



App Planet

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Developing Games on the BlackBerry Smartphone

 **BlackBerry.**



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Agenda

Agenda



- BlackBerry® solution moving into Consumer Market
- BlackBerry smartphone games
- Next level: Open GL API
- BlackBerry smartphone specifics

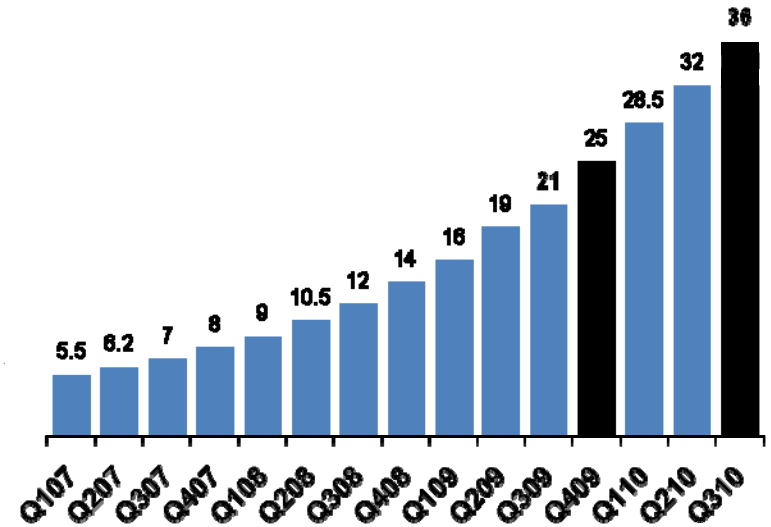


BlackBerry Solution Moving into the Consumer Market

The BlackBerry Experience



Over **500** Carriers & Distribution Partners in **170+** Countries
Approximately **36 million** subscribers at end of quarter
Net subscriber adds of approximately **4.4 million** in quarter



- BlackBerry solution moving into consumer market
 - 25% of applications on App World are Games



The screenshot shows the BlackBerry App World interface for the Games category. The left sidebar lists various categories, with 'Games (1135)' highlighted in a red circle. The main content area displays the 'Games' section with a search bar, a 'Refine by Subcategory' list, and a list of featured apps. The 'Ka-Glom - Free' app is prominently displayed with a 'Get it Today' button. Below it, the 'GT Blackjack' app is also shown with a 'Get it Today' button. The interface includes sorting options (Popular, Free, Paid, Free & Paid) and a '25 per page' limit.

Categories

- Business (175)
- Entertainment (322)
- Finance (119)
- Games (1135)**
- Health & Wellness (131)
- IM & Social Networking (92)
- Maps & Navigation (161)
- Music & Audio (122)
- News (161)
- Photo & Video (75)
- Productivity (251)
- Reference & eBooks (505)
- Shopping (31)
- Sports & Recreation (144)
- Test Center (3)
- Themes (482)
- Travel (191)
- Utilities (404)
- Weather (25)

BlackBerry App World > Browse All Categories >

Search BlackBerry App World

Help

Games

Refine by Subcategory:

- Action (122)
- ArCADE (95)
- Board Games (78)
- Cards (114)
- Combat (66)
- Movie & TV Themes (94)
- Puzzles (239)
- Space (23)
- Sports (147)
- Strategy (157)

RSS

Sort By: Popular | Free | Paid | Free & Paid | 25 per page | 1 2 3 4 5 | Next >

Ka-Glom - Free
Now Free for a Limited Time! Combine the explosive Ka-Glom jelly to blast blocks and get the ultimate chain reaction. Ka-Glom is a high-pressure game of falling blocks. Of the two block types, only the Ka-Glom jelly is ...
FREE | by Magmic | ★★★★★ | Details >

GT Blackjack
This is the online multiplayer blackjack casino game. Once logon, you can play with a community of 1.2 million BlackBerry players all around the world. You can also chat with other players on the table. We are proud to ...
FREE | by Golden Thumb Inc. | ★★★★★ | Details >

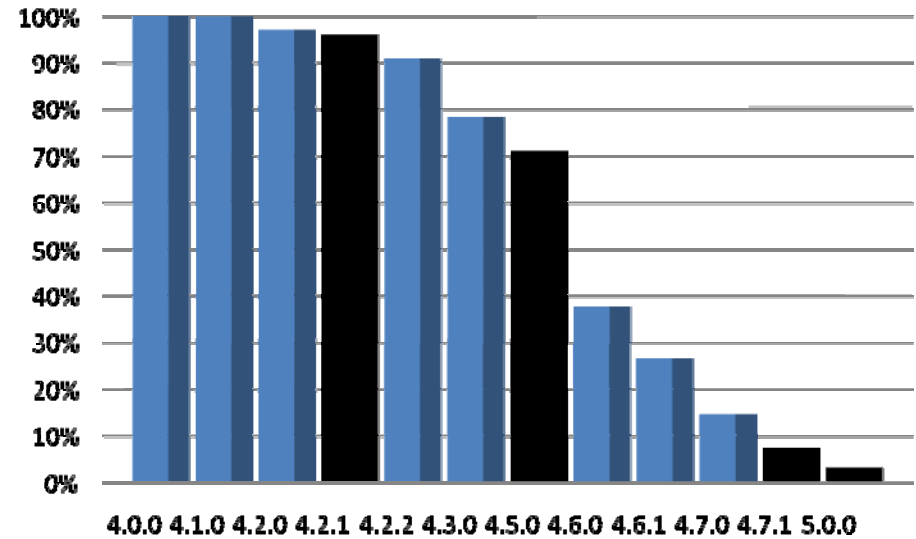
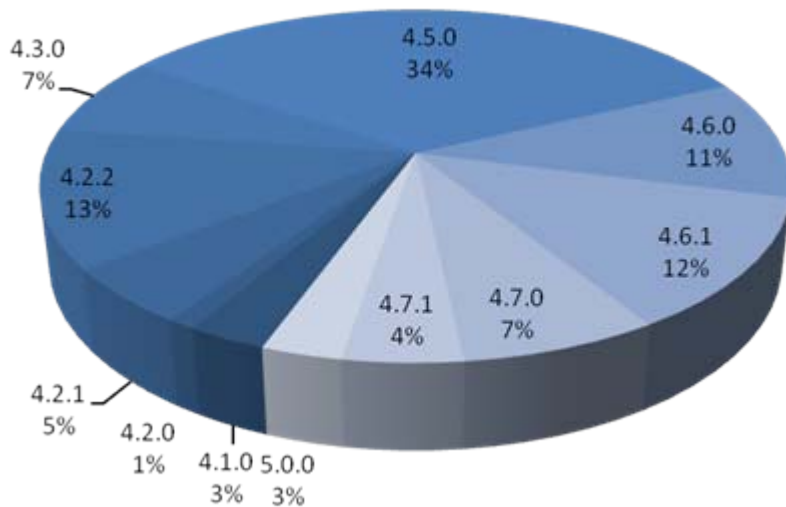
Evolution of BlackBerry Smartphone Software



3.3	3.6	3.7	4.0	4.0.2	4.1	4.2	4.2.1	4.3	4.5	4.6	4.6.1	4.7	4.7.1	5.0
Initial Release MIDP 1.0 CLDC 1.0	PIM APIs Mail APIs	Color Smartphone Support	MIDP 2.0 CLDE 1.1 Invoke APIs	JSR 179 (LBS)	Smartard APIs	Multimedia Focus JSR 75 (File API)	JSR 82 (Bluetooth) Application Permissions	JSR-172 (Web services) JSR-205 (MMS) JSR-211 (CHAPI) JSR-238 (Internationaliztn)	Map Field Spell Check API HTML Email	JSR-226 (SVG) Décor APIs Multi-PIM Support SMS & MMS Listeners	Touch Screen - Input - Keyboard Orientation APIs Accelerometer Invoke - Video Recorder	JSR 239 – OpenGL improved UI Customization Networking API Hotspot API Push API JSR 234 (AMMS) Media Key Events Reverse Geo-coding Biometric API User Auth API Attachment API		

Operating System Analysis

- 4.2.1 Applications can reach almost 97% of the addressable market
- Targeting development at 4.5.0 devices can reach over 70% of the addressable market
- Storm exclusive applications can reach over 10% of the addressable market

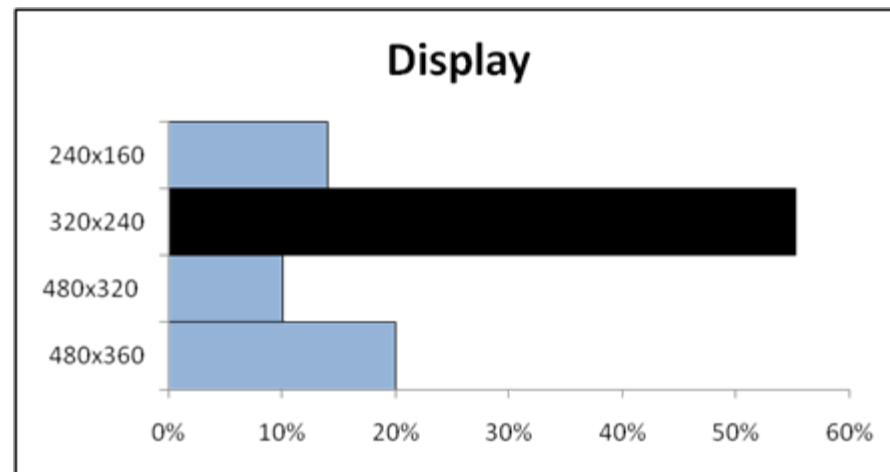
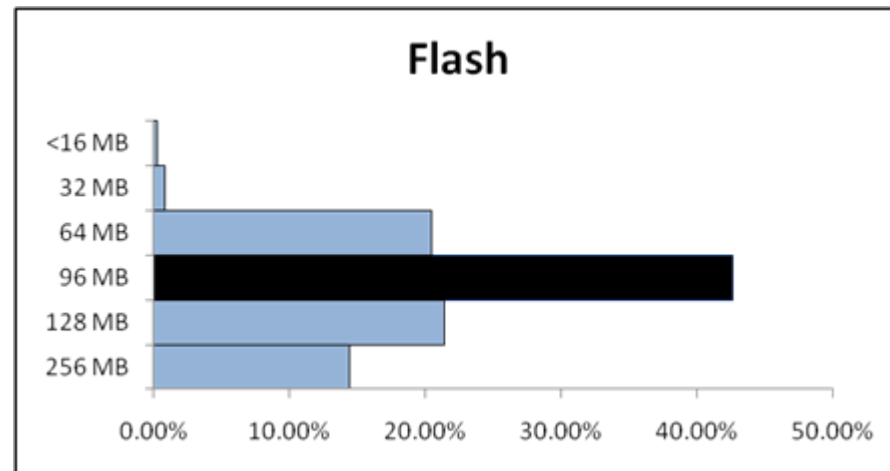


BlackBerry Coverage: Q3 2010



Device Feature Analysis

- Keyboard:
 - QWERTY: 76%
 - SureType: 14%
 - Touchscreen: 10%
- Navigation
 - Touchscreen: 10%
 - Trackpad: 2%
 - Trackball: 83%
 - Trackwheel: 5%
- GPS: 80%
- Wi-Fi: 30%
- SD Card Support: 95%
- Camera / Media Player: 95%
- Video Recording: 65%
- New Browser Rendering Engine: 36%





BlackBerry Games

The BlackBerry smartphone is a pure Java device with all built-in applications and APIs written in Java

- BlackBerry smartphones support:
 - MIDP Standard APIs (MIDP v2.1 supported) for cross platform development
 - CLDC Standard APIs (CLDC v1.1 supported) for connectivity
 - BlackBerry smartphone specific Java APIs

- MIDlet
 - Application built using the MIDP framework
 - javax.microedition.*
 - public class HelloWorld extends MIDlet
- BlackBerry Java Application
 - Application built using the Research In Motion® API set
 - net.rim.device.api.ui.*
 - public class HelloWorld extends UiApplication

When to Mix Other APIs



Some classes in the RIM package space can be used by a MIDlet

- PhoneListener
- Phone.getDevicePhoneNumber()
- GPRSInfo / CDMAInfo / RadiInfo / DeviceInfo
- CoverageInfo / CoverageStatusListener
- WLANListener / WLANInfo
- Keypad / Characters
- GlobalEventListener
- FolderListener
- PersistentStore / PersistentObject / RuntimeStore
- KeyListener
- ApplicationPermissions / ApplicationPermissionsManager
- BlackBerryCanvas / BlackBerryGameCanvas
- Invoke / CodeModuleManager / CodeModuleGroupManager / ApplicationDescriptor / ApplicationManager
- ServiceRecord / ServiceBook
- Browser / BrowserSession

UI Needs to be Kept Separate!



- MIDlet UI and BlackBerry® Java Application UI are not compatible
- Do not mix `net.rim.device.api.ui.*` with `javax.microedition.*`
- Different UI models
- Not compatible

Pros and Cons



- **MIDlet**

- Pros:
 - Portable to other J2ME devices
- Cons:
 - Limited UI functionality
 - Device integration limited to platformRequest() and CHAPI

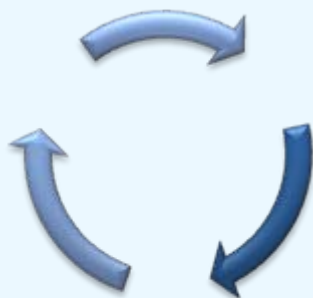
- **BlackBerry® Java Application**

- Pros:
 - Rich UI definitions
 - Customize anything and everything
 - Rich integration with other applications
 - Launch other apps, insert menu items into other apps
 - Embed BlackBerry® Maps, embed BlackBerry® Browser
 - Faster execution
 - Access to low level smartphone properties
 - Supports background applications, running on startup, library definitions
- Cons:
 - Only portable to other BlackBerry® smartphones

Game Structure

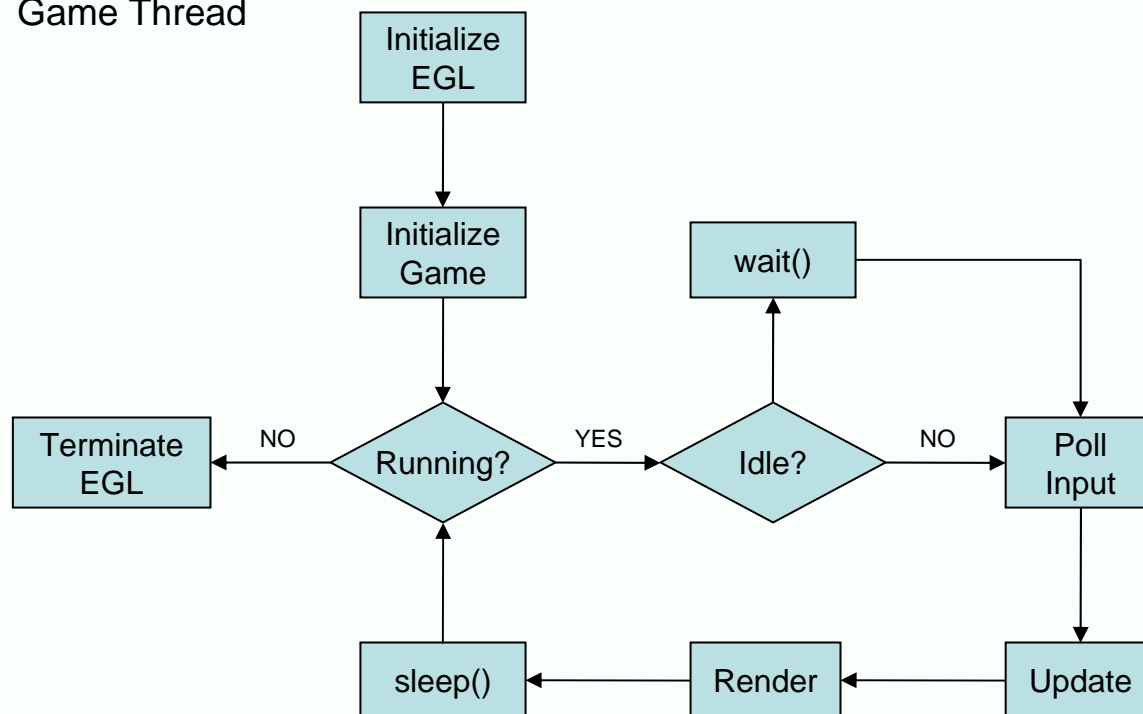


Event Dispatch Thread



```
MIDP  
void startApp()/pauseApp()  
void paint(Graphics)  
void pointerEvent(int, int)  
  
CLDC  
void activate()/deactivate()  
void paint(Graphics)  
boolean touchEvent(TouchEvent)
```

Game Thread



Java Development Platform: Tools



- Options for BlackBerry Java Development

- BlackBerry Java Development Environment
- BlackBerry® JDE Plugin for Eclipse™
- Other IDEs (e.g NetBeans)



- Key Features

- Eclipse open development platform for the BlackBerry solution development
- Debugging (Java Debug Wire Protocol (JDWP) Development)
- Optimization (Objects and Profiling Window)
- Localization Support (Editor for the BlackBerry solution resource bundles)
- Supports building against multiple JDEs and Simulator Integration
- Documentation and Sample Applications

- GUI Builder (Coming Soon)

- Drag & Drop UI development
- Automatic creation of underlying Java code
- Support for round-tripping between visual design and code

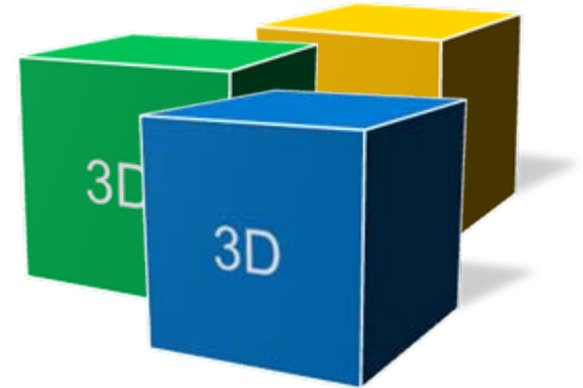


Next level: Open GL API

3D Games: Motivation



- Stand out from the crowd
- More immersive game play
 - Dynamic camera
 - Simulated reality
- More realistic environments
 - Dynamic lights and shadows
- Combine 2D and 3D
 - Don't force 3D - use it where it makes sense



Big Opportunities for Developers

- Cool Games:
 - 3D + 2D Games
- Rich Viewport Applications:
 - Fast Rendering
 - Fast Transformations
 - Per Vertex Data
 - Texturing, Lighting and Illumination
 - 3D Geometry
 - Depth/Stencil Buffering

OpenGL® ES : Overview



The Leading 3D Rendering API for mobile devices

- Based on desktop OpenGL® – Optimized for mobile
- Removes redundancy & rarely used features

OpenGL® ES - Adopted by every major handset OS

- Pervasive mobile 3D is evolving fast

OpenGL® ES - Most widely deployed 3D API

- Used in diverse applications, devices and markets
- Mobile phones, game consoles, personal navigation devices, personal media players, etc.

JSR 239 : Introduction – Java Interfaces



Access to Hardware Accelerated 3D Graphics:

JSR 239 Packages

- `javax.microedition.khronos.egl.*`
- `javax.microedition.khronos.opengles.*`
- `java.nio.*`

EGLTM API
OpenGL® ES API
Native I/O

BlackBerry® smartphone packages

- `net.rim.device.api.opengles.*`
- `net.rim.device.api.math.*`

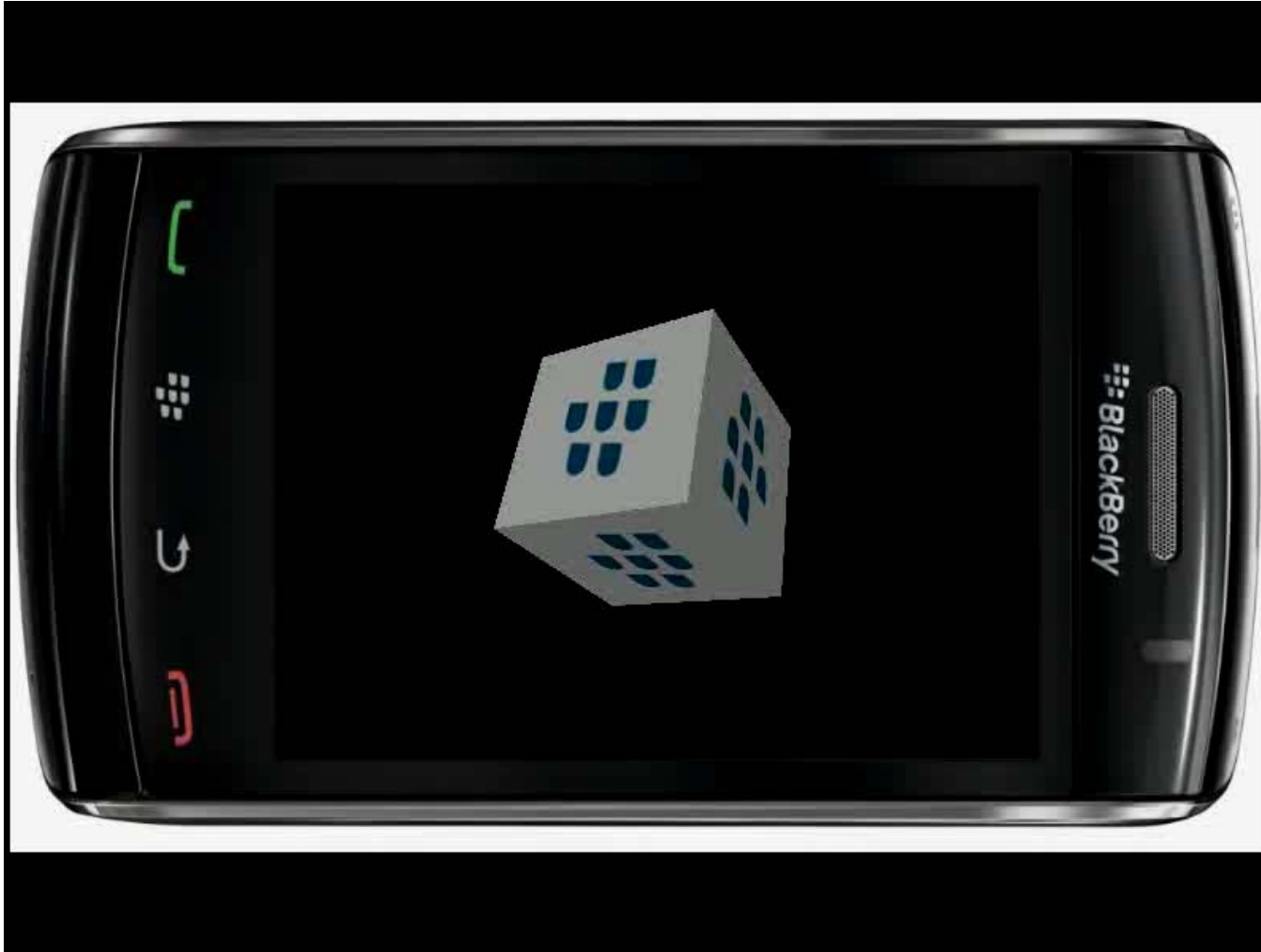
OpenGL® ES Utilities
3D Math Utilities

EGL™ – Native Platform Graphics Interface package: javax.microedition.khronos.egl



- Bindings for EGL™ 1.0 and 1.1 for OpenGL® ES API
- Rendering Contexts
 - Container for OpenGL ES rendering state
- Rendering Surfaces
 - Window surfaces: onscreen rendering
 - Pbuffer surfaces: offscreen rendering
 - Pixmap surfaces: offscreen rendering to client buffers
- Synchronization between OpenGL and Platform APIs

OpenGL® ES - Window Surface – Games



BlackBerry® Storm™ smartphone

OpenGL® ES - Pbuffer Surface - Applications



BlackBerry® Storm™ smartphone

net.rim.device.api.opengl.GLUtils

- GLU routines: gluPerspective, gluLookAt, etc
- Check for OpenGL support: isSupported()
- Load texture from Bitmap: glTexImage2D(..., Bitmap, ...)
- Explicitly free memory for GL client array: freeBuffer(Buffer)
- Useful between level loads, etc

net.rim.device.api.math

- Vector3f
- Quaternion4f
- Matrix4f

BlackBerry Smartphones with OpenGL Support



BlackBerry® Storm2™ 9550 smartphone & BlackBerry® Curve™ 8530 smartphone

Content for JSR 239 Games



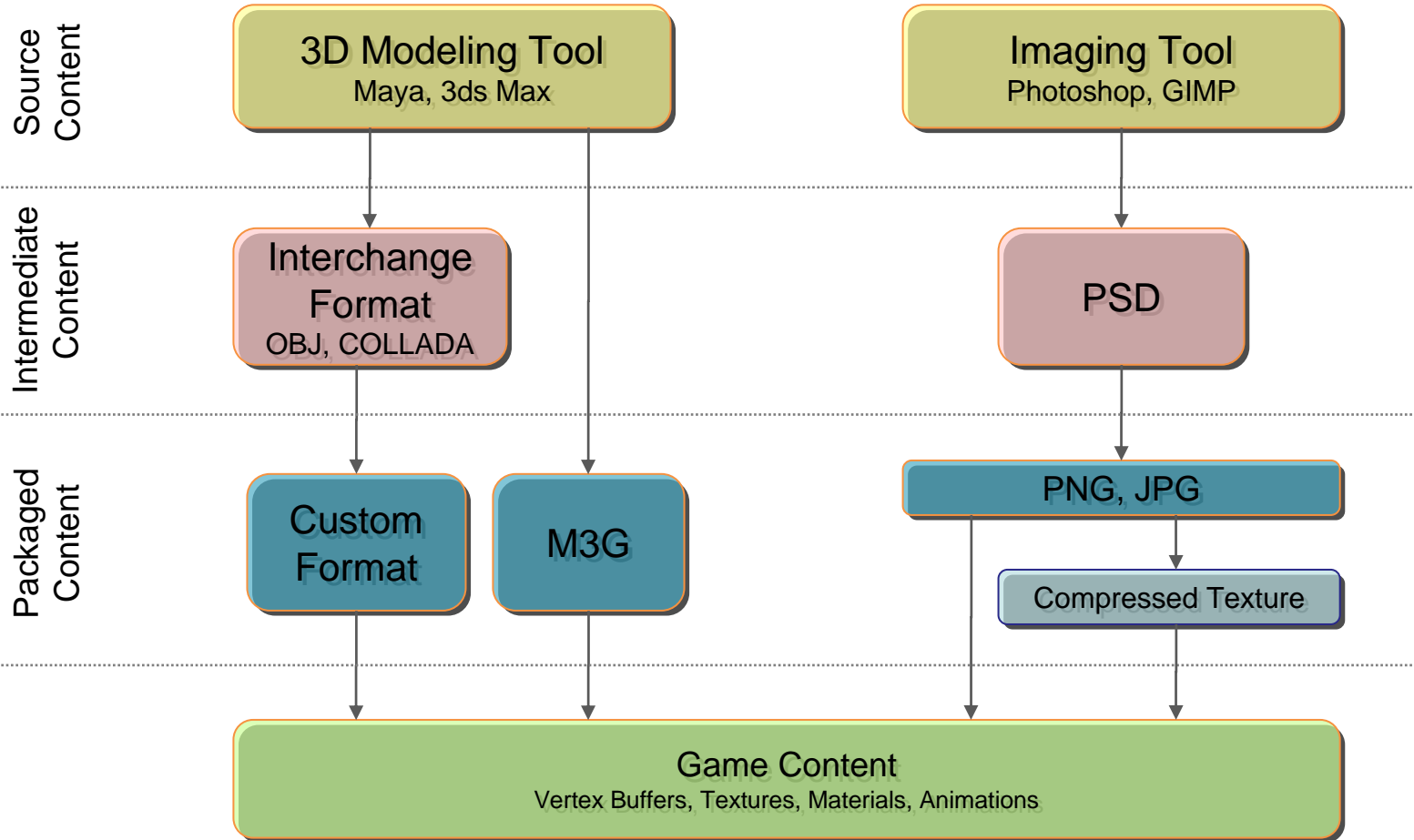
- JSR 239 is a rendering API only
 - No built-in support for 3D file formats
- No right answer when choosing a format
 - Pick what works best for your project

Comparison of Popular 3D File Formats

	Complexity	Flexibility	Performance*	Format
OBJ	Best	Worst	Average	Text
COLLAD	Worst	Best	Worst	XML
M3G	Average	Average	Best	Binary

* Performance is based on loading performance at runtime.

Content Pipeline for JSR 239



Improving 2D Games with JSR 239: Motivation



- OpenGL doesn't mean abandon 2D!
- Casual games, wider audience more intuitive
- Simpler to develop than 3D games
- Improved performance over software Graphics
- Improved quality
 - High quality image transformations
 - Advanced effects (particles, transitions, etc)



Original



Rotated 45°
(Software)



Rotated 45°
(OpenGL)



Scaled x2 (Software)



Scaled x2 (OpenGL)

2D Games: Techniques



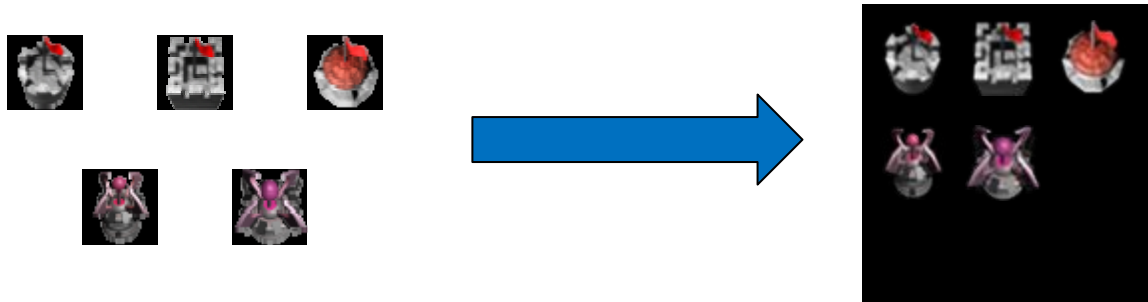
- Batch sprites for optimal performance

- Multiple sprites, one draw call
- Best for static sprites/geometry (must be pre-transformed)

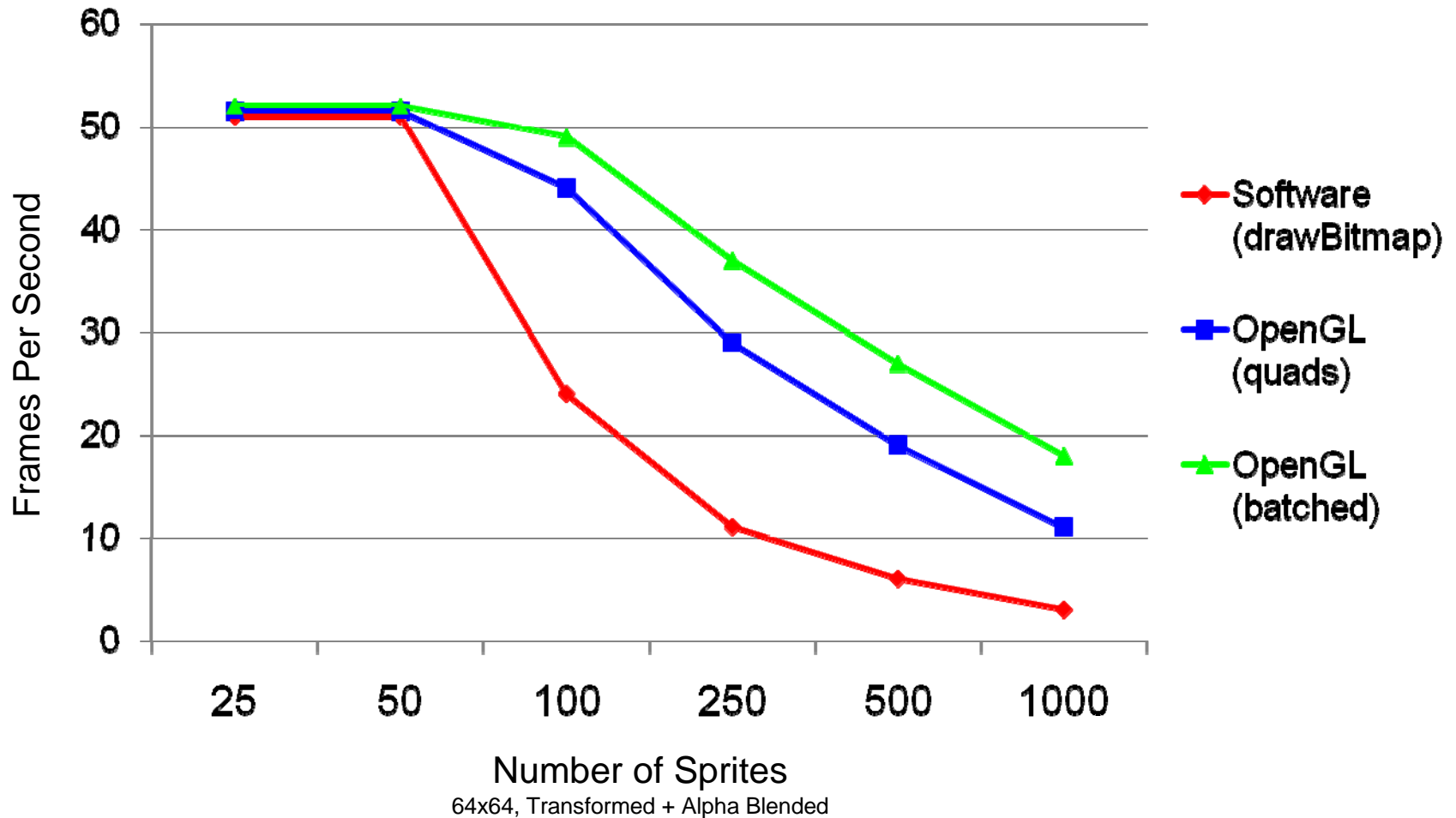
Vertex Buffer:	Sprite 1 Vertices	Sprite 2 Vertices	Sprite 3 Vertices	...
TexCoord Buffer:	Sprite 1 TexCoords	Sprite 2 TexCoords	Sprite 3 TexCoords	...

- Combine multiple sprites into larger texture atlases

- Minimize texture state changes (expensive)



2D Graphics Performance





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Demo: Concrete Software – PBA Bowling

Going from 2D to 3D

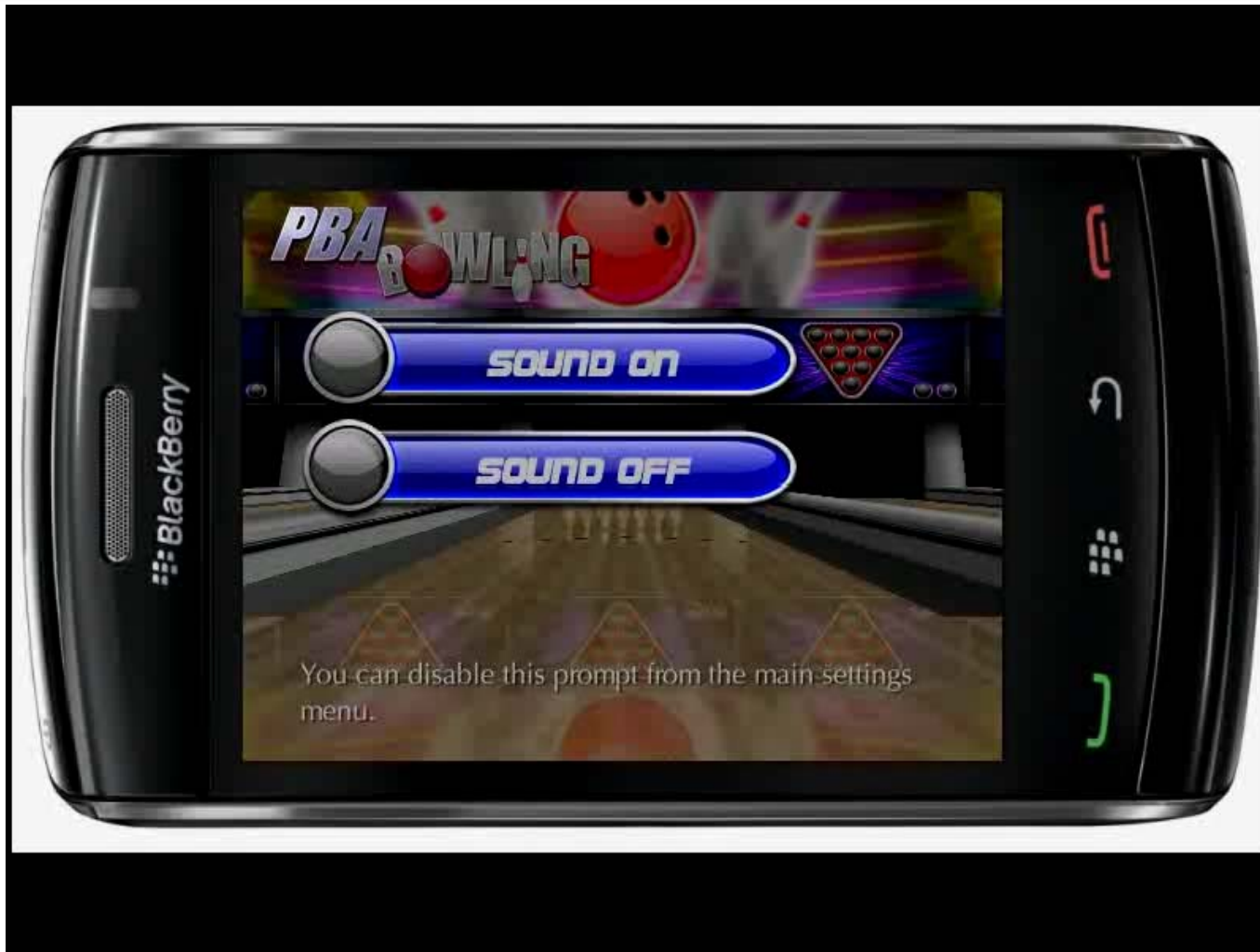


CONCRETE
SOFTWARE

BlackBerry® Storm2™ smartphone

BlackBerry.

Going from 2D to 3D





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BlackBerry Specifics

Tips – User Input



- Mimic the behavior of device applications

- Hardware keys
 - The right action for the right key
- Touchscreen BlackBerry® smartphones
 - Unique interaction model
- MIDlet
 - All navigation and keyboard events: `Canvas.keyPressed()`
 - `Canvas.FIRE` mapped to trackball click
 - `LEFT/RIGHT/DOWN/UP` mapped to trackball movements
 - Special values for volume keys: `-150` (up), `-151` (down)
 - `Keypad.getHardwareLayout()`
 - DANGER: `KEY_NUMx`, `KEY_STAR`, `KEY_POUND`
 - `Application.getApplication().addKeyListener()`



Tips – User Input



- BlackBerry® Java Application
 - Navigation events:
 - `Screen.navigationClick()`
 - `Screen.navigationMovement()`
 - Keyboard events:
 - `Screen.keyChar()`, `keyControl()`, etc.
 - Special control characters defined in `Characters` class
 - `Characters.CONTROL_MENU`
 - `Characters.CONTROL_VOLUME_UP`

Tips - Supporting Touchscreens



- Touch Screens
 - Are clickable!
 - Users expect this behaviour from all applications
- Implementation:
 - Basic MIDlet support via `pointerPressed()`, `pointerDragged()`, `pointerReleased()`
 - Does not catch click
 - Enhanced MIDlet support via `BlackBerryCanvas.touchEvent(TouchEvent message)`
 - DOWN, UP, CLICK, UNCLICK, MOVE, and CANCEL
 - TouchGesture – `TouchEvent.getGesture()`
 - SWIPE, HOVER, TAP, etc
 - `getTapCount()`, `getHoverCount()`

Tips - Match User Expectations



- Sound toggle
 - Should be off by default
- There is no such thing as soft keys
 - To put up a bar that shows expected key usage is incorrect
- Detect backgrounding of application
 - Go dormant!
 - CPU usage should be at 0%
 - Verify using the IDE's Profiler and Threads tools
 - Continued animations, backlight, audio, sleep / wakeup threads, etc will all seriously impact battery life
 - MIDlet.pauseApp() / MIDlet.startApp()
 - Application.deactivate() / Application.activate()

Tips – OpenGL - Performance Tips



- Avoid software rendering (MIDP/CLDC Graphics)
- Cull geometry outside the view frustum
- Batch as much as possible
- Texture atlases
- Compressed textures (especially for large textures)
- Mipmaps enhance visual fidelity and performance
- Reduce lighting costs when possible
 - Use specular light sparingly
 - Consider lightmaps and other static lighting models

Tips – OpenGL - Performance Tips



- Minimize state changes (especially texture changes)
- Minimize overdraw (let the depth buffer do its job)
 - Sort front to back for opaque geometry
 - Sort back to front for transparent geometry
- Prefer triangle strips
- Avoid frequent modification of index arrays
 - Results in extra validation
- Use audio sparingly (uses CPU)
 - Consider playback in separate thread

BlackBerry Platform Services



- **Payment Services**

- Payment Service and SDK to support taking a payment within an app

- **Advertising Services**

- Provides one-stop access to multiple networks, centralized management console, reporting, and Omniture analytics
- Advertising SDK embed ad units in apps: click-to-call, click to calendar, click to contacts and click to App World

BlackBerry Platform Services



- Geolocation Services
 - Reverse Geo-coding
 - Provides an estimation of a user's location based on cell tower positioning, instead using of a satellite GPS fix.
- BlackBerry® Internet Bundle Push service
 - New free Push Essentials tier open to all developers!

BlackBerry App World™

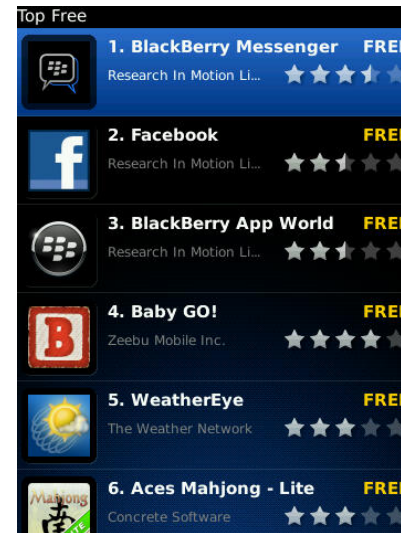
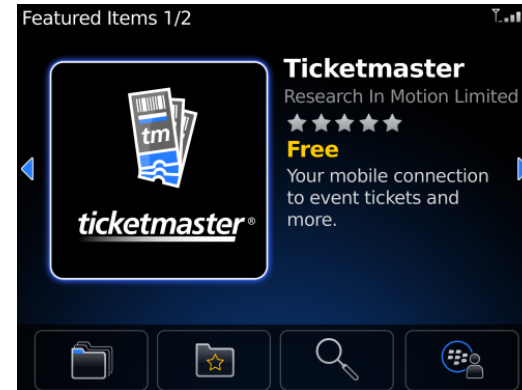


- 1.0 Release

- Initial launch in the US, UK, and Canada

- 1.1 Release

- Now available in 5 languages and 40 countries
- Featured, Top Free, Top Paid, and Newest Applications
- Enhanced Performance
- Memory Indicator
- Archive Applications
- Sort Search Results





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Questions?



Thank You