ENDL
T E X A S

Date: 10 February 2004
To: T10 Technical Committee and SNIA OSD TWG
From: Ralph O. Weber
Subject: OSD Quota Enforcement

This proposal describes changed to be made in OSD r08 to describe OSD quota enforcement.

Since reporting OSD quota violations requires sense data changes, a few changes in SPC-3 r17 are also requested.

Summary of SPC-3 r17 Changes

- Add a new sense data descriptor in 4.5.2 that identifies the quota violated using the attributes page and attribute number of the attribute containing the quota limit value.
- Add a new additional sense code QUOTA ERROR (proposed 55h/07h).

Summary of OSD r08 Changes

- Add a new subclause to the model describing quota enforcement.
- Add text to every command definition identifying specifically the quota values to be enforced and referencing the model subclause for the rules on how quotas are enforced.
- Rename the Resources attributes pages to the Quotas attributes pages.
  This change has the following benefits:
    - It clearly identifies the purpose of these pages and reduce temptations to put non-quota attributes in them).
    - It eliminates the need to have the word 'quota' in every attribute name.
- Define the quotas shown in the following table (new in blue, removed in blue strikeout):

Attribute Number	Root (Attributes Page R+2h)	Partition (Attributes Page P+2h)	User Object (Attributes Page 2h)
1h	~~Partition capacity quota~~	~~Capacity quota~~	~~Capacity quota~~
	Maximum User Object Length	Maximum User Object Length	Maximum User Object Length
2h	~~User object capacity quota~~	~~User object capacity quota~~	
3h		~~Object count~~ (see 10001h below)	
4h	~~Partition count~~ (see 20001h below)		
5h	~~Total capacity~~ (move this non-quota attribute to the Root Information attributes page)		
10001h	Partition object count	Object count	
20001h	Partition count		

- The changes in the table on the preceding page (as per the discussion in the 28 January OSD telephone conference call) eliminate all limits on the dynamic creation of attributes. This proposal includes defining the new quotas in following table would restore some controls.

Attribute Number	Root (Attributes Page R+2h)	Partition (Attributes Page P+2h)	Collection and User Object (Attributes Pages C+2h & 2h)
2h	Maximum Number of Dynamic User or Collection Attributes	Maximum Number of Dynamic User or Collection Attributes	Maximum Number of Dynamic Attributes
3h	Maximum Dynamic User or Collection Attribute Length	Maximum Dynamic User or Collection Attribute Length	Maximum Dynamic Attribute Length

- N.B. The addition of quotas for dynamic attributes requires that a definition for a Collection Quotas attributes page be added.

Specific of SPC-3 r17 Changes

Add the following new additional sense code definition (additional sense code value is a recommendation only):

55h/07h … F QUOTA ERROR

Add the following sense data descriptor to table 13 and in proper order within subclause 4.5.2.

4.5.2.x OSD attribute identification sense data descriptor

The OSD attribute identification sense data descriptor (see table x1) identifies one or more attributes (see OSD) associated with the error reported in the sense data.

Table x1 — OSD attribute identification sense data descriptor format

Bit / Byte	7	6	5	4	3	2	1	0
0	DESCRIPTOR TYPE (08h)							
1	ADDITIONAL LENGTH (n-2)							
2	Reserved							
3	Reserved							
	Attribute descriptors							
4	Attribute descriptor 0 (see table x2)							
	. . .							
n	Attribute descriptor x (see table x2)							

Each attribute descriptor identifies one attribute associated with the error reported in the sense data.

Table x2 — Sense data attribute descriptor format

Bit Byte	7	6	5	4	3	2	1	0
0	(MSB)							
3				ATTRIBUTE PAGE				(LSB)
4	(MSB)							
7				ATTRIBUTE NUMBER				(LSB)

The ATTRIBUTE PAGE field (see OSD) contains the attribute page number for the attributes page containing the attribute associated with the error reported in the sense data.

The ATTRIBUTE NUMBER field (see OSD) contains the attribute number of the attribute associated with the error reported in the sense data.

Specific of OSD r08 Changes

Add the following new subclause to the OSD model (clause 4).

4.x.y Quotas

4.x.y.1 Introduction

The root, partition, collection, and user objects include attributes pages (see 4.6.3) that define limits on an application client's ability to consume OSD logical unit resources. The attributes pages are the:

  a) Root Quotas attributes page (see 7.1.2.11);
  b) Partition Quotas attributes page (see 7.1.2.12);
  c) Collection Quotas attributes page (see 7.1.2.xx); and
  d) User Object Quotas attributes page (see 7.1.2.13).

The command definitions in this standard (see clause 6) specify which quotas are to be tested and how they are to be tested for each command. The testing of quotas specific to dynamically created attributes pages and values are defined in 4.x.y.5.

4.x.y.2 Quota errors

If one of the quota error conditions described in clause 6 or 4.x.y.5 occurs, processing of the command shall be terminated and a quota error shall be reported as follows:

  a) The status shall be CHECK CONDITION;
  b) The sense key shall be DATA PROTECT;
  c) The additional sense code shall be QUOTA ERROR; and
  d) The sense data shall include the OSD attribute identification sense data descriptor (see SPC-3) with one or more attribute descriptors identifying the quota attribute or attributes that have been infringed.

4.x.y.3 Quota testing

Tests for quota errors may be made at any time during the processing of a command. The processing of a command may be partially completed at the time a quota error is detected. The device server is not required to restore the state of the OSD logical unit to the state that was present before processing was begun for the command in which the quota error has been detected.

The device server may implement a vendor specific margin in the tests related to any quota and generate a quota error if a command attempts to consume resources within the margin adjusted quota limit. The size of the vendor specific margin may vary over time in a vendor specific manner.

4.x.y.4 Changing quotas

The quota values are contained in attributes that may be set by command with an appropriate capability.

Setting a quota to a value that is less than the applicable resources already consumed in the OSD logical unit:

a) Shall not be an error; and
b) Shall not result in the truncation or removal of any information (e.g., user data or attribute values) already stored by the OSD logical unit.

As long as the quota value remains set to a value that is less than the applicable resources already consumed in the OSD logical unit, all commands that attempt to consume the applicable resource shall be terminated with a quota error.

4.x.y.5 Quota enforcement for dynamic attributes

Attributes in the dynamic user attributes pages (i.e., attributes pages with page numbers of 0001 0000h through 1FFF FFFFh) and the dynamic collection attributes pages (i.e., attributes pages with page numbers of 6001 0000h through 7FFF FFFFh) are defined only as the result of a command that sets them. There are no practical limits on the amount of resources the attributes in such pages may consume.

The maximum number of dynamic attributes attribute and the maximum dynamic attribute length attribute in the User Object Quotas attributes page (see 7.1.2.13) may be used as quotas on the consumption of resources by dynamic user attributes.

The maximum number of dynamic attributes attribute and the maximum dynamic attribute length attribute in the Collection Quotas attributes page (see 7.1.2.xx) may be used as quotas on the consumption of resources by dynamic collection attributes.

If a command requests the creation of a previously undefined dynamic attribute and creating the dynamic attribute would cause the collection or user object to have more dynamic attributes that the value in the maximum number of dynamic attributes attribute, then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the maximum number of dynamic attributes quota.

If a command attempts to set the length of a collection dynamic attribute or a user object dynamic attribute to a value that is larger that the value in the maximum dynamic attribute length attribute, then a quota error shall be generated. The quota testing principles in 4.x.y.3 apply to the testing of the maximum dynamic attribute length quota.

No quotas are applied to the number of length of dynamic attributes associated with partitions or the root object.

Add the following paragraphs to the indicated subclauses in clause 6.

6.2 APPEND

If an APPEND command causes the value in the object logical length attribute in the User Object Information attributes page (see 7.1.2.10) to exceed the value in the maximum user object length attribute in the User Object Quotas attributes page (see 7.1.2.13), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the maximum user object length quota.

Note: The above paragraph replaces the paragraph that begins "If there is a capacity quota on…".

6.3 CREATE

If a CREATE command causes the sum of the number of collections and the number of user objects in the partition to exceed the value in the object count attribute in the Partition Quotas attributes page (see 7.1.2.12), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the object count quota.

6.3 CREATE AND WRITE

If a CREATE AND WRITE command causes the sum of the number of collections and the number of user objects in the partition to exceed the value in the object count attribute in the Partition Quotas attributes page (see 7.1.2.12), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the object count quota.

If a CREATE AND WRITE command causes the value in the object logical length attribute in the User Object Information attributes page (see 7.1.2.10) to exceed the value in the maximum user object length attribute in the User Object Quotas attributes page (see 7.1.2.13), then a quota error shall be generated. The quota testing principles in 4.x.y.3 apply to the testing of the maximum user object length quota.

6.5 CREATE COLLECTION

If a CREATE COLLECTION command causes the sum of the number of collections and the number of user objects in the partition to exceed the value in the object count attribute in the Partition Quotas attributes page (see 7.1.2.12), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the object count quota.

6.6 CREATE PARTITION

If a CREATE PARTITION command causes the number of partitions to exceed the value in the partition count attribute in the Root Quotas attributes page (see 7.1.2.11), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the object count quota.

6.19 WRITE

If a WRITE command causes the value in the object logical length attribute in the User Object Information attributes page (see 7.1.2.10) to exceed the value in the maximum user object length attribute in the User Object Quotas attributes page (see 7.1.2.13), then a quota error shall be generated (see 4.x.y.2). The quota testing principles in 4.x.y.3 apply to the testing of the maximum user object length quota.

Note: The above paragraph replaces the text that begins "If there is a capacity quota on…" in the paragraph that begins with "A WRITE to a byte that is greater than the object logical length…".

In subclause 7.1.2, modify the tables that summarize the attributes pages and define the various quota attributes as follows. (Note: each definition contains sufficient information to specify the contents of the tables defining the related attributes pages, so the details of those tables are omitted from this proposal.)

Remove all other attributes in these pages as described in the proposal summary on page 1.

7.1.2.11 Root Quotas attributes page

All attributes in the Root Quotas attributes page are quotas (see 4.x.y).

The maximum user object length attribute (number 0000 0001h) specifies the value to be copied to the maximum user object length attribute in the Partition Quotas attributes page (see 7.1.2.12) for each newly created partition. The FORMAT OSD command (see 6.8) shall set the maximum user object length attribute to FFFF FFFF FFFF FFFFh.

The maximum number of dynamic user or collection attributes attribute (number 0000 0002h) specifies the value to be copied to the maximum number of dynamic user or collection attributes attribute in the Partition Quotas attributes page for each newly created partition. The FORMAT OSD command shall set the maximum number of dynamic user or collection attributes attribute to FFFF FFFF FFFF FFFFh.

The maximum dynamic user or collection attribute length attribute (number 0000 0003h) specifies the value to be copied to the maximum dynamic user or collection attribute length attribute in the Partition Quotas attributes page for each newly created partition. The FORMAT OSD command shall set the maximum dynamic user or collection attribute length attribute to FFFFh.

The partition object count attribute (number 0001 0001h) specifies the to be copied to the object count attribute in the Partition Quotas attributes page for each newly created partition. The FORMAT OSD command shall set the partition object count attribute to FFFF FFFF FFFF FFFFh.

The partition count attribute (number 0002 0001h) specifies the maximum number of partitions allowed in the OSD logical unit. If a CREATE PARTITION command (see 6.6) attempts to exceed the partition count quota, a quota error (see 4.x.y.2) shall be generated. The FORMAT OSD command shall set the partition count attribute to FFFF FFFF FFFF FFFFh. A command that attempts to set the partition count attribute value to zero shall be terminated with a CHECK CONDITION status, the sense key set to ILLEGAL REQUEST, the additional sense code set to INVALID FIELD IN CDB, and the value in the partition count attribute shall not be changed.

7.1.2.12 Partition Quotas attributes page

All attributes in the Partition Quotas attributes page are quotas (see 4.x.y).

The maximum user object length attribute (number 0000 0001h) specifies the value to be copied to the maximum user object length attribute in the User Object Quotas attributes page (see 7.1.2.13) for each newly created user object. The CREATE PARTITION command (see 6.6) shall set this attribute to the value in the maximum user object length attribute in the Root Quotas attributes page (see 7.1.2.11).

The maximum number of dynamic user or collection attributes attribute (number 0000 0002h) specifies the value to be copied to the maximum number of dynamic user or collection attributes attribute in the:

  a) Collection Quotas attributes page for each newly created collection; and
  b) User Object Quotas attributes page for each newly created user object.

The CREATE PARTITION command shall set this attribute to the value in the maximum number of dynamic user or collection attributes attribute in the Root Quotas attributes page.

The maximum dynamic user or collection attribute length attribute (number 0000 0003h) specifies the value to be copied to the maximum dynamic user or collection attribute length attribute in the

a) Collection Quotas attributes page for each newly created collection; and
b) User Object Quotas attributes page for each newly created user object.

The CREATE PARTITION command shall set this attribute to the value in the maximum dynamic user or collection attribute length attribute in the Root Quotas attributes page.

The object count attribute (number 0002 0001h) specifies the maximum number allowed for the sum of the number of collections and the number of user objects in the partition. If a CREATE command (see 6.3), a CREATE AND WRITE command (see 6.4), or a CREATE COLLECTION command (see 6.5) attempts to exceed the object count quota, a quota error (see 4.x.y.2) shall be generated. The CREATE PARTITION command shall set this attribute to the value in the partition object count attribute in the Root Quotas attributes page.

7.1.2.xx Collection Quotas attributes page [new subclause]

All attributes in the Collection Quotas attributes page are quotas (see 4.x.y).

The maximum number of dynamic attributes attribute (number 0000 0002h) is a quota on the number of dynamically created attributes (see 4.x.y.5). The CREATE COLLECTION command (see 6.5) shall set this attribute to the value in the maximum number of dynamic user or collection attributes attribute in the Partition Quotas attributes page (see 7.1.2.12).

The maximum dynamic attribute length attribute (number 0000 0003h) is a quota on the size of each dynamically created attribute (see 4.x.y.5). The CREATE COLLECTION command shall set this attribute to the value in the maximum dynamic user or collection attribute length attribute in the Partition Quotas attributes page.

7.1.2.13 User Object Quotas attributes page

All attributes in the User Object Quotas attributes page are quotas (see 4.x.y).

The maximum user object length attribute (number 0000 0001h) specifies the maximum value allowed in the object logical length attribute in the User Object Information attributes page (see 7.1.2.10). If an APPEND command (see 6.2), a CREATE AND WRITE command (see 6.4), or a WRITE command (see 6.19) attempts to exceed the maximum user object length quota, a quota error (see 4.x.y.2) shall be generated. The CREATE command (see 6.3) and CREATE AND WRITE command (see 6.4) shall set this attribute to the value in the maximum user object length attribute in the Partition Quotas attributes page (see 7.1.2.12).

The maximum number of dynamic attributes attribute (number 0000 0002h) is a quota on the number of dynamically created attributes (see 4.x.y.5). The CREATE command and CREATE AND WRITE command shall set this attribute to the value in the maximum number of dynamic user or collection attributes attribute in the Partition Quotas attributes page.

The maximum dynamic attribute length attribute (number 0000 0003h) is a quota on the size of each dynamically created attribute (see 4.x.y.5). The CREATE command and CREATE AND WRITE command shall set this attribute to the value in the maximum dynamic user or collection attribute length attribute in the Partition Quotas attributes page.