Tackling Java ME Device Fragmentation: Orange and Sun Collaboration

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Goal

Reduce number of versions for your mobile application. See how Sun and Orange think it should be done.

Agenda

Overview

Design Approach

Case Studies

The Sun and Orange Collaboration

Q&A

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Overview

- **Fragmentation—operator's view**
- **Problem parameters**
- **Possible solutions**

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The Sun and Orange Collaboration

Q&A

Fragmentation—Operator's View

Problem dimensions

- Problem scope
  - Some numbers and stats
- Too many SKUs to manage
- Too many apps to test and sign
- Uneconomical to deploy
- Un-friendly for users: "Can I get it too?"

Fragmentation—Operator's View

Impact on operator

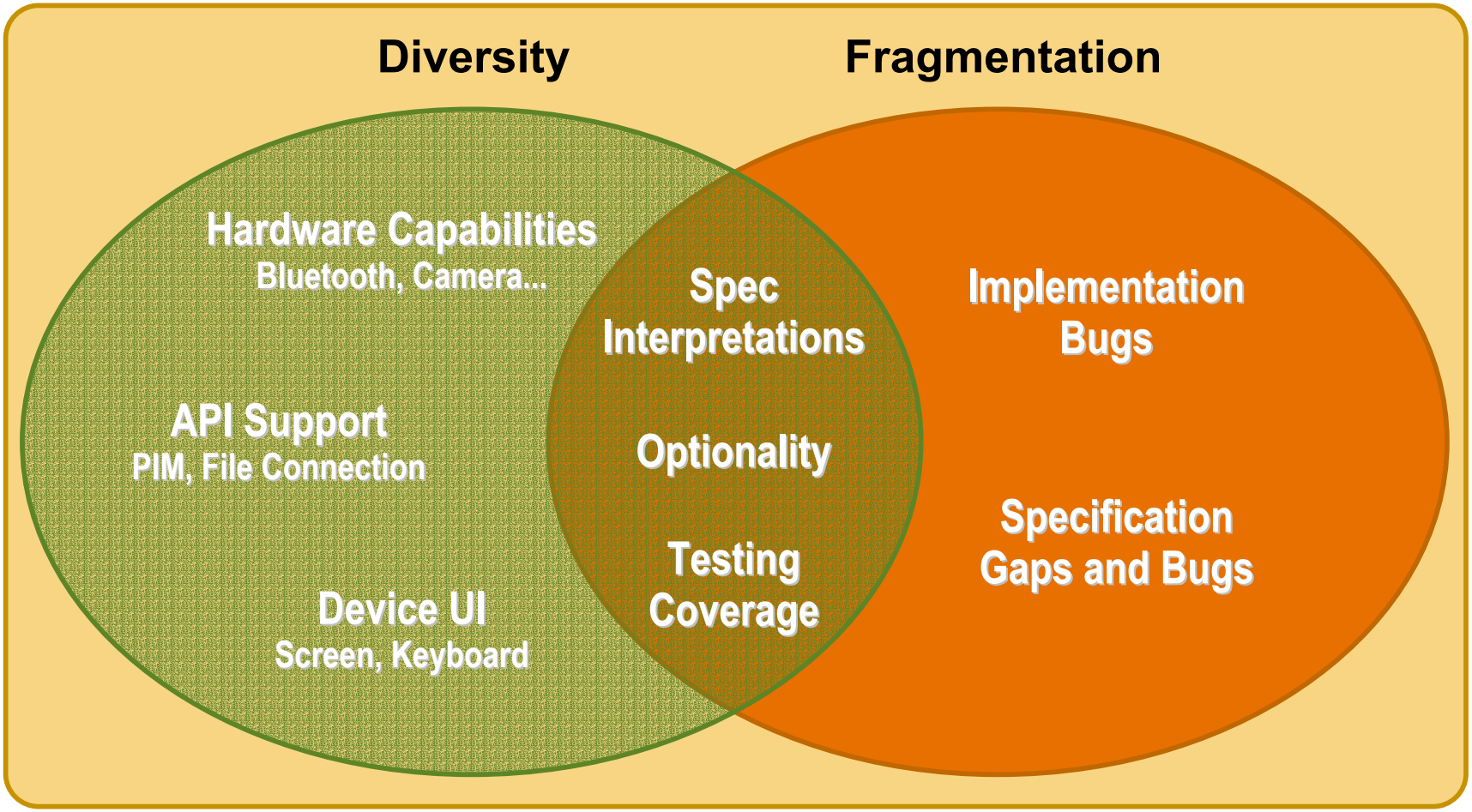
- Impractical to deploy to wide number of handsets
  - End up with just games for top 20
  - Artificial restriction of addressable market
  - Becomes uneconomical to address as a mass market
- Operators will lose interest!

Problem Parameters

A technical view at fragmentation

- Why are devices different?
  - Technological differences
  - Consumers are different
  - Price range
  - Implementation bugs
- When are differences “bad”?

Diversity vs. Fragmentation



A Technical View at Fragmentation

Main fragmentation areas

- Platform (MIDP version, CPU, language)
- Screen parameters (size, colour depth)
- Input methods (layout, touchscreen, keycodes)
- Memory (heap and persistent, RMS capabilities)
- Multimedia support (codecs, mixing)
- Connectivity (Bluetooth, IR, number of connections)

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/overview.html

Possible Solutions

A technical view at fragmentation

- Mandate a single Java™ Platform, Micro Edition (Java ME platform) implementation for devices
- “Tighten” device specifications
  - Java Specification Request (JSR) 248 MSA
- Create “aim low” applications
- Fragment applications

- Consider a different design approach

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/overview.html

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Design Approach

- **Traditional vs. suggested approach**
- **Picking the right solution**
- **Optimisation considerations**

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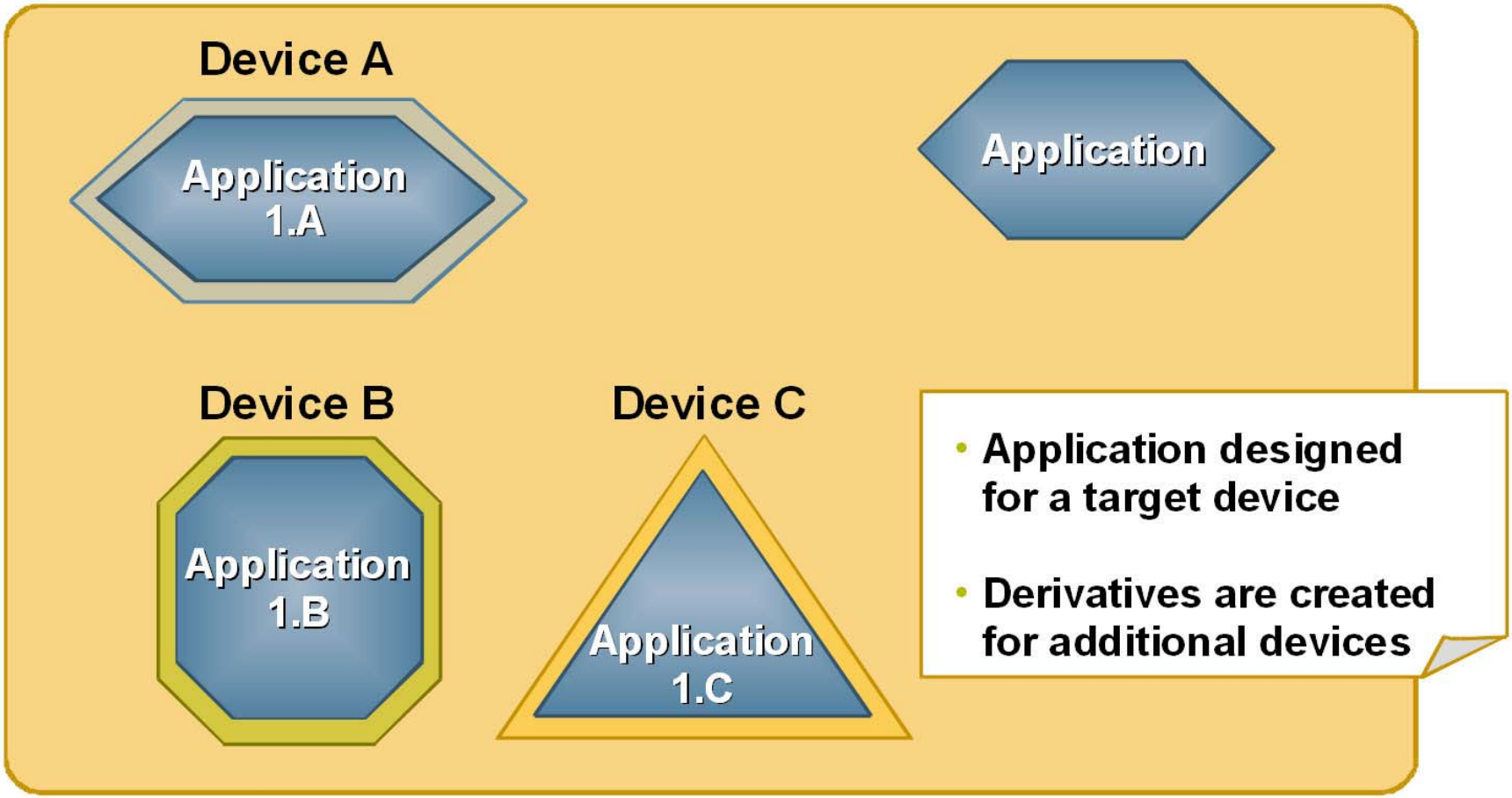
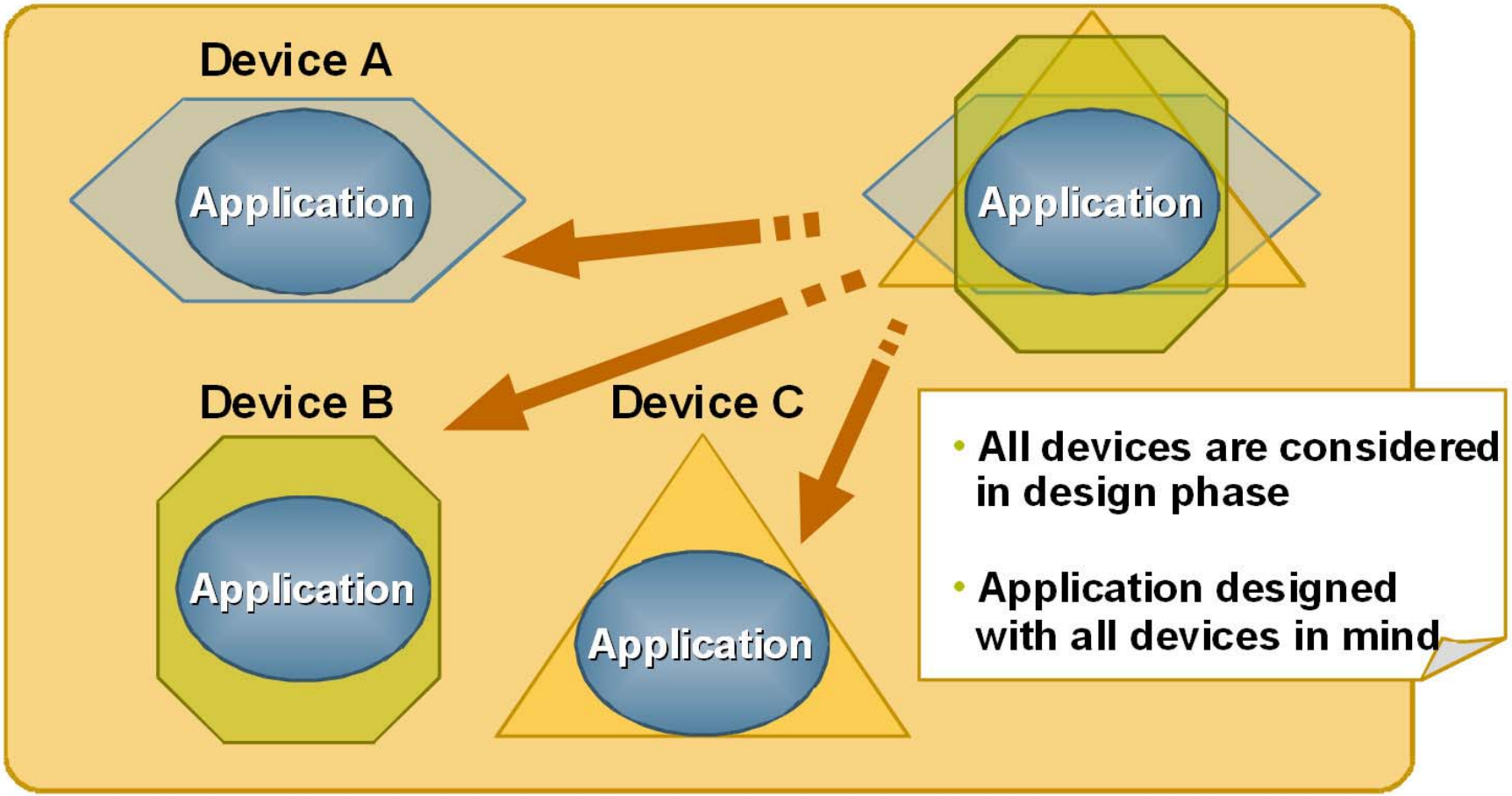
The Traditional Approach

Write once, debug anywhere



The Suggested Approach

Design for a device range



De-Fragmentation Considerations

Selecting the right solution

- Consider application requirements
  - Performance, persistent/heap memory requirements, API support
- Evaluate flexibility
  - Is your application pushing the limits of the device?
- Analyse device capabilities

- **Select your solution!**

De-Fragmentation Considerations

Performance considerations

- The trade-off of flexibility vs.
  - Memory
  - CPU time
  - Feature set
  - Java Archive (JAR) file size
- Device categories

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- **Language**
- **Key input**
- **Screen size**
- **HTTP redirection**

The Sun and Orange Collaboration

Q&A

De-Fragmenting Languages

The challenge

- Support various languages and regions
- Aspects of localisation
  - Text messages
  - Formatting policy (date/time/numeric quantities)
  - String collation—lexicographic sorting

Source: https://www28.cplan.com/javaone05_93_1/session_details.jsp?isid=269828&ilocation_id=93-1&ilanguage=english

MIDP and CLDC Support for Localization

- java.util package:
  - Calendar, Date, and TimeZone classes
- **Use:** `microedition.encoding, microedition.locale`
- User-defined Java Application Descriptor (JAD) file attributes
  - `MIDlet.getAppProperty()`
- Use resource files from the MIDlet suite JAR file
  - `Class.getResourceAsStream`
- **Retrieve classes dynamically**
  - `Class.forName(className)`

Source: https://www28.cplan.com/javaone05_93_1/session_details.jsp?isid=269828&ilocation_id=93-1&ilanguage=english

Solution Overview

- Query device parameters
- Retrieve localised information from:
  - JAD file
  - JAR file
  - Class files

Code Sample—1

Query device parameters

```
// The current locale of the device
System.getProperty("microedition.locale");
// The default character encoding name
```

- `System.getProperty("microedition.encoding");`

Read Messages From JAD File

- Adding user-defined attributes to the JAD file
- One attribute per application string per locale
- Attribute name represents the locale context
- Pros and cons
  - Very simple, does not require extra coding
  - Easy for translators
  - This approach might not be useful for large amount of resources
  - Performance might be affected due to reading of large JAD file
  - This approach addresses only string resources

Code Sample—Messages in JAD File

```
{
    String locale = System.getProperty
                    ("microedition.locale");

    //Get User-Defined attribute from JAD
    String exitStr =
      getAppProperty("hello" + "-" + locale);

    Command exitCommand = new Command(exitStr,
                                      Command.EXIT, 1);
    }

    Attributes in the JAD file
    hello-en-US: hello
    hello-fr-FR: bonjour
```

Read Messages From JAR File

- Text files that contain localized attributes
- Define one file for each locale
- File name contains the locale (e.g., en-US.txt)
- Resource files are bundled in JAR file
- Pros and cons
  - Easy integration with translator work
  - Separate translators can work independently
  - Need to create a stream parser
  - No StringTokeniser
  - Needs to hold the resources in internal data structure
  - Increases startup time

Read Messages From Class File

- Java class files contain localised resources
- Classes are compiled and packaged in JAR file
- Design your own version of Java Platform, Standard Edition (Java SE platform) Resource Bundles
- Resource files are bundled in JAR file
- Pros and cons
  - No stream handling
  - No file parsing
  - This approach addresses all I10n resources, not only strings
  - Difficult to integrate translation work
  - Large footprint on stack/JAR file size

Code Sample—Messages in Class File

```
public abstract class ResourceBundle {
//Gets a resource bundle using the specified base name and
locale
    public static final ResourceBundle getBundle
                (String baseName, String locale){
        String className = baseName + "_" + locale;
        Class c = Class.forName(className);
        ResourceBundle bundle =
                (ResourceBundle)c.newInstance();
        return bundle;
    }
//Gets an object for the given key from this resource
bundle
    protected abstract Object handleGetObject(String key);
}
```

Code Sample—Messages in Class File

```
public class Resources_fr_FR extends ResourceBundle {

    private Hashtable resources = new Hashtable();

    public Resources_fr_FR() {
        resources.put("hello", "bonjour");
        resources.put("bye", "au revoir");
        ...
    }

    protected Object handleGetObject(String key){
        return resources.get(key);
    }
}
```

Code Sample—Messages in Class File

```
{
    //The current locale of the device
    String locale = System.getProperty
                        ("microedition.locale");
    ResouceBundle bundle = ResourceBundle.getBundle
                        ("Resources", locale);
    String exitStr = (String)
                    bundle.handleGetObject("bye");
Command exitCommand = new Command(exitStr,
                                  Command.EXIT, 1);
}
```

De-Fragmenting Key Assignment

The challenge

- On different devices game key events are assigned to different keys
- Soft keys are assigned different key codes

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/key_assignment.html

De-Fragmenting Key Assignment

Possible solutions

- Use MIDP abstraction: `Canvas.getGameAction()`
  - **Will support multiple key pads**
  - **Small footprint solution**
  - **Does not resolve soft keys allocation for customised UI implementation**
- **Use JAD file to map keys to actions**
  - **Requires device research**
  - **Requires large JAD file/JAD file management**
  - **Resolves soft key implementation**

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/key_assignment.html

Code Sample—1

Generating a keyCode data base

```
Class myClass{
    public final static int SOFT_LEFT=-6;
    ...
// This code can be called anywhere in the code
 //Get User-Defined attribute from JAD
int upKeyCode = 0;
int softLeftKeyCode = 0;

String codeStr;
try {
    codeStr = getAppProperty("DEVICE-UP-KEY");
    upKeyCode = Integer.parseInt(codeStr);
    codeStr = getAppProperty("DEVICE-LEFT-SOFTKEY");
    softLeftKeyCode = Integer.parseInt(codeStr);
} catch (NumberFormatException nfe) {
...
```

Code Sample—2

```
// This method returns the assigned keyCode
    public int myGetGameAction(int keyCode) {
        if (keyCode == upKeyCode) {
            return Canvas.UP;
        }
        ...
        if (keyCode == softLeftKeyCode) {
        return myClass.SOFT_LEFT;
        }


    ...
    }
    ...
```

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/key_assignment.html

De-Fragmenting Screen Size

The challenge

- Different devices have different screen sizes
- MIDP does not support image scaling—requires different JAR file for every screen size

De-Fragmenting Screen Size

Possible solutions

- Query device screen size
- Use MIDP 2.0 tiling mechanism
  - Limited to simple background imaging
  - Does not solve character image scaling
- Re-scale images to appropriate size
  - Use `javax.microedition.lcdui.Graphics` ***clipping options***
  - Performance considerations
  - Memory consumption consideration

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/image_resizing.html

Code Sample—Querying Screen Size

```
/* This code can be called anywhere in the application.
 * recommended to use during startApp
 * int width and int height are class members*/

    Canvas dummyCanvas = new Canvas()

   // asuming application will run in full screen
   dummyCanvas.setFullScreenMode(true);

   // get the dimensions of the screen:

   width = dummyCanvas.getWidth ();
  height = dummyCanvas.getHeight();
```

Code Sample—Resizing the Image

```
int srcWidth = src.getWidth();
int srcHeight = src.getHeight();
Image tmp = Image.createImage(screenWidth,srcHeight);
Graphics g = tmp.getGraphics();
int ratio = (srcWidth << 16) / screenWidth;
int pos = ratio/2;

//Horizontal Resize

for (int x = 0; x < screenWidth; x++) {
//public void setClip(int x, int y, int width, int height)
    g.setClip(x, 0, 1, srcHeight);
    g.drawImage(src, x - (pos >> 16), 0, Graphics.LEFT
|                                   Graphics.TOP);
   pos += ratio;
}
```

Code Sample—Resizing the Image

```
Image resizedImage = Image.createImage(screenWidth,
                                       screenHeight);
g = resizedImage.getGraphics();
ratio = (srcHeight << 16) / screenHeight;
pos = ratio/2;

//Vertical resize

for (int y = 0; y < screenHeight; y++) {
    g.setClip(0, y, screenWidth, 1);
    g.drawImage(tmp, 0, y - (pos >> 16), Graphics.LEFT |
                                    Graphics.TOP);
    pos += ratio;
}
```

De-Fragmenting Screen Size

Solution considerations

- Memory/performance trade off
  - Call once at first startup and save resized images to memory
- How to categorise devices?
- How to decide which image to use?

Source: http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/image_resizing.html

De-Fragmenting HTTP 302 Code

The challenge

- Different devices handle the HTTP 302 code in different ways
  - Implementation returns 302 code to the MIDlet
    - “Expected” behavior
  - Implementation handles the redirection
    - Returns 302 but redirect address is set to null
    - When the redirection will be complete a Code 200 is received
  - Redirect address is inside the response content
    - Due to bad parsing of HTTP headers

Solution approach—build robust code to handle all cases

- **Wait after 302 code is received**
- **Parse response content for redirection**

http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/http_redirection.html

DEMO

Verifying solutions on NetBeans™ Mobility Pack for CLDC

Screen size

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- **Background**
- **Outcomes**
- **How can you help?**

Q&A

Sun and Orange Collaboration

Background

- Goals
  - Reduce the number of application derivatives submitted to Orange
  - Provide short-term solution as part of a long-term quality improvement program
- Time frames
  - 18 months to date

Sun and Orange Collaboration

- Audience: Developers, operators and the Java platform eco-system; what's good for one is good for all
- Java platform fragmentation: Identified as root cause of growth restriction
- Action plan
  - Short term: Application guidelines
  - Mid to long term:
    - Influence future standards
    - Raising the bar on quality
- Generating positive change immediately and a brighter future

Releasing to the Community

What have we come up with so far?

- Stay tuned for a press release!

- Sun Developer Website
  - http://developers.sun.com/techtopics/mobility/reference/techart/design_guidelines/overview.html
- Orange partner website
  - http://www.orangepartner.com/site/enuk/develop/initiatives/java_fragmentation/l_fragmentation.jsp
  - http://www.orangepartner.com/site/enuk/develop/initiatives/java_fragmentation/l_java_design_guides_index.jsp

Summary

- Fragmented applications are an unsustainable headache
- Long-term solutions are being explored
- There is no magic solution
  - More sophisticated design and coding
  - Use guile rather than brute force
- Match solution to application requirements
  - Consider trade-offs
- Design for device categories

Q&A

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