To: INCITS Technical Committee T10

From: Kevin Butt, IBM Date: August 21, 2004 Document: T10/04-271r0

Subject: SPC: Time Of Day Settings

1. Introduction

The intended use of this Time-Of-Day (TOD) setting is for capture in device logs such that they can be correlated to other devices in the system as well as application logs on the host. As such we see no need for guaranteeing no loss in precision from the transmit time. (i.e. Any losses to accuracy incurred by the time on the link are negligible and need not be accounted for.)

The ADI working group, in answering ADC Letter Ballot comments HP-139 and IBM Roberts-3 (both related to setting time of day to the device) has determined that this belongs in SPC and has given me an action to write and present this proposal to CAP. The direction suggested was to use a Maintenance-In and Maintenance-Out command for SET TIME OF DAY and GET TIME OF DAY commands. In working through this proposal, it is apparent that there are also mode parameters required to make this unambiguous.

2. Proposal

6.xx REPORT TIME-OF-DAY command

The REPORT TIME-OF-DAY command (see table xy) requests the the value of the devices time-of-day clock.

The REPORT TIME-OF-DAY command is a service action of the MAINTENANCE IN command. Additional MAINTE-NANCE IN service actions are defined in SCC-2 and in this standard. The MAINTENANCE IN service actions defined in SCC-2 apply only to logical units that return a device type of 0Ch or the SCCS bit equal to one in their standard INQUIRY data (see 6.4.2).

TABLE xyz. REPORT TIME-OF-DAY command

Byte	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>		
<u>0</u>		OPERATION CODE (A3h)								
1		Reserved			SERV	ICE ACTION	I (0Fh)			
<u>2</u>				Decorned						
<u>5</u>		<u>Reserved</u>								
<u>6</u>	ALLOCATION LENGTH									
<u>9</u>				ALLOCATIO	JN LENGIII					

TABLE xvz. REPORT TIME-OF-DAY command

Byte	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>10</u>		<u>Reserved</u>						
<u>11</u>				<u>CON</u>	ΓROL			

The ALLOCATION LENGTH field specifies the number of bytes that have been allocated for the returned parameter data. An allocation length that is not sufficient to contain the entire parameter list shall not be considered an error.

If the complete list is required, the application client should send a new REPORT TIME-OF-DAY command with an allocation length large enough to contain the entire list.

The format of the parameter data returned by the REPORT TIME-OF-DAY command is shown in table yvv.

TABLE yyy. REPORT TIME-OF-DAY parameter data format

<u>Byte</u>	<u>7</u>	<u>6</u>	<u>5</u>	4	<u>3</u>	<u>2</u>	1	<u>0</u>
<u>0</u>			TIME-OF-DA	AV PARAME	TER DATA I	ENGTH (n-3))	
<u>3</u>			TIME-OI-DE	AT TAICAIVIL	TER DATA E	LINGTII (II-5)	<u>L</u>	
				Time-of-da	y descriptors			
<u>4</u>			First tin	ne of day dec	criptor (see ta	hla vvv)		
		First time-of-day descriptor (see table xxx)						
		<u>:</u>						
	Last time-of-day descriptor (see table xxx)							
<u>n</u>			<u>Last till</u>	ic-or-day des	criptor (see ta	oic axaj		

The TIME-OF-DAY PARAMETER DATA LENGTH field specifies the number of bytes of parameter data that follow.

Each time-of-day descriptor (see table xxx) contains time-of-day information for a single method.

TABLE xxx. Time-of-day descriptor

<u>Byte</u>	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	1	<u>0</u>
<u>0</u>		ADDITIONAL DESCRIPTOR LENGTH (n-1)						
1			ADDIT	IONAL DESCR	I TOR ELIVOTI	<u> </u>		
<u>2</u>		Reserved TODC						<u>DC</u>
<u>3</u>		Reserved						
<u>4</u>	TIME-OF-DAY							
<u>11</u>				<u> 1 11VIL-C</u>	<u> JI-DAI</u>			

The time-of-day clock (TODC) field reports the source of the TIME-OF-DAY value returned

TABLE 1. TIME-OF-DAY METHOD Field

Value	<u>Definition</u>
<u>00b</u>	<u>Time-of-day value of the clock set by the device (i.e. device's internal clock value)</u>
<u>01b</u>	Reserved
<u>10b</u>	Time-of-day value of the clock set by a SCSI command
<u>11b</u>	<u>Time-of-day value of the clock set by Protocol specific methods</u>

The TIME-OF-DAY field contains the current time-of-day value to be set to the time-of-day clock. The Time-of-Day (TOD) clock is a binary counter with a 64-bit format. Bit 32 represents a 1 second clock; that is, the TOD is incremented by 1 in bit position 32, once every second. This gives the TOD clock a cycle time of approximately 136 years.

If the TOD field has never been set, the TOD field contains the elapsed power on time from the default value of 00h, which corresponds to a time of January 1, 1970, 0:00 AM, Greenwich Mean Time (GMT).

6.vv SET TIME-OF-DAY command

The SET TIME-OF-DAY command (see table xx) is used to provide the device with an estimate of the time-of-day. The time-of-day set by this command shall remain in effect until one of the following occurs:

- a) Another SET TIME-OF-DAY command is received;
- b) The TODM field of the Control Extension mode page is set to 01b or 11b and a protocol specific method of changing the time-of-day is received; or
- c) Power off.

The time-of-day set by this command shall not be affected by an I_T nexus loss and should not be affected by a Logical Unit reset or Hard reset.

The SET TIME-OF-DAY command is a service action of the MAINTENANCE OUT command. Additional MAINTENANCE OUT service actions are defined in SCC-2 and in this standard. The MAINTENANCE OUT service actions defined only in SCC-2 apply only to logical units that return a device type of 0Ch or the sccs bit equal to one in their standard INQUIRY data..

TABLE xx. SET TIME-OF-DAY command

Byte	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>		
<u>0</u>	OPERATION CODE (A4h)									
1		Reserved		SERVICE ACTION (0Fh)						
<u>2</u>	Reserved									
<u>5</u>				Kese	<u>arveu</u>					

TABLE xx. SET TIME-OF-DAY command

Byte	<u>7</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>0</u>
<u>6</u>		ALLOCATION LENGTH						
<u>9</u>		ALLUCATION LENGTH						
<u>10</u>		Reserved						
<u>11</u>				<u>CON</u>	ΓROL			

The PARAMETER LIST LENGTH field specifies the length in bytes of the SET TIME-OF-DAY parameter list (see table zzz) that shall be contained in the Data-Out Buffer. A parameter list length of zero indicates that the Data-Out Buffer shall be empty. This condition shall not be considered as an error.

TABLE xxx. SET TIME-OF-DAY parameter list format

Byte	<u>7</u>	<u>6</u>	<u>5</u>	4	<u>3</u>	<u>2</u>	1	<u>0</u>
<u>0</u>				ADDITIONAL I	ENCTH (n-1)			
1				ADDITIONALI	<u>-ENGITI (II-1)</u>			
<u>2</u>		Reserved						
<u>3</u>		Reserved						
<u>4</u>				TIME-C	DE-DAV			
<u>11</u>				1 HVIL)-(DI-DAI			

The ADDITIONAL LENGTH field indicates the number of bytes that follow in the SET TIME-OF-DAY parameter list.

The TIME-OF-DAY field contains the current time-of-day value to be set to the time-of-day clock. The Time-of-Day (TOD) clock is a binary counter with a 64-bit format. Bit 32 represents a 1 second clock; that is, the TOD is incremented by 1 in bit position 32, once every second. This gives the TOD clock a cycle time of approximately 136 years. If the high order byte is set to any number greater than X'F0', the device server shall return CHECK CONDITION status with the sense key set to ILLEGAL REQUEST and an additional sense code of INVALID FIELD IN PARAMETER LIST.

The default time-of-day setting at power on is 00h, which corresponds to a time of January 1, 1970, 0:00 AM, Greenwich Mean Time (GMT). The TOD clock begins counting relative time from that point.

7.4.7 Control Extension mode page

The Control Extension mode page (see table 233) is a subpage of the Control mode page (see 7.4.6) provides controls over SCSI features that are applicable to all device types. The mode page policy (see 6.7) for this subpage shall be shared. If a field in this mode subpage is changed while there is a task already in the task set, it is vendor specific whether the old or new value of the field applies to that task.

Byte	7	6	5	4	3	2	1	0
0	PS	SPF (1b)			PAGE CC	DE (0Ah)		
1				SUBPAGE	CODE (01h)			
2				DA CE I EN	IGTH (1Ch)			
3				TAGE LEN	idili (icii)			
4				<u>TO</u> :	<u>DM</u>	<u>TODCP</u>	TODCS	IALUAE
5						INITIAL I	PRIORITY	
6								
31								

TABLE 239. Control Extension mode page

The PS bit, SPF bit, PAGE CODE field, SUBPAGE CODE field, and PAGE LENGTH field are described in 7.4.5.

An implicit asymmetric logical unit access enabled (IALUAE) bit set to one specifies that implicit asymmetric logical unit access state changes (see 5.8.2.7) are allowed. An IALUAE bit set to zero specifies that implicit asymmetric logical unit access state changes be disallowed and indicates that implicit asymmetric logical unit access state changes are disallowed or not supported.

A time-of-day changeable via SCSI (TODCS) bit set to one specifies that the time-of-day clock is changeable via the SET TIME OF DAY and GET TIME OF DAY commands. A TODCS bit set to zero specifies the time-of-day clock is not changeable via the SET TIME OF DAY and GET TIME OF DAY commands.

A time-of-day changeable via protocol specific methods (TODCP) bit set to one specifies that the time-of-day clock is changeable via protocol specific methods. A TODCP bit set to zero specifies that the time-of-day clock is not changeable by protocol specific methods.

A time-of-day method (TODM) field specifies the method to used to set the time-of-day clock. Table x shows the useage of the TODM field.

<u>Value</u>	<u>Definition</u>
<u>00b</u>	Use internal clock as time-of-day clock
<u>01b</u>	Use last time-of-day setting received by any method
<u>10b</u>	SCSI command method overrides protocol specific method
<u>11b</u>	Protocol specific method overrides SCSI command method

TABLE X. TIME-OF-DAY METHOD Field

The INITIAL PRIORITY field specifies the priority that may be used as the task priority (see SAM-3) for tasks received in any I_T_L nexus where a priority has not been modified by a SET PRIORITY command (see 6.29). If a MODE SELECT command specifies an initial priority value that is different than the current initial priority then the device server shall set any priorities that have not be set with a SET PRIORITY command to a value different than the new initiator

priority value to the new priority. The device server shall generate a unit attention condition for any I_T_L nexus that receives a new priority with an additional sense code of PRIORITY CHANGED.