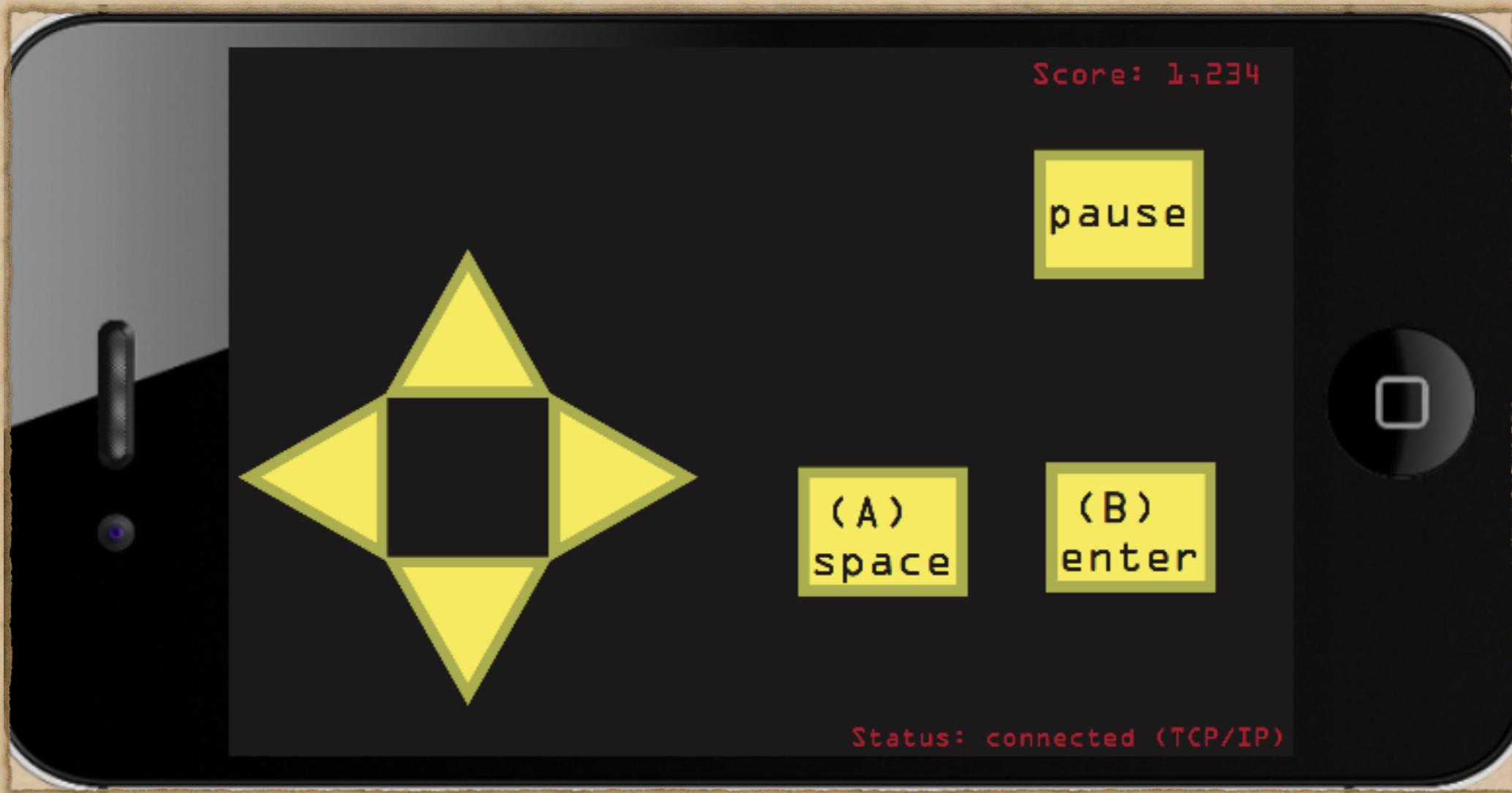




# Cloud Architecture for mobile Resources







# Adapt Control

Have a custom controller that adapts to the user input.

# Neurofeedback games

Use the brainwaves as a input  
for games.



# Jecripe

A game to teach children with  
Down syndrome.





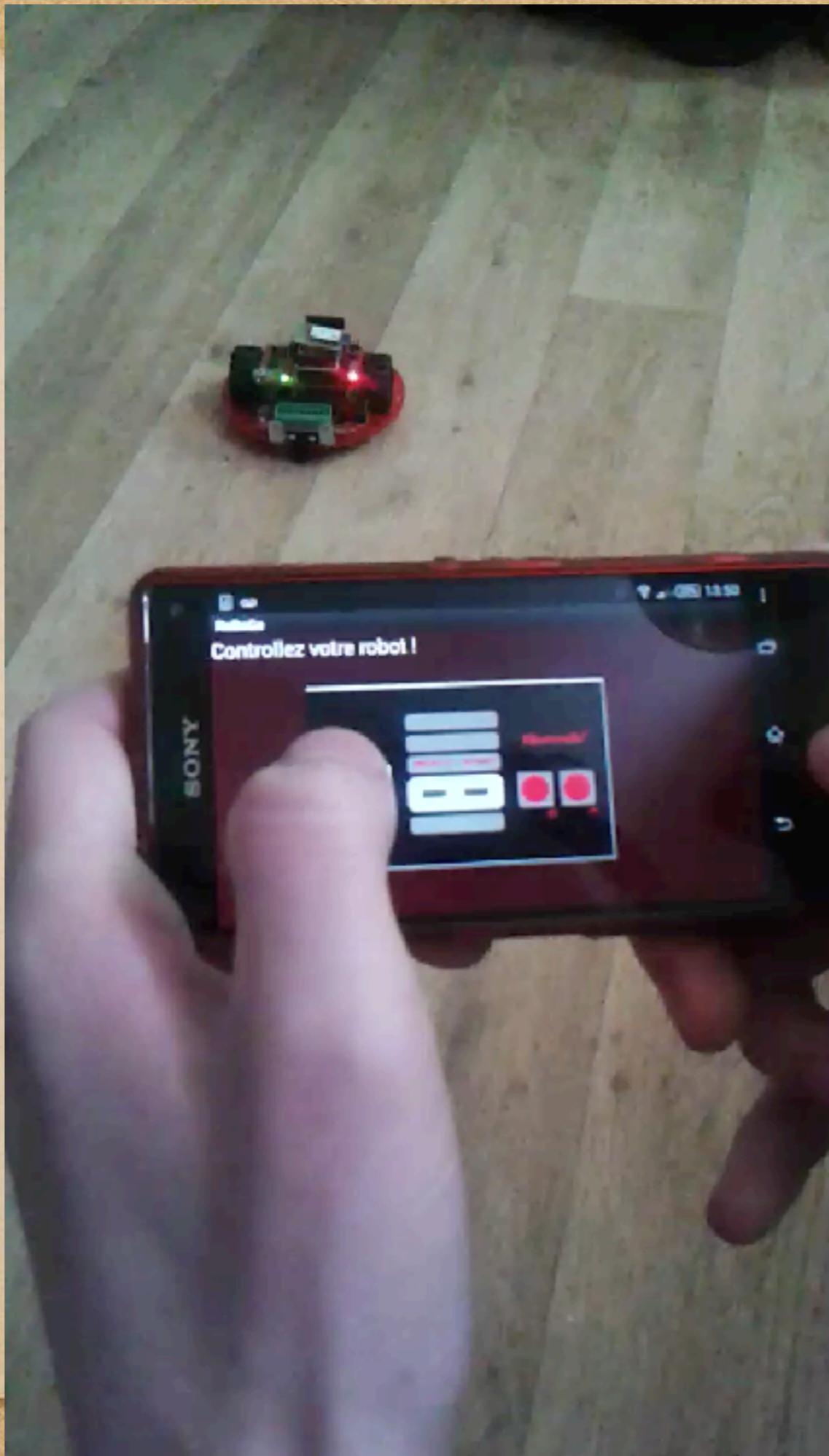
# Carnaval Machine

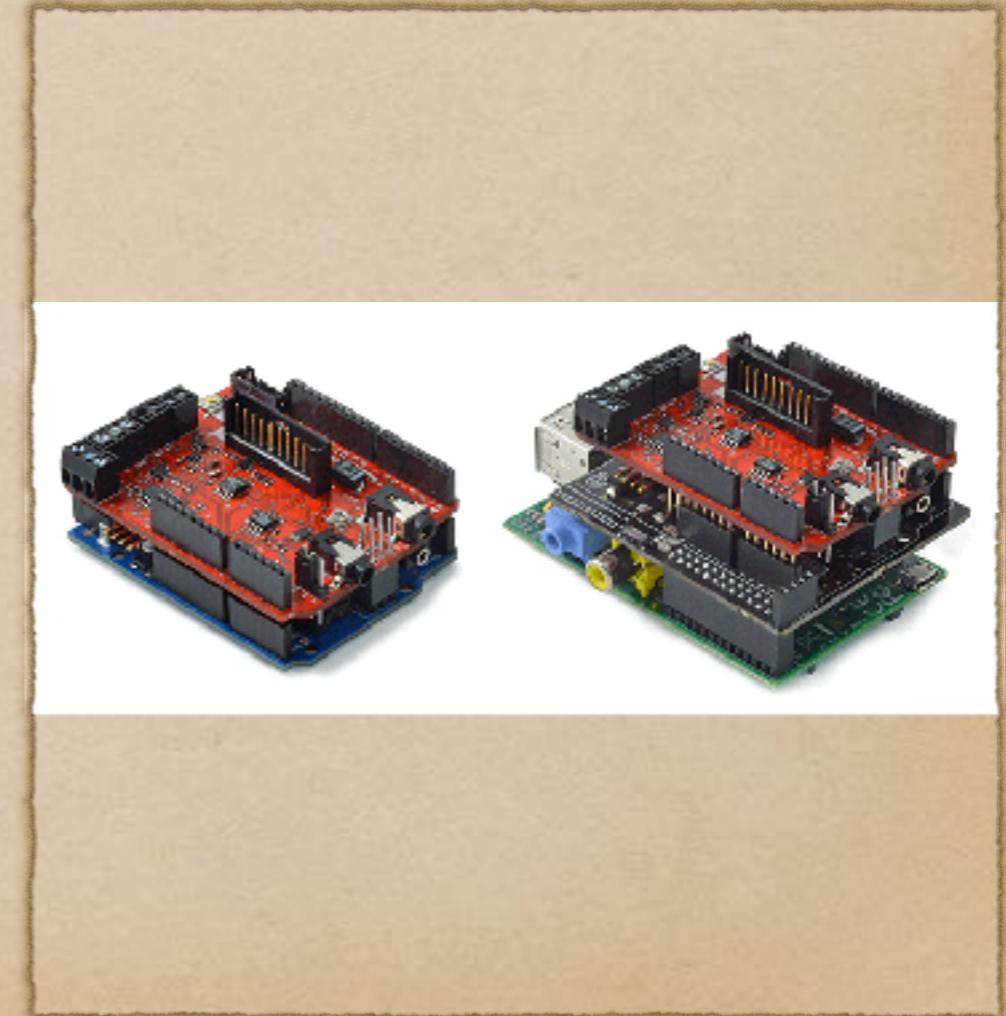
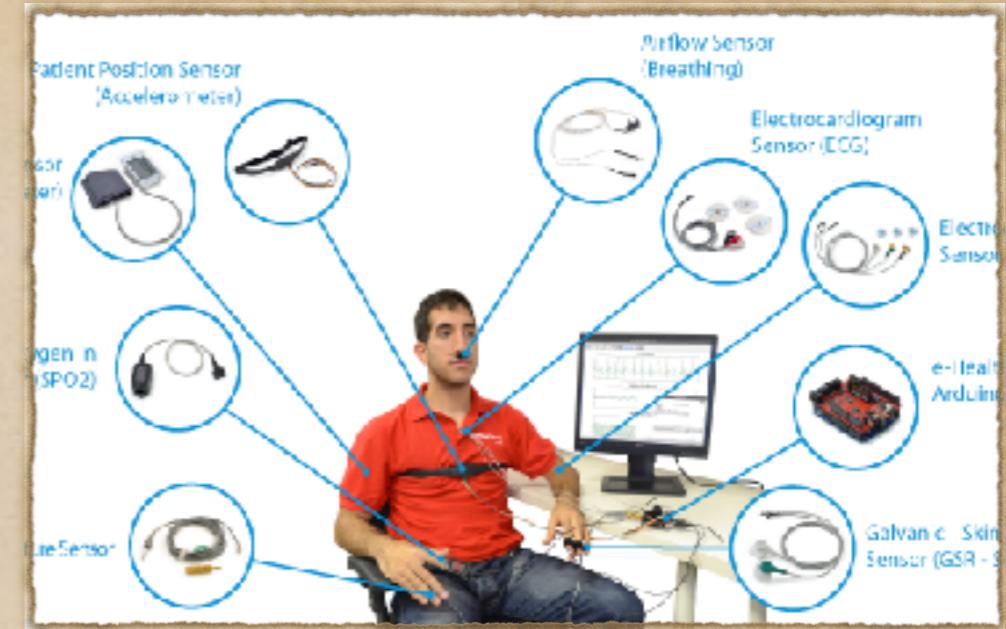
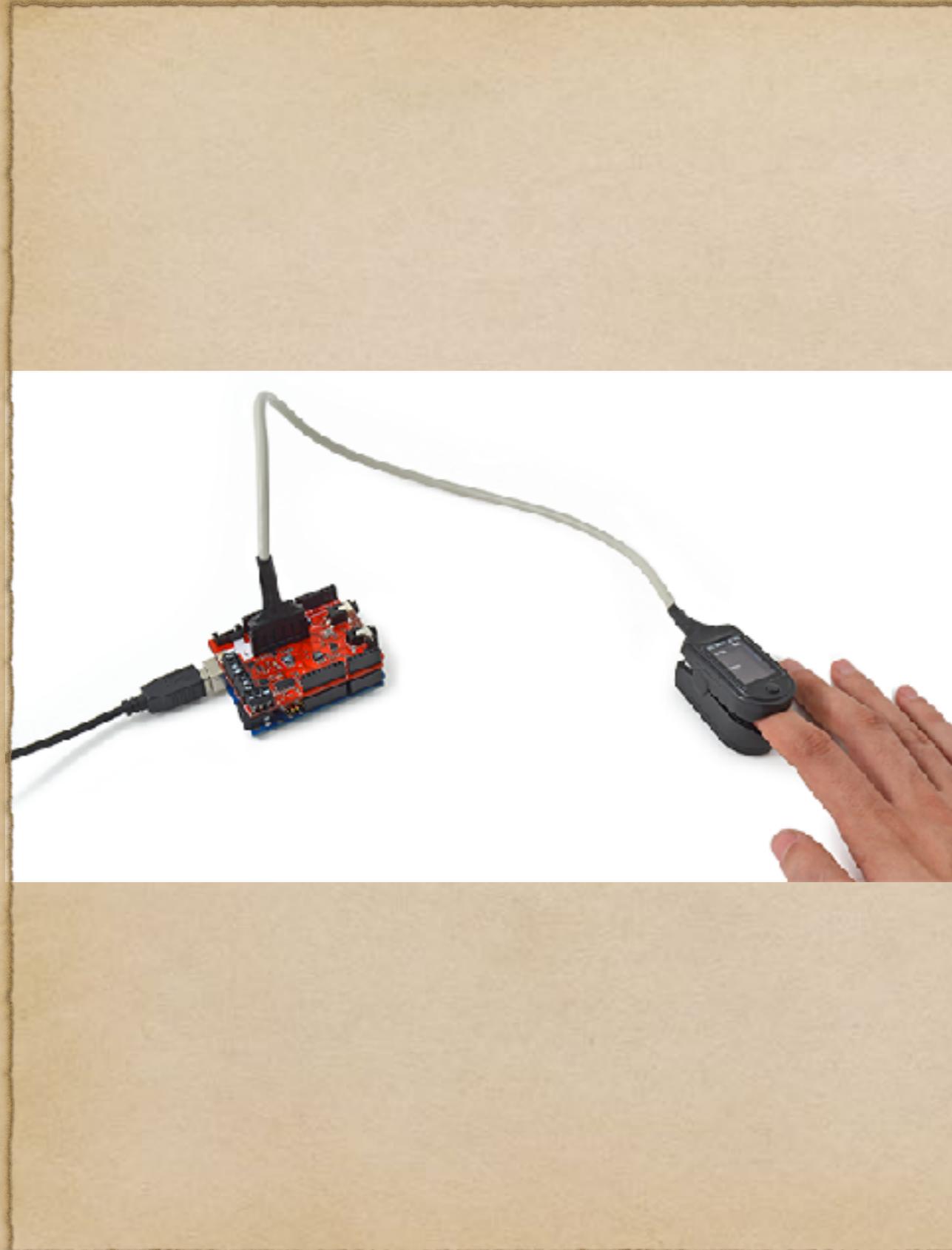
A game to present to the world the culture and world  
of the Carnaval.

What do I teach in  
ESIGELEC?

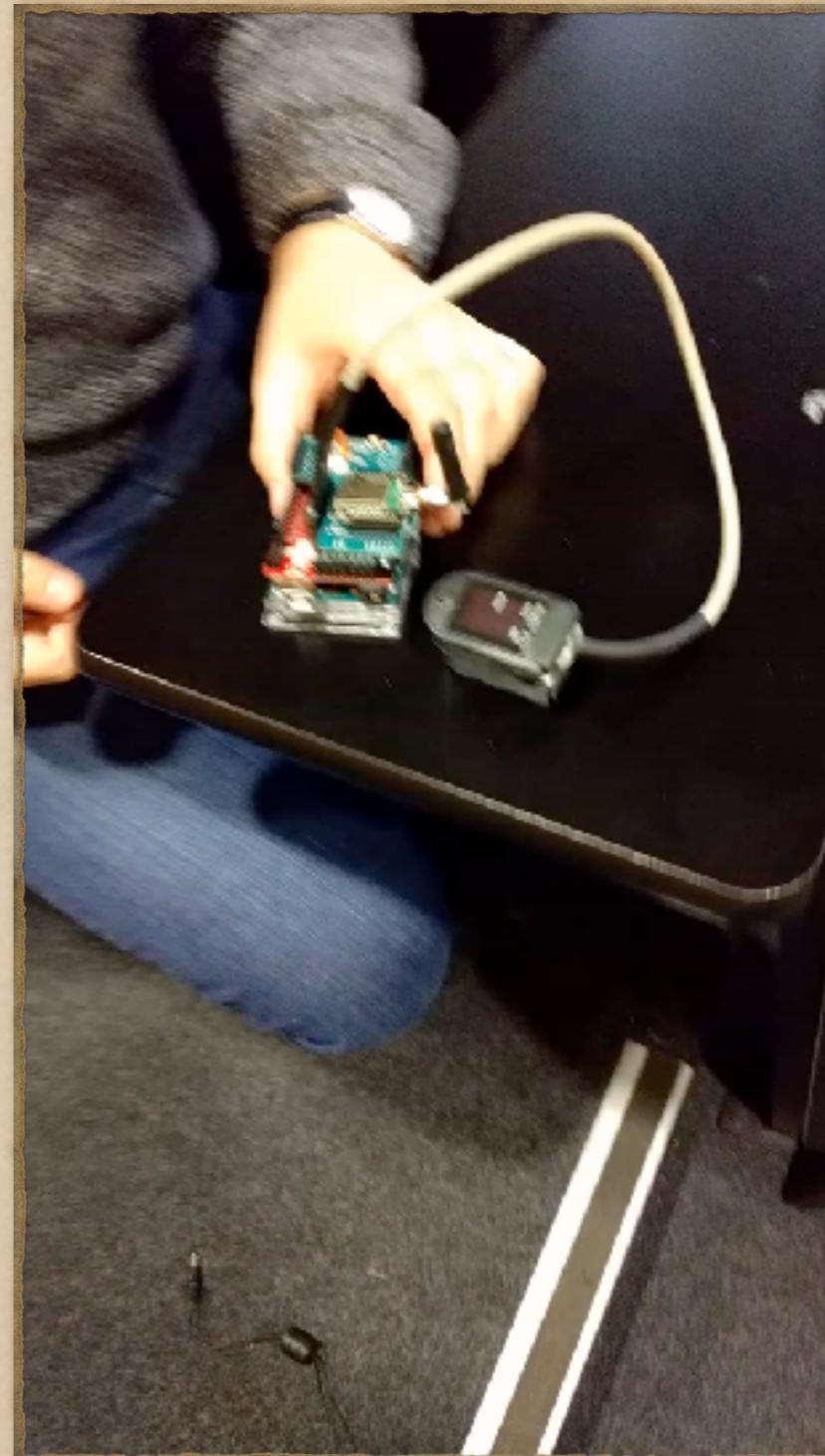
# Android

- ◆ I teach mobile development using Android;
- ◆ The goal is that after the course the student is able to develop Apps;
- ◆ I teach in two courses:
  - ◆ Android and Innovation - where the students build an App to control a robot
  - ◆ Android for Health Care and Well-being - where students build an health App using extra sensors;





# Project with Oximeter



# Schedule

- ◆ 04/12/2023 - 09:00~12:00 - Introduction to Android
- ◆ 04/12/2023 - 14:00~17:00 - Introduction to Kotlin
- ◆ 05/12/2023 - 08:30~12:30 - Hello Android
- ◆ 06/12/2023 - 13:30~17:30 - Intents and Dynamic Binding
- ◆ 08/12/2023 - 08:30~12:30 - RecyclerView + Room + MVC
- ◆ 11/12/2023 - 08:30~12:30 - MVVM
- ◆ 12/12/2023 - 08:30~12:30 - Composer
- ◆ 13/12/2023 - 08:30~12:30 - Presentation of Final project

# Grades

- ◆ One small app with recycler view (20%)
- ◆ One final project App (80%)



# An introduction to Android.

# Introduction to Android

- ◆ “Android is a software stack for mobile devices that includes an operating system, middleware and key applications.”
- ◆ “The Android SDK provides the tools and APIs necessary to begin developing applications on the Android platform using the Java programming language.”
- ◆ Stated goal: “accelerate innovation in mobile and offer consumers a richer, less expensive, and better mobile experience.”



*Our goal is not just a single device. Our vision is a mobile platform that runs on many many different devices.*

– Eric Schmidt

# Visión

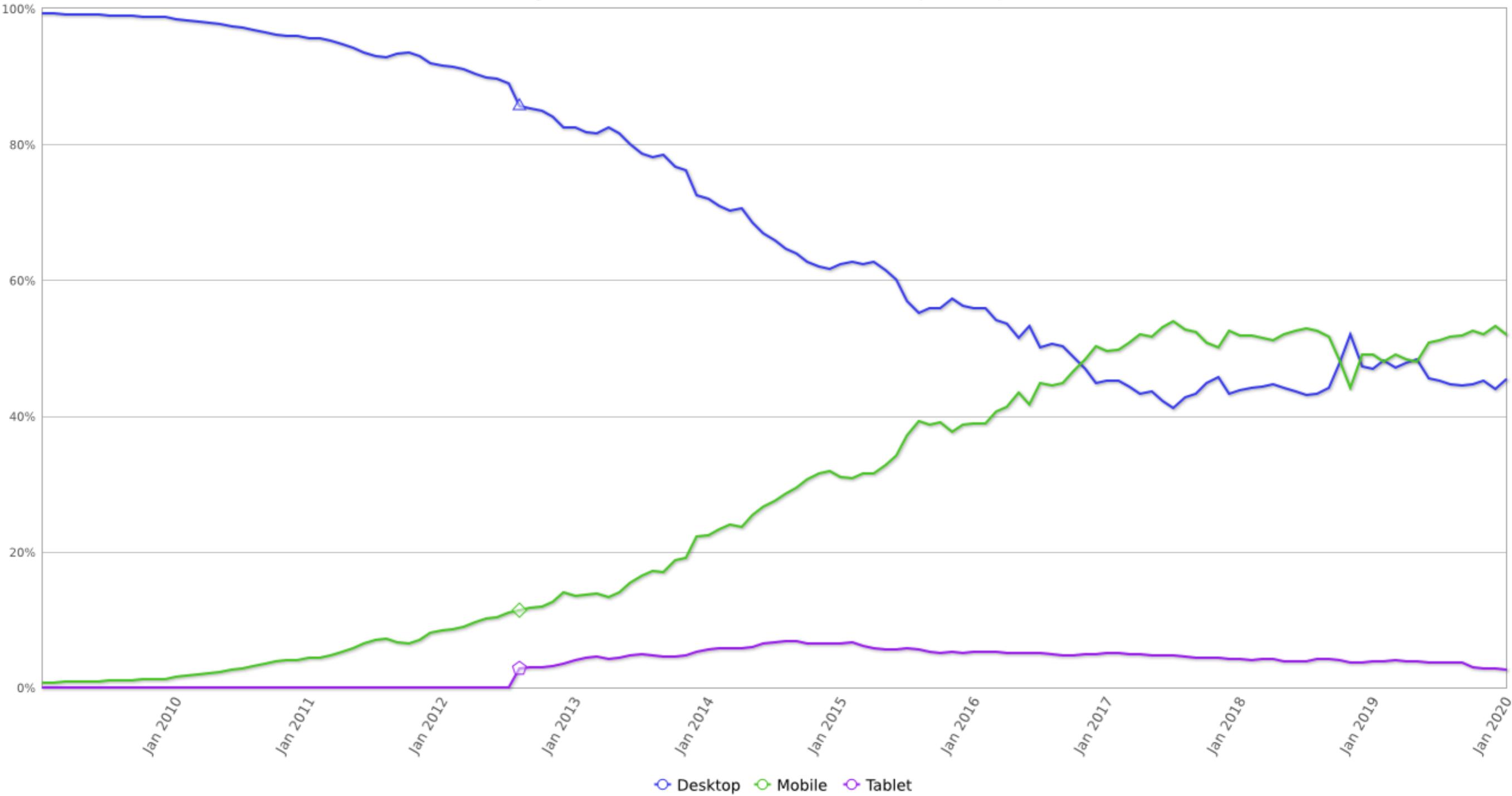
# Android: Pros and Cons

- ◆ Many different Android devices, more being developed all the time;
- ◆ Backed by Google, one of the world's biggest and most powerful IT companies;
- ◆ Google is deliberately “disruptive”;
- ◆ Free development environment for low cost of entry;
- ◆ Free OS for hardware developers;

# Android: Pros and Cons

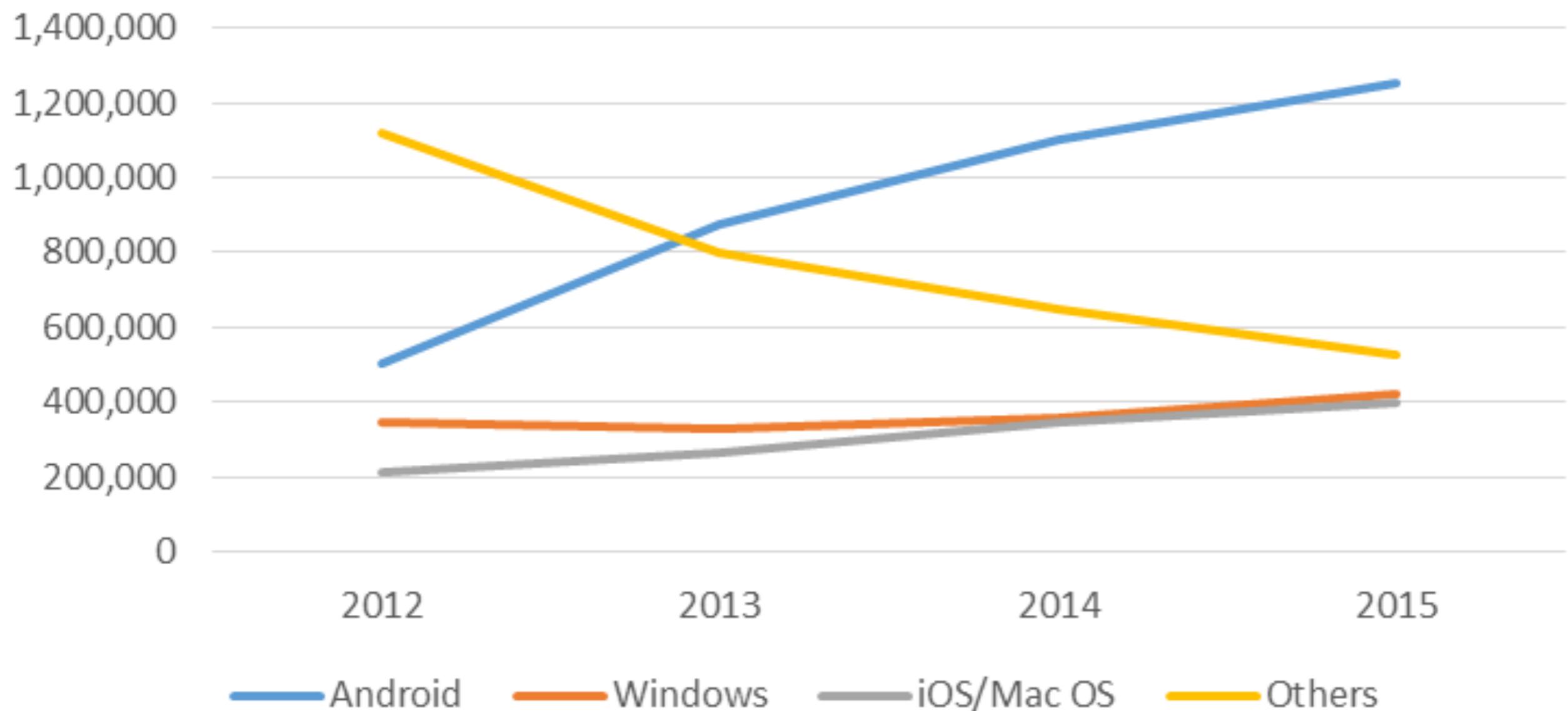
- ◆ Although Android can be used on many types of devices, they are not always supported by Google;
- ◆ Devices must support quite a rich mix of capabilities in order to be certified as Android compatible;
- ◆ Only “compatible” devices have access\* to Google Play (the Android Market);

**StatCounter Global Stats**  
Desktop vs Mobile vs Tablet Market Share Worldwide from Jan 2009 - Jan 2020



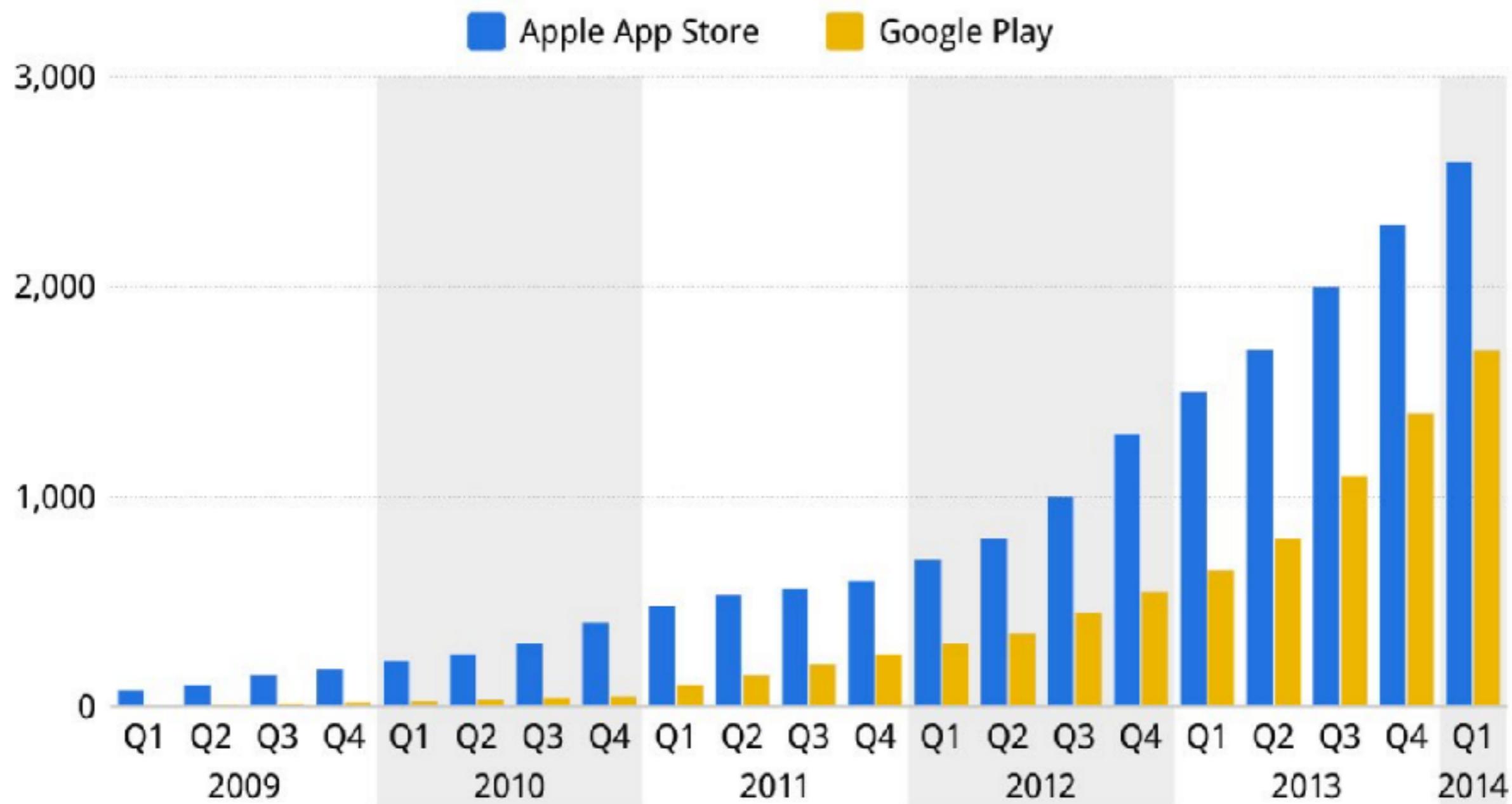
# Android vs. iOS

Worldwide Device Shipments by Operating System (Thousands of Units)



# How Much Apple And Google Pay Out To App Developers

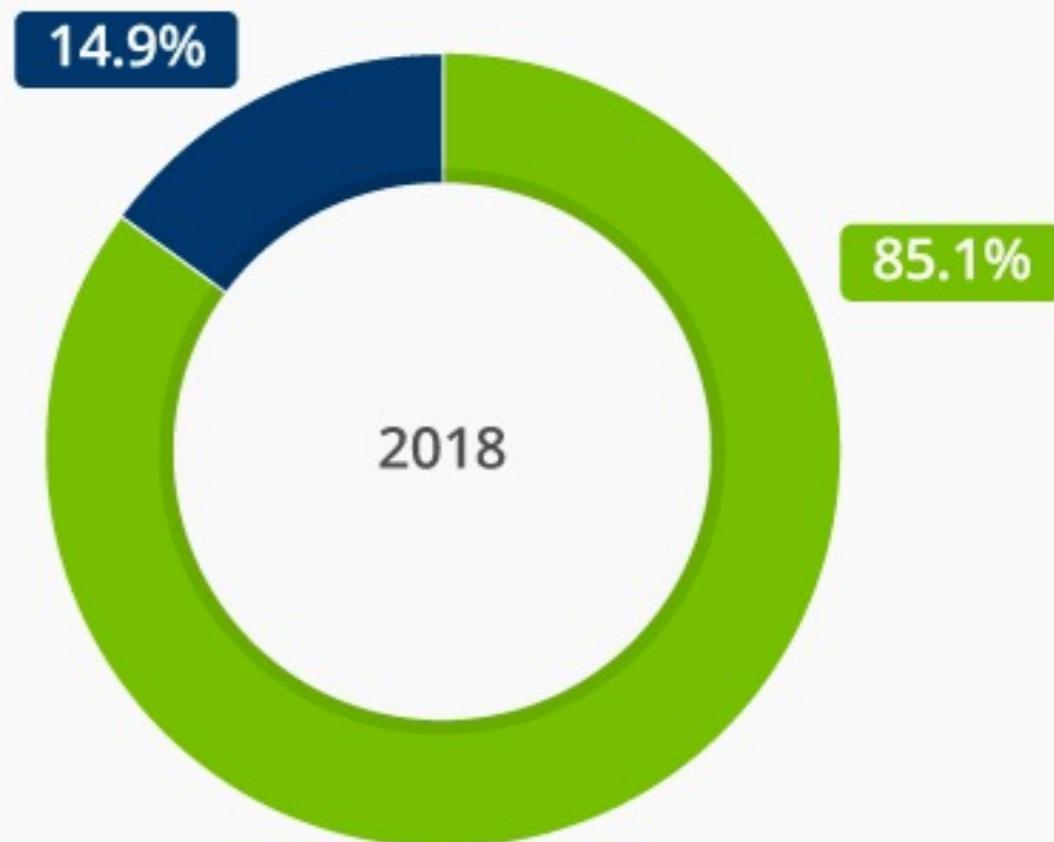
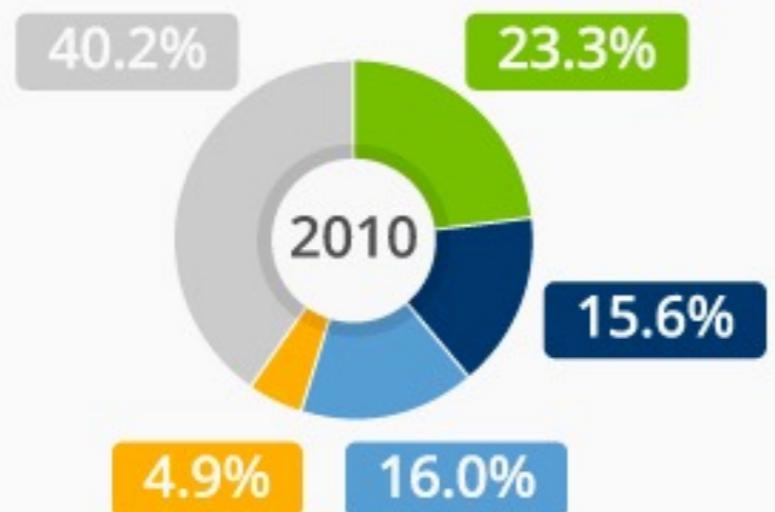
Quarterly payments to app developers made by Apple and Google (in million U.S. dollars)



# The Smartphone Duopoly

Worldwide smartphone market share by operating system (based on unit shipments)

● Android   ● iOS   ● BlackBerry   ● Windows Phone   ● Others



Total sales

305m

1,405m

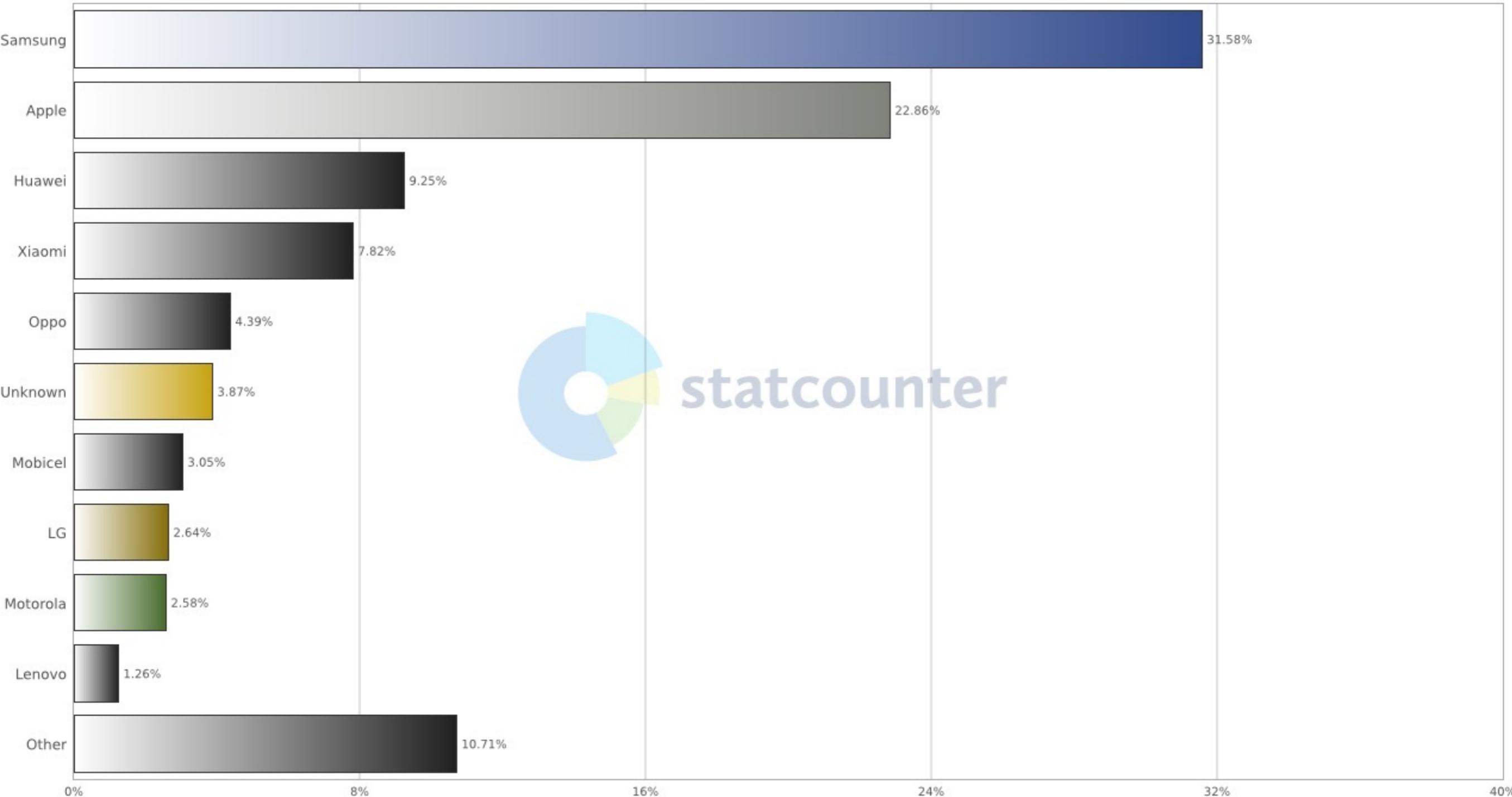


@StatistaCharts

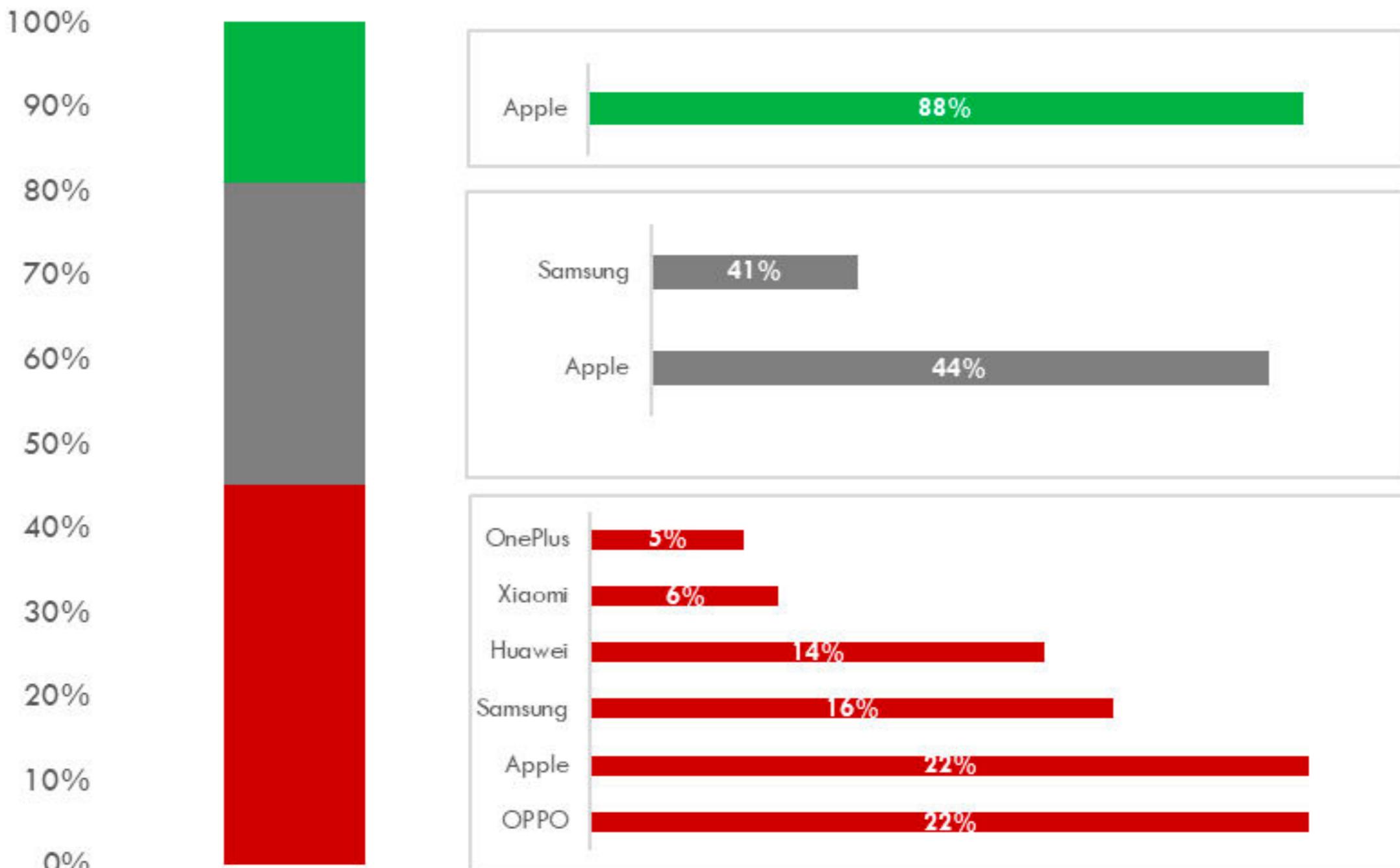
Source: IDC

statista

**StatCounter Global Stats**  
Mobile Vendor Market Share Worldwide from Jan 2019 - Jan 2020

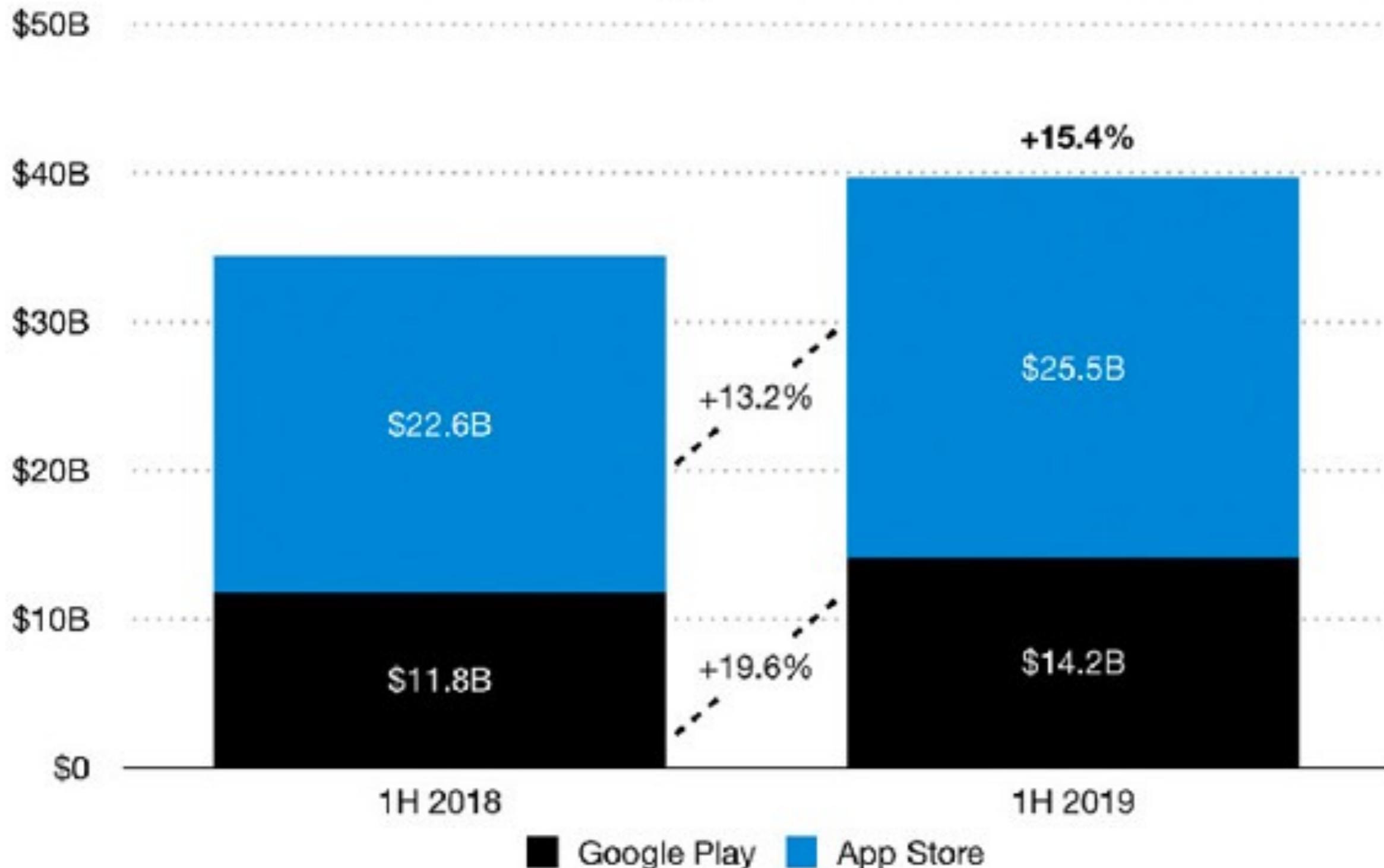


# Premium Smartphone Segment Price Tier Split and OEM Share



■ 400~600 ■ 600~800 ■ >\$800

## Worldwide Gross App Revenue - First Half 2019



SensorTower



SensorTower Data That Drives App Growth

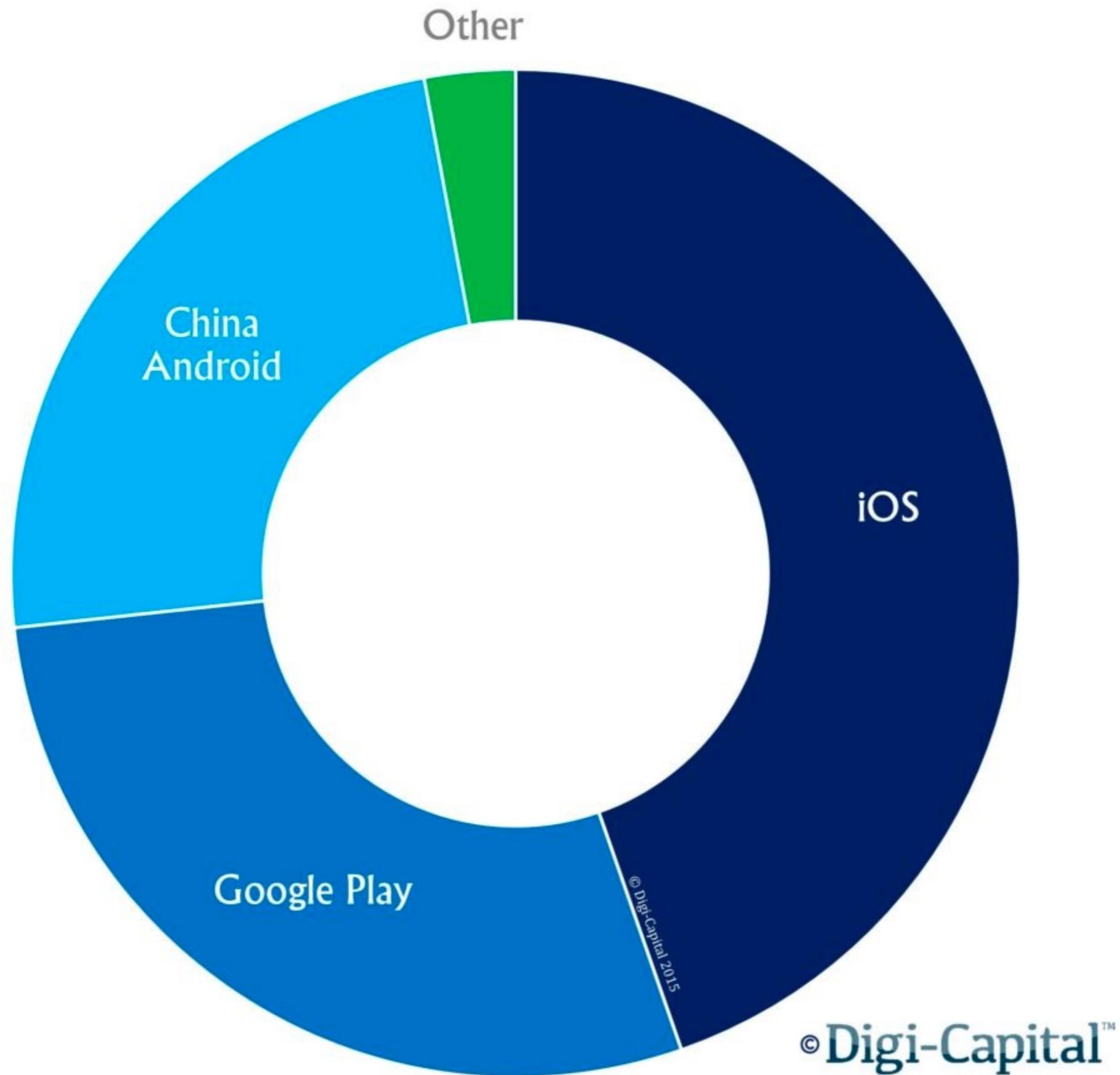
[sensortower.com](https://sensortower.com)

## Worldwide App Downloads and Revenue by Store



Compared to Q1 2016, the downloads gap remained the same, but iOS extended its lead over Google Play in revenue by 10 percentage points.

# Global app stores revenue value share 2014



# Android: Why develop?

- ◆ Google Play Apps is open to all applications
  - ◆ No screening except for illegal or malware content
  - ◆ No controls on applications which compete with Google
  - ◆ Android explicitly allows new components to replace old ones, even at the OS level
- ◆ The downside is that some apps are very poor quality, check user feedback scores
- ◆ But Google is implementing a review process for publication on the store.

# Android: Success

- ◆ Android is tightly regulated by Google at the hardware level
- ◆ But Android is an open system for developers
- ◆ The success of Android has surprised many
- ◆ Much of the success may be down to:
  - ◆ Apple's iPhone, opening a new market sector
  - ◆ Apple and its over-controlling nature
  - ◆ Microsoft's inactivity and ball-dropping
  - ◆ Google's aggressive development



# Fragmentation Remains an Issue in the Android Universe

% of iOS/Android devices running the latest versions of iOS/Android

Released in

Earlier versions  
7%

iOS

iOS 10  
Sep 16  
28%

iOS 11  
Sep 17

65%

Earlier versions  
17%

Lollipop  
Nov 14  
25%

android

Marshmallow  
Oct 15  
28%

Oreo  
Aug 17  
1%

Nougat  
Aug 16

29%

Data collected by the App Store  
on January 18, 2018

Data collected during a 7-day period ending  
on February 5, 2018



@StatistaCharts

Sources: Apple, Google

statista



# Android Garden

# List of Android Versions and Initial Stable Release Dates



**Android 1.0**  
September 23, 2008



**1.5 - Cupcake**  
April 27, 2009



**1.6 - Donut**  
September 15, 2009



**2.0/2.1 - Éclair**  
October 26, 2009



**2.2 - Froyo**  
May 20, 2010



**2.3 - Gingerbread**  
December 6, 2010



**3.0 - Honeycomb**  
February 22, 2011



**4.0 - Ice Cream Sandwich**  
October 18, 2011



**4.1/4.3 - Jelly Bean**  
July 9, 2012



**4.4 - KitKat**  
October 31, 2013



**5.0 - Lollipop**  
November 12, 2014



**6.0 - Marshmallow**  
October 5, 2015



**7.0 - Nougat**  
August 22, 2016



**8.0 - Oreo**  
August 21, 2017



**9.0 - Pie**  
August 6, 2018



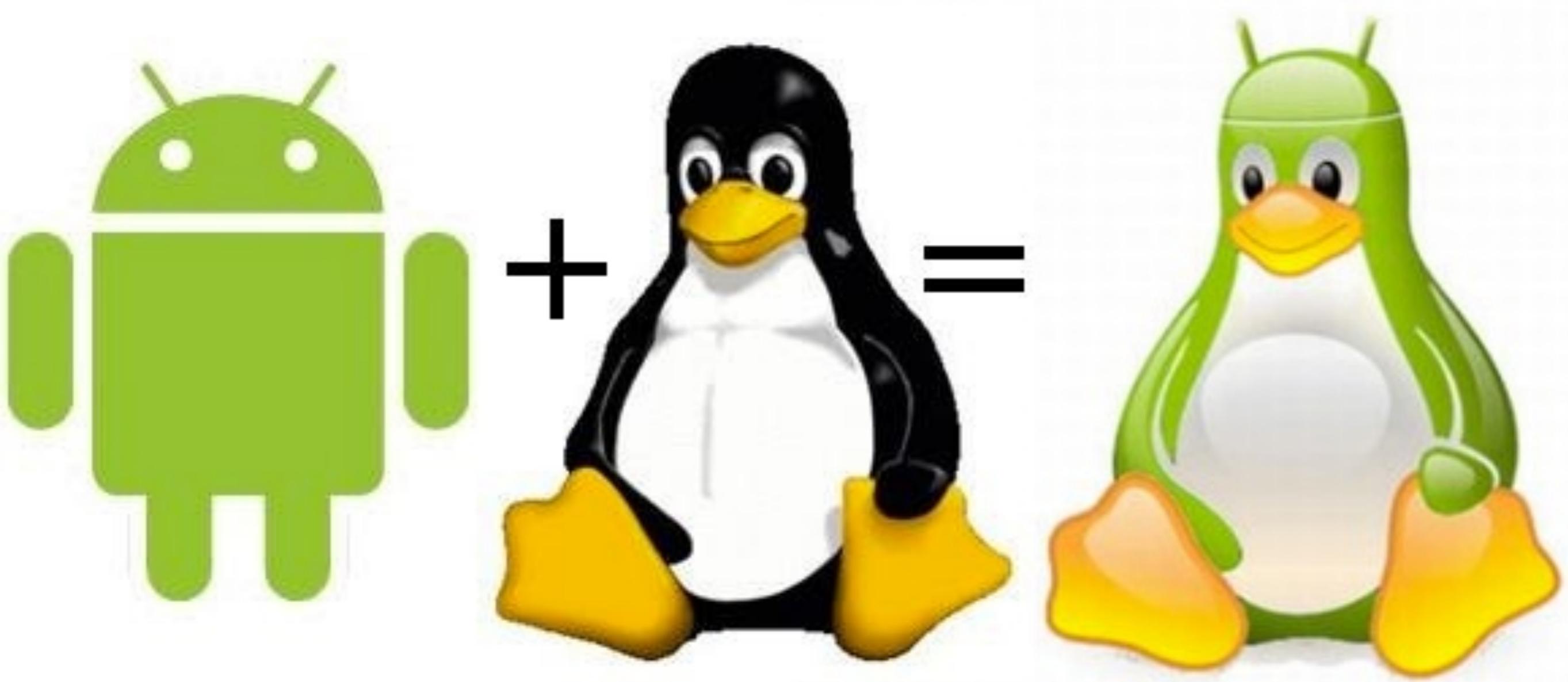
**Android 10**  
September 3, 2019



**Android 11**  
September 8, 2020



**Android 12**  
October 17, 2021

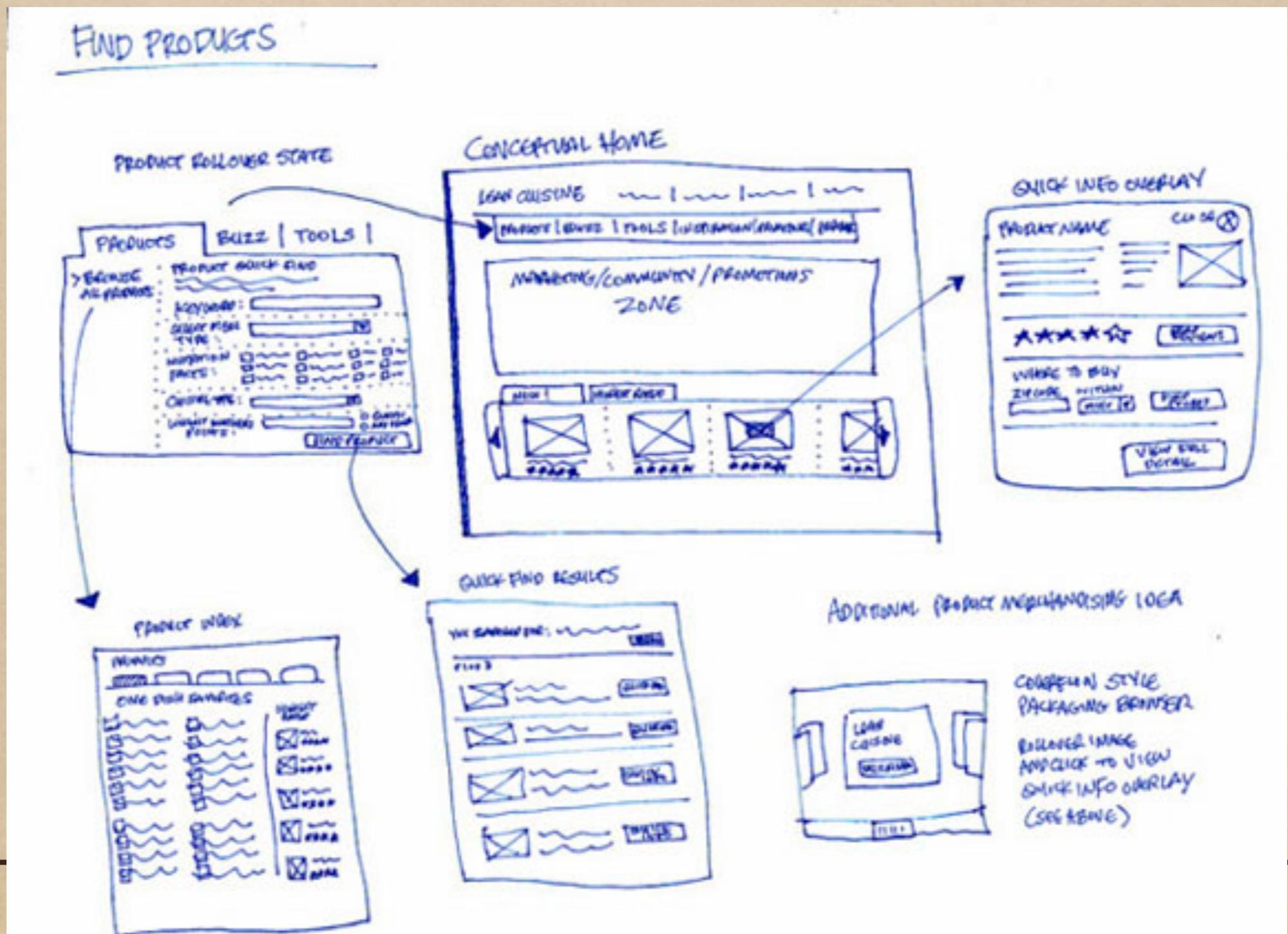


Design

# Prototyping?

- ◆ It is a simplification of the information.
  - ◆ Prototype can mean -> to build
  - ◆ wireframe || mockup || prototype
-

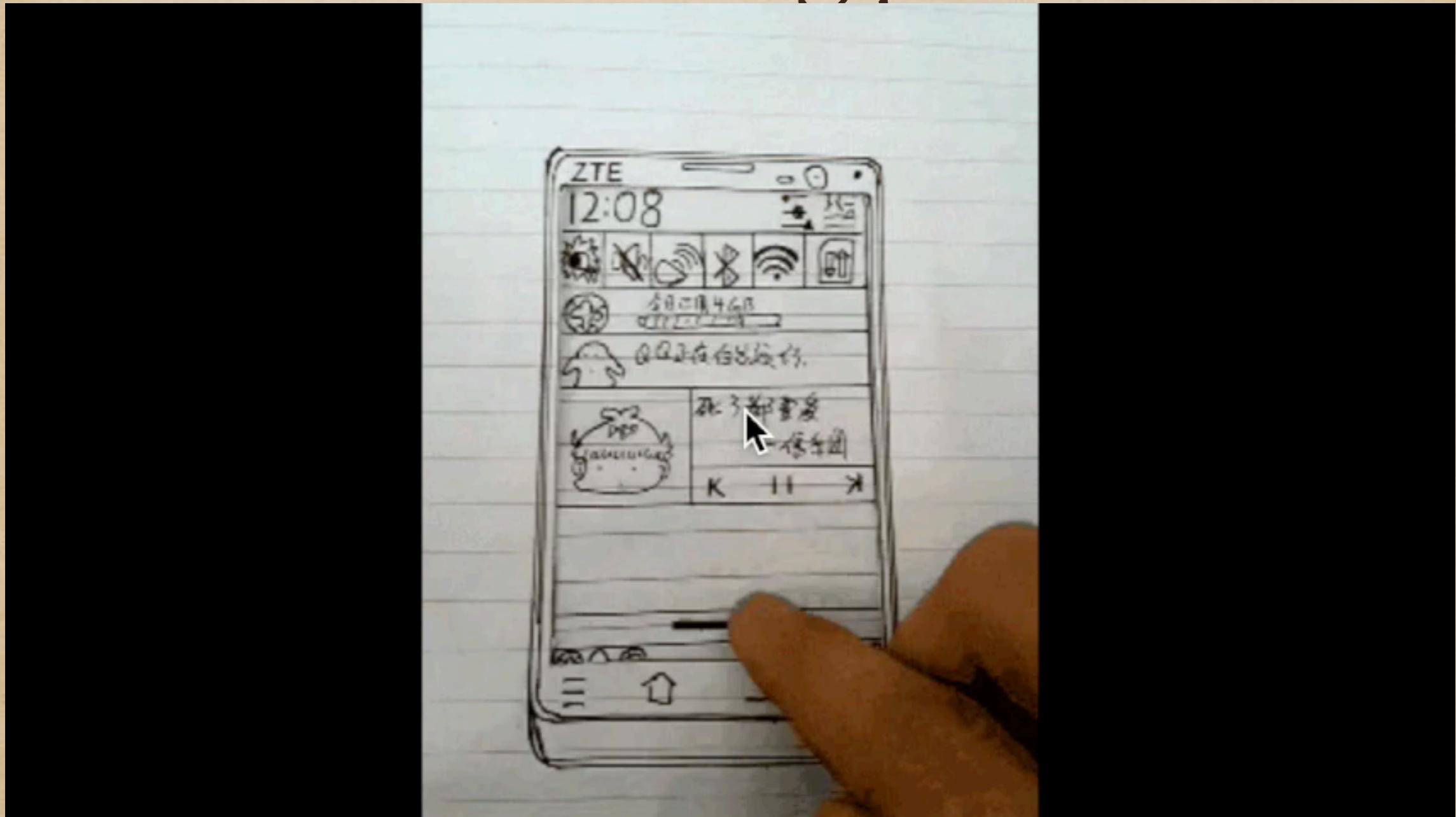
# Wireframe



# Mockup



# Prototype



# Android Architecture

## APPLICATIONS

Home

Contacts

Phone

Browser

...

## APPLICATION FRAMEWORK

Activity Manager

Window Manager

Content Providers

View System

Package Manager

Telephony Manager

Resource Manager

Location Manager

Notification Manager

## LIBRARIES

Surface Manager

Media Framework

SQLite

OpenGL | ES

FreeType

WebKit

SGL

SSL

libc

## ANDROID RUNTIME

Core Libraries

Dalvik Virtual Machine

ART

## LINUX KERNEL

Display Driver

Camera Driver

Flash Memory Driver

Binder (IPC) Driver

Keypad Driver

WiFi Driver

Audio Drivers

Power Management

# The life of an APK

