INTELLI GENT PROCESSORS. TRANSFORMING COMPUTING.
Legal Disclaimers

All dates and products specified are for planning purposes only and are subject to change without notice.

Relative performance is calculated by assigning a baseline value of 1.0 to one benchmark result, and then dividing the actual benchmark result for the baseline platform into each of the specific benchmark results of each of the other platforms, and assigning them a relative performance number that correlates with the performance improvements reported.

SPEC, SPECint, SPECfp, SPECjbb, SPECweb, and SPECpower_ssj are trademarks of the Standard Performance Evaluation Corporation. See http://www.spec.org for more information.

Warning: Altering PC memory frequency and/or voltage may (i) reduce system stability and use life of the system, memory and processor; (ii) cause the processor and other system components to fail; (iii) cause reductions in system performance; (iv) cause additional heat or other damage; and (v) affect system data integrity. Intel assumes no responsibility that the memory, included if used with altered clock frequencies and/or voltages, will be fit for any particular purpose. Check with memory manufacturer for warranty and additional details.

Warning: Altering clock frequency and/or voltage may (i) reduce system stability and useful life of the system and processor; (ii) cause the processor and other system components to fail; (iii) cause reductions in system performance; (iv) cause additional heat or other damage; and (v) affect system data integrity. Intel has not tested, and does not warranty, the operation of the processor beyond its specifications.

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.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor series, not across different processor sequences. See http://www.intel.com/products/processor_number for details.

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Grove’s Rules of Recessions:

*Annotations by Bryant*

They always end

In the middle you feel like it never will

You don’t “save” yourself out of one

Bankruptcy court is full of people who blindly followed this philosophy

Some emerge stronger than before

Only through focused, disciplined investment.
Downturns Present Opportunities

Intel Total Revenues
1985 – 2008

Flash memory

Pentium®II

300 mm

80386

Intel Confidential. Historical financial information is as reported and does not reflect restatements. Source: Intel
Downturns Present Opportunities

Intel Total Revenues
1985 – 2008

$B

32nm High-K/metal gate products

Flash memory

Pentium®II

300 mm

80386

Intel Confidential. Historical financial information is as reported and does not reflect restatements. Source: Intel
## The Cost of a Leading Edge Fab

<table>
<thead>
<tr>
<th>Component</th>
<th>Cost</th>
</tr>
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<tbody>
<tr>
<td>FAB</td>
<td>$4 B</td>
</tr>
<tr>
<td>PILOT LINE</td>
<td>$1-2 B</td>
</tr>
<tr>
<td>R&amp;D PROCESS TEAM</td>
<td>$0.5-1 B</td>
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</table>

*Source: Intel*
### On-Time 2 Year Manufacturing Cycles

*The “Tick” of Tick-Tock*

<table>
<thead>
<tr>
<th>Node Size</th>
<th>Year 1</th>
<th>Year 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>130 nm</td>
<td>2001</td>
<td>2003</td>
</tr>
<tr>
<td>90 nm</td>
<td>2003</td>
<td>2005</td>
</tr>
<tr>
<td>65 nm</td>
<td>2005</td>
<td>2007</td>
</tr>
<tr>
<td>45 nm</td>
<td>2007</td>
<td>2009*</td>
</tr>
<tr>
<td>32 nm</td>
<td>2009*</td>
<td></td>
</tr>
</tbody>
</table>

- **291 Mbit**
- **SRAM**
- **2nd gen.**
- **HK+MG**
- **Sep. 2007**

*Forecast*
Extending Intel Architecture...

Ultra Low Power
Sufficient Performance
Extreme Integration

Performance
Performance/Watt
User Valued Features

Intel Architecture

PLATFORMS

MID  CE  Simple and Affordable PC
Notebook  Desktop  Server

Common Element: Adaptability of Moore’s Law
Intelligent Choice
Delivers higher performance, lower TCO
Estimated 8 month payback for single-core server refresh

Most Important Server Launch Since Pentium® Pro
15 Billion Connected Devices
Design and Discovery

Intelligent Platform
World’s Most Adaptable Server Platform

Intel® Xeon® Processor 5500 Series: Transforming Computing
Intel® Xeon® Processor 5500 Series: Transforming Computing

Most Important Server Launch Since Pentium® Pro

15 Billion Connected Devices

Design and Discovery

Intelligent Platform

World’s Most Adaptable Server Platform

Intelligent Choice

Delivers higher performance, lower TCO

Estimated 8 month payback for single-core server refresh
“Intel is days from launching its major offensive into the server market”

April 9, 1996

Established the Standard High Volume Server
The Foundation of the World Wide Web

Annual Server Unit Shipments


- 1 2 3 4 5 6 7 8 9

- Total Market
- Intel Market

IA High Volume Server Standards Software

*Source: IDC Worldwide Server Tracker, updated Q4 2008
Evolving to the Embedded Internet

Requires Dynamic, Efficient and Scalable Infrastructure
NASA Ames will develop a computational system with one PetaFLOPs peak performance in 2009. “Such a monumental increase in performance will help fulfill NASA's increasing need for computing capacity…for future missions.”

S. Pete Worden, Ames Director

“Scinet has an insatiable demand for performance… investigating the forces that govern the universe. The clusters based on the new Intel® Xeon® 5500 series processor keep us on the leading edge… to enable new discoveries.”

Dr. Chris Loken, Chief Technology Officer

Top performing Manufacturers:
- Get product to market 58 days faster
- Have 48% lower prototyping costs

Source: Aberdeen Group

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Engineering Scalability

Supersonic Speed

Huge Capacity

Maximum Fuel Efficiency

Silicon Offers the Opportunity to Scale with a Single Design
Intel® Xeon® 5500 Processor

- 45 nm Hi-K Quad Core processor
- Intelligent Performance
- Adaptable Energy Efficiency
- Flexible Virtualization

A New Generation of Intelligent Server Processors
Intel® Xeon® 5500 Platform

- New Memory Subsystem
- Intel® QuickPath Interconnect
- Intel® Intelligent Power Technology
- New I/O Subsystem

Platform Ready for Future 32nm Products
Intel® Xeon® 5500: Intelligence Built-In

Responsive Performance
- Intel® Microarchitecture Nehalem
- Intel® Turbo Boost Technology
- Intel® Hyper-Threading Technology

Intel® Intelligent Power Technology
- Integrated Power Gates
- Automated Low-Power States
- Intel® Node Manager

Adapts To Your Application and User Environment
2-Socket Server Performance

The Greatest Intel® Xeon® Performance Leap In History!

Relative Performance

- Intel Xeon (2005)
- Intel Xeon 5000
- Intel Xeon 5100
- Intel Xeon 5300
- Intel Xeon 5400
- Intel Xeon 5500

Platform Idle Power (Watts)

- Intel Xeon 5400
- Intel Xeon 5500

50% Power Savings

Performance When You Need It. Power Savings When You Don’t

Intel® Xeon® 5500 Performance Publications

SPECint*_rate_base2006
- 240 score (+71%)
- Fujitsu

SPECpower*_ssj2008
- 1943 ssj_ops/watt (+71%)
- Verari systems
- Oracle JRockit* JVM

SPECfp*_rate_base2006
- 194 score (+125%)
- Fujitsu

SPECjAppServer*2004
- 3,975 JOPS (+93%)
- Dell
- Oracle WebLogic* Server

TPC*-C
- 631,766 tpmC (+130%)
- HP
- Oracle 11g* database

SAP-SD* 2-Tier
- 5,100 SD Users (+102%)
- IBM
- SAP* ERP 6.0/IBM DB2*

SPECComp*Mbase2001
- 43,593 score (+154%)
- Cisco
- Intel Compiler 11.0/RHEL 5.3*

TPC*-E
- 800 tpsE (+152%)
- Fujitsu
- Microsoft SQL Server* 2008

SPECWeb*2005
- 71,045 score (+140%)
- HP
- Rock Web* Server

Fluent* 12.0 benchmark
- Geo mean of 6 (+127%)
- ANSYS Fluent*

SPECjbb*2005
- 604,417 BOPS (+64%)
- IBM
- IBM J9* JVM

SPECapc* for Maya 6.5
- 7.70 score (+87%)
- Dell
- Autodesk* Maya

Over 30 New 2S Server and Workstation World Records!

Percentage gains shown are based on comparison to Xeon 5400 series; Performance results based on published/submitted results as of March 30, 2009. Platform configuration details are available at http://www.intel.com/performance/server/xeon/summary.htm. Other names and brands may be claimed as the property of others. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel products as measured by those tests. 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. For more information on performance tests and the performance of Intel products, visit Intel Performance Benchmark Limitations.
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World’s Most Adaptable Server Platform

Intelligent Choice
Delivers higher performance, lower TCO
Estimated 8 month payback for single-core server refresh
"Data centers receive a lot of attention because they are an obvious concentration."

"However, the real area where the greatest overall effect can be made quickly is at the desktop and with client devices."

Client Age & Power Management Regimen All Impact Your Energy Budget so Spend Smart
Saving Money through lower Energy Consumption

Estimated Annual Energy Consumption²

- **Unmanaged**
  - Typical 3-year old desktop
  - Intel® Pentium® D Processor 945: 1008 KWh
  - Intel® Core™2 Duo Processor, Unmanaged then Managed
    - Typical 1-year old desktop
    - Intel® Core™2 Duo Processor E7200: 491 KWh
  - Managed Mobile
    - Intel® Core™2 Duo Processor T9400: 38 KWh

>26x Reduction by going Mobile
Go Mobile, Go Green, Spend Smart, Save Money
Enabling the Power Efficient Performance and Features of Nehalem for Mainstream PC Users

- **Fast**
  - 20% faster than previous generation

- **Low Power**
  - >50% Lower Idle Power than the previous generation

- **Sleeker Design**
  - 40% package size reduction going to 2-chip solution

1. Intel® Core™ i5-750 (8MB, 2.66 GHz) vs. Intel® Core2 Quad Processor Q9400 (6M, 2.66 GHz) based on Sysmark* 2007 Overall
2. Intel® Core™ i5-750 (8MB, 2.66 GHz) vs. Intel® Core2 Quad Processor Q9400 (6M, 2.66 GHz) system Idle Power Measurements
3. Intel® Core™ i5-750 (8MB, 2.66 GHz) + Intel® P55 Express Chipset vs. Intel® Core2 Quad Processor Q9400 (6M, 2.66 GHz) + Intel® P45 Express Chipset + Intel® ICH10
Lynnfield Value Proposition

Lynnfield delivers intelligent performance for faster multi-tasking, digital media creation, and gaming.

**Smart.**

- *Intel® Turbo Boost Technology*\(^1\) gives maximum performance to applications that need it most.
- Smoother and more realistic gaming by distributing AI, physics, and rendering *across 8 threads with Intel® Hyper-Threading Technology*\(^1\).
- *Intel® Smart Cache*\(^1\) provides a higher-performance, more efficient cache subsystem, optimizing performance on multi-threaded applications.

**Fast.**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Betterity</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>iTunes* 7.4.3</td>
<td>BETTER</td>
<td>14%</td>
</tr>
<tr>
<td>CINEBENCH* 10.0</td>
<td>BETTER</td>
<td>20%</td>
</tr>
<tr>
<td>3DMark*Vantage – CPU Score</td>
<td>BETTER</td>
<td>62%</td>
</tr>
</tbody>
</table>

Intel® Core™ i7-870 Processor 2.93 GHz vs. Intel® Core™2 Quad Processor Q9650

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  1. See backup for disclaimers.
DP55XX Platform Proposition
Transition to LGA1156

Today’s 3-Chip Solution:
P45 Express Chipset Example

New 2-Chip Solution: P55 Express Chipset

Memory Controller moves into the Processor
Graphics support moves into the Processor
Intel® Management Engine moves into PCH
Clock Buffers integrate into PCH

New Two Chip technology Delivers Performance and Minimizes Power!
Re-architected Platform Delivers Nehalem To New Price Points

Flexible, Scalable, Cost Optimized, Highly Integrated Platform Delivers The Awesome Power of Nehalem To the Mainstream
Introducing the P55 family
Four SKUs for the new LGA1156 socket

- Extreme Series
  - DP55 KG

- Media Series
  - DP55 WG
  - DP55 WB

Intel
Intel® Turbo Boost Technology\(^1\) in mainstream
Dynamically delivering optimal performance & energy efficiency

*Previous Generation*

**Lynnfield**\(^1\)

*with Turbo*

- Single-Threaded Workload < TDP
  
  Near zero power for inactive cores

- Lightly-Threaded Workload < TDP

- Highly Threaded Workload < TDP

---

\(^1\) Example based on 2.93GHz Lynnfield, Please refer to the Legal Disclaimer Slide.
Találós kérdések

Mi az az IDF?
Mi az a Westmere?
Mi az a Sandy Bridge?
Mi az a Larrabee?
Találós kérdések
Intel Developer Forum

Westmere – új CPU, 32nm, integrált grafika, TurboBoost, Hyper-Threading, Advanced Encryption Standard

Sandy Bridge - új CPU, 32nm, 6-ik generációs integrált grafika

Larrabee – párhuzamosan programozható feldolgozó (grafikai is) egység, Intel architektúrán, X86-os utasításokkal
Találós kérdések

Milyen kicsi, működő tranzisztort tud ma az Intel sorzatban előállítani?

Hány tranzisztort tud ma az Intel egy lapkára zsúfolni?
Találós kérdések

22 nanométer

2,9 milliárdot