

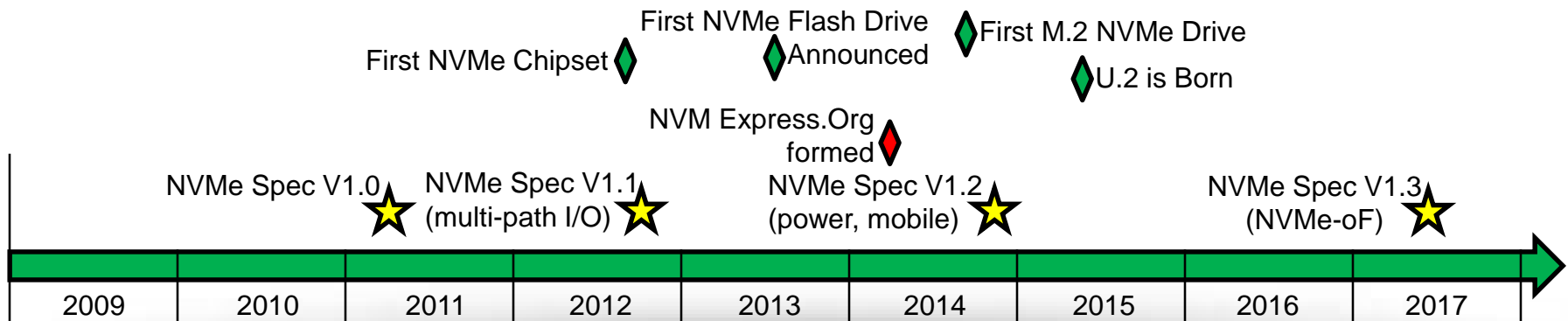


# **NVM Express® Past and Present: What We Have Accomplished, and Where We Are Going**

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G2M Research**

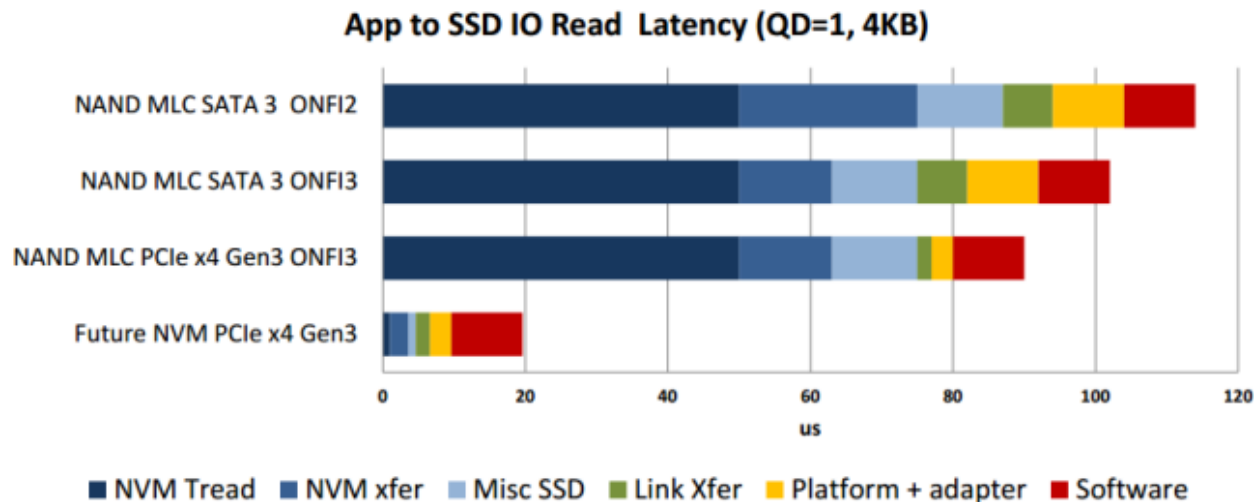
# NVMe From a Historical Standpoint

- ❑ Original focus on standardizing interface to PCIe-based storage add-on cards
  - ❑ Alternative to SCSI interfaces (SATA, SAS)
  - ❑ Flash-oriented command structure
  - ❑ Evolved to include 2.5" disk drive (U.2) and small form factor flash cards (M.2)
- ❑ 2017: NVMe over Fabrics (NVMe-oF)
  - ❑ Initially Fibre Channel and RDMA-based Ethernet
  - ❑ TCP-based Ethernet to be added by 2017/end



# Why Is NVMe Being Widely Adopted?

- ❑ Simpler AND faster than SCSI-based protocols
  - ❑ Smaller protocol stack, which can be easily implemented in HW
  - ❑ Much lower latency than SCSI-based protocols
  - ❑ Optimized for flash (more command queues)
- ❑ G2M Research: NVMe SSD prices lower than SATA SSDs by 2018
  - ❑ Already there on M.2 in the hyperscale market; nearly there in the consumer M.2 market (driven by gamers)



# Applications Driving NVMe Adoption

Enterprise



Cloud/xSP



Vertical



# G2M Research NVMe Market Predictions



**NVMe  
Market  
Size**

**The NVMe market will near \$45 Billion by 2020**

(servers, software-defined storage servers, external arrays, connectivity, I/O)



**NVMe SSD  
U.2 & M.2  
in Servers**

**Over 50% of servers will ship with NVMe drives by 2020**

(The average server will have 5.5 NVMe devices)



**SDS  
Storage  
Servers**

**Over 60% of storage servers drives are NVMe by 2020**

(The average storage server will have 29 NVMe devices)



**NVMe-oF  
Networking**

**NVMe-oF adapter shipments exceed 250K units by 2020**

(Over 75% of these will be RDMA enabled Ethernet Adapters)



**AFA  
Moves to  
NVMe**

**Over 40% of AFAs arrays will be NVMe-based by 2020**

(This will grow faster than the AFA transition vs HDD SAS arrays)



**NVMe SSD  
& SATA  
Parity**

**NVMe SSD will reach price parity with SATA SSD by 2018**

(The Intel push on NVMe-integrated infrastructure and SCM will drive cost down)

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