# VXG Media Camera Capture SDK for Android Programmer's Guide

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Nov 30, 2016

## Content

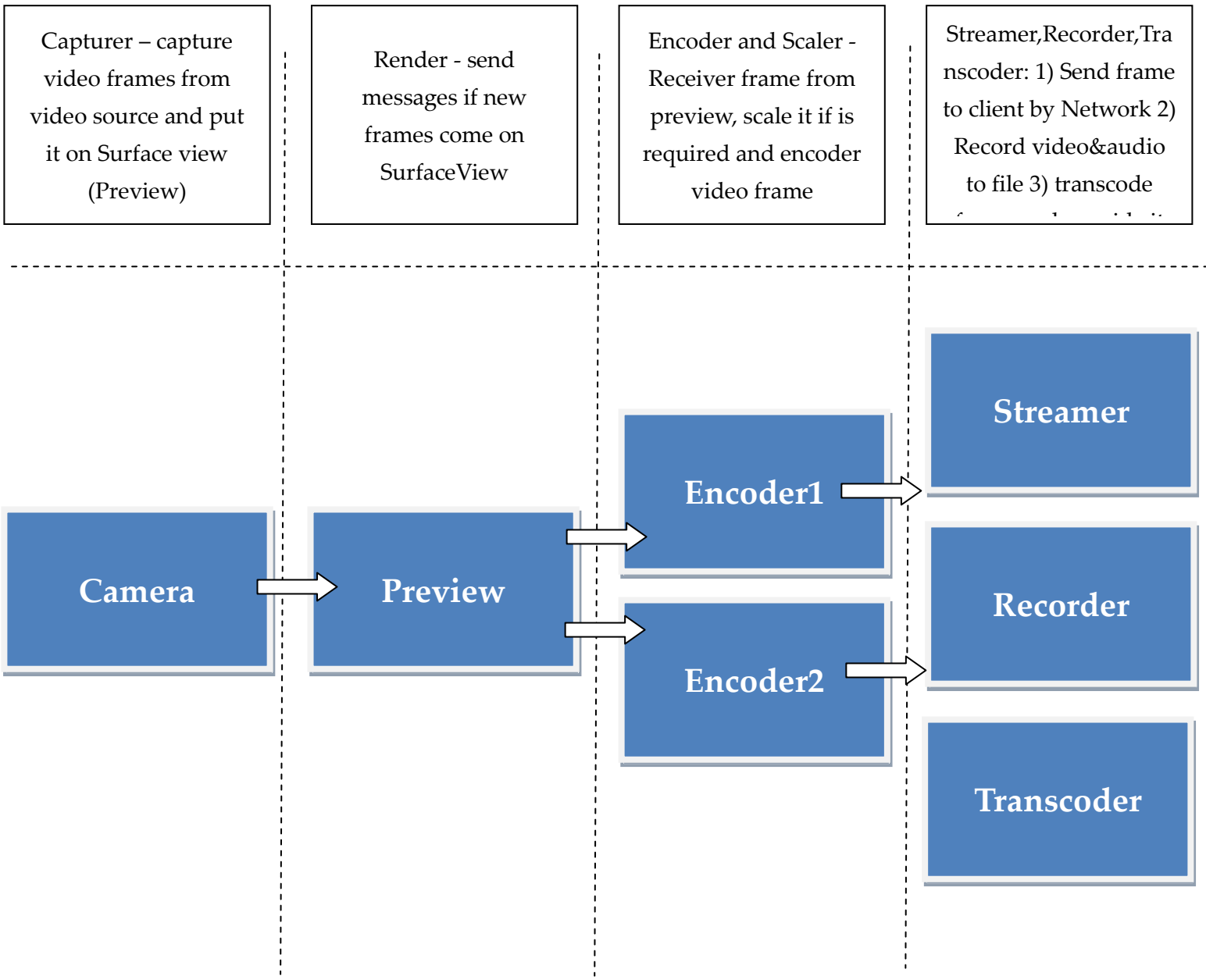
# 1. Overview

Mobile Camera Capture SDK consists of a set of resources for fast and convenient development of mobile applications to capture video or audio stream and provide it by network using Publish RTMP, RTSP. The core of the SDK is a library for application development.

**Key Features:**

**Hardware acceleration** – a new hardware accelerated encoder up to UHD resolution.
**Multi-core encoding** – support of the multiple processor cores for decoding.
**Multi-channel support** – simultaneous encoding of 2 streams: Main and Secondary channels.
**Video integration with any Activity** – is based on SurfaceView and can be integrated into any Activity.
**Hardware pre and post video processing –** hardware de-interlacing and various pre and post video processing using OpenGL shaders.
**Custom and standard notifications** – notifies application about connection, disconnection and other events. It is possible to add custom events.
**Low latency for network stream** – special API to control encoder latency.
**Record streams** – special API to record streams into mp4 file.
**Transcoding** – obtain the raw video or elementary streams video or/and audio.

## 2. Block diagram



# 3. How to Use

## 3.1 Android version

The SDK works with Android version 4.1 (API 16+) or newer.

## 3.2 Folders and files

The SDK package consists of the following folders.

**bin** *(Sample application package)*
MediaStreamTest.apk
**libs** *(Library files to be linked to the application)*
mediacapturedk.jar
libstreamer.so
librtstm.so
**src** *(Sample project to test the SDK)*
**doc** **(***Documentation including this document)*

## 3.3 Development tools

Build environment is Eclipse, Android Studio and using gradle.

## 3.4 Integration with an application

### 3.4.1 Integration using a resource file in 2 steps:

**Step1:** Add to layout xml for your activity as below:

```
<FrameLayout xmlns:android="http://schemas.android.com/apk/res/android"
   android:layout_width="fill_parent"
   android:layout_height="fill_parent"
   >

   <veg.mediacapture.sdk.MediaCapture
     android:id="@+id/captureView"
     android:layout_width="fill_parent"
```

```
    android:layout_height="fill_parent"
    android:layout_gravity="center"
    />

    </FrameLayout>
```

**Step 2**: Change main activity
(MainActivity.java)

```
public class MainActivity extends Activity implements MediaCapture.MediaCaptureCallback
{
...
    // callback handler
   @Override
        public int OnCaptureStatus(int arg) { return 0; };
   @Override
        public int OnCaptureReceiveData(ByteBuffer buffer, int type, int size, long pts){
return 0; };


   @Override
   public void onCreate(Bundle savedInstanceState)
   {
    ...
                // Create Capturer instance
                capturer = (MediaCapture)findViewById(R.id.captureView);

                //adjust Capturer' config
                MediaCaptureConfig config = capturer.getConfig();
                config.setUrl("rtmp://srv");
                config.setStreaming(true);
                //etc
                //open the Capturer
                capturer.Open(null, this);
```

```
protected void onPause()
{
	Log.e(TAG, "onPause()");
	super.onPause();

	if (capturer != null)
		capturer.onPause();
}

@Override
protected void onResume()
{
	Log.e(TAG, "onResume()");
	super.onResume();
	if (capturer != null)
		capturer.onResume();
}

@Override
protected void onStart()
{
Log.e(TAG, "onStart()");
	super.onStart();
	sMainActivity = this;

	// Lock screen
	mWakeLock.acquire();

	if (capturer != null)
		capturer.onStart();
}

@Override
protected void onStop()
{
	Log.e(TAG, "onStop()");
```

```
        super.onStop();
        if (capturer != null)
            capturer.onStop();

        // A WakeLock should only be released when isHeld() is true !
        if (mWakeLock.isHeld()) mWakeLock.release();

        if (toastShot != null)
            toastShot.cancel();

        if(misSurfaceCreated){
            finish();
        }
    }

@Override
public void onBackPressed()
{
        if (toastShot != null)
            toastShot.cancel();

        if(capturer != null)
            capturer.Close();

        super.onBackPressed();
}

    @Override
    public void onWindowFocusChanged(boolean hasFocus)
    {
        Log.e(TAG, "onWindowFocusChanged(): " + hasFocus);
        super.onWindowFocusChanged(hasFocus);
        if (capturer != null)
            capturer.onWindowFocusChanged(hasFocus);
    }
```

```
	@Override
	public void onLowMemory()
	{
		Log.e(TAG, "onLowMemory()");
		super.onLowMemory();
		//if (capturer != null)
		//	capturer.onLowMemory();
	}

	@Override
	protected void onDestroy()
	{
		Log.e(TAG, "onDestroy()");
		if (toastShot != null)
			toastShot.cancel();

		if (capturer != null)
			capturer.onDestroy();

		System.gc();

		if (multicastLock != null) {
		   multicastLock.release();
		   multicastLock = null;
		}
		super.onDestroy();
	}

}
```

### 3.4.2 Integration dynamically (without modifying resources)

**Step 1**: The approach is similar to 2.4.1 except the capturer is created dynamically within onCreate() method:

```
   @Override
```

```
public void onCreate(Bundle savedInstanceState)
{
 ...
        // Create Capturer instance
        capturer = new MediaCapture(this, null);

        FrameLayout.LayoutParams params = new
    FrameLayout.LayoutParams(250,250, Gravity.CENTER);
    capturer.setLayoutParams(params);

  //
  // Add Capture Instance to layout
  FrameLayout lp = (FrameLayout)findViewById(R.id.captureView);
  lp.addView(capturer);

        //adjust Capturer' config
        MediaCaptureConfig config = capturer.getConfig();
        config.setUrl("rtmp://srv");
        config.setStreaming(true);
        //etc
        //open the Capturer
        capturer.Open(null, this);

protected void onPause()
    {
        Log.e(TAG, "onPause()");
        super.onPause();

        if (capturer != null)
            capturer.onPause();
    }

    @Override
    protected void onResume()
    {
        Log.e(TAG, "onResume()");
```

```
        super.onResume();
        if (capturer != null)
                capturer.onResume();
}

@Override
protected void onStart()
{
Log.e(TAG, "onStart()");
        super.onStart();
        sMainActivity = this;

        // Lock screen
        mWakeLock.acquire();

        if (capturer != null)
                capturer.onStart();
}

@Override
protected void onStop()
{
        Log.e(TAG, "onStop()");
        super.onStop();
        if (capturer != null)
                capturer.onStop();

        // A WakeLock should only be released when isHeld() is true !
        if (mWakeLock.isHeld()) mWakeLock.release();

        if (toastShot != null)
                toastShot.cancel();

        if(misSurfaceCreated){
                finish();
        }
```

```
	}

@Override
public void onBackPressed()
{
		if (toastShot != null)
			toastShot.cancel();

		if(capturer != null)
			capturer.Close();

		super.onBackPressed();
}

	@Override
	public void onWindowFocusChanged(boolean hasFocus)
	{
		Log.e(TAG, "onWindowFocusChanged(): " + hasFocus);
		super.onWindowFocusChanged(hasFocus);
		if (capturer != null)
			capturer.onWindowFocusChanged(hasFocus);
	}

	@Override
	public void onLowMemory()
	{
		Log.e(TAG, "onLowMemory()");
		super.onLowMemory();
		//if (capturer != null)
		//	capturer.onLowMemory();
	}

	@Override
	protected void onDestroy()
	{
		Log.e(TAG, "onDestroy()");
```

```
        if (toastShot != null)
                toastShot.cancel();

        if (capturer != null)
                capturer.onDestroy();

        System.gc();

        if (multicastLock != null) {
           multicastLock.release();
           multicastLock = null;
        }
        super.onDestroy();

    }
```

### 3.4.3 Integration with Activity

The SDK is based on SurfaceView and can be integrated into any Activity using the code below:

```
<FrameLayout
        android:id="@+id/captureViewLayout"
        android:layout_width="fill_parent"
        android:layout_height=" fill_parent " >

        < veg.mediacapture.sdk.MediaCapture
           android:id="@+id/captureView"
           android:layout_width="fill_parent"
           android:layout_height="fill_parent"
           android:layout_gravity="center" />
    </FrameLayout>
```

## 3.5 Manifest requirements

Following settings should be set in manifest to avoid any issues with camera using and SDK.

android:launchMode="singleInstance"
android:noHistory="true"
android:configChanges="orientation|screenSize"

# 4. Media Capture

## 4.1 Notifications

SDK notifies about results, errors and notifications using "MediaCapture" callback. All messages are synchronous and SDK core waits until the application handles a message.

| Value | Name | Type | Description |
|---|---|---|---|
| 700 | CAP_OPENED | NOTIFICATION | Capturer has been opened successfully |
| 701 | CAP_STARTED | NOTIFICATION | Capturer has been started successfully |
| 702 | CAP_STOPPED | NOTIFICATION | Capturer has been stopped successfully |
| 703 | CAP_CLOSED | NOTIFICATION | Capturer has been closed successfully |
| 704 | CAP_ERROR | NOTIFICATION | Error is happened, details can be got by call function: ErrorGetRTMPStatus or getRECStatus |
| 705 | CAP_TIME | NOTIFICATION | Modules statistics were refreshed |
| 706 | CAP_SURFACE_CREATED | NOTIFICATION | Surface is created, Important notification start function is to be called after this notification |
| 707 | CAP_SURFACE_DESTROYED | NOTIFICATION | Surface is destroyed |
| 708 | CAP_RECORD_STARTED | NOTIFICATION | File record started, see the record property PP_RECORD_STAT_FILE_NAME |
| 709 | CAP_RECORD_STOPPED | NOTIFICATION | File record stopped see the record property PP_RECORD_STAT_FILE_NAME_STOPPED |

## 4.2 Functions description

Following functions are member of MediaCapture class. These functions should be used to playback network content and media files.

**Open**

Open camera, create preview and initialize all modules.

Definition
int Open(final MediaCaptureConfig config, final MediaCaptureCallback callback)

Parameters:

| | |
|---|---|
| MediaCaptureConfig | Initialize parameters |
| MediaPlayerCallback | notification callback, event is provided over this callback |

Return Value

Upon successful completion **Open**() returns 0. Otherwise -1 is returned. All errors are provided in callback status.

Remarks

Connect to network resource or open local media file, create pipeline, allocate resource and start video playback.

Example

```
MediaCapture  capturer = new MediaCapture();
// Get config
MediaCaptureConfig config = capturer.getConfig();
        config.setStreaming(true);
        config.setCaptureMode(ncm);
        config.setAudioFormat(MediaCaptureConfig.TYPE_AUDIO_AAC);
        config.setVideoBitrate(abitrate);
        config.setAudioSamplingRate(44100); //hardcoded
        config.setAudioChannels(2);
        config.setUrl(rtmp_url);
        config.setvideoOrientation(0); //landscape
        config.setVideoFramerate(30);
        config.setVideoBitrate(vbitrate);

player.Open(null, This);
```

All configuration parameters are described in the table below:

| Name | Description | Values | Default value | Type |
|---|---|---|---|---|
| Streaming | Set/Get<br>Enable streaming | | True | Boolean |

| | | | | |
|---|---|---|---|---|
| | module | | | |
| UseAVSync | Set/Get<br>Enable AV sync | | True | Boolean |
| AudioFormat | Set/Get<br>Control audio format | TYPE_AUDIO_AAC<br>TYPE_AUDIO_AC3<br>TYPE_AUDIO_AMR_N<br>TYPE_AUDIO_AMR_WB<br>TYPE_AUDIO_EAC3<br>TYPE_AUDIO_FLAC<br>TYPE_AUDIO_G711_ALAW<br>TYPE_AUDIO_G711_MLAW<br>TYPE_AUDIO_RAW<br>TYPE_AUDIO_VORBIS<br>TYPE_AUDIO_MPEG<br>TYPE_AUDIO_MSGSM<br>TYPE_AUDIO_OPUS<br>TYPE_AUDIO_QCELP | TYPE_AUDIO_G711_ALAW | String |
| AudioSamplingRate | Set/Get<br>Control audio sample rate | 8000-96000 (depends on device capabilities) | 44100 | Int |
| AudioChannels | Set/Get<br>Control num of audio channels | 1-5 (depends on device capabilities) | 2 | Int |
| AudioBitrate | Set/Get<br>Control Audio bitrate | Kpbs | 128 | Int |
| VideoBitrate | Set/Get<br>Control Video bitrate | Kpbs | 1000 | Int |
| VideoFramerate | Set/Get<br>Control video frame rate | | 30 | Int |
| videoOrientation | Set/Get<br>Control orientation | 0: landscape; 90: portrait | 0 | Int |
| VideoResolution | Set/Get<br>Control Video resolution | VR_1920x1080(0)<br>VR_1280x720(1)<br>VR_640x480(2)<br>VR_320x240(3)<br>VR_3840x2160(4),<br>VR_720x576(5),<br>VR_640x480(6),<br>VR_352x288(7),<br>VR_176x144(8),<br>VR_640x360(9),<br>VR_720x405(10),<br>VR_864x486(11), | VR_1280x720 | CaptureVideoResolution |

| | | | | |
|---|---|---|---|---|
| | | VR_960x540(12) | | |
| SecVideoBitrate | RTSP only secondary video<br>Set/Get<br>Control Video bitrate | Kpbs | 1000 | Int |
| SecVideoFramerate | RTSP only secondary video<br>Set/Get<br>Control video frame rate | Kbps | 30 | Int |
| SecVideoResolution | RTSP only secondary video<br>Set/Get<br>Control Video resolution | VR_1920x1080(0)<br>VR_1280x720(1)<br>VR_640x480(2)<br>VR_320x240(3)<br>VR_3840x2160(4),<br>VR_720x576(5),<br>VR_640x480(6),<br>VR_352x288(7),<br>VR_176x144(8),<br>VR_640x360(9),<br>VR_720x405(10),<br>VR_864x486(11),<br>VR_960x540(12) | VR_320x240 | CaptureVideoResolution |
| Recording options | | | | |
| Recording | Set/Get<br>Enable video recording | | false | Boolean |
| RecordPath | Set/Get<br>Set full path for recorded files | | "" | String |
| RecordFlags | Set/Get<br>Set setting for recording | PP_RECORD_NO_START(0x00000000)<br>PP_RECORD_AUTO_START(0x00000001)<br>PP_RECORD_SPLIT_BY_TIME(0x00000002)<br>PP_RECORD_SPLIT_BY_SIZE(0x00000004)<br>PP_RECORD_DISABLE_VIDEO(0x00000008)<br>PP_RECORD_DISABLE_AUDIO(0x00000010) | 0 | PlayerRecordFlags |
| RecordSplitTime | Set/Get<br>Split stream on chunks by time if flags are | | 0 | Int |

| | | | | |
|---|---|---|---|---|
| | PP_RECORD_SP LIT_BY_TIME, in seconds | | | |
| RecordSplitSize | Set/Get<br>Split stream on chunks by size if flags are PP_RECORD_SP LIT_BY_ SIZE, in seconds | | 0 | Int |
| RecordPrefix | Set/Get<br>Prefix is added to name of recorded files | | "" | String |
| Transcoding options | | | | |
| Transcoding | Set/Get<br>Enable transcoding | | False | Boolean |
| TransWidth | Set/Get<br>Control width of transcoded picture | | 256 | Int |
| TransHeight | Set/Get<br>Control height of transcoded picture | | 144 | Int |
| TransFps | Set/Get<br>Control height of transcoded picture | | 2 | Int |
| TransFormat | Set/Get | TYPE_VIDEO_RAW | TYPE_VIDEO _RAW | String |

## Close

Close capturer and release all resources.

Definition

public void Close()

Parameters

There are no parameters for this call

Return Value

Upon successful completion, **Close()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks

Close capturer, destroy pipeline, free all resources that were allocated on Open() call.

Examples
capturer.Close ();

## Start

Start all modules (streaming, recording and transcoding) according configuration.

Definition
public void Start()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **Start()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Start all modules (streaming, recording and transcoding) according configuration. ***Important note:*** **Start** function should be called after CAP_SURFACE_CREATED notification.

Examples
capturer.Start();

## Stop

Stop all started modules. State is changed from Started to Stopped.

Definition
public void Stop()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **Stop()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Stop all started modules and change state from Started to Stopped.

Examples
capturer.Stop ();

## StartStreaming

Start only streaming module.

Definition
public void StartStreaming()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **StartStreaming()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Start streaming module. Format of streaming is set configuration.
***Important note:*** **Start** function should be called after CAP_SURFACE_CREATED notification.

Examples
capturer.StartStreaming();

## StopStreaming

Stop streaming module.

Definition
public void StopStreaming()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **StopStreaming()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Stop streaming module.

Examples
capturer.StopStreaming ();

## StartRecodring

Start only recording module.

Definition
public void StartRecording()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, **StartRecording()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks

Start recording module.
***Important note:*** **Start** function should be called after CAP_SURFACE_CREATED notification.

Examples
capturer.StartRecording();

## StopRecording

Stop recording module.

Definition
public void StopRecording()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **StopRecording()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Stop only recording module.

Examples
capturer.StopRecording ();

## StartTranscoding

Start only transcoding module.

Definition
public void StartTranscoding()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **StartTranscoding()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Start transcoding module.
***Important note:*** **Start** function should be called after CAP_SURFACE_CREATED notification.

Examples
capturer.StartTranscoding();

## StopTranscoding

Stop transcoding module.

Definition
public void StopTranscoding()

Parameters
There are no parameters for this call

Return Value
Upon successful completion, **StopTranscoding()** returns 0. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Stop trancoding module.

Examples
capturer.StopTranscoding ();

**getState**

Return capturer state.

Definition
public CaptureState getState()

Parameters
There are no parameters for this call

Return Value
Following states are provided:
0 - Opening
1 - Opened
2 - Started
3 - Paused
4 - Stopped
5 - Closing
6 - Closed

Remarks
Provide the current state of capturer.

Examples
if (capturer.getState() == CapturerState.Closing) ;

**getRTMPStatus**

Return status of RTPM.

Definition
public CaptureState getRTMPState()

Parameters
There are no parameters for this call

Return Value
Following states are provided:
0 – NO ERROR
-1 – Try to connect
-5 – Connecting error
-12 – Out of memory
-999 – Demo version

Remarks
Provide the current state of capturer.

Examples
if (capturer.getRTMPState() == CapturerState.Closing) ;

**getRecStatus**

Return status of Recording module.

Definition
public CaptureState getRecState()

Parameters
There are no parameters for this call

Return Value
Following states are provided:
0 – NO ERROR
-1 – Try to open file
-5 – File open error
-12 – Out of memory
-999 – Demo version

Remarks
Provide the current state of capturer.

Examples

if (capturer.getRecState() == CapturerState.Closing) ;

**getDuration**

Return time from that is expired from starting of capturer.

Definition
public long getDuration()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getDurarion**()** returns time in milliseconds from capturer start. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Return time from that is expired from starting of capturer.

Examples
int duration = capturer.getDuration() ;

**getVideoPackets**

Provide the number of video frames in buffer before streaming.

Definition
public long getVideoPackets()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getVideoPackets**()** returns number of frames. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks

Provide the number of video frames in buffer before streaming. It is used for streaming only, mode :Publish RTMP.

Examples
int duration = capturer. getVideoPackets () ;

**getAudioPackets**

Provide the number of audio frames in buffer before streaming.

Definition
public long getAudioPackets()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getAudioPackets**()** returns number of frames. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Provide the number of audio frames in buffer before streaming. It is used for streaming only, mode :Publish RTMP.

Examples
int duration = capturer. getAudioPackets () ;

**getLastVideoPTS**

Provide the timestamp for last video frame is sent by streaming module by network.

Definition
public long getLastVideoPTS()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getLastVideoPTS **()** returns timestampt. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Provide the timestamp for last video frame is sent by streaming module by network. It is used for only streaming module in case if mode is Publish RTMP.

Examples
int v_pts = capturer. getLastVideoPTS () ;

**getLastAudioPTS**

Provide the timestamp for last audio sample is sent by streaming module by network.

Definition
public long getLastAudioPTS()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getLastVideoPTS **()** returns timestampt. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Provide the timestamp for last audio sample is sent by streaming module by network. It is used for only streaming module in case if mode is Publish RTMP.

Examples
Int a_pts = capturer. getLastAudioPTS () ;

**getStatReconnectCount**

Provide the number or reconnections to RTMP server that happened from the

streaming start.

Definition
public long getStatReconnectCount()

Parameters
There are no parameters for this call.

Return Value
Upon successful completion, getStatReconnectCount returns number of reconnection. Otherwise, -1 is returned. All errors are provided in callback status.

Remarks
Provide the number or reconnections to RTMP server that happened from streaming start. It is used for only streaming module in case if mode is Publish RTMP.

Examples
Int a_pts = capturer. getStatReconnectCount () ;

**get Record Properties**

| Name | Description | Function | Type |
|---|---|---|---|
| PP_RECORD_STAT_DURATION | Get current recording file duration in milliseconds | getPropLong(PP_RECORD_STAT_DURATION) | long |
| PP_RECORD_STAT_DURATION_TOTAL | Get total recording duration in milliseconds | getPropLong(PP_RECORD_STAT_DURATION_TOTAL) | long |
| PP_RECORD_STAT_SIZE | Get current recording file size in bytes | getPropLong(PP_RECORD_STAT_SIZE) | long |
| PP_RECORD_STAT_SIZE_TOTAL | Get total recorded bytes | getPropLong(PP_RECORD_STAT_SIZE_TOTAL) | long |
| PP_RECORD_STAT_FILE_NAME | Get current recording file name | getPropString(PP_RECORD_STAT_FILE_NAME) | String |
| PP_RECORD_STAT_FILE_NAME_STOPPED | Get file name of file just recorded | getPropString(PP_RECORD_STAT_FILE_NAME_STOPPED) | String |