



3D XPoint Today: Any Change?

Jim Handy

**OBJECTIVE
ANALYSIS**

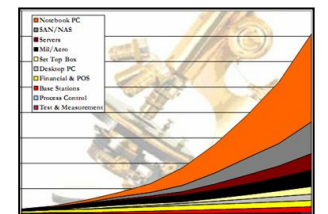
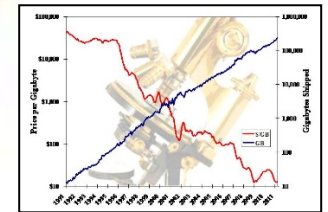
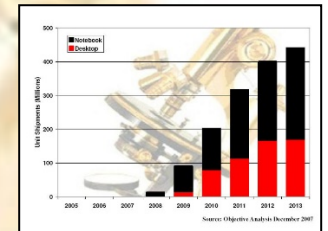
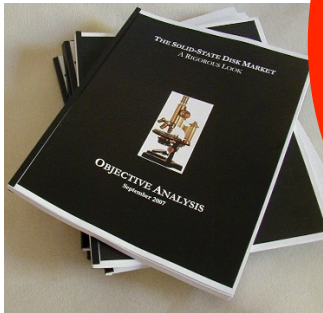
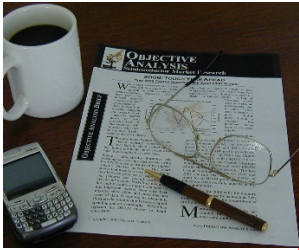
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Objective Analysis

Semiconductor Forecast Accuracy

Year	Forecast	Actual
<u>2008</u>	Zero growth at best.	-3%
<u>2009</u>	Growth in the mid teens	-9%
<u>2010</u>	Should approach 30%	32%
<u>2011</u>	Muted revenue growth: 5%	0%
<u>2012</u>	Revenues drop as much as -5%	-2.7%
<u>2013</u>	Revenues increase nearly 10%	4.9%
<u>2014</u>	Revenues up 20%+	9.9%
<u>2015</u>	Revenues up ~10%	-0.2%
<u>2016</u>	Revenues up ~10%	TBD

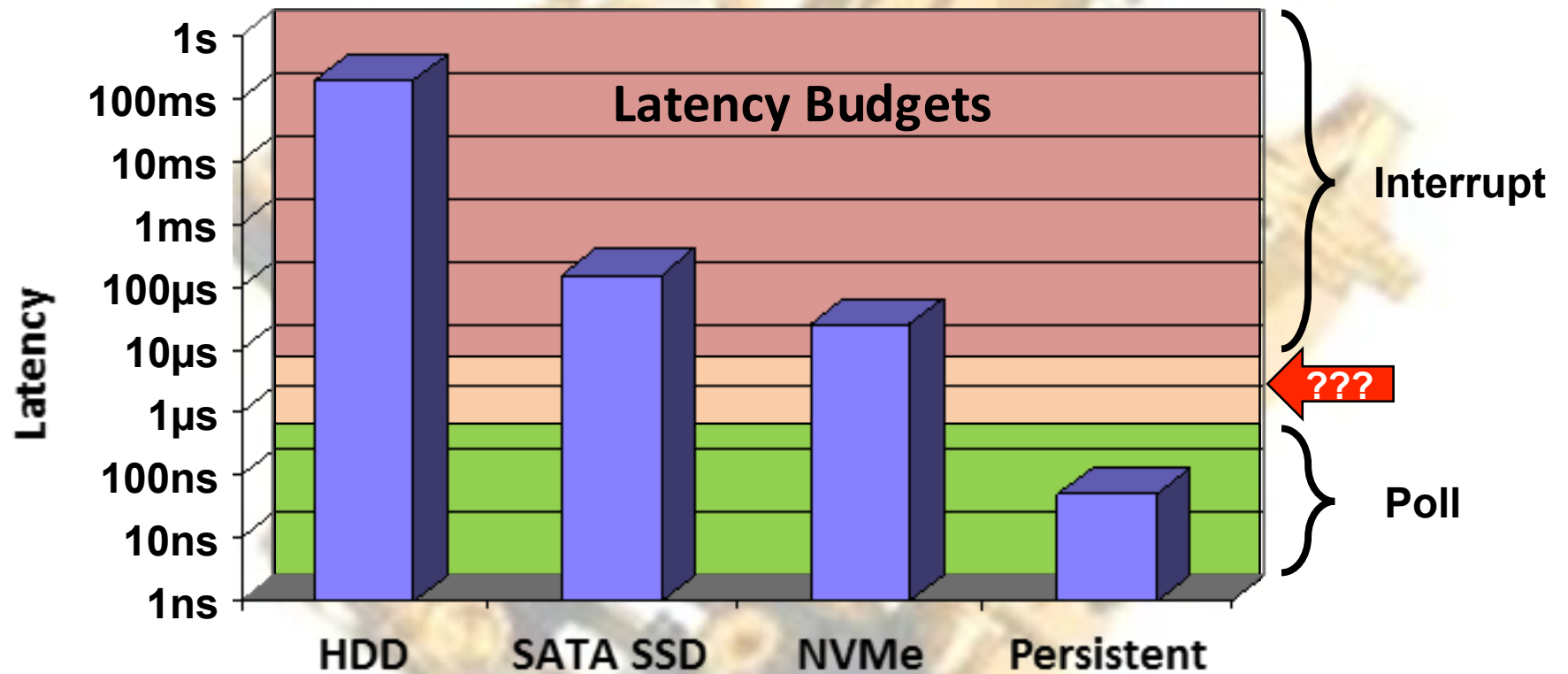
Last Year's Summary

- New layer necessary... eventually!
 - 3D XPoint shows promise
- Lots of support will be required
 - Hardware, software, standards
- Getting pricing below DRAM will be tough
 - Smaller die size isn't the only factor
- Don't expect big changes soon

What's New?

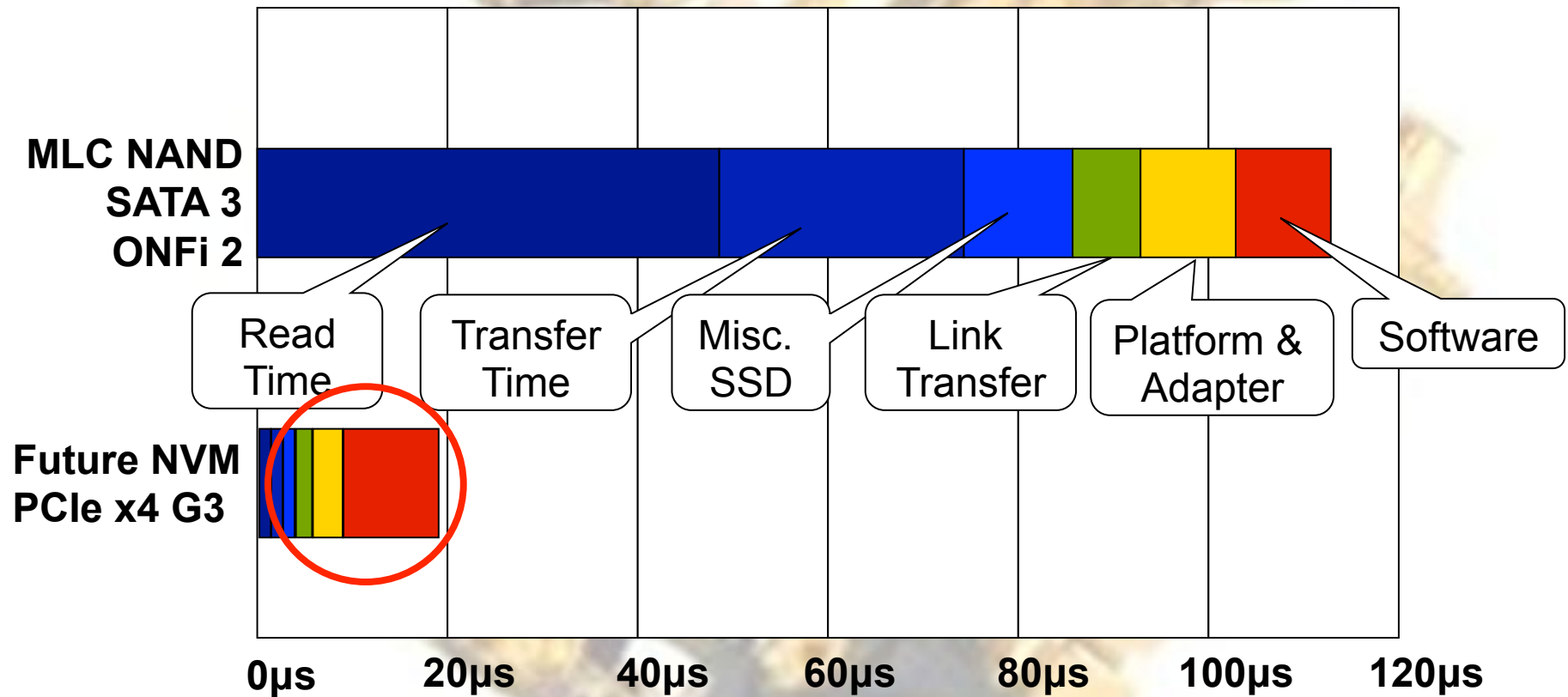
- Support on DDR4 bus can be done
 - Poll on a status bit
 - Faster (!) than an interrupt
- PCIe squanders its speed advantage
 - Too much overhead
 - 1,000X performance advantage drops to 7-8X
- SNIA has NVM Programming Standard
- Product is sampling to select customers
- Intel/Micron still won't say what's inside!

Polling Instead of Interrupts



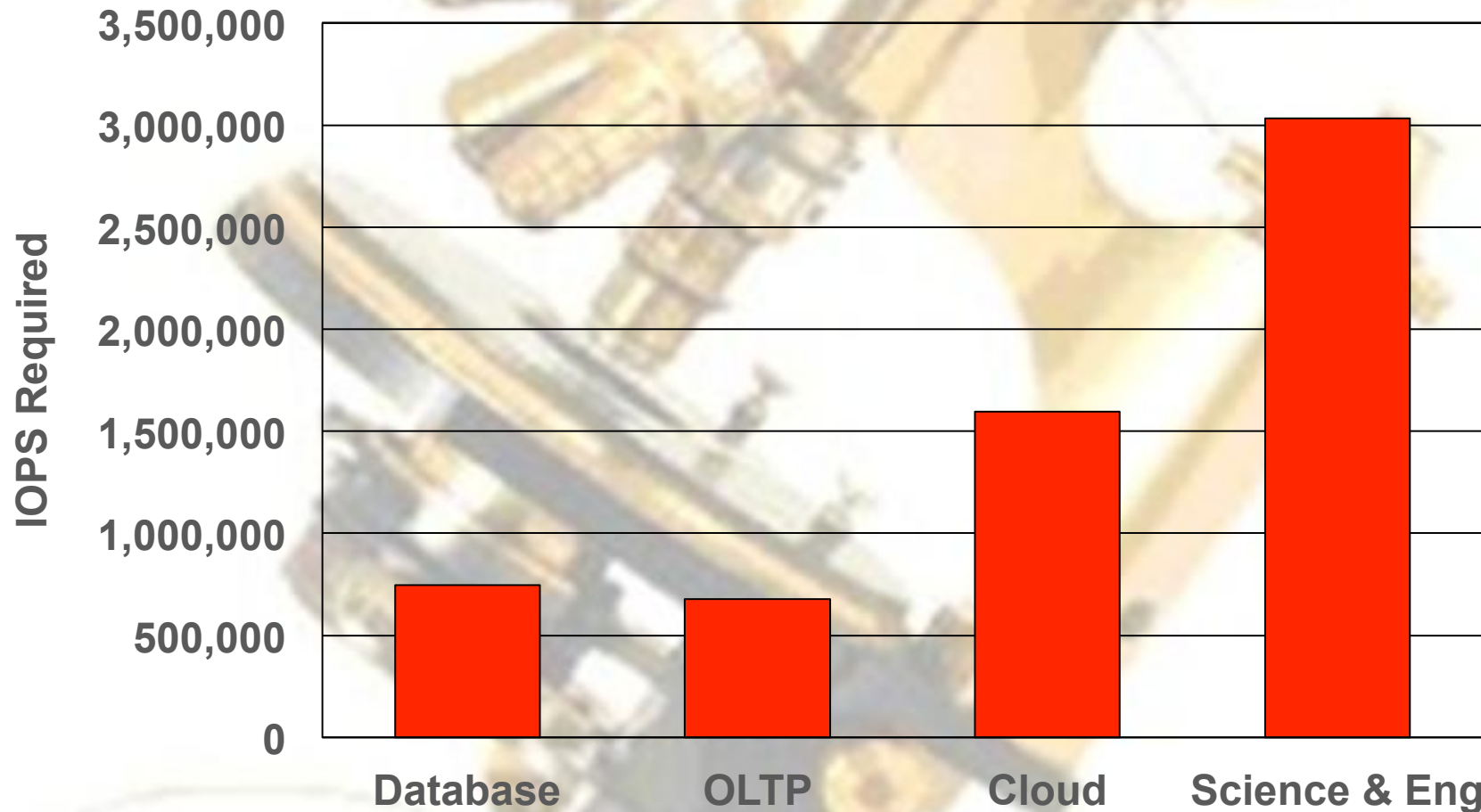
Source: SNIA

Wasting a Speed Advantage



Source: SNIA

Average IOPS by Application



From: *How Many IOPS Do You Really Need?* Objective Analysis & Coughlin Assoc.

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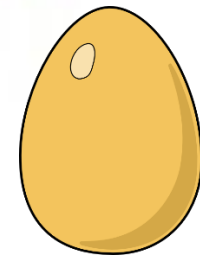
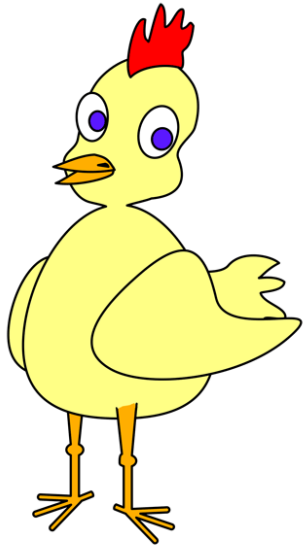


The Cost Issue

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A Chicken & Egg Problem

- 3D XPoint will be sell in volume once it's priced lower than DRAM
- 3D XPoint prices will fall below DRAM once the volume is high enough



Why Lose Money?

- Intel can sell more expensive processors
 - \$50 higher ASP by losing \$10 on each XPoint sale
- Micron may sell only through Intel
 - Intel is probably making it worthwhile for Micron
- Other memory makers may have a harder time

Summary

- Standard DDR4 can support slower parts
- Likely to be polled, not interrupted
- It's better suited to DDR4 than PCIe
- Expect for it to lose money for a couple of years



Thank You!

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