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Embedded Java: Smart, Connected, Pervasive

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JAVA
(LIKE SPACE)
IS BIG. REALLY BIG.





	Servers	Desktop	Embedded	TV	Mobile	Card
Key APIs	Java EE	JavaFX		BD-J Java TV	MSA	
Platform	Java SE			Java ME		Java Card
Language	Java Language					

Java Platform

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Java Everywhere

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Java Metrics

- 5 billion Java Cards in use
- 3 billion Java-based handsets
- 850+ million Java desktops
- 120+ million Java-based TV devices
- All Blu-ray disc players ship with Java
- Many more embedded devices with Java everywhere

Run Anywhere

Java: The Best Platform for Embedded Applications

1. Decouples software development from hardware development cycle
2. Development and testing can be done (mostly) using standard desktop systems
3. Highly productive language, APIs, runtime, and tools mean quick time to market
4. Create high-performance, portable, secure, robust, cross-platform applications easily
5. Java isolates your apps from language and platform variations (e.g. C/C++, kernel, libc differences)
6. Most popular embedded processors supported allowing design flexibility
7. Support for key embedded features (low footprint, power mgmt., low latency, etc)
8. Leverage huge Java developer ecosystem (expertise, existing code)
9. Easily create end-to-end solutions integrated with Java back-end services
10. Solutions from constrained devices to server-class systems

Java Mobile & Embedded in 2011

- NFC payments, e-passport
- M2M and embedded security

- 3 billion phones, 125 million TV's running Java
- Web integration, new UI technologies

- Embedded apps connected to the Enterprise
- New TV apps e.g. Media/web servers streaming

Design Objectives

Java ME – Moving Forward

Bridge the Java SE/Java ME divide

- Synchronize CLDC and JDK releases
- Converge CDC and Java SE Embedded

Full coverage of embedded vertical markets

- Java Platform covering all CPU/Footprint variants
- Dedicated APIs for vertical market segments

Deep integration of content and services

- Services embedded into Oracle runtimes and tools
- Developer/consumer access to carrier services

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Bridging the Java SE/ME divide

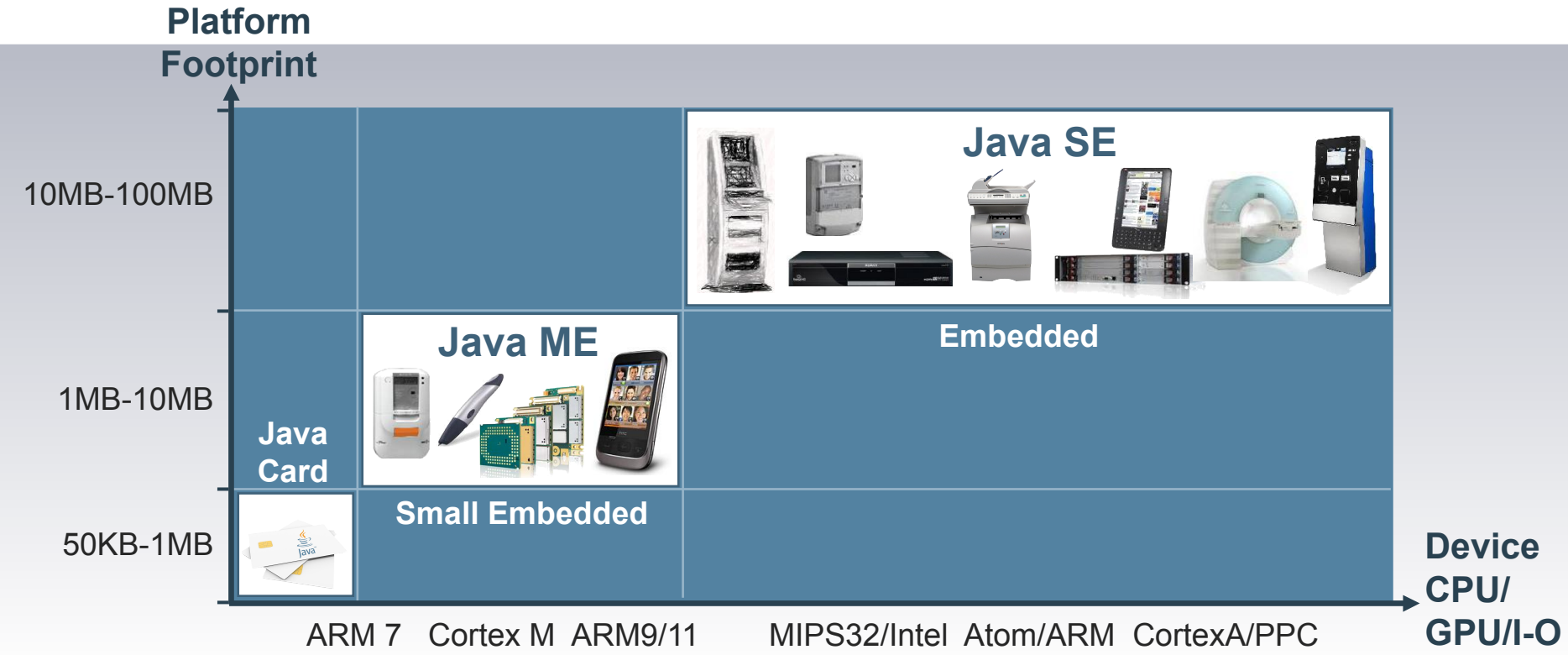
Java ME 7 & 8

- Java ME alignment with SE
  - Synchronized releases
  - Latest Java language support
  - Java ME APIs can run on Java SE
  - Consistent tool interfaces
- New APIs for mobile phones and billions of connected devices

CDC/Java SE 8 convergence

- “CDC Profile” in SE 8
  - Porting CVM features to Hotspot JVM
  - JDK 8 libraries with smaller and faster variants/subsets
- JavaFX as graphics framework
- Best features and performance from CDC and SE for Embedded

Java technology for Embedded Device - 2013



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Java SE for Embedded

Example Markets & Deployments

- ATMs
- Parking Meters
- POS Systems
- Lottery/Gaming Systems
- Multi Function Printers
- Intelligent Power Module
- Netbooks

- Routers & Switches
- Storage Appliances
- Network Management Systems
- Medical Imaging
- Radar
- Industrial PCs
- Factory Automation
- Geo-Imaging Devices

- Smart Meters
- RFID Readers
- Video Conferencing
- In-Flight Entertainment
- Video Streaming
- Electronic Voting
- Voice Messaging
- Security

Oracle Java ME Embedded Client

Example Markets & Deployments

- Ported to a number of processors and operating systems

- Digital TVs, Set-tops, & Media Players
- Blu-ray Players
- Network Equipments & Storage Devices
- VoIP Telephony
- eBook Readers
- Smart Grid/Meters
- Automotive/Telematix
- Multi-Functional Printers (MFP)
- Handheld Terminals/Kiosk

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Advanced VoIP Phone

- Enterprise-class voice communications
  - Advanced call features
  - Remote provisioning and management
  - Integrated with enterprise systems
- Advanced User Experience
  - UI fully customizable
  - Full Touch Screen support
  - Advanced graphics and rendering
  - Interactive video
  - Extensibility through applications
- Built on Java

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Java Embedded breaks free of the Blu-ray Disc

Demo : “Postcards from Rio”

Courtesy of Twentieth Century Fox

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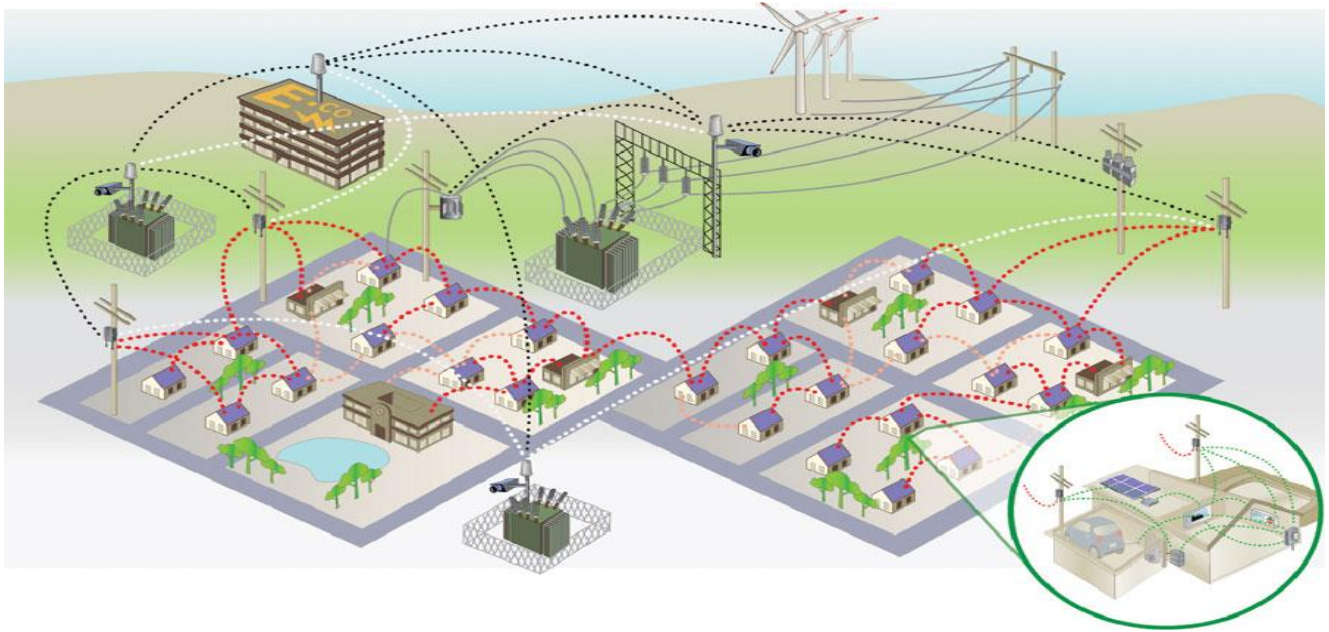
Java in Smart Metering



EnergyICT
Java SE Embedded Based
Smart Meter Concentrator

Automated Meter Management

- The EDF group is a leading energy provider in France
  - Due to regulations EDF is obligated to buy their devices (meters, concentrators) from several different companies
- Concentrators built by EDF Vendors run Java ME
  - Atos Origin built a Java application to run on the concentrators
  - If EDF decides to upgrade or provision hardware from another manufacturer, the concentrator application will still work

Kronos® InTouch™

Smart Time Clock

- New User Experience
  - Flexible touch-screen UI
- Connected
  - Biometric ID, card reader
  - Integrated with back-end services
  - Built for the cloud
- Extensible
  - Kronos App Platform
- Built on Java

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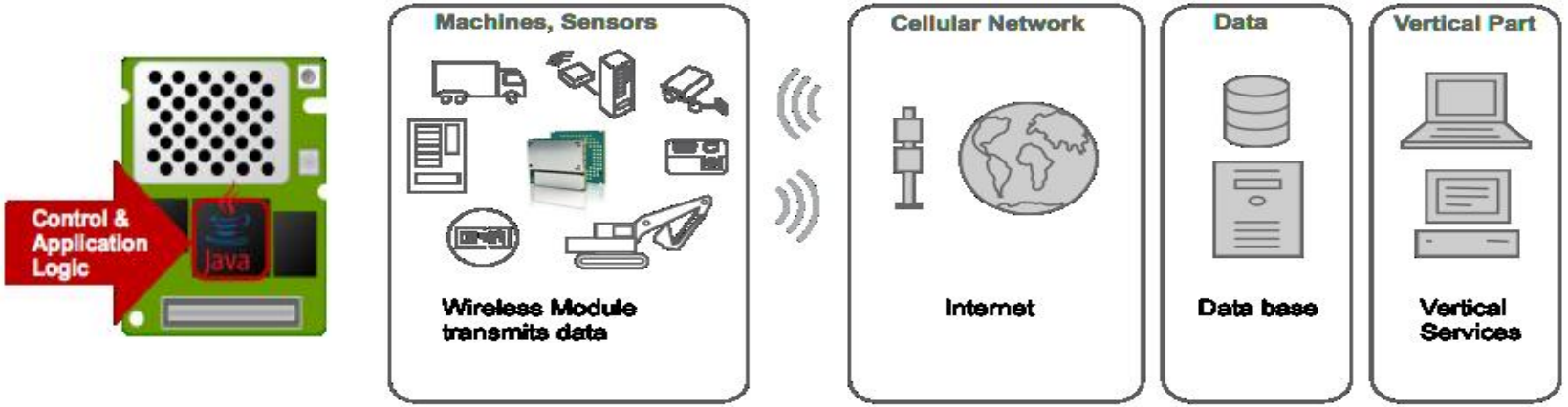
Java in M2M

The Internet of Things: The next 50 Billion ...



- Connect with “Out of Reach” data and processes
- Dramatically increase efficiency
- Enable new business fields

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Cinterion Wireless Modules

Smart, Connected, Versatile

- Small and Wireless
  - Highly integrated, 2G/3G connectivity (voice + data), low power
- Smart & programmable
  - CPU, RAM/Flash, I/O, SIM
  - Java Runtime
- Add intelligence and connectivity to vertical solutions
  - Automotive, mHealth, industrial automation, sensing, logistics, security, monitoring, ...

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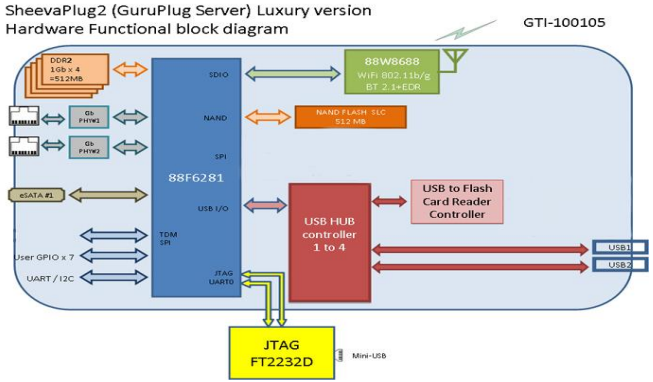
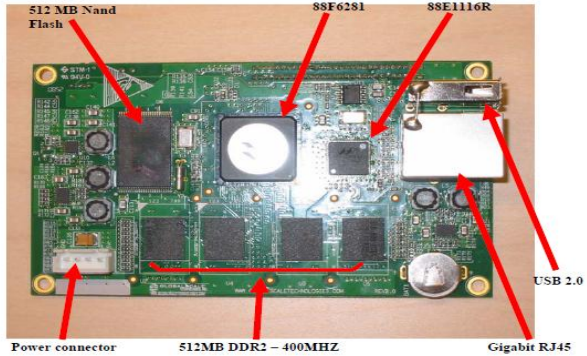
Embedded Java Platform Example

GuruPlug

- Low Power ARM/Linux based device design by Marvell
  - 1.2 GHz CPU, 512MB RAM, 512MB Flash, <20W power
  - USB, eSata, gigabit Eth, WiFi, microSD, GPIO
  - ca. 100-120 US$ for single devices
- Complete, powerful, flexible Linux server
- Runs Java SE Embedded or OJEC (CDC)





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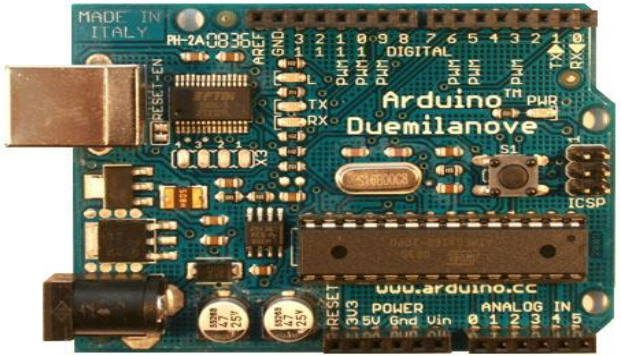
Microcontroller Example

Arduino Duemilanove



- Microcontroller: AVM ATMega168
  - 20 Mhz, 8 bit, 1K SRAM, 16KB Flash
  - 8 ch. A/D, 23 I/O pins
- Arduino Board
  - USB, LED, button, headers, power via USB
  - Many add-on boards (shields) available (sensors, drivers, etc)
  - Other form factors/price points available
- Software development
  - No OS, code runs on bare metal
  - Develop in C using Java-based Arduino IDE

Demo

- Sensing environmental data with Java
- Development, remote deployment, and live debugging with NetBeans

Resources

- Oracle Embeddable Java Overview
  http://oracle.com/us/technologies/embedded/embeddable-java-185427.html
- Java Embedded Home
  http://oracle.com/technetwork/java/embedded/
- Java ME (incl. Mobile) and Java Card Home
  http://oracle.com/technetwork/java/javame
- Blogs and News
  http://blogs.oracle.com/java
  http://terrencebarr.wordpress.com
- The Java Spotlight Podcast
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Thank You!