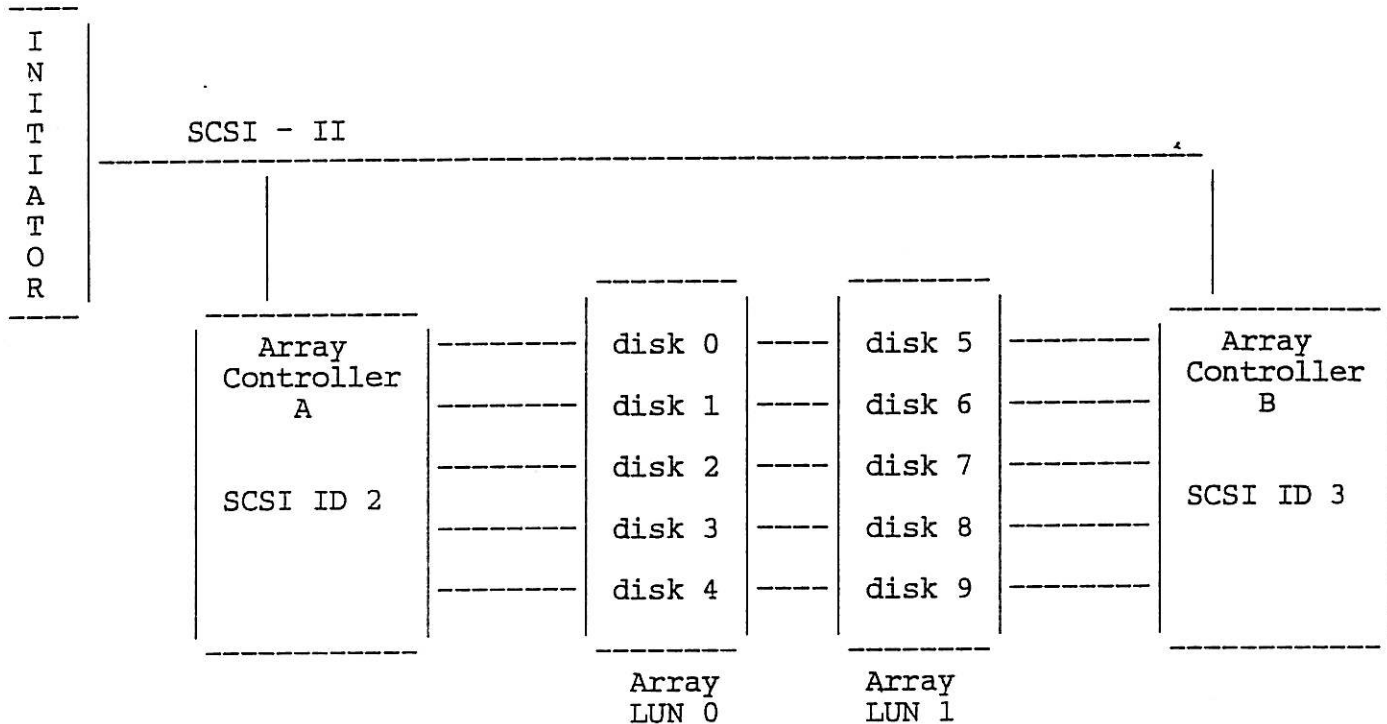X3T9.2/93-11
Steve Todd

In addition to previously discussed issues, the RAID study group should consider the case of dual Array controllers accessing a single set of Array LUNS:

Definition:
        Peer controller - Two disk array controllers are considered to be peers if they are each capable of accessing the same disks or disk LUNs.

Configuration Assumptions:
        o Multiple Array Controllers are active
        o LUNs may be "owned" by one controller, or shared by multiple controllers
        o Configuration is not limited to only two LUNs
        o Configuration is not limited to only two Array Controllers

1) How do controllers establish ownership of Array LUNs?
2) If a LUN is exclusively "owned" by one controller:
        A) How should a peer controller respond to the following commands?
                Inquiry
                Test Unit Ready
                Reads and Writes
                Reservation
        B) How can an initiator force ownership of a LUN to a peer controller?
        C) Does a peer controller report error information on LUNs that it does not own?
    3) If LUNs are shared, which controller reports disk errors?
    4) When multiple controllers detect a hardware/configuration problem, which controller notifies the host? Does this imply that controllers 'own' hardware components?
    5) How does an initiator know that controllers are peers?
    6) If a controller which exclusively owns a LUN fails, should the initiator be allowed to access that LUN through a peer controller? If so, can the peer access data immediately, or is a "Trespass" command from an initiator required?
    7) Do any of the above answers change in a multiple initiator configuration?

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CLARiiON Disk Array/Data General Corp. - 1/4/93

Questions and Proposed Solutions:

1) How do controllers establish ownership of Array LUNs?

Proposal: Include a field in "array creation" mode page.
Add new mode page to modify setting.

2) If a LUN is exclusively "owned" by one controller:
   A) How should a peer controller respond to the following commands?
      Inquiry
      Test Unit Ready
      Reads and Writes
      Reservation

      Proposal:
      Inquiry - returns valid information
      Test Unit Ready - Check condition:
                        sense key- Not Ready, Define a new Qualifier
      Reads and Writes - same as Test unit ready.
      Reservation - is allowed to occur

   B) How can an initiator force ownership of a LUN to a peer controller?

      Proposal: New mode page for 'Trespass'

   C) Does a peer controller report error information on LUNs that it does not own?

      Proposal: A controller only reports errors which it detects.

3) If LUNs are shared, which controller reports disk errors?

   Proposal: A controller only reports errors which it detects.

4) When multiple controllers detect a hardware/configuration problem, which controller notifies the host? Does this imply that controllers 'own' hardware components?

      Proposal: A controller only reports errors which it detects.
      Errors may be reported by any and all controllers which detect them.

5) How does an initiator know that controllers are peers?

      Proposal: New mode page to identify peer's SCSI ID, and a unique signature for the current target and any peers that it can detect.

6) If a controller which exclusively owns a LUN fails, should the initiator be allowed to access that LUN through a peer controller? If so, can the peer access data immediately, or is a "Trespass" command from an initiator required?

      Proposal: Should be a configurable option through a new mode page.

7) Do any of the above answers change in a multiple initiator configuration?