Intel Roadmap Overview
Sept 22\(^{nd}\), 2009

Stephen L. Smith
Vice President, Director of Operations
Intel Architecture Group

Contact George Alfs with any questions
Agenda

- Server Roadmap
- Client Roadmap
- Netbook / Nettop Roadmap
### Intel® Enterprise Roadmap

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<td><strong>Mission Critical</strong></td>
<td>Future Intel® micro-architecture codename</td>
<td>Future Kittson Processor</td>
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#### 32nm Upgrades Across All Intel® Segments

All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.
Nehalem-EX: 4-Socket Platform

- 8 cores per processor
- 64 threads
- Intel® Scalable Memory Interconnect with Buffers
  - Up to 1 TB memory support (4S)
- Scalable to 8+ sockets with OEM node controllers

Enterprise, Virtualization, and HPC Leadership

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Nehalem-based Server Performance

The Greatest Intel® Xeon® Performance Leap In History!

**Xeon® 5500 vs. Xeon® 5400**
(Nehalem-EP)               (Harpertown)

- Up to **3.5x** Memory Bandwidth
- Up to **2.5x** Database Performance
- Up to **1.7x** Integer Throughput
- Up to **2.2x** Floating Point Throughput

**Nehalem-EX vs. Xeon® 7400**
(Dunnington)

- Up to **9x** Memory Bandwidth
- Up to **3x** Database Performance
- > **1.7x** Integer Throughput
- > **2.2x** Floating Point Throughput

**Expecting larger gains from Nehalem Architecture in EX**

---

1. Based on May’09 internal measurement using Intel internal workload
2. 3x Performance vs. Prior Generation based on Intel internal measurements on an internal OLTP workload comparing 4S Nehalem-EX to 4S Intel® Xeon® X7460 (“Caneland” platform).

Westmere-EP: Next Generation Xeon® Processor

- Significant compute performance increase at the same power*
- Enhanced security
  - TXT for hardened virtualization
  - AES to broaden encryption usage**

Socket Compatible with Intel® Xeon® 5500 Platform

**Intel internal measurements based on 140Kb standard banking transaction comparison between Westmere-EP CPU with and without AES-NI acceleration.
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- Server Roadmap
- Client Roadmap
- Netbook / Nettop Roadmap
## Nehalem / Westmere Client Roadmap

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<tr>
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<td>Intel® Core i7 Extreme Processor (4C/8T)</td>
<td>32nm Gulftown Processor (6C/12T)</td>
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<tr>
<td>Intel® Core i7 Processor (4C/8T)</td>
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<td>Intel® X58 Express Chipset</td>
<td>Intel® X58 Express Chipset</td>
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<td>McCreary Platform</td>
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<tr>
<td>Lynnfield (4C/8T)</td>
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<tr>
<td>45nm Intel® Processor</td>
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<tr>
<td>32nm Clarkdale (2C/4T)</td>
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<tr>
<td>Intel 5 series Chipset</td>
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<tr>
<td>Calpella Platform</td>
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<td>Clarksfield (4C/8T)</td>
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<tr>
<td>32nm Arrandale (2C/4T)</td>
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<tr>
<td>Intel 5 series-M Chipset</td>
<td></td>
</tr>
</tbody>
</table>

### Mobile Extreme / Performance / Mainstream

| McCreary Platform                         | Calpella Platform                     |
| 45nm Intel® Processor                     |                                        |
| Intel 5 series-M Chipset                 |                                        |

### Desktop Performance / Mainstream

- **2009**
  - Desktop Extreme / High-End Desktop
  - X58 Platform
    - Intel® Core i7 Extreme Processor (4C/8T)
    - Intel® Core i7 Processor (4C/8T)
    - Intel® X58 Express Chipset
  - McCreary Platform
    - Lynnfield (4C/8T)
  - 45nm Intel® Processor
  - 32nm Clarkdale (2C/4T)
  - Intel 5 series Chipset

- **2010+**
  - 2010 HEDT Platform
    - 32nm Gulftown Processor (6C/12T)
  - Calpella Platform
    - Clarksfield (4C/8T)
  - 32nm Arrandale (2C/4T)
  - Intel 5 series-M Chipset

### Future Intel® Micro-architecture Codename

- **Sandy Bridge**

---

32nm Westmere extends Nehalem through the mainstream.

All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.
Enabling Nehalem For Every Segment

2008
- High End Desktop
  - Revolutionary Microarchitecture
  - 4 Cores / 8 Threads

2009+
- Mainstream Desktop
  - Lynnfield
- Thin & Light Notebook
  - Clarksfield
- Platform Re-partition
- 2 Cores / 4 Threads with Integrated Graphics
- 32nm Process Technology
- 32nm High-K

45 nm High-K

All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.
Get the Best of Both Worlds with the new Intel® Core™ i7 processor

Highly Threaded Apps

- Balanced performance with Dynamic Architecture

Lightly Threaded Apps

- Accelerate Everything!

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System Configurations and Disclaimers: End of Presentation
Mainstream Client Platform Repartitioning

Repartitioning of the Client Platform
Greater Performance and Lower Power via Higher Integration
First 32nm Westmere Products

Key Features

- Intel® Turbo Boost Technology
- Intel® Hyper-Threading Technology
- Intel® Graphics Media Accelerator
- Integrated Memory Controller with 2 Channel DDR3

Not all features are available on every processor line item. All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.
Intel® Clarkdale Processors:
Major Performance Advances for desktop PCs

- Expand the Processor value proposition with new media, 3D and power management technologies that scale with our process technology and tick tock cadence
  - Small form factors
  - Power savings
  - Media functionality
  - 3D standards

1. Feature only available on the mobile version

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Extending Performance Leadership for Enthusiasts

2008

- High End Desktop
- 4 Cores
- 8 Threads
- Revolutionary Microarchitecture
- 45nm High-K

2010

- GULFTOWN
- 6 Cores
- 12 Threads
- Compatible with Intel® X58 Express Chipset
- 32nm High-K

6-Core Gulftown Platform Coming in 2010

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Larrabee Execution Update

- First products: discrete performance graphics
- Software development vehicle shipping now
- Enemy territory: Quake Wars, id Software
Different Devices for Different Uses

**Ultra-thin Laptop**
- Premium offering spanning consumer price pts
- 0.8-1.0” high, >= 11.6” screens
- Thin & light for increased mobility
- Multitasking performance & rich internet experience
- Content Creation/Editing

**Mainstream Laptop**
- Great performance for entertainment, productivity, and rich web experience
- Content creation and Intense workloads
- Range of form factors

**Netbook**
- <= 10.2” screens
- Purpose-built for Internet use
- Learn, Communicate, View
- Content consumption

IDF2009
Intel Developer Forum
Momentum Continues With Transition to Intel® Dual Core Processors for Ultra-Thin Laptops!

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<th>Q3 '09</th>
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<tr>
<td><strong>Performance</strong></td>
<td>SU9xxx Dual Core ULV Processors</td>
<td>SU7xxx Dual Core</td>
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<td>SU3xxx Single Core</td>
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<td><strong>Transactional</strong></td>
<td>SU2xxx Single Core</td>
<td>SU2xxx Single Core</td>
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<tr>
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<td>Dual Core</td>
<td>SU2xxx Dual Core</td>
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<td><strong>Value</strong></td>
<td>7xx Single Core</td>
<td>7xx Single Core</td>
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Netbook / Nettop Roadmap

**2009**

**Netbook Platform**
- Diamondville Processor
  - Mobile Intel® 945GSE Express Chipset
  - ICH7-M

**Nettop Platform**
- Diamondville Processor (1 or 2 cores)
- Intel® 945GC Express Chipset
- ICH7

**2010+**

**Pine Trail-M Platform**
- Pineview-M Processor
- Tiger Point PCH

**Pine Trail-D Platform**
- Pineview-D Processor (1 or 2 cores)
- Tiger Point PCH

3 chip to 2 chip

*Purpose built solutions to enable netbooks and nettops for the internet and basic computing*

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Integration offers platform BOM savings, power reduction, and improved performance.
Summary

• Intel executing to tick-tock CPU roadmap

• 32 nm Westmere processors deliver higher integration and energy efficient performance

• Turbo Technology in Westmere is a breakthrough in multicore dynamic design

• Ultra-Thin laptop momentum continues to build with new dual-core processor lineup
Risk Factors

The above statements and any others in this document that refer to plans and expectations for the third quarter, the year and the future are forward-looking statements that involve a number of risks and uncertainties. Many factors could affect Intel’s actual results, and variances from Intel’s current expectations regarding such factors could cause actual results to differ materially from those expressed in these forward-looking statements. Intel presently considers the following to be the important factors that could cause actual results to differ materially from the corporation’s expectations.

Ongoing uncertainty in global economic conditions pose a risk to the overall economy as consumers and businesses may defer purchases in response to tighter credit and negative financial news, which could negatively affect product demand and other related matters. Consequently, demand could be different from Intel's expectations due to factors including changes in business and economic conditions, including conditions in the credit market that could affect consumer confidence; customer acceptance of Intel’s and competitors’ products; changes in customer order patterns including order cancellations; and changes in the level of inventory at customers. Intel operates in intensely competitive industries that are characterized by a high percentage of costs that are fixed or difficult to reduce in the short term and product demand that is highly variable and difficult to forecast. Additionally, Intel is in the process of transitioning to its next generation of products on 32nm process technology, and there could be execution issues associated with these changes, including product defects and errata along with lower than anticipated manufacturing yields. Revenue and the gross margin percentage are affected by the timing of new Intel product introductions and the demand for and market acceptance of Intel's products; actions taken by Intel's competitors, including product offerings and introductions, marketing programs and pricing pressures and Intel's response to such actions; and Intel's ability to respond quickly to technological developments and to incorporate new features into its products. The gross margin percentage could vary significantly from expectations based on changes in revenue levels; capacity utilization; start-up costs, including costs associated with the new 32nm process technology; variations in inventory valuation, including variations related to the timing of qualifying products for sale; excess or obsolete inventory; product mix and pricing; manufacturing yields; changes in unit costs; impairments of long-lived assets, including manufacturing, assembly/test and intangible assets; and the timing and execution of the manufacturing ramp and associated costs. Expenses, particularly certain marketing and compensation expenses, as well as restructuring and asset impairment charges, vary depending on the level of demand for Intel's products and the level of revenue and profits. The current financial stress affecting the banking system and financial markets and the going concern threats to investment banks and other financial institutions have resulted in a tightening in the credit markets, a reduced level of liquidity in many financial markets, and heightened volatility in fixed income, credit and equity markets. There could be a number of follow-on effects from the credit crisis on Intel's business, including insolvency of key suppliers resulting in product delays; inability of customers to obtain credit to finance purchases of our products and/or customer insolvencies; counterparty failures negatively impacting our treasury operations; increased expense or inability to obtain short-term financing of Intel's operations from the issuance of commercial paper; and increased impairments from the inability of investee companies to obtain financing. The majority of our non-marketable equity investment portfolio balance is concentrated in companies in the flash memory market segment, and declines in this market segment or changes in management’s plans with respect to our investments in this market segment could result in significant impairment charges, impacting restructuring charges as well as gains/losses on equity investments and interest and other. Intel's results could be impacted by adverse economic, social, political and physical/infrastructure conditions in countries where Intel, its customers or its suppliers operate, including military conflict and other security risks, natural disasters, infrastructure disruptions, health concerns and fluctuations in currency exchange rates. Intel's results could be affected by adverse effects associated with product defects and errata (deviations from published specifications), and by litigation or regulatory matters involving intellectual property, stockholder, consumer, antitrust and other issues, such as the litigation and regulatory matters described in Intel's SEC reports. A detailed discussion of these and other risk factors that could affect Intel's results is included in Intel's SEC filings, including the report on Form 10-Q for the quarter ended June 27, 2009.
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# Nehalem and Westmere Decoder Ring

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<th>Segment</th>
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<th>Westmere (32nm)</th>
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<tr>
<td>High-End</td>
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<tr>
<td><strong>Mobile</strong></td>
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<td></td>
</tr>
<tr>
<td>Clarksfield</td>
<td>Clarksfield (4C / 8T)</td>
<td>Arrandale (2C / 4T + iGFX)</td>
</tr>
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<td><strong>Server</strong></td>
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<td>Nehalem-EX (8C / 16T)</td>
<td>Westmere-EX</td>
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<tr>
<td>Scalable</td>
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<td>(typically 4+ sockets)</td>
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<td>Performance</td>
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<tr>
<td>(typically 2 sockets)</td>
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<tr>
<td>Entry (EN)</td>
<td>Lynnfield (4C / 8T)</td>
<td>Clarkdale (2C / 4T + iGFX)*</td>
</tr>
<tr>
<td>(typically 1 socket)</td>
<td></td>
<td></td>
</tr>
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</table>

* Client branded product supported for servers
Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See www.intel.com/products/processor_numbers for details.

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### Configuration 1:
- **Intel® Core™ i7-870 processor** (2.93GHz, 4C/8T, 8MB Cache, IMC, DDR3-1333) on Intel® DP55KG-400, Dual-channel SS Crucial 2GB (2x1GB) DDR3-1333 9-9-9-24 1T with 1x GF 9600GT PCIe graphics + Seagate* 320GB NCQ SATA2 (BIOS: 2429, INF:9.1.1.1014, Graphics: NV180.48, IMON compliant with VRD 11.1 requirements)

### Configuration 2:
- **Intel® Core™ i7-860 processor** (2.80GHz, 4C/8T, 8MB Cache, IMC, DDR3-1333) on Intel® DP55KG-400, Dual-channel SS Crucial 2GB (2x1GB) DDR3-1333 9-9-9-24 1T with 1x GF 9600GT PCIe graphics + Seagate* 320GB NCQ SATA2 (BIOS: 2429, INF:9.1.1.1014, Graphics: NV180.48, IMON compliant with VRD 11.1 requirements)

### Configuration 3:
- **Intel® Core™ i5-750 processor** (2.66GHz, 4C/4T, 8MB Cache, IMC, DDR3-1333) on Intel® DP55KG-400, Dual-channel SS Crucial 2GB (2x1GB) DDR3-1333 9-9-9-24 1T with 1x GF 9600GT PCIe graphics + Seagate* 320GB NCQ SATA2 (BIOS: 2429, INF:9.1.1.1014, Graphics: NV180.48, IMON compliant with VRD 11.1 requirements)

**Common Operating System for Configurations 1, 2 and 3:** Windows* Vista* Ultimate 32bit.

**Chassis for Configurations 1, 2 and 3:** Antec NSK6580B

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INTEL DEVELOPER FORUM
Consumer Configurations

**Configuration 4:** Intel® Core™ i7-950 Processor (8MB Cache, 3.06GHz, 4.8GT/s Intel® QPI) Intel® Hyper-Threading Technology ON, Intel® Turbo Boost Technology ON on Intel® DX58SO X58 Tri-channel SS Samsung* 3GB (3x1GB) DDR3-1066 7-7-7-20 with 1x GF 9600GT PCIe graphics, Seagate* 320GB NCQ SATA2 (BIOS: 2786, INF:9.1.0.1007, Graphics: NV180.48), Windows® Vista® Ultimate 32bit.

**Configuration 5:** Intel® Core™ i7-920 Processor (8MB Cache, 2.66GHz, 4.8GT/s Intel® QPI) Intel® Hyper-Threading Technology ON, Intel® Turbo Boost Technology ON on Intel® DX58SO X58 Tri-channel SS Samsung* 3GB (3x1GB) DDR3-1066 7-7-7-20 with 1x GF 9600GT PCIe graphics, Seagate* 320GB NCQ SATA2 (BIOS: 2786, INF:9.1.0.1007, Graphics: NV180.48), Windows® Vista® Ultimate 32bit.

**Configuration 6:** Intel® Core™2 Quad Processor Q9650 (12MB Cache, 3.00GHz, 1333MHz FSB) Intel® DQ45CB/DG45ID, Dual channel DS Micron* 2GB (2x1GB) DDR2-800 5-5-5-18 with Integrated Intel® GMA X4500HD onboard graphics subsystem, Seagate* 320GB Barracuda* NCQ Serial ATA, (BIOS:0059, Intel Chipset INF: 9.0.0.1007, Graphics: 15.9.9.1527), Windows® Vista® Ultimate 32bit.

**Configuration 7:** Intel® Core™2 Quad Processor Q9550 (12MB Cache, 2.83GHz, 1333MHz FSB) Intel® DQ45CB/DG45ID, Dual channel DS Micron* 2GB (2x1GB) DDR2-800 5-5-5-18 with Integrated Intel® GMA X4500HD onboard graphics subsystem, Seagate* 320GB Barracuda* NCQ Serial ATA, (BIOS:0059, Intel Chipset INF: 9.0.0.1007, Graphics: 15.9.9.1527), Windows® Vista® Ultimate 32bit.

**Configuration 8:** Intel® Core™2 Quad Processor Q9400 (6MB Cache, 2.66GHz, 1333MHz FSB) Intel® DQ45CB/DG45ID, Dual channel DS Micron* 2GB (2x1GB) DDR2-800 5-5-5-18 with Integrated Intel® GMA X4500HD onboard graphics subsystem, Seagate* 320GB Barracuda* NCQ Serial ATA, (BIOS:0059, Intel Chipset INF: 9.0.0.1007, Graphics: 15.9.9.1527), Windows® Vista® Ultimate 32bit.

**Configuration 9:** Intel® Core™ i7-870 processor (2.93GHz, 4C/8T, 8MB Cache, IMC, DDR3-1333) on Intel® DP55KG-400, Dual-channel SS Crucial 2GB (2x1GB) DDR3-1333 9-9-9-24 1T with 1x GTX 280 PCIe graphics + Intel® 80GB X25-M SSD SATA2 (BIOS: 2429, INF:9.1.1.1014, Graphics: NV180.48, IMON compliant with VRD 11.1 requirements)

**Configuration 10:** Intel® Core™2 Quad Processor Q9650 (12MB Cache, 3.00GHz, 1333MHz FSB) on Asus* P5E3 Premium X48 chipset, Dual-channel Corsair CMX31024-1333C9DHX 2GB (2x1GB) 9-9-9-24-1T with 1x GTX 280 PCIe graphics + Intel® 80GB X25-M SS D SATA2 (BIOS: 0505, INF:8.4.0.1016, Graphics:NV177.41), Windows® Vista® Ultimate 32bit.

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