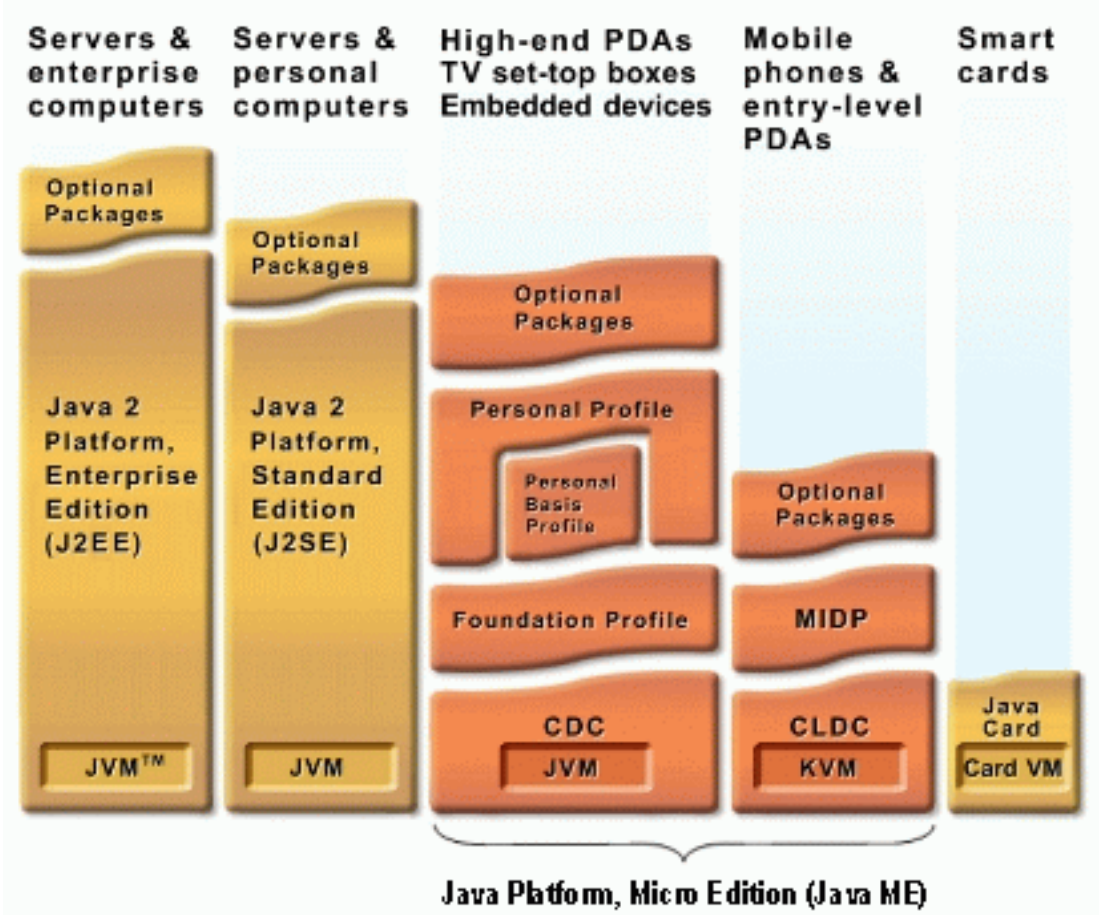
Mobile Computing

Java Platform, Mobile Edition

Java Platform (1)

- Java Platform, Standard Edition (Java SE)
  - Desktop applications
- Java Platform, Enterprise Edition (Java EE)
  - Server applications
- Java Platform, Micro Edition (Java ME)
  - Handheld/embedded devices

Java 2 Platform (2)



source: http://java.sun.com

Java Platform, Micro Edition (Java ME)

- Presented in 1999 (Java is from 1995)
- Supported by more than 600 device models currently in the market (more than 2.1 billion Java ME enabled mobile phones and PDAs, [source http://www.java.com/en/about/])
  - BD-J profile for developing interactive Blu-ray applications
- Sun Microsystems' reference implementation released as open source under the GNU GPL in 2006 (phoneME)

Java Micro Edition

- The Java runtime environment is adapted for constrained devices:
  - extremely limited memory;
  - small screen sizes;
  - alternative input methods;
  - slow processors.

Java ME Core Concepts

- Configurations
  - The Java runtime environment
- Profiles
  - Fills the missing functionality
- Optional packages
  - Support for additional features

Java ME Configurations

- A Java virtual machine (VM) to execute Java bytecode.
- Native code to interface with the underlying system.
- A set of core Java runtime classes.

Java ME Configurations

- *Connected Limited Device Configuration*(CLDC)
  - very constrained (limited) devices
  - just a basic subset from the java.lang, java.io and java.util packages, with a few additional classes from javax.microedition.io
- *Connected Device Configuration* (CDC)
  - full Java VM
  - larger set of core classes
  - Superset of CLDC

Java ME Profiles

- Adds domain-specific classes to a configuration to be used by similar devices
- Supports specific uses of a device

Java ME Profiles

- Mobile Information Device Profile (MIDP)
  - CLDC-based profile for running applications on cellphones and interactive pagers with small screens, wireless HTTP connectivity, and limited memory.
- Information Module Profile (IMP)
  - subset of MIDP with no UI APIs for embedded, “headless” devices Foundation Profile (FP)
  - extends the CDC with additional Java SE classes
- Personal Basis Profile (PBP)
  - extends the FP with lightweight (AWT-derived) user interface classes and a new application model
  - basis for BD-J
- Personal Profile
  - extends the PBP with applet support and heavyweight UI classes

Java ME Optional Packages

- support for additional behaviors that don't really belong in one specific configuration or profile (E.g. Bluetooth)
- Some optional packages
  - *The RMI Optional Package*
  - the *Java APIs for Bluetooth*
  - the *JDBC Optional Package for CDC/Foundation Profile*

Connected Limited Device Configuration (CLDC)

- Capabilities of the Java virtual machine (VM), which is *not* a full-featured Java VM.
- *Very small* subset of the J2SE 1.3 classes.
- New set of APIs (application programming interfaces) for input/output called the Generic Connection Framework.
- CLDC does not define
  - APIs related to user interfaces
  - How applications are loaded onto a device or how they are activated or deactivated.

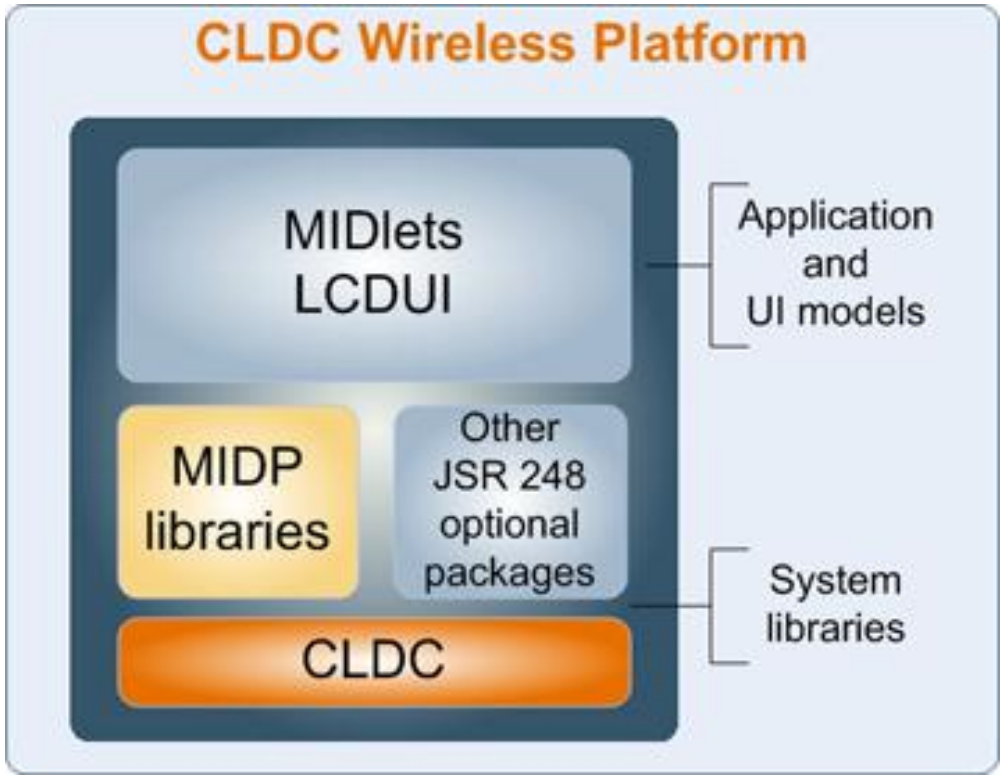
MIDP Devices

- Enough memory to run MIDP applications
- A bit addressable display at least 96 pixels wide by 56 pixels high, either monochrome or color
- A keypad, keyboard, or touch screen
- Two-way wireless networking capability

MIDP APIs

- Support for application lifecycle management similar to the way applets are defined in Java Standard Edition
- Persistent storage of data.
- HTTP-based network connectivity based on the CLDC's Generic Connection Framework
- Simple user interface support, with enough flexibility to build games or business applications

CLDC Wireless Platform

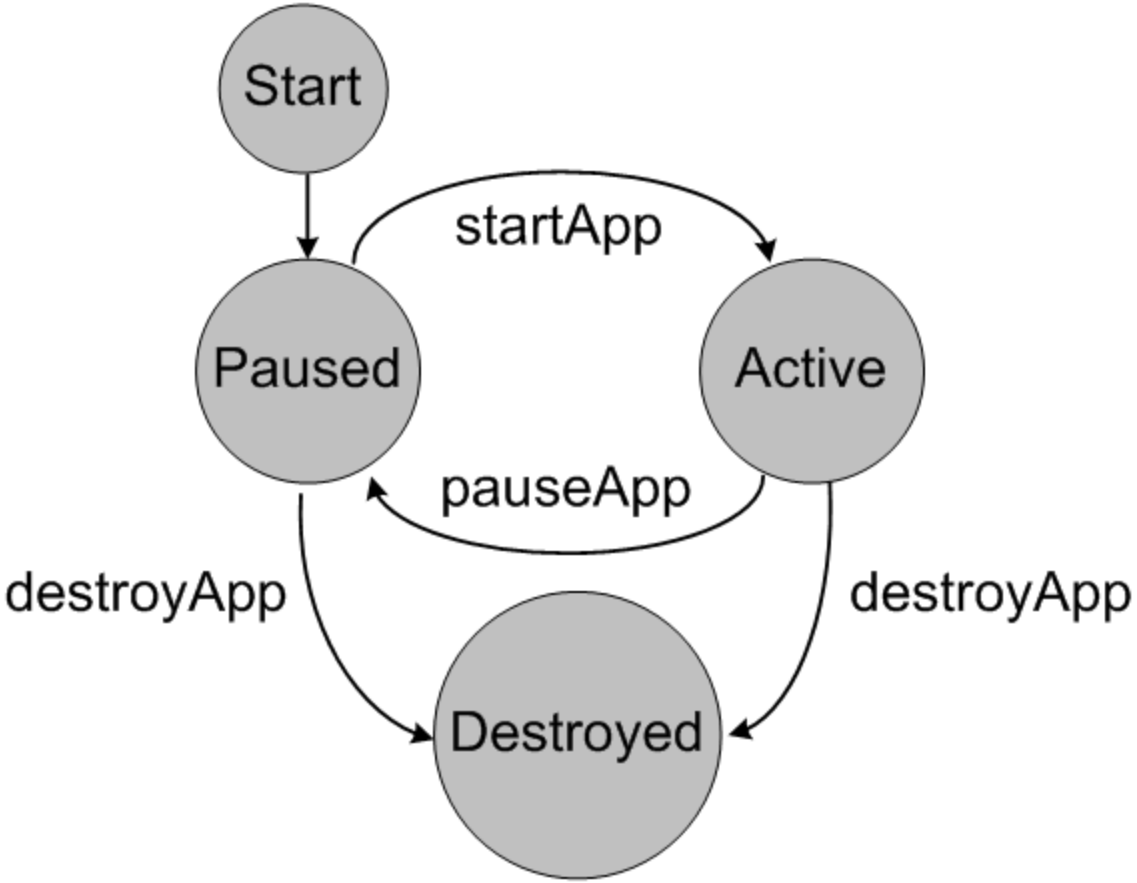


source: http://java.sun.com

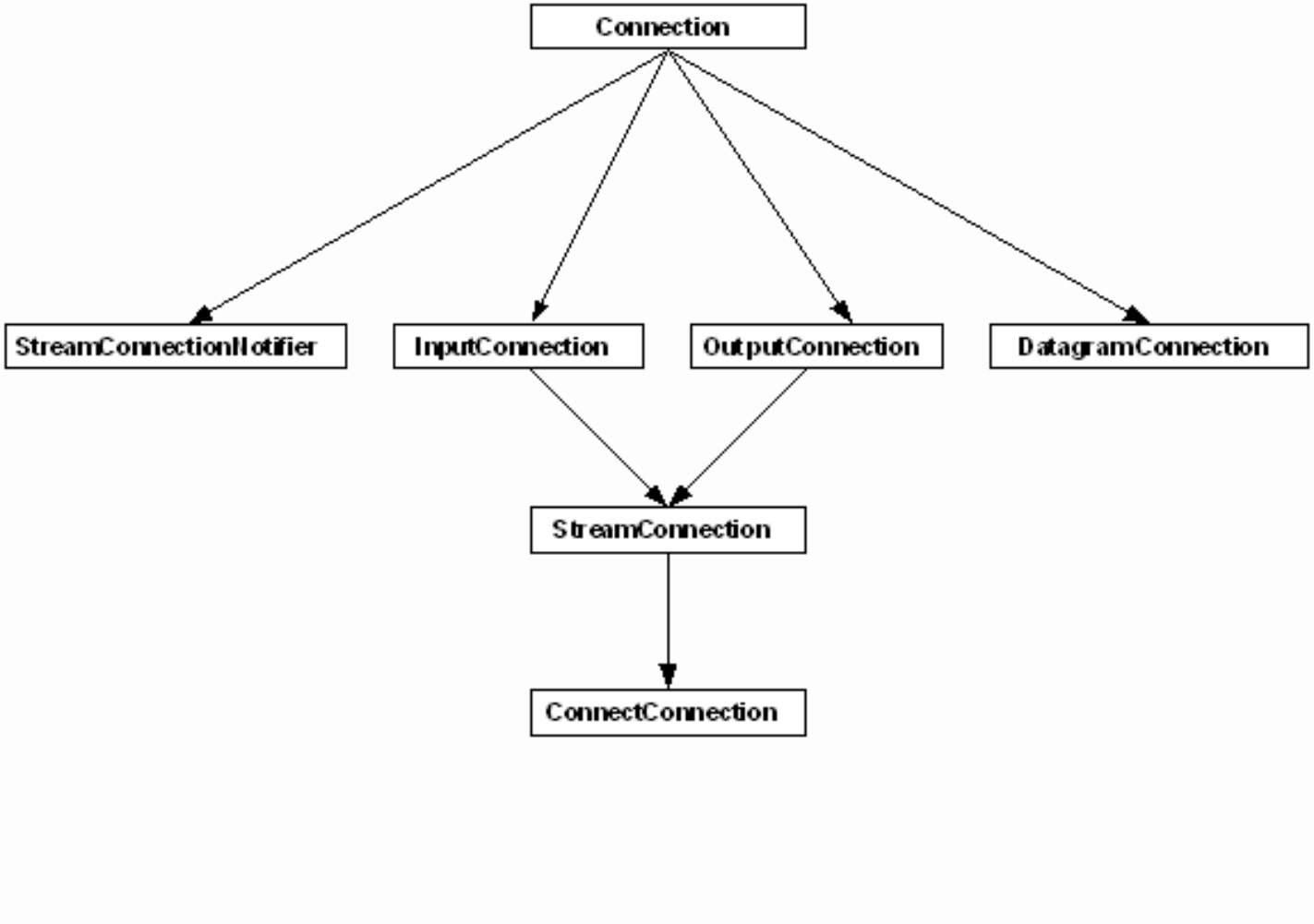
MIDlet and MIDlet Suites

- MIDlet
  - MIDP application
  - Class that extends javax.microedition.midlet.MIDlet
- MIDlet suite
  - Packages one or more MIDlets
  - Consists of two files
    - Jar file
    - Jad file (application descriptor file)

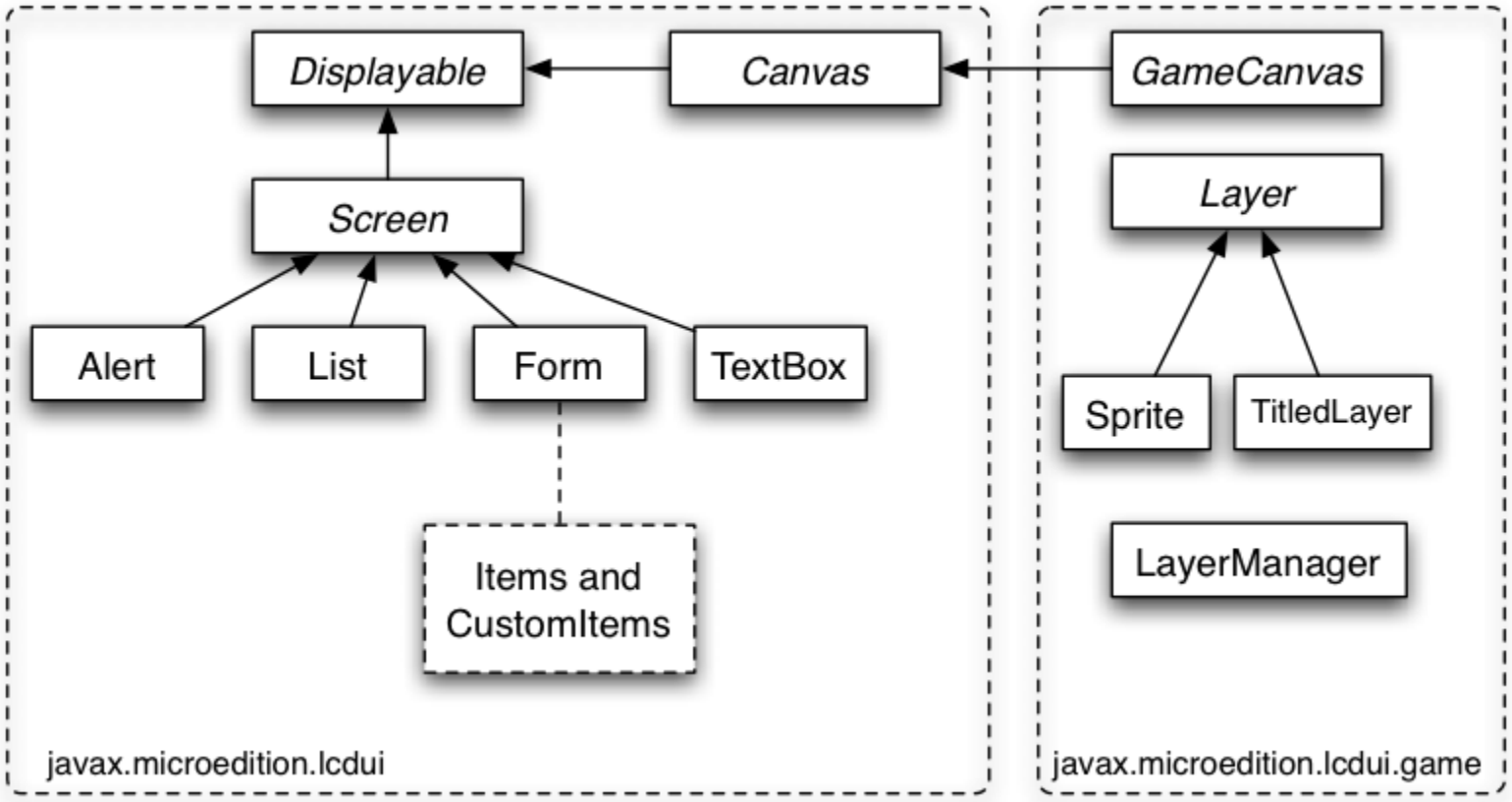
MIDlet lifecycle



Java ME
Generic Connection Framework



MIDP UI


Displayable
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GameCanvas
Screen
Layer
Alert
List
Form
TextBox
Sprite
TitledLayer
Items and
CustomItems
LayerManager
javax.microedition.lcdui
javax.microedition.lcdui.game

Development tools

- Eclipse Indigo (Mobile Tools for Java)
- Java ME toolkits:
  - **Sun Java Wireless Toolkit for CLDC**
    - **Alameda: Installed in /usr/lib/WTK2.5.2**
    - **TagusPark: Installed in /opt/WTK2.5.2**
  - Java ME Platform SDK 3.2 (current)
    - Unifies Java ME development for all configurations/profiles, supports BD-J
- Sample source code available at the course website

Today's class assignment

- Learn how to use Java ME development tools
  - HelloWorld
- Learn how to perform device communication
  - NetworkDemo (socket-based)
- Learn how to build UI
  - NetworkDemo2
- Learn how to build games for mobile phones!
  - GameDemo ☺

Today's class challenge!

- Build a two-player networked game based on the sample code provided!

Useful link

- www.oracle.com/technetwork/systems/reference-156412.html

- Remember, Google is your friend! ☺