

Product Development: Build a Solid State Drive (SSD)

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Build a Solid State Drive (SSD)

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What is a Solid State Drive?

- Solid State Drive = SSD
- An SSD is a storage device that typically uses NAND memory to store data
- SSDs replace traditional hard drives
 - SSDs are much faster
 - Hard drives are slower due to mechanical parts/spinning disk
 - SSDs are more durable
 - SSDs are quieter
 - SSDs have lower power consumption

Note: hard drives are still used in some applications because they are less expensive than SSDs



Hard Disk Drive (HDD) – many moving parts

Actuator – motor that controls movement of the actuator arm and read/write head

Actuator arm – positions the read/write head

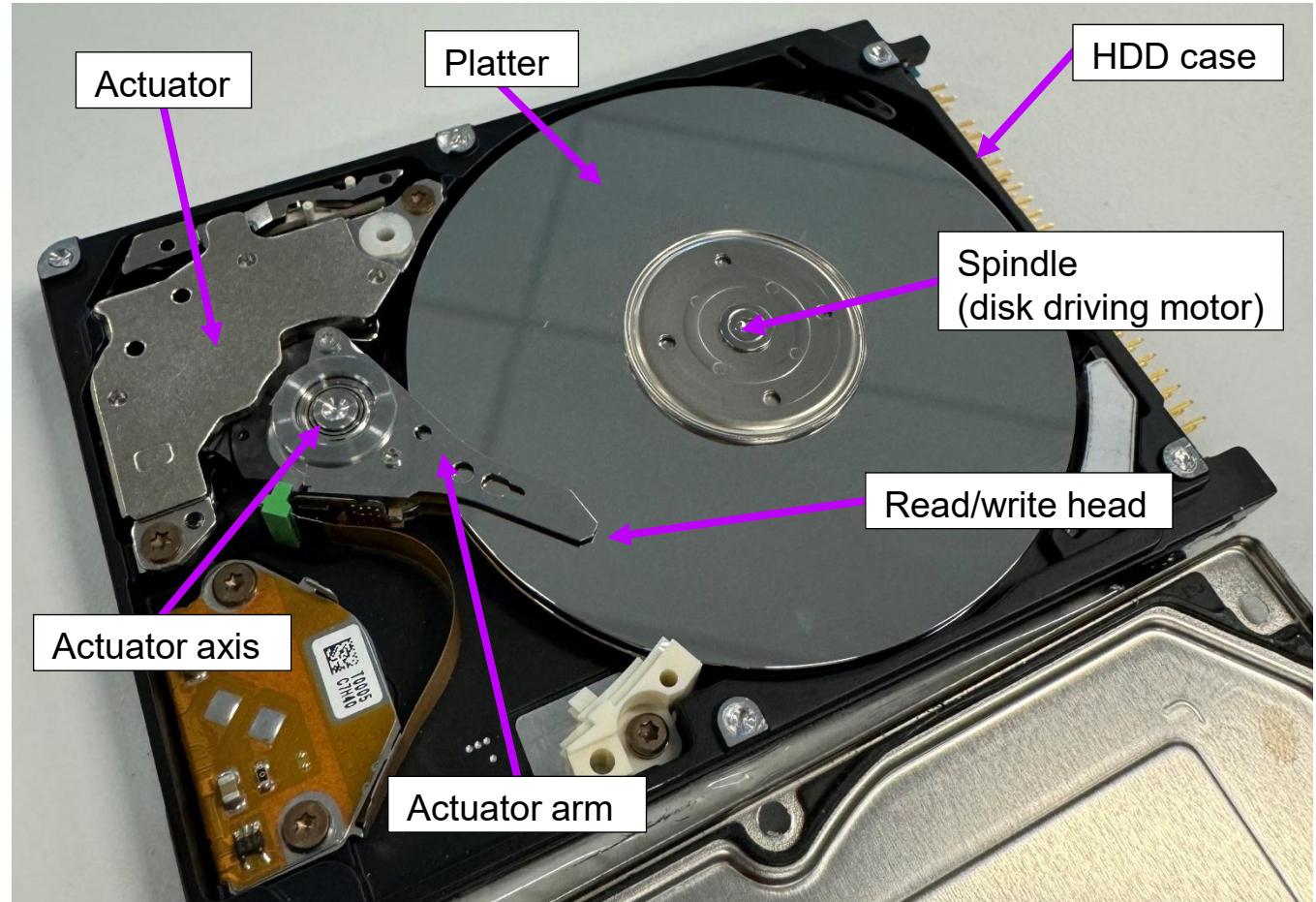
Actuator axis – pivot point for actuator arm to move

HDD case – secure housing for the HDD

Platter – data storage disk made of aluminum, glass, or ceramic and coated with a magnetic material that allows data to be stored

Read/write head – reads data from and writes data to the HDD disk platter

Spindle – central post that securely holds and spins the disk platters



Parts of a Solid State Drive

A. **PCB (printed circuit board)**

Foundation for building the SSD

B. **Connector**

Interface between SSD and PC/Laptop/Server/etc.
(outside world)

C. **Controller**

Brains of the SSD - manages information in and out of
NAND or DRAM (memory components)

D. **Power management**

Responsible for managing and regulating power delivery
across all internal components

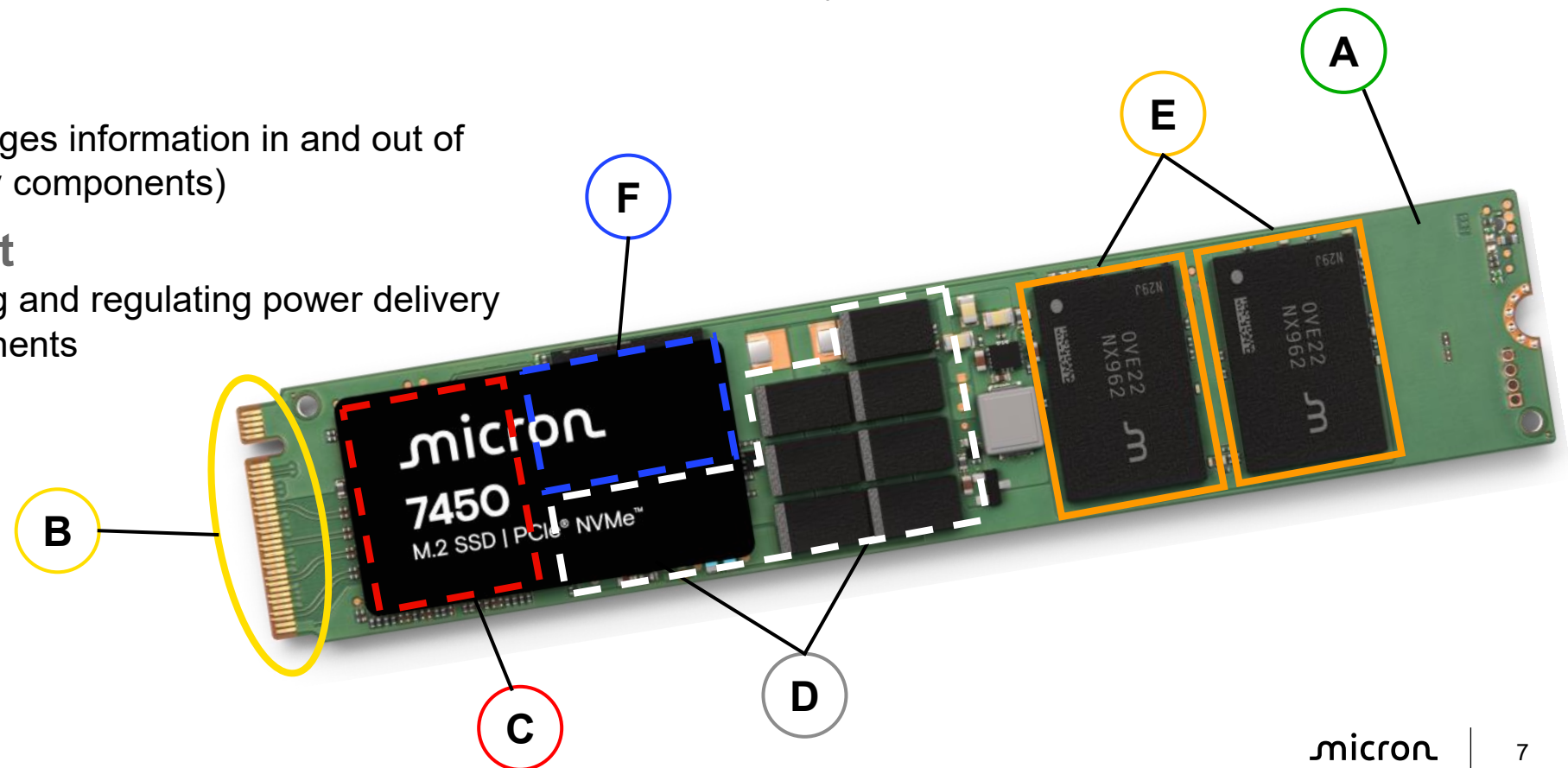
MEMORY COMPONENTS

E. **NAND (final storage location)**

Information can be stored in NAND for years!

F. **DRAM (temporary storage location)**

Temporary buffer between controller and NAND



Market Segments = different customers

Mobile



Personal Computer



Devices



Enterprise



Autonomous Vehicles



Industrial

Where are SSDs used?

Market segment examples

Mobile: smart phone, handheld gaming

- Small size, low cost and efficient power management

Devices: desktop computer, smart TVs

- Consider tradeoff of price and performance (lower price = lower speed)

Autonomous Vehicles: self-driving cars

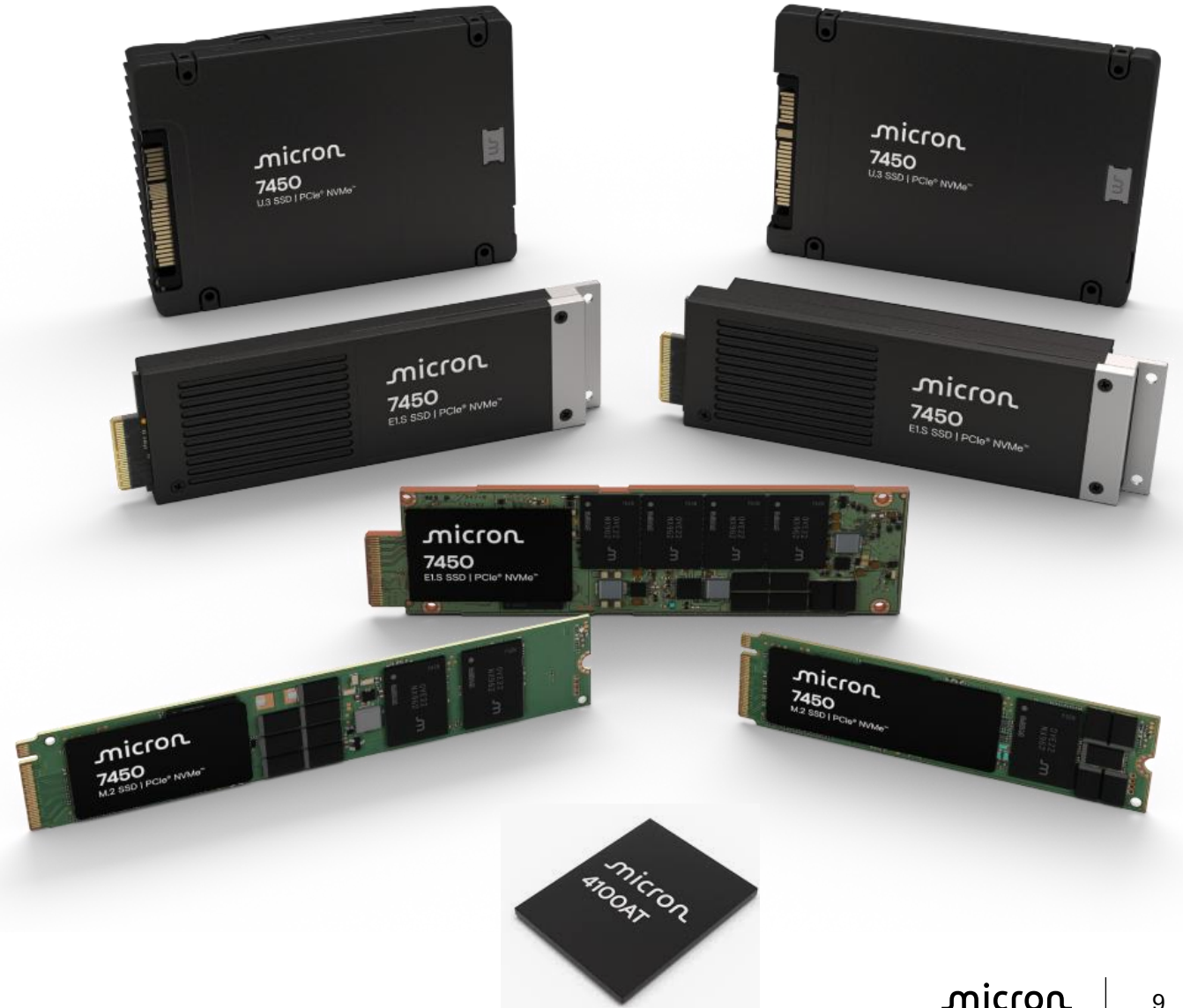
- High reliability, high speed and efficient power management

Industrial: high speed trains

- High reliability and high speed

Enterprise: cloud computing, datacenter

- High security, high reliability and high speed





Understand your team's Market & Customers

- **Team Assignment**

- Design and build a Solid State Drive to meet the customer needs for your team's market segment
- Each team member has a specific role

- **Considerations**

- Products: What types of computing devices fit this market segment?
- Most Important: What features to focus on as top priority?
- Least Important: What features are low priority?
- Storage: How much NAND?
- Memory: How much DRAM?
- Budget: Don't go over!

Build your SSD



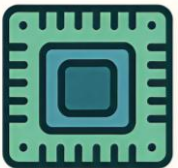
Marketing – Decide on features of your team's SSD based on your market segment



Architect – Note how many of each component were used on the 'SSD Activity Sheet'



Procurement – Fill in the numbers on the 'SSD Cost Worksheet' & calculate budget



Board Layout – Place BRICK components on the PCB



Quality Assurance – Evaluate the completed SSD

Does the SSD:

1. meet the customer priorities set by Marketing?
2. stay within budget?
3. require any changes?

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