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## Project Overview

CSE 403, Winter 2003  
Software Engineering

<http://www.cs.washington.edu/education/courses/403/03wi/>

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## Readings and References

- References
  - » What will people pay for? Dan Bricklin.
  - » Accessing a whole new world via multimedia phones. Dan Gillmor.
  - » J2ME Data Sheet from Sun
  - » Wireless Toolkit 1.0.4 User Guide from Sun
- Links to all of these are on the "otherlinks" web page

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## Initial project motivation

- Dan Bricklin: What will people pay for?
  - » "You keep reading stories about how cellphones will be used for checking stock quotes and making trades, buying stuff, and other eCommerce. It seems business plans are based on people paying for such stuff. I think that eCommerce is not where things will go."
  - » *"People like to interact with people they care about. The interactions are often simple, but personally important. They are willing to pay money for this."*

<http://www.bricklin.com/peoplepay.htm>

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## Opportunity

- The cell phone / mobile industry is in the state that the PC industry was in 15-20 years ago
  - » nobody knows what the killer apps will be, although simple messaging (aka email) is big
  - » there is still a relatively competitive environment with multiple operating systems and suppliers
  - » the existing players are not necessarily the ones who will dominate or have the big ideas
  - » the technology opens a wide range of new possibilities that have never existed before

## *mobile means personal*

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- Mobile devices are small, portable, and personal
- Business support
  - » contact list, daily calendar, sales support
- Personal interest
  - » ringtones, games
  - » personal information management
  - » connectivity
    - web sites, text messaging (SMS), image messaging (MMS)
    - always-on information access is *very nice!* Google ...

## Connectivity

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- Cell networks are growing in speed
- Data types are already a rich environment and the phones are rapidly growing more capable
  - » larger color screens
  - » sound capture and playback
  - » video capture and playback
- Wireless Connectivity
  - » *all media at all times in all places*

## Our project domain

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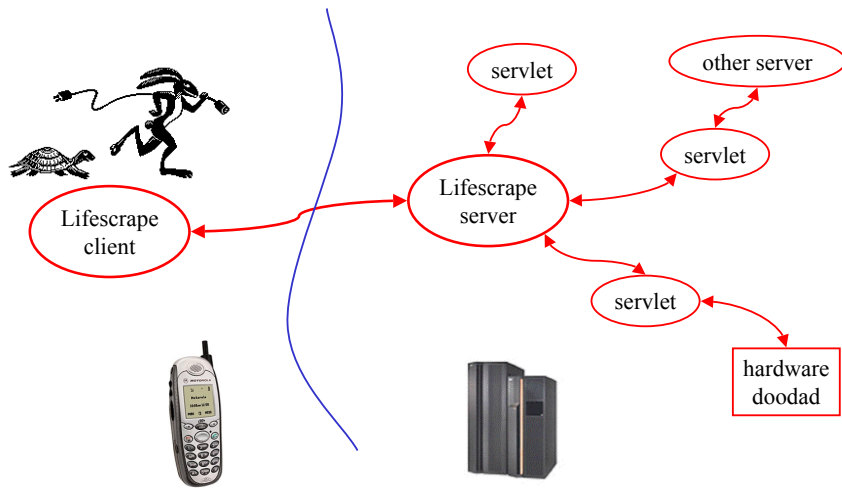
- We will focus on mobile clients talking to simple servers over http links
- Lifescape, the application
  - » server can reach out and grab information from any network aware source according to user setup
  - » servlet packages the information in concise form for transmission to/from cell phone upon request
  - » custom client midlet on the cell phone manages interaction with the user: commands and display

## What sort of information?

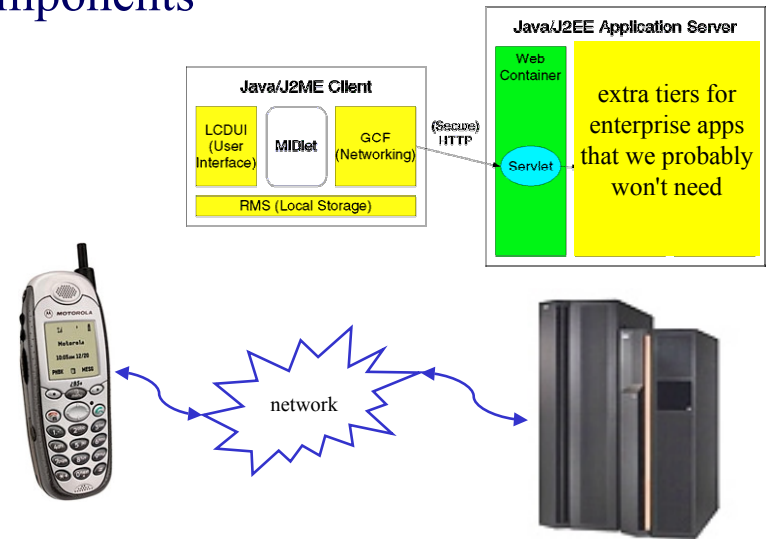
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- Anything you want to know that can somehow be manipulated by a network aware application
  - » online game events and status, virtual agents
  - » transportation events (next bus, commute time)
  - » friends on-line (AIM, Unix finger)
  - » device state/control (laundry machine status, coke machine, coffee maker, room occupied?)
  - » video/audio snapshots (burning man snaps, sports, ...)
- Where is all this ultimately heading?
  - » Gillmor: *Ask a teenager. She'll be first to figure it out.*

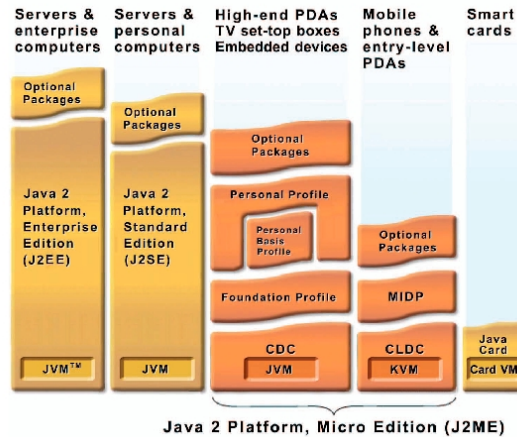
# Architecture bubbles



# Software Components



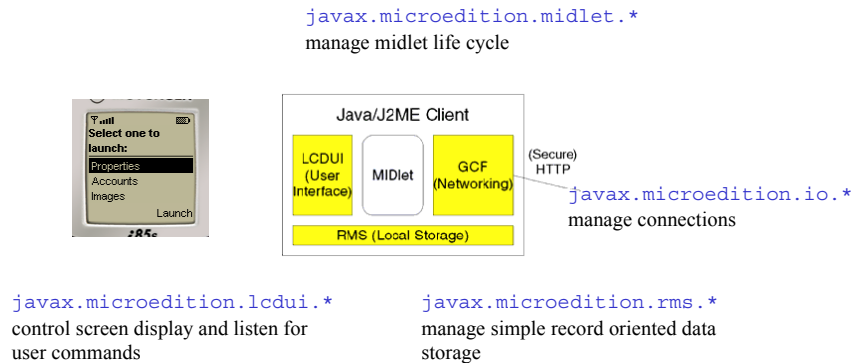
# Java editions - huge to tiny



# J2ME terminology

- J2ME architecture
  - » configurations, profiles, and optional packages
- *Configuration* is a virtual machine and a minimal set of class libraries
  - » Connected Limited Device Configuration (CLDC)
- *Profiles* define the application life cycle model, user interface, device interface
  - » Mobile Information Device Profile (MIDP)
- *Optional packages* add features
  - » Mobile Media API (MMAPI)

## Java 2 MicroEdition (J2ME) packages



## Smaller class libraries than J2SE

- The class libraries in J2ME are much smaller than they are in J2SE (the standard desktop edition of Java)
- Devices are small in memory and horsepower
  - » fewer classes reduces footprint significantly
- Display is limited
  - » no overlapping windows, one application at a time
- API documentation is located in Wireless Toolkit installation directory

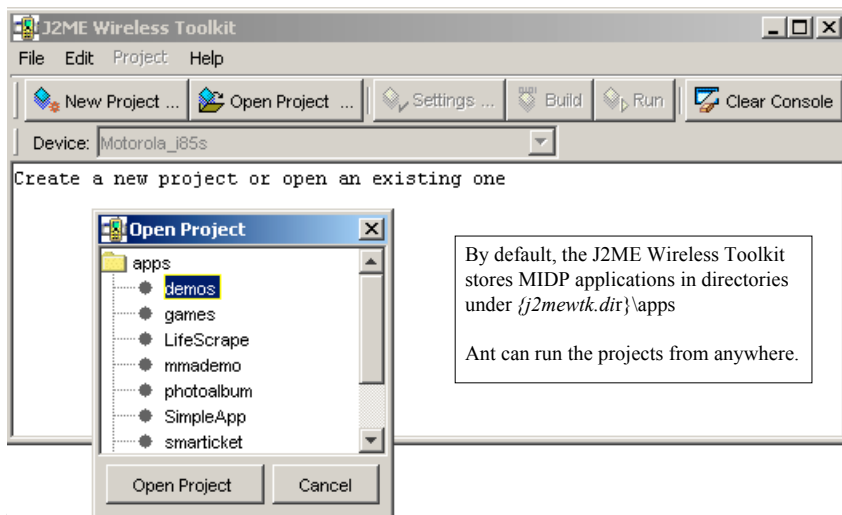
## J2ME development tools

- Primary tool is Wireless Toolkit 1.0.4
- It's a little bit simplified, but it provides the ability to compile, verify, and package midlets
  - » uses J2SE compiler to compile sources
  - » special system class libraries for J2ME
  - » preverify and package midlet and update jad file
- User manual included in the installation
  - » read it over to get an introduction to the process

## run WTK with KToolBar or Ant

- KToolBar is a minimal development environment for developing MIDlet suites.
  - » From the KToolBar, you can:
    - Create a new project or open an existing one
    - Build, run, and debug your MIDlet
    - Package your project files
    - Modify the attributes of your MIDlet suite
- Ant is a general purpose build tool like make
  - » you can run WTK emulators from Ant
  - » you can run Ant from jEdit

## WTK Open Project



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## Write once, run in a bunch of places



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## sample ant build file

```
>ant -buildfile build403.xml -projecthelp
Buildfile: build403.xml
```

This Ant buildfile is used to build a Java midlet to run on a MIDP device (eg, a cell phone). The tasks assume that the Wireless Toolkit has been installed and that the WTK directory is defined in the wtk.home property. Also, the name of the directory that this build file is in is used as the value of midlet.name for this midlet suite.

The tasks assume that the directory structure is

```
../midlet.name/
  build.xml
  bin/
  classes/
  doc/
  res/
  src/
../zips
```

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## ant clean and build

```
C:\home\finson\cse403\dev\hw403-solutions\HW1>ant -buildfile build403.xml clean
Buildfile: build403.xml
init:
clean:
  [delete] Deleting 16 files from C:\home\finson\cse403\dev\hw403-solutions\HW1\classes
BUILD SUCCESSFUL
Total time: 5 seconds

C:\home\finson\cse403\dev\hw403-solutions\HW1>ant -buildfile build403.xml build
Buildfile: build403.xml
init:
build:
  [wtkbuild] Compiling 13 source files to C:\home\finson\cse403\dev\hw403-
    solutions\HW1\classes
[wtkpackage] New version is 1.9
[wtkpackage] Building jar: C:\home\finson\cse403\dev\hw403-solutions\HW1\bin\HW1.jar
[wtkpackage] Preverifying C:\home\finson\cse403\dev\hw403-solutions\HW1\bin\HW1.jar
[wtkpackage] Updating JAD file C:\home\finson\cse403\dev\hw403-solutions\HW1\bin\HW1.jad
BUILD SUCCESSFUL
Total time: 14 seconds
C:\home\finson\cse403\dev\hw403-solutions\HW1>
```

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20

# ant run

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```
C:\home\finson\cse403\dev\hw403-solutions\HW1>ant -buildfile build403.xml run
Buildfile: build403.xml
init:
run:
[wtkrun] Running C:\home\finson\cse403\dev\hw403-solutions\HW1\bin\HW1.jad in Motorola_i85s
[wtkrun] Execution completed successfully
[wtkrun] 113908 bytecodes executed
[wtkrun] 7 thread switches
[wtkrun] 319 classes in the system (including system classes)
[wtkrun] 811 dynamic objects allocated (28148 bytes)
[wtkrun] 4 garbage collections (15520 bytes collected)
[wtkrun] Total heap size 1048576 bytes (currently 1033900 bytes free)

BUILD SUCCESSFUL
Total time: 25 seconds
C:\home\finson\cse403\dev\hw403-solutions\HW1>
```