MIDP 2.0

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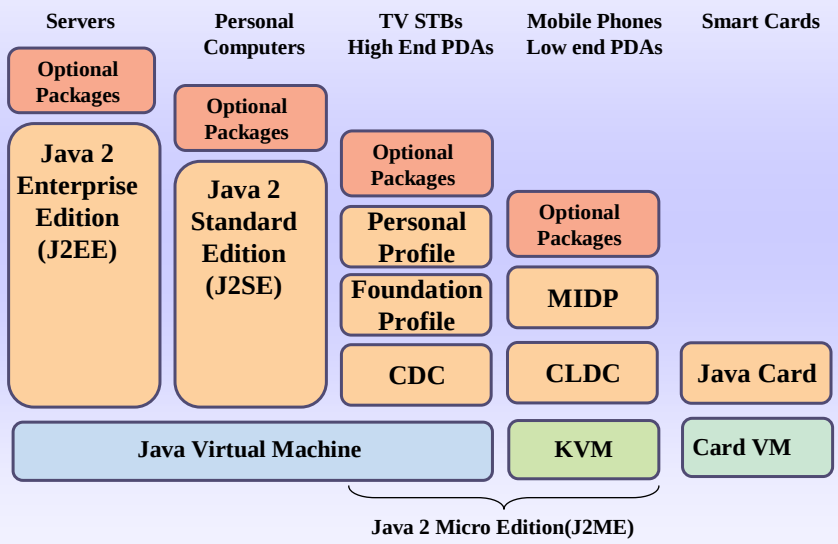
T-111.590 Research Seminar on Digital Media
Digital TV Services in Handheld Devices

Outline

- Java Overview (Editions/Configurations/Profiles)
- Java 2 Micro Edition (J2ME)
  - Connected Device Configuration (CDC)
  - Connected, Limited Device configuration (CLDC)
- Mobile Information Device Profile (MIDP)
  - Architecture
  - User Interface
  - Multimedia
  - Problems



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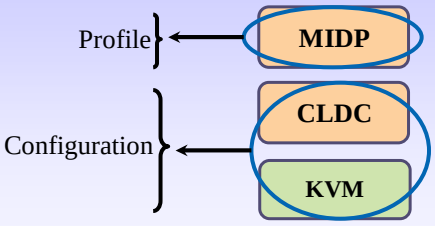
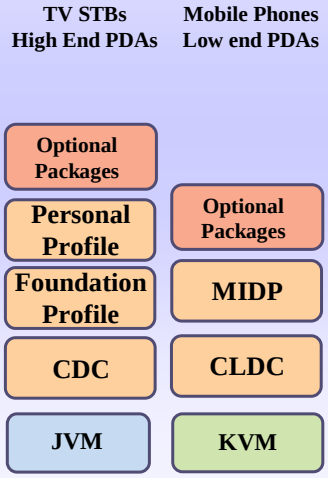
Java Overview

- Nowadays, trying to target all kind of computer devices
- Editions:
  - Java 2 Enterprise Edition (J2EE): for servers and enterprise computers
  - Java 2 Standard Edition (J2SE): for servers and personal computers
  - Java 2 Micro Edition (J2ME): for embedded devices, PDAs, mobile phones, and Digital television set-top boxes
  - Java Card: for smart cards
- Profile
  - Requirements for a specific vertical market of devices (set of APIs)
- Configuration
  - Minimum platform for a horizontal grouping of devices (VM + core APIs)

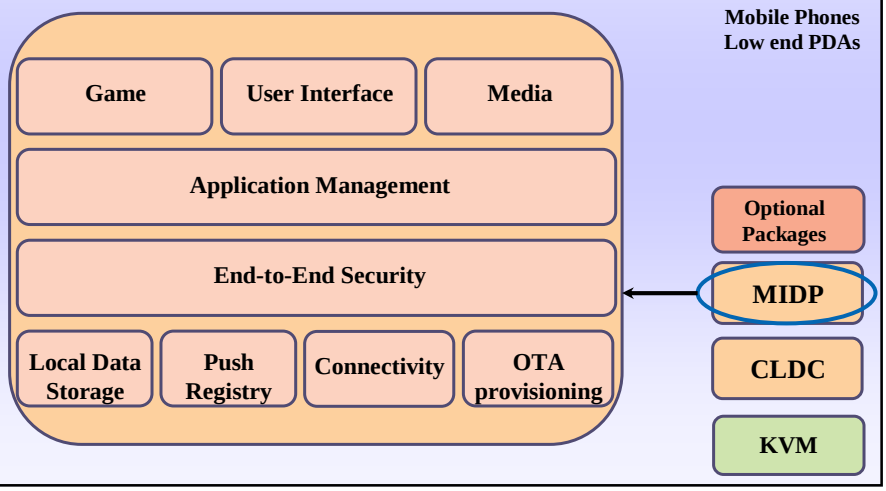


J2ME

- Defines two Configurations:
  - CDC: High end consumer devices
    - Processor: 32 bits
    - RAM Java Memory: around 2MB
    - ROM Java Memory: around 2.5MB
  - CLDC: Low end consumer devices
    - Processor:16 bit/16 MHz or higher
    - Java total memory: 160-512 KB
    - Power: Limited power
- CDC (Connected Device)
  - Personal Profile
    - Adds support for lightweight AWT
  - Foundation Profile
    - Basic application APIs (no GUI)
- CLDC (Connected Limited Device)
  - Mobile Information Device Profile (MDIP)
    - Application APIs + GUI APIs



MIDP Architecture



MIDP Architecture

- Basic Layer
  - Local data storage
    - Persistent storage of data
  - Push Registry
    - Allows MIDlets to be launched in response to incoming network connections (e.g., alerts)
  - Connectivity
    - Connection for datagrams, sockets, and server sockects
  - OTA provisioning
    - Simplifies the way applications are delivered to consumers
    - Ability to dynamically deploy and update applications over-the-air (OTA). How applications are discovered, installed, updated...
- Second Layer
  - End-to-End security
    - MIDP provides a robust security model: http and https connections, and public key management

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MIDP Architecture

- Third Layer
  - Application Management
    - Applications are called MIDlets, manager in charge of controlling their state
- Higher Layer
  - Game
    - Specific game API for developers
  - User Interface
    - Both High Level (ready made widgets), and high level API (developer can paint on the screen)
  - Media
    - Audio utilities API

MIDP User Interface

- User interface for handheld devices are different from PCs
  - Smaller display size
  - Input device not always include pointing device
- MIDP is not a subset of AWT!!!!!!
  - AWT is designed for PCs
  - AWT assumes certain interaction models (e.g., mouse)
  - AWT assumes the use of Windows (drag, move, resize)

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MIDP User Interface

- Basic Class (Display): output device of the mobile phone
  - 1 display -> multiple Screens
  - 1 Application -> 1 Display
- Basic interface (Displayable): each screen of the services
  - 1 Application -> multiple Displayable objects
- Two kind of Displayable Objects (Cannot be mixed):
  - Screen: High Level API, each MIDP application has a Display in which a single screen is shown (title, multiple commands, ticker)
  - Canvas: Low Level API, it is extended for drawing

MIDP User Interface

- High Level API
  - Intended for applications where portability is important
  - High Level widgets, developer has no control on their look (appearance) and feel (interaction)
- Low Level API
  - Intended for applications where portability is not as important as control over the graphics
  - Developer has full control over what is drawn, where, and how

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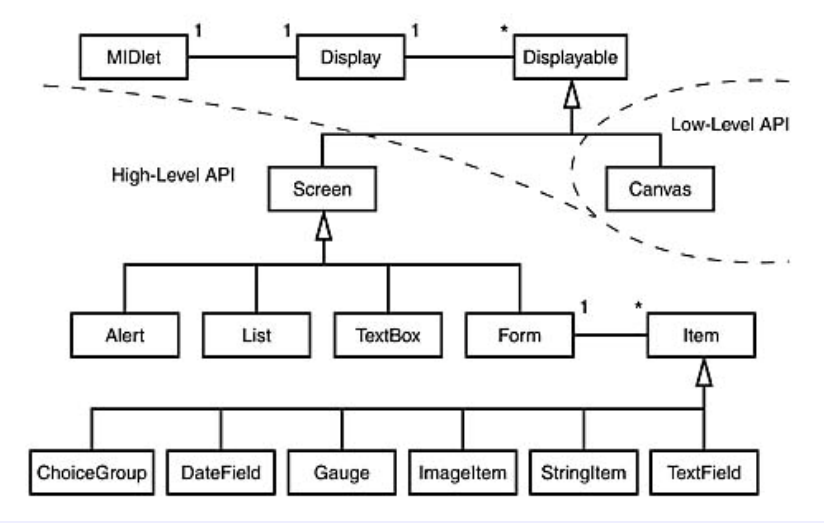
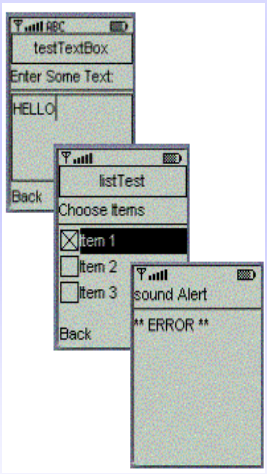


MIDP User Interface: High Level API

- TextBox:
  - Screen that allows the user to enter and edit text
- List
  - Screen that contains a list of choices
    - Implicit: like a menu
    - Exclusive: select one element (radio buttons)
    - Multiple choice: select many elements (check boxes)
- Alert
  - Screen that shows a message and an optional image to the user



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MIDP User Interface: High Level API

- Forms
  - Screen that contains a combination of items
- Items:
  - Components of a Form
    - ImageItem, StringItem, TextField, ChoiceGroup, DateField, Gauge

MIDP User Interface: Low Level API

- Developer extends Canvas class and overrride the paint method to create her own widgets
- Allows developers to:
  - Control what is drawn on the display
  - Handle primitive events (e.g., Key Released)
  - Access concrete keys and other input devices
- Similar to AWT's Graphics:
  - Drawing model: there is not composition of images, the canvas is visible in the display or not visible
  - Double buffer: canvas can be stored as a off-screen image buffer
  - Coordinte system: origin is the upper-left corner of the display
  - Translation: the coordinte system can be translated over X or Y axis
  - Clipping: clipping is possible (so, no modifications are done over constant pixel values)
  - Color model: both gray scale (0 to 255) or color (24 bits)
  - Fonts: requested to the device (never created)

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MIDP Multimedia

- Game API (MIDP 2.0)
  - GameCanvas: subclass of Canvas with specific game functionalities
  - Layer: visual element of the game (abstract class)
    - Sprite: animated layer that can display several graphical frames
    - TiledLayer: enables the creation of large areas of content, but at a low resource cost
  - LayerManager: to control the layers and the user's view
- 3D Graphics API (optional package)
  - Two APIs for displaying 3D content
    - Immediate mode API: create and manipulate 3D elements directly
    - Retained mode API (scene graph): load and display entire 3D scenes
- Mobile Media API (MMAPI) (optinal package)
  - Extends MIDP functionality by providing audio, video and other time-based multimedia support
  - It is not JMF
  - MIDP 2.0 includes the audio-only subset

Problems

Size of graphics package:
- CLDC: 436 KB
- CDC: 527 KB

New Classes:
- Form (Container?)
- CustomItem (Component?)

Interoperability: