BAPCo® MobileMark® 2014
User Guide

Introduction

MobileMark® 2014 is an application based, battery life benchmark designed to assist users in making PC purchasing decisions.

Setup

Before attempting to install or run MobileMark 2014, verify that the test system meets the recommended minimum system configuration for running the benchmark.

- **CPU:** Dual core 800 MHz processor AMD or Intel CPU
- **RAM:** 2GB system RAM
- **Free Space:** 30GB available for installation
- **Operating System:** Microsoft® Windows® 8 64 bit and Microsoft® Windows® 7 64-bit. The OS languages listed below will support MobileMark 2014 provided the OS Regional Language settings are set to US English.
    - US English
    - Brazilian Portuguese
    - Chinese (Simplified)
    - French
    - German
    - Japanese
    - Spanish
    - Russian
- **Resolution:** 1024x768 display resolution or higher
- **Graphics:** DirectX 9 compatible
- **Wireless Router:** Required for testing the Office Productivity and Media Creation scenarios (see FAQ page for recommended models)

Image configuration

For best results, MobileMark 2014 should be installed to a clean instance of a supported operating system, with updated hardware drivers. See the Applications section for a list of application software installed by the benchmark, as these any pre-installed versions of these applications must be removed prior to installing MobileMark2014. A list of image configuration guidelines is provided below. Note that MobileMark® 2014 includes an integrated configuration tool that will disable many of these items. See the Usage section for more details

- Administrative rights: An account with administrative privileges is required. Use the same account to install and run MobileMark 2014.
- User Account Control: Disable UAC on the test system.
- Uninstall known conflicting software: Pre-existing software installations may conflict with the software installed by MobileMark 2014.

- Screen saver: Disable screen saver.
- Windows Defender: Disable Windows Defender.
- Firewalls: Disable any firewall software.
- Windows Update: Disable Windows update.
- Anti-virus software: Uninstall AV software.

MobileMark® 2014 installation

To install MobileMark 2014, insert DVD 1 from the installation media set into the test system's optical drive. Launch MobileMark2014_Setup.exe and follow the prompts to install the benchmark software. If User Account control has not been turned off please right click the MobileMark2014_Setup.exe file and choose 'Run as Administrator' from the context menu.
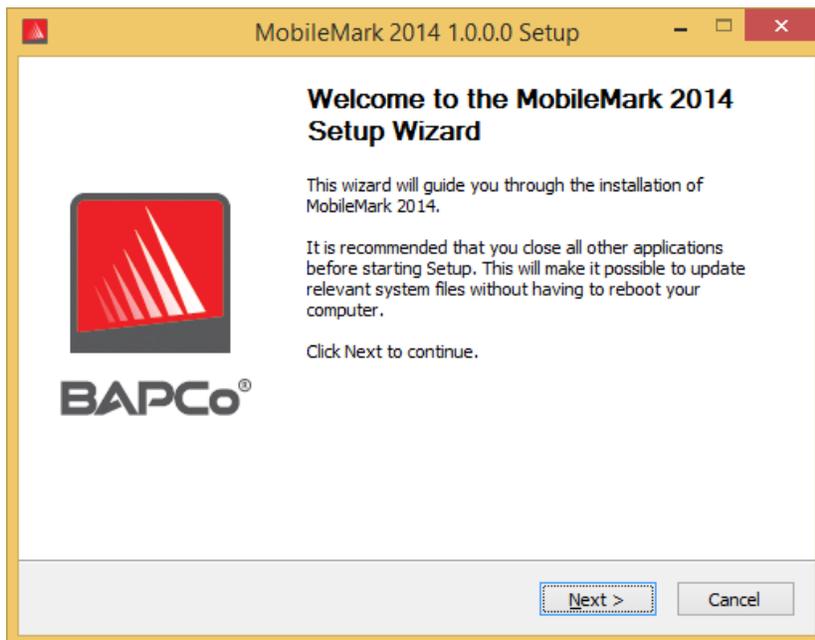
Figure 1: MobileMark 2014 installer window.

A serial number is provided with the benchmark purchase. Record the serial number for safe keeping, as it will be required for installation.
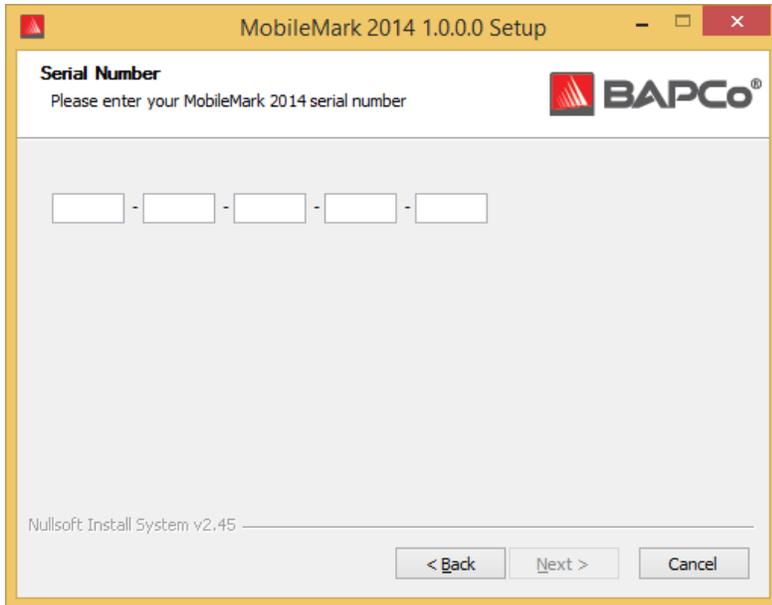
Figure 2: Enter your provided MobileMark 2014 serial number to proceed with installation.

Figure 3 shows the default full installation of the benchmark. All core components, all scenarios, the results browser, and the system configuration tool will be installed.
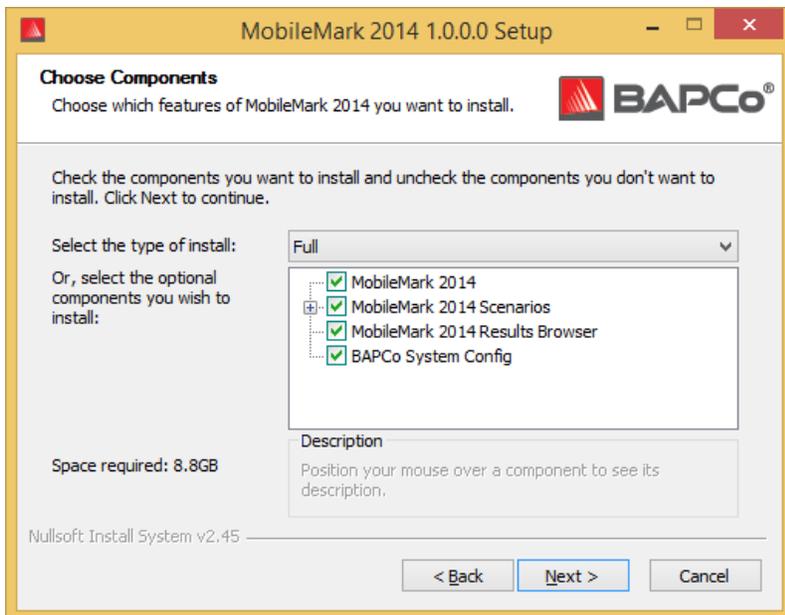
Figure 3: Default full install of MobileMark 2014

The installer also supports custom installation options as shown in Figure 4. Uncheck the components you do not wish to install. The MobileMark® 2014 component is required when installing any benchmark scenario. Scenarios not installed will not be available for selection when running the benchmark.
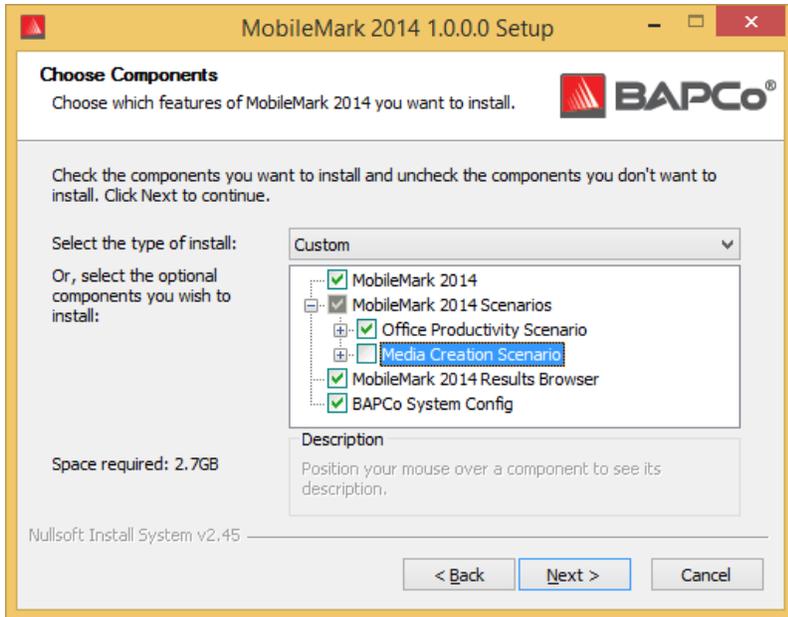
Figure 4: Uncheck the components for custom installation.

Upon successful completion of installation, MobileMark 2014 will display a window as shown in Figure 5 below.
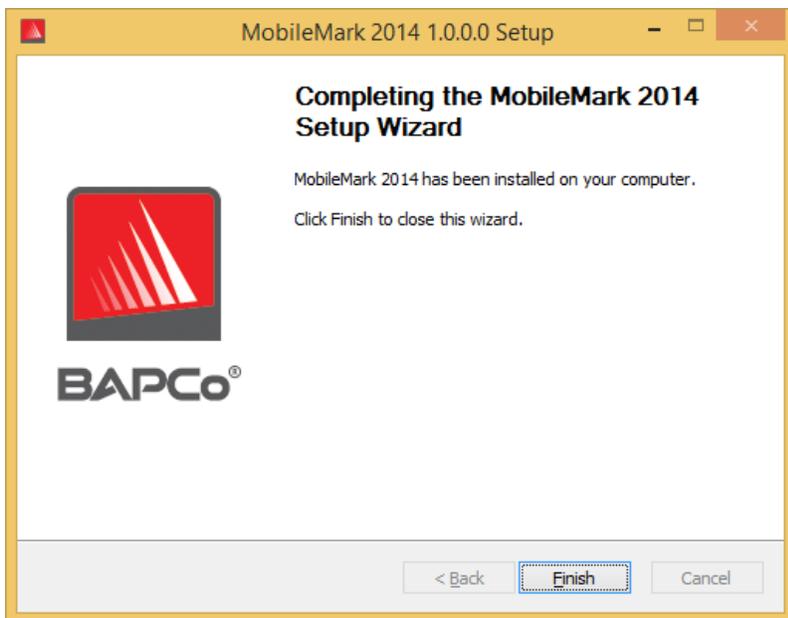
Figure 5: Installation of MobileMark 2014 has completed successfully.

MobileMark 2014 may also be installed through the command line. The following command line switches are available:

- /S - silent install, no GUI
- /SN=<serial number> - install with supplied serial number
- /SerialNumber=<serial number> - install with supplied serial number
  - Both /SN and /SerialNumber are case insensitive

Command line install example

To install MobileMark 2014 from the command line, open a command prompt, change to the directory where the MobileMark2014_Setup.exe file is located and issue the following command. Replace xxxxx-xxxxx-xxxxx-xxxxx-xxxxx with your provided serial number.

C:\>start /wait MobileMark2014_Setup.exe /S /SN=xxxxx-xxxxx-xxxxx-xxxxx-xxxxx

Installer exit codes

When complete, the installer will return an exit code (stored in %ERRORLEVEL%). See below for the exit codes and their meanings:

- 0 - Success
- 3010 - Success, reboot required
- 1 - Installation abort by user
- 2 - General installation problem
- 3 - Missing or invalid serial number
- 4 - The following applications must be uninstalled before installing MobileMark 2014
- 5 - MobileMark 2014 (64-bit) can only be installed on 64 bit machines
- 6 - MobileMark 2014 installer is already running
- 7 - Installer must be run from the top level installer: MobileMark2014_Setup.exe
- 8 - Disc 2 version does not match the version in Disc 1
- 9 - Application installation missing. Invalid installation. Please uninstall and reinstall MobileMark 2014
- 10 - Installation directory must be less than 145 characters.
- 11 - Installer cannot find Disc2 media
- 12 - Failed to execute installer component
- 13 - Benchmark version incompatibility with already installed benchmark
- 14 - Benchmark cannot be installed on this version of the OS

Usage

The MobileMark 2014 interface may be launched by

- Double clicking the MobileMark 2014 desktop icon
- Navigating to C:\Program Files (x86)\BAPCo\MobileMark2014\bin\ directory in Windows Explorer and double clicking the MobileMark 2014.exe file
- From the Start menu: Start>All Programs>BAPCo and clicking the MobileMark 2014 menu icon

Important: If User Account Control has not been previously disabled, right click the icon and choose 'Run as administrator'. UAC can then be disabled using the integrated configuration tool. More information on the integrated configuration tool is available in the Automated Configuration section below

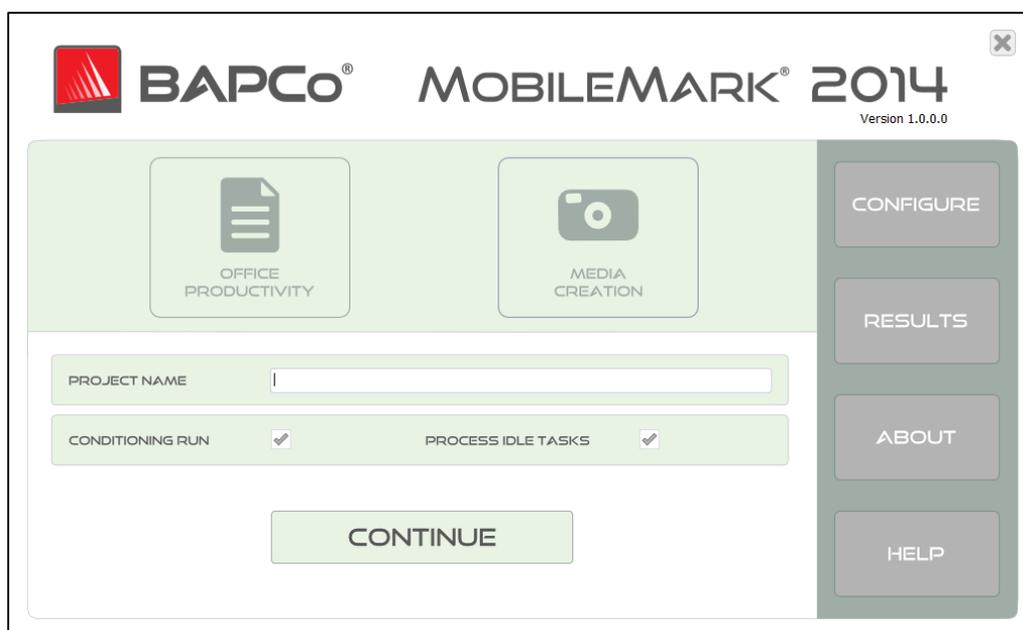The benchmark interface window will open as illustrated in Figure 6:

Figure 6: MobileMark 2014 main GUI interface.

Launch benchmark project from GUI

MobileMark 2014 benchmark runs are controlled through the main GUI. The elements of the interface are described below.

Configuration: Launches the system configuration tool and allows the user to customize the default options. A reboot may be required after applying the configuration changes. See the Automated Configuration section below for more details on the configuration tool.

Project name: Type the desired project name in the 'Project name' field. Spaces and underscores are permitted. Special characters such as (\, /, :, *, ?, ", >, <, |) are not supported in project names.

Scenarios: Select the scenario to run by clicking the appropriate button. Scenarios not installed at install time are not available for selection in the GUI. Only one scenario can be selected per project.

Conditioning run: Default value: Selected. The conditioning run executes one iteration of the selected scenario and may help the system achieve more repeatable results. The project FDR will indicate whether the conditioning run was executed. However, if executed, the conditioning run will not be included in the final scores for the project. See the FAQ page for more information about the conditioning run.

Process Idle Tasks: Default value: Selected. Process idle tasks option directs MobileMark 2014 to execute the Windows operating system process idle tasks queue before starting the benchmark run. Clearing the idle tasks queue prior to running the benchmark may help achieve more repeatable results.

Continue: Click the continue button to run the configuration verification check.

Verify Configuration: After clicking 'Continue', MobileMark 2014 will verify that the system is properly configured before proceeding with the test.

Battery status: If the current battery charge is less than 100%, MobileMark 2014 will display a warning (Figure 7a). Although a battery charge warning does not prevent the test from starting, if battery does not have sufficient charge to complete one iteration of the selected scenario, neither performance qualification nor battery life will be reported.

Battery health: MobileMark 2014 also reports battery health prior to starting the test (Figure 7a). If the battery health is detected at 80% or less, a warning will be displayed.
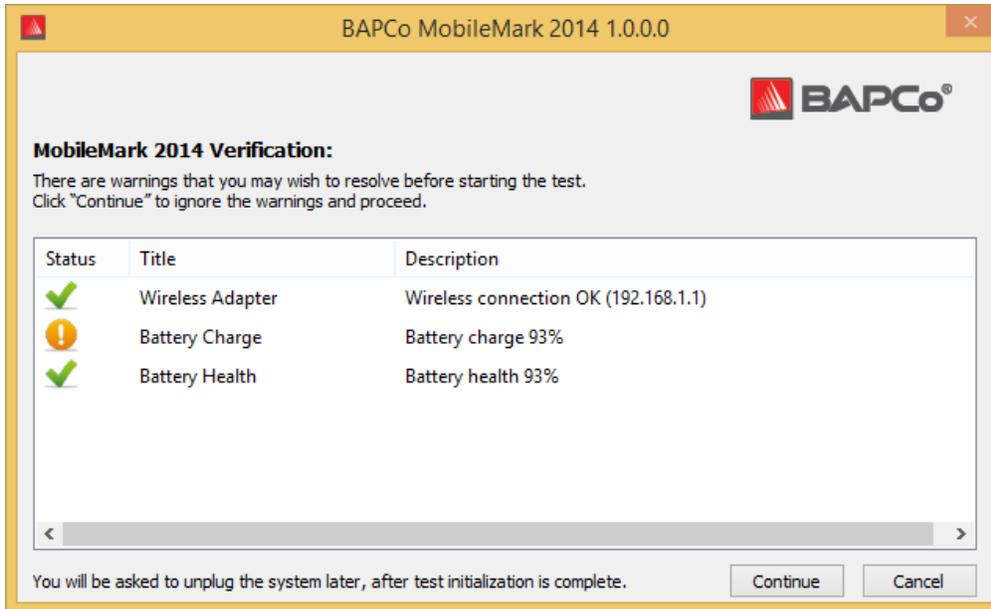
Figure 7a: Configuration verification displays a battery charge warning and shows battery health at 98%.

Wireless adapter status: If the WLAN adapter is not connected to a wireless access point when testing OP or MC, MobileMark 2014 will display an error, and will not allow the test to continue until the WLAN adapter has been properly connected. When setting up the wireless network profile, be sure the 'Connect Automatically' option is checked.

Note: The wireless router used during MobileMark 2014 testing should not be connected to the Internet, as this may interfere with one or more benchmark applications.
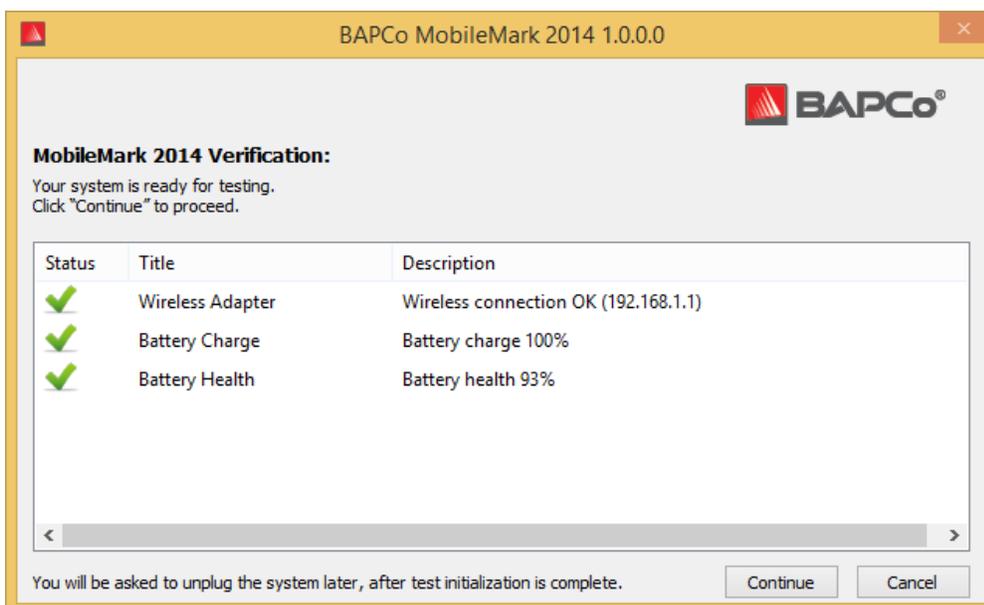
Figure 7b: Configuration verification complete, the test can proceed.

Continue: Start the test by clicking the 'Continue' button in the 'Verify Configuration' window. The system remains plugged while MobileMark 2014 initializes the workload applications for the selected scenario.

Unplug the system when prompted: After MobileMark 2014 has completed all the system initialization tasks, the user will be prompted to unplug the system for the start of the battery life test.
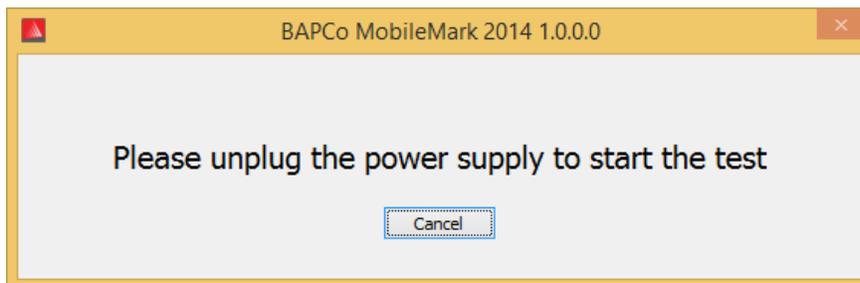
Figure 9: MobileMark 2014 prompts the user to unplug the system.

Automated Configuration

New for MobileMark 2014, BAPCo has integrated a system configuration tool into the benchmark GUI to better assist users with configuring the system prior to executing the benchmark. The system configuration tool will automatically apply a set of default options to the system which are required for MobileMark 2014 to run. The configuration tool settings can be viewed by clicking the configuration button in the main GUI.

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Figure 10: MobileMark 2014 configuration button

The configuration tool window will display the options available for configuring the test system, as pictured in Figure 8 below. Modify the set of options and click 'Save' to save the profile. When SYSmark 2014 is launched, the saved settings will be applied to the system. Note that Figure 8 displays the options that appear under Windows 8.1, other support operating systems may display a different set of options

Figure 11: MobileMark 2014 configuration tool, shown with default options selected.

System Configuration Tool Items List

The following is a list of configuration options with their priorities that can be applied using the System Configuration tool.

Required

Make configuration changes that are required for the benchmark to run. These items are checked by default.

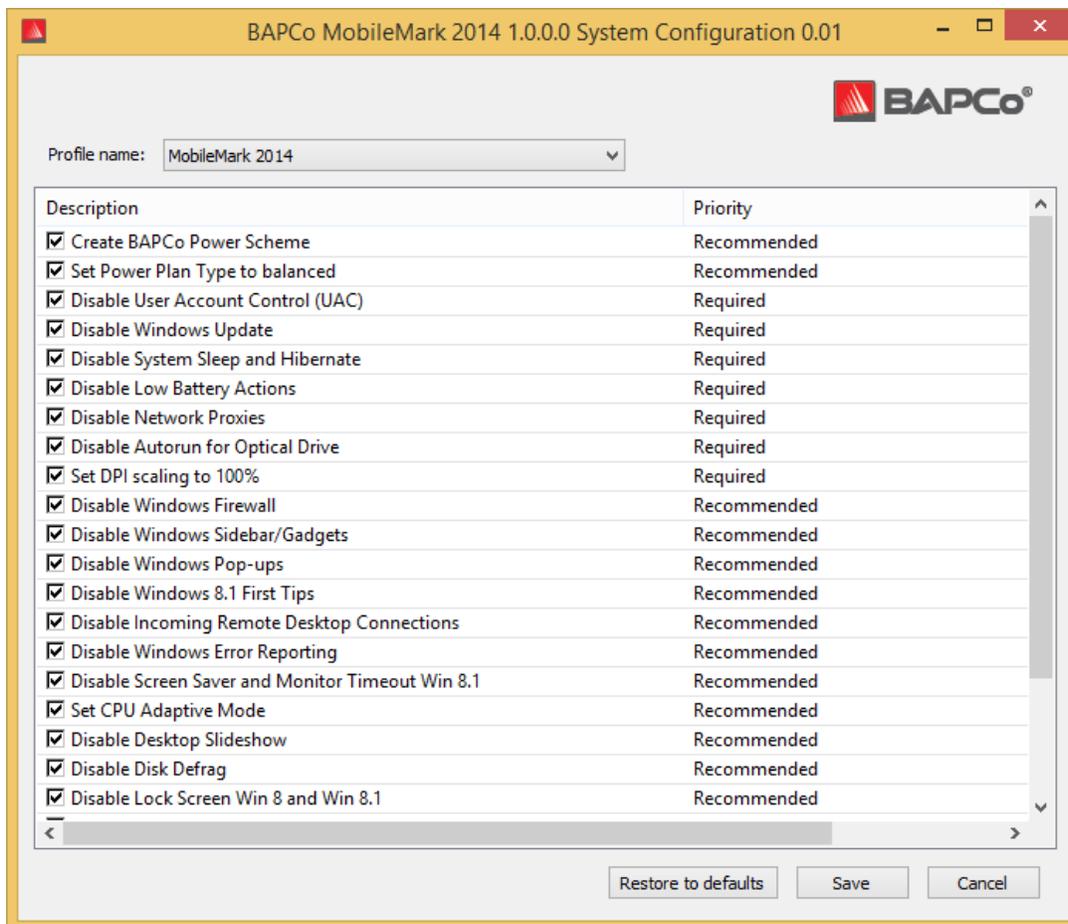**Recommended**

Make configuration changes that are recommended in order to obtain repeatable scores. Recommended items are checked by default. Recommended items may be disabled by unchecking the corresponding box.

Optional

Make configuration changes that are typically not needed to obtain repeatable scores, but which may be needed in some rare cases. Optional items are not checked by default.

Create BAPCo Power Scheme – Recommended

Creates a new power scheme named "BAPCo MobileMark 2014" based on the system's currently active power scheme. If applied, all subsequent power profile configuration changes will be applied to the newly created power scheme. If this option is not checked, all power profile configuration changes will be applied to the currently active power scheme.

Set Power Plan Type To "Balanced" – Recommended

Sets the "Power Plan Type" option (sometimes referred to as "Power Plan Personality") of the active power scheme to "Balanced". This setting tags the active power plan with an overall personality that favors a balance between performance and battery life. Drivers and applications may query this setting to determine their respective performance vs energy savings behavior. This option may be used whether or not the "Create BAPCo Power Scheme" option is checked. If "Create BAPCo Power Scheme" is unchecked, "Set Power Plan Type" will be applied to the currently active power scheme.

Disable User Account Control (UAC) – Required

Disables User Account Control to prevent Administrator elevation prompts from appearing during benchmark runs. The system must be rebooted to apply this change.

Disable Windows Update – Required

Stops and disables the Windows Update service. Prevents the Windows Update service from starting and/or checking for updates during benchmark runs.

Disable Sleep and Hibernate – Required

Prevents the system from going to sleep or hibernate and disables the "Require password on wake" setting.

Set Screen Dimming Timeout (2mins) - Required Sets the screen dimming timer to wait for 2 minutes of inactivity before allowing the screen to dim. This setting is not supported on Win 8.1

Disable Low Battery Action – Required

Prevents the system from shutting down or posting a warning when the battery reaches the low level.

Disable Network Proxies – Required

Disables proxy server configuration for Internet connection settings.

Disable Autorun for Optical Drive – Required

Disables Autorun function when DVD/Video Playback is placed in the optical drive.

Set DPI Scaling to 100% - Required

Sets DPI scaling to 100%. Prevents automation errors that may be encountered on higher resolution displays.

Disable Windows Firewall – Recommended

Stops and disables the Windows Firewall service. Prevents blocking of application functions during the benchmark run.

Disable Windows Sidebar/Gadgets – Recommended

Turns off Gadgets.

Disable Windows Pop-ups – Recommended

Disables all pop up notifications (Balloon tips) in the systray.

Disable Incoming Remote Desktop Connections – Recommended

Denies remote desktop connection requests from remote systems.

Disable Windows Error reporting – Recommended

Prevents Windows Error reporting tool from presenting error reporting windows.

Disable Screen Saver and Monitor Timeout – Recommended

Turns off the screen saver. Disables display timeout in the power profile for both AC and DC options. For Windows 8.1, the monitor timeout will be set to 5 minutes on DC and 10 minutes on AC

Set CPU Adaptive Mode – Recommended

Sets the maximum processor state to 100% on AC and DC power.

Sets the minimum processor state to 5% on AC and DC power.

Disable Desktop Slide Show – Recommended

Prevents the desktop background from changing.

Disable Disk Defrag – Recommended

Disables the Defrag scheduled task.

Disable Hard Disk Timeout – Optional

Prevents the hard disk from going to sleep.

Disable Windows Defender – Optional

Stops and disables the Windows Defender Service.

Disable System Restore – Optional

Prevents System Restore from attempting to create restore points.

Ignore Laptop Lid Close – Optional

Prevent system suspend when closing the laptop lid.

Disable Adaptive Brightness – Optional

Stops and disables the Adaptive Display Service.

Set Maximum Display Brightness – Optional

Sets display brightness to 100%. Sets dimmed display brightness to 100%. Sets "Dim Display After" value to "Never".

Launch System Configuration Tool from command line

The System Configuration Tool may be launched from the command line. Using the parameters below.

-p or --profile="ProfileName"	Specifies the configuration profile to apply. Profile names are case sensitive, and must be listed in the SystemConfig.xml file. The default profile is: MobileMark 2014
-h or --help	Displays the help dialog

Autoconfig from command line

"C:\Program Files (x86)\BAPCo\MobileMark2014\bin\System Configuration.exe" -p="MobileMark 2014"

Launching a benchmark project from command line

MobileMark 2014 also supports execution from the command line. Supported command line parameters are provided in the list below. The MobileMark 2014 GUI will launch if there are syntax errors in the command line text.

-p *or* --project="project name"	Specifies the name of the project. This option determines if the GUI is presented to the user, or if the benchmark runs silently. If this option is supplied, it is assumed that the GUI should not appear.
-s *or* --scenarios="OP"	Specifies the scenario to be run. Valid options are: OP or MC
-nc *or* --noconditioning	Turns OFF system conditioning run. The default is ON.
-np or – noprocessIdletask	Turns OFF process idle tasks. The default is ON
-h *or* --help	Displays the help screen.
-v *or* --verbose	Turns on verbose mode. The default is off.

Example command line

"C:\Program Files (x86)\BAPCo\MobileMark2014\bin\MobileMark 2014.exe" -p test_project -s OP

Tips for Usage

This subsection describes the behavior of MobileMark 2014 during the execution of a benchmark run.

Screen Brightness

MobileMark 2014 run rules require that the test system display brightness must be set to a value not less than 150 nits, as measured on DC (battery) power in the center of an all-white screen. The setting must be maintained for the duration of the test, except when screen dimming, screen off or Connected Standby is in use (see below). In cases where the system display is not capable of reaching 150 nits brightness on DC (battery) power as measured in the center of an all-white screen, the screen brightness must be set to the maximum brightness value as measured on DC (battery) power, for the duration of the test, except when screen dimming is in use as per the rules below. System displays not capable of reaching 150 nits brightness on DC (battery) power must be documented as part of any FDR submission.

Screen Dimming

Use of operating system supported screen dimming capability is allowed at the tester's option provided that:

- The installed Operating System is Microsoft Windows 7 or Windows 8.0*.

- The initial screen brightness is set as specified in the Screen Brightness section of this document.

- Screen dimming timeout value must be set to minimum of 2 minutes on DC power

- The dimmed display value must not be less than 45 nits, as measured on DC power

- *Screen dimming is not allowed in Windows 8.1 and Windows 10

Screen Off

Use of operating system supported screen off capability is allowed at the tester's option provided that:

- The installed Operating System is Microsoft Windows 8.1 or Windows 10*.

- Screen off timeout value must be set to minimum of 5 minutes on DC power.

- Screen off only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.

- *Screen off is not allowed in Windows 7 or Windows 8.0

Connected Standby

Use of operating system supported connected standby is allowed at the tester's discretion provided that:

- The installed operating system is Microsoft Windows 8.1 or Windows 10

- Screen off timeout value must be set to a minimum of 5 minutes on DC power

- Connected standby only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.

- The test system meets the requirements of the Microsoft Connected Standby specification. The whitepaper outlining these requirements can be found here: http://msdn.microsoft.com/en-us/library/windows/hardware/jj248729.aspx

- Standby/Hibernate: Use of operating system supported standby/hibernate capability is NOT allowed, with the exception of connected standby when used in accordance with the rules above.

Windows 10 Battery Saver

Use of Windows 10 "Battery Saver" is permitted under the condition that it set to activate at no greater than 20% and the check box "Lower Screen brightness while in battery saver" is disabled

Standby/Hibernate

Use of operating system supported standby/hibernate capability is NOT allowed, with the exception of connected standby when used in accordance with the rules above.

System Configuration

To ensure the integrity of MobileMark2014 results, test systems must maintain the same hardware configuration and software settings throughout the execution of the test. Any modification to hardware configuration and/or software settings will invalidate the results

Heads Up Display (HUD)

The Heads Up Display appears in the upper right corner of the desktop and provides information about the currently running project.

Figure 12: BAPCo Heads Up Display.

Process idle tasks

Prior to executing benchmark workloads, the MobileMark 2014 workload manager will idle for 120 seconds to allow the system to stabilize. When the 120 seconds has elapsed, the workload manager will issue the process idle tasks command. Once the idle tasks queue is cleared, the benchmark workload will begin. Note: Process idle tasks completion time can vary from system to system and run to run.

Keyboard/mouse input blocking

Once workload execution begins, the workload manager will the lock system to prevent accidental input from the mouse or keyboard from disrupting the workload automation. The workload manager will continue to execute the selected scenarios for the current project, and will display the results at the conclusion of the run. Refer to the **Stopping a run in progress** section below for additional information on keyboard and mouse input blocking.

Error handling

By default, when MobileMark 2014 encounters an error during the execution of a project, the workload manager will log the error and reboot the system. The MobileMark2014 GUI will relaunch and display the error message to the user. Additional information about the error is located under the ../Results/<Project Name>/Errors folder. When requesting support from BAPCo, please include these error logs.

Increasing timeout tolerance

MobileMark 2014 allows further control of error handling timeouts through the BENCHMARK_TIMEOUT_MULT environment variable. This variable can be configured to increase the amount of time a benchmark script waits before throwing an error and either attempting a retry or halting the run. The default value for BENCHMARK_TIMEOUT_MULT is 1.0. Increasing the value to 2.0 doubles the error handling timeout, 3.0 triples the timeout, and so on. Note that this environment variable is created during benchmark installation, and is not available until the installation has completed. Access the BENCHMARK_TIMEOUT_MULT variable by following the steps below:

- Navigate to: Control Panel>System and Security>System> Advanced system settings
- Click 'Environment Variables' and scroll down until ''BENCHMARK_TIMEOUT_MULT' is visible
- Highlight the variable and and click the Edit button to change the value
- When finished, close all dialog boxes and execute the benchmark run as usual
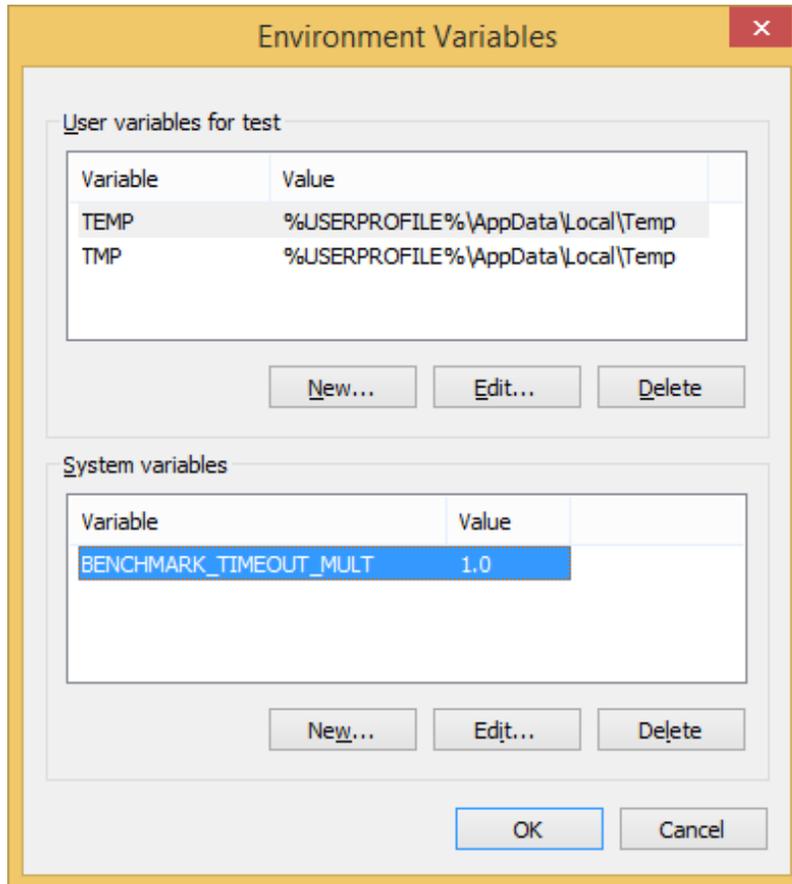
Stopping a run in progress

If it becomes necessary to stop a benchmark run in progress, follow these steps:

- Depress the CTRL-ALT-DEL keys at the same time, bringing up the Windows change password screen
- Click 'Cancel' to return to the desktop
- Keyboard and mouse input should now be enabled
- Navigate to the systray in the lower right corner of the screen and find the BAPCo icon, as shown in Figure 13 below
- Right click the icon and choose 'Stop'

Figure 13: BAPCo icon. The green triangle indicates that MobileMark 2014 is running

Results browser

The MobileMark 2014 results browser adds new functionality over the MobileMark 2007 results browser. New features include:

Double click support for viewing single FDR

Double clicking on an FDR file will launch the results browser, load and display that FDR. Double clicking another FDR file will display the FDR in the browser window. Previously loaded FDRs will be available from the results browser drop down menu.

Drag and drop support for viewing multiple FDRs

Drag and drop an FDR file on the open results browser window, and the FDR will be displayed. Multiple FDRs may also be selected, dragged and dropped onto the results browser window. The results browser will display one FDR, the other selected FDRs will be available from the drop down menu.

Save FDR to PDF for distribution

Generated FDRs may be exported to PDF for easier distribution. Save to PDF by first loading the desired FDR into the results browser. Once the FDR is displayed, click the 'Save Results' button in the lower right corner of the results browser window. The Windows save file dialog will appear. The default file path is: C:\Program Files (x86)\BAPCo\MobileMark2014\Results\<project_name>.
Select the path and choose a file name. Finally, choose 'PDF (*.pdf)' from the 'Save as type' drop down and click 'Save'.

Standalone installation support

The MobileMark 2014 results browser supports standalone installation, allowing the user to view FDRs quickly and easily on almost any system. To install the results browser, follow the steps below.

- Launch the MobileMark 2014 installer from DVD 1
- Enter a valid serial number and click 'Next'
- Accept the license agreement and click 'Next'
- Under the 'Select type of install' option, choose 'Custom'
- Uncheck the 'MobileMark 2014' and the 'MobileMark 2014 Scenarios' component
- Be sure the 'MobileMark 2014 Results Browser' component remains checked and click 'Next'
- Click 'Next' to accept the default location

- Click the 'Install' button
- Click the 'Finish' button to close the installer window

Launch the Results browser by

- Double clicking the desktop icon
- Double clicking any FDR file
- Navigating to the Start menu>All Programs>BAPCo and clicking the MobileMark 2014 Results Browser icon

Viewing results

Upon successful completion of a project, MobileMark 2014 launches the results browser and loads the Full Disclosure Report (FDR) for the project as shown in Figure 14.
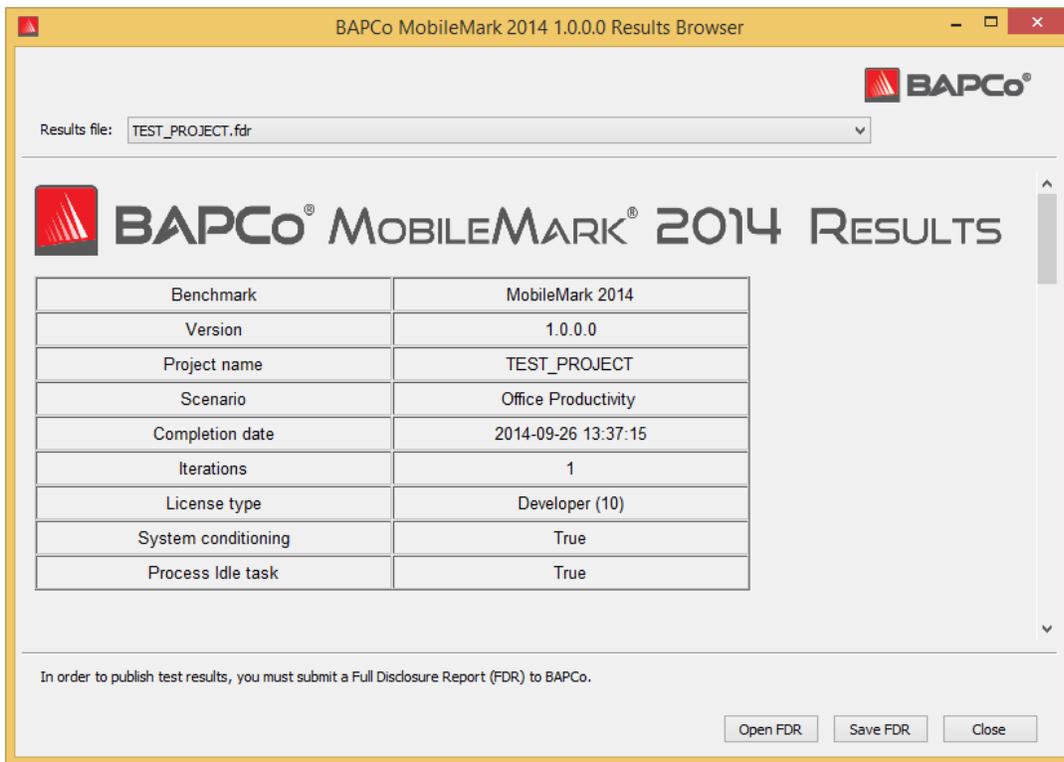
Figure 14: Results Browser test summary information.

Scroll down in the window to view the table of scores, as shown in Figure 15.
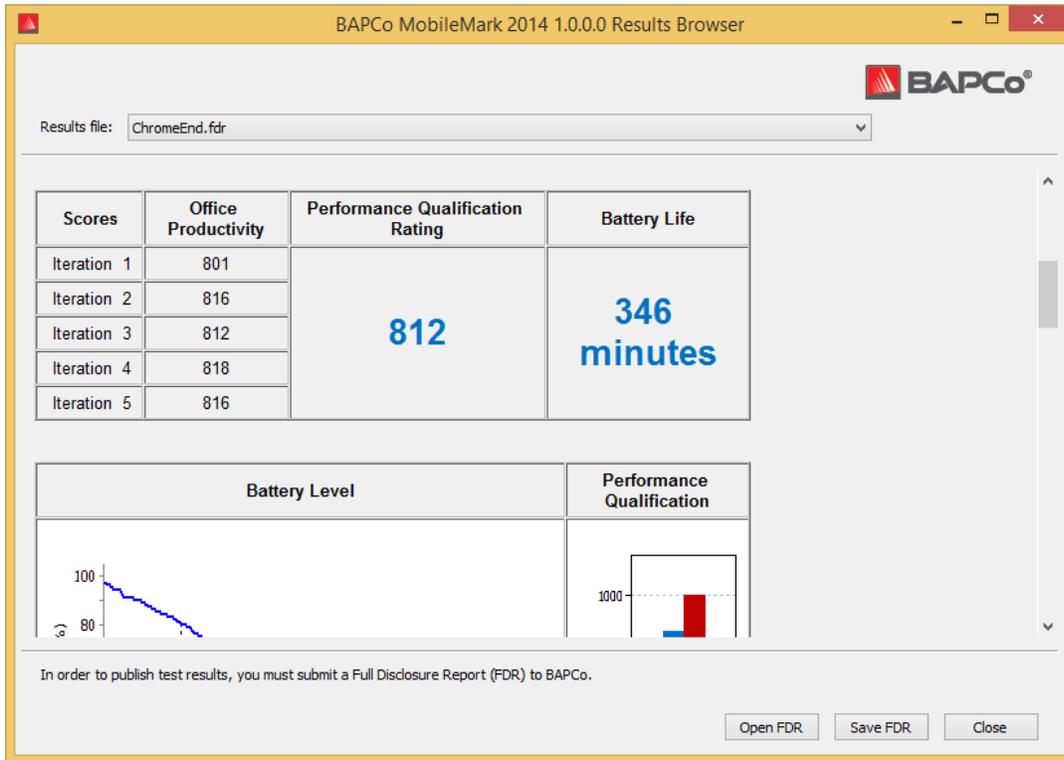
Figure 15: Project scoring information for the Office Productivity scenario.

Figure 16 illustrates the MobileMark 2014 Office Productivity scenario battery chart.
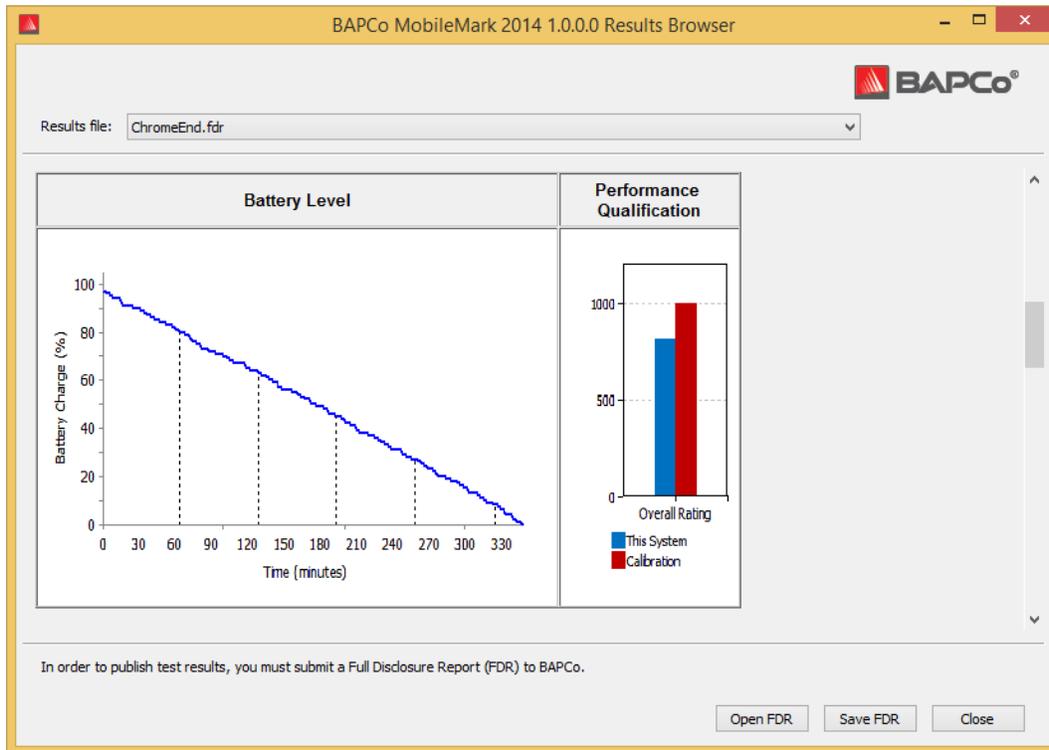
Figure 16: Example of Office Productivity scenario battery chart.

Reference system

MobileMark 2014 performance scores are normalized using a reference system. The reference system scores a performance rating of '100' for the Office Productivity and Media Creation scenarios.

Reference system specifications:

Lenovo T440

- CPU: Core i3 4010U @ 1.7GHz
- Graphics: Intel HD4400
- OS: Win 8.1 (64bit)
- RAM: 4GB PC3 12800 DDR3 1600MHz
- Storage: 500gb 7200 RPM, 16GB SSD cache
- Display: 14 inch @ 1600x900
- External 3 cell Battery: 23.2 Whr
- Internal 3 cell Battery: 23.2 Whr

Publishing results

BAPCo encourages users to submit FDRs (Full Disclosure Reports) generated from Official Runs of MobileMark 2014 for publication at www.bapco.com.

- Load the desired FDR into the results browser, or, if the Official Run has just completed, the corresponding scores will already be displayed in the results browser window
- Click the 'Save Results' button in the lower right corner of the results browser window
- The Windows save file dialog will appear. The default file path for saving FDRs is: C:\Program Files (x86)\BAPCo\MobileMark2014\Results\<project_name>
- Select the desired path and choose a file name
- Choose 'PDF (*.pdf)' from the 'Save as type' drop down and click 'Save'
- Email the PDF to report@bapco.com

Applications

The following applications (grouped by scenario) are installed and/or used by MobileMark 2014. Some applications appear in multiple scenarios, but only one instance of the application is installed.

Office Productivity

- Adobe® Acrobat® XI Pro
- Google Chrome
- Microsoft® Excel® 2013
- Microsoft® OneNote® 2013
- Microsoft® Outlook® 2013
- Microsoft® PowerPoint® 2013
- Microsoft® Word 2013
- WinZip® Pro 17.5

Media Creation

- Adobe® Photoshop® CS6 Extended
- Adobe® Premiere® Pro CS6
- Adobe® Premiere® Pro CS4 (for 32 bit)
- Trimble SketchUp™ Pro 2013

Scenarios

MobileMark 2014 scenarios and workload descriptions are provided below.

Office Productivity

The Office Productivity scenario models productivity usage including word processing, spreadsheet data manipulation, and email creation/management. Web browsing is also included.

Media Creation

The Media Creation scenario models using digital photos and digital video to create, preview, and render a video advertisement for a fictional business.

Support

Technical support for MobileMark 2014 is provided through support@bapco.com

When contacting support please include the following information.

- MobileMark 2014 version, eg, 1.0.0.123
- System configuration information
- Step by step instructions for reproducing the problem
- Rate of error, eg, 100%, 50%
- Archive of the benchmark error logs from the failing run
    - Locate the error folder:
    - C:\Program Files (x86)\BAPCo\MobileMark2014\Results\<Project_name>\Errors\
    - Locate the benchmark installation logs:
        - %TEMP%\MobileMark2014.log
    - Locate the System Config Tool log (note: this file exists only if the System Config Tool was used to configure the system)
        - C:\Program Files (x86)\BAPCo\MobileMark2014\bin\Results\systemconfig.txt
    - Archive the error folder and the logs listed above using WinZip, WinRAR, etc.
    - Attach the archive file to the support request email sent to BAPCo support
    - When reporting multiple errors, please include an error archive for each problem being reported

MobileMark® 2014 Benchmarking Rules

This document describes the rules governing publication of results derived from running the BAPCo MobileMark 2014 benchmark. The Software License Agreement governs use of MobileMark 2014. Any licensee who wishes to publish MobileMark 2014 results is obliged to adhere to all rules and regulations as described in this document or other documents provided by BAPCo concerning the execution and reporting of MobileMark 2014 benchmark results. BAPCo reserves the right to change the rules outlined in this document at any time. Licensees are encouraged to consult the BAPCo website at www.bapco.com for the latest information regarding execution and publication rules.

Benchmark Execution

Workload Manager All benchmark tests must be run using the MobileMark 2014 Workload Manager. This utility is an executable program that runs the MobileMark 2014 benchmark. The Workload Manager is responsible for generating the benchmark results for the system under test.

All published results must be derived only from a complete and correct run of the benchmark. All tests must be performed without modification to any part of the MobileMark 2014 software.

The collective set of hardware and software used in generation of valid MobileMark 2014 results must be available to the public as defined by BAPCo's availability criteria. The following specific rules apply:

Operating System The operating system used to generate and publish results must be a publicly available release from the original software vendor. Consult the product manual at www.bapco.com for the current list of supported operating systems. Upgrade of specific drivers that are released and maintained by vendors other than the operating system vendor (e.g. graphics drivers, disk drivers, motherboard setting files, multimedia drivers) are allowed provided those drivers are release-quality, publicly available drivers obtained from the original vendor(s). Licensees may also use operating system service packs, API updates (e.g. Direct X) and other updates provided the update(s) are release-quality, publicly available software from the original vendor, and meet the benchmark supported operating system requirements. Licensees should also consult license agreements from individual software vendors to ensure compliance with vendor benchmark restrictions

Hardware Original Equipment Manufacturer (OEM) hardware used to generate official MobileMark 2014 results must be available for public purchase as a complete system platform from the OEM within 60 days of results publication. Alternatively, licensees of BAPCo benchmarks may publish results generated on non-OEM systems, provided that all of the individual system

components are available for public purchase through one or more hardware vendors within 60 days of results publication.

Software OEM software used to generate official MobileMark 2014 results has no grace period, and therefore must be release quality and publically available from the original vendor immediately upon publication of results.

Performance Enhancements Use of performance enhancements such as a software utility or other technique is allowed under the following conditions. Any performance enhancing software must be a release-quality, publicly available offering from the original vendor(s). Any performance enhancing techniques must be accessible to the public at large. Use of either method must be documented and included with the FDR submission. Performance enhancing techniques must not compromise the integrity of the system under test or the MobileMark2014 software. The use of drivers or other software specifically optimized for the purpose of increasing MobileMark 2014 battery life or performance qualification scores is expressly prohibited. BAPCo shall reserve the right to review the usage of such tools or techniques and invalidate submitted results at its sole discretion.

Wireless Connectivity The Office Productivity and Media Creation scenarios require that the system's wireless network adapter be turned on and associated to a wireless network which is not connected to the Internet for the duration of the test.

Ambient Light Sensors Use of adaptive brightness screen dimming technologies is strictly forbidden and must be disabled prior to running the test. Refer to Screen Brightness.

Screen Brightness The test system display brightness must be set to a value not less than 150 nits, as measured on DC (battery) power in the center of an all-white screen. The setting must be maintained for the duration of the test, except when screen dimming, screen off or Connected Standby is in use (see below). In cases where the system display is not capable of reaching 150 nits brightness on DC (battery) power as measured in the center of an all-white screen, the screen brightness must be set to the maximum brightness value as measured on DC (battery) power, for the duration of the test, except when screen dimming is in use as per the rules below. System displays not capable of reaching 150 nits brightness on DC (battery) power must be documented as part of any FDR submission.

Screen Dimming Use of operating system supported screen dimming capability is allowed at the tester's option provided that:

- The installed Operating System is Microsoft Windows 7 or Windows 8.0*.

- The initial screen brightness is set as specified in the Screen Brightness section of this document.

- Screen dimming timeout value must be set to minimum of 2 minutes on DC power

- The dimmed display value must not be less than 45 nits, as measured on DC power

- *Screen dimming is not allowed in Windows 8.1 and Windows 10

Screen Off Use of operating system supported screen off capability is allowed at the tester's option provided that:

- The installed Operating System is Microsoft Windows 8.1 or Windows 10*.

- Screen off timeout value must be set to minimum of 5 minutes on DC power.

- Screen off only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.

- *Screen off is not allowed in Windows 7 or Windows 8.0

Connected Standby Use of operating system supported connected standby is allowed at the tester's discretion provided that:

- The installed operating system is Microsoft Windows 8.1 or Windows 10

- Screen off timeout value must be set to a minimum of 5 minutes on DC power

- Connected standby only occurs during idle periods of the benchmark, only after the point in each idle period where 5 minutes of idle has elapsed.

- The test system meets the requirements of the Microsoft Connected Standby specification. The whitepaper outlining these requirements can be found here: http://msdn.microsoft.com/en-us/library/windows/hardware/jj248729.aspx

- Standby/Hibernate: Use of operating system supported standby/hibernate capability is NOT allowed, with the exception of connected standby when used in accordance with the rules above.

Windows 10 Battery Saver Use of Windows 10 "Battery Saver" is permitted under the condition that it set to activate at no greater than 20% and the check box "Lower Screen brightness while in battery saver" is disabled

Standby/Hibernate Use of operating system supported standby/hibernate capability is NOT allowed, with the exception of connected standby when used in accordance with the rules above.

System Configuration To ensure the integrity of MobileMark2014 results, test systems must maintain the same hardware configuration and software settings throughout the execution of the test. Any modification to hardware configuration and/or software settings will invalidate the results

Full Disclosure Report

MobileMark 2014 results are displayed in the Result Browser at the completion of the benchmark run. Results may be saved in FDR format for submission to BAPCo, or in PDF format for publication. The format and content of the FDR are determined at the sole discretion of BAPCo. FDRs that are modified in whole or in part, or that were not generated by the Workload Manager shall be considered invalid for any purpose.

Publication of Results

Licensees are encouraged to submit FDRs to BAPCo for inclusion in the FDR database maintained on the BAPCo website (www.bapco.com). Results may be submitted by emailing a valid FDR to report@bapco.com. FDR submissions that BAPCo determines to be invalid shall be excluded from the FDR database. Refer to the FDR Processing section of this document for more information.

Licensees may publish results through channels other than the BAPCo website FDR database. However, upon request from BAPCo, the licensee must provide the supporting FDR for any published results within 5 business days. Licensees are responsible for retaining FDR records for all published results.

All FDRs submitted by licensees to BAPCo are subject to a 10 working day review period. During this review period any BAPCo member can challenge the submitted FDR or submit a counter FDR. When a challenge occurs or a counter FDR is submitted, BAPCo will decide which, if any, of the FDRs will be accepted for inclusion in the FDR database.

Any publication of results must be accompanied by at least the system model number plus any discrepancies between the shipping configuration of that system model and the configuration of the system model actually tested.

Results collected on systems that do not meet the minimum system requirements for running MobileMark 2014 may be published or submitted to BAPCo for inclusion in the FDR database. However, BAPCo will only offer technical support for system configurations that meet or exceed the minimum system requirements for MobileMark 2014.

Any publication of results from the MobileMark 2014 Office Productivity scenario or the MobileMark 2014 Media Creation scenario must include both the MobileMark 2014 Battery Life score and the overall MobileMark 2014 Performance Qualification score from the same run.

FDR Processing

FDRs submitted to BAPCo for inclusion in the FDR database will be classified into one of the two following categories:

Released for publication- The results are released for publication as submitted by licensee, and will be included in the FDR database.

Rejected- The results are not released for publication as submitted by licensee, and will be excluded from the FDR database.

The Released for publication classification is in no way a validation or an endorsement of the results by BAPCo. Licensees are free to publish results pending the review of the FDR by BAPCo. BAPCo may perform audits of submitted FDRs and reserves the right to revoke the license granted to licensees who have not adhered to the regulations described in this or other BAPCo documentation. In the case where an FDR is returned to the licensee with Rejected classification, the licensee must immediately stop all publication of the rejected results until the matter is clarified by BAPCo.

The term MobileMark is a registered trademark of the Business Applications Performance Corporation and may only be used in conjunction with results generated by the MobileMark 2014 Workload Manager.

Any other performance and/or battery life characterizations may be made but must be derived from the performance metrics and/or battery life generated by the MobileMark program. The terms MobileMark and MobileMark 2014 may not be used when describing other derived battery life characterizations.

Publication of Results on Non-OEM Platforms

BAPCo accepts FDR submissions and allows the publication of battery life indices when using MobileMark 2014 for making "Non-OEM" platform comparisons. This includes battery life comparisons on systems that are not shipped from an OEM as a complete platform. An example of such comparisons would be swapping to a different hard disk or changing the amount of RAM in the test system, and demonstrating the impact on the benchmark results. Results submitted to BAPCo or published on Non-OEM platforms must be marked as Modified on the accompanying FDR submission and whenever appearing in publications of any kind.as Modified on the accompanying FDR and whenever appearing in publications of any kind.

Publication of Results for Competitive Comparisons

Licensees may publish results on competitor systems as long as the results for the competitor system have been submitted and accepted by BAPCo for inclusion in the FDR database. The submitted results may not be published until the FDR review period has expired and BAPCo has resolved all matters with respect to any challenges or counter FDR submissions.

Media outlets may publish results for making competitive comparisons without being subject to the restrictions in the preceding paragraph. Media outlets are subject to all other regulations set forth in this document.