32nm Westmere Family of Processors

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Highlights from Paul Otellini Speech Today

• Intel is making the largest-ever investment in a single process technology in the U.S. to support advanced manufacturing facilities upgrades and the move to its next-generation, 32nm chip manufacturing technology.

• Intel is investing approximately $7 billion this year and next on 32nm manufacturing technology, bringing our total by the end of next year to approximately $8 billion (for 32nm investment in the U.S.).

• This new investment is made against the backdrop of Intel’s combined capital and R&D investment in the U.S. of more than $50 billion since 2002.

• This new multi-billion-dollar investment to upgrade facilities in New Mexico, Arizona and Oregon will ensure U.S. state-of-the-art chip technology manufacturing.
  • – Oregon (D1D, D1C, and AFO)
  • – New Mexico (Fab 11x)
  • – Arizona (Fab 22-32 megafab)

All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.
## Tick-Tock Development Model:
### Sustained Microprocessor Leadership

<table>
<thead>
<tr>
<th>Intel® Core™ Microarchitecture</th>
<th>Intel® Microarchitecture codename Nehalem</th>
<th>Future Intel® Microarchitecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merom</td>
<td>Penryn</td>
<td>Sandy Bridge</td>
</tr>
<tr>
<td>NEW Microarchitecture 65nm</td>
<td>NEW Microarchitecture 45nm</td>
<td>NEW Microarchitecture 32nm</td>
</tr>
<tr>
<td>NEW Process Technology 45nm</td>
<td>NEW Microarchitecture 45nm</td>
<td>NEW Process Technology 32nm</td>
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</tbody>
</table>

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**TICK**  
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*Forecast*

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Intel 32nm Production Ready in 2009

Today’s News

• Intel is demonstrating the first working 32nm based microprocessor, in both mobile and desktop systems

• Great 32nm process and product health is enabling Intel to accelerate 32nm product ramp
  – Westmere mobile and desktop processor production in Q4’09
  – 32nm enables increased performance and power flexibility

• Intel® processors based on Westmere will ramp into mobile, desktop, and server segments over time, as the 32nm process ramps

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Westmere

Westmere: Nehalem migrated to 32nm process

Client: brings Nehalem through the mainstream
- Increased performance across single and multithread usages (vs. today’s Intel Core 2 product family)
- Enables processors (Codenamed Gulftown) with 6 cores supporting 12 threads on the desktop roadmap
- Smaller processor core size
- New Multi-Chip Package with graphics integrated in processor

Server: extends leadership platforms
- Clarkdale*: refresh 1 socket servers
- Westmere based refresh for 2 socket servers
- Westmere based refresh for 4+ socket servers

Further Demonstrating Intel Product and Process Leadership

* Client branded product supported for servers

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## Transitioning to Mainstream

<table>
<thead>
<tr>
<th>Year</th>
<th>Product Description</th>
<th>Core Technology</th>
<th>Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>High End Desktop</td>
<td>45 nm High-K</td>
<td>Lynnfield, Clarkdale</td>
</tr>
<tr>
<td></td>
<td>Mainstream Desktop</td>
<td>4 Cores / 8 Threads</td>
<td>Clarkfield, Arrandale</td>
</tr>
<tr>
<td></td>
<td>Thin &amp; Light Notebook</td>
<td>2 Cores / 4 Threads with Integrated Graphics</td>
<td></td>
</tr>
<tr>
<td>2009+</td>
<td></td>
<td>32nm High-K</td>
<td></td>
</tr>
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Nehalem/Westmere Client Roadmap

2009

- X58 Platform
  - Intel® Core i7 Extreme Processor (4C/8T)
  - Intel® Core i7 Processor (4C/8T)
  - Intel® X58 Express Chipset

2010+

- 2010 HEDT Platform
  - 32nm Gulftown Processor (6C/12T)
  - Intel® X58 Express Chipset

Piketon / Kings Creek Platforms

- Lynnfield (4C/8T)
- 32nm Clarkdale (2C/4T)
- Intel 5 series Chipset

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

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Intel® Xeon® Enterprise Roadmap

2009

Expandable 7000 Sequence

Nehalem-EX Processor

Boxboro-EX Platform*

Boxboro-EX Chipset

Efficient Performance 5000 Sequence

Nehalem-EP Processor

Tylersburg-EP Platform

Tylersburg & Dual-IOH Chipsets

Entry 3000 Sequence

Lynnfield Processor

Foxhollow Platform

Intel 5 series Chipset

32nm Westmere Based Processor

32nm Clarkdale Processor**

32nm Westmere Based Processor

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* Targeted for production in 2H'09
** Client branded product supported for servers
Mainstream Client Platform Repartitioning

Penryn based 3-Chip Solution

- Processor
- Intel® 4 Series Chipset
  - iGFX
  - MC
  - DDR 2/3
  - DMI
- ICH
- Clocks
- PCIe Graphics
- Display

Westmere based 2-Chip Solution

- Processor
- Intel® 5 Series Chipset
  - iGFX
  - IMC
  - DDR 3
- Display
- PCIe Graphics
- Intel® Flexible Display Interface
- DMI
- Clock
- Buffer
- ME

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

45 nm Penryn processor Core

32nm Westmere processor core

45nm integrated graphics & integrated memory controller

Key Features
- Intel® Turbo Boost technology
- Intel® Hyper-Threading technology (2 Cores, 4 threads)
- Integrated graphics, discrete / switchable graphics support
- Integrated Memory Controller (IMC) - 2ch DDR3

Not all features are available on every processor line item
Westmere: AES New Instructions

- Use additional transistor budget to add new capabilities
  - Similar to adding SSE4.1 in Penryn (45nm tick)
- 7 new instructions for accelerating encryption/decryption algorithms
  - Carryless multiply (PCLMULQDQ)
  - 6 instructions for AES
- Example client usage
  - Enables full disk encryption

Early Intel Analysis shows significant Speedup on Encryption
Tick-Tock Development Model: Sustained Microprocessor Leadership

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Summary:
- 32nm process technology on track for Q4’09 production readiness
- 32nm enables increased performance and power flexibility
- Westmere-based processors will span across Desktop, Mobile, and Server

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Back-Up
# Nehalem and Westmere Decoder Ring

<table>
<thead>
<tr>
<th>Segment</th>
<th>Nehalem (45nm)</th>
<th>Westmere (32nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desktop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High-End</td>
<td>Bloomfield (4C / 8T)</td>
<td>Gulftown (6C / 12T)</td>
</tr>
<tr>
<td>Mainstream</td>
<td>Lynnfield (4C / 8T)</td>
<td>Clarkdale (2C / 4T + iGFX)</td>
</tr>
<tr>
<td>Mobile</td>
<td>Clarksfield (4C / 8T)</td>
<td>Arrandale (2C / 4T + iGFX)</td>
</tr>
<tr>
<td>Server</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expandable</td>
<td>Nehalem-EX (8C / 16T)</td>
<td>Future Westmere Based</td>
</tr>
<tr>
<td>Scalable</td>
<td></td>
<td>Processor</td>
</tr>
<tr>
<td>(typically 4+ sockets)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficient</td>
<td>Nehalem-EP (4C / 8T)</td>
<td>Future Westmere Based</td>
</tr>
<tr>
<td>Performance</td>
<td></td>
<td>Processor</td>
</tr>
<tr>
<td>(typically 2 sockets)</td>
<td></td>
<td></td>
</tr>
<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
Key Features:

- Intel microarchitecture codename Nehalem on 32nm
- Multi-Chip Package (MCP) processor with:
  - processor cores built on 32nm 2nd generation high-k metal gate process
  - integrated graphics controller & memory controller built on 45nm high-k metal gate process
- Intel® Turbo Boost technology
- Intel® Hyper-Threading technology (2 Cores, 4 threads)
- Intel® Smart Cache
- Integrated memory controller (IMC)
- Integrated, discrete / switchable graphics support
- Advanced Encryption Standard (AES) acceleration
- Compatible with the Intel® 5 series chipset based platforms due to be released in 2H’09

1 Not all features are available on every processor line item
Risk Factors

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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. 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The gross margin percentage could vary significantly from expectations based on changes in revenue levels; capacity utilization; excess or obsolete inventory; product mix and pricing; variations in inventory valuation, including variations related to the timing of qualifying products for sale; 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, including start-up 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 tax rate expectation is based on current tax law and current expected income. 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The current volatility in the financial markets and overall economic uncertainty increases the risk that the actual amounts realized in the future on our debt and equity investments will differ significantly from the fair values currently assigned to them. 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. 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