Application Agnostic Machine Learning Engines in SSD

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Agenda

- Challenges of Traditional NVMe® SSDs
- Why MLE in NVMe® SSDs ?
- NAND BER Analysis

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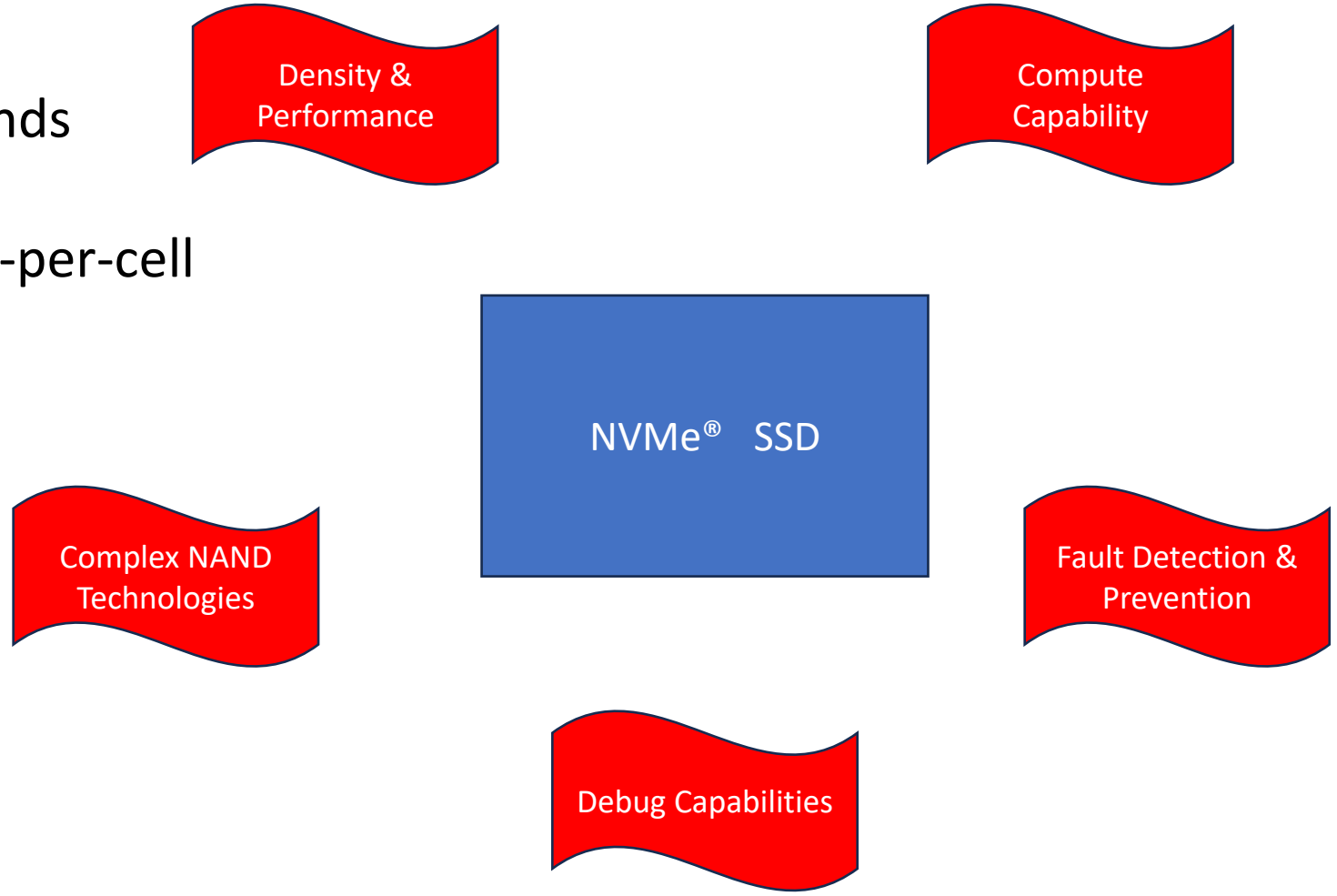
Challenges of Traditional NVMe® SSDs

Challenges of Traditional NVMe® SSDs:

- SSD density and performance demands
- Complex NAND management,
  - Increasing number of layers, bits-per-cell
  - Change in technologies
- Compute capability of NVMe® SSDs
- Fault detection and prevention
- Debug capabilities on failure



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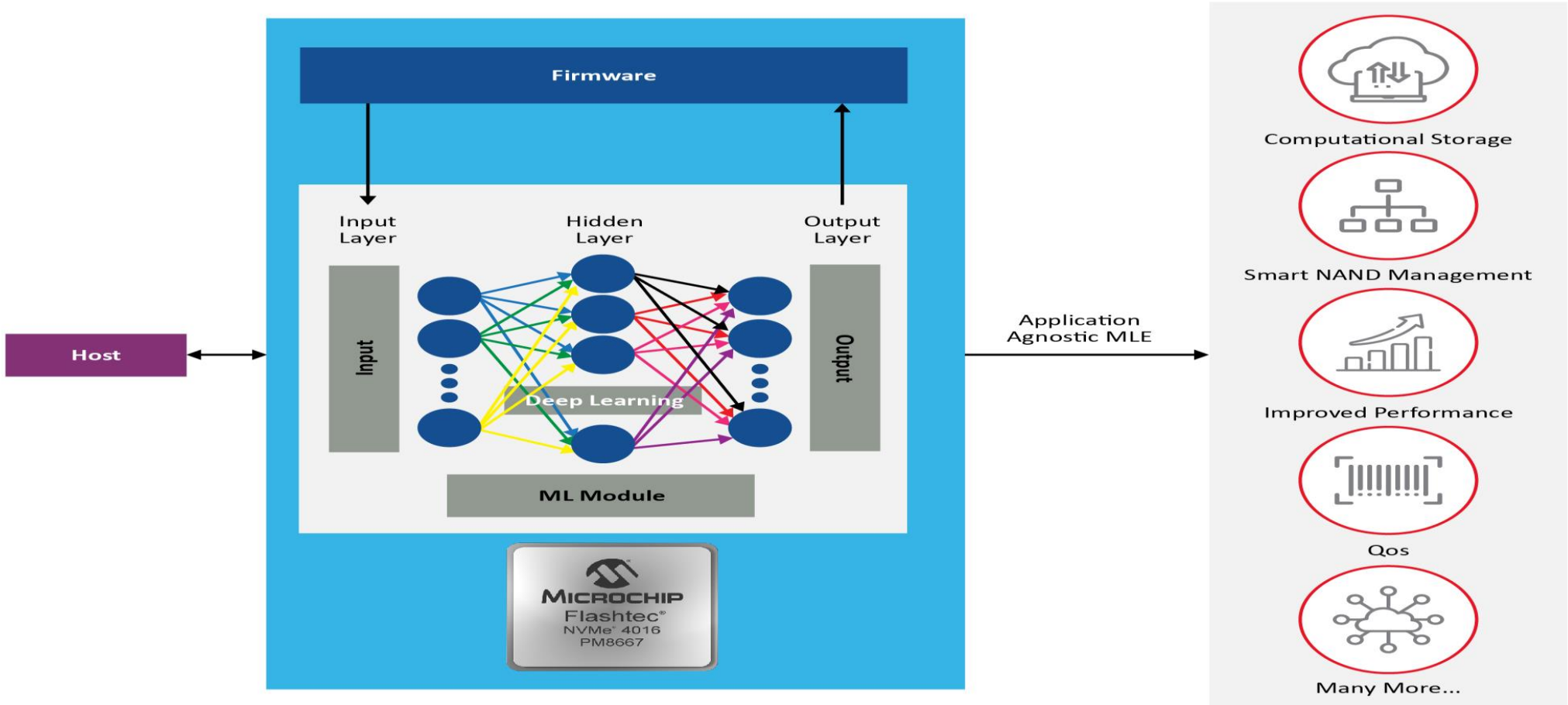
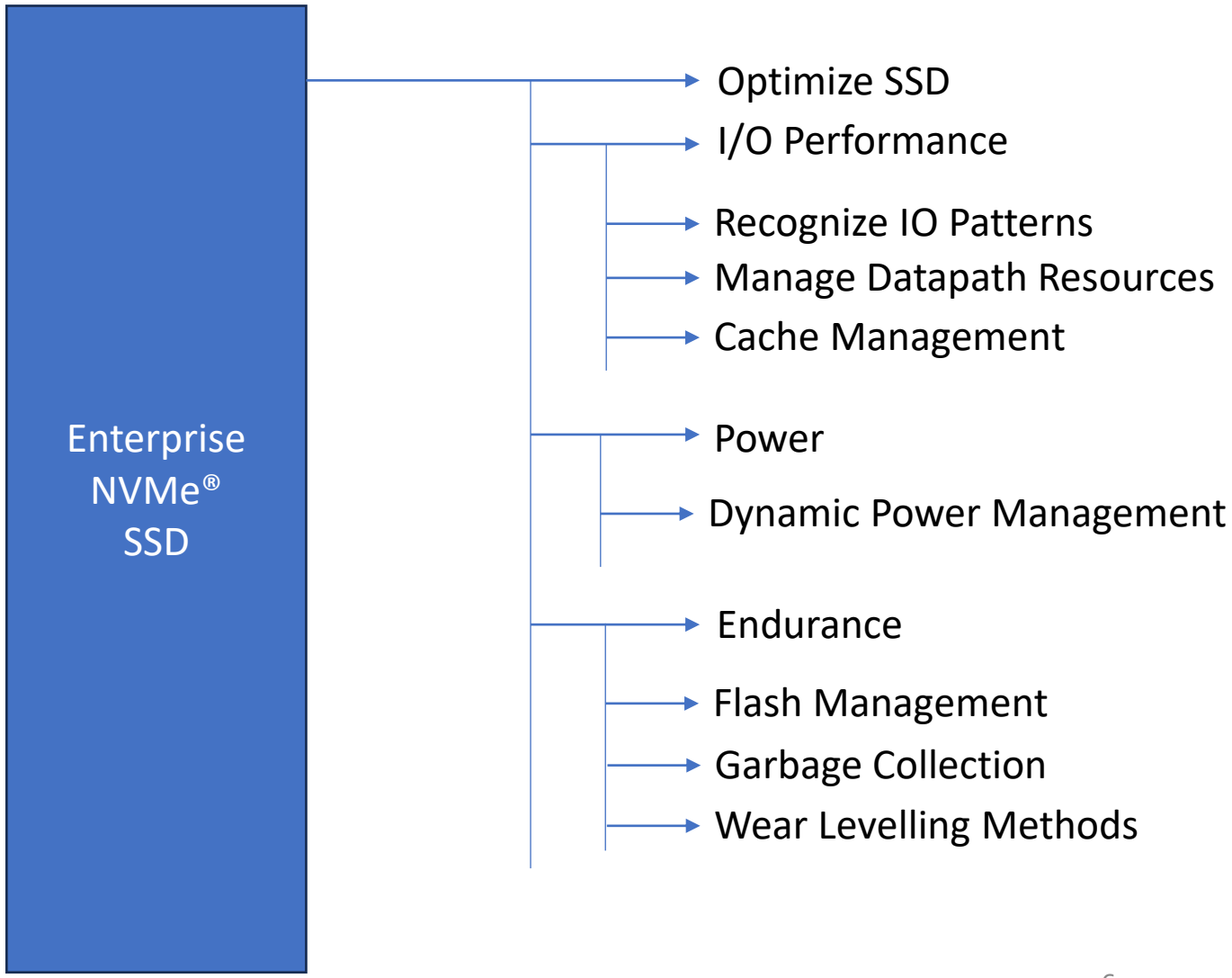
Why MLE in NVMe® SSDs?



MLE For Optimizing Performance and Health of an SSD



Other Applications of MLE in NVMe® SSD

- ML for QOS (Quality of Service):
  - NAND errors cause fallback to error correction and impacts QOS
  - By using effective NAND management, the number of NAND errors can be reduced thus causing less impact to QOS

Other Applications of MLE in NVMe® SSD

- Other uses of ML:
  - AI/ML engine in NVMe® controller provides endless capabilities to the NVMe® device
  - Some additional scenarios are:
    - Minimizing disruptions by early detecting and recovering or failover from faults, FW upgrades, security attacks
    - Optimizing power and performance by throttling the resources
    - Dynamically adjusting the information to be collected and stored for smart telemetry
    - Performing self-tests and corrections
    - Scaling with varying needs during the operation of the SSD without human intervention

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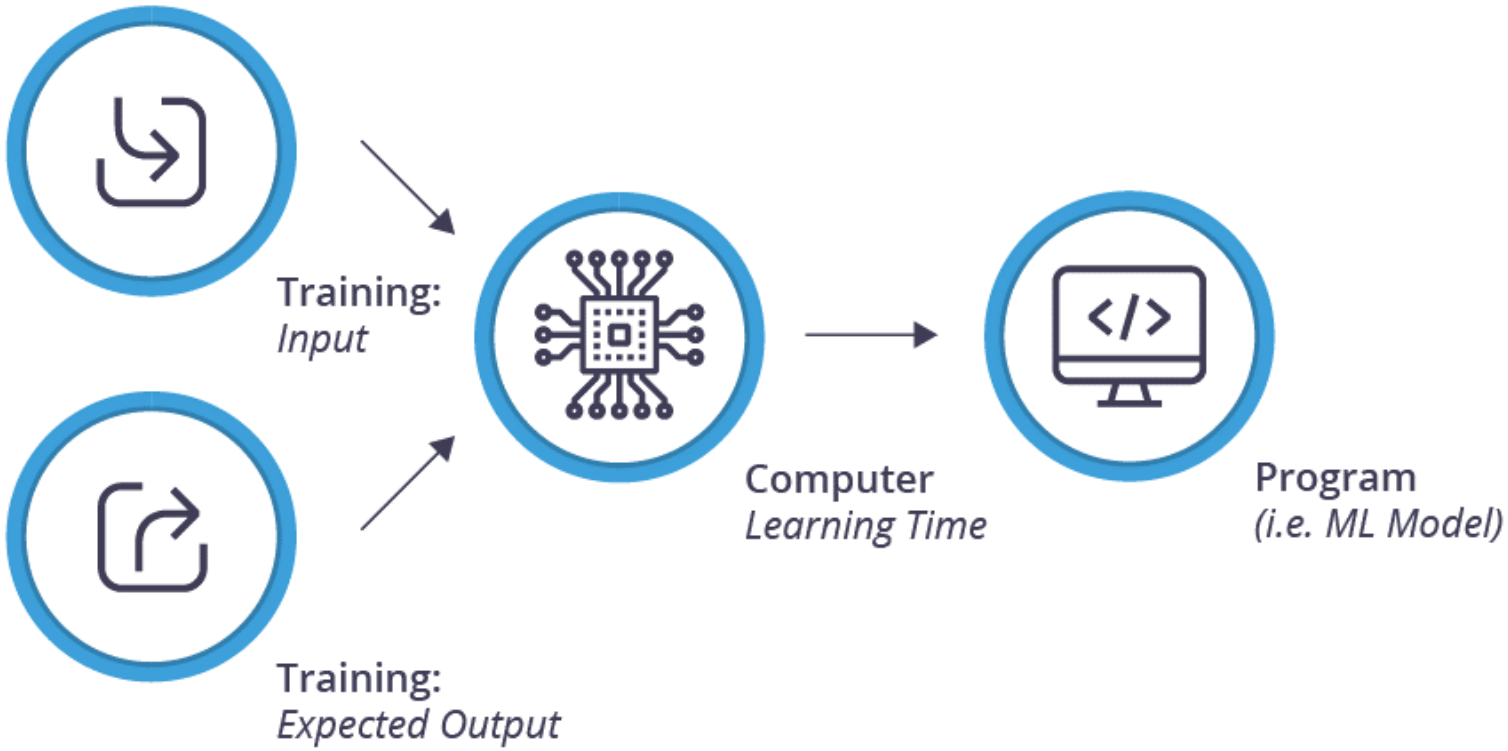
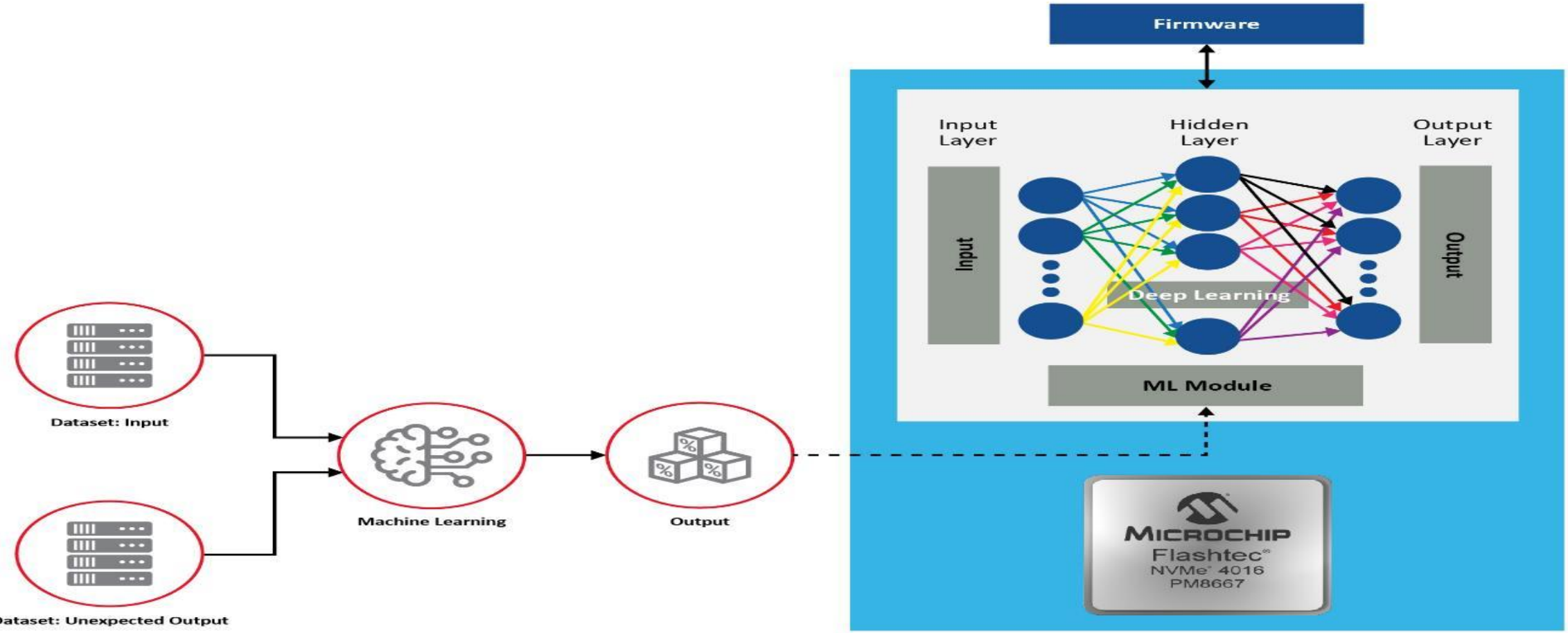
Neural Network Training

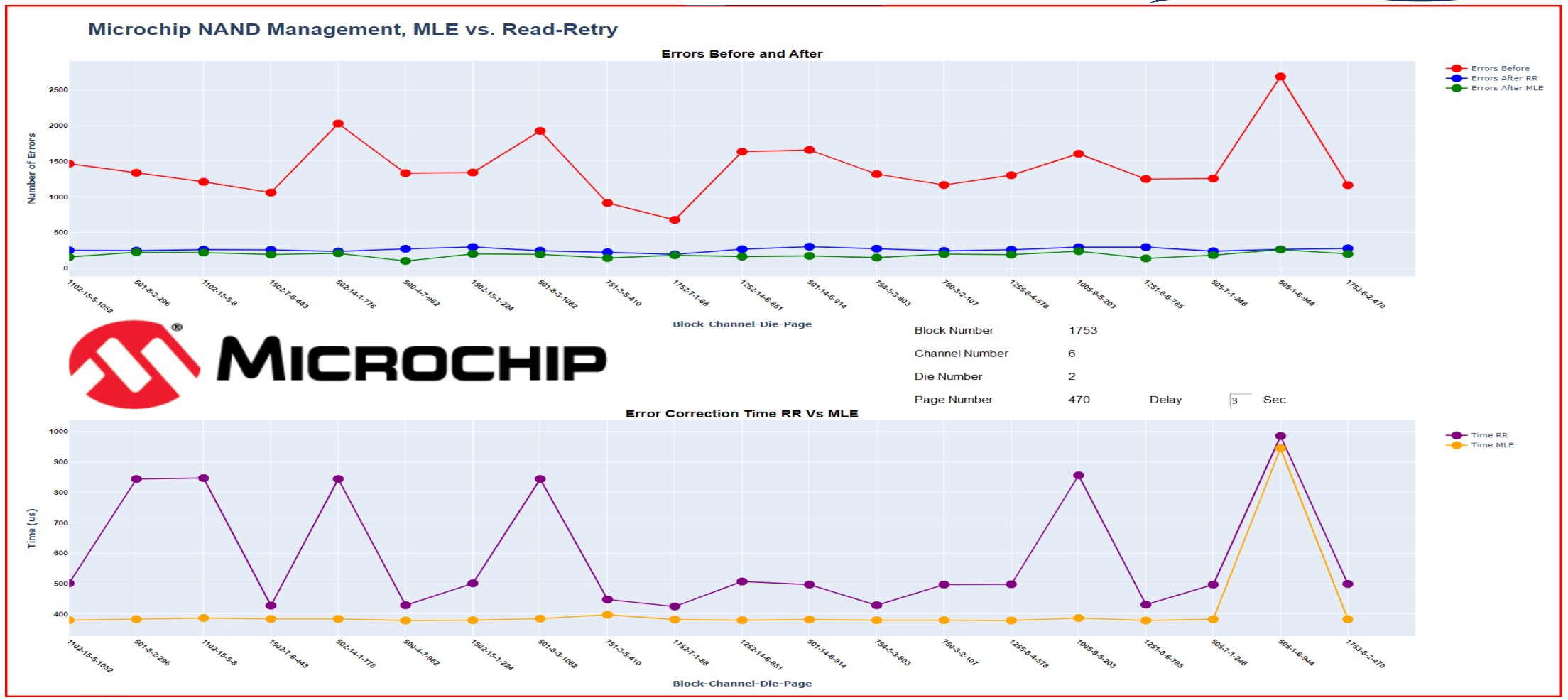


NVMe® SSD MLE Architecture (Flashtec® NVMe® 4016)



Error Correction Using MLE

Live Demo in Microchip Booth !



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