To: INCITS Technical Committee T10

From: Kevin Butt, IBM

Date: September 14, 2004

Document: T10/04-271r4

Subject: SPC: Time Of Day Settings

# 1. Revisions

04-271r0 - Initial Version

04-271r1 - Added a model section, change time base of clock to 48.16 (48 bits for seconds.16 bits for fractional seconds). Improve definition of clock format, have a descriptor for each clock that has been set returned.

04-271r2 - Incorporate comments from George Penokie. Also resolves comments from several others on the time-of-day format.

Use definition from OSD

04-271r3 - Made timestamp description match table. Incorporate Ralph Weber comments.

04-27r4 - Made corrections requested by CAP WG in Sept. and per private discussions with Paul Entzel afterward related to the mode page configuration bits.

# 2. 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 REPORT TIME OF DAY commands. In working through this proposal, it is apparent that there are also mode parameters required to make this unambiguous. A model section seems also to be required.

# 3. Proposal

Add the following sections to SPC-3.

**3.1.121 universal time (UT):** The time at longitude zero, colloquially known as Greenwich Mean Time.See http://aa.usno.navy.mil/faq/docs/UT.html.

### 5.6.1 Persistent Reservations overview

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**TABLE 30. — SPC commands that are allowed in the presence of various reservations**

| Command | Addressed LU has this type of persistent reservation held by another I_T nexus | | | | |
| | From any I_T nexus | | From registered I_T nexus (RR all types) | From I_T nexus not registered | |
| | Write Excl | Excl Access | | Write Excl RR | Excl Access - RR |
|---|---|---|---|---|---|
| ... | | | | | |
| REPORT TIMESTAMP | Allowed | Allowed | Allowed | Allowed | Allowed |
| ... | | | | | |
| SET TIMESTAMP | Allowed | Conflict | Allowed | Allowed | Conflict |
| ... | | | | | |

## 5.12 Device Clocks

The timestamp may be recorded in drive error logs.

The timestamp origin (TORIG) shall be one of those specified in Table xx.

**TABLE xx. Timestamp Origin**

| Value | Definition |
|---|---|
| 000b | Timestamp initialized to zero at power-on |
| 001b | Reserved |
| 010b | Timestamp initialized by the SET TIMESTAMP command |
| 011b | Timestamp initialized by methods outside the scope of this standard |
| 100b - 111b | Reserved |

Once a timestamp is initialized it shall begin counting from that time forward. Once the times-tamp is initialized it shall remain in effect until one of the following occurs:

a) A SET TIMESTAMP command is processed;

b) A method outside the scope of this standard; or

c) A Hard reset.

The method used is indicated in the extended control mode page (see 7.4.7).

The Timestamp shall not be affected by an I_T nexus loss or a Logical Unit reset.

The TIMESTAMP is specified in table 39.

**TABLE 39. TIMESTAMP Format**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------|---|---|---|---|---|---|---|---|
| **0 . . 5** | MSB | | | TIMESTAMP | | | | LSB |

The TIMESTAMP field contains the value established at the last action that set the timestamp incremented by one for every millisecond that has elapsed since the timestamp was set, within vendor-specific constraints.

## 6.xx REPORT TIMESTAMP command

The REPORT TIMESTAMP command (see table xy) requests the value of the devices timestamp.

The REPORT TIMESTAMP command is a service action of the MAINTENANCE IN command. Additional MAINTENANCE 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 TIMESTAMP command**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------|---|---|---|---|---|---|---|---|
| **0** | OPERATION CODE (A3h) | | | | | | | |
| **1** | Reserved | | | SERVICE ACTION (TBD) | | | | |
| **2** **5** | Reserved | | | | | | | |
| **6** **9** | ALLOCATION LENGTH | | | | | | | |
| **10** | Reserved | | | | | | | |
| **11** | CONTROL | | | | | | | |

The ALLOCATION LENGTH field indicates how many bytes have been allocated for the returned parameter data. If the length is not sufficient to contain all the parameter data, the first portion of the data shall be returned. This shall not be considered an error. The actual length of the parameter data is available in the TIMESTAMP PARAMETER DATA LENGTH field in the parameter data. If the remainder of the parameter data is required, the application client should send a new REPORT TIMESTAMP command with an ALLOCATION LENGTH field large enough to contain all the data.

The format of the parameter data returned by the REPORT TIMESTAMP command is shown in table yyy.

**TABLE xxx. Timestamp descriptor**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------|---|---|---|---|---|---|---|---|
| 0 | TIMESTAMP PARAMETER DATA LENGTH (0Ah) | | | | | | | |
| 1 | | | | | | | | |
| 2 | Reserved | | | | Timestamp Origin | | | |
| 3 | Reserved | | | | | | | |
| 4 : 9 | MSB TIMESTAMP LSB | | | | | | | |
| 10 | Reserved | | | | | | | |
| 11 | Reserved | | | | | | | |

The timestamp origin field indicates the origin of the timestamp returned (see 5.12.1)

The TIMESTAMP field shall contain the current value of the timestamp (see 5.12).

### 6.yy SET TIMESTAMP command

The SET TIMESTAMP command (see table xx) provides the initial value of the timestamp, if the SCSIP bit or TCMOS bit (see xxx) is set to one. If the SCSIP bit (see xxx) is set to zero, the command shall be terminated with a CHECK CONDITION status, with the sense key set to ILLEGAL REQUEST and the additional sense code set to INVALID FIELD IN CDB.

The SET TIMESTAMP 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 TIMESTAMP command**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| 0 | OPERATION CODE (A4h) | | | | | | | |
| 1 | Reserved | | | SERVICE ACTION (TBD) | | | | |
| 2 | Reserved | | | | | | | |
| 5 | | | | | | | | |
| 6 | PARAMETER LIST LENGTH | | | | | | | |
| 9 | | | | | | | | |
| 10 | Reserved | | | | | | | |
| 11 | CONTROL | | | | | | | |

The PARAMETER LIST LENGTH field specifies the length in bytes of the SET TIMESTAMP parameters that shall be transferred from the application client to the device server. A parameter list length of zero indicates that no data shall be transferred, and that no change shall be made to the timestamp.

**TABLE xxx. SET TIMESTAMP parameter list format**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| 0 | Reserved | | | | | | | |
| 1 | | | | | | | | |
| 2 | Reserved | | | | | | | |
| 3 | Reserved | | | | | | | |
| 4 : 9 | MSB TIMESTAMP LSB | | | | | | | |
| 10 | Reserved | | | | | | | |
| 11 | Reserved | | | | | | | |

The TIMESTAMP field shall contain the initial value of the timestamp in the timestamp format (see Table 39). The timestamp should be the number of milliseconds that have elapsed since midnight, 1 January 1970 UT (see 3.1.121). If the high order byte is greater than F0h, 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.

### 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.

**TABLE 239. Control Extension mode page**

| Byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| 0 | PS | SPF (1b) | PAGE CODE (0Ah) | | | | | |
| 1 | SUBPAGE CODE (01h) | | | | | | | |
| 2 | PAGE LENGTH (1Ch) | | | | | | | |
| 3 | | | | | | | | |
| 4 | Reserved | | | | | TCMOS | SCSIP | IALUAE |
| 5 | Reserved | | | | INITIAL PRIORITY | | | |
| 6 | Reserved | | | | | | | |
| 31 | | | | | | | | |

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 SCSI precedence (SCSIP) bit set to one specifies that the timestamp changed using a SET TIMESTAMP command shall take precedence over methods outside the scope of this standard. A SCSIP bit set to zero specifies that methods outside this standard may change the timestamp after it has been set by the SET TIMESTAMP command.

A timestamp changeable by methods outside this standard (TCMOS) bit set to one specifies that the timestamp may be initialized my methods outside the scope of this standard. A TCMOS bit set to zero specifies that the timestamp shall not be changed by any method except those defined by this standard.

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.

## ADC

If in time to add to ADC add to ADC, otherwise add to ADC-2.

Add the following rows to Table 5.

**TABLE 5. — Command set for automation drive interface**

| Command name | Operation code | Required | Reference | Notes |
|---|---|---|---|---|
| REPORT TIMESTAMP | A3h/TBD | Optional | SPC-3 | |
| SET TIMESTAMP | A4h/TBD | Optional | SPC-3 | |