H79.2580
mobile application design
week 1

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  Setting up your environment, writing your first program ("Hello Mob!"), homework

1. What does **"mobile"** mean?

Mobile

From the Latin *mobilis - "to move"*

"able to move freely or easily"

"able or willing to move freely or easily between occupations, places of residence and social classes"

Device, state of being, industry

Mobile device

Mobile, *wireless or cellular* phone - a portable, handheld communications device connected to a wireless network that allows users to make voice calls, send text messages and run applications.

AKA *keitai*, personal handy phone

WARNING: Jargon & Acronym laden

Multimedia
Computer

Reinvented
Phone

Many devices. Many manufacturers.
Many formats.

Motorola

RIM

Samsung

Kyocera

Palm

Nokia

BenQ

Fujitsu

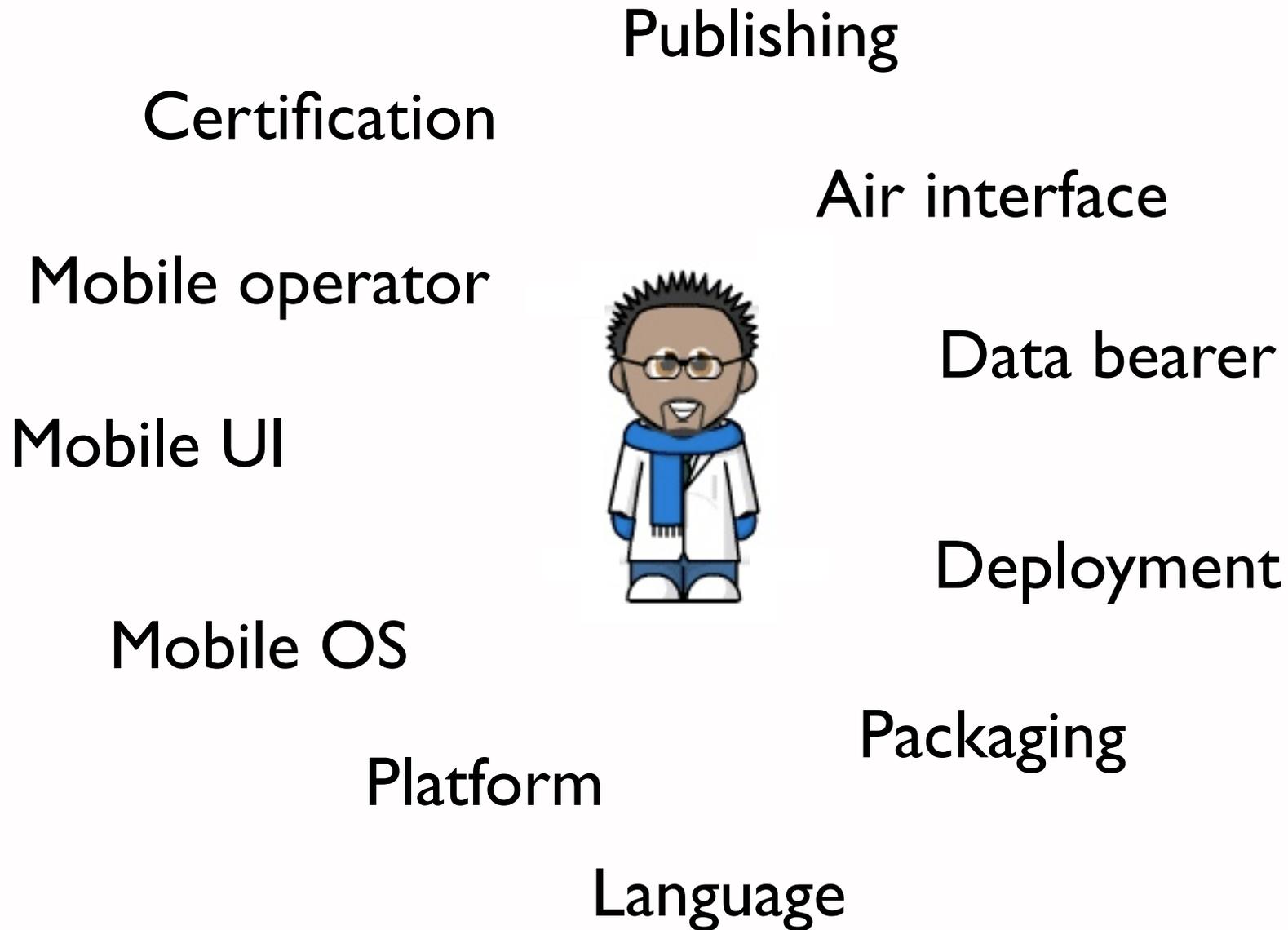**Mobile device manufacturers**

Sanyo

Sharp

LG

SonyEricsson

Apple

	Feature phones	**Smart phones**	**PDAs/ handheld**
Price	$	$$	$$$
OS	Proprietary, Series40	S60, Windows Mobile, Linux, OS X	PalmOS, PocketPC
Applications	Java or BREW	Any	Any

Mobile development ecosystem

Publishing

Certification

Air interface

Mobile operator

Data bearer

Mobile UI

Deployment

Mobile OS

Packaging

Platform

Language
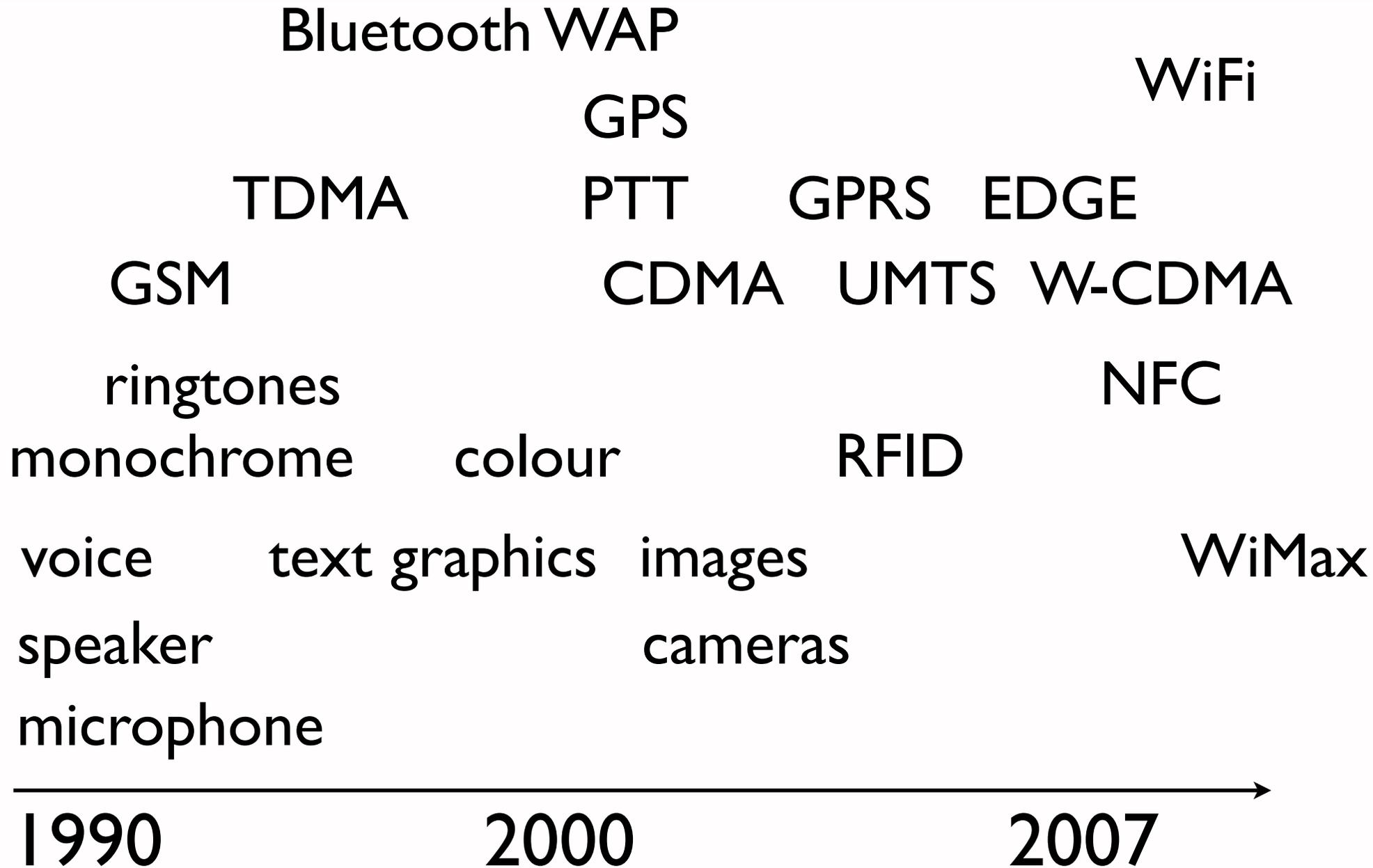
why mobile?

- ⭐ **one handed use**
- ⭐ **limited (input, processing, battery life)**
- ⭐ **rich (sensors, usage)**
- ⭐ **small!**
- ⭐ **truly ubiquitous**

Mobile phone capabilities

Bluetooth WAP

WiFi

GPS

TDMA PTT GPRS EDGE

GSM CDMA UMTS W-CDMA

ringtones NFC

monochrome colour RFID

voice text graphics images WiMax

speaker cameras

microphone

1990 2000 2007

Mobile evolution (briefly)

G - 1/2/3/4 G

G refers to the different generations of mobile devices.

First generation (**1G**) cellphones were analog devices. Second generation (**2G**) devices were digital, and third generation (**3G**) allows for voice, data and advanced services.

0G

1946-1980's

Early mobile phones
- Expensive
- In cars/trucks/briefcases
- Voice only

1G

1980's-now

- First generation cellular networks
- Radio signals = analog
- Technologies - AMPS / DataTac
- First Blackberry (850)
- Voice + Limited data

2G
1990's-now

- Second generation cellular networks
- Digital. Voice + SMS + Circuit switched data
- GSM, iDEN, CDMA, TDMA

2.5G
1990's-now

- Marketing term
- GPRS, HSCSD, WiDEN
- Also EDGE, CDMA2000 1x-RTT

GSM

Global System for Mobile Communications

GSM is the most popular standard for mobile phones worldwide used by 2.2 billion people on over 210 networks.*

US Operators = T-Mobile, Cingular

* according to this http://en.wikipedia.org/wiki/GSM

GPRS

<u>G</u>eneral <u>P</u>acket <u>R</u>adio <u>S</u>ervices

A mobile data service for use on GSM networks.

Part of the 2.5G standards family

iDEN

Integrated Digital Enhanced Network

A second generation (2G) mobile telecommunications standard developed entirely by Motorola.

US Operators = Sprint-Nextel / Boost

CDMA

Code Division Multiple Access

A second generation (2G) standard for mobile phones.

US Operators = Sprint, Verizon

3G

2004-now

- Third generation cellular networks
- Broadband data + voice, streaming video!
- W-CDMA (UMTS, FOMA), 1xEV-DO

4G

the future!

- "high-speed broadband for data- and visual- centric information"
- WiMax / WiBro / iBurst etc
- Transmits data at 100mbps while moving and 1Gbs while standing still

some refreshing statistics

- ⭐ **3.2m** Blackberries
- ⭐ **50m** PDAs
- ⭐ **70m** iPods
- ⭐ **190m** Gameboys
- ⭐ **820m** PCs
- ⭐ **1.5bn** TV sets
- ⭐ **2.5bn** Mobile phones*

2. The State of the Industry

Developing for Mobile
(mainly in the US)

Operators in the US

Service	AT&T	Verizon	Sprint	T-Mobile
Subscribers	63.7m	62.1m	54.0m	26.9m
Technology	GSM	CDMA	CDMA/iDEN	GSM
Platforms	J2ME	BREW	J2ME	J2ME
Openness	Open	Semi-Walled	Open	Semi-Walled
Network	2.5G/3G	2.5G/3G	2.5G/3G	2.5G/3G
Location	TDOA (no access)	A-GPS	A-GPS	TDOA (no access)

Sprint (Nextel + Boost), T-Mobile & Cingular* support J2ME

* 3 out of the 4 largest carriers
(but who's counting anyway?)

3. Mobile Development Options

Mobile Development in 2007
is kinda like the web in 1997

Anybody remember <blink> ? <marquee>?

This is worse

1997	2007
Netscape vs Microsoft	Symbian vs Flash Lite vs Java ME vs Python vs BREW vs .NET vs WAP vs Palm
Proprietary features vs standards <blink> vs <marquee>	Platform features / standards OEM APIs (Java)
Free environment	$$ environment (contracts)
Free development tools	Mostly free development tools (except for BREW)
Clear development / deployment process	Convoluted development & painful deployment process

Client side apps	Server side apps
Symbian vs Flash Lite vs Java ME vs Python vs BREW vs .NET vs Palm	Display: WAP, XHTML MP / WML PHP, Perl, Python, Ruby, Java
Low level control over interface, access to native hardware,	Less control over interface
Free development tools (except BREW)	Free development tools
Extensive deployment process, testing difficult	Rapid development process, slow testing.

Java ME / J2ME

Java ME (formerly known as Java 2 Platform, Micro Edition or J2ME), is a **collection** of Java APIs for developing software on resource constrained devices such as PDAs, cell phones and other consumer appliances.

Flash Lite

Flash Lite is a development platform created by Macromedia, based on their hugely successful Flash web application platform.

v1.1 - most widely deployed, limited

v2.x - improved experience, language

Symbian

Operating system based on original PDAs from Psion. Largest installed base. Multiple versions customized for different manufacturers. Language = C++

UIQ - SonyEricsson
Series 60 - Nokia
MOAP - NTT Docomo FOMA

Python for Series 60

Open source scripting language ported by Nokia

Only on Series 60 smartphones

Python wrappers around low-level APIs, easy access to native OS features

BREW

Binary **R**untime **E**nvironment **W**ireless

Proprietary mobile device platform developed by Qualcomm.Development language is C with C++ interfaces. Certification and development process is expensive.

WAP

Wireless **A**pplication **P**rotocol

Originally used to describe lightweight protocol which used **W**ireless **M**arkup **L**anguage (WML).

Currently used to refer to Mobile Web, which uses XHTML MP/Basic + CSS.

Platform	Overview
Java ME	Second best reach, best overall development
Flash Lite	Good for graphics-heavy applications in supported markets
Symbian	Strong support from Nokia, best access to hardware
.NET	PocketPC + Windows Mobile Devices
BREW	The only option for CDMA networks
Python	Great for quick prototypes, still immature
WAP	Largest overall reach, lightweight functionality

Platform	Language	X-Platform	Learning Curve	Emulator	Availability
Java ME	Java	Average	Average	Free	~1.5bn
Flash Lite	AS	Excellent	Average	With IDE	77-115m
Symbian	C++	Average	STEEP!	Free	120m
.NET	C#, C++, VB.NET	WM	STEEP!	IDE	4.5m
BREW	C++	CDMA only	STEEP!	Simulator	????
Python	Python	Nokia-only	Gentle	Add-on	120m
WAP / Mobile Web	XHTML, WML	FREE	Gentle	Free	2bn+

Platform	GUI	Functionality	Phone Data Access	Developer Community
Java ME	2D/3D, Many widgets, Visual Form Builder	Varies by handset, no CellID, high res pics	Varies by handset, Optional APIs	Extensive
Flash Lite	2D/3D, Many widgets, Visual IDE	Partial through API	None	Extensive
Symbian	2D/3D, Many widgets, Visual Form Builder	No restriction	Simulator	Extensive
.NET	2D/3D, Many widgets, Visual Form Builder	Limited audio	Full	MSDN
BREW	2D/3D, Many widgets, uiOne	Operator dependent	Full	Limited
Python	2D Graphics, some widgets	Partial through API	Partial	Small, but growing
WAP / Mobile Web	Basic forms. Inconsistencies	Limited to browser	None	Extensive

Java ME (J2ME)

Java

- Object oriented, statically typed programming language

- Platform independent - programs are easily portable between multiple operating systems

- Programs run in Virtual Machine

Java Sources

- Java Community Process - http://jcp.org
  - JSR specification requests
  - reference implementations

- Sun - http://java.sun.com
  - SDK, tools, community

- Manufacturer
  - SDKs, community, device emulators

Java ME

Configurations
- specifies minimum Java technology that we can expect for certain devices
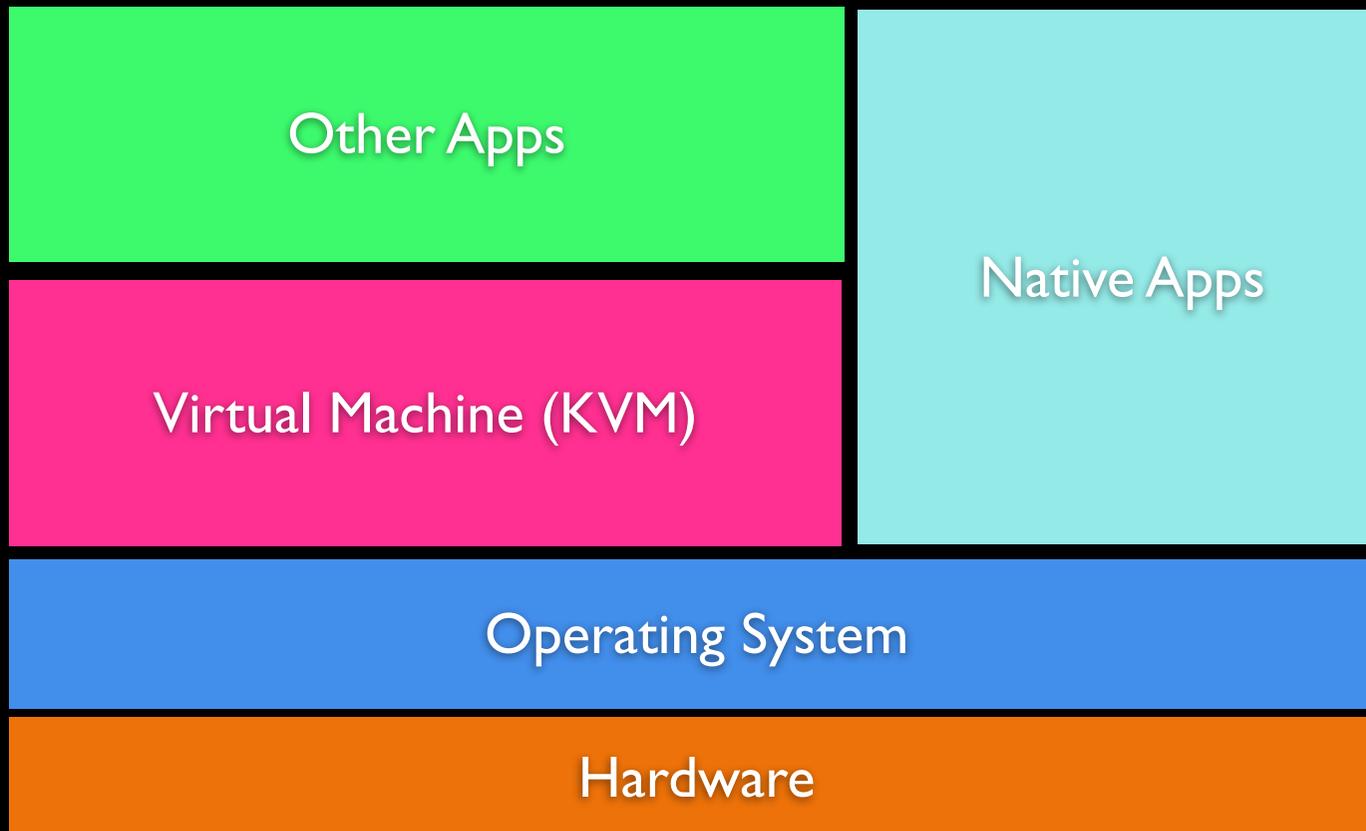- Includes language, virtual machine features, core libraries

Profiles
- layer defining APIs and specifications for a particular device or market - MIDP, FP
- MIDlets

Optional Packages
- includes additional functionality only supported by certain devices - e.g. Bluetooth API, Location API

Java VM

Other Apps

Native Apps

Virtual Machine (KVM)

Operating System

Hardware

CLDC

Connected Limited Device Configuration

- specifies environment for mobile phone, pagers
- 160-512k of memory for Java
- limited power / batteries
- intermittent, low-bandwidth connectivity

CLDC 1.0
- May 2000, JSR 30
- java.lang

CLDC 1.1
- Dec 2002, JSR 139
- adds floating point support
- bug fixes

MIDP

Mobile Information Device Profile

MIDP 1.0
- December 2000, JSR 37
- java.microedition.midlet
- java.microedition.rms
- java.microedition.lcdui
- java.microedition.io.HttpConnection

MIDP 2.0
- Nov 2002, JSR 118
- java.microedition.media
- java.microedition.lcdui.game

MIDP 3.0
- Q3 2006? Soon?

Optional Packages

Bluetooth API (JSR 82)
- communication with Bluetooth devices

Wireless Messaging API (JSR 120, JSR 205)
- SMS, MMS, multi-part messages

Mobile Media API (JSR 135)
- audio, video and multimedia

Location API (JSR 179)
- interface to location services

MIDP 3.0
AKA "The Future"

- Background MIDlets
- Enable drawing to secondary displays
- Improved large screen support
- Auto-start MIDlets
- And much more... to forget about for the moment

? MIDlets

MIDlets are like Java applets for mobile devices.

Has a lifecycle with four stages, created, started, paused, destroyed.

Packaging MIDlets

JADs and JARS
- Java Application Descriptor (JAD)
- Java Archives (JArs)

JAD
- describes MIDlet suite
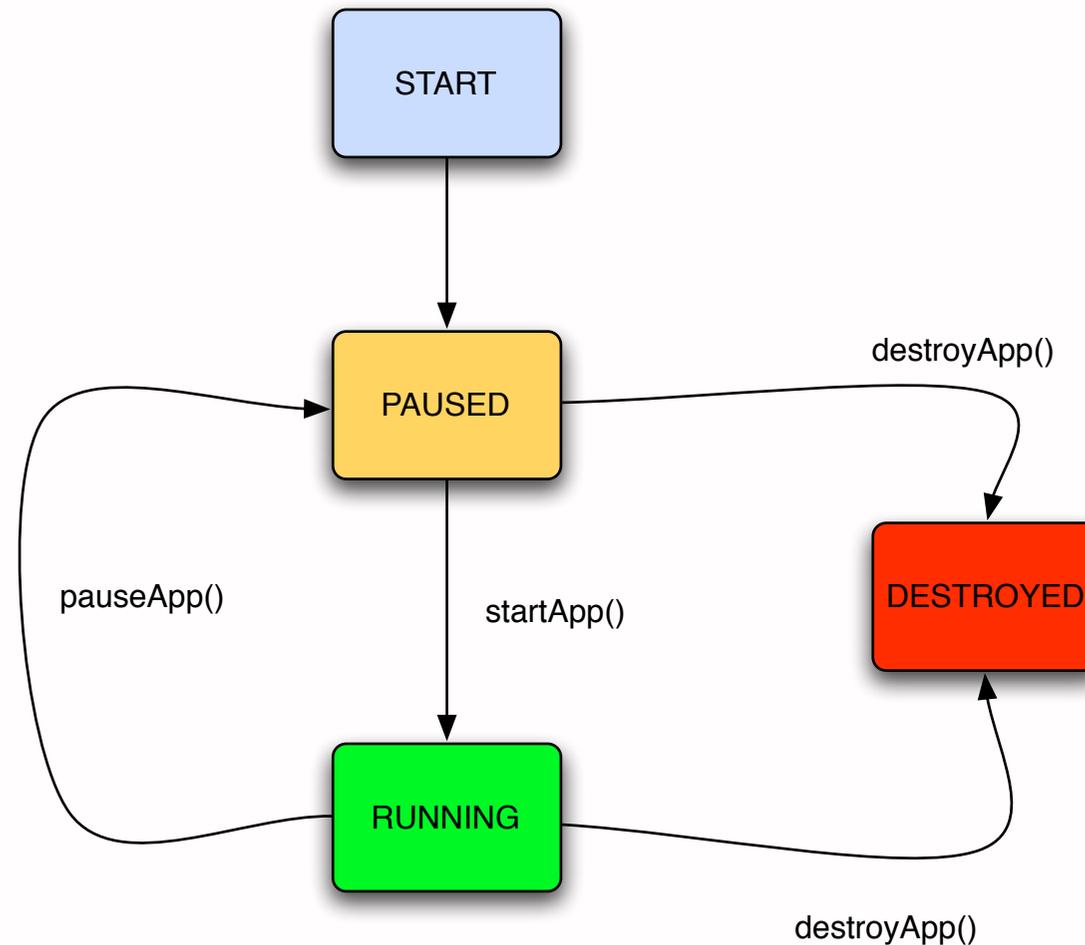**- specifies name, icon, MIDlets, permissions**

JAR
- contains class files, resources

AMS
- application management software

The Not-So-Secret Lives of MIDlets

START

PAUSED

DESTROYED

RUNNING

destroyApp()

pauseApp()

startApp()

destroyApp()

Provisioning
AKA "getting it on the phone"

Over the Air (OTA)
- Web / WAP / Carrier Deck
- JAD file specifies location

Bluetooth
- Easy, quick installation

USB cable
- expensive
- difficult to obtain

? Mobile.Processing

Open source framework for developing J2ME applications.

Inherits syntax, IDE, style from Processing.

Quick, easy to develop Canvas applications. Some debugging issues.

Assignments!