**Intel Corporation**
2200 Mission College Blvd.
P.O. Box 58119
Santa Clara, CA 95052-8119

# Fact Sheet

CONTACT: Connie Brown
503-791-2367
connie.m.brown@intel.com

## Intel® Centrino® Processor Technology and Intel® Centrino® with vPro™ Technology

Intel® Centrino® processor technology and Intel® Centrino® with vPro™ technology are Intel's next-generation mobile platforms enabling a wave of innovative and powerful new notebook PC designs to meet the needs of even the most demanding user. Intel's latest processor technologies are designed to enable breakthrough performance and improved battery life over previous-generation Intel Centrino processor technology platforms. Intel Centrino processor technology and Intel Centrino with vPro technology-based laptops mark a dramatic step forward with the following next-generation components working together to deliver outstanding mobile computing capabilities:

- **45nm Intel® Core™2 Duo Processor**: Introducing 45nm process technology and an enhanced Intel® Core™ microarchitecture to Intel's energy-efficient microprocessor to deliver breakthrough mobile performance and responsiveness in thin and light notebook PCs for demanding business users and consumers alike.
- **Mobile Intel® 965 Express Chipset Family**: New Intel chipset graphics drivers and features for notebook PCs using Intel Centrino processor technology features Intel's fourth-generation integrated graphic engine, the Graphics Media Accelerator X3100, enhancements for clear, vivid video playback as well as increased realism and stunning visual quality for gaming.
- **Intel® Next-Gen Wireless-N**: Intel's optional wireless network connection delivers outstanding wireless performance with support for draft 802.11n networks so you can get up to twice the range and enjoy networking that's up to five times faster when connecting to your Wireless N home network.[2]

**– more –**

## Next-Generation Processor and Chipset Driver/Feature Enhancements Improve Mobile Computing

### Intel Core 2 Duo Processor

The Intel Core 2 Duo processor is Intel's energy-efficient microprocessor that delivers breakthrough mobile performance and responsiveness for demanding business users and consumers alike who will see improved performance when running multiple intense applications simultaneously and when running dual-core optimized applications.

Key new features of the latest Intel Core 2 Duo processor include:

- **Intel 45nm Hi-K Metal Gate Silicon Technology** – Lower leakage transistors for improved switching speeds and with nearly 2x more transistors than 65nm technologies, delivers new levels of performance and power efficiency.
- **Intel® HD Boost** – Faster performance on intensive multimedia applications like HD video encoding
- **6MB L2 Cache** – Performance improvements
- **Deep Power Down Technology** – Shuts down processor cores and L2 cache when they are not needed for greater energy efficiency

Key architectural features of the Intel Core 2 microarchitecture include:

- Intel Wide Dynamic Execution:
    - **Wider** – A full 4-wide super scalar pipeline that can fetch, decode, execute and retire instructions at a sustained rate of four instructions-per-clock vs. three for the Intel Core Duo processor.
    - **Deeper** – Buffer sizes optimize the effective number of instructions in flight relative to the pipeline, allowing the processor to look deeper into the program flow to find instructions that can be executed in parallel.
    - **Faster** – Efficiency optimized pipeline improves the architectural critical path for a very short and efficient 14-stage pipeline, attributing to higher frequency while delivering higher instructions-per-clock.
    - **Smarter** – Macro fusion combines commonly used instruction sequences into a single instruction for execution, reducing the internal resources required and increasing the instructions-per-clock rate, thus enabling the retiring of five instructions with the same work it would normally take to retire four.
- **Intel® Intelligent Power Capability** – A set of capabilities designed to reduce power consumption and design requirements by managing the runtime power consumption of all the processor's execution cores. The result is excellent energy optimization, enabling Intel Core microarchitecture to deliver more energy-efficient performance notebook PCs.
- **Intel® Advanced Smart Cache** – A multi-core optimized cache that significantly reduces latency to frequently used data, thus improving performance and efficiency by increasing the probability that each execution core of a multi-core processor can access data from a higher-performance, more efficient cache subsystem.
- **Intel® Smart Memory Access** – Improves system performance by optimizing the use of the available data bandwidth from the memory subsystem and hiding the latency of memory accesses. This innovation also includes a capability called "memory

disambiguation," which increases the efficiency of out-of-order processing by providing the execution cores with the built-in intelligence to speculatively load data for instructions that are about to execute before all previous store instructions are executed.

- **Intel® HD Boost** – Significantly improves performance when executing streaming SIMD extension (SSE/SSE2/SSE3/SSE4) instructions, accelerates a broad range of applications, including video, speech and image, photo processing, encryption, financial, engineering and scientific applications.
- **Intel® 64** – 64-bit headroom in hardware to take advantage of 64-bit operating systems such as Microsoft Vista* and 64-bit applications as they become available for the mobile client.

**Mobile Intel® 965 Express Chipset Family**

The Mobile Intel 965 Express chipset family is the latest Intel chipset architecture for notebook PCs using Intel Centrino processor technology and Intel Centrino with vPro technology. The Mobile Intel 965GM Express chipset family, compared to previous-generation mobile Intel chipsets, offers new capabilities and greater performance for an outstanding mobile computing experience based on integrated graphics (GM965/GL960) or discrete graphics (PM965).

Key new features & graphics drivers include:

- **HD-DVD* & Blu-Ray* –**Great high-definition video playback support via an optional 3rd party decoder.
- **Hardware Transform & Lighting** - Improved gaming performance through hardware acceleration, and expanded gaming content playability.
- **Vertex Shader* 3.0** - Improved 3D graphics capability and overall gaming experience with hardware supported pixel shading.
- **VC-1 Hardware Acceleration** - Enhanced high definition video experience while playing VC-1 and WMV9 content, resulting in fewer motion artifacts and smoother video playback.
- **DirectX 10*** - Expanded gaming capabilities for next-generation game play including state-of-the-art 3-D effects, realism and expands available gaming content to those written with DX10 extensions.

**Intel Next-Gen Wireless-N**

Intel Next-Gen Wireless-N, introduced in 2007, is Intel's latest optional wireless LAN solution available for Intel Centrino processor technology and supports draft 802.11n as well as IEEE 802.11a/b/g standards.

Key features include:

- **Quad-Mode Solution** – Intel Wireless Wi-Fi Link 4965AGN provides deployment flexibility and connectivity convenience by offering a quad-mode (supporting 802.11a/b/g/Draft-N) product for both 2.4 and 5 GHz.
- **Data rates up to 300Mbps** – Up to five times faster, a major improvement over 802.11a/g products that deliver 54Mbps, which helps overcome network capacity issues, allowing increased simultaneous network activity for large file transfers, network

backups, streaming high-definition video in and around the home, multi-player gaming, VoIP and more.[2]

- **MIMO, diversity and three antennae support** – Up to two times greater range; enables better wireless reception for greater bandwidth at farther distances; reduces the number of "dead zones," dropped data packets and network re-connects; and dramatically improves connectivity throughout the home and provides more consistent coverage for the enterprise.
- **Friendly Neighbor Assurance** – Supports current 802.11n standard direction to support 40MHz channels only in 5GHz spectrum to minimize negative impact to legacy devices/networks nearby.
- **Intel® PROSet v11.1 WLAN Software** – Feature-rich application provides continued support for legacy and next-generation Draft-N features on Microsoft Windows 2000*, Microsoft Windows XP* and Microsoft Vista* via an easy-to-use interface.
- **Intel® PROSet/Wireless Software v11 IT Administrator Tool** – This optionally installed toolkit enables network managers to create and distribute WLAN connection profiles, centrally set driver and application settings, distribute driver and software updates and package custom settings into a self-installing executable file. These tools simplify deploying or updating wireless settings and profiles on notebooks remotely.
- **Advanced Security via 802.11i** – Allows for increased wireless security by providing the WPA2 AES based algorithm. AES is the strongest encryption algorithm available today for mobile clients and helps ensure that enterprise wireless networks are protected.
- **Intel Active Management Technology over Wireless** – Allows IT managers to remotely discover, heal and protect wireless notebooks. Features include enhanced asset management, remote system diagnostics, network protection and security independent of the operating system functional state, resulting in reduced on-site support costs.
- **Connect with Centrino®** – Intel is certifying leading vendors' access points through extensive compatibility testing so users can connect with confidence. The program identifier can be found on Draft-N wireless access points and ensures compatibility with notebooks based on Intel Centrino Duo processor technology.
- **Business Class Wireless Suite** – **High Density Networking** – Collaboration between Intel and Cisco for integrated WLAN solutions. Version one includes Enhanced VoIP quality technology and optimal AP selection technology. Version two includes high density networking that reduces interference between devices by dynamically changing settings on Cisco Access Points and Intel WLAN clients. This effectively raises overall capacity of the network by increasing throughput per client and also allows for denser AP deployments.
- **Cisco* Compatible Extensions v4** – Intel is the lead collaborator with Cisco on Cisco Compatible Extensions*. Key features in version four include Cisco Centralized Key Management*, call admission control, Unscheduled Automatic Power Save Delivery (U-APSD) and voice metrics. Results include no noticeable delay in VoIP calls when roaming between access points and improved network diagnostics.

**Intel® Turbo Memory:**

- An optional feature available on many Intel Centrino processor technology and Intel Centrino with vPro technology-based notebooks that improves performance, boot time and

battery life. It's a non-volatile memory module that increases system performance while reducing power consumption.[4]

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1 System performance, battery life, high-definition quality video playback and functionality, and wireless performance and functionality will vary depending on your specific operating system, hardware, chipset, connection rate, site conditions, and software configurations. References to enhanced performance including wireless as measured by SYSMark* 2004 SE, PCMark* 2005 and 3DMark*06, SPEC* CPU2006* and Adjacent Channel Interface (ACI)* refer to comparisons with previous generation Intel® Centrino® technologies. References to improved battery life as measured by MobileMark* 2007, if applicable, refer to previous generation Intel Centrino processor technology. Wireless connectivity and some features may require you to purchase additional software, services or external hardware. Availability of public wireless LAN access points is limited, wireless functionality may vary by country and some hotspots may not support Linux-based Intel Centrino processor technology systems. See http://www.intel.com/products/centrino/more_info for more information.

2 Up to 2x greater range and up to 5x better performance enabled by 2x3 Draft N implementations with 2 spatial streams. Actual results may vary based on your specific hardware, connection rate, site conditions, and software configurations. See http://www.intel.com/performance/mobile/index.htm for more information. Also requires a Connect with Intel® Centrino® processor technology certified wireless n access point. Wireless n access points without the connect with Intel Centrino processor technology identifier may require additional firmware for the increased performance results. Check with your PC and access point manufacturer for details.

3 Intel® Active Management Technology requires the platform to have an Intel® AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. With regards to notebooks, Intel AMT may not be available or certain capabilities may be limited over a host OS-based VPN or when connecting wirelessly, on battery power, sleeping, hibernating or powered off. For more information, see http://www.intel.com/technology/manage/iamt.

4 Tests run on customer reference boards and preproduction latest generation Intel® Centrino® processor technology with optional Intel® Turbo Memory enabled against like systems without Intel® Turbo Memory. Results may vary based on hardware, software and overall system configuration. All tests and ratings reflect the approximate performance of Intel products as measured by those tests. All testing was done on Microsoft* Vista* Ultimate (build 6000). Application load and runtime acceleration depend on Vista*'s preference to pre-load those applications into the Microsoft* ReadyBoost* cache. See http://www.intel.com/performance/mobile/Intel_Turbo_Memory.htm for more information.

*Other names and brands may be claimed as the property of their respective owners. SPEC, SPECint, SPECfp, SPECrate, SPECweb, SPECjbb are trademarks of the Standard Performance Evaluation Corporation. See: http://www.spec.org for more information on the benchmarks.

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