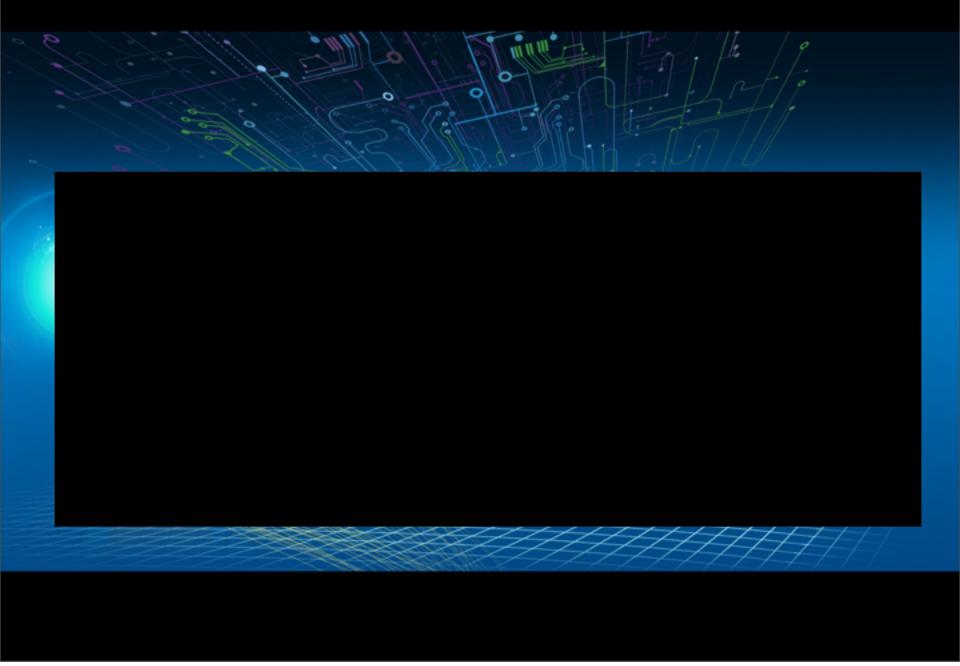
How SSDs Are Changing the Computing Paradigm The Miracle of Flash Francois Piednoel Senior Performance Analyst, Intel Corp.



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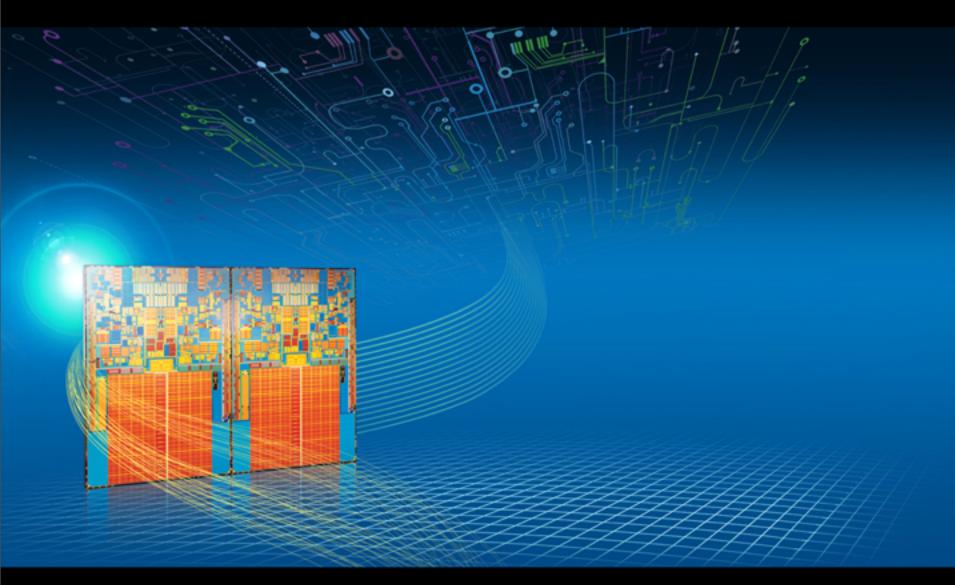
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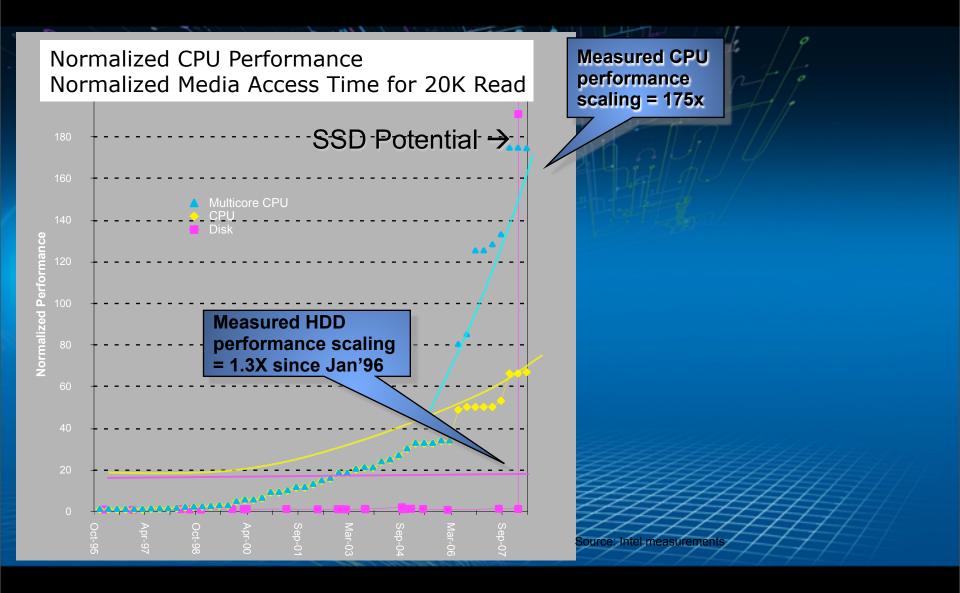
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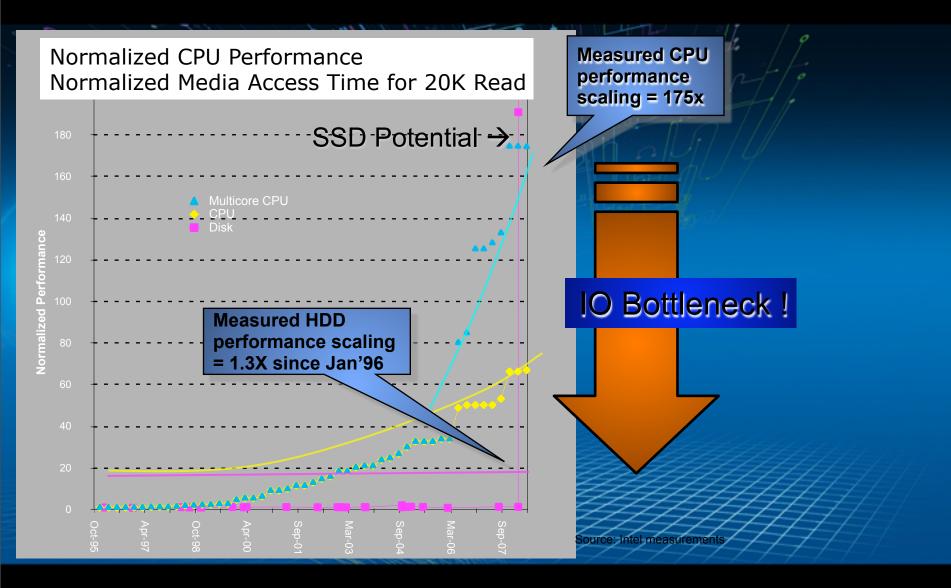


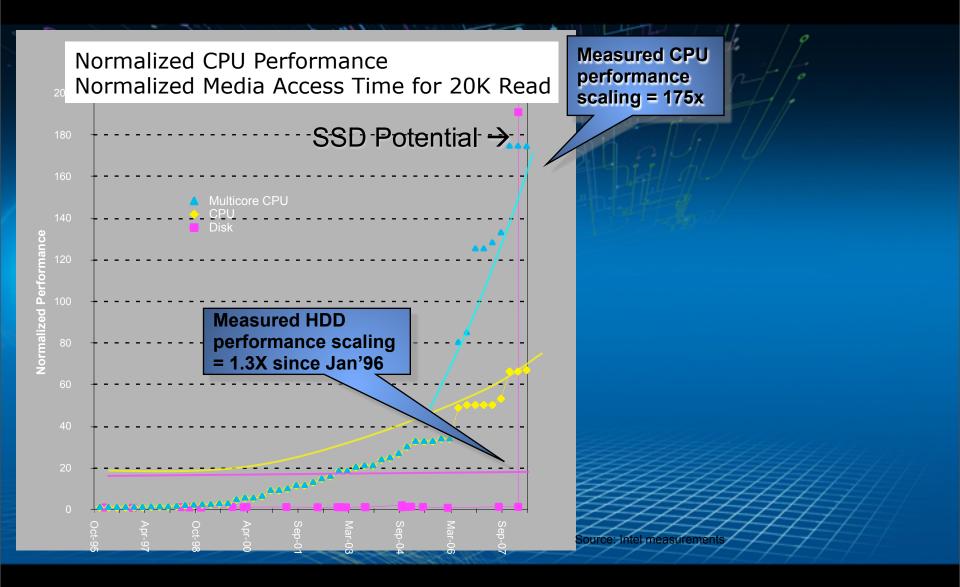
PC Bottleneck

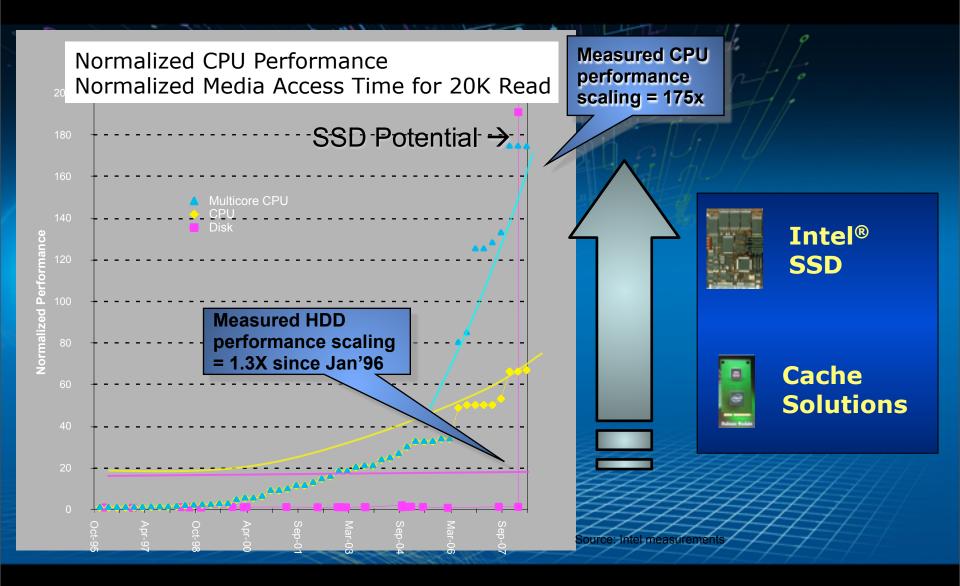


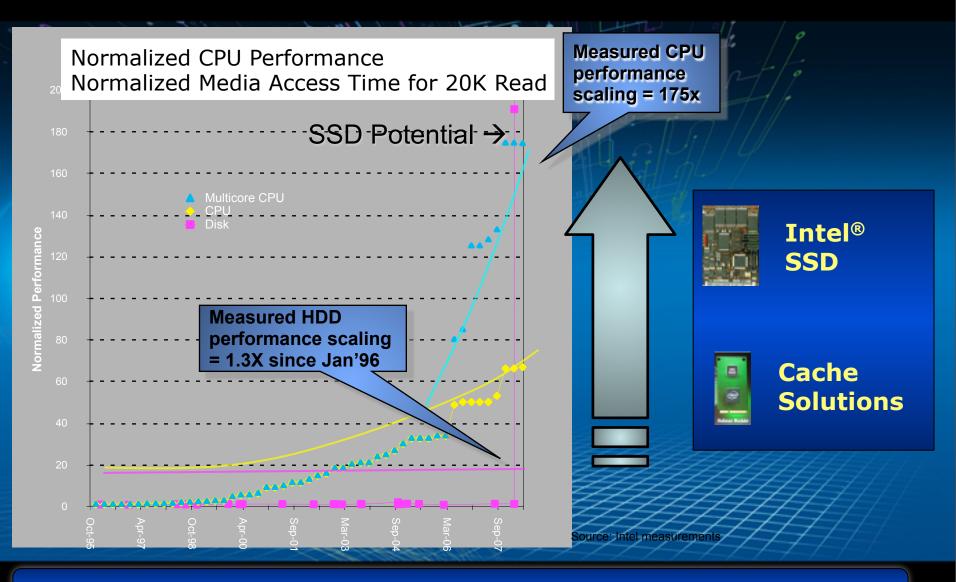
Memory → Nehalem : Done
IO → PCI express : Done
Integration coming
Storage?



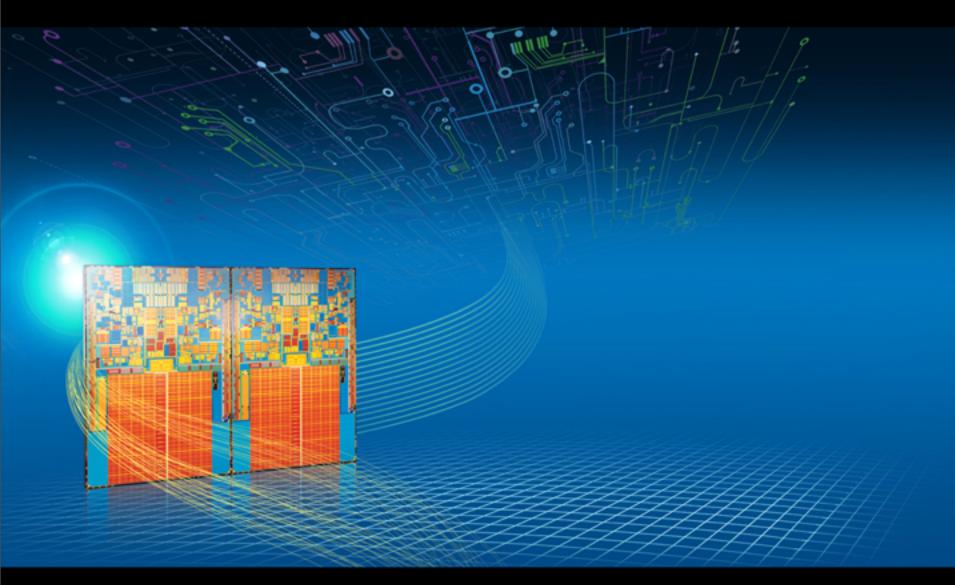








Our Mission is to remove the IO bottleneck







Rise in NAND Flash will lead to further increase in the price of solid-state disk (SSD) ITPRO, 9th July, 2009

Price hike could damage the data center. The memory market price hike could be one reason why data center managers start to think twice... zdnet.co.uk 10th up 2009 Price Hikes killing SSD sales for laptop. NAND Chip prices have increased 127% since late '08 Computerworld.com, 8th July, 2009

Intel® Decreases SSD Price by up to 60%

Rise in NAND Flash will lead to further increase in the price of solid-state disk (SSD) ITPRO, 9th July, 2009

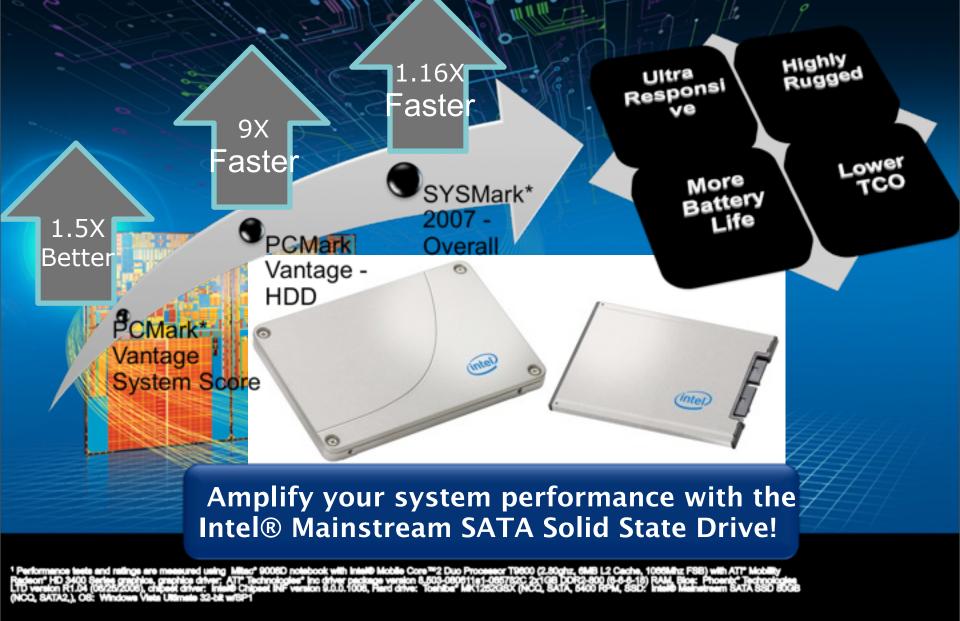
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Intel® Decreases SSD Price by up to 60%



Intel[®] Mainstream SATA Solid State Drive

Benchmark improvements compared to a 5400 RPM HDD¹





¹ Performance tests and ratings are measured using Mitac* 9008D notebook with Intel® Mobile Core[™]2 Duo Processor T9600 (2.80ghz, 6MB L2 Cache, 1066Mhz FSB) with ATI* Mobility Radeon* HD 3400 Series graphics, graphics driver: ATI* Technologies* Inc driver package version 8.503-080611a1-065782C 2x1GB DDR2-800 (6-6-6-18) RAM. Bios: Phoenix* Technologies LTD version R1.04 (06/25/2008), chipset driver: Intel® Chipset INF version 9.0.0.1008, Hard drive: Toshiba* MK1252GSX (NCQ, SATA, 5400 RPM, SSD: Intel® Mainstream SATA SSD 80GB (NCQ, SATA2, fw8510), OS: Windows Vista Ultimate 32-bit w/SP1

Intel[®] Mainstream SATA Solid State Drive Benchmark improvements compared to a 5400 RPM HDD¹

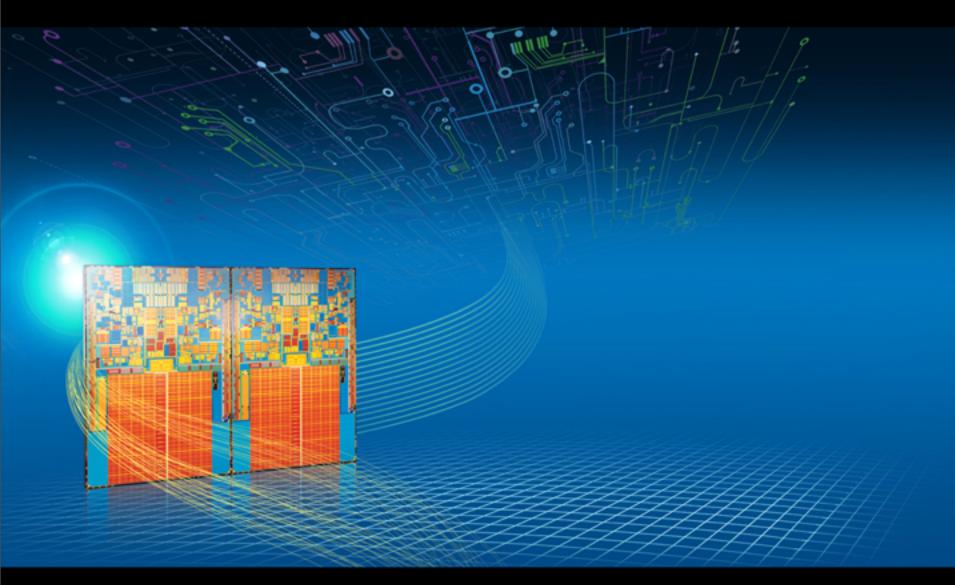


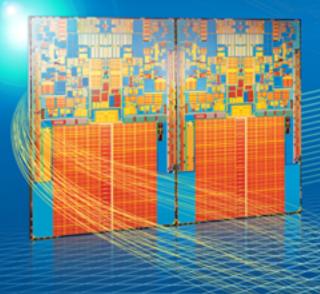
¹ Performance tests and ratings are measured using Mitac* 9008D notebook with Intel® Mobile Core[™]2 Duo Processor T9600 (2.80ghz, 6MB L2 Cache, 1066Mhz FSB) with ATI* Mobility Radeon* HD 3400 Series graphics, graphics driver: ATI* Technologies* Inc driver package version 8.503-080611a1-065782C 2x1GB DDR2-800 (6-6-6-18) RAM. Bios: Phoenix* Technologies LTD version R1.04 (06/25/2008), chipset driver: Intel® Chipset INF version 9.0.0.1008, Hard drive: Toshiba* MK1252GSX (NCQ, SATA, 5400 RPM, SSD: Intel® Mainstream SATA SSD 80GB (NCQ, SATA2, fw8510), OS: Windows Vista Ultimate 32-bit w/SP1



Breeze through daily tasks with Intel® Mainstream SATA SSDs!

¹ Performance tests and ratings are measured using Mitac* 9008D notebook with Intel® Mobile Core[™]2 Duo Processor T9600 (2.80ghz, 6MB L2 Cache, 1066Mhz FSB) with ATI* Mobility Radeon* HD 3400 Series graphics, graphics driver: ATI* Technologies* Inc driver package version 8.503-080611a1-065782C 2x1GB DDR2-800 (6-6-6-18) RAM. Bios: Phoenix* Technologies LTD version R1.04 (06/25/2008), chipset driver: Intel® Chipset INF version 9.0.0.1008, Hard drive: Toshiba* MK1252GSX (NCQ, SATA, 5400 RPM, SSD: Intel® Mainstream SATA SSD 80GB (NCQ, SATA2, fw8510), OS: Windows Vista Ultimate 32-bit w/SP1

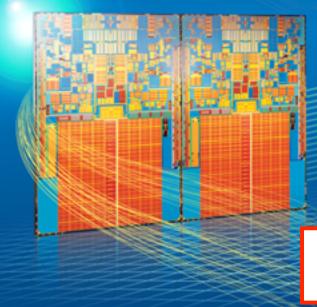




Next step ...



Your Digital life is turning MASSIVE



204 Gigs of Pictures

- 19 Gigs of Videos
- 21700 Pictures
- 250 videos.

230 Tera Pixels!

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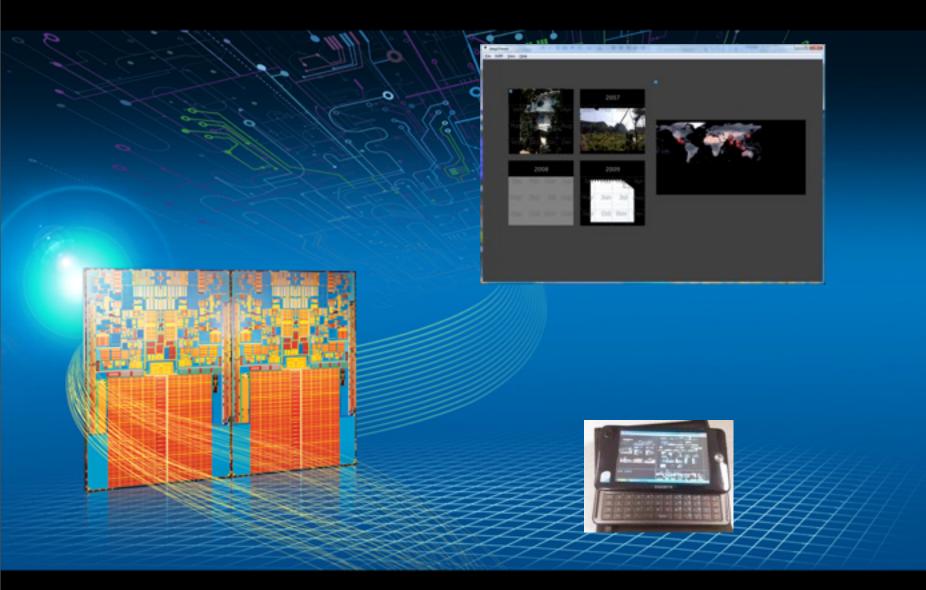
Real time on HDD requires sacrifice.

Seek time ...

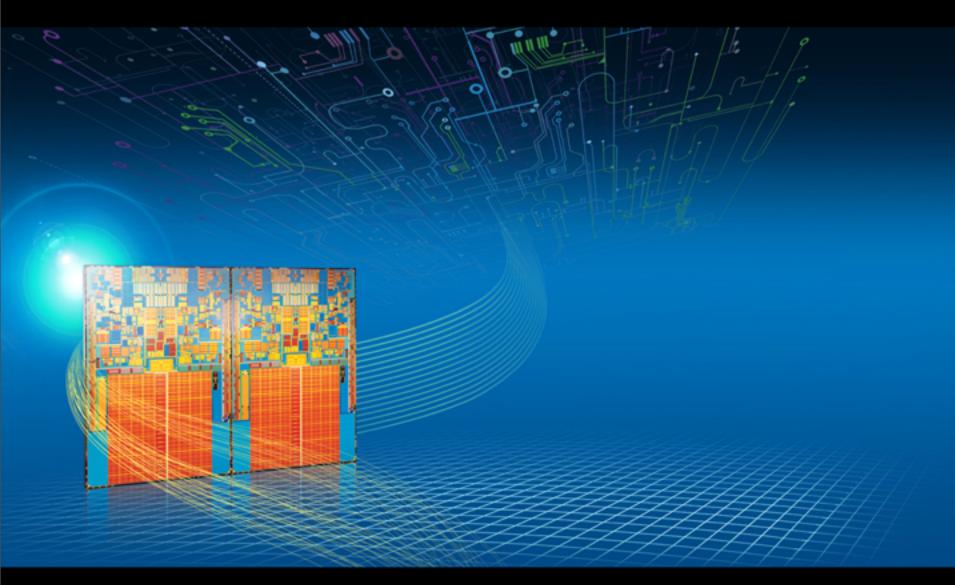
21700 files x 12ms = 260.4 Seconds → 4> minutes of <u>seek time</u>...

Real time on HDD requires sacrifice.

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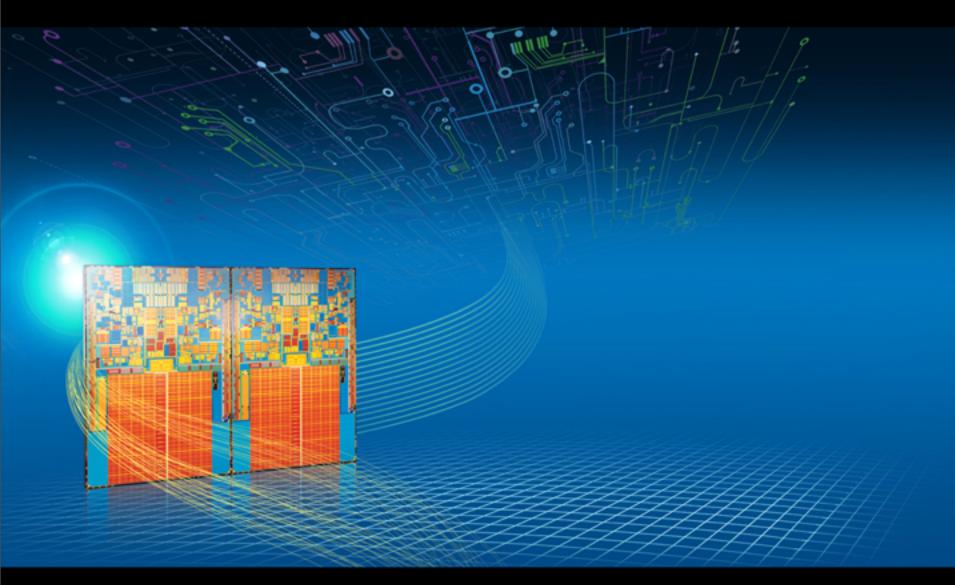


SSD = Processor amplifier

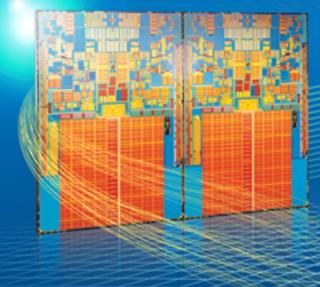
 100% CPU utilization on pictures



Dual SSD RAID 0 Maxed
Rich User Interface needs low latencies



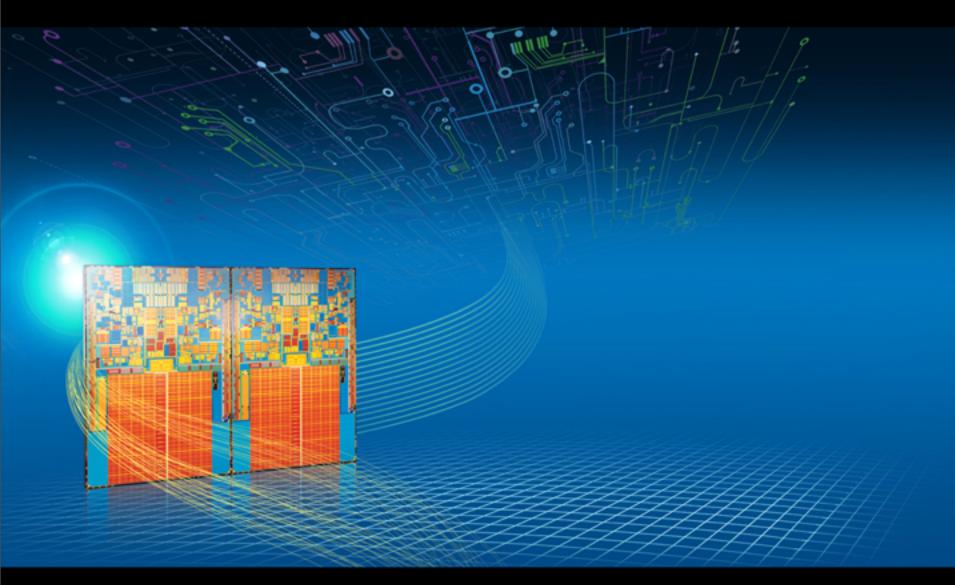
ERA of Parallelism



Multi Cores-Many Cores

 Storage need to have Low latency, high bandwidth to feed the cores

 HDD don't match CPU needs, Larrabee will increase needs



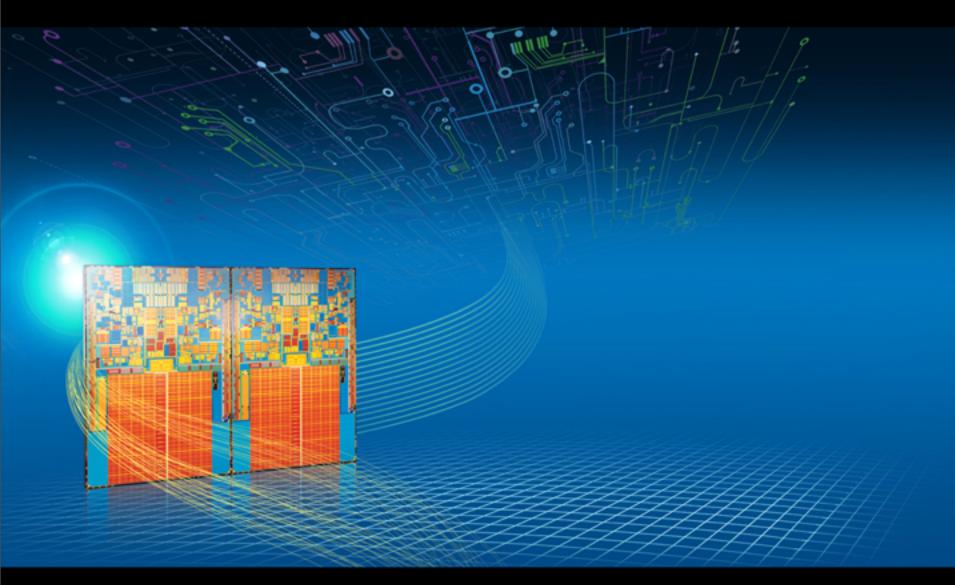
Conclusion



Keep increasing bandwidth
Keep decreasing latencies

Seek times...

Get read for thousands of files open competitively
Target mainstream



• Thanks!



Questions?