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To: T10 Committee Membership
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Subject: SRP Buffer Descriptor Subclause Rewrite

My notes from the June 19-20 SRP working group include substantial changes requested to the description of data buffer descriptors. However I can find no mention of these in the official minutes of that meeting (01-195). Since the minutes do spell out much more trivial changes, I hesitate to include these changes without approval.

Revision 0 of this document is the affected portions of SRP with change bars from SRP revision 07.

Revision 1 of this document incorporates changes from the July 19-20 SRP working group, including the changes described by 01-227r1 (SRP Buffer Descriptor Formats).

Revision 2 of this document incorporates changes from the August 21 SRP teleconference.

5.4.2 Data buffer descriptors

5.4.2.1 Overview

An SRP_CMD request (see 6.8) may contain a data-out buffer descriptor, a data-in buffer descriptor, both or neither, depending upon the data transfer(s) requested by the SCSI command. The format of each data buffer descriptor is specified by a format code value. Some data buffer descriptor format code values use the contents of a count field to further specify the data buffer descriptor format. Table 2 defines data buffer descriptor format code values.

Table 2 - Data buffer descriptor formats

Data buffer descriptor format code	Reference	format code value[a]	buffer descriptor length (bytes)[c]
NO DATA BUFFER DESCRIPTOR PRESENT.	5.4.2.3	0h	0
DIRECT DATA BUFFER DESCRIPTOR	5.4.2.4	1h	16
INDIRECT DATA BUFFER DESCRIPTOR	5.4.2.5	2h	20+16*count

[a] The format code value for a data-out buffer descriptor is specified by the DATA-OUT BUFFER DESCRIPTOR FORMAT field of an SRP_CMD request. The format code value for a data-in buffer descriptor is specified by the DATA-IN BUFFER DESCRIPTOR FORMAT field of an SRP_CMD request. See 6.8.
[b] The count field for a data-out buffer descriptor is the DATA-OUT BUFFER DESCRIPTOR COUNT field of an SRP_CMD request. The count field for a data-in buffer descriptor is the DATA-IN BUFFER DESCRIPTOR COUNT field of an SRP_CMD request. See 6.8.
[c] The length of a data buffer descriptor is determined from its format code value and and the contents of its count field

5.4.2.2 Supported data buffer descriptor formats

The REQUIRED BUFFER FORMATS field of the SRP_LOGIN_REQ request indicates the data buffer descriptor formats that an SRP initiator port may specify in requests sent on an RDMA channel (see 6.2). An SRP initiator port shall set the REQUIRED BUFFER FORMATS field to indicate all data buffer descriptor formats that the SRP initiator port may specify in SRP_CMD requests sent on that RDMA channel (see 6.8). An SRP initiator port shall not specify a data buffer descriptor format that was not indicated in the REQUIRED BUFFER FORMATS field

value for that RDMA channel. SRP target ports are not required to check SRP_CMD requests for data buffer descriptor formats that were not indicated in the REQUIRED BUFFER FORMATS field value.

An SRP target port may accept an RDMA channel and return an SRP_LOGIN_RSP response if the SRP target port is able to support all of the data buffer descriptor formats indicated in the REQUIRED BUFFER FORMATS field on that RDMA channel. An SRP target port shall reject the RDMA channel and return an SRP_LOGIN_REJ response if the SRP target port is unable to support one or more of the data buffer descriptor formats indicated in the REQUIRED BUFFER FORMATS field on that RDMA channel.

An SRP target port shall indicate the data buffer descriptor formats that it supports in the SUPPORTED BUFFER FORMATS field of the SRP_LOGIN_RSP response and the SRP_LOGIN_REJ response (see 6.3 and 6.4). All SRP target ports shall support the DIRECT DATA BUFFER DESCRIPTOR format. SRP target ports may or may not support other data buffer descriptor formats.

Table 3 defines the contents of the REQUIRED BUFFER FORMATS field and the SUPPORTED BUFFER FORMATS field.

Table 3 - Supported data buffer descriptor formats

Byte \ Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	Reserved					IDBD	DDBD	Reserved

The indirect data buffer descriptor (IDBD) bit shall be set to one in an SRP_LOGIN_REQ request if the SRP initiator port may specify the INDIRECT DATA BUFFER DESCRIPTOR format. The indirect data buffer descriptor (IDBD) bit should be set to zero in an SRP_LOGIN_REQ request if the SRP initiator port does not use the INDIRECT DATA BUFFER DESCRIPTOR format.

The indirect data buffer descriptor (IDBD) bit shall be set to one in an SRP_LOGIN_RSP response or in an SRP_LOGIN_REJ response if the SRP target port supports the INDIRECT DATA BUFFER DESCRIPTOR format. The indirect data buffer descriptor (IDBD) bit shall be set to zero in an SRP_LOGIN_RSP response or in an SRP_LOGIN_REJ response if the SRP target port does not support the INDIRECT DATA BUFFER DESCRIPTOR format.

The direct data buffer descriptor (DDBD) bit shall be set to one in an SRP_LOGIN_REQ request if the SRP initiator port may specify the DIRECT DATA BUFFER DESCRIPTOR format. The direct data buffer descriptor (DDBD) bit should be set to zero in an SRP_LOGIN_REQ request if the SRP initiator port does not use the DIRECT DATA BUFFER DESCRIPTOR format.

The direct data buffer descriptor (DDBD) bit shall be set to one in an SRP_LOGIN_RSP response or in an SRP_LOGIN_REJ response.

NOTE 1 - The MAXIMUM INITIATOR TO TARGET IU LENGTH field value returned in the SRP_LOGIN_RSP response limits the length of requests that may be sent by an SRP initiator port (see 6.3). This limit may restrict the data buffer descriptor formats that the SRP initiator port may specify independent of the REQUIRED BUFFER FORMATS field value.

5.4.2.3 No data buffer descriptor present

The NO DATA BUFFER DESCRIPTOR PRESENT format code value specifies that the corresponding data buffer descriptor field is not present. The contents of the count field are reserved. SRP target ports are not required to check the contents of the count field.

5.4.2.4 Direct data buffer descriptor format

The DIRECT DATA BUFFER DESCRIPTOR format code value specifies that the corresponding data buffer descriptor field is sixteen bytes in length and contains a direct data buffer descriptor. The contents of the count field are reserved. SRP target ports are not required to check the contents of the count field.

A direct data buffer descriptor contains a single memory descriptor (see table 1). The memory descriptor identifies the data buffer, which is a single memory segment within a memory region's virtual address space. If a direct data buffer descriptor defines a data-out buffer, the SRP target port shall only issue RDMA Read operations using the memory descriptor contained in the direct data buffer descriptor. If a direct data buffer descriptor defines a data-in buffer, the SRP target port shall only issue RDMA Write operations using the memory descriptor contained in the direct data buffer descriptor. The SRP target port shall use the contents of the DATA LENGTH field of the memory descriptor as the length of the data-out buffer or data-in buffer.

5.4.2.5 Indirect data buffer descriptor format

The INDIRECT DATA BUFFER DESCRIPTOR format code value specifies that the corresponding data buffer descriptor field contains an indirect data buffer descriptor. The length of the data buffer descriptor field is twenty bytes plus the contents of the count field multiplied by sixteen bytes.

An indirect data buffer is comprised of one or more memory segments. The memory segments may or may not be contiguous. The memory segments may be in a single memory region or spread among several memory regions. The indirect data buffer is the concatenation of the memory segments. Each memory segment may have any length, including a length of zero bytes.

Table 4 shows the format of an indirect data buffer descriptor.

Table 4 - Indirect data buffer descriptor

Byte \ Bit	7	6	5	4	3	2	1	0
0								
• • •				INDIRECT TABLE MEMORY DESCRIPTOR				
15								
16	(MSB)							
• • •				TOTAL LENGTH				
19								(LSB)
20								
• • •				PARTIAL MEMORY DESCRIPTOR LIST				
16*n+19								

[a] The value n is the value contained in the data buffer descriptor's count field.

The INDIRECT TABLE MEMORY DESCRIPTOR field value is a memory descriptor (see table 1) that specifies a memory segment containing an indirect table. An indirect table is a list of one or more memory descriptors. The memory segments specified by the memory descriptors in the indirect table, concatenated together, comprise the indirect data buffer. The DATA LENGTH field of the INDIRECT TABLE MEMORY DESCRIPTOR field value contains the number of memory descriptors in the indirect table times sixteen. SRP target port behavior when the DATA LENGTH field of the INDIRECT TABLE MEMORY DESCRIPTOR field value contains any other value is vendor specific.

The TOTAL LENGTH field value is the sum of the DATA LENGTH field values of the memory descriptors in the indirect table. SRP target port behavior when the TOTAL LENGTH field contains any other value is vendor specific. The SRP target port shall use either the TOTAL LENGTH field value or the sum of the DATA LENGTH field values as the length of the data-out buffer or data-in buffer.

The PARTIAL MEMORY DESCRIPTOR LIST field is only present when the data buffer descriptor's count field contains a non-zero value. The PARTIAL MEMORY DESCRIPTOR LIST field contains a list of n memory descriptors that are copies of the first n memory descriptors in the indirect table. The value n is the value contained in the associated count field. SRP target port behavior when the PARTIAL MEMORY DESCRIPTOR LIST field contains any other value is vendor specific.

An SRP target port shall only issue RDMA Read operations to the indirect table.

If an indirect data buffer descriptor specifies a data-out buffer, the SRP target port shall only issue RDMA Read operations using the memory descriptors contained in the indirect table or the PARTIAL MEMORY DESCRIPTOR LIST field value.

If an indirect data buffer descriptor specifies a data-in buffer, the SRP target port shall only issue RDMA Write operations using the memory descriptors contained in the indirect table or the PARTIAL MEMORY DESCRIPTOR LIST field value.

Figure 5 illustrates an indirect data buffer descriptor that does not contain a PARTIAL MEMORY DESCRIPTOR LIST field. Memory is shown containing four memory segments: the indirect table, memory segment 1, memory segment 2 and memory segment 3. The mapping of each memory descriptor to its memory segment has been shown as a single arrow. For details of this mapping see 5.4.1 and figure 4. Figure 5 does not show the memory regions in which the memory segments reside. All four segments might be in a single memory region, each might be in a separate memory region, or several might be in one memory region and the remainder in one or more other memory regions.

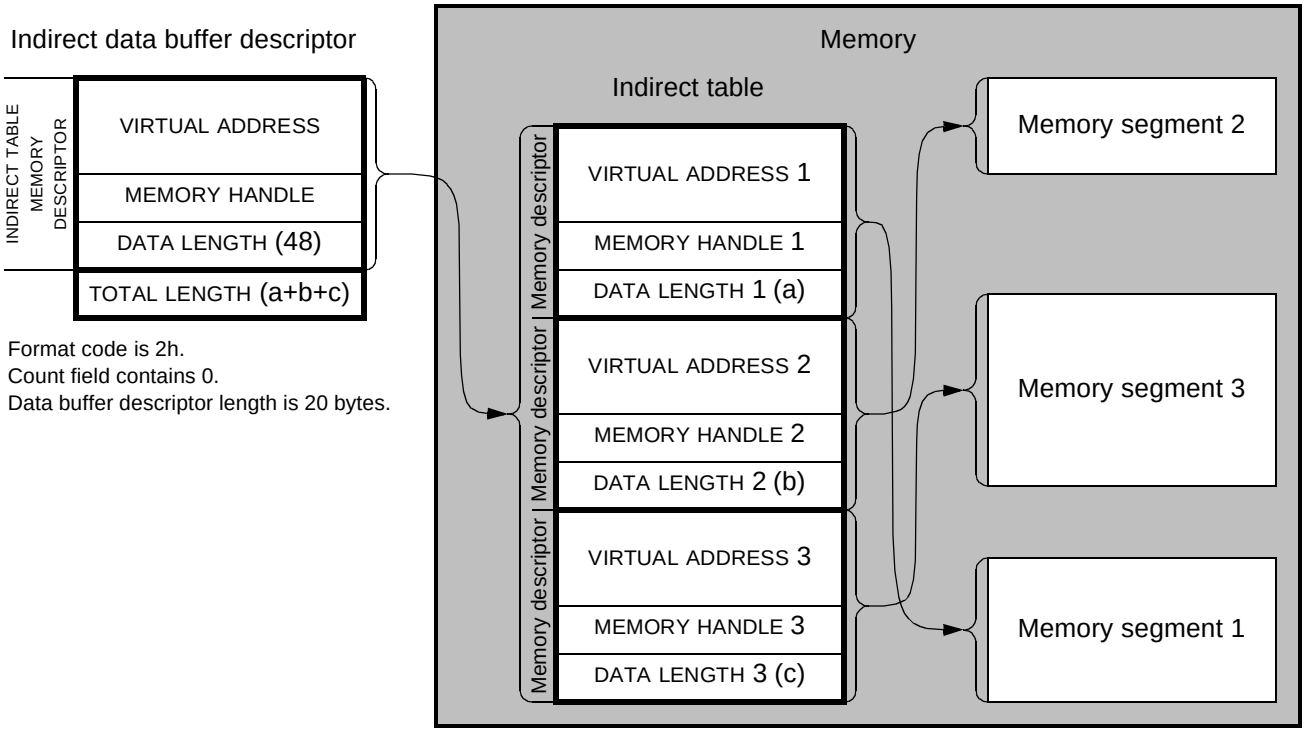
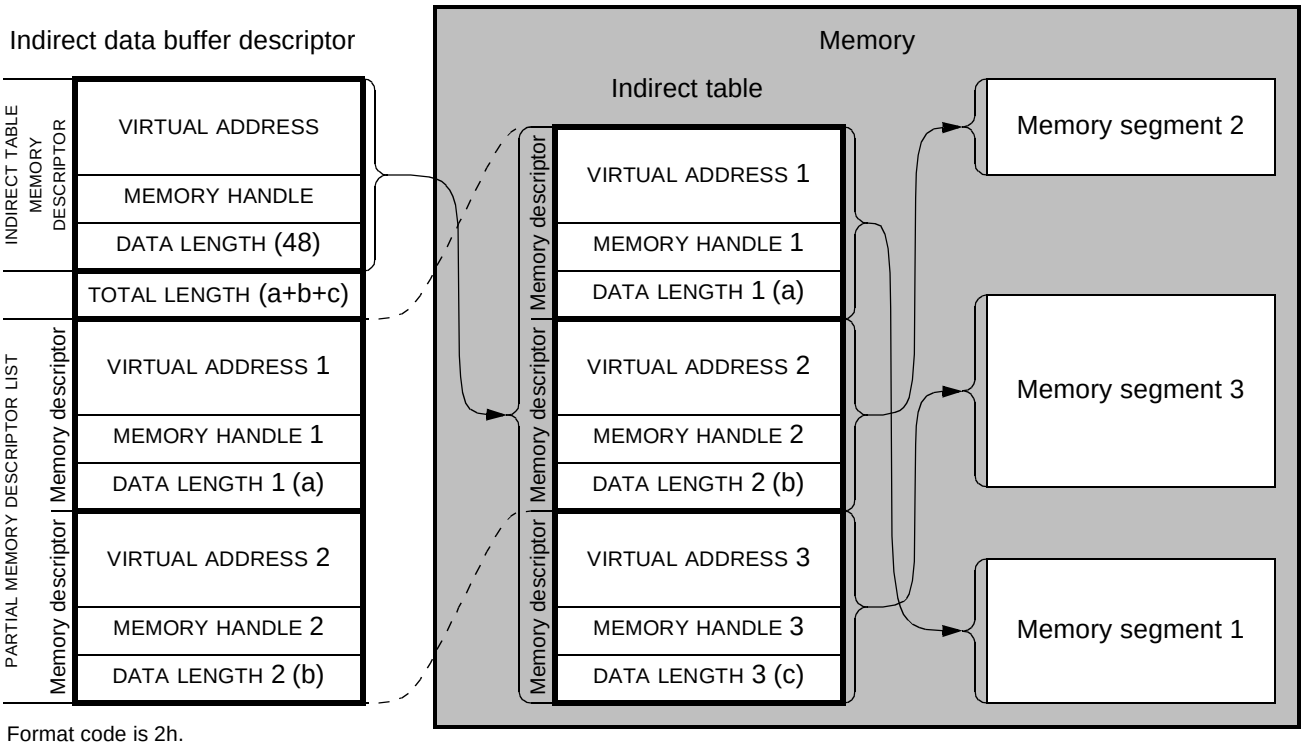


Figure 5 - Example indirect data buffer descriptor with no PARTIAL MEMORY DESCRIPTOR LIST field

In the example shown in figure 5 the data buffer descriptor format code value is 2h and the count field contains zero. The indirect data buffer descriptor is 20 bytes long. The data buffer is comprised of three memory segments: memory segment 1, memory segment 2 and memory segment 3. A separate memory segment contains the indirect table, a list of three memory descriptors specifying memory segments 1 through 3. The INDIRECT TABLE MEMORY DESCRIPTOR field value of the indirect data buffer descriptor specifies the memory segment containing the indirect table. The DATA LENGTH field of the INDIRECT TABLE MEMORY DESCRIPTOR field

value contains 48 (i.e. the length of the indirect table). The TOTAL LENGTH field of the data buffer descriptor contains the sum of the DATA LENGTH field values of the memory descriptors in the indirect table (i.e. the sum of DATA LENGTH 1, DATA LENGTH 2 and DATA LENGTH 3). This sum is the total length of the data buffer.

Figure 6 illustrates the same example as in figure 5 except with a PARTIAL MEMORY DESCRIPTOR LIST field. The data buffer, indirect table, INDIRECT TABLE MEMORY DESCRIPTOR field value and TOTAL LENGTH field value are all identical to the example in figure 5. The data buffer descriptor format code is 2h, the same as in figure 5. However the count field contains the value 2, indicating that the PARTIAL MEMORY DESCRIPTOR LIST field is present and contains two memory descriptors. Those two memory descriptors are copies of the first two memory descriptors in the indirect table. The third memory descriptor is only present in the indirect table. The indirect data buffer descriptor is 52 bytes long.



Format code is 2h.
Count field contains 2.
Data buffer descriptor length is 52 bytes.

Figure 6 - Example indirect data buffer descriptor with a PARTIAL MEMORY DESCRIPTOR LIST field

6.2 SRP_LOGIN_REQ request

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Table 5 - SRP_LOGIN_REQ request

Bit / Byte	7	6	5	4	3	2	1	0
24	REQUIRED BUFFER FORMATS							
25								

...

The REQUIRED BUFFER FORMATS field is defined in 5.4.2.2.

...

6.3 SRP_LOGIN_RSP response

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Table 6 - SRP_LOGIN_RSP response

Bit / Byte	7	6	5	4	3	2	1	0
24	SUPPORTED BUFFER FORMATS							
25								

...

The SUPPORTED BUFFER FORMATS field is defined in 5.4.2.2.

...

6.4 SRP_LOGIN_REJ response

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Table 7 - SRP_LOGIN_REJ response

Bit / Byte	7	6	5	4	3	2	1	0
24	SUPPORTED BUFFER FORMATS							
25								

...

Table 8 - SRP_LOGIN_REJ REASON codes

REASON code	Description
0001 0004h	One or more requested data buffer descriptor formats are not supported.

...

The SUPPORTED BUFFER FORMATS field is defined in 5.4.2.2.

...

5.7 SRP_LOGOUT request

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Table 9 - SRP_LOGOUT REASON codes

REASON code	Description
0000 0006h	Unsupported code value specified in DATA-OUT BUFFER DESCRIPTOR FORMAT field.
0000 0007h	Unsupported code value specified in DATA-IN BUFFER DESCRIPTOR FORMAT field.
0000 0008h	Invalid count value specified in DATA-OUT BUFFER DESCRIPTOR COUNT field.
0000 0009h	Invalid count value specified in DATA-IN BUFFER DESCRIPTOR COUNT field.

...

5.7 SRP_CMD request

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Table 10 - SRP_CMD request

Byte \ Bit	7	6	5	4	3	2	1	0
0	TYPE (02h)							
1	Reserved							
• • •								
3								
4	Reserved							
5	DATA-OUT BUFFER DESCRIPTOR FORMAT				DATA-IN BUFFER DESCRIPTOR FORMAT			
6	DATA-OUT BUFFER DESCRIPTOR COUNT							
7	DATA-IN BUFFER DESCRIPTOR COUNT							

...

48+4*n	DATA-OUT BUFFER DESCRIPTOR
• • •	
47+4*(n+do)	
48+4*(n+do)	DATA-IN BUFFER DESCRIPTOR
• • •	
47+4*(n+do+di)	

[a] The value do is the length of the DATA-OUT BUFFER DESCRIPTOR field, determined from the format code value contained in the DATA-OUT BUFFER DESCRIPTOR FORMAT field and the count value contained in the DATA-OUT BUFFER DESCRIPTOR COUNT field (see 5.4.2).

[b] The value di is the length of the DATA-IN BUFFER DESCRIPTOR field, determined from the format code value contained in the DATA-IN BUFFER DESCRIPTOR FORMAT field and the count value contained in the DATA-IN BUFFER DESCRIPTOR COUNT field (see 5.4.2).

The DATA-OUT BUFFER DESCRIPTOR FORMAT field specifies the format of the DATA-OUT BUFFER DESCRIPTOR field (see 5.4.2).

The DATA-IN BUFFER DESCRIPTOR FORMAT field specifies the format of the DATA-IN BUFFER DESCRIPTOR field (see 5.4.2).

The DATA-OUT BUFFER DESCRIPTOR COUNT field provides additional information to specify the format of the DATA-OUT BUFFER DESCRIPTOR field (see 5.4.2).

The DATA-IN BUFFER DESCRIPTOR SIZE field provides additional information to specify the format of the DATA-IN BUFFER DESCRIPTOR field (see 5.4.2).

...

The DATA-OUT BUFFER DESCRIPTOR field specifies the buffer that shall be used for data-out transfers (see 5.4.2).

The DATA-IN BUFFER DESCRIPTOR field specifies the buffer that shall be used for data-in transfers (see 5.4.2).