Cisco TSP Media Driver

Cisco Media Driver introduces a new and innovative way for TAPI-based applications to provide media interaction such as play announcements, record calls, and so on.

Cisco TSP 8.0(1) includes support for both Cisco Media Driver and Cisco Wave Driver, but only one driver can be active at any given time.

Cisco Media Driver offers several advantages:

- Simplified Installation and Management—Cisco Media Driver configuration can be completed through the Cisco TSP Installation Wizard. Channel and port settings are consistently and automatically applied to all configured TSP instances.
- Performance and Scalability—Cisco Media Driver can scale to support up to 1000 configured ports with hundreds of simultaneously active media channels. Refer to the application vendor's Installation Guide to determine the number of channels supported by the TAPI application.
- Codec Support—Cisco Media Driver supports 8KHz, 16-bit PCM, G.711 a-law, G.711 u-law natively. Additionally, G.729a can be supported when pass-through mode is enabled.
- Reliability—Cisco Media Driver runs as an independent process, similar to Windows applications, providing greater application stability and reliability. Creating and debugging media applications is now much easier.

Cisco Rtp Library Components

Header Files

The following header files contain declaration of all functions, data structures, etc. exposed by Cisco Rtp Library.

- ciscortpapi.h
- ciscortpbase.h
- ciscortpcbcs.h
- ciscortpcodec.h
- ciscortperr.h
- ciscortpep.h
- ciscortpip.h

In order to use Cisco Rtp Library functionality a typical application would only need to explicitly include ciscortpapi.h and ciscortpep.h files.

Import Library

The following import library has to be linked with an application in order to use Cisco Rtp Library functionality:

- cmrtplib.lib

DLLs

The following DLLs are installed as a part of CiscoTSP plug-in and used by Cisco Rtp Library:

Windows 32bit OS (x86):

- ciscortplib.dll
- ciscortpmon.dll
- ciscortpg711a.dll
- ciscortpg711u.dll
- ciscortpg729.dll
- ciscortppcm16.dll

Windows 64bit OS (x64):

- ciscortplib64.dll
- ciscortpmon64.dll
- ciscortpg711a64.dll
- ciscortpg711u64.dll
- ciscortpg72964.dll
- ciscortppcm1664.dll

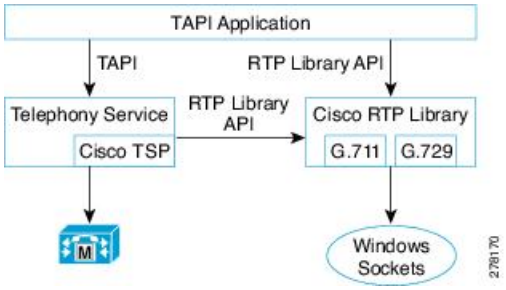
TAPI Application Support

CiscoTSP and Cisco Rtp Library Interaction

In order to allow TAPI applications to associate TAPI line device with Rtp Library media endpoints Cisco TSP implements two new device classes: ciscowave/in and ciscowave/out. If TAPI line device is capable to terminate media by means of Cisco Rtp Library, an application can use ciscowave/in and ciscowave/out device class names in the TAPI lineGetID() function to obtain associated media device identifiers. Media device identifier can be used in Cisco Rtp Library APIs to create media endpoints and manipulate media on a corresponding TAPI line device.

The following figure shows high level view of TAPI application which uses Cisco TAPI service provider and Cisco Rtp Library functionalities.

Figure 1: TAPI Application with Cisco Components



Codec Advertisement

Cisco Media Driver devices advertise G.711 support natively. Cisco Unified CM automatically invokes Media Termination Points (MTPs) when needed to provide transcoding (see Example 1). If MTPs are not configured and transcoding is required, call setup fails (see Example 2).

Example 1

1. G729PassThrough set to OFF (default).
2. TSP application registers CTI port 1.
3. CTI port 1 advertises G.711 support (default).
4. Unified CM is configured with MTPs, which can be used if transcoding is needed.
5. CTI port 1 calls Device 1000.
6. Device 1000 only supports G.729, so an MTP is inserted to provide transcoding.

Example 2

1. G729PassThrough set to OFF (default).

2. TSP application registers CTI port 1.
3. CTI port 1 advertises G.711 support (default).
4. Unified CM is not configured with MTPs for transcoding.
5. CTI port 1 calls Device 1000.
6. Device 1000 only supports G.729 and no MTPs are available, so call setup fails.

Applications which natively support G.729 can change the default codec advertisement by setting the G729PassThrough registry option to ON (1).

The TSP application is then responsible for playing the appropriate media file (G.711 or G.729) based on the compatible codecs supported by the Device receiving the media (see Example 3 below).

The Registry key can be found at:

- Windows XP: HKEY_Local_Machine/Software/Cisco Systems, Inc./ RtpLib/G729PassThrough
- Windows Vista: HKEY_USERS\S-1-5-20\Software\Cisco Systems, Inc.\ RtpLib\G729PassThrough

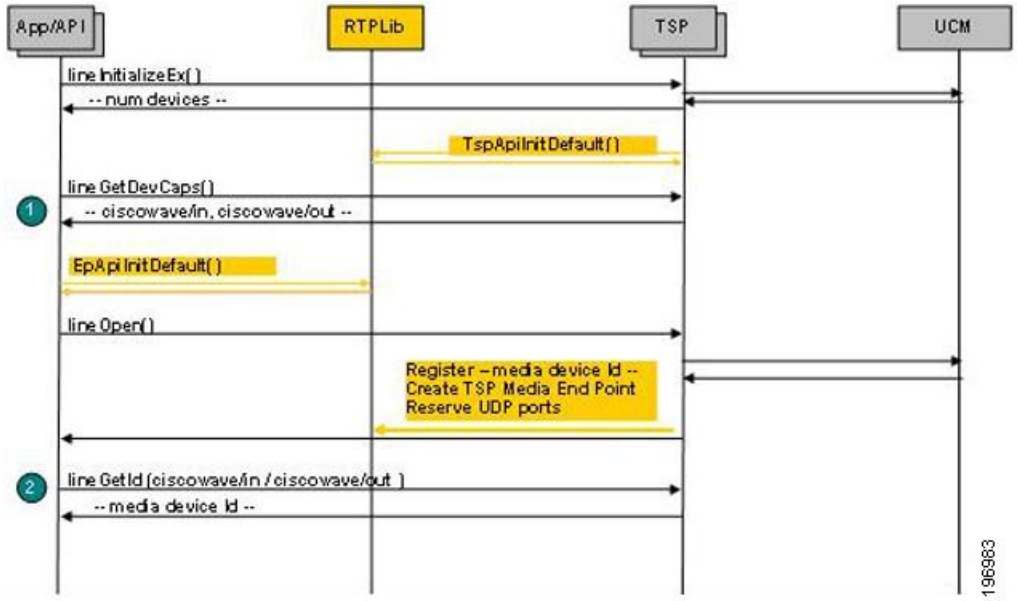
Example 3

1. G729PassThrough set to ON.
2. TSP application registers CTI port 1.
3. CTI port 1 advertises G.711 and G.729 support.
4. Unified CM is not configured with MTPs for transcoding.
5. CTI port 1 calls Device 1000.
6. Device 1000 only supports G.729, so the application plays the appropriate G.729 media file.

Typical TAPI Application Message Flow

The message flow in the following figure is described in steps 1 and 2.

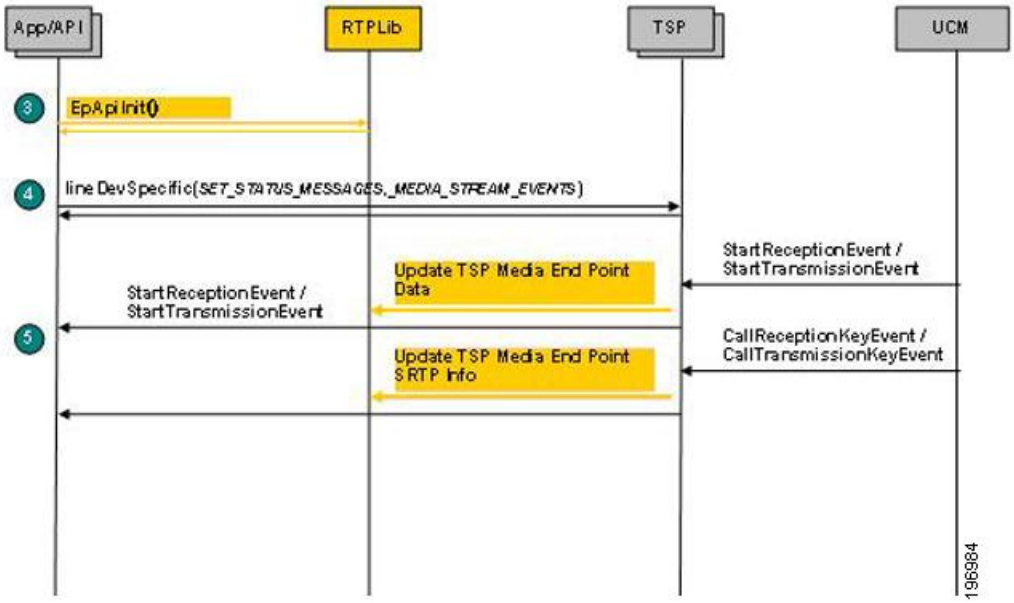
Figure 2: Typical TAPI Application Message Flow 1



1. Initialize TAPI, get LINEINFO for available line devices, find devices which are capable of using Cisco Rtp Library functionalities
2. Get media device identifier associated with a particular line device

   The message flow in the following figure is described in steps 3 to 5.

Figure 3: Typical TAPI Application Message Flow 2

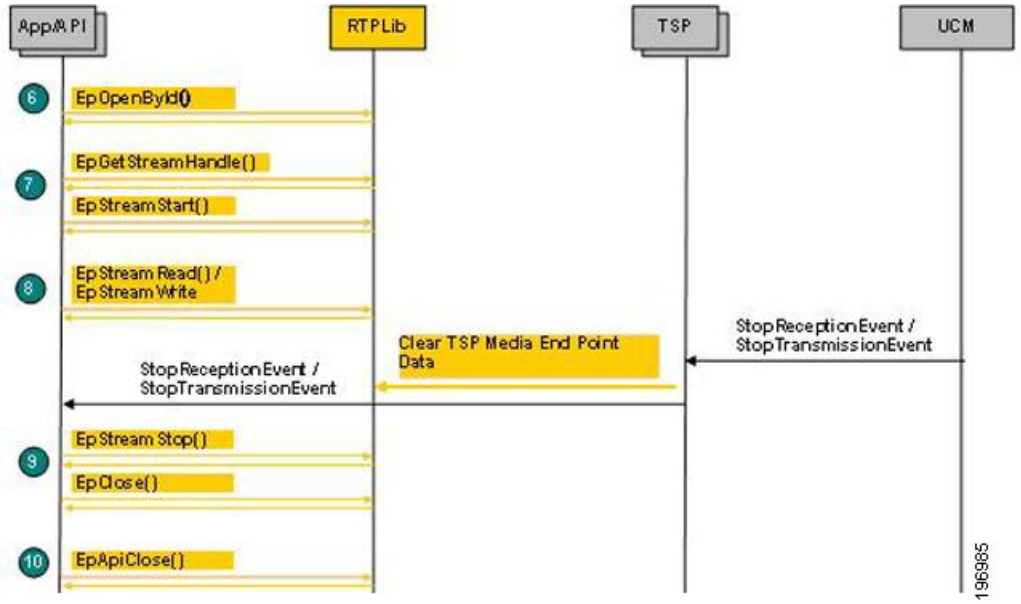


3. Initialize Rtp Library
4. Subscribe for media stream events for relevant devices using Cisco lineDevSpecific extension

5. Start monitoring media events

   The message flow in following figure is described in steps 6 to 10.

   Figure 4: Typical TAPI Application Message Flow 3



6. Create media endpoint
7. Get in/out stream handle and start data streaming
8. Receive / transmit data
9. Stop data streaming, close endpoint
10. Close EpAPI before exiting the program

EpAPI Functions

EpApiInit

Initializes EpApi and Rtp Library.

Syntax

```
CMAPI bool     EpApiInit (
PRTPLIBTRACE   pTraceCallback,
USHORT         portRangeStart,
USHORT         numPorts,
int            IPAddressFamily,
PRTPADDR       pDefaultRtpAddr
);
```

Parameters

pTraceCallback

Pointer to an application callback function to be called with the trace record data passed to it.

portRangeStart

First port number in the continuous range of UDP ports (port pool) which can be used to create endpoints.

numPorts

Number of ports in the UDP port range (port pool) which can be used to create endpoints.

IPAddressFamily

IP address family to be used by Rtp Library to create endpoints can be set to:

- AF_UNSPEC: both AF_INET and AF_INET6 can be used.
- AF_INET: AF_INET only can be used.
- AF_INET6: AF_INET6 only can be used.

This settings can be overwritten by the pDefaultRtpAddr parameter.

pDefaultRtpAddr

IP address to be used use by Rtp Library to create endpoints. If not NULL, only this address will be used.

Return Value

If no errors occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_ADDR_NOTAVAIL	Unable to create endpoint with specified IP address family
EP_ERR_PARAM_INVALID	The following describes a possible cause of the error: Invalid number of UDP ports
RTP_ERR_INITALREADY	Already initialized
RTP_ERR_TIMER_NOTAVAIL	Unable to create high resolution timer

Remarks

An error code can be set even when EpApiInit returns true. In some cases a default action / value can be assumed even if a parameter or registry settings is invalid. In those cases EpApiInit returns true but also set a proper error code to indicate an issue.

EpApiInitByDefault

Initializes EpApi and Rtp Library with default settings.

Syntax

```
CMAPI bool EpApiInitByDefault (
    PRTPLIBTRACEpTraceCallback,
);
```

Parameters

pTraceCallback

Pointer to an application callback function to be called with the trace record data passed to it.

Return Value

If no errors occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
RTP_ERR_INITALREADY	Already initialized

Remarks

Rtp Library will be initialized as if registry is set as follows:

- UDPPortRangeStart = 50000
- UDPPortRangeEnd = 50999

EpApiClose

Closes EpApi.

Syntax

```
CMAPI bool EpApiClose ();
```

Return Value

If no errors occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.

Remarks

As a result of this function execution all active sessions, connections and streams will be terminated, timers closed and all data freed.

EpLocalAddressGetAll

Returns an array of RTPADDR structures which contain local IP addresses available for use by Rtp Library.

Syntax

```
CMAPI int EpLocalAddressPortGetAll(
  PRTPADDR pBuffer,
  int *    pBufSize
);
```

Parameters

pBuffer

Pointer to a memory buffer to fill in with array of RTPADDR structures or NULL.

pBufSize

- IN—Length of the buffer (in bytes), pointed to by pBuffer.
- OUT—Space in the buffer used or required.

Return Value

If no errors occurs, this function returns a number of available local IP addresses and an array of RTPADDR structures in the pBuffer.

If pBuffer parameter value is NULL, the function returns the number of available local IP addresses and the pBufSize will contain the buffer size required for the RTPADDR structure array.

If an error occurs, 0 is returned and a specific error code can be retrieved by calling EpApiGetLastError. In case of EP_ERR_PARAM_INVALID error, pBufSize will contain the size of the required buffer.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_PARAM_INVALID	Buffer is not large enough.

EpLocalAddressPortGet

Reserves port from the port pool and returns it together with a local IP address.

Syntax

```
CMAPI PRTPADDR EpLocalAddressPortGet();
```

Return Value

If no errors occurs, this function returns pointer to RTPADDR structure with the first (or default) local IP address used by Rtp Library and reserved UDP port number.

If an error occurs, NULL is returned and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
RTP_ERR_PORT_NOTAVAIL	No UDP port available.

EpLocalAddressPortGetByFamily

Reserves port from the port pool and returns it alone with a local IP address for the specified family.

Syntax

```
CMAPI PRTPADDR EpLocalAddressPortGetByFamily(
  int          IPAddressFamily
);
```

Parameters

IPAddressFamily

IP address family: AF_INET or AF_INET6

Returns: Pointer to RTPADDR structure or NULL.

Return Value

If no errors occurs, this function returns pointer to RTPADDR structure with the first local IP address for the specified family used by Rtp Library and reserved UDP port number. If an error occurs, NULL is returned and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
RTP_ERR_ADDR_NOTAVAIL	No IP address available for specified family
RTP_ERR_PORT_NOTAVAIL	No UDP port available.

EpLocalAddressPortGetByIdx

Reserves UDP port from the Rtp Library port pool and returns it in the RTPADDR data structure alone with the IP address of the network interface card specified by the index parameter.

Syntax

```
CMAPI PRTPADDR EpLocalAddrPortGetByIdx (
  int          index
);
```

Parameters

index

Index in the list of available local network addresses returned by EpLocalAddressGetAll function call.

Return Value

If no error occurs, this function returns pointer to RTPADDR structure which contains local IP address and reserved UDP port number. If an error occurs, NULL is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_PARAM_INVALID	Invalid index value.
RTP_ERR_PORT_NOTAVAIL	No UDP port available.

Remarks

List of available local network addresses can be obtained by EpLocalAddressGetAll function call.

EpLocalAddrPortFree

Returns local UDP port previously reserved by EpLocalAddressGet, EpLocalAddressGetByIdx or EpLocalAddressGetByFamily back to the port pool.

Syntax

```
CMAPI bool EpLocalAddrPortFree (
  PRTPADDR pLocalAddrPort
);
```

Parameters

pLocalAddrPort

Pointer to RTPADDR data structure which contains port number of previously reserved local UDP port.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.

Remarks

Local UDP could is reserved by EpLocalAddressGet, EpLocalAddressGetByIdx or EpLocalAddressGetByFamily.

EpOpenById

Creates media endpoint based on TSP data associated with the specified media device identifier.

Syntax

```
CMAPI HANDLE EpOpenById (
  DWORD             deviceId,
  StreamDirection   streamDir,
  PRTPDATACALLBACK  pCallback
);
```

Parameters

deviceId

Media device identifier obtained by calling TAPI lineGetID() for ciscowave/in or ciscowave/out device class.

streamDir

Stream direction. This parameter can be one of the following values:

- ToApp
- ToNwk
- Both

pCallback

Pointer to an application callback function to be called when data buffer is received/sent or an error occurred.

Return Value

If no errors occurs, this function returns a handle which can be used to reference the endpoint. If an error occurs, NULL is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_PARAM_INVALID	The following describes a possible cause of the error: • Specified device identifier is invalid. • Required data associated with device identifier data is missing • Specified stream direction is invalid

Remarks

Endpoint is created based on a data associated by TSP with the deviceId.

EpClose

Close endpoint created by EpOpen.

Syntax

```
CMAPI bool EpClose (
  HANDLE   hEp
);
```

Parameters

hEp

Endpoint handle returned by EpOpen.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified endpoint handle is invalid.

EpGetStreamHandle

Returns endpoint stream handle for a specified stream type and direction

Syntax

```
CMAPI HANDLE EpGetStreamHandle (
  HANDLE           hEp,
  StreamType       streamType,
  StreamDirection  streamDir
);
```

Parameters

hEp

Endpoint handle returned by EpOpen.

streamType

Stream type. This parameter can be one of the following values:

- STREAM_TYPE_AUDIO
- STREAM_TYPE_VIDEO

streamDir

Stream direction. This parameter can be one of the following values:

- ToApp
- ToNwk

Return Value

If no errors occurs, this function returns stream handle which can be used to reference the stream. If an error occurs, NULL is returned, and a specific error code can be retrieved by calling EpApiGetLastError

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified endpoint handle is invalid.
EP_ERR_PARAM_INVALID	Specified stream type or direction is invalid.

EpStreamStart

Enables data flow on a specified stream

Syntax

```
CMAPI bool EpStreamStart (
  HANDLE            hStream,
  PRTPDATACALLBACK  pCallback
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pCallback

Pointer to an application callback function to be called when data buffer is received/sent or an error occurred.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified endpoint handle is invalid.
EP_ERR_ADDR_INUSE	Address (protocol-IPaddress-port) is already in use.

Remarks

EpStreamStart() should be explicitly called by an application in order to stream data flow (open socket, port). It is not done implicitly by the Rtp Library as it was done before by the Cisco kernel mode wave driver.

EpStreamStop

Disables data flow on a specified stream.

Syntax

```
CMAPI bool EpStreamStop (
  HANDLE   hStream
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

Return Value

If no errors occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

Remarks

EpStreamStop() should be explicitly called by an application in order to disable stream data flow. It is not done implicitly by the Rtp Library as it was done before by the Cisco kernel mode wave driver.

EpStreamRead

Read data from a stream.

Syntax

```
CMAPI bool EpStreamRead (
  HANDLE            hStream,
  PUCHAR            pBuffer,
  int               bufLen,
  PVOID             pAppData,
  PRTPDATACALLBACK  pCallback
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pBuffer

Pointer to a buffer for incoming data.

bufLen

Buffer size.

pAppData

Pointer to an application data area. It will be associated with the buffer and will be passed back to the application callback function as the pAppData parameter.

pCallback

Pointer to an application callback function to be called when data buffer is received or an error occurred.

Return Value

If no errors occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpStreamWrite

Write data to a stream.

Syntax

```
CMAPI bool EpStreamWrite (
  HANDLE           hStream,
  PUCHAR           pBuffer,
  int              bufLen,
  PVOID            pAppData,
```

```
  PRTPDATACALLBACK pCallback
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pBuffer

Pointer to a buffer which contains data.

bufLen

Data length

pAppData

Pointer to an application data area. It will be associated with the buffer and will be passed back to the application callback function as the pAppData parameter.

pCallback

Pointer to an application callback function to be called when data buffer has been written or an error occurred.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpStreamCodecInGet

Returns stream inbound codec format information.

Syntax

```
CMAPI bool EpStreamCodecInGet (
  HANDLE         hStream,
  PWAVEFORMATEX  pWaveFormat
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pWaveFormat

Pointer to a WAVEFORMATEX data structure. Upon successful completion of the request this structure is filled with stream inbound codec format data.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpStreamCodecInSet

Sets stream inbound codec format.

Syntax

```
CMAPI bool EpStreamCodecInSet (
  HANDLE         hStream,
  PWAVEFORMATEX  pWaveFormat,
  ULONG          pktSizeMs
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pWaveFormat

Pointer to a WAVEFORMATEX data structure which contains codec information.

pktSizeMs

Packet size in milliseconds. If value 0 (zero) is specified a default value (20) is used.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpStreamCodecOutGet

Returns stream outbound codec format information.

Syntax

```
CMAPI bool EpStreamCodecOutGet (
  HANDLE          hStream,
  PWAVEFORMATEX   pWaveFormat
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pWaveFormat

Pointer to a WAVEFORMATEX data structure. Upon successful completion of the request this structure is filled with stream outbound codec format data.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpStreamCodecOutSet

Sets stream outbound codec format.

Syntax

```
CMAPI bool EpStreamCodecInSet (
  HANDLE          hStream,
  PWAVEFORMATEX   pWaveFormat,
  ULONG           pktSizeMs
);
```

Parameters

hStream

Stream handle returned by EpGetStreamHandle.

pWaveFormat

Pointer to a WAVEFORMATEX data structure which contains codec information.

pktSizeMs

Packet size in milliseconds. If value 0 (zero) is specified a default value (20) is used.

Return Value

If no error occurs, this function returns true. If an error occurs, false is returned, and a specific error code can be retrieved by calling EpApiGetLastError.

Error code	Description
EP_ERR_INIT	EpAPI is not initialized.
EP_ERR_HANDLE_INVALID	Specified stream handle is invalid.

EpApiTraceLevelSet

Sets EpApi (Rtp Library) trace level.

Syntax

```
CMAPI bool EpApiTraceLevelSet (
  int  traceLevel
);
```

Parameters

traceLevel

Required Rtp Library trace level. This parameter can be one of the following values:

Table 1: Error Codes for EpApiTraceLevelSet

Trace level	Description
0 -Error	Output only error messages (reported in Windows Event Log).
1 -Alarm	Output alarms and error messages (reported in Windows Event Log).
2 -Warning	Output warnings, alarms and error messages (reported in Windows Event Log).
3 -Info	Output informational messages, alarms, warnings, and error messages (not reported in Windows Event Log).
4 -Debug	Output debug information, informational messages, alarms, warnings, and error messages (not reported in Windows Event Log).

Return Value

Current trace level.

EpApiGetLastError

Retrieves last-error code value. The last-error code is maintained on a per-thread basis.

Syntax

CMAPI int EpApiGetLastError();

Parameters

This function has no parameters.

Return Value

The return value is the calling thread's last error code.

EpApi Error Codes

Most of the EpApi functions do not return a specific cause of an error when the function returns but rather set global error code value which can be retrieved by calling EpApiGetLastError function. The following list describes possible error codes returned by EpApiGetLastError function. Errors are listed in numerical order.

Table 2: Error Codes for EpApi

Return code/Value	Description
EP_ERR_OK 0	No error occurred.
EP_ERR_INIT 17002	EpAPI is not initialized.
EP_ERR_PARAM_INVALID 17003	Invalid parameter.
EP_ERR_ADDR_NOTAVAIL 17100	Unable to create endpoint with specified IP address family
EP_ERR_ADDR_INUSE 17101	Address (Protocol -IP address -port) is already in use.
EP_ERR_HANDLE_INVALID 17102	Invalid endpoint or stream handle.

Callback Function

An application can define a callback function in order to receive information about such things as operation completions, data transfers, and errors. Callback functions can be specified when an endpoint is created, when a stream callback is opened, and when a stream callback operation is initiated. If a callback operation is not specified a corresponding stream callback is invoked, if defined. If a stream callback is not specified a corresponding callback endpoint is invoked, if defined.

Note If the callback function is defined, it is invoked for every operation that is initiated on a corresponding stream, endpoint, etc. Consideration should be given to the case where a callback function is defined as a method in an object that is dynamically created and destroyed. In that case destruction should not occur until all initiated operations are complete.

Endpoint Callback

Syntax

```
typedef void (WINAPI  *PRTPENDPOINTCALLBACK) (
  HANDLE           hEp,
  HANDLE           hStream,
  DWORD            dwError,
  PUCHAR           pData,
  DWORD            dwDataSize,
  LPVOID           pUserData,
  bool             bIsSilence,
  StreamDirection  streamDir
);
```

Parameters

hEp

Endpoint handle

hStream

Rtp stream handle

dwError

If not 0 (zero), indicates an error

pData

Endpoint handle

dwDataSize

Number of bytes received / transferred.

pUserData

Application data associated with an operation.

bIsSilence

If set to true, indicates that silence has been detected.

streamDir

Stream direction. Can be one of the following:

- ToApp
- ToNwk

Data Callback

Syntax

```
typedef void (WINAPI  *PRTPDATACALLBACK) (
  HANDLE           hStream,
  DWORD            dwError,
  PUCHAR           pData,
  DWORD            dwDataSize,
  LPVOID           pUserData,
  bool             bIsSilence,
);
```

Parameters

hStream

Rtp stream handle

dwError

If not 0 (zero), indicates an error

pData

Endpoint handle

dwDataSize

Number of bytes received / transferred.

pUserData

Application data associated with an operation.

bIsSilence

If set to true, indicates that silence has been detected.

Data Structures

RTPADDR

Basic endpoint data structure which contains all endpoint related data, such as IP address, UDP port number, etc.

```
typedef struct sRTPAddrInfo {
  ADDRINFOT         info,
  SOCKADDR_STORAGE  addr,
  SOCKET            sock,
  bool              multicast,
  DWORD             dscp,
  SRTPINFO2         srtp,
  RTPSIL            silence,
  ULONG             pktSizeMs
} RTPADDR, *PRTPADDR;
```

Where:

info

System defined ADDRINFOT structure

addr

System defined SOCKADDR_STORAGE structure

sock

System defined SOCKET data (bound socket)

multicast

If set to true, RTPADDR instance represents multicast address, otherwise unicast.

dscp

DSCP / QoS data

srtp

SRTP data

silence

Silence processing parameters

pktSizeMs

Packet size in milliseconds

RTPSIL

Contains silence processing related data for a specific endpoint. It uses the following SilenceType enumeration:

```
typedef enum {
  Off     = 0,
  Packets = Off + 1,
  Energy  = Packets +1
} SilenceType;

typedef struct {
  SilenceType  type,
  ULONG        duration,
  ULONG        threshold,
  ULONG        currentOffset,
  bool         detecting
} RTPSIL, *PRPTSIL;
```

Where:

type

Silence detection type as it is defined in SilenceType.

duration

Duration in milliseconds.

threshold

Energy threshold.

currentOffset

Silence offset (G.729).

detecting true

Silence detection enabled.

RTPCODEC

```
typedef struct {
    WAVEFORMATEX   wfe;
    WORD           (WINAPI *formatTag) ();
    WORD *         (WINAPI *supported) (ULONG & nmb);
    ULONG          (WINAPI *fmtBytesToThis) (WORD fmt, ULONG len);
    ULONG          (WINAPI *thisBytesToFmt) (ULONG len, WORD fmt);
    UCHAR          (WINAPI *pad) ();
    PXLATE          xlateTo;
    PXLATE          xlateFrom;
    PRTPSIL        (WINAPI *silenceInit)(PRTPSIL ps, SilenceType type,
 ULONG duration, ULONG threshold);
    ULONG          (WINAPI *silenceSet) (PRTPSIL, PUCHAR, ULONG);
    bool           (WINAPI *isSilence)  (PRTPSIL, ULONG pcktSizeInMs,
 bool & beenChanged, PUCHAR, ULONG);
    void           (WINAPI *silenceFree)(PRTPSIL);
} RTPCODEC, *PRTPCODEC;
```

Trace Options

Rtp Library have several logging options to facilitate application debugging and trouble-shooting:

Reporting in the Windows Event Log

Sending trace data to the OutputDebugString and can be view by any “trace listener”, for example Sysinternals DebugView

Providing trace data to an application in the trace callback

Trace Level

Trace level specifies what messages are to be included in trace output and is defined as follows:

Trace level	Description
0 -Error	Output only error messages (reported in Windows Event Log).
1 -Alarm	Output alarms and error messages (reported in Windows Event Log).
2 -Warning	Output warnings, alarms and error messages (reported in Windows Event Log).
3 -Info	Output informational messages, alarms, warnings, and error messages (not reported in Windows Event Log).
4 -Debug	Output debug information, informational messages, alarms, warnings, and error messages (not reported in Windows Event Log).

Trace level can be set and modified with the EpApiTraceLevelSet() function.

Trace Callback Function

An application can set trace callback. The callback function will be invoked by Rtp Library whenever it is ready to record a trace and will be provided with the trace record data. Trace callback can be set and modified when EpApi is initialized. Trace callback function type is declared as follows:

Syntax

```
typedef void (WINAPI  *PRTPLIBTRACE) (
  int           level,
  const         _TCHAR  *pData
);
```

Parameters

level

Current trace record level.

pData

Pointer to the current trace record data.

Known Problems or Limitations

Below is the list of currently known Rtp Library problems and limitations:

- CSCsy13584 – RtpLib: The only supported PCM encoding is 8k16bit, mono
- There is no G.729 transcoding available