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To:	T10 Committee Membership		
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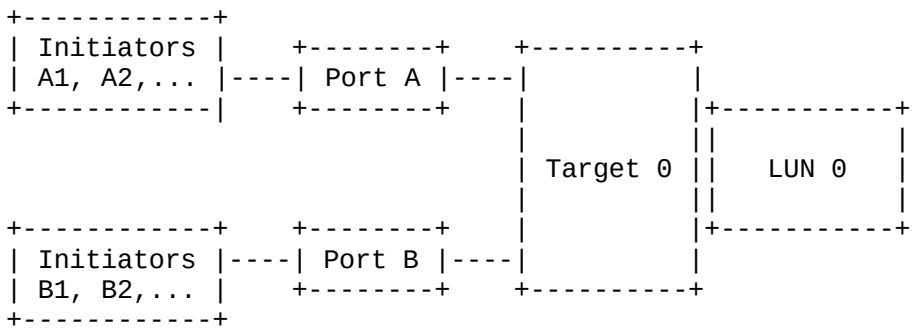
Subject:	Multi-port vs. Multi-target SCSI devices		

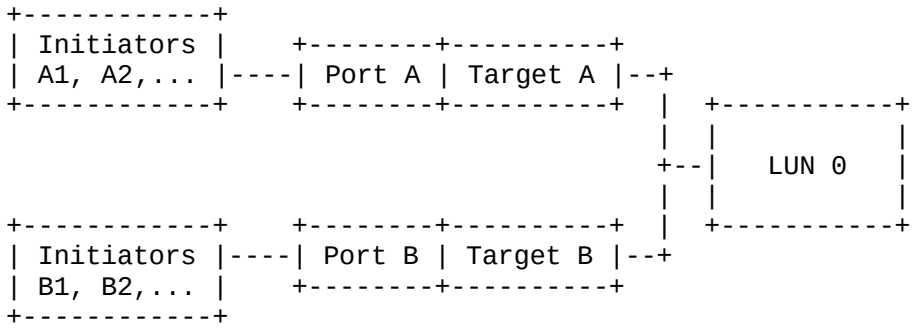
This is prompted by the discussion of SCSI Multi-port Units in SAM-2 clause 4.10 and at the May 17 working group meeting.

Consider a dual port SCSI device. For a concrete example consider a Fibre Channel disk drive with two ports and a single LUN. I'll also postulate the FCP model where the sets of Initiators accessible through each port are disjoint (see postscript). That is, if the same host driver or adapter is accessible through both ports, it is treated as separate Initiators.

We have commonly discussed such devices as having a single SCSI target:



However an alternate view is that there are two different targets, one associated with each port:



What are the observable differences, if any, between these two device models?

The differences between the two models appear minimal. There is a one-to-one mapping of I_T nexuses between the two models. The task set is associated with the LUN.

Commands are directed at a LUN or task set or device server (the terms are equivalent in this context). These are the same in either model since the LUN is the same.

Most task management functions are either directed at a LUN or task set or device server, or at the portion of a task set associated with the issuing I_T nexus. All such task management functions operate identically in the two models. This applies to ABORT TASK, ABORT TASK SET, CLEAR ACA, CLEAR TASK SET and LOGICAL UNIT RESET.

So far as I can determine, there are only two differences between the two models:

1. TARGET RESET: I'm not certain if this is really a difference. In the single target model, it seems clear that all tasks from all initiators are aborted. In the multi-target model, the name "TARGET RESET" suggests that tasks issued through one port or target would be aborted

while those issued through the other port or target would not. However, SAM-2 specifies that TARGET RESET shall perform a LOGICAL UNIT RESET on all attached logical units, which would imply the same behavior as the single target model.

2. LUN numbers: a single Target implies that LUN numbering is the same through both ports, multiple Targets imply that LUN numbering might be different. The primary significance is with commands that alter LUN numbering, in particular the SCC-2 LUN mapping page and the access controls proposal. In the single Target model, a command that changes LUN numbering would only have to be issued once, in the multi-Target model it might have to be issued to each port or Target.

Although I haven't been able to find it, there might be some way to determine a Target serial number or the like, which would be the same in one model and different in the other.

Proposal

I submit that the differences between the multi-ported single Target and the multi-Target models are negligible. Given this, why are we complicating SCSI (e.g. SAM-2) by trying to deal with both? The notion of several Targets accessing a single LUN is already established. I recommend we remove from SAM-2 all normative discussion of ports and SMUs. A SCSI Target (or Initiator) has a single port. If a device has multiple ports, there is a separate Target and/or Initiator behind each port. An informative Annex illustrating this might be useful.

Note that the definition of Initiator and Target Identifiers in existing protocols is already consistent with this. For example, FCP devices use Fibre Channel addresses as Initiator and Target Identifiers. A dual port FCP disk with both ports connected to the same fabric will have different Fibre Channel addresses for the two ports, therefore different Target Identifiers for the two ports, therefore the two ports have different Targets.

We also need to discuss the behavior of TARGET RESET when a LUN is accessible through multiple ports or Targets. There has been past disagreement on this issue. The current SAM-2 definition, that of issuing a LOGICAL UNIT RESET to each attached LUN, is a reasonable guideline, but I don't feel comfortable that it is always the right semantic. I recommend we change SAM-2 to make that a recommendation ("should") rather than a requirement ("shall"), until such time as we gain sufficient understanding and consensus.

Postscript

At the beginning of this I postulated the FCP model where the sets of Initiators accessible through each port are disjoint. Suppose this is not the case, suppose that a local entity (e.g. Target) can use multiple ports to talk to the same remote entity (e.g. Initiator)? That is, the Initiator or Target or both can use multiple ports for communication on the same I_T nexus?

There are not very many good example of this. One that comes to mind is Infiniband's ability to failover or migrate connections from one port or adapter to another. (Migration between ports on the same adapter is part of the specification, migration between adapters is an optional or vendor unique extension). Other examples include hot-standbys, where a standby system or adapter takes over after a failure and adopts the network address of the failed system or adapter.

All of these can be modeled as a single port (single Target and/or Initiator) that happens to have multiple physical attachments to the SCSI Service Delivery Subsystem. Since the multiple attachments are interchangeable or replaceable, they can be considered to be a single "port" or Initiator/Target. The shared address that identifies the multiple attachments is the natural value for an Initiator or Target Identifier.