

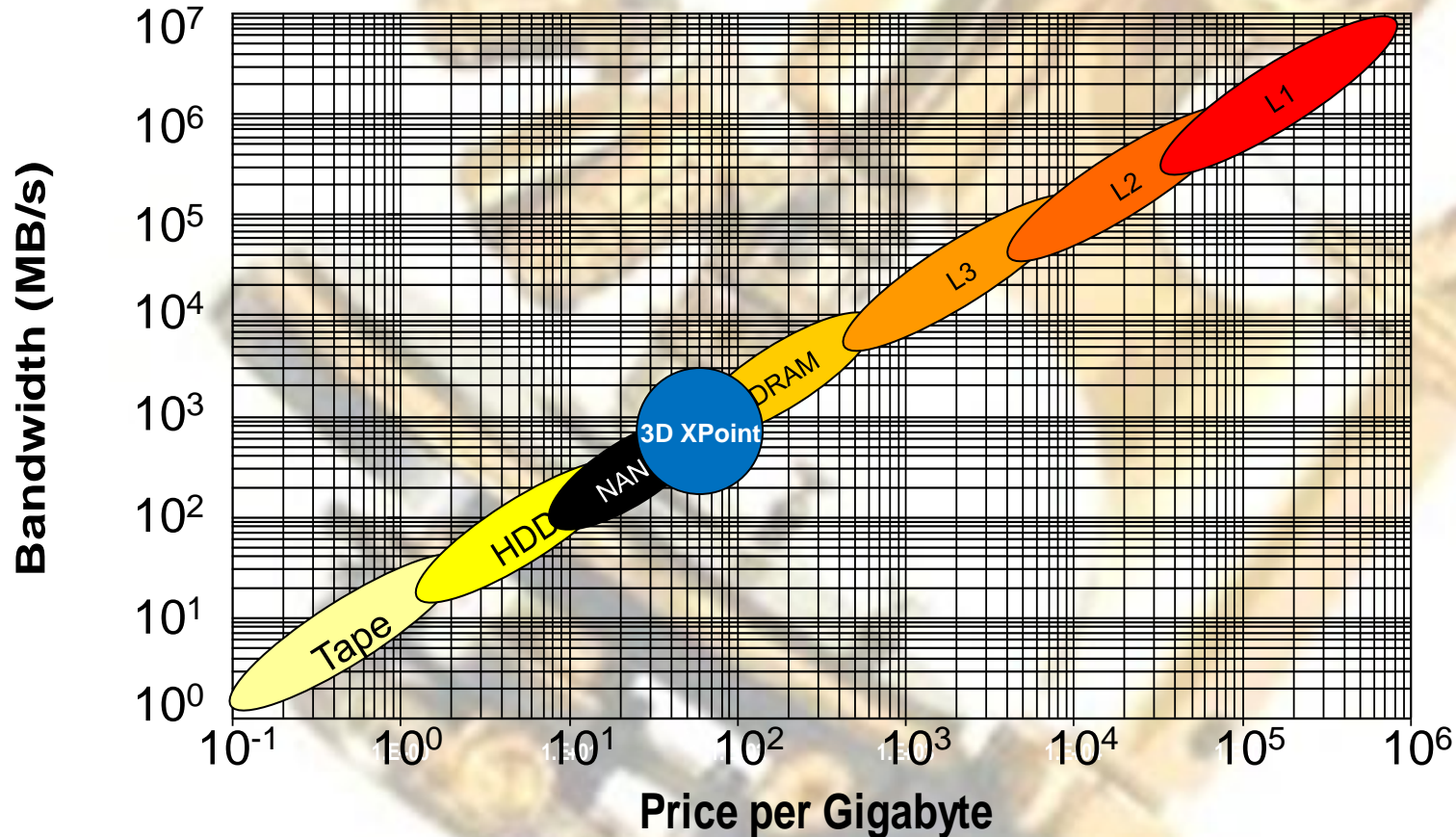


3D XPoint: Speed At What Cost?

Jim Handy

OBJECTIVE ANALYSIS – Semiconductor Market Research

3D XPoint A Good Fit For The Memory/Storage Hierarchy



Cost/Performance MUST Fit The Hierarchy!

From: Solid State Drives in the Enterprise

Biggest Market: DIMMs in Servers

- 3D XPoint “Optane” SSDs are slow
 - 3D XPoint: 1,000 times as fast as NAND flash
 - Optane SSD 7-8 times as fast as NAND SSD
 - NVMe interface & I/O stack undermine speed advantage
- XPoint DIMMs will succeed in data centers
 - Provide most of 3D XPoint’s speed benefit
 - Server users will understand the advantage
 - Hard for PC consumers to understand

Three Factors Determine Cost

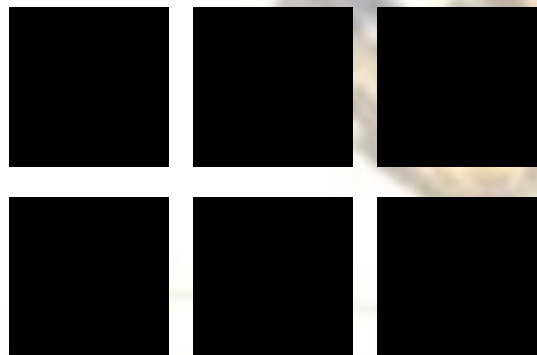
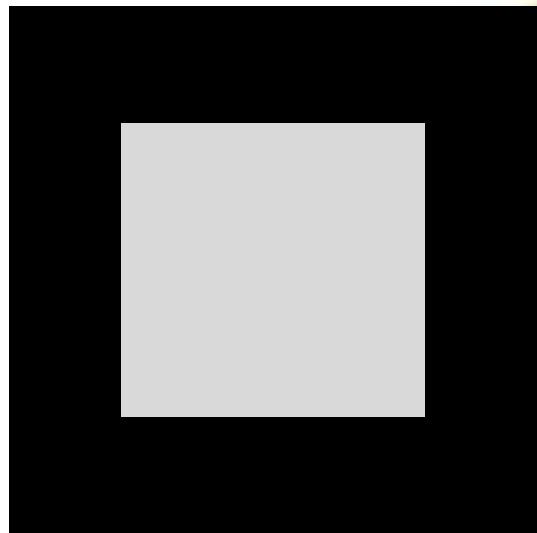
- Die area
 - How many gigabytes fit on a 300mm wafer?
 - Intel/Micron: “Twice as dense as DRAM”
- Process peculiarities
 - Does this wafer cost more than standard silicon?
 - XPoint uses new materials
- Volume
 - Perhaps the most important factor



3D XPoint will lose
money its first 2+ years.

Who can afford that?!?!?

Only Intel Can Do This



| Intel | Micron/ Others |
|---|---|
| <ul style="list-style-type: none">• CPU: \$50 more | |
| <ul style="list-style-type: none">• XPoint: Lose \$10 | <ul style="list-style-type: none">• XPoint: Lose \$10 |



Thank You!

Jim Handy

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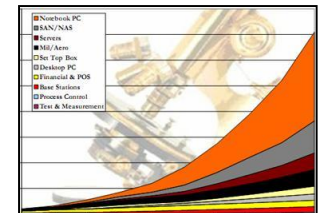
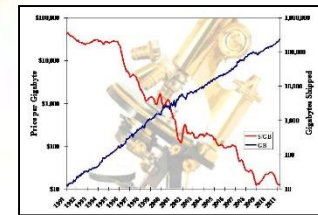
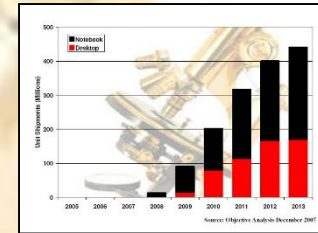
OBJECTIVE ANALYSIS



**Profound
Analysts**

**Reports &
Services**

**Custom
Consulting**



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% | 1.1% |
| <u>2017</u> | Revenues up ~20% | TBD |