Software Synthesizer
MIDI Player /Driver Library
Specification

Version 2.8

CONFIDENTIAL

bismark

History:

Date	Version	Description
2013/10/17	2.8	

目次

1. About This Document

This document defines the specification of the Software Synthesizer MIDI Player / MIDI Driver Library.

2. Abstract

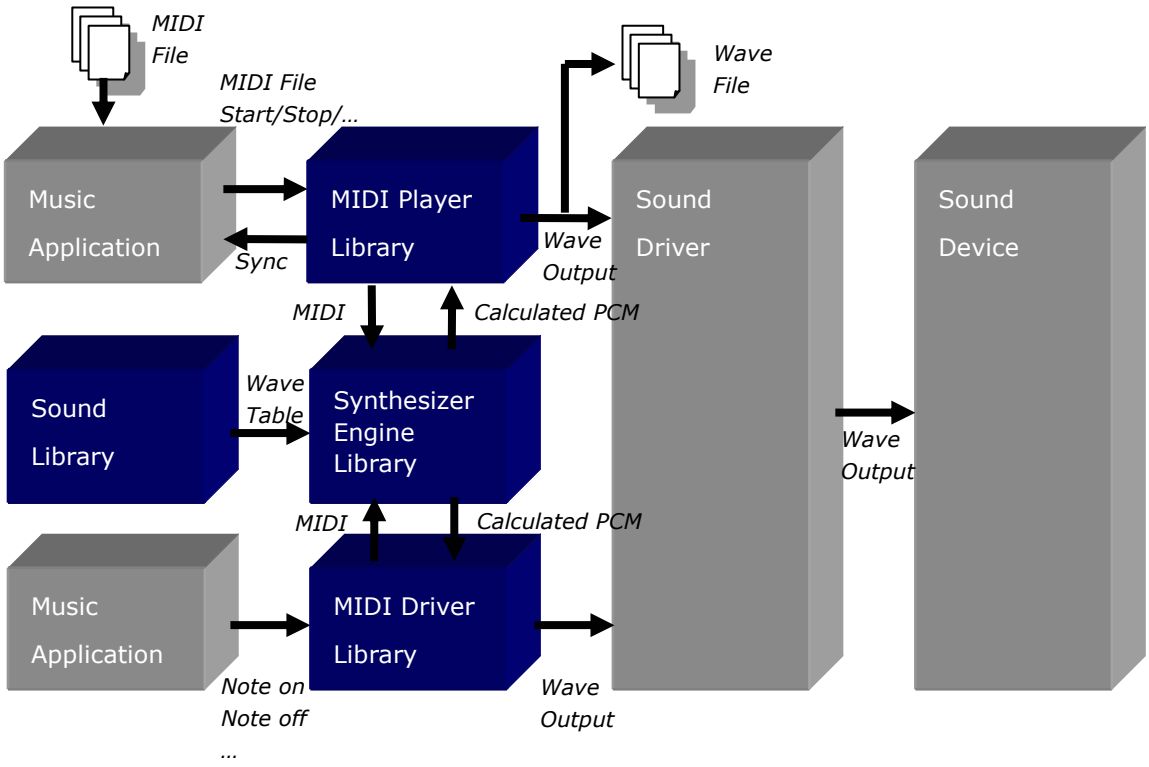
This library include Synthesizer Engine Library (bsse: bismark Synthesizer Engine), and Sound Library, also offers application interfaces for MIDI Player (bsmp: described later), and MIDI Driver (bsmd: described later).

bsmp (bismark MIDI Player) library is an additional library for Synthesizer Engine Library. It provides functions to construct MIDI file players, Karaoke players, MIDI to Wave converts easily.
The main basic functions of bsmp library are follows;

- Import MIDI files
  - Supporting SMF (Standard MIDI File)
  - Also can be added the user specified file formats as customization
- MIDI to Wave conversion using Synthesizer Engine Library
  - Including wave output device and thread schedule control for various OS
  - Export to wave files
- Application support
  - API for playback start, stop
  - Callback functions for sending synchronizing information to the application

bsmd (bismark MIDI Driver) library is an another additional library for Synthesizer Engine Library. It enables the substitution of hardware MIDI modules, and provides Real-time MIDI function and simple MIDI file player for virtual musical instrument applications.
The main basic functions of bsmd library are follows;。

- Real-time MIDI
  - Including wave output device and thread schedule control for various OS
- Simple MIDI file player
  - Supporting SMF (Standard MIDI File)



bsmp and bsmd library can not be used at the same time.

2.1. Supported OS

- Microsoft Windows
  - MBCS build
  - UNICODE build
- Linux/BSD
- Mac OS X
- iOS (iOS 7 SDK, armv7/armv7s)
- Android (NDK r7b)

2.2. Inputs

2.2.1. MIDI Files

- SMF (Standard MIDI File)
  - Format: 0 or 1
  - Number of track: Up to 64
  - Division / TPQN: No limitation
  - File extension: *.mid

2.2.2. Sound Library Files

- SoundFont
  - Version 2
  - File extension: *.sf2
- DLS (Downloadable Sounds)[1]
  - Level1, Level2, Mobile DLS
  - File extension: *.dls

2.3. Outputs

2.3.1. Wave Output Devices

- Win:
  - MME drivers
  - Steinberg ASIO 2.1 drivers (Only bsmd driver, 44100Hz sample rate)

[1] There are some limitations for supporting DLS specification. Please refer to 5.1 About DLS File Format

- Linux:
  - OSS
  - ALSA
- Mac OS X / iOS:
  - AudioQueue
  - AudioUnit (Only bsmd driver)
- Android
  - OpenSL ES

- Playback sample rate: Depends on each wave output drivers

2.3.2. Wave Files

bsmp library only.

- Microsoft RIFF Wave
- Apple AIFF
  - Playback sample rate: No limitation
  - Output bit depth: 16[bit]
  - Number of output channels: 2 (Interleaved)

2.4. File Lists

- Common
  - bsmd.h : bsmd (MIDI Driver Library) header file
  - bsmp.h : bsmp (MIDI Player Library) header file
- Win (DLL / Shared library)
  - bsmpd*.dll : Shared library
  - bsmpd*.lib : Library module
- Linux / Mac OS X / iOS / Android (Static library)
  - libbsmpd*.a (MIDI Player / MIDI Driver Library)
  - libbsmp*.a (MIDI Player Library)
  - libbsmd*.a (MIDI Driver Library)

2.5. Related Libraries

- Synthesizer Engine Library
  - Win
    - Included
  - Linux / Mac OS X / iOS / Android
    - libbsse*.a: Static library

3. MIDI Player Library Specification

3.1. Constants

3.1.1. BSMP_ERR

typedef enum for result code.

code	description	
BSMP_OK	Success	
BSMP_ERR_PROTECTION	Protection error	
BSMP_ERR_INVALID_HANDLE	Invalid handle error	
BSMP_ERR_FILE	File error	
BSMP_ERR_MEMORY	Memory error	
BSMP_ERR_RESOURCE	Resource error	
BSMP_ERR_PARAM	Parameter error	
BSMP_ERR_AUDIO_DRIVER	Wave output error	
BSMP_ERR_DATA	Data error	
BSMP_ERR_MODULE	External module error	
BSMP_ERR_NOT_SUPPORTED	Unsupported error	
BSMP_ERR_UNDEFINED	Undefined	

3.1.2. BSMP_CTRL

typedef enum for control API. Please refer to section 3.4.21 ctrl.

3.1.3. BSMP_CALLBACK_TYPE

typedef enum for callback types. Please refer to section 3.5 Callback (BSMP_CALLBACK).

3.1.4. BSMP_WAVE_FILE

typedef enum for bounced wave file formats.

code	description	
BSMP_WAVE_FILE_RIFF	Microsoft RIFF Wave	
BSMP_WAVE_FILE_AIFF	Apple AIFF	

3.1.5. BSMP_SOUND_LIBRARY_SEL_MODE

typedef enum for selection modes of sound library files.

code	description	
BSMP_SOUND_LIBRARY_SEL_MODE_NORMAL	Default mode	

3.2. Typedefs

3.2.1. BSMP_HANDLE

Handle for controlling this library.

3.2.2. BSMP_CALLBACK

Callback function type for sending information from this library to the user application. Please refer to section 3.5 Callback (BSMP_CALLBACK).

callback ()		
Input:	*BSMP_HANDLE handle*	*Effective handle of the library*
	BSMP_CALLBACK_TYPE type	*Callback type*
	*void *data*	*Pointer of the data*
	*void *user*	*Pointer of the specified user area*
Output:	*void*	

3.2.3. BSMP_CALLBACK_BOUNCE

Callback function type for displaying progress on exporting wave files. This callback will be used on calling the API "bounce" described on section 3.4.20.

BSMP_CALLBACK_BOUNCE ()		
Input:	*int percent*	*Progress value (%)*
	*void *user*	*Pointer to the specified user area*
Output:	*int*	*0: Continue* *1: Cancel exporting*

3.2.4. BSMP_LOAD

Function type for Geting the API table（BSMP_FUNC）.

3.3. Structures

3.3.1. BSMP_FUNC

Structure for API table. Please refer to section 3.4 API.

3.3.2. BSMP_SOUND_LIBRARY

Structure for specifying the sound library file.

```
typedef struct {
        int index; /* Index for the sound library file */
        LPCTSTR path; /* Full path of the sound library file */
} BSMP_SOUND_LIBRARY;
```

3.3.3. BSMP_SOUND_LIBRARY_MEMORY

Structure for specifying the sound library file mapped on the memory.

```
typedef struct {
        int index; /* Index for the sound library file */
        char *address; /* Memory address for the mapped sound library file */
        unsigned long *size; /* Size of the sound library file [Byte] */
} BSMP_SOUND_LIBRARY_MEMORY;
```

3.3.4. BSMP_SOUND_LIBRARY_SEL

Structure for specifying details of referring the sound library files.

```
typedef struct {
        int module; /* Module index (0, 1, …) */
        int part; /* Part index (0, 1, …, 15) */
        int index; /* Index of the sound library file */
        BSMP_SOUND_LIBRARY_SEL_MODE mode; /*  selection modes (section 3.1.5) */
} BSMP_SOUND_LIBRARY_SEL;
```

3.4. API

3.4.1. initialize

BSMP_ERR initialize ()		
Input:		
	*BSMP_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMP_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the default sound library (from own resource, or from the defined path) to index #0.

Before using the library, the application have to call the on of initialize* () functions.

The application have to set 64 byte key code to the argument "key".

This functions requires the fixed processing time because of loading the sound library.

The application have to set the following values to argument "target"

- Win: The handle of the parent window (HWND)
- Android: This library receives pointer of the following sturucture, and calls the Activity class method of your application using information this information.

```
typedef struct {
    JNIEnv *env;
    jobject thiz;
}
```

- Other OS: NULL

3.4.2. initializeWithSoundLib

BSMP_ERR initializeWithSoundLib ()

Input:		
	*BSMP_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMP_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	LPCTSTR libraryPath	*Full path of the sound library file*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the sound library file on the specified path to index #0.

3.4.3. initializeWithSoundLibMemory

BSMP_ERR initializeWithSoundLibMemory ()		
Input:		
	*BSMP_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMP_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	*char *libraryAddress*	*Address of the mapped sound library*
	unsigned long librarySize	*Size of the sound library file [Byte]*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the sound library file on the specified memory to index #0.

3.4.4. exit

BSMP_ERR exit ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*

Output:

Error code

Finalize the library.

The application have to call this function before termination. If the library is playing, the application have to stop playback before calling this function.

3.4.5. getNumDrivers

int getNumDrivers ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*

Output:

The number of supported drivers.

Get the number of wave output drivers supported by the library.

3.4.6. getNumDevices

int getNumDevices ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of wave output driver*

Output:

The number of available wave output devices

Get the number of available wave output devices in the specified wave output driver.

3.4.7. getDriverName

LPCTSTR getDriverName ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
int index	*Index for the wave output driver*

Output:

Name of the specified wave output driver

Get the name of the specified wave output driver.

3.4.8. getDeviceName

LPCTSTR getDeviceName ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of the wave output driver*
int index	*Index for the wave output device*

Output:

Name of the specified wave output device

Get the name of the specified wave output device.

3.4.9. showDeviceControlPanel

void showDeviceControlPanel ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of the wave output driver*
LPCTSTR device	*Name of the wave output device*

Display the control panes of the specified wave output device

3.4.10. open

BSMP_ERR open ()

Input:

	BSMP_HANDLE handle	*Effective handle of the library*
	LPCTSTR driver	*Name of the wave output driver*
	LPCTSTR device	*Name of the wave output device*
Output:		
	Error code	

Open the specified wave output device. If the argument "driver" and "device" is NULL, default wave output driver and device will be selected automatically.

3.4.11. close

BSMP_ERR close ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
Output:		
	Error code	

Close the wave output device.

3.4.12. setFile

BSMP_ERR setFile ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	LPCTSTR path	*Full path of the MIDI file*
Output:		
	Error code	

Specify the MIDI sequence file with file path. See **2.2 Inputs** for available file formats.

3.4.13. setFileMemory

BSMP_ERR setFileMemory ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	*char *address*	*Memory address for the mapped MIDI file*
	long size	*Size of the MIDI file [byte]*
Output:		
	Error code	

Specify the MIDI sequence file mapped on the memory controlled by the application.

3.4.14. getFileMemory

BSMP_ERR getFileMemory ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	*char **address*	*Pointer of the memory address*
	*long *size*	*Pointer of the file size [byte]*
Output:		
	Error code	

Get the memory address and size used for loading MIDI file. This memory is controlled by the library.

3.4.15. getFileInfo

BSMP_ERR getFileInfo ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	*int *format*	*Pointer of the MIDI file format*
	*unsigned short *division*	*Pointer of the MIDI file division [TPQN]*
	*unsigned long *totaltick*	*Pointer of the number of tick*
	*unsigned long *totaltime*	*Pointer of the length [s]*
Output:		
	Error code	

Get information of the specified MIDI sequence file.

3.4.16. start

BSMP_ERR start ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*

Output:

Error code

Start playback of the specified MIDI file from current song position.

3.4.17. stop

BSMP_ERR stop ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*

Output:

Error code

Stop playback of the specified MIDI file.

Calling this function means the application instructs the start of fade out process, and the playback still alive. The application has to detect the completion of the playback by the callback function described later.

Current song position will be saved after calling this function.

3.4.18. seek

BSMP_ERR seek ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
unsigned long tick	*Song Position [MIDI tick]*

Output:

Error code

Specify song position.

3.4.19. isPlaying

int isPlaying ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*

Output:

1: playing

0: not playing

Get the flag for the library is playing the MIDI file, or not.

3.4.20. bounce

BSMP_ERR bounce ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	LPCTSTR path	*Full path of the output file*
	BSMP_WAVE_FILE type	*Output file type*
	BSMP_CALLBACK_EXPORT callback	*Callback function*
	*void *user*	*User parameter for the callback*
Outpu:		
	Error code	

Outputs the result of the specified MIDI file to the wave file. This function can not be used when normal playback process is effective. (Started with 3.4.16 start)

3.4.21. ctrl

BSMP_ERR ctrl ()

Input:

BSMP_HANDLE handle	*Effective handle of the library*
BSMP_CTRL ctrl	*Control target*
*void *data*	*Address of data*
int size	*Size of data [byte]*

Output:

Error code

Do various operations.

ctrl	data		description
	type	I/O	
BSMP_CTRL_SET_MASTER_VOLUME	int	I	Set playback volume (BSMP_VOLUME_MIN ~ BSMP_VOLUME_MAX). The default value is BSMP_VOLUME_DEF.
BSMP_CTRL_GET_MASTER_VOLUME	int	O	Get playback volume
BSMP_CTRL_SET_MASTER_KEY	int	I	Set playback key (BSMP_KEY_MIN ~ BSMP_KEY_MAX). The unit of the values is 100[cent], and the default value is BSMP_KEY_DEF. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_MASTER_KEY	int	O	Get playback key.
BSMP_CTRL_SET_MASTER_TUNE	int	I	Set fine tuning (BSMP_TUNE_MIN ~ BSMP_TUNE_MAX). The unit of the values is 1[cent], and the default value is BSMP_TUNE_DEF. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_MASTER_TUNE	int	O	Get fint tuning.
BSMP_CTRL_SET_SPEED	int	I	Set playback speed. (BSMP_SPEED_MIN ~ BSMP_SPEED_MAX). The unit of the value is 1[%], and the default value is BSMP_SPEED_DEF. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_SPEED	int	O	Get playback speed.

ctrl	data		description
	type	I/O	
BSMP_CTRL_SET_GUIDE	int	I	Set guide melody playback volume (BSMP_GUIDE_MIN ~ BSMP_GUIDE_MAX). The default value is BSMP_GUIDE_DEF. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_GUIDE	int	O	Get guide melody playback volume.
BSMP_CTRL_SET_GUIDE_MAIN_CH	int	I	Set target of guide melody control. -1: off 0: MIDI port A, MIDI channel 1 1: MIDI port A, MIDI channel 2 … 15: MIDI port A, MIDI channel 16 16: MIDI port B, MIDI channel 1 …
BSMP_CTRL_GET_GUIDE_MAIN_CH	int	O	Get target of guide melody control
BSMP_CTRL_SET_GUIDE_SUB _CH	int	I	Same as BSMP_CTRL_SET_GUIDE_MAIN_CH
BSMP_CTRL_GET_GUIDE_SUB _CH	int	O	Same as BSMP_CTRL_SET_GUIDE_MAIN_CH

ctrl	data		description
	type	I/O	
BSMP_CTRL_SET_REVERB	*int*	I	Set effectiveness of reverb. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_REVERB	*int*	O	Get effectiveness of reverb
BSMP_CTRL_GET_REVERB _AVAILABLE	*int*	O	Get availability of reverb
BSMP_CTRL_SET_CHORUS	*int*	I	Set effectiveness of chorus. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_CHORUS	*int*	O	Get effectiveness of chorus
BSMP_CTRL_GET_CHORUS _AVAILABLE	*int*	O	Get availability of chorus
BSMP_CTRL_SET_DELAY	*int*	I	Set effectiveness of delay. This value is not cleared on the end of the playback.
BSMP_CTRL_GET_DELAY	*int*	O	Get effectiveness of delay
BSMP_CTRL_GET_DELAY _AVAILABLE	*int*	O	Get availability of delay
BSMP_CTRL_SET_REVERB_HQ	*int*	I	Set HQ Reverb (1: On, 0: Off, Customized version only)

ctrl	data		description
	type	I/O	
BSMP_CTRL_SET_SAMPLE_RATE	unsigned long	I	Set playback sample rate [Hz]
BSMP_CTRL_GET_SAMPLE_RATE	unsigned long	O	Get playback sample rate [Hz]
BSMP_CTRL_SET_BLOCK_SIZE	long	I	Set frame size [sample] of wave output.
BSMP_CTRL_GET_BLOCK_SIZE	long	O	Get frame size [sample] of wave output.
BSMP_CTRL_SET_CHANNELS	int	I	Not supported
BSMP_CTRL_GET_CHANNELS	int	O	Get number of output channels
BSMP_CTRL_SET_POLY	int	I	Set polyphonic number of synthesizer
BSMP_CTRL_GET_POLY	int	O	Get polyphonic number of synthesizer

ctrl	data		description
	type	I/O	
BSMP_CTRL_GET_SOUND_LIBRARY_NUM	int	O	Get number of the slots for sound libraries
BSMP_CTRL_SET_SOUND_LIBRARY	BSMP_SOUND_LIBRARY	I	Set sound library with file path
BSMP_CTRL_SET_SOUND_LIBRARY_MEMORY	BSMP_SOUND_LIBRARY_MEMORY	I	Set sound library with memory
BSMP_CTRL_SET_SOUND_LIBRARY_SEL	BSMP_SOUND_LIBRARY_SEL	I	Set selection mode for the loaded sound library
BSMP_CTRL_GET_SOUND_LIBRARY_SEL	BSMP_SOUND_LIBRARY_SEL	I/O	Get selection mode for the loaded sound library
BSMP_CTRL_SET_NO_INSTRUMENT_FIX	int	I	Set function for substituting instrument. (1: On, 0: Off)
BSMP_CTRL_GET_NO_INSTRUMENT_FIX	int	O	Get value for the substituting instrument.
BSMP_CTRL_SET_NUMBER_OF_REGIONS	int	I	Set maximum number of region in each instrument

ctrl	data		description
	type	I/O	
BSMP_CTRL_GET_INSTRUMENT_NAME ~ BSMP_CTRL_GET_INSTRUMENT_NAME + 15	char (TCHAR)	O	Get instrument name of the specified part (Ch1~16)
BSMP_CTRL_SET_MUTE ~ BSMP_CTRL_SET_MUTE + 15	int	I	Set mute (0: Off, 1: On) to the specified part (Ch1~16)
BSMP_CTRL_GET_MUTE ~ BSMP_CTRL_GET_MUTE + 15	int	O	Get mute (0: Off, 1: On) of the specified part (Ch1~16)
BSMP_CTRL_SET_SOLO ~ BSMP_CTRL_SET_SOLO + 15	int	I	Set solo (0: Off, 1: On) to the specified part (Ch1~16)
BSMP_CTRL_GET_SOLO ~ BSMP_CTRL_GET_SOLO + 15	int	O	Get solo (0: Off, 1: On) of the specified part (Ch1~16)

ctrl	data		Description
	type	I/O	
BSMP_CTRL_SET_CALLBACK_DELAY	int	I	Set callback sync offset
BSMP_CTRL_GET_CALLBACK_DELAY	int	O	Get callback sync offset
BSMP_CTRL_SET_PORT_SELECTION_METHOD	int	I	Set port selection method (Customized version only)
BSMP_CTRL_GET_PORT_SELECTION_METHOD	int	O	Get port selection method (Customized version only)
BSMP_CTRL_SET_WAVE	BSMP_WAVE	I	Add wave file (customized version only)
BSMP_CTRL_GET_OPEN_SL_ENGINE		O	Get OpenSL Engine (Android only)
CTMP_CTRL_GET_OPEN_SL_ENGINE_INTERFACE		O	Get OpenSL Engine Interface (Android only)

3.4.22. version

void version ()		
Input:		
	BSMP_HANDLE handle	*Effective handle of the library*
	LPTSTR engine	*Version of Synthesizer Engine Library*
	int engineSize	*Length of engine*
	LPTSTR player	*Version of MIDI Player Library*
	int playerSize	*Length of player*

Get the name of MIDI Player Library and Synthesizer Engine Library.

3.5. Callback (BSMP_CALLBACK)

Callback function provides various information to the application. It is specified on 3.4.1 initialize, with function type defined in section 3.2.2 BSMP_CALLBACK.

This callback is not called on processing the function 3.4.20 bounce.

Each callback is called from calculation thread of synthesizer. So the application can not spend long duration on receiving them.

3.5.1. Open

type = BSMP_CALLBACK_TYPE_OPEN, data = Not used

Wave output driver has been opened

3.5.2. Close

type = BSMP_CALLBACK_TYPE_CLOSE, data = Not used

Wave output driver has been closed

3.5.3. Start

type = BSMP_CALLBACK_TYPE_START, data = Not used

Playback has been started

3.5.4. Stop

*type = BSMP_CALLBACK_TYPE_STOP, data = (unsigned long *) errorcode*

Playback has beed stopeed.

errorcode:

0 : Normal

BSMP_ERR_AUDIO_DRIVER : Error stop by wave output driver

BSMP_ERR_DATA : Error stop by data

3.5.5. Seek

type = BSMP_CALLBACK_TYPE_SEEK, data = Not used

Playback song position has been changed

If your application calculates song position using 3.5.6 MIDI Clock callback, please reset song position to start, tempo to 120[BPM], on receiving this callback.

3.5.6. MIDI Clock

type = BSMP_CALLBACK_TYPE_CLOCK, data = Not used

Standard MIDI clock (24[TPQN])

3.5.7. Tempo

*type = BSMP_CALLBACK_TYPE_TEMPO, data = (unsigned long *) tempo*

Playback tempo has been changed ([usec/beat])

3.5.8. Time Signature

*type = BSMP_CALLBACK_TYPE_TIME_SIGNATURE, data = (unsigned long *) timeSignature*

Playback time signature（nn/dd/cc/bb）has been changed.

3.5.9. Channel Message

*type = BSMP_CALLBACK_TYPE_CHANNEL_MESSAGE, data = (unsigned long *) data*

Channel message has been sent by player

bit 31-24: MIDI Port (0x00 ~)

bit 23 - 16: Status Byte (0x90 ~ 0xEF)

bit 15 – 8 : First Data (0x00 ~ 0x7F)

bit 7 – 0 : Second Data (0x00 ~ 0x7F)

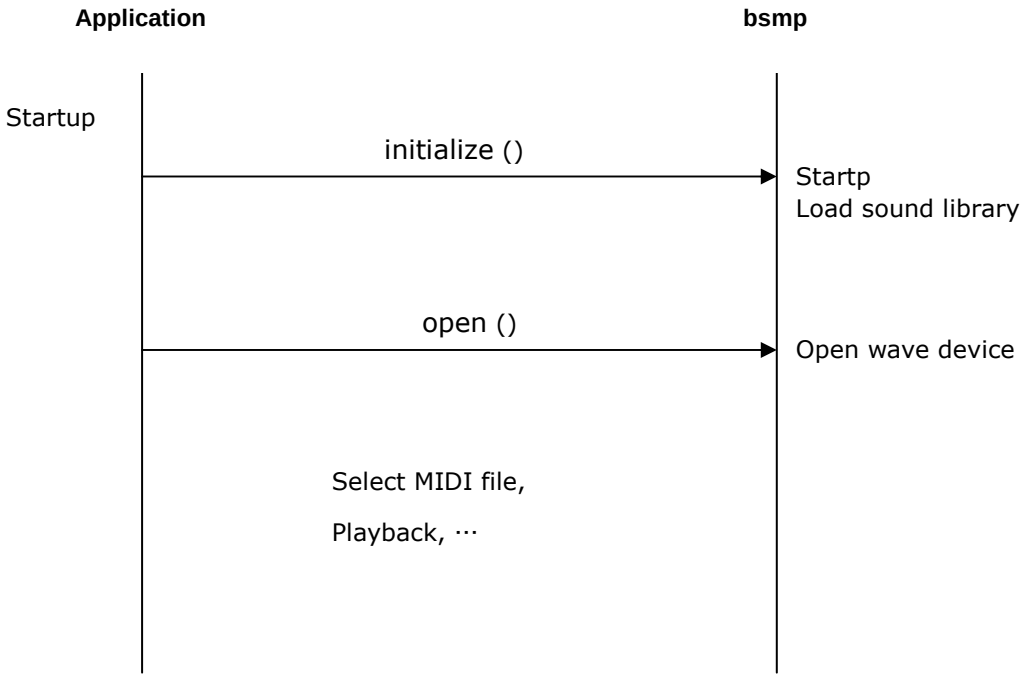
3.5.10. System Exclusive Message

type = BSMP_CALLBACK_TYPE_SYSTEM_EXCLUSIVE_MESSAGE, data = Not used

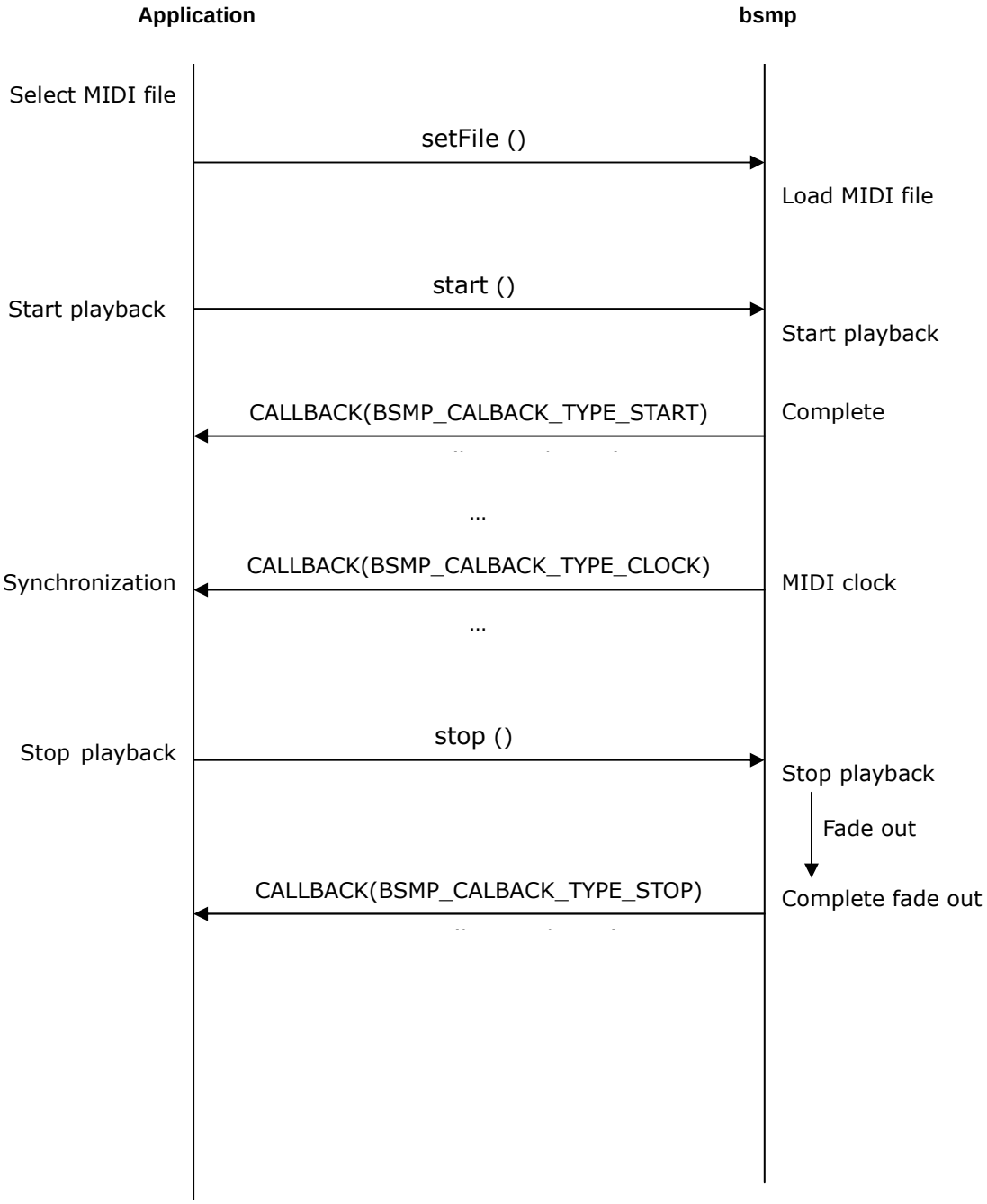
System exclusive message has been sent by player.

3.6. Sequences

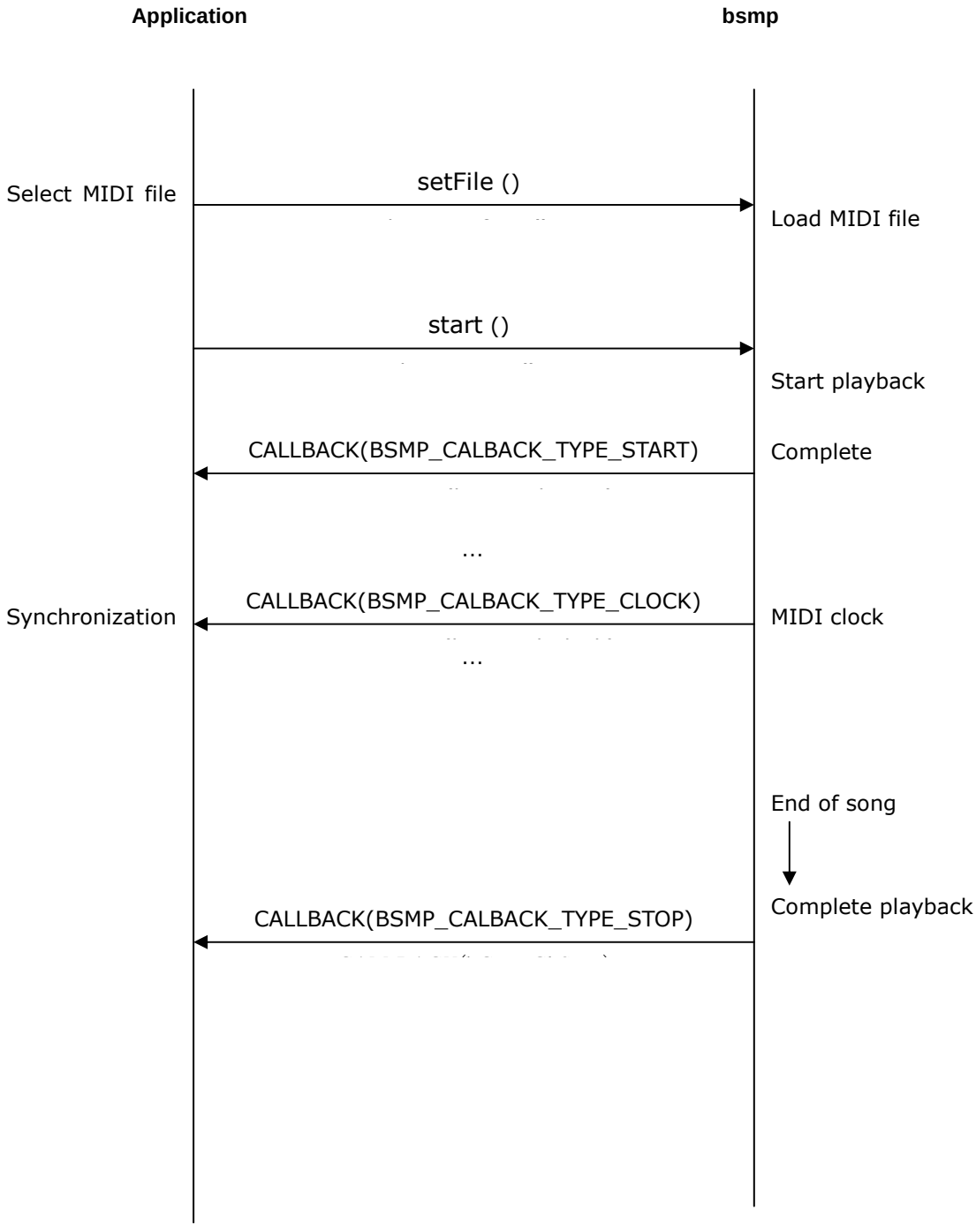
3.6.1. Initialization



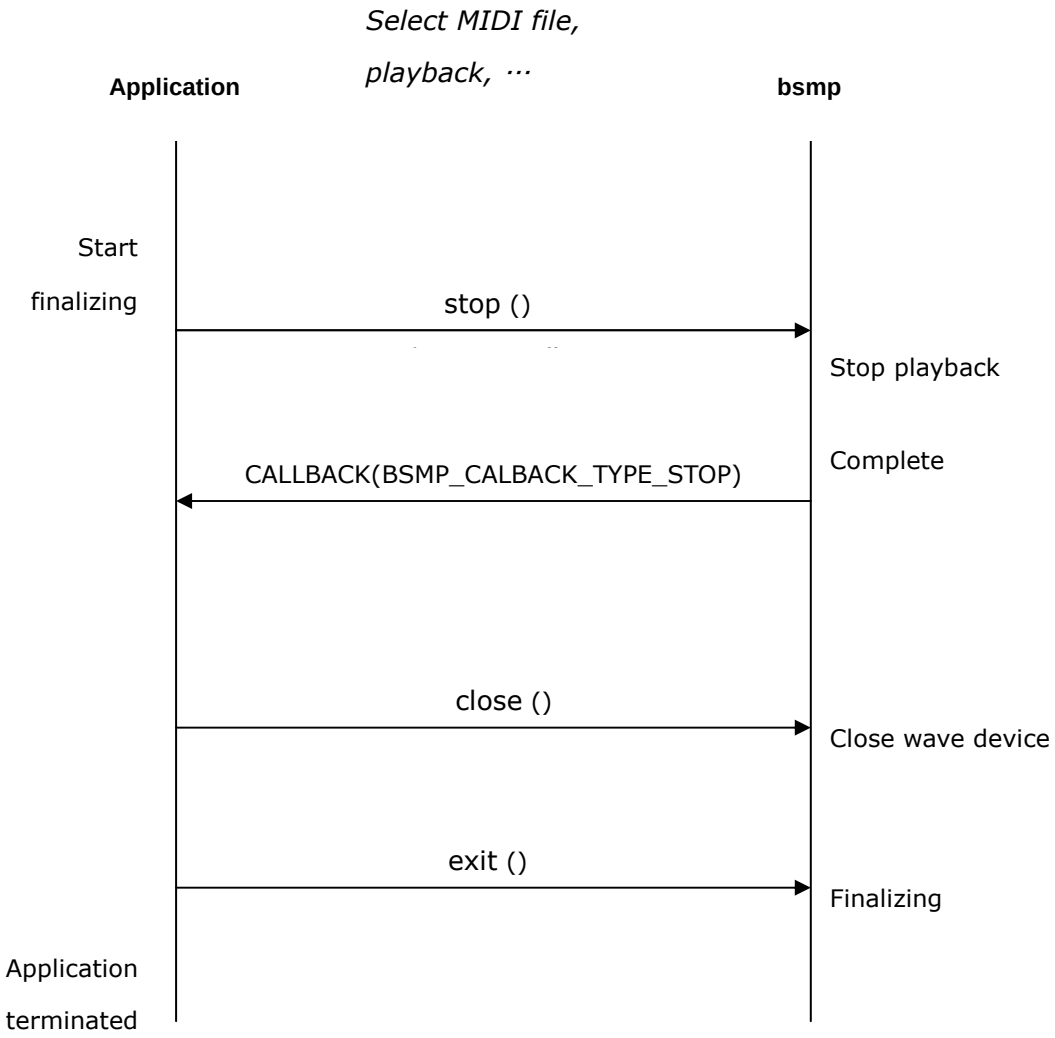
3.6.2. Specifying the MIDI Files - Start Playback – Stop by User



3.6.3. Specifying the MIDI File – Start Playback - End of the Song



3.6.4. Finalizing



4. MIDI Driver Library Specification

4.1. Constants

4.1.1. BSMD_ERR

typedef enum for result code.

code	内容	
BSMD_OK	Success	
BSMD_ERR_PROTECTION	Protection error	
BSMD_ERR_INVALID_HANDLE	Invalid handle error	
BSMD_ERR_FILE	File error	
BSMD_ERR_MEMORY	Memory error	
BSMD_ERR_RESOURCE	Resource error	
BSMD_ERR_PARAM	Parameter error	
BSMD_ERR_AUDIO_DRIVER	Wave output error	
BSMD_ERR_DATA	Data error	
BSMD_ERR_MODULE	External module error	
BSMD_ERR_NOT_SUPPORTED	Unsupported error	
BSMD_ERR_UNDEFINED	Undefined	

4.1.2. BSMD_CTRL

Typede enum for control API. Please refer to section 4.4.25 ctrl.

4.1.3. BSMD_CALLBACK_TYPE

Typedef enum for callback types. Please refer to section 4.5 Callback (BSMD_CALLBACK).

4.1.4. BSMD_SOUND_LIBRARY_SEL_MODE

typedef enum for selection modes of sound library files.

code	内容	
BSMD_SOUND_LIBRARY_SEL_MODE_NORMAL	Default mode	

4.2. Typedefs

4.2.1. BSMD_HANDLE

Handle for controlling this library.

4.2.2. BSMD_CALLBACK

Callback function type for sending information from this library to the user application. Please refer to section 4.5 Callback (BSMD_CALLBACK).

BSMD_CALLBACK ()		
Input:	*BSMD_HANDLE handle*	*Effective handle of the library*
	BSMD_CALLBACK_TYPE type	*Callback type*
	*void *data*	*Pointer of the data*
	*void *user*	*Pointer of the specified user area*
Output:	*void*	

4.2.3. BSMD_LOAD

Function type for Geting the API table(BSMP_FUNC).

4.3. Structures

4.3.1. BSMD_FUNC

Structure for API table. Please refer to section 4.4 API.

4.3.2. BSMD_SOUND_LIBRARY

Structure for specifying the sound library file.

```
typedef struct {
        int index; /* Index for the sound library file */
        LPCTSTR path; /* Full path of the sound library file */
} BSMD_SOUND_LIBRARY;
```

4.3.3. BSMD_SOUND_LIBRARY_MEMORY

Structure for specifying the sound library file mapped on the memory.

```
typedef struct {
        int index; /* Index for the sound library file */
        char *address; /* Memory address for the mapped sound library file */
        unsigned long *size; /* Size of the sound library file [Byte] */
} BSMD_SOUND_LIBRARY_MEMORY;
```

4.3.4. BSMD_SOUND_LIBRARY_SEL

Structure to specify relationship between each part and sound library files.

```
typedef struct {
        int module; /* Module index (0, 1, …) */
        int part; /* Part index (0, 1, …, 15) */
        int index; /* Index of the sound library file */
        BSMD_SOUND_LIBRARY_SEL_MODE mode; /* selection modes (section 4.1.4) */
} BSMD_SOUND_LIBRARY_SEL;
```

4.3.5. BSMD_FRAME

Structure for callback (BSMD_CALLBACK_TYPE_FRAME)

```
typedef struct {
        long sampleFrames; /* audio frame length [sample] */
        void *data; /* buffer for output audio (Signed 16bit, 2ch interleaved) */
} BSMD_FRAME;
```

4.4. API

4.4.1. initialize

BSMD_ERR initialize ()		
Input:		
	*BSMD_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMD_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the default sound library (from own resource, or from the defined path) to index #0.

Before using the library, the application have to call the on of initialize* () functions.

The application have to set 64 byte key code to the argument "key".

This functions requires the fixed processing time because of loading the sound library.

The application have to set the following values to argument "target"

- Win/WinCE: The handle of the parent window (HWND)
- Android: This library receives pointer of the following sturucture, and calls the Activity class method of your application using information this information.

```
typedef struct {
    JNIEnv *env;
    jobject thiz;
}
```

- Other OS: NULL

4.4.2. initializeWithSoundLib

BSMD_ERR initializeWithSoundLib ()

Input:		
	*BSMD_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMD_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	LPCTSTR libraryPath	*Full path of the sound library file*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the sound library file on the specified path to index #0.

4.4.3. initializeWithSoundLibMemory

BSMD_ERR initializeWithSoundLibMemory ()		
Input:		
	*BSMD_HANDLE *handle*	*Pointer of the handle (!= NULL)*
	BSMD_CALLBACK callback	*Pointer of the callback function*
	*void *user*	*Pointer of the user area for callback*
	*char *libraryAddress*	*Address of the mapped sound library*
	unsigned long librarySize	*Size of the sound library file [Byte]*
	*void *target*	*Target independent data*
	*const unsigned char *key*	*Key code*
Output:		
	Error code	

Initialize the library and Synthesizer Engine Library.

Synthesizer Engine Library loads the sound library file on the specified memory to index #0.

4.4.4. exit

BSMD_ERR exit ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*

Output:

Error code

Finalize the library.

The application have to call this function before termination. If the library is playing, the application have to stop playback before calling this function.

4.4.5. getNumDrivers

int getNumDrivers ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*

Output:

The number of supported drivers.

Get the number of wave output drivers supported by the library.

4.4.6. getNumDevices

int getNumDevices ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of wave output driver*

Output:

The number of available wave output devices

Get the number of available wave output devices in the specified wave output driver.

4.4.7. getDriverName

LPCTSTR getDriverName ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*
int index	*Index for the wave output driver*

Output:

Name of the specified wave output driver

Get the name of the specified wave output driver.

4.4.8. getDeviceName

LPCTSTR getDeviceName ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of the wave output driver*
int index	*Index for the wave output device*

Output:

Name of the specified wave output device

Get the name of the specified wave output device.

4.4.9. showDeviceControlPanel

void showDeviceControlPanel ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*
LPCTSTR driver	*Name of the wave output driver*
LPCTSTR device	*Name of the wave output device*

Display the control panes of the specified wave output device

4.4.10. open

BSMD_ERR open ()

Input:

	BSMD_HANDLE handle	*Effective handle of the library*
	LPCTSTR driver	*Name of the wave output driver*
	LPCTSTR device	*Name of the wave output device*
Output:		
	Error code	

Open the specified wave output device. If the argument "driver" and "device" is NULL, default wave output driver and device will be selected automatically.

4.4.11. close

BSMD_ERR close ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
Output:		
	Error code	

Close the wave output device.

4.4.12. start

BSMD_ERR start ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
Output:		
	Error code	

Start Real-time MIDI function.

4.4.13. stop

BSMD_ERR stop ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
Output:		

	Error code	

Stop Real-time MIDI function.

4.4.14. isPlaying

int isPlaying ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
Output:		
	1: playing	
	0: not playing	

Get the flag for the library's Real-time function is enabled, or not.

4.4.15. setChannelMessage

void setChannelMessage ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	unsigned char port	*MIDI Port (0 = A, 1 = B, …)*
	unsigned char status	*MIDI Status (0x80 ~0xEF)*
	unsigned char data1	*1st data (0x00 ~0x7F)*
	unsigned char data2	*2nd data (0x00 ~0x7F)*

Set MIDI channel message.

4.4.16. setSystemExclusiveMessage

void setSystemExclusiveMessage ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	unsigned char port	*MIDI Port (0 = A, 1 = B, …)*
	unsigned char status	*MIDI Status (0xF0)*
	*unsigned char *data*	*Address of data array*

int size	*Length of data [byte]*

Set MIDI system exclusive message.

4.4.17. setFile

BSMD_ERR setFile ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	LPCTSTR path	*Full path of the MIDI file*
Output:		
	Error code	

Specify the MIDI sequence file with file path. See **2.2 Inputs** for available file formats.

4.4.18. setFileMemory

BSMD_ERR setFileMemory ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	*char *address*	*Memory address for the mapped MIDI file*
	long size	*Size of the MIDI file [byte]*
Output:		
	Error code	

Specify the MIDI sequence file mapped on the memory controlled by the application.

4.4.19. getFileMemory

BSMD_ERR getFileMemory ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	*char **address*	*Pointer of the memory address*
	*long *size*	*Pointer of the file size [byte]*
Output:		
	Error code	

Get the memory address and size used for loading MIDI file. This memory is controlled by the library.

4.4.20. getFileInfo

BSMD_ERR getFileInfo ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	*int *format*	*Pointer of the MIDI file format*
	*unsigned short *division*	*Pointer of the MIDI file division [TPQN]*
	*unsigned long *totaltick*	*Pointer of the number of tick*
	*unsigned long *totaltime*	*Pointer of the length [s]*
Output:		
	Error code	

Get information of the specified MIDI sequence file.

4.4.21. startFilePlay

BSMD_ERR startFilePlay ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*

Output:

Error code

Start playback of the specified MIDI file from current song position.

4.4.22. stopFilePlay

BSMD_ERR stopFilePlay ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*

Output:

Error code

Stop playback of the specified MIDI file.

Calling this function means the application instructs the start of fade out process, and the playback still alive. The application has to detect the completion of the playback by the callback function described later.

Current song position will be saved after calling this function.

4.4.23. seekFilePlay

BSMD_ERR seekFilePlay ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*
unsigned long tick	*Song position [MIDI tick]*

Output:

Error code

Specify song position.

4.4.24. isFilePlaying

int isFilePlaying ()

Input:

BSMD_HANDLE handle	*Effective handle of the library*

Output:

1: playing

0: not playing

Get the flag for the library is playing the MIDI file, or not.

4.4.25. ctrl

BSMD_ERR ctrl ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	BSMD_CTRL ctrl	*Control target*
	*void *data*	*Address of data*
	int size	*Size of data [byte]*
Output:		
	Error code	

Do various operations.

ctrl	data		description
	type	I/O	
BSMD_CTRL_SET_SAMPLE_RATE	unsigned long	I	Set playback sample rate [Hz]
BSMD_CTRL_GET_SAMPLE_RATE	unsigned long	O	Get playback sample rate [Hz]
BSMD_CTRL_SET_CHANNELS	int	I	Not supported
BSMD_CTRL_GET_CHANNELS	int	O	Get number of output channels
BSMD_CTRL_SET_BLOCK_SIZE	long	I	Set frame size [sample] of wave output. This value affects the latency of Real-time MIDI function. In ASIO / AudioUnit drives, this value is overwrote by the device drivers. So the applications have to get this value after calling open in section 3.4.10, using BSMD_CTRL_GET_BLOCK_SIZE.
BSMD_CTRL_GET_BLOCK_SIZE	long	O	Get frame size [sample] of wave output.
BSMD_CTRL_SET_BUFFERS	int	I	Set number of frames for wave output. This value affects the latency of Real-time MIDI function. In ASIO / AudioUnit drivers, this value is fixed (= 1).
BSMD_CTRL_GET_BUFFERS	int	O	Get number of frames for wave output.
BSMD_CTRL_SET_POLY	int	I	Set polyphonic number of synthesizer
BSMD_CTRL_GET_POLY	int	O	Get polyphonic number of synthesizer

ctrl	data		description
	type	I/O	
BSMD_CTRL_SET_MASTER_VOLUME	int	I	Set playback volume (BSMP_VOLUME_MIN ~ BSMP_VOLUME_MAX). The default value is BSMP_VOLUME_DEF.
BSMD_CTRL_GET_MASTER_VOLUME	int	O	Get playback volume
BSMD_CTRL_SET_MASTER_KEY	int	I	Set playback key (BSMD_KEY_MIN ~ BSMD_KEY_MAX). The unit of the values is 100[cent], and the default value is BSMD_KEY_DEF. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_MASTER_KEY	int	O	Get playback key.
BSMD_CTRL_SET_MASTER_TUNE	int	I	Set fine tuning (BSMD_TUNE_MIN ~ BSMD_TUNE_MAX). The unit of the values is 1[cent], and the default value is BSMD_TUNE_DEF. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_MASTER_TUNE	int	O	Get fint tuning.
BSMD_CTRL_SET_SPEED	int	I	Set playback speed. (BSMD_SPEED_MIN ~ BSMD_SPEED_MAX). The unit of the value is 1[%], and the default value is BSMD_SPEED_DEF. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_SPEED	int	O	Get playback speed.

ctrl	data		description
	Type	I/O	
BSMD_CTRL_SET_REVERB	*int*	I	Set effectiveness of reverb. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_REVERB	*int*	O	Get effectiveness of reverb
BSMD_CTRL_GET_REVERB _AVAILABLE	*int*	O	Get availability of reverb
BSMD_CTRL_SET_CHORUS	*int*	I	Set effectiveness of chorus. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_CHORUS	*int*	O	Get effectiveness of chorus
BSMD_CTRL_GET_CHORUS _AVAILABLE	*int*	O	Get availability of chorus
BSMD_CTRL_SET_DELAY	*int*	I	Set effectiveness of delay. This value is not cleared on the end of the playback.
BSMD_CTRL_GET_DELAY	*int*	O	Get effectiveness of delay
BSMD_CTRL_GET_DELAY _AVAILABLE	*int*	O	Get availability of delay
BSMD_CTRL_SET_REVERB_HQ	*int*	I	Set HQ Reverb (1: On, 0: Off, Customized version only)

ctrl	data		description
	type	I/O	
BSMD_CTRL_GET_SOUND_LIBRARY_NUM	int	O	Get number of the slots for sound libraries
BSMD_CTRL_SET_SOUND_LIBRARY	BSMD_SOUND_LIBRARY	I	Set sound library with file path
BSMD_CTRL_SET_SOUND_LIBRARY_MEMORY	BSMD_SOUND_LIBRARY_MEMORY	I	Set sound library with memory
BSMD_CTRL_SET_SOUND_LIBRARY_SEL	BSMD_SOUND_LIBRARY_SEL	I	Set selection mode for the loaded sound library
BSMD_CTRL_GET_SOUND_LIBRARY_SEL	BSMD_SOUND_LIBRARY_SEL	I/O	Get selection mode for the loaded sound library
BSMD_CTRL_SET_NUMBER_OF_REGIONS	int	I	Set maximum number of region in each instrument

ctrl	data		description
	type	I/O	
BSMD_CTRL_GET_INSTRUMENT_NAME ~ BSMD_CTRL_GET_INSTRUMENT_NAME + 15	char (TCHAR)	O	Get instrument name of the specified part (Ch1~16)
BSMD_CTRL_SET_MUTE ~ BSMD_CTRL_SET_MUTE + 15	int	I	Set mute (0: Off, 1: On) to the specified part (Ch1~16)
BSMD_CTRL_GET_MUTE ~ BSMD_CTRL_GET_MUTE + 15	int	O	Get mute (0: Off, 1: On) of the specified part (Ch1~16)
BSMD_CTRL_SET_SOLO ~ BSMD_CTRL_SET_SOLO + 15	int	I	Set solo (0: Off, 1: On) to the specified part (Ch1~16)
BSMD_CTRL_GET_SOLO ~ BSMD_CTRL_GET_SOLO + 15	int	O	Get solo (0: Off, 1: On) of the specified part (Ch1~16)

ctrl	data		description
	type	I/O	
BSMD_CTRL_GET_AUDIO_UNIT			Get AudioUnit

4.4.26. version

void version ()		
Input:		
	BSMD_HANDLE handle	*Effective handle of the library*
	LPTSTR engine	*Version of Synthesizer Engine Library*
	int engineSize	*Length of engine*
	LPTSTR driver	*Version of MIDI Driver Library*
	int driverSize	*Length of driver*
Output:		
	void	

Get the name of MIDI Driver Library and Synthesizer Engine Library.

4.5. Callback (BSMD_CALLBACK)

Callback function provides various information to the application. It is specified on 4.4.1 initialize, with function type defined in section 4.2.2. BSMD_CALLBACK.
Each callback is called from calculation thread of synthesizer. So the application can not spend long duration on receiving them.

4.5.1. Open

type = BSMD_CALLBACK_TYPE_OPEN, data = Not used

Wave output driver has been opened

4.5.2. Close

type = BSMD_CALLBACK_TYPE_CLOSE, data = Not used

Wave output driver has been closed

4.5.3. Start

type = BSMD_CALLBACK_TYPE_START, data = Not used

Real-time MIDI function has been started

4.5.4. Stop

type = BSMD_CALLBACK_TYPE_STOP, data = Not used

Real-time MIDI function has been stopped

4.5.5. Audio Frame

*type = BSMD_CALLBACK_TYPE_FRAME, data = (BSMD_FRAME *) frameData*

Called on every frames of wave output process

4.5.6. File Start

type = BSMD_CALLBACK_TYPE_FILE_START, data = Not used

Playback has been started

4.5.7. File Stop

*type = BSMD_CALLBACK_TYPE_FILE_STOP, data = (unsigned long *) errorcode*

Playback has been stopped

errorcode:

0 : Normal

BSMD_ERR_AUDIO_DRIVER : Error stop by wave output driver

BSMD_ERR_DATA : Error stop by data

4.5.8. File Seek

type = BSMP_CALLBACK_TYPE_FILE_SEEK, data = 未使用

Playback song position has been changed.

If your application calculates song position using 4.5.9 MIDI Clockcallback, please reset song position to start, tempo to 120[BPM], on receiving this callback.

4.5.9. MIDI Clock

type = BSMP_CALLBACK_TYPE_CLOCK, data = 未使用

Standard MIDI clock (24[TPQN])

4.5.10. Tempo

*type = BSMP_CALLBACK_TYPE_TEMPO, data = (unsigned long *) tempo*

Playback tempo has been changed ([usec/beat])

4.5.11. Time Signature

*type = BSMP_CALLBACK_TYPE_TIME_SIGNATURE, data = (unsigned long *) timeSignature*

Playback time signature（nn/dd/cc/bb）has been changed.

4.5.12. Channel Message

*type = BSMP_CALLBACK_TYPE_CHANNEL_MESSAGE, data = (unsigned long *) data*

Channel message has been sent by player

bit 31-24: MIDI Port (0x00 ~)

bit 23 - 16: Status byte (0x90 ~ 0xEF)

bit 15 – 8 : First Data (0x00 ~ 0x7F)

bit 7 – 0 : Second Data (0x00 ~ 0x7F)

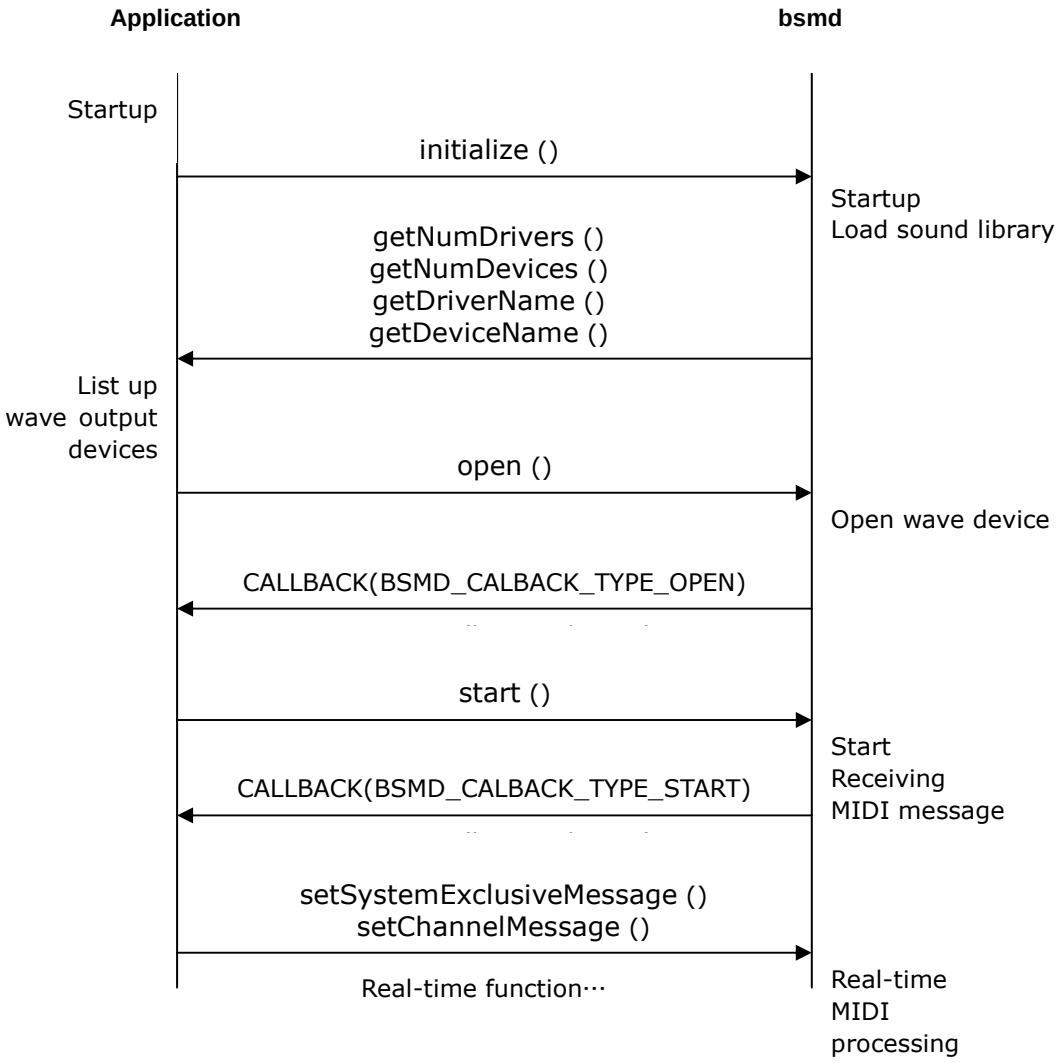
4.5.13. System Exclusive Message

type = BSMP_CALLBACK_TYPE_SYSTEM_EXCLUSIVE_MESSAGE, data = Not used

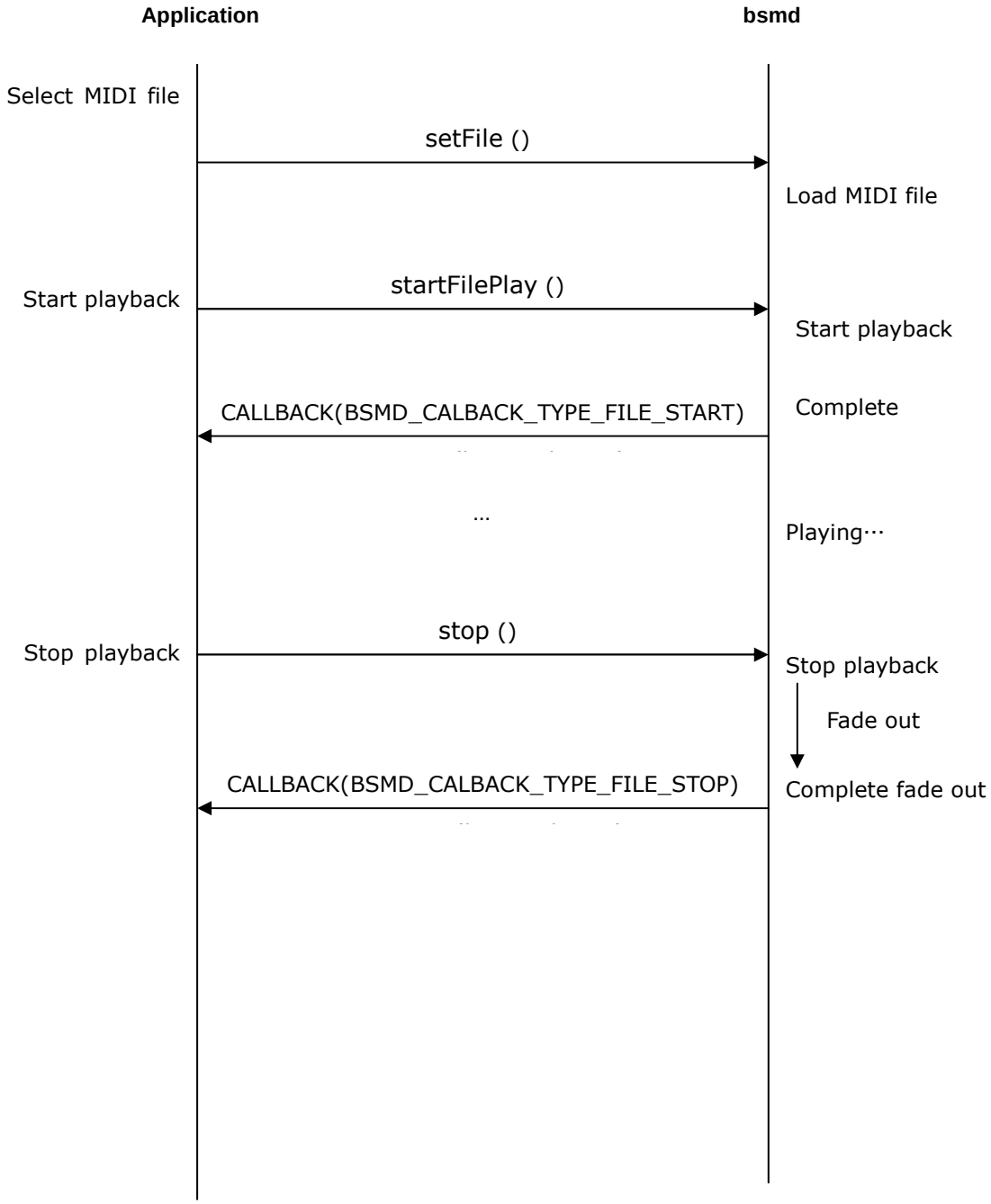
System exclusive message has been sent by player.

4.6. Sequences

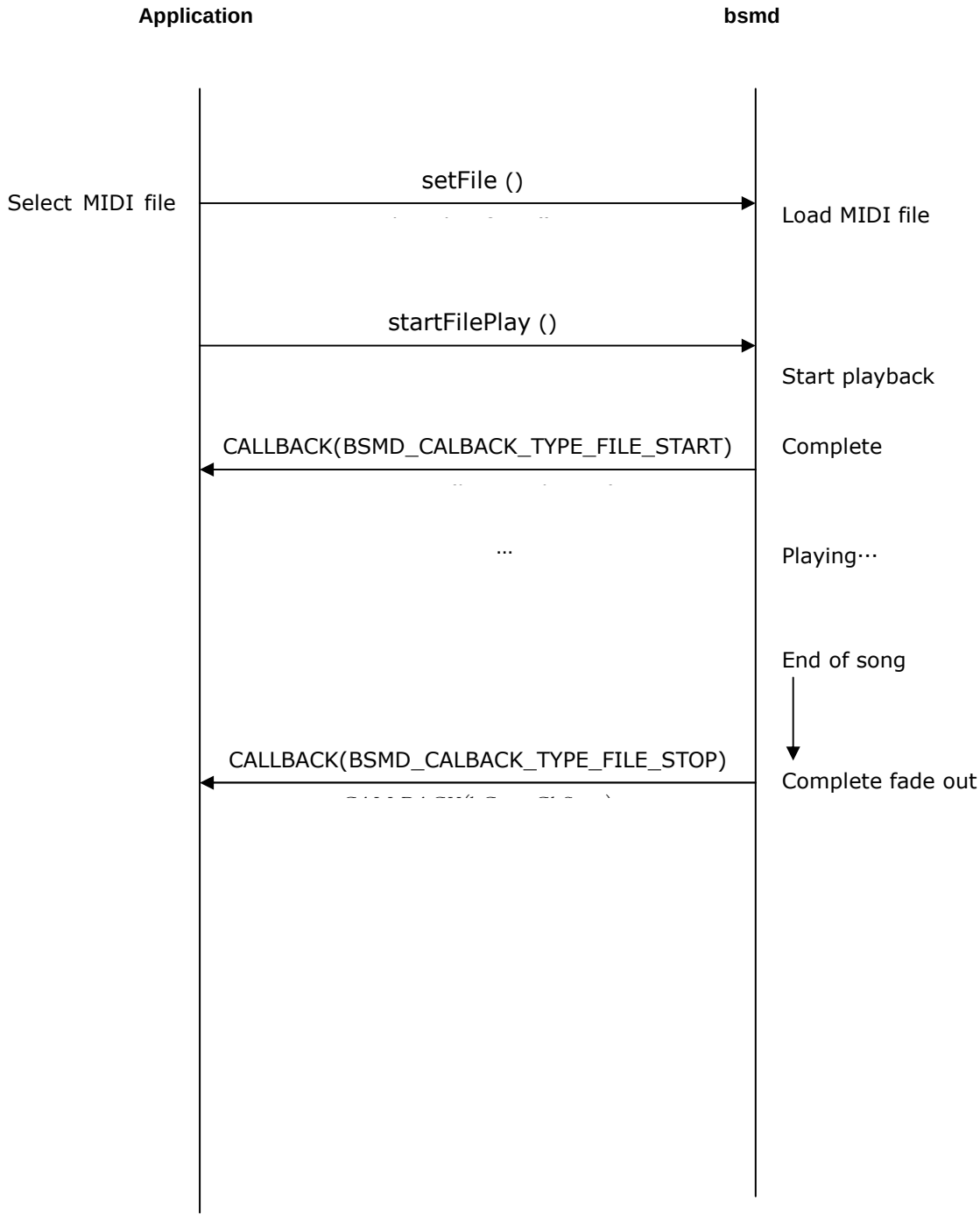
4.6.1. Initializing



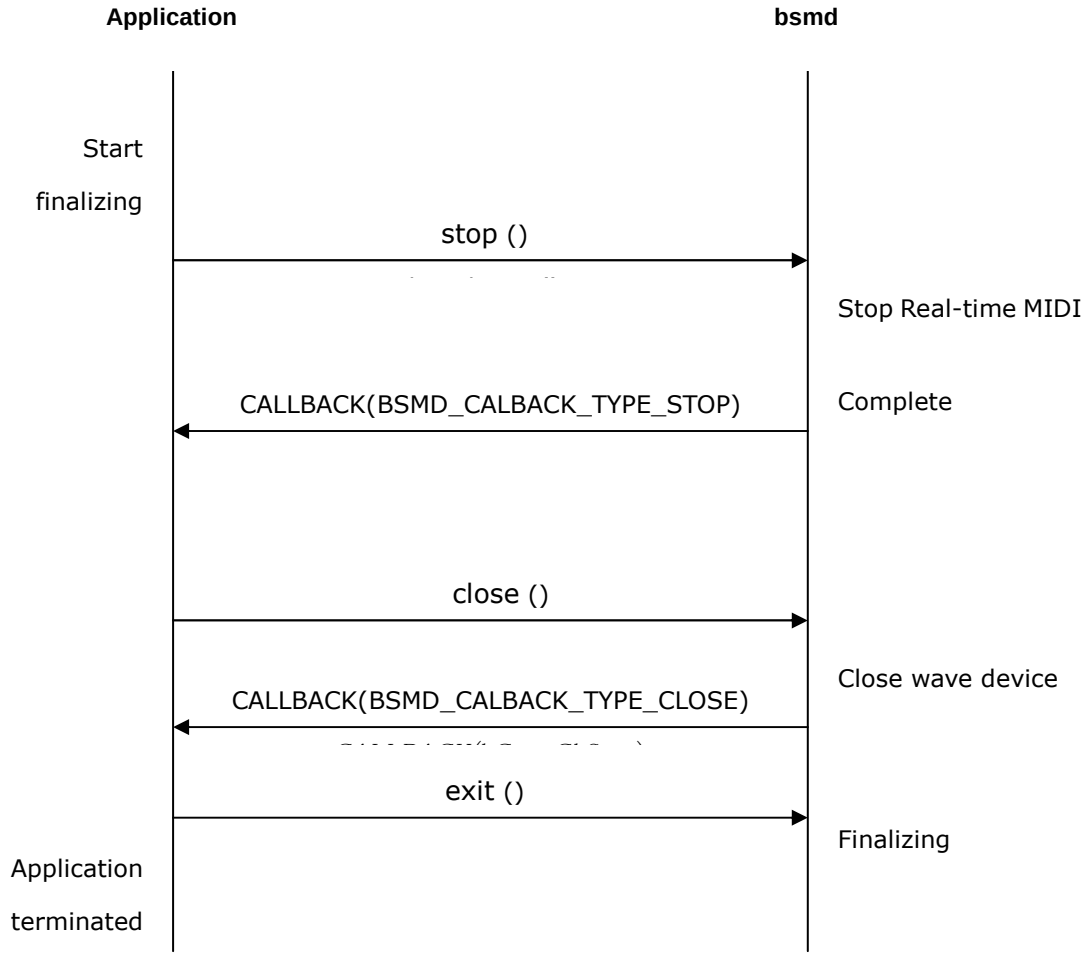
4.6.2. Specifying the MIDI Files – Start Playback – Stop by User



4.6.3. Specifying the MIDI File – Start Playback – End of the Song



4.6.4. Finalizing



5. Appendix

5.1. About DLS File Format

Wave format in <wave-list> chunk should satisfy following specification.

- linear PCM
- monaural

Following modulation routings are not supported. All parameters work with default value.

- Key Number Generator
  - MIDI Note to Key
  - RPN2 to Key
- Filter
  - Mod LFO CC1 to Fc
  - Mod LFO Channel Press. to Fc
- Gain
  - Mod LFO CC1 to Gain
  - Mod LFO Chan. Press. to Gain
  - Velocity to Gain
  - MIDI CC7 to Gain
  - MIDI CC11 to Gain
- Pitch
  - Pitch Wheel RPN0 to Pitch
  - RPN1 to Pitch
  - Vib LFO CC1 to Pitch
  - Vib LFO Chan. Press. to Pitch
  - Mod LFO CC1 to Pitch
  - Mod LFO Chan. Press. to Pitch
- Output
  - MIDI CC10 to Pan
  - Default Reverb Send
  - Default Chorus Send