

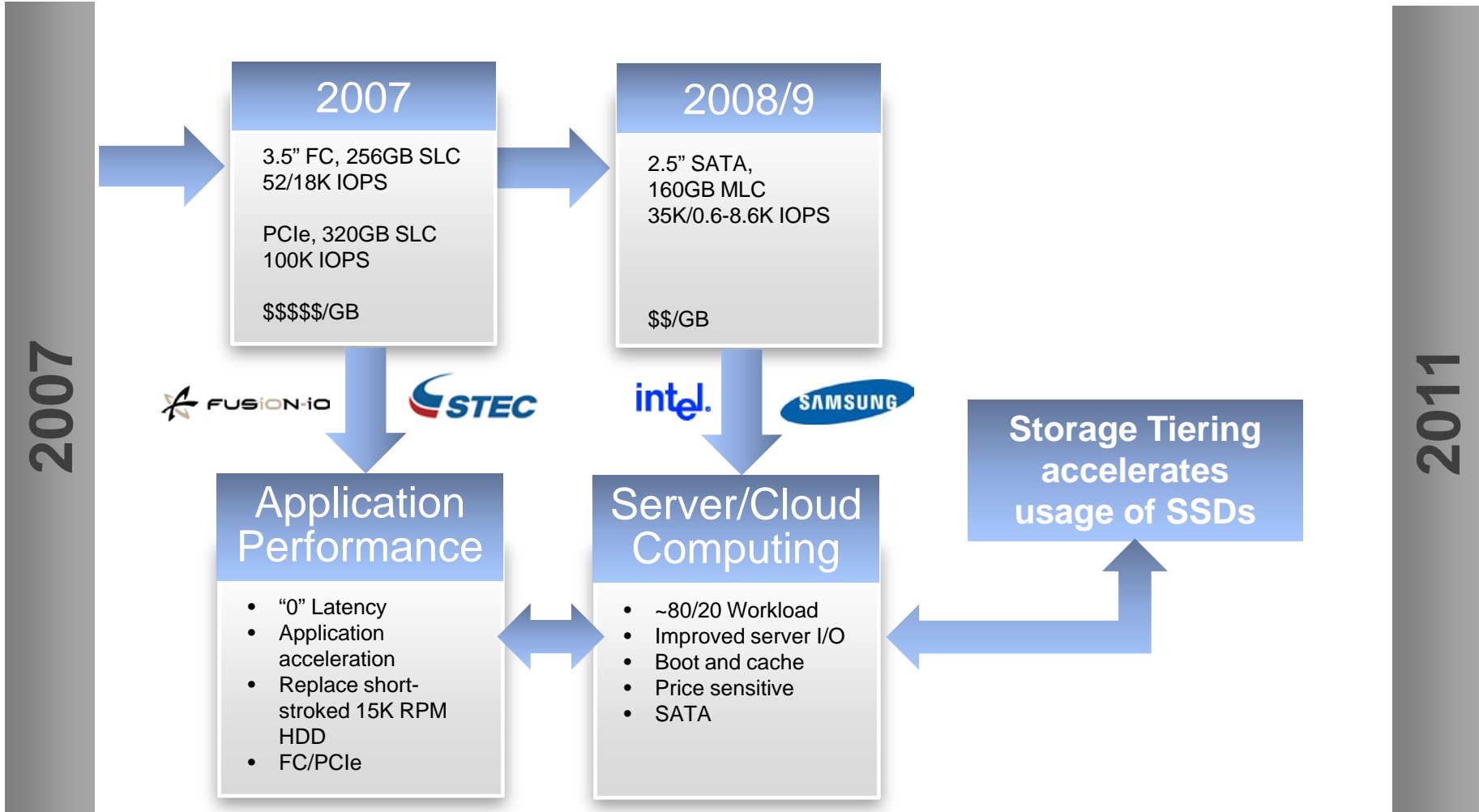


Differentiation in the SSD Market

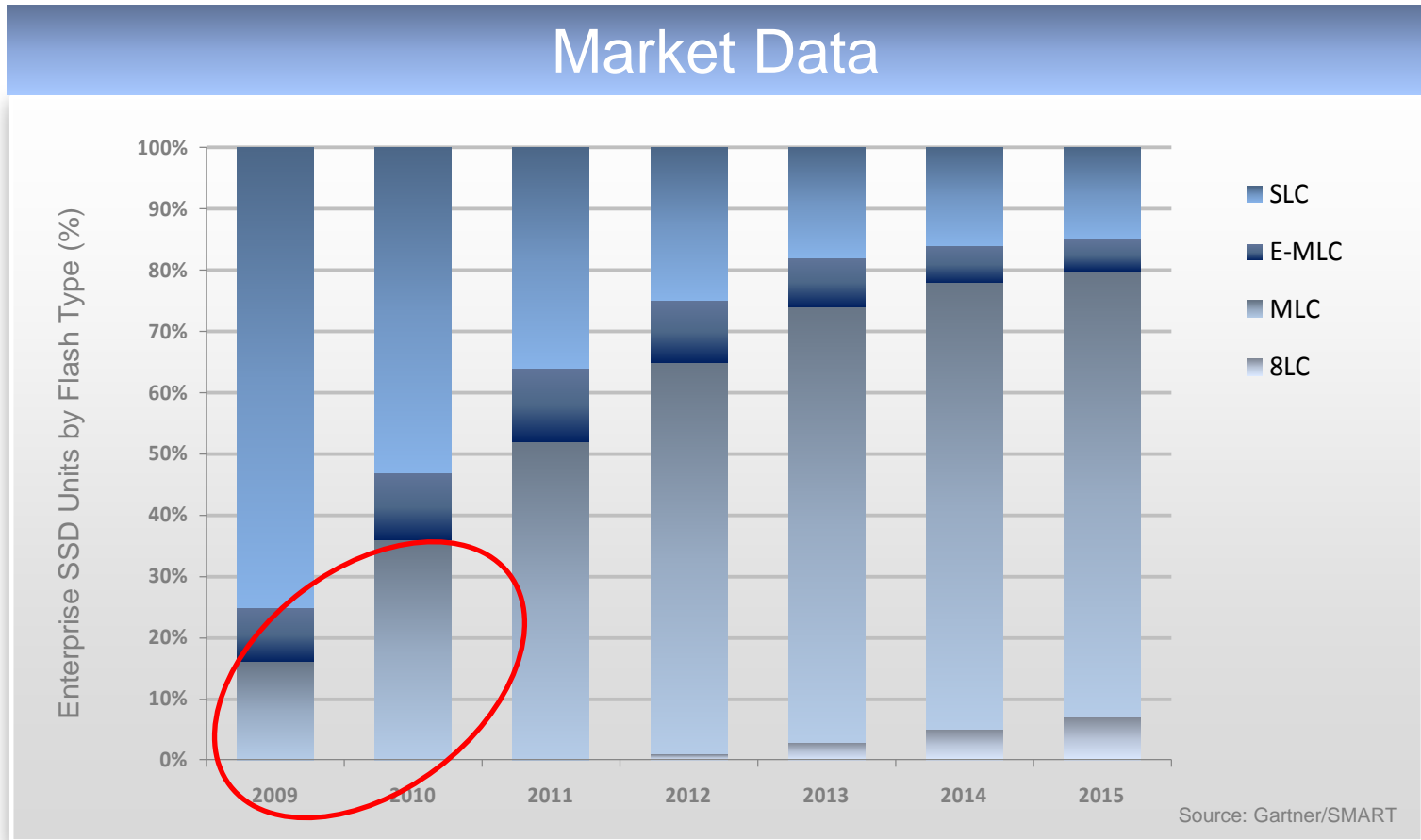
Opportunity for the Enterprise



Enterprise SSD Market History

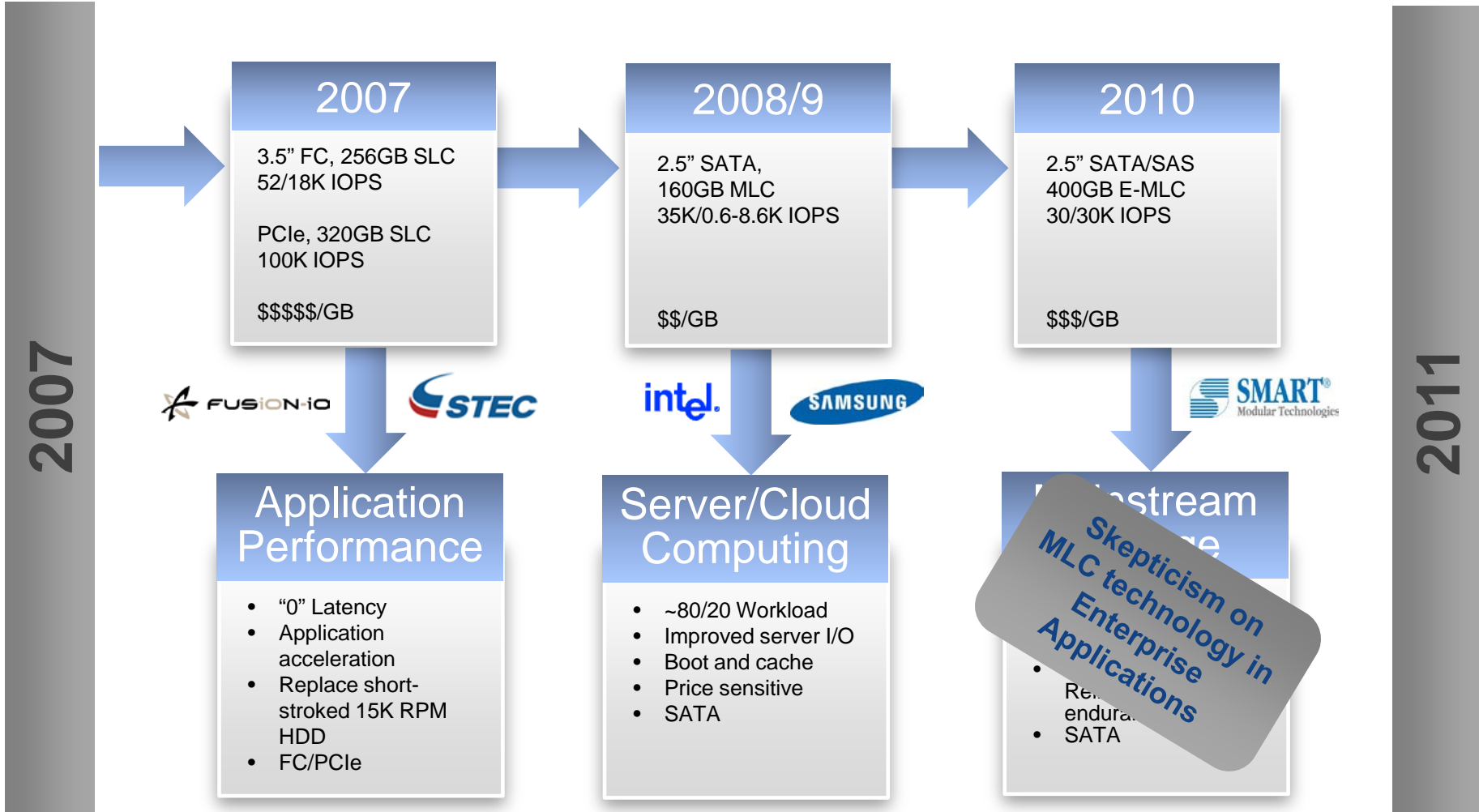


Enterprise market: SLC vs MLC



MLC growth fueled by cost-efficient Entry Server SSD for Server/Cloud computing market

Enterprise SSD Market History



Application Performance

- "0" Latency
- Application acceleration
- Replace short-stroked 15K RPM HDD
- FC/PCIe

Server/Cloud Computing

- ~80/20 Workload
- Improved server I/O
- Boot and cache
- Price sensitive
- SATA

Streamline

- Re...
- endur...
- SATA

Skepticism on MLC technology in Enterprise Applications

Changing Storage Infrastructure

Existing storage infrastructure



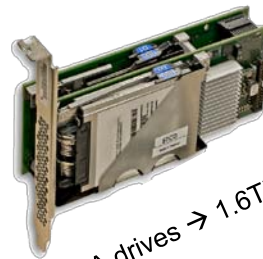
SSD optimized infrastructure



24x 15K RPM HDD



24x 1.8" SATA drives → 4.8TB MLC flash

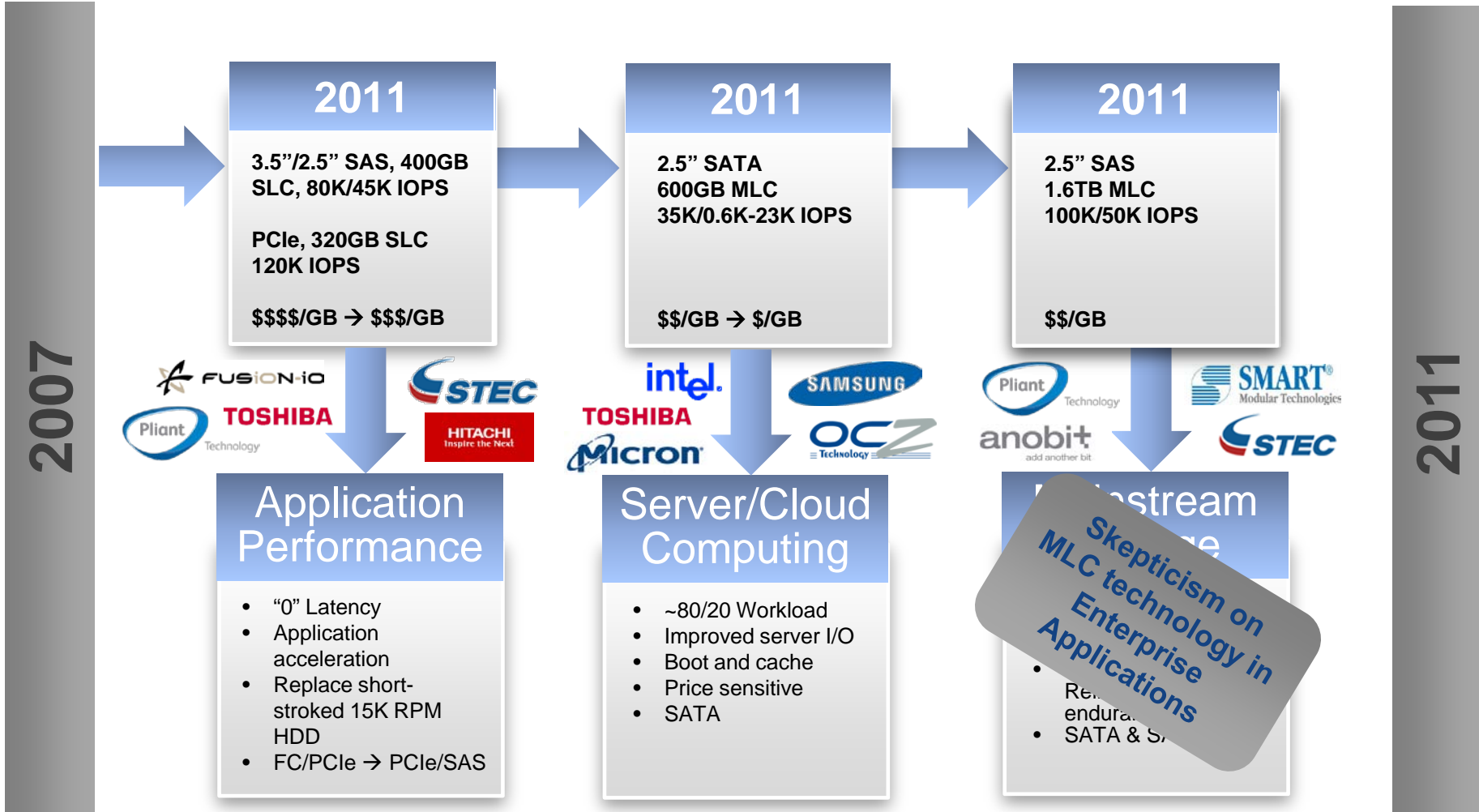


8x 1.8" SATA drives → 1.6TB MLC flash



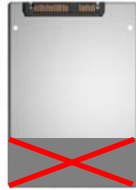
20x 2.5" SAS drives → 40TB MLC flash

One year makes a huge difference: 2010 → 2011

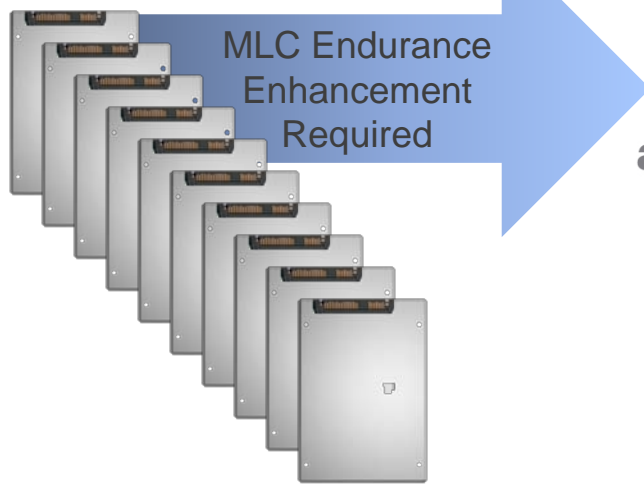


MLC in the Enterprise

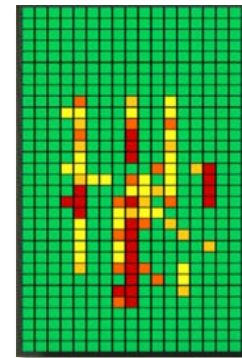
Standard MLC
0.75x
drive writes/day



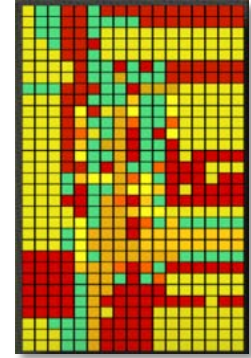
Storage Needs
10x
drive writes/day



WITHOUT Endurance Enhancement

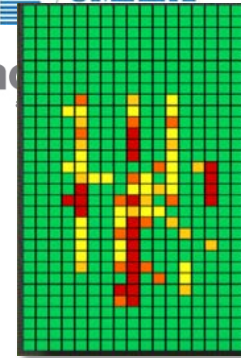


T0

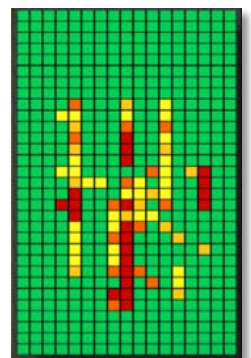


T0 + 5 years

WITH Endurance Enhancement

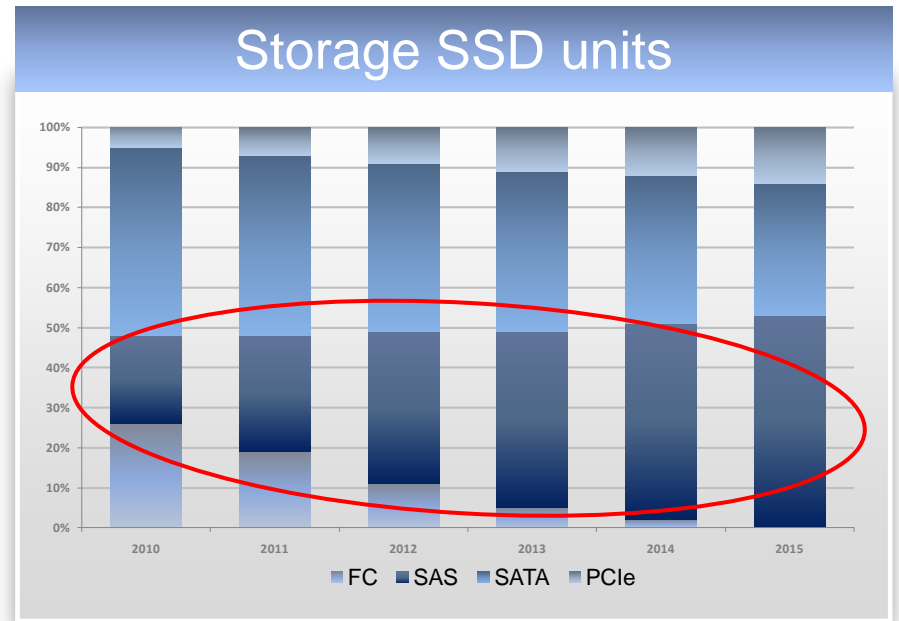
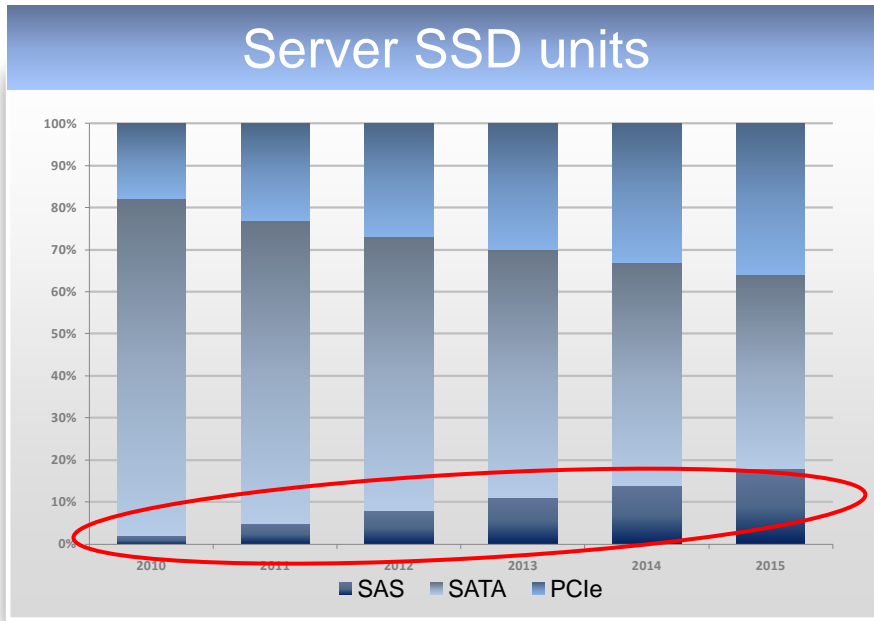


T0



T0 + 5 years

Changing Interface

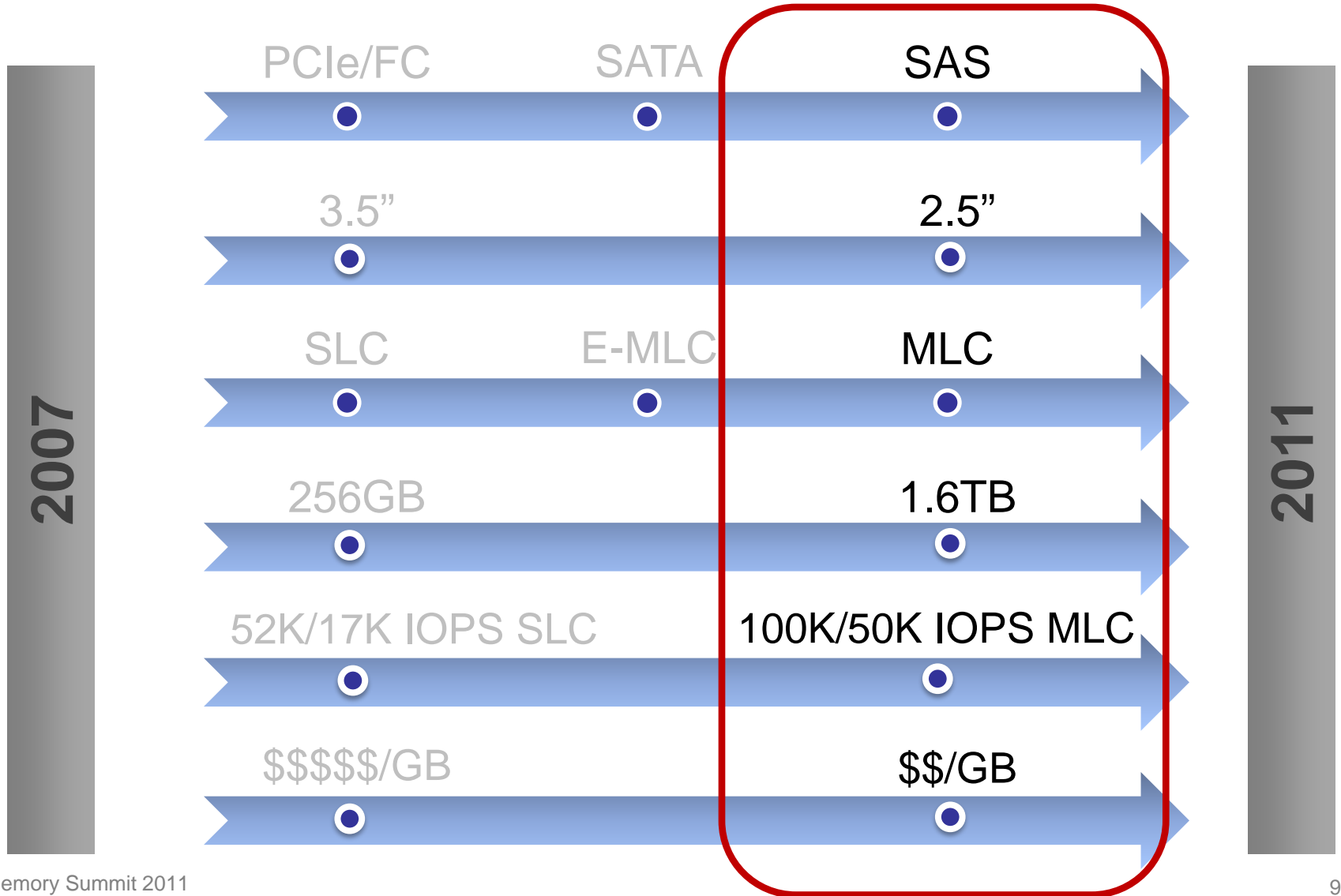


Source: Gartner/SMART

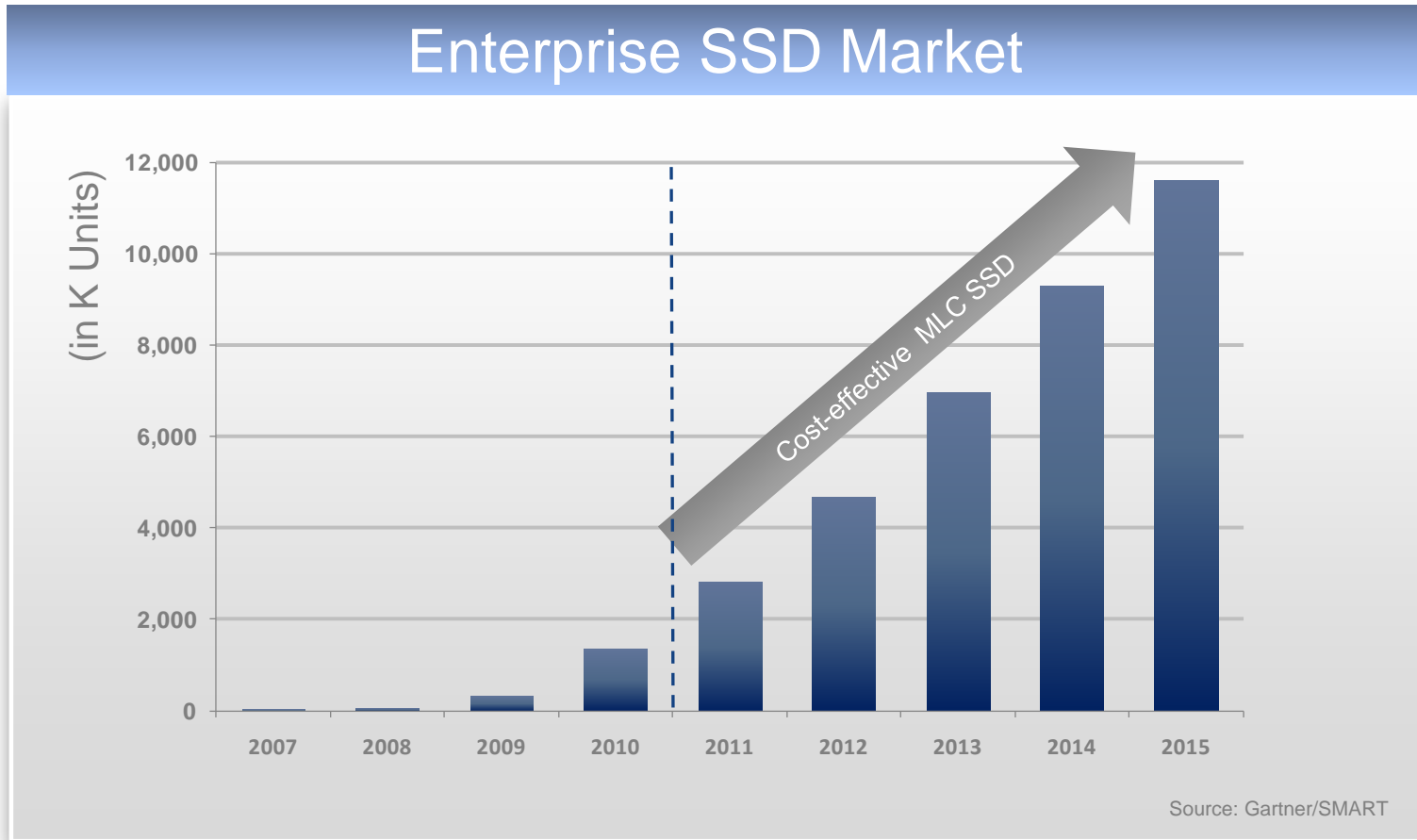
SAS interface growing in importance in the coming years

Low cost SAS MLC enables further SSD adoption in Server Market

Huge Changes in the Market!



Inflection Point



Market Growth Fueled by Cost-effective Enterprise Class SSD

Summary

- First FC and PCIe SSDs enabled high end applications
 - SLC price high, but application pain points higher
- First MLC SSDs enabled entry level server & cloud applications
 - Cost effective, low performance, no enterprise features
- Storage infrastructure is changing to take full advantage of SSD capabilities
- Mass adoption enabled by new breed of Enterprise SSD
 - Cost effective → MLC with endurance enhancements
 - Meet 5 year endurance needs → 10 drive writes/day
 - Enterprise reliability → BER 10^{-17}



Thank You!

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