

Intel Architecture Press Briefing

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17 March, 2008



Today's News

Intel Technology: Delivering on the Promise

Mission Critical

Tick-Tock

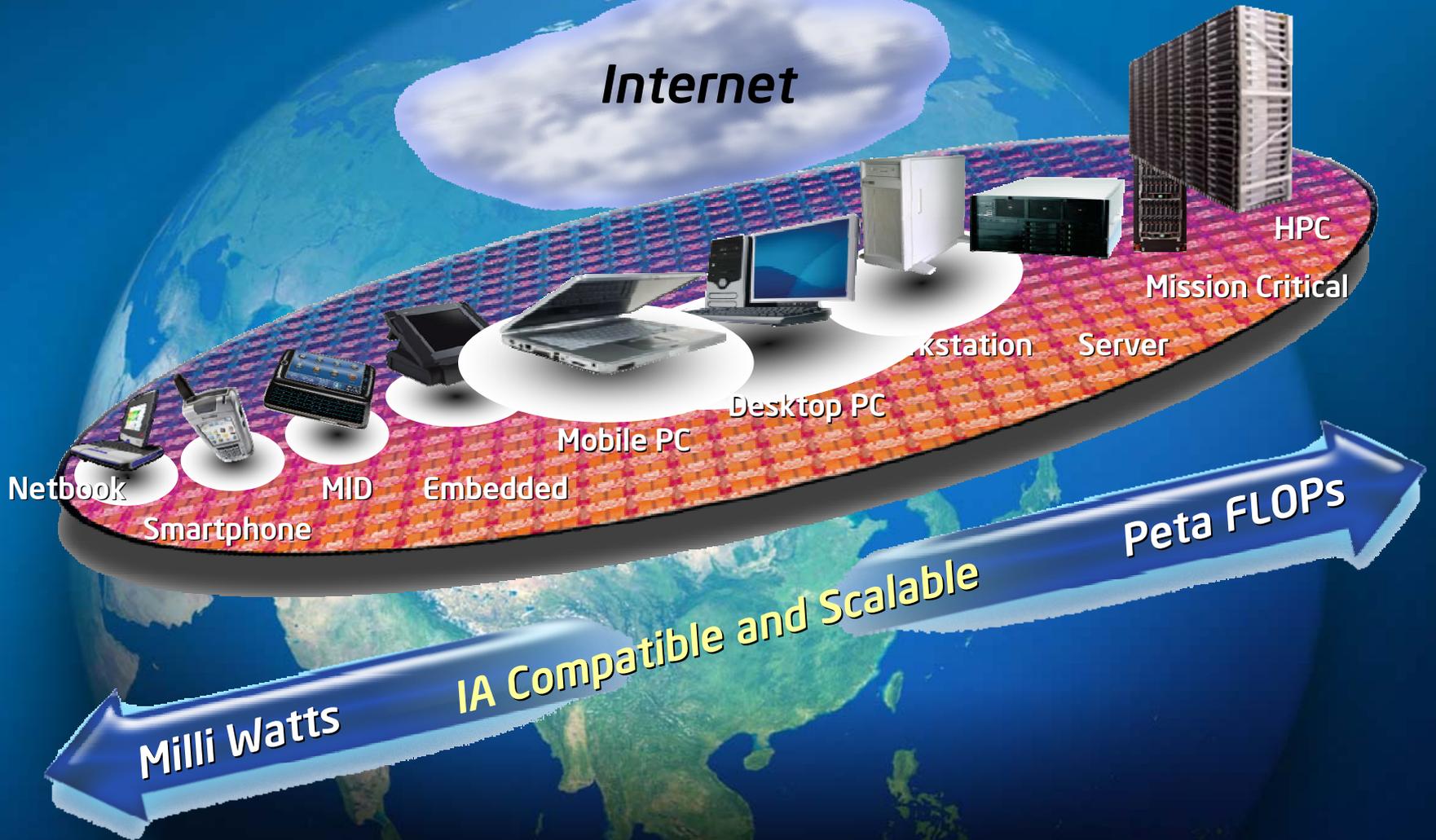
Expandable Server

Nehalem

Larrabee



Intel: The Architecture for Life

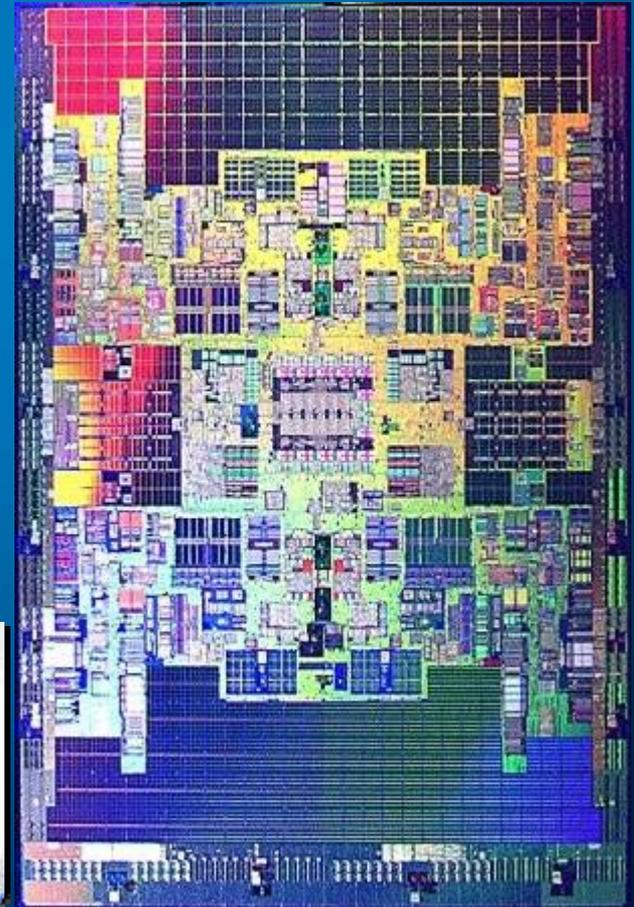


Tukwila: Delivering Performance to World's Most Powerful Computers

- Quad-core with 30 MB cache
- 2 billion transistors
- Multi-Threading Technology
- Intel QuickPath interconnect
- Dual Integrated Memory Controllers
- Estimate >2x* performance
- Mainframe-class RAS

"With Intel's upcoming quad-core Tukwila processor, Windows Server solutions running on Itanium-based systems will provide an even more scalable, reliable, agile and dynamic datacenter foundation for our customers."

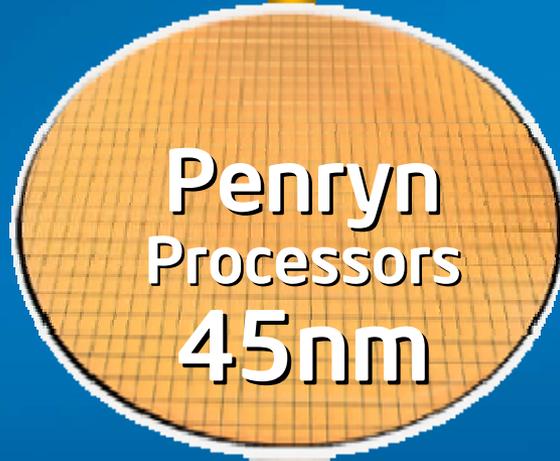
—Bill Laing, GM Windows Server & Solutions Division, Microsoft



* Compared to Dual-core Itanium® Processor 9100 series

Product Cadence for Sustained Leadership

2007-08



TICK

TOCK

Delivering Products on Schedule and Moore's Law



Expandable and Scalable: Quad-Core Intel® Xeon® processor 7300

- Caneland platform built for virtualization and consolidation
- Energy Efficient performance: Leading in benchmarks
- Scalable
- Enterprise proven reliability and investment protection
- Great customer acceptance

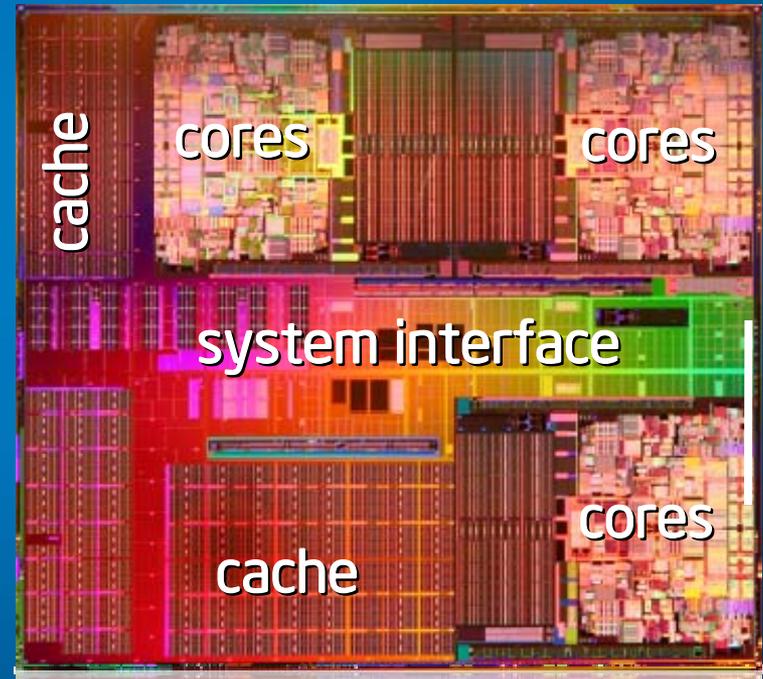


Industry's **Virtualization** Platform of Choice



Expandable and Scalable: Gets Better with Dunnington

- 6 core Processor
- 1.9 billion transistors
- 45nm Hi-K technology
- 16 MB L3 cache
- Latest Intel virtualization capabilities
- Socket compatible with Caneland platform
- Available 2H'08



Energy Efficiency: Top SPECpower* Results



Rank	Sponsor	SPECpower_ssj2008 result	Platform	Processors
1	HP	778	DL180 G5	2x Intel® Xeon® E5450
2	Dell	719	PE 2950 III	2x Intel® Xeon® E5440
3	Dell	712	PE 1950 III	2x Intel® Xeon® E5440
4	HP	698	DL160 G5	2x Intel® Xeon® E5450
5	FSC	690	RX300 S4	2x Intel® Xeon® E5440
6	Dell	682	PE 2950	2x Intel® Xeon® E5440
7	FSC	667	TX150 S6	1x Intel® Xeon® X3220
8	HP	662	DL360 G5	2x Intel® Xeon® E5450
9	HP	546	DL580 G5	4x Intel® Xeon® L7345
10	Intel	468	SM 6025B	2x Intel® Xeon® L5335

First industry standard Energy Efficiency benchmark

Public SPECpower results from http://www.spec.org/power_ssj2008/results/power_ssj2008.html as of Feb 28, 2008

SPECpower_ssj2008 results measured as ssj_ops/watt



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Product Cadence for Sustained Leadership

2007-08

Penryn
Processors
45nm

TICK

Nehalem
Processors
45nm

TOCK

Driving Products to Deliver on Moore's Law



Nehalem Micro-architecture: Dynamically Scalable and Innovative New Design

Scalable from 2 to 8 cores

Micro-architecture enhancements (4 -wide)

2-way simultaneous multi-threading

Integrated memory controller

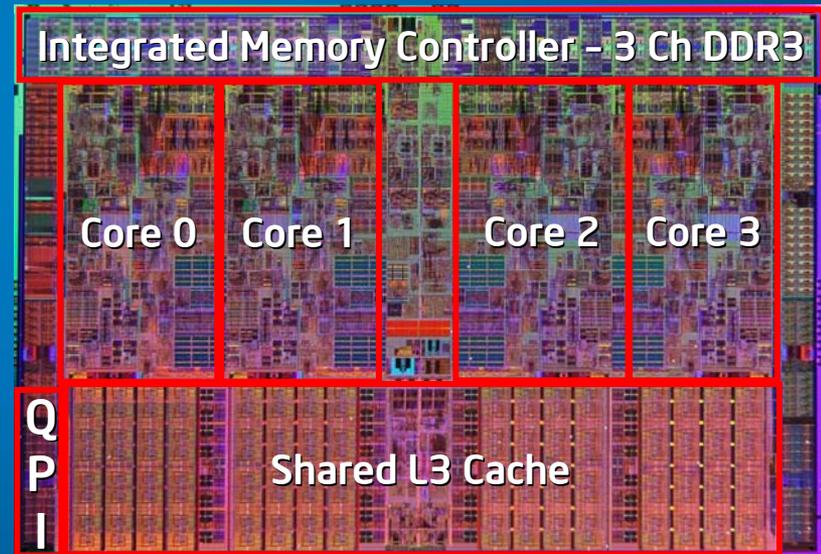
QuickPath interconnect

Shared and Inclusive Level-3 cache

Dynamic power management

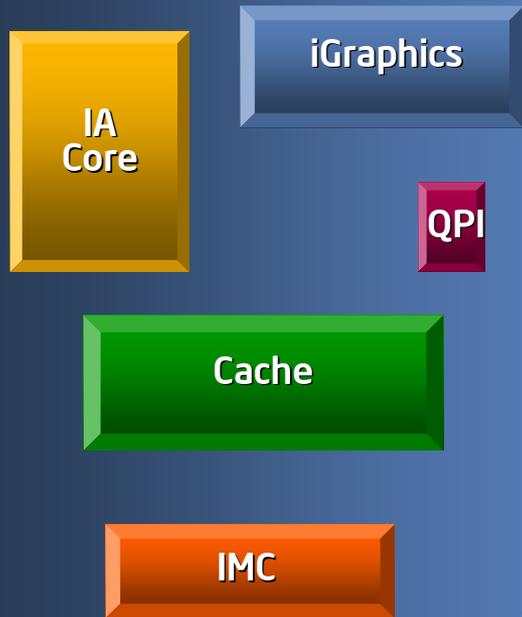
SSE 4.2

Production: Q4'08

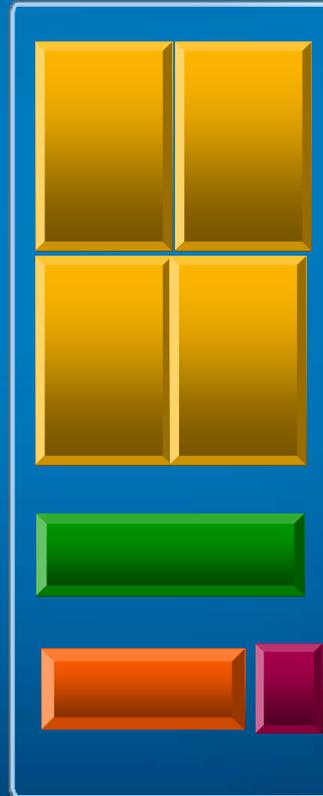


Nehalem Design Scalable Via Modularity

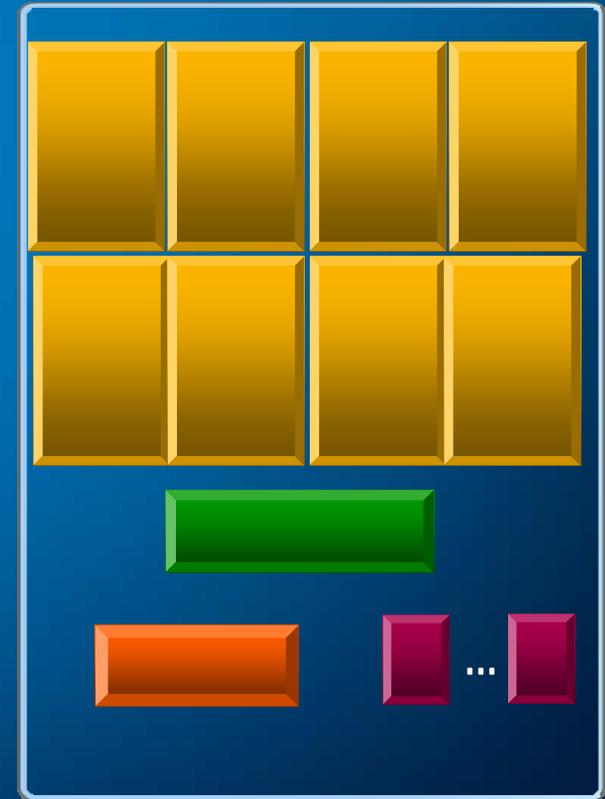
Nehalem Building Block Library



Ex: 4 Core



Ex: 8 Core



Sample Range of Product Options

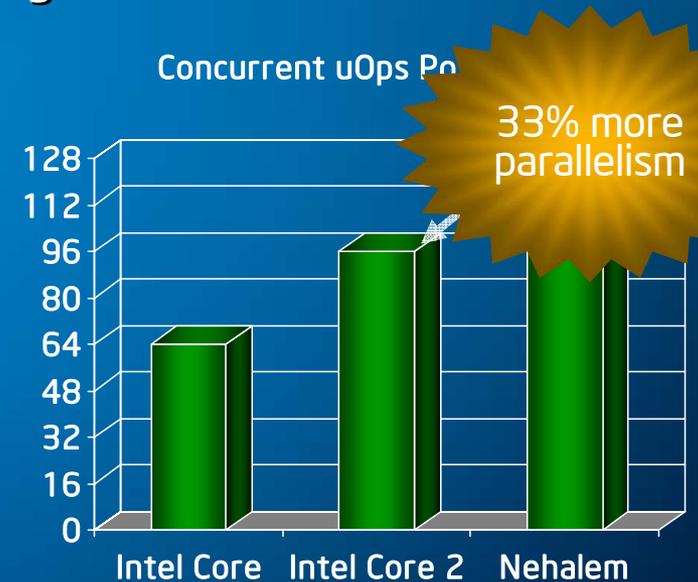


Nehalem: Core uArch Enhancements

Foundation: Intel® Core™ Microarchitecture

Significant Performance and Efficiency Enhancements

- Increased parallelism
 - 33% more micro-ops in flight possible
- Enhanced algorithms
 - Faster “unaligned” cache accesses
 - Faster synchronization primitives
- Further branch prediction enhancements
 - New 2nd level branch predictor
 - Renamed Return Stack Buffer

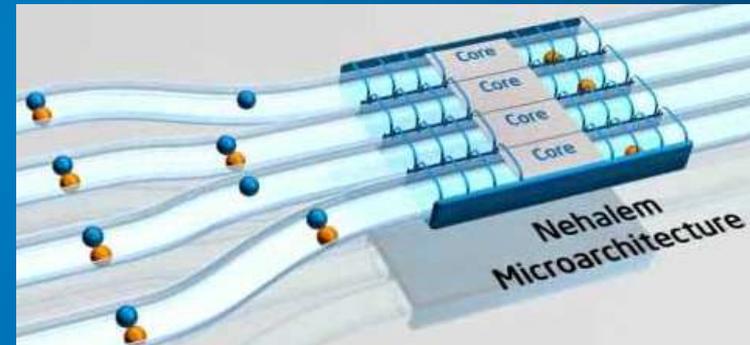


Builds upon Industry Leading 4 Instruction issue Intel® Core micro-architecture



Simultaneous Multi-Threading (SMT)

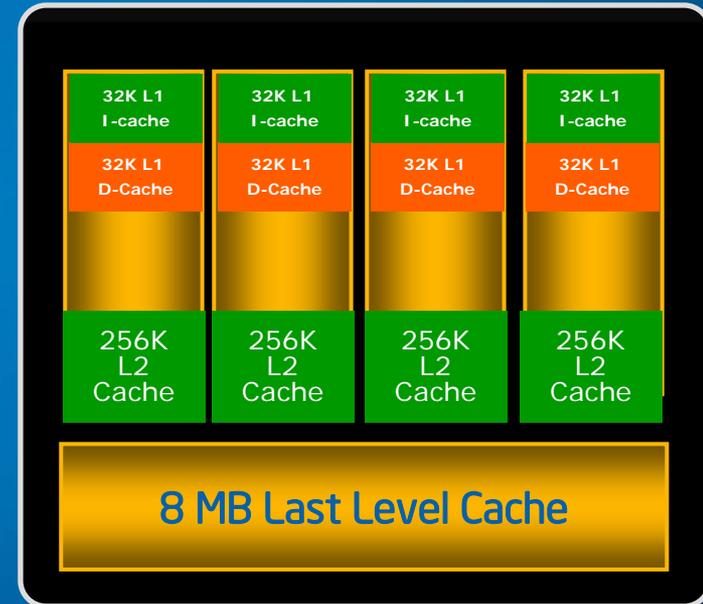
- Each core able to execute two software threads simultaneously
- Extremely power efficient
- Enhanced with larger caches and more memory bandwidth
- Benefits
 - Highly threaded workloads (eg, multi-media apps, databases, search engines)
 - Multi-Tasking scenarios



Simultaneous Multi-threading Enhances Performance and Energy Efficiency

Enhanced Cache Subsystem

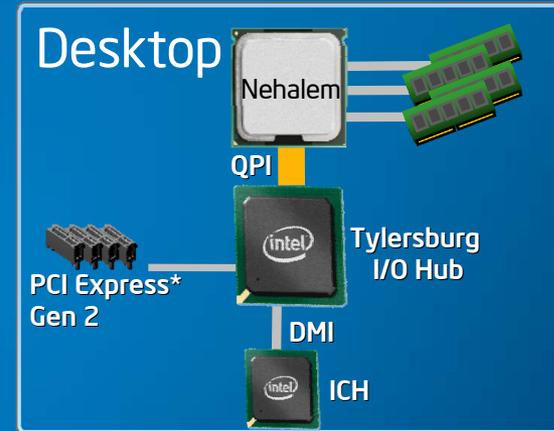
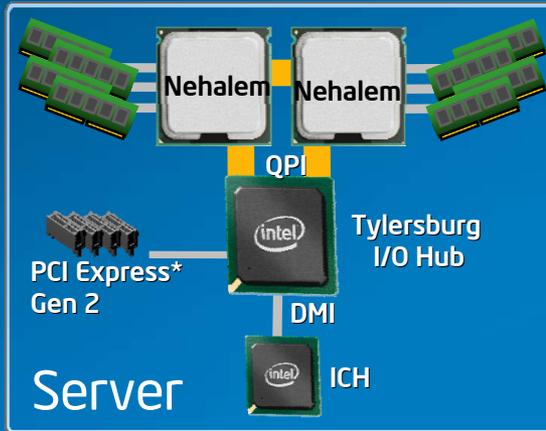
- **New 3-level Cache Hierarchy**
 - L1 cache same as Intel Core™ uArch
 - 32 KB Instruction/32 KB Data
 - New 256 KB/core, low latency L2 cache
 - New Large 8MB fully-shared L3 cache
 - Inclusive Cache Policy - minimize snoop traffic
- **New 2-level TLB hierarchy**
 - Adds 2nd level 512 entry Translation Look-aside Buffer



Superior multi-level shared cache extends Intel® Smart Cache technology



Nehalem/Tylersburg Platforms (High End Desktop and Server/Workstation)



- Intel® QuickPath Interconnect

- New point to point interconnect
- 2 links per CPU socket
- Up to 25.6 Gb/sec total bandwidth/link

- Integrated DDR3 Memory Controller

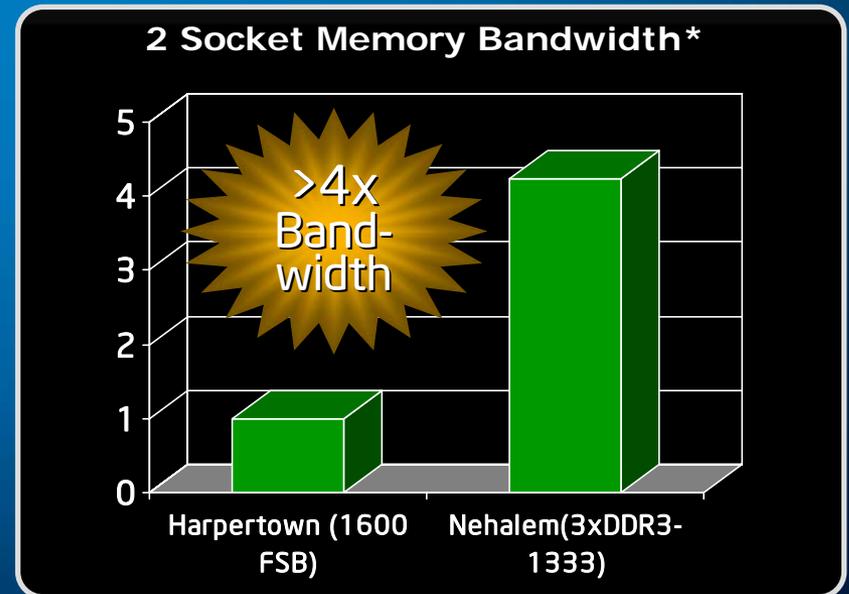
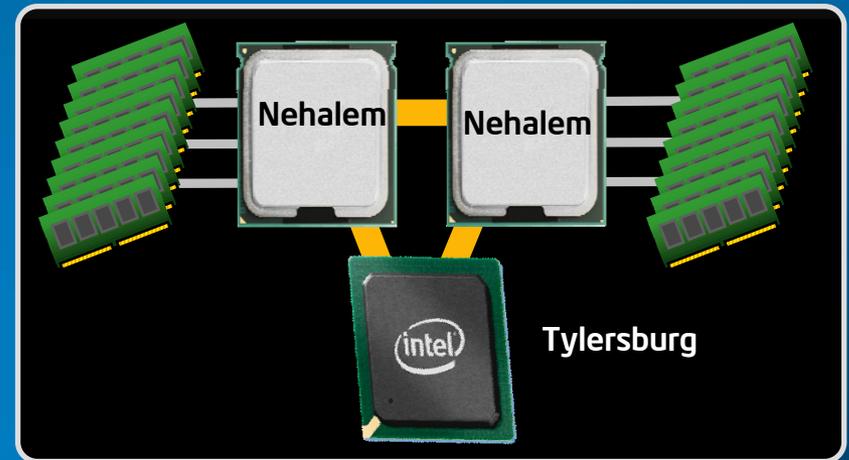
- 3 channels per processor
- Massive amounts of Bandwidth
- Significant Memory Latency Reduction

Huge Latency Decrease and Bandwidth Increase over Prior Generation



Nehalem High End Desktop/Server IMC

- 3 channels per socket
- Up to 3 DIMMs/channel
- DDR3-800, 1066, 1333
 - Future scalability
- Supports RDIMM and UDIMM
- Very low latency
- Very high bandwidth
- Built-In RAS Features



Leadership Memory Bandwidth



*Source: Intel internal measurement

Product Cadence for Sustained Leadership

2009-10

Westmere
Processors
32 nm

TICK

Sandy Bridge
Processors
32 nm

TOCK

Continuing the Pace of Innovation



Intel® Advanced Vector Extension (AVX)

256-bit vector extension to SSE for FP intensive applications

KEY FEATURES

Wider Vectors

Increased from 128 bit to 256 bit

Enhanced Data Rearrangement

Use the new 256 bit primitives to broadcast, mask loads and do data permutes

Three Operand, Non Destructive Syntax

Designed for efficiency and future extensibility

BENEFITS

Up to 2x peak FLOPs output

Organize, access and pull only necessary data more quickly and efficiently

Fewer register copies, better register use, more opportunities for parallel loads and compute operations, smaller code size



Visual Computing: Graphics Re-defined

Mainstream Graphics

- Triangle / Rasterization
- Rigid pipeline architecture
- Tools constrained by architecture
- Inefficient for non-graphics computing



Visual Computing

- New life-like Rendering e.g. Global illumination
- Programmable, ubiquitous architecture
- High definition audio and video processing
- Combines with model based computing (e.g. Physics)

Visual Computing

Acquiring, Analyzing,
Modeling and Synthesizing
Visual Workloads



Photorealistic
3D Rendering



Computational
Modeling



Interactive
User Interface



High Definition
Audio, Video

Visual Computing: What Does it Take?

Intel Leadership

- Platforms: Client, Workstation, Server
- CPU, Graphics, Media Architecture
- Process and Technology Leadership
- Software, Tools & Developer Support



Photorealistic
3D Rendering



Computational
Modeling



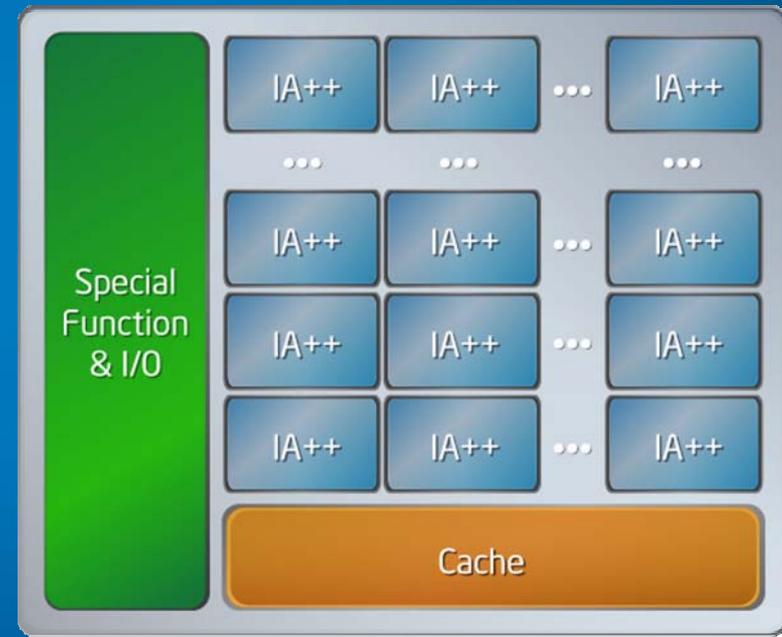
Interactive
User Interface



High Definition
Audio, Video

Larrabee: Visual Computing Architecture

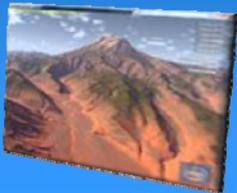
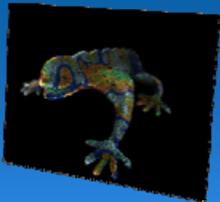
- Many IA cores
 - Scalable to TeraFLOPS
- New cache architecture
- New vector instruction set
 - Vector memory operations
 - Conditionals
 - Integer and FP arithmetic
- New vector processing unit / wide SIMD



Intel Software: Unleashes Developer Freedom

Industry Leading Intel® Software Tools

Addresses development and
performance tuning needs



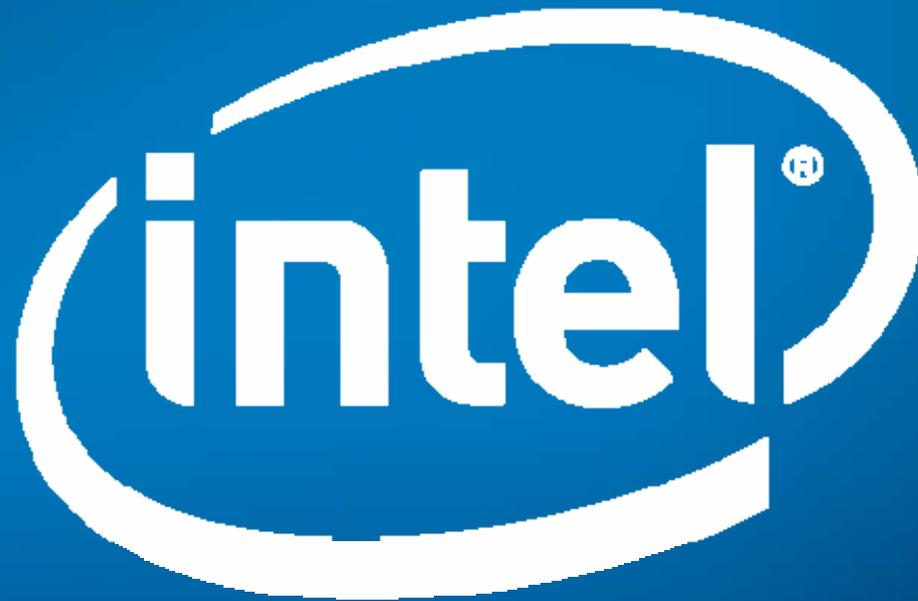
Visual Computing Tools & Resources

Extending Intel® Software for Larrabee Architecture
Supports industry standard APIs (DirectX* & OpenGL*)



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Q & A



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Performance Backup

- Source: Intel. Configuration: Intel® Core™ 2 Quad Q9450 (12MB L2, 2.66 GHz, 1333MHz FSB), Intel® Core™ 2 Quad Q8400 (6MB L2, 3.00 GHz, 1333MHz FSB), E6750 (4MB L2, 2.66 GHz, 1333MHz FSB) and Q6600 (8MB L2, 2.40 GHz, 1066MHz FSB) on Intel Desktop DG33TL board with Intel G33 Integrated Graphics, Intel Chipset INF 8.4.0.1016,, 2x1GB Dual Channel Corsair* DDR2-800 5-5-5-18, Seagate* 320GB Barracuda* NCQ Serial ATA 7200 RPM, Windows* Vista* Ultimate 32bit. 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/>

