

NEW FOR 2010

INTRODUCING THE ALL NEW
INTEL® CORE™ PROCESSOR FAMILY



AND FOR BUSINESS... THE ALL NEW
INTEL® CORE™ vPRO™ PROCESSOR FAMILY



Intel® Processor Guide
2010



Inside This Document

This guide provides decision makers with essential information about Intel® processors. It highlights the advantages of innovative Intel® technology, and it will help you differentiate Intel processors from one another so you can determine which ones best meet your organization's needs. It will help IT and Managed Service Providers make informed decisions when:

- Determining technology criterion
- Evaluating PC performance
- Evaluating PC total cost of ownership
- Matching the right processors to the PC requirements of their various user categories

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Executive Summary

Key Considerations

When it comes to purchasing new PCs for their companies, business and government buyers have a lot of factors to consider. For example:

Usage: What Do Users Really Need?

The procurement of PC computing platforms needs to take into account usage patterns within the organization, as well as the various types of users and their PC computing requirements. What do users require in their systems to successfully achieve the company's goals? Do they have the right tools to do the job?

Total Cost of Ownership: Not Just Upfront Costs

Today, more than ever, it is critical that companies take into account their total cost of ownership when making PC procurement decisions. This requires a mindset shift from simply considering the initial acquisition costs involved to taking into account all the direct and indirect costs associated with the acquisition and continued maintenance and support of their computers.

Studies have shown that return on investment can be achieved in as little as 19 months for PCs based on a new 2010 Intel® Core™ i5 processor, and in as little as 9 months for a new 2010 Intel® Core™ i5 vPro™ processor.¹

PC Adaptability and New Capabilities for IT and Service Providers

With users demanding the latest processor-intensive software applications (such as video and data analysis), organizations need to be sure they are meeting their needs both today and over a full three-year lifecycle. Given the pace of technological change, what are users going to be doing next year? In two or three years? Do the systems you're purchasing today have the headroom you need for tomorrow?

Additionally, as PC technology continues to advance, organizations can take advantage of new capabilities to increase efficiency and competitiveness.

For instance: the all new 2010 Intel® Core™ vPro™ processor family can help organizations by delivering intelligent security, cost-saving manageability, and adaptable performance.

Mobility

In today's increasingly mobile world, travelers need to stay connected and productive no matter where they roam.

Laptops powered by a new Intel Core vPro processor include Intel® Centrino™ wireless technology (either WiFi or WiFi with optional WiMAX) and are more energy efficient, enabling long battery life and excellent coverage.



Purchasing Considerations

Many elements go into drawing up a list of PC requirements; below are some key questions to consider.

Usage: What Do Users Really Need?

- ❑ Are the task requirements for each PC clearly defined? Do the specified PCs have the capabilities to meet those tasks?
- ❑ For PCs needed for performance-intensive tasks (such as engineering, graphics rendering, etc.), are you specifying sufficiently powerful systems?
- ❑ Do the specified PCs have the mobile capabilities needed to ensure that your organization's staff can stay productive whether they're in the office, at home, or on the road?

Total Cost of Ownership: Not Just Upfront Costs

- ❑ Do the specified PCs meet appropriate environmental and energy-saving guidelines?
- ❑ Do the specified PCs deliver a favorable return on investment and total cost of ownership?
- ❑ Are the specified PCs supported by a stable image platform guarantee in order to avoid unnecessary re-imaging of software images and unnecessary management costs?

PC Adaptability and Longevity

- ❑ Do the specified PCs have the performance headroom to ensure they will be able to meet expanding demands throughout their expected life spans?
- ❑ Do the specified PCs provide hardware-based security features to protect against viruses and malware?
- ❑ Do the specified PCs provide support for remote management to lower the overall cost of maintenance and support?



Why Intel?

Innovations That Move the World Forward

Technology Leadership

Intel Corporation is one of the most fundamental names in computing—as well as one of the most trusted. Intel® technology and research continually raise the bar on innovation and excellence in the computing industry. Intel creates and encourages standards-based technology and industry collaboration by working with more than 100 industry standards groups worldwide. Intel products symbolize world-class leadership in technology and performance, outstanding quality, and lasting reliability.

A Complete PC Computing Solution

Today, computing is not just about processors. Intel technology covers a wide range of components, including processors, chipsets, motherboards, wired and wireless networking connections, storage, and more. The all new 2010 Intel® Core™ processor family combines several Intel technologies that help deliver an optimal experience for the needs of today's businesses.

A Commitment to Quality, Reliability and Compatibility

To ensure leading performance, reliability, and compatibility, Intel invests hundreds of millions of dollars annually in component and platform validation. Thousands of employees in twenty facilities around the world are dedicated to software development, validation testing, and product qualification.

Intel® Stable Image Platform Program²³





The Intel Stable Image Platform Program (Intel® SIPP) provides image stability for OEMs, system builders, large enterprise IT, and service providers, giving them an annual roadmap they can count on. The program aligns and stabilizes key Intel platform components to enable a more predictable annual transition from one generation of technology to the next. Intel SIPP enhances software stability by ensuring there are no changes to key platform components or drivers for at least 15 months from introduction, reducing the potential for a forced change to the IT gold software image. This allows for a 3-month qualification period and a 12-month deployment cycle.

- World's largest semiconductor maker
- US\$6 billion R&D budget
- Worldwide network of R&D labs and over 41,000 engineers
- Several hundred million dollars annual investment in component and platform validation

Sponsors of Tomorrow™

Intel's ability to deliver industry-leading products today comes about because of its continual focus on the future—a focus emphasized in the "Sponsors of Tomorrow" campaign launched in Spring 2009. For over forty years, Intel has been delivering tomorrow's "normal." As Deborah Conrad, Intel Vice President and General Manager, Corporate Marketing Group put it, "We're hoping to convey that we're not just a microprocessor company, but a move-society-forward-by-quantum-leaps company. The greatest strength of the Intel brand will always be what is still to come."

PC Processor Guide

Best For:	Recommended Intel® Processors	Capabilities & Benefits	Technologies
Performance, Security, Manageability	 <p># Intel® vPro™ technology activation required</p>	<p>More Security. Less Stress.^{# 2}</p> <ul style="list-style-type: none"> • Remotely repair and secure PCs with hardware-based KVM Remote Control, even if they are asleep, hibernating, powered down, or the OS is inoperable, wired and wireless, inside or outside the corporate firewall.² • PC protection through hardware-based local “poison pill” support (Intel® Anti-Theft Technology).³ • Remotely isolate infected PCs from the network and repair.² <p>All the performance of Intel® Core™ i5 and Intel® Core™ i7 processors.</p>	<ul style="list-style-type: none"> • Intel® vPro™ Technology • Intel® Turbo Boost Technology⁵ • Intel® Hyper-Threading Technology⁶ • Up to 8-way processing • Large cache sizes • Energy efficiency
Intelligent Performance		<p>The Heart of Faster, More Intelligent PCs:</p> <ul style="list-style-type: none"> • Up to 2.5x faster multitasking⁴ and 60% more energy efficiency²⁴ on a desktop with the new 2010 Intel® Core™ i5 processor vs. a 3-year-old PC.⁴ • Intel® Turbo Boost Technology in Intel® Core™ i5 and Intel® Core™ i7 processors automatically speeds up the processor when the user’s workload requires extra performance.⁵ • The Intel® Core™ i5 processor encrypts data up to 3.5x faster.⁴ 	<ul style="list-style-type: none"> • Intel Turbo Boost Technology⁵ • Intel® Hyper-Threading Technology⁶ • Energy efficiency
		<ul style="list-style-type: none"> • Intel® Hyper-threading Technology allows each processor core to work on two tasks at the same time.⁶ • Performance to run anti-virus/spam, spyware, and data backup in the background. 	<ul style="list-style-type: none"> • Intel Hyper-Threading Technology⁶ • Energy efficiency
Entry-Level Computing		<ul style="list-style-type: none"> • Personal productivity. • Essential communication. 	<ul style="list-style-type: none"> • Previous-generation technology

Intel vPro technology features and benefits require specific computer configuration and set up by purchaser.

All New 2010 Intel® Core™ Processor Family

Key Technologies

Intel® Turbo Boost Technology⁵

Thanks in large part to Intel Turbo Boost Technology, new 2010 Intel® Core™ i7 and Core™ i5 processors deliver greater performance and increased productivity by automatically adapting to each user's unique needs.^{5,6}

Intelligent Performance

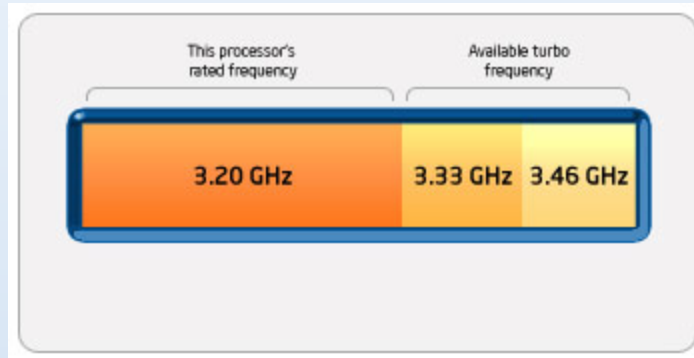
Intel Turbo Boost Technology⁵ intelligently allocates extra processing power to the applications that need it most, accelerating the processor clock speed by up to 20% to match the workload.

Intelligent Efficiency

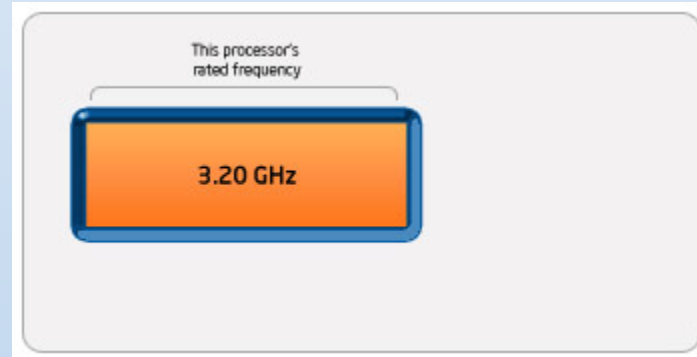
Intel Turbo Boost Technology automatically speeds up the processor when the user's workload requires extra performance, then cuts back when less performance is needed, reducing energy costs on all PCs and extending battery life on laptops.

Processor Frequency

With
Intel® Turbo Boost Technology activated



Without
Intel® Turbo Boost Technology activated



All New 2010 Intel® Core™ Processor Family

Key Technologies

Intel® Advanced Encryption Standard-New Instructions (Intel® AES-NI)⁸

Select new 2010 Intel® Core™ i7 and Core™ i5 processors feature performance for data encryption and decryption through the Intel AES-NI instruction set.

AES (Advanced Encryption Standard) is an encryption standard adopted by the U.S. government starting in 2001. It is widely used across the software ecosystem to protect network traffic, personal data, and the corporate IT infrastructure.

Intel® AES-NI are a new set of processor instructions that enable fast and secure data encryption and decryption, using the Advanced Encryption Standard (AES). Since AES is the dominant block cipher, and it is deployed in various protocols, the new instructions will be valuable for a wide range of applications. They offer a significant increase in performance compared to pure software implementations.

Improved Encryption Performance Through Hardware

Now you can run demanding applications simultaneously without slowing down. New PCs encrypt sensitive data up to 3.5x faster on select 2010 Intel® Core™ i5 processors versus a 3-year-old PC with an Intel® Core™2 Duo processor.⁴



Whole-Disk Encryption



Internet Security



File Storage Encryption

All New 2010 Intel® Core™ Processor Family

Key Technologies

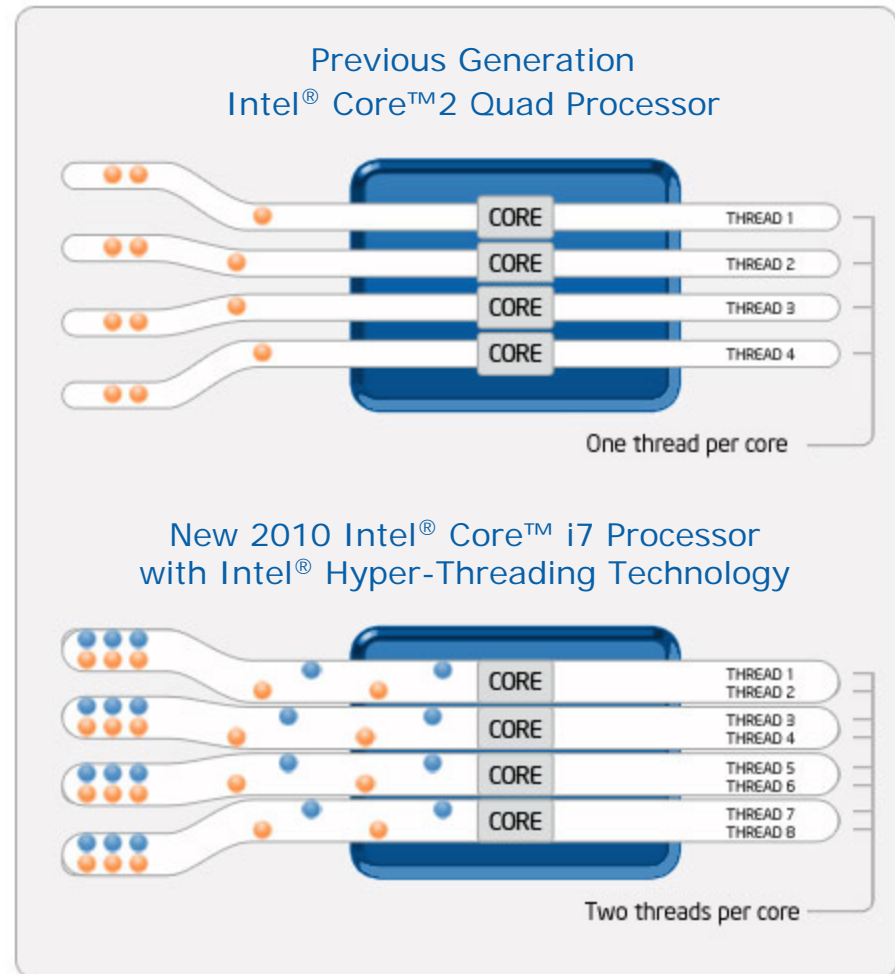
Intel® Hyper-Threading Technology⁶

Intel Hyper-Threading Technology enables each processor core to work on two tasks at the same time. This typically doubles the number of threads being executed. Computational latency is reduced and every clock cycle is used to its optimum potential. For example, one thread may be waiting for a result or event while another is executing in that core, minimizing down cycles.

With faster performance, users can get more accomplished in less time. This results in a more efficient use of processor resources—higher processing throughput—and improved performance on the multi-threaded applications of today and tomorrow.

As a result, organizations can:

- Run demanding applications simultaneously.
- Reduce the burden of security applications that process in the background, minimizing their impact on productivity—yet still keeping systems more secure, efficient, and manageable.
- Provide headroom for future business growth.



All New 2010 Intel® Core™ Processor Family

Key Technologies

Intel® Smart Cache

Intel Smart Cache is a multi-core, optimized cache that improves performance and efficiency by increasing the probability that each execution core of a multi-core processor can access data from a more efficient, higher-performance cache subsystem.

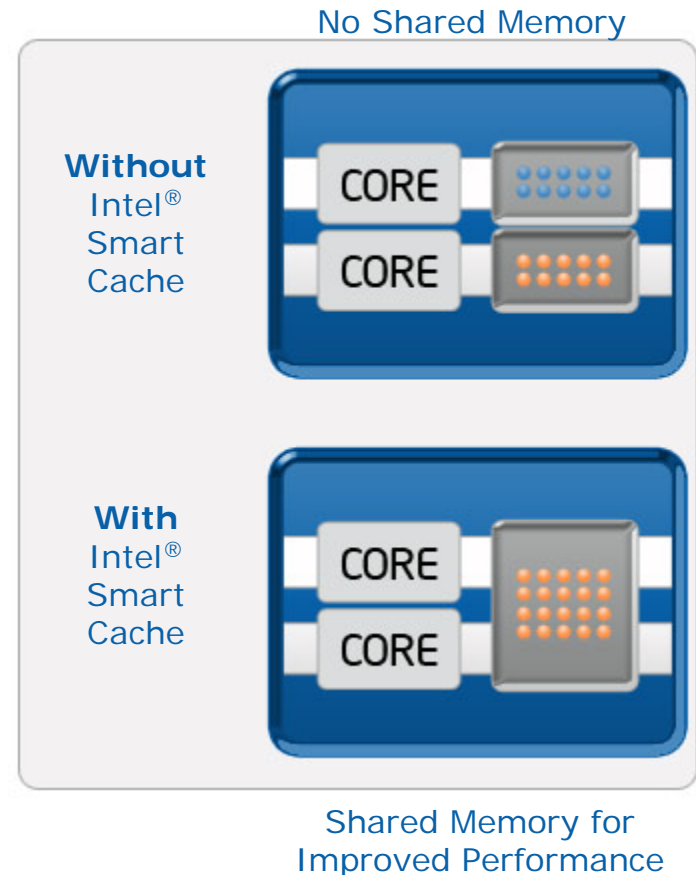
By sharing L2 and L3 caches among each core based on the workload, Intel Smart Cache allows each core to dynamically use up to 100% of available cache. When one core has minimal cache requirements, other cores can increase their percentage of cache, reducing cache misses and increasing performance.

Intel® Smart Memory Access

Intel Smart Memory Access improves system performance by optimizing the use of the available data bandwidth from the memory subsystem and reducing the effective latency of memory accesses.

Integrated DDR3 Memory Controller

Instead of using a single shared pool of memory connected to all the processors through a Front Side Bus and memory controller hubs, each new 2010 Intel® Core™ processor has its own dedicated memory that it accesses directly through an Integrated Memory Controller.



All New 2010 Intel® Core™ vPro™ Processor Family

Introducing...

The All New 2010 Intel® Core™ vPro™ Processor Family

PCs powered by an all new 2010 Intel® Core™ vPro™ processor help businesses cut costs and increase efficiency by taking advantage of intelligent performance and unique hardware-assisted security and manageability features.

The new 2010 Intel Core vPro processor family is designed to keep downtime and desk-side visits to a minimum, enabling remote monitoring, diagnosis, and repair of PCs—even if they're shut down or the OS is unresponsive.²

For Laptops:

Laptops powered by a new 2010 Intel Core vPro processor provide the same smart security, cost-saving manageability, and intelligent mobile performance—all in lighter, ultra-thin designs. And your laptops will be so smart they can even disable themselves if they get lost or stolen.³

Plus, mobile users can take advantage of Intel® Centrino® wireless products, which deliver great coverage and reliable connectivity while consuming minimal power.¹⁰

- Intelligent performance
- Smart security
- Cost-saving manageability



All New 2010 Intel® Core™ vPro™ Processor Family

What is Intel® vPro™ Technology?

Benefits

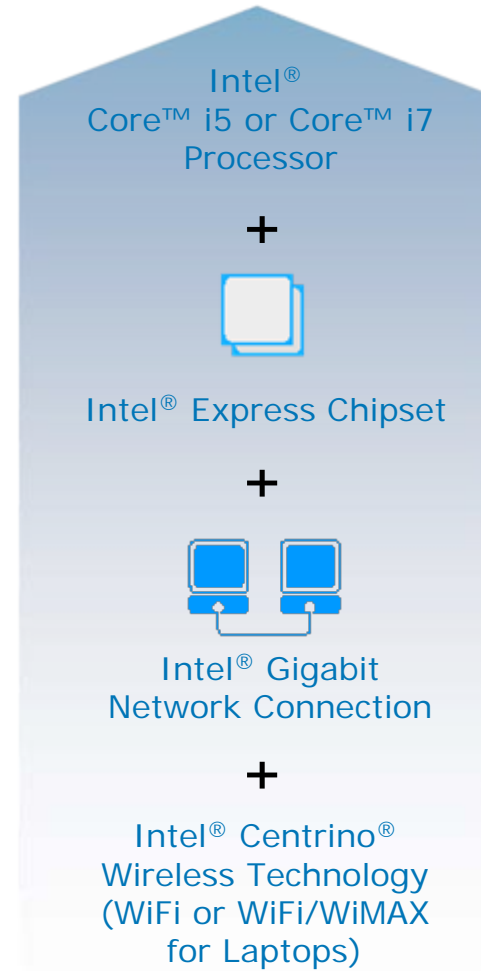
- Increased cost-saving manageability
- Increased smart security

Proven Intel vPro Technology...

...is built into laptop and desktop PCs to extend the reach and functionality of the management console and enable IT and service providers to meet critical challenges for small to large businesses.

- New 2010 Intel® Core™ i7 vPro™ processor
- New 2010 Intel® Core™ i5 vPro™ processor

PCs with Intel vPro technology integrate robust hardware-based security and enhanced maintenance and management capabilities that work seamlessly with independent software vendors (ISV) consoles.² Because these capabilities are built into the hardware, Intel vPro technology provides IT and service providers with the industry's first solution for true OS-absent manageability and down-the-wire security. PCs can be managed even when they are off, the OS is unresponsive, or software agents are disabled.²



All New 2010 Intel® Core™ vPro™ Processor Family

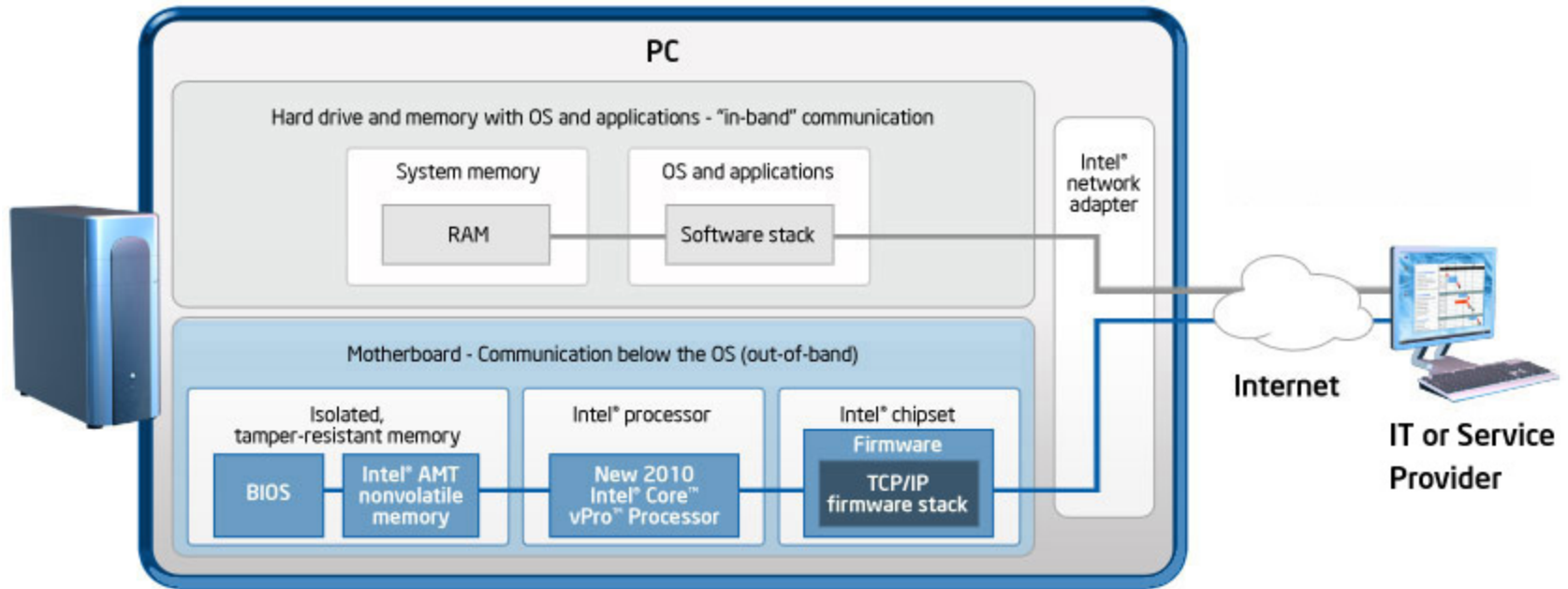
What is Intel® vPro™ Technology?

Remote Communication Virtually Anywhere²

Software-only management applications are usually installed at the same level as the OS, as shown below. This leaves their management agents vulnerable to tampering. Communication privacy is also a concern.

In contrast, the all new 2010 Intel® Core™ vPro™ processor family delivers both “readily-available” out-of-band remote communication and robust security technologies. These security technologies deliver new levels of

protection, helping ensure that data stored on users’ systems is protected.



Out-of-band communication. Secure communication channel runs “under” or outside the OS, regardless of the health of the operating system or the power state, even if the PC’s hard drive is removed.

All New 2010 Intel® Core™ vPro™ Processor Family

What is Intel® vPro™ Technology?

Which Intel® Processor?

The chart below details basic capabilities and differences in the lineups of the all new 2010 Intel® Core™ processor family and all new 2010 Intel® Core™ vPro™ processor family.

		Intel® Core™ i7 vPro™	Intel® Core™ i5 vPro™	Intel® Core™ i7	Intel® Core™ i5	Intel® Core™ i3
Intelligent Security, Manageability, and Performance	Hardware-assisted smart security, anti-theft technology, and cost-saving manageability.	✓	✓			
	Hardware-based KVM Remote Control. ^{a,b,11}	✓	✓			
	Hardware-assisted remote power management. ^a	✓	✓			
Intelligent Business Performance	Intelligent performance at its best with large cache and up to 8-way processing.	✓		✓		
	Hardware-based acceleration of encryption with Intel® AES-NI. ⁸	✓ #	✓ #	✓ #	✓ #	
	Increased processor speeds when performance is needed with Intel® Turbo Boost Technology. ⁵	✓	✓	✓	✓	
	Hardware-assisted virtualization support for running multiple operating systems, such as Windows* XP with Windows* 7. ¹²	✓	✓	✓	✓	✓
	Intelligent performance with Intel® Hyper-Threading Technology ⁹ and Intel® Smart Cache.	✓	✓	✓	✓	✓
	Energy-efficiency with Intel® Intelligent Power Technology.	✓	✓	✓	✓	✓

a: IT must activate Intel vPro technology in order to take advantage of these intelligent security and remote manageability features. b: Hardware-based KVM Remote Control works on all new 2010 Intel® Core™ i5 vPro™ processor-based PCs that have Intel® HD integrated graphics, and select all new 2010 Intel® Core™ i7 vPro™ processor-based PCs that have Intel HD integrated graphics. Hardware-based KVM Remote Control will not work on PCs that use discrete graphics.

Select processors.

All New 2010 Intel® Core™ vPro™ Processor Family

What is Intel® vPro™ Technology?

Cost-Saving Manageability Use Case Models^{a,2}

Challenge	Solution
PCs unmanageable when powered down	Remotely and securely monitor and manage PCs anytime: <ul style="list-style-type: none"> • Access the PC even if PC power is off, the OS is unresponsive, agents are missing, or hardware has failed. • Access critical system information (asset information, event logs, BIOS, etc.) virtually anytime, even if power is off, to identify systems that need service. • PC Alarm Clock: client-side intelligence performs a scheduled wake, so the PC can report in.
Unsecured communications	More securely communicate with laptop and desktops inside/outside firewalls: <ul style="list-style-type: none"> • Secure, remote communication inside the firewall, or outside the firewall via an open wired/wireless LAN.
Spiraling and costly deskside visits	Significantly reduce deskside visits with: <ul style="list-style-type: none"> • Remote remediation, even if management agents are missing or the OS is unresponsive. • Remove problem resolution even if the OS is unresponsive or hardware (such as a hard drive) has failed. • KVM Remote Control¹¹ lets you can see exactly what the user sees and remotely repair the PC.
Costly manual inventories	Eliminate virtually all manual inventories: <ul style="list-style-type: none"> • Accurate, remote asset inventories, even if PCs are powered off or management agents are missing.
Undiscoverable assets	Discover virtually all PCs: <ul style="list-style-type: none"> • Persistent device ID available anytime, even if PC power is off, the OS has been rebuilt, hardware or software configuration has changed, or the hard drive has been re-imaged.
Re-imaging systems requires a deskside visit	Reduce deskside visits, speed up remote deployment, and minimize user interruptions: <ul style="list-style-type: none"> • Remotely re-image systems even if PC power is off at the start of the upgrade cycle.

a: Intel vPro technology must be activated in order to take advantage of these intelligent security and remote manageability features.

All New 2010 Intel® Core™ vPro™ Processor Family

Cost-Saving Manageability

Remote Manageability²

- OS-absent, down-the-wire manageability, even if the PC is off or the OS is down
- 24x7 remote monitoring capabilities
- Seamless integration with management consoles
- Manage PCs outside the organization's firewall

Intel® vPro™ technology enables IT and Managed Service Providers to remotely monitor their PCs on a continual basis. This means they can provide new levels of service that give users greater peace of mind knowing that knowledgeable experts are looking out for them 24x7. Plus, because some organizations may have tight security issues, all communications are encrypted for security.

PCs with Intel vPro technology incorporate enhanced, hardware-based maintenance and management capabilities that integrate seamlessly with consoles from leading software vendors. Because these capabilities are built into the hardware, Intel vPro technology provides IT and service providers with the industry's first solution for OS-absent and down-the-wire manageability.

Built on Standards

Processors built on industry standards give you many choices in selecting OEMs and software vendors. Some of the standards upon which the latest processors are built include ASF, XML, SOAP, TLS, HTTP authentication, Kerberos, DASH* and WS-MAN.

And because Intel vPro technology provides access to a PC's non-volatile memory, monitoring and management can take place even when the PC is off, the OS is unresponsive, or software agents are disabled.

How Do All New 2010 Intel® Core™ vPro™ Processors Compare with Earlier-Generation Technology?

Increased Control	Up to 94% faster time to patch saturation on desktops. ^{2,9}
Increased Manageability	Up to 56% reduction in time-consuming desk-side visits. ^{2,19}
Increased Productivity	Reduce average system downtime by up to 36%. ^{2,9}

All New 2010 Intel® Core™ vPro™ Processor Family

Cost-Saving Manageability

KVM Remote Control¹¹

KVM Remote Control is a new hardware-based feature that works for wired and wireless PCs with a new Intel® Core™ vPro™ processor and integrated Intel® HD Graphics. Using KVM Remote Control, an authorized IT technician or service provider can remotely control the keyboard, video, and mouse of a remote PC as if he or she were deskside at the PC itself.¹¹ With this full interactivity, the technician can remotely resolve complex issues with the BIOS, startups/shutdowns, blue screens, OS freezes, disk failures, and network software issues.

KVM Remote Control helps eliminate the need to purchase and maintain costly hardware KVM switches in the production environment. It works for PCs both inside and outside the corporate firewall.

KVM Remote Control Enables Technicians to:

- Remotely reduce the IT or service provider effort required for manual resolutions of patch deployment failures by up to 84%.¹
- Remotely reduce the manual IT or service provider effort required for major software malfunctions by up to 96%.¹



All New 2010 Intel® Core™ vPro™ Processor Family

Cost-Saving Manageability

Common IT Problems

- Staff leave PCs running 24x7 to enable off-hours software updates.
- Wake-on-LAN lacks reliability and security to remotely power on PCs.
- >50% of desktop PCs in enterprises studied left on overnight.⁷

Solutions Enabled by the All New 2010 Intel Core vPro Processor Family

- Turn PCs off at night and save up to 70% of your power budget.¹³
- Power-on PCs remotely to deploy patches at night; users won't be interrupted during the day and won't have to leave their PCs on overnight to receive software patches, saving power.

Fight High Energy Prices with Intel® vPro™ Technology:² A Real Life Example

In 2007, the State of Indiana's Office of Technology* (IOT) cut expenses by converting 20,000 desktop systems to PCs with Intel vPro technology over four years. IOT was supporting agencies throughout the state, resulting in expensive and time-consuming travel to remote offices for support calls.

"We were delighted to find out that the new [Intel vPro technology] desktops will save us a million dollars a year through vastly improved IT efficiency. But what really surprised us is that the new [Intel vPro technology] desktops will save us \$400,000 a year from lower power consumption," said Paul Baltzell, Director, Indiana Office of Technology.

Plus, the remote remediation capabilities of Intel vPro technology allowed technicians to respond faster and reduce desktop visits by 80% for a total savings of US\$1,386,929 within the four-year period. Less traveling also meant less carbon dioxide (CO2) emissions—IOT projects a cut of over 800,000 pounds of CO2.²¹



All New 2010 Intel® Core™ vPro™ Processor Family

Cost-Saving Manageability

Total Cost of Ownership

Now you can inventory and update PCs quickly, reliably, and more securely, without leaving your desk. That's why Intel® Core™ vPro™ processor-based PCs can make a large difference for business.²

Actual Customer Experiences with Intel® vPro™ Technology [#]			
Total Cost of Ownership	Current Process	With Intel vPro Technology	Percent Improvement
Deskside visits for software fix	1.64	0.14	91%
Deskside visits for hardware fix	2.29	1	55%
User downtime (hours), software issue—remote resolution	16	0.31	98%
User downtime (hours), hardware issues—remote resolution	48	16	66%
Patch Management	Current Process	With Intel vPro Technology	Percent Improvement
Average hours to patch 1,000 PCs	64.8	9.2	85%
Average hours to achieve saturation	278.4	16.8	94%

[#] "Case Studies with Intel® vPro™ Processor Technology - An Analysis of Early Testing of Intel vPro Processor Technology in Large IT Departments," C. La Grand & M. Salamasick, 2007



As low as
9-Month
Recoup on
Investment¹

All New 2010 Intel® Core™ vPro™ Processor Family

Smart Security Capabilities

Capability ²	What It Does	Common Uses
Agent Presence Checking	Ensures critical applications are running. Third-party applications check in with hardware-based timers at IT-defined intervals.	<ul style="list-style-type: none"> Automated, out-of-band check for missing or disabled agent (in combination with policy-based out-of-band alerting).
System Isolation and Recovery	Automated or manual policy-based protection against virus outbreaks. Filters check inbound and outbound network traffic for threats before the OS and applications load and before they close down.	<ul style="list-style-type: none"> Monitor in- and out-bound network traffic for threats. Identify suspicious packet headers and suspicious packet behavior, including fast- and slow-moving worms (desktop PCs with Intel® vPro™ technology). Port-isolate even if agent/OS is disabled.
Software Support	Supports 802.1x, Cisco SDN*, Microsoft NAP*, and PXE (pre-execution environment). Lets the network verify a PC's security "posture" even before the OS loads, allowing the PC access to the network.	Enable remote, out-of-band management and PXE boot of the PC while still maintaining full network security in a Cisco SDN or Microsoft NAP environment.
Access to Critical System Information†	Lets you access critical system information (such as software version information, .DAT file information, and machine IDs) anytime.	Verify a PC's posture. Identify PCs that need to be updated/patched, even for PCs that do not have an agent installed.
Thwart Thieves Even if the PC is Lost or Stolen.# 3	Disable a PC and/or protect its data virtually any time. Built-in triggers and responses protect data and the PCs after loss or theft. ³	<ul style="list-style-type: none"> "Poison-pill" to "brick" a lost or stolen PC. Data is not destroyed and can be easily reactivated later. Remote notification via a 3G cell phone modem to flag a system in the process of being stolen. Policy-based PC-side timers can trigger a lockdown if the user has not logged in before timer expiration.
Improved Patching	Accelerate the process of remote software patching by up to 91% on desktop PCs. ^{2,9}	<ul style="list-style-type: none"> Remote inventory and agent presence checking as a hardware-based, automated, policy-based service.
Protect Assets from Software-Based Attacks	Protect assets better. Built-in system defense filters and agent-presence checking.	<ul style="list-style-type: none"> Remotely power up PCs anytime to help ensure more complete patch and update saturation. Automated, hardware-based virus protection.

Available on select systems. See OEM for details. † Access to dedicated, protected memory, including UUID, event logs, hardware asset information, and software asset information in the third-party data store is also available when the PC is connected to the corporate network through a host OS-based VPN.

All New 2010 Intel® Core™ vPro™ Processor Family

Smart Security Capabilities

Proactive Security Features²

- Proactively identify threats
- Isolate infected systems
- Monitor key security agents to reduce attacks

New 2010 Intel® Core™ vPro™ processor-based PCs proactively help third-party security software to identify threats before they reach the OS, isolate and quarantine infected systems with suspicious network traffic, and enforce the presence of key agents, thus reducing system vulnerability to viruses and attacks.

Managing Encrypted Hard Drives

IT and service providers can remotely unlock encrypted drives that require pre-boot authentication, even when the OS is unavailable (for example, if the OS is inoperable or software agents are missing). IT and service providers can remotely manage data security settings even when the PC is powered down.

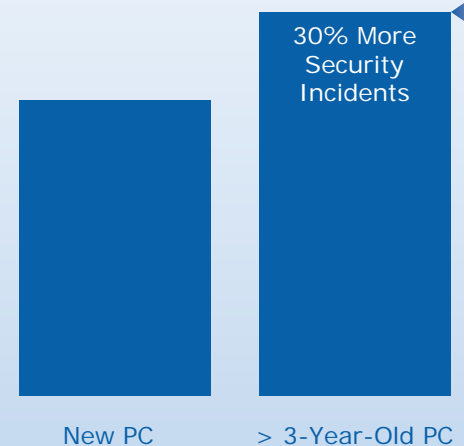
Security Matters

- Ensure compliance down-the-wire on virtually all new 2010 Intel Core vPro processor-based PCs, so that third-party security software is available when needed.
- Remotely identify viruses, worms, and other threats faster, and stop those threats more effectively.
- New 2010 Intel Core vPro processor-based PCs support 802.1x, Cisco Self-Defending Network* (Cisco SDN), or Microsoft Network Access Protection* (Microsoft NAP), so you can maintain and manage these PCs even in secure network environments.
- Intel® Anti-Theft Technology (Intel® AT) can help prevent unauthorized access to encrypted data if a PC is lost or stolen.#

Older PCs Have Higher Rates Of Security Incidents¹

Older PCs are more prone to security attacks due to less sophisticated hardware and software systems. Newer anti-virus software runs better on newer machines. In addition, while old and new PCs are vulnerable to virus and spyware, older systems have been around longer, increasing the opportunity for exposure. Once infected, older systems often require costly staff with higher levels of expertise to fix them, especially if the firm has a high level of variety and complexity in its PC fleet.

PCs Older than 3 Years Experience More Security Incidents



Available on select systems. See OEM for availability.

All New 2010 Intel® Core™ vPro™ Processor Family

Smart Security Capabilities

Intel® Anti-Theft Technology (Intel® AT)³

- Protecting encrypted data
- “Poison pill” protection
- Easy reactivation and recovery

Enterprises today face increasingly daunting challenges in managing and securing mobile PCs: increasing numbers of data breaches, identity theft and computer theft, and compliance with increasingly stringent regulations in data security and privacy. Select laptops with a new 2010 Intel® Core™ vPro™ processor address these challenges by incorporating a new security technology called Intel® Anti-Theft Technology (Intel® AT). When properly configured, Intel AT delivers client-side intelligence that helps protect encrypted data and system configurations against unauthorized access if a laptop is lost or stolen.

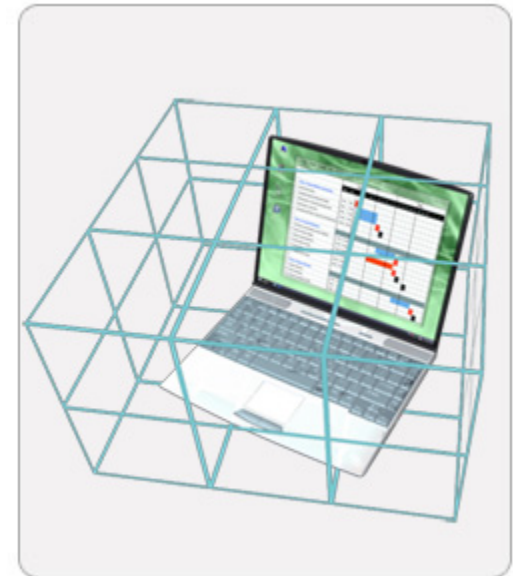
“Poison Pill” Response To Disable PC Or Lock Out Access To Data

Intel AT uses a set of programmable and interdependent hardware-based triggers and responses to identify unauthorized attempts to access encrypted data or the OS. Triggers include repeated login failures, failure to log into a central server within a particular timeframe, or a receipt of a notice from the central server to disable the PC or data access. Poison pill responses can be local and self-administered (based on a trigger) so that the laptop has local, self-initiated defense, even when disconnected from the network. Or responses can be remote, based on an alert or upon receiving a call from the user (for example, that a laptop was lost while traveling).

You can use flexible policies to specify that the poison pill:

- Disables access to encrypted data by deleting software-based encryption keys or other cryptographic credentials needed for access to data.
- Disables the PC, so it cannot boot the OS, even if the hard drive is replaced or reformatted.
- Disables both the PC and access to encrypted data.

For example, you can define a trigger so that the system locks down after five attempts to log in. You can also define a trigger for critical machines, such as a financial officer’s laptop, so that if the system does not connect to the central server every day, access to the system is disabled. If the laptop is reported lost, you can flag the system in a central database. The next time the laptop connects to the Internet, it calls home using in-band communication and synchronizes with the central server. When Intel AT receives notification that the laptop has been lost or stolen, it disables the PC and/or access to data, according to company policy.



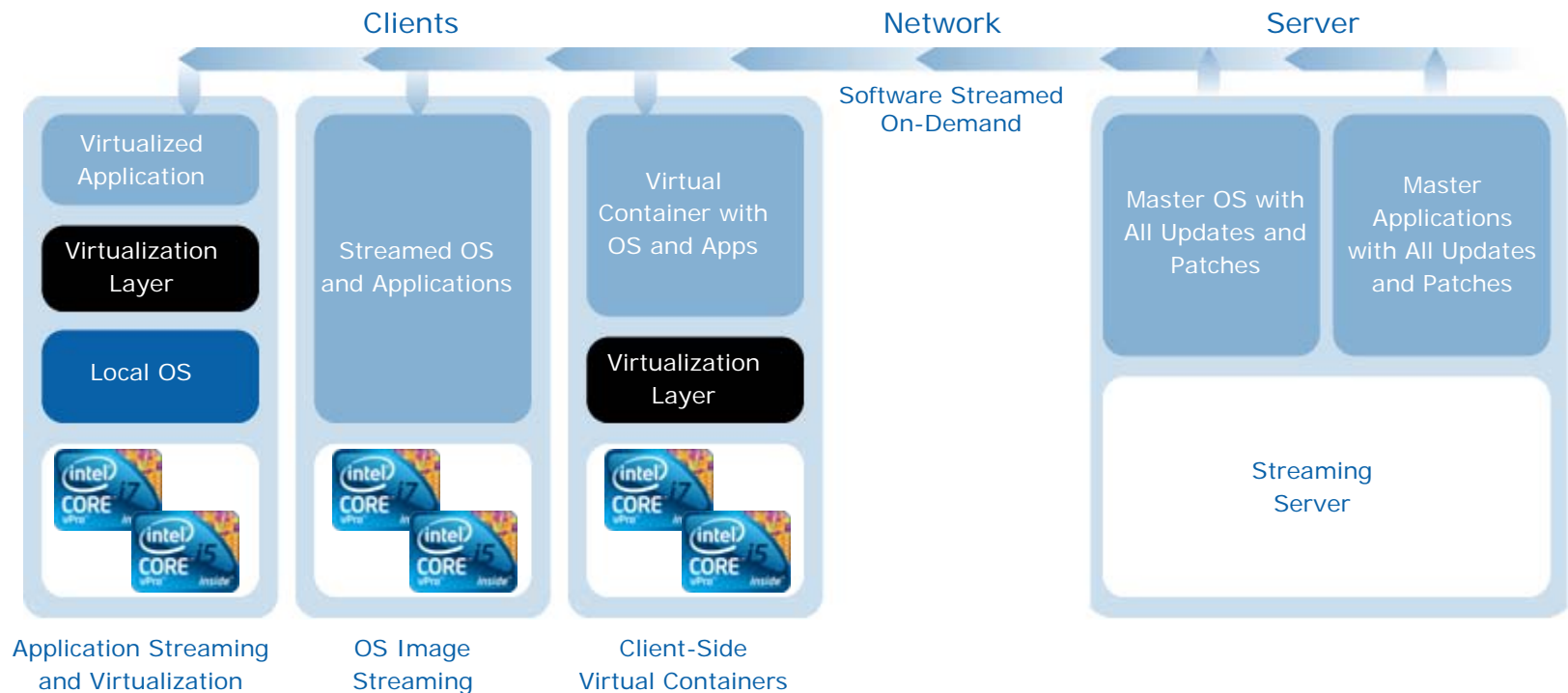
All New 2010 Intel® Core™ vPro™ Processor Family

Desktop Virtualization

Desktop Virtualization encompasses a family of application delivery methods that centralize both management and data security, while still providing a rich user experience and mobility for client-side executions. PCs with Intel® vPro™ technology include Intel® Virtualization Technology (Intel® VT)¹² and Intel® Trusted Execution Technology (Intel® TXT)¹⁴ to help ensure an optimal desktop virtualization experience.

Benefits of PCs with All New 2010 Intel® Core™ vPro™ Processors

- Built-in security and virtualization so you are ready for the compute models of today and tomorrow.
- Responsive client-side computation with off-network mobility.¹⁵



Processor Roadmap

Planning the Future

A Technology Roadmap

Intel regularly provides technology roadmaps that lay out, in detail, processors that are scheduled for release in the future.

Businesses can use these roadmaps to help plan their purchases.

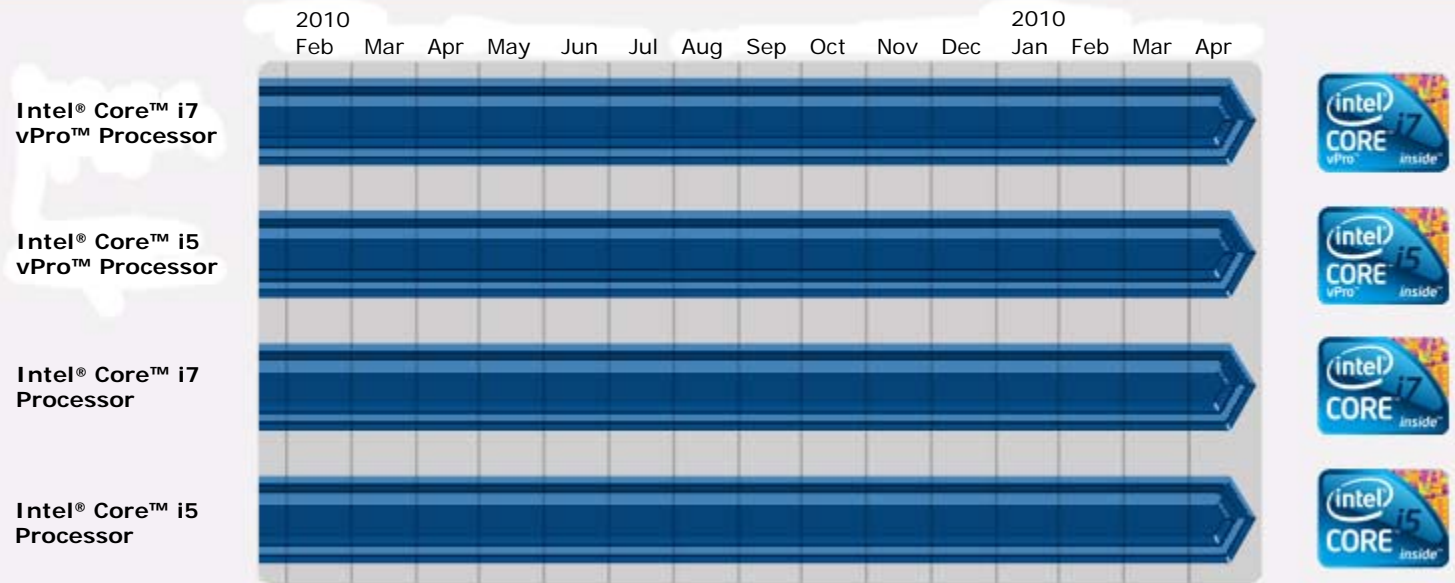
Intel® Stable Image Platform Program (Intel® SIPP)²³

The program aligns and stabilizes key Intel platform components to enable a more predictable annual transition from one generation of technology to the next. Intel SIPP enhances software stability by ensuring no changes to key

platform components or drivers for at least 15 months from introduction, reducing the potential for a forced change to the IT gold software image. This allows for a 3-month qualification period and a 12-month deployment cycle.

Intel® Stable Image Platform Program

Select All New 2010 Intel® Core™ Processors and Intel® Core™ vPro™ Processors



For laptop PCs, the Intel Stable Image Platform program supports only Intel® Core™ i7 and Intel® Core™ i5 processors.

Why Intel® Technologies?

32nm and 45nm Process Technology

Benefits

- Increased processor density for increased performance
- Up to 8 MB of shared cache on all new 2010 Intel® Core™ processors
- New levels of breakthrough energy efficiency

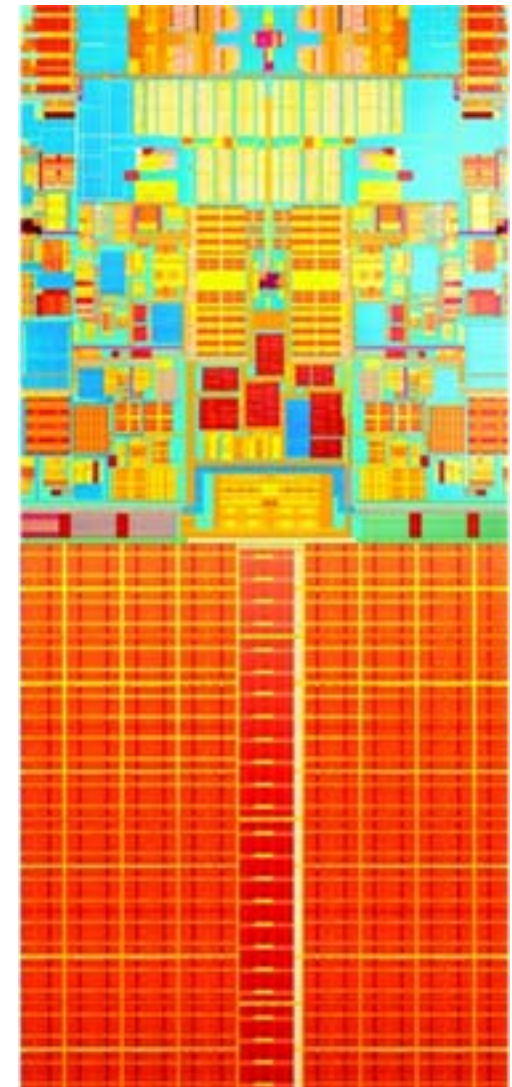
32 and 45 nanometer process technologies are among the biggest advancements in fundamental transistor design in 40 years—the implementation of dramatically different transistor materials to build the hundreds of millions of microscopic transistors inside all new 2010 Intel® Core™ processors.

Intel® high-k metal gate silicon technology is at the heart of Intel® Core™ micro-architecture. With approximately twice the density of previous Intel® 65nm technology, Intel® 45nm technology packs about double the number of transistors into the same silicon space. That's more than 400 million transistors for dual-core processors and more than 800 million for quad-core.

Intel's 32nm technology pushes the boundaries even further, enabling Intel to continue delivering faster and more energy-efficient processors that deliver outstanding performance, and superior energy effectiveness—including long battery life for laptops.

The 32nm process continues to deliver on the promise of Moore's Law while also continuing to transform the way we live, work, and communicate. And with breakthrough 32nm logic technology, you can expect faster processing speeds, greater computing capability, improved functionality, and more sophisticated applications.

While others are not scheduled to deliver on this technology until much later, Intel 32nm microprocessors are now in full production.



Why Intel® Technologies?

Intel Environmental Leadership

Environmental Standards

RoHS* Compliance

- Intel is compliant with the European RoHS Directive and ships millions of RoHS-compliant products per week.

ENERGY STAR*¹⁸

- Intel worked with the EPA to develop the ENERGY STAR v4.0 specification.
- Intel helped author an implementation design guide for system manufacturers of Intel-based ENERGY STAR v4.0 compliant systems.
- Leading OEMs offer a broad range of Intel-based platforms that are ENERGY STAR v4.0 compliant.

EPEAT

- A “platform level” procurement standard for rating green products, including desktops and laptops.
- Covers a variety of areas, including materials, energy consumption, recycling, batteries, and packaging.
- Covers multiple existing standards, including ENERGY STAR, RoHS, Blue Angel*, and others.
- Leading OEMs, including Dell*, HP*, and Lenovo*, offer a wide selection of EPEAT-compliant Intel-based PCs.

Lead-Free Products¹⁶

- Intel has reduced the use of lead by 95% across all product lines and 100% in selected and regulated products.

Halogen-Free Products¹⁷

- Intel has proactively worked to eliminate the use of halogenated flame retardants from products.
- Most 45nm processors use halogen-free packaging technology.



Why Intel® Technologies?

Chipsets Make a Difference

Maximize the Benefits of Intel® Processors

The processor is not the only critical component in a PC. The choice of chipset also has a significant effect on performance and the overall user experience. Intel® chipset technologies for desktop and laptop PCs maximize the power of systems with the newest technologies.

Intel® Express Chipsets

Intel® Express chipsets and Mobile Intel® Express chipsets, when combined with the all new 2010 Intel® Core™ processor family, deliver innovative capabilities and energy-efficient performance for business platforms. Providing industry-leading advancements in both security and manageability, Intel Express chipsets are also designed to support Intel® vPro™ technology and enable enhanced performance, power management, and data protection.

Delivering Centralized Platform Capabilities for PCs

Intel Express chipsets deliver simplified, centralized platform capabilities, thanks to hardware features that help enable expanded security and new levels of manageability and power management.

- Support for new levels of remote PC management, whether wired or wireless, including KVM (Keyboard Video Mouse) Remote Control support for the all new 2010 Intel® Core™ vPro™ processor family.
- Expanded platform security, including Intel® Anti-Theft Technology.
- Robust data protection with RAID and RRT, plus expanded NAND usage beyond data caching.
- Expanded digital interface support enables multiple video and audio options for playback of the latest high-definition content.

Intel® HD Graphics

- Support for full Windows* 7 functionality.
- For business, Intel HD Graphics offers stability, ease of use, and lower power consumption in a cost-effective solution.
- Supports Intel® Stable Image Platform Program (Intel® SIPP) for reduced qualification and deployment costs and a stable platform image.²³



Why Intel® Technologies?

Microsoft Windows* 7 Support



Intel and Microsoft* worked together to ensure that the all new 2010 Intel® Core™ processor family and Windows 7 deliver the capabilities businesses need.

- Improved performance and stability compared to Windows XP.
- Upgrade to Windows 7 quickly and remotely.
- Take advantage of hardware-enabled virtualization to support legacy applications.

	Intel® Technology	Windows 7 Feature	Benefit
Performance	All New 2010 Intel® Core™ processor family with Intel® Hyper-Threading Technology ⁶	Pre-emptive multitasking architecture	4-way (and 8-way) multitask processing that allows each core of the processor to work on two tasks at the same time.
Graphical User Interface	Intel® HD Graphics	Graphics functions of Windows 7, including Windows AERO* and Windows Display Driver Model*	Dynamic user interface for visualizing and working with information, while providing a smoother and more stable PC experience.
Run Multiple Windows Environments	Intel® Virtualization Technology ¹²	Windows XP* Mode and Virtual PC recommends a processor with hardware-assisted virtualization	Provides capability to run multiple Windows environments, such as Windows XP Mode, from Windows 7 desktop, helping smooth migration to Windows 7.
Security	Intel® AES New Instructions (Intel® AES-NI) ⁸	Window 7 BitLocker	Encrypt and protect sensitive data faster.







Processors for Desktop PCs

Intelligent Desktops for 2010

This section provides detail on Intel® technologies that are used in desktop PCs. Today's users can experience new levels of speed, convenience, and compatibility with Intel® processors, chipsets, and motherboards that offer optimized performance in a variety of desktop PCs. Providing remote manageability, unique hardware-assisted security, and energy-efficient performance, these PCs offer an amazing desktop experience with less downtime.¹⁹



How to Select the Right Intel® Desktop Processor

Best For:	Recommended Intel® Processors	Capabilities	Intel® vPro™ Technology#	Intel® Turbo Boost	Intel® Hyper-Threading	L3 Cache	Cores
Performance Security Manageability	  Activation required#	<ul style="list-style-type: none"> Remotely repair and secure PCs with hardware-based KVM Remote Control, even if asleep, hibernating, powered down, or the OS is inoperable, wired and wireless, inside or outside the corporate firewall.² PC protection: hardware-based local “poison pill” support (Intel® Anti-Theft Technology).³ Remotely isolate infected PCs from the network and repair.² All the performance of Intel® Core™ i5 and Intel® Core™ i7 processors.	✓	✓	✓	Up to 8MB ^a Up to 4MB ^b	4 Cores ^a 2 Cores ^b
Intelligent Performance	 	<ul style="list-style-type: none"> Up to 2.5x faster multitasking⁴ and 60% more energy efficiency^{2,4} with the new 2010 Intel® Core™ i5 processor vs. a 3-year-old PC. Intel® Turbo Boost Technology automatically speeds up the processor when the user’s workload requires extra performance.⁵ The Intel® Core™ i5 processor encrypts data up to 3.5x faster vs. a 3-year-old PC.⁴ 		✓	✓	Up to 8MB ^a Up to 4MB ^b	4 Cores ^a 2 Cores ^b
		<ul style="list-style-type: none"> Intel® Hyper-Threading Technology allows each processor core to work on two tasks at the same time.⁶ Performance to run anti-virus/spam, spyware, and data backup in the background. 			✓	Up to 4MB	2 Cores
Entry Level		<ul style="list-style-type: none"> Personal productivity. Essential communication. 				Up to 3MB	1-2 Cores

Intel vPro technology features and benefits require specific computer configuration and set-up by purchaser.
 a: Intel® Core™ i7 processor. b: Intel® Core™ i5 processor.







Desktop PCs

Security and Manageability Use Cases with the All New 2010 Intel® Core™ vPro™ Processor Family²
 (See the Intel® vPro™ technology section for more information on cross-client capabilities.)

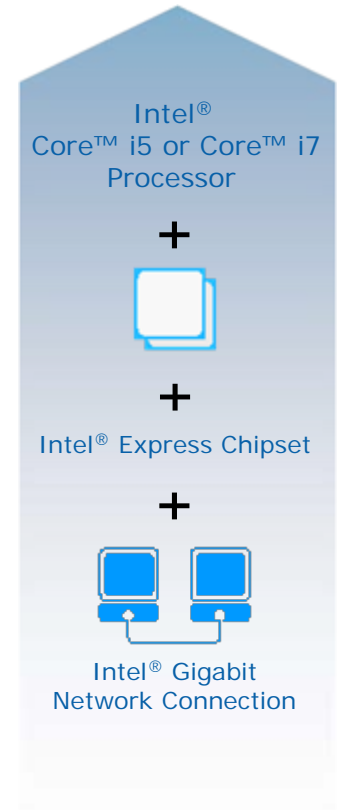
Use Cases	Usages ^a	Awake, OS Working	Awake, but OS Unresponsive	Asleep (Sx)
Remote Power/ Power-Up Cycle	IT/service provider remotely powers PC down then up again to reset for servicing. Reduces energy costs.	✓	✓ _a	✓
Agent Presence Checking and Alerting	Ensure critical applications are running, and notified when they miss a check-in.	✓ _b	✓ _a	N/A
System Isolation and Recovery	Automated or manual policy-based protection against virus outbreaks.	✓	✓	N/A
Remote Diagnosis and Repair	Diagnose and repair problems remotely via out-of-band event log, remote/redirected boot, console redirection. KVM Remote Control ¹¹ , and preboot access to BIOS settings.	✓	✓	✓
Remote Hardware/ Software Asset Tracking	Take a hardware or software inventory regardless of OS state or power state.	✓ _b	✓	✓
Remote Software Update	Power up PCs during off-hours for software updates. Also client-initiated scheduled wake for update.	✓	✓ _a	✓

a: Requires WPA or WPA2/802.11i security and Controller Link 1 for wireless operation when the user OS is down. b: Also available when using host OS-based VPN.

Intel® Desktop Processor Specifications

Intel® Desktop Processors					
Processor Technology	Processor Number	Clock Speed (GHz)	Cores/Threads	L3 Cache	Intel® AES-NI ⁸
 	i7-960	3.20	4/8	8 MB	
	i7-920	2.66	4/8	8 MB	
	i7-870	2.93	4/8	8 MB	
	i7-860	2.80	4/8	8 MB	
 	i5-750	2.66	4/4	8 MB	
	i5-670	3.46	2/4	4 MB	✓
	i5-661	3.33	2/4	4 MB	✓
	i5-660	3.33	2/4	4 MB	✓
	i5-650	3.20	2/4	4 MB	✓
	i3-540	3.06	2/4	4 MB	
	i3-530	2.93	2/4	4 MB	
	G6950	2.80	2/2	3 MB	
	E6500	2.93	2/2	2 MB	
	E5400	2.70	2/2	2 MB	

Intel® vPro™ Technology



Processors for Laptop PCs







Intelligent Laptops for 2010

This section provides detail on Intel® technologies that are used in laptop PCs.

Enterprises can unlock their computing experience on-the-go with mobile-optimized processor technologies from Intel. Providing revolutionary levels of performance and long battery life, along with enhanced security and manageability for business, Intel technologies enable a powerful computing experience in sleek, thin, and light laptop designs.¹⁰



How to Select the Right Intel® Laptop Processor

Best For:	Recommended Intel® Processors	Capabilities	Intel® vPro™ Technology#	Intel® Turbo Boost	Intel® Hyper-Threading	L3 Cache	Cores
Performance Security Manageability	  Activation required#	<ul style="list-style-type: none"> Remotely repair and secure PCs with hardware-based KVM Remote Control, even if asleep, hibernating, powered down, or the OS is inoperable, wired and wireless, inside or outside the corporate firewall.² PC protection: hardware-based local “poison pill” support (Intel® Anti-Theft Technology).³ Remotely isolate infected PCs from the network and repair.² All the performance of Intel® Core™ i5 and Intel® Core™ i7 processors.	✓	✓	✓	Up to 8MB ^a Up to 3MB ^b	2-4 Cores ^a 2 Cores ^b
Intelligent Performance	 	<ul style="list-style-type: none"> Up to 2x faster multitasking and 80% faster on business applications with the new 2010 Intel® Core™ i5 processor vs. a 3-year-old PC.⁴ Intel® Turbo Boost Technology automatically speeds up the processor if the workload requires extra performance.⁵ The Intel® Core™ i5 processor encrypts data up to 3.5x faster.⁴ 		✓	✓	Up to 8MB ^a Up to 3MB ^b	2-4 Cores ^a 2 Cores ^b
		<ul style="list-style-type: none"> Intel® Hyper-threading Technology allows each processor core to work on two tasks at the same time.⁶ Performance to run anti-virus/spam, spyware, and data backup in the background. 			✓	Up to 3MB	2 Cores
Entry Level		<ul style="list-style-type: none"> Personal productivity. Essential communication. 					1-2 Cores

Intel vPro technology features and benefits require specific computer configuration and set up by purchaser.

a: Intel® Core™ i7 processor. b: Intel® Core™ i5 processor.

Laptop PCs

Security and Manageability Use Cases with the All New 2010 Intel® Core™ vPro™ Processor Family²
 (See the Intel® vPro™ Technology section for more information on cross-client capabilities.)

Use Cases	Usages ^{a,b}	AC-Powered / Battery-Powered Wired or Wireless PCs		
		Awake, OS Working	Awake, but OS Unresponsive	Asleep (Sx)
Remote Power/ Power-Up Cycle	IT/service provider remotely powers PC down then up again to reset for servicing. Reduces energy costs.	✓	✓ ^c	✓ AC-Powered N/A (for Battery-Powered)
Protection vs. Loss or Theft ³	Prevents system and data access if PC is lost or stolen. Disables PC and access to encryption keys. Rapid reactivation on PC recovery.	✓	✓	✓ AC-Powered N/A (for Battery-Powered)
Agent Presence Checking and Alerting	Ensure critical applications are running, and notified when they miss a check-in.	✓ ^d	✓ ^c	N/A
System Isolation and Recovery	Automated or manual policy-based protection against virus outbreaks.	✓	✓	N/A
Remote Diagnosis and Repair	Diagnose and repair problems remotely via out-of-band event log, remote/redirected boot, console redirection. KVM Remote Control ¹¹ , and preboot access to BIOS settings.	✓	✓	N/A
Remote Hardware/ Software Asset Tracking	Take a hardware or software inventory regardless of OS state or power state.	✓ ^d	✓	N/A
Remote Software Update	Power up PCs during off-hours for software updates. Also client-initiated scheduled wake for update.	✓ ^c	✓ ^c	N/A

a: All use cases work with wired PC-initiated secure communications outside the corporate firewall (with exception of protection against loss or theft). b: IT must activate Intel® vPro™ technology. c: Requires WPA or WPA2/802.11i security and Controller Link 1 for wireless operation when the user OS is down. d: Also available when using host OS-based VPN.

Laptop PCs

Connectivity

Intel® Centrino® Wireless Products

Laptops with the all new 2010 Intel® Core™ processor family feature the latest in WiFi and WiMAX technology.

- **Intel® Centrino® Wireless-N 1000** for reliable Intel 802.11abgn WiFi.
- **Intel® Centrino® Advanced-N 6200** for advanced 802.11abgn WiFi with faster connections in more places.
- **Intel® Centrino® Advanced-N + WiMAX 6250** for ultra-fast WiMAX and advanced 802.11abgn WiFi for maximum versatility and flexible coverage.
- **Intel® Centrino® Ultimate-6300** for a premium 802.11abgn WiFi adapter offering long battery life and up to 8x greater speed, perfect for reliable and predictable coverage.²⁰

Intel® WiFi Link 6000 Series provides high-performance, low-latency connectivity.

- Delivers up to 450 Mbps of bandwidth for accessing files, video conferencing, etc.
- 802.11n for greater range compared to 802.11abg.
- More consistent network coverage for fewer packet drops and re-transmissions.
- Supports Intel® vPro™ technology for remote management and security of laptops over wireless, even outside the company network.






Intel is committed to the adoption of the 802.11n standard. Intel has worked closely with leading wireless Access-Point (AP) vendors and has conducted extensive testing to verify the implementation of the technology. Laptops with 2010 Intel® Core™ processors and Intel Centrino wireless products can be counted on to work well with existing 802.11abg access points and also provide great benefits with new Wireless-N networks.

Getting More Done on the Road

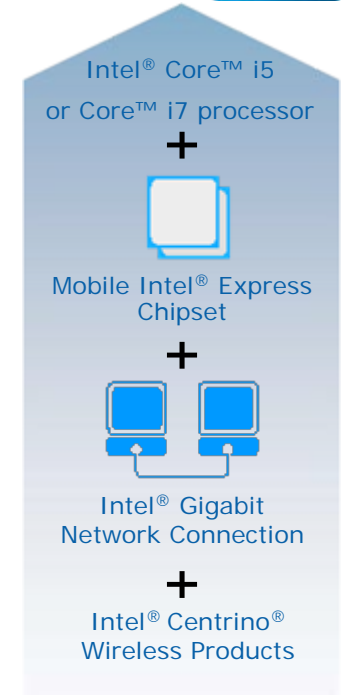
On average, mobile PC users gain up to **51** additional minutes of productivity per day.²⁵



Intel® Laptop Processor Specifications

Intel® Laptop Processors					
Processor Technology	Processor Number	Clock Speed (GHz)	Cores/Threads	Cache	Intel® AES-NI ⁸
	i7-820QM	1.73	4/8	8 MB	
	i7-720QM	1.60	4/8	6 MB	
	i7-620M	2.66	2/4	4 MB	✓
	i5-540M	2.53	2/4	3 MB	✓
	i5-520M	2.40	2/4	3 MB	✓
	i5-430M	2.26	2/4	3 MB	
	i3-350M	2.26	2/4	3 MB	
	i3-330M	2.13	2/4	3 MB	
	T6570	2.10	2/2	2 MB	
	T3300	2.0	2/2	1 MB	
	T3100	1.90	2/2	1 MB	
	900	2.20	1/1	1 MB	

Intel® vPro™ Technology



Processor Suffixes:
M = Mobile Power Optimized Performance (35W TDP)
UM = Mobile Ultra-Thin (25W TDP)
LM = Mobile Low Voltage (15W TDP)
QM = Quad-Core Mobile

Sample Technical Specifications

Desktop/Laptop Purchasing Recommendations Processor/Chipset/Motherboard

Before purchasing desktops or laptop PCs, it's important to make sure you have a comprehensive list of requirements. Below are specifications that lay out in general, straightforward terms what you can consider specifying for new PCs. Note that this checklist addresses the most central PC components: processors, chipsets, and motherboard, but no components such as monitors, hard drives, keyboards, I/O, ports, or software, which are dependent on the specific needs of users.

Feature	Benefits
Multi-Core Architecture	Increased performance.
Multi-Threaded Processing (4- or 8-Way Processing of Threads)	Increased performance, headroom.
Large Level 3 Cache (3-8 MB)	Increased performance.
Integrated Memory Controller	Increased performance.
DDR3 Memory	DDR3 enables higher capacity, higher performance, and lower power than earlier DDR2 memory.
Integrated WiFi and WiMAX	Wireless connectivity lets employees stay productive both in and out of the office. Laptops with integrated WiFi and supporting software let users seamlessly connect to the Internet (or company intranets) when they travel, and WiMAX capabilities extend their connectivity options.

Sample Technical Specifications

Desktop/Laptop Purchasing Recommendations Processor/Chipset/Motherboard

Feature	Benefits
<p>Built-In Remote Manageability and Hardware-Assisted Security with Out-of-Band System Access</p>	<p>Increases management control while decreasing PC maintenance costs. Built-in hardware features enable managers to remotely discover, access, and heal networked PCs.</p>
<p>Hardware-Assisted Virtualization</p>	<p>Using virtualization technology, one computer system can operate as multiple "virtual" systems. The convergence of affordable, powerful platforms and robust scalable virtualization solutions is spurring many organizations to examine the broad range of uses for virtualization. Hardware-assisted virtualization capabilities can improve the performance and robustness of virtualization as compared to software-only virtualization solutions.</p>
<p>Image Stability with a Guaranteed Stable Image Hardware Platform for at Least 12 Months</p>	<p>After PC purchase, unexpected platform changes can force software image revisions or hardware upgrades, raising hardware support costs and image management costs.</p> <p>A stable image hardware platform is a standardized configuration for key hardware components (processor, chipset, and wired/wireless LAN), as well as reference drivers, that you can deploy throughout your company for a set period of time. During this period you maintain a standardized image (OS, drivers, application software) that can be loaded on new PCs without concerns about compatibility between the hardware and software.</p>

Frequently Asked Questions

Q: What is the optimal PC lifecycle? What metrics should I use to evaluate the PC lifecycle?

A: When considering ways to stretch IT budgets, it may be tempting to delay PC refreshes and extend PC lifecycles. While this allows organizations to avoid PC acquisition costs, older PCs cost more to maintain, so the Total Cost of Ownership (TCO) may actually increase. In order to accurately assess current PC ownership and management costs, Intel commissioned Wipro¹ analysts to gather detailed data from 106 firms in North America and Europe, including representation from 15 different industries. Each firm had a minimum of 2,500 PCs, of which at least 25% were laptops. The firms all managed elements of PC support with internal IT staff. The data shows that for most firms, the optimal PC refresh lifecycle for both laptop and desktop PCs is three years. You can download the entire study at:

<http://communities.intel.com/docs/DOC-3144>

Q: What should you keep in mind when reviewing benchmark information?

A: There are a number of questions to ask about benchmark information:

- Are the configurations an apples-to-apples comparison? The processor is only one of many components that make up the platform.
- Are industry standard benchmarks and/or mainstream software being used?
 - Good: Mainstream Software Application Workload
 - Better: Industry Standard Benchmark—Independent Company (FutureMark*)
 - Best: Industry Standard Benchmark—Independent Consortia (SPEC*)
- Is the latest version of the benchmark or software being used?
- Do the selected benchmarks or software reflect the desired usage model?
- Is full documentation of configurations and workloads available to ensure third-party reproducibility?
- Are the standard settings being used for the configurations? Has anything been modified in the configuration to improve performance?
- Were the latest software drivers used when the benchmark results were published?

- Are there standalone benchmark and software scores? Scores should not be systematically aggregated to create “overall” performance results. This misrepresents the actual benchmark or software scores to users and is subject to bias regarding benchmark or software selection and weighting.
- Are there complete and clear visual representations or graphs?

Q: Why should we specify business PCs vs. high-end consumer systems?

A: PCs built specifically for business, such as those equipped with Intel® Core™ vPro™ processors, come complete with hardware-based features that enable and simplify many standard business tasks, such as manageability and security. High-end consumer PCs typically do not provide these capabilities. In addition, here are other reasons:

Consumer PCs:

- Less performance
- Harder to manage
- Inconsistent configurations (not part of the Intel® Stable Image Platform Program)²³
- Higher hardware failure rates[#]

For more information, please see the research report “Keeping Notebooks Past Their Prime” by J. Gold Associates, 2009 <http://download.intel.com/business/resources/reports/keepingnotebookspastprime.pdf>

Frequently Asked Questions

Q: Why should we specify the latest processors?

A: The latest processors, such as those in the all new 2010 Intel® Core™ processor family and Intel® Core™ vPro™ processor family, feature advanced intelligence that enables new levels of energy efficient performance while also delivering increased energy efficiency. Thanks to Intel® Turbo Boost Technology and Intel® Hyper-Threading Technology, a single dual-core 2010 Intel® Core™ i5 processor can outperform a quad-core Intel® Core™2 Quad processor. This is especially helpful when running today's powerful software packages; it improves responsiveness during multitasking and accelerates multithreaded applications such as Microsoft* Excel.

Q: What is the significance of processor frequency (i.e., speed)?

A: GHz is a measure of a processor's clock speed, i.e. the cycles per second at which a processor performs basic operations. Very often, clock speed is taken to be an indication of a processor's performance, but this alone is not a good measure of a processor's power. The performance of a PC is not simply dependent on the clock speed of the processor. A variety of factors come into play. These include the processor's pipeline, instruction sets per clock cycle, cache

size, and front side bus, as well as the number of execution cores within a single processor. The all new 2010 Intel Core processor family delivers multiple execution cores, providing much greater performance at lower clock speeds compared to single-core processors that clock in at greater speeds.

In addition, Intel Turbo Boost Technology intelligently allocates extra processing power to the applications that need it most, accelerating the processor clock speed up to 20% to match the workload.⁵

Q: Are your PCs running your software effectively?

A: Today, many software programs are built as multi-threaded applications, which can greatly improve their performance. To take advantage of this software architecture, however, a PC must be capable of processing multiple threads independently. The all new 2010 Intel Core processor family and the all new 2010 Intel Core vPro processor family are specifically designed to streamline processing of multi-threaded applications. This is in contrast to earlier generation processors that are not designed to handle

multi-threaded applications. Users on these older systems will see no (or little) benefit when running multi-threaded programs.

Q: How can we take advantage of encryption without sacrificing performance?

A: Select new 2010 Intel® Core™ processors and Intel® Core™ vPro™ processors feature Intel® AES-New Instructions. Intel® AES-NI is available on Intel® Core™ i5-600 Desktop Processor Series, Intel® Core™ i7-600 Mobile Processor Series, and Intel® Core™ i5-500 Mobile Processor Series. AES is an encryption standard adopted by the U.S. government that is widely used across the software ecosystem to protect network traffic, personal data, and corporate IT infrastructure. Because Intel AES-NI support is built into the hardware, users can see up to a 3.5x performance improvement for encryption of sensitive data when compared to a 3-year-old PC with an Intel® Core™2 Duo processor.⁴

For More Information

[Intel PC Total Cost of Ownership Estimator](#)

[All New 2010 Intel® Core™ vPro™ Processor Family](#)

[Intel® vPro™ Expert Center](#)

[Powering the Energy Efficiency Revolution](#)

[Technology Leadership](#)

Legal Disclaimers

1 "Using Total Cost of Ownership to Determine Optimal PC Refresh Lifecycles", Wipro Technologies, March 2009 (www.wipro.com/industryresearch). Based on a survey of 106 firms in North America and representing 15 different industries and projections based on a Model Company developed by Wipro Technologies. Computer system price data updated November 2009. Actual results may vary based on the number of use-cases implemented and may not be representative of results that individual businesses may realize. For additional implementation examples refer to Intel Case Studies available at <http://communities.intel.com/openport/docs/DOC-1494>.

2 Intel® Active Management Technology requires the computer system to have an Intel® AMT-enabled chipset, network hardware and software, as well as connection with a power source and a corporate network connection. Setup requires configuration by the purchaser and may require scripting with the management console or further integration into existing security frameworks to enable certain functionality. It may also require modifications of implementation of new business processes. With regard 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. System Defense only works with select Intel® vPro™ technology brand verified LAN cards. For more information, see <http://www.intel.com/technology/platform-technology/intel-amt/>

3 Intel® Anti-Theft Technology—PC Protection (Intel® AT-p). No computer system can provide absolute security under all conditions. Intel® Anti-Theft Technology (Intel® AT-p) requires the computer system to have an Intel® AT-enabled chipset, BIOS, firmware release, software, and an Intel AT-capable Service Provider/ISV application and service subscription. The detection (triggers), response (actions), and recovery mechanisms only work after the Intel® AT functionality has been activated and configured. Certain functionality may not be offered by some ISVs or service providers and may not be available in all countries. Intel assumes no liability for lost or stolen data and/or systems or any other damages resulting thereof.

4 (Cross Client) Cross client claim based on lowest performance data number when comparing desktop and mobile benchmarks. Configurations and performance test as follows:

(Mobile) Comparing pre-production Intel® Core™ i5-520M processor-based laptops to theoretical installed base of Intel® Core™2 Duo processor T5500. Laptop system configurations: Intel® Core™ i5-520M (3 MB Cache, 2.4 GHz), with Intel® Turbo Boost Technology and Intel® Hyper-Threading Technology on pre-production Intel® Ibex Peak HM55, Dual-channel Micron* 4 GB (2x2 GB) DDR3-1066 7-7-7-20 with Intel® HD Graphics, Hitachi* 320 GB HDD, Intel® Matrix Storage Manager 8.9.0.1023 (BIOS, Intel® INF and Graphics: pre-production, Imon compliant with VRD 11.1 requirements), Microsoft* Windows* 7 Ultimate 64-bit RTM.

Intel® Core™2 Duo processor T5500 (2 MB Cache, 1.66 GHz, 667 MHz FSB) in Lenovo* Thinkpad* T60 laptop, Mobile Intel® 945GM Express Chipset, Micron* PC5300 DDR2 667 2x1 GB 5-5-5-15 memory, Intel® GMA 950 graphics 224 MB Dynamic video memory technology, Hitachi* Travelstar* HTS721010G9SA00 SATA 100 GB 7200RPM HDD, BIOS Lenovo* 79ETD7WW 2.17 with default settings, Microsoft* Windows* Vista Ultimate.

(Desktop) Comparing pre-production Intel® Core™ i5-650 processor-based desktops to theoretical installed base of Intel® Core™2 Duo Processor E6400 with comparable frequency. Desktop configurations: pre-production Intel® Core™ i5-650 processor (4MB Cache, 3.20 GHz) on pre-production Intel® Ibex Peak P55, Dual-channel DS Micron* 4 GB (2x2 GB) DDR3-1333 9-9-9-24 with Intel® HD Graphics graphics @ 900 MHz, Seagate* 1TB HDD, Intel® Matrix Storage Manager 8.9.1023 (BIOS, Intel® INF and Graphics: pre-production, Imon compliant with VRD 11.1 requirements), Microsoft* Windows* 7 Ultimate 64-bit RTM.

Intel® Core™2 Duo Processor E6400 (2M Cache, 2.13 GHz, 1066 MHz FSB) on Intel® DQ45CB, Dual channel DS Micron* 2 GB (2x1 GB) DDR2-800 5-5-5-18 with Integrated Intel® GMA 3000 onboard graphics subsystem, Seagate* 320 GB HDD, (BIOS:0059, Intel® Chipset INF: 8.4.0.1016, Graphics: 7.14.10.1329), Microsoft* Windows* 7 Ultimate 64-bit RTM, Microsoft* Windows* Vista Ultimate 32-bit.

Business productivity claims based on SYSmark* 2007, which is the latest version of the premier performance metric that measures and compares PC performance based on real world applications. SYSmark* 2007 Preview is an application-based benchmark that reflects usage patterns of business users in the areas of Video creation, E-learning, 3D Modeling and Office Productivity. Multitasking claims based on financial calculations workload consisting of advanced spreadsheet calculation measured using Microsoft* Excel* Monte Carlo Simulation plus Virus Scan. Security workload consists of Winzip*12 decompressing an encrypted archive containing 200 photos, 125 of which are 10MP photos and 75 which are 6MP photos. The photos are in jpeg format. The total size of all the photos is about 830 MB.

5 Intel® Turbo Boost Technology available on the Intel® Core™ i7 processor and the Intel® Core™ i5 processor only. Intel® Turbo Boost Technology requires a PC with a processor with Intel Turbo Boost Technology capability. Intel Turbo Boost Technology performance varies depending on hardware, software and overall system configuration. Check with your PC manufacturer on whether your system delivers Intel Turbo Boost Technology. For more information, see <http://www.intel.com/technology/turboboost>.

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6 Intel® Hyper-Threading Technology (Intel® HT Technology) requires a computer system with a processor supporting Intel HT Technology and an Intel HT Technology-enabled chipset, BIOS, and operating system. Performance will vary depending on the specific hardware and software you use. The Intel® Core™ i5-750 desktop processor does not support Intel HT Technology. For more information, including details on which processors support Intel HT Technology, see <http://www.intel.com/technology/platform-technology/>.

7 Andi Mann, Vice President of Research, Enterprise Management Associates March 11, 2009. Symantec ManageFusion 2009 - Las Vegas Nevada.

8 AES-NI is a set of instructions that consolidates mathematical operations used in the Advanced Encryption Standard (AES) algorithm. Enabling AES-NI requires a computer system with an AES-NI-enabled processor as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on Intel® Core™ i5-600 Desktop Processor Series, Intel® Core™ i7-600 Mobile Processor Series, and Intel® Core™ i5-500 Mobile Processor Series. For further availability of AES-NI enabled processors or systems, check with your reseller or system manufacturer. For more information, see http://softwarecommunity.intel.com/isn/downloads/intelavx/AES-Instructions-Set_WP.pdf.

9 Results shown are from Intel MSP Case Studies: Alpheon*, Brite Computers*, Dempsey8, Nex-Tech*, Sabio*, Sft (<http://msp.intel.com/>). Actual results may vary.

10 System performance, battery life, power savings, 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 refer to comparisons with previous generation Intel technologies. See <http://www.intel.com/products/centrino/index.htm> and <http://www.intel.com/performance/mobile/benchmarks.htm> for more information on performance, power savings, and energy efficiency.

11 KVM Remote Control (Keyboard Video Mouse) is only available with Intel® Core™ i5 vPro™ processors and i7 vPro™ processors with active integrated graphics. Discrete graphics not supported.

12 Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, Virtual Machine Monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor.

13 Capgemini Services* leveraging Intel® Centrino® Pro and Intel® Processor Technology with Microsoft Windows Vista*, Capgemini, January 2008. <http://www.rwthosting.com/documents/White-Papers/Reduce-power-consumption-Whitepaper.pdf>

14 Intel® Trusted Execution Technology. No computer system can provide absolute security under all conditions. Intel® Trusted Execution Technology (Intel® TXT) requires a computer system with Intel® Virtualization Technology, an Intel TXT-enabled processor, chipset, BIOS, Authenticated Code Modules and an Intel TXT-compatible measured launched environment (MLE). The MLE could consist of a virtual machine monitor, an OS or an application. In addition, Intel TXT requires the system to contain a TPM v1.2, as defined by the Trusted Computing Group and specific software for some uses. For more information, see <http://www.intel.com/technology/security>.

15 Off-network mobility not supported in current OS streaming products. Expected in future versions.

16 Intel 45nm product is manufactured on a lead-free process. Lead is below 1000 PPM per EU RoHS Directive (2002/95/EC, Annex A). Some EU RoHS exemptions for lead may apply to other components used in the product package.

17 Halogen-free applies only to halogenated flame retardants and PVC in components. Halogens are below 900 PPM bromine and 900 PPM chlorine.

18 ENERGY STAR denotes a system level energy specification, defined by the US Environmental Protection Agency, that relies upon all of the system's components, including processor, chipset, power supply, HDD, graphics controller and memory to meet the specification. For more information, see http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO.

19 Results shown are from the 2007 EDS Case Studies with Intel® Centrino® Pro and the 2007 EDS case studies with Intel® vPro™ technology, by LeGrand and Salamasick, 3rd party audit commissioned by Intel, of various enterprise IT environments and the 2007 Benefits of Intel® Centrino® Pro Processor Technology in the Enterprise, Wipro Technologies study commissioned by Intel. The EDS studies compare test environments of Intel® Centrino® Pro and Intel® vPro™ processor technology equipped PCs vs. non-Intel® vPro™ processor technology environments. Tested PCs were in multiple OS and power states to mirror a typical working environment. The Wipro study models projected ROI of deploying Intel® Centrino® Pro processor technology. Actual results may vary and may not be representative of the results that can be expected for smaller businesses. The study is available at www.intel.com/vpro, www.eds.com, and www.wipro.com.

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20 Bandwidth: Up to 8x Bandwidth increase based on the theoretical maximum bandwidth enabled by 3x3 Draft-N implementations with 3 spatial streams in combination with a 3 spatial stream Access Point. Actual wireless throughput and/or range will vary depending on your specific operating system, hardware and software configurations. Check with your PC manufacturer for details. Range: Up to 2X greater range enabled by 3x3 802.11n implementations with 3 spatial streams. Up to 450 Mbps bandwidth based on the theoretical maximum bandwidth enabled by 3x3 802.11n implementations with 3 spatial streams in combination with a 3 spatial stream Access Point. Actual wireless throughput and/or range will vary depending on your specific operating system, hardware, and software configurations. Check with your PC manufacturer for details. Actual platform battery life savings will vary depending on your specific operating system, hardware and software configurations. Check with your PC manufacturer for details.

21 State of Indiana Office of Technology ROI case study <http://communities.intel.com/docs/DOC-2020>. Based on EPA* standards for carbon content of gasoline and assuming 21 mpg.

22 Intel White Paper, "Virtualizing the Client PC: A Proof of Concept". <http://communities.intel.com/docs/DOC-1756>.

23 Check with your PC vendor for availability of computer systems that meet Intel® SIPP guidelines. A stable image computer system is a standardized hardware configuration that IT departments can deploy into the enterprise for a set period of time. Intel SIPP is a client program only and does not apply to servers or Intel-based handhelds and/or handsets.

24 Cross client claim based on lowest data number when comparing desktop and mobile benchmarks. Configurations and performance test as follows: (Mobile) Intel® Core™ i5-520M processor (3MB Cache, 2.40 GHz) with Intel® Turbo Boost Technology and Intel® Hyper-Threading Technology and Mobile Intel® HM55 Express Chipset on Lenovo* ThinkPad* T410, Intel® HD Graphics and driver ver. 8.15.10.1968, Dual-channel Micron* 4GB (2x2GB) DDR3-1066, Hitachi* 320GB 7200rpm HDD and driver ver. 9.5.0.1037, BIOS Lenovo* 6IET38WW (0.38) with default setting, Wireless Intel® Centrino® Advance-N 6200 AGN with driver ver. 13.0.0.107, Screen size 14.1" 1280x800 (32bit), Microsoft* Windows* 7 Ultimate 6.1 Build 7600 64-bit, DirectX 11, Chipset INF ver. 9.1.1.1020, Power Management Lenovo Power Scheme. Approximate annual energy cost: \$3.92. Intel® Core™2 Duo processor T5500 (2 MB Cache, 1.66 GHz, 667 MHz FSB) in Lenovo* Thinkpad* T60 laptop, Mobile Intel® 945GM Express Chipset, Micron* PC5300 DDR2 667 2x1 GB 5-5-5-15 memory, Intel® Graphics Media Adapter 950, Hitachi* Travelstar* HTS721010G9SA00 SATA 100 GB 7200RPM HDD, BIOS Lenovo* 79ETD7WW 2.17 with default settings, Microsoft* Windows* Vista* Ultimate. Approximate annual energy cost: \$6.24 (Desktop) Intel® Core™2 Duo processor E6400 (2M Cache, 2.13 GHz, 1066 MHz FSB), Chipset: Intel® 945G Express chipset, Intel® chipset software installation file (INF): 9.0.0.1011, BIOS: CL94510J.86A.0034, Memory: Micron MT16HTF12864AY-80ED4 2x1GB DDR2 667MHz, Seagate ST3320620AS 320GB Barracuda 7200.10 (7200 RPM, 16MB cache, NCQ, SATA2), Integrated Intel Graphics driver 7.14.10.1329, Running on Windows* Vista* x86 Ultimate SP1. Approximate annual energy cost: \$13.17 Intel® Core™ i5-650 Processor (4M Cache, 3.20 GHz), Chipset: Intel Q57, BIOS version TMBX10J.86A.0020, Memory: Micron* MT16JTF25664AZ-1G4 2x2GB DDR3, Seagate Barracuda ST31000528AS 1TB Serial ATA (7200 RPM, 16MB cache), Intel HD Graphics, Chipset driver: Intel INF 9.1.1.1020, Graphics driver: 8.15.10.1995, Microsoft* Windows* 7 Ultimate 64-bit. Approximate annual energy cost: \$8.07

*Energy cost figures derived from Intel Energy Efficient 2.0 methodology, described here: <http://www.intelcapabilitiesforum.net/EEP/>. Source of Energy Cost Data: US Department of Energy, Electric Power Monthly November 2009 with data for August 2009 (DOE/EIA-0226 (2009/11)); Average Retail Price of Electricity, Year to Date through August 2009): 10.01 Cents/kWh. Results are for illustrative purposes only. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing.

25 "Increase Productivity by Providing Notebooks Beyond Road Warriors," Forrester Consulting, October 2008 (www.Forrester.com).

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