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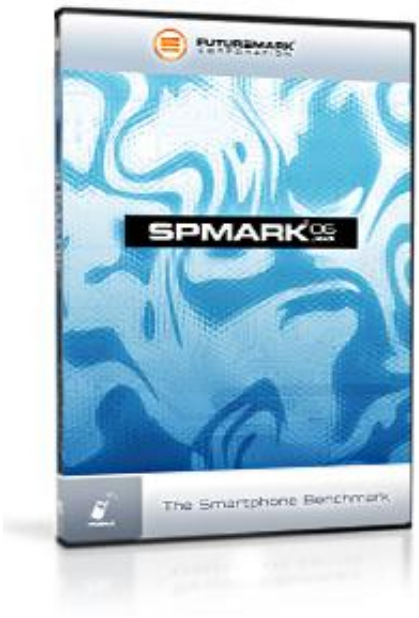
Futuremark Corporation (USA) Tel. +1-408-517-9020
12930 Saratoga Avenue, B-7 Fax +1-408-517-9119
Saratoga, CA 95070 USA



SPMARK™ JSR 184

Reviewer's Guide: SPMark™Java JSR 184

Product Name: SPMark™Java JSR 184

Product Tagline: The Java Benchmark for Mobile Devices

About this Guide: This Reviewer's Guide is intended to provide test procedures for media interested in benchmarking Java enabled mobile hardware, as well as provide product details for those that are interested in reviewing the SPMarkJava JSR 184 benchmark tool.

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Benchmarking Java performance in mobile devices

SPMarkJava JSR 184 is a richly featured handheld device benchmark designed to measure and evaluates the system's performance in running Java applications. Targeted for MIDP 2.0 and JSR 184 capable handheld devices, the benchmark's workloads consist of 3D gaming, 2D gaming, video playback, image processing, Java Virtual Machine (JVM) testing, and battery testing. Additionally the benchmark displays detailed system information of the device and its Java implementation. Coupled with Futuremark's original Online ResultBrowser (ORB) service it is now possible to submit results and compare those against any other phones in the database.

The benchmark runs on most mobile devices using a variety of current Java APIs. It will utilize handset UI code depending on the model and its Java implementation. Supported Java APIs include JSR 184, JSR 135, using the MIDP 2.0 Profile on the CLDC 1.0 configuration (CLDC 1.1 required to run tests that require floating point calculations). Supported video codec is H.263. Running the complete series of default tests will result in a calculated overall performance score, SPMarkJava JSR 184 score. Any number of user selectable individual tests can be selected and run for custom benchmarking requirements. The optional battery test runs selected tests in a continuous loop until the battery is drained or the OS shuts down the Java application due to low battery.

Availability

Three versions of SPMarkJava JSR 184 are available: a free **Basic Edition** for consumers, the **Advanced Edition** for consumers as well, which includes more features, more detailed system information and a playable 2D game test demo. Lastly, the **Professional Edition** for business usage is available as source code and compiled binaries.

The Basic Edition .jar/.jad files will be made available as a free download from the Futuremark website, and via mirror websites. On request, Futuremark will supply the SPMarkJava JSR 184 Basic Edition for distribution by media and other interested parties. Advanced Edition .jar/.jad files will be available for purchase and download from Futuremark for $3.00 per license. Professional Edition is available as source code and as compiled .jar/.jad files. Futuremark's handheld BDP members are entitled to a reduced source code license fee. Operators are provided a free 12 month trial of the Professional Edition binary license.

Key Features

- MIDP 2.0 / JSR 184 Java benchmark application for handheld devices
- Extensively researched workloads evaluate performance across a broad range of Java APIs and profiles
- Source code licensing available under separate license
- Version available for business users with full functionality and results publishing rights
- Free consumer version available for personal testing
- Small fee consumer version available with playable game and extensive features
- Includes high and low detail 3D game tests, 2D game test, 3D fill rate and polygon throughput tests, video playback, image processing, Java Virtual Machine (JVM) testing and battery life testing tool
- Option to upload and compare results in Futuremark Online ResultBrowser (ORB).

Key Benefits

- SPMarkJava JSR 184 is the most comprehensive benchmark for measuring Java performance on mobile devices
- Developed in close cooperation with industry leading companies, including ARM, ATI, Bitboys, DMP, Falanx, Imagination Technologies, Intel, NVIDIA and Symbian to ensure well designed, valid workloads with unbiased, reliable results comparison across different architectures and environments
- Consists of popular end user application workloads including 2D and 3D gaming, video playback and image processing, in addition to measuring JVM operations and battery life
- Uses common Java APIs and will run on a wide variety of devices which have MIDP 2.0 and JSR 184

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- Source code licensing option allows customizing and compiling benchmarks to suit semiconductor manufacturers, hardware and handset manufacturers, application developers and operator requirements

Game Tests and Feature Test Details

Game Tests

High Detail 3D Game Test – Flying warship in fast pursuit of off-road vehicle
- JSR 184 implementation required to run this test
- Runs at full resolution for device, up to QVGA (320*240)
- Approximately 5,000 polygons rendered per frame
- Total of 21,380 triangles in the scene
- 15 objects, 1 camera, 1 directional light affecting one object (warship)
- 128x128 texture size
- M3g options/hints in default run
  - imageFilter: IMAGE_FILTER_LINEAR
  - levelFilter: LEVEL_FILTER_NEAREST
  - shading: SHADING_SMOOTH
  - lighting: LIGHTING_ON
  - perspectiveCorrection: PERSPECTIVE_CORRECTION_ON
- Performance measurement reported as Frames per second
- This test is available only in the Professional Edition

Low Detail 3D Game Test – off-road vehicle driving around a desolated area
- JSR 184 implementation required to run this test
- Runs at full resolution for device, up to QVGA (320*240)
- Approximately 3,000 polygons rendered per frame
- Total of 12,139 triangles in the scene
- 10 objects, 1 camera, 1 light (disabled in default setting)
- 128x128 texture size
- M3g options/hints in default run
  - imageFilter: IMAGE_FILTER_NEAREST
  - levelFilter: LEVEL_FILTER_BASE_LEVEL
  - shading: SHADING_SMOOTH
  - lighting: LIGHTING_OFF
  - perspectiveCorrection: PERSPECTIVE_CORRECTION_OFF
- Performance measurement reported as Frames per second

2D Game Test – designed to replicate workload of simple game with bitmap graphics: Driving game with bird's eye view
- MIDP 2.0 required to run test
- Test measures performance on CLDC 1.0 devices
- javax.microedition.lcdui.game package classes used heavily including bitmap rendering and collision detection
- Workload generated by adding independently scrolling bitmap layers with transparency
- Race track rendered as single, large, fully opaque TiledLayer object
- Benchmark code operates as a fully playable, but limited game (Game available only in Advanced and Professional Editions)
- Performance measurement reported as Frames per second

Feature Tests

3D Fill Rate test
- Measures the 3D fill rate of the target device
- Draws two 64*64 textures to a single triangle polygon
- Rotation used as a visual effect

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- Performance measurement reported as thousand texels per second (Ktexels/s)

3D Polygon Throughput test

- Measures the amount of polygons drawn on the screen
- Contains a set of 19*19 cubes in a single mesh
- Each cube wall created from two triangles, total triangle count 4332 (with 2888 vertices)
- No light used
- No texturing, rotation used as visual effect
- Performance measurement reported as vertices processed per second

Video Processing

- Measures video playback rate
- Uses H.263 Codec and JSR 135 API
- 176 x 144 resolution
- 15 FPS frame rate
- 40kBps bit rate
- Measurement reported as "Pass/fail"
- This test is available only in the Professional Edition

Image Processing

- Portions of an image are encoded and decoded on screen
- PNG image format (the format widely used in internal image storing in handheld devices)
- Each test operation result is displayed
- Geometric mean of both operations used to produce test results
- The result is given as a geometric mean of encoding and decoding test results. The individual test results in kPixels processed per second are also available

JVM-Test

- Theoretical test, consisting of series of subtests
- Subtests measure specific JVM operations
- Subtests vary from simple arithmetic operations to complicated but critical operations such as object creation
- Different data type variations tested:
  - 8bit
  - 16bit
  - 32bit
  - 64bit
- Subtests include:
  - Integer addition and subtraction in various data types
  - Integer multiplication and division in various data types
  - Conditional code test (if-else-statement)
  - Simple object creation test
  - java.lang.System.arraycopy(…) test – results in MB/s
  - Static method point call
  - Floating point addition/multiplication tests (these tests require CLDC 1.1)
  - Sine, cosine, tangent and square root calculations (these tests require CLDC 1.1)
- Performance measurement reported as operations per second
- Individual test results displayed
- Overall JVM-Test score is a geometric mean of subtest scores

Battery Test

- User selected tests run in looped sequence until battery is fully drained or the OS shuts down the Java application due to low battery.
- Measurement reported as the Time to drain battery in seconds
- Results not factored into overall SPMarkJava JSR 184 score
- This test is available only in the Professional Edition

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Online ResultBrowser

SPMarkJava JSR 184 is the first mobile phone benchmark from Futuremark with online services enabled. The Online ResultBrowser (ORB), which has so far only been accessible via Futuremark's PC performance benchmarks, is the ultimate tool for any user to search and compare benchmark results and system information online. Futuremark first implemented the ORB concept in 1997, to allow their users to upload their 3DMark and later PCMark benchmark results. By expanding the service to include SPMarkJava JSR 184 results, mobile device benchmarkers can join the nearly three million current ORB users and harness the power of a global database of over 13 million real-life benchmark results.

Performance results and system information can be uploaded directly from SPMarkJava JSR 184, which uses the device's default internet browser. Users can create a free account on the ORB or log onto their existing account with their username and password. Once the data is loaded into the ORB, the results can be browsed using their internet connected PC or the device's browser. This will permit the user to compare virtually any phone against each other and see which J2ME features are supported by various phones.

Device Requirements

Min system requirements

MIDP 2.0 and JSR 184 enabled device for 3D Game Test
JSR 135 implementation for Video Processing Test
CLDC 1.0 device required for 2D Game Test
CLDC 1.1 for floating point calculations in 3D tests and certain JVM tests
1MB Free space during run time
800kB minimum JAR size limit

Availability and Pricing

Futuremark offers different versions of SPMarkJava JSR 184 to meet the varying needs of a broad user base

The **Professional Edition** is the most comprehensive and provides industry companies with rights to publish results. Binary versions of the Professional Edition are priced at $20,000 USD for the first license, $5000 for each additional license. Operators will be provided a 12 month free trial Professional Edition license. Optional source-code licensing for members of Futuremark's Benchmark Developer Program (BDP) supports technology developers and device manufacturers.

Consumers have two versions available to them. The **Advanced Edition**, available for $3.00 USD per license, offers more features and a playable game. The **Basic Edition** is available at no cost to allow testing of the user's personal devices.

The SPMarkJava JSR 184 benchmark is available immediately via source-code licensing to Futuremark's BDP members and interested third parties. Compiled versions are also available immediately to professional users and consumers as downloads from the Futuremark Web site:

http://www.futuremark.com/products/spmark/spmarkjavajsr184/.

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How will the benchmark be used?

Semiconductor manufacturers, Handset and device manufacturers, Software developers, Operators, Commercial users:
An MIDP 2.0 / JSR 184 benchmark based on workloads that correlate with a blend of popular, real world applications and theoretical tests, supported by and developed in partnership with leading industry members, is currently not available on the market. The industry needs tests that consist of Java driven applications and commonly used functions to generate workloads for mobile devices they are developing and marketing.

Being able to run on most Java API enabled mobile devices will allow these customers to measure and compare Java application performance across their products in development and existing published products.

Source code will allow custom development of benchmark to meet customer requirements

Unbiased, consistent and fair tests that generate accurate measurement data will appeal to these users, providing them with metrics to use for implementation testing, hardware purchasing decisions, and for B2B marketing and sales reference points.

Media
Media need a thorough Java benchmark to test performance and generate trusted hard review data, with tests that include games, video playback, image processing, and JVM functionality, in addition to measuring battery life.

A benchmark that runs across a wide range of Java implementations on many different devices will enable journalists to compare performance results across a number of reviews and across many platforms.

Being able to run the default series of tests to generate an overall score is beneficial, but having the ability to run individual tests will help to target the strengths and weaknesses of devices in the review process.

End users
Allowing mobile device owners to physically measure their device's Java performance for comparison to other devices in the market, or to those ratings posted in editorial reviews will foster a demand for better performing devices and content to run on those devices. Better performing devices will appeal to demanding customers as the results show performance in applications and features they actually use.

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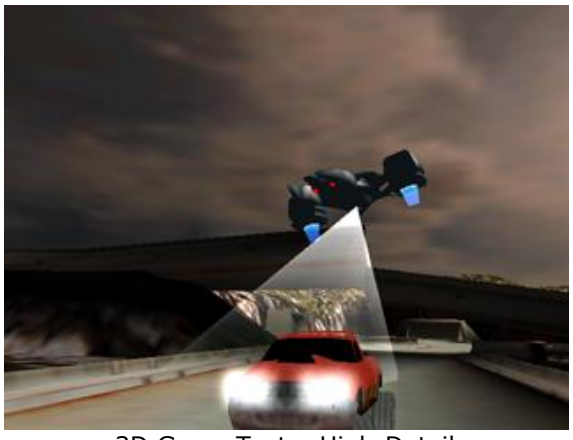
Screen Shots

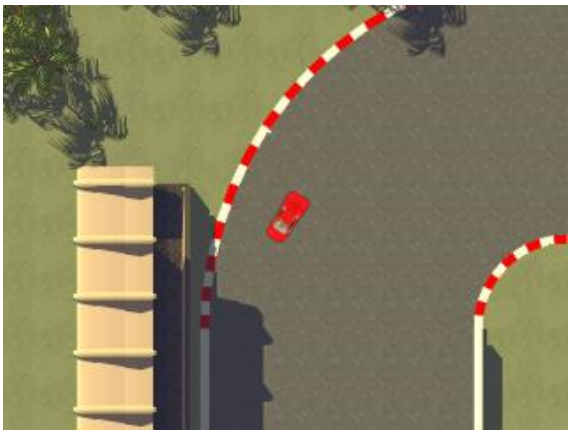
System information

Test selection

Online ResultBrowser



3D Game Test – High-Detail



2D Game Test

Image Processing Test

Sample SPMarkJava JSR 184 Results

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Usage & Distribution Guidelines

These guidelines contain important information about using SPMark™Java06 and publishing results. Please refer to these guidelines below before using the software or publishing results. If you have any questions related to these matters, please contact us!

Testing guidelines
For optimal benchmarking results, we highly recommend that you follow with these testing guidelines and steps:

- The benchmark should be run on a "clean" system i.e. no additional software installed
- No other software should be running in the background (use task list to close applications)
- The screensaver/power options idle period should be set to at least 5 minutes
- Fully recharge the battery before test run, and unplug the phone from any charging system, cradle or cables

Publishing benchmark results
Only licensed users may publish benchmark results in marketing materials or in any media or publication. Make sure that you follow instructions set forth in the license agreement and in our testing guidelines. Also, include the official SPMarkJava JSR 184 logo with a link or referral to Futuremark. Logos can be found at: http://www.futuremark.com/pressroom/?products

Default scores
In order to keep the reported scores comparable, we highly recommend that you use the default settings as a reference point. Referring to the default settings will make comprehending the results easier for other users running SPMarkJava JSR 184 on their systems. Any change to the default settings need to be communicated in the published results.

Distribution guidelines
SPMarkJava JSR 184 or parts of it can not be distributed without a specific written permission from Futuremark.

Please contact sales@futuremark.com for more details on how to obtain a Source Code license or for compiled binaries for SPMarkJava JSR 184 Professional Edition.

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Additional Information

For market and development information and press inquiries; send your request via email to sales@futuremark.com