

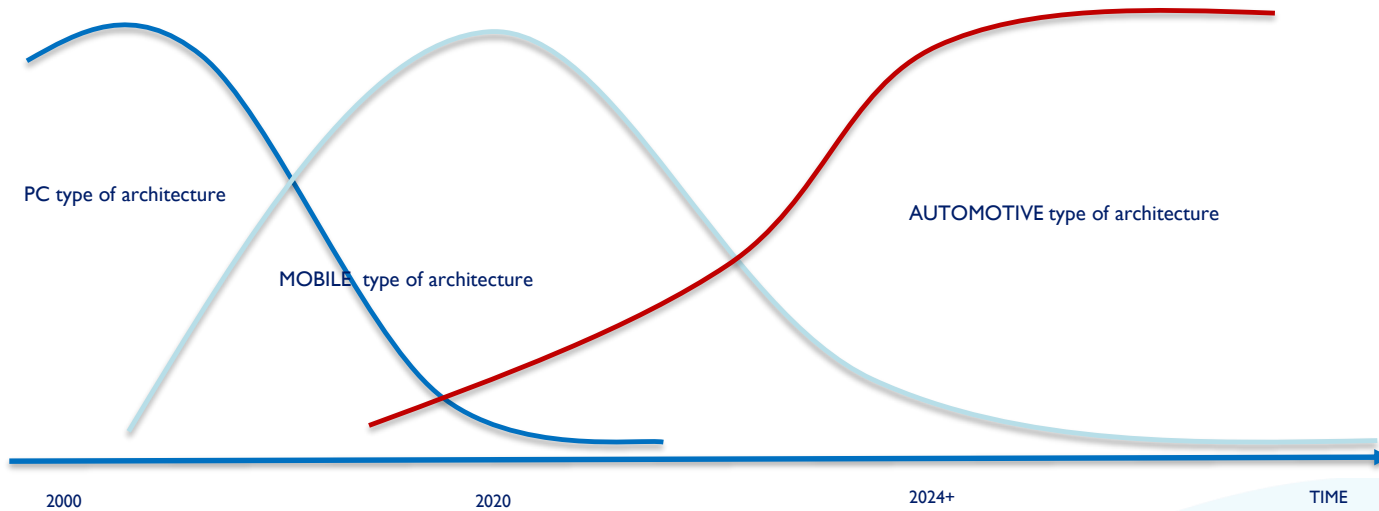


# HARMAN – STORAGE MEMORY SOLUTIONS

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JULY 2018



# INDUSTRIES DRIVING MEMORY SYSTEM ARCHITECTURE INNOVATIONS



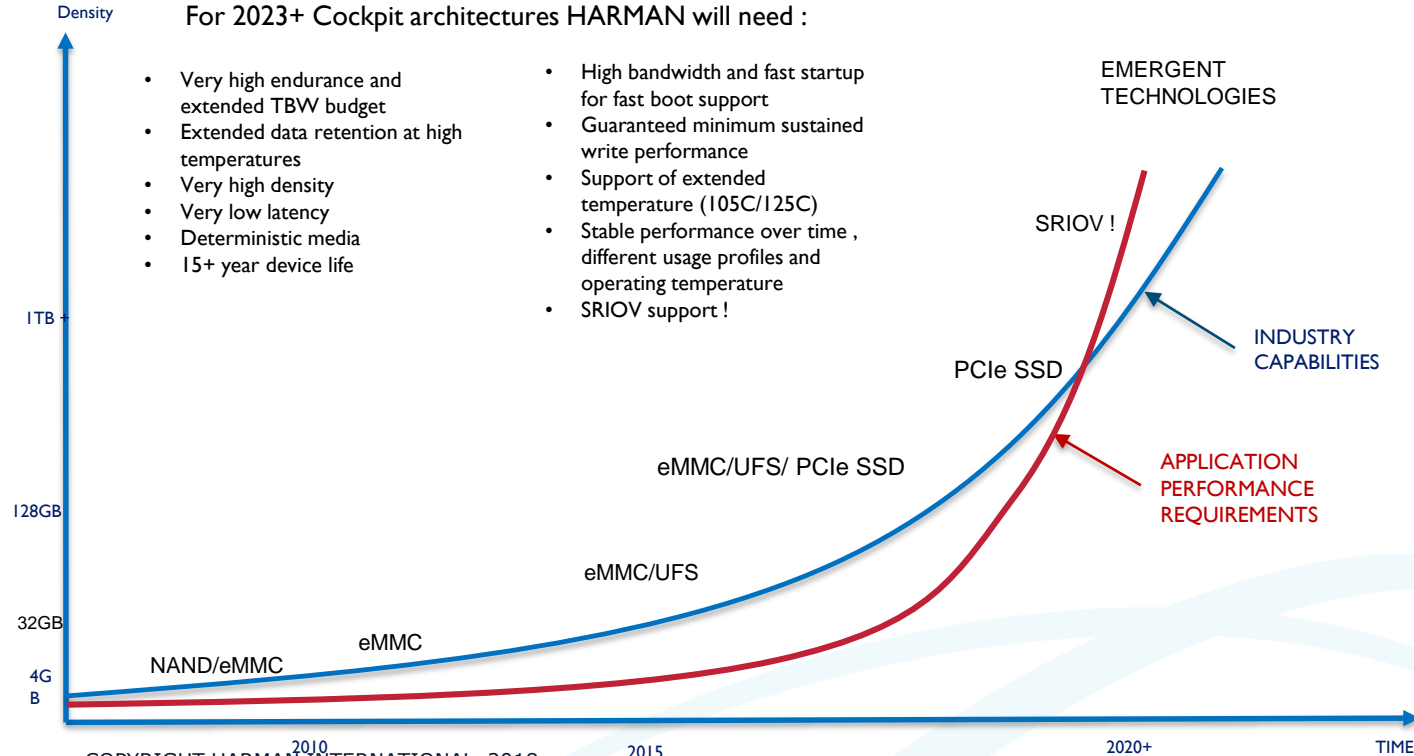
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# STORAGE TECHNOLOGIES EVOLUTION HARMAN COCKPIT SYSTEM APPLICATION REQUIREMENTS



For 2023+ Cockpit architectures HARMAN will need :

- Very high endurance and extended TBW budget
  - Extended data retention at high temperatures
  - Very high density
  - Very low latency
  - Deterministic media
  - 15+ year device life
- High bandwidth and fast startup for fast boot support
  - Guaranteed minimum sustained write performance
  - Support of extended temperature (105C/125C)
  - Stable performance over time , different usage profiles and operating temperature
  - SRIOV support !



2010  
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2015

2020+

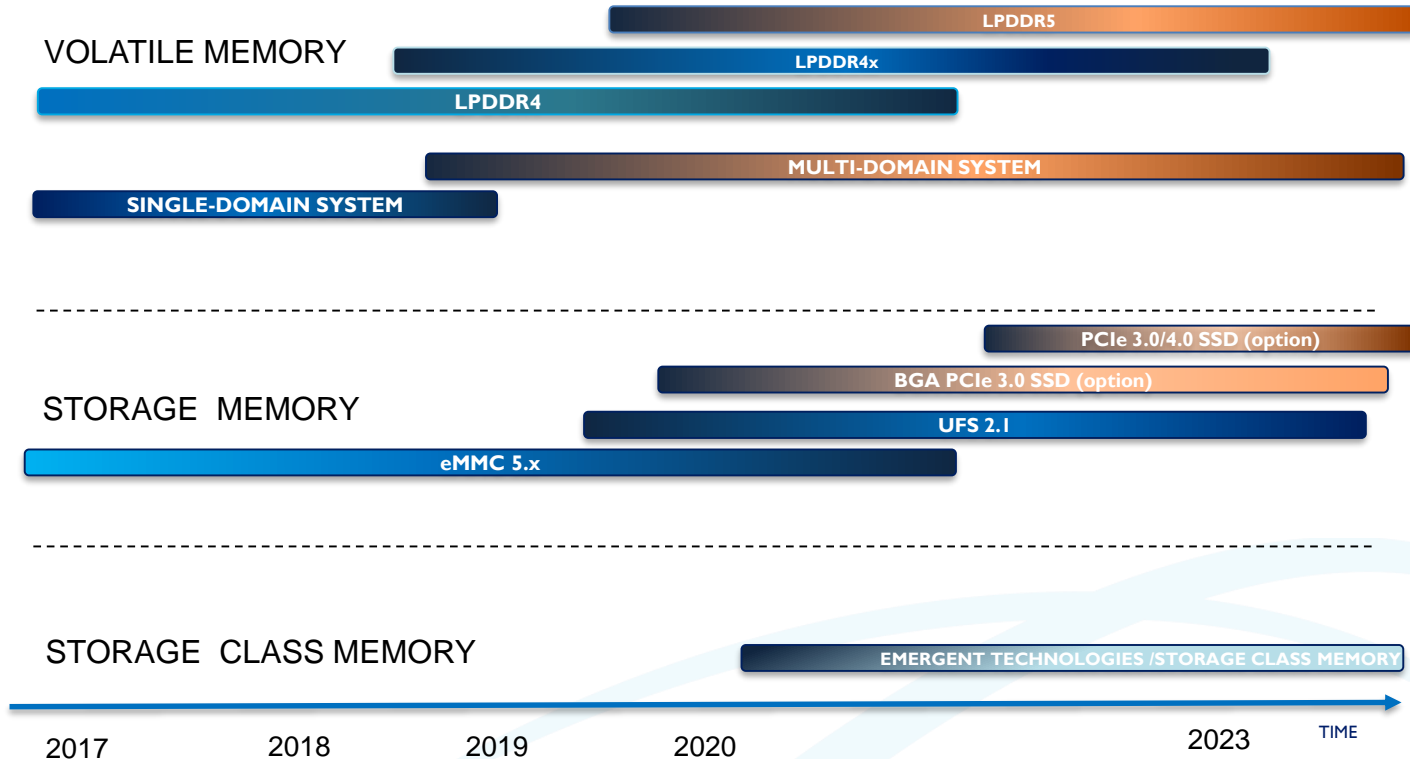
TIME

Picture is Not to scale and for reference only

# AUTOMOTIVE KEY TECHNOLOGY TRANSITIONS

## HARMAN NEEDS AT PLATFORM LEVEL

(FOR REFERENCE ONLY)



# SCM STORAGE CLASS MEMORY ARCHITECTURE HARMAN HIGH-LEVEL REQUIREMENTS



- ✓ **Extended data retention** → 15 years+ at temperature >> 95C Tc
- ✓ **Very high Read/Write speed** ( DRAM like ) , symmetric access
- ✓ **Byte-accessible**
- ✓ **NO wearing mechanism**
- ✓ **BER ( Bit Error Rate )** → Potential Replacement for DRAM ( UBER 10e15 )
- ✓ **On die ECC in flight** ( no added latency in read mode)
- ✓ **Zero power in standby mode**
- ✓ **NO refresh needed**
- ✓ **Instant-on support**
- ✓ **Non-volatile**
- ✓ **MLC/TLC/QLC.. - capable technology**
- ✓ **3D-capable**
- ✓ **Scalable** ( for reference → below 5 nm)
- ✓ **Samples 8/16 Gbits per die and more in 2023+**
- ✓ **Cost infrastructure** → better ( less ) than DRAM



**THANK YOU**

