Introduction to Mobile Systems

MN1374

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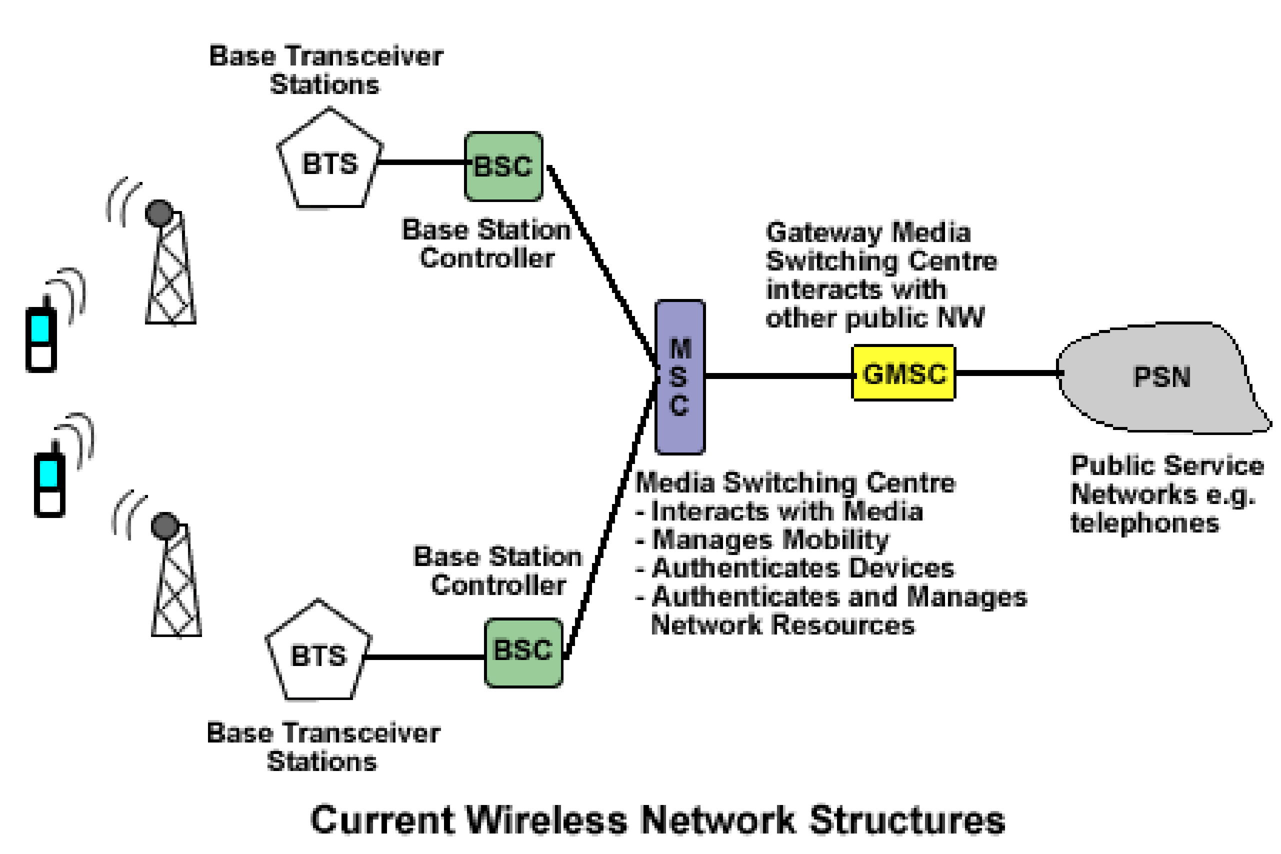
Topics

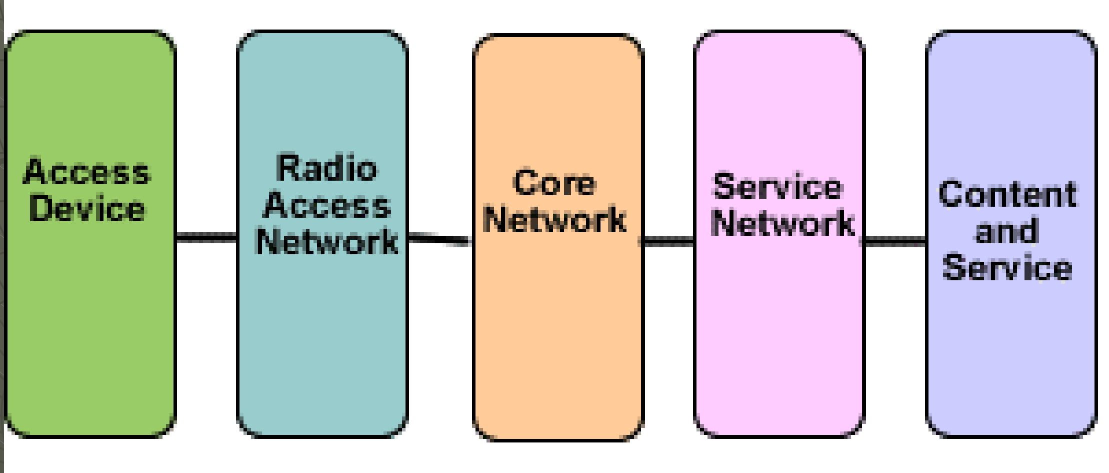
- How Mobile Systems Work (Present & Future)
- Introduction to enabling technologies (specifically Java Technology)

Wireless Systems Architecture (Current)


Base Transceiver Stations
BTS
BSC
Base Station Controller
Gateway Media Switching Centre interacts with other public NW
M S C
GMSC
PSN
Media Switching Centre
- Interacts with Media
- Manages Mobility
- Authenticates Devices
- Authenticates and Manages Network Resources
Public Service Networks e.g. telephones
Base Station Controller
BTS
BSC
Base Transceiver Stations
Current Wireless Network Structures

Source: Sun Micro Systems Educational Services

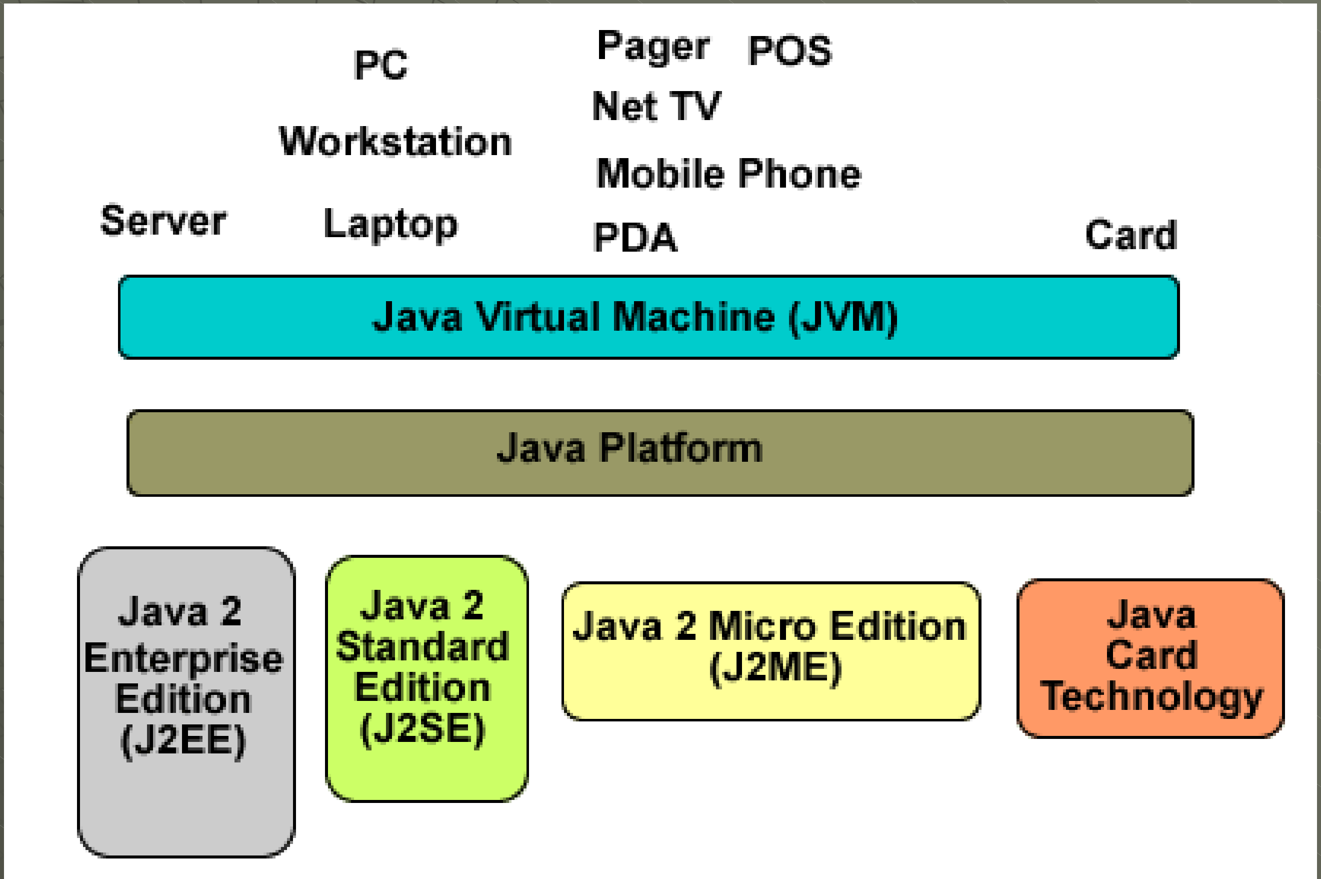
Wireless Systems Architecture (Possible Future Scenario)



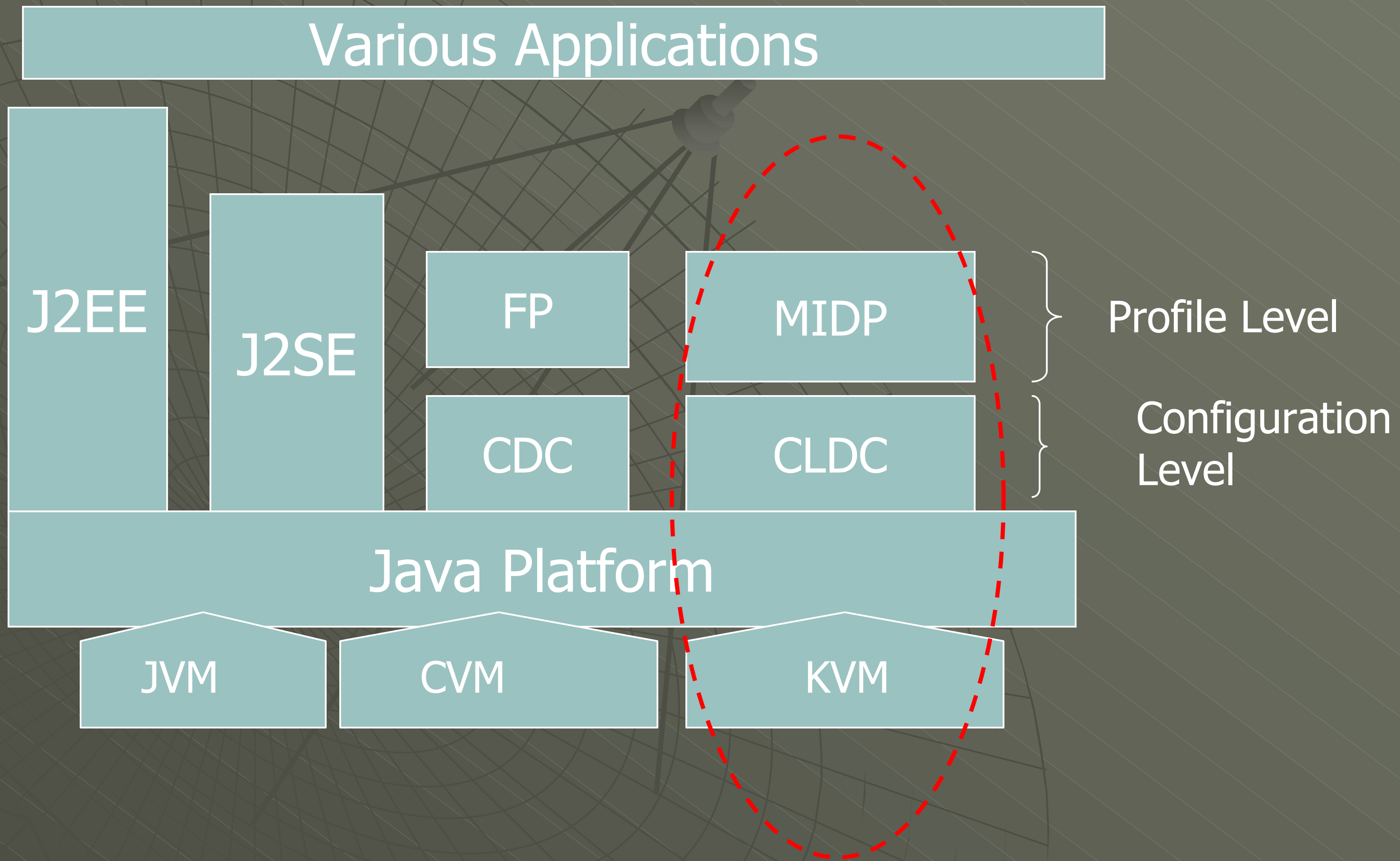
Future Architecture of Wirelss Systems

Source: Sun Micro Systems Educational Services

Java™ Platform


PC
Pager
POS
Net TV
Workstation
Mobile Phone
Server
Laptop
PDA
Card
Java Virtual Machine (JVM)
Java Platform
Java 2 Enterprise Edition (J2EE)
Java 2 Standard Edition (J2SE)
Java 2 Micro Edition (J2ME)
Java Card Technology

J2ME Schematic



J2ME Platform

- Extends java programming language to consumer and embedded devices - new virtual machine (CVM)

- Categorises devices based on memory capacity, power and display

- Guarantees smooth integration of device applications into existing J2SE and J2EE platform application

J2ME Components

- *Configurations (CLDC):*
  - defines a minimum Java platform for a family of devices
  - Members of this family all have similar requirements for memory and processing power

- *Profiles (MIDP):*
  - specifies application-level interface
  - consists of a set of Java class libraries that provides this application level interface.
  - can theoretically specify all kinds of functionality and services.

Connected Limited Device Configuration (CLDC)

- Supports PDAs, mobile devices, pagers etc.
- Defines a standard java Platform for consumer devices
- Focuses on generality and portability
- Target devices have 160-512 KB memory available
- 16-bit or 32-bit processor
- Power consumption constraints (mainly battery powered)
- Intermittent network connectivity

Kilo-Byte Virtual Machine (KVM)

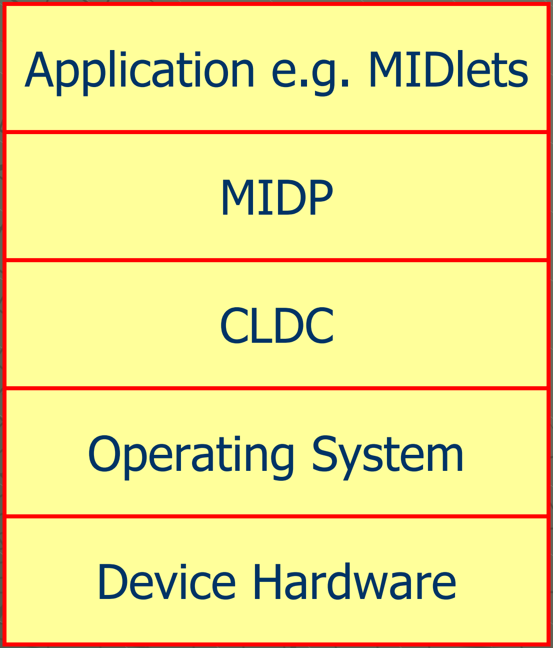
- CLDC defines a VM that is highly portable and designed for resource constrained devices

- The VM that comes with CLDC reference implementation is called KVM. It is not a full featured JVM

Mobile Information Device Profile (MIDP)

- Most popular and well-known
- Sits on top of ***CLDC*** configuration
- Defines a set of user interface (UI), networking, local data storage and APIs for current mobile devices
- A MIDP application is called a ***MIDlet***
  - A MIDlet is a java application that uses MIDP and CLDC to be run on a mobile device
  - A MIDlet suite is one or more MIDlets packaged together using a Java Archive (*JAR*) file
- MIDP commonly exists on mobile phones, PDAs and pagers

J2ME Platform Layers



Application e.g. MIDlets

MIDP

CLDC

Operating System

Device Hardware

Running a J2ME application on a device

- Creating a Run-Time environment (CLDC & MIDP)
- Application Management Software (AMS)
- Java Archive File (JAR)
- Java Descriptor File (JAD)

Application Management Software (AMS)

The **Application Manager** Software is installed on the device and is:

1. Device Dependent (manufacturer specification)
2. Responsible for installing, running and removing MIDlets

Java Archive Files (JAR)

JAR files contain:

1. Java classes

2. Resources (images and application data files)

3. Manifest file (manifest.mf): The system attributes are defined in Manifest files such as:

    - MIDlet Name, MIDlet Version, MIDlet Vendor, MIDlet <n>, Micro-Edition Profile, Micro-Edition Configuration, etc.
    - Compulsory / Optional

Java Descriptor File (JAD)

JAD files may be available as part of the MIDlet suite to provide information about the MIDlets within a *JAR* file.

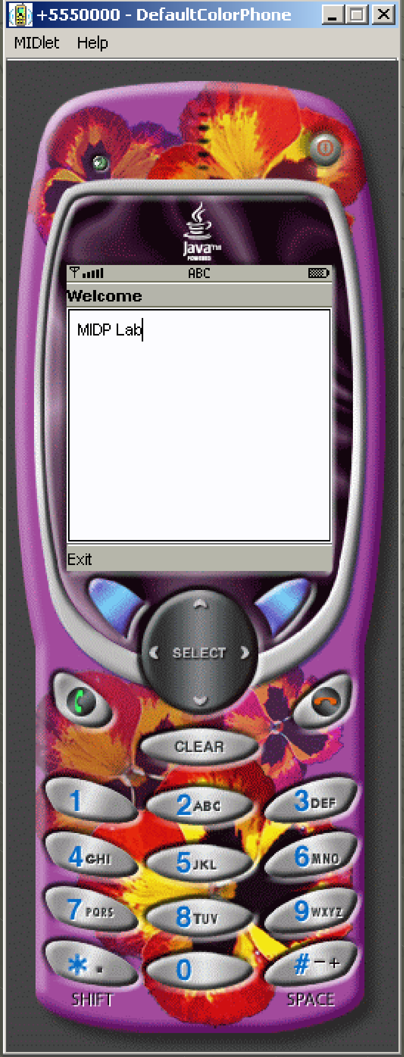
The rationale behind using *JAD* file:

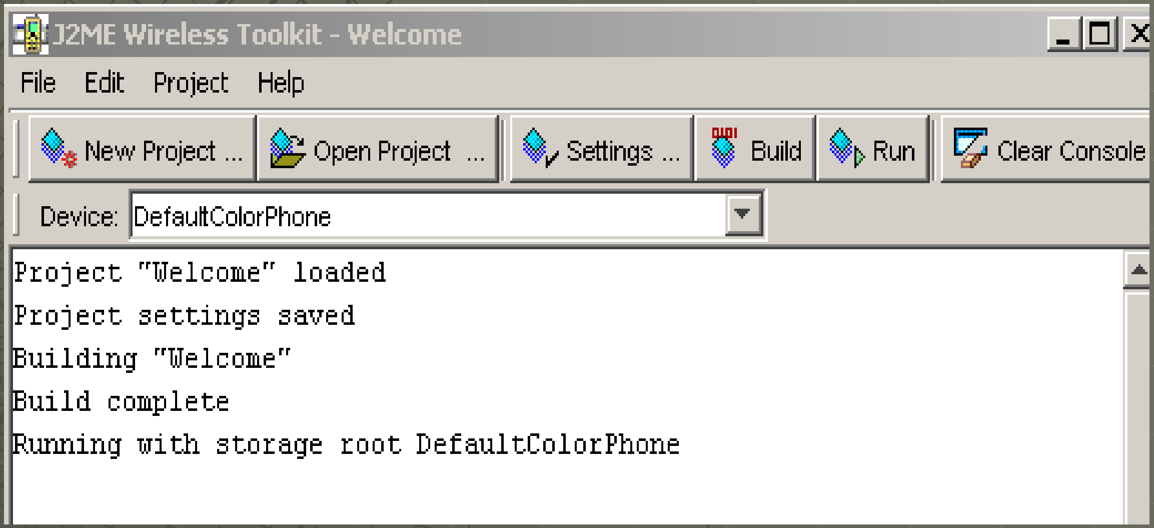
1. Provides information to the application manager about the contents of *JAR*
2. Provides means for parameters to be passed to a MIDlet without having to make changes to the *JAR*

The steps for developing and testing MIDlets (J2ME Application)

1. Write the program in Java for the MIDlet
2. Compile the MIDlet source code
3. Pre-verify the MIDlet compiled code – ensure that the code executes safely – it verifies codes before downloading on device
4. Provide attributes that are used during the application installation and execution (create the “manifest.mf” file)
5. Package the MIDlet by creating the *JAR* file containing the application resources and the *JAD* file containing application information. It helps to keep applications organised
6. Execute the application using the emulator

Example





Device: DefaultColorPhone

```
Project "Welcome" loaded
Project settings saved
Building "Welcome"
Build complete
Running with storage root DefaultColorPhone
```