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To: **T10 CAP Working Group**
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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.
4	15-Jan-2009	Updated to include comments from USB DWG and CAP WG

1 Related documents

UASr1, USB Attached SCSI revision 1
USB-2, Universal 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 an association between a logical function in a device and an application client.

USB endpoint - A collection of characteristics describing a pipe (see USB-2).

USB interface - The description of one or more USB endpoints (see USB-2).

USB device - One or more USB interfaces and at least the default control endpoint (see USB-2).

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

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

UAS initiator device - A USB host (see USB-2) 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

Editor's Note 1: Globally change IUs to all caps throughout UAS.

4.1.1 Overview

USB devices shall support full or high speed operation as defined by the USB-2 specification. The minimum configuration for a UAS target port (see figure 1) consists of:

    a)   the default Control pipe (see USB-2);
    b)   two Bulk-in pipes:
          A)   Status pipe; and
          B)   Data-in pipe;

       and

    c)   two Bulk-out pipes:
          A)   Command pipe; and
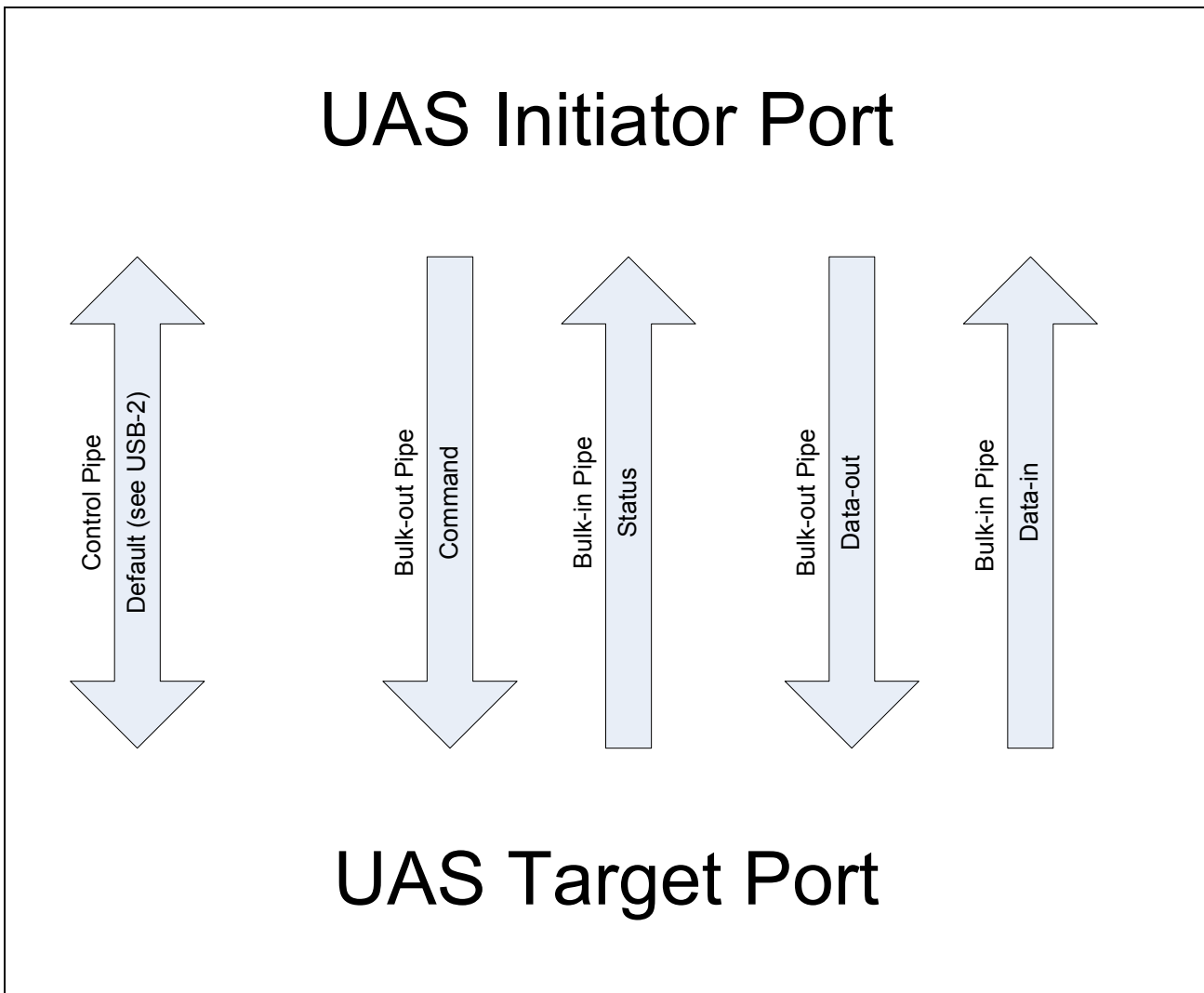   B)   Data-out pipe.

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 sufficient buffering available to receive commands after the USB device has been

configured. The UAS initiator port should have sufficient buffering 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 all commands in the task set and all commands that the UAS target port receives until the UAS target port is able to terminate a command with CHECK CONDITION status with sense key set to UNIT ATTENTION with the additional sense code set to COMMANDS CLEARED BY DEVICE SERVER status to the UAS initiator port.

The INITIATOR PORT TRANSFER TAG field in a command IU contains the command identifier defined in SAM-4. The INITIATOR PORT TRANSFER TAG field in a Task Management IU corresponds to a SAM-4 association. The number space used in the INITIATOR PORT TRANSFER TAG fields is shared across COMMAND IUs and TASK Management IUs (e.g., if an initiator port transfer tag is used for a COMMAND IU, then it is not also used for a concurrent TASK management IU).

4.1.2 Data Transfers

The 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 Sense 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 device returns a Read Ready IU or a Write Ready IU on the status pipe, then the UAS target device 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 device shall return a Sense 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
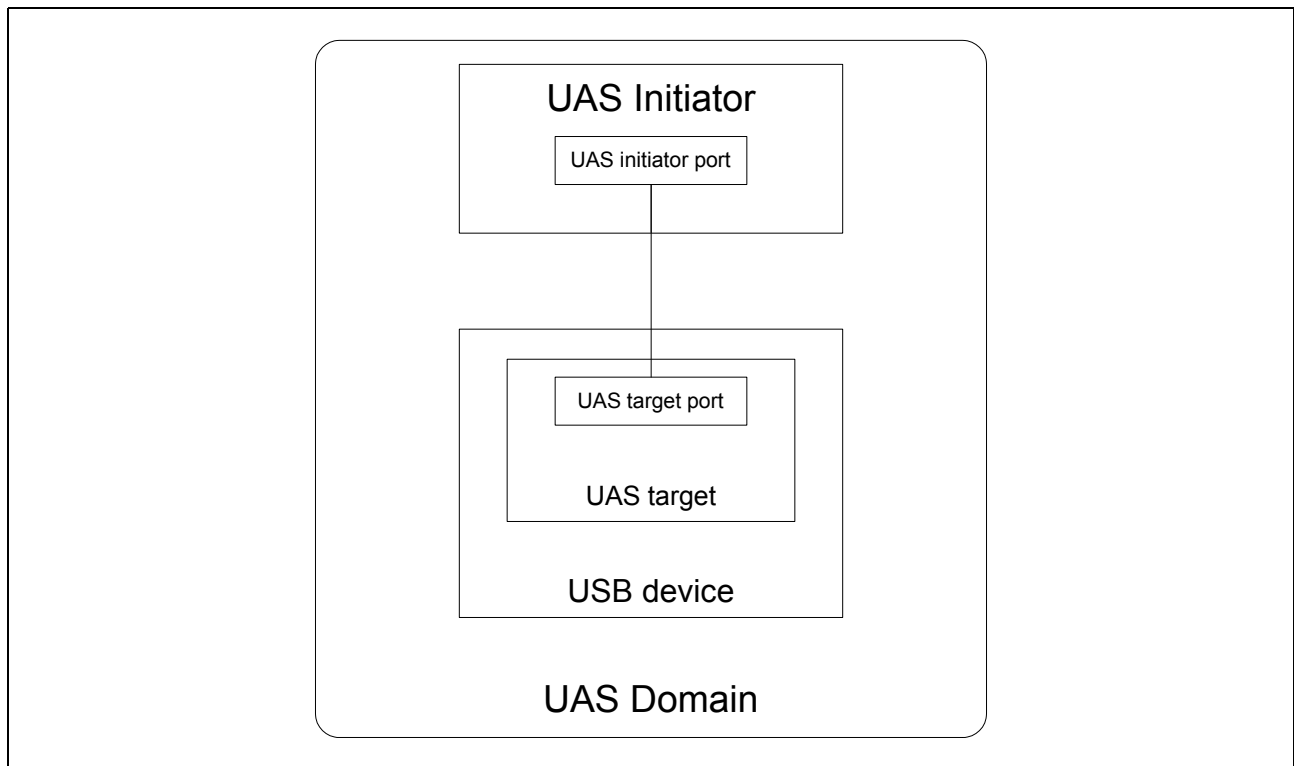
Figure 2 shows an example of a simple UAS domain.

Figure 2 — Example Simple UAS domain
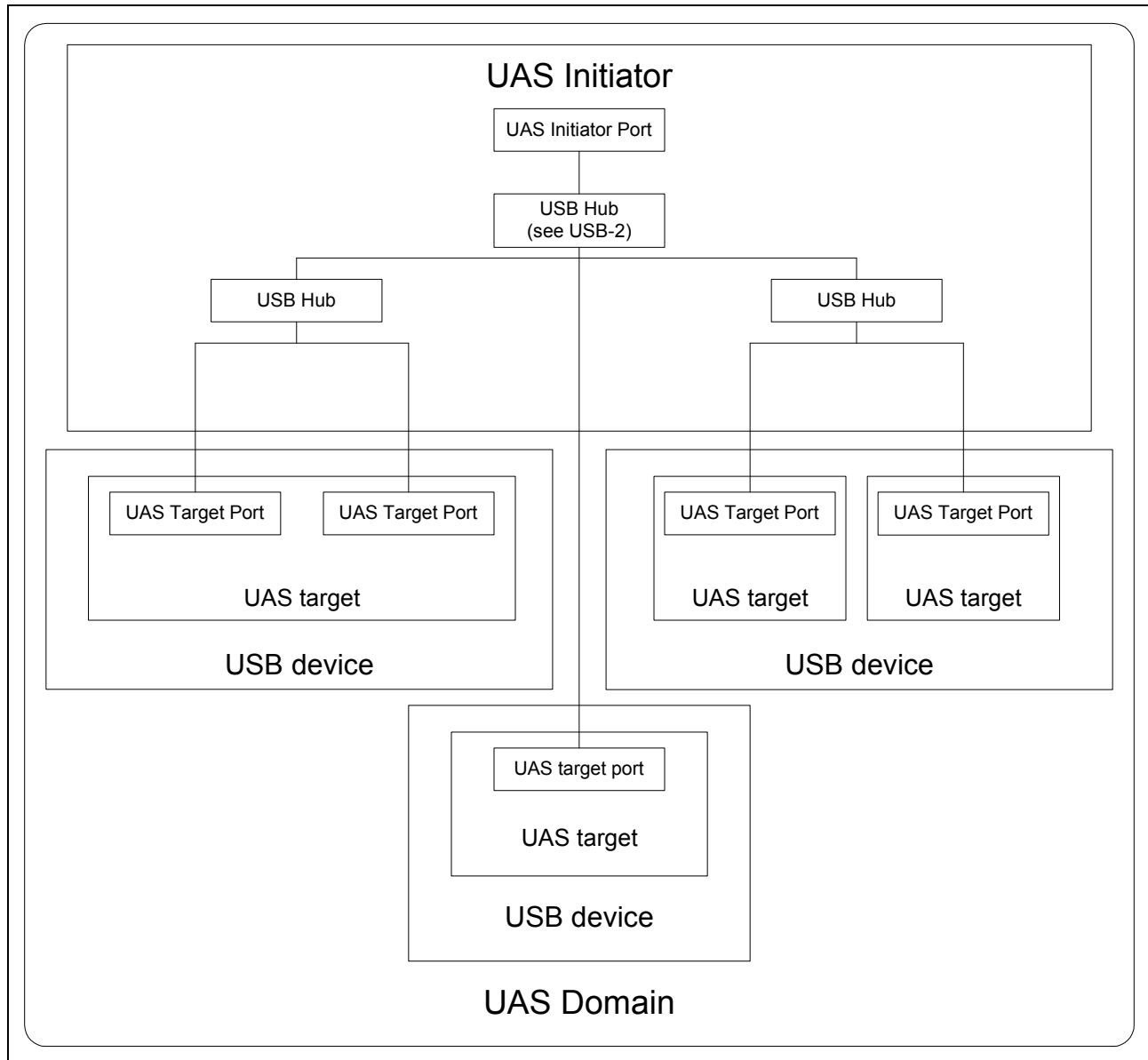
Figure 3 shows an expample of a complex UAS domain.

Figure 3 — Example Complex UAS Domain

4.1.4 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.

4.1.5 Resets

UAS target devices perform the operations for all conditions resulting from SCSI events as defined in SAM-4 with the additions in this subclause.

A USB bus reset signal shall be treated as a hard reset (see SAM-4).

4.1.6 I_T Nexus Loss

IIf the UAS target port and UAS initiator port are disconnected then the device shall perform the actions for I_T Nexus Loss as defined in SAM-4.

4.1.7 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