How SSDs Are Changing the Computing Paradigm

The Miracle of Flash

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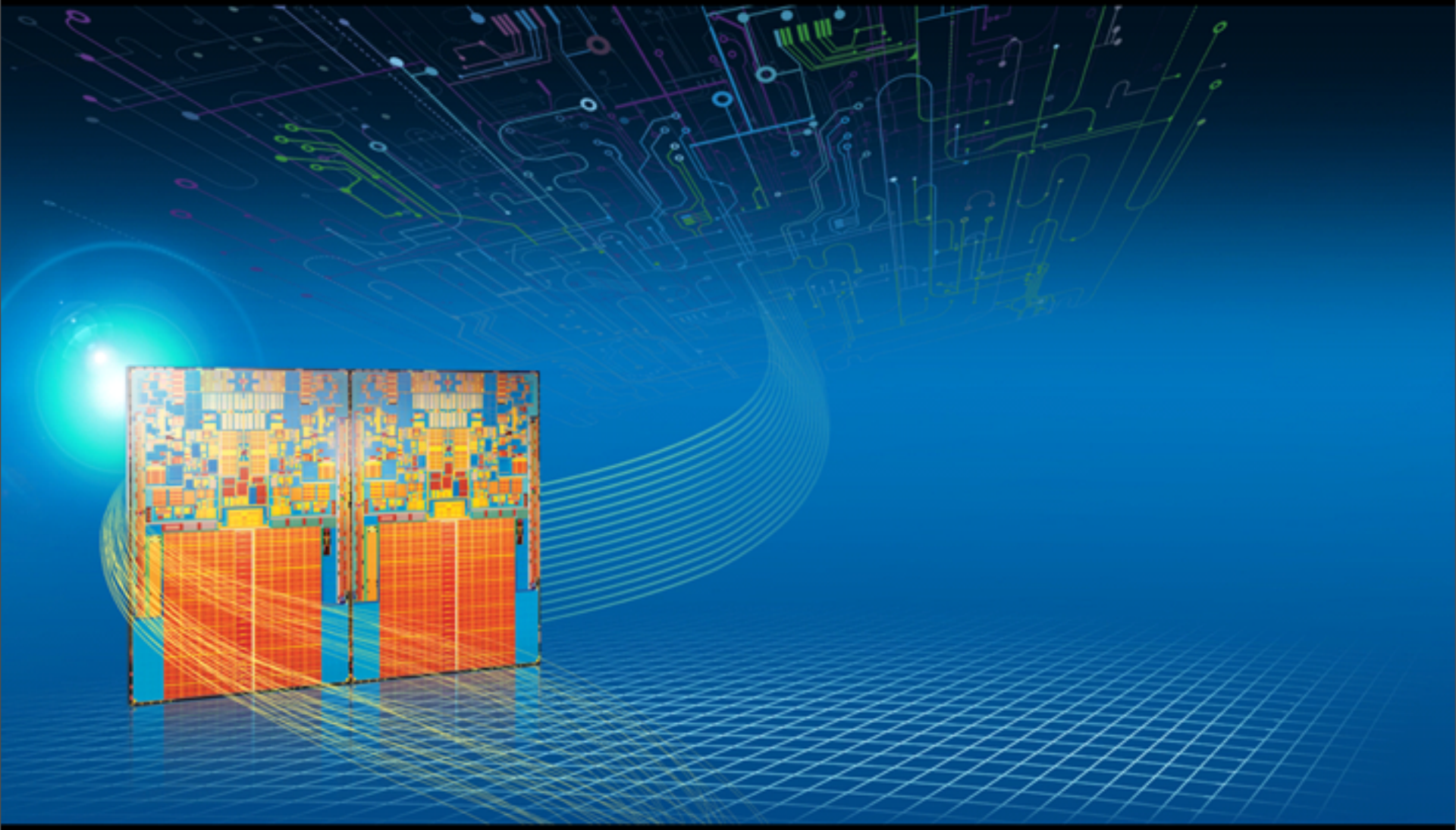
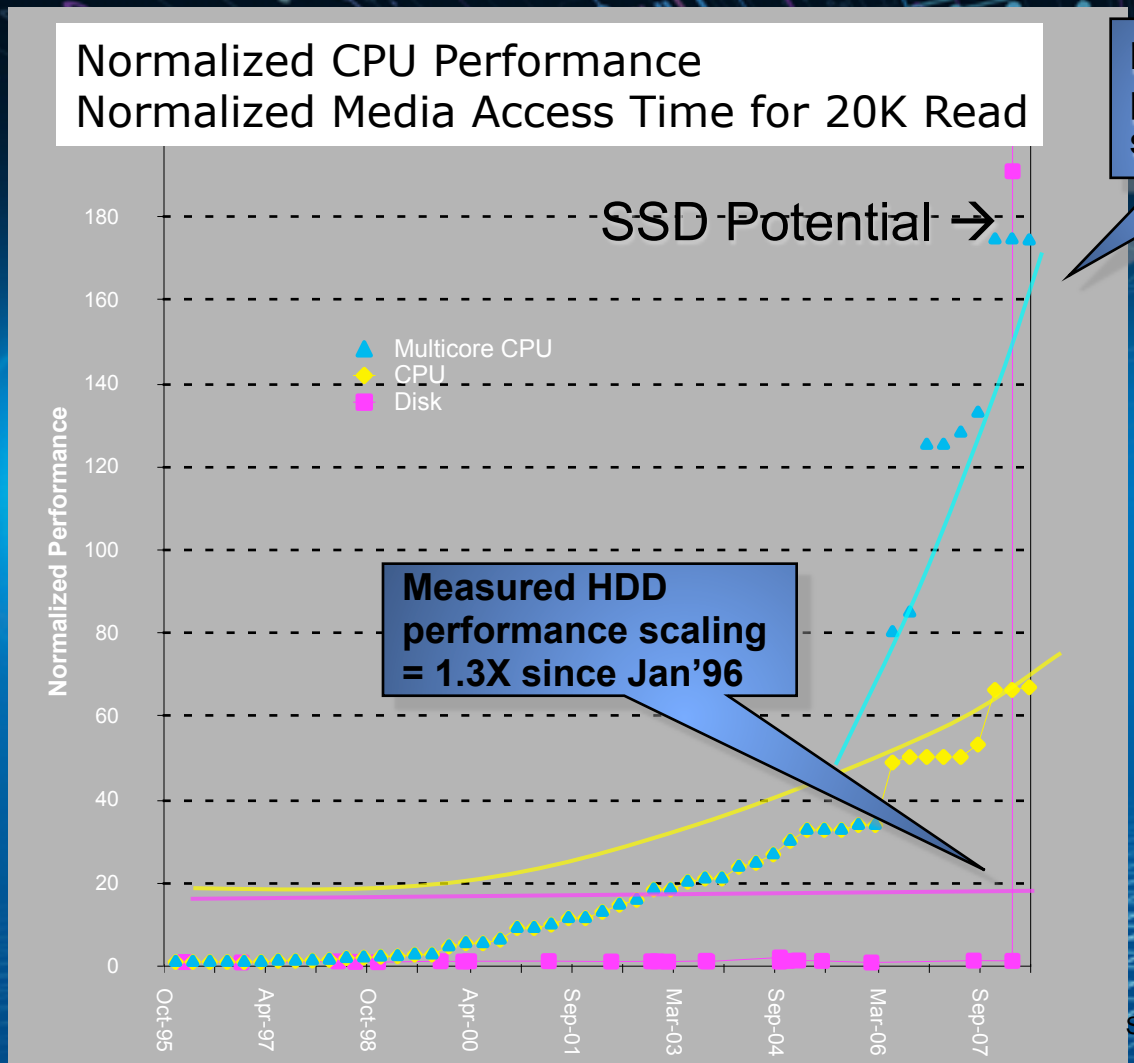
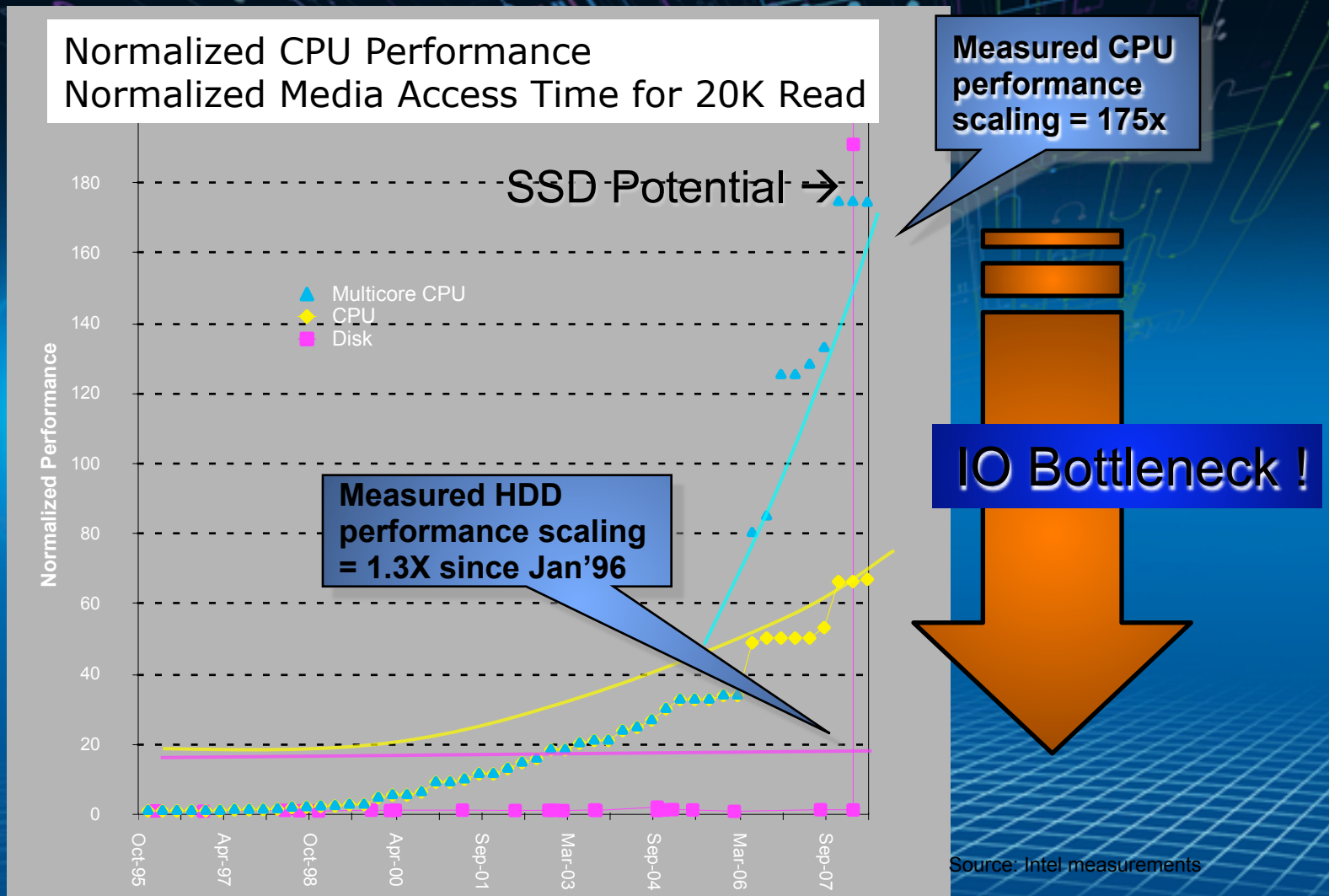


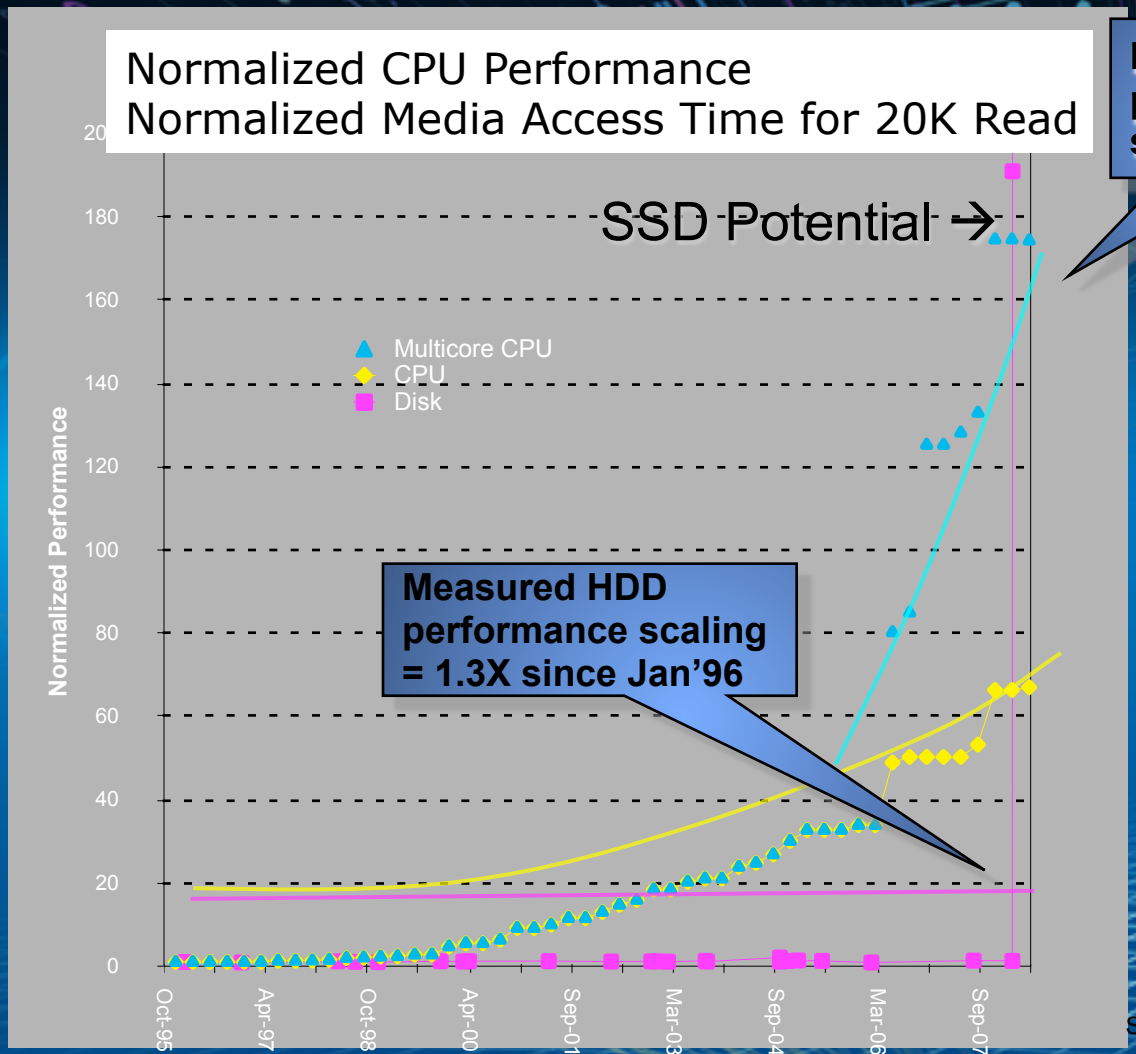
PC Bottleneck

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

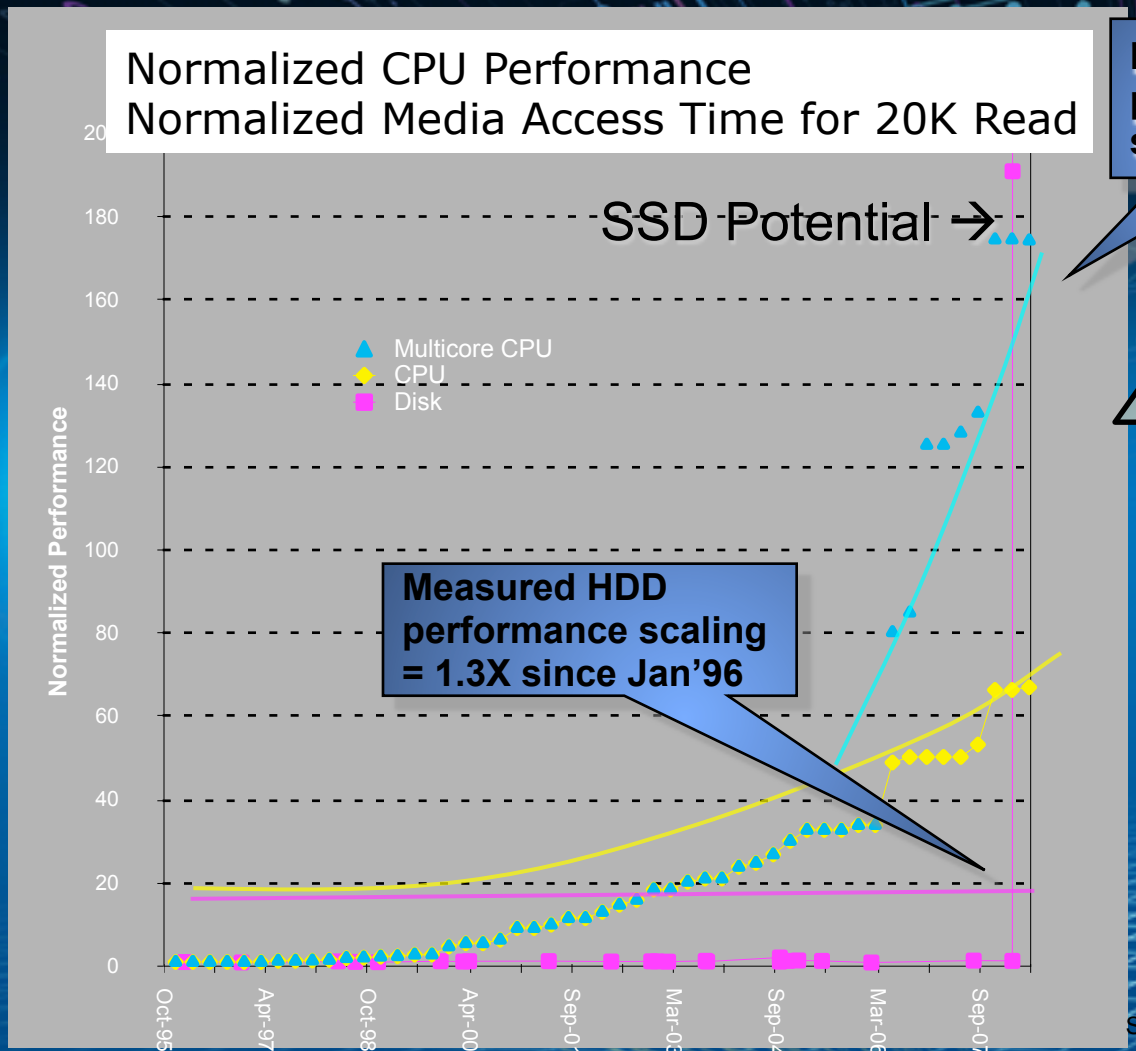


Source: Intel measurements


Normalized CPU Performance
Normalized Media Access Time for 20K Read
SSD Potential →
Multicore CPU
CPU
Disk
Normalized Performance
0
20
40
60
80
100
120
140
160
180
Oct-95
Apr-97
Oct-98
Apr-00
Sep-01
Mar-03
Sep-04
Mar-06
Sep-07
Measured HDD performance scaling = 1.3X since Jan'96
Measured CPU performance scaling = 175x
IO Bottleneck !
Source: Intel measurements



Source: Intel measurements

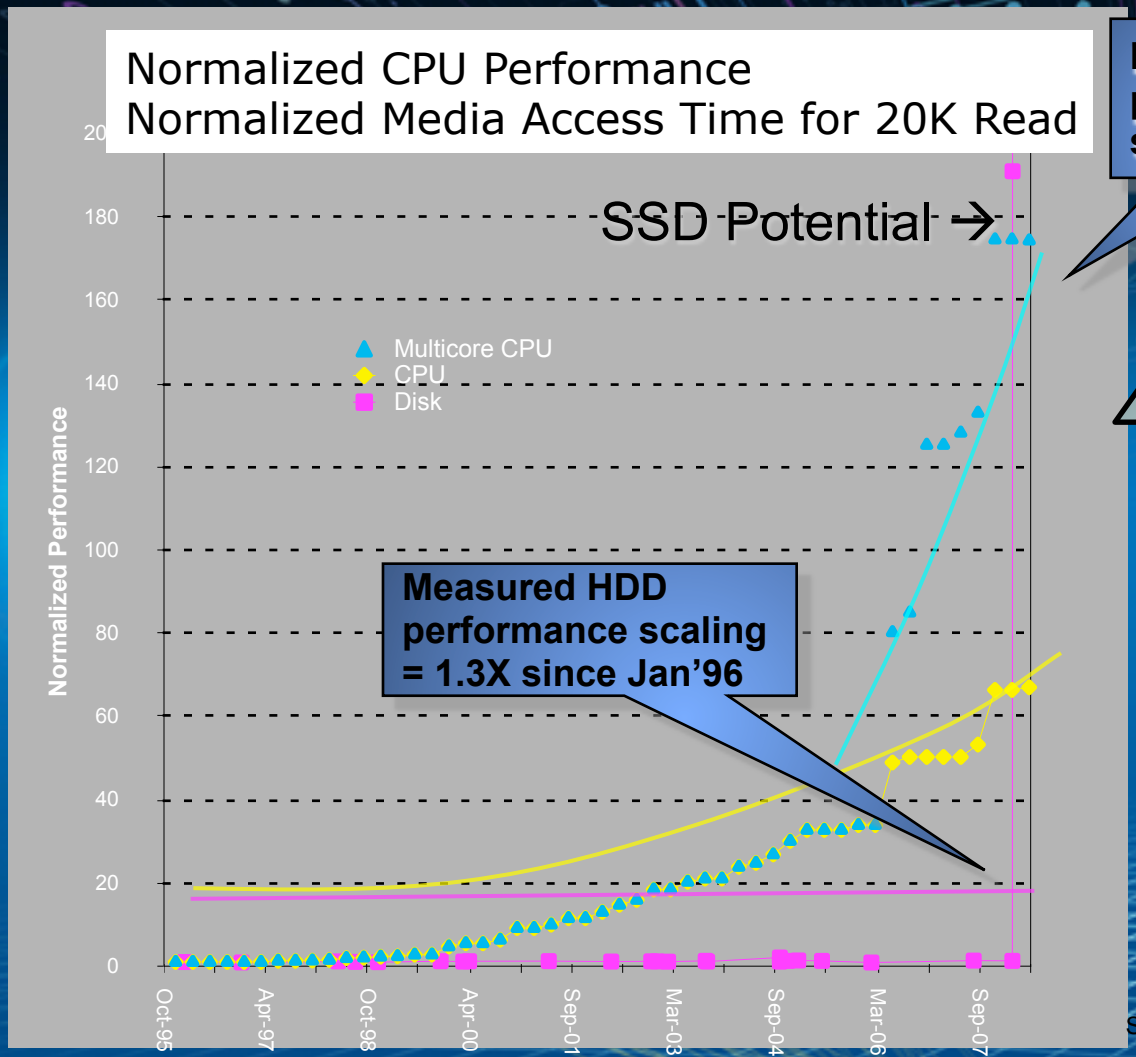


Measured CPU performance scaling = 175x

Intel® SSD

Cache Solutions

Source: Intel measurements



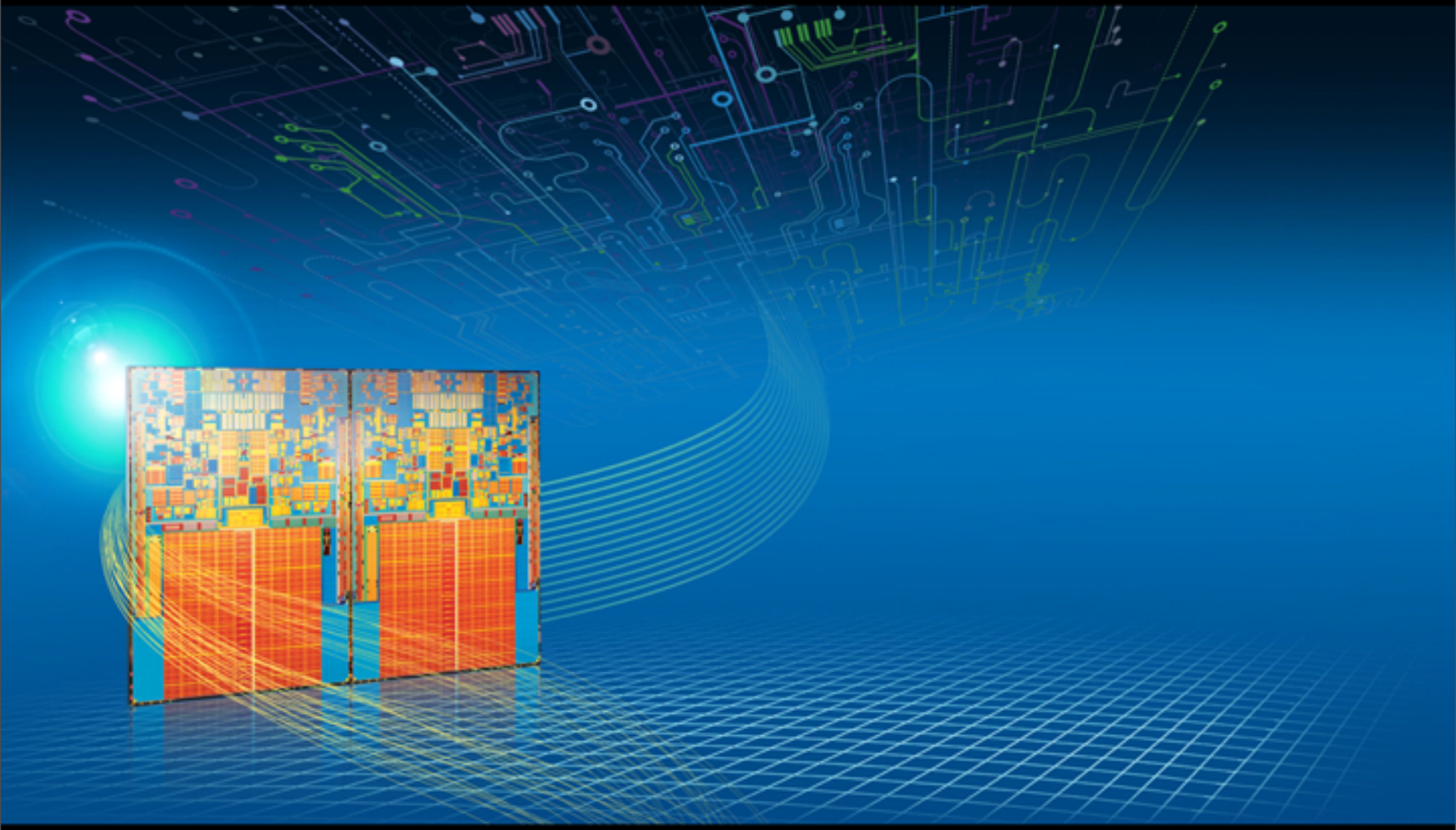
Measured CPU performance scaling = 175x

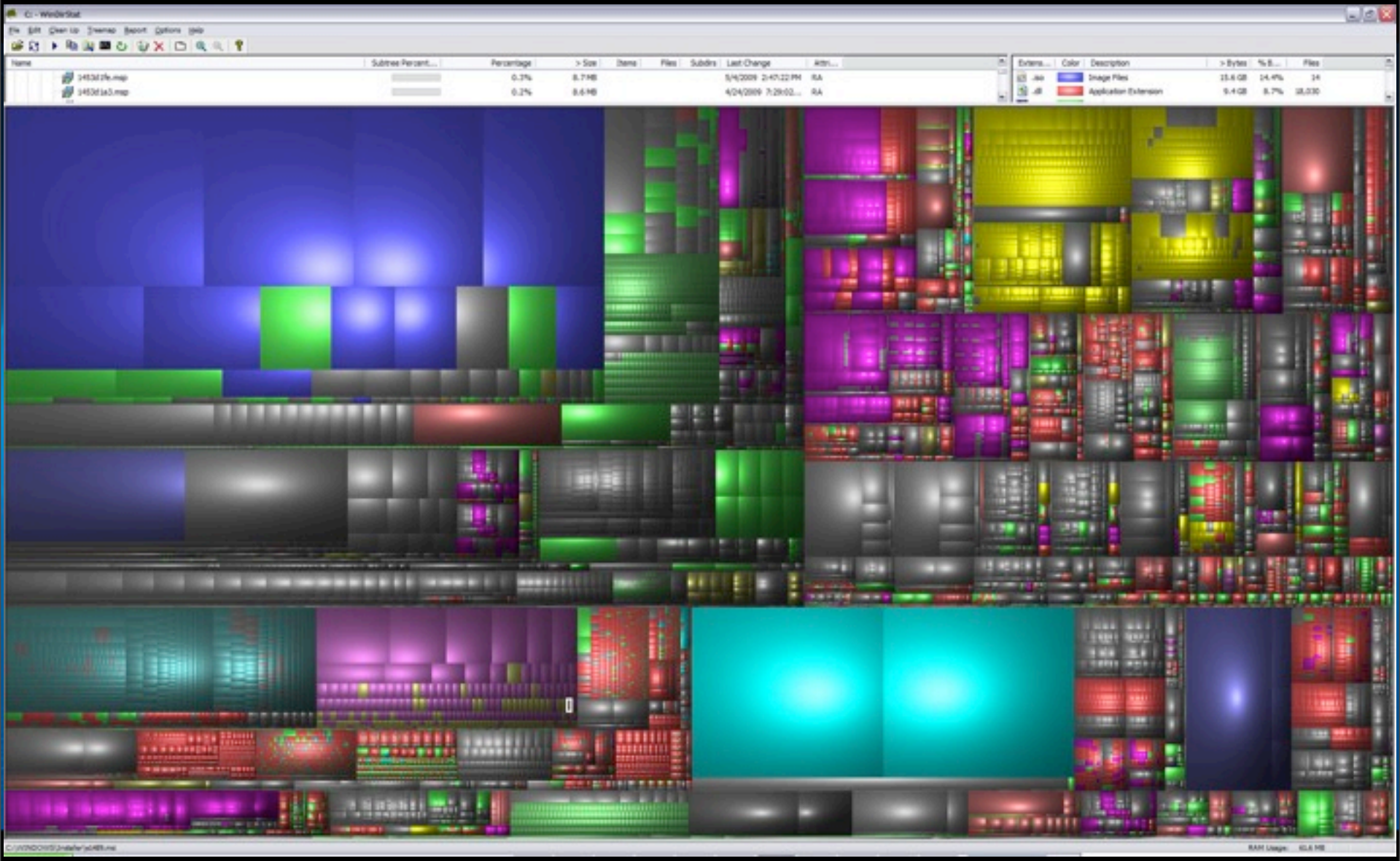
Intel® SSD

Cache Solutions

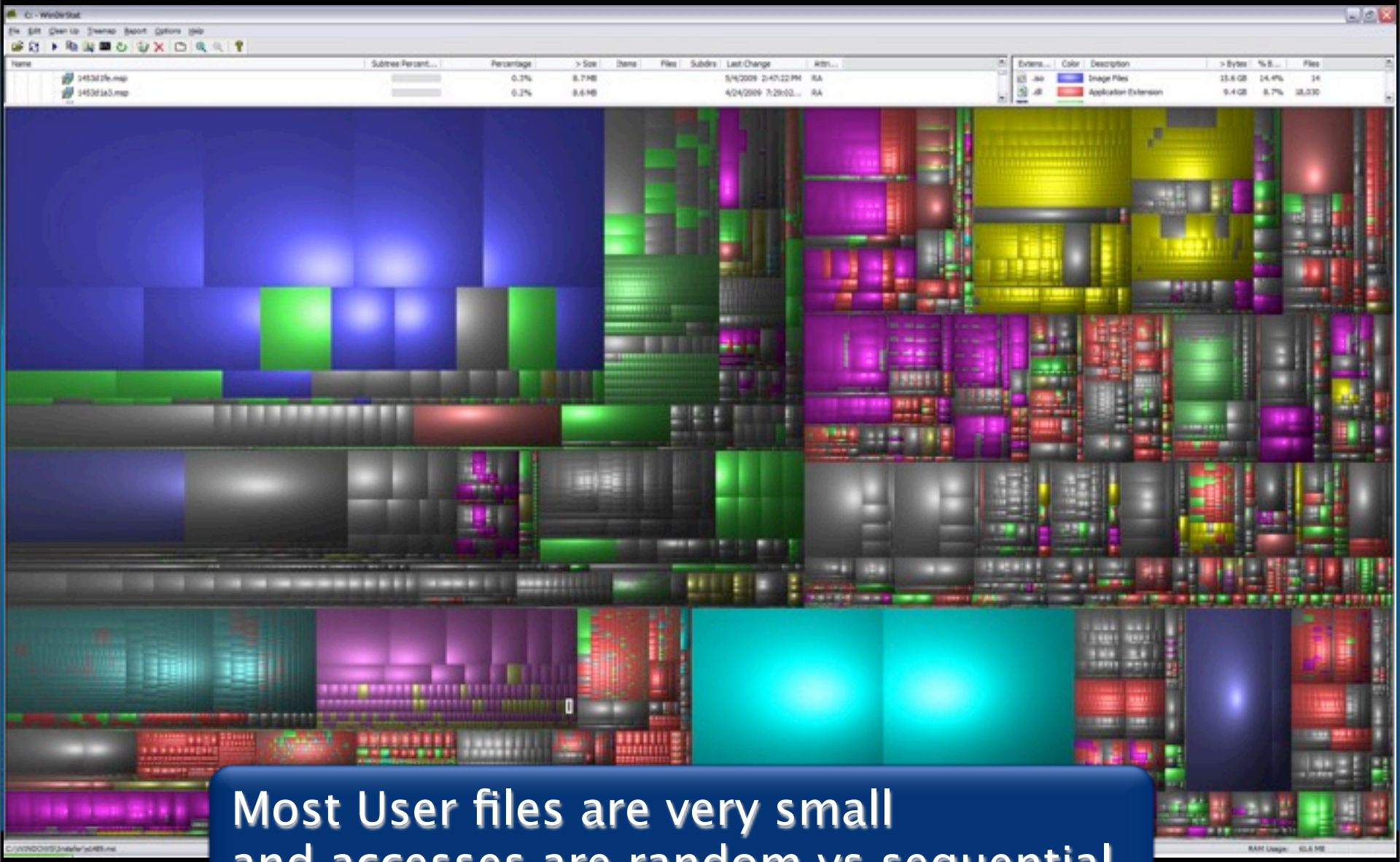
Source: Intel measurements

Our Mission is to remove the IO bottleneck





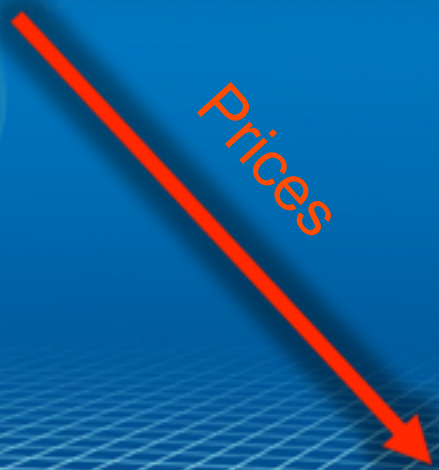
Thursday, September 3, 2009


Most User files are very small
and accesses are random vs sequential

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 July, 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%!

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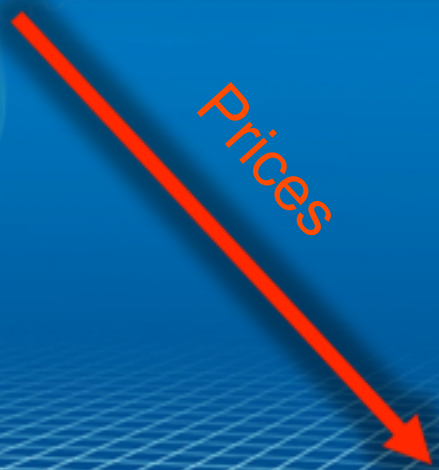

Intel® Decreases SSD Price by up to 60%!

1.5X Better

9X Faster

1.16X Faster

Ultra Responsive

Highly Rugged

More Battery Life

Lower TCO

Amplify your system performance with the Intel® Mainstream SATA Solid State Drive!

[1] Performance tests and ratings are measured using Mitac® 9006D 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 (04/25/2008), 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,), OS: Windows Vista Ultimate 32-bit w/SP1

Intel® Mainstream SATA Solid State Drive

Benchmark improvements compared to a 5400 RPM HDD[1]

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Intel® Mainstream SATA Solid State Drive

Benchmark improvements compared to a 5400 RPM HDD[1]

Spyware Scan w/ Windows* Defender*	40% faster
Installing Microsoft* Office* 2007	40% faster
Exporting Email in Microsoft* Outlook* 2007	100% faster!
Blizzard* World of Warcraft* patch + Windows* Defender	140% faster!

Breeze through daily tasks with Intel® Mainstream SATA SSDs!

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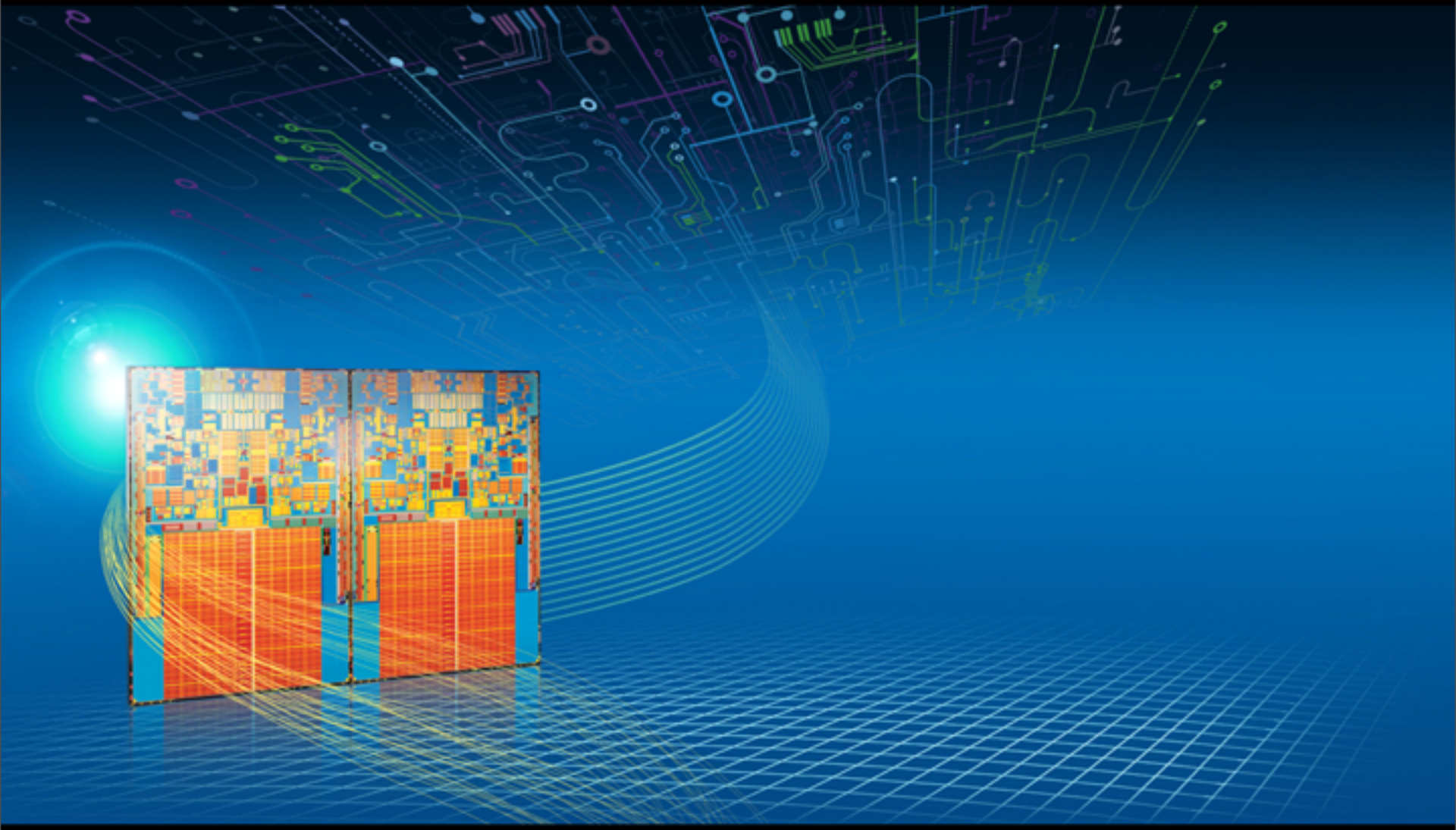


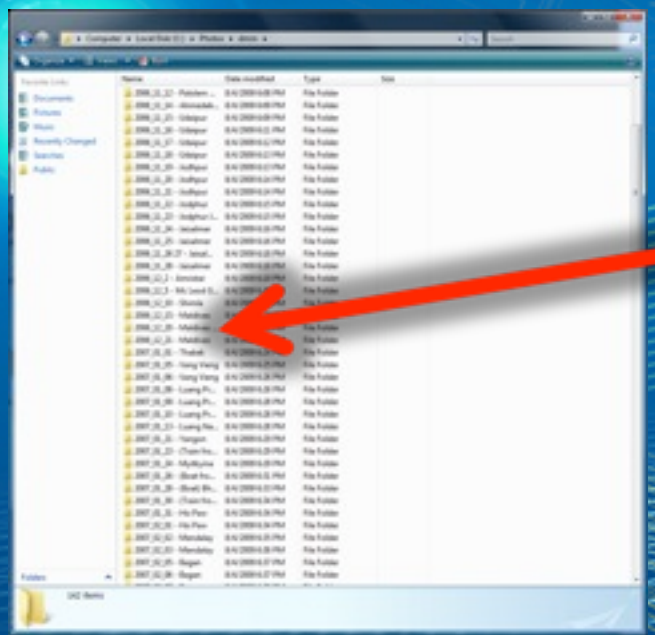

Next step …


230 Tera Pixels!

Your Digital life is turning MASSIVE

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

230 Tera Pixels!

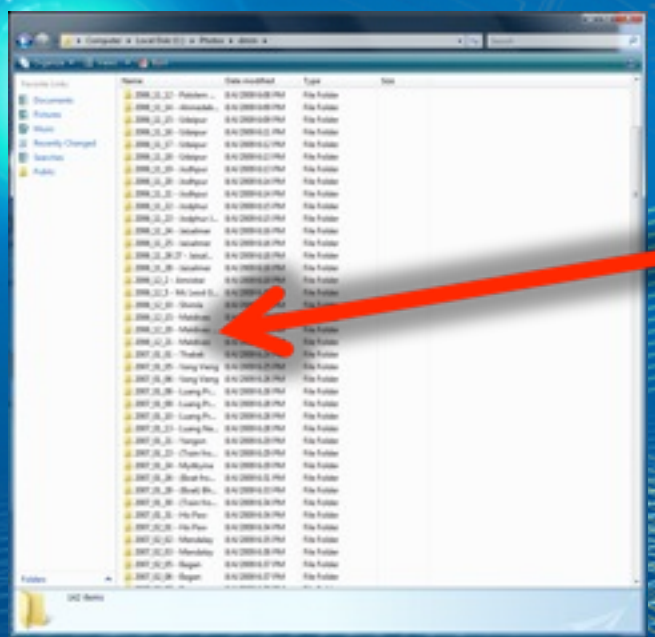


Real time on HDD
requires sacrifice.

Seek time …

21700 files x 12ms = 260.4 Seconds

➔ 4> minutes of seek time …



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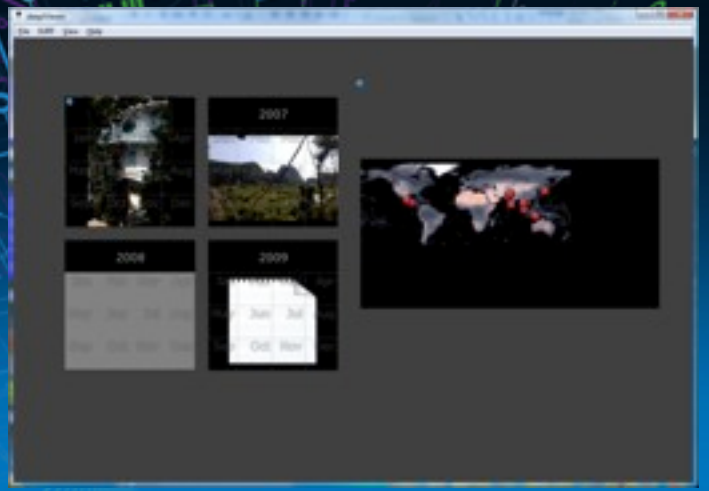
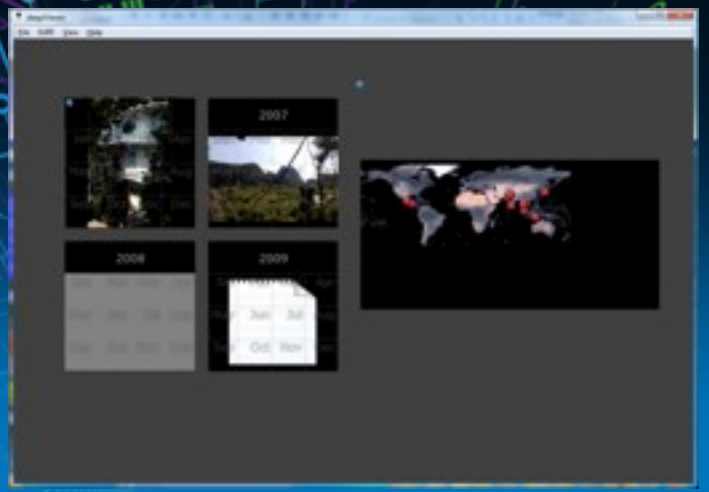
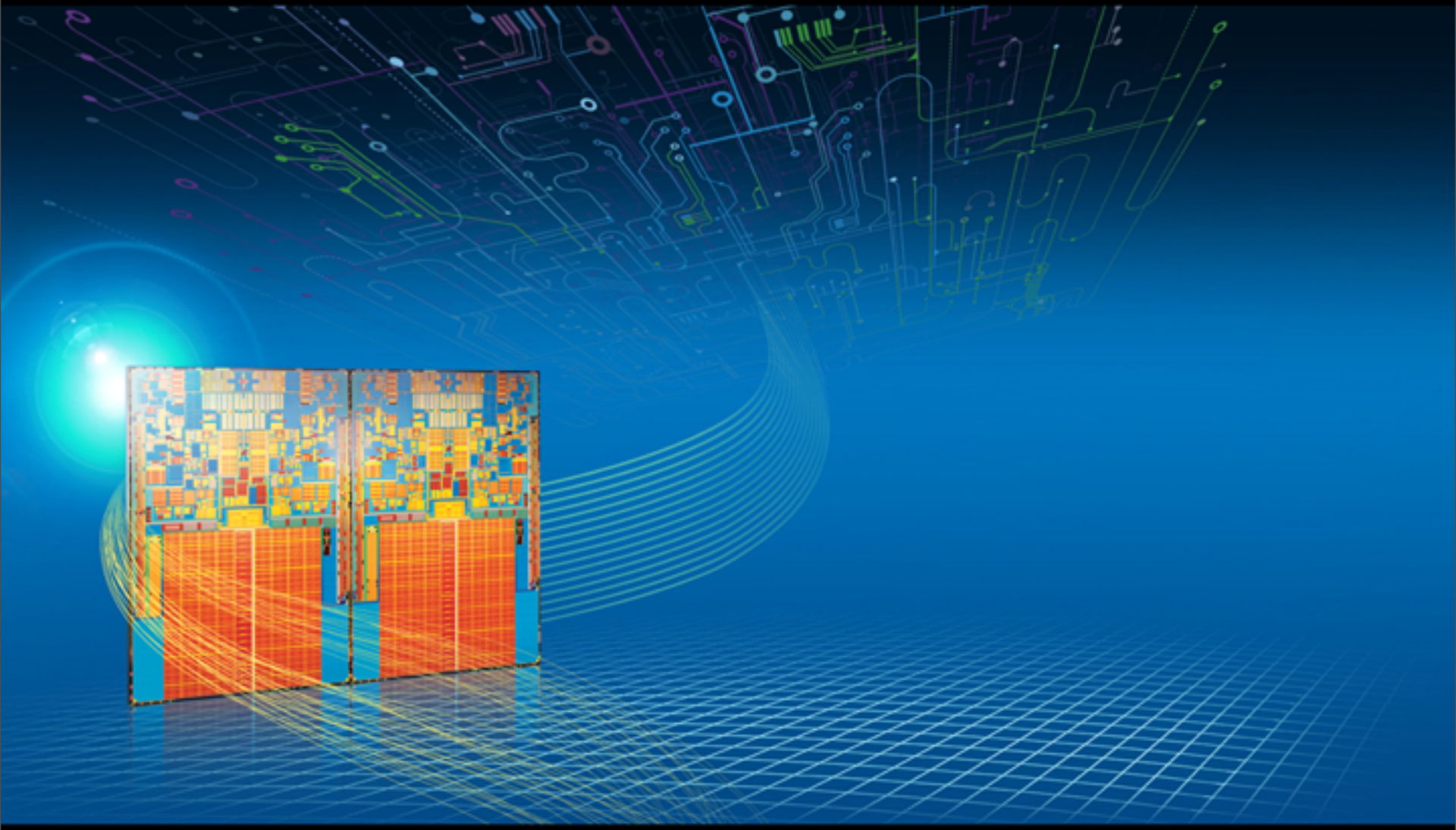
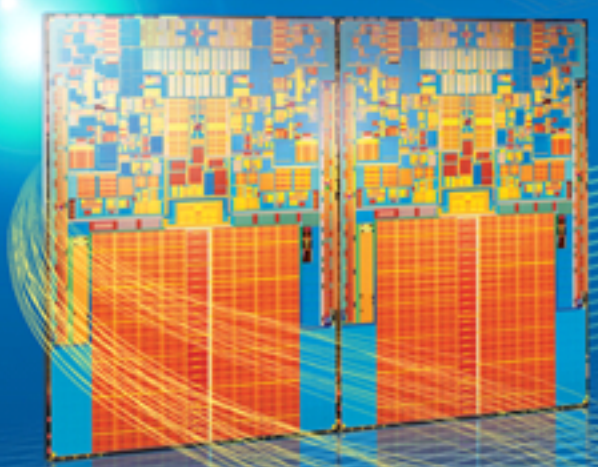

2007
2008
2009



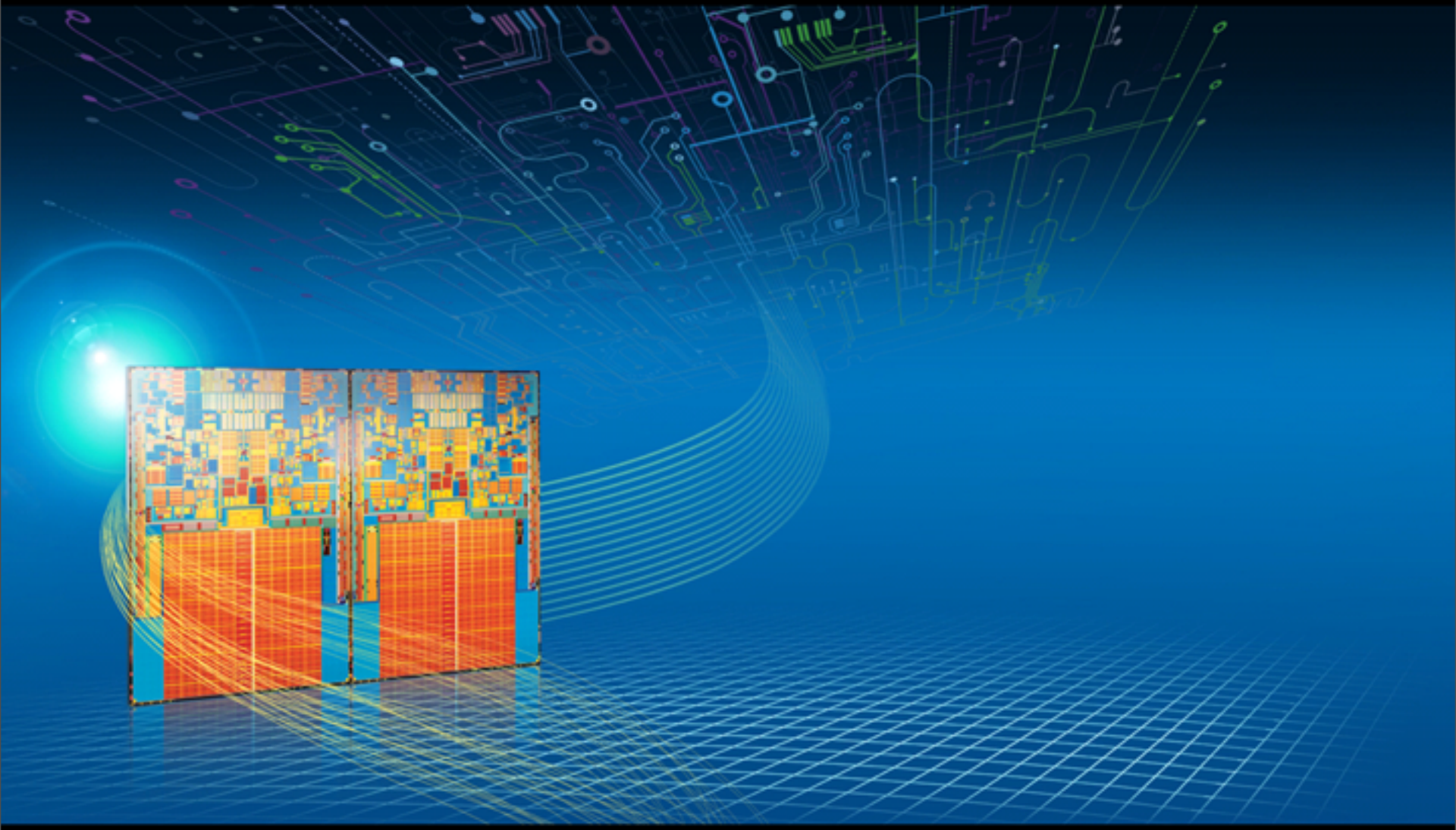
DEMO!!!



SSD = Processor amplifier

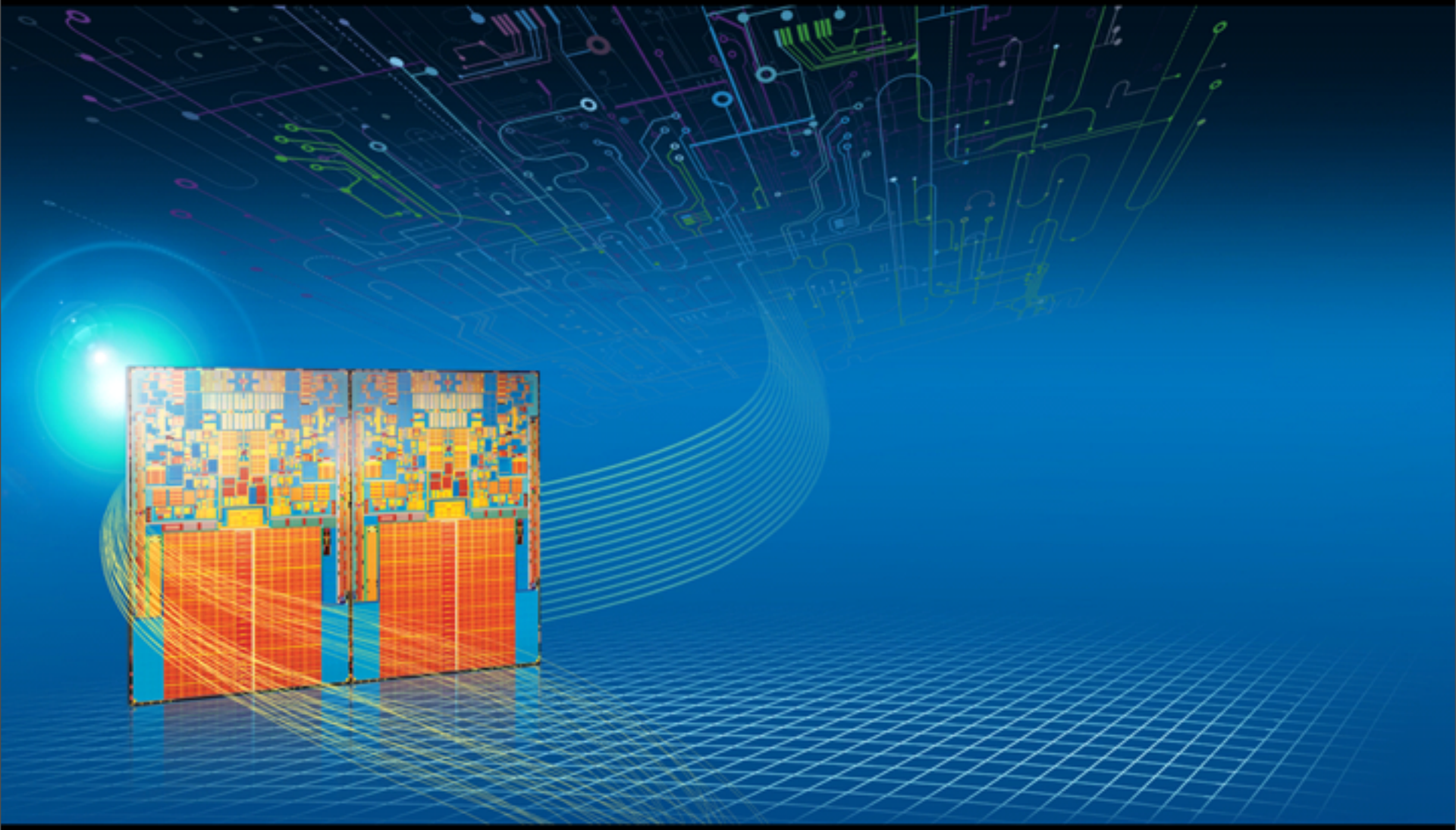


- 100% CPU utilization on pictures
- Dual SSD RAID 0 Maxed
- Rich User Interface needs low latencies



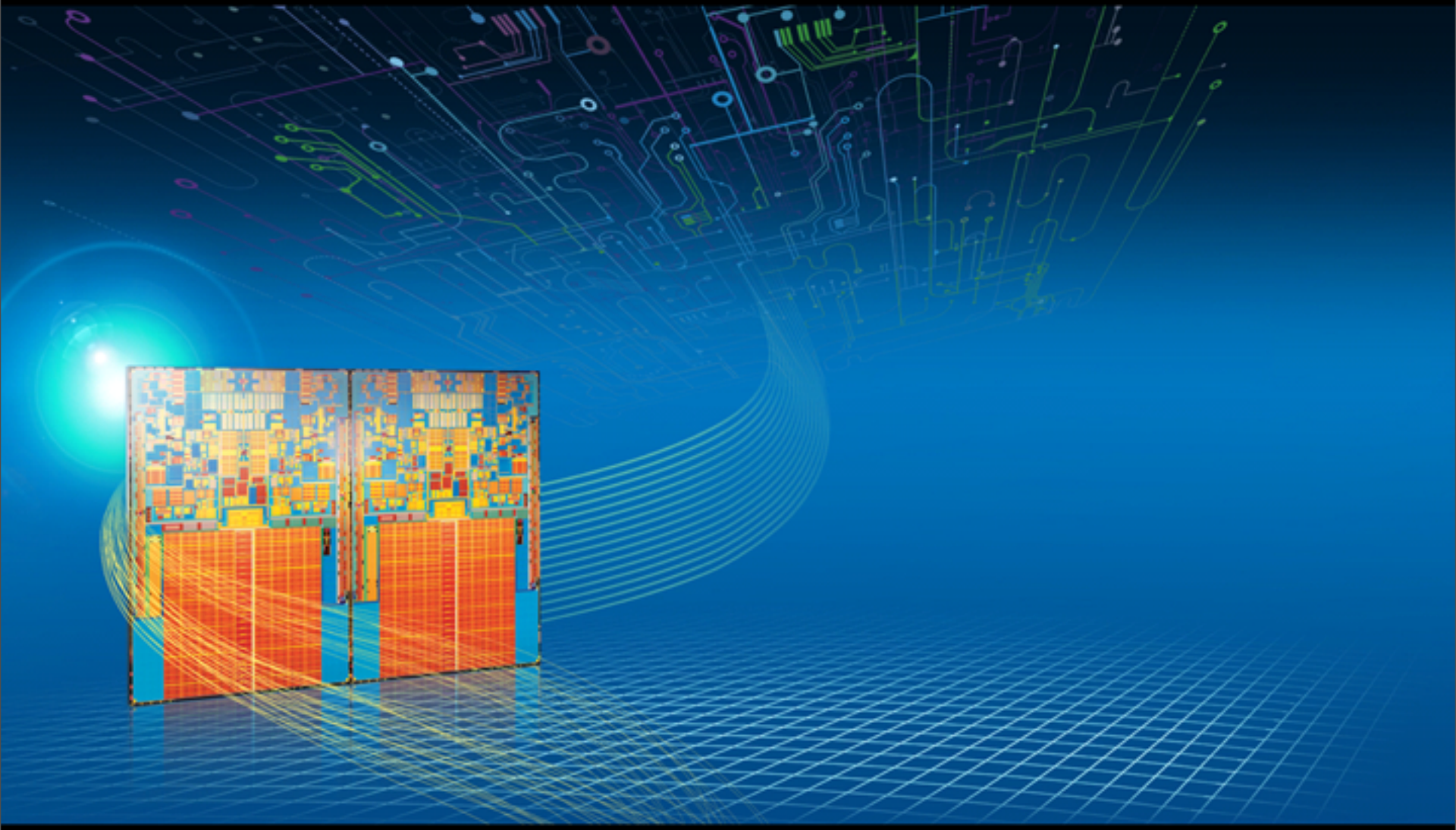
ERA of Parallelism

- 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?