

SSD in Enterprise Storage

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New Dynamics in the Storage World

A.k.a. – What problem are we trying to solve?



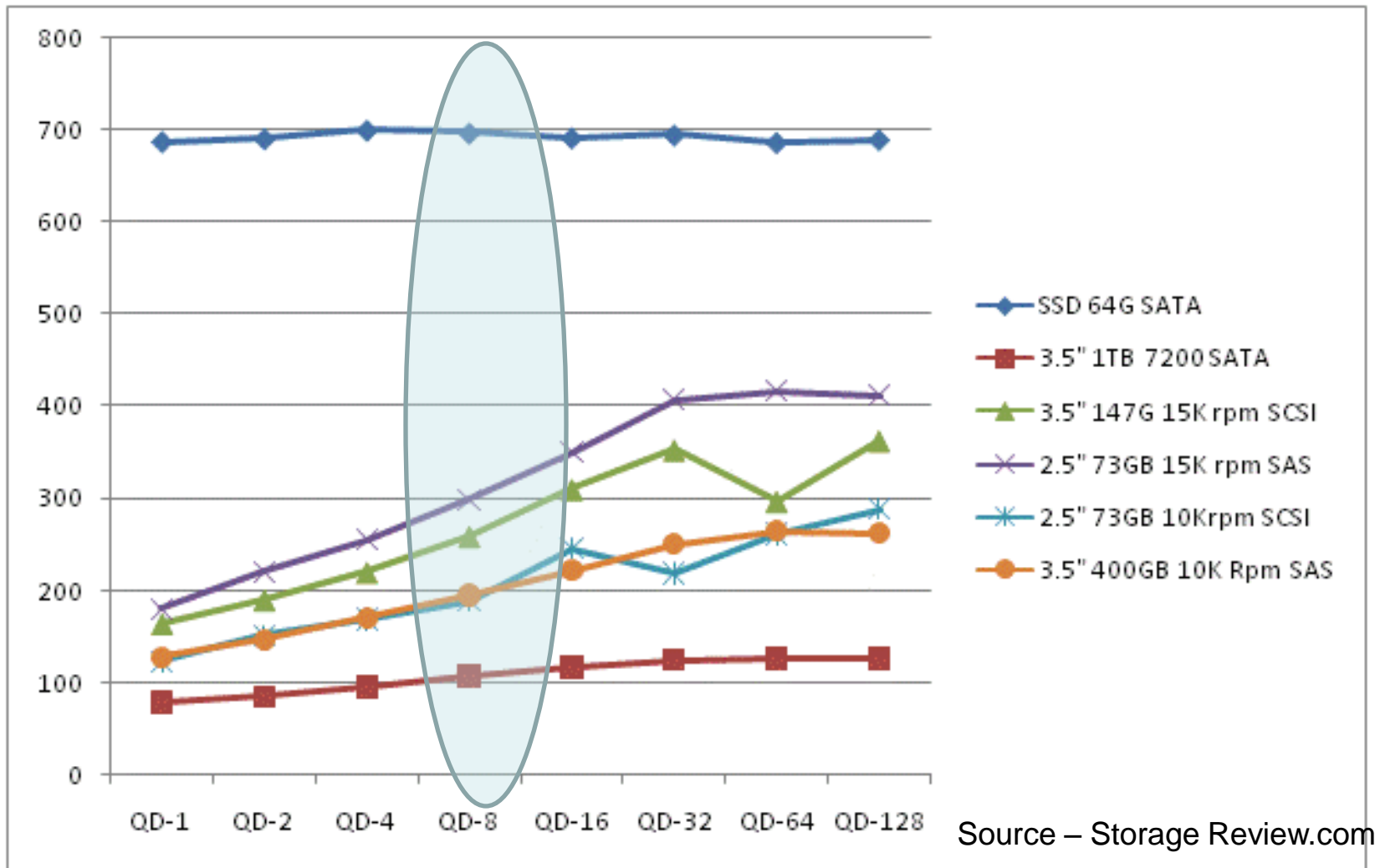
Creating Content – Finding/Storing Content – Buying/Consuming Content
What Matters ? ... BOTH Storage Performance and Storage Capacity

SAMSUNG

Samsung Storage...at the speed of imagination

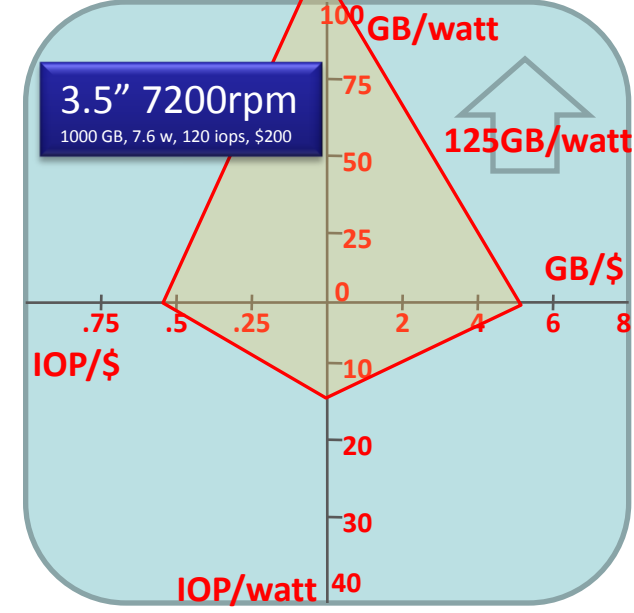
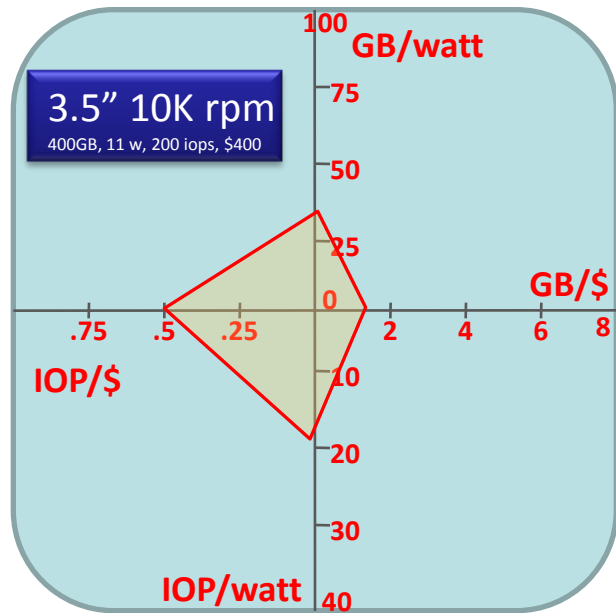
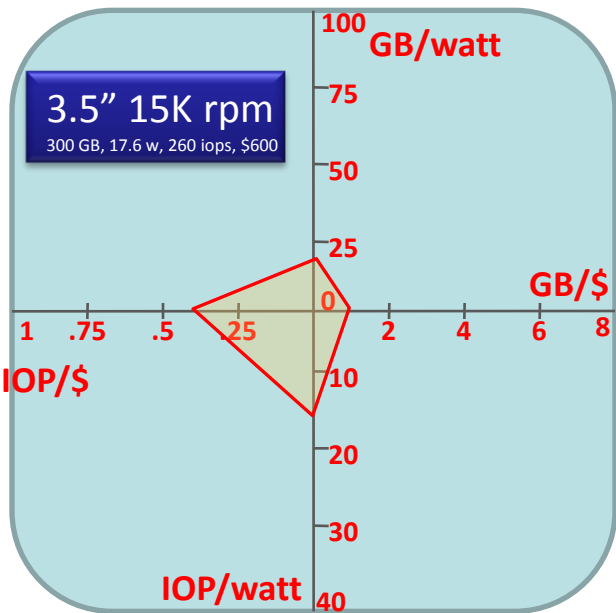
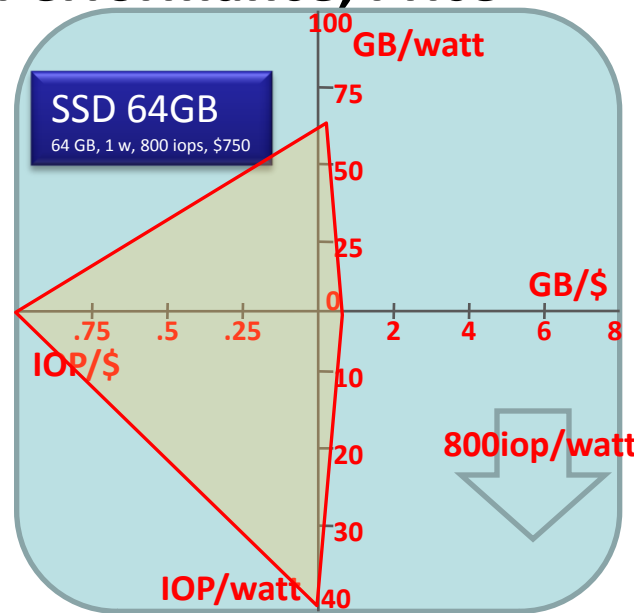
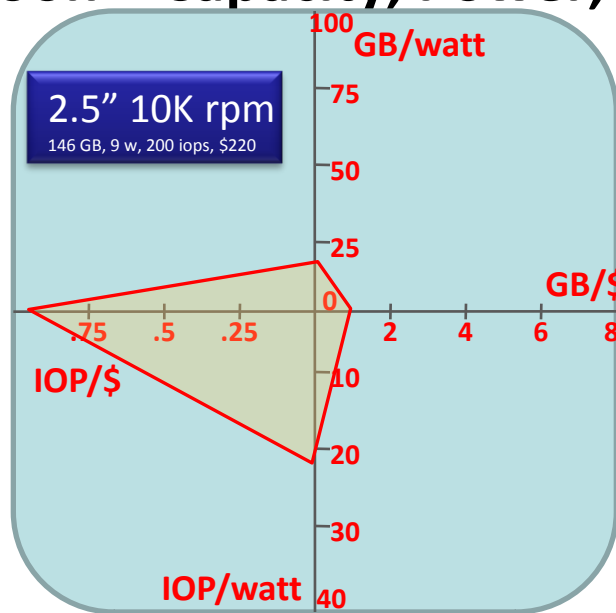
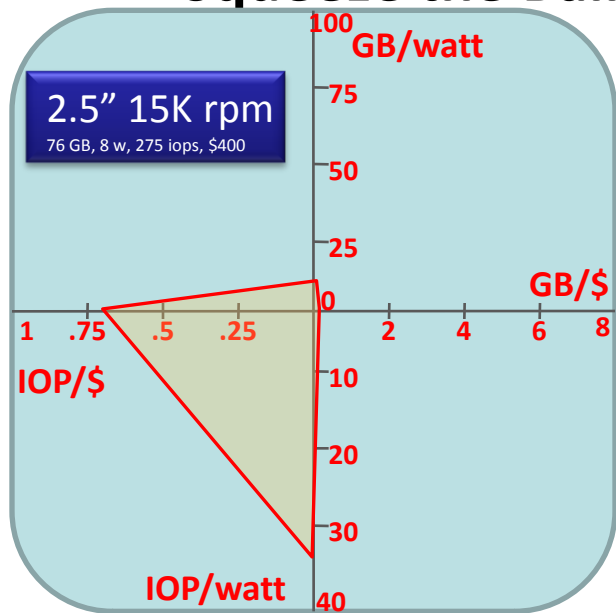


Storage Performance (IOmeter FileServer)



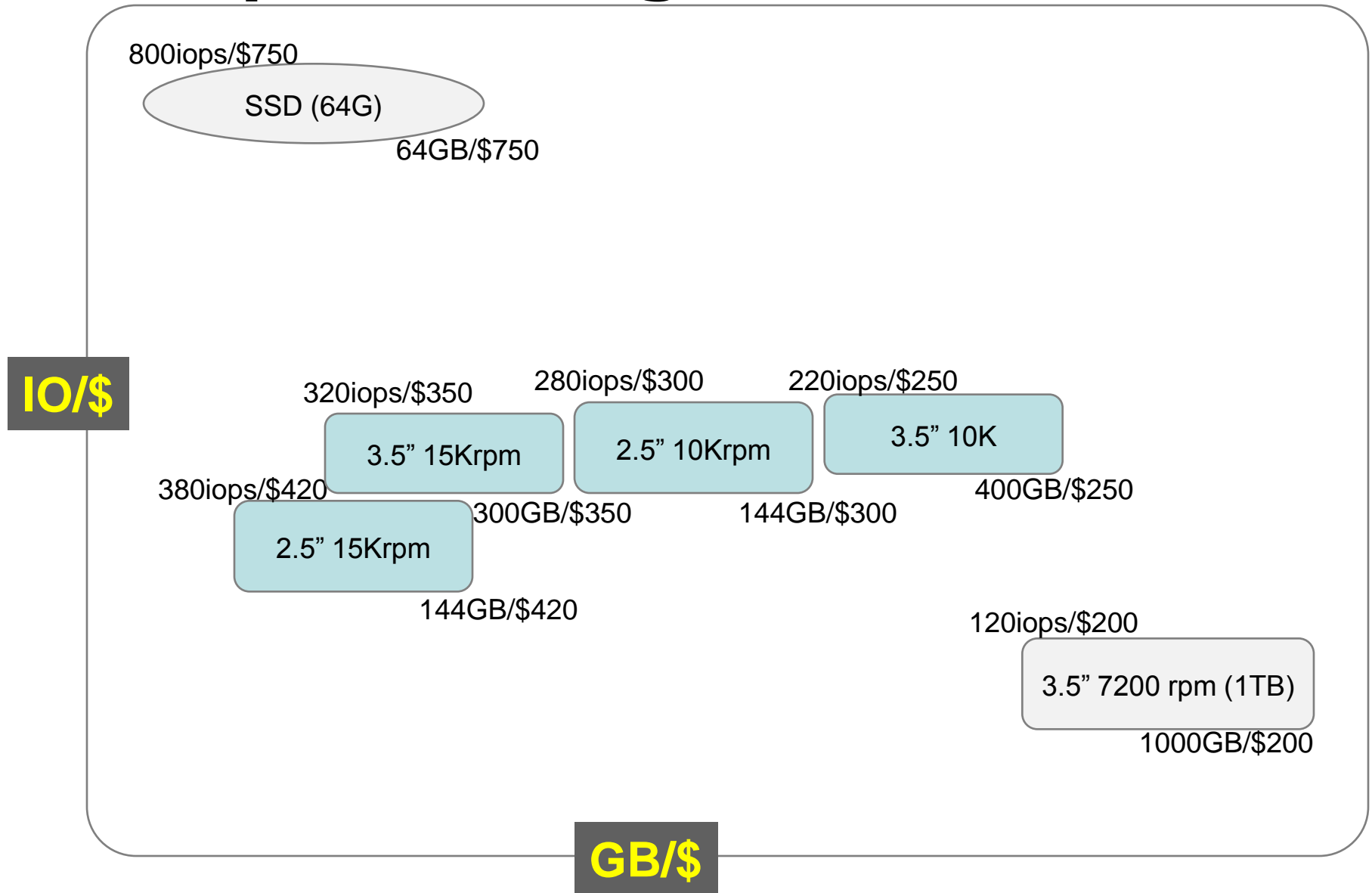
Clear, real-world Storage Performance
Our customers deserve clarity

Squeeze the Balloon – Capacity, Power, Performance, Price

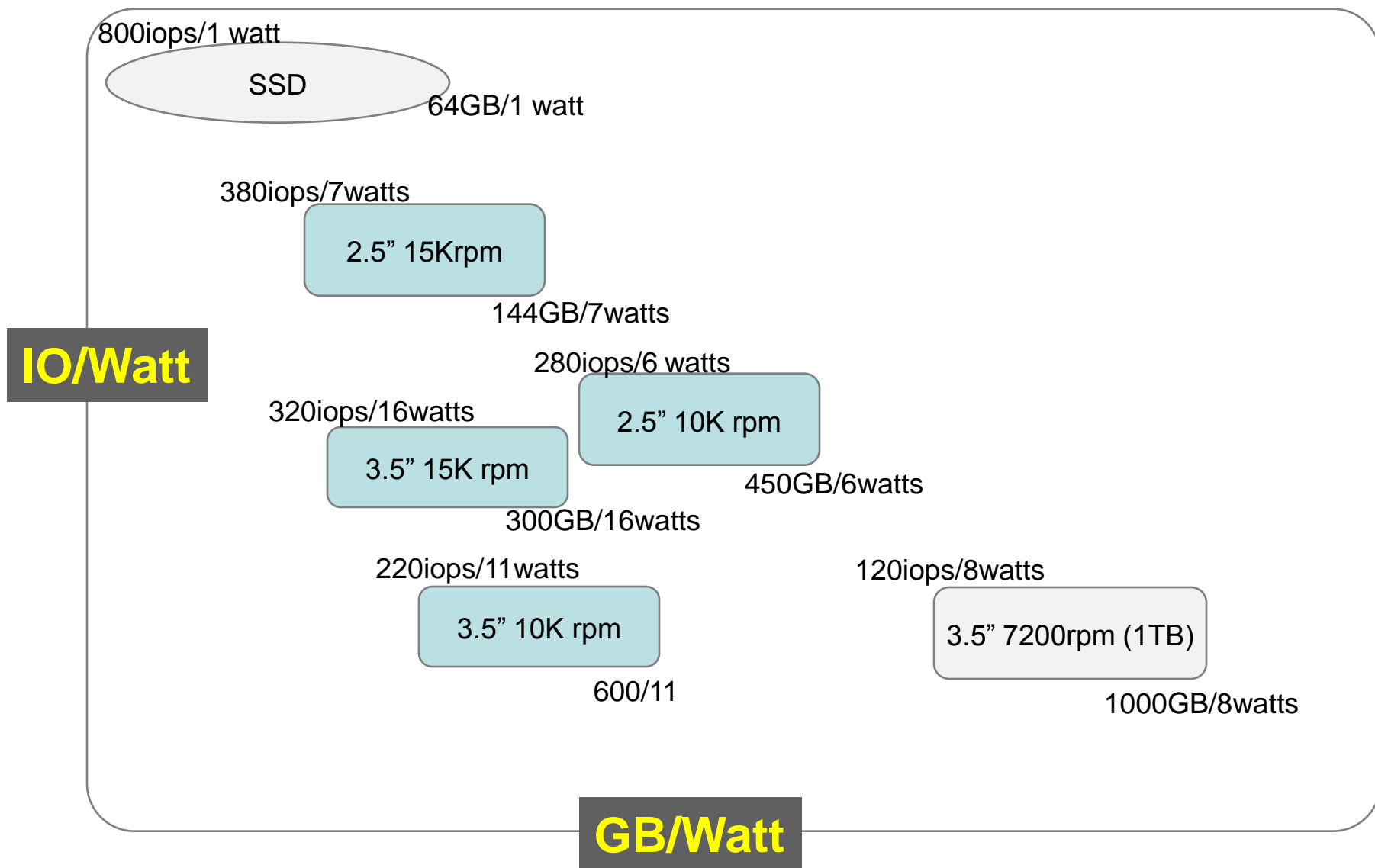


Samsung Storage...at the speed of imagination

Enterprise Storage: IOP/\$ and GB/\$



Enterprise Storage: IOP/watt and GB/watt



Case Study

- Internet Service Provider - medical office software (real)
- Workload is mostly database – scheduling, billing, insurance claim processing. Very limited scanned documents
- 3,000 to 5,000 simultaneous users
- Capacity: **8.6 TB** - 60 drives – 15,000 rpm
- Storage Performance: **12,000** IOPs at typical Queue depth of 8

15K rpm (PO)		
IOP/watt	15.1	bad
IOP/\$	0.29	bad
GB/watt	8.7	bad
GB/\$	0.16	bad
TCO		
initial cost \$	52,257	bad
power \$	4,892.43	bad

SSD (PO)		
IOP/watt	376.0	very good indeed
IOP/\$	1.00	very good indeed
GB/watt	38.5	good
GB/\$	0.10	bad
TCO		
initial cost \$	83,984	not so good
power \$	\$1,100.80	good

SSD + 7200 1TB (PO + CO)		
IOP/watt	28.4	good, 2x 15Krpm
IOP/\$	0.31	OK, same as 15Krpm
GB/watt	83.5	very good indeed
GB/\$	0.91	very good indeed
TCO		
initial cost \$	38,824	good
power \$	2,081.72	good

(PO) = Performance Optimized
(CO) = Capacity Optimized

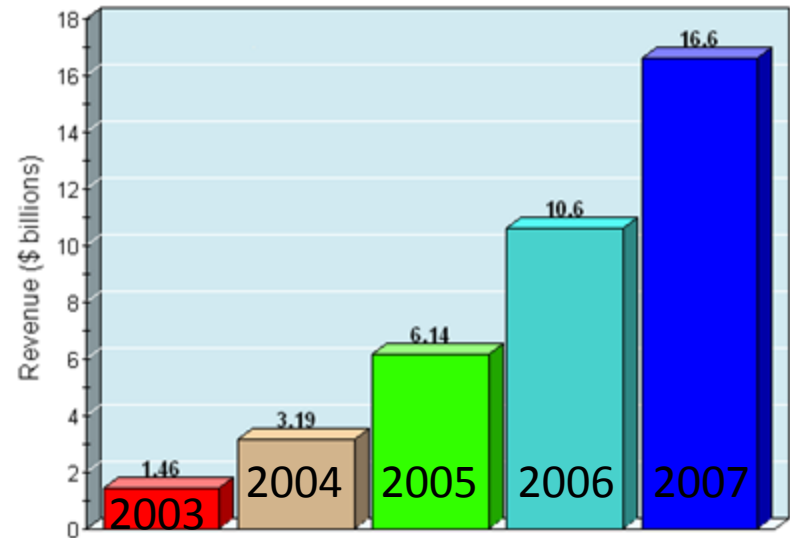
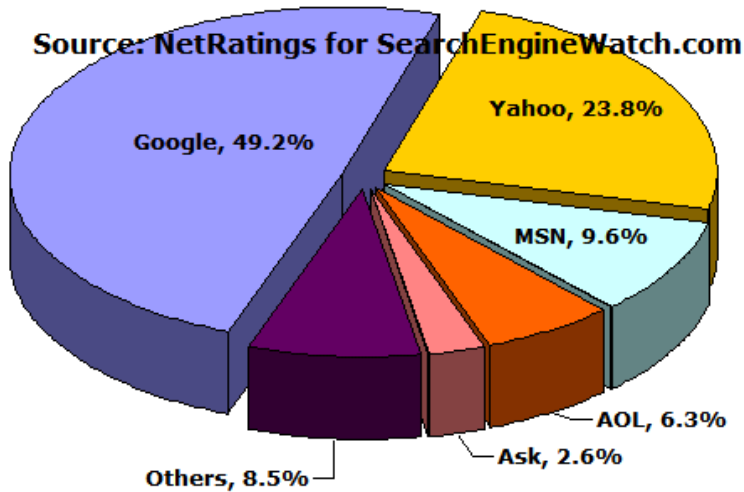
Conclusion

- Enterprise SSD Drivers –
 - User experience – business need to capture users (ad based), good user experience drives market share
 - Economics – the business need to deliver affordable performance and affordable capacity and low power
- Enterprise SSD Enablers –
 - PO/CO – performance optimized and capacity optimized storage with logic or processes to manage the hot data and cold data
 - SATA Enterprise adoption was the dress rehearsal for SSD adoption
- Call to action –
 - Be good to our customers through consistent use of KPC: IOP/\$, IOP/watt, GB/\$, GB/watt and simpler storage performance

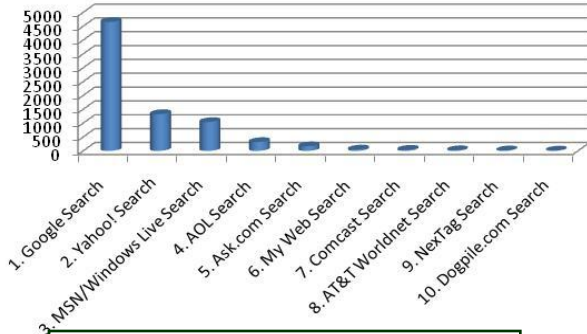
SSD adoption drivers – User Experience, Economics and PO/CO
SSD(PO) adoption requires a bookend: 1TB 7200rpm (CO)

Web Advert Market

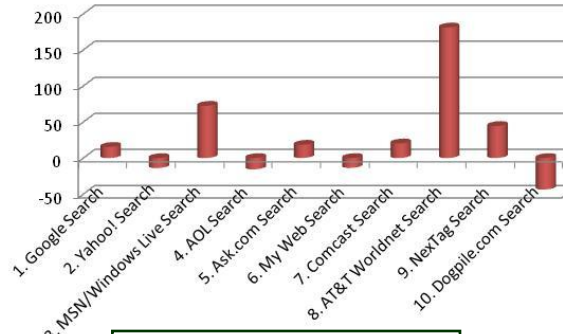
Google Sales Revenue - \$16.6B in 2007



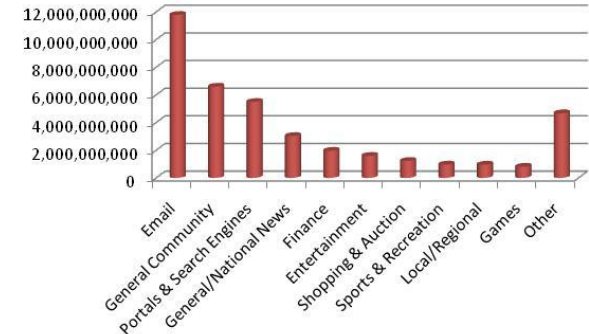
Source – Google annual report 2007



Search MSS (000,000 per month)



Search MSS Growth (%)



Ad Imprints per week (39B)

Neilsen On-Line ad relevance June23-Jun29 2008