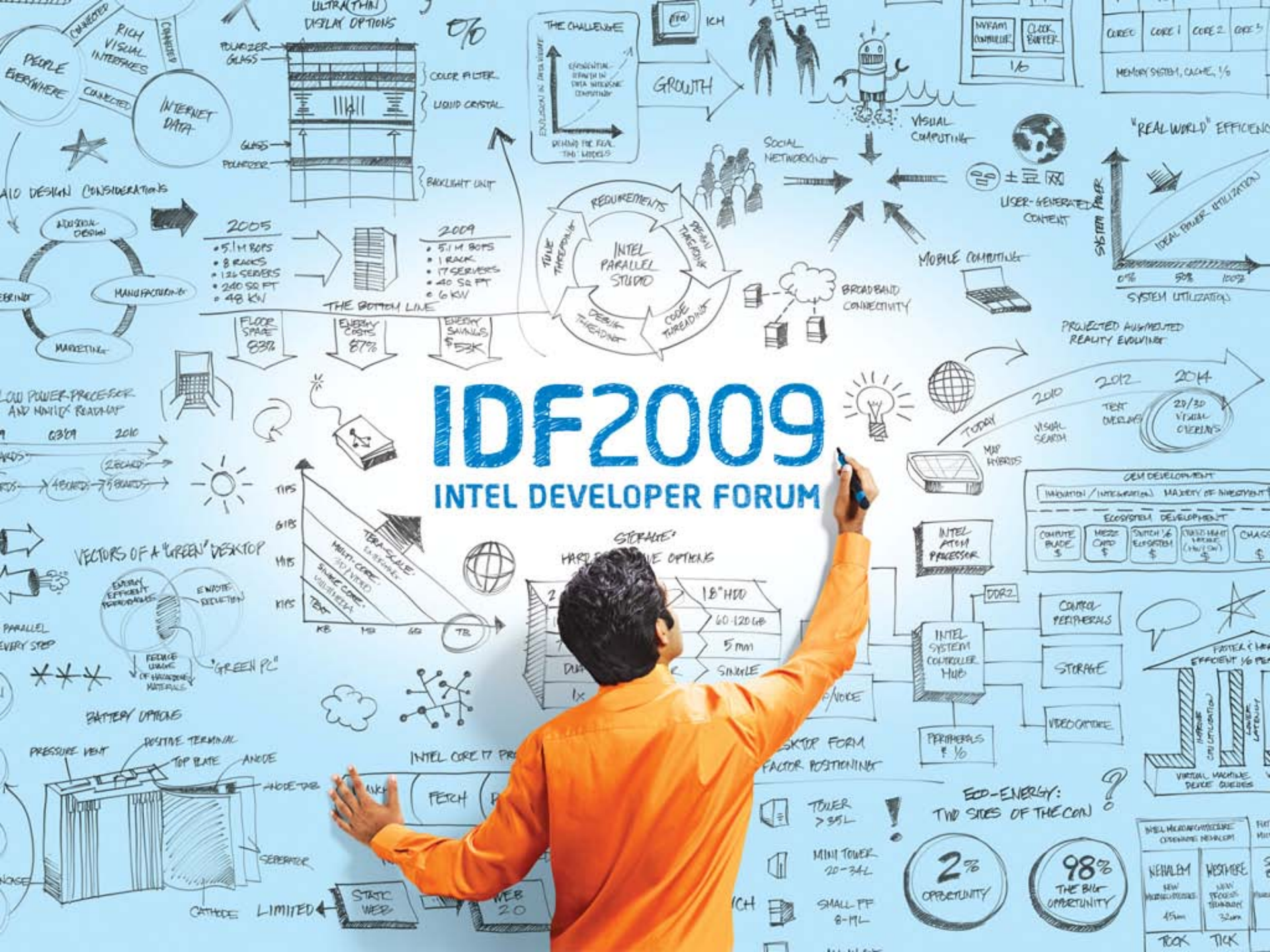
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Intel Roadmap Overview
Sept 22nd, 2009

Stephen L. Smith

Vice President, Director of Operations

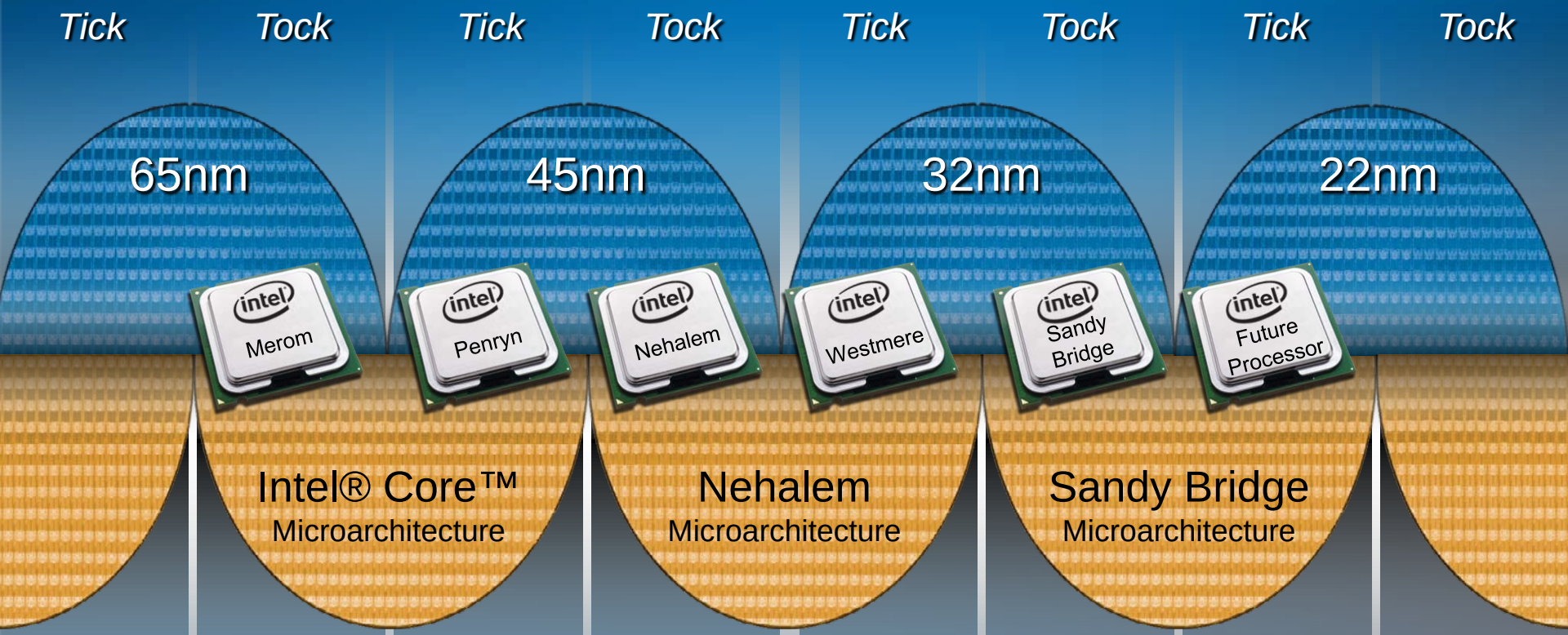
Intel Architecture Group

Contact George Alfs with any questions

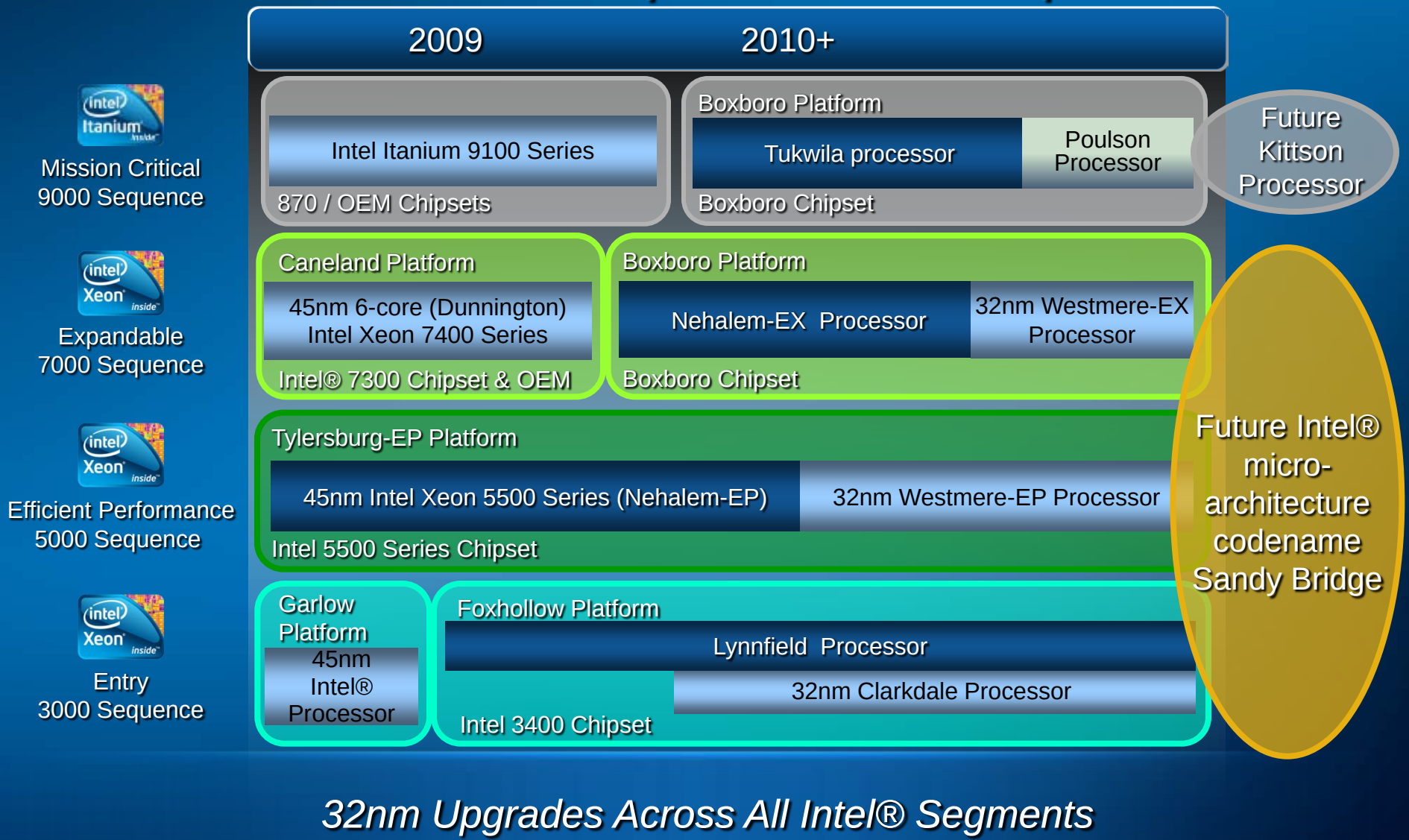
Agenda

- Server Roadmap
- Client Roadmap
- Netbook / Nettop Roadmap

Tick-Tock Development Model:
Sustained Microprocessor Leadership



Intel® Enterprise Roadmap



32nm Upgrades Across All Intel® Segments

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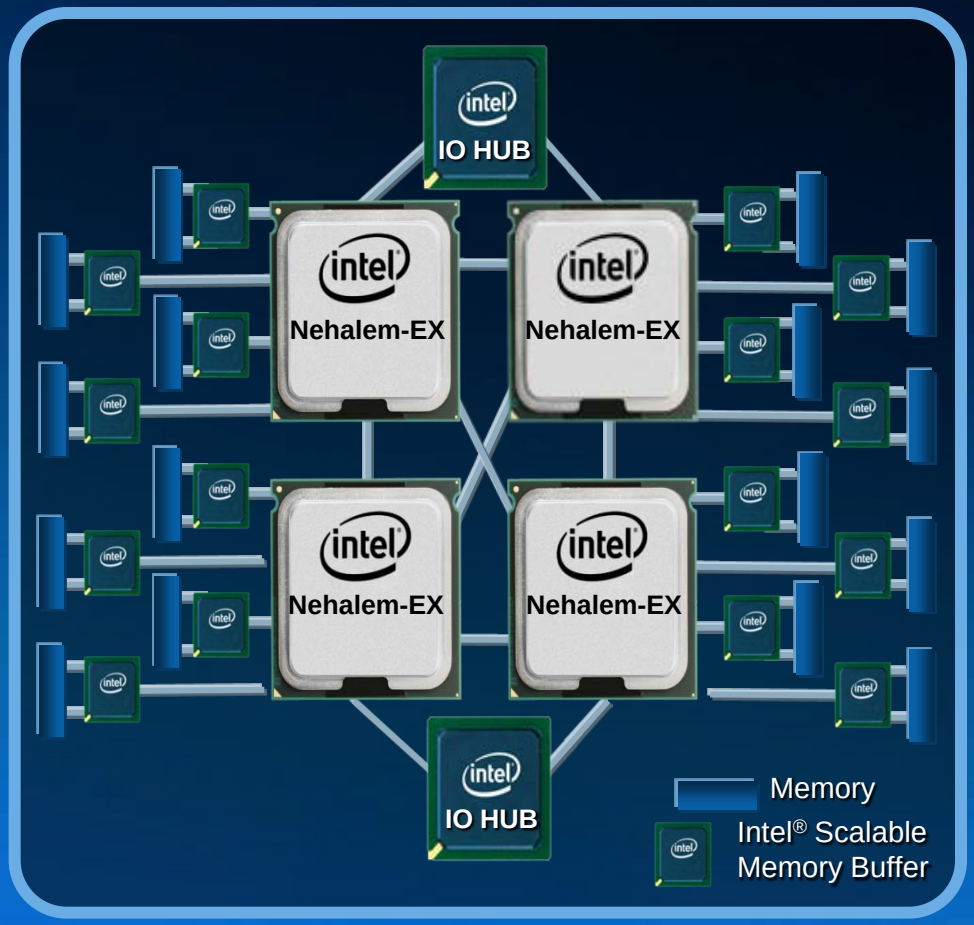
Nehalem-EX: 4-Socket Platform



- 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

All dates, product descriptions, availability, and plans are forecasts and subject to change without notice.

Nehalem-based Server Performance

The Greatest Intel® Xeon® Performance Leap In History!

Xeon® 5500 vs. Xeon® 5400		***Nehalem-EX vs. Xeon® 7400***	
(Nehalem-EP)	***(Harpertown)***		***(Dunnington)***
Up to 3.5x	Memory Bandwidth	Up to 9x	Memory Bandwidth[1]
Up to 2.5x	Database Performance	Up to 3x	Database Performance[2]
Up to 1.7x	Integer Throughput	> 1.7x	Integer Throughput
Up to 2.2x	Floating Point Throughput	> 2.2x	Floating Point Throughput

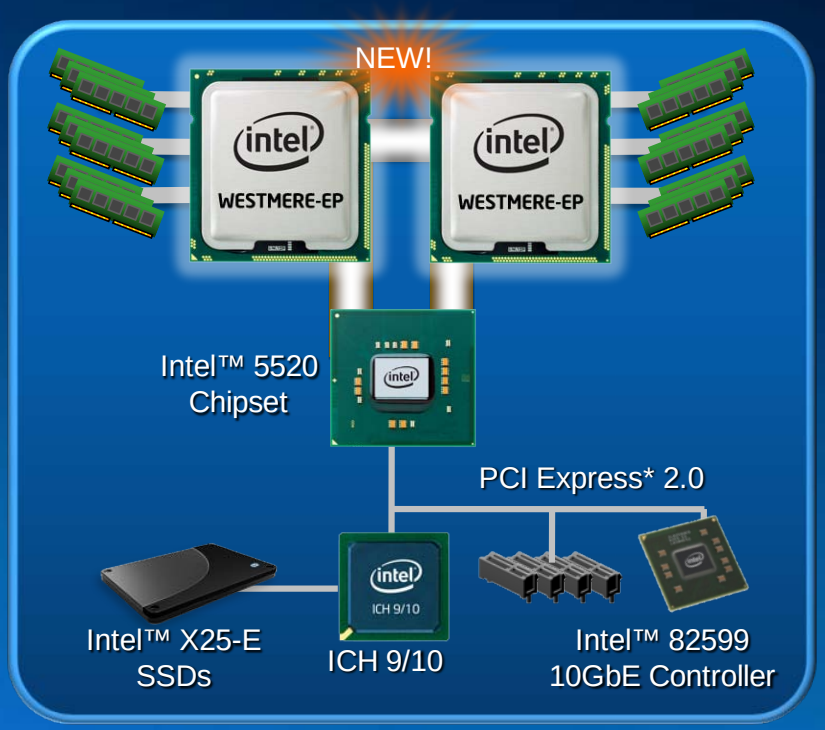
Expecting larger gains from Nehalem Architecture in EX

[1]Based on May'09 internal measurement using Intel internal workload

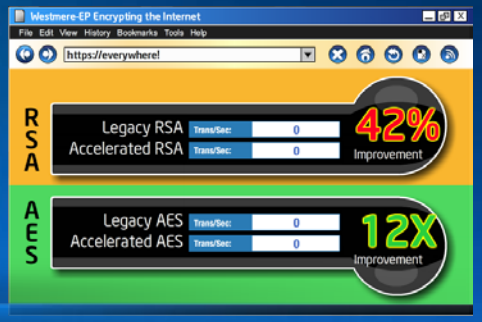
[2]3x Performance vs. Prior Generation based on Intel internal measurements on an internal OLTP workload comparing 4S Nehalem-EX to 4S Intel® Xeon® X7460 ("Caneland" platform).

Source. Intel. December 8, 2008. Based on Internal testing on pre-production Intel Xeon Processor 5500 based servers. Performance Gains Represent A Blend (GEO Mean) Of Five Common 2-socket Workload Types Across A Range Of Typical Usages

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

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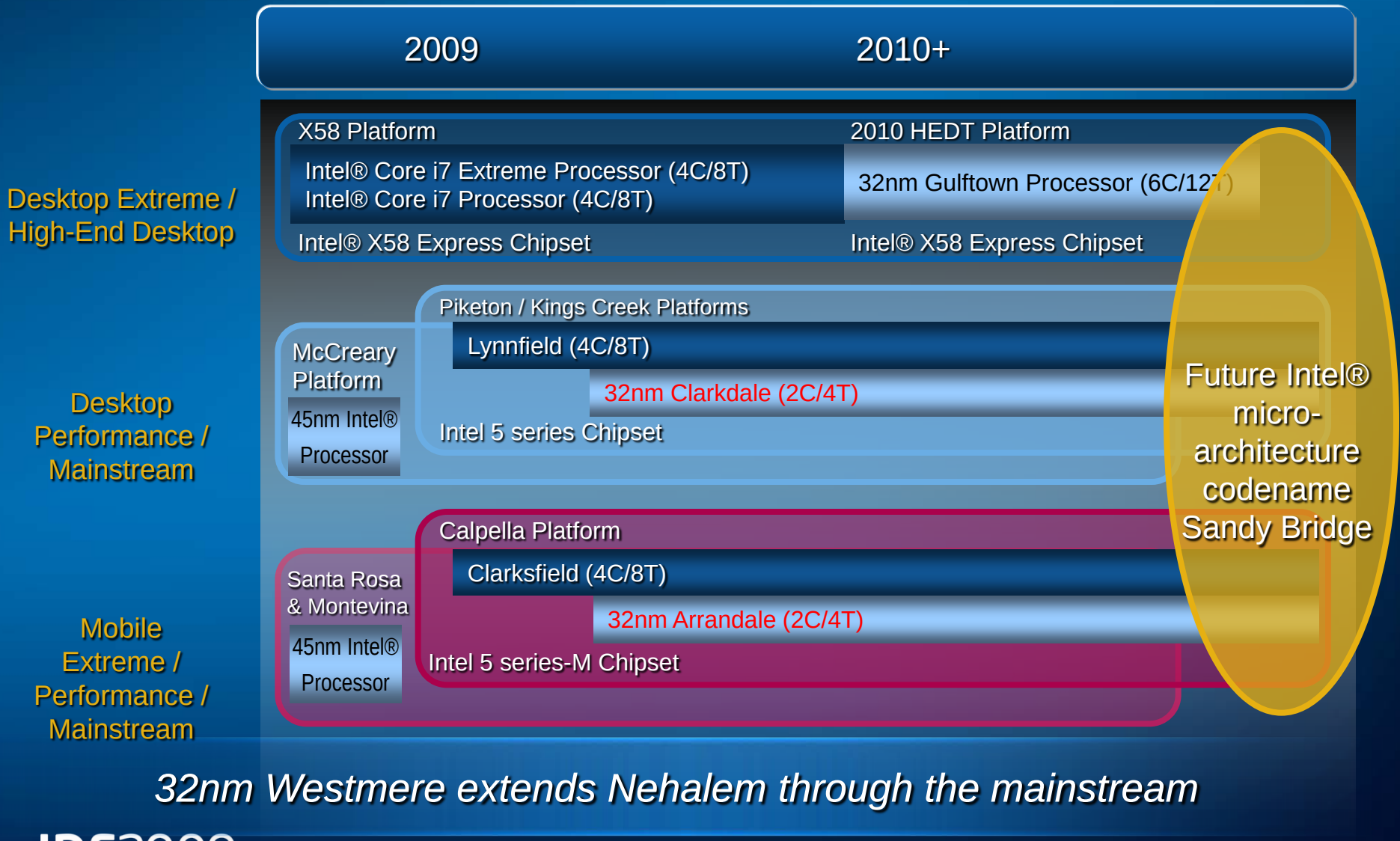
**Intel internal estimate of integer measurements comparing Westmere-EP reference system and Nehalem-EP system*

***Intel internal measurements based on 140Kb standard banking transaction comparison between Westmere-EP CPU with and without AES-NI acceleration.*

Agenda

- Server Roadmap
- Client Roadmap
- Netbook / Nettop Roadmap

Nehalem / Westmere Client Roadmap



32nm Westmere extends Nehalem through the mainstream

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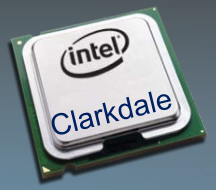
Enabling Nehalem For Every Segment

High End Desktop

2008	2009+	
	4 Cores / 8 Threads	2 Cores / 4 Threads with Integrated Graphics
Revolutionary Microarchitecture	Mainstream Desktop: Lynnfield Thin & Light Notebook: Clarksfield Platform Re-partition	Clarkdale Arrandale 32nm Process Technology



45 nm High-K → *32nm High-K*

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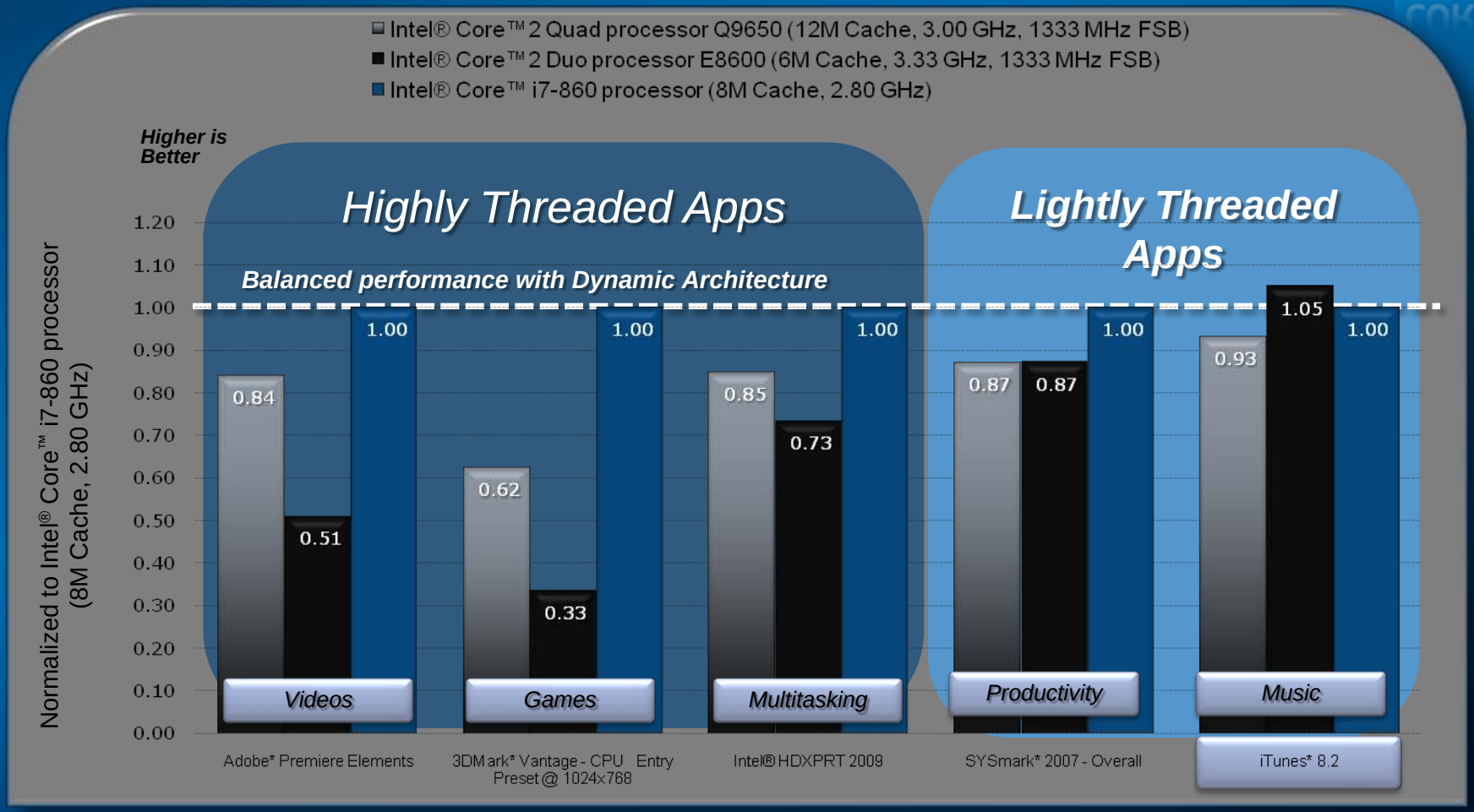
Get the Best of Both Worlds with the new Intel® Core™ i7 processor



Accelerate Everything!

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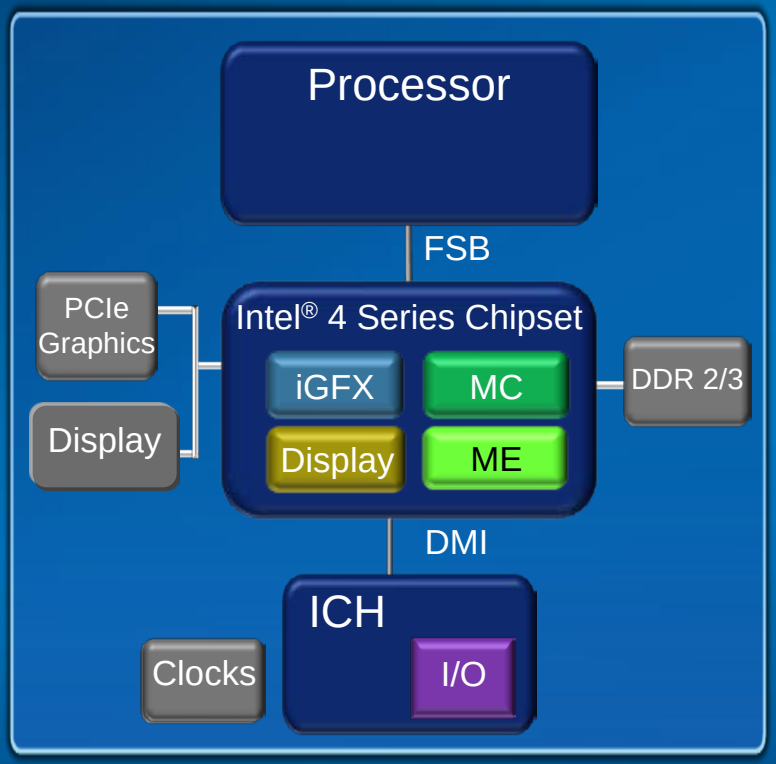
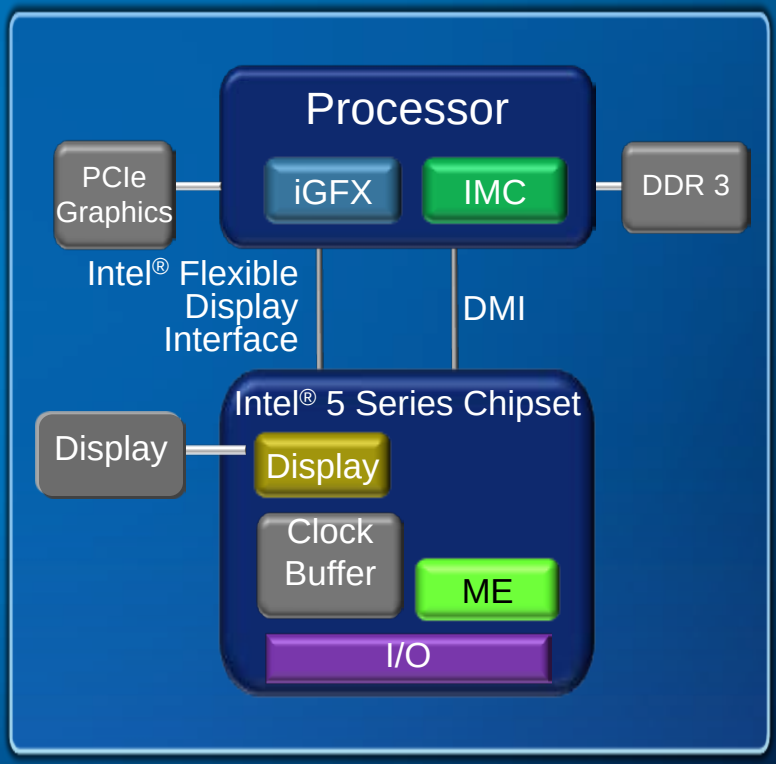
*Other names and brands may be claimed as the property of others.
System Configurations and Disclaimers: End of Presentation

Mainstream Client Platform Repartitioning

Penryn based
3-Chip Solution

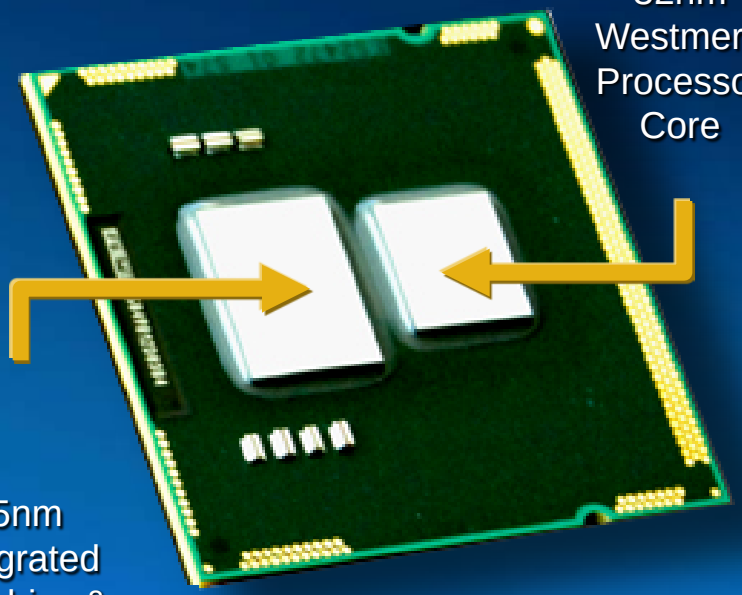


Westmere based
2-Chip Solution



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

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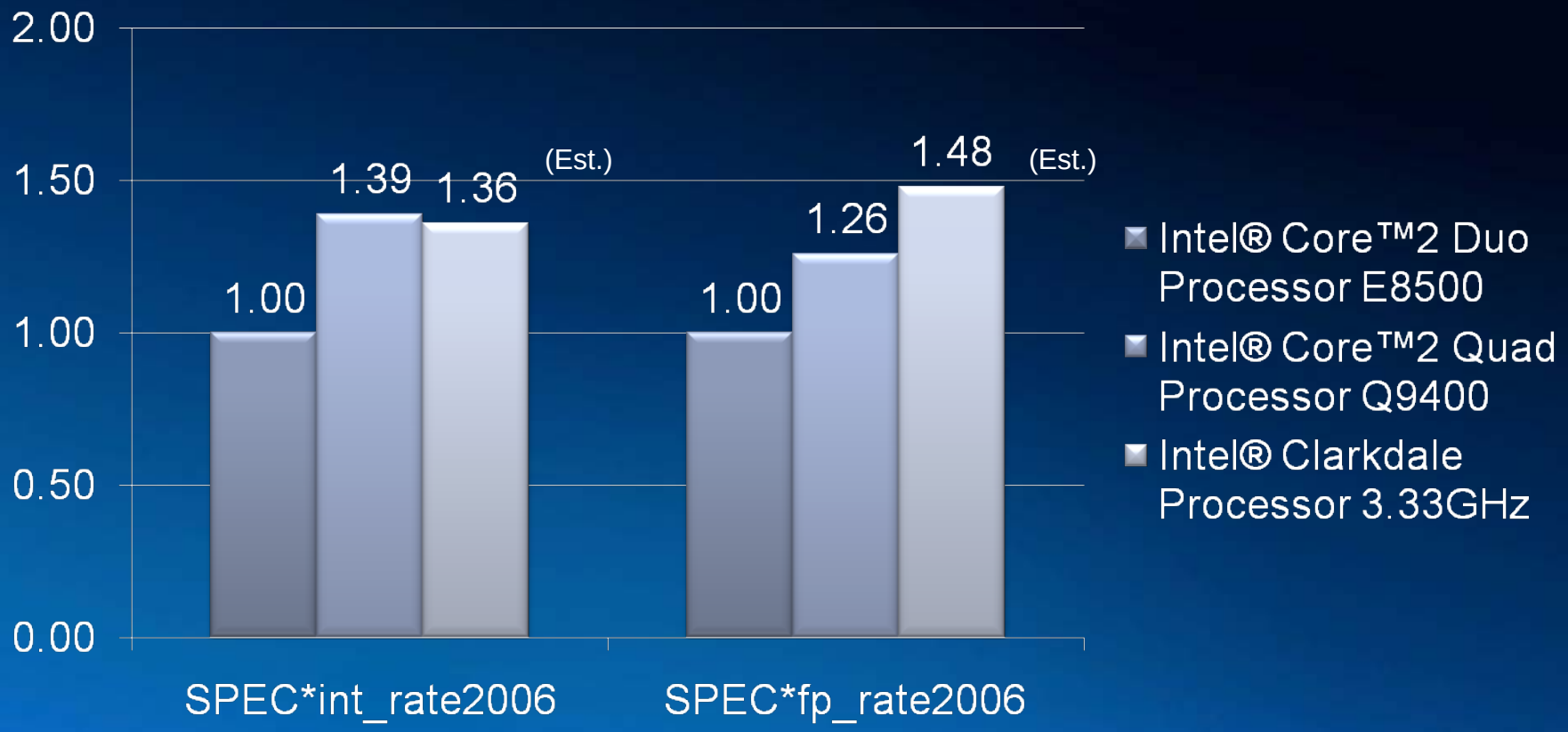
SPEC* CPU2006



Intel® Clarkdale Processors: Major Performance Advances for desktop PCs

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SPEC, SPECint, SPECfp, SPECrate are trademarks of the Standard Performance Evaluation Corporation. For more information go to: www.spec.org/spec/trademarks.html.

Source: Intel. Estimate based on pre-production Clarkdale processor (3.33GHz/4MB), 4GB (2x2GB) Dual channel DDR3-1333, 7200 rpm HDD. Measured results based on Intel® Core™ 2 Duo E8500 3.16GHz/1333MHz FSB/6MB and Intel® Core™ 2 Quad Q9400 2.66GHz/1333MHz FSB/6MB: Intel DG45ID, Kingston* 4GB (2x2GB) Dual channel DDR2 800 5-5-5-18, Seagate* 1TB HDD, X4500HD with 8.15.10.1840 BIOS: IDG4510H.86A.1357, Intel INF 9.1.1.1015)

Graphics Capability Roadmap: 2009-2011

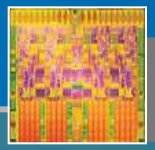
- **Expand the Processor value proposition with new media, 3D and power management technologies that scale with our process technology and tick tock cadence**
  - Small form factors
  - Power savings
  - Media functionality
  - 3D standards

G45
GM45

- Full HD/Bluray support
- DX10, WDDM1.1 Graphics
- Advanced Mobile power saving technologies

Clarkdale
Arrandale

- Intel® Clear Video HD Technology with dual HD stream support
- Premium Audio
- Graphics Turbo[1]



Sandy Bridge

- Next gen Intel® Clear Video HD Technology
- Graphics Turbo+

1. Feature only available on the mobile version

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Extending Performance Leadership for Enthusiasts

High End Desktop

2008	2010
4 Cores 8 Threads	6 Cores 12 Threads
Revolutionary Microarchitecture	Compatible with Intel® X58 Express Chipset
45nm High-K	32nm High-K

6-Core Gulftown Platform Coming in 2010

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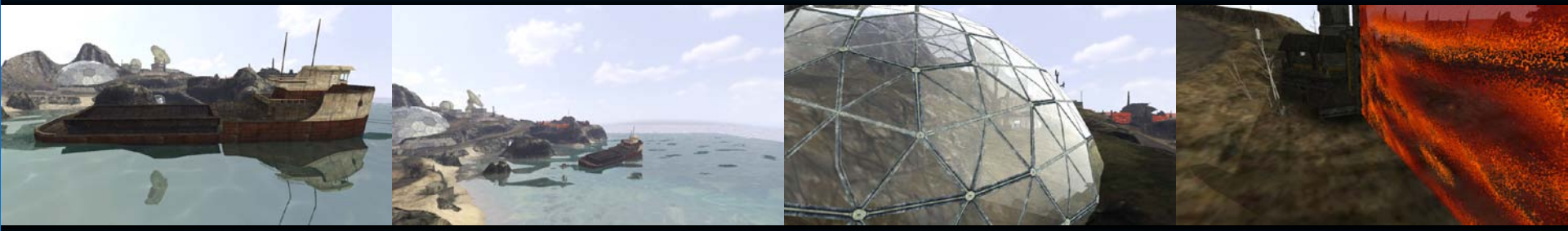
Larrabee Execution Update

- 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

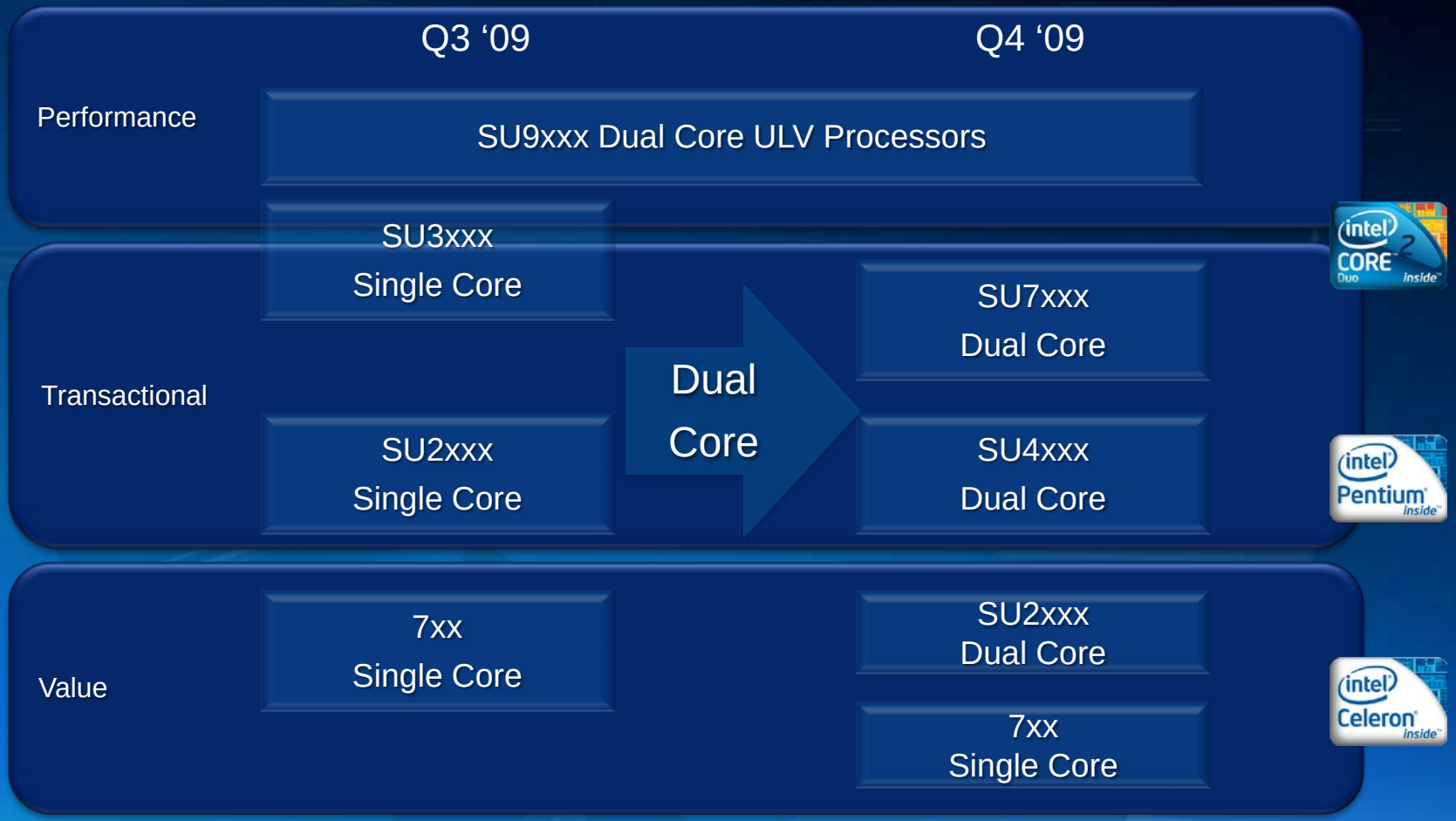
Netbook

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

Mainstream Laptop

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

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



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Agenda

- Server Roadmap
- Client Roadmap
- Netbook / Nettop Roadmap

Netbook / Nettop Roadmap

Netbooks

Nettops

2009	2010+
Netbook Platform Diamondville Processor Mobile Intel® 945GSE Express Chipset ICH7-M	Pine Trail-M Platform Pineview-M Processor Tiger Point PCH
Nettop Platform Diamondville Processor (1 or 2 cores) Intel® 945GC Express Chipset ICH7	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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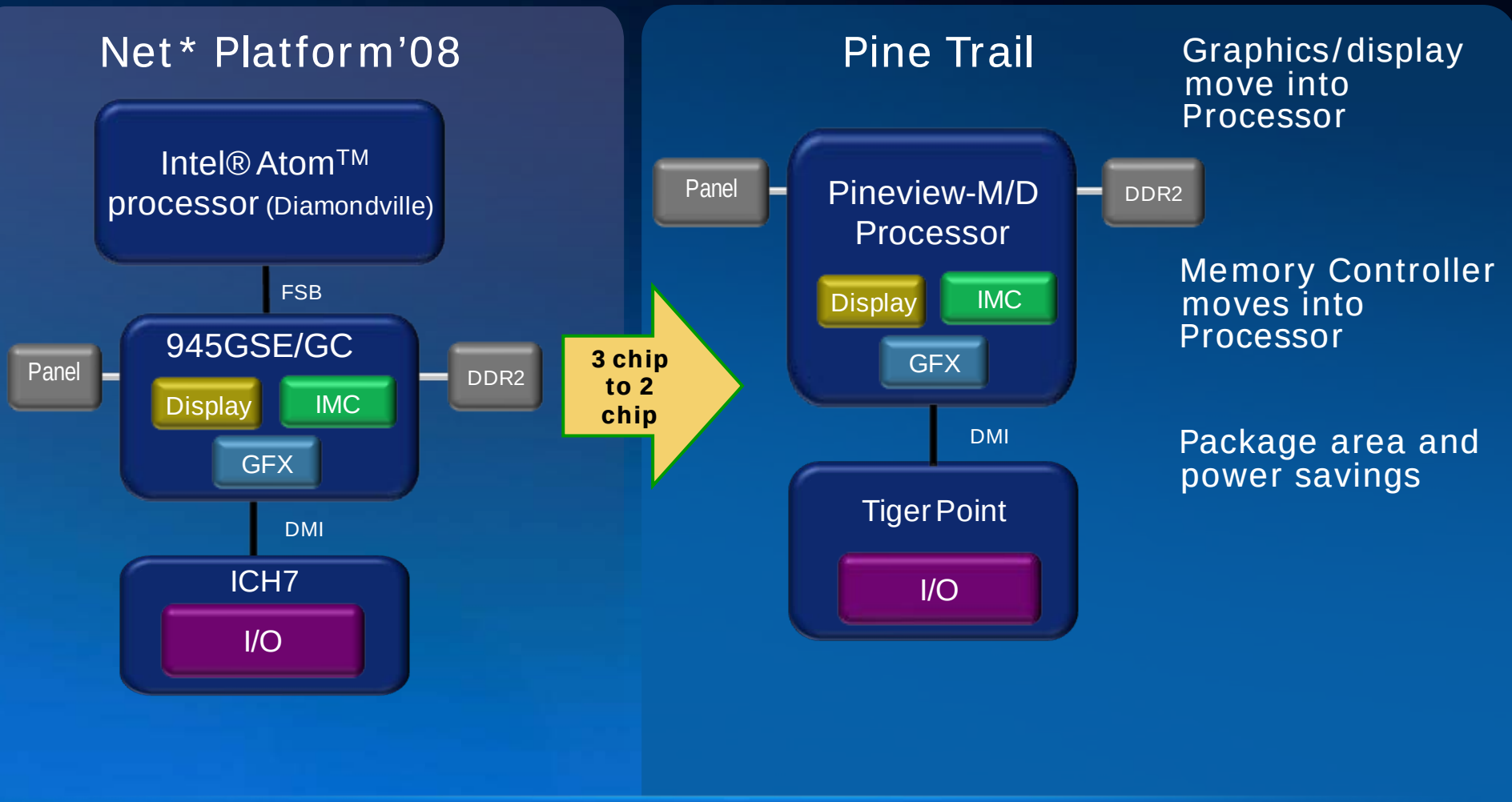
Pine Trail: Second Generation Net* Platform



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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Hyper-Threading Technology requires a computer system with a processor supporting HT Technology and an HT Technology-enabled chipset, BIOS and operating system. Performance will vary depending on the specific hardware and software you use. For more information including details on which processors support HT Technology, see http://www.intel.com/info/hyperthreading.

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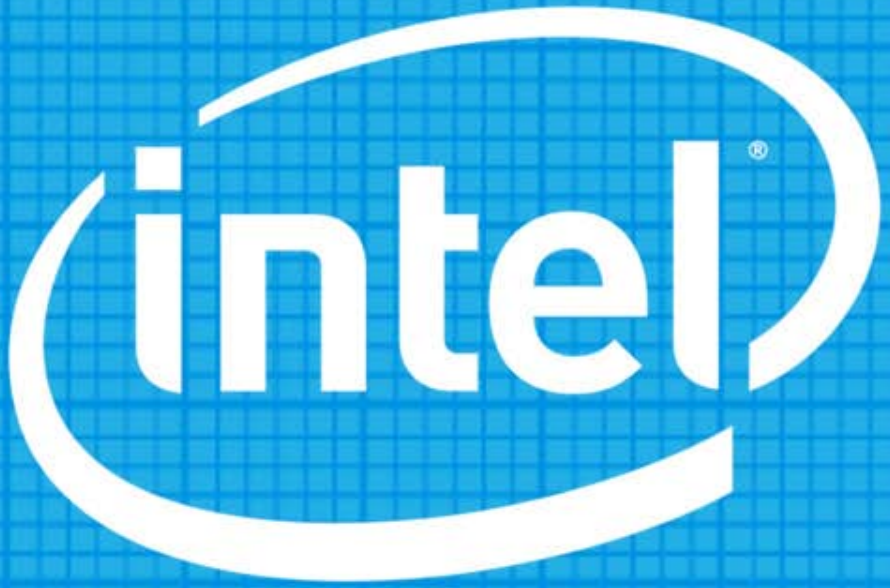

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Nehalem and Westmere Decoder Ring

	Segment	Nehalem (45nm)	Westmere (32nm)
Desktop	High-End	Bloomfield (4C / 8T)	Gulftown (6C / 12T)
	Mainstream	Lynnfield (4C / 8T)	Clarkdale (2C / 4T + iGFX)
Mobile		Clarksfield (4C / 8T)	Arrandale (2C / 4T + iGFX)
Server	Expandable Scalable (typically 4+ sockets)	Nehalem-EX (8C / 16T)	Westmere-EX
	Efficient Performance (typically 2 sockets)	Nehalem-EP(4C / 8T)	Westmere-EP (6C / 12T)
	Entry (EN) (typically 1 socket)	Lynnfield (4C / 8T)	Clarkdale (2C / 4T + iGFX)*

* Client branded product supported for servers

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Regarding the performance measurements in this presentation

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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Desktop Configurations – Intel® processors codename Lynnfield

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

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 on the performance of Intel products, visit http://www.intel.com/performance/

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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.

Gaming System Configurations

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 CM3X1024-1333C9DHX 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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