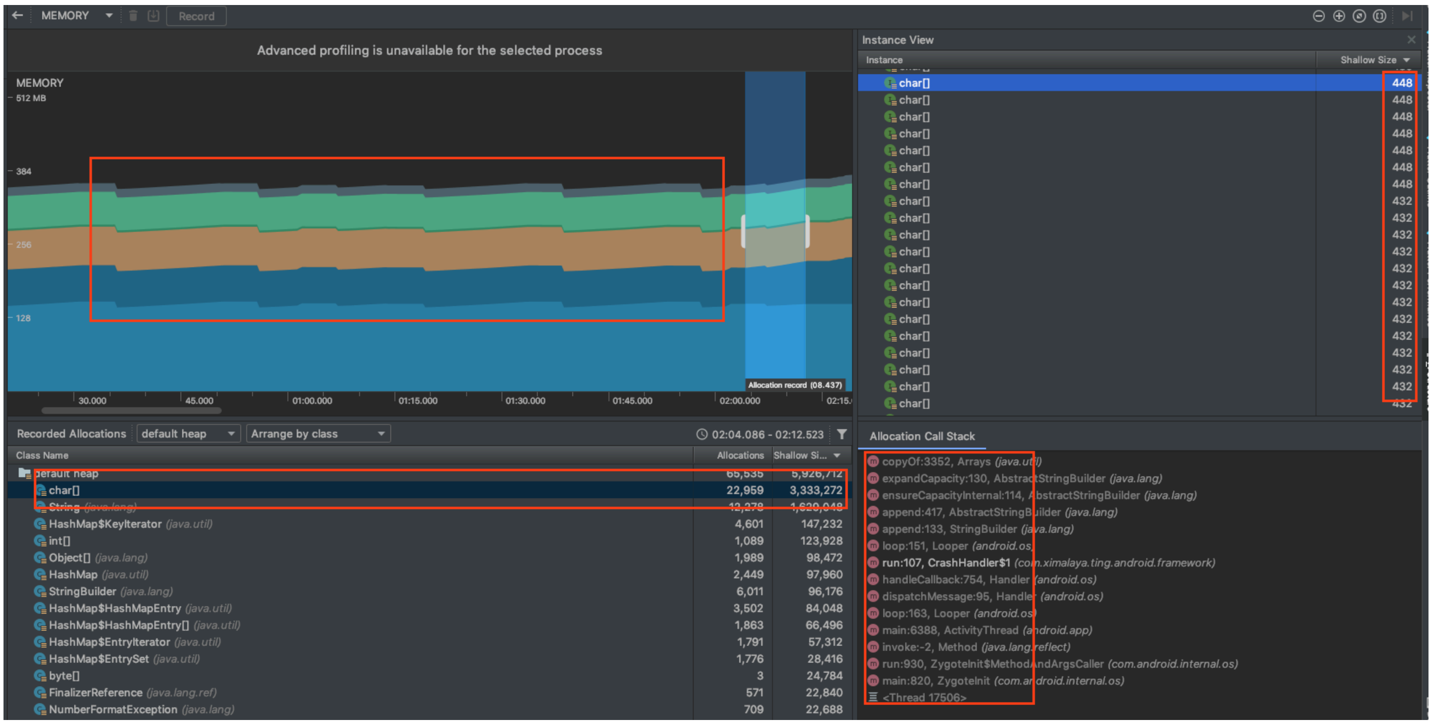
1. 字符串使用加号拼接

简单的拼接:

```
protected void onDraw(Canvas canvas) {
 ...
 Logger.d("test","sampleIndex:" + sampleIndex + ",mSamplingScaleFactor:" + mSampling
 ...
}
```

设置"setMessageLogging"后，触发Looper中的日志打印，线程消息频繁时，扩容明显:

```
 public static void loop() {
        for (;;) {
            Message msg = queue.next(); // might block
            if (msg == null) {
                // No message indicates that the message queue is quitting.
                return;
            }
            final Printer logging = me.mLogging;
            if (logging != null) {
                logging.println(">>>>> Dispatching to " + msg.target + " " +
                        msg.callback + ": " + msg.what);
            }
            .......
            if (logging != null) {
                logging.println("<<<<< Finished to " + msg.target + " " + msg.callba
            }
        }
 }
```

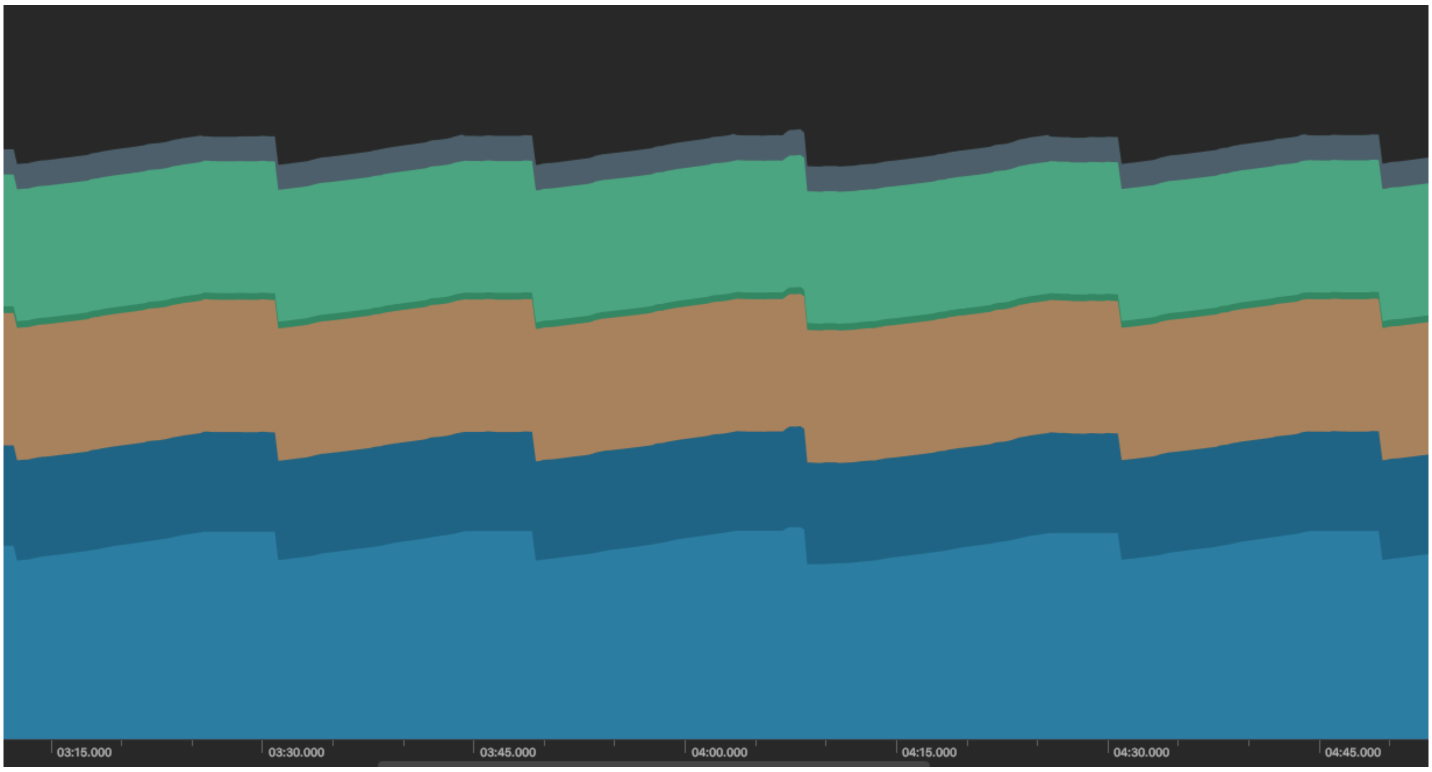


Class Name	Allocations	Shallow Si...
default heap	65,535	5,926,712
char[]	22,959	3,333,272
String *(java.lang)*	12,278	1,620,048
HashMap$KeyIterator *(java.util)*	4,601	147,232
int[]	1,089	123,928
Object[] *(java.lang)*	1,989	98,472
HashMap *(java.util)*	2,449	97,960
StringBuilder *(java.lang)*	6,011	96,176
HashMap$HashMapEntry *(java.util)*	3,502	84,048
HashMap$HashMapEntry[] *(java.util)*	1,863	66,496
HashMap$EntryIterator *(java.util)*	1,791	57,312
HashMap$EntrySet *(java.util)*	1,776	28,416
byte[]	3	24,784
FinalizerReference *(java.lang.ref)*	571	22,840
NumberFormatException *(java.lang)*	709	22,688

Instance	Shallow Size
char[]	448
char[]	448
char[]	448
char[]	448
char[]	448
char[]	448
char[]	448
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432
char[]	432

```
copyOf:3352, Arrays (java.util)
expandCapacity:130, AbstractStringBuilder (java.lang)
ensureCapacityInternal:114, AbstractStringBuilder (java.lang)
append:417, AbstractStringBuilder (java.lang)
append:133, StringBuilder (java.lang)
loop:151, Looper (android.os)
run:107, CrashHandler$1 (com.ximalaya.ting.android.framework)
handleCallback:754, Handler (android.os)
dispatchMessage:95, Handler (android.os)
loop:163, Looper (android.os)
main:6388, ActivityThread (android.app)
invoke:-2, Method (java.lang.reflect)
run:930, ZygoteInit$MethodAndArgsCaller (com.android.internal.os)
main:820, ZygoteInit (com.android.internal.os)
<Thread 17506>
```

以上是主app静置，大约20~30s左右出现一次锯齿；

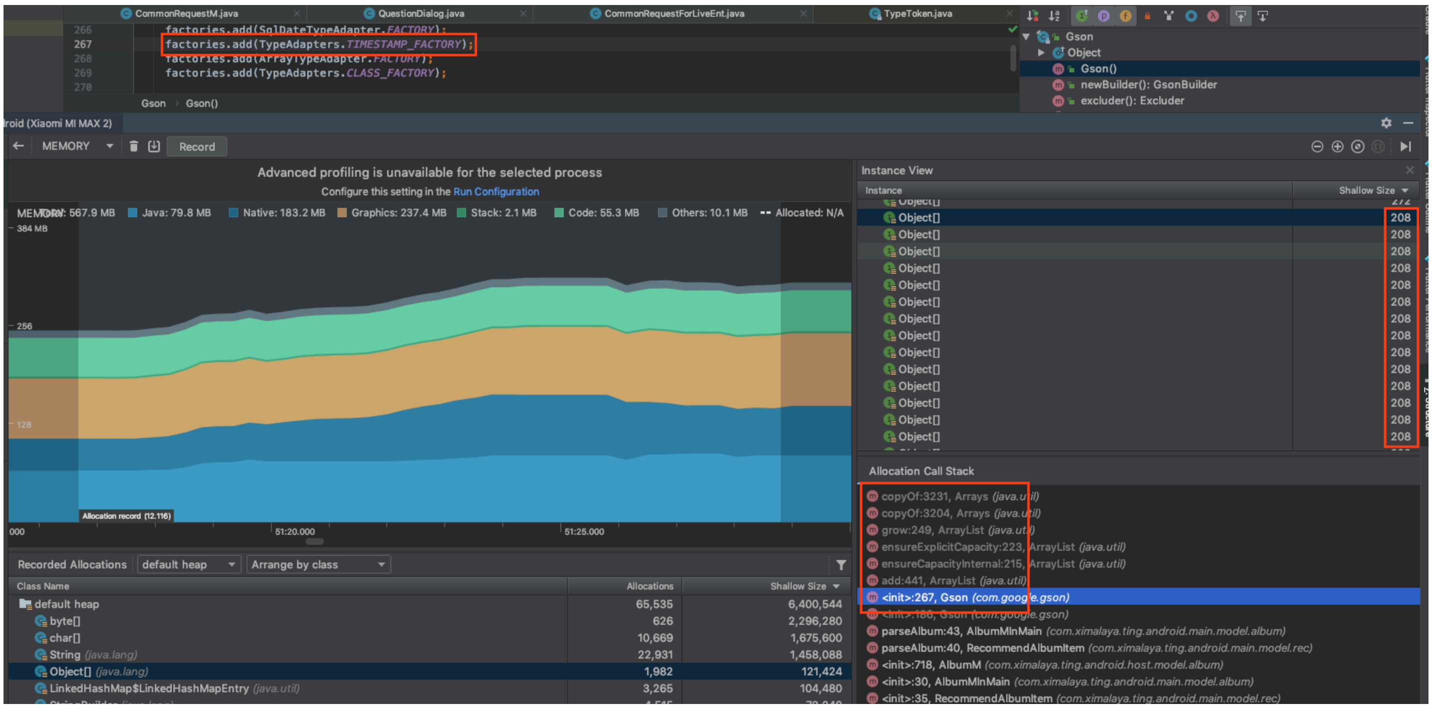


录音页回调消息依赖MainLooper，且回调频繁，大约10s左右出现一次锯齿，频率更高；

2. 对象(资源)未能复用

```
while(isRun) {
    ShortBuffer buf = new ShortBuffer();
    int read = mAudioRecord.read(buff.array(), 0,   buff.capacity());
    ....
}
```

Gson 实例化代价大，ArrayList初始化的高占用



```
factories.add(SqlDateTypeAdapter.FACTORY);
factories.add(TypeAdapters.TIMESTAMP_FACTORY);
factories.add(ArrayTypeAdapter.FACTORY);
factories.add(TypeAdapters.CLASS_FACTORY);
```

Advanced profiling is unavailable for the selected process
Configure this setting in the Run Configuration

MEMORY: 567.9 MB Java: 79.8 MB Native: 183.2 MB Graphics: 237.4 MB Stack: 2.1 MB Code: 55.3 MB Others: 10.1 MB Allocated: N/A

Allocation record (12.116)

Instance	Shallow Size
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208
Object[]	208

Allocation Call Stack

```
copyOf:3231, Arrays (java.util)
copyOf:3204, Arrays (java.util)
grow:249, ArrayList (java.util)
ensureExplicitCapacity:223, ArrayList (java.util)
ensureCapacityInternal:215, ArrayList (java.util)
add:441, ArrayList (java.util)
<init>:267, Gson (com.google.gson)
<init>:186, Gson (com.google.gson)
parseAlbum:43, AlbumMInMain (com.ximalaya.ting.android.main.model.album)
parseAlbum:40, RecommendAlbumItem (com.ximalaya.ting.android.main.model.rec)
<init>:718, AlbumM (com.ximalaya.ting.android.host.model.album)
<init>:30, AlbumMInMain (com.ximalaya.ting.android.main.model.album)
<init>:35, RecommendAlbumItem (com.ximalaya.ting.android.main.model.rec)
```

Recorded Allocations default heap Arrange by class

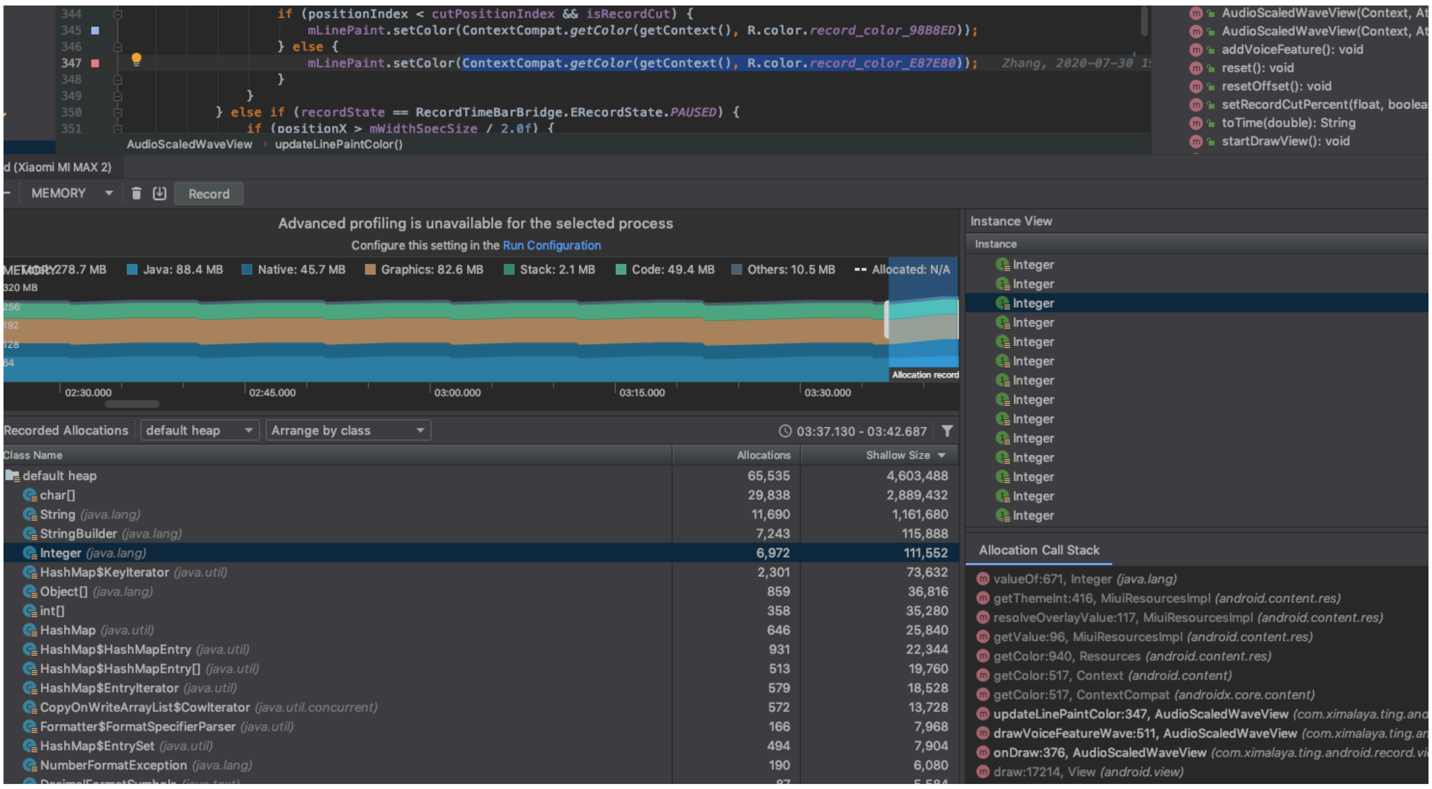
Class Name	Allocations	Shallow Size
default heap	65,535	6,400,544
byte[]	626	2,296,280
char[]	10,669	1,675,600
String (java.lang)	22,931	1,458,088
Object[] (java.lang)	1,982	121,424
LinkedHashMap$LinkedHashMapEntry (java.util)	3,265	104,480

3. 存在不合理的对象创建

```
        @Override
    protected void onDraw(Canvas canvas) {
        super.onDraw(canvas);
        updateLinePaintColor(canvas);
    }

    private void updateLinePaintColor(Canvas canvas) {
        if (mShowMode == WaveScaleHelper.ONLY_SHOW_MODE) {
            if (recordState == RecordTimeBarBridge.ERecordState.RECORDING) {
                if (positionX > mWidthSpecSize / 2.0f) {
                    mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color
                } else {
                    if (positionIndex < cutPositionIndex && isRecordCut) {
                        mLinePaint.setColor(ContextCompat.getColor(getContext(), R.c
                    } else {
                        mLinePaint.setColor(ContextCompat.getColor(getContext(), R.c
                    }
                }
            } else if (recordState == RecordTimeBarBridge.ERecordState.PAUSED) {
                if (positionX > mWidthSpecSize / 2.0f) {
                    mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color
                } else {
                    mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color
                }
            }
        } else if (mShowMode == WaveScaleHelper.TRY_LISTENER_MODE) {
            if (positionX > mWidthSpecSize / 2.0f) {
                //还没播放的显示灰色
                mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color.rec
            } else {
                mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color.rec
            }
        }
    }
```

在每次onDraw中，都去临时getColor，这Color值其实固定的



```
            if (positionIndex < cutPositionIndex && isRecordCut) {
                mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color.record_color_98B8ED));
            } else {
                mLinePaint.setColor(ContextCompat.getColor(getContext(), R.color.record_color_E87E80));   Zhang, 2020-07-30 1
            }
        }
    } else if (recordState == RecordTimeBarBridge.ERecordState.PAUSED) {
        if (positionX > mWidthSpecSize / 2.0f) {
```

AudioScaledWaveView › updateLinePaintColor()

Advanced profiling is unavailable for the selected process

Configure this setting in the Run Configuration

MEMORY 278.7 MB ▮ Java: 88.4 MB ▮ Native: 45.7 MB ▮ Graphics: 82.6 MB ▮ Stack: 2.1 MB ▮ Code: 49.4 MB ▮ Others: 10.5 MB -- Allocated: N/A

Recorded Allocations | default heap | Arrange by class | 03:37.130 - 03:42.687

Class Name	Allocations	Shallow Size
default heap	65,535	4,603,488
char[]	29,838	2,889,432
String *(java.lang)*	11,690	1,161,680
StringBuilder *(java.lang)*	7,243	115,888
Integer *(java.lang)*	6,972	111,552
HashMap$KeyIterator *(java.util)*	2,301	73,632
Object[] *(java.lang)*	859	36,816
int[]	358	35,280
HashMap *(java.util)*	646	25,840
HashMap$HashMapEntry *(java.util)*	931	22,344
HashMap$HashMapEntry[] *(java.util)*	513	19,760
HashMap$EntryIterator *(java.util)*	579	18,528
CopyOnWriteArrayList$CowIterator *(java.util.concurrent)*	572	13,728
Formatter$FormatSpecifierParser *(java.util)*	166	7,968
HashMap$EntrySet *(java.util)*	494	7,904
NumberFormatException *(java.lang)*	190	6,080

Instance View

Instance
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer
Integer

Allocation Call Stack

```
valueOf:671, Integer (java.lang)
getThemeInt:416, MiuiResourcesImpl (android.content.res)
resolveOverlayValue:117, MiuiResourcesImpl (android.content.res)
getValue:96, MiuiResourcesImpl (android.content.res)
getColor:940, Resources (android.content.res)
getColor:517, Context (android.content)
getColor:517, ContextCompat (androidx.core.content)
updateLinePaintColor:347, AudioScaledWaveView (com.ximalaya.ting.and
drawVoiceFeatureWave:511, AudioScaledWaveView (com.ximalaya.ting.an
onDraw:376, AudioScaledWaveView (com.ximalaya.ting.android.record.vi
draw:17214, View (android.view)
```

获取的Integer由于超过了AutoBox的范围，每次都会实例化

一些建议：

1. 使用StringBuilder代替加号；初始化时设置容量，减少StringBuilder扩容

2. 减少主线程的非必要消息处理，降低主线程压力(在MainLooper设置setMessageLogging时）。

3. 使用对象缓存池，以重用频繁申请和释放的对象.

```
ShortBuffer  buff = Buffer.obtain();
int read = mAudioRecord.read(buff.array(), 0, buff.capacity());
....
Buffer.recycle(buff);
```

4. 避免在循环中不断创建局部变量

循环也可以是getView、onDraw等；局部变量可以使用全局代替，一次初始化多次复用；

```
int C_C3C5CC;

void init (){
    C_C3C5CC = ContextCompat.getColor(context, R.color.record_color_c3c5cc);
}

void updateLinePaintColor(Canvas canvas) {
    mLinePaint.setColor(C_C3C5CC);
}

@Override
protected void onDraw(Canvas canvas) {
    super.onDraw(canvas);
    updateLinePaintColor(canvas);
}
```

一次实例化Gson，多次复用：

```
static sGson = new Gson();
func() {
    sGson.fromJson();
}
```

5. 使用合理的数据结构

使用 **SparseArray类族**、**ArrayMap** 来替代 **HashMap。**