Expanding the Role of Flash Technology in Computing Devices

Kevin Kettler
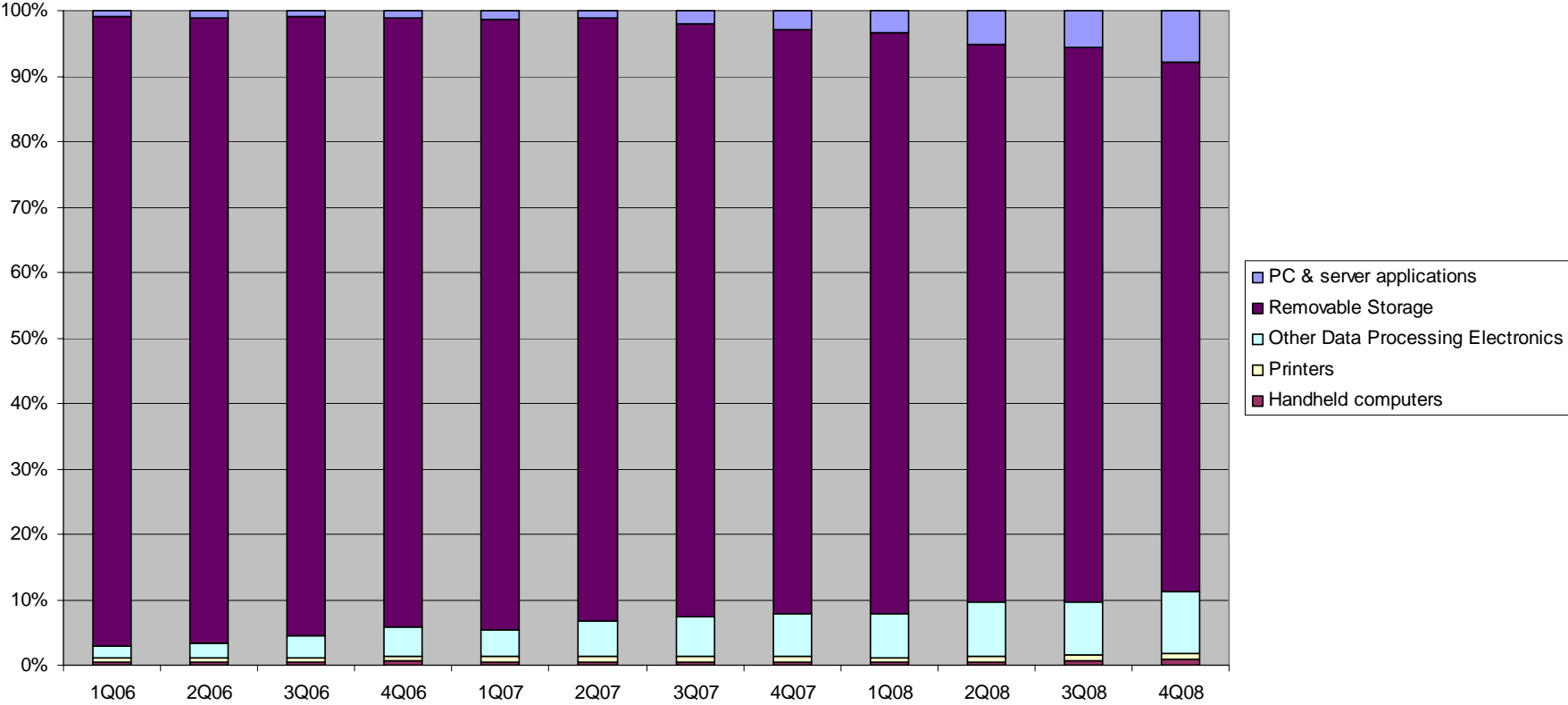
Dell CTO

NAND Flash Consumption Forecast for Computing Devices

Legend:
- PC & server applications
- Removable Storage
- Other Data Processing Electronics
- Printers
- Handheld computers

X-axis categories: 1Q06, 2Q06, 3Q06, 4Q06, 1Q07, 2Q07, 3Q07, 4Q07, 1Q08, 2Q08, 3Q08, 4Q08

Y-axis: 0% to 100%
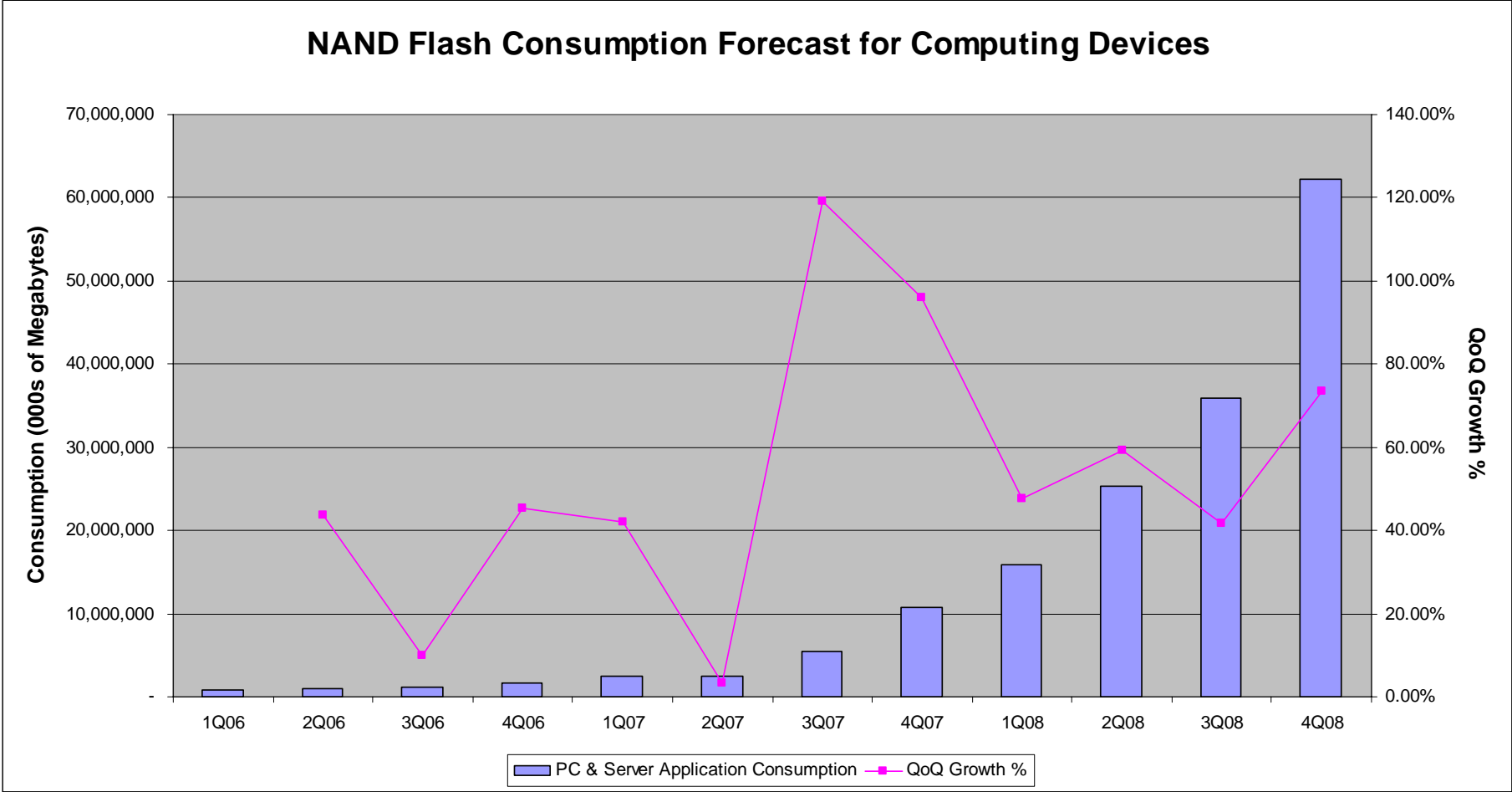
NAND Flash Consumption Forecast for Computing Devices

Removable Storage

BIOS / Firmware
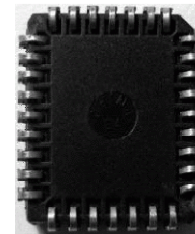
Historical Platform Storage Hierarchy

Cache Memory

Main Memory - DRAM

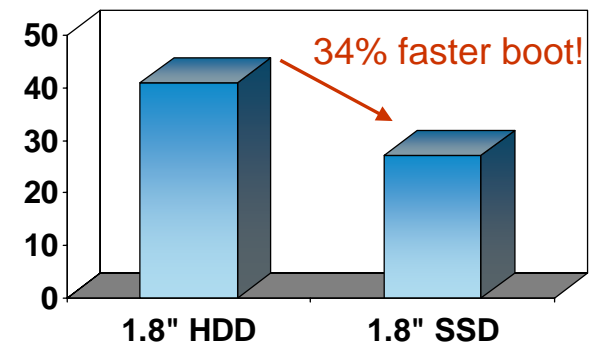**Disk Drive**

Removable
(Optical/USB)

L2 Cache

speed
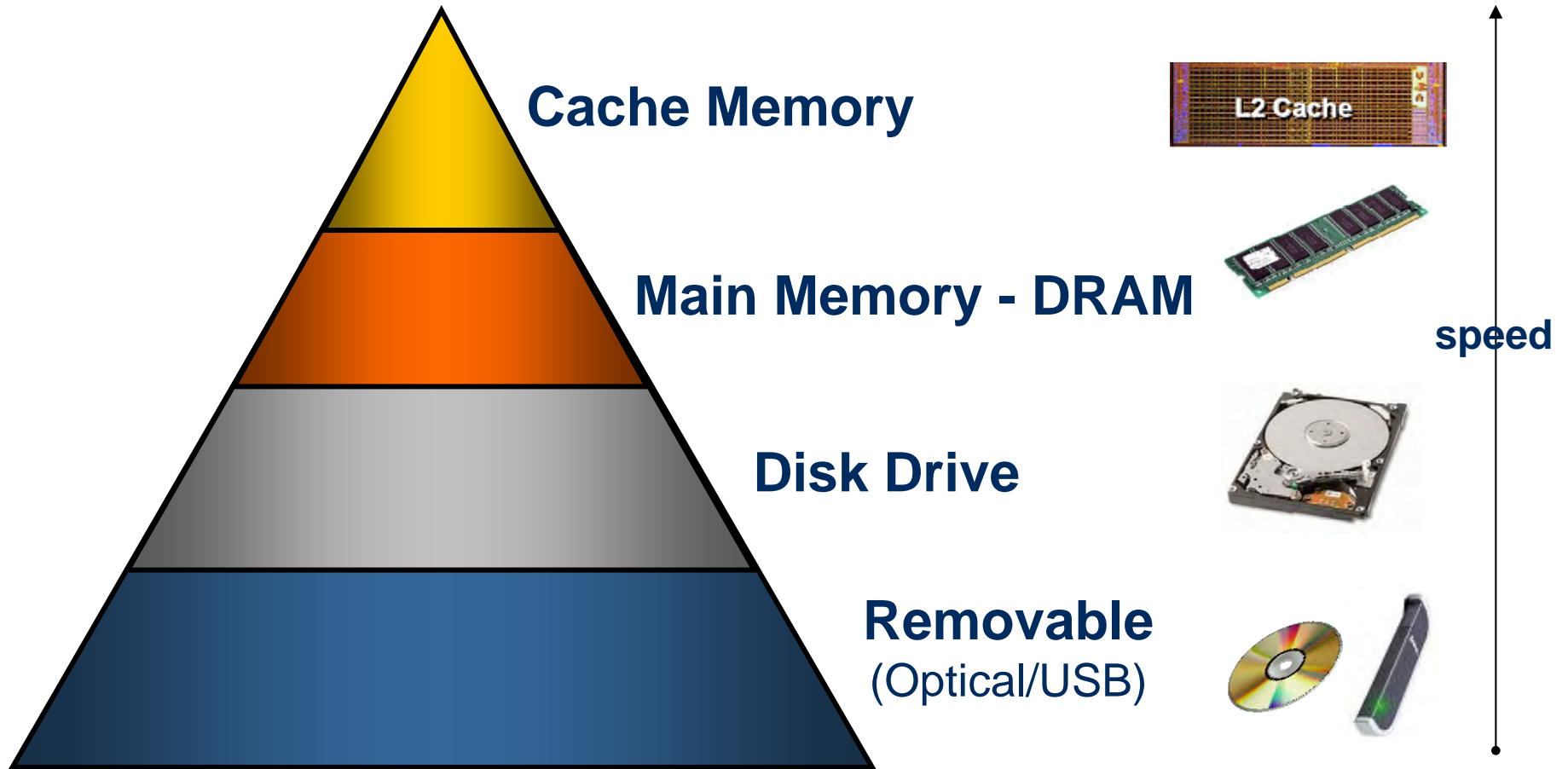
Mechanical disk drive replacement…

DELL

- **System responsiveness and performance**
- **System start/boot up**
- **Acoustics**
- **Reliability**
- **Durability**
- **Power consumption**
- **Potential Weight Reduction**

System Boot Time (in sec)

34% faster boot!

1.8" HDD   1.8" SSD

SYSMark 2004SE Overall

23% higher!

1.8" HDD   1.8" SSD

Performance results based on internal Dell testing.
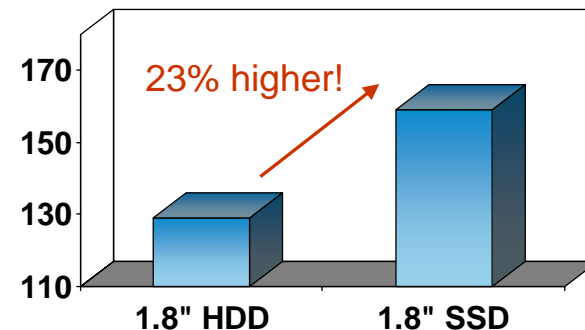
Use as internal cache…

- Minimize HDD spin-up latency impact

- Faster application loading

- Utilized by ReadyBoost and ReadyDrive

- Potential power savings

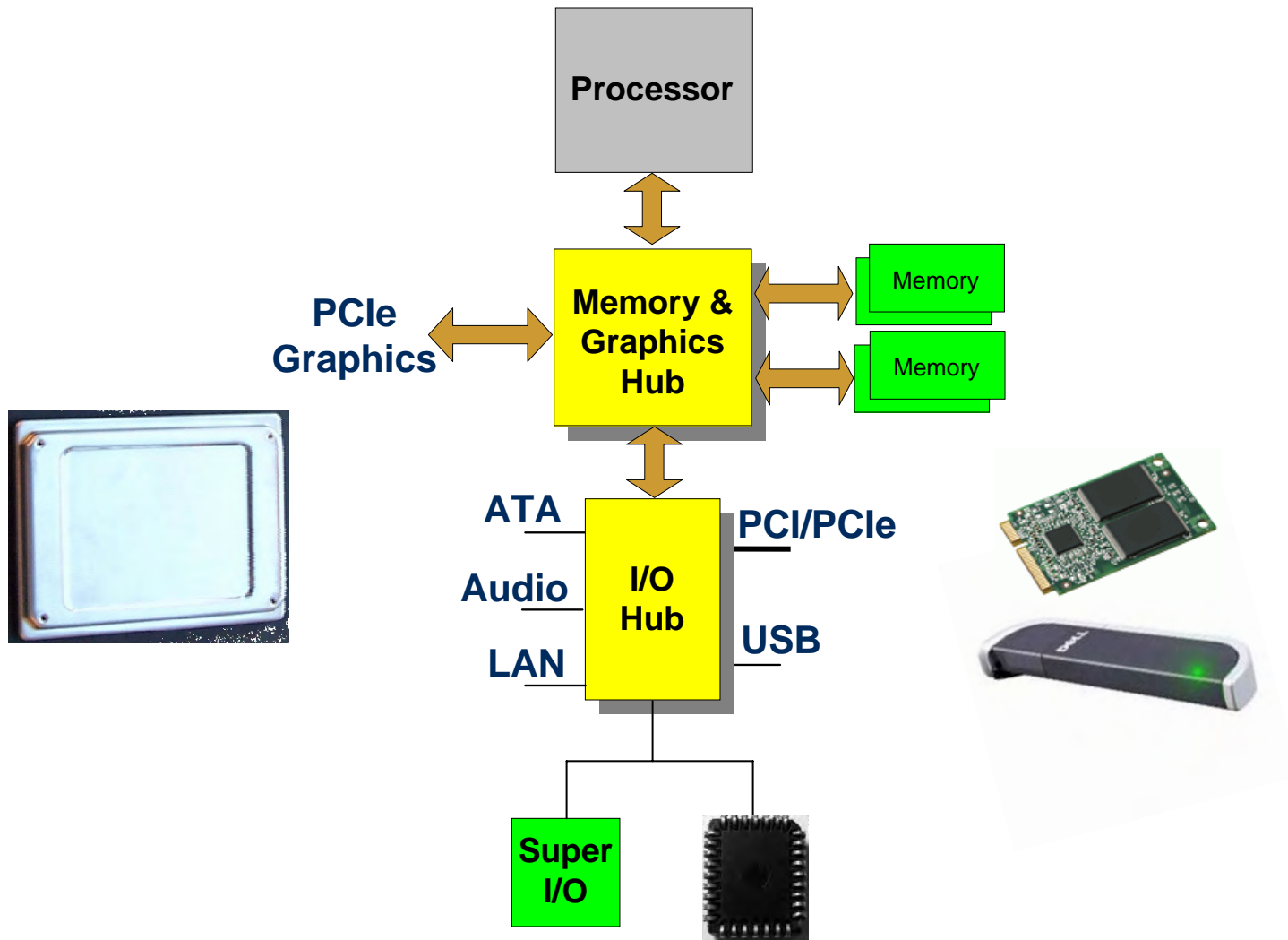# NVMHCI: Non-Volatile Memory Host Controller Interface

- ## What is it?

  - A standardization effort defining a host controller interface for nonvolatile memory in the PC

  - Led by Intel, supported by Dell

- ## Why?

  - Enable greater innovation through standardization

    - Application knowledge of flash in the system will encourage novel uses
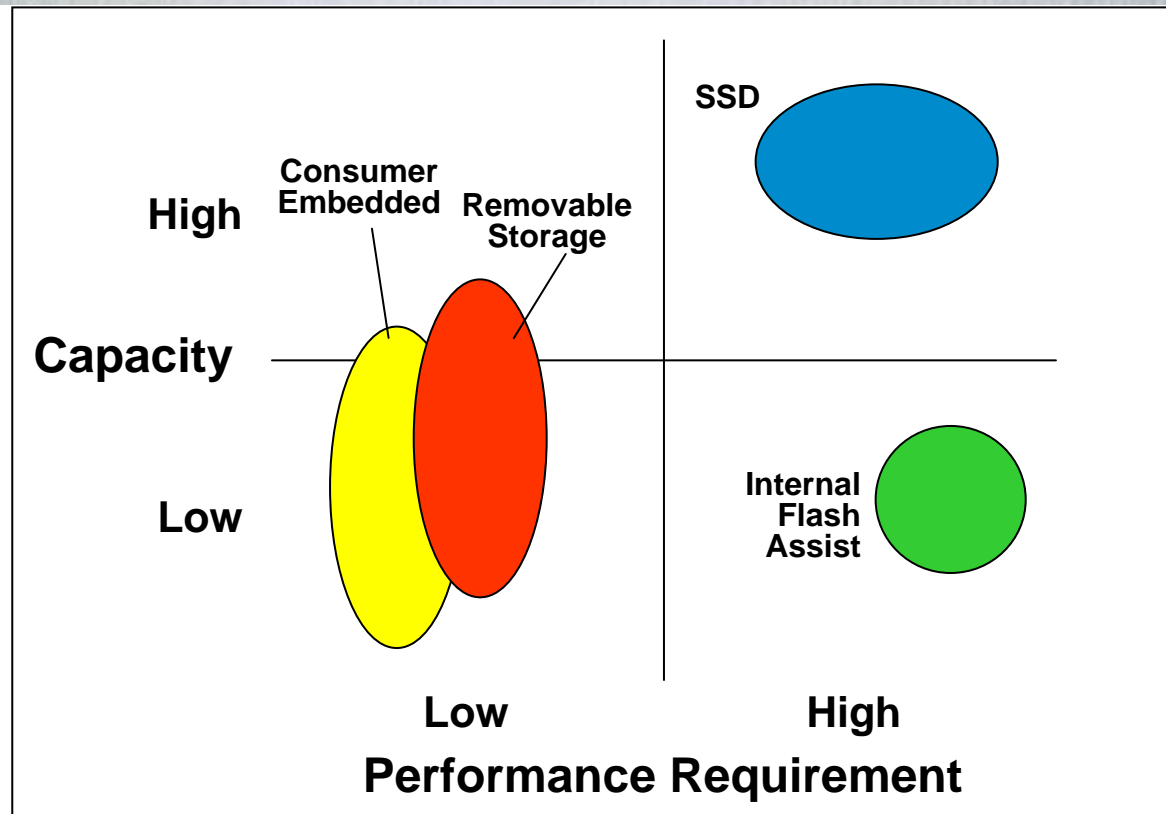
Emerging Computing Architecture

- **SSD in desktops**

- **SSD in servers and network storage**

- **SSD for ruggedized products**

- **Embedded flash in emerging clients architectures**

- **Embedded flash in diskless servers**

Conflicting Market Needs

- Consumer applications are the current market drivers
- Computing device applications will drive future growth but with different needs

- **Standard**
  - **Develop standards-based solutions (NVMHCI)**
  - **Update current standards to accommodate flash (ATA, SMART)**
- **Relevant**
  - **Match device capabilities to customer usage model**
  - **Deliver product solutions that are easy to implement and manage**
- **Accessible**
  - **Maintain backward compatibility**
  - **Drive affordability**

Focus on customer benefits!

Office of the CTO

DELL

Dell is an early adopter…

… SSD as a notebook HDD replacement

… Hybrid HDD option for notebooks

… Intel's Turbo Memory

Let's continue to innovate with FLASH!!

THANK YOU!!