



Sun Microsystems, Inc.  
2550 Garcia Avenue  
Mountain View, CA 94045  
415 960-1300

## Changes to FCP, Revision 4

- Reformatted to meet editorial requirements.
- Added Foreword and Introduction
- Removed reference to P1275 Open Boot Standard
- Examples moved to Annex A
- Technical Changes:
  - Link Management improved
  - Optional Data Transfer Ready provided
  - Combined Command/Data Sequence provided
  - FCP Entity Address, Data Descriptor, Status matched to FC-PH
  - Informative Annex for Entity Address included
  - Default Entity Address Defined

RNS April 13, 1993 Page 1 of 16



Sun Microsystems, Inc.  
2550 Garcia Avenue  
Mountain View, CA 94045  
415 960-1300

## Link Management

- Link Application Frames for FCP
- FCP login
  - Command + Data Allowed bit
  - Transfer Ready Disabled bit
- FCP logout
  - Terminates FCP login
- FCP reject
  - Rejects Link Application Frame
- FCP accept
  - Accepts Link Application Frame

RNS April 13, 1993 Page 2 of 16



## Sequence Formats

### ■ Optionally disable Data Transfer Ready

Controlled by FCP Login

Default value is Data Transfer Ready required

### ■ Combined Command/Data Sequence

Controlled by FCP Login

Default value is separated Command/Data Sequence

Combined Command/Data Sequence allowed only if Data Transfer Ready is disabled.

Data/Status Sequence cannot be combined.



## Sequence Formats

### ■ FCP Sequences sent to Targets

SN	PHASE	DATA BLOCK		F/M/L	SI	SC	RO	M/O
		CAT	CONTENT					
T1	CMD	6	COMMAND	F	T	0	0	M
T2	CMD	6	COMMAND	F	H	0	0	O
T3	DATA	1	DATA	M	T	0	disp	M
T4	DATA	1	DATA	M	H	0	disp	O
T5	CMD/DATA	6/1	COMMAND + DATA	F	T	0	0	O
T6	CMD/DATA	6/1	COMMAND + DATA	F	H	0	0	O



## Sequence Formats

### ■ FCP Sequences sent to Initiators

SN	PHASE	DATA BLOCK		F/M/L	SI	SC	RO	M/O
		CAT	CONTENT					
I1	DATA	5	WRITE XFER RDY	M	T	0	0	M
I2	DATA	5	READ XFER RDY	M	H	0	0	M
I3	DATA	1	DATA	M	H	0	disp	M
I4	STATUS	7	STATUS	L	T	0	0	M

RNS April 13, 1993 Page 5 of 16



## FCP Entity Address, Data Descriptor

### ■ Entity Address

At beginning of Command Sequences (Category 6)

Field	Size
ENT_ADDR_0	2 bytes
ENT_ADDR_1	2 bytes
ENT_ADDR_2	2 bytes
ENT_ADDR_3	2 bytes

### ■ Data Descriptor

At beginning of Read/Write Xfer Ready Sequences (Category 5)

Field	Size
SEQ_RO	4 bytes
BURST_LEN	4 bytes
Reserved	4 bytes



## FCP Generic Status

### ■ Generic Status

Included in first four bytes of FCP Status Sequence (Category 7)

Field	Size
reserved	4 bytes
reserved	4 bytes
FCP_STATUS	4 bytes
FCP_RESID	4 bytes
FCP_SNS_LEN	4 bytes
FCP_RSP_LEN	4 bytes
FCP_SNS_INFO	n bytes
FCP_RSP_INFO	m bytes

Bytes are presently reserved = 0, pending future definition

RNS April 13, 1993 Page 7 of 16



## Entity Address

### ■ Annex B defined to describe Entity Address model

### ■ Default Entity Address defined (7.1.1)

Address of '0000 0000 0000 0000' hexadecimal shall exist and accept INQUIRY command.

Type, Manufacturer, Model, Driver Requirements, and configuration mechanism can be determined from INQUIRY data.



## Discussion Items for FCP

- **Relative Offset not available**
- **Data Descriptor boundary restrictions**
- **Class 1 Behavior**
- **ACK\_N behavior**
- **Class 3 Behavior**
- **Reset and related behavior**
- **ACA behavior**

RNS April 13, 1993 Page 9 of 16



## Discussion Item Relative Offset not available

- **Limitations if RO not supported**

Propose: In order delivery required within a sequence.

Data Transfer Ready establishes order among sequences, if enabled.

Data transferred in a single sequence if Transfer Ready not enabled either.

- **Data Base operations may require "in order" delivery**

Propose: Use of FCP\_CNTL bit = 1 to require "in order" delivery over entire data transfer, even if RO and Data Transfer Ready enabled.

Use bit 0 in Byte 2.

RNS April 13, 1993 Page 10 of 16



## Discussion Item Data Descriptor boundary restrictions

### ■ Cache line boundaries easier to handle on Data Transfer

Present: No boundaries enforced between Data sequences. A Data sequence may be any length and end on any boundary.

Suggestion: Some have requested that Data sequence length be restricted to a multiple of 4, 16, or 64 bytes.

Propose: No change from present architecture.

Reason: Since there are no inherent limitations on where a sequence may begin putting data in memory, hardware should be capable of managing any boundary. If so, then it can manage any boundary for every sequence. Then sequence length does not matter.

RNS April 13, 1993 Page 11 of 16



## Discussion Item Class 1 Behavior

### ■ Class 2 Behavior

Defined by normal FCP transactions

### ■ Class 1 Behavior

Propose: To maintain parallel operation among many I/O operations, connections will be made for the duration of one sequence. If multiple commands or status are available for the same destination, the connection may carry multiple sequences. Reverse sequences are optional.

### ■ Hybrid Behavior

Propose: For fabrics supporting mixed Class 1 and 2 operation, performance optimization may put Data sequences in Class 1 and the short sequences in Class 2. All have same exchange id.



## Discussion Item ACK N behavior

### ■ No problem for FCP

Present: No problem for FCP because sequences within an exchange are not streamed. If a sequence is not complete, the exchange stops and times out. Parallel exchanges continue normally and with no possibility of ambiguity.

RNS April 13, 1993 Page 13 of 16



## Discussion Item Class 3 Behavior

### ■ Class 3 Behavior

Propose: Class 3 should not be allowed.

FCP depends on verified receipt of sequences within an exchange to continue the processing through an exchange. Class 3 would require additional sequences to perform the same function, putting the ACK\_N function into the ULP behavior and removing it from the hardware assisted behavior typical of Class 1 and Class 2. FCP would then have two independent protocols, one using a ULP ACK\_N, the other using an FC-PH ACK\_N.



## Discussion Item Reset and related behavior

### ■ Under Study

### ■ Straw Man

SCSI	FCP
RST	Logout/Login
Bus Device Reset	FCP_CNTL Reset (byte 2, bit 5)
Abort, Abort Tag	Abort Exchange
Clear Queue	n x Abort Exchange
Terminate I/O	NA

RNS April 13, 1993 Page 15 of 16



## ACA Behavior

### ■ Under Study

### ■ Straw Man

Propose:

Request Sense Data returned as part of Response sequence

Normal/default operation ends ACA automatically at end of command.

Extended Contingent Allegiance mode of ACA may be invoked by FCP\_LOGI option. If invoked, extended ACA begins automatically at end of command presenting Check Condition and Request Sense Data. All other commands to the Entity remain suspended. All commands with Queue Type ACA\_Q from the same source and image are accepted by the Entity. The extended ACA is cleared at the end of the first Queue Type ACA\_Q command with the Clear ACA bit set in byte 2 of FCP\_CNTL.