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X-NAND™ Gen 2

World's Fastest 3D NAND Architecture

August 2023

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Presentation | X-NAND Gen 2 Technology

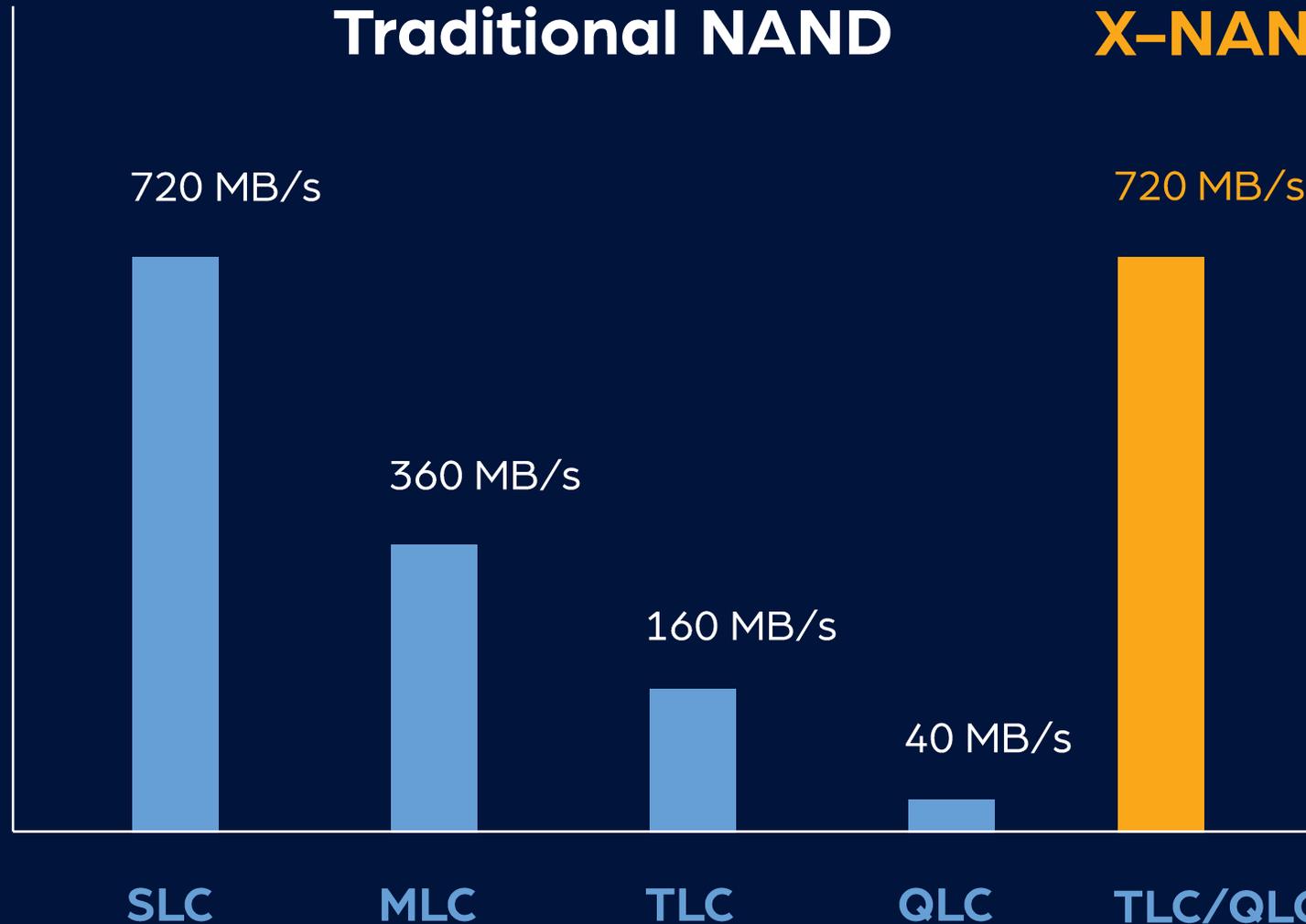
NAND Flash Performance Degradation

X-NAND

Write Speed

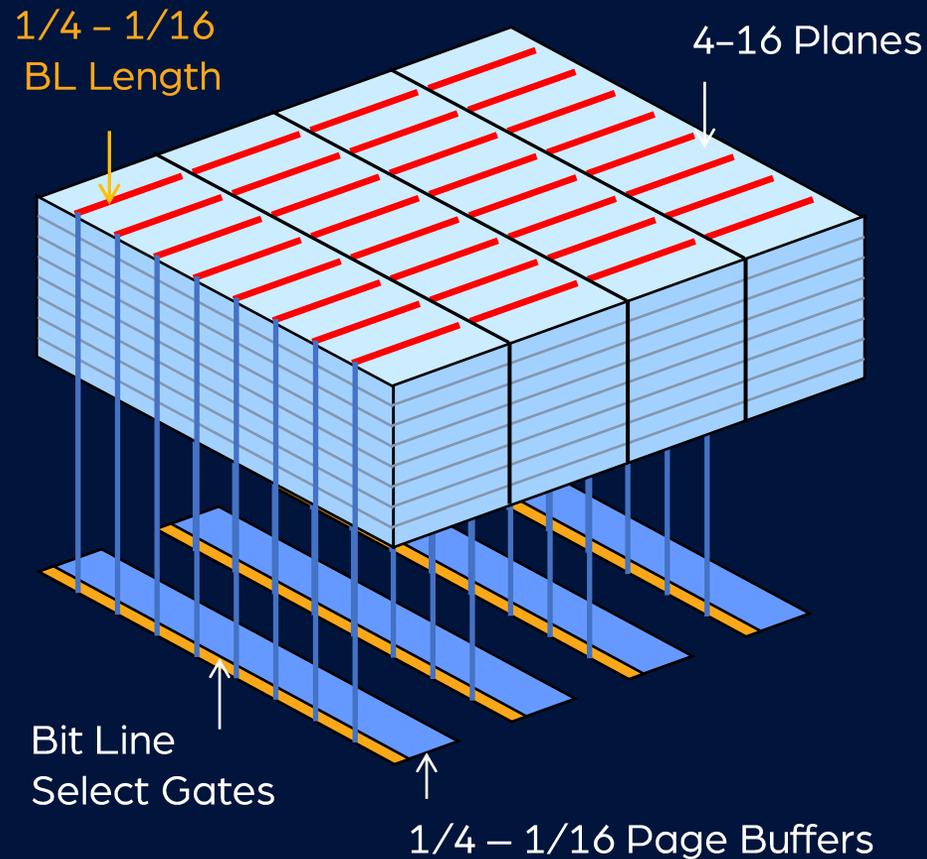
Traditional NAND

X-NAND



World's Fastest NAND Flash Architecture

X-NAND



3X

Random R/W Speed

20X

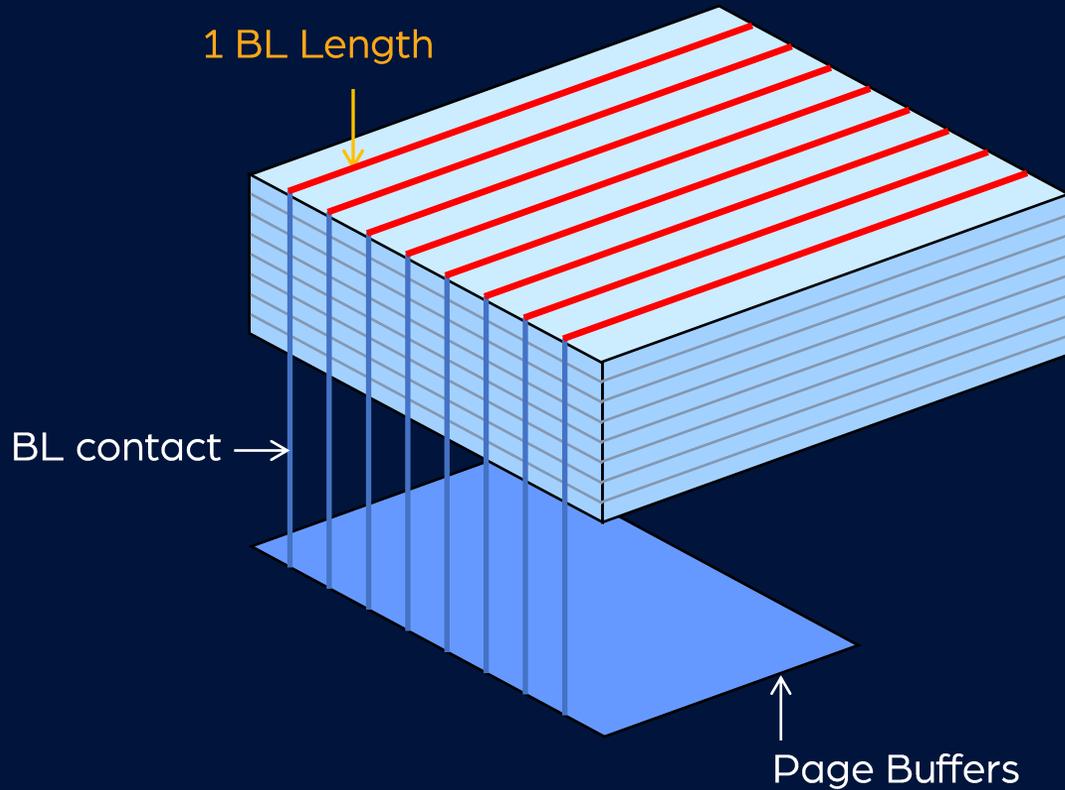
Sequential R/W Speed

0%

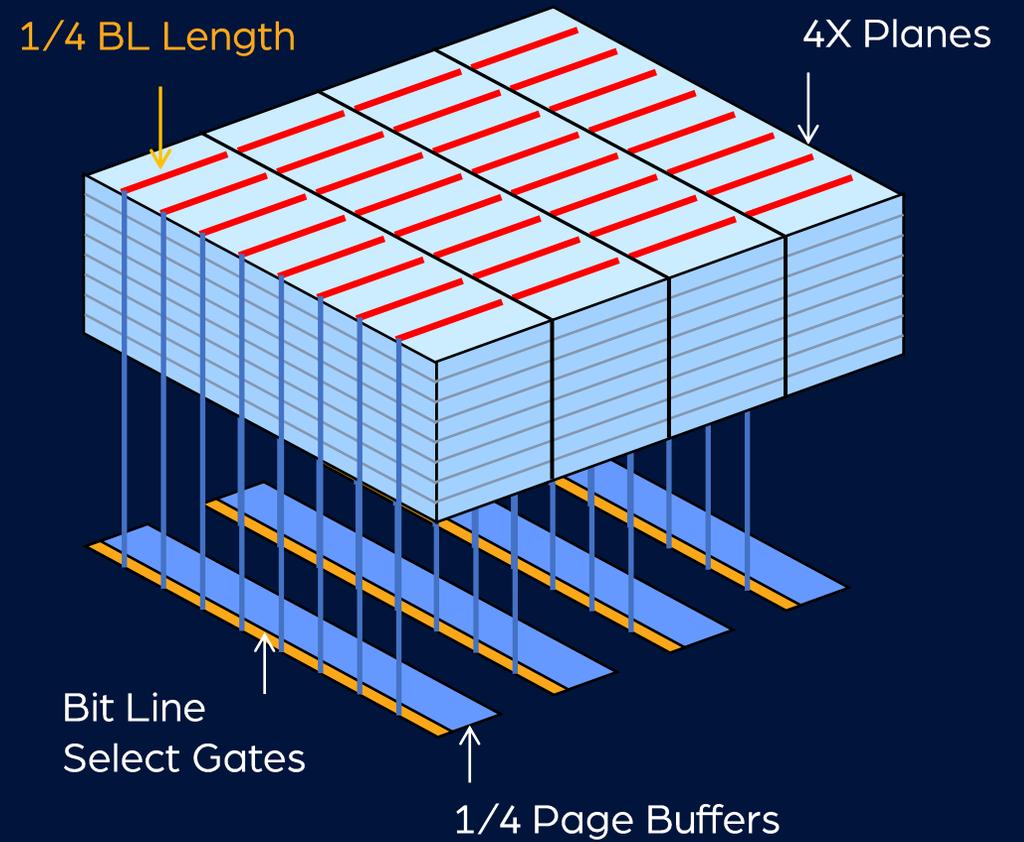
Cost Increase

3D X-NAND Architecture

Conventional 3D NAND



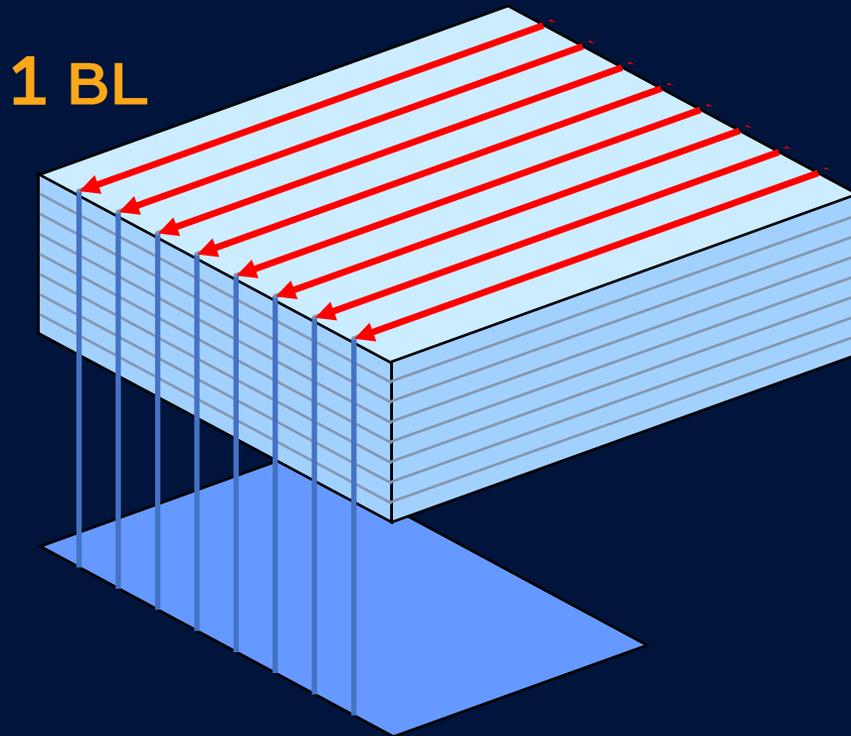
3D X-NAND



X-NAND architectural innovations to bit length, page buffer and circuit creates a performance advantage

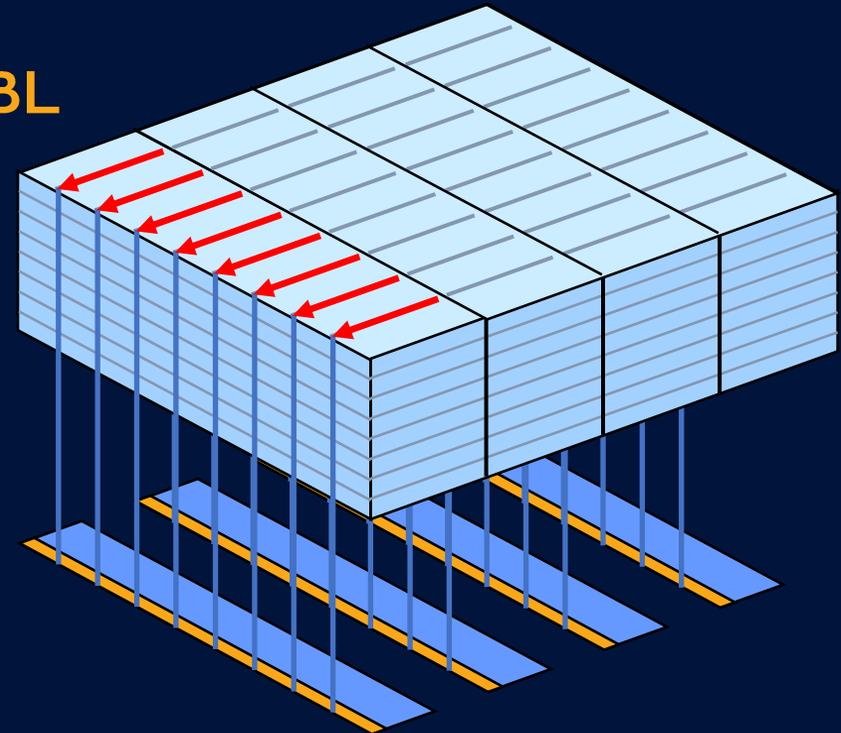
Read Speed Comparison

Conventional 3D NAND



3D X-NAND

1/4 BL



4X

Read Speed

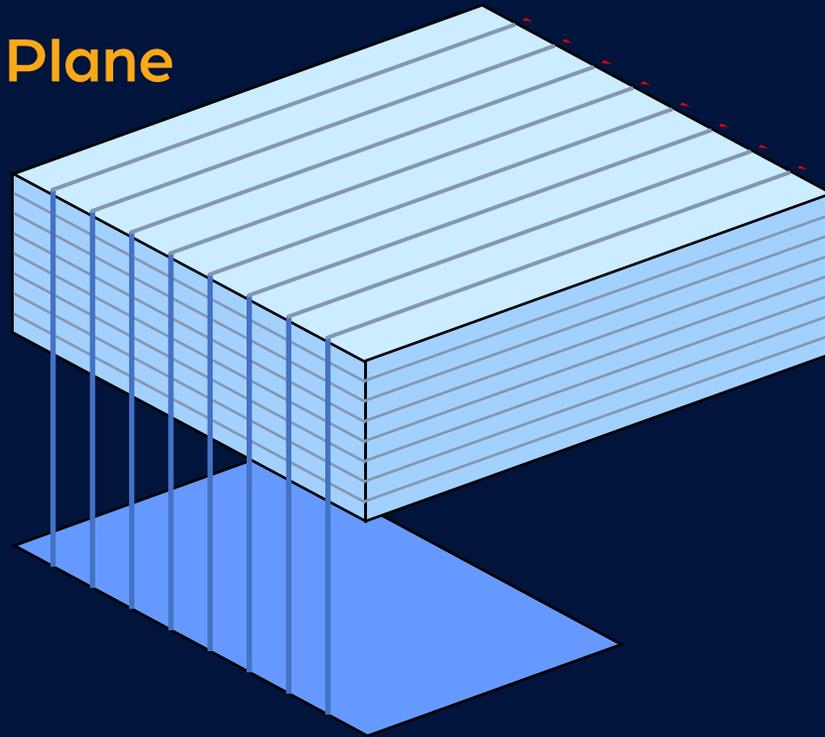
X-NAND has 1/4 bit lines in each plane that increases bit line read speed by 4X.

NAND vs. X-NAND

Read Throughput Comparison

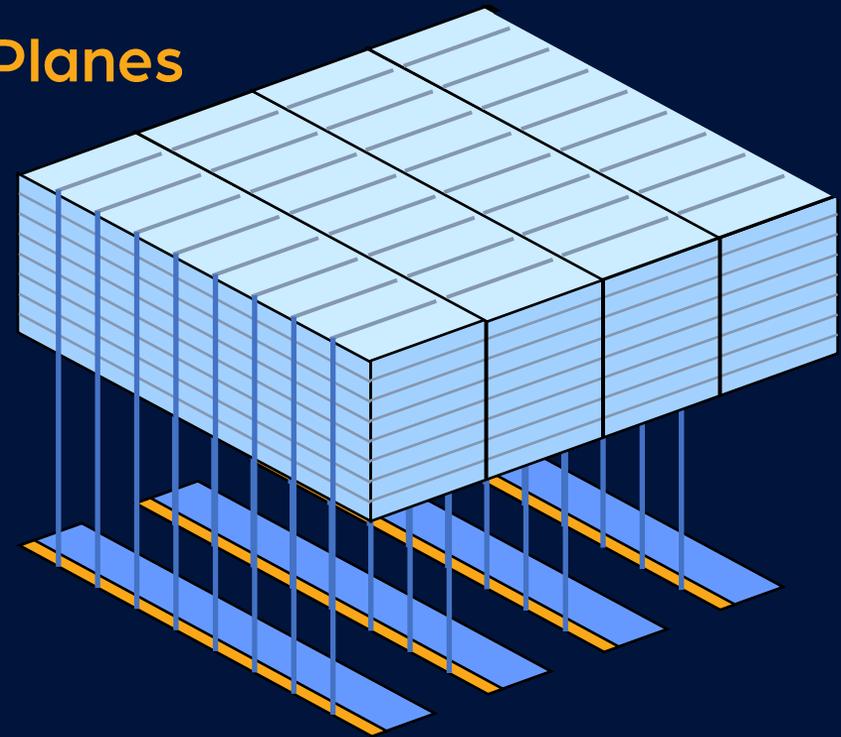
Conventional 3D NAND

1X Plane



3D X-NAND

4X Planes



16X
Read Throughput

X-NAND has 4X more planes plus 1/4 shorter bit lines that increases read throughput by 16X.

NAND vs. X-NAND

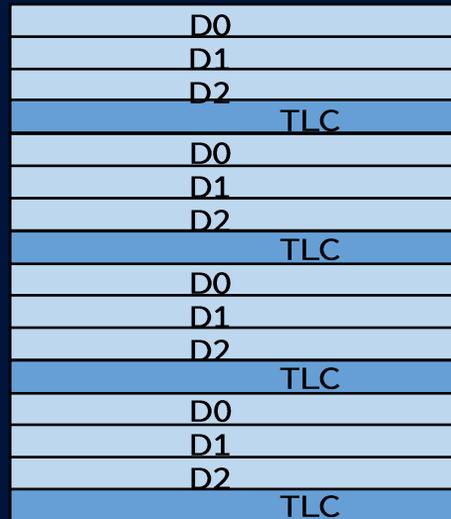
TLC Write Throughput

NAND vs. X-NAND

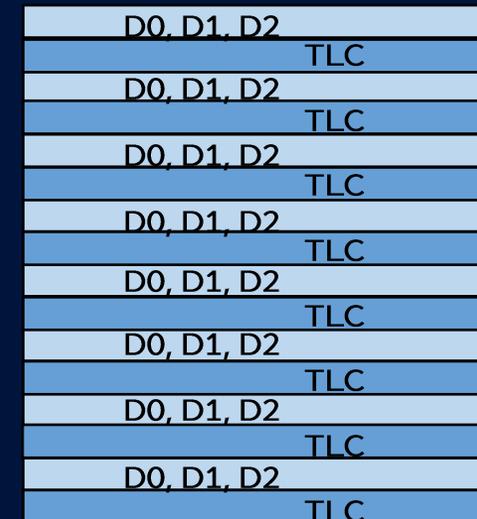
NAND
160 MB/s



X-NAND Gen1
1.6 GB/s



X-NAND Gen2
3.2 GB/s



10X

20X

* Based on simulation

X-NAND Gen 2 Advantages

4X

Planes

10X

Sequential
Read Speed

4X

Sequential
Write Speed

3X

Random
Read Speed

2.5X

Random
Write Speed

16X

Planes

80X

Sequential
Read Speed

28X

Sequential
Write Speed

5X

Random
Read Speed

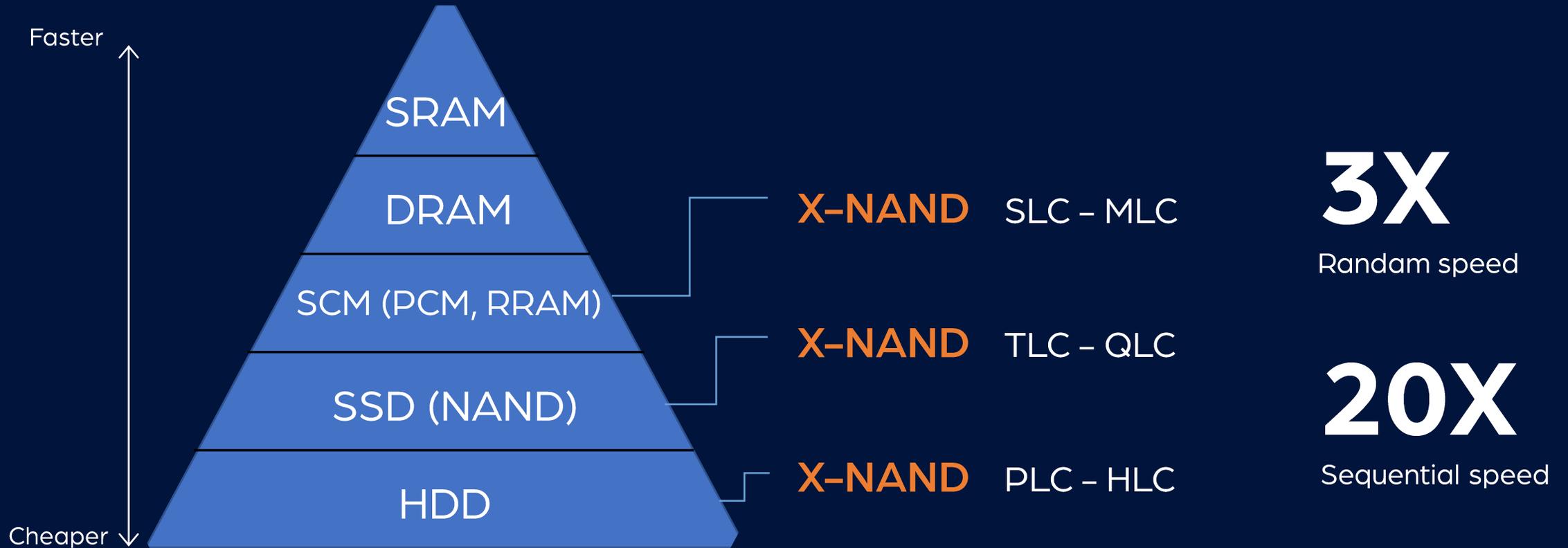
3.5X

Random
Write Speed

* Based on simulation

Next Gen Memory Hierarchy

Conclusion



X-NAND and X-DRAM are preferred alternatives to conventional storage and memory

SLC = 1 bit / cell
MLC = 2 bits / cell
TLC = 3 bits / cell

QLC = 4 bits / cell
PLC = 5 bits / cell
HLC = 6 bits / cell



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Next Gen Memory Architectures