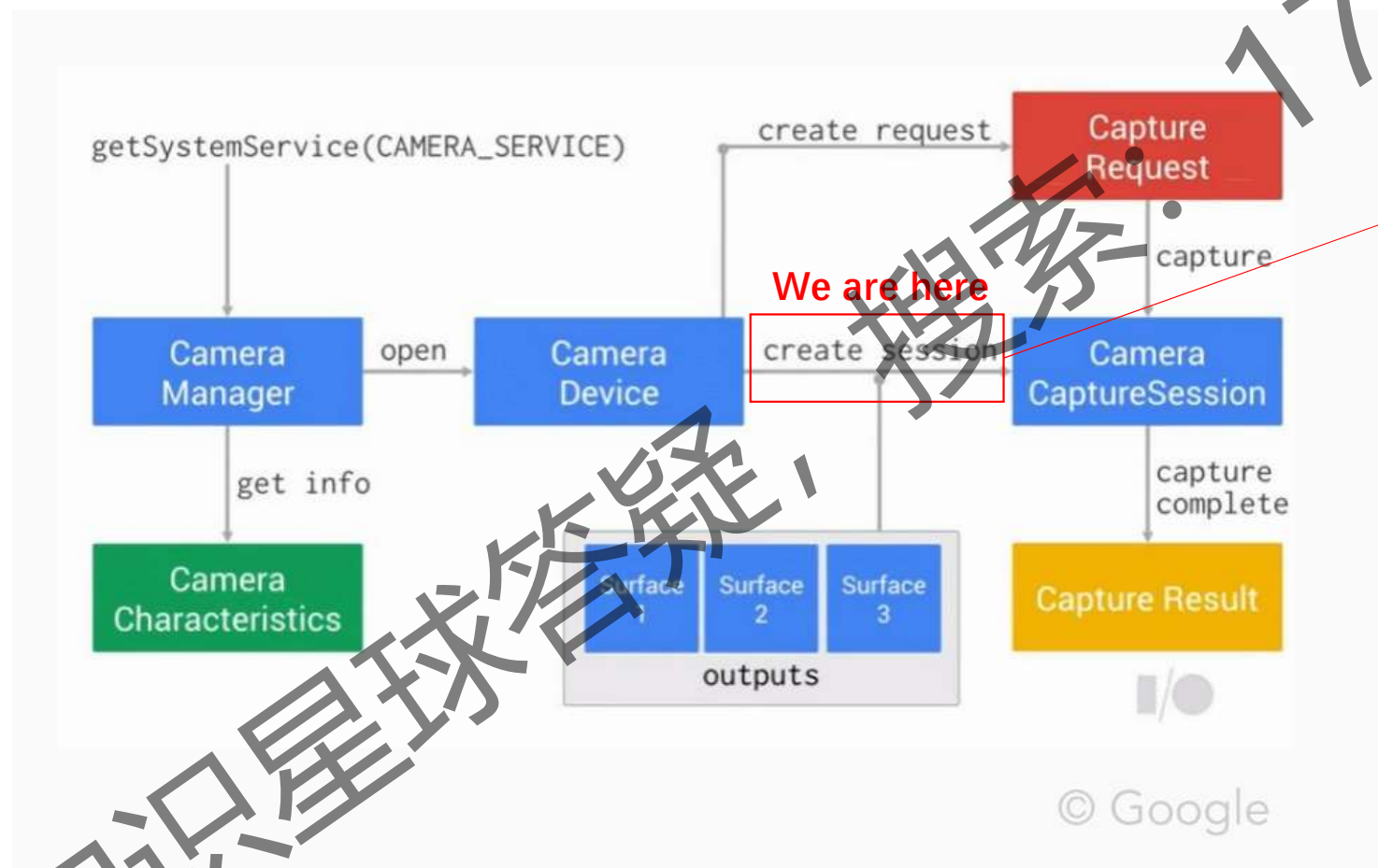


Android Camera2 API专题

第21讲

createCaptureSession详解

课程体系



- StreamConfigurationMap
- OutputConfiguration
- InputConfiguration
- SessionConfiguration
- **createCaptureSession**

Agenda

- createCaptureSession (SessionConfiguration config)介绍
- 根据不同的场景选择Surface
- 流配置表说明
- Regular流配置表
- Reprocessing流配置表（第17讲介绍过）
- Constrained high-speed recording流配置

createCaptureSession (SessionConfiguration config)介绍

- 创建CameraCaptureSession
 - 创建CameraCaptureSession时，需要包含所有的Output/Input Surfaces
 - 创建好CameraCaptureSession后，提交的CaptureRequest中带的Surfaces只能在这组Surfaces里面选择
- 创建CameraCaptureSession一般需要几百毫秒，Camera HAL会对一些硬件做上电操作、创建Pipeline动作等等
- CameraCaptureSession的切换
 - 直接调用createCaptureSession，前面的CameraCaptureSession会被close掉
 - 最快的切换方式
 - 先调用旧CameraCaptureSession#abortCaptures，再创建新的CameraCaptureSession

根据不同的场景选择Surface

场景	Surface组件	使用方法
Preview	SurfaceView	surfaceCreated(SurfaceHolder holder)时调用SurfaceHolder.setFixedSize(int, int)设置Size, 然后调用SurfaceHolder.getSurface()来获取Surface
OpenGL ES处理 (Preview)	SurfaceTexture	调用SurfaceTexture.setDefaultBufferSize(int, int)设置Size, 然后通过new Surface(SurfaceTexture)来获取Surface
录像	MediaCodec	配置完MediaCodec后, 调用MediaCodec.createInputSurface()来获取Surface
录像	MediaRecorder	配置完MediaRecorder后, 调用MediaRecorder.getSurface()来获取Surface
YUV处理	Renderscript	配置好Allocation后, 调用Allocation.getSurface()来获取Surface
抓图(Raw/YUV/JPEG...)	ImageReader	配置好ImageReader后, 调用ImageReader.getSurface()来获取Surface
Reprocess	CameraCaptureSession	CameraCaptureSession创建好后, 调用CameraCaptureSession#getInputSurface来获取Surface

流配置表格说明

- Format

- PRIV: `ImageFormat.PRIVATE`, 对App透明的
- YUV: `ImageFormat.YUV_420_888`
- JPEG: `ImageFormat.JPEG`
- RAW: `ImageFormat.RAW_SENSOR`

- Size

- PREVIEW: 跟屏幕宽高比一致, $\leq 1080P$
- RECORD: `CamcorderProfile`中定义的最大录像Size
- MAXIMUM: `StreamConfigurationMap#getOutputSizes`中的最大值
- MULTI_RES: `MultiResolutionStreamConfigurationMap#getOutputInfo(int)`获取到的值

流配置表格说明

- 超出流配置表限制

- 如何理解是否超出表格限制

- 某一行表示一个Streams Configuration组合，比如这一行支持8MP YUV和2MP PRIV
 - [8 MP YUV, 2 MP PRIV] 或者 [2 MP YUV, 2 MP PRIV]组合配置能成功
 - [8 MP YUV, 4 MP PRIV], 或者 [4 MP YUV, 4 MP PRIV], 或者 [8 MP PRIV, 2 MP YUV]不能确保是否成功

- 如果App使用超出下面表格限制的Surfaces来创建Session，有三种可能发生

- CameraCaptureSession能创建成功，并能正常工作
 - CameraCaptureSession能创建成功，但帧率无法达到StreamConfigurationMap#getOutputMinFrameDuration的要求
 - CameraCaptureSession创建失败

- 也有可能可以成功创建Session，可以通过如下两种方式尝试

- isSessionConfigurationSupported(SessionConfiguration)
 - 调用createCaptureSession看是否不会发生Exception 或 收到onConfigured回调

Regular Capture - LEGACY

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
PRIV	MAXIMUM					Simple preview, GPU video processing, or no-preview video recording.
JPEG	MAXIMUM					No-viewfinder still image capture.
YUV	MAXIMUM					In-application video/image processing.
PRIV	PREVIEW	JPEG	MAXIMUM			Standard still imaging.
YUV	PREVIEW	JPEG	MAXIMUM			In-app processing plus still capture.
PRIV	PREVIEW	PRIV	PREVIEW			Standard recording.
PRIV	PREVIEW	YUV	PREVIEW			Preview plus in-app processing.
PRIV	PREVIEW	YUV	PREVIEW	JPEG	MAXIMUM	Still capture plus in-app processing.

Regular Capture - LIMITED

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
PRIV	PREVIEW	PRIV	RECORD			High-resolution video recording with preview.
PRIV	PREVIEW	YUV	RECORD			High-resolution in-app video processing with preview.
YUV	PREVIEW	YUV	RECORD			Two-input in-app video processing.
PRIV	PREVIEW	PRIV	RECORD	JPEG	RECORD	High-resolution recording with video snapshot.
PRIV	PREVIEW	YUV	RECORD	JPEG	RECORD	High-resolution in-app processing with video snapshot.
YUV	PREVIEW	YUV	PREVIEW	JPEG	MAXIMUM	Two-input in-app processing with still capture.

Regular Capture - FULL

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
PRIV	PREVIEW	PRIV	MAXIMUM			Maximum-resolution GPU processing with preview.
PRIV	PREVIEW	YUV	MAXIMUM			Maximum-resolution in-app processing with preview.
YUV	PREVIEW	YUV	MAXIMUM			Maximum-resolution two-input in-app processing.
PRIV	PREVIEW	PRIV	PREVIEW	JPEG	MAXIMUM	Video recording with maximum-size video snapshot
YUV	640x480	PRIV	PREVIEW	YUV	MAXIMUM	Standard video recording plus maximum-resolution in-app processing.
YUV	640x480	YUV	PREVIEW	YUV	MAXIMUM	Preview plus two-input maximum-resolution in-app processing.

Regular Capture – RAW Capability

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
RAW	MAXIMUM					No-preview DNG capture.
PRIV	PREVIEW	RAW	MAXIMUM			Standard DNG capture.
YUV	PREVIEW	RAW	MAXIMUM			In-app processing plus DNG capture.
PRIV	PREVIEW	PRIV	PREVIEW	RAW	MAXIMUM	Video recording with DNG capture.
PRIV	PREVIEW	YUV	PREVIEW	RAW	MAXIMUM	Preview with in-app processing and DNG capture.
YUV	PREVIEW	YUV	PREVIEW	RAW	MAXIMUM	Two-input in-app processing plus DNG capture.
PRIV	PREVIEW	JPEG	MAXIMUM	RAW	MAXIMUM	Still capture with simultaneous JPEG and DNG.
YUV	PREVIEW	JPEG	MAXIMUM	RAW	MAXIMUM	In-app processing with simultaneous JPEG and DNG.

Regular Capture – BURST Capability

Target 1		Target 2		Sample use case(s)
Type	Max size	Type	Max size	
PRIV	PREVIEW	PRIV	MAXIMUM	Maximum-resolution GPU processing with preview.
PRIV	PREVIEW	YUV	MAXIMUM	Maximum-resolution in-app processing with preview.
YUV	PREVIEW	YUV	MAXIMUM	Maximum-resolution two-input in-app processing.

Regular Capture – LEVEL_3

Target 1		Target 2		Target 3		Target 4		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	Type	Max size	
PRIV	PREVIEW	PRIV	640x480	YUV	MAXIMUM	RAW	MAXIMUM	In-app viewfinder analysis with dynamic selection of output format.
PRIV	PREVIEW	PRIV	640x480	JPEG	MAXIMUM	RAW	MAXIMUM	In-app viewfinder analysis with dynamic selection of output format.

Regular Capture – Concurrent stream

Target 1		Target 2		Sample use case(s)
Type	Max size	Type	Max size	
YUV	s1440p			In-app video / image processing.
PRIV	s1440p			In-app viewfinder analysis.
JPEG	s1440p			No viewfinder still image capture.
YUV / PRIV	s720p	JPEG	s1440p	Standard still imaging.
YUV / PRIV	s720p	YUV / PRIV	s1440p	In-app video / processing with preview.

sVGA: $\min(\max(\text{StreamConfigurationMap}\#\text{getOutputSizes}), 640 \times 480)$

s1440p: $\min(\max(\text{StreamConfigurationMap}\#\text{getOutputSizes}), 1920 \times 1440)$

s720p: $\min(\max(\text{StreamConfigurationMap}\#\text{getOutputSizes}), 1280 \times 720)$

Regular Capture – MultiResolution outputs Legacy Level

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
PRIV	MULTI_RES					Simple preview, GPU video processing, or no-preview video recording.
JPEG	MULTI_RES					No-viewfinder still image capture.
PRIV	PREVIEW	JPEG	MULTI_RES			Standard still imaging.
PRIV	PREVIEW	YUV	PREVIEW	JPEG	MULTI_RES	Still capture plus in-app processing.

Regular Capture – MultiResolutionoutputs LIMITED Level

Target 1		Target 2		Target 3		Sample use case(s)
Type	Max size	Type	Max size	Type	Max size	
YUV	PREVIEW	YUV	PREVIEW	JPEG	MULTI_RES	Two-input in-app processing with still capture.

Regular Capture – 特殊对待QCIF

- 前面介绍的一定支持的流配置表时，提到只要小于这个表中的Size也能支持，但有一个例外：QCIF(176x144)
- 因为通常Camera底层的downscale能力都是有限的（最大能downscale多少倍），如果从 $\geq 1920 \times 1080$ 的分辨率downscale到176x144，有可能不支持

Constrained high-speed recording 流配置

- 支持CONSTRAINED_HIGH_SPEED_VIDEO Capability
- 帧率 ≥ 120 FPS
- 与普通Capture Session比，有如下限制
 - 最多支持2个Output Surfaces
 - 每个Output Surface的Size必须一样，来自StreamConfigurationMap#getHighSpeedVideoSizes
 - 只能通过captureBurst 或 setRepeatingBurst方法向Camera底层送CaptureRequest List， CaptureRequest List来自CameraConstrainedHighSpeedCaptureSession#createHighSpeedRequest List
 - FPS Range必须来自StreamConfigurationMap#getHighSpeedVideoFpsRangesFor

Thanks