To: X3T10 Committee (SCSI)
From: George Penokie (IBM)

Subject: Simplification of SACL Configuration

1 SCC parameters needed to configure a redundancy group

In SCC to configure a redundancy group the following information must be given to the storage array:
- LUN_R
- redundancy type identifier
- granularity of units
- create/modify selection - this is new and needs to be added to current command.
- p_extent descriptor that consists of:
    - set pattern
    - defer calculation
    - protected spate pattern
    - start check data interleave unit
    - number of units of check data
    - number of units of user data
    - p_extent that consists of:
        + LUN_P
        + start LBA_P
        + number of LBA_Ps
        + number of bytes per LBA_P

The above information provides enough flexibility to configure redundancy groups in most, if not all, possible ways. The problem is very few people understand how the various parameters affect performance, reliability, etc. on various products nor do they want the level of detail allowed for in this command. As a result the following simplified version of the parameters needed to configure a redundancy group is proposed:
- LUN_R - This is the name of the redundancy group (same as current command).
- redundancy type identifier - This would define the type of redundancy that would be created within the redundancy group (same as in the current command.
- create/modify selection - this indicates if the command is a create redundancy group or an add to an existing redundancy group.
- make all/make rest/make selected - This would allow the entire (make all) storage array to be configured to a single redundancy type, allow the remaining nonconfig-ured p_extents (make rest) to be configured to a single redundancy type, or use the LUN_P descriptor (make selected) to define the boundaries of the redundancy group.
- LUN_P descriptor - A list of peripheral devices that make up the redundancy group being configured (only used with 'make selected' option).
    - LUN_P - The address of the peripheral device to which the percentages will be applied.
    - Number of bytes of protected space - This would be the amount of protected space within the selected LUN_P to be configured as protected space.
    - Number of bytes of check data - This would be the amount of check data within the selected LUN_P to be configured as check data.

2 SCC parameters needed to configure a volume set

In SCC to configure a volume set the following information must be given to the storage array:

- LUN_V
- granularity of units
- create/modify selection - this is new and needs to be added to current command.
- ps_extent stripe length
- ps_extent interleave depth
- ps_extent descriptor that consists of:
    - increment/decrement
    - LUN_R
    - user data stripe depth
    - ps_extent that consists of:
        +LUN_P
        +start LBA_PS
        +number of LBA_PSs
        +number of bytes per LBA_PS

The above information provides enough flexibility to configure volume sets in most, if not all, possible ways. The problem is very few people understand how the various parameters effect performance, reliability, etc. on various products nor do they want the level of detail allowed for in this command. As a result the following simplified version of the parameters needed to configure a volume set is proposed:

- LUN_V - This is the name of the volume set (same as current command).
- create/modify selection - this indicates if the command is a create volume set or an add to an existing volume set.
- make all/make rest/make selected capacity/make selected - This would allow the entire (make all) storage array to be configured to a single volume set, allow the remaining nonconfigured ps_exents (make rest) to be configured to a single volume set, allow the remaining nonconfigured ps_extents (make selected capacity) to be configured with a volume set with the selected capacity, or use the LUN_P descriptor (make selected) to define the boundaries of the volume set and capacity to define the size of the volume set.
- Capacity of volume set - The number of bytes that would be contained within the volume set after the configuration is complete (only used with 'make selected capacity' and 'make selected' option).
- LUN_P descriptor - A list of peripheral devices that make up the volume set being configured (only used with 'make selected' option).
    - LUN_P - The address of the peripheral device to which the number of bytes of user data will be applied.
    - Number of bytes of user data - This is the number of bytes of the volume sets requested capacity that would be placed on the selected LUN_P.

3 New service actions

3.1 New maintenance group service actions

One new maintenance group service actions will be needed to implement the simplified redundancy group configuration; report unassigned peripheral device.

3.1.1 Report unassigned peripheral device service action

The CDB for the report unassigned peripheral device service action would contain the following:

- LUN_P = address of peripheral device to report unassigned information about
- allocation length = expected length of parameter list
- report selection bit - 1 = report unassigned information on LUN_P, 0 = report unassigned information on all LUN_Ps

The parameter list of the report simple redundancy group service action would contain the following:

- LUN_P descriptor - contains the following:
    - LUN_P = the peripheral device reporting the percentages
    - number of bytes of unassigned peripheral space = amount of LUN_P not configured
    - peripheral device type = the SCSI device type of the LUN_P
    - peripheral device state = the state of the reported LUN_P

3.2 New redundancy group service actions

Three new redundancy group service actions will be needed to implement the simplified redundancy group configuration; simple create/modify redundancy group, report simple create/modify redundancy group, and report unassigned redundancy group percentage.

3.2.1 Simple create/modify redundancy group service action

The CDB for the simple create/modify redundancy group service action would contain the following:

- redundancy type identifier = type of protection for redundancy group
- LUN_R = address of redundancy group
- list length = length of parameter list
- immediate bit - 1 = complete in background, 0 = complete before completion
- set LUN bit - 1 = makeup LUN_R value, 0 = use LUN_R value
- create (0b)/modifiy selection (1b)bit
- make all (11b)/make rest (10b)/make selected (00b)(2 bit field)

The parameter list of the simple create/modify redundancy group service action would contain the following:

- LUN_P descriptor - contains the following:
  - LUN_P = the peripheral device to use the percentages
  - number of bytes of protected space = amount of LUN_P used for protected space
  - number of bytes of check data = amount of LUN_P used for check data

3.2.2 Report simple redundancy group service action

The CDB for the report simple redundancy group service action would contain the following:

- LUN_R = address of redundancy group to report simple information about
- allocation length = expected length of parameter list
- report selection bit - 1 = report simple information on LUN_R, 0 = report simple information on all LUN_Rs

The parameter list of the report simple redundancy group service action would contain the following:

- redundancy group descriptor - contains the following:
  - LUN_R = address of redundancy group being reported
  - redundancy type identifier = type of protection for the reported redundancy group
  - redundancy group state = the state of the reported redundancy group
  - LUN_P descriptor - contains the following:
    +LUN_P = the peripheral device using the percentages
    +number of bytes of protected space = amount of LUN_P being used for protected space
    +number of bytes of check data = amount of LUN_P being used for check data

3.2.3 Report unassigned redundancy group protected space

The information returned in that service action could be used in the simple create/modify volume set service action to allocate space for a new volume set or expand an existing volume set.

The CDB for the report unassigned redundancy group protected space service action would contain the following:

- LUN_R = address of redundancy group to report unassigned protected space about
- allocation length = expected length of parameter list
- report selection bit - 1 = report protected space information on LUN_R, 0 = report protected space information on all LUN_Rs

The parameter list of the report unassigned redundancy group protected space service action would contain the following:

- redundancy group descriptor - contains the following:
  - LUN_R = address of redundancy group being reported
  - overlaid - 0 = no redundancy group overlay the LUN_R, 1 = some number of

redundancy group overlay the LUN_R.
- redundancy type identifier = type of protection for the reported redundancy group
- redundancy group state = the state of the reported redundancy group
- LUN_P descriptor - contains the following:
    +LUN_P = the peripheral device being reported
    +number of unassigned protected space bytes = amount of LUN_P not being used for user data.

3.3 New volume set service actions

Two new volume set service actions will be needed to implement the simplified volume set configuration; simple create/modify volume set, and report simple create/modify volume set.

3.3.1 Simple create/modify volume set service action

The CDB for the simple create/modify volume set service action would contain the following:

- LUN_V = address of volume set
- list length = length of parameter list
- immediate bit - 1 = complete in background, 0 = complete before completion
- set LUN bit - 1 = makeup LUN_V value, 0 = use LUN_V value
- create (0b)/modifiy selection (1b)bit
- make all (11b)/make rest (10b)/make selected capacity(01)/make selected (00b)(2 bit field)

The parameter list of the simple create/modify redundancy group service action would contain the following:

- volume set capacity - size to make the volume set in blocks
- LUN_P descriptor - contains the following:
    - LUN_P = the peripheral device to use the percentage
    - number of bytes of user data = This is the number of bytes of the requested volume set capacity that would be associated with the selected LUN_P.

3.3.2 Report simple volume set service action

The CDB for the report simple volume set service action would contain the following:

- LUN_V = address of Volume set to report simple information about
- allocation length = expected length of parameter list
- report selection bit - 1 = report simple information on LUN_V, 0 = report simple information on all LUN_Vs

The parameter list of the report simple volume set service action would contain the following:

- volume set descriptor - contains the following:

- LUN_V = address of volume set being reported
- volume set state = the state of the reported volume set
- LUN_P descriptor - contains the following:
    +LUN_P = the peripheral device reporting the percentage
    +number of bytes of user data = number of bytes of the capacity associated
    with the volume set on the reporting LUN_P