



The following is intended to outline our general product direction. It is intended for information purposes only, and may not be incorporated into any contract. It is not a commitment to deliver any material, code, or functionality, and should not be relied upon in making purchasing decisions. The development, release, and timing of any features or functionality described for Oracle's products remains at the sole discretion of Oracle.



# Developing with Berkeley DB and Oracle Database Mobile Server for Java Embedded

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Consulting Member of Technical Staff

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MAKE THE  
FUTURE  
JAVA

ORACLE®

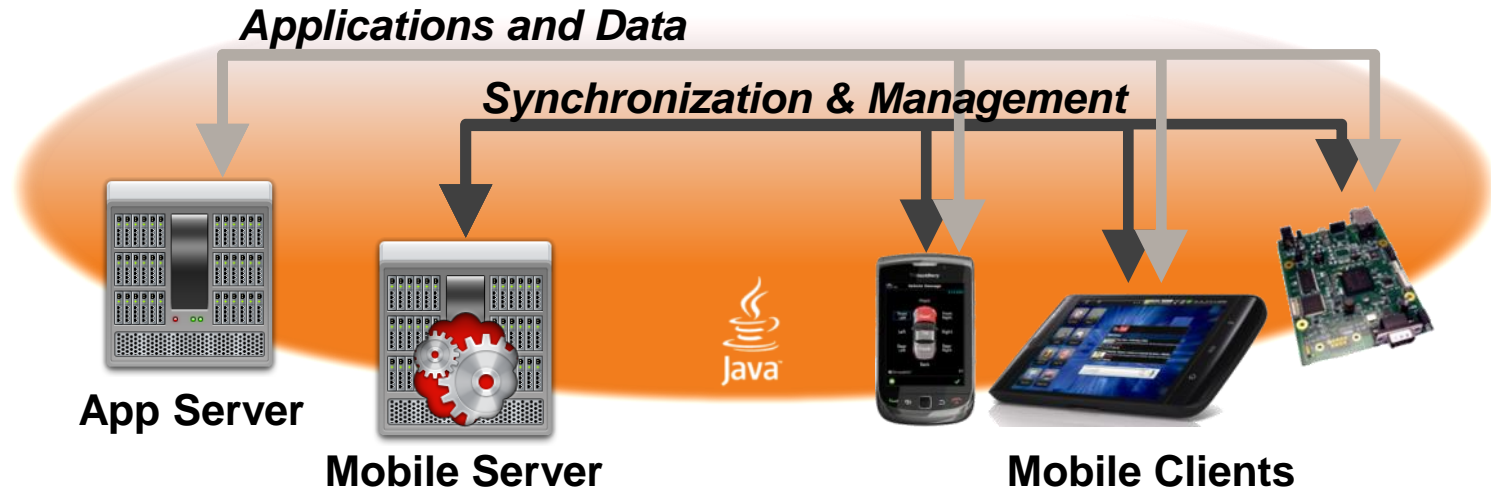
# Program Agenda

- Java Embedded Overview
- Java Embedded Development
- Berkeley DB, with Use Cases
- Database Mobile Server with Use Cases
- Getting Started



# The Oracle Java Advantage

## Single Unified Platform And Language`



# Java Embedded

- Deployed on billions of devices, amazing variety
  - Multi-function printers
  - VOIP Phones
  - E-book readers
  - Medical equipment
  - Industrial controllers
  - Smartphones, feature phones
  - Electric Metering
  - *and many more...*



# Overview: Java Embedded

## What is Java Embedded?

- **Proven & Stable, Huge Developer Base, Rapid Application Development**
- **Fully Object Oriented, Runs on a Virtual Machine**
- **Memory Management, Portability, Cross Platform ...**
- **Multi-Thread, -Process and -CPU/Core support**
- **Security**
- **Networking**



# Overview: Java Embedded (cont)

## What is Java SE Embedded?

- **Fully implements Java SE specification**
  - **Significant memory optimizations**
    - **Smaller persistent (ROM/disk) and volatile (RAM)**
  - **Runtime optimizations**





# The Spectrum of Java



Servers

Desktop

Embedded

TV

Mobile

Card

BD-J

Java EE

JavaFX

Java TV

MSA

Java SE

Java ME

Java Card

Java Language

# Best Practices for Java Embedded

## How is it best used?

- Managing limited memory
  - Static initializers
  - Lazy memory allocation
- Limiting static footprint size
  - Ahead-of-Time Compilation
- Limiting use of threads
- Dealing with lower powered CPUs
  - ARM devices



# Developing for Java Embedded

Where is it used?

- **Embedded Devices**
- **Smaller memory and lower powered CPUs**
- **Wirelessly networked**
- **Headless or small screens**
- **Limited input (touchscreen or keypad)**



# Java Platform Overview

## SE Embedded

- Small footprint
- Full Java 1.6 API available

## ME

- Smaller footprint
- Install base in the billions

## Java Card™

- Smallest footprint
- Install base nearing 10 billion

# Java Platform Overview

## SE Embedded

- Small footprint
- Full Java 1.6 API available
- Large Commercial / Industrial
- “fixed location” assets

## ME

- Smaller footprint
- Install base in the billions
- Mobile devices
- Dominates the feature phone market

## Java Card™

- Smallest footprint
- Install base nearing 10 billion
- M2M networks
- Cyber-physical systems

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# Oracle Databases

## Full Range

Healthcare Equipment

Industrial Systems

Manufacturing Systems

Semiconductor Equipment

Communications Systems

Telecom Billing

IP Multimedia Systems

Core Networking Systems

Telco Soft switches

Call Centers / CRM

Gateways / Metadata

Storage, Config & Sys Mgmt

Security / Authentication

Mobile Services Software

Messaging and Queue Mgmt

Mobile Devices

Telematics

Field Force Automation

Point-of-Sale Devices

Distrib Asset Mgmt

**ORACLE®**  
DATABASE



Data Center  
Applications

**ORACLE®**  
TIMESTEN



Edge Applications

**ORACLE®**  
BERKELEY DB



Mobile  
Applications

**ORACLE®**  
BERKELEY DB



# The Oracle Berkeley DB Advantage

Single Database For All Edge/Mobile/Embedded/M2M

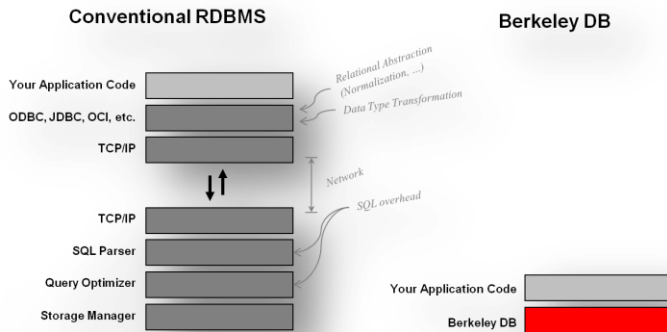
*High Performance, Low Overhead Data Management*





# Why an embedded database?

- Performance
- Zero Admin
- Simplicity
- Small but Scalable



# Berkeley DB

## What is it?

- A library that links directly into your application
  - Transparently store and query data, without incurring the client/server overhead
- Provides very fast, highly reliable, scalable, recoverable local data storage
  - With zero external administration
- Used extensively in middle-tier, edge, mobile or embedded applications
  - Often serving as part of the enabling infrastructure, gateways or as the mobile data repository
- Do more with less
  - Through high performance, reliability, small footprint and flexibility



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# Berkeley DB

## Product Feature Review

- Berkeley DB is very fast, and also
  - Scales to terabyte datasets
  - Concurrent
  - Proven 5 9s or better reliability
  - Fully ACID transactional
  - Small Footprint
  - Secure
  - Integrates with all major IDEs
- Multiple API options: Key/Value (NoSQL), SQL API (SQLite)
- Self contained; no DBA required
- High Availability (HA) with automatic failover
- Operate in memory, on disk, or both



# Application Development Requirements

## Trends

**Preference for Open Source technology**

**Data: at the edge, on the move**

**Services: Hands-off, lights-out, always-on**

**Web Requirements: Speed, Scalability**

**SaaS Requirements: Reliability, Availability**

## Business Needs

**Reduce development time**

**Minimize cost, risk**

**Focus valuable resources on core competency**

**Technologies that can be leveraged across all products**



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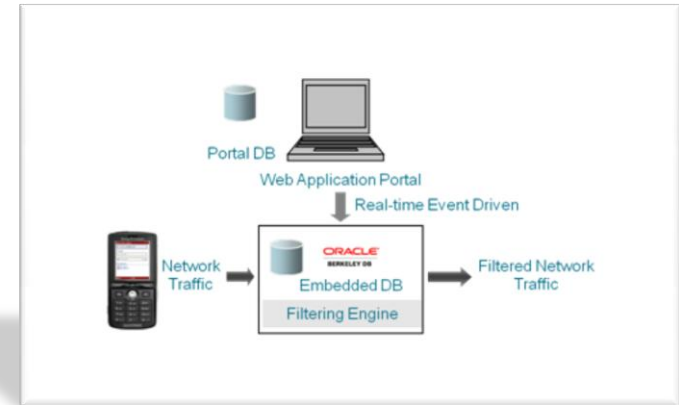




# Real Time Content Protection

## Berkeley DB delivered:

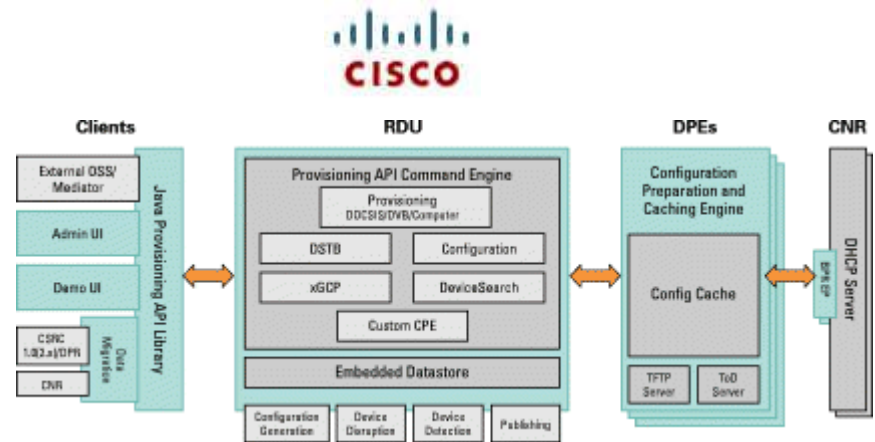
- Very fast, concurrent access
- Durable, scalable, zero admin
- Small footprint
- No extra hardware & fewer critical nodes
- Easier deployment



# Cisco Systems Broadband Provisioning Register

## Berkeley DB enabled:

- Manage 5 million networked devices and 150 config changes / second
- Fast, scalable, reliable and cost-effective solution
- Replaced an object-oriented database
- The result was faster, more reliable and saved Cisco \$50,000/CPU



“When we switched to Berkeley DB we never looked back. It gave us high performance, small footprint and a set of well-targeted features that let us take our solution to a new level.”

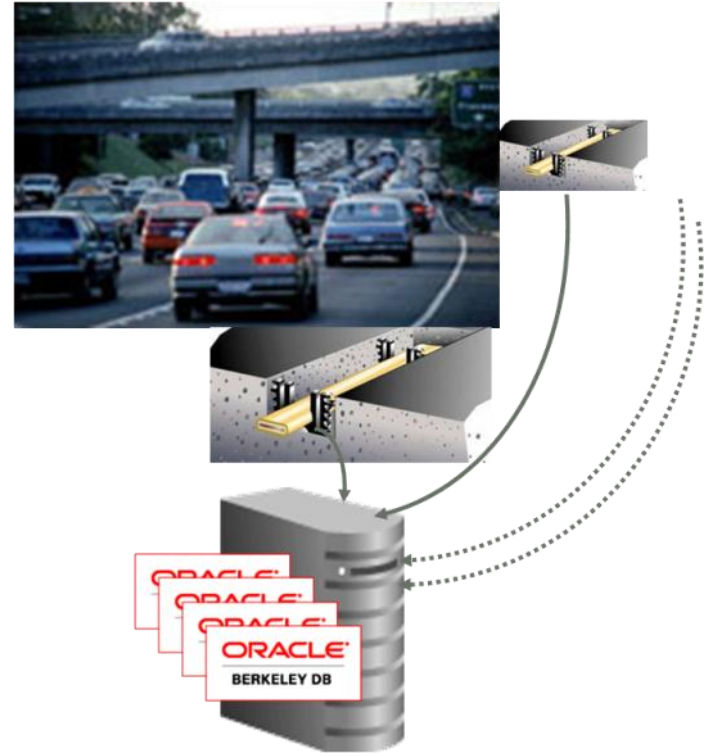
## **Anton Okmianski**

Senior Software Engineer,  
Cisco Systems

# Capturing Sensor Data

## Berkeley DB enabled:

- Transportation monitoring system
- Capture continuous monitoring of road conditions
- Cameras, velocity, temperature, humidity sensors every 2 miles
- Requirements: Scalability, Fault-tolerance, Reliability, Multiple concurrent sensor inputs, Small memory footprint, High performance



# Yammer's Scalable NoSQL Data Store

## Berkeley DB powers:

- Yammer's enterprise social networking platform
- Requirement: reliable, massively scalable data store that developers could depend upon
- Enabled Yammer to focus on their core value add; their social platform



# Program Agenda

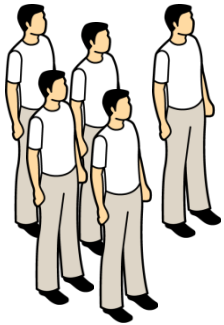
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# Oracle Database Mobile Server

Ties it all together

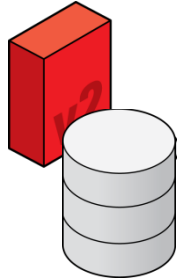
Mobile  
Users



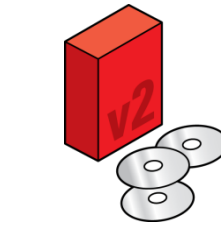
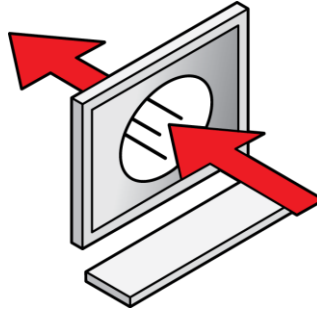
Mobile  
Clients



Applications  
Subscriptions



Database  
Mobile Server



Published  
Applications

Oracle  
Database



# Database Mobile Server

## What is it?

- Sync Server and Mobile Manager Console
  - Provides scalable, secure management of data, applications, devices, and users
- Mobile Development Kit (MDK)
  - Suite of tools for packaging, publishing and testing applications
- Mobile Clients
  - Includes Berkeley DB, available on multiple client platforms including Embedded Java



# Oracle Database Mobile Server

Value Proposition: Autonomy + Total Integration + Security

- Autonomy: device can perform primary function with no network
  - This is a key component of any M2M implementation
  - Without it even minor network issues can lead to device failures
- Total Integration: data streams and device mgmt
  - Secure, selective remote access to backend data
  - Remote management, diagnostics
  - Remote mobile provisioning
- Security: very important in mobile scenarios
  - Data is encrypted both on device and in flight
  - Device offers no “upstream” path to compromise the network



# Oracle Database Mobile Server

## Feature Support for Client Platforms

Platform	Automatic synchronization	Device management through the DM Agent
Oracle Embedded Java	✓	
Android	✓	✓
Blackberry	✓	
Windows, WinCE	✓	✓
Windows mobile	✓	✓
Linux	✓	✓

# Database Mobile Server

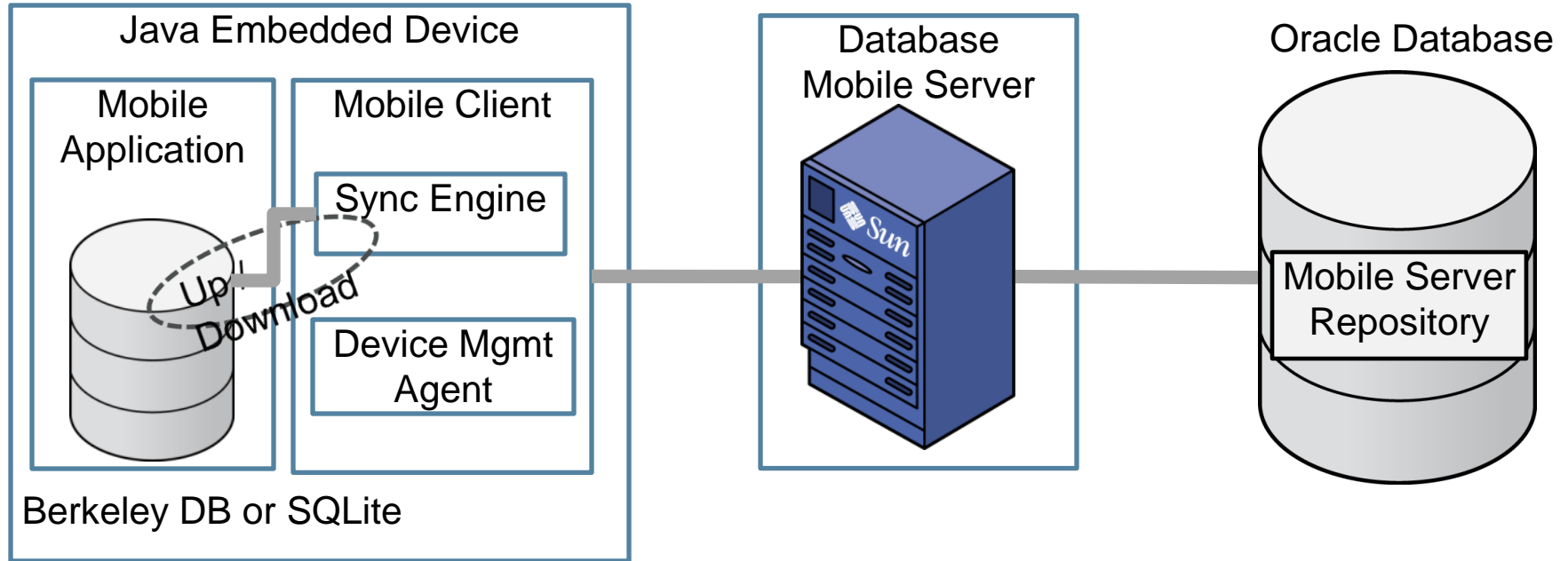
## Product Feature Review

- Enables disconnected operation
- Provides secure, selective mobile access to backend data
  - Powerful configuration options provide the right amount of access for every mobile user
- Remote management, diagnostics
  - For devices and applications
- Enables remote mobile provisioning
- End-to-end encryption safeguards data generated by (or provided to) mobile users
- Client platforms include: Java, embedded Java, Linux, Windows, Android



# Database Mobile Server

Architecture for Device with a Mobile Client and Client Database



# Oracle Database Mobile Server

## How It Works: Data Synchronization

- Database Mobile Server is designed to allow offline operation
- Highly configurable sync functionality
- Uses a publish/subscribe model
- Supports data sub-setting (select columns and rows on server)
- Advanced conflict detection and resolution
- Fault tolerant



# Oracle Database Mobile Server

## How It Works: Application Management

- Applications are published to the Mobile Server using Packaging Wizard, managed by Mobile Manager
  - Application modify/suspension/resumption
  - Roll out new application versions, or delete applications
  - Administration of users and user groups
- Clients normally need to be boot-strapped during first install
- Subsequent actions can be initiated on the server side



# Oracle Database Mobile Server

## How It Works: Device Management

- Remote Diagnostics
  - Inspection of client hardware, operating system settings
  - Inspection and modification of application configuration
- Command Execution
  - Client database information retrieval and synchronization with Oracle Database
  - Client device lock down, application removal, application data removal

# Database Mobile Server

## Mobile Client Security

- Encryption support in every layer
- Externalized security administration
- Sits on top of Oracle Platform Security Services





# Program Agenda

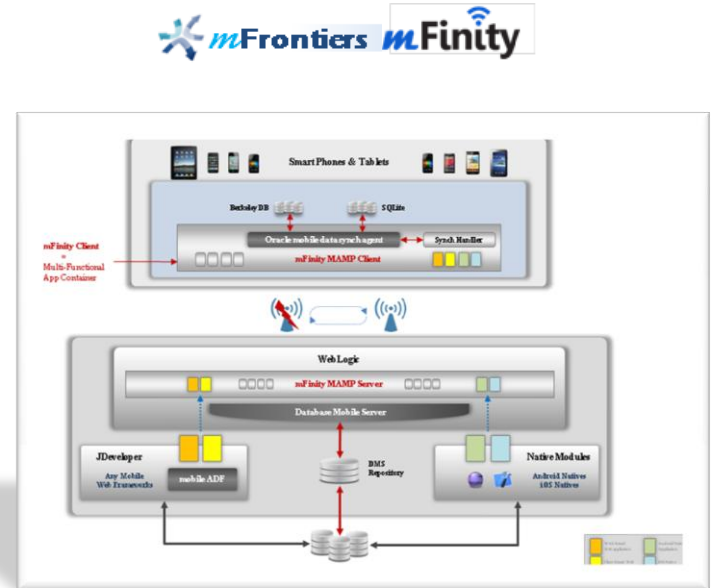
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# mFrontiers mFinity

## Database Mobile Server enables:

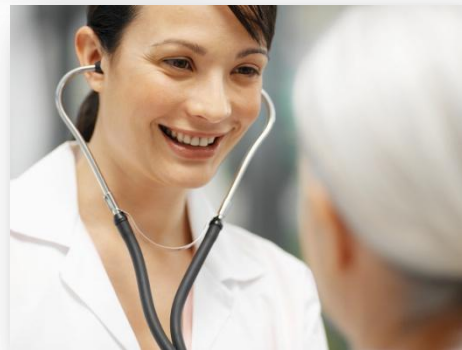
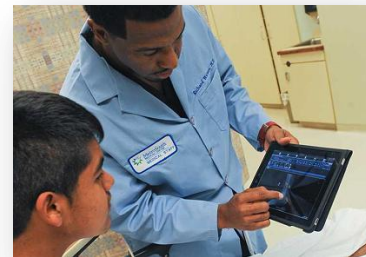
- Role-based mobile application management
- Data sync for disconnected mode operation
- Moscone South, Left - 136



# Demo: Seamless M2M + Mobile Healthcare Solutions

## Database Mobile Server and Berkeley DB enabled:

- Java-powered M2M pulse oximeter captures blood oxygen data
- Automatic data flow between M2M health monitoring system, Oracle backend, mobile devices
- Data is secure, both in transit and at rest
- Manage data access on mobile devices



# How To Get Started



- Install and Configure your Java Embedded Device
- Install Database Mobile Server: Mobile Development Kit (MDK)
- See Database Mobile Server Developer's Guide  
[http://docs.oracle.com/cd/E35865\\_01/doc.1120/e29740/toc.htm](http://docs.oracle.com/cd/E35865_01/doc.1120/e29740/toc.htm)
- Try out your first sync-enabled app with Berkeley DB!

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# Q&A

# More Information

## Blogs, Social

- <https://blogs.oracle.com/hinkmond/>
- <http://blogs.oracle.com/berkeleydb/>
- [https://blogs.oracle.com/mobile\\_and\\_embedded/](https://blogs.oracle.com/mobile_and_embedded/)
- LinkedIn
  - <http://www.linkedin.com/groups?gid=3598496>
  - <http://www.linkedin.com/groups?gid=2131985>
- Twitter
  - @erichjensen



# More Information

## About these products

- <http://www.oracle.com/technetwork/database/berkeleydb/overview/index.html>
- <http://www.oracle.com/technetwork/database/database-mobile-server/overview/index.html>
- <http://www.oracle.com/technetwork/java/embedded/>





# MAKE THE FUTURE JAVA



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