



System Benefits of EZ NAND/ Enhanced ClearNAND™ Flash

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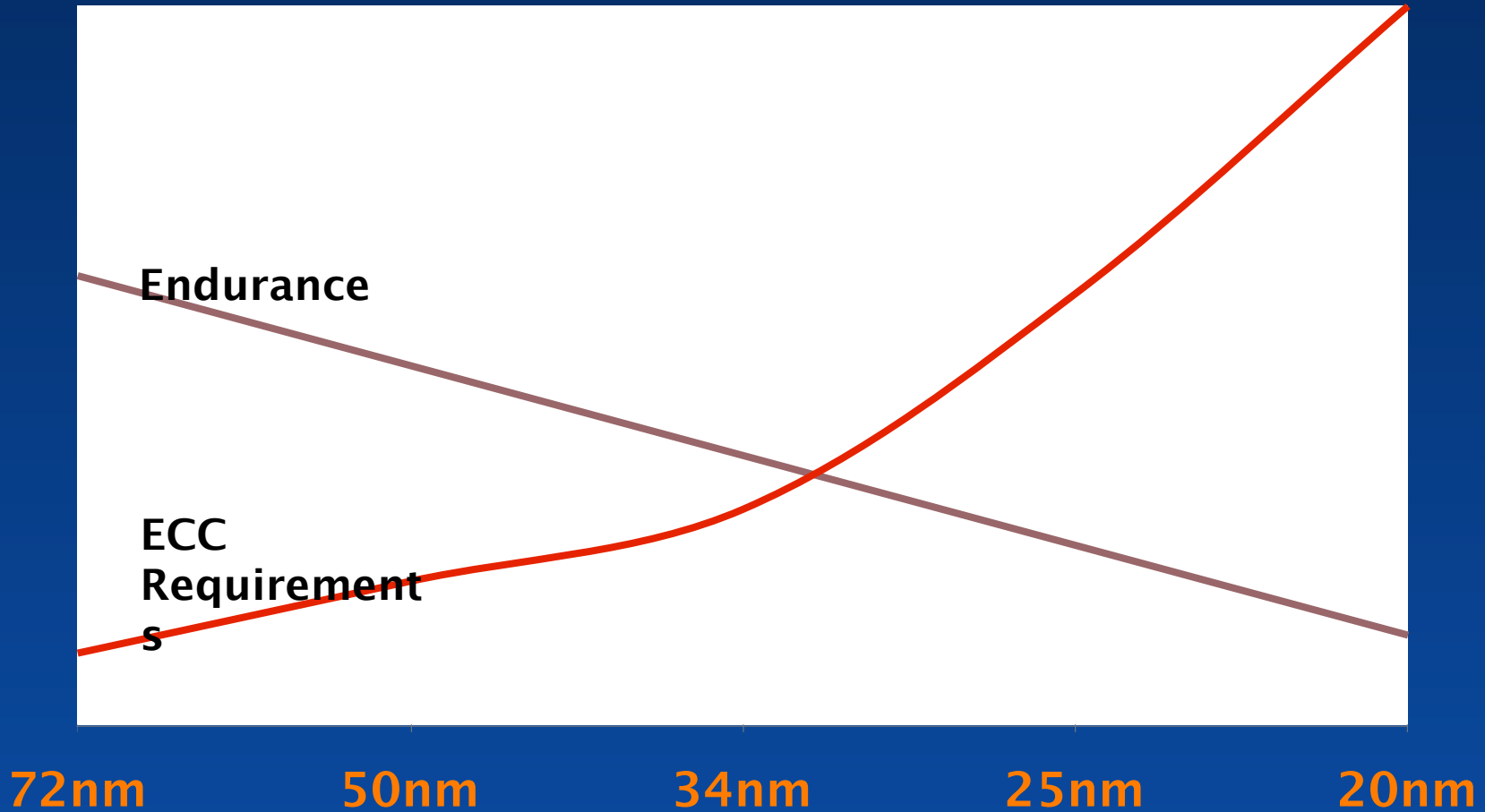
Santa Clara, CA
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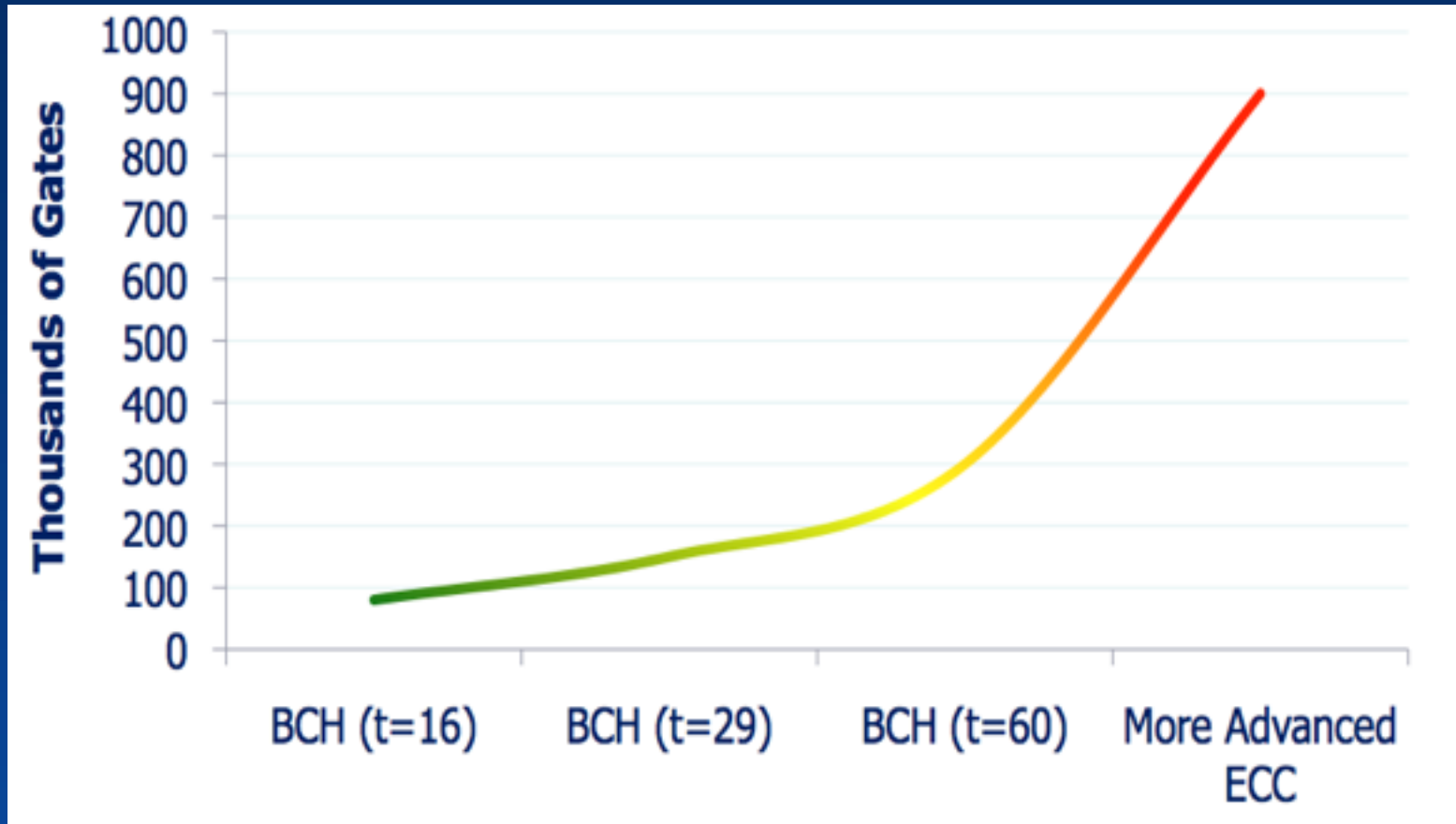
Agenda

- NAND Challenges
 - Scaling
 - ECC Complexity
- The EZ NAND Solution
- Additional Controller Benefits
 - Enhanced ClearNAND
- Summary

The Drawbacks of NAND Scaling



ECC Complexity vs. Logic



Increasing RBERs requires more ECC to achieve equivalent UBERs

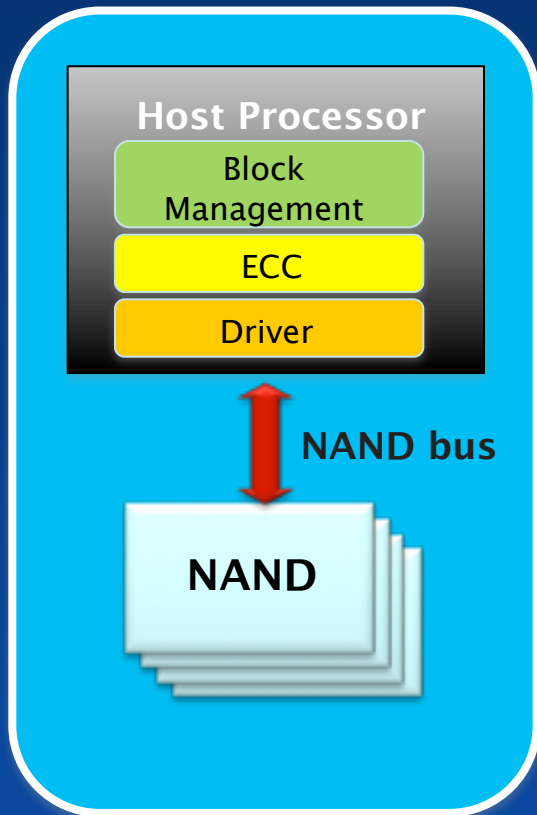


The EZ NAND Solution

- Minimizes impact of NAND technology transitions
 - Latest technology can be used **sooner**
- Allows host processor to focus on system-level optimization
- Internal controller offers performance and scaling benefits
 - Provides buffer to reduce channel loading, improving signal integrity

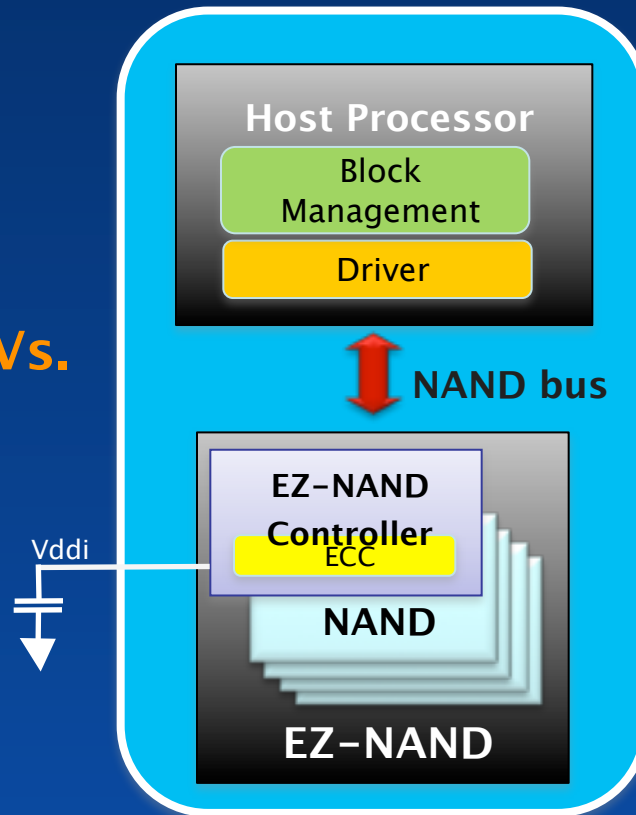
Raw NAND vs. EZ-NAND

System Using Raw NAND



Vs.

System Using EZ-NAND

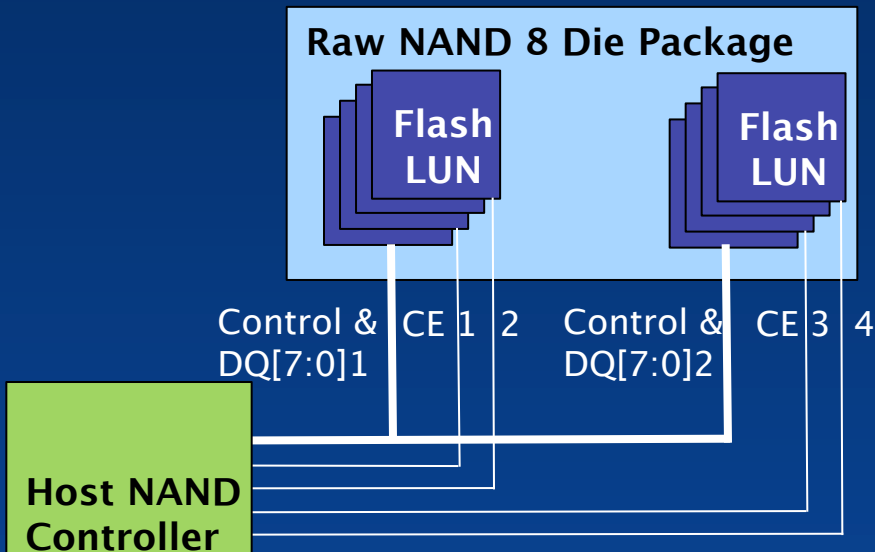


EZ-NAND:

- Relieves Host's ECC burden
- Host maintains control:
 - Block Management

EZ NAND: Loading Improvements

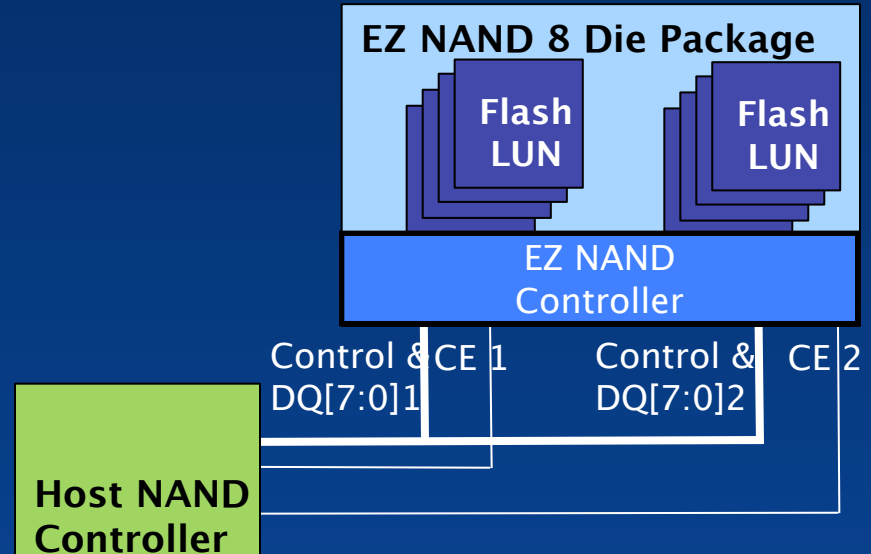
System Using Raw NAND



Raw NAND:

- Loading increases with additional NAND die
- May limit I/O speed; reduce system performance

System Using EZ NAND



EZ NAND:

- EZ NAND Controller serves as buffer to NAND die
- Allows for faster I/O speed with more NAND die

Additional Controller Benefits

- Internal Controller allows for additional features:
 - Command Queuing
 - Multi-Core/Multithreaded Architecture Support
 - LUN Optimization
 - Commands optimized to utilize LUNs efficiently; reduces Host command complexity
 - Power Management
 - Limit number of active LUNs, etc.

Command Queuing

- Available on Enhanced ClearNAND via “Enhanced” Command Set
- Allows commands to be queued if LUNs are busy
 - READ/ERASE queue dependent on command queue depth
 - PROGRAM queue dependent on buffer availability

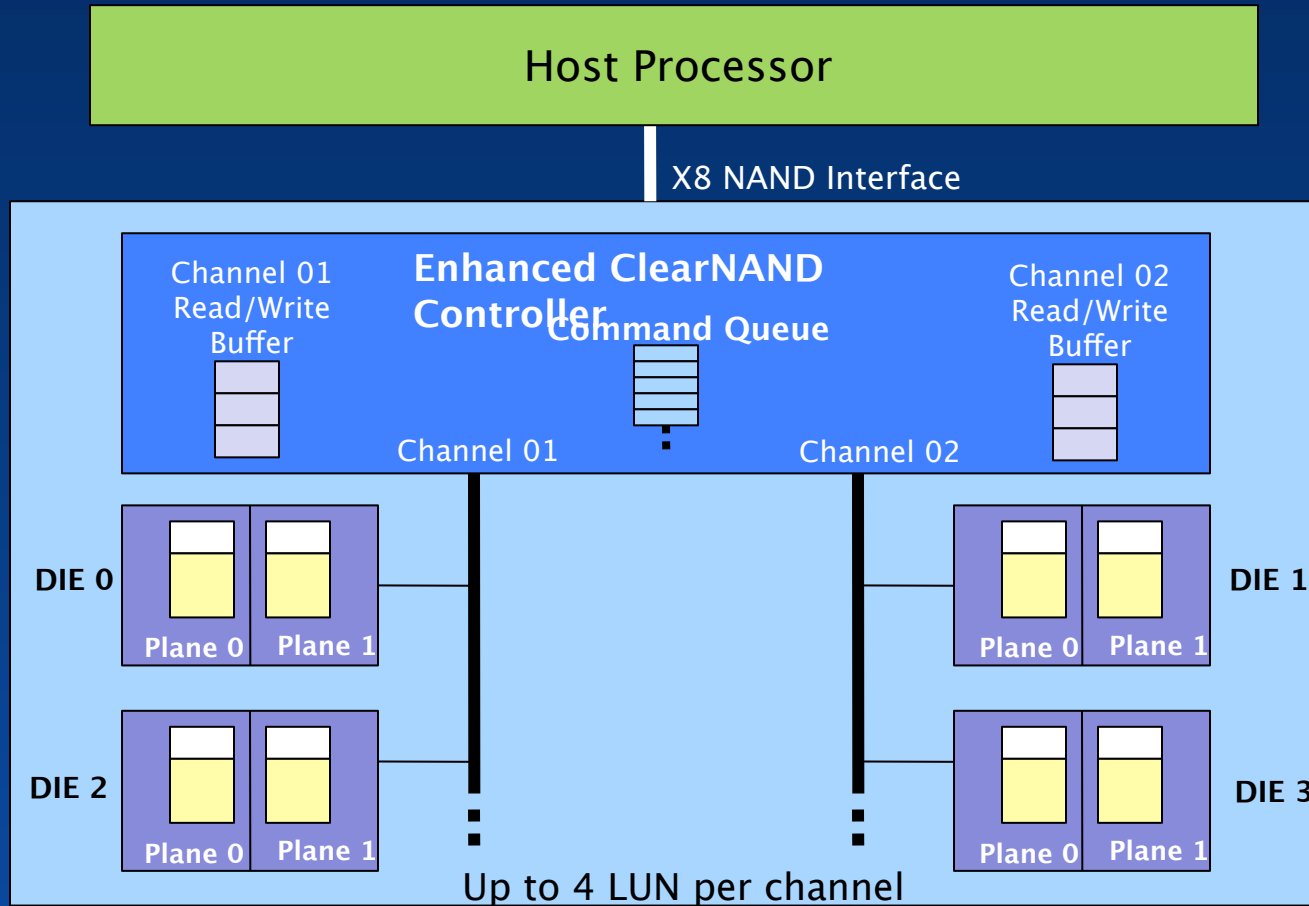
LUN Optimization

- Internal Controller is able to optimize LUN usage by combining commands where possible
 - Multi-LUN commands
 - Additional NAND optimization
- Allows each NAND vendor to utilize expertise without requiring host to customize commands

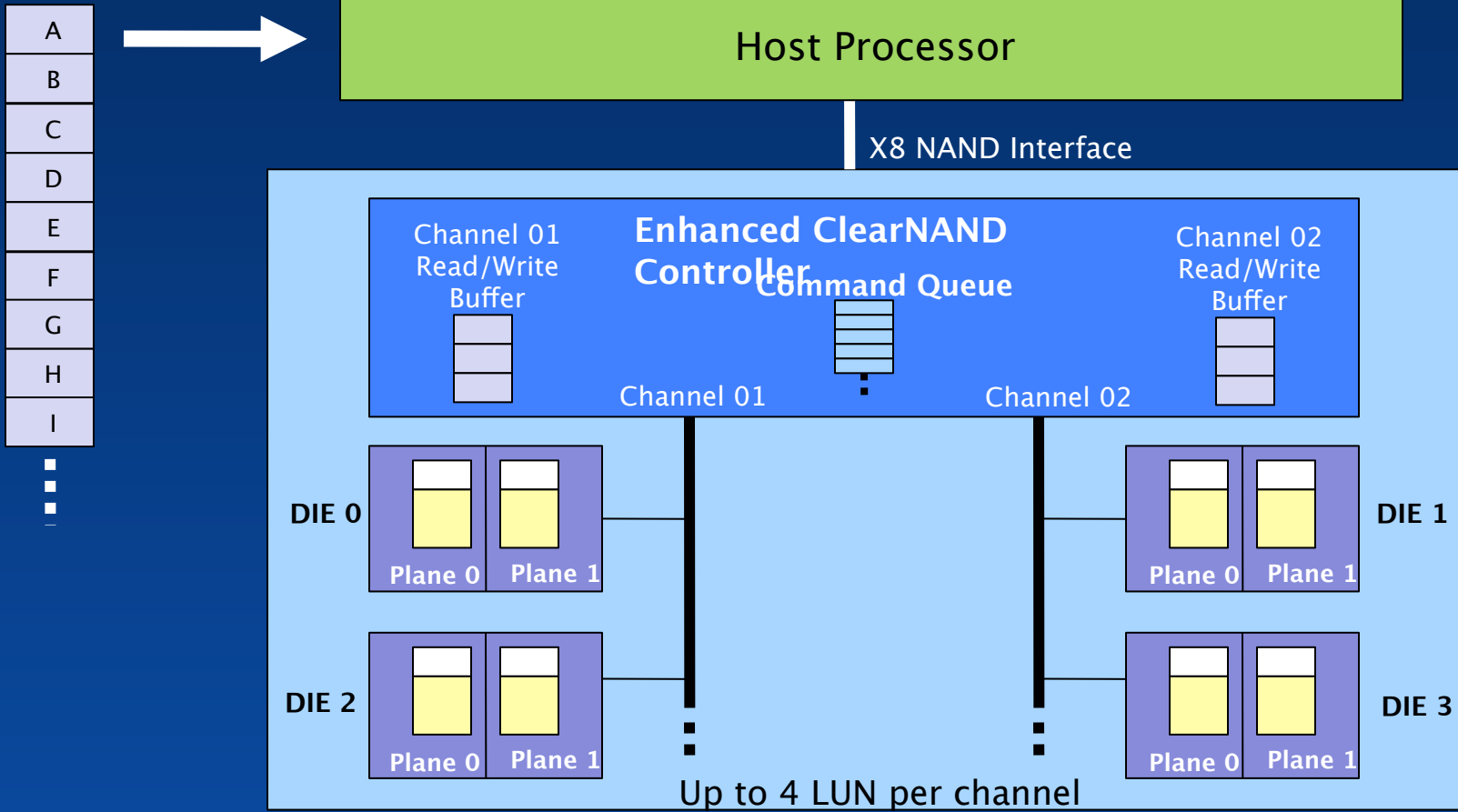
Power Management

- Internal Controller can assist with power management
 - Limit number of active LUNs
 - Additional power management techniques
- Allows each EZ NAND device to be tailored for power/performance based on application requirements

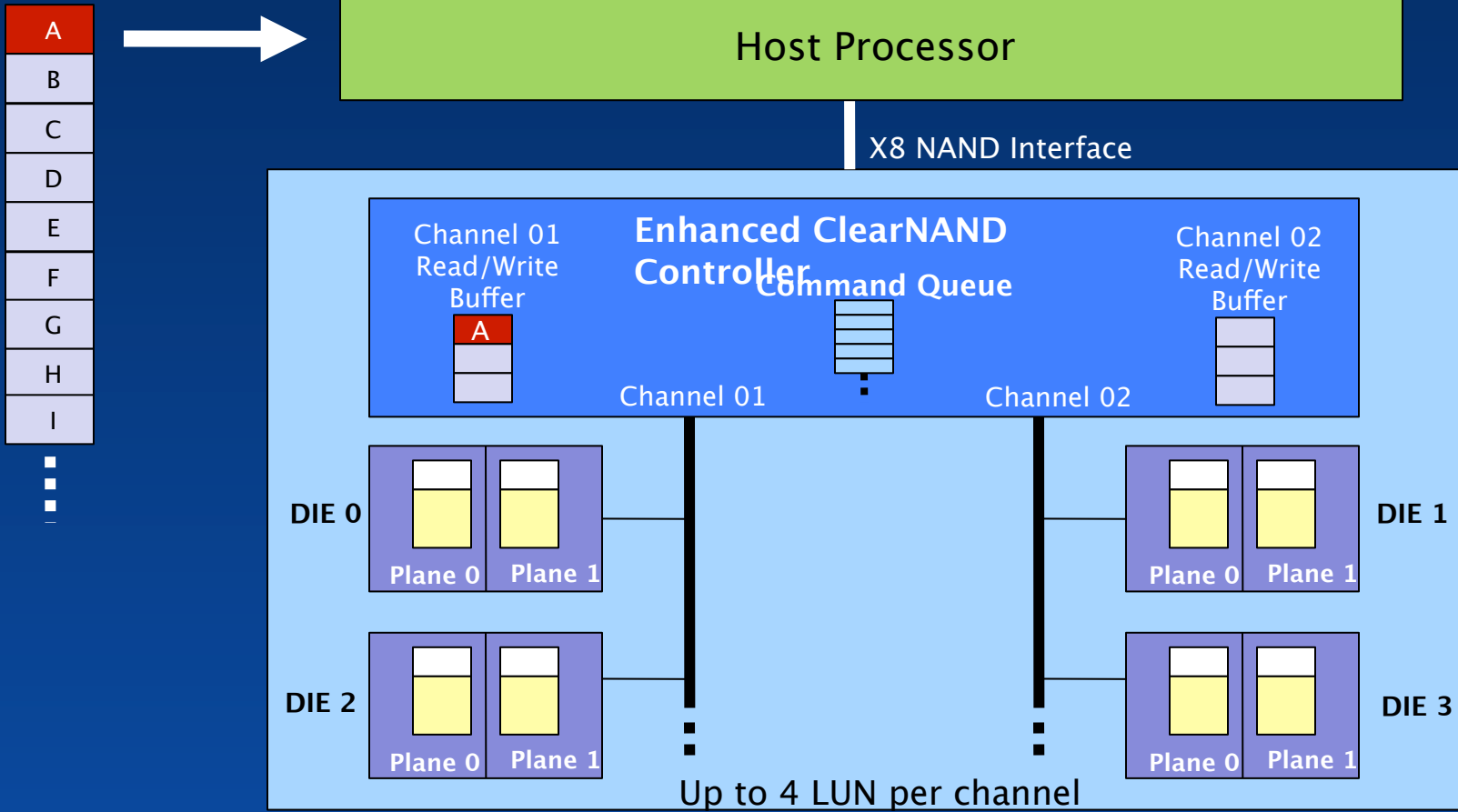
Enhanced ClearNAND



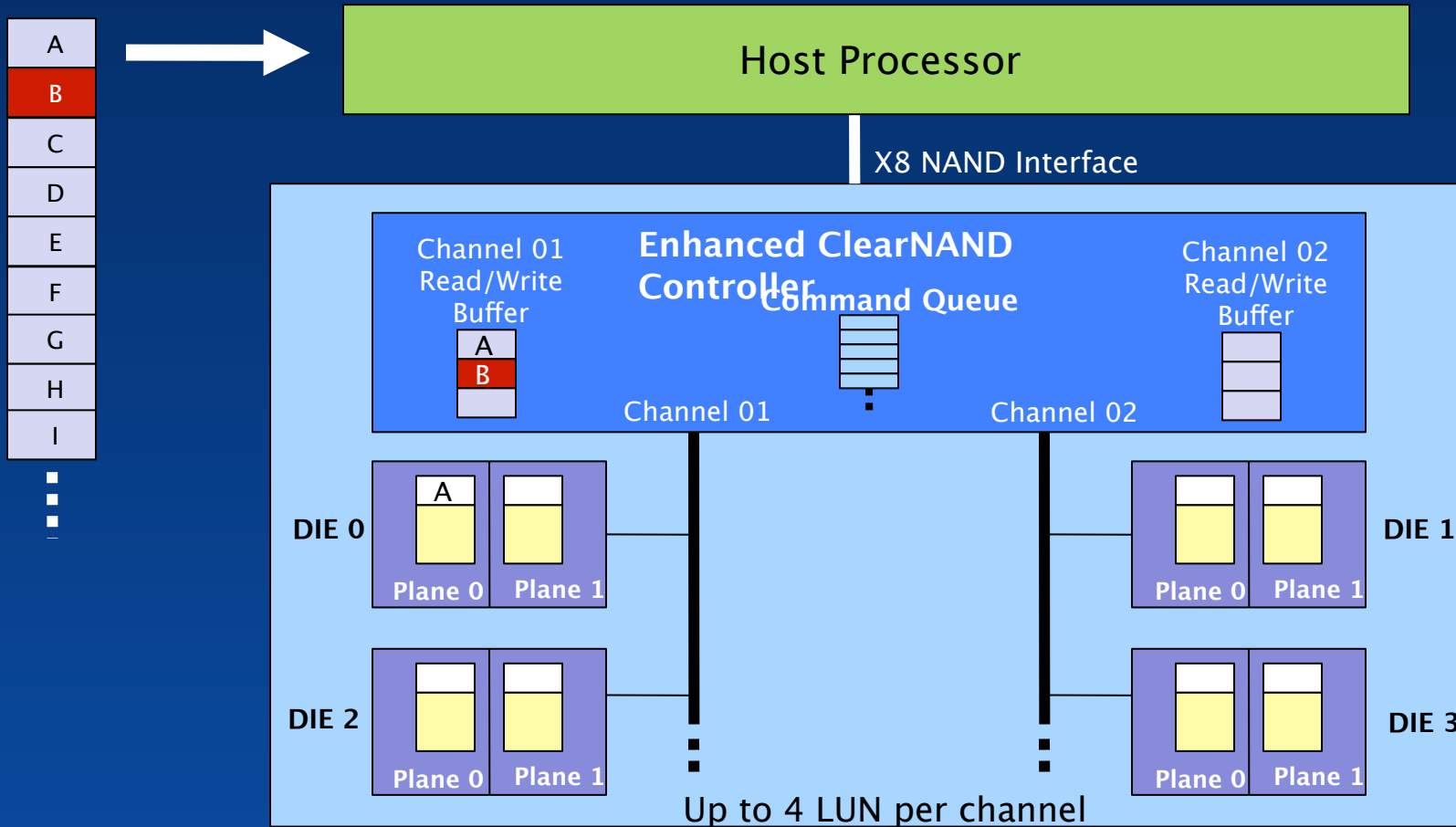
Enhanced ClearNAND



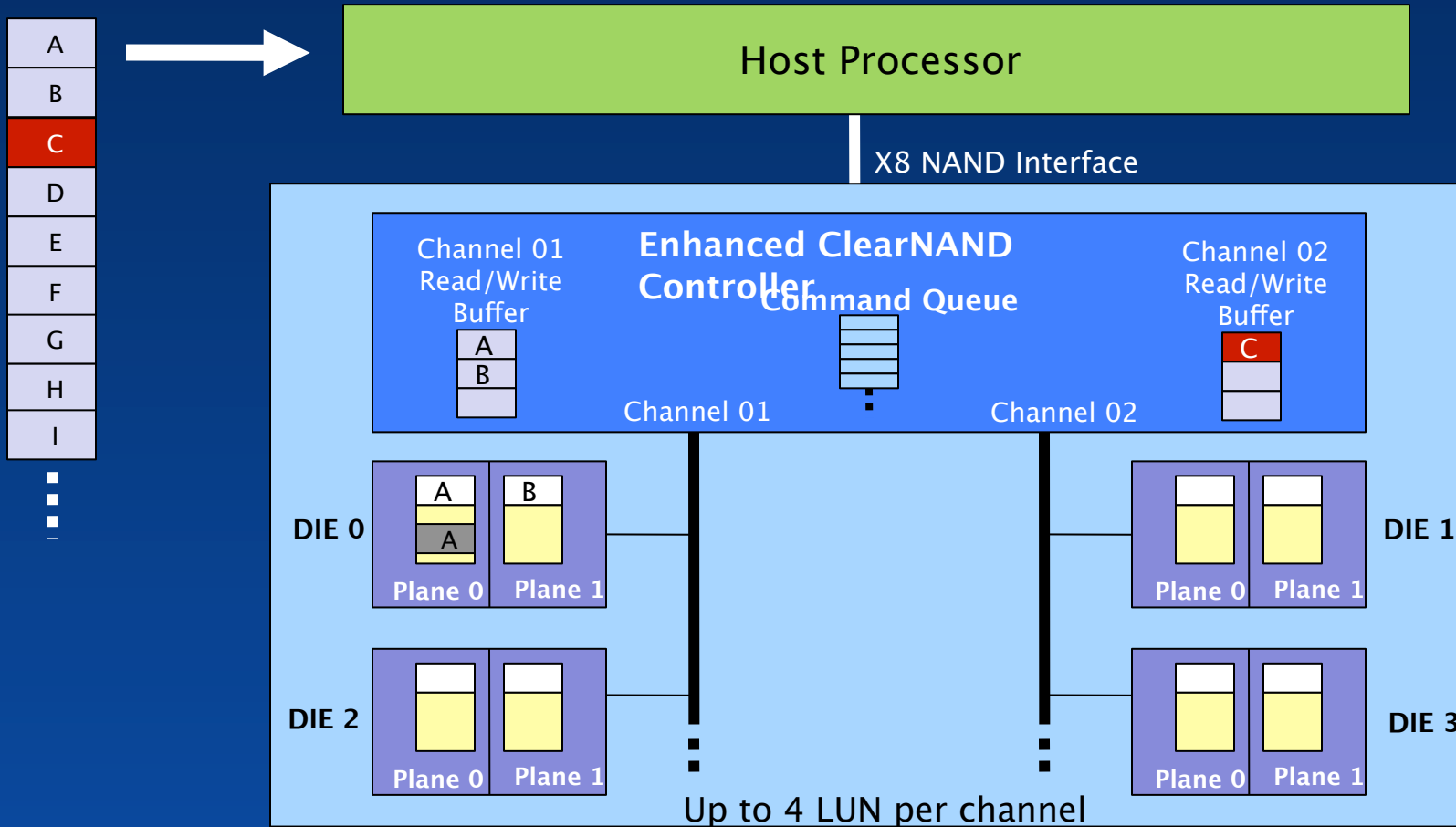
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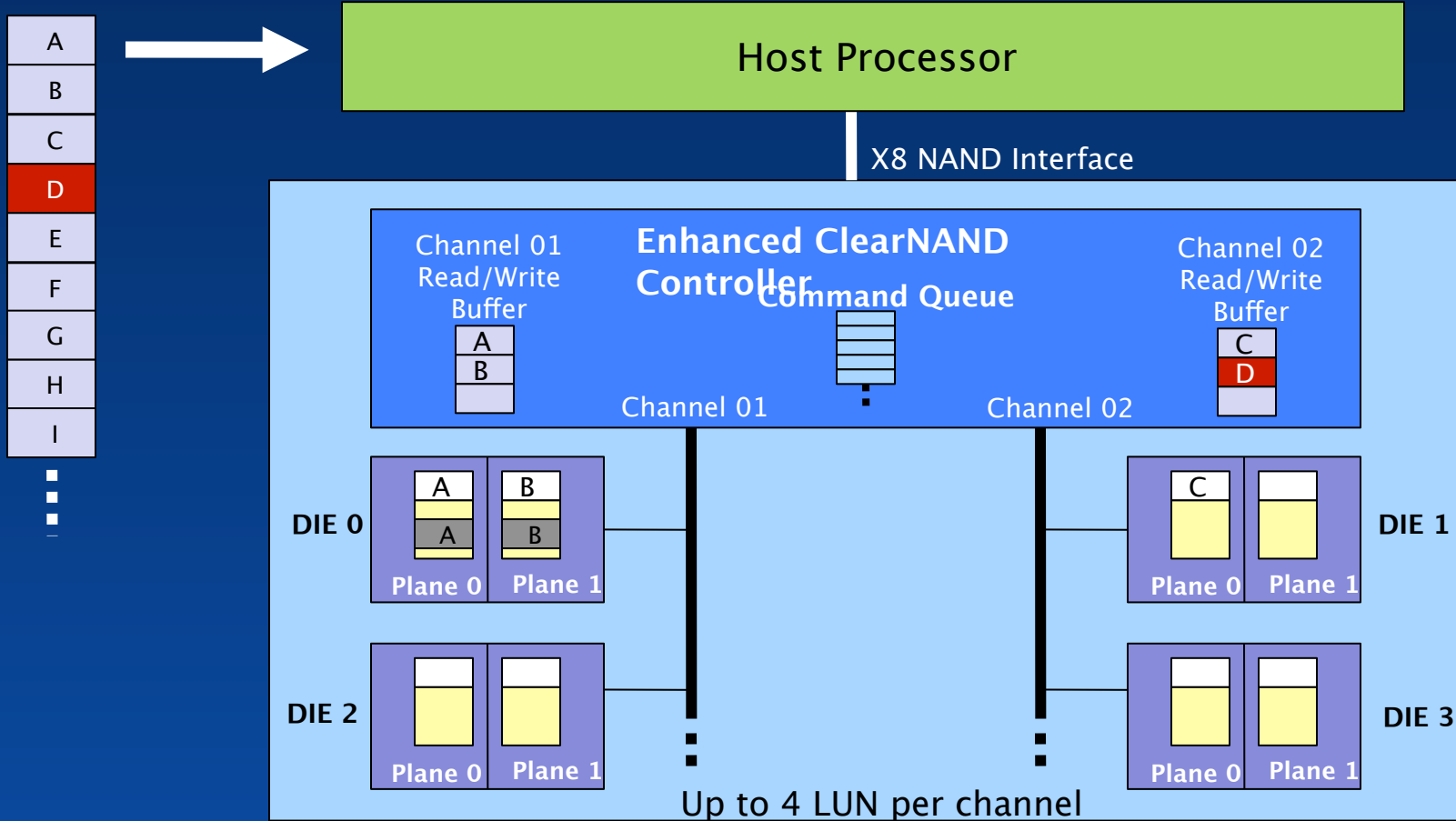
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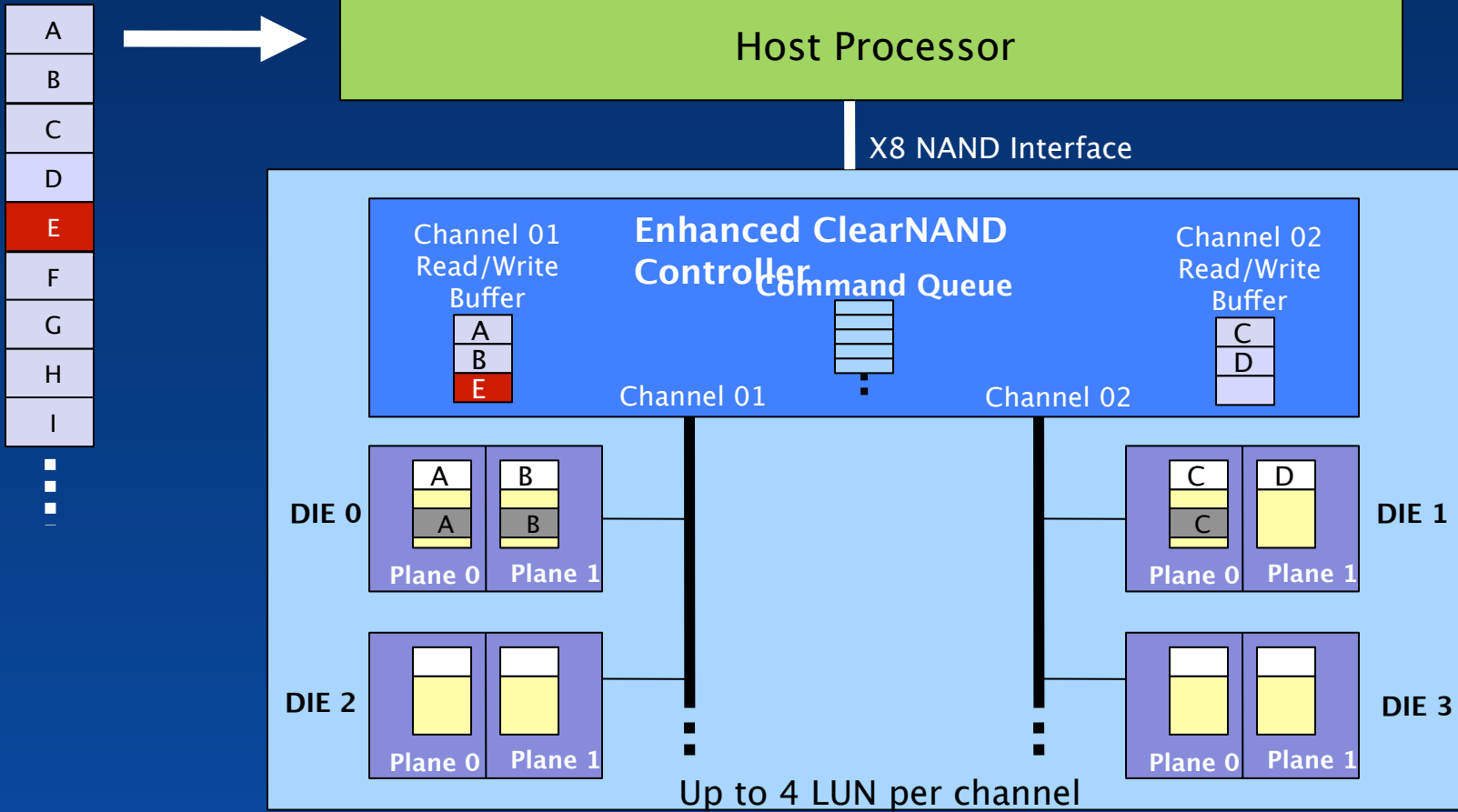
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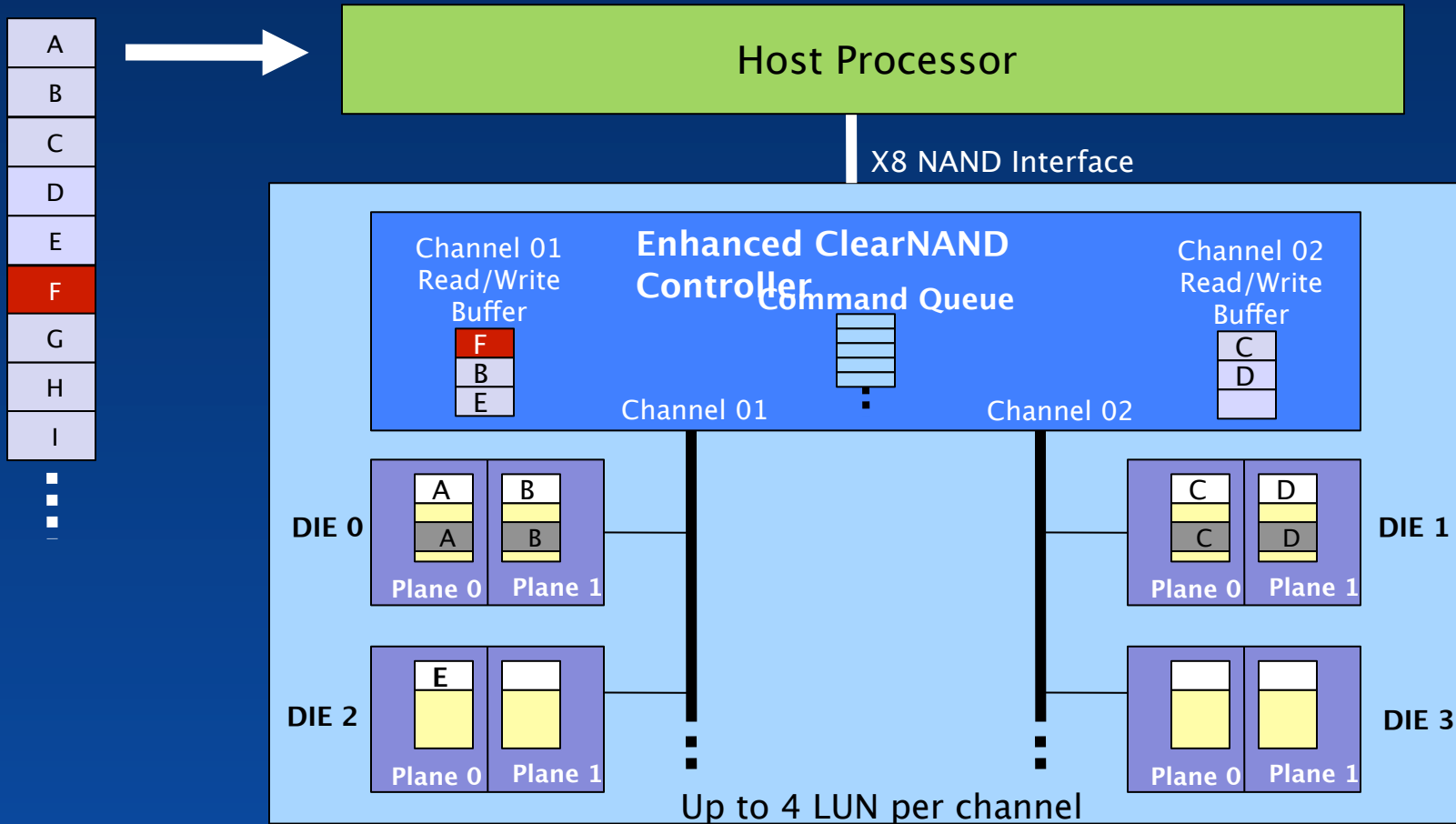
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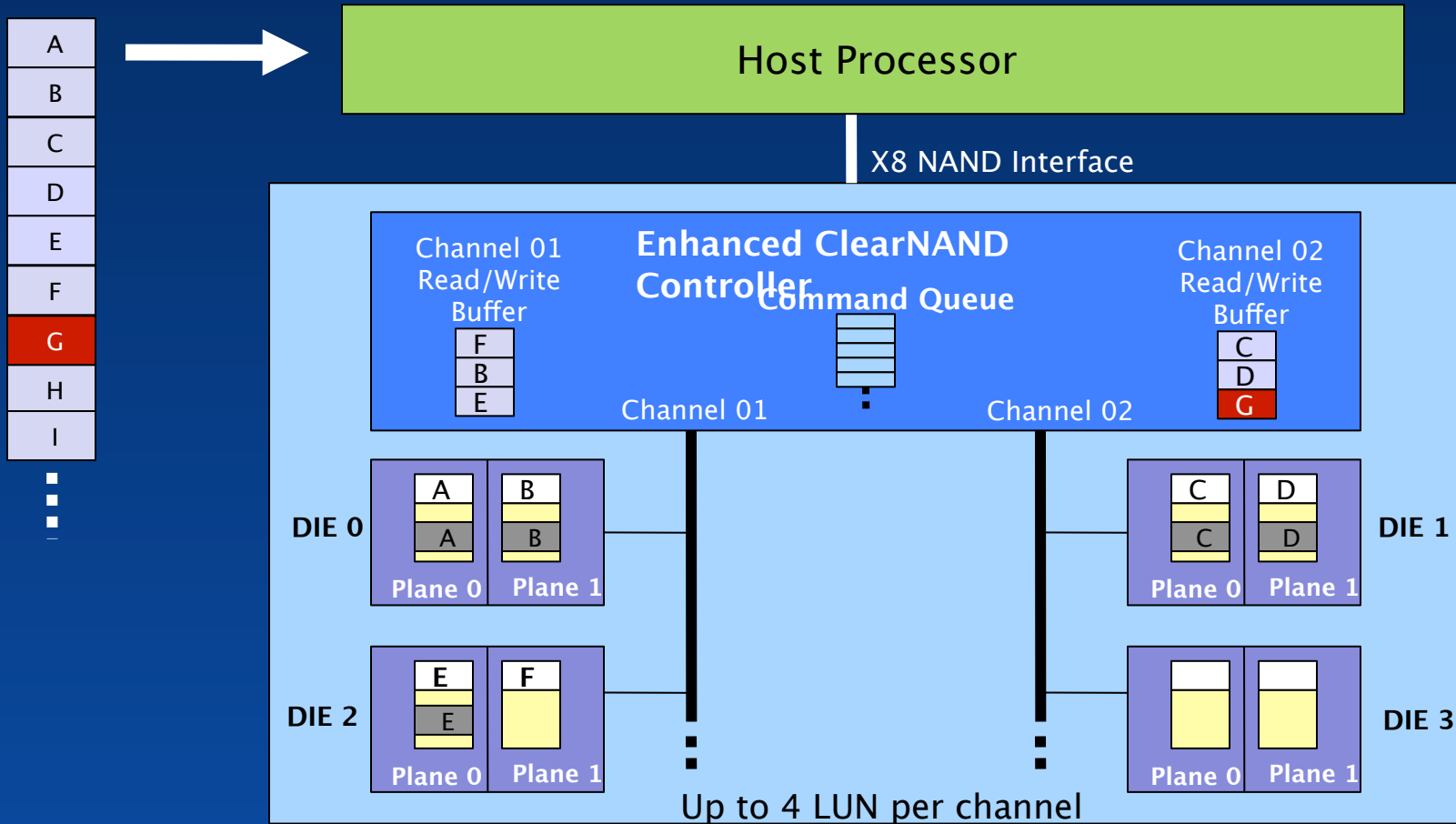
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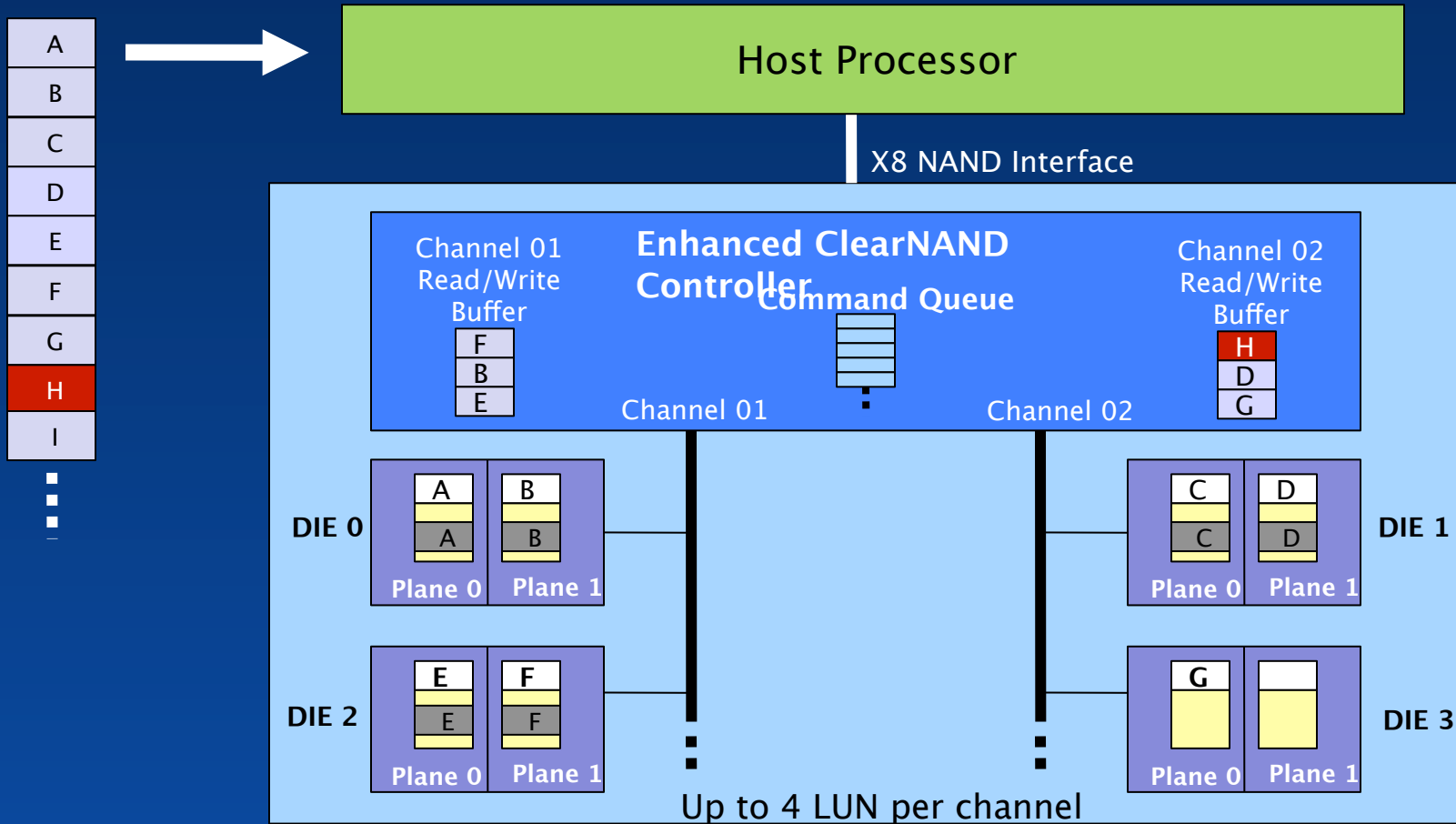
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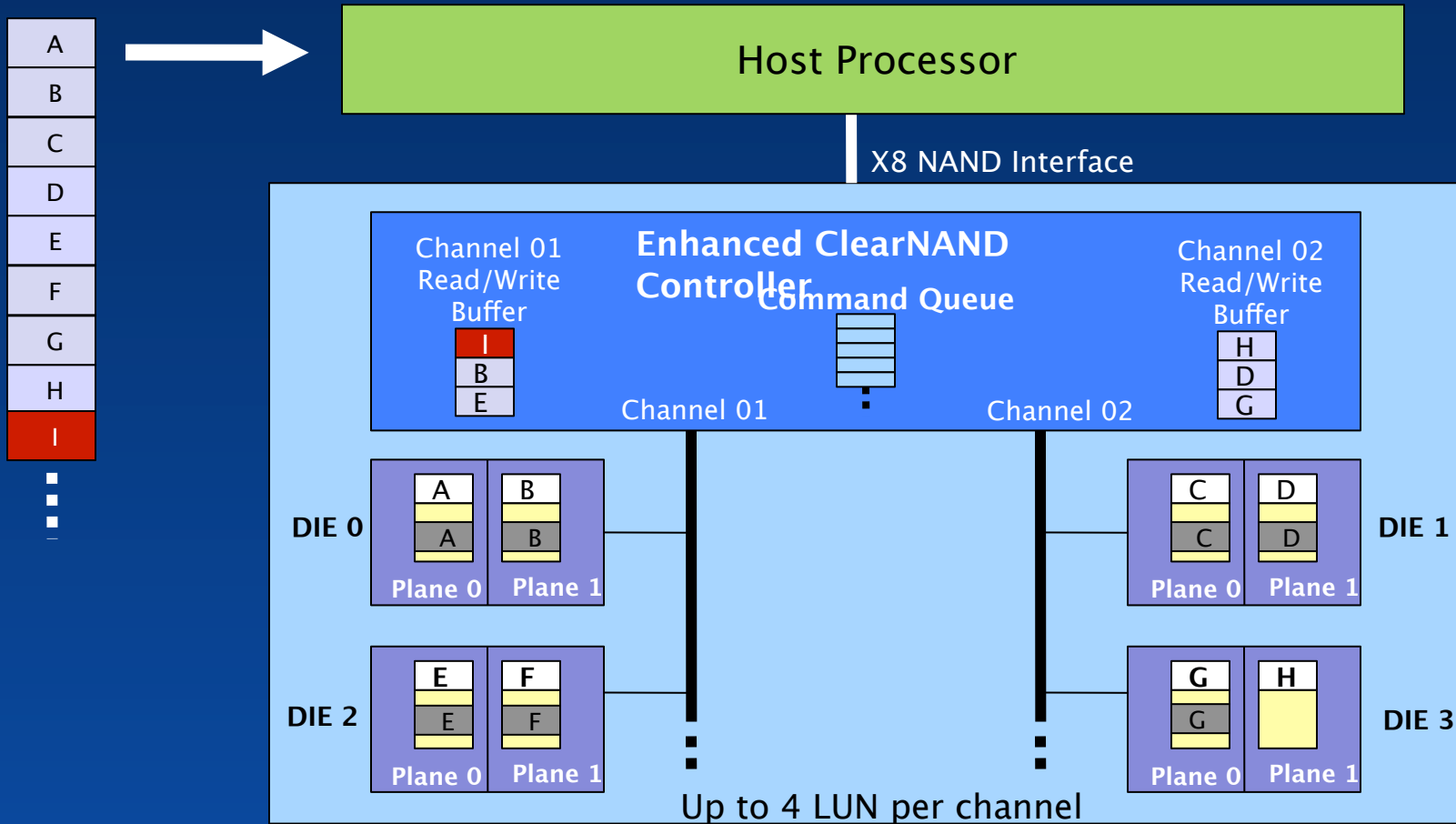
Enhanced ClearNAND



Enhanced ClearNAND



Enhanced ClearNAND



- EZ NAND allows host to optimize NAND usage for each application
- Additional features are available based on internal controller capabilities
- Enhanced ClearNAND provides flexible NAND solution to suit many applications



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