To: T10 Technical Committee
From: Rob Elliott, Compaq Computer Corporation (Robert.Elliott@compaq.com)
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Subject: SPI-4: SCC Subpages for SPI initiator negotiated settings

Revision History
Revision 0: 15 Feb 01 first revision

Related Documents
T10/spi4r02 – SPI-4 revision 2
T10/00-396r2, accepted for SPC-3, defines mode page subpages
T10/00-397r1, accepted for SPI-4, defines a SPI-specific Port Control mode page 19h subpage 3h to report a target device's current negotiated settings.

Overview
This proposal adds mode page subpages to a controller device (SCC-2) that has a parallel SCSI bus on the output side. These pages are used to report and set parameters for the initiator on the output side.

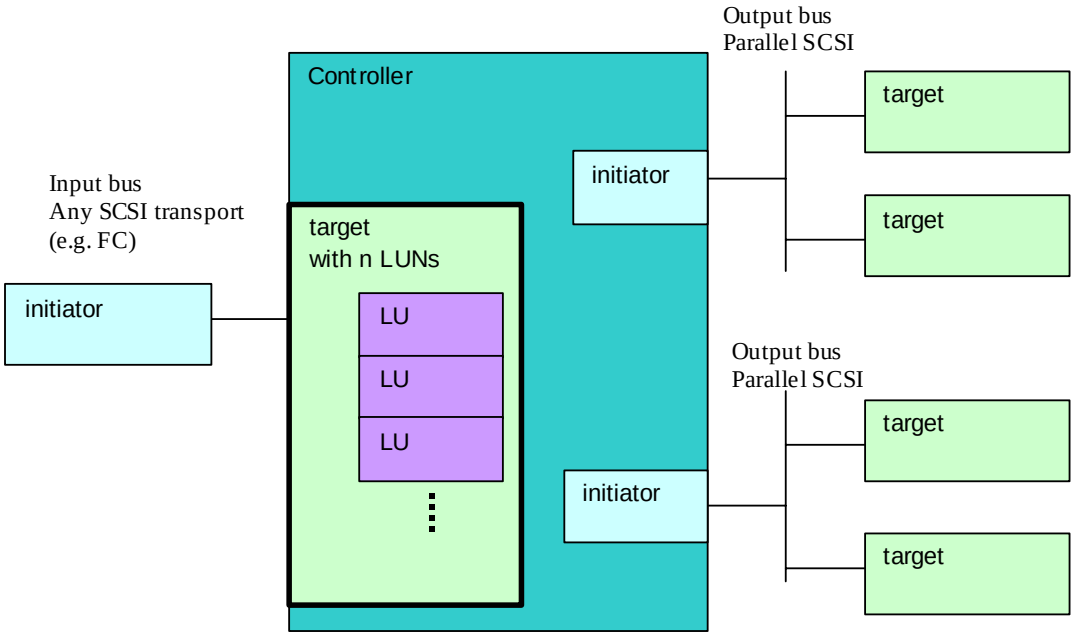

Figure 1. Controller example.

Per SCC, each logical unit on the output side may be mapped to a logical unit number on the input side using the peripheral device addressing method or logical unit addressing method. Two bytes of the input LUN field indicate the output bus number, target number on that bus, and LUN within that target. If the output bus is parallel SCSI, the initiator on the output bus maintains a set of negotiated settings (the PPR, WDTR, and SDTR values) for each target on that bus.

Additional logical unit numbers on the input side form the volume set addressing space, and represent virtual devices created from the physical targets (e.g. RAID volumes). These do not have a 1:1 relationship with parallel SCSI target devices.

On the output parallel SCSI bus, each initiator negotiates with and runs domain validation to each target. There are three sets of values that might be maintained by the initiator:

1. Initial values. This controls where domain validation starts. It normally contains the largest values supported by the initiator (by construction) and target (determined by INQUIRY command). If a DT-capable initiator finds a target does not support DT (in INQUIRY byte 56; see SPC-2), it must start domain validation for that target with DT disabled.
2. Post-DV values. These were the values determined by the initial domain validation run. These are the initial operating conditions.
3. Current values. These are the current values being used. They may differ from the post-DV values if speed changes were made due to error rate detection or user selection. The current negotiated settings understood by the initiator should agree with those the target reports via its Port Control mode page 19h subpage 3h.

For all protocols (on the input side), if the logical unit represents a logical unit on a parallel SCSI target on the output side of a controller, a new set of subpages is proposed representing the initiator's negotiation settings to the target containing that logical unit.

00-396r2 defines an extended device-type specific mode page as a generic home for subpages. This proposal adds subpages to that page for the device-type of SCC.

Effects on standards:

Standard	Effect
SPI-4	Since these new subpages are parallel SCSI specific, their definitions seem to fit best in SPI-4.
SCC-3	If SCC-3 is ever created, it should mark these subpages as output-protocol specific. SPI-4 is the output protocol defined here.
SPC-3	Already labels the page "extended device-specific mode page." Since the subpages are only defined for SCC devices, SPC-3 needs not mention the subpage code allocations. Since SCC-3 does not exist, SPC-3 may want to include a placeholder reference for the SCC subpage code allocations.

Proposed changes

Add this to SPC-3 as a placeholder for SCC-3 near where the extended device-specific mode page is defined.

Table x. Extended device-specific mode page subpages for SCC devices.

Subpage code	Access	Subpage name for SCC pages
00h		Reserved
01h	R/W	Output-protocol specific current settings
02h	R/W	Output-protocol specific initial settings
03h	R	Output-protocol specific report integrity checking results

[existing extended device-specific mode page text:]
The first byte of the page is a PROTOCOL IDENTIFIER field.

The PROTOCOL IDENTIFIER field indicates the protocol to which the page applies. For MODE SENSE commands, the device server shall set the PROTOCOL IDENTIFIER field to one of the values shown in table xxx to indicate the protocol used by its service delivery subsystem. For MODE SELECT commands, the application client shall set the PROTOCOL IDENTIFIER field to one of the values shown in table xxx indicating the protocol to which the protocol-specific mode parameters apply. If a device server receives a page containing a protocol identifier value other than the one used by its service delivery subsystem, it shall terminate the command with a

CHECK CONDITION status. The sense key shall be set to ILLEGAL REQUEST and the additional sense code shall be set to INVALID FIELD IN PARAMETER LIST.

[table xxx referred to above is table 172 in SPC-2 revision 18. This table defines protocol identifiers with a 4 bit field. The page has 4 extra bits available for protocol identification.]

[add this sentence:]
Pages are defined in protocol standards (SPI, FCP, etc.).

[Changes to SPI-4:]
[create this new section in the SPI-4 mode page area:]

18.1.5 Extended device-specific mode page for SCC

18.1.5.1 Extended device specific mode page for SCC overview

Table x defines the extended device-specific mode page subpages for logical units in SCC devices that represent logical units in devices attached via output SPI busses.

Table x. Extended device-specific mode page subpages for SCC

Subpage code	Access	Subpage name for SCC
00h		Reserved
01h	R/W	Protocol-specific current settings for SPI
02h	R/W	Protocol-specific initial settings for SPI
03h	R	Protocol-specific report integrity checking results for SPI
04h – FFh		Reserved

18.1.5.2 Current settings subpage for SPI

The current settings subpage, shown in table X.10, is used to report the negotiated settings that the controller uses as a SPI initiator with the target containing the logical unit represented by the logical unit containing the subpage.

A MODE SENSE returns the current negotiated values and the current bus transceiver state. A MODE SELECT causes a new negotiation to occur on the next connection, requesting the values provided.

[Editor's note: All the PPR values should match those in the corresponding target's port control mode page current settings subpage with two exceptions:
a) The transceiver mode values may differ if an expander sits between the initiator and target.
b) The PCOMP_EN bits may differ if an expander sits between them and changes the precomp selection during negotiation.]

Table X.10 — Current settings subpage (01h)

Bit / Byte	7	6	5	4	3	2	1	0
0	PROTOCOL IDENTIFIER (01H)							
1	RESERVED							
2	RESERVED							
3	RESERVED							
4	TRANSFER PERIOD FACTOR							
5	RESERVED							
6	REQ/ACK OFFSET							
7	TRANSFER WIDTH EXPONENT							
8	PROTOCOL OPTION BITS							
	RSVD	RTI	RD_STRM	WR_FLOW	RSVD	QAS_REQ	DT_REQ	IU_REQ
9	RESERVED				TRANSCEIVER MODE		SENT PCOMP EN	RECEIVED PCOMP EN
10	RESERVED							
11	RESERVED							

The PROTOCOL IDENTIFIER field indicates that the logical unit represents a logical unit in a device attached via an output SPI bus.

The TRANSFER PERIOD FACTOR field indicates the negotiated transfer period factor (see 16.3.11.1) for the I_T nexus.

The REQ/ACK OFFSET field indicates the negotiated REQ/ACK offset (see 16.3.11.1) for the I_T nexus.

The TRANSFER WIDTH EXPONENT field indicates the negotiated transfer width exponent (see 16.3.11.1) for the I_T nexus.

The PROTOCOL OPTIONS BITS field contains the negotiated protocol options (see 16.3.11.1) for the I_T nexus.

The RECEIVED PCOMP_EN bit contains the value of the PCOMP_EN bit (see 16.3.11.1) received by the initiator for the I_T nexus.

The SENT PCOMP_EN bit contains the value of the PCOMP_EN bit (see 16.3.11.1) sent by the initiator for the I_T nexus.

The TRANSCEIVER MODE field specifies the current bus mode of the initiator as defined in table 81. [Editor's note: that table is in the port control page current settings subpage description.]

18.1.5.3 Initial settings subpage for SPI

The initial settings subpage, shown in table X.11, is used to report the negotiated settings that the controller uses as an initiator when establishing an I_T nexus with the target containing the logical unit represented by the logical unit containing the subpage.

A MODE SENSE returns the values the initiator uses after a reset condition when starting negotiation and performing integrity checks (see Annex X). A MODE SELECT causes the initiator to store a different set of values in nonvolatile storage and start from this set of values.

[Editor's note: To speed up booting, host software could instruct the controller to start DV at the speed each target ended up using during a previous boot.]

Table X.11 — Initial settings subpage (02h)

Bit / Byte	7	6	5	4	3	2	1	0
0	PROTOCOL IDENTIFIER (01H)							
1	RESERVED							
2	RESERVED							
3	RESERVED							
4	TRANSFER PERIOD FACTOR							
5	RESERVED							
6	REQ/ACK OFFSET							
7	TRANSFER WIDTH EXPONENT							
8	PROTOCOL OPTION BITS							
	PCOMP EN	RTI	RD_STRM	WR_FLOW	RSVD	QAS_REQ	DT_REQ	IU_REQ
9	RESERVED							
10	RESERVED							
11	RESERVED							

The PROTOCOL IDENTIFIER field indicates that the logical unit represents a logical unit in a device attached via an output SPI bus.

The TRANSFER PERIOD FACTOR field indicates the initial requested transfer period factor (see 16.3.11.1) for the current I_T nexus.

The REQ/ACK OFFSET field indicates the initial requested REQ/ACK offset (see 16.3.11.1) for the current I_T nexus.

The TRANSFER WIDTH EXPONENT field indicates the initial requested transfer width exponent (see 16.3.11.1) for the current I_T nexus.

The PROTOCOL OPTIONS BITS field contains the initial requested protocol options (see 16.3.11.1) for the current I_T nexus.

18.1.5.4 Report integrity checking results subpage for SPI

The report integrity checking results subpage, shown in table X.12, is used to report the negotiated settings that the controller obtained as an initiator when establishing an I_T nexus with the target containing the logical unit represented by the logical unit containing the subpage.

A MODE SENSE returns the integrity checking results. This subpage is read-only.

[Editor's note: the contents may differ from the current values subpage if renegotiation occurred for any reason.]

Table X.12 — Report integrity checking results subpage (03h)

Bit / Byte	7	6	5	4	3	2	1	0
0	PROTOCOL IDENTIFIER (01H)							
1	RESERVED							
2	RESERVED							
3	RESERVED							
4	TRANSFER PERIOD FACTOR							
5	RESERVED							
6	REQ/ACK OFFSET							
7	TRANSFER WIDTH EXPONENT							
8	PROTOCOL OPTION BITS							
	RSVD	RTI	RD_STRM	WR_FLOW	RSVD	QAS_REQ	DT_REQ	IU_REQ
9	RESERVED				TRANSCEIVER MODE		SENT PCOMP EN	RECEIVED PCOMP EN
10	RESERVED							
11	VENDOR-SPECIFIC RESULT CODE							

The PROTOCOL IDENTIFIER field indicates that the logical unit represents a logical unit in a device attached via an output SPI bus.

The TRANSFER PERIOD FACTOR field indicates the transfer period factor (see 16.3.11.1) for the I_T nexus after the initial integrity checking sequence.

The REQ/ACK OFFSET field indicates the requested REQ/ACK offset (see 16.3.11.1) for the I_T nexus after the initial integrity checking sequence.

The TRANSFER WIDTH EXPONENT field indicates the requested transfer width exponent (see 16.3.11.1) for the I_T nexus after the initial integrity checking sequence.

The PROTOCOL OPTIONS BITS field contains the requested protocol options (see 16.3.11.1) for the I_T nexus after the initial integrity checking sequence.

The RECEIVED PCOMP_EN bit contains the value of the PCOMP_EN bit (see 16.3.11.1) received by the initiator for the I_T nexus.

The SENT PCOMP_EN bit contains the value of the PCOMP_EN bit (see 16.3.11.1) sent by the initiator for the I_T nexus.

The TRANSCEIVER MODE field specifies the current bus mode of the initiator as defined in table 81. [Editor's note: that table is in the port control page current settings subpage description.]

The VENDOR-SPECIFIC RESULT CODE field is vendor specific.