Handling Common Challenges When Designing with NVMe-over-Fabrics

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Discussion topics

- What is Verification IP?
- NVMe-OF World
- NVMe-OF Hurdles
- Summary
Verification IP

- Verification IP
  - What
    - a library of reusable components
    - Supports industry standards
    - Built-In Protocol Checks and Coverage
  - Why
    - To ensure IP interoperability and system behavior.
    - To improve quality
    - Saves engineering resources to do verification on own
    - Reduces schedule time
Symbolic VIP environment

- Configuration
  - To configure host/controller
- Stimulus
  - To execute scenarios
- Assertions
  - To check protocol validity
- Coverage
  - To observe execution of test plan
NVMe-OF World
NVMe-OF hurdles

Standard in its infancy.
Transport Hurdles-1

- **Transport Connect for Discovery service at initial stage**
  - Hurdle
    - Which transport to use to connect to discovery service?
  - Solution/Clarification
    - Administrator configures every node with transport type
    - Manually configures each host’s discovery client with the transport address of the Discovery Service.
  - How VIP helps
    - **Configuration** - Configurable transport type of each port
    - **Stimulus** - generation as per transport requirement
Transport Hurdles-2

- Max RNR NAK handling if requester exhausts
  - Hurdle
    - RNR Retry limit exhausted, how host knows
  - Solution/Clarification
    - Treat this as FATAL
    - start teardown process
  - How VIP helps
    - Assertion – for max retry limit and others
    - Configuration – FATAL severity can be changed
    - Coverage - all possible scenarios covered
• **Queue deletion at Transport Level**
  - **Hurdle**
    - No Disconnect process definition
    - What if queue deletion process at transport fails?
  - **Solution**
    - Host will initiate disconnect process through pre defined verbs and allows it to completed before initiating any new process
    - If disconnect fails transport will report the same to local NVMe layer through verbs
  - **How VIP helps**
    - **Configuration** – Dynamic deletion of Queues and its process
    - **Stimulus** – to start deletion process
    - **Assertion** – to report errors for any violation
Connect Hurdles-4

- **CID and SQHD for Connect commands**
  - Hurdle
    - SQHD and CID for Connect Command?
  - Solution/Clarification
    - Zero! Initially for non-created queues
    - “Command sequence error” for created queues, so valid CQID and SQHD must be present

- **How VIP helps**
  - Configuration
    - Configurable SQID and CID fields for any command
    - Configurable status messages
  - Stimulus – to insert any user-defined values in command fields
  - Assertion – to report error for violation of any field values
Connect Hurdles-5

• Connect Commands:- Status “invalid Field in command”
  • Hurdle
    • What status for invalid fields in connect command?
  
  • Solution/Clarification
    • “Connect Invalid Parameter”
  
• How VIP helps
  • Configuration - Configurable status messages
  • Stimulus – to insert any user defined values in command fields
  • Assertion – to report error for violation of any field values
Protocol Hurdles-6

- **Mix SGLs type in Single Capsule**
  - Hurdle
    - Assorted SGLs in single command capsule?

  - Submission Queue Entry
    - SGL1 -> Last Segment (length =32)
    - SGL = Data block with offset =x and length = M)
    - SGL = Data block with offset =x+M, length = N)

  - Solution/Clarification
    - Assorted Data Segments Not Allowed

  - How VIP helps
    - **Stimulus** – to execute commands contain assorted SGL types
    - **Assertion** – to report error for violation such behavior
    - **Coverage** – to cover all SGL types
Miscellaneous Hurdles-7

- Discovery Log Entry
  - Hurdle
    - Assorted Log Entries?

- PSĐT
  - Hurdle
    - Reserved in NVMe-OF means 2'b00 or 2'b10?

- Command Sequence Error for create IO Queue
  - Hurdle
    - Can host send IO queue connect before enabling controller

- TRADDR and IP Address mapping
  - Hurdle
    - TRADDR – Network Address DGID etc. mapping not defined
Summary

- The transport hurdles can be avoided by proper communication channel
- connect commands not interpreted by Controller i.e. fabric specific
- NVMe-Of standard will get hand-2-hand with NVMe standard
- Above all can be easily resolved by using QVIP in any defined/generic behavior
Mentor QVIP portfolio
Thank You

• Please visit us at our Booth 136 in the Exhibition area for a demo

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