The Future of Java

Terrence Barr
Senior Technologist, Oracle
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JAVA
( LIKE SPACE )
IS BIG. REALLY BIG.

Key APIs
- Java EE
- JavaFX
- BD-J
- Java TV
- MSA
- Java Card

Platform
- Java SE
- Java ME
- Java Card

Language
- Java Language

Java Platform
Moving Java Forward
# Java Scorecard 2011: Technology

<table>
<thead>
<tr>
<th>Result</th>
</tr>
</thead>
</table>
| **Java SE** | ✔ JDK 7 for Mac OS X Developer Preview  
| ✔ JDK 7  
| ✔ JRockit released gratis under same license as JDK |
| **Java EE** | ✔ GlassFish 3.1.1  
| ✔ Java EE 7 specification development underway |
| **Java FX** | ✔ Java FX 2.0  
| ✔ Java FX 2.0 for Mac OS X Developer Preview |
| **Java ME/Embedded** | ✔ Oracle Java Wireless Client 3.0  
| ✔ Oracle Java Embedded Client 1.0  
| ✔ Java SE for Embedded 7  
| ✔ Java ME SDK 3.0.5 and LWUIT 1.5 |
# Java Scorecard 2011: Community

<table>
<thead>
<tr>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OpenJDK</strong></td>
</tr>
<tr>
<td>✓ IBM, Apple, SAP, Azul join OpenJDK</td>
</tr>
<tr>
<td>✓ OpenJDK community bylaws ratified</td>
</tr>
<tr>
<td>✓ OpenJDK becomes official Java SE 7 Reference Implementation</td>
</tr>
<tr>
<td>✓ JVM Language Summit held July 2011</td>
</tr>
<tr>
<td>✓ OpenJDK Twitter feed launched with thousands of followers</td>
</tr>
<tr>
<td>✓ JSR for Java SE 7 passed &amp; JSR for Java SE 8 submitted &amp; in process</td>
</tr>
<tr>
<td>✓ SouJava, London JUG elected to JCP Executive Committee</td>
</tr>
<tr>
<td>✓ JSR 348 in process for greater transparency</td>
</tr>
<tr>
<td>✓ JSR 342 submitted for Java EE 7 platform</td>
</tr>
<tr>
<td>✓ Oracle lead bi-weekly JUG leaders call</td>
</tr>
<tr>
<td>✓ Oracle lead JUG leader summit January 2011</td>
</tr>
<tr>
<td>✓ Over 250 JUGs from 50+ countries involved in JDK 7 launch</td>
</tr>
<tr>
<td>Ongoing Investment</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>✓ Successfully integrated Java development teams (We’re hiring!)</td>
</tr>
<tr>
<td>✓ Launched global JavaOne: Brazil, China, Russia, India</td>
</tr>
<tr>
<td>✓ Reinvigorated flagship JavaOne 2011</td>
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**Result**

- Successfully integrated Java development teams (We’re hiring!)
- Launched global JavaOne: Brazil, China, Russia, India
- Reinvigorated flagship JavaOne 2011
- Oracle launches Java Magazine (over 50k subscriptions)
- Over 80 Java Developer Days held around the world
- Java evangelist team reaches 80k developers @ 170 events
- Over 250k Java Podcast downloads
- JDK downloads up 91% Year over Year
- Over 1 million active NetBeans users
- Increase of TV devices running Java from 80 million to 115 million
- Over 45,000 Java ME applications
Servers and Desktops
Design Objectives
Java SE – Moving Forward

• **Write Once Run Anywhere**
• New application models & new hardware
• Flexible and smaller deployment through modularization
• Productivity for Java developers
• Runtime performance, monitoring & diagnostics
• Platform for multiple languages
Java SE Key Statistics

• 9 Million Java developers worldwide*
• #1 Choice for developers
• #1 Development platform
• 97% of enterprise desktops run Java

* Approximately the population of Sweden. (But there are more Moose in Sweden than Java-coding Moose.)
# JavaOne 2010: What We Set Out To Do

<table>
<thead>
<tr>
<th>JDK 7</th>
<th>JVM Convergence</th>
<th>Open Source</th>
</tr>
</thead>
</table>
| • Available for Windows, Linux, Solaris, embedded platforms  
  • Mac OS X Developer Preview released | • Initial JRockit/HotSpot convergence in JDK 7  
  • JRockit released under "gratis" JDK license (BCL) | • OpenJDK official Java SE 7 Reference Implementation  
  • OpenJDK project initiated for JDK 8 |
JDK 8 – Summer 2013

• **Strong feedback** from community – 2 years needed between JDK releases

• **Release date revised** to summer 2013 (from late 2012)

• **Enables larger scope**, such as:
  – Jigsaw – complete platform modularization, container support
  – Lambda – Bulk operations
  – JavaScript Interop
  – Device Support

<table>
<thead>
<tr>
<th>Theme</th>
<th>Description/Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Jigsaw <strong>EXPANDED</strong></td>
<td>• Module system for Java applications and the Java platform</td>
</tr>
<tr>
<td>Project Lambda <strong>EXPANDED</strong></td>
<td>• Closures and related features in the Java language (JSR 335)</td>
</tr>
<tr>
<td></td>
<td>• Bulk parallel operations in Java collections APIs (filter/map/reduce)</td>
</tr>
<tr>
<td>Oracle JVM Convergence</td>
<td>• Complete migration of performance and serviceability features from JRockit, including Mission Control and the Flight Recorder</td>
</tr>
<tr>
<td>JavaFX 3.0</td>
<td>• Next generation Java client</td>
</tr>
<tr>
<td>JavaScript <strong>NEW</strong></td>
<td>• Next-gen JavaScript-on-JVM engine (Project Nashorn)</td>
</tr>
<tr>
<td></td>
<td>• JavaScript/Java interoperability on JVM</td>
</tr>
<tr>
<td>Device Support <strong>NEW</strong></td>
<td>• Multi-Touch (JavaFX), Camera, Location, Compass and Accelerometer</td>
</tr>
<tr>
<td>Developer Productivity</td>
<td>• Annotations on types (JSR 308), Minor language enhancements</td>
</tr>
<tr>
<td>API and Other Updates</td>
<td>• Enhancements to Security, Date/Time, (JSR 310) Networking, Internationalization, Accessibility, Packaging/Installation</td>
</tr>
<tr>
<td>Open Source</td>
<td>• Open development in OpenJDK, open source additional closed components</td>
</tr>
</tbody>
</table>

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# NetBeans

**IDE for the Java Platform**

## Day one support for Java SE 7
- Java Editor support for Project Coin
- Bulk refactoring of projects and packages to Java SE 7

## Comprehensive Java EE 6 Support
- Concurrent support for the latest GlassFish releases
- Improved support for CDI, REST services and Java persistence

## Day one support for JavaFX 2.0
- Full edit/compile/debug cycle support
- Visual debugging of JavaFX apps

## Continued growth in IDE adoption
- Over 1 million active users
- Over 22 million downloads
JDK Roadmap

2011

NetBeans 7
- Java SE 7 support
- more

JDK 7
- JRE 7 on java.com
- JavaFX 2.0 co-install

Mac OS X
- JDK 7 Dev Preview
- JavaFX 2.0 Dev Preview

NetBeans 7.1
- JavaFX 2.0 support

2012

JDK 7u2
- Last public JDK 6 update

JDK 7u4
- OS X JDK Port (for developers)

2013

JDK 7u6
- OS X JRE port (for end-users)
- Improved OS integration, auto-update

NetBeans.next
- Java SE 8 support
- JavaFX 3.0 support
- more

2014

NetBeans 7.1
- JavaFX 2.0 support

JDK 8
- Windows, Linux, Solaris, OS X
- Jigsaw
- Lambda
- JavaFX 3.0
- Complete Oracle JVM convergence
- JavaScript interop
- more

NetBeans 7
- Java SE 7 support
- more

JDK 7
- JRE 7 on java.com
- JavaFX 2.0 co-install

Mac OS X
- JDK 7 Dev Preview
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JDK 8
- Windows, Linux, Solaris, OS X
- Jigsaw
- Lambda
- JavaFX 3.0
- Complete Oracle JVM convergence
- JavaScript interop
- more
Twitter joins OpenJDK
### Java SE Vision – Beyond JDK 8

<table>
<thead>
<tr>
<th>Category</th>
<th>Features</th>
</tr>
</thead>
</table>
| **Interoperability**             | • Multi-language JVM  
• Improved Java/Native integration                                       |
| **Cloud**                        | • Multi-tenancy support  
• Resource management                                                       |
| **Ease of Use**                  | • Self-tuning JVM  
• Language enhancements                                                      |
| **Advanced Optimizations**       | • Unified type system  
• Data structure optimizations                                                 |
| **Works Everywhere and with**    | • Scale down to embedded, up to massive servers  
• Support for heterogenous compute models                                    |
JavaFX
Design Objectives
JavaFX – Moving Client Forward

Oracle’s next generation Java client solution

• Built on Java in Java
• Modular architecture
• Migration path for Java client UI technologies
• Advanced tooling
• Support for modern device interaction
• Delivering on the cross-platform promise
JavaFX 2.0 Features
Modern Rich Client Platform

• JavaFX APIs in Java
• Scene-graph architecture
• Rich UI controls
• Rich animations and transitions
• XML-based mark-up (FXML)
• High-performance media engine
• High-performance, H/W-accelerated graphics pipeline
• Full-fledged HTML/JavaScript engine
• Seamless integration with Swing apps
Goals for 2012

Open Source
- OpenJFX project under OpenJDK
- First phase will focus on UI Controls

Convergence
- Common license with Java SE
- JavaFX to be included in Java 8
- JavaFX to reach out to Java Embedded

Standardization
- Oracle committed to JavaFX standardization
- JSR to be submitted through JCP
JavaFX Roadmap

2011
- JavaFX 2.0 GA
  - Windows GA
  - Mac OS X Dev. Preview
- NetBeans 7.1 Beta
  - JavaFX 2.0 support
- JavaFX Scene Builder EA

2012
- JavaFX 2.0.2
  - JDK 7 co-install
- JavaFX 2.x
  - Mac OS X GA
  - Linux Dev. Preview

2013
- JavaFX 2.x
  - Linux GA
- JavaFX Scene Builder GA

2014
- JavaFX 3.0
  - Bundled with JDK 8
  - Windows, Mac OS X, Linux
- NetBeans.next
  - JavaFX 3.0 support
  - more
Mobile and Embedded
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
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
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
Mobile Services Integration
Payment, Store Client, Advertizing, Carrier API

Oracle Java Wireless Client

- **Smart content** on mass market devices leveraging the carrier infrastructure
- **Value-added services distribution** in Oracle runtimes
- **Monetization options** for developers
Java technology for Embedded Device - 2013

Platform Footprint

<table>
<thead>
<tr>
<th>Device</th>
<th>CPU/GPU/I-O</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARM 7</td>
<td>Cortex M</td>
</tr>
<tr>
<td>ARM9/11</td>
<td>MIPS32/Intel</td>
</tr>
<tr>
<td>Atom/ARM</td>
<td>CortexA/PPC</td>
</tr>
</tbody>
</table>

Java Card

Small Embedded

Java ME

Java SE

Java technology for Embedded Device - 2013

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ARM joins the JCP ME EC
Java ME/Embedded Roadmap Milestones

**OJWC 3.1**
- Mobile Services
  - Payment
  - Store
  - Carrier apps

**Java ME 7**
- Java SE 7 alignment
  - CLDC 7
  - New APIs for Embedded and Mobile

**Java SE Embedded 8**
- CDC/Java SE convergence

2011 - 2012 - 2013

Incremental updates to CDC and Java SE Embedded

Download developer tools today:
- Java ME SDK 3.0.5
- LWUIT 1.5
Application Servers
Java EE 6 – Key Statistics

- 40+ Million Java EE 6 Component Downloads
- #1 Choice for Enterprise Developers
- #1 Application Development Platform
- Fastest implementation of a Java EE release
Design Objectives
Java EE – Moving Forward

• **Standard for Developing Enterprise Applications**
  – From small-scale web applications to large-scale, multi-tier enterprise applications

• **Enhance Productivity for Enterprise Java Developers**
  – Simplified and comprehensive programming model

• **Portability: Across vendors and infrastructure**

• **Extensibility: Embracing non-Java EE frameworks**

• **Rightsizing: Supporting modular design and Profiles**
But The Cloud is Making Developers Restless

• Enterprise developers expect cloud solutions from IT
  – IaaS is the new Self-Service Data Center
  – Instantaneous, on-demand provisioning
  – Hosted, secure cloud services
• Virtualization is a technology building block, not a platform
• Developers are looking for a PaaS Standard for the next generation of cloud-based applications
  – The Java EE platform will be the PaaS Standard
<table>
<thead>
<tr>
<th>Cloud</th>
<th>Modularity*</th>
<th>HTML5</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provisioning</td>
<td>• Building on Jigsaw</td>
<td>• Emerging Web Standards</td>
</tr>
<tr>
<td>• Elastic &amp; Autonomic Scalability</td>
<td>• Supporting Profiles &amp; Modular Applications</td>
<td>require a programming model</td>
</tr>
<tr>
<td>• Multi-Tenancy</td>
<td>• Focus on OSGi interop</td>
<td>• JSON, WebSockets, off-line, APIs &amp; DOM</td>
</tr>
</tbody>
</table>

* Aligning with delivery schedules of Jigsaw in Java SE 8
Java EE 7 – Design Objectives

- Multi-Tenancy
- Service Definition & Orchestration
- Elasticity
- New Roles
- Build on EE 6 Momentum
- JMS 2.0
- Caching API
- JSON API
- Expanded CDI & REST Support
- Broad Industry Participation
## Java EE 7 – Proposed Content

<table>
<thead>
<tr>
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<th>Description/Content</th>
</tr>
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</table>
| **PaaS Enablement** | • Service Definitions and Service Provisioning to enable Java as Platform as a Service  
  • Enable Multi-tenancy in APIs |
| **Web Profile** | • Provide popular additions to the Web Profile including JAX RS 2.0 Support |
| **JMS 2.0** | • Simplify the programming model for building messaging based applications  
  • Dependency Injection support |
| **CDI** | • Tighter Integration with JSF  
  • Expand scope of container managed transactions  
  • Expanded service metadata and improved configuration |
| **Caching** | • Provide APIs for accessing caching systems |
| **Concurrency Utilities** | • Support for Java concurrency APIs within the container |
| **Pruning** | • Allow vendors to optionally support older APIs  
  • EJB CMP/BMP, JAX-RPC |
| **Open Source and Transparency** | • Open development under project GlassFish on java.net  
  • Java EE 7 JSRs run in open with publicly viewable EG mail archive |
Announcing
Project Avatar
Project Avatar – Context
HTML 5 is a game-changer

• HTML 5 Clients
  – Utilize bi-directional communication to enable event-driven applications
  – Rich, standardized client-side programming model: APIs, high-performance JavaScript and standardized offline capabilities

• The Cloud
  – We’ve got the building blocks: WebSockets (Comet), JSON (JAX RS), RESTful WS
  – Missing data change notifications, asynchronous infrastructure, and …

• Programming Model
  – More than the sum of the parts
  – Web-native, bi-directional binding to the cloud
  – Unifying Java ME, SE and EE
Project Avatar - Scope
Complete Solution for Dynamic Rich Clients

HTML 5 browser

HTML & Java hybrid application

Java application

JSON over WebSocket

Java EE Cloud
Summary
## Technology

### Moving Java Forward

<table>
<thead>
<tr>
<th>Technology</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Java SE</strong></td>
<td>SE 7 &amp; 8, Mac OS X</td>
</tr>
<tr>
<td><strong>JavaFX</strong></td>
<td>Windows, Mac OS X, Linux, Embedded, Open source and standardize</td>
</tr>
<tr>
<td><strong>Java ME</strong></td>
<td>Align with SE</td>
</tr>
<tr>
<td><strong>Java EE</strong></td>
<td>Cloud enablement</td>
</tr>
<tr>
<td><strong>Avatar</strong></td>
<td>HTML5 integration for Java</td>
</tr>
</tbody>
</table>
## Community

<table>
<thead>
<tr>
<th>OpenJDK</th>
<th>IBM, Apple, RedHat, SAP, Azul, <strong>Twitter</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>JCP</td>
<td><strong>ARM</strong></td>
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</table>
For More, Tune Into …

The Java Spotlight Podcast

http://www.javaspotlight.org
Twitter: @javaspotlight
Thank You!