SBP Isochronous Data Handling Proposal **July 15, 1994**

From: Scott Smyers, Apple Computer

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re: Proposed changes to SBP related to isochronous data handling

The original text is taken from SBP revision 17a. Strike through letters and column change bars mark changes from the original text.

10.9. LOGIN CDS

The LOGIN CDS (table 25) performs the login function that allocates resources in a target and provides an identifier for the initiator to use.

Table 25 - LOGIN CDS

Bytes	Description			
0 to 3	Reserved			
4 to 7	Reserved			
8 to 11	Address of this CDS (msq)			
12 to 15	Address of this CDS (lsq)			
16 to 19	Reserved	Identifier	Logical unit number	
20 to 23	CDS codes	Reserved	Reserved	Login flags
24 to 27	Numerator		Denominator	
28 to 31	Integer count		Number of slots	AE sense length
32 to 35	AE buffer address (msq)/Packet length			
36 to 39	AE buffer address (lsq)			
40 to 43	CDS transfer length			
44 to 47	Data transfer control		CDS sense length	
48 to 51	Data buffer address (msq)			
52 to 55	Data buffer address (lsq)			
56 to 59	CDS status fifo address (msq)			
60 to 63	CDS status fifo address (lsq)			
64 to 67	CDS sense buffer address (msq)			
68 to 71	CDS sense buffer address (lsq)			

...

The integer count, numerator, denominator and packet length fields apply only to the ISOCHRONOUS LOGIN CDS.

The packet length field defines the number of bytes in an isochronous data payload packet.

The integer count field specifies the number of isochronous data payload packets to send each isochronous cycle.

The numerator and denominator fields specify the effective fractional portion of an isochronous data payload packet to send each isochronous cycle

> NOTE: only whole isochronous data payload packets are sent each isochronous cycle; the data fields of the isochronous data block packets which make up an isochronous channel alternate in size between I and I+1 isochronous data payload packets according to the values in the numerator and denominator fields. See section 14 for more information.

10.5 Stream control CDS

The Stream Control CDS has a CDS type of "Stream Control CDS" in the CDS type field. The STREAM CONTROL CDS (table 31) shall be delivered to the isochronous urgent FIFO for the stream for which it applies.

Table 31 STREAM CONTROL CDS

Bytes	Description			
0 to 3	Address of next CDS (msq)			
4 to 7	Address of next CDS (lsq)			
8 to 11	Address of this CDS (msq)			
12 to 15	Address of this CDS (lsq)			
16 to 19	Reserved	Identifier	Logical unit number	
20 to 23	CDS codes	Reserved	Reserved	Channel Number
24 to 27	Action	Stream Event	sy Synch/sy Trigger	sy default
28 to 31	Synch Period			
32 to 35	Seconds High Count			
36 to 39	Seconds count/cycle count			
40 to 43	CDS transfer length			
44 to 47	Data transfer control		CDS sense length	
48 to 51	Error Handling	Reserved	~~Byte Offset~~	
52 to 55	Reserved			
56 to 59	CDS status fifo address (msq)			
60 to 63	CDS status fifo address (lsq)			
64 to 67	CDS sense buffer address (msq)			
68 to 71	CDS sense buffer address (lsq)			

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The Error Handling field contains one of the following values:

Table 34 Error Reporting Field

Value	Description
0	Report error and stop
1	Report error and continue
2	Ignore all errors
3-15	reserved

The definition for these values is described in the section below entitled "Isochronous Error Reporting".

~~The byte offset field only has meaning if the action field contains a value of stop or pause. This field contains the number of bytes that the target is to source or sink on the isochronous cycle on which the stop or pause action takes affect.~~

14.0. Isochronous Transfers

This section describes the algorithm by which the talker determines the length, in bytes, of the data field of each isochronous data block packet.

14.1. Definitions

The following terms are unique to isochronous transfers.

talker - the source of the isochronous data being transferred on a given isochronous channel number. There shall only be at most 1 talker per isochronous channel number.

listener - the destination of the isochronous data being transferred on a given isochronous channel number. There may be zero, one or more than one listeners per isochronous channel number.

isochronous data block packet - a packet whose format is defined in the 1394 standard.

isochronous data payload packet - a packet which is carried as payload in an isochronous data block packet and whose format is application specific.

As required by the 1394 standard, there shall be at most one isochronous data block packet per channel per isochronous cycle.

SBP requires that there shall be an integer number of isochronous data payload packets per isochronous data block packet. Isochronous data payload packets shall not be split across multiple isochronous data block packets.

14.2. Isochronous Data Packetization

The talker transmits 8,000 isochronous data block packets per second. Each of these packets carries an integer number of isochronous data payload packets. In order to emulate data rates which are not multiples of 8,000 isochronous data payload packets per second, a talker sends isochronous data block packets having data fields of more than one length.

The ISOCHRONOUS LOGIN CDS contains 4 parameters that define an isochronous data rate. These parameters are:

I = value in the integer count field

N = value in the numerator field

D = value in the denominator field

L = value in the packet length field

With the following restrictions:

I, N and D are non-negative integers

N shall be less than D (If N is zero, D shall be ignored)

L shall be greater than zero

For this discussion we define another parameter, R, as follows:

R = isochronous data rate in units of isochronous data payload packets per second

R is related to I, N and D as follows:

$R = (I + N/D) * 8000$

The isochronous rate in units of bytes per second is:

bytes per second = R * L

As an example, assume that a talker is configured to send 1 isochronous channel of digital audio data. Assume that the isochronous data payload packet length is 4 bytes and the rate is 44,100 isochronous data payload packets per second. The resulting isochronous rate is:

L = 4

$R = 44,100 = (I + N/D) * 8,000$

Given the constraints on the values of I, N and D, their values are completely determined.

44,100/8,000 = I + N/D

I = 5

N = 41

D = 80

L = 4

The talker supports this rate by sending isochronous data block packets of length 5 isochronous data payload packets alternating with isochronous data block packets of length 6 isochronous data payload packets.

Every 80 cycles, the talker transmits an extra isochronous data block packet of length 6 isochronous data payload packets.

Over the course of D (80) isochronous cycles the number of isochronous data block packets transmitted is exactly what is *required* to sustain *the* desired isochronous data rate.