VXG Media Camera Capture SDK for Android Programmer's Guide

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Content

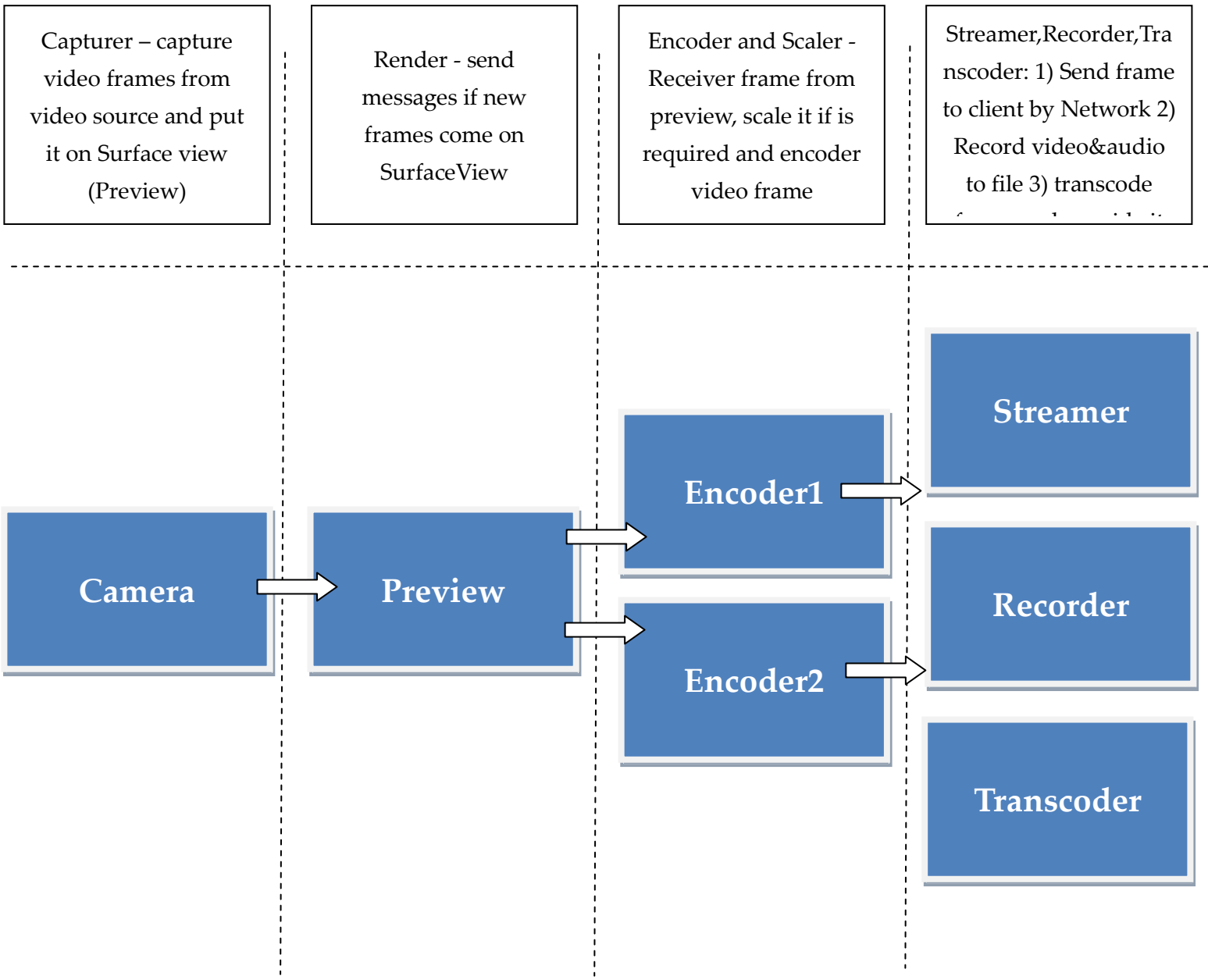
1. Overview

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 Preview channel.
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.

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
1	CAP_OPENED	NOTIFICATION	Capturer has been opened successfully
2	CAP_STARTED	NOTIFICATION	Capturer has been started successfully
3	CAP_STOPPED	NOTIFICATION	Capturer has been stopped successfully
4	CAP_CLOSED	NOTIFICATION	Capturer has been closed successfully
5	CAP_ERROR	NOTIFICATION	Error is happened, details can be got by call function: ErrorGetRTMPStatus or getRECStatus
6	CAP_TIME	NOTIFICATION	Modules statistics were refreshed
7	CAP_SURFACE_CREATED	NOTIFICATION	Surface is created, Important notification start function is to be called after this notification
8	CAP_SURFACE_DESTROYED	NOTIFICATION	Surface is destroyed

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 Enable streaming module		True	Boolean
UseAVSync	Set/Get Enable AV sync		True	Boolean
AudioFormat	Set/Get Control audio format	TYPE_AUDIO_AAC TYPE_AUDIO_AC3 TYPE_AUDIO_AMR_N TYPE_AUDIO_AMR_WB TYPE_AUDIO_EAC3	TYPE_AUDIO_G711_ALAW	String

		TYPE_AUDIO_FLAC TYPE_AUDIO_G711_ALAW TYPE_AUDIO_G711_MLAW TYPE_AUDIO_RAW TYPE_AUDIO_VORBIS TYPE_AUDIO_MPEG TYPE_AUDIO_MSGSM TYPE_AUDIO_OPUS TYPE_AUDIO_QCELP		
AudioSamplingRate	Set/Get Control audio sample rate	8000-96000 (depends on device capabilities)	44100	Int
AudioChannels	Set/Get Control num of audio channels	1-5 (depends on device capabilities)	2	Int
AudioBitrate	Set/Get Control Audio bitrate	Kpbs	128	Int
VideoBitrate	Set/Get Control Video bitrate	Kpbs	1000	Int
VideoFramerate	Set/Get Control video frame rate		30	Int
videoOrientation	Set/Get Control orientation	0: landscape; 90: portrait	0	Int
VideoResolution	Set/Get Control Video resolution	VR_1920x1080 VR_1280x720 VR_640x480 VR_320x240	VR_1280x720	CaptureVideoResolution
SecVideoBitrate	RTSP only secondary video Set/Get Control Video bitrate	Kpbs	1000	Int
SecVideoFramerate	RTSP only secondary video Set/Get Control video frame rate	Kbps	30	Int
SecVideoResolution	RTSP only secondary video Set/Get Control Video resolution	VR_1920x1080 VR_1280x720 VR_640x480 VR_320x240	VR_320x240	CaptureVideoResolution
Recording options				

Recording	Set/Get Enable video recording		false	Boolean
RecordPath	Set/Get Set full path for recorded files		""	String
RecordFlags	Set/Get Set setting for recording	PP_RECORD_NO_START(0x00000000) PP_RECORD_AUTO_START(0x00000001) PP_RECORD_SPLIT_BY_TIME(0x00000002) PP_RECORD_SPLIT_BY_SIZE(0x00000004) PP_RECORD_DISABLE_VIDEO(0x00000008) PP_RECORD_DISABLE_AUDIO(0x00000010)	0	PlayerRecordFlags
RecordSplitTime	Set/Get Split stream on chunks by time if flags are PP_RECORD_SPLIT_BY_TIME, in seconds		0	Int
RecordSplitSize	Set/Get Split stream on chunks by size if flags are PP_RECORD_SPLIT_BY_ SIZE, in seconds		0	Int
RecordPrefix	Set/Get Prefix is added to name of recorded files		""	String
Transcoding options				
Transcoding	Set/Get Enable transcoding		False	Boolean
TransWidth	Set/Get Control width of transcoded picture		256	Int
TransHeight	Set/Get Control height of transcoded picture		144	Int
TransFps	Set/Get 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 () ;