SCSI Target Mode Framework

Version 1.~~2~~~~3~~4

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Table of Contents

1 Introduction

The SCSI Target Mode Framework(stmf) helps developers to create software to use a solaris host as a SCSI Target. The SCSI Target subsystem can be divided into the following layers

Logical Unit Providers

These are kernel modules which implement the functionality of a SCSI Logical Unit. They interface with stmf through the LU Provider interface. The functionality implemented by LU Providers is transport protocol independent.

SCSI Target Mode Framework

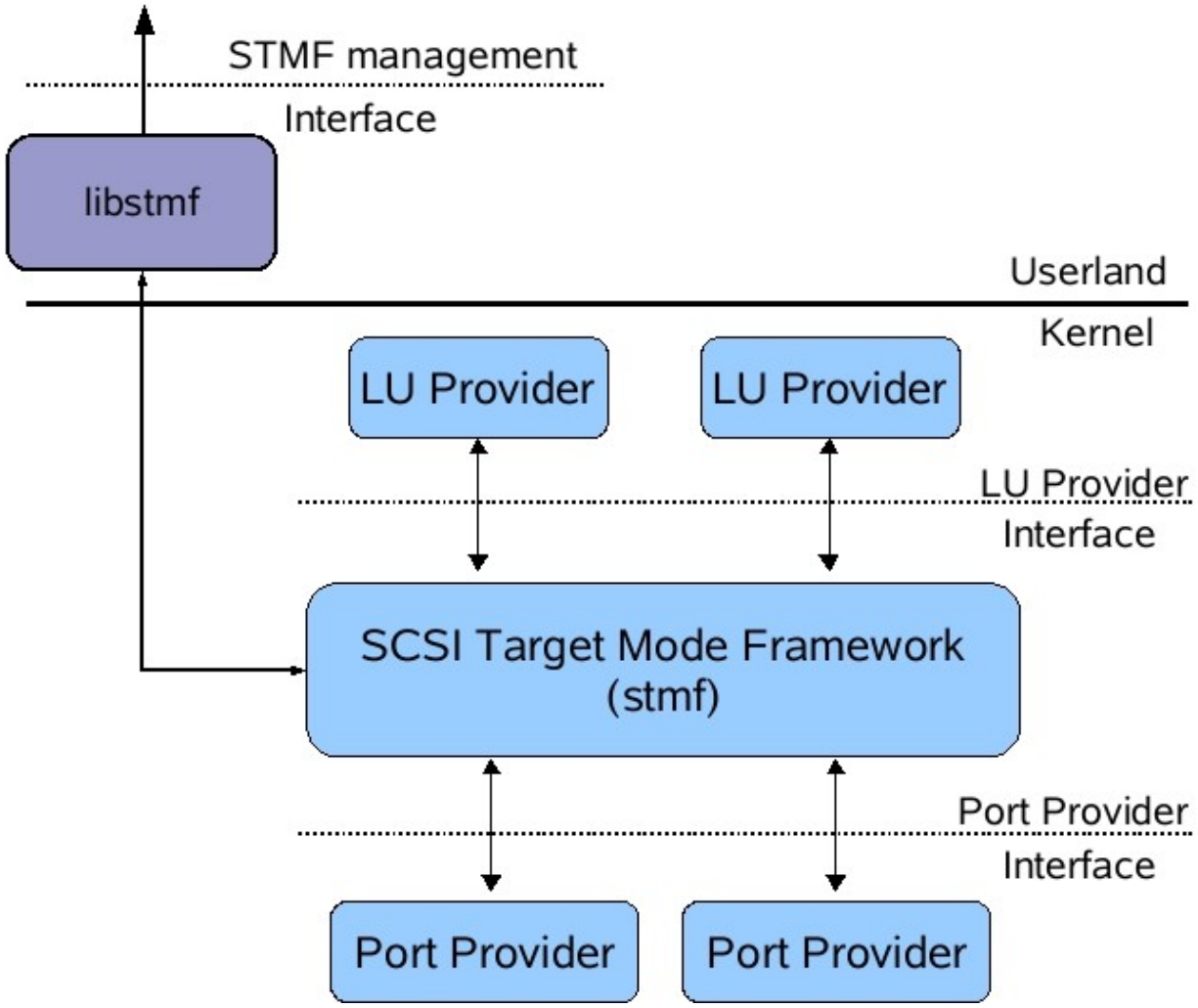
The framework itself performs a number of different tasks.

- Manages and keeps track of LU Providers and Target Port Providers.
- Manages LUN Mappings for an Initiator and I_T sessions.
- Manages context and resources for SCSI command execution.
- Handles abnormal termination of commands and cleanup.

Port Providers

These are kernel modules which implement the protocol for SCSI command transport e.g. Fibre channel, iSCSI, SAS, iSER etc. and provide local ports to be used as targets. The port providers only focus on the transport protocol and dont need to worry about SCSI command functionality of the Logical units exposed through the port.

1.1 High level view of the framework



2 Terms

The terms that are used in this specification are defined in this section.

Term	Definition
STMF, Framework	SCSI Target Mode Framework.
LU Provider	The kernel subsystem that exports Logical Units to STMF
LU, Logical Unit	The software that implements the functionality of a Logical Unit.
Port Provider	The kernel subsystem that exports Local Ports to STMF which implement the functionality of a SCSI target.
LPORT, Port	The software that implements the functionality of a SCSI Target.
Remote Port	An entity talking to the LPORT i.e. The initiator.
Transport	A subsystem for sending and receiving SCSI tasks. It consists of the LPORT and related support functions from STMF.

3 Constants and types

3.1 stmf_status_t

Return status from the interface entry points.

Format

```
typedef uint64_t    stmf_status_t;
```

Values

STMF_SUCCESS

The operation was successful.

STMF_FAILURE

A generic failure code to indicate that the operation failed in the stmf layer.

STMF_BUSY

The operation cannot be performed at this time but can be retried at a later time.

STMF_NOT_FOUND

The Requested object was not found.

STMF_INVALID_ARG

Atleast one of the arguments is not valid

STMF_LUN_TAKEN

The Logical Unit Number is already in use.

STMF_ABORTED

The operation was aborted

STMF_ABORT_SUCCESS

The request to abort has completed successfully.

STMF_TARGET_FAILURE

A generic error code to indicate a target level failure. Target port providers can use STMF_FSC() macro to define more error codes.

STMF_LU_FAILURE

A gereric error code to indicate a LU level failure. LU Providers can use STMF_FSC() macro to define more error codes.

STMF_ALLOC_FAILURE

Allocation of an object or memory failed.

STMF_ALREADY

The requested action is already in progress or has already completed

STMF_TIMEOUT

The requested action timed out.

STMF_NOT_SUPPORTED

The requested operation is unknown or not supported by the module.

Macros

STMF_FSC(x)

Defines a failure sub code. e.g. a target port can define failure codes as follows

```
#define FCT_TRAN_ERROR   (STMF_TARGET_FAILURE | STMF_FSC(3))
```

STMF_GET_FSC(x)

Returns the failure subcode.

3.2 stmf_struct_id_t

IDs for different structures allocated and freed by the framework.

Format

```
typedef enum stmf_struct_id {
        STMF_STRUCT_LU_PROVIDER = 1,
        STMF_STRUCT_PORT_PROVIDER,
        STMF_STRUCT_STMF_LOCAL_PORT,
        STMF_STRUCT_STMF_LU,
        STMF_STRUCT_SCSI_SESSION,
        STMF_STRUCT_SCSI_TASK,
        STMF_STRUCT_DATA_BUF,
        STMF_STRUCT_DBUF_STORE
} stmf_struct_id_t;
```

Fields

STMF_STRUCT_LU_PROVIDER

Identifier to represent data type stmf_lu_provider_t

STMF_STRUCT_PORT_PROVIDER

Identifier to represent data type stmf_port_provider_t

STMF_STRUCT_STMF_LOCAL_PORT

Identifier to represent data type stmf_local_port_t

STMF_STRUCT_STMF_LU

Identifier to represent data type stmf_lu_t

STMF_STRUCT_SCSI_SESSION

Identifier to represent data type stmf_scsi_session_t

STMF_STRUCT_SCSI_TASK

Identifier to represent data type scsi_task_t

STMF_STRUCT_DATA_BUF

~~O~~Identifier to represent data type stmf_data_buf_t

STMF_STRUCT_DBUF_STORE

Identifier to represent data type stmf_dbuf_store_t

Notes

All the data structures that are share between a provide module and stmf are divided into three structures. A framework specific structure, shared structure and module specific structure. Memory for all the three structures is allocated by the framework. The shared structure maintains two pointers in the beginning of the structure. The first pointer points to the framework specific structure and the second pointer is initialized to the module specific structure. Providers use stmf_alloc() and stmf_free() interfaces to allocate and free these structures. These are described in the interface section below.

3.3 stmf_lu_provider_t

Structure representing the LU Provider.

Format

```
typedef struct stmf_lu_provider {
        void                    *lp_stmf_private;
        void                    *lp_private;
        uint32_t                lp_lpif_rev;
        int                     lp_instance;
        char                    *lp_name;
        void                    (*lp_cb)(
                struct stmf_lu_provider *lp, int cmd,
                void *arg, uint32_t flags);
} stmf_lu_provider_t;
```

Fields

lp_lpif_rev

This is set by the LU provider to the LU Provider rev. supported by the provider. Current rev value is LPIF_REV_1

lp_instance

Instance number of the LU provider. Can be initialized to zero in case the provider does not have an instance assigned.

lp_name

The provider sets this value to a NULL terminated string representing the name of the provider. This string is used by management applications.

Notes

The stmf_lu_provider_t represents the kernel module that exports zero or more SCSI logical units to the target mode framework. This structure allows the provider to register with and validate the framework without exporting any logical units.

3.3.1 lp_cb

LU Provider callback. The LU Provider can leave this to NULL if it does not want to receive callbacks from the framework.

Format

```
void (*lp_cb)(struct stmf_lu_provider *lp, int cmd,
                void *arg, uint32_t flags);
```

Fields

lp

Pointer to the LU Provider structure.

cmd

Callback command. Currently defined commands are:

STMF_PROVIDER_DATA_UPDATED

The private data for this provider has been updated. The 'arg' field points to a nvlist_t which was passed in to the libstmf's stmfSetProviderData() interface by the provider's management application. The update can be due to a variety of reasons which are indicated by the flags field.

arg

Command specific argument.

flags

Command specific flags. If the command is STMF_PROVIDER_DATA_UPDATED, the following flags are defined:

STMF_PCB_STMF_ONLINING

This provider callback is made because the stmf service was going online. During the service online process, the provider data is loaded from the persistent store and once the data is loaded, if the provider has already been registered, stmf will perform the callback so that the provider can initialize itself using this data.

STMF_PCB_PREG_COMPLETE

This provider callback was made because the provider registered with the framework. After the provider registers with the framework, if the provider private data is available, the framework will do the callback with this flag set.

Notes

If during the STMF_PROVIDER_DATA_UPDATED callback, none of the flags are set, then it means that the callback is due to the provider's management application calling libstmf to modify the provider's private data.

3.4 stmf_port_provider_t

Structure representing the Port Provider.

Format

```
typedef struct stmf_port_provider {
        void                    *pp_stmf_private;
        void                    *pp_provider_private;

        uint32_t                pp_portif_rev;
        int                     pp_instance;
        char                    *pp_name;
        void                    (*pp_cb)(
            struct stmf_port_provider *pp,
            int cmd, void *arg, uint32_t flags);
} stmf_port_provider_t;
```

Fields

pp_portif_rev

This is set by the port provider to the Port Provider rev. supported by the provider. Current rev value is PORTIF_REV_1

pp_instance

Instance number of the provider. Can be initialized to zero if the provider does not have an instance assigned.

pp_name

The provider sets this value to a NULL terminated string representing the name of the provider. This string is used by management applications.

Notes

The stmf_port_provider_t represents the kernel module that exports zero or more SCSI ports to the target mode framework. This structure allows the provider to register with and validate the framework without exporting any ports.

3.4.1 pp_cb

Port Provider callback. The Port Provider can leave this to NULL if it does not want to receive callbacks from the framework.

Format

```
void (*pp_cb)(struct stmf_port_provider *pp, int cmd,
                    void *arg, uint32_t flags);
```

Fields

pp

Pointer to the Port Provider structure.

cmd

Callback command. Currently defined commands are:

STMF_PROVIDER_DATA_UPDATED

The private data for this provider has been updated. The 'arg' field points to a nvlist_t which was passed in to the libstmf's stmfSetProviderData() interface by the provider's management application. The update can be due to a variety of reasons which are indicated by the flags field.

arg

Command specific argument.

flags

Command specific flags. If the command is STMF_PROVIDER_DATA_UPDATED, the following flags are defined:

STMF_PCB_STMF_ONLINING

This provider callback is made because the stmf service was going online. During the service online process, the provider data is loaded from the persistent store and once the data is loaded, if the provider has already been registered, stmf will perform the callback so that the provider can initialize itself using this data.

STMF_PCB_PREG_COMPLETE

This provider callback was made because the provider registered with the framework. After the provider registers with the framework, if the provider private data is available, the framework will do the callback with this flag set.

Notes

If during the STMF_PROVIDER_DATA_UPDATED callback, none of the flags are set, then it means that the callback is due to the provider's management application calling libstmf to modify the provider's private data.

3.5 scsi_devid_desc_t

Device identification descriptor for both LUs and LPORTs as per SPC3.

Format

```
typedef struct scsi_devid_desc {
#ifdef  _BIT_FIELDS_HTOL
        uint8_t         protocol_id:4,
                        code_set:4;
        uint8_t         piv:1,
                        rsvd1:1,
                        association:2,
                        ident_type:4;
#else
        uint8_t         code_set:4,
                        protocol_id:4;
        uint8_t         ident_type:4,
                        association:2,
                        rsvd1:1,
                        piv:1;
#endif
        uint8_t         rsvd2;
        uint8_t         ident_length;
        uint8_t         ident[1];
} scsi_devid_desc_t;
```

Notes

scsi_devid_desc_t represents device identification descriptor as defined in SPC3 section 7.6.3. The device identification descriptor can be used to represent both Logical units and targets.

The LUs can have multiple device identification descriptors and report them in the INQUIRY VPD page 0x83. However when registering with stmf, they should use the ident_type of ID_TYPE_NAA (3) and NAA type of 6 (GUID).

3.6 stmf_data_buf_t

Structure to abstract out a data buffer and the transfer associated with it.

Format

```
typedef struct tgt_data_buf {
        void            *db_stmf_private;
        void            *db_port_private;
        void            *db_lu_private;
        uint32_t        db_buf_size;
        uint32_t        db_data_size;
        uint32_t        db_relative_offset;
        uint16_t        db_flags;
        uint16_t        db_sglist_length;
        stmf_status_t   db_xfer_status;
        uint8_t         db_handle;
        struct stmf_sglist_ent {
               uint32_t       seg_length;
               uint8_t        *seg_addr;
        }               db_sglist[1];
} stmf_data_buf_t;
```

Fields

db_lu_private

Pointer for the LU to store any buffer specific information.

db_buf_size

Total size in bytes for the entire buffer.

db_data_size

Size in bytes of the data contained within this buffer.

db_relative offset

Relative offset of this buffer in the data transfer phase of the SCSI command.

db_flags

This is a bit field with following bit values defined:

DB_DIRECTION_TO_RPORT

Transmit data to remote port.

DB_DIRECTION_FROM_RPORT

Receive data from remote port.

DB_SEND_STATUS_GOOD

This flag is set to request transfer of SCSI status good with no residual counts along with the data.

DB_STATUS_GOOD_SENT

This flag is set by the transport layer to indicate that SCSI good status has been successfully sent and no additional status transfer completion will be posted.

DB_DONT_CACHE

This flag is set by the transport layer upon allocation of data buffer to indicate that stmf layer should not cache this data buffer for future allocations.

db_sglist_length

Number of buffers (scatter gather list) which makeup the entire data space of this buffer.

db_xfer_status

Transfer completion status for this buffer.

db_handle

Handle assigned to the buffer by the framework within the context of a SCSI task. This is used by the framework to track buffers a given SCSI task has.

db_sglist

The scatter gather list describing this buffer. The structure defines the first element but during allocation the port can request bigger size for the structure and hence can have multiple elements in the scatter gather list. The db_sglist has following members:

seg_length - Length of the segment.

seg_addr - Kernel address of the segment.

3.7 stmf_scsi_session_t

Structure representing a I_T nexus established when a remote port performs a SCSI login into a LPORT.

Format

```
typedef struct stmf_scsi_session {
        void                    *ss_stmf_private;
        void                    *ss_port_private;

        struct scsi_devid_desc  *ss_rport_id;
        struct stmf_local_port  *ss_lport;
        uint64_t                ss_session_id;
} stmf_scsi_session_t;
```

Fields

ss_rport_id

Remote port identifier. Defined as per SPC3.

ss_lport

Local port maintaining this session.

ss_session_id

A unique identifier assigned by the framework to the session upon registration of the session. Upon allocation of the session structure this value is initialized to STMF_SESSION_ID_NONE to indicate that no session is yet established.

Notes

A stmf_scsi_session_t represents an I_T nexus. All the sessions are tracked on a stmf_local_port_t basis.

3.8 scsi_task_t

Structure used to manage the execution of a SCSI task.

Format

```
typedef struct scsi_task {
        void            *task_stmf_private;
        void            *task_port_private;

        void            *task_lu_private;
        struct stmf_scsi_session *task_session;
        struct stmf_local_port *task_lport;
        struct stmf_lu  *task_lu;
        void            *task_lu_itl_handle;

        uint8_t         task_lun_no[8];
        uint8_t         task_flags;
        uint8_t         task_priority;
        uint8_t         task_mgmt_function;
        uint8_t         task_curmax_nbufs; uint16_t
task_additional_flags;

        uint8_t         task_cur_nbufs;
        uint8_t         task_csn_size;
        uint16_t        task_additional_flags;
        uint32_t        task_cmd_seq_no;
        uint32_t        task_expected_xfer_length;
        uint32_t        task_timeout;
        uint16_t        task_ext_id;
        uint16_t        task_cdb_length;
        uint8_t         *task_cdb[16];
        uint32_t        task_cmd_xfer_length;
        uint32_t        task_nbytes_transferred;

        stmf_status_t   task_completion_status;
        uint32_t        task_resid;
        uint8_t         task_status_ctrl;
        uint8_t         task_scsi_status;
        uint16_t        task_sense_length;
        uint8_t         *task_sense_data;

        /* Misc. task data */
```

```
        void            *task_extended_cmd;
} scsi_task_t;
```

Fields

task_lu_private

Pointer for Logical Unit Emulation code to store per task data.

task_session

Pointer to session structure representing the I_T nexus.

task_lport

Pointer to local port which has received this task.

task_lu

Pointer to the logical unit processing the task.

task_lu_itl_handle

Contains the handle established by LU for this ITL nexus (See stmf_register_itl_handle for details). If no handle is established, this field contains NULL.

task_lun_no

8 byte LUN received with the task.

task_flags

This is a bit field with the following values

TF_INITIAL_BURST

The task received an initial burst of data.

TF_READ_DATA

The data direction is towards the remote port.

TF_WRITE_DATA

The data direction is towards the local port.

TF_ATTR_MASK

This is a mask to obtain the SCSI Task attributes as defined by SAM. The different attribute values are:

TF_ATTR_UNTAGGED

TF_ATTR_SIMPLE_QUEUE

TF_ATTR_ORDERED_QUEUE

TF_ATTR_HEAD_OF_QUEUE

TF_ATTR_ACA

task_priority

Task priority as defined by SAM-3

task_mgmt_function

Task management function as defined under SAM-3. This can have following values. A lot of these values were choosen to be in sync. with the iSCSI spec also.

TM_NONE

TM_ABORT_TASK

TM_ABORT_TASK_SET

TM_CLEAR_ACA

TM_CLEAR_TASK_SET

TM_LUN_RESET

TM_TARGET_WARM_RESET

TM_TARGET_COLD_RESET

TM_TARGET_RESET

TM_TASK_REASSIGN

task_cur_nbufs

Number of parallel data buffers currently in use by the task.~~task_additional_flags~~

~~This is a bit field to defined additional attributes beyond what is defined by SAM. Currently the only attribute defined is TASK_AF_ENABLE_COMP_CONF to enable fibre channel completion confirmations.~~

task_max_nbufs

This field is set by the framework to indicate maximum number of parallel data buffers the task can use. LPORT should initialize this field to maximum number of parallel data buffers it can handle or STMF_BUFS_MAX if it has no such limits. STMF will adjust this field based on its own limits before passing this task on to the LU.

task_csn_size

Size of the command sequence number in bits. Since different transport protocols support different size for command sequence number, this field helps stmf to compare CSNs received in ABORT TASK task management request.

task_additional_flags

This bit field defines additional attributes for the task. Currently defined values are:

TASK_AF_ENABLE_COMP_CONF

Enable FCP completion confirmations.

TASK_AF_PORT_LOAD_HIGH

Set by LPORT to indicate that the I/O load is high for the current port. The LU may take appropriate action depending upon the command like send SCSI Queue Full status to the initiator.

TASK_AF_NO_EXPECTED_XFER_LENGTH

Set by LPORT to indicate that the port does not provide any expected transfer length and hence the task_expected_transfer_length field is not valid.

task_cmd_seq_no

Command sequence number. This is a 32 bit integer to cover most of the cases. It is defined as 32 bit in iSCSI spec but only a 8 bit integer in Fibre channel (FCP) spec.

task_expected_xfer_length

This field contains the expected data transfer size as requested by the initiator as a part of the transport protocol.

task_timeout

Timeout value, in seconds, to be used for this task. This field is initialized by the LPORT. But it can be adjusted by the LU if a longer timeout value is needed. This field is initialized to zero upon allocation of the task. If it is neither initialized by LPORT (left at zero) nor set by LU, stmf will use an internal timer for this task.

task_ext_id

An identifier representing extention to the scsi_task_t structure. Currently defined values for task_ext_id are:

STMF_TASK_EXT_NONE

There is no extension pointed to by task_extended_cmd field.

task_cdb_length

Length of the uint8_t array, in bytes, pointed to by task_cdb.

task_cdb

~~The SCSI CDB. This field contains the initial 16 bytes, which covers the most common case. 'task_extended_cmd' field will be used in case the CDB extends beyond 16 bytes.~~This field contains a pointer to an array of uint8_t containing the SCSI CDB. The

length of this array is given by task_cdb_length field.

task_cmd_xfer_length

This field in initialized by the LU to the data transfer length as per the command. This field indicates the actual amount of data the LU should transfer based on the command and independent of the 'task_expected_xfer_length'. This is used to calculate the residual count and 'underrun' or 'overrun' conditions by the framework.

task_nbytes_transferred

This field is initialized to the actual number of bytes which were transferred. This field is kept updated by the LU.

task_completion_status

This field indicates how the task completed. The only time task_completion_status is not STMF_SUCCESS, is when the task is aborted due to some reason.

task_resid

The residual count indicating the amount of data not transferred as compared with task_expected_xfer_length. This value could indicate an overrun or underrun depending upon the task_status_ctrl value.

task_status_ctrl

This field contains additional information about task SCSI status. It can have the following values:

TASK_SCTRL_OVER

The LU was supposed to transfer more data than what was indicated by task_expected_xfer_length.

TASK_SCTRL_UNDER

The LU transferred less data than what was indicated by task_expected_xfer_length.

task_scsi_status

SCSI status value to be sent to the remote port.

task_sense_length

Length of the sense data, if any, pointed to by task_sense_data.

task_sense_data

The sense information. The SCSI status must be 2 (CHECK CONDITION) in this case.

The buffer pointed to by this pointer is no longer needed (copied by transport) after the call has been made to send SCSI status.

task_extended_cmd

Pointer for defining extensions to scsi_task_t. None are defined at this point.

3.9 stmf_state_change_info_t

Information about the state change request through a (*lu_ctl)() or (*lport_ctl)() entry point.

Format

```
typedef struct stmf_state_change_info {
        uint64_t        st_rflags;
        char            *st_additional_info;
} stmf_state_change_info_t;
```

Fields

st_rflags

Bit flags describing the reason for this change. Defined flags are:

STMF_RFLAG_USER_REQUEST

The state change was initiated by the user.

STMF_RFLAG_FATAL_ERROR

The state change was initiated due to a fatal error.

STMF_RFLAG_STAY_OFFLINE

Unless requested b user, an online request should not be initiated after the offline has completed.

STMF_RFLAG_RESET

Online the LU or LPORT after offline (Reset).

STMF_RFLAG_COLLECT_DEBUG_DUMP

Collect debug dump as a part of offline.

st_additional_info

A text string describing why the state change was requested. Can also be NULL. When stmf_state_change_info_t is passed to stmf_ctl(), the framework makes a local copy of the entire structure including st_additional_info (if any). So the caller can allocate this string on the stack if needed.

3.10 stmf_state_change_status_t

Completion status of a state change request.

Format

```
typedef struct stmf_change_status {
        stmf_status_t   st_completion_status;
        char            *st_additional_info;
} stmf_change_status_t;
```

Fields

st_completion_status

Completion status of the change request.

st_additional_info

A text string describing the completion status. Can also be NULL.

4 LU entry points

LU exports entry points through the stmf_lu_t structure described below.

Format

```
typedef struct stmf_lu {
        void                    *lu_stmf_private;
        void                    *lu_provider_private;

        struct scsi_devid_desc  *lu_id;
        char                    *lu_alias;
        struct stmf_lu_provider *lu_lp;
        uint32_t                lu_abort_timeout;

        stmf_status_t           (*lu_task_alloc)(
            struct scsi_task *task);
        void                    (*lu_new_task)(
            struct scsi_task *task, struct tgt_data_buf
            *initial_dbuf);
        void                    (*lu_dbuf_xfer_done)(
            struct scsi_task *task, struct tgt_data_buf
            *dbuf);
        void                    (*lu_send_status_done)(
            struct scsi_task *task);
        void                    (*lu_task_free)(
            struct scsi_task *task);
        stmf_status_t           (*lu_abort)(
            struct stmf_lu *lu, int abort_cmd, void *arg,
            uint32_t flags);
        void                    (*lu_task_poll)(struct
            scsi_task *task);
        void                    (*lu_ctl)(
            struct stmf_lu *lu, int cmd, void *arg);
        stmf_status_t           (*lu_info)(uint32_t cmd,
            struct stmf_lu *lu, void *arg,
            uint8_t *buf, uint32_t *bufsizep);
        void                    (*lu_event_handler)(
            struct stmf_lu *lu, int eventid,
            void *arg, uint32_t flags);
} stmf_lu_t;
```

Fields

lu_id

Device identification descriptor for the logical unit. This descriptor has to have the ident_type of ID_TYPE_NAA (3) and NAA type of 6 (GUID).

lu_alias

A character string representing an alias for this LU. This field is initialized by LU before registering the Logical unit. It can be initialized to NULL if no alias is to be defined.

lu_lp

Pointer to the LU provider structure for this Logical Unit.

lu_abort_timeout

Timeout value, in seconds, to be used by the framework when aborting a scsi task. The LU is expected to successfully abort an I/O within this time. Failure to do so will result in the framework offlining the LU.

4.1 lu_task_alloc

This enatry point is called whenever the framework is allocating a new scsi_task_t for this logical unit. The purpose of this entry point is to allocate per task logical unit specific data and initialize the task_lu_private member of the scsi_task_t with that data.

Format

```
stmf_status_t (*lu_task_alloc)(struct scsi_task *task);
```

Parameters

task

Pointer to the scsi task structure for which the LU needs to do allocations.

Return value

STMF_SUCCESS

The operation completed successfully.

STMF_ALLOC_FAILURE

The LU could not allocate task private data. This will result in stmf aborting the task.

Notes

The LU frees this data when the framework calls the lu_task_free() entry point. The tasks are cached by the framework. Hence the framework might not call lu_task_alloc or lu_task_free for every task. This optimization saves the LU from allocating a per task structure every time.

4.2 lu_new_task

This entry point is called whenever a new SCSI task is received by the framework for this Logical Unit.

Format

```
void (*lu_new_task)(sruct scsi_task *task, struct
                            tgt_data_buf *initial_dbuf);
```

Parameters

task

Pointer to the SCSI task struct allocated by the framework.

initial_dbuf

The transport may pass on a data buffer with the task. In case the transport receives an initial data burst with the command, task_flags field will be used to indicate that there is data in this buffer other wise the buffer is empty and is passed by the transport to save a call to allocate buffer. The initial_dbuf pointer may be NULL.

4.3 lu_dbuf_xfer_done

This entry point is called by the framework whenever a data transfer operation completes for a SCSI task.

Format

```
void (*lu_dbuf_xfer_done)(struct scsi_task *task,
                          struct stmf_data_buf *dbuf);
```

Parameters

task

scsi_task_t associated with this transfer.

dbuf

stmf_data_buf_t for which the transfer has completed.

Notes

If the logical unit has already indicated that it is done processing this task, then this entry point may not be called by the framework. Logical unit should be able to handle this call even after telling the framework that it is done processing a task.

If the buffer transfer request also requested a transfer of scsi STATUS GOOD and the transport was able to successfully send both buffer and status as a part of the same request, the db_flags bit DB_STATUS_GOOD_SENT will be set. Otherwise the framework will call the lu_send_status_done() entry point.

4.4 lu_send_status_done

This entry point is called when the framework completes the transfer of SCSI status.

Format

```
void (*lu_send_status_done)(scsi_task_t *task);
```

Parameters

task

The SCSI task for which the status transfer has completed.

Notes

The task_completion_status member of the scsi_task structure contains the status of the status transfer request.

This entry point may not be called if the LU has already indicated to the framework that it is done with this task.

4.5 lu_task_free

This entry point is called when the framework is about to free the SCSI task structure.

Format

```
void (*lu_task_free)(scsi_task_t *task);
```

Parameters

task

The SCSI task which is being freed.

Notes

This entry point is only called after the LU has indicated to the framework that it is done processing the task. The only purpose of this entry point is for the LU to free its per task structure. The LU should have released any other resource it has for the task before indicating to the framework that it is done processing the task.

The framework might not call this entry point after a task is done to keep the LU's per task structure cached and the next call to lu_new_task() entry point may reuse the this structure. In this case the task_lu_private member of the scsi_task_t will not be NULL.

4.6 lu_abort

This entry point is called when the framework wants the LU to abort processing of a task.

Format

```
stmf_status_t (*lu_abort)(struct stmf_lu *lu, int abort_cmd
                          void *arg, uint32_t flags);
```

Parameters

lu

Pointer to the logical unit structure.

abort_cmd

The abort operation being requested by the framework. Currently defined operations are:

STMF_LU_ABORT_TASK

Abort the task pointed to by the 'arg' parameter.

STMF_LU_RESET_STATE

Reset the logical unit state. For more information on this command see section 7.5

STMF_LU_ITL_HANDLE_REMOVED

An I_T_L handle, previously registered by this LU via stmf_register_itl_handle, has been removed. The 'arg' parameter contains the I_T_L handle. The framework ensures that when lu_abort is called with this abort_cmd, there is no active scsi_task_t which is referenceing this I_T_L handle. The removal of the I_T_L handle could be a result of the LU explicitly deregistering it or some external event which destroys the I_T_L nexus. The reason for the removal is given by the flags parameter.

arg

abort_cmd specific arguments.

flags

Any additional conditions modifying the abort behavior. ~~Currently no flags are defined.~~If the command is STMF_LU_ITL_HANDLE_REMOVED, the flags parameter masked with STMF_ITL_REASON_MASK i.e. (flags & STMF_ITL_REASON_MASK) can have the following values:

STMF_ITL_REASON_UNKNOWN

No additional information is available as to why this I_T_L handle was removed.

STMF_ITL_REASON_DEREG_REQUEST

The I_T_L handle was removed due to a handle deregister request made by the Logical Unit itself.

STMF_ITL_REASON_USER_REQUEST

The I_T_L handle was removed due to a user request such a LUN mapping and masking operation.

STMF_ITL_REASON_IT_NEXUS_LOSS

The I_T_L handle was removed because the I_T nexus has been lost e.g. The initiator has logged out or the target port has reset.

Return values

The LU should return one of the following values in response to this call.

STMF_SUCESS

For the abort_cmd of STMF_LU_ABORT_TASK, this return status means that ~~T~~the LU has accepted the abort request and will abort the task asynchronously. For all other abort_cmds, this status indicates a successful completion of the abort operation by the LU.

STMF_BUSY

The LU cannot accept this request at this time. The framework should retry again after some time.

STMF_NOT_FOUND

The LU is not aware of the task. This is not considered a failure by the framework.

STMF_ABORTED

The LU has completed the request synchronously.

Notes

If the task abort operation is being performed asynchronously the LU must call stmf_task_lu_aborted() to indicate completion of the abort operation.

4.7 lu_task_poll

Entry point called by the framework when the LU requests polling a scsi task.

Format

```
void (*lu_task_poll)(struct scsi_task *task);
```

Parameters

task

scsi_task_t for which the LU requested polling.

Notes

When the LU receives a new task but cannot handle it yet, it can request the framework to call it back after a certain milliseconds by calling stmf_task_poll_lu(). When the specified timeout expires, the framework will call lu_task_poll entry point. A call to stmf_abort() will terminate a pending poll on a task.

4.8 lu_event_handler

This entry point is used by LU to receive asynchronous events.

Format

```
void (*lu_event_handler)(struct stmf_lu *lu, int eventid,
                         void *arg, uint32_t flags);
```

Parameters

lu

Pointer to the logical unit structure receiving the event.

eventid

The identifier representing the event.

arg

Any additional argument related to the event.

flags

Bit flags modifing the event.

4.9 lu_ctl

Logical Unit control entry point.

Format

```
void (*lu_ctl)(struct stmf_lu *lu, int cmd,
                                        void *arg);
```

Parameters

lu

Pointer to the logical unit structure itself.

cmd

Control command. Currently defined values are:

STMF_CMD_LU_ONLINE

Bring the logical unit online. arg (3rd argument to the entry point) points to stmf_state_change_info_t.

STMF_CMD_LU_OFFLINE

Bring the LU offline. arg points to stmf_state_change_info_t

STMF_ACK_LU_ONLINE_COMPLETE

An acknowledgement from the framework that everythi ng that is needed to bring this LU online has been done. This is sent in response to a call from the LU to stmf_ctl() interface with a CMD calue of STMF_CMD_LU_ONLINE_COMPLETE. arg is a pointer to the stmf_change_status_t, passed in the stmf_ctl() call.

STMF_ACK_LU_OFFLINE_COMPLETE

An acknowledgement from the framework that the framework has removed all references to this LU. After this call the LU can deregister from the framework and even unload itself if needed.

arg

Argument specific to the cmd.

Notes

- When a LU is offlined, it does not have to worry about terminating existing commands as the framework takes care of doing that before calling the (*lu_ctl)() entry point. As soon as the LU has done its internal shutdown (e.g. close any file descriptors etc.), it should call stmf_ctl(STMF_CMD_LU_OFFLINE_COMPLETE, lu, ...).
- After the LU been offlined, it must return STMF_ABORT_SUCCESS from the (*lu_abort)() entry point if that entry point is called by the framework. This entry point will not be called after the framework ACKs the offline.

4.10 lu_info

This entry point is used to get extended information on an object related to the LU.

Format

```
stmf_status_t (*lu_info)(uint32_t cmd, struct stmf_lu *lu,
        void *arg, uint8_t *buf, uint32_t *bufsizep);
```

Parameters

cmd

The cmd represents the type of information requested.

lu

Pointer to the Logical unit structure.

arg

arg ia any additional argument related to cmd.

buf

Buffer in which the information is to be returned.

bufsizep

During the call this field points to the uint32_t containing the size of the buffer. Upon returning from the call, if the return value is STMF_SUCCESS, the uint32_t pointed by this field is updated with the actual size of the data returned if the buffer space was enough. If the buffer space was not enough, the updated value will contain the amount of space needed for the requested information.

Return value

STMF_SUCCESS

The call succeeded and the requested information is returned in the buffer provided.

STMF_NOT_SUPPORTED

The specified cmd is not supported by the LU.

5 LPORT entry points

A LPORT exports entry points through the stmf_local_port_t as described below.

Format

```
typedef struct stmf_local_port {
  void                            *lport_stmf_private;
  void                            *lport_port_private;

  struct scsi_devid_desc          *lport_id;
  char                            *lport_alias;
  struct stmf_port_provider       *lport_pp;
  uint32_t                        lport_abort_timeout;
uint32_t *pminsize, uint32_t flags);
  void                            (*lport_free_data_buf)(
        struct stmf_local_port *lport, stmf_data_buf_t
                                  *dbuf);
  uint32_t size, struct scsi_task *task,
                        stmf_data_buf_t *
(*lport_alloc_data_buf)(
        struct stmf_local_port *lport,
stmf_dbuf_store_t               *lport_ds;
  stmf_status_t                 (*lport_xfer_data)(
       struct scsi_task *task, struct tgt_data_buf *dbuf,
                                    uint32_t ioflags);
  stmf_status_t                 (*lport_send_status)(
       struct scsi_task *task, uint32_t ioflags);
  void                          (*lport_task_free)(
                                struct scsi_task *task);
  stmf_status_t                 (*lport_abort)(
       struct stmf_local_port *lport, int abort_cmd,
                                void *arg, uint32_t flags);
  void                          (*lport_task_poll)(
       struct scsi_task *task);
  void                          (*lport_ctl)(
    struct stmf_local_port *lport, int cmd, void *arg);
  stmf_status_t                 (*lport_info)(uint32_t cmd,
    struct stmf_local_port *lport, void *arg, uint8_t *buf,
    uint32_t *bufsizep);
  void                          (*lport_event_handler)(
    struct stmf_local_port *lport, int eventid,
                void *arg, uint32_t flags);
```

```
} stmf_local_port_t;
```

Fields

lport_id

Device identification descriptor for the LPORT.

lport_alias

A character string representing an alias for this LPORT. This field is initialized by LPORT before registering the Logical unit. It can be initialized to NULL if no alias is to be defined.

lport_pp

Pointer to the port provider structure for this LPORT.

lport_abort_timeout

Timeout value, in seconds, to be used by the framework when aborting a scsi task. The LPORT is expected to successfully abort an I/O within this time. Failure to do so will result in the framework offlining the LPORT.

5.1 stmf_dbuf_store_t

This structure represents an entity within the LPORT which is responsible for managing data buffers.

Format

```
typedef struct stmf_dbuf_store {
        void                    *ds_stmf_private;
        void                    *ds_port_private;

        stmf_data_buf_t *       (*ds_alloc_data_buf)(
    struct scsi_task *task, uint32_t size,
    uint32_t *pminsize, uint32_t flags);

        void                    (*ds_free_data_buf)(
    struct stmf_dbuf_store *ds, stmf_data_buf_t *dbuf);

} stmf_dbuf_store_t;
```

Notes

Multiple LPORTs can share the same stmf_dbuf_store_t if they share the same physical hardware (e.g. virtual ports) or logical transport. This will allow the framework to optimize caching of data buffers by not maintaining a separate cache for each of these LPORTs.

5.1.1 lportds_alloc_data_buf

This entry point is called when the framework needs a buffer for data transfer.

Format

```
stmf_data_buf_t *(*lportds_alloc_data_buf)(
        struct stmf_local_port *lport,    struct scsi_task
*task,
        uint32_t size,
        uint32_t *pminsize,
uint32_t flags);
```

Parameters **This pointer can be NULL if the SCSI task pointer is not NULL.**

lport

Pointer to the local port structure.

task

Pointer to the associated scsi task. This can be NULL is the lport pointer above is valid.

size

Size in bytes of the buffer needed.

pminsiz

Pointer to a uint32_t containing the minimum buffer size needed by the caller.

flags

Additional modifier flags for the allocation. Currently no flags are defined.

Return Values

This entry point returns pointer to a data buffer of type stmf_data_buf_t. The return value can be NULL if the data buffer cannot be allocated in which case pminsize will be updated to indicate the minimum size of buffer that can be allocated. The LPORTstore can initialize the uint32_t pointed to by pminsize to zero to indicate that it cannot allocate any buffer size. Some protocols (like iSER) may not support allocating generic buffers and will fail this call with STMF_NOT_SUPPORTED if a scsi task pointer is not specified.pointer is NULL then the port will use the lport pointer to provide the buffer which is not specific to any task.

Note

The port will use the scsi task pointer to allocate the buffer. If the scsi task

5.1.2 ~~lport~~ds_free_data_buf

The framework calls this entry point to free a data buffer previously allocated via ~~lport~~ds_alloc_data_buf() entry point.

Format

```
void (*~~lport~~ds_free_data_buf)(struct
stmf_~~local_port~~dbuf_store *~~lport~~ds,
                                    stmf_data_buf_t *dbuf);
```

Parameters

~~lport~~ds

Pointer to the ~~local port structure~~data buffer store structure.

dbuf

Pointer to the data buf to be freed.

Notes

The framework may cache the buffers and hence not call free for a buffer for a long time. If the store does not want the framework to cache the allocations, it can set the DB_DONT_CACHE bit.

5.2 lport_xfer_data

This entry point is called by the framework when data needs to be transported to or from a data buffer for a SCSI task.

Format

```
stmf_status_t (*lport_xfer_data)(struct scsi_task *task,
     struct tgt_data_buf *dbuf, uint32_t ioflags);
```

Parameters

task

Pointer to the scsi task structure responsible for data transfer.

dbuf

Pointer to the data buffer which is the source or destination of the data depending upon the direction.

ioflags

Flags to control the I/O flow. None are defined at this point.

Return values

STMF_SUCCESS

The port has accepted the request to transfer data.

STMF_BUSY

The port cannot accept the request at this time. The framework should try later.

Any other return value will result in framework aborting this task.

5.3 lport_send_status

This entry point is called by the framework to send scsi status to the initiator.

Format

```
stmf_status_t (*lport_send_status)(struct scsi_task *task,
                                   uint32_t ioflags);
```

Parameters

task

task for which the scsi status is to be sent

ioflags

Flags to control the I/O flow. None are defined at this point.

Return values

STMF_SUCCESS

The port has accepted the request to transfer status.

STMF_BUSY

The port cannot accept the request at this time. The framework should try later.

Any other return value will result in framework aborting this task.

Notes

task_scsi_status member of scsi_task_t contains the scsi status value to be sent. task_status_ctrl provides the information about and underrun or overrun that might have occurred during the execution of this task in which case task_resid contains any residual count. If the task had a check condition then task sense length will be nonzero and task_sense_data will point to a buffer with the sense data information. The port should copy the sense data before returning from this call.

5.4 lport_task_free

This entry point is called when the framework is about to free the SCSI task structure.

Format

```
void (*lport_task_free)(scsi_task_t *task);
```

Parameters

task

The SCSI task which is being freed.

Notes

This entry point is only called after the target port has indicated to the framework that it is done processing the task. The only purpose of this entry point is for the port to free its per task structure. The LU should have released any other resource it has for the task before indicating to the framework that it is done processing the task.

5.5 lport_abort

This entry point is called by the framework to abort processing of a task.

Format

```
stmf_status_t (*lport_abort)(struct stmf_local_port_t *lport,
          int abort_cmd, void *arg, uint32_t flags);
```

Parameters

lport

Pointer to the local port structure.

abort_cmd

The abort operation being requested by the framework. Currently defined operations are:

STMF_TGT_PORT_ABORT_TASK

Abort the task pointed to by the 'arg' parameter.

arg

abort_cmd specific arguments.

flags

Any additional conditions modifying the abort behavior. Currently no flags are defined.

Return values

The target port should return one of the following values in response to this call.

STMF_SUCESS

The target port has accepted the abort request and will abort the task asynchronously.

STMF_BUSY

The target cannot accept this request at this time. The framework should retry again after some time.

STMF_NOT_FOUND

The target is not aware of the task. This is not considered a failure by the framework.

STMF_ABORTED

The target port has completed the request synchronously.

Notes

If the abort operation is being performed asynchronously the target port must call stmf_task_tgt_port_aborted() to indicate completion of the abort operation.

5.6 lport_task_poll

Entry point called by the framework when the LPORT requests polling a scsi task.

Format

```
void (*lport_task_poll)(struct scsi_task *task);
```

Parameters

task

scsi_task_t for which the LPORT requested polling.

Notes

When the LPORT receives a new task but cannot handle it yet, it can request the framework to call it back after a certain milliseconds by calling stmf_task_poll_lport(). When the specified timeout expires, the framework will call lport_task_poll entry point. A call to stmf_abort() will terminate a pending poll on a task.

5.7 lport_event_handler

This entry point is used by LU to receive asynchronous events.

Format

```
void (*lport_event_handler)(struct stmf_local_port *lport,
    int eventid, void *arg, uint32_t flags);
```

Parameters

lport

Pointer to the local port structure receiving the event.

eventid

The identifier representing the event. Currently defined events are:

LPORT_EVENT_INITIAL_LUN_MAPPED

This event is generated when first LUN to an active session is mapped (asuming no LUNs were mapped at the time of session creation). 'arg' points to the stmf_scsi_session structure for which the initial LUN was mapped.

arg

Any additional argument related to the event.

flags

Bit flags modifing the event.

5.8 lport_ctl

Local port control entry point.

Format

```
void (*lport_ctl)(struct stmf_local_port *lport, int cmd,
                                        void *arg);
```

Parameters

lport

Pointer to the stmf_local_port structure itself.

cmd

Control command. Currently defined values are:

STMF_CMD_LPORT_ONLINE

Bring the local port online. arg (3rd argument to the entry point) points to stmf_state_change_info_t.

STMF_CMD_LPORT_OFFLINE

Bring the local port offline. arg points to stmf_state_change_info_t

STMF_ACK_LPORT_ONLINE_COMPLETE

An acknowledgement from the framework that everythi ng that is needed to bring this local port online has been done. This is sent in response to a call from the LPORT to stmf_ctl() interface with a CMD calue of STMF_CMD_LPORT_ONLINE_COMPLETE. arg is a pointer to the stmf_change_status_t, passed in the stmf_ctl() call.

STMF_ACK_LPORT_OFFLINE_COMPLETE

An acknowledgement from the framework that the framework has removed all references to this LPORT. After this call the LPORT can deregister from the framework and even unload itself if needed.

arg

Argument specific to the cmd.

Notes

- When a LPORT is offlined, the LPORT must cleanup all of its internal commands before calling the stmf_ctl(STMF_CMD_LPORT_OFFLINE_COMPLETE, lport, ..); For SCSI commands, the LPORT must call stmf_queue_cmd_for_termination(task) and wait for the command to get terminated.
- After the port has been offlined, it must return STMF_ABORT_SUCCESS from the (*lport_abort)() entry point if that entry point is called by the framework.

5.9 lport_info

This entry point is used to get extended information on an object related to the LPORT.

Format

```
stmf_status_t (*lport_info)(uint32_t cmd,
        struct stmf_local_port *lport, void *arg,
        uint8_t *buf, uint32_t *bufsizep);
```

Parameters

cmd

The cmd represents the type of information requested.

lport

Pointer to the local port structure.

arg

arg ia any additional argument related to cmd.

buf

Buffer in which the information is to be returned.

bufsizep

During the call this field points to the uint32_t containing the size of the buffer. Upon returning from the call, if the return value is STMF_SUCCESS, the uint32_t pointed by this field is updated with the actual size of the data returned if the buffer space was enough. If the buffer space was not enough, the updated value will contain the amount of space needed for the requested information.

Return value

STMF_SUCCESS

The call succeeded and the requested information is returned in the buffer provided.

STMF_NOT_SUPPORTED

The specified cmd is not supported by the LPORT.

6 STMF Interfaces

These interfaces are provided by stmf to lports and lus and their respective providers.

6.1 stmf_alloc

This interface is used to allocate shared data structures.

Format

```
void * stmf_alloc(stmf_struct_id_t struct_id, int
                                  additional_size, int flags);
```

Parameters

struct_id

Identifier for the data structure to be allocated. See section 3.2 for details on stmf_struct_id_t

additional_size

Size of the caller private data. The 2nd void pointer in the structure will be initialized to point to this block.

flags

Flags affecting the allocation. Currently defined values are:

AF_FORCE_NOSLEEP

This flag is force the allocation to use KM_NOSLEEP while doing kmem_zalloc(9F).

Return values

The function returns a pointer to the allocated structure. In case of failure the function returns NULL.

Notes

Every data structure allocated through stmf alloc() starts with two void pointers. The 1st pointer points to the stmf private data and the 2nd pointer points to the caller private data.

The function uses KM_NOSLEEP if called from interrupt context. Otherwise it uses KM_SLEEP to do the allocations. Callers can override KM_SLEEP behavior by specifying the flag AF_FORCE_NOSLEEP.

Caller should use stmf_free() to free any data structures allocated via stmf_alloc.

6.2 stmf_free

This interface is used to free any data structures which were allocated using stmf_alloc()

Format

```
void stmf_free(void *ptr);
```

Parameters

ptr

Pointer to the memory block which needs to be freed.

6.3 stmf_register_lu_provider

This interface is called by the LU provider to register itself with the framework.

Format

```
stmf_status_t stmf_register_lu_provider(
                                    stmf_lu_provider_t *lp);
```

Parameters

lp

Pointer to the LU Provider structure allocated vis stmf_alloc().

Return values

The function return STMF_SUCCESS upon success.

6.4 stmf_deregister_lu_provider

This interface is called by the LU providers to de register themselves from the framework.

Format

```
stmf_status_t stmf_deregister_lu_provider(
                              stmf_lu_provider_t *lp)
```

Parameters

lp

Pointer to the LU provider structure.

Return Values

STMF_SUCCESS

The deregister operation was successful.

STMF_BUSY

The deregister operation was not successful because the provider has Logical units registered with the framework.

Notes

The call to deregister LU provider will not succeed until all the LUs this provider has have been deregistered first.

6.5 stmf_register_port_provider

This interface is called by the Port Provider to register itself with the framework.

Format

```
stmf_status_t stmf_register_port_provider(
                                    stmf_port_provider_t *pp);
```

Parameters

pp

Pointer to the Port Provider structure allocated vis stmf_alloc().

Return values

The function return STMF_SUCCESS upon success.

6.6 stmf_deregister_port_provider

This interface is called by the Port Providers to deregister themselves from the framework.

Format

```
stmf_status_t stmf_deregister_port_provider(
                              stmf_port_provider_t *pp)
```

Parameters

pp

Pointer to the Target Port Provider structure.

Return Values

STMF_SUCCESS

The deregister operation was successful.

STMF_BUSY

The deregister operation was not successful because the provider has LPORTs registered with the framework.

Notes

The call to deregister Target Port Provider will not succeed until all the LPORTs this provider has have been deregistered first.

6.7 stmf_register_lu

This function is called by LU providers to register a LU with the framework.

Format

```
stmf_status_t stmf_register_lu(stmf_lu_t *lu);
```

Parameters

lu

Pointer to the logical unit structure to be registered.

Return values

The function returns STMF SUCCESS if the registration was successful.

6.8 stmf_deregister_lu

This function is called by LU provider to deregister a LU from the framework.

Format

```
stmf_status_t stmf_deregister_lu(stmf_lu_t *lu);
```

Parameters

lu

Pointer to the LU structure to deregister.

Return Values

The function returns STMF_SUCCESS if the deregisteration process succeeds.

Notes

If there are pending I/Os on this LU the function will fail with a return code of STMF_BUSY.

6.9 stmf_register_local_port

This function is called by Port Providers to register a local port with the framework.

Format

```
stmf_status_t stmf_register_local_port(
                    stmf_local_port_t *lport);
```

Parameters

lport

Pointer to the local port structure to be registered.

Return values

The function returns STMF SUCCESS if the registration was successful.

6.10 stmf_deregister_local_port

This function is called by Port Provider to deregister a local port from the framework.

Format

```
stmf_status_t stmf_deregister_local_port(
                           stmf_local_port_t *lport);
```

Parameters

lport

Pointer to the local port structure to deregister.

Return Values

The function returns STMF_SUCCESS if the deregisteration process succeeds.

Notes

If there are pending I/Os on this port the function will fail with a return code of STMF_BUSY.

6.11 stmf_register_scsi_session

This function is called by LPORTs to register a SCSI session representing a I_T nexus.

Format

```
stmf_status_t stmf_register_scsi_session(
     stmf_local_port_t *lport, stmf_scsi_session_t *ss);
```

Parameters

lport

Pointer to local port structure receiving the login from initiator.

ss

Pointer to a SCSI session structure allocated and initialized by the LPORT.

Return Values

The function returns STMF_SUCCESS upon a successful registration of the session.

Notes

The framework will perform LUN mapping for this initiator as a part of the registration.

6.12 stmf_deregister_scsi_session

This function is called by LPORT to deregister a SCSI session and remove the I_T nexus.

Format

```
void stmf_deregister_scsi_session(
     stmf_local_port_t *lport, stmf_scsi_session_t *ss);
```

Parameters

lport

Pointer to the local port to which the session belongs.

ss

Pointer to the SCSI session to be deregistered.

Notes

The LPORT should terminate all the exchanges before calling stmf_deregister_scsi_session.

6.13 stmf_register_itl_handle

This function is called by the LU to register a handle for an I_T_L nexus. Throughout the life of the I_T_L nexus, the framework will pass this handle to the LU in every SCSI task.

Format

```
stmf_status_t stmf_register_itl_handle(stmf_lu_t *lu,
        uint8_t *lun, stmf_scsi_session_t *ss,
        uint64_t session_id, void *itl_handle);
```

Parameters

lu

Pointer to the logical unit structure representing the L in the I_T_L nexus.

lun

The LUN number for which this handle is being registered.

ss

The pointer session structure representing the I_T in the I_T_L nexus. This can be NULL if a valid session_id is passed.

session_id

The session identifier representing the I_T in the I_T_L nexus. This value is ignored if a non-NULL pointer to session structure is passed. This value should be set to STMF_SESSION_ID_NONE if a session identifier is not available.

itl_handle

The I_T_L handle to be registered. This value is not interpreted by the framework. Its passed as it is in every scsi_task_t belonging to that I_T_L nexus.

Return Values

STMF_SUCCESS - Registration of the handle was successful.

STMF_NOT_FOUND - The specified session_id was not found or the LUN was not found in the session.

STMF_ALREADY - There is already a handle registered for the I_T_L nexus. The current handle has to be deregistered before a new handle can be registered again.

Notes

If no handle is registered for a I_T_L nexus and a SCSI task is received on that nexus, the framework will initialize task_lu_itl_handle field in the scsi_task_t to be NULL. LUs can check task_lu_itl_handle and register one if nothing is registered already.

If the request to register a handle is being made while executing a SCSI task, the stmf_scsi_session_t pointer from the scsi_task_t can be used instead of a session_id. However if the register request is being made outside the scsi_task_t context, session_id should be used to register I_T_L handles.

If any event destroys the I_T_L nexus, the framework will wait for all the I/Os related to a I_T_L handle to be completed and then call the lu_abort entry point with the cmd STMF_LU_ITL_HANDLE_REMOVED so that the LU can free the I_T_L handle and any associated resources. See section 4.6 for more details.

The LU can also request that a I_T_L handle be removed by calling stmf_deregister_itl_handle or stmf_deregister_all_lu_itl_handles

6.14 stmf_deregister_all_lu_itl_handles

This call deregisters all the handles which a given Logical Unit has registered.

Format

```
stmf_status_t
    stmf_deregister_all_lu_itl_handles(stmf_lu_t *lu);
```

Parameters

lu

Pointer to the logical unit structure for which all the handles are to be deregistered.

Return Values

STMF_SUCCESS - The request completed successfully.

STMF_NOT_FOUND - No registered I_T_L handles were found.

Notes

The LU should not free the I_T_L handles until the lu_abort entry point has been called with cmd of STMF_LU_ITL_HANDLE_REMOVED. See lu_abort and stmf_deregister_itl_handle for more details.

6.15 stmf_deregister_itl_handle

This function is called by the LU to request removal of a I_T_L handle from an I_T_L nexus. Upon completion of this function the I_T_L handle is deregistered such that new I/Os will no longer refer to this handle through task_lu_itl_handle field of scsi_task_t. The framework will track existing I/Os that are still referring to this handle and will inform the LU via lu_abort entry point once all those I/Os have completed.

Format

```
stmf_status_t stmf_deregister_itl_handle(stmf_lu_t *lu,
        uint8_t *lun, stmf_scsi_session_t *ss,
        uint64_t session_id, void *itl_handle) ;
```

Parameters

lu

Pointer to the logical unit structure representing the L in the I_T_L nexus.

lun

The LUN number for which this handle is being deregistered. This value can be NULL if a valid (non NULL) itl_handle is specified.

ss

The pointer session structure representing the I_T in the I_T_L nexus. This can be NULL if a valid session_id is passed.

session_id

The session identifier representing the I_T in the I_T_L nexus. This value is ignored if a non-NULL pointer to session structure is passed. This value should be set to STMF_SESSION_ID_NONE if a session identifier is not available.

itl_handle

The I_T_L handle to be deregistered. This value is ignored if a valid LUN number is specified.

Return Values

STMF_SUCCESS - Registration of the handle was successful.

STMF_NOT_FOUND - The specified session_id was not found or the LUN was not found in the session.

Notes

The LU should not free the handle and any associated resources until it receives a call to the lu_abort entry point with the cmd of STMF_LU_ITL_HANDLE_REMOVED.

6.16 stmf_get_itl_handle

This function return a previously registered I_T_L handle.

Format

```
stmf_status_t stmf_get_itl_handle(stmf_lu_t *lu,
        uint8_t *lun, stmf_scsi_session_t *ss,
        uint64_t session_id, void **itl_handle_retp) ;
```

Parameters

lu

Pointer to the logical unit structure representing the L in the I_T_L nexus. This value can be NULL if a valid LUN number is specified.

lun

The LUN number for which this handle is being requested. This value can be NULL if a non-NULL lu pointer is specified.

ss

The pointer session structure representing the I_T in the I_T_L nexus. This can be NULL if a valid session_id is passed.

session_id

The session identifier representing the I_T in the I_T_L nexus. This value is ignored if a non-NULL pointer to session structure is passed. This value should be set to STMF_SESSION_ID_NONE if a session identifier is not available.

itl_handle_retp

The pointer to the I_T_L handle to be returned upon success.

Return Values

STMF_SUCCESS - A valid I_T_L handle is returned in itl_handle_retp

STMF_NOT_FOUND - The specified session_id was not found or the LUN was not found in the session.

6.17 stmf_alloc_dbuf

This interface is used by both LUs and LPORTs to allocate a data buffer for a SCSI task.

Format

```
stmf_data_buf_t * stmf_alloc_dbuf(scsi_task_t *task,
          uint32_t size, uint32_t *pminsize, uint32_t flags);
```

Parameters

task

SCSI task for which the buffer is needed.

size

Data size in bytes needed for transfer.

pminsiz

Pointer to a uint32_t containing minimum buffer size in bytes needed.

flags

Flags to modify the allocation. None defined at this time.

Return Values

This function returns a pointer to the allocated data buffer. If the allocation process fails, the return value is NULL in which case pminsize will be initialized to the size which the framework can allocate. A value of zero in pminsize indicates that the framework cannot allocate any buffer.

Notes

The returned data buffer may be of a smaller size than what is requested but will not be less than *pminsize. If the request size is very large, the LU should use smaller buffer sizes to do multiple transfers instead of allocating one big buffer.

6.18 stmf_free_dbuf

This interface is used by both LUs and LPORTs to free a data buffers previously allocated via stmf_alloc_dbuf().

Format

```
void stmf_free_dbuf(scsi_task_t *task,
                            stmf_data_buf_t *dbuf);
```

Parameters

task

SCSI task to which the data buffer currently belongs.

dbuf

Pointer to the data buffer to be freed.

Notes

The framework frees all the data buffers a task has when the task is freed.

6.19 stmf_handle_to_buf

Given a SCSI task and a handle, this call returns the associated stmf_data_buf_t.

Format

```
stmf_data_buf_t *stmf_handle_to_buf(scsi_task_t *task,
                                    uint8_t h);
```

Parameters

task

The SCSI task holding the required data buffer.

h

Handle to the data buffer for the task.

Return values

This function returns the associated stmf_data_buf_t or NULL if the data buffer cannot be found.

6.20 stmf_task_alloc

This function is called by LPORT to allocate a scsi_task_t data structure upon receiving a new scsi task from an initiator.

Format

```
struct scsi_task *stmf_task_alloc(
  struct stmf_local_port *lport, stmf_scsi_session_t *ss,
       uint8_t *lun, uint16_t
cdb_length, uint16_t ext_id)
```

Parameters

lport

Pointer to the stmf_local_port structure receiving the task.

ss

Pointer to a previously registered scsi session representing this I_T nexus.

lun

8 byte LUN received from the initiator.

cdb_length

Length of the CDB received. The framework uses this value to initialize the task_cdb and task_cdb_length fields in the returned scsi task.

ext_id

Extension identifier for scsi task extensions used to populate task_extended_cmd field of the returned task. Currently defined identifier is:

STMF_TASK_EXT_NONE

No extension. task_extended_cmd will be NULL.

Return value

This function allocated a new scsi_task_t structure and returns a pointer to it. It returns NULL in case any allocation error happens or the session is not valid.

6.21 stmf_post_task

This function is called by the LPORT to dispatch a new scsi_task_t to the framework.

Format

```
void stmf_post_task(scsi_task_t *task,
                            stmf_data_buf_t *dbuf);
```

Parameters

task

Pointer to the task structure to be submitted.

dbuf

An initial data buffer. This may contain an initial burst from the initiator or just an empty buffer provided by LPORT to the LU to avoid an extra allocation. This pointer can also be NULL in which case the LU will allocate a data buffer if it needs one.

6.22 stmf_xfer_data

This function is called by LU to start a data transfer. The direction of the transfer can be from the initiator or towards the initiator as determined by the db_flags field of the stmf_data_buf_t.

Format

```
stmf_status_t stmf_xfer_data(scsi_task_t *task,
                stmf_data_buf_t *dbuf, uint32_t ioflags);
```

Parameters

task

Pointer to scsi_task_t representing the task for which this data transfer is being done.

dbuf

The data buffer for the transfer.

ioflags

Flags to indicate LU's state. Currently defines values are:

0 - No change in LU's state.

STMF_IOF_LU_DONE - The LU is done with this task.

Return values

STMF_SUCCESS - Transfer was started successfully

STMF_ABORTED - The task has been aborted.

6.23 stmf_data_xfer_done

This function is called by the LPORT to indicate completion or failure or a data transfer operation started by stmf_xfer_data().

Format

```
void stmf_data_xfer_done(scsi_task_t *task,
                         stmf_data_buf_t *dbuf, uint32_t iof);
```

Parameters

task

Pointer to SCSI task to which the data transfer belongs.

dbuf

The data buffer for the transfer.

iof

Flags to indicate LPORT's state. Currently defined values are:

0	- No change in LPORT's state.
STMF_IOF_ LPORT_DONE	- LPORT is done with this task.

Notes

The status of the transfer is stored in the db_xfer_status member of the dbuf.

6.24 stmf_send_scsi_status

This function is called by LU to transfer SCSI status.

Format

```
stmf_status_t stmf_send_scsi_status(scsi_task_t *task,
                                    uint32_t ioflags);
```

Parameters

tsak

Pointer to scsi_task_t for which the status is to be sent. The scsi_task_t structure contains the status information to be sent.

ioflags

Flags to indicate LU's state. Currently defines values are:

0	- No change in LU's state.
STMF_IOF_LU_DONE	- The LU is done with this task.

Return values

STMF_SUCCESS	- Transfer was started successfully.
STMF_ABORTED	- The task has been aborted.

Notes

See definition of scsi_task_t in section 3.8 for details on how to setup status values.

6.25 stmf_send_status_done

This function is called by LPORT when it has finished transferring SCSI status.

Format

```
void stmf_send_status_done(scsi_task_t *task,
                           stmf_status_t s, uint32_t iof);
```

Parameters

task

Pointer to the scsi_task_t to which this SCSI status belongs.

s

Completion status of the command.

iof

Flags indicating the LPORT state. This is same as defined in section 6.23

6.26 stmf_task_lu_done

This function is called by LU to indicate that it has finished processing of a SCSI task.

Format

```
void stmf_task_lu_done(scsi_task_t *task)
```

Parameters

task

Pointer to the scsi_task_t structure which LU has finished processing.

Notes

Normally the LU will not reach this stage i.e. need to call this function because it would have already indicated to the framework that it is done with the task. The only time LU will need to call this function if it needs confirmation of the SCSI status transfer.

LU should not free any memory associated with the task (pointed to by task_lu_private) and should wait for the framework to call lu_task_free entry point.

~~stmf_queue_task_for_termination~~

~~This function can be called by either LU or LPORT to queue a scsi_task_t for abnormal termination.~~

~~Format~~

```
~~void stmf_queue_task_for_termination(scsi_task_t *task,~~
~~                                     stmf_status_t s);~~
```

~~Parameters~~

~~task~~

~~Pointer to scsi_task_t which needs to be termination.~~

~~s~~

~~Status indicating the reason for termination.~~

~~Notes~~

~~Either LU or LPORT or both can call this function for a task as long as they have not indicated to the framework that they are done with the processing of a task. This function will result in the framework calling the abort entry point of the LU or LPORT, if it has not already indicated that it is done with the processing of the task. It is possible that the framework might call the abort entry point even after the LU or LPORT has indicated that it is done processing the task but it will never be called after the *_task_free() entry point has been called.~~

6.27 stmf_abort

Interface to queue various tasks or task sets for abnormal termination.

Format

```
void stmf_abort(int abort_cmd, scsi_task_t *task,
     stmf_status_t s, void *arg);
```

Parameters

cmd

The abort operation being requested. The various operations are:

STMF_QUEUE_TASK_ABORT

Queue the task for termination.

STMF_REQUEUE_TASK_ABORT_LPORT

This command can be used by LPORT to request that the framework should retry the LPORT's abort entry point for the specified task.

STMF_REQUEUE_TASK_ABORT_LU

This command can be used by LU to request that the framework should retry the LU's abort entry point for the specified task.

STMF_QUEUE_ABORT_LU

This command is used to request an abort for all the commands currently pending with a LU. The LU is represented by stmf_lu_t pointed to by the 'arg' field. The task field is ignored in this case.

task

If abort is being requested for a task, this field contains the pointer to the task.

s

Completion status for the task or task set being aborted. This represents the reason of abort.

arg

Any additional argument for the command. This field points to the stmf_lu_t in case of the STMF_QUEUE_ABORT_LU command. In all other cases this field is ignored.

6.28 stmf_task_lu_aborted

This function is called by the LU to indicate the completion of abort, after the framework has called the lu_abort entry point of the LU.

Format

```
void stmf_task_lu_aborted(scsi_task_t *task,
                          stmf_status_t s, uint32_t iof);
```

Parameters

task

Pointer to the scsi_task_t for which lu_abort() was called.

s

The status of the framework's abort request. The LU can return STMF_ABORTED or STMF_NOT_FOUND to indicate a successful completion of the abort. Any other status will result in framework offlining the LU.

iof

State of the LU after completion of abort. The LU should set this value to STMF_IOF_LU_DONE if the abort was successful.

Notes

If the framework calls lu_abort() entry point of the LU, it will not free the task until the LU responds back with stmf_task_lu_aborted().

6.29 stmf_task_lport_aborted

This function is called by the LPORT to indicate the completion of abort, after the framework has called the lport_abort entry point of the LPORT.

Format

```
void stmf_task_lport_aborted(scsi_task_t *task,
                    stmf_status_t s, uint32_t iof);
```

Parameters

task

Pointer to the scsi_task_t for which lport_abort() was called.

s

The status of the framework's abort request. The LPORT can return STMF_ABORTED or STMF_NOT_FOUND to indicate a successful completion of the abort. Any other status will result in framework offlining the LPORT.

iof

State of the LPORT after completion of abort. The LPORT should set this value to STMF_IOF_LPORT_DONE if the abort was successful.

Notes

If the framework calls lport_abort() entry point of the LPORT, it will not free the task until the LPORT responds back with stmf_task_lport_aborted().

6.30 stmf_task_poll_lu

This function is called by the LU to request the framework to call back the LU for the task after a certain interval. The framework will use the lu_task_poll entry point to do the callback.

Format

```
stmf_status_t stmf_task_poll_lu(scsi_task_t *task,
                                uint32_t delay);
```

Parameters

task

Pointer to the scsi_task_t to be polled.

delay

Delay in milliseconds before calling back the LU. This value can be set to ITASK_DEFAULT_POLL_TIMEOUT to let the framework choose a suitable delay value.

Return values

This function return STMF_SUCCESS if the task is successfully queued for callback or if the task was already queued for callback. The function returns STMF_BUSY if the framework's internal callback queue is full.

Notes

Any error condition which will result in abnormal termination of the task including an explicit call to stmf_abort for the task, will result in cancellation of any pending callbacks.

6.31 stmf_task_poll_lport

This function is called by the LPORT to request the framework to call back the LPORT for the task. The framework will use the lport_task_poll entry point to do the callback.

Format

```
stmf_status_t stmf_task_poll_lport(scsi_task_t *task,
                                   uint32_t delay);
```

Parameters

task

Pointer to the scsi_task_t to be polled.

delay

Delay in milliseconds before calling back the LPORT. This value can be set to ITASK_DEFAULT_POLL_TIMEOUT to let the framework choose a suitable delay value.

Return values

This function return STMF_SUCCESS if the task is successfully queued for callback or if the task was already queued for callback. The function returns STMF_BUSY if the framework's internal callback queue is full.

Notes

Any error condition which will result in abnormal termination of the task including an explicit call to stmf_abort for the task, will result in cancellation of any pending callbacks.

6.32 stmf_lu_add_event/stmf_lu_remove_event

Adds or removes an event to the list of enabled events for the LU. When the event is generated, lu_event_handler entry point will be called by the framework.

Format

```
stmf_status_t stmf_lu_add_event(stmf_lu_t *lu, int eventid);

stmf_status_t stmf_lu_remove_event(stmf_lu_t *lu,
            int eventid);
```

Parameters

lu

Pointer to the LU which will be affected.

eventid

Event to be added or removed. In case of stmf_lu_remove_event call, this field can be STMF_EVENT_ALL to indicate that all the currently enabled events are to be removed.

Return Values

These function return STMF_SUCCESS if the specified event was successfully added or removed. The return code is STMF_INVALID_ARG if an invalid even is specified.

6.33 stmf_lport_add_event/stmf_lport_remove_event

Adds or removes an event to the list of enabled events for the LPORT. When the event is generated, lport_event_handler entry point will be called by the framework.

Format

```
stmf_status_t stmf_lport_add_event(stmf_local_port_t *lport,
            int eventid);

stmf_status_t stmf_lport_remove_event(
            stmf_local_port_t *lport, int eventid);
```

Parameters

lport

Pointer to the LPORT which will be affected.

eventid

Event to be added or removed. In case of stmf_lport_remove_event call, this field can be STMF_EVENT_ALL to indicate that all the currently enabled events are to be removed. Currently defined events for LPORTs are:

LPORT_EVENT_INITIAL_LUN_MAPPED

If the session is created with no LUNs and a LUN mapping and masking operation later on maps LUNs to this session, this event is generated to the LPORT so that the LPORT can inform the initiator, if the protocol allows for the same.

Return Values

These function return STMF_SUCCESS if the specified event was successfully added or removed. The return code is STMF_INVALID_ARG if an invalid even is specified.

6.34 stmf_ctl

STMF interface to drive various control operations on LUs and LPORTs.

Format

```
stmf_status_t stmf_ctl(int cmd, void *obj, void *arg);
```

Parameters

cmd

Control command. The following cmds are currently defined.

STMF_CMD_LU_ONLINE

Initiate the online of the stmf_lu_t pointed to by obj. arg points to stmf_state_change_info_t structure.

STMF_CMD_LU_OFFLINE

Initiate offline of the stmf_lu_t pointed to by obj. Again arg points to stmf_state_change_info_t structure.

STMF_CMD_LU_ONLINE_COMPLETE

A stmf_lu_t, pointed to by obj, has completed the online request. The result of the completion is provided by the structure stmf_change_status_t which is pointed to by arg.

STMF_CMD_LPORT_ONLINE

Initiate the online of the stmf_local_port_t pointed to by obj. arg points to stmf_state_change_info_t structure.

STMF_CMD_LPORT_OFFLINE

Initiate offline of the stmf_local_port_t pointed to by obj. Again arg points to stmf_state_change_info_t structure.

STMF_CMD_LPORT_ONLINE_COMPLETE

A stmf_local_port_t, pointed to by obj, has completed the online request. The result of the completion is provided by the structure stmf_change_status_t which is pointed to by arg.

obj

Depends upon the cmd. See the description of cmd above.

arg

Depends upon the cmd. See the description of cmd above.

Return values

STMF_SUCCESS	- The ctl cmd was accepted successfully.
STMF_ALREADY	- The object is already in the requested state.
STMF_INVALID_ARG	- Invalid cmd specified or a completion was reported when the operation is not in progress.

Notes

During initial registration of a LU or LPORT, unless the user has explicitly offlined the object, the framework automatically calls stmf_ctl to online it.

7 Support Functions

This section describes several support functions provided by STMF to simplify the development of a LU provider or a LPORT provider.

7.1 stmf_scsilib_send_status

Support routine to handle SCSI status phase, calculate residuals and send any check condition.

Format

```
void stmf_scsilib_send_status(scsi_task_t *task,
                              uint8_t st, uint32_t saa);
```

Parameters

task

scsi_task_t for which status is to be sent.

st

8 bit SCSI status.

saa

A combination of 'sense key', ASC and ASCQ. Bits 16-23 is the sense key, Bits 8-15 is the ASC and bits 0-7 is ASCQ. The routine forms the appropriate sense data based on these 3 values, iff the scsi status is 'STATUS_CHECK' (0x02).

Notes

This routine eventually calls stmf_send_scsi_status(). So various transfer lengths should be properly updated before calling this routine. See stmf_send_scsi_status for more details.

7.2 stmf_scsilib_default_handling

Shifts the ownership of a task from a LU to stmf and lets stmf handles the task.

Format

```
void stmf_scsilib_default_handling(scsi_task_t *task,
                                   stmf_data_buf_t *dbuf);
```

Parameters

task

scsi_task_t for which the LU wants to transfer ownership.

dbuf

A pointer to an initial dbuf passed to the LU. This can be NULL.

Notes

If a LU receives a scsi_task_t which it does not understand then instead of responding to the initiator with a check condition, it can call this routine to let stmf decode and respond to this task. Also LUs should not decode commands like REPORT LUN and instead pass those commands to stmf using this routine.

7.3 stmf_scsilib_uniq_lu_id

During LU registration, stmf requires that the lu_id be set to a unique identifier of type GUID.

This support routine can be used by a LU provider to generate a GUID.

Format

```
stmf_status_t stmf_scsilib_uniq_lu_id(uint32_t company_id,
                scsi_devid_desc_t *lu_id);
```

Fields

company_id

24 bit NAA company ID. This can be set to COMPANY_ID_NONE if the LU does not care about company identifiers. It defaults to COMPANY_ID_SUN in that case.

lu_id

An empty lu_id which will be filled by this function. The caller must set the ident_length to 0x10 and have 16 bytes allocated for the ident field.

Return Values

STMF_SUCCESS - lu_id has been created successfully.

STMF_INVALID_ARG - ident_length was not set to 0x10.~~stmf_scsilib_handle_inquiry_page83~~

~~This routine responds to inquiry Page 83 request based on the lu_id field of the stmf_lu_t~~

~~Format~~

```
~~void stmf_scsilib_handle_inquiry_page83(
    scsi_task_t *task, stmf_data_buf_t *dbuf,
    uint8_t byte0);~~
```

~~Parameters~~

~~task~~

~~Pointer to the scsi_task_t structure representing the inquiry command.~~

~~dbuf~~

~~The initial dbuf passed in by the LPORT. Can also be NULL.~~

~~byte0~~

~~Byte #0 if the inquiry response. This contains the device type identifier.~~

~~Notes~~

~~If the LU only wants to send one descriptor out for the inquiry page 83 command and that descriptor is based on the lu_id registered with the framework in the stmf_lu_t structure, then the LU can use this support routine to do the same.~~

7.4 stmf_scsilib_prepare_vpd_page83

Fills a data buffer with requested SCSI VPD device data descriptors.

Format

```
uint32_t stmf_scsilib_prepare_vpd_page83(scsi_task_t *task,
                uint8_t *page, uint32_t page_len,
                uint8_t byte0, uint32_t vpd_mask);
```

Parameters

task

The SCSI task containing the LU and SCSI session for the VPD descriptors.

page

The data buffer to be filled with descriptors.

page_len

The total allocated size of the data buffer.

byte0

Byte0 of the standard inquiry data. This is part of the VPD descriptors.

vpd_mask

A bitmask specifying which descriptors are to be added to the buffer. The defined bit values are:

STMF_VPD_LU_ID

The logical unit identifier associated with the task.

STMF_VPD_TARGET_ID

The target identifier associated with the SCSI session (I_T nuxus) in the task.

STMF_VPD_TP_GROUP

The target port group identifier associated with the target.

STMF_VPD_RELATIVE_TP_ID

The relative target port identifier associated with the target.

Return Value

If enough buffer space was available, this function returns the number of bytes filled into the buffer. If the specified buffer length was smaller than the buffer space needed for all the requested descriptors, it fills out the buffer upto page_len and returns the number of bytes required for all the descriptors in the vpd_mask.

7.5 stmf_scsilib_handle_task_mgmt

This function is called by the LU if it wants the framework to handle SCSI task management command on its behalf.

Format

```
void stmf_scsilib_handle_task_mgmt(scsi_task_t *task);
```

Parameters

task

Pointer to the received SCSI task structure containing the task management command.

Notes

The framework will handle the following task management requests.

TM_ABORT_TASK, TM_ABORT_TASK_SET, TM_LUN_RESET, TM_TARGET_RESET, TM_TARGET_COLD_RESET, TM_TARGET_WARM_RESET

If the task management function request is not from the list specified above, the command will be completed with a check condition with key/ASC/ASCQ value of 0x05/0x0E/0x03 , i.e. 'Invalid field in command IU'.

The framework will do the necessary cleanup and abort any tasks as per the TM request. For the tasks pending with the LU that are getting aborted, the framework will call the lu_abort entry point with the STMF_LU_ABORT_TASK command and will wait for the LU to complete the abort request.

In case of any of TM_LUN_RESET and all the TM_*_TARGET_RESET task management requests, the framework will also prevent new tasks from getting submitted to the LU queue until this task management completes.

In case of TM_LUN_RESET and all the TM_*_TARGET_RESET task management requests, the framework will also call the lu_abort entry point with the command STMF_LU_RESET_STATE. This call is made after the framework has completed the required cleanup for the task management request but before the framework has responded back to the initiator.

7.6 stmf_scsilib_handle_report_tpgs

If the LU wants to support 'Symmetric Logical Unit Access' as per section 5.8.3 in SPC-3 standard, it can ask the framework to handle REPORT TARGET PORT GROUPS command by calling this function.

Format

```
void stmf_scsilib_handle_report_tpgs(scsi_task_t *task,
                                     stmf_data_buf_t *dbuf);
```

Parameters

task

Pointer to the SCSI task containing the report TPGS command from the initiator.

dbuf

Any initial data buffers passed in by the port receiving the command.

Notes

The LU should set TPGS field in the standard inquiry data to 0x01.

The LU can also report Target port group and relative target port identifier in the inquiry VPD page 0x83. See section 7.4 for more details.

7.7 stmf_wwn_to_devid_desc

Initialize scsi_devid_desc_t from 8 byte 'World Wide Name' of a target port.

Format

```
void stmf_wwn_to_devid_desc(scsi_devid_desc_t *sdid,
        uint8_t *wwn, uint8_t protocol_id);
```

Parameters

sdid

Pointer to scsi_devid_desc_t to be initialized. The ident field should be valid and must contain atleast 20 bytes of buffer space.

wwn

8 Byte World wide name.

protocol_id

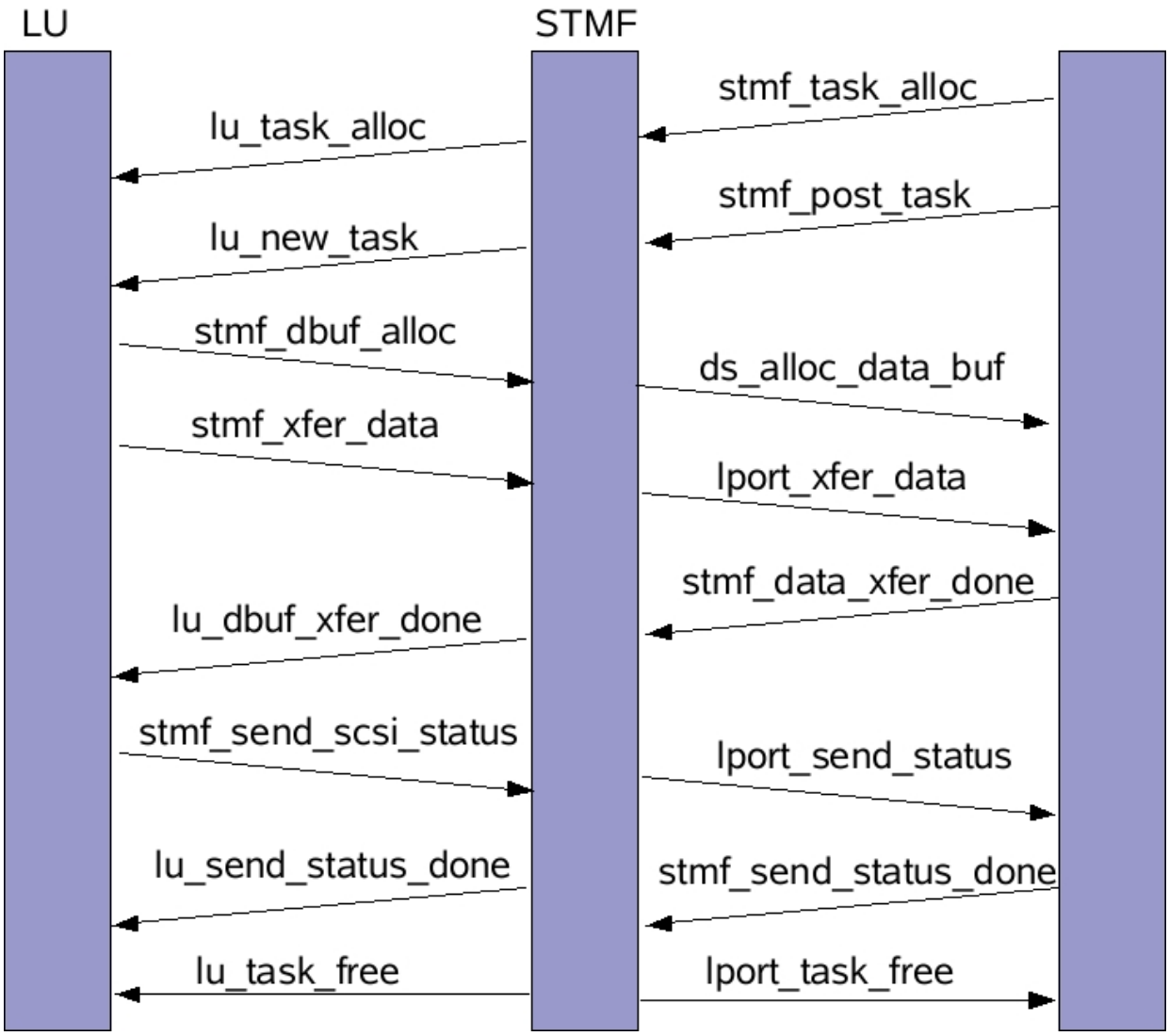
Protocol identifier of the target port as defined by SPC-3, section 7.5.1

Notes

This function will use code set ASCII and upon return the identifier format will be “wwn.<WWN in ASCII>”.

8 Flow Diagrams

8.1 SCSI IO Flow



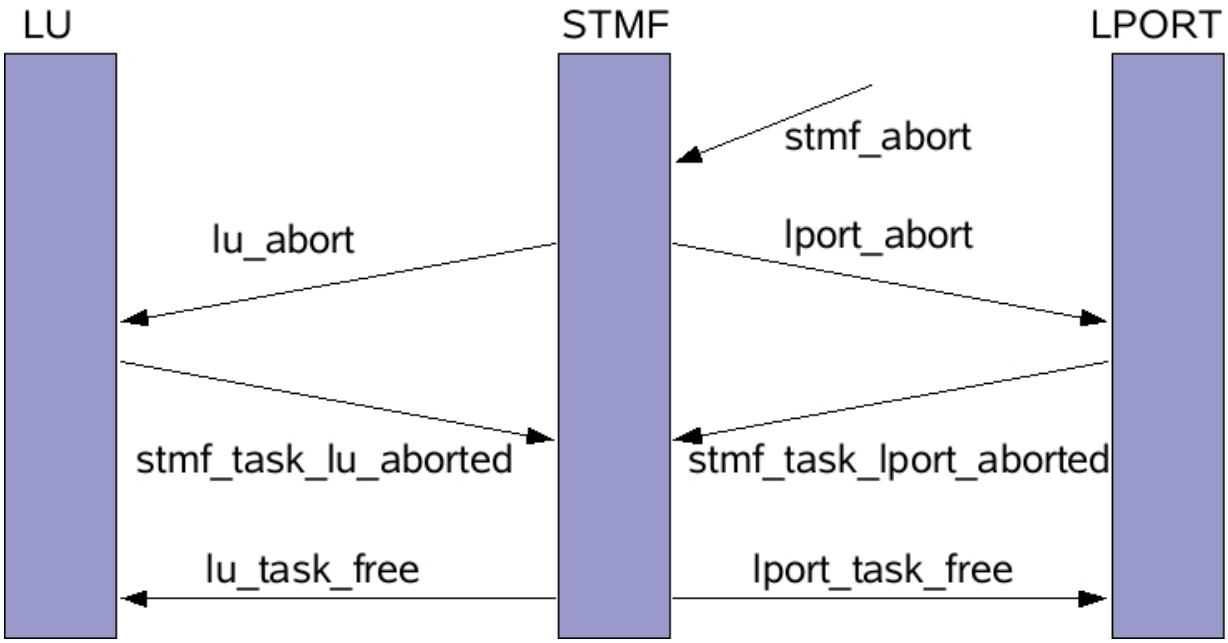
8.1.1 Notes on SCSI IO Flow

STMF maintains a cache of scsi_task_t on a per LU basis. If the task is pulled from the cache, stmf will not call lu_task_alloc(). Similarly STMF maintains a cahe of data bufs on a per lport basis and it may not call ~~lport~~ds_alloc_data_buf() when the LU requests a buffer.

A LU has the option of ending a SCSI flow at stmf_xfer_data level (by combining the data xfer and good SCSI status) or at the stmf_send_scsi_status() level by setting the ioflags parameter. See descriptions of these interfaces for detail.

Both the LPORT and LU have the option of terminating an IO abnormally by calling stmf_queue_task_for_termination() before they indicate that they are done with the IO by setting the ioflags. See the abnormal IO termination flow for details.

8.2 Abnormal IO Termination Flow



8.2.1 Notes on abnormal IO termination

Both LU and LPORT can call stmf_~~queue_task_for_termination~~abort with an abort command of STMF_QUEUE_TASK_ABORT anytime before they have indicated to the framework that they are done with the task using ioflags. After a task has been submitted for termination, any attempt by both LU and LPORT to normally complete this task will be ignored by the framework and an explicit acknowledgment of the abort request will be needed.

The framework will not call the lu_task_free or lport_task_free until either the task has been aborted or completed by both LU and LPORT.

The lu_abort and lport_abort can complete synchronously by returning STMF_ABORT_SUCCESS fron the ***_abort() entry point in which case a stmf_task_*_aborted() call will not be needed.