Western Digital Corporation
20511 Lake Forest Drive
Lake Forest, CA 92630

To: **T10 CAP Working Group**
Contact: **Curtis E. Stevens**
Phone: 949-672-7933
Email: Curtis.Stevens@wdc.com
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Subject: **UAS Clause 4 (Model)**

Table 1 — Revision History

Revision	Date	Description
0	14-Jul-2008	Initial Revision
1	15-Jul-2008	Added clarification on operation during data transfers
2	9-Sep-2008	Added subclauses for resets and to match SAM-4 requirements
3	3-Nov-2008	Updated to include comments from USB DWG and CAP WG.

1 Related documents

UASr1, USB Attached SCSI revision 1
USB-2, Universial Serial Bus Revision 2.0

2 Introduction

This proposal defines the model clause for UAS. The model clause describes to 4 pipe configuration for USB 2 and

3 Proposed additions to UAS

The following text replaces clause 4 of UAS and adds to the definition of terms as follows:

Add to definition of terms:

Pipe - A logical abstraction representing the association between a logical function in a device and an application client.

USB endpoint - A collection of characteristics describing a pipe.

USB interface - The description of one or more USB endpoints.

USB device - One or more USB interfaces and at least the default control endpoint.

UAS domain - One USB initiator port and one or more USB target ports.

UAS target - A USB device that attaches to a UAS initiator and contains one or more UAS target ports.

UAS initiator - A USB host which contains one or more UAS initiator ports.

UAS target port - A USB interface that contains two USB bulk-in endpoints, two USB bulk-out endpoints and the default USB control endpoint.

UAS initiator port - A logical entity capable of communicating with a UAS target port.

4 Model

4.1 USB

4.1.1 Overview

USB devices implementing this standard shall support full or high speed operation as defined by the USB-2 specification. The minimum configuration for a UAS target port consists of:

a) one Control pipe
b) two Bulk-in pipes (i.e., one Status pipe and one Data-in pipe); and
c) two Bulk-out pipes (i.e., one Command pipe and one Data-out pipe).

Figure 1 shows the minimum configuration of pipes between a UAS target port and a UAS initiator port.

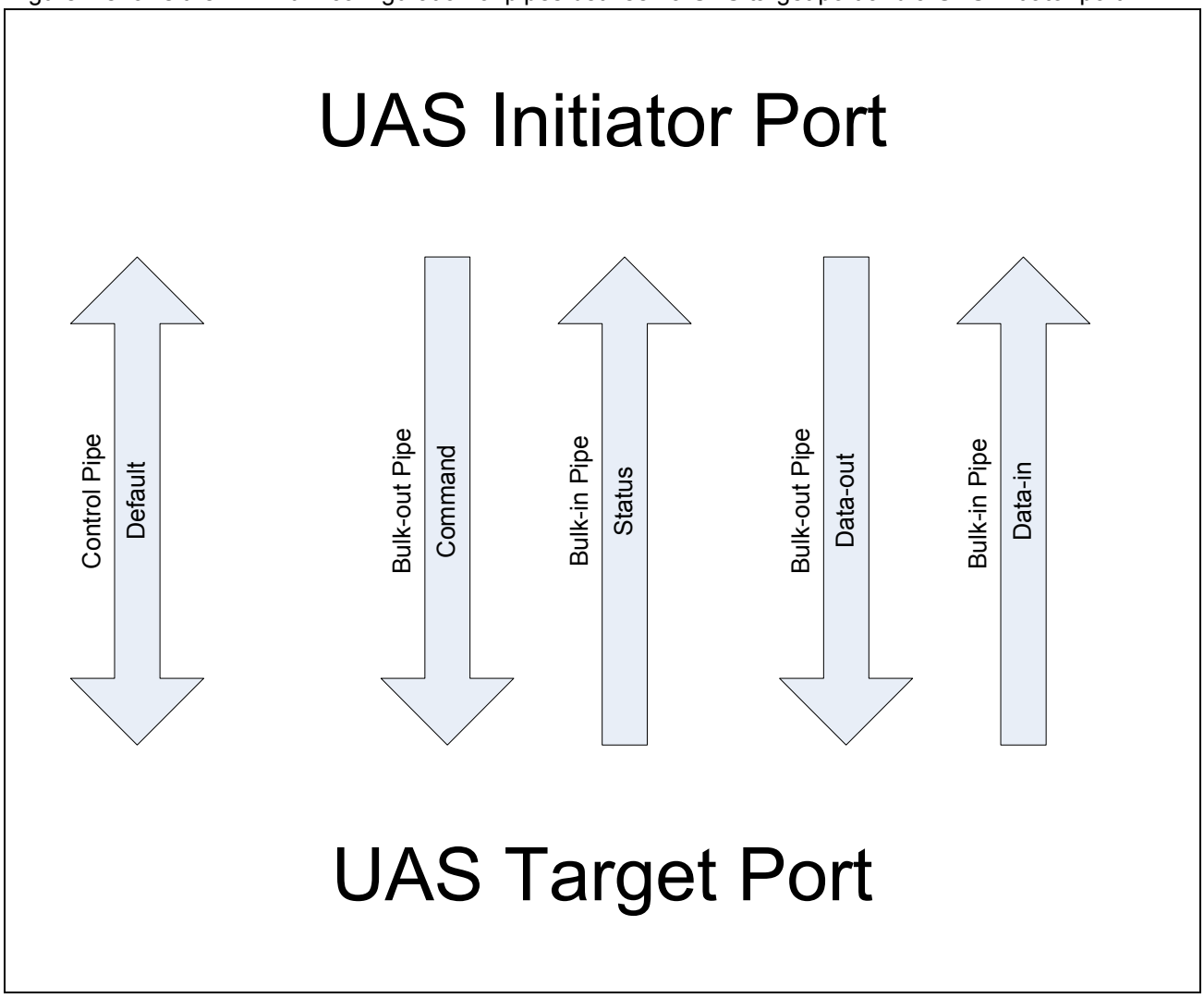

Figure 1 — USB Model

The Default Control pipe is a required by USB-2, and is not defined in this standard.

The UAS target port receives IUs from the UAS initiator port using the Command pipe and responds with IUs using the Status pipe.

The Data-in pipe and the Data-out pipe transmit data between the UAS initiator port and the UAS target port.

The UAS target port shall have buffers available to receives commands once the USB device has been fully configured. The UAS initiator port should have buffers available to receive status from the UAS target port. If the UAS initiator port is unable to receive status when the UAS target port is ready to send status, then the UAS target port may abort the task set and all the commands its receives until the UAS target port is able to send TASK SET ABORTED status to the UAS initiator port.

4.1.2 Data Transfers

The five-pipe UAS model described in 4.1.1xxx enables a UAS target port to process commands and return status during data transfers. If the UAS target port is transferring data on the Data-out or Data-in pipes, then the UAS target port shall also be capable of processing Command IUs or Task Management IUs. If the UAS target port's queue is full, then the UAS target port shall return a Response IU using the Status pipe. The Response IU may be returned while data is transferred on the Data-out or Data-in pipes.

Once the UAS target returns a Read Ready IU or a Write Ready IU on the status pipe, then the UAS target shall be ready to send or receive all the data for the indicated request. After the last byte of data is transferred, the UAS target shall return a Status IU on the Status pipe to indicate command completion. After the command is complete, the associated Data-out or Data-in pipe may be used to transfer data for another command.

4.1.3 UAS Domain

Figure 2 shows an example of a simple UAS domain.

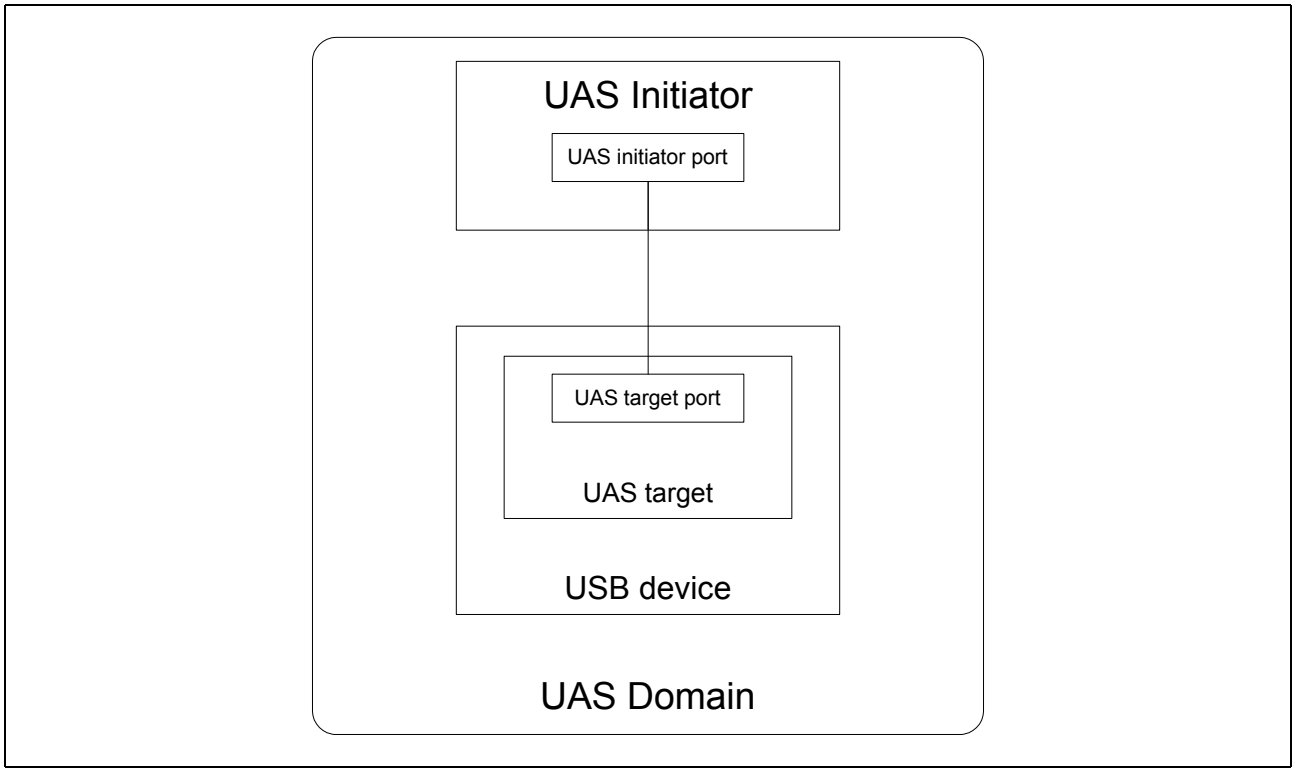

Figure 2 — Example Simple UAS domain

Figure 3 shows an expample of a complex UAS domain.

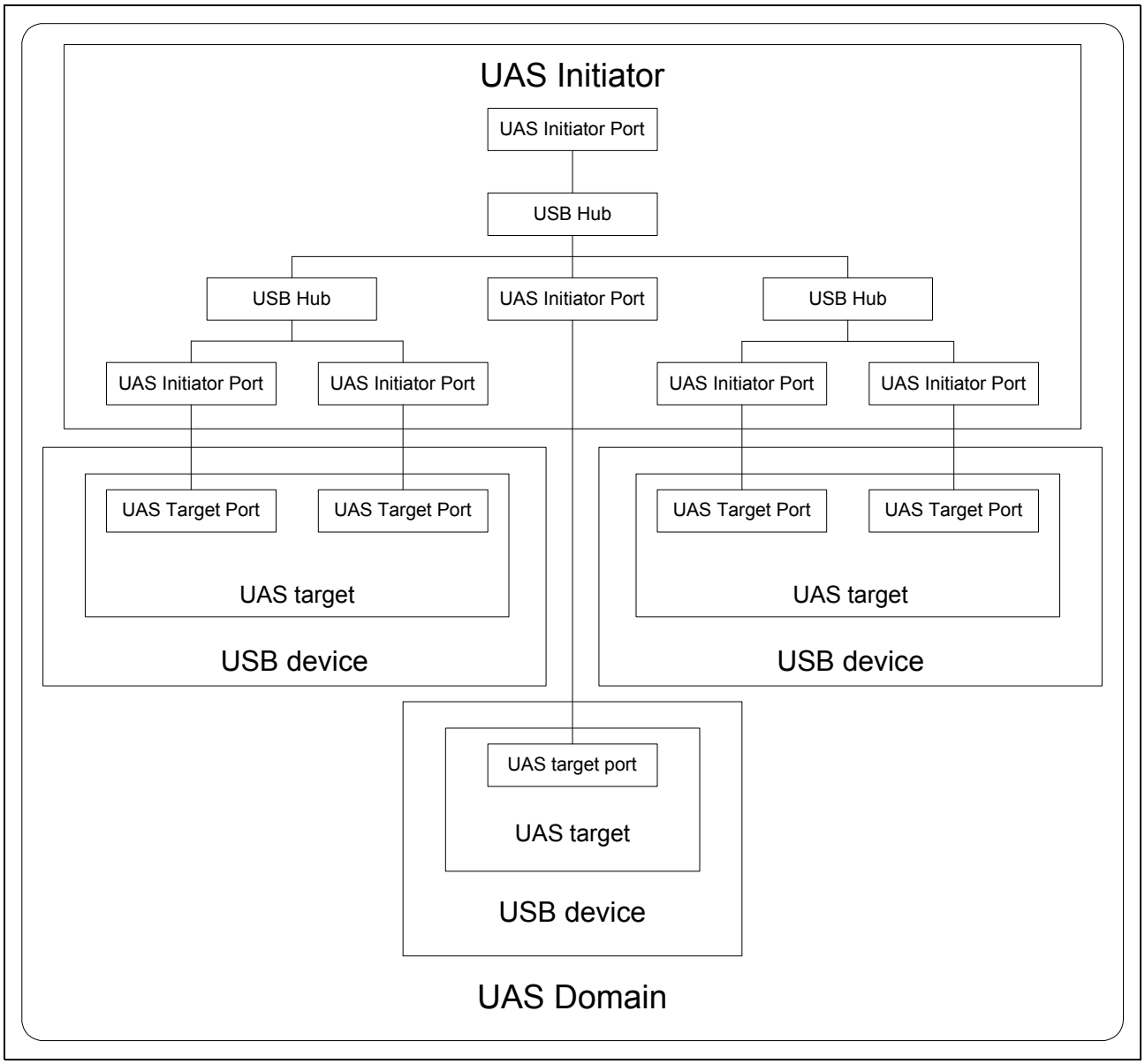

Figure 3 — Example Complex UAS Domain

4.1.4 Task Management Model

Editor's Note 1: This description is not found in SAS. Do we need to make a statement like the following: See SAM-4 for the Task Management Model.

4.1.5 Addressing

USB devices are accessed based on the port number assigned as a part of the USB enumeration process (See USB-2). All UAS target ports and UAS initiator ports shall be addressed using the WWN assigned to the port.

4.1.6 Resets

4.1.6.1 Overview

UAS targets perform the operations for all conditions resulting from SCSI events as defined in SAM-4 with the following additions.

4.1.6.2 USB bus reset

A USB bus reset signal shall be treated as a SCSI bus reset which includes a hotplug event (see I_T Nexus Loss). The USB device shall perform the actions defined for hard reset in SAM-4.

4.1.6.3 SCSI Resets

4.1.6.3.1 Hard Reset (Power Reset)

When a UAS target port performs the operations in response to a hard reset (see SAM-4), the USB device shall wait for the UAS Initiator to establish communication with its UAS target ports (see USB-2).

The USB device shall perform the actions defined for hard reset in SAM-4. After processing the hard reset, each logical unit shall establish a unit attention condition with the additional sense code set to SCSI BUS RESET OCCURRED (see SAM-4 and SPC-4).

4.1.6.3.2 Logical Unit Reset (Task Management Function)

The task manager shall perform the LOGICAL UNIT RESET task management function with the L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). The Logical Unit Reset does not affect the state of the UAS target port.

4.1.6.3.3 I_T Nexus Reset (Task Management Function)

If the UAS target port processes an I_T NEXUS RESET task management function, then the UAS target port shall perform the actions defined for I_T NEXUS RESET in SAM-4.

4.1.6.3.4 Device Internal Reset

If the device performs an internal reset, the device may disconnect from the UAS initiator port. Recovery from the condition shall be treated as an I-T Nexus Loss.

4.1.7 I_T Nexus Loss

I_T Nexus Loss indicates that the USB target port was disconnected from the USB initiator port. The device shall perform the actions defined for hard reset in SAM-4.

4.1.8 Power Loss Expected

If the USB device detects that it may lose power (e.g., a battery is running low on power), then the USB target port shall report a CHECK CONDITION with additional sense code POWER_LOSS_EXPECTED on completion of the next command.

Editor's Note 2: ASC/ASCQ needs an assignment in SPC-4
