Introduction to Java 2 Micro Edition

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What is J2ME

• Java platform for small devices
• A subset of Java 2 Standard Edition
• Complementary technology to WAP/WML
• For programming the Palm
• For programming wireless devices (e.g. mobile phones)
J2ME-Enabled Devices

- **Motorola**
  - i85s and i50sx iDen phones
  - Applications are downloaded and installed via a special cable
    http://commerce.motorola.com/iupdatephone/main/j2me_softcat.cfm

- **NTT DoCoMo**
  - Japanese phone company
    - ~80% of wireless internet users are in Japan
  - iMode and iAppli support

- **Research In Motion**
  - CLDC and MIDP compliant
  - http://www.rim.net/

- **Palm and compatibles**

- **WinCE devices**
Configurations and Profiles

- CDC - Connected Device Configuration
- CLDC - Connected Limited Device Configuration
- MIDP - Mobile Information Device Profile
- PDAP - Personal Digital Assistant Profile
- Personal Profile
CLDC
Connected Limited Device Configuration

- Specification Version 1.0
- Hardware Requirements
  - 160 - 512 kB of memory
  - 16 or 32 bit processor
  - network connectivity (possibly wireless)
- No floating point support
- Deliver applications dynamically
CLDC (Cont’d)
Connected Limited Device Configuration

• CLDC addresses
  – Java languages and virtual machine features
  – Core Java libraries
  – Input/output
  – Networking
  – Security
  – Internationalization
CLDC (Cont’d)
Connected Limited Device Configuration

• CLDC does not address
  – Application life-cycle management
  – User interface functionality
  – Event handling
  – High-level application model

• These can be addressed in profiles
CLDC
What’s been removed

• Floating point
• Java Native Interface
• User-defined class loaders
• Reflection
• Thread groups and daemon threads
• Finalization
• Weak references
CLDC Security

• Less memory-consuming than J2SE model
• Sandbox
  – No user-defined class loaders
  – Classes loaded at native level
• No native method calls except from JVM
• System classes cannot be overridden by programmer
Programming the Palm

• Development Environment
  – J2ME CLDC API
    • Contains a subset of the standard J2SE classes
  – J2ME KJava API
    • GUI components
    • Access to Palm database
    • Access to IR port
  – JBuilder Handheld Express
  – POSE Palm Emulator

Already superceded. Not supported!
Programming the Palm CLDC Packages

• io
  – InputStream, OutputStream, Reader, Writer

• lang - No floating point support

• util
  – Enumeration, Calendar, Date, Hashtable, Random, Stack, TimeZone, Vector

• javax.microedition.io
  – Connection, Datagram, InputConnection, OutputConnection, Connector
Programming the Palm
KJava GUI Components

• Spotlet
  – Container for other components
  – Handles events
    • All events go to the spotlet.
    • Spotlet must send events to the contained components.
  – Only one spotlet can be registered
    • The registered spotlet is displayed.
    • The registered spotlet receives all events from keys and screen.
public class HelloSpotlet extends Spotlet {

    private Graphics g;  // Graphics must be managed manually!

    private Button quitButton;
    private String message = "Hello Spotlet!";

    public HelloSpotlet() {
        g = Graphics.getGraphics();
        g.clearScreen();
        quitButton = new Button("Quit", 5, 125);
        quitButton.paint();
        g.drawString(message, 5, 5, Graphics.PLAIN);
    }
}
public void penDown(int x, int y){
    if (quitButton.pressed(x, y)) {
        System.exit(0);
    }
}

public static void main(String[] args) {
    new HelloSpotlet().register(Spotlet.NO_EVENT_OPTIONS);
}

Pass screen events to the button

Register for screen events only. No key events
Programming the Palm
Deploy & Test HelloSpotlet

• Use JBuilder Wizard to create .prc file

• Command line
  
  java palm.database.MakePalmApp

• Install into POSE

• No debugger
Programming the Palm
KAWT Project

• Implementation of the AWT classes
• Can make GUIs that work in J2ME & J2SE
• Open source
• Not part of J2ME
• Lightweight
• Clean-room implementation
Building the Conduit

• Synchronizes data with desktop
• Java Conduit Development Kit
  – Claims to require Visual Café
  – MS Windows
  – Supports generic conduits
What is MIDP?

• Provides APIs for building software on mobile devices with limited resources.
• Works on top of the Connected Limited Device Configuration (CLDC)
Where does MIDP fit in the Java platforms?

– Works with CLDC
– Runs in the KVM
– Examples of devices:
  mobile phones
  pagers
  BlackBerry devices
  personal digital assistants

From http://java.sun.com/products/midp/
public class HelloMIDlet extends MIDlet implements CommandListener {
    private Command exitCommand;
    private Display display;

    public HelloMIDlet() {
        display = Display.getDisplay(this);
        exitCommand = new Command("Exit", Command.SCREEN, 2);
    }

    public void startApp() {
        TextBox t = new TextBox("Hello MIDlet", "Hello World!", 256, 0);
        t.addCommand(exitCommand);
        t.setCommandListener(this);
        display.setCurrent(t);
    }

    public void destroyApp(boolean unconditional) {}  
    public void commandAction(Command c, Displayable s) {
        if (c == exitCommand) {
            destroyApp(false);
            notifyDestroyed();
        }
    }
}
J2ME Wireless Toolkit

• J2ME Wireless Toolkit 1.01
  – Integrates with Sun Forte IDE

• J2ME Wireless Toolkit 1.02
  – adds debugging capabilities
  – adds new emulators
  – early access version available (as of 6/3/01)
J2ME Wireless Toolkit Emulators
Final thoughts

• What happened to write-once, run anywhere. Now there are different configurations and profiles to write to.

• How many developers can actually write for phones? Access may be controlled by the phone companies.

• CLDC & KJava provides a more familiar development paradigm.

It’s back with J2ME for Palm!

Wireless SIG
Wireless SIG

• A joint special interest group of the St. Louis Web Developers Organization and the St. Louis Java User’s Group
• http://www.stlwebdev.org
• First meeting is on Tuesday, July 24 at 6:30 p.m. in this auditorium.
• I will be talking about J2ME MIDP
• Contact Mark Balbes (me) to be a speaker at mark@balbes.com
References

- CLDC Specification
  http://java.sun.com/aboutJava/communityprocess/final/jsr030/index.html
- MIDP Specification
  http://java.sun.com/aboutJava/communityprocess/final/jsr037/index.html
- J2ME Archive http://www.billday.com/j2me/index.html
- http://www.kvmworld.com/
- Palm Emulator (POSE) http://www.palmos.com/dev/tech/tools/emulator/
- Conduit Development Kit - Windows Java Edition
  http://www.palmos.com/dev/tech/tools/cdk/java