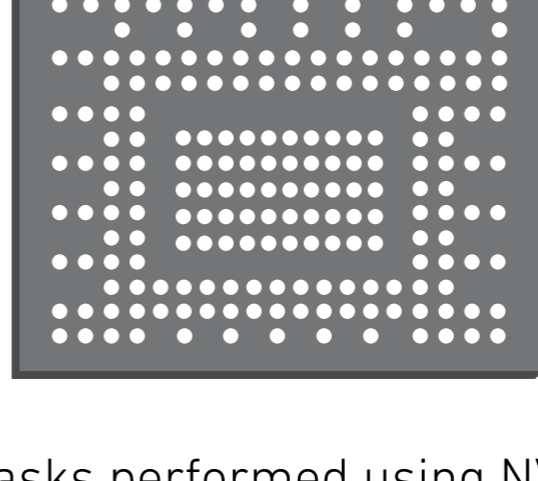
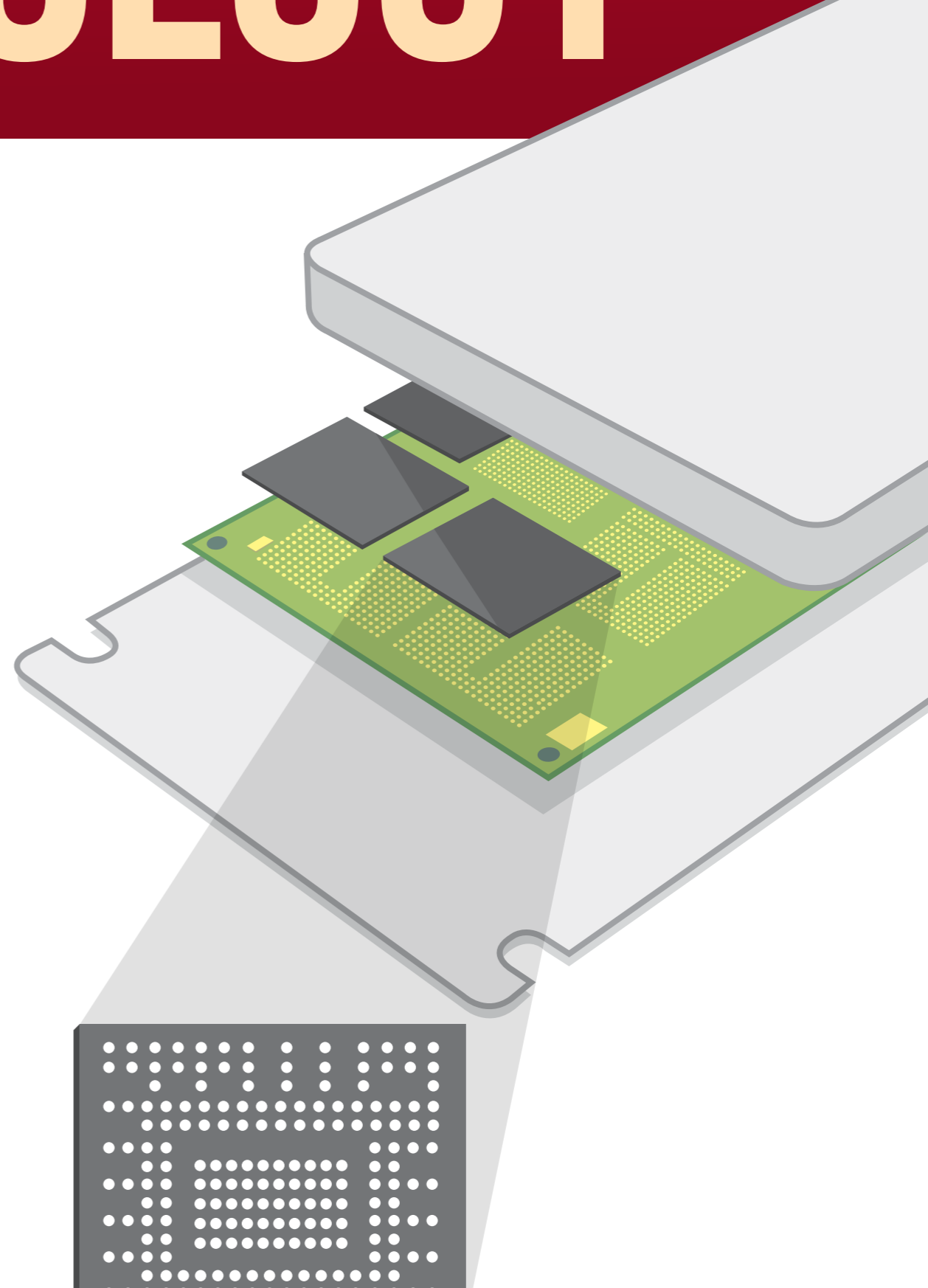
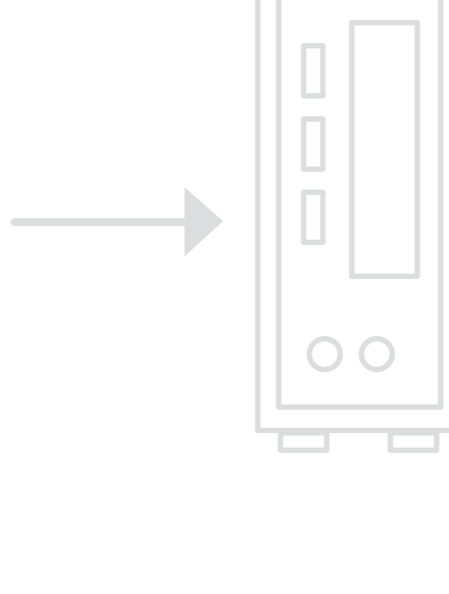


# UNDERSTANDING NVMe AND SSD TECHNOLOGY

NVMe (Non-Volatile Memory Express) is a communications interface and driver that defines a command set and feature set for PCIe-based SSDs with the goals of increased and efficient performance and interoperability on a broad range of enterprise and client systems.

NVMe was designed for SSD. It communicates between the storage interface and the System CPU using high-speed PCIe sockets, independent of storage form factor.

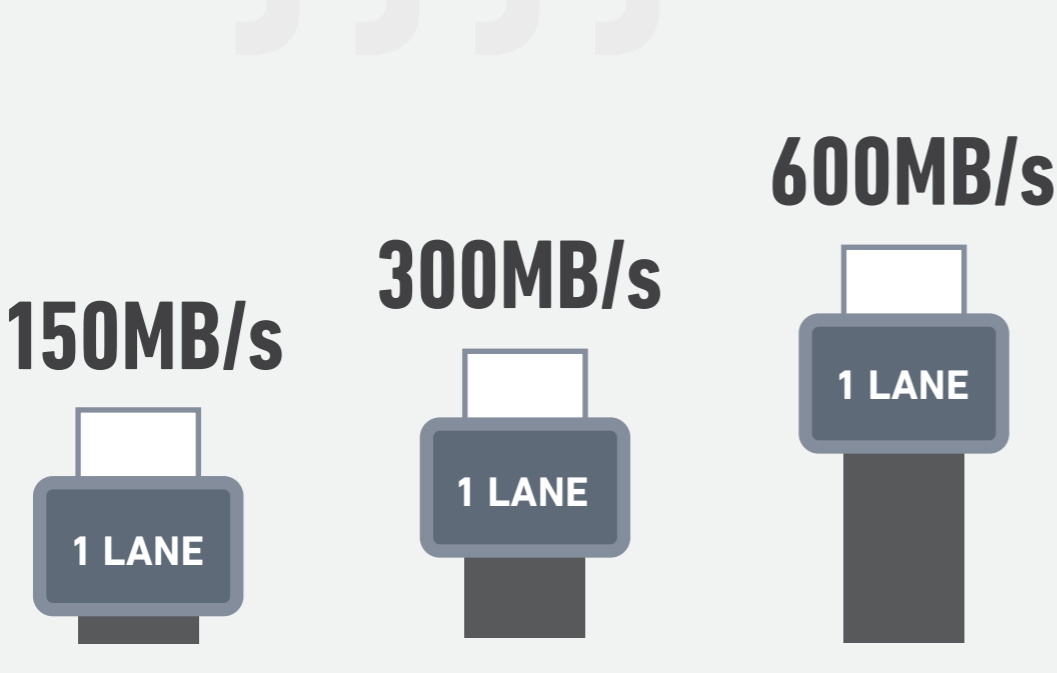


Input/Output tasks performed using NVMe drivers begin faster, transfer more data, and finish faster than older storage models using older drivers, such as AHCI (Advanced Host Controller Interface). Because it was designed specifically for SSDs, NVMe is becoming the new industry standard.

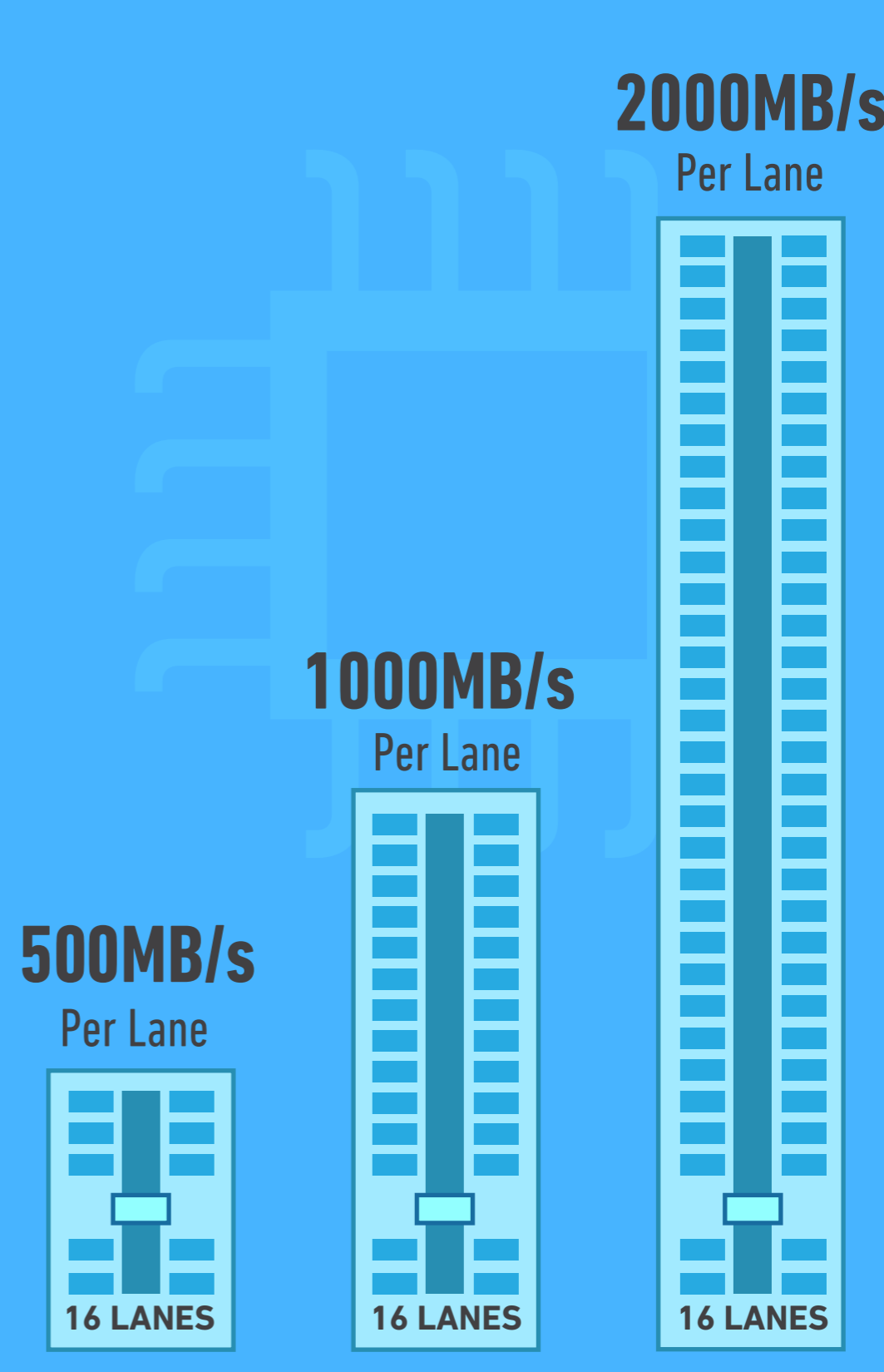
## WHAT SHOULD YOU KNOW? STORAGE: THEN AND NOW

DATA BUSES: Transport data within a system

SATA  
Transfers up to...



PCIe  
Transfers up to...



Using **16 lanes**, PCIe Gen 4 can transfer data at **32,000MB/s**

## COMMUNICATION DRIVERS

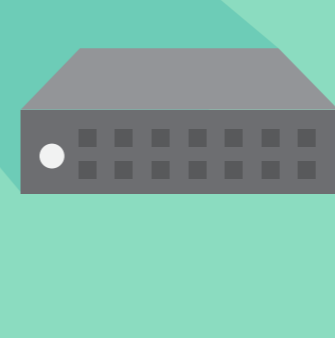
Used by Operating Systems to communicate data with storage devices

AHCI

NVMe



Designed for Hard Drives with **Spinning Disk technology**



Designed for SSDs with **Flash technology**

1

Has only **1 command queue**

64K

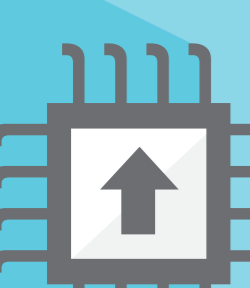
Has **64K command queues**

32

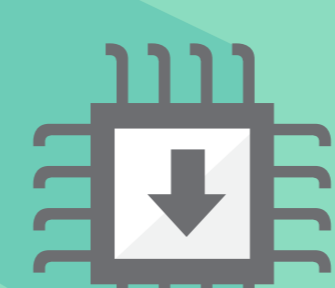
Can only send **32 commands per queue**



Can send **64K commands per queue**



Commands utilize **High CPU cycles**



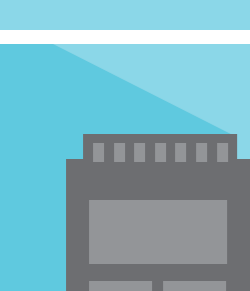
Commands utilize **Low CPU cycles**



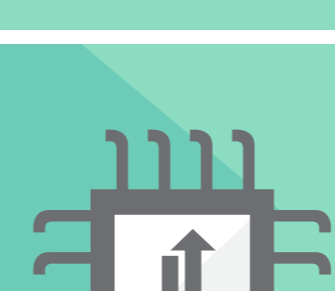
Has a latency of **6 microseconds**



Has a latency of **2.8 microseconds**



Must communicate with the **SATA controller**



Communicates directly with the **System CPU**



IOPs up to **100K**



IOPs over **1 million**

## SSD FORM FACTORS

The shapes and sizes of solid-state storage

SATA



2.5"

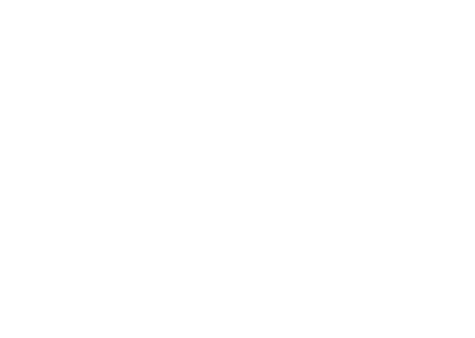


1.8"



mSATA

(designed for smaller form factor systems)



M.2

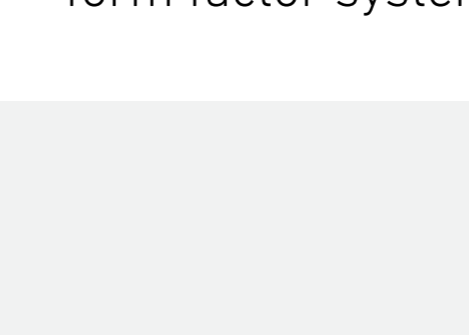
(supports AHCI version)

PCIe



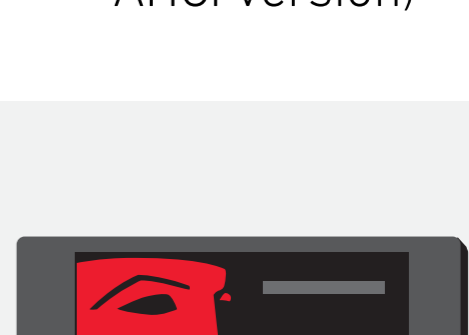
HHHL – Half Height, Half Length (also called AIC or Add-In Card)

- AHCI versions of these drives plug into the PCIe slot, but use the AHCI drivers
- Some older versions of HHHL use proprietary drivers
- NVMe versions typically use native OS drivers



M.2

(supports NVMe version)



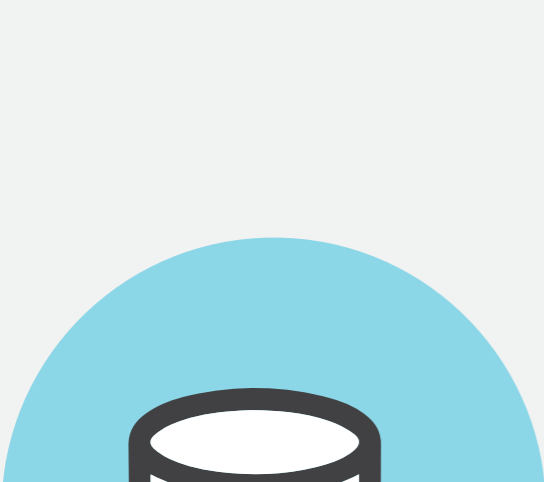
U.2

(only available in NVMe)

## BEYOND THE NUMBERS

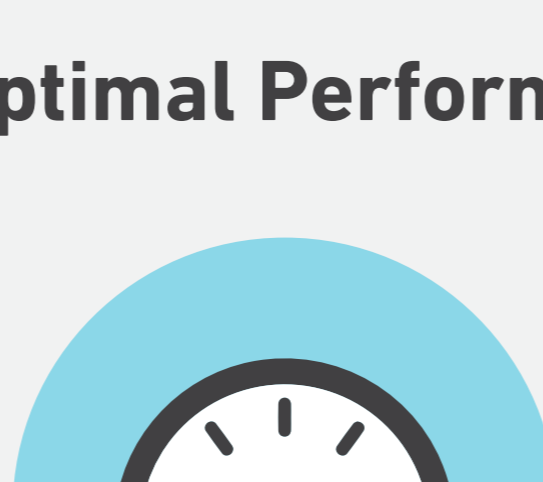
Benefits of NVMe Technology

### Optimal Performance



**Superior Storage**

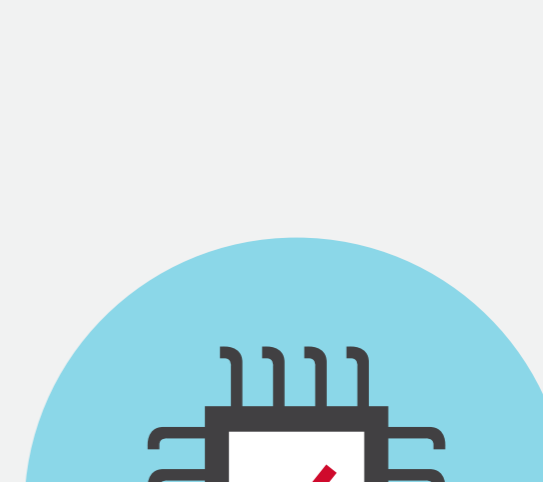
PCIe sockets transfer **>25x more data** than their SATA equivalent



**Superior Speed**

NVMe begins sending commands more than **2x faster** than AHCI drivers

NVMe Input/Output Operations per Second exceeds 1 million and is up to **900% faster** than its AHCI equivalent



**Superior Compatibility**

NVMe cuts out the middle man by **communicating directly with the System CPU**

NVMe-based drives work with all major Operating Systems, regardless of form factor

Contact your local Kingston representative to find out which Kingston SSD drive is right for you

