

# Programmation des Systèmes Mobiles et Sans Fil Mobile and Wireless Systems Programming

## General Introduction



## Technologies

- Operating Systems : WM, Symbian OS, Android, iPhone, BlackBerry, LiMO...
- Manufacturers : Nokia, Sony Ericsson, Samsung...
- Programming languages : C,C++,Objective-C,C Sharp, Java...
- Developement environments :
  - Native applications (Android, Blackberry, MeeGo, Palm WebOS...)
  - Java ME
  - Flash Lite
  - BREW
  - Widget (Widset)
  - ...

Which platform ?

How to choose a technology ?

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How to choose a technology ?

# Know your market

- Mass market
- Business market
- Entertainment market
- ...

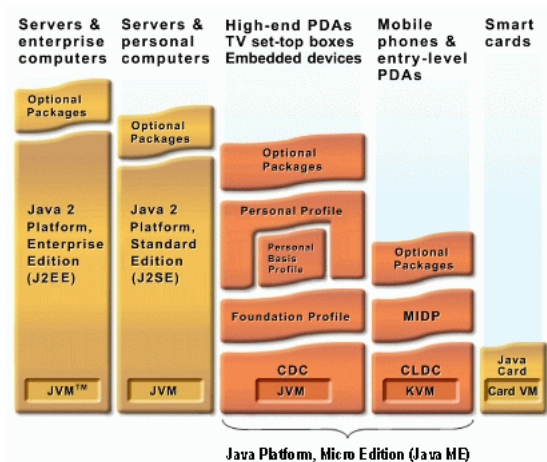
## Java ME what else ?

- Widly deployed (more than 80% of mobile phones are Java ME compatible)
- Huge community (documentation, developement tools...)
- Easy start
- Evolving capabilities (Java Community Process)
- Funny !

Java ME what else ?

Not really true since iphone, Android...

# Java ME positioning



## KiloByte Virtual Machine

- Adapted for embedded devices (memory and cpu constraints, security...)
- Delivered by Sun but not only (Jbed, IBM...)
- Open Source version (Phone ME project)

## Connected Limited Device Configuration

- 2 Versions : CLDC-1.0 (JSR 30) - CLDC-1.1 (JSR 139)
- Packages :
  - java.io : system input and output through data streams
  - java.lang : Java programming language(String, Thread...)
  - java.util : date and time facilities and utility classes (Date, Vector...)
  - javax.microedition.io : generic connections (HTTP, Socket...)
  - javax.lang.ref : weak references [Only for CDLC-1.1]

### CLDC-1.0 vs. CLDC-1.1

#### Double and Float



## 2,3 or 4 versions !

- MIDP-1.0 (JSR 37)
  - GUI
  - Persistence
  - Generic connections
- MIDP-2.0 (JSR 118)
  - Backward compatibility with MIDP 1.0 applications
  - MMAPAPI
  - Game
  - Security
- MIDP-2.1 (JSR 118)
  - MIDP-2.0 with corrections and optimization
  - Exemple : Canvas pointer events **MUST** be supported, if the underlying hardware supports this feature. In this case, the method `Canvas.hasPointerEvents()` SHALL always return true.
  - More details : <http://jcp.org>

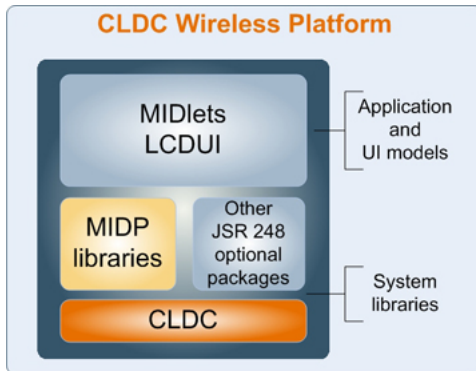
## 2,3 or 4 versions !

- MIDP-3.0 (JSR 271)
  - Backward compatibility with MIDP 1.0/2.x applications
  - Required concurrency
  - Inter-MIDlet communication mechanisms
  - Shared libraries (LIBlets)
  - Updated Security mechanism for finer-grained policy
  - New LCDUI elements and layouts
  - Improvements to all APIs

## Packages

- User Interface Package
  - `javax.microedition.lcdi` : features for implementation of user interfaces
  - `javax.microedition.lcdi.game` (MIDP-2.x) : development of rich gaming content
- Persistence Package
  - `javax.microedition.rms` : store and retrieve data
- Application Lifecycle Package
  - `javax.microedition.midlet` : application lifecycle and interactions with its environment
- Public Key Package
  - `javax.microedition.pki` (MIDP-2.x) : information authenticate

## Global vision



## VM features

- No Native Methods : Java Native Interface (JNI)
- No object finalizers : `finalize()` (`java.lang.Object`)
- No reflection
- No classloaders (Yes but not for your application)
- Not all Java SE methods are available  
(`compareToIgnoreCase(String str)`)

## Embedded not Desktop

- Limited memory and CPU capabilities
- Small screen
- High security limits (Applets)
- ...

## MSA (JSR 248)

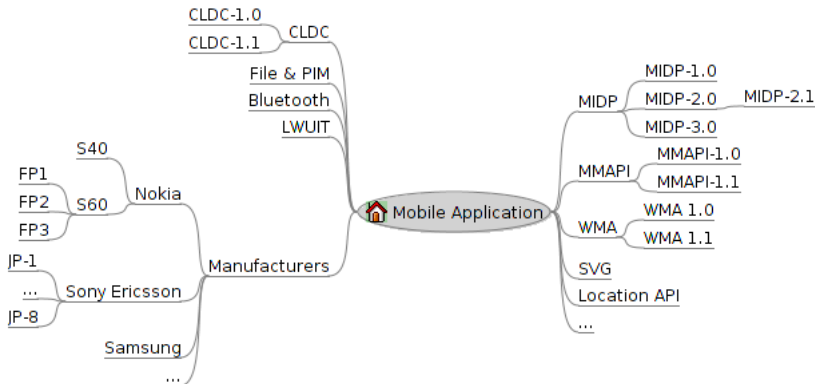
### MSA:

JSR 238 (Internationalization)
JSR 234 (Multimedia Supplements)
JSR 229 (Payment)
JSR 211 (Content Handler)
JSR 180 (SIP)
JSR 179 (Location)
JSR 177 (Security & Trust)
JSR 172 (Web Services)
JSR 226 (Vector Graphics)
JSR 205 (Messaging)
JSR 184 (3D Graphics)
JSR 135 (Mobile Media)
JSR 82 (Bluetooth)
JSR 75 (File & PIM)
JSR 118 (MIDP)
JSR 139 (CLDC)

### MSA Subset:

JSR 226 (Vector Graphics)
JSR 205 (Messaging)
JSR 184 (3D Graphics)
JSR 135 (Mobile Media)
JSR 82 (Bluetooth)
JSR 75 (File & PIM)
JSR 118 (MIDP)
JSR 139 (CLDC)

# Write Once, Run Anywhere?





## Conclusion

- MIDP and CLDC
- Hardware and Software constraints
- Fragmentation issue
- More details : <http://java.sun.com/javame/index.jsp>